

Ten New Species of Paramunnid Isopods (Peracarida: Asellota: Paramunnidae) from Kyushu, Southern Japan

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Abstract Ten new species of the asellote family Paramunnidae are described from Kyushu, southwestern Japan, three of which are assigned to two new genera: *Pleurogonium tanseimaruae* sp. nov., *P. kyushuense* sp. nov., *Notoxenoides setosa* sp. nov., *Austrogonium japonicum* sp. nov., *Heterosignum hashimotoi* sp. nov., *Acutomunna minuta* sp. nov., *Ascionana bathyalis* sp. nov., *Dentigonium tantulum* gen. et sp. nov., *Spinogonium spinosum* gen. et sp. nov., and *S. decoratum* gen. et sp. nov. Systematic position of each species is discussed in detail.

Key words: Isopoda, Asellota, Paramunnidae, new genus, new species, Japan.

The Paramunnidae Vanhöffen, 1914 is one of the largest family in the suborder Asellota, consisting of about 125 species classified into 36 genera, all of which are tiny benthic dwellers known worldwide from shallow tidal to abyssal depths (Just and Wilson, 2004; 2006; 2007). Among them, eleven species and one subspecies of six genera have been so far reported from Japanese waters: *Ascionana rhipis* (Shimomura and Mawatari, 1999), *Tethygonium armigerum* (Shimomura and Mawatari, 2000), *Boreosignum orientale* (Shimomura and Mawatari, 2000), *Paramunna koreana* Malyutina and Ushakova, 2001, *Pleurogonium bifolium* Shimomura and Mawatari, 2001, *P. hispidum* Shimomura and Mawatari, 2001, *P. angustum* Kussakin, 1972, *P. inerme orientale* Kussakin, 1962, *Heterosignum mutsuensis* Gamô, 1976, *H. elegans* Shimomura and Mawatari, 2002, *H. ohtsukai* Shimomura and Mawatari, 2002, and *H. otsuchiensis* Shimomura and Mawatari, 2002 (Shimomura *et al.*, 2008).

Collections of small crustaceans obtained during three research cruises around Kyushu, southern Japan (Fig. 1), by the RV *Tansei-maru* of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) (cruise KT-07-01) and the TS *Nagasaki-maru* of Nagasaki University

(cruises N237 and N251), contained ten undescribed species of the family. In this study, these ten new species are described and illustrated in detail, and compared with allied taxa. Two new genera are also described for the three new species.

Materials and Methods

The sampling gears used for collections were beam trawls of 3 m span opening. Samples were suspended on board, and the suspensions containing light particles such as small organisms were decanted through a sieve with a pore size of 0.5 mm. The processed sediment samples were fixed in 10% borate buffered formalin sea-water immediately. Thereafter, isopod specimens were sorted out under a stereomicroscope and preserved in 70% ethanol. Each specimen was dissected and prepared for observation under a differential interference contrast microscope (Nikon E600) equipped with a camera lucida.

Terminology and measurements used herein follows those of Just and Wilson (2004; 2006). The type specimens are deposited in the Kitakyushu Museum of Natural History and Human History (KMNH) and the National Museum of

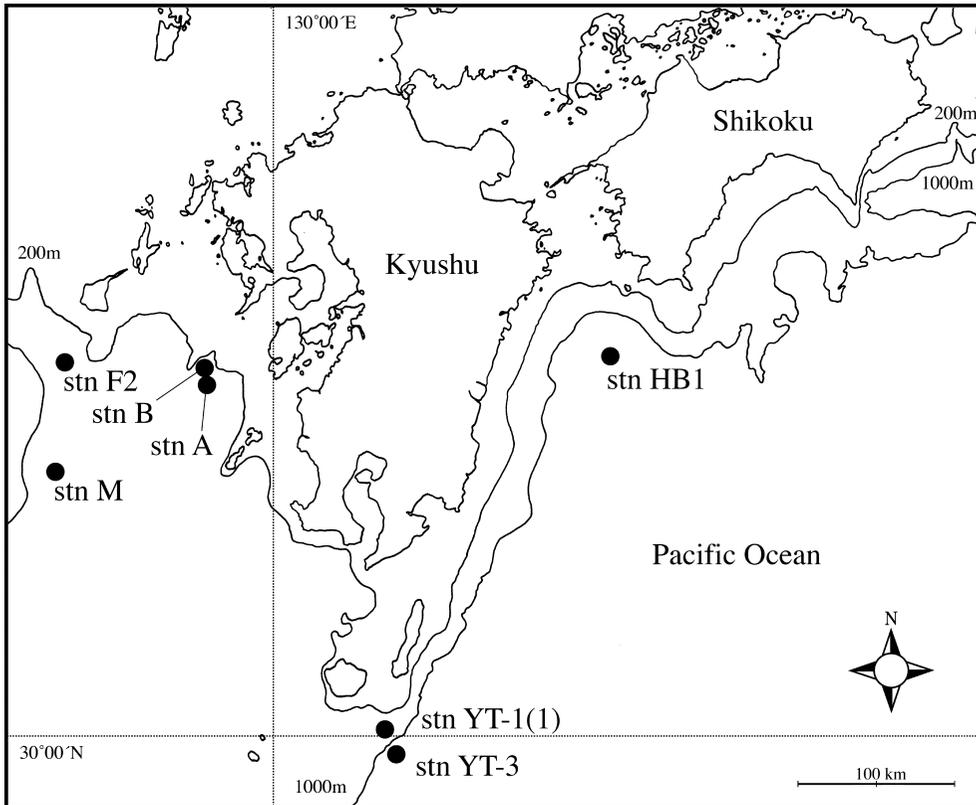


Fig. 1. Sampling sites for beam trawl operations by the RV *Tansei-maru* and TS *Nagasaki-maru*.

Nature and Science, Tokyo (NSMT).

Taxonomy

Genus *Pleurogonium* G. O. Sars, 1864

[New Japanese name: Menashi-hime-mizumushi-zoku]

Pleurogonium tanseimaruae sp. nov.

[New Japanese name: Tansei-menashi-hime-mizumushi]

(Figs. 2–3)

Material examined. Holotype: male (1.24 mm), KMNH IvR 500,287, RV *Tansei-maru*, KT07-01 cruise, stn YT-3, off Yakushima to Tanegashima islands, Ohsumi Islands, 1677–1769 m, 29°51.041'N, 130°55.685'E to 29°49.815'N, 130°54.457'E, 24 February 2007, beam trawl.

Allotype: female (1.27 mm, with 6 eggs), KMNH IvR 500,288, same data as holotype.

Paratypes: 2 ovigerous females (1.14 mm, with 3 eggs, KMNH IvR 500,289; 1.13 mm, with 6 eggs, NSMT-Cr 19565); 3 females (1.06 mm, NSMT-Cr 19566; 1.00 mm, KMNH IvR 500,292; 0.96 mm, KMNH IvR 500,293), same data as holotype.

Description. Male (holotype). Body (Fig. 2A) widest at pereonite 3, width 0.4 times length. Head (Fig. 2A) 0.6 times as long as wide. Frontal margin broadly rounded; eyestalks short, vestigial.

Pereonites (Fig. 2A) each with few setae laterally, without dorsal setae; lateral margins broadly rounded. Coxae (Fig. 2A) visible in dorsal view on all pereonites, each with simple seta laterally; coxae 1–4 each with single, short, spine-like projection laterally; coxae 5–7 rounded laterally. Pleon (Fig. 2A) 0.3 times as long as wide, without setae. Pleotelson (Fig. 2A) 1.2 times as long

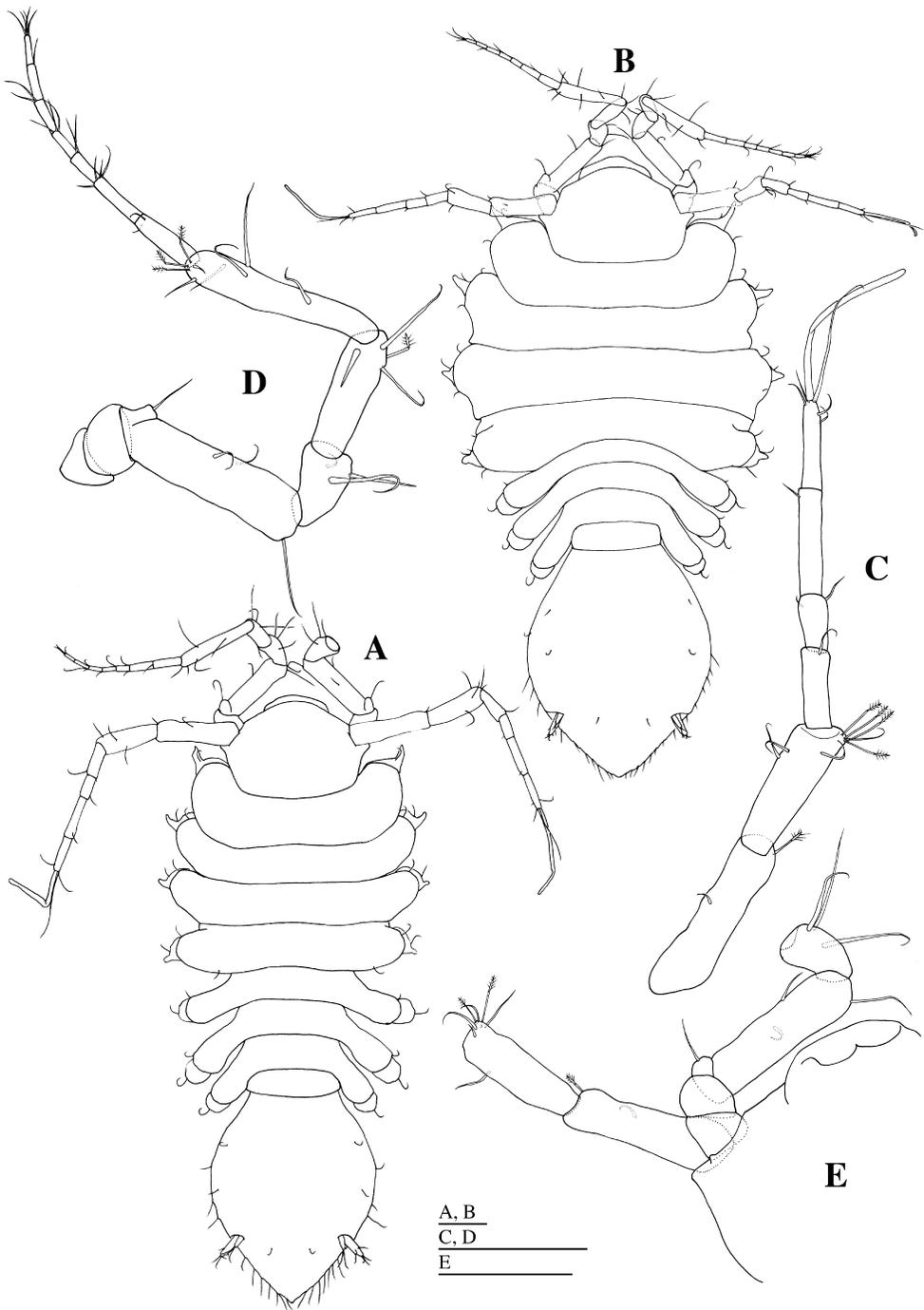


Fig. 2. *Pleurogonium tanseimaruae* sp. nov. A, C–E, holotype, male (KMNH IvR 500,287); B, allotype, female (KMNH IvR 500,288). A, B, habitus, dorsal view; C, left antennula, dorsal view; D, left antenna, dorsal view; E, right part of head, antennula, and antenna, ventral view. Scale bars: 100 μ m.

as wide, with 6 short setae dorsally and 20 short setae laterally.

Antennula (Fig. 2C, E) with article 1 bearing simple seta and broom seta laterally; article 2 0.8 length of article 1, with 2 simple setae laterally, 2 simple setae and 4 broom setae medially; article 3 0.6 length of article 2, with simple seta distally; article 4 0.7 length of article 3, with 2 simple setae distally; article 5 1.9 length of article 4, with simple seta distally; article 6 0.8 length of article 5, with 2 short simple setae subapically, 2 short and 1 long simple setae and aesthetasc apically.

Antenna (Fig. 2D, E) with articles 1 and 2 combined 0.4 length of article 3; articles 1 and 2 without setae; article 3 with 3 simple setae laterally and 1 simple seta mediolaterally, without distomedial projection; article 4 with 3 simple setae medially; article 5 1.6 length of article 4, with 3 simple setae and 1 broom seta distally; article 6 1.5 length of article 5, with 4 simple setae medially, and 2 simple setae and 3 broom setae distally. Flagellum consisting of 7 articles; proximal article 1.3 length of second article.

Left mandible (Fig. 3A) with 4-toothed lacinia mobilis on incisor process and 2 fine simple setae on molar process; right mandible (Fig. 3B) with 2 serrate setae on incisor process and 1 fine simple seta and membranous seta on molar process.

Maxillula (Fig. 3C) with 2 stout simple setae and fine simple seta on inner ramus and 10 stout simple setae and few fine setae on outer ramus. Maxilla (Fig. 3D) with 8 stout simple setae distally on inner ramus; 4 stout simple setae on each lobes of outer ramus.

Maxilliped (Fig. 3E) with article 1 of palp bearing short seta medially; article 2 twice as long as article 1, with 1 seta medially; article 3 1.3 length of article 2, with 2 setae medially and 1 seta distolaterally; article 4 0.9 length of article 3, with 2 setae medially; article 5 0.6 length of article 4, with 5 setae. Endite with 2 fan-shaped setae and 4 serrate setae distally, and 2 coupling hooks medially; epipod ovate, apically blunt.

Pereopod 1 (Fig. 3F) with 1 simple dorsal and 2 simple ventral setae on basis; ischium 0.7

length of basis, with simple seta dorsally and distoventrally; merus trapezoidal, half length of ischium, with 2 simple setae dorsally and 4 simple setae ventrally; carpus triangular, 1.1 length of merus, 0.5 times as long as wide, with 1 denticle and 4 robust setae on ventral margin and 1 simple seta dorsally; propodus 2.5 length of carpus, with 4 simple setae and small fringe of scales on ventral margin, 2 simple setae dorsally and 1 simple seta medially; dactylus with 4 subapical and 2 apical simple setae, unguis as long as dactylus, supplementary claw almost half length of unguis. Pereopod 2 (Fig. 3G) with 1 dorsal and 2 ventral simple setae on basis; ischium 1.1 length of basis, with 1 dorsal, 2 ventral and 1 medial simple setae; merus half length of ischium, with 2 dorsal and 3 ventral simple setae; carpus 2.2 length of merus, with 3 simple setae dorsally and 3 robust and 1 simple setae ventrally; propodus 0.9 length of carpus, with 2 simple and 1 broom setae dorsally, and 1 robust and 3 simple setae ventrally; dactylus with 2 subapical and 2 apical simple setae, unguis and supplementary claw. Pereopods 2 to 7 slightly increasing in length posteriorly.

Pleopod 1 (Fig. 3H) with lateral lobes arising at level of 0.7 of its length; lateral lobe 0.3 times of total width of single ramus of pleopod; distal projection 0.3 times of total length of pleopod, acuminate. Pleopod 2 (Fig. 3I) with protopod 2.8 longer than wide, with 16 lateral simple setae; second article of endopod moderately short, not reaching apex of protopod. Pleopod 3 (Fig. 3J) with endopod 0.5 length of second article of exopod.

Uropod (Fig. 3L) with endopod bearing 2 simple setae laterally, 1 simple seta medially and 5 broom setae apically; exopod with 2 simple setae apically.

Female (allotype). Body half as wide as long (Fig. 2B). Pleotelson (Fig. 2B) 1.2 times as long as wide. Operculum (Fig. 3K) 0.8 times as wide as long, with 36 fine setae laterally and 7 simple setae ventrally.

Paratypes. The female paratypes are morphologically very similar to the allotype. Body width

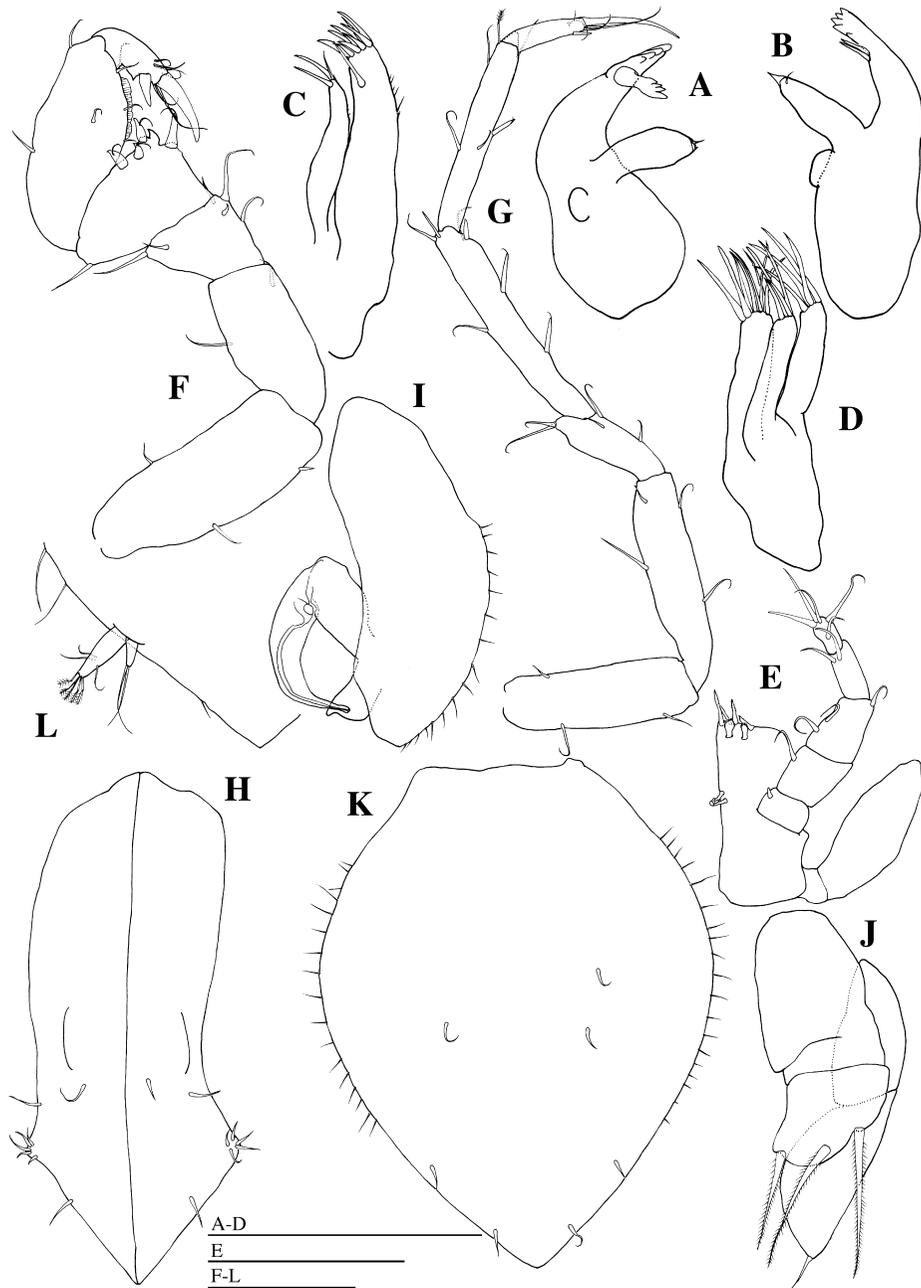


Fig. 3. *Pleurogonium tanseimaruae* sp. nov. A–J, L, holotype, male (KMNH IvR 500,287); K, allotype, female (KMNH IvR 500,288). A, left mandible, ventral view; B, right mandible, ventral view; C, left maxillula, ventral view; D, left maxilla, ventral view; E, left maxilliped, ventral view; F, left pereopod 1, medial view; G, left pereopod 2, medial view; H, pleopod 1, ventral view; I, left pleopod 2, ventral view; J, right pleopod 3, dorsal view; K, operculum, ventral view; L, left uropod, dorsal view. Scale bars: 100 μ m.

0.5–0.6 times length.

Remarks. *Pleurogonium tanseimaruae* sp. nov. is similar to *P. intermedium* Hansen, 1916, known from the northwestern Atlantic (north of Iceland and northwest of the Faeroes) in having a single spine-like projection on each coxae 1–4 and unarmed coxae 5–7. It differs from *P. intermedium* in having four robust setae and one ventral denticle on the carpus of the pereopod 1. In *P. intermedium*, there are three robust setae but no denticle on the carpus of the pereopod 1.

Etymology. The species is named after the RV *Tansei-maru* of JAMSTEC.

***Pleurogonium kyushuense* sp. nov.**

[New Japanese name: Kyushu-menashi-hime-mizumushi]
(Figs. 4–5)

Material examined. Holotype: male (1.06 mm), KMNH IvR 500,294, RV *Tansei-maru*, KT07-01 cruise, stn YT-1(1), off Yakushima to Tanegashima islands, 565–723 m, 30°04.401'N, 130°59.945'E to 30°04.538'N, 130°57.889'E, 24 February 2007, beam trawl.

Allotype: female (1.49 mm, with 8 eggs, KMNH IvR 500,295), same data as holotype.

Paratypes: 4 ovigerous females (1.38 mm, with 5 eggs, NSMT-Cr 19567; 1.33 mm, with 6 eggs, KMNH IvR 500,296; 1.25 mm, with 3 eggs, NSMT-Cr 19568; 1.17 mm, with 6 eggs, KMNH IvR 500,298), 7 females (1.48 mm, KMNH IvR 500,299; 1.38 mm, KMNH IvR 500,300; 1.33 mm, KMNH IvR 500,301; 1.15 mm, KMNH IvR 500,302; 1.09 mm, KMNH IvR 500,303; 1.07 mm, KMNH IvR 500,304; 1.04 mm, KMNH IvR 500,305), same data as holotype; 1 male (1.31 mm, KMNH IvR 500,306), 1 female (1.39 mm, KMNH IvR 500,307), TS *Nagasaki-maru*, N237 cruise, stn B, 415–406 m, 32°15.09'N, 129°29.65'E to 32°15.12'N, 129°28.19'E, 8 May 2007, beam trawl.

Description. Male (holotype). Body (Fig. 4A) widest at pereonite 3, width 0.4 times length. Head (Fig. 4A) 0.7 times as long as wide, with pair of short setae dorsally; frontal margin broadly rounded; eyestalks short, vestigial.

Pereonites (Fig. 4A) broadly rounded, each with few lateral setae and pair of dorsal setae. Coxae (Fig. 4A) visible in dorsal view on all pereonites, each with simple seta laterally; coxae 1–4 each with single, long, spine-like projection laterally; coxae 5–7 rounded laterally. Pleon (Fig. 4A) 0.3 times as long as wide, with pair of dorsal setae. Pleotelson (Fig. 4A) 1.4 times longer than wide, with pair of setae dorsally and some fine setae posterolaterally.

Antennula (Fig. 4C, E) with 1 medial simple seta on article 1; article 2 0.8 length of article 1, with 2 simple setae distolaterally, 1 simple seta and 4 broom setae distomedially; article 3 half length of article 2, with simple seta distally; article 4 0.9 length of article 3, with 1 simple seta distally; article 5 1.3 length of article 4; article 6 as long as article 5, with 3 short simple setae subapically, 1 short and 1 long simple setae and aesthetasc apically.

Antenna (Fig. 4D, E) with articles 1 and 2 combined 0.3 length of article 3; articles 1 and 2 without setae; article 3 projecting mediodistally, with 2 simple setae laterally and 1 simple seta ventrally, and 2 simple setae mediodistally; article 4 with 3 simple setae; article 5 twice length of article 4, with 4 simple setae and 1 broom seta distally; article 6 1.2 length of article 5, with 4 simple setae medially, and 1 simple seta and 3 broom setae distally. Flagellum consisting of 7 articles; proximal article 0.9 length of second article.

Left mandible (Fig. 5A) with 4-toothed lacinia mobilis and 3 serrate setae on incisor process and 1 simple seta on molar process; right mandible (Fig. 5B) with 3 serrate setae on incisor process.

Maxillula (Fig. 5C) with 3 stout simple setae on inner ramus and 7 stout simple setae on outer ramus. Maxilla (Fig. 5D) with 6 stout simple setae distally on inner ramus; 4 stout simple setae on each lobes of outer ramus.

Maxilliped (Fig. 5E) with article 1 of palp bearing seta medially; article 2 twice as long as article 1, with 1 seta medially; article 3 1.1 length of article 2, with 2 setae medially; article 4 0.9 length of article 3, with 2 setae medially;

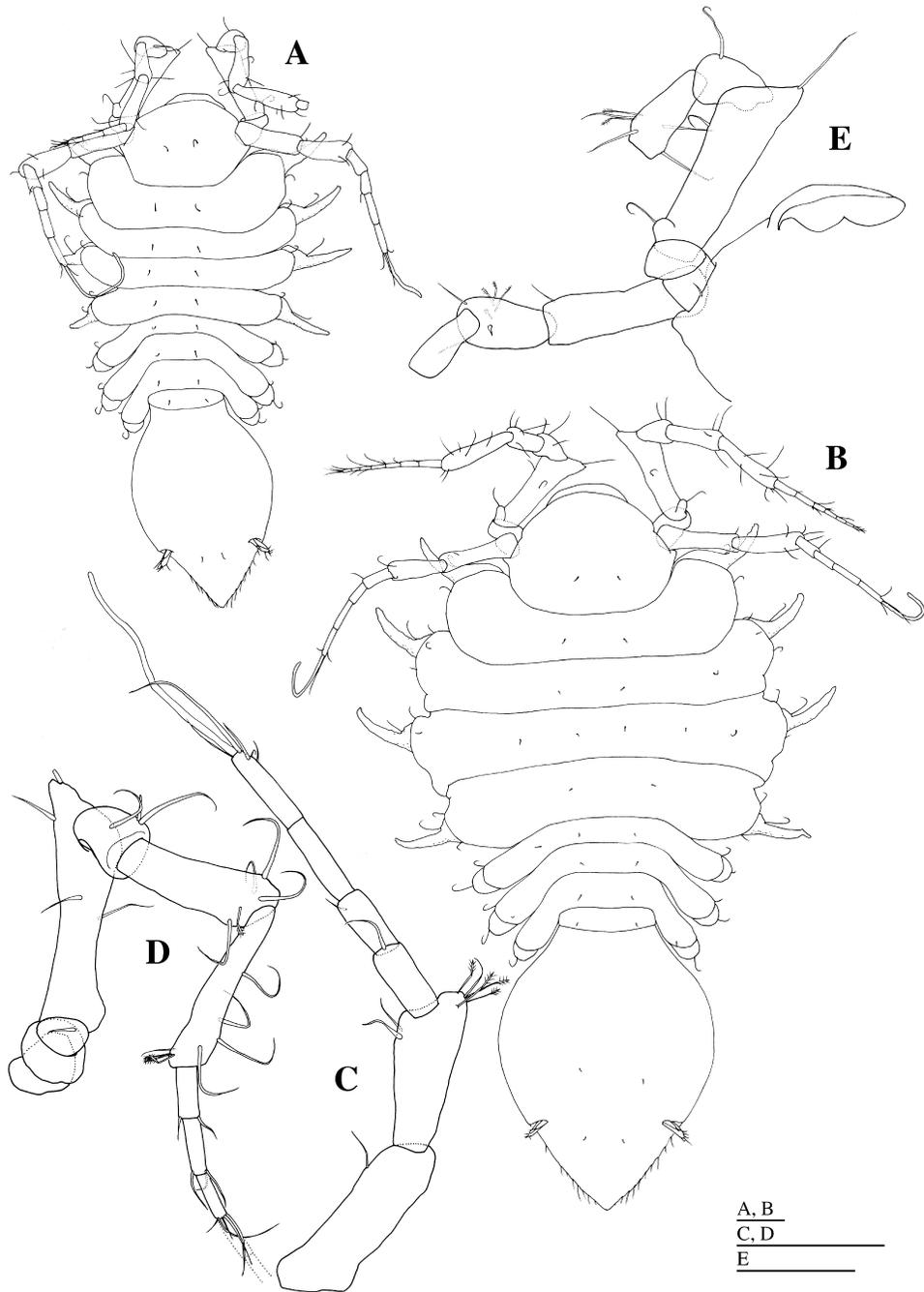


Fig. 4. *Pleurogonium kyushuense* sp. nov. A, C–E, holotype, male (KMNH IvR 500,294); B, allotype, female (KMNH IvR 500,295). A, B, habitus, dorsal view; C, left antennula, dorsal view; D, left antenna, ventral view; E, right part of head, antennula and antenna, ventral view. Scale bars: 100 μ m.

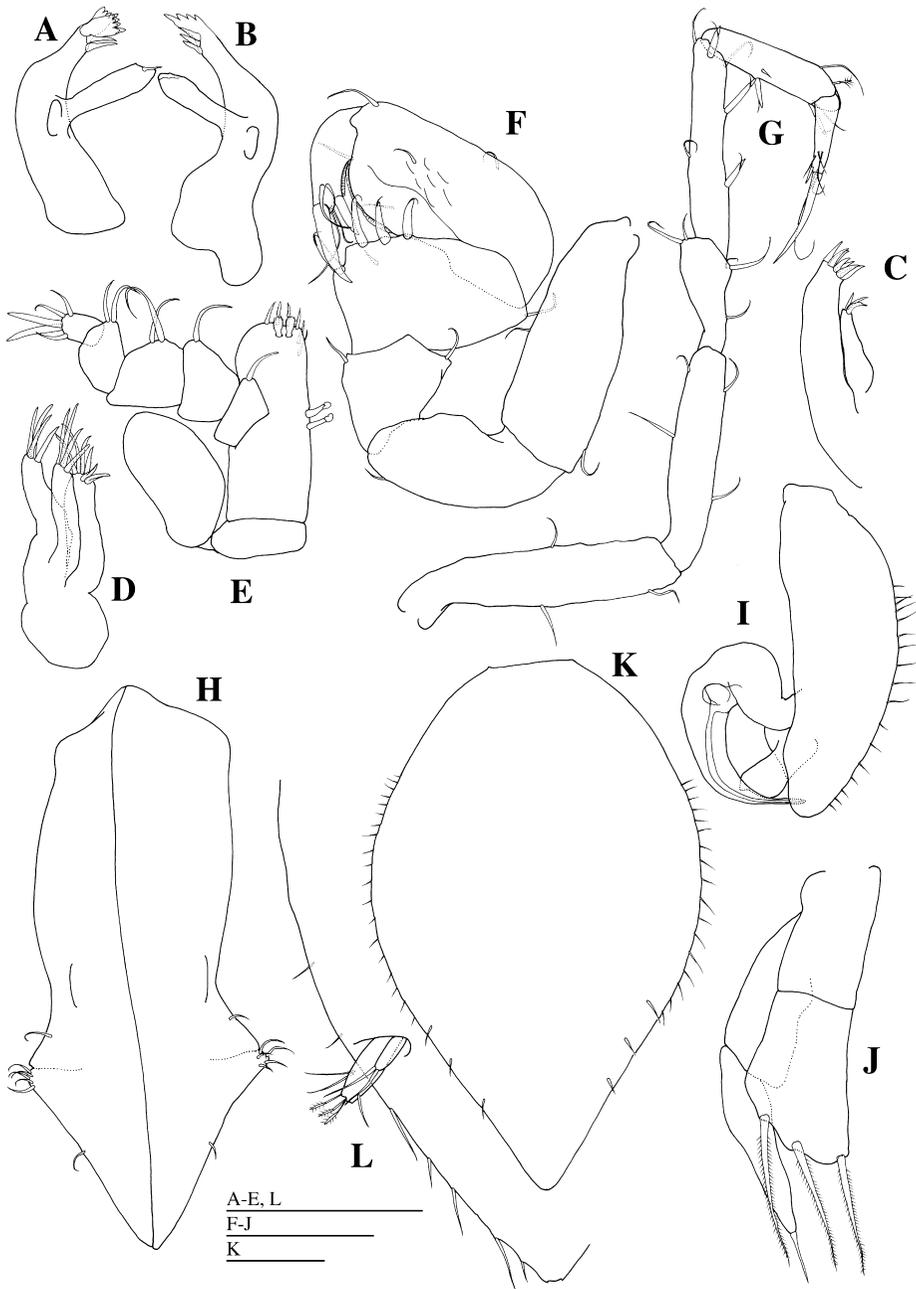


Fig. 5. *Pleurogonium kyushuense* sp. nov. A–J, L, holotype, male (KMNH IvR 500,294); K, allotype, female (KMNH IvR 500,295). A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxillula, dorsal view; D, left maxilla, dorsal view; E, right maxilliped, ventral view; F, right pereopod 1, medial view; G, left pereopod 2, medial view; H, pleopod 1, ventral view; I, left pleopod 2, ventral view; J, right pleopod 3, ventral view; K, operculum, ventral view; L, left uropod, dorsal view. Scale bars: 100 μ m.

article 5 0.6 length of article 4, with 5 setae. Endite with 2 fan-shaped setae and 4 serrate setae distally, and with 2 stout simple setae and 2 coupling hooks medially; epipod ovate, apically blunt.

Pereopod 1 (Fig. 5F) with basis bearing simple seta dorsally and ventrally; ischium 0.8 length of basis, with 1 simple seta distoventrally; merus trapezoidal, 0.6 length of ischium, with simple seta dorsally and ventrally; carpus rectangular, 1.3 length of merus, 0.6 times as long as wide, with 4 robust setae on ventral margin and 1 simple seta laterally and dorsally; propodus 1.6 length of carpus, with 1 simple seta and small fringe of scales on ventral margin, 2 simple setae dorsally, 1 simple seta laterally, and with 1 simple seta and 7 simple scales medially; dactylus with 2 subapical and 2 apical simple setae, unguis and supplementary claw. Pereopod 2 (Fig. 5G) with basis bearing 1 dorsal and 2 ventral simple setae; ischium 0.8 length of basis, with 2 simple setae dorsally and ventrally; merus half length of ischium, with 2 dorsal and 3 ventral simple setae; carpus twice length of merus, with 2 simple setae dorsally and 3 robust and 1 simple setae ventrally; propodus 0.7 length of carpus, with 1 simple and 1 broom setae dorsally, and 2 robust and 2 simple setae ventrally; dactylus with 3 subapical and 2 apical simple setae, unguis and supplementary claw. Pereopods 2 to 7 slightly increasing in length posteriorly.

Pleopod 1 (Fig. 5H) with lateral lobes arising at 0.7 of its length; lateral lobe 0.4 times of total width of single ramus of pleopod; distal projection 0.3 times of total length of pleopod, acuminate. Pleopod 2 (Fig. 5I) with protopod 2.8 times longer than wide, with 17 lateral simple setae; second article of endopod moderately short, not reaching apex of protopod. Pleopod 3 (Fig. 5J) with endopod 0.8 length of second article of exopod.

Uropod (Fig. 5L) with endopod with 2 lateral simple setae, 1 simple medial seta and 3 apical broom setae; exopod with 2 apical simple setae.

Female (allotype). Body width half of length (Fig. 4B). Operculum (Fig. 5K) 0.6 times as wide

as long, with 36 fine setae laterally and 6 simple setae ventrally.

Paratypes. The male paratype does not show any noteworthy differences from the holotype. The female paratypes agree with the allotype in most characters. However, the pleotelson and the operculum are more setose in some paratypes.

Remarks. *Pleurogonium kyushuense* sp. nov. is morphologically similar to *P. tanseimaruae* sp. nov. in the possession of a single, spine-like lateral projection on each coxae 1–4 and the unarmed coxae 5–7. The most distinctive feature of *P. kyushuense* is the presence of a strong mediodistal projection on the article 3 of the antenna. Furthermore, the lateral projections on the coxae 1–4 of *P. kyushuense* are proportionally longer than those of *P. tanseimaruae*.

Etymology. The species is named after Kyushu, embracing the type locality of the present new species.

Genus *Notoxenoides* Menzies, 1962

[New Japanese name: Tsunotoge-hime-mizumushi-zoku]

Notoxenoides setosa sp. nov.

[New Japanese name: Tsunotoge-hime-mizumushi]

(Figs. 6–8)

Material examined. Holotype: male (1.11 mm), KMNH IvR 500,308, RV *Tansei-maru*, KT07-01 cruise, stn YT-1(1), off Yakushima to Tanegashima islands, Ohsumi Islands, 565–723 m, 30°04.401'N, 130°59.945'E to 30°04.538'N, 130°57.889'E, 24 February 2007, beam trawl.

Allotype: female (1.37 mm, with 8 eggs, KMNH IvR 500,322), same data as holotype.

Paratypes: 22 males (1.20 mm, KMNH IvR 500,309; 2 exs., 1.19 mm, KMNH IvR 500,310, 500,311; 1.16 mm, NSMT-Cr 19569; 1.14 mm, NSMT-Cr 19570; 1.12 mm, KMNH IvR 500,314; 3 exs., all 1.10 mm, KMNH IvR 500,315–500,317; 1.09 mm, KMNH IvR 500,318; 1.08 mm, KMNH IvR 500,319; 1.07 mm, KMNH IvR 500,310; 1.06 mm, KMNH IvR 500,311; 1.05 mm, KMNH IvR 500,312; 1.03 mm, KMNH IvR 500,313; 2 exs., 1.02 mm, KMNH IvR 500,314,

500,315; 0.99 mm, KMNH IvR 500,316; 0.98 mm, KMNH IvR 500,317; 2 exs., 0.96 mm, KMNH IvR 500,318, 500,319; 0.87 mm, KMNH IvR 500,320), 2 ovigerous females (1.45 mm, with 5 eggs, KMNH IvR 500,321; 1.35 mm, with 5 eggs, NSMT-Cr 19571), 23 females (1.62 mm, KMNH IvR 500,323; 1.49 mm, KMNH IvR 500,324; 1.39 mm, KMNH IvR 500,325; 1.38 mm, KMNH IvR 500,326; 1.37 mm, KMNH IvR 500,327; 2 exs., 1.36 mm, KMNH IvR 500,328, 500,329; 1.35 mm, KMNH IvR 500,330; 1.34 mm, KMNH IvR 500,331; 1.31 mm, KMNH IvR 500,332; 1.29 mm, KMNH IvR 500,333; 1.28 mm, KMNH IvR 500,334; 1.27 mm, KMNH IvR 500,335; 1.26 mm, KMNH IvR 500,336; 1.24 mm, KMNH IvR 500,337; 2 exs., 1.23 mm, KMNH IvR 500,338, 500,339; 1.22 mm, KMNH IvR 500,340; 1.17 mm, KMNH IvR 500,341; 2 exs., 1.16 mm, KMNH IvR 500,342, 500,343; 0.88 mm, KMNH IvR 500,344; 0.82 mm, KMNH IvR 500,345), same data as holotype; 2 ovigerous females (1.37 mm, with 5 eggs, KMNH IvR 500,346; 1.24 mm, with 7 eggs, KMNH IvR 500,347), 2 females (1.18 mm, KMNH IvR 500,348; 9.2 mm, KMNH IvR 500,349), TS *Nagasaki-maru*, N237 cruise, stn F2, 501–498 m, 31°42.93'N, 128°35.72'E to 31°42.05'N, 128°34.76'E, 9 May 2007, beam trawl.

Description. Holotype (male). Body (Fig. 6A) widest at pereonite 3, width 0.4 times length (excluding lateral spine-like projections on pereon). Head (Fig. 5A) half as long as wide, with pair of curved, long, spine-like projections laterally; frontal margin slightly convex.

Pereonites 1–4 (Fig. 6A) each with many small, sharp denticles and fine setae dorsally and 1–3 larger denticles anterolaterally and with 0–2 larger denticles posterolaterally; pereonites 5–7 each with many small, sharp denticles dorsally and 1 or 2 larger denticles posterolaterally, without denticles anterolaterally. Lateral margins of pereonites each with very long, spine-like projection. Coxae 1–3 and 5–7 (Fig. 6A) visible in dorsal view, each with 2 or 3 denticles and simple seta laterally; coxa 4 not visible in dorsal view. Pleon (Fig. 6A) 0.4 times as wide as long, with 1

elongate projection, 1 pair of denticles and short setae dorsally. Pleotelson (Fig. 6A) 1.3 times longer than wide, with few denticles and short setae dorsally and 8 pairs of denticles laterally, apex acute.

Antennula (Fig. 6C–D) with article 1 bearing 1 long spine medially, 2 long spines mediolaterally and 1 long spine distolaterally, and with 2 simple setae dorsally and 2 simple setae and 1 broom seta distally; article 2 0.7 length of article 1, with 1 spine mediolaterally and 5 simple setae distally; article 3 0.4 length of article 2, with 1 simple seta mediolaterally; article 4 0.8 length of article 3, with 1 simple seta laterodistally; article 5 1.9 length of article 4; article 6 0.8 length of article 5, with 2 short simple setae subapically, 2 short and 1 long simple setae and aesthetasc apically.

Antenna (Figs. 6D, 7A) with articles 1 and 2 combined 0.6 length of article 3; article 2 with 1 short seta medially; article 3 with 4 simple setae, including 2 lateral, 1 medial, and 1 dorsodistal in position; article 4 with 2 simple setae; article 5 2.7 length of article 4, with 4 simple setae and 1 broom seta; article 6 1.2 length of article 5, with 1 simple seta dorsally, and 3 simple and 4 broom setae distally. Flagellum consisting of 7 articles; proximal article as long as second article.

Left mandible (Fig. 7B) with 3 serrate setae and lacinia mobilis on incisor process and 2 simple setae on molar process; right mandible (Fig. 7C) with 5 serrate setae on incisor process and 2 simple setae on molar process.

Maxillula (Fig. 7D) with 5 stout simple setae on inner ramus and 12 stout simple setae and few fine setae on outer ramus. Maxilla (Fig. 7E) with 6 stout simple setae and some fine setae on inner ramus; 4 stout simple setae on each lobes of outer ramus.

Maxilliped (Fig. 7F) with article 1 of palp bearing short seta medially; article 2 1.3 length of article 1, with 2 setae medially; article 3 1.4 length of article 2, with 3 setae medially and 1 seta laterodistally; article 4 1.1 length of article 3, with 2 setae medially; article 5 0.6 length of article 4, with 5 setae. Endite with 2 fan-shaped setae, 1 simple seta ventrally, 5 stout simple setae

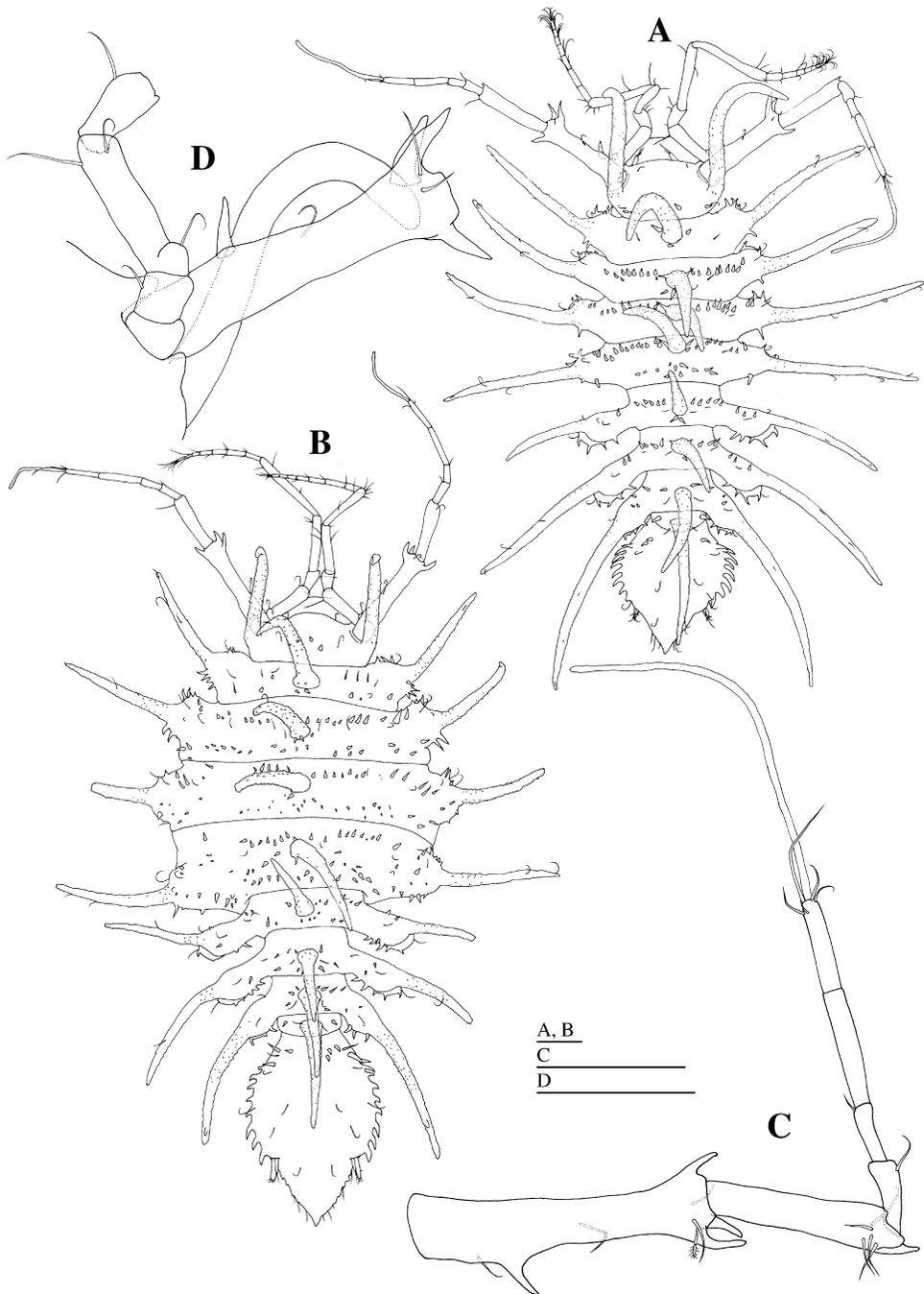


Fig. 6. *Notoxenoides setosa* sp. nov. A, C, D, holotype, male (KMNH IvR 500,308); B, allotype, female (KMNH IvR 500,322). A, B, habitus, dorsal view; C, right antennula, ventral view; D, left part of head, antennula and antenna, ventral view. Scale bars: 100 μ m.

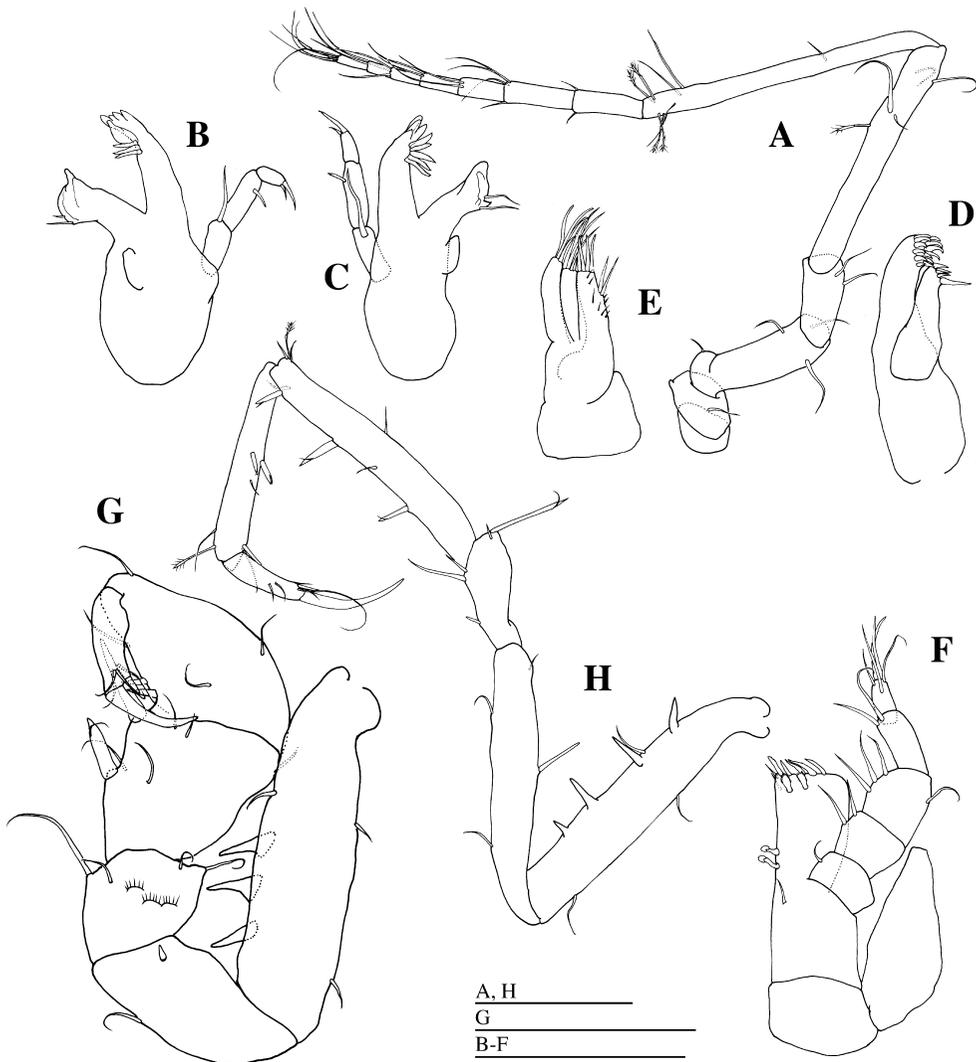


Fig. 7. *Notoxenoides setosa* sp. nov. Holotype, male (KMNH IvR 500,308). A, right antenna, ventral view; B, left mandible, ventral view; C, right mandible, ventral view; D, left maxillula, dorsal view; E, left maxilla, dorsal view; F, left maxilliped, ventral view; G, right pereopod 1, medial view; H, right pereopod 2, medial view. Scale bars: 100 μ m.

distally and 2 fine setae, and 2 coupling hooks medially; epipod lanceolate, apically blunt.

Pereopod 1 (Fig. 7G) with basis having 1 simple seta and 3 robust spines dorsally and 2 simple setae ventrally; ischium 0.6 length of basis, with 1 short spine mediolaterally and 1 simple seta ventrally; merus trapezoidal, half length of ischium, with 1 simple seta and 3 setulate scales medially, 2 simple setae dorsally and 1 long simple seta ventrally; carpus triangular, 1.7 length of merus,

as long as wide, with 2 robust setae and 1 simple seta on ventral margin, 3 simple setae medially and 1 simple seta dorsally; propodus 1.4 length of carpus, with 1 simple seta and 2 robust setae on ventral margin, 1 simple seta medially and 2 simple setae dorsally; dactylus with 4 subapical simple setae, unguis and supplementary claw. Pereopod 2 (Fig. 7H) with basis bearing 4 robust spines, and 1 dorsal simple and 2 ventral simple setae; ischium 1.4 length of basis, with 1 robust

and 1 simple setae dorsally, and with 2 simple setae ventrally; merus 0.4 length of ischium, with 1 robust and 1 simple setae dorsally, and with 3 simple setae ventrally; carpus 2.4 length of merus, with 3 simple setae and 1 broom seta dorsally, and with 3 robust and 2 simple setae ventrally; propodus 0.7 length of carpus, with 1 simple and 1 broom setae dorsally, and with 3 robust and 3 simple setae ventrally; dactylus with 2 subapical and 3 apical simple setae, unguis and supplementary claw. Pereopods 2 to 7 slightly increasing in length posteriorly.

Pleopod 1 (Fig. 8A) with lateral lobes at level of 0.7 of its length; lateral lobe 0.4 times of total width of single ramus of pleopod; distal projection 0.3 times of total length of pleopod, acumi-

nate. Pleopod 2 (Fig. 8B) with protopod twice longer than wide, with 16 lateral simple setae; second article of endopod moderately short, not reaching apex of protopod. Pleopod 3 (Fig. 8C) with endopod 1.2 length of second article of exopod.

Uropod (Fig. 8E) with endopod bearing 2 simple setae laterally, 1 simple seta medially and 5 broom setae apically; exopod with 2 simple setae apically.

Female (allotype). Body width about half of length (Fig. 6B). Pleotelson (Fig. 6B) with 8 (left) or 9 (right) denticles on lateral margins, apex acute. Operculum (Fig. 8D) 0.7 times as wide as long, with 34 fine setae laterally and 4 simple setae ventrally.

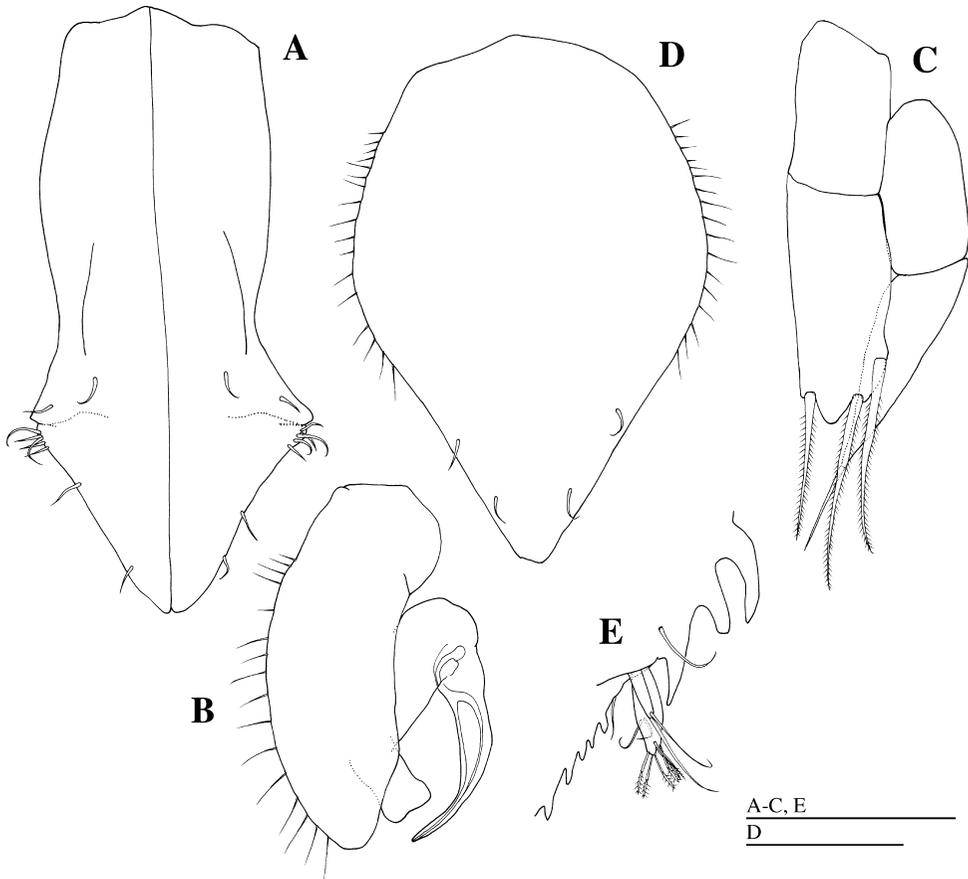


Fig. 8. *Notoxenoides setosa* sp. nov. A–C, E, holotype, male (KMNH IvR 500,308); D, allotype, female (KMNH IvR 500,322). A, pleopod 1, ventral view; B, right pleopod 2, ventral view; C, left pleopod 3, ventral view; D, operculum, ventral view; E, right uropod, dorsal view. Scale bars: 100 μ m.

Paratypes. The paratypes agree well with the holotype and the allotype in most characters. Body 0.4–0.5 times in female paratypes. Pleotelson with 7–10 pairs of denticles on lateral margin in male paratypes, 8–10 pairs of denticles in female paratypes.

Remarks. In the shape of the pleotelson, the new species is similar to *Notoxenoides vema* Menzies, 1962 known from the South Atlantic and *N. dentata* Menzies and George, 1972 from the Peru-Chile Trench in the southeastern Pacific. In these species, the apex of the pleotelson is pointed, but not strongly produced. However, *Notoxenoides setosa* sp. nov. appears distinctive in the genus in the possession of many setae on the dorsal surface of the pereon and the ventrally unarmed carpus of the pereopod 1. It is further distinguished from *N. vema* by the following characters: the spine-like projections of the head is directed forward in *N. setosa*, rather than directed laterally in *N. vema*; setae on the pereon are much more numerous in *N. setosa* than in *N. vema*; the second article of the antennula is armed with one mediobasal spine in *N. setosa*, whereas it is unarmed in *N. vema*; the ventral margin of the carpus of the pereopod 1 is smooth in *N. setosa*, but there are four denticles on that margin in *N. vema*. *Notoxenoides dentata* differs from the present new species in having laterally directed spine-like projections of the head, the spine-like projections on the pereonite 1 being shorter than half of those of the pereonite 2, and the carpus of the pereopod 1 armed with four denticles ventrally.

Etymology. From the Latin *setosus*, meaning bearing numerous setae, referring to the dense short setae on the dorsal surface of the pereon.

Genus *Austrogonium* Menzies and George, 1972
[New Japanese name: Ashitoge-hime-mizumushi-zoku]

Austrogonium japonicum sp. nov.

[New Japanese name: Ashitoge-hime-mizumushi]

(Figs. 9–11)

Material examined. Holotype: ovigerous fe-

male (2.09 mm), KMNH IvR 500,350, RV *Tan-sei-maru*, KT07-01 cruise, stn HB1, Hyuga Basin, 1651–1677 m, 32°16.97'N, 132°28.96'E to 32°19.23'N, 132°30.75'E, 22 February 2007, beam trawl.

Description. Holotype (female). Body (Fig. 9A) widest at pereonite 3, half as wide as long, with many simple setae dorsally. Head (Fig. 9A) 0.8 times as long as wide; frontal margin broadly rounded; lateral margins smooth, without projection.

Pereonites (Fig. 9A) each with pair of short spines dorsally; lateral margins of pereonites 1–3 each with pair of spine-like projections directed anteriorly; lateral margins of pereonites 4 and 7 with pair of spine-like projections directed posteriorly; pereonites 5 and 6 each with 2 pairs of spine-like projections laterally. All coxae (Fig. 9A) visible in dorsal view; coxae 1–4 and 7 each with spine-like projections laterally; coxae 5 and 6 each with 2 greatly unequal spine-like projections (anterior projection much longer than posterior projection). Pleon (Fig. 9A) 0.4 times as long as wide, with 1 pair of spines and 2 pairs of simple setae dorsally. Pleotelson (Fig. 9A) 1.5 times longer than wide, with 4 pairs of denticles laterally, and with 25 simple setae dorsally and 17 simple setae posterolaterally.

Antennula (Fig. 9B, D) with article 1 bearing 2 simple and 1 broom setae distally; article 2 0.8 length of article 1, with simple setae medially, laterally and dorsally, and with 1 simple and 4 broom setae distally; article 3 half length of article 2, with simple seta distolaterally; article 4 0.9 length of article 3, with 1 simple and 1 broom seta distolaterally; article 5 2.2 length of article 4; article 6 0.8 length of article 5, with 3 short simple setae subapically, 2 long simple setae and aesthetasc apically.

Antenna (Fig. 9C, D) with articles 1 and 2 combined 0.4 length of article 3; article 2 with 1 spine medially and laterally; article 3 with 1 spine proximolaterally and 2 spines distally, and with 1 simple seta laterally and dorsally, and with 3 simple setae medially and 2 simple setae laterally; article 4 with 3 simple setae medially. Arti-

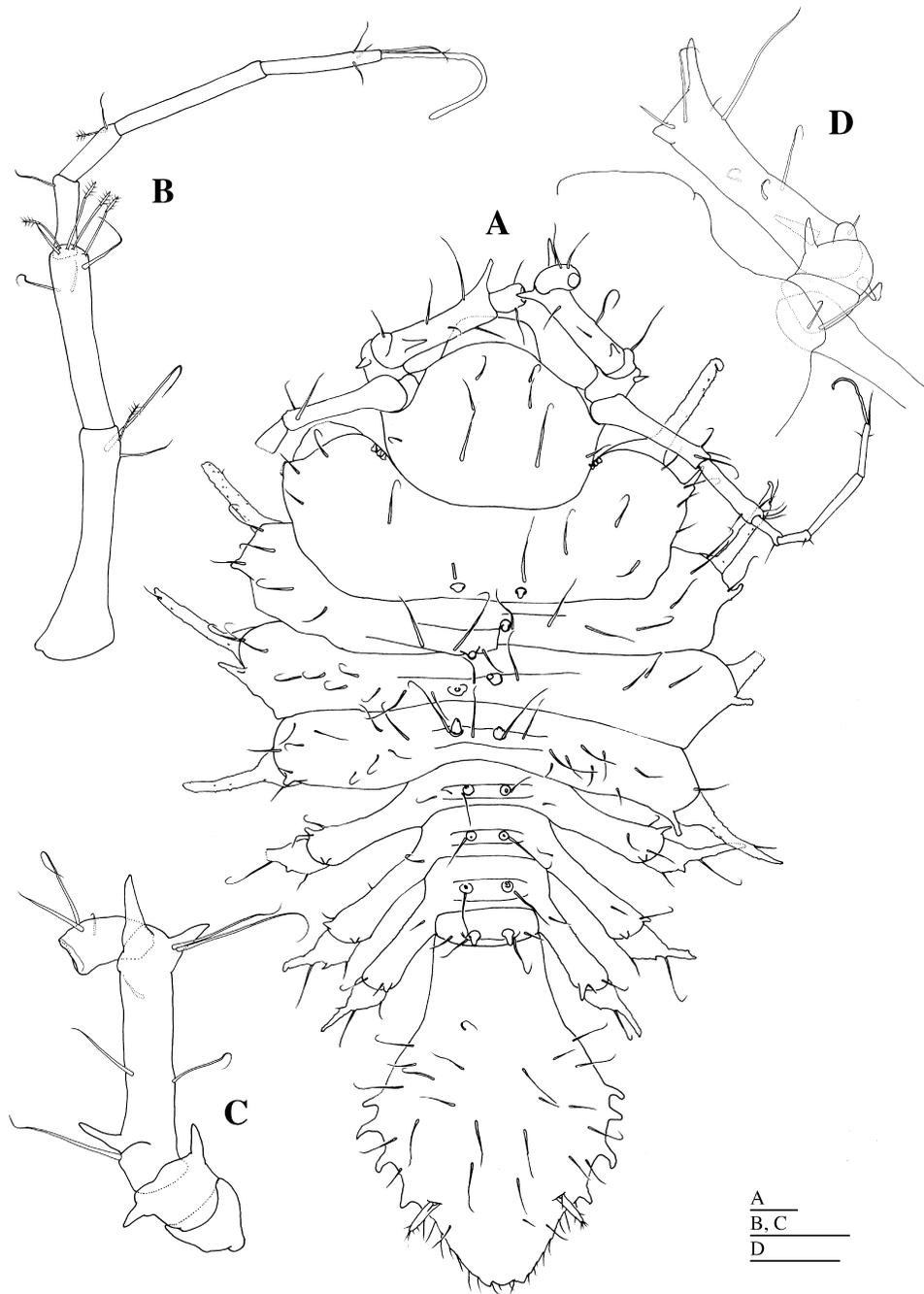


Fig. 9. *Austrogonium japonicum* sp. nov. Holotype, female (KMNH IvR 500,350). A, habitus, dorsal view; B, right antennula, ventral view; C, right antenna, ventral view; D, left part of head, antennula and antenna, ventral view. Scale bars: 100 μ m.

cles 5, 6 and flagellum missing.

Left mandible (Fig. 10A) with 4-toothed lacinia mobilis and 3 serrate setae on incisor process, and 2 short setae on molar process; right mandible (Fig. 10B) with 4 serrate setae on incisor process and 2 robust setae on molar process.

Maxillula (Fig. 10C) with 4 stout simple setae and few fine simple setae on inner ramus and 11 stout simple setae on outer ramus. Maxilla (Fig. 10D) with 8 stout simple setae distally on inner ramus; 4 stout simple setae on each lobes of outer ramus.

Maxilliped (Fig. 10E) with article 1 of palp

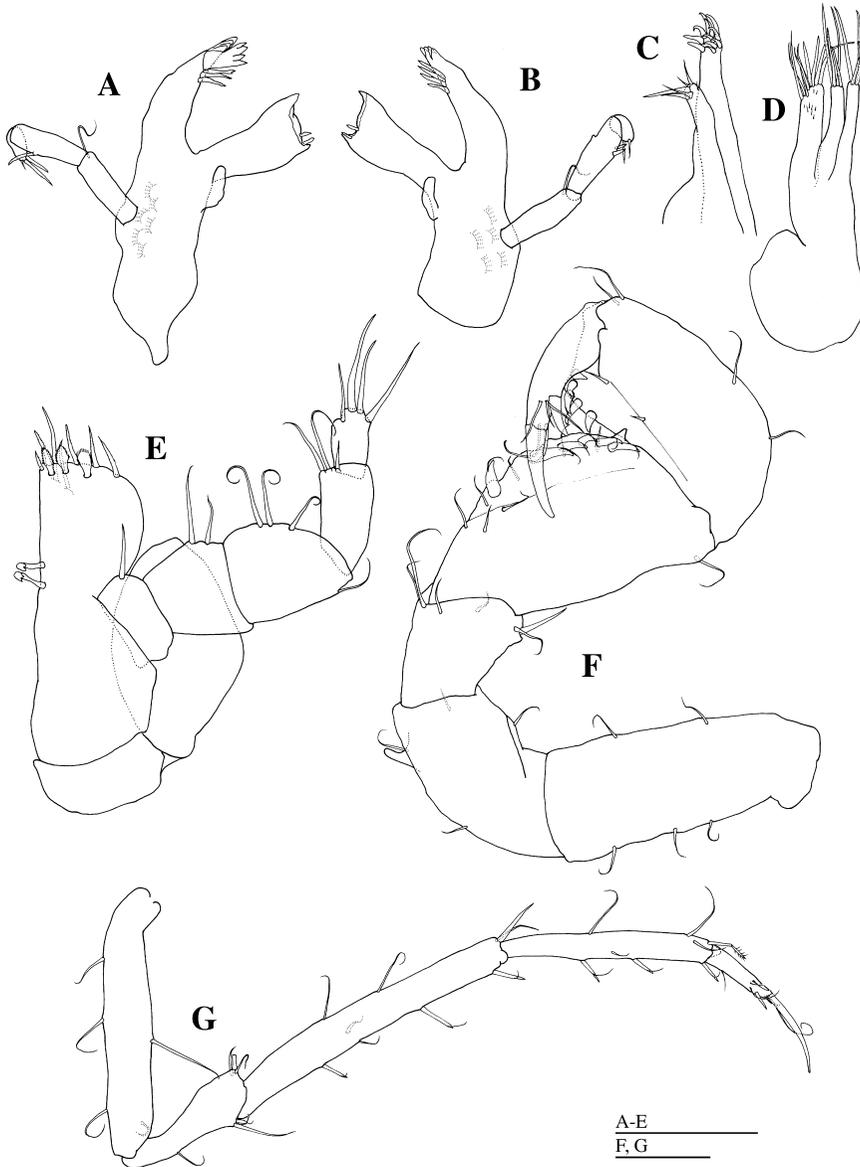


Fig. 10. *Austrogonium japonicum* sp. nov. Holotype, female (KMNH IvR 500,350). A, left mandible, dorsal view; B, right mandible, dorsal view; C, right maxillula, dorsal view; D, right maxilla, dorsal view; E, left maxilliped, ventral view; F, right pereopod 1, medial view; G, left pereopod 2, medial view. Scale bars: 100 μ m.

bearing 1 seta medially; article 2 1.7 length of article 1, with 2 setae medially; article 3 1.6 length of article 2, with 3 setae medially and 1 seta distolaterally; article 4 0.9 length of article 3, with 3 setae medially; article 5 0.6 length of article 4, with 2 subapical and 2 apical setae. Endite with 3 fan-shaped, 5 serrate and 2 stout simple setae distally, and 2 coupling hooks medially; epipod ovate, apically blunt.

Pereopod 1 (Fig. 10F) with basis bearing 2 dorsal and 3 ventral simple setae; ischium 0.8 length of basis, with 1 simple seta dorsally and distolaterally and 2 simple setae ventrally, and with 1 denticle ventrally; merus trapezoidal, 0.6 length of ischium, with 1 simple seta distolaterally, 2 simple setae dorsally and 3 simple setae ventrally; carpus ovate, 2.3 length of merus, 1.3 times as long as wide, with 2 simple setae laterally and 3 simple setae medially, dorsal margin with 1 simple seta, ventral margin with 1 denticle, 6 robust setae and 1 simple seta; propodus twice length of carpus, with 2 simple setae medially and 4 simple setae dorsally, 5 robust setae ventrally; dactylus with 3 subapical and 2 apical simple setae, unguis and supplementary claw.

Pereopod 2 (Fig. 10G) partially broken, basis missing; ischium with 1 distolateral, 1 dorsal and 3 ventral simple setae; merus half length of basis, with 3 dorsal and 4 ventral simple setae; carpus 2.2 length of merus, with 3 simple setae and 1 robust seta dorsally, 3 robust and 1 simple setae ventrally and 1 simple seta laterally; propodus 0.7 length of carpus, with 2 simple and 1 broom setae dorsally, 3 robust setae ventrally and 2 simple setae medially; dactylus with 1 ventral, 3 subapical and 2 apical simple setae, unguis and supplementary claw.

Operculum (Fig. 11A) 0.7 times as wide as long, with 50 fine setae laterally and 3 pairs of simple setae ventrally. Pleopod 3 (Fig. 11B) with endopod 1.5 length of second article of exopod.

Uropod (Fig. 11C) with endopod bearing 2 simple setae subapically and 4 broom setae apically; exopod minute, with 1 simple seta apically.

Remarks. This new species differs from the only other species in the genus *Austrogonium*, i.e. *A. abyssale* Menzies and George, 1972 known from the Peru-Chile Trench in the southeastern Pacific by the following characters: pereonites 1 and 2 are each armed with a single spine on the

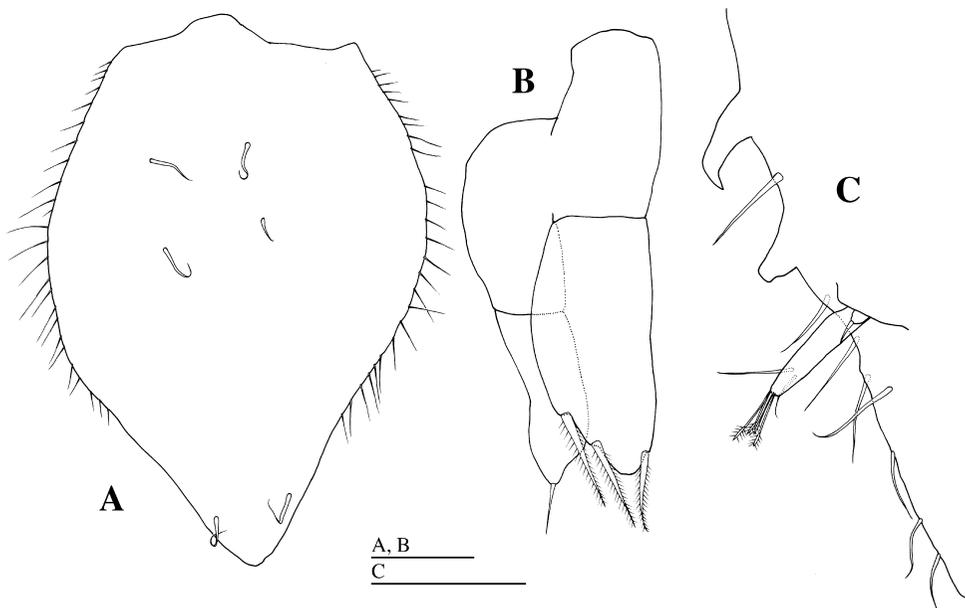


Fig. 11. *Austrogonium japonicum* sp. nov. Holotype, female (KMNH IvR 500,350). A, operculum, ventral view; B, left pleopod 3, dorsal view; C, left uropod, dorsal view. Scale bars: 100 μ m.

posterolateral corners in the new species, instead of two spines in *A. abyssale*; the pleotelson is proportionally longer in *A. japonicum* than in *A. abyssale* (1.5 times longer than wide versus 1.3 times); there are four denticles on the lateral margin of the pleotelson in *A. japonicum*, rather than seven denticles in *A. abyssale*; the uropod is biramous in *A. japonicum*, whereas it is uniramous in *A. abyssale*.

Etymology. The specific name is derived from the country where the present new species was discovered.

Genus *Heterosignum* Gamô, 1976

[New Japanese name: Munetoge-hime-mizumushi-zoku]

Heterosignum hashimotoi sp. nov.

[New Japanese name:

Hashimoto-munetoge-hime-mizumushi]

(Figs. 12–14)

Material examined. Holotype: male (1.74 mm), KMNH IvR 500,351, TS *Nagasaki-maru*, N237 cruise, stn F2, 501–498 m, 31°42.93'N, 128°35.72'E to 31°42.05'N, 128°34.76'E, 9 May 2007, beam trawl.

Paratypes: 2 males (1.86 mm, KMNH IvR 500,352; 1.79 mm, NSMT-Cr 19572), TS *Nagasaki-maru*, N251 cruise, stn M, 524–533 m, 31°35.54'N, 128°28.21'E to 31°36.89'N, 128°28.26'E, 14 November 2007, beam trawl.

Description. Male (holotype). Body (Fig. 12A) widest at pereonite 3 (excluding lateral spine-like projections on pereon), width 0.4 times length. Head (Fig. 12A) 0.2 times as long as wide (including eyestalks), partly fused with pereonite 1; frontal margin convex, having pair of stout preocular lobes. Eyestalks (Fig. 12A, B) stout, 1.2 length of head, without ocelli, directed anterolaterally (angle against horizontal plane of head about 21°), surface strongly granulated.

Pereonites (Fig. 12A) scattered with short setae on dorsum. Pereonite 1 with broadly rounded lateral margin. Pereonites 2–7 each with elongate, spine-like projections on lateral margins, surface of them granular. Pleon (Fig. 12A) 0.3

times as long as wide, with pair of fine setae dorsally. Pleotelson (Fig. 12A) 1.5 times longer than wide, with 16 short setae dorsally, anterior 0.3 times of total length of pleotelson, narrow, subcylindrical, remainder distinctly broadened with convex lateral margins, bearing 6 pairs of denticles, posterior margin broadly triangular.

Antennula (Fig. 12B–D) with articles 1 and 2 combined surpassing distal margin of eyestalk; article 1 with simple seta and broom seta distally; article 2 1.1 length of article 1, with simple seta dorsally, 2 simple setae and 5 broom setae distoventrally; article 3 0.4 length of article 2, with 1 simple seta medially; article 4 shorter than article 3, with 1 simple seta distolaterally; article 5 as long as article 3, with simple seta distomedially and distolaterally; article 6 1.3 length of article 5, with 2 short simple setae subapically, 1 short and 1 long simple setae and aesthetasc apically.

Antenna (Fig. 12C–D) with articles 1 and 2 combined 0.9 length of article 3; article 2 with 2 simple setae laterally and 1 simple seta medially; article 3 with 1 simple seta laterally and ventrally, 2 simple setae distolaterally and 4 simple setae medially; article 4 with 4 simple setae; article 5 2.2 length of article 4, with 2 simple setae and 1 broom seta laterally, and 2 simple setae distomedially; article 6 1.2 length of article 5, medial surface with 3 simple and 3 broom setae, lateral surface with 2 simple and 2 broom setae. Flagellum consisting of 7 articles; proximal article as long as second article.

Left mandible (Fig. 13A) with 4-toothed lacinia mobilis and 4 serrate setae on incisor process, and 2 short simple setae on molar process; right mandible (Fig. 13B) with 5 serrate setae on incisor process and 2 short simple setae on molar process.

Maxillula (Fig. 13C) with 1 serrate, 1 setulate and 3 stout simple setae on inner ramus and 11 stout simple and few fine setae on outer ramus. Maxilla (Fig. 13D) with 2 setulate and 6 stout simple setae distally and many fine setae dorsally on inner ramus; 4 stout simple setae on each lobes of outer ramus.

Maxilliped (Fig. 13E) with article 1 of palp

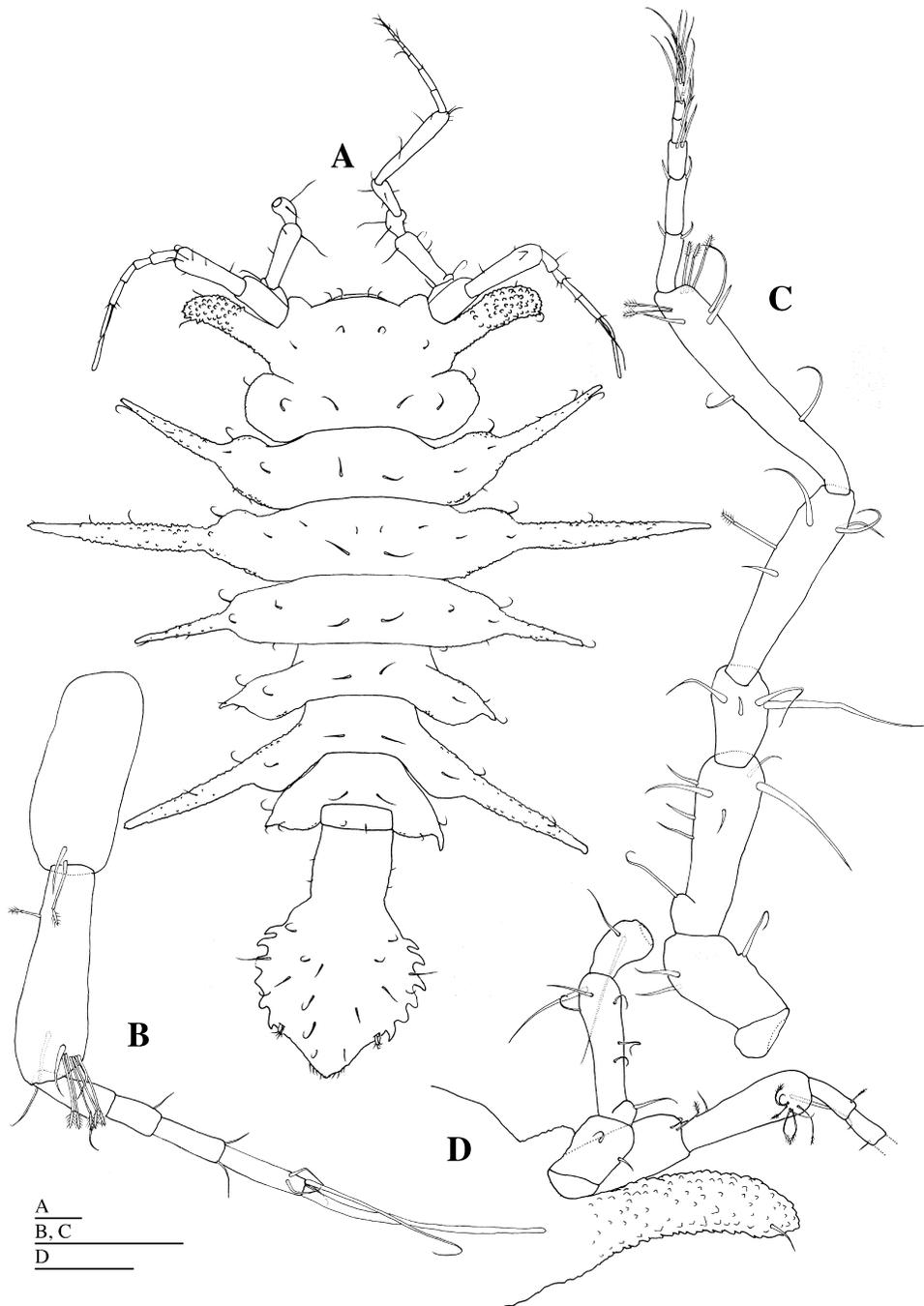


Fig. 12. *Heterosignum hashimotoi* sp. nov. Holotype, male (KMNH IvR 500,351). A, habitus, dorsal view; B, right antennula, ventral view; C, right antenna, ventral view; D, left part of head, antennula and antenna, ventral view. Scale bars: 100 μ m.

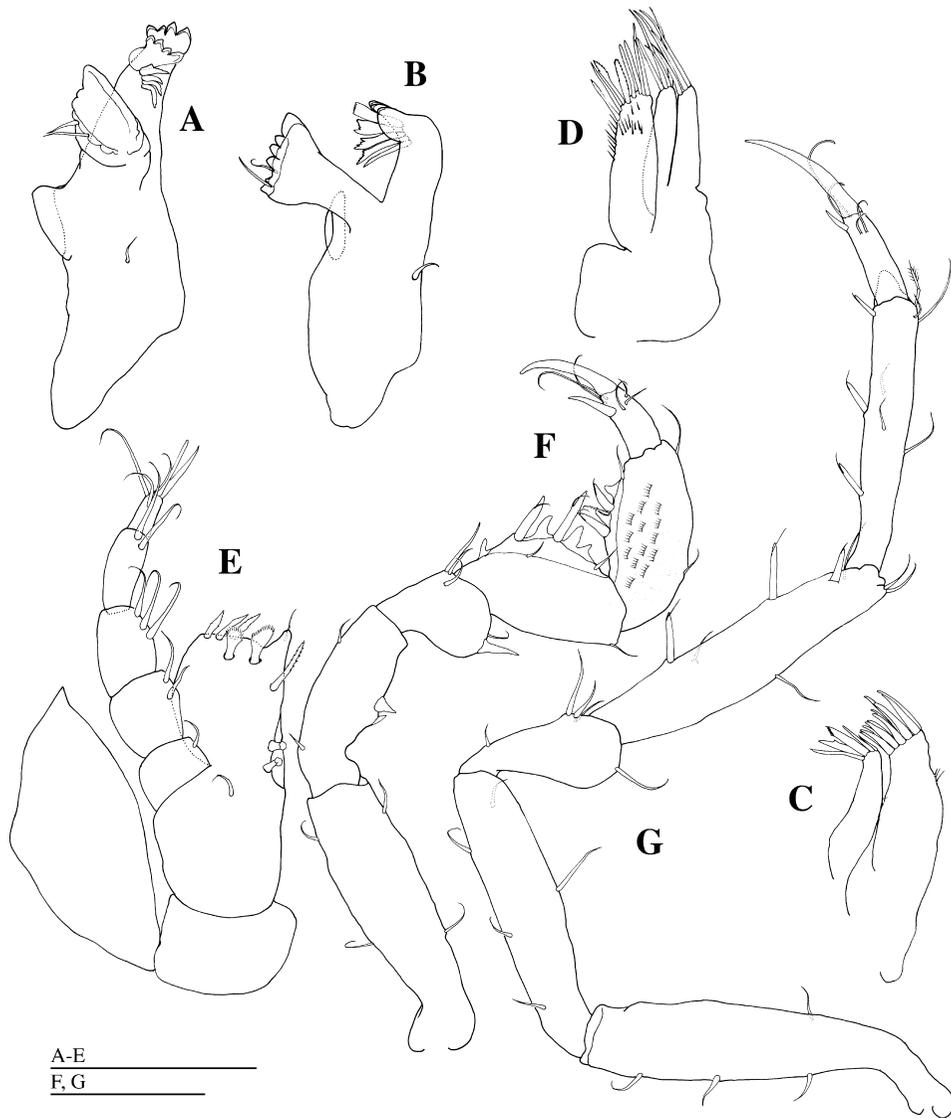


Fig. 13. *Heterosignum hashimotoi* sp. nov. Holotype, male (KMNH IvR 500,351). A, left mandible, medial view; B, right mandible, dorsal view; C, right maxillula, dorsal view; D, right maxilla, dorsal view; E, right maxilliped, ventral view; F, right pereopod 1, medial view; G, right pereopod 2, medial view. Scale bars: 100 μ m.

bearing 1 seta medially; article 2 1.6 length of article 1, with 2 setae medially; article 3 1.1 length of article 2, with 3 setae medially; article 4 1.1 length of article 3, with 2 setae distally; article 5 half length of article 4, with 5 setae. Endite with 2 fan-shaped setae, 3 serrate setae and 1 fine seta distally, and 1 serrate seta and 2 coupling hooks medially; epipod subtriangular, pointed apically.

Pereopod 1 (Fig. 13F) with basis bearing 2 dorsal and 2 ventral simple setae; ischium 0.7 length of basis, with 2 spines dorsally and 2 simple setae ventrally; merus trapezoidal, half length of ischium, with 1 spine and 1 simple seta dorsally, and 3 simple setae distoventrally; carpus ovate, relatively narrow, 1.5 length of merus, 1.9 times as long as wide, with 4 denticles, 2 robust

setae and 2 simple setae on ventral margin and 1 simple seta on dorsal margin; propodus 1.1 length of carpus, with 2 denticles, 2 robust setae and 2 simple setae ventrally, 2 simple setae dorsally and 14 setulate scales medially; dactylus with 3 subapical and 2 apical simple setae, unguis and supplementary claw. Pereopod 2 (Fig. 13G) with basis bearing 1 dorsal and 3 ventral simple setae; ischium 0.8 length of basis, with 1 dorsal, 3 ventral and 1 lateral simple setae; merus half length of ischium, with 1 dorsal and 4 ventral simple setae; carpus 1.9 length of merus, with 3 simple setae dorsally and 3 robust and 2 simple setae on ventral margin; propodus 0.9 length of carpus, with 3 simple and 1 broom setae dorsally, 3 robust setae ventrally, and 1 simple seta on each lateral and medial margin; dactylus with 2 subapical and 2 apical simple setae, unguis and supplementary claw. Pereopods 2 to 7 slightly increasing in length posteriorly.

Pleopod 1 (Fig. 14A) with lateral lobes at level of 0.6 of its length; lateral lobe 0.2 times of total width of single ramus of pleopod; distal projec-

tion 0.4 times of total length of pleopod, acuminate. Pleopod 2 (Fig. 14B) with protopod 2.8 times longer than wide, with 18 simple setae on lateral margin; second article of endopod moderately short, reaching apex of protopod. Pleopod 3 (Fig. 14C) with endopod 1.3 length of second article of exopod.

Uropod (Fig. 14D) with endopod bearing 2 simple setae laterally and 5 broom setae apically; exopod with 2 simple setae apically.

Paratypes. The two male paratypes are similar to the holotype in morphology. Head 0.2–0.3 times as long as wide. Eystalks 1.2–1.3 length of head.

Remarks. The strongly elongate lateral projections on the pereonites 2–7 link the new species to *Heterosignum elegans* Shimomura and Mawatari, 2002 known from Yamaguchi Prefecture and the Nansei Islands, Japan (Shimomura and Mawatari, 2002; Shimomura and Ohtsuka, 2005). The present new species, however, is distinguished from *H. elegans* by the following characters: in the new species, the eyestalk is

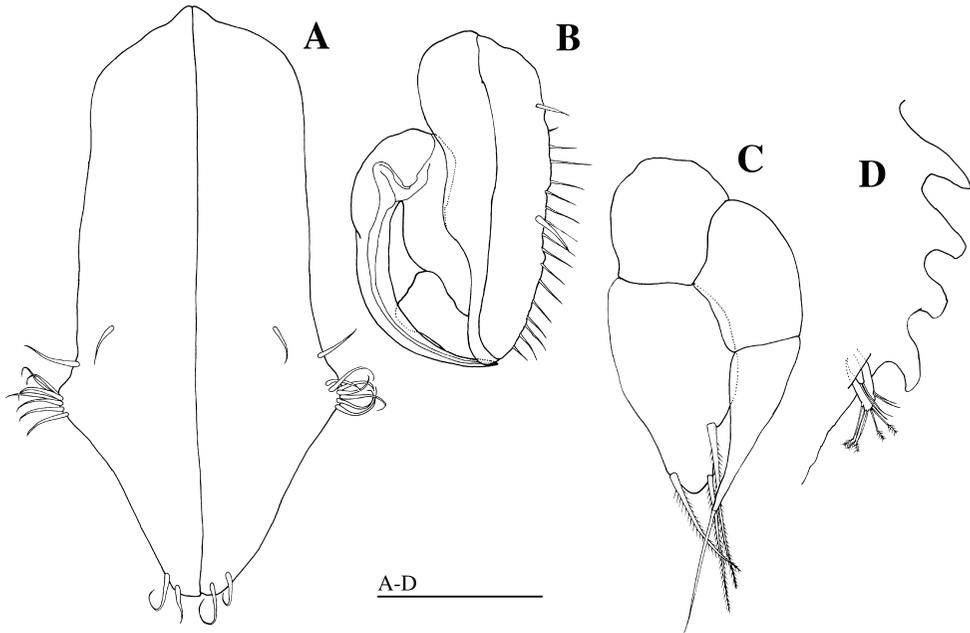


Fig. 14. *Heterosignum hashimotoi* sp. nov. Holotype, male (KMNH IvR 500,351). A, pleopod 1, ventral view; B, left pleopod 2, ventral view; C, left pleopod 3, ventral view; D, right uropod, dorsal view. Scale bar: 100 μ m.

1.2–1.3 times as long as the head, of which the surface is strongly granulated, whereas in *H. elegans*, it is 1.5 times as long as the head in males or 1.4 times in females, of which the surface is only sparsely granulated; the carpus of the pereopod 1 is armed with four denticles in the new species, instead of seven denticles in *H. elegans*; the second article of the endopod of pleopod 2 only reaches the apex of the protopod, whereas distinctly overreaching it. It can be said that the eyestalk of this new species is much more stout than those of other congeneric species.

Etymology. The new species is dedicated to Prof. J. Hashimoto of Nagasaki University, who provided me with an interesting material for this study.

Genus *Acutomunna* Winkler, 1994

[New Japanese name: Fuchidori-hime-mizumushi-zoku]

Acutomunna minuta sp. nov.

[New Japanese name: Fuchidori-hime-mizumushi]

(Figs. 15–16)

Material examined. Holotype: male (1.08 mm), KMNH IvR 500,354, RV *Tansei-maru*, KT07-01 cruise, stn YT-3, off Yakushima to Tanegashima islands, 1677–1769 m, 29°51.041' N, 130°55.685' E to 29°49.815' N, 130°54.457' E, 24 February 2007, beam trawl.

Allotype: female (1.22 mm, KMNH IvR 500,357), same data as holotype.

Paratypes: 1 male (1.02 mm, KMNH IvR 500,355), 1 ovigerous female (1.13 mm, with 4 eggs, KMNH IvR 500,356), 1 female (1.07 mm, NSMT-Cr 19573), same data as holotype.

Description. Male (holotype). Body (Fig. 15A) widest at pereonite 3, narrowest at pereonite 7, denticulate laterally, remarkably cuticulated laterally; width 0.7 times length. Head (Fig. 15A) 0.4 times as long as wide; frontal margin broadly rounded. Eyestalks conspicuous, bluntly pointed, without ocelli, directed anterolaterally (angle against horizontal plane of head about 17°).

Pereonites (Fig. 15A) each with few fine setae

laterally, without dorsal setae; lateral margins of pereonites 1–3 broad, acutely pointed; pereonite 4 with nearly straight lateral margins; lateral projections of pereonites 5–7 directed posteriorly. Pleon (Fig. 15A) 0.2 times as long as wide. Pleotelson (Fig. 15A) as long as wide, with pair of fine setae on dorsal surface and on lateral margins; lateral margins each with 19 denticles.

Antennula (Fig. 15C, E) with article 1 projecting distomedially, with 9 denticles and 1 simple seta mediodistally, and with 2 denticles laterodistally; article 2 0.7 length of article 1, with 2 simple and 1 broom setae; article 3 0.4 length of article 2; article 4 0.8 length of article 3, with 1 broom seta distolaterally; article 5 1.7 length of article 4; article 6 0.8 length of article 5, with 3 simple setae subapically, 1 simple seta and aesthetasc apically.

Antenna (Fig. 15D, E) with articles 1 and 2 combined 0.4 length of article 3; articles 1 and 2 without setae; article 3 subtriangular, projecting laterally, with 2 denticles and 3 simple setae laterally, and with 2 denticles mediodistally; article 4 with simple seta medially; article 5 missing.

Left mandible (Fig. 16A) with lacinia mobilis and 3 serrate setae on incisor process, and 2 fine simple setae on molar process; right mandible (Fig. 16B) with 5 serrate setae on incisor process and 2 simple setae on molar process.

Maxillula (Fig. 16C) with 5 stout simple setae on inner ramus and 8 stout simple setae on outer ramus. Maxilla (Fig. 16D) with 7 stout simple setae distally and some fine setae medially on inner ramus; 4 stout simple setae on each lobes of outer ramus.

Maxilliped (Fig. 16E) with article 1 of palp bearing short seta medially; article 2 1.2 length of article 1, with 2 setae medially; article 3 1.4 length of article 2, with 3 setae medially and 1 seta laterally; article 4 1.2 length of article 3, with 2 setae medially; article 5 0.6 length of article 4, with 5 setae. Endite with 2 fan-shaped setae and 5 serrate setae distally, 1 simple seta ventrally and 1 stout simple seta medially, and with 2 coupling hooks medially; epipod subtriangular, apically blunt.

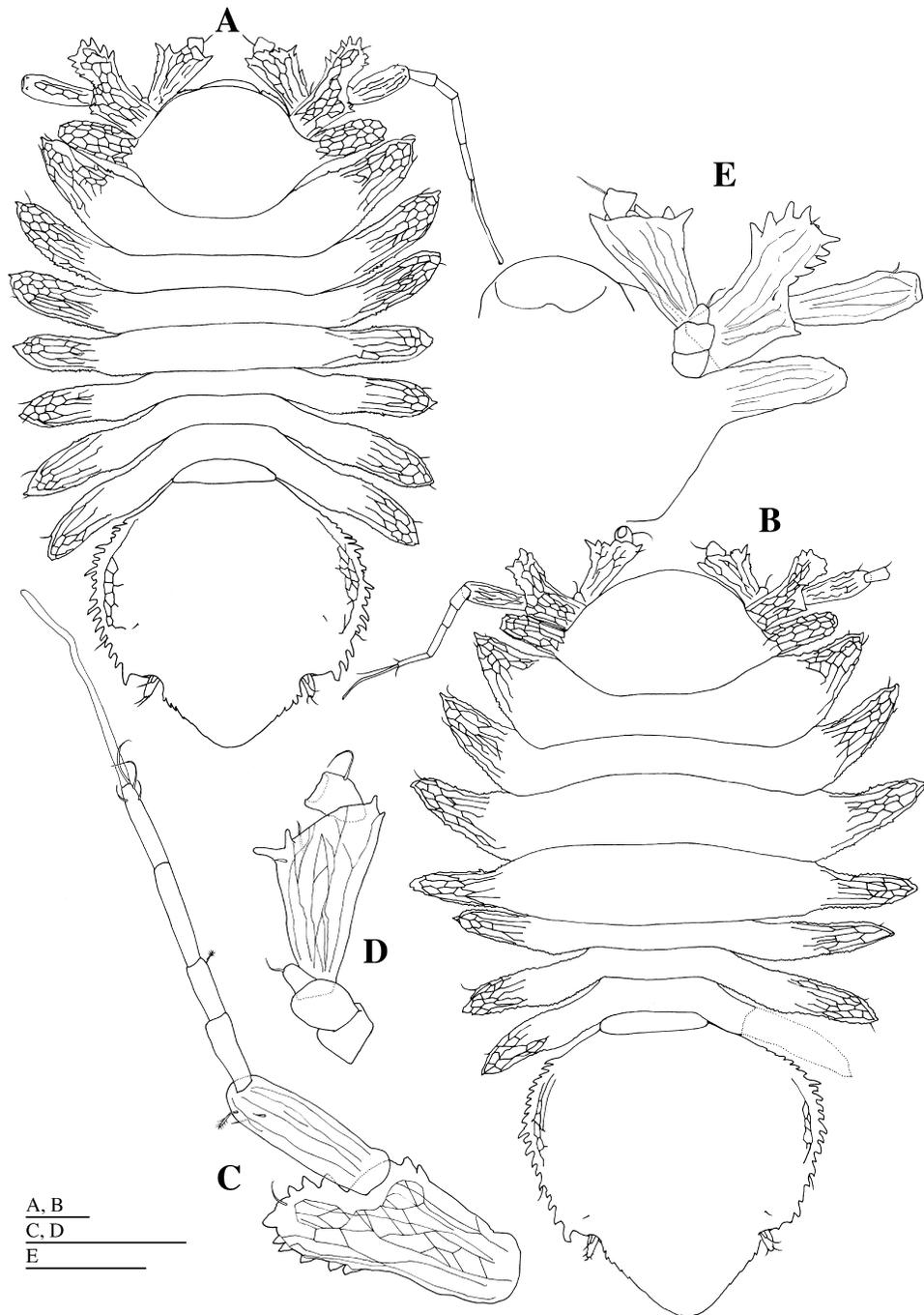


Fig. 15. *Acutomunna minuta* sp. nov. A, C–E, holotype, male (KMNH IvR 500,354); B, allotype, female (KMNH IvR 500,357). A, B, habitus, dorsal view; C, left antennule, ventral view; D, right antenna, ventral view; E, left part of head, antennule and antenna, ventral view. Scale bars: 100 μ m.

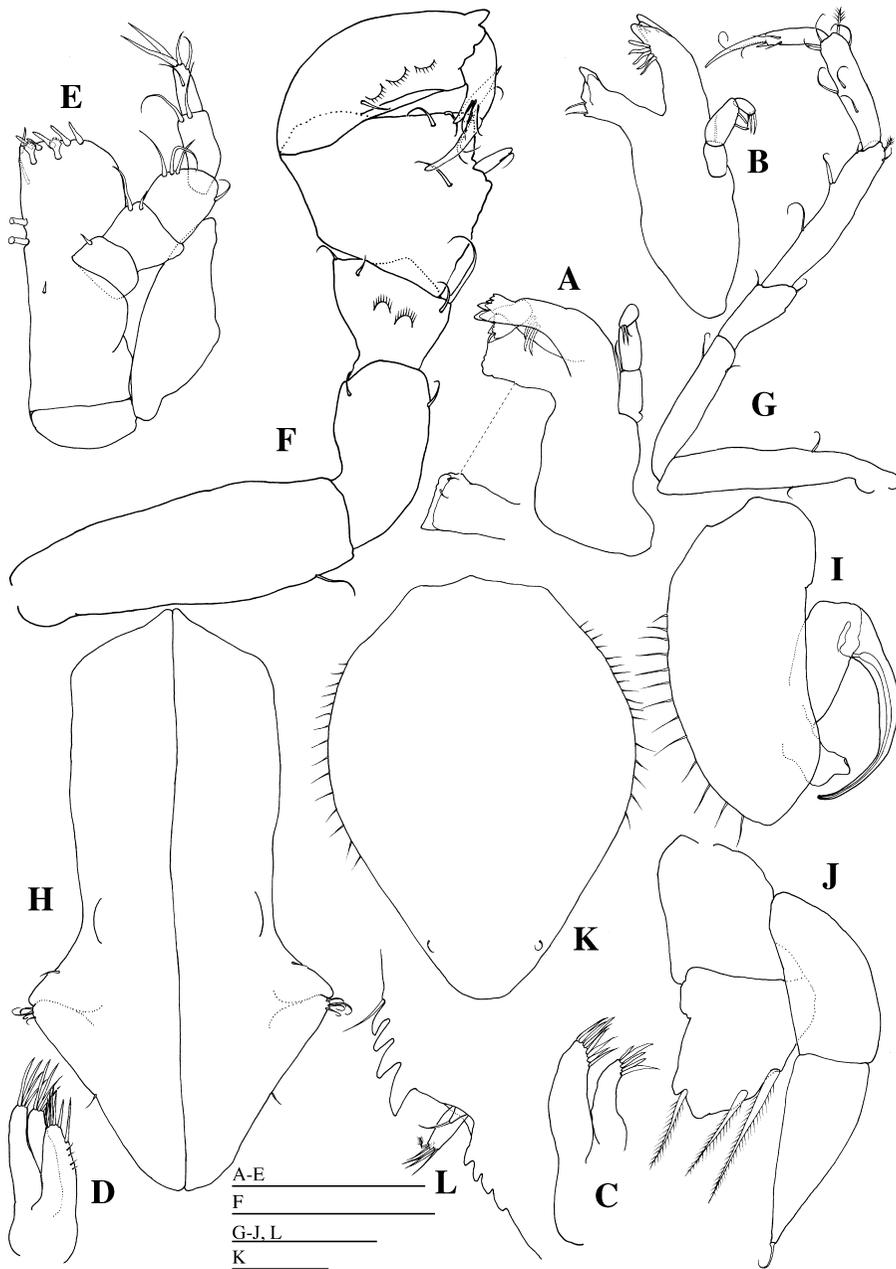


Fig. 16. *Acutomunna minuta* sp. nov. A–J, L, holotype, male (KMNH IvR 500,354); K, allotype, female (KMNH IvR 500,357). A, left mandible, ventral view; B, right mandible, dorsal view; C, left maxillula, dorsal view; D, left maxilla, dorsal view; E, left maxilliped, ventral view; F, left pereopod 1, medial view; G, right pereopod 2, medial view; H, pleopod 1, ventral view; I, right pleopod 2, ventral view; J, right pleopod 3, dorsal view; K, operculum, ventral view; L, left uropod, dorsal view. Scale bars: 100 μ m.

Pereopod 1 (Fig. 16F) with basis bearing 1 simple seta ventrally; ischium 0.6 length of basis, with simple seta dorsally and ventrally; merus trapezoidal, 0.7 length of ischium, with 2 simple setae ventrally, 1 simple seta dorsally, and with 1 simple seta and 2 setulate scales medially; carpus rectangular, relatively robust, 1.5 length of merus, 0.9 times as long as wide, with 2 robust setae and 2 simple setae on ventral margin, and with 2 simple setae medially; propodus 1.3 length of carpus, with 1 simple seta ventrally and 3 setulate scales medially; dactylus with 3 sub-apical and 2 apical simple setae. Pereopod 2 (Fig. 16G) with basis bearing 1 simple seta dorsally and ventrally; ischium 0.7 length of basis, with 1 simple seta dorsally and ventrally; merus half length of ischium, with 1 simple seta dorsally and ventrally; carpus 2.2 length of merus, with 1 simple seta and 1 broom seta dorsally and 1 robust seta and 2 simple setae ventrally; propodus 0.7 length of carpus, with 1 simple and 1 broom setae dorsally, 1 robust and 2 simple setae ventrally, and with 2 simple setae medially; dactylus with 2 subapical simple setae and 3 apical simple setae. Pereopods 2 to 7 subequal in length.

Pleopod 1 (Fig. 16H) with lateral lobes at level of 0.7 of its length; lateral lobe 0.4 times of total width of single ramus of pleopod; distal projection 0.3 times of total length of pleopod, acuminate. Pleopod 2 (Fig. 16I) with protopod 2.2 times longer than wide, with 13 simple setae on lateral margin; second article of endopod moderately short, not reaching apex of protopod. Pleopod 3 (Fig. 16J) with endopod 0.8 length of exopod.

Uropod (Fig. 16L) with endopod bearing 4 simple setae and 1 broom seta apically; exopod with 1 simple seta apically.

Female (allotype). Body widest at pereonite 3 (Fig. 15B). Operculum (Fig. 16K) 0.7 times as wide as long, with 32 fine setae laterally.

Paratypes. The paratypes agree well with the holotype and the allotype in most characters. Body 0.6 times as wide as long in male paratype, 0.7 times as wide as long in female paratypes. Lateral margins of pleotelson each with 16 (left)

or 18 (right) denticles in male paratype, 19 or 20 (left) or 19 (right) denticles in female paratypes.

Remarks. *Acutomunna minuta* sp. nov. is distinguished from the only other congener *A. foliacea* (Chardy, 1975) known from the Guinea Basin at the depth of 2470 m by the following minor characters: the head is proportionally shorter in *A. minuta* than in *A. foliacea* (0.4 times as long as wide versus 0.5 times); the eyestalk is less strongly directed anteriorly (the angle against the horizontal plane of the head is 17° in the new species, 33° in *A. foliacea*); the pleotelson is as wide as long in *A. minuta*, rather than 0.9 times as wide as long in *A. foliacea*); the distomedial projection of the article 1 of the antenna reaches half length of antennular article 2 in *A. minuta*, while this projection is directed laterally, not surpassing the distal margin of article 1 in *A. foliacea*; the article 3 of the antenna is widest at the distal part in the new species, rather than widest at the midlength in *A. foliacea*; and the new species is much smaller than *A. foliacea*, attaining only 1.13 mm in the body length in ovigerous female. The maximal length of the ovigerous females of *A. foliacea* is 2.50 mm.

Etymology. The Latin *minutus* (very small) refers to the small size of the new species.

Genus *Ascionana* Just and Wilson, 2004

[New Japanese name: Hirata-hime-mizumushi-zoku]

Ascionana bathyalis sp. nov.

[New Japanese name: Shinkai-hirata-hime-mizumushi]

(Figs. 17–19)

Material examined. Holotype: male (0.97 mm), KMNH IvR 500,359, RV *Tansei-maru*, KT07-01 cruise, stn YT-1(1), off Yakushima to Tanegashima islands, 565–723 m, 30°04.401'N, 130°59.945'E to 30°04.538'N, 130°57.889'E, 24 February 2007, beam trawl.

Allotype: ovigerous female (1.50 mm, with 7 eggs, KMNH IvR 500,362), same data as holotype.

Paratypes: 2 males (1.19 mm, KMNH IvR 500,360; 1.08 mm, NSMT-Cr 19574), 2 oviger-

ous females (1.43 mm, with 4 eggs, NSMT-Cr 19575; 1.41 mm, with 3 eggs, KMNH IvR 500,364), 4 females (1.44 mm, KMNH IvR 500,365; 1.29 mm, KMNH IvR 500,366; 1.28 mm, KMNH IvR 500,367; 1.27 mm, KMNH IvR 500,368), same data as holotype.

Description. Male (holotype). Body (Fig. 17A) widest at pereonite 1, narrowest at pereonite 4, maximal width 0.6 times length. Head (Fig. 17A) 0.4 times as long as wide; front divided in 2 lobes by narrow, deep median slit, each anterolateral margin oblique; frontal lobe half times as long as total length of head. Eystalks at posterolateral corner of head, terminally blunt, reaching anterolateral corner of front, directed laterally.

Pereonites (Fig. 17A) each with few fine setae on lateral margin, without dorsal setae; lateral margins of pereonites 1–3 quadrate, that of pereonite 4 projecting laterally, those of pereonites 5–7 angular and projecting. Pleon (Fig. 17A) 0.2 times as long as wide. Pleotelson (Fig. 17A) subheptagonal in general outline in dorsal view, 0.8 times as long as wide; lateral margins between anterolateral angles and posterolateral angles nearly straight, latter with 2 denticles; postero-median margin rounded.

Antennula (Fig. 17C, E) with article 1 bearing simple seta medially; article 2 not reaching tip of eyestalk, 0.6 length of article 1, with 2 simple and 2 broom setae; article 3 0.8 length of article 2, with simple seta distally; article 4 0.9 length of article 3; article 5 1.2 length of article 4; article 6 1.4 length of article 5, with 3 short and 1 long simple setae and aesthetasc apically.

Antenna (Fig. 17D, E) with articles 1 and 2 combined 0.3 length of article 3; articles 1 and 2 without setae; article 3 with 1 simple seta laterally; article 4 with simple seta medially; article 5 2.7 length of article 4, with simple seta laterally and medially; article 6 1.8 length of article 5, with some simple setae. Flagellum consisting of 7 articles; proximal article 1.3 length of second article.

Mandibles each with palp: left mandible (Fig. 18A) with 4 serrate setae on incisor process and

fine simple seta on molar process; right mandible (Fig. 18B) with 5 serrate setae on incisor process and 1 robust seta and 1 membranous seta on molar process.

Maxillula (Fig. 18C) with 3 stout simple and 1 fine simple setae on inner ramus and 8 stout simple setae on outer ramus. Maxilla (Fig. 18D) with 7 stout simple setae distally and some fine setae medially on inner ramus; 4 stout simple setae on each lobes of outer ramus.

Maxilliped (Fig. 18E) with article 1 of palp bearing 1 short seta medially; article 2 1.3 length of article 1, with 2 setae medially; article 3 1.4 length of article 2, with 2 setae medially and 1 seta laterally; article 4 1.3 length of article 3, with 2 setae medially; article 5 0.6 length of article 4, with 5 setae. Endite with 2 fan-shaped setae and 6 serrate setae distally and 1 stout simple seta medially, and with 2 coupling hooks medially; epipod small, lanceolate, apically blunt.

Pereopod 1 (Fig. 18F) with basis having crenate ridge dorsally, and with 1 simple seta dorsally and 2 simple setae ventrally; ischium 0.6 length of basis, with simple seta dorsally; merus strongly projecting dorsally, half length of ischium, dorsal margin with 2 denticles and 1 simple seta, ventral margin with 4 denticles and 1 robust and 2 simple setae; carpus rectangular, 2.4 length of merus, 0.9 times as long as wide, with 2 robust setae on ventral margin; propodus 1.1 length of carpus, with 2 simple setae on each medial, dorsal and ventral surfaces, and with 6 simple scales; dactylus with 3 subapical and 2 apical simple setae, unguis and supplementary claw. Pereopod 2 (Fig. 18G) with basis bearing 2 ventral simple setae; ischium 0.8 length of basis, also with 2 ventral simple setae; merus 0.6 length of ischium, with 1 medial, 1 dorsal and 1 ventral simple setae; carpus 1.9 length of merus, with 2 simple setae dorsally and 3 simple setae ventrally; propodus as long as carpus, with 2 simple and 1 broom setae dorsally, and 1 robust and 2 simple setae ventrally; dactylus with 3 apical simple setae, unguis and supplementary claw. Pereopods 2 to 7 subequal in length.

Pleopod 1 (Fig. 18H) with lateral lobes at level

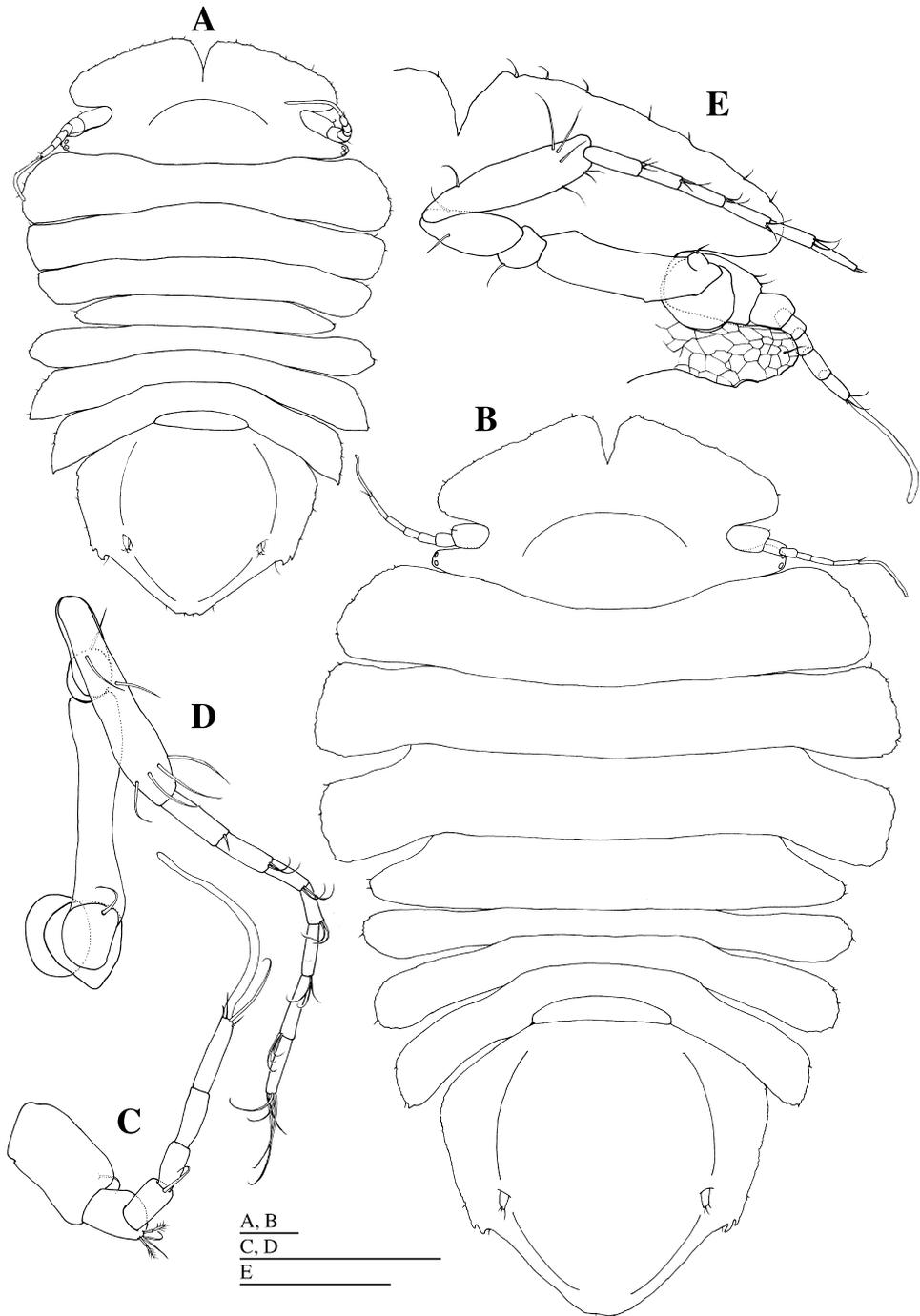


Fig. 17. *Ascionana bathyalis* sp. nov. A, C–E, holotype, male (KMNH IvR 500,359); B, allotype, female (KMNH IvR 500,362). A, B, habitus, dorsal view; C, right antennula, ventral view; D, right antenna, dorsal view; E, left part of head, antennula and antenna, ventral view. Scale bars: 100 μ m.

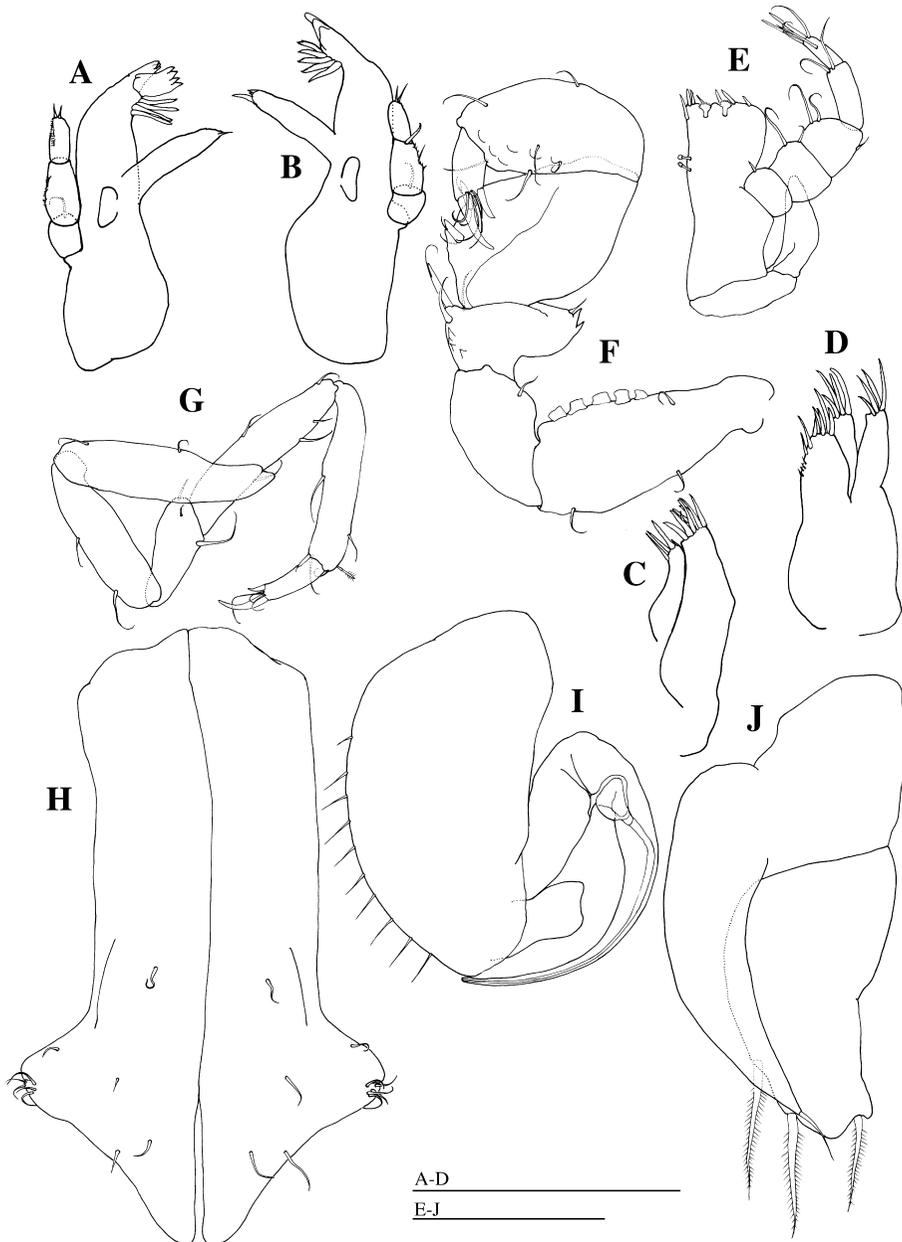


Fig. 18. *Ascionana bathyalis* sp. nov. Holotype, male (KMNH IvR 500,359). A, left mandible, dorsal view; B, right mandible, dorsal view; C, right maxillula, dorsal view; D, right maxilla, dorsal view; E, left maxilliped, ventral view; F, right pereopod 1, medial view; G, left pereopod 2, medial view; H, pleopod 1, ventral view; I, right pleopod 2, ventral view; J, right pleopod 3, ventral view. Scale bar: 100 μ m.

of 0.7 of its length, roundly triangular; lateral lobe 0.4 times of total width of single ramus of pleopod; distal projection 0.3 times of total length of pleopod, acuminate. Pleopod 2 (Fig.

18I) with protopod 1.9 times longer than wide, bearing 10 simple setae on lateral margin; second article of endopod moderately long, reaching apex of protopod. Pleopod 3 (Fig. 18J) with en-

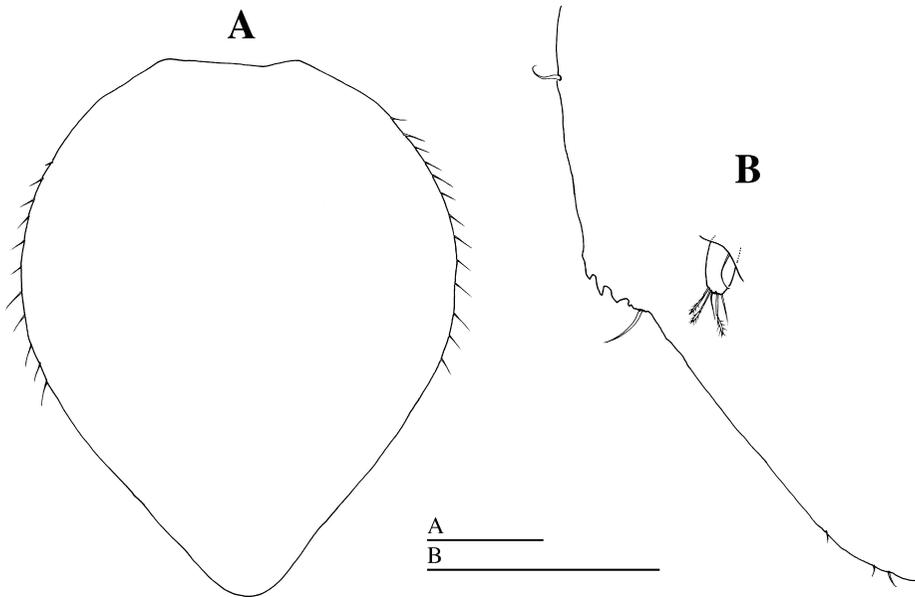


Fig. 19. *Ascionana bathyalis* sp. nov. A, allotype, female (KMNH IvR 500,362); B, holotype, male (KMNH IvR 500,359). A, operculum, ventral view; B, left uropod, dorsal view. Scale bars: 100 μ m.

dopod 0.8 length of exopod.

Uropod (Fig. 19B) with endopod bearing 2 simple and 3 broom setae apically; exopod invisible in dorsal view, with 1 simple seta apically.

Female (allotype). Body 0.6 times as wide as long (Fig. 17B). Head (Fig. 17B) 0.6 times as long as wide. Pleotelson (Fig. 17B) 0.9 times as long as wide. Operculum (Fig. 19A) 0.8 times as wide as long, with 24 fine setae on lateral margin.

Paratypes. The paratypes agree well with the holotype and the allotype in most characters. Body 0.6–0.7 times as wide as long in male paratypes. Head 0.5–0.6 times in female paratypes. Pleotelson 0.8–0.9 times in female paratypes.

Remarks. The present new species is morphologically similar to *Ascionana rhipis* (Shimomura and Mawatari, 1999) known from northern Japan and *A. dentifera* Just and Wilson, 2004 from southeastern Australia in the armature of the pleotelson. In these three species, the pleotelson is armed with only two denticles at each posterolateral angle. *Ascionana bathyalis* sp. nov. is separated from *A. rhipis* by the following charac-

ters: the median slit of the frontal margin of the head is relatively broader in the new species than in *A. rhipis*; with regard to males, the pereonites 1 to 3 decreases in the width in *A. bathyalis*, whereas these three pereonites are subequal in the width in *A. rhipis*; the pereonite 4 is the narrowest among all pereonites in males of *A. bathyalis*, where as in *A. rhipis*, it is wider than pereonites 6 and 7; and the lateral margins of the pereonite 4 are broadly rounded in *A. bathyalis*, rather than quadrate in *A. rhipis*. The new species differs from *A. dentifera* in the presence of a median slit on the frontal margin of the head, which is absent in *A. dentifera*, broadly rounded, rather than quadrate, lateral margins of the pereonite 4, and the relatively wider body in females (0.6 times as wide as long versus 0.5 times).

Etymology. The species name is derived from the Greek bathyalis, the deep-sea, referring to the depth zone where the new species was collected (upper bathyal zone of 565–723 m).

***Dentigonium* gen. nov.**

[New Japanese name: Giza-hime-mizumushi-zoku]

Type species. *Dentigonium tantulum* sp. nov.*Composition.* So far monotypic.

Diagnosis. Body broadly ovate in general outline in dorsal view. Frontal margin of head with rounded median projection. Eyestalks short, apically pointed, with 1–3 spines. Pereonites dorsally smooth, lateral margins projecting; pereonites 1–6 denticulate posterolaterally. Pleotelson laterally rounded, marginally denticulate. Antennula article 1 about half length of article 2, with denticles dorsodistally. Antennal article 3 broad, with robust denticles laterally. Mandibular palp present; molar process well developed. Coxae dorsally invisible. Pereopod 1 with triangular carpus; propodus without denticles or spines. Female operculum ovoid. Uropodal endopod straight, apex truncate.

Remarks. *Dentigonium* gen. nov. resembles *Pleurogonium* in the absence of prominent spines or spine-like projections on the dorsal margin of the pereon and long eyestalks on the head. However, the new genus differs from *Pleurogonium* in the possession of numerous denticles on the posterolateral margins of the pereonites 1–6, the presence of many marginal denticles on the pleotelson and dorsally invisible coxae. In *Pleurogonium*, the pereonites 1–6 are unarmed on the posterolateral margins; the pleotelson is also unarmed marginally; and the coxae are visible in the dorsal view.

Etymology. The generic name includes the Latin *dens* meaning tooth, alluding to denticles on the pereon.

***Dentigonium tantulum* sp. nov.**

[New Japanese name: Giza-hime-mizumushi]

(Figs. 20–22)

Material examined. Holotype: male (0.98 mm), KMNH IvR 500,369, RV *Tansei-maru*, KT07-01 cruise, stn St. YT-1(1), off Yakushima to Tanegashima islands, Ohsumi Islands, 565–723 m, 30°04.401'N, 130°59.945'E to

30°04.538'N, 130°57.889'E, 24 February 2007, beam trawl.

Allotype: ovigerous female (1.22 mm, with 4 eggs, KMNH IvR500,371), same data as holotype.

Paratypes: 1 male (0.92 mm, KMNH IvR 500,370), 2 ovigerous females (1.10 mm, with 3 eggs, NSMT-Cr 19576; 1.07 mm, with 4 eggs, KMNH IvR 500,373), 5 females (1.17 mm, KMNH IvR 500,374; 1.13 mm, KMNH IvR 500,375; 1.10 mm, KMNH IvR 500,376; 1.05 mm, KMNH IvR 500,377; 1.04 mm, KMNH IvR 500,378), same data as holotype; 2 females (0.97 mm, KMNH IvR 500,379; 1.05 mm, KMNH IvR 500,380), TS *Nagasaki-maru*, cruise N237 cruise, stn F2, 501–498 m, 31°42.93'N, 128°35.72'E to 31°42.05'N, 128°34.76'E, 9 May 2007, beam trawl; 1 male (0.92 mm, NSMT-Cr 19577), 4 females (1.24 mm, KMNH IvR 500,382; 1.14 mm, KMNH IvR 500,383; 1.10 mm, KMNH IvR 500,384; 1.09 mm, KMNH IvR 500,385), TS *Nagasaki-maru*, N251 cruise, stn A, 482–489 m, 32°10.29'N, 129°28.38'E to 32°09.51'N, 129°30.03'E, 13 November 2007, beam trawl.

Description. Male (holotype). Body (Fig. 20A) widest at pereonite 3, narrowest at pereonite 7, maximum width 0.6 times length. Head (Fig. 20A) 0.6 times as long as wide; frontal margin broadly rounded. Eyestalks pointed apically, with 1 or 2 spines, without ocelli.

Pereonites (Fig. 20A) each with few fine setae dorsally and laterally; lateral margin of pereonites 1–6 with many denticles posterolaterally; pereonite 7 unarmed posterolaterally. Pleon (Fig. 20A) 0.27 times as long as wide. Pleotelson (Fig. 20A) as long as wide; lateral margins each with 29 denticles, with few fine setae dorsally and posteriorly.

Antennula (Fig. 20C, E) with article 1 bearing 2 denticles and 1 simple seta medially, and with 1 simple seta distolaterally; article 2 1.7 length of article 1, with 1 simple seta medially and 1 simple seta and 3 broom setae distolaterally; article 3 0.4 length of article 2, with 1 simple seta distoventrally; article 4 0.7 length of article 3, with

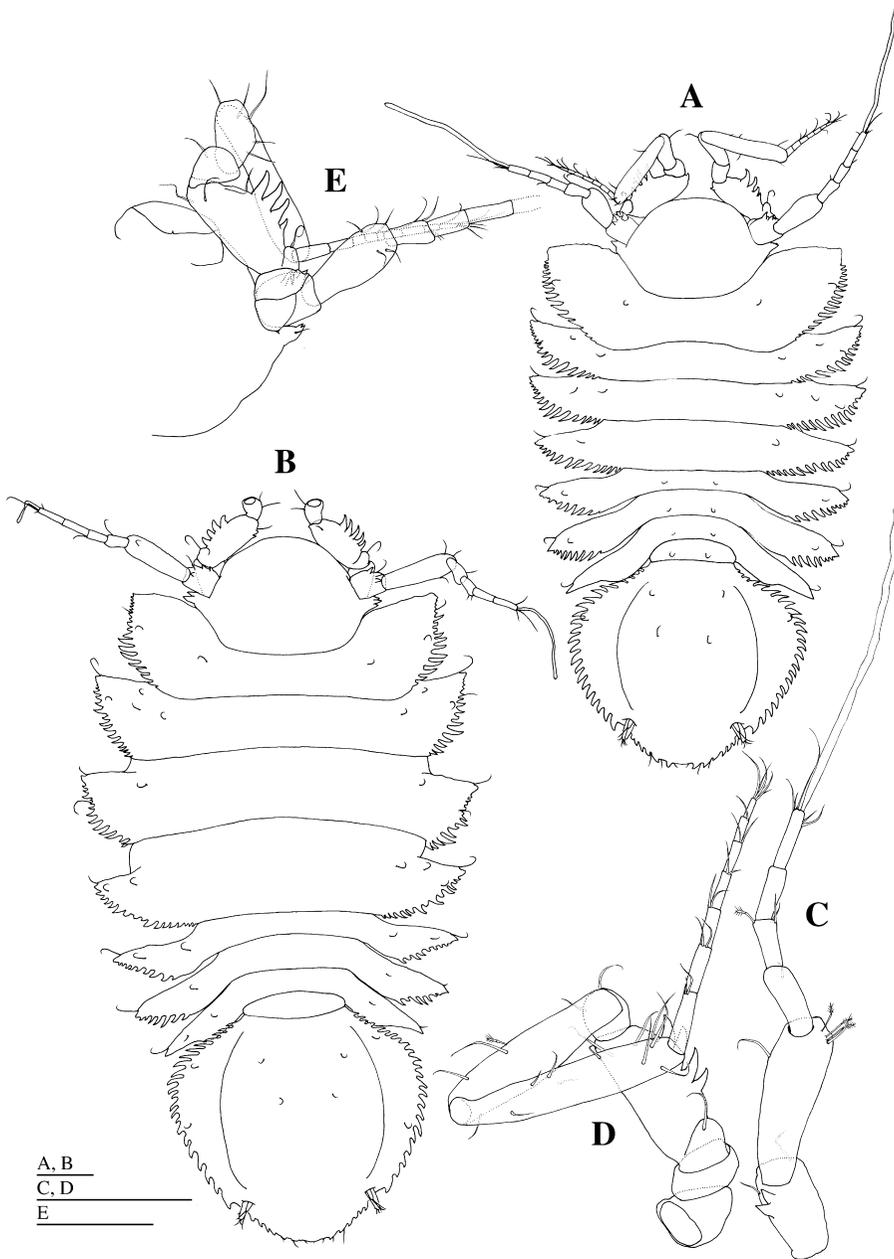


Fig. 20. *Dentigonium tantulum* gen., sp. nov. A, C–E, holotype, male (KMNH IvR 500,369); B, allotype, female (KMNH IvR 500,371). A, B, habitus, dorsal view; C, right antennula, dorsal view; D, right antenna, dorsal view; E, left part of head, antennula and antenna, ventral view. Scale bars: 100 μ m.

1 broom seta distolaterally and 2 simple setae distomedially; article 5 1.1 length of article 4; article 6 1.1 length of article 5, with 2 simple setae subapically, 3 simple seta and aesthetasc apically.

Antenna (Fig. 20D, 21A) with articles 1 and 2

combined 0.6 length of article 3; article 2 without setae or spines; article 3 with 4 large denticles laterally, and with 1 simple seta laterally and distomedially; article 4 with 2 simple setae medially; article 5 2.4 length of article 4, with 2 sim-

ple setae and 1 broom seta laterally and 1 simple seta distomedially; article 6 1.2 length of article 5, with 7 simple setae dorsally and 2 simple setae laterally. Flagellum consisting of 7 articles; proximal article 1.4 length of second article.

Left mandible (Fig. 21A) with 4-toothed lacinia mobilis and 4 serrate setae on incisor process, and 2 fine simple setae on molar process; right mandible (Fig. 21B) with 5 serrate setae on incisor process and 2 simple setae on molar process.

Maxillula (Fig. 21C) with 5 stout simple setae and 1 fine seta on inner ramus and 8 stout simple setae on outer ramus. Maxilla (Fig. 21D) with 6

stout simple setae distally, 2 setulate setae and some fine setae medially on inner ramus; 4 stout simple setae also present on each lobes of outer ramus.

Maxilliped (Fig. 21E) with article 1 of palp bearing short seta medially; article 2 1.6 length of article 1, with 2 setae medially and 1 seta laterally; article 3 1.2 length of article 2, with 3 setae medially and 1 seta laterally; article 4 1.2 length of article 3, with 2 setae medially; article 5 0.6 length of article 4, with 5 setae. Endite with 2 fan-shaped, 4 serrate and 1 stout simple setae distally, and with 2 coupling hooks medially; epipod lanceolate, apically blunt.

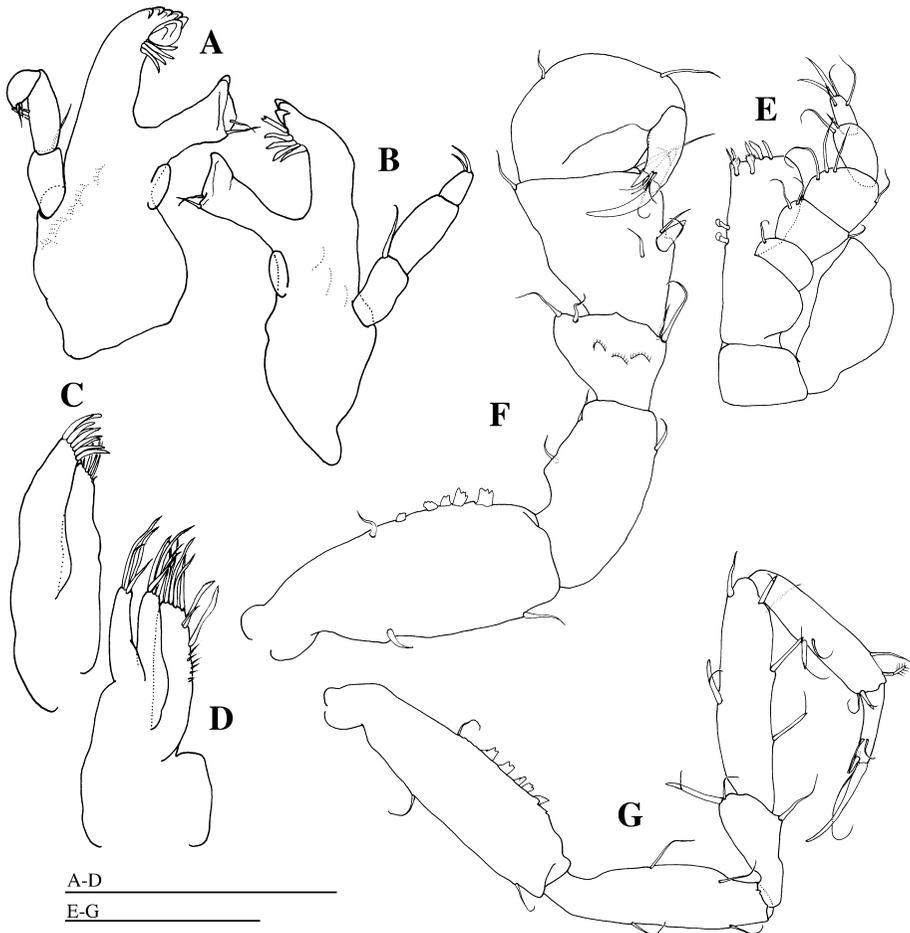


Fig. 21. *Dentigonium tantulum* gen., sp. nov. Holotype, male (KMNH IvR 500,369). A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxillula, dorsal view; D, right maxilla, ventral view; E, left maxilliped, ventral view; F, left pereopod 1, medial view; G, left pereopod 2, medial view. Scale bar: 100 μm .

Pereopod 1 (Fig. 21F) with basis bearing 5 unequal, occasionally multifid denticles and 1 simple seta on dorsal margin, and with 2 simple setae on ventral margin; ischium 0.6 length of basis, with 2 simple setae dorsally and 1 simple seta ventrally; merus trapezoidal, half length of ischium, with 2 simple setae on each dorsal and ventral margins, and also with 3 setulate scales medially; carpus triangular, 1.8 length of merus, 1.2 times as long as wide, with 2 robust setae and 2 simple setae on ventral margin, and with 1 simple seta on medial surface; propodus 1.1 length

of carpus, with 2 simple setae dorsally; dactylus with 2 subapical and 2 apical simple setae, unguis and supplementary claw. Pereopod 2 (Fig. 21G) with basis bearing 5 unequal, occasionally multifid denticles and 1 simple seta on dorsal margin, and with 2 simple setae on ventral margin; ischium 0.8 length of basis, with 2 simple setae dorsally and ventrally; merus half length of ischium, with 1 robust seta and 1 simple seta dorsally, and with 1 simple seta ventrally; carpus twice as long as merus, with 2 robust setae dorsally and 3 robust setae and 1 simple seta ventral-

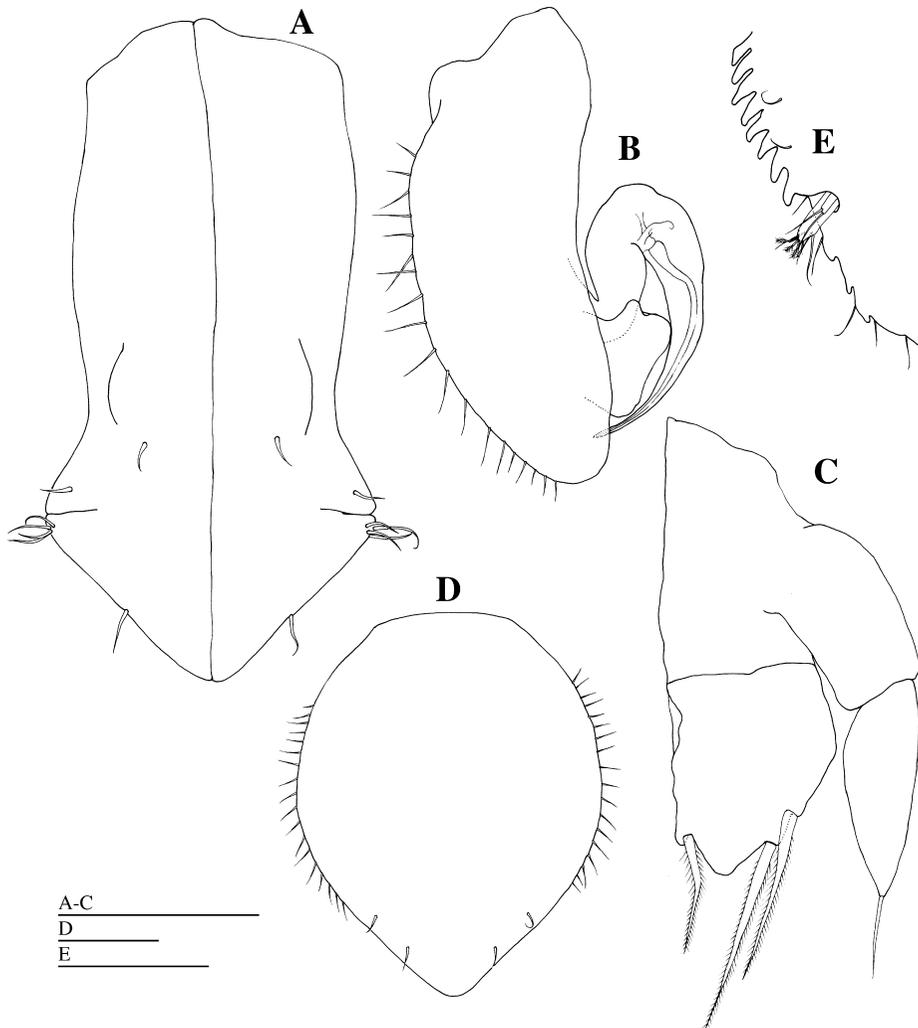


Fig. 22. *Dentigonium tantulum* gen., sp. nov. A–C, E, holotype, male (KMNH IvR 500,369); D, allotype female (KMNH IvR 500,371). A, pleopod 1, ventral view; B, right pleopod 2, ventral view; C, right pleopod 3, ventral view; D, operculum, ventral view; E, left uropod, dorsal view. Scale bars: 100 μ m.

ly; propodus 0.7 length of carpus, with 1 simple and 1 broom setae dorsally, and with 2 robust and 2 simple setae ventrally; dactylus with 2 subapical simple setae and 2 apical simple setae, unguis and supplementary claw. Pereopods 2 to 7 slightly increasing in length posteriorly.

Pleopod 1 (Fig. 22A) with lateral lobes at level of 0.7 of its length; lateral lobe 0.3 times of total width of single ramus of pleopod; distal projection 0.3 times of total length of pleopod, acuminate. Pleopod 2 (Fig. 22B) with protopod 2.6 times longer than wide, with 19 simple setae on lateral margin; second article of endopod moderately short, not reaching apex of protopod. Pleopod 3 (Fig. 22C) with endopod 0.9 length of exopod.

Uropod (Fig. 22E) with endopod bearing 1 simple seta medially and 2 simple setae and 4 broom setae apically; exopod with 2 simple setae apically.

Female (allotype). Body width 0.6 times length (Fig. 20B). Head (Fig. 20B) 0.6 times as wide as long. Pleotelson (Fig. 20B) 0.9 times as long as wide; lateral margins each with 28 denticles (left) or 29 denticles (right). Eyestalks pointed apically, with 2 or 3 spines. Antennal article 3 with 4 or 5 large denticles laterally. Operculum (Fig. 22D) 0.8 times as wide as long, with 36 fine setae laterally and 4 setae ventrally.

Paratypes. The paratypes agree well with the holotype and the allotype in most characters. Body maximum width 0.6 times length in female paratypes. Head 0.6–0.7 times as long as wide in both male and female paratypes. Pleotelson 0.9–1.0 times as long as wide in both male and female paratypes; lateral margins each with 25 or 26 denticles in male paratypes, 25–28 denticles in female paratypes. Antennal article 3 with 4–6 large denticles laterally in both male and female paratypes.

Etymology. From the Latin adjective *tantulus* (so small), referring to the very small size of this new species.

Spinogonium gen. nov.

[New Japanese name: Nagatoge-hime-mizumushi-zoku]

Type species. *Spinogonium spinosum* sp. nov.

Composition. In addition to the type species, *Spinogonium decoratum* sp. nov. is included.

Diagnosis. Body slender, ovate in general outline in dorsal view. Head with frontal margin evenly convex. Eyestalks absent. Pereonites 1–6 each with pair of long, spine-like lateral projections; pereonites 1–3 each with single projection on dorsal midline. Pleotelson rounded laterally, with denticles on lateral margins. Antennular article 1 spinulated. Mandibular palp present; molar process well developed. Coxae 1–7 dorsally visible in males; coxae 1 and 5–7 visible in females. Pereopod 1 with ovate carpus; propodus with 2 robust setae and some simple setae on ventral margin. Second article of exopod of pleopod 3 with 4 or 5 serrations subapically. Female operculum tapering distally. Uropods biramous, endopod straight, apex truncate.

Remarks. *Spinogonium* gen. nov. resembles *Notoxenoides* in possessing spine-like projections on the lateral margins and on the dorsum of the pereon, and serrations on the lateral margins of the pleotelson. The new genus differs from *Notoxenoides* in the following points: the head is devoid of lateral projections in *Spinogonium*, which are present in *Notoxenoides*; the pleonite lacks prominent projections on the dorsal surface in *Spinogonium*, whereas it is armed with prominent, spine-like projections in *Notoxenoides*.

Etymology. The generic name includes the Latin *spinus*, meaning spine, alluding to the spine-like projections on the pereon.

Spinogonium spinosum sp. nov.

[New Japanese name: Nagatoge-hime-mizumushi]

(Figs. 23–25)

Material examined. Holotype: male (1.25 mm), KMNH IvR 500,386, RV *Tansei-maru*, KT07-01 cruise, stn YT-1(1), off Yakushima to Tanegashima islands, Ohsumi Islands, 565–723 m, 30°04.401'N, 130°59.945'E to

30°04.538'N, 130°57.889'E, 24 February 2007, beam trawl.

Allotype: female (1.92 mm, KMNH IvR 500,388), same data as holotype.

Paratype: 1 male (1.32 mm, NSMT-Cr 19578),

same data as holotype.

Description. Male (holotype). Body (Fig. 23A) widest at pereonite 3 (excluding lateral projections), maximum width 0.4 times length. Head (Fig. 23A) 0.6 times as long as wide; frontal mar-

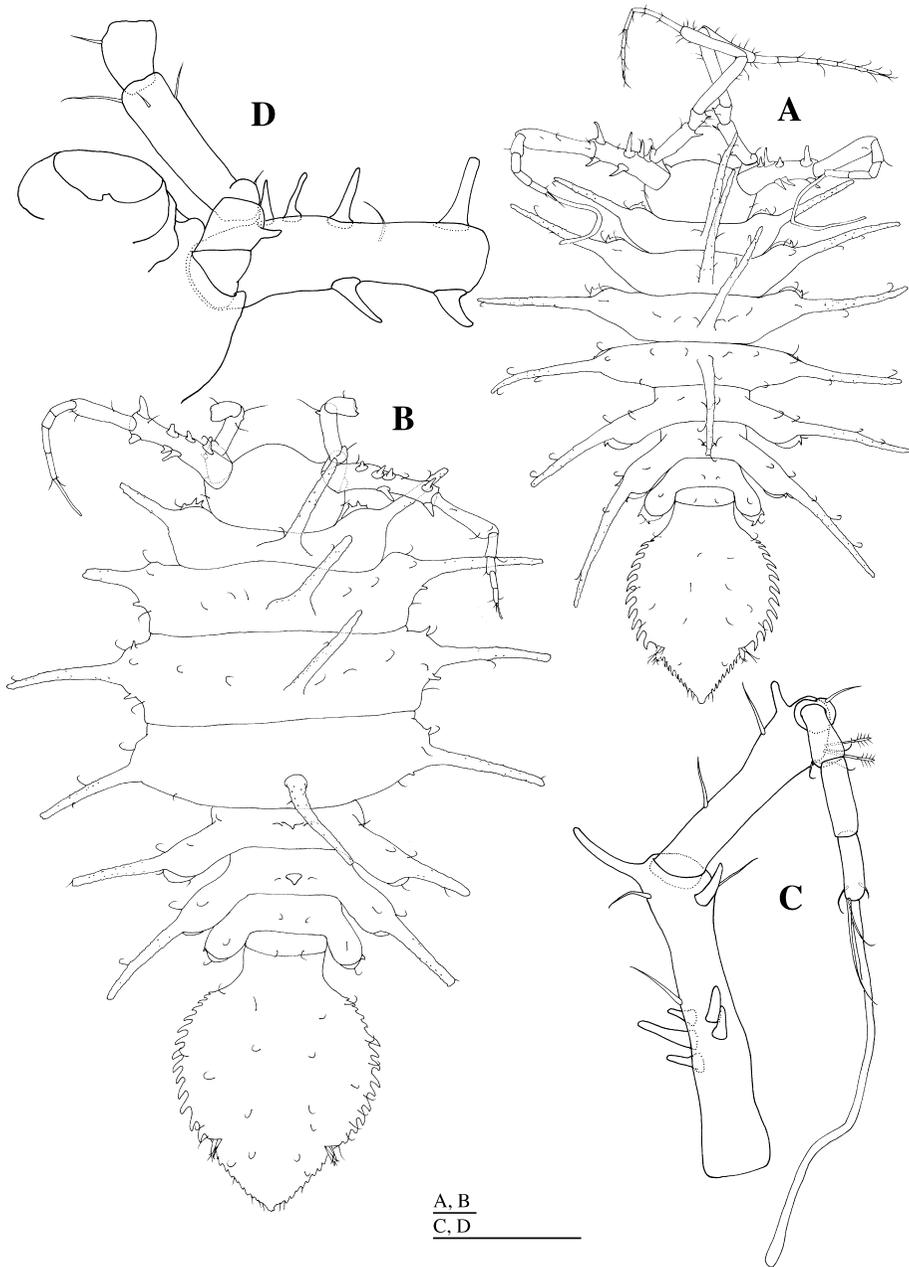


Fig. 23. *Spinogonium spinosum* gen., sp. nov. A, C, D, holotype, male (KMNH IvR 500,386); B, allotype, female (KMNH IvR 500,388). A, B, habitus, dorsal view; C, right antennula, dorsal view; D, left part of head, antennula and antenna, ventral view. Scale bars: 100 μ m.

gin slightly convex.

Pereonites (Figs. 23A, 24I) each with scattered fine setae on dorsal surface and lateral margins; pereonites 1–6 each with long, spine-like lateral projection on either side, pereonites 1–4 each with long spine-like, middorsal projection; pereonites 5 and 6 each with short middorsal projection. All coxae (Fig. 23A) visible in dorsal view, each with 1 or 2 denticles and simple seta on lateral margin. Pleon (Fig. 23A) 0.4 times as long as wide, with pair of short setae dorsally. Pleotelson (Fig. 23A) 1.5 times longer than wide, with 10 short setae dorsally, 11 pairs of large denticles on lateral margin and 8 pairs of small denticles at posterolateral angles.

Antennula (Fig. 23C, D) with article 1 bearing 1 long spine and 1 simple seta mediodistally, 3 spines and 1 simple seta medially, and with 3 spines and 1 simple seta laterally; article 2 0.7 length of article 1, with 1 spine mediodistally, 2 simple setae medially, and 2 simple setae and 2 broom setae distolaterally; article 3 0.4 length of article 2, with 1 simple seta distomedially; article 4 0.6 length of article 3, with 1 simple seta distolaterally; article 5 1.3 length of article 4; article 6 0.9 length of article 5, with 2 short simple setae subapically, 1 short and 1 long simple setae and aesthetasc apically.

Antenna (Figs. 23D, 24A) with articles 1 and 2 combined 0.6 length of article 3; article 2 with 1 spine laterally; article 3 with 3 simple setae laterally, and with 1 short spine medially, and 3 simple setae distomedially; article 4 with 2 simple setae medially; article 5 3.9 length of article 4, with 2 simple setae laterally and 3 simple setae medially; article 6 1.1 length of article 5, with 1 simple seta and 1 broom seta distolaterally and 4 simple setae and 2 broom setae medially. Flagellum consisting of 7 articles; proximal article 1.4 length of second article.

Left mandible (Fig. 24B) with 4-toothed lacinia mobilis and 4 serrate setae on incisor process and 2 simple setae on molar process; right mandible (Fig. 24C) with 5 serrate setae on incisor process and 2 simple setae on molar process.

Maxillula (Fig. 24D) with 4 stout simple setae on inner ramus and 10 stout simple setae and few fine setae on outer ramus. Maxilla (Fig. 24E) with 6 stout simple setae and some fine setae on inner ramus; 4 stout simple setae also present on each lobes of outer ramus.

Maxilliped (Fig. 24F) with article 1 of palp bearing short seta medially; article 2 1.5 length of article 1, with 2 setae medially; article 3 1.3 length of article 2, with 3 setae medially and 1 seta distolaterally; article 4 1.1 length of article 3, with 2 setae medially; article 5 0.7 length of article 4, having 5 setae. Endite with 2 fan-shaped setae, 1 ventral simple seta, 6 distal serrate setae and 2 distodorsal simple setae, and 2 coupling hooks on medial margin; epipod lanceolate, apically blunt.

Pereopod 1 (Fig. 24G) with basis bearing 2 robust spines and 1 simple seta dorsally and 1 simple seta ventrally; ischium 0.6 length of basis, with 1 simple seta ventrodorsally; merus trapezoidal, 0.6 length of ischium, with 2 simple setae and 4 setulate scales medially, 1 simple seta dorsally and ventrally; carpus ovate, 1.4 length of merus, 1.5 times as long as wide, with 4 robust setae and 1 simple seta on ventral margin, 2 simple setae medially and 1 simple seta on dorsal margin; propodus as long as carpus, with 3 simple seta and 2 robust setae on ventral margin, 1 simple seta medially and dorsally; dactylus with 2 subapical and 2 apical simple setae, unguis and supplementary claw. Pereopod 2 (Fig. 24H) with basis bearing 2 robust spines, 1 simple seta and 1 broom seta dorsally, and with 1 simple seta medially and 2 simple setae ventrally; ischium 0.8 length of basis, with 1 simple seta dorsally, 2 simple setae ventrally, and with 1 simple seta distomedially and distolaterally; merus half length of ischium, with 2 simple setae dorsally and ventrally; carpus twice as long as merus, with 2 simple setae dorsally, 3 robust and 1 simple seta ventrally, and with 1 simple seta distomedially and distolaterally; propodus 0.7 length of carpus, with 2 simple and 1 broom setae dorsodistally, 3 robust setae and 1 simple seta ventrally, and with 1 simple seta medially; dactylus with 3 subapical

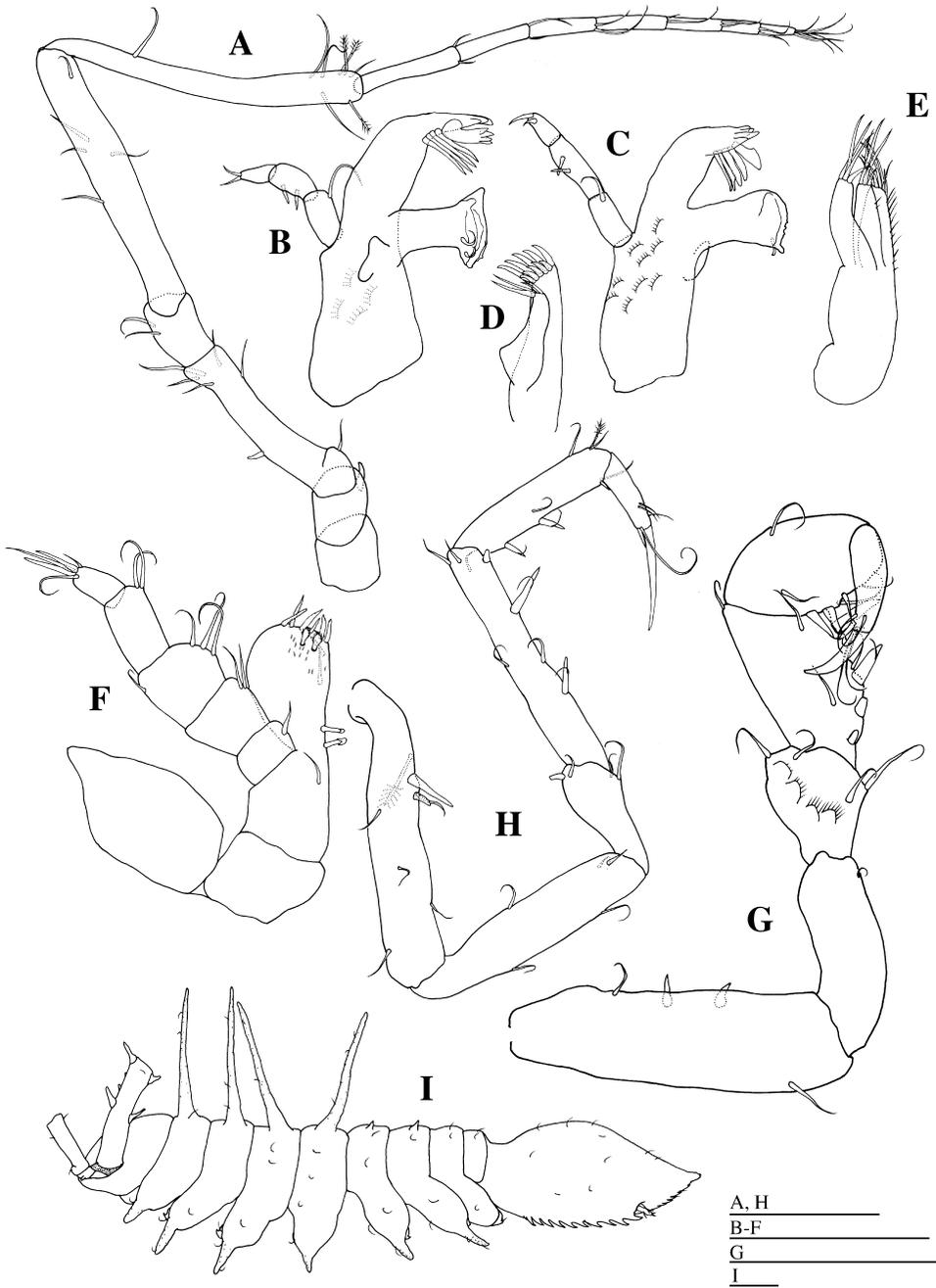


Fig. 24. *Spinogonium spinosum* gen., sp. nov. Holotype, male (KMNH IvR 500,386). A, right antenna, dorsal view; B, left mandible, dorsal view; C, right mandible, ventral view; D, left maxillula, ventral view; E, right maxilla, ventral view; F, right maxilliped, ventral view; G, left pereopod 1, medial view; H, left pereopod 2, medial view; I, habitus, lateral view. Scale bars: 100 μ m.

and 1 apical simple setae, unguis and supplementary claw. Pereopods 2 to 7 slightly increasing in length posteriorly.

Pleopod 1 (Fig. 25A) with lateral lobes at level of 0.6 of its length; lateral lobe 0.2 times of total width of single ramus of pleopod; distal projection 0.3 times of total length of pleopod, acuminate. Pleopod 2 (Fig. 25B) with protopod 3.4 times longer than wide, with 15 simple setae on lateral margin; second article of endopod moderately short, not reaching apex of protopod. Pleopod 3 (Fig. 25C) with 5 denticles and 1 simple seta apically on second article of exopod.

Uropod (Fig. 25E) with endopod bearing 2 simple setae laterally, 1 simple seta medially and 4 broom setae apically; exopod with 2 simple

setae apically.

Female (allotype). Body half as wide as long (Fig. 23B). Operculum (Fig. 25D) 0.7 times as wide as long, with 32 fine setae laterally and 6 simple setae ventrally.

Paratype. The paratype does not differ significantly from the holotype.

Remarks. Differences between the present new species and the sole congeneric *S. decoratum* sp. nov. will be discussed under the account of the latter species.

Etymology. From the Latin *spinosus*, meaning "spiny", referring to the presence of prominent spine-like projections on the pereon in this new species.

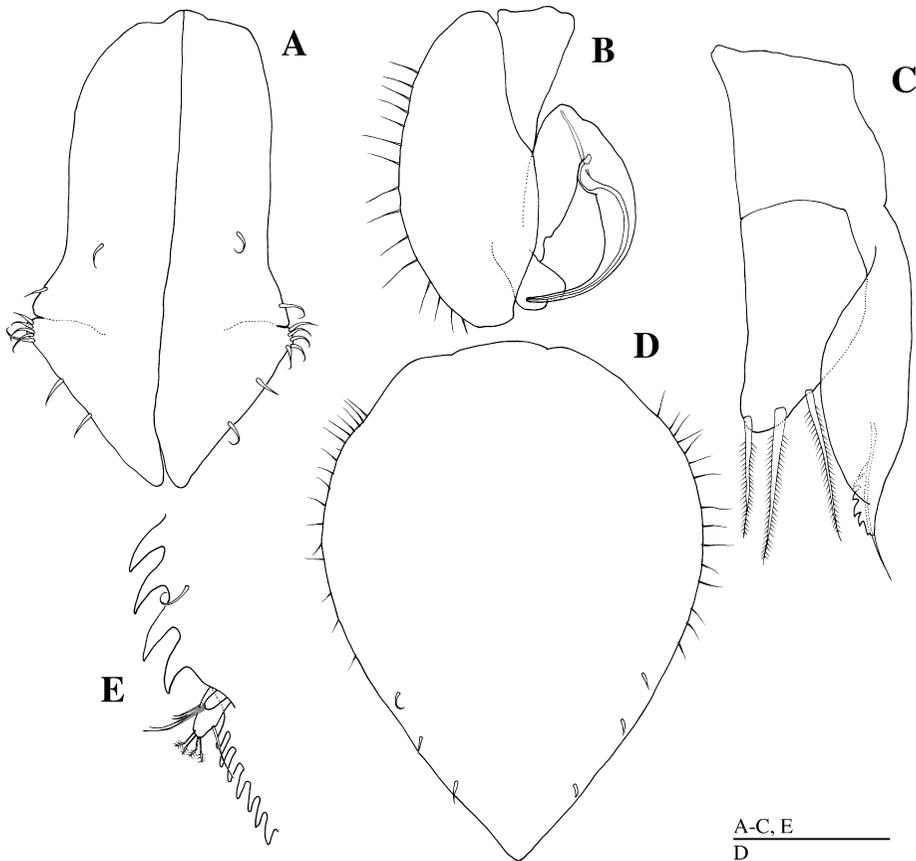


Fig. 25. *Spinogonium spinosum* gen., sp. nov. A–C, E, holotype, male (KMNH IvR 500,386); D, allotype, female (KMNH IvR 500,388). A, pleopod 1, ventral view; B, right pleopod 2, ventral view; C, left pleopod 3, ventral view; D, operculum, ventral view; E, left uropod, dorsal view. Scale bars: 100 μ m.

Spinogonium decoratum sp. nov.

[New Japanese name: Kazari-nagatoge-hime-mizumushi]

(Figs. 26–27)

Material examined. Holotype: male (1.02 mm), KMNH IvR 500,389, RV *Tansei-maru*, KT07-01 cruise, stn YT-3, off Yakushima to Tanegashima islands, Ohsumi Islands, 1677–1769 m, 29°51.041'N, 130°55.685'E to 29°49.815'N, 130°54.457'E, 24 February 2007, beam trawl.

Description. Male (holotype). Body (Fig. 26A) widest at pereonite 3 (excluding lateral spine-like projections on pereon), maximum width 0.4 times length. Head (Fig. 26A) 0.7 times as long as wide, with 3 short spines and pair of fine setae on dorsal surface; frontal margin slightly convex.

Pereonites (Fig. 26A, E) each scattered fine setae on dorsal surfaces and lateral margins, and with short spines on dorsal surfaces; pereonites 1–6 each with long spine-like lateral projection on either side and short spine at posterolateral angle; pereonite 1 with robust, middorsal projection, surface of middorsal projection having many spinules, granules, and simple setae; pereonites 2 and 3 each with granular middorsal projection. All coxae (Fig. 26A) visible in dorsal view, each with 1 simple seta on lateral margin. Pleon (Fig. 26A) 0.4 times as long as wide, with 1 spine and pair of short setae on dorsal surface. Pleotelson (Fig. 26A) 1.41 times longer than wide, with 24 short setae on dorsal surface, lateral margin with 11 (left) or 10 (right) large denticles, posterolateral angle each with 8 small denticles.

Antennula (Fig. 26B, D) with article 1 bearing 2 long spines and 3 simple setae on medial surface, and with 1 simple seta on dorsal margin; article 2 1.1 length of article 1, with 1 spine dorso-distally, 2 simple setae and 3 broom setae distally; article 3 0.4 length of article 2, with 1 simple seta distolaterally; article 4 slightly shorter than article 3, with 1 simple seta ventro-distally; article 5 1.5 length of article 4; article 6 0.9 length of article 5, with 2 short simple setae sub-

apically, 2 short and 1 long simple setae and aesthetasc apically.

Antenna (Fig. 26C, D) with articles 1 and 2 combined 0.7 length of article 3; articles 1 and 2 without setae or spines; article 3 with 1 spine and 2 simple setae laterally, 1 spine and 1 simple seta medially, and with 1 simple seta distodorsally and distoventrally; article 4 with 2 simple setae medially; article 5 3.9 length of article 4, with 1 simple seta and 1 broom seta laterally and 2 simple setae distally; article 6 1.2 length of article 5, with 1 simple seta ventrally, 2 simple setae dorsally, and with 2 simple setae and 2 broom setae distally. Flagellum consisting of 7 articles, proximal article 1.5 length of second article.

Left mandible (Fig. 27A) with lacinia mobilis and 7 serrate setae on incisor process and 1 simple seta on molar process; right mandible (Fig. 27B) with 3 serrate setae on incisor process and 2 simple setae on molar process.

Maxillula (Fig. 27C) with 4 stout simple setae on inner ramus and 9 stout simple setae on outer ramus. Maxilla (Fig. 27D) with 7 stout simple setae and some fine setae on inner ramus; 4 stout simple setae also present on each lobes of outer ramus.

Maxilliped (Fig. 27E) with article 1 of palp bearing 1 short seta medially; article 2 1.7 length of article 1, with 2 setae medially; article 3 as long as article 2, with 3 setae medially and 1 seta laterally; article 4 1.3 length of article 3, with 3 setae distally; article 5 0.7 length of article 4, with 5 setae. Endite with 2 fan-shaped setae, 1 ventral simple seta, 6 distal serrate setae and 1 medial simple seta, and with 2 coupling hooks medially; epipod missing.

Pereopod 1 (Fig. 27F) with basis bearing 1 simple seta dorsally and ventrally; ischium 0.4 length of basis, with 1 simple scale and 1 setulate scale medially; merus trapezoidal, 0.8 length of ischium, with 1 simple seta and 3 setulate scales medially, 1 simple seta dorsally, and with 2 simple setae ventro-distally; carpus ovate, 1.1 length of merus, 1.1 times as long as wide, with 3 denticles, 2 robust setae and 2 simple setae on ventral margin, 1 simple scale medially, and with 1 sim-

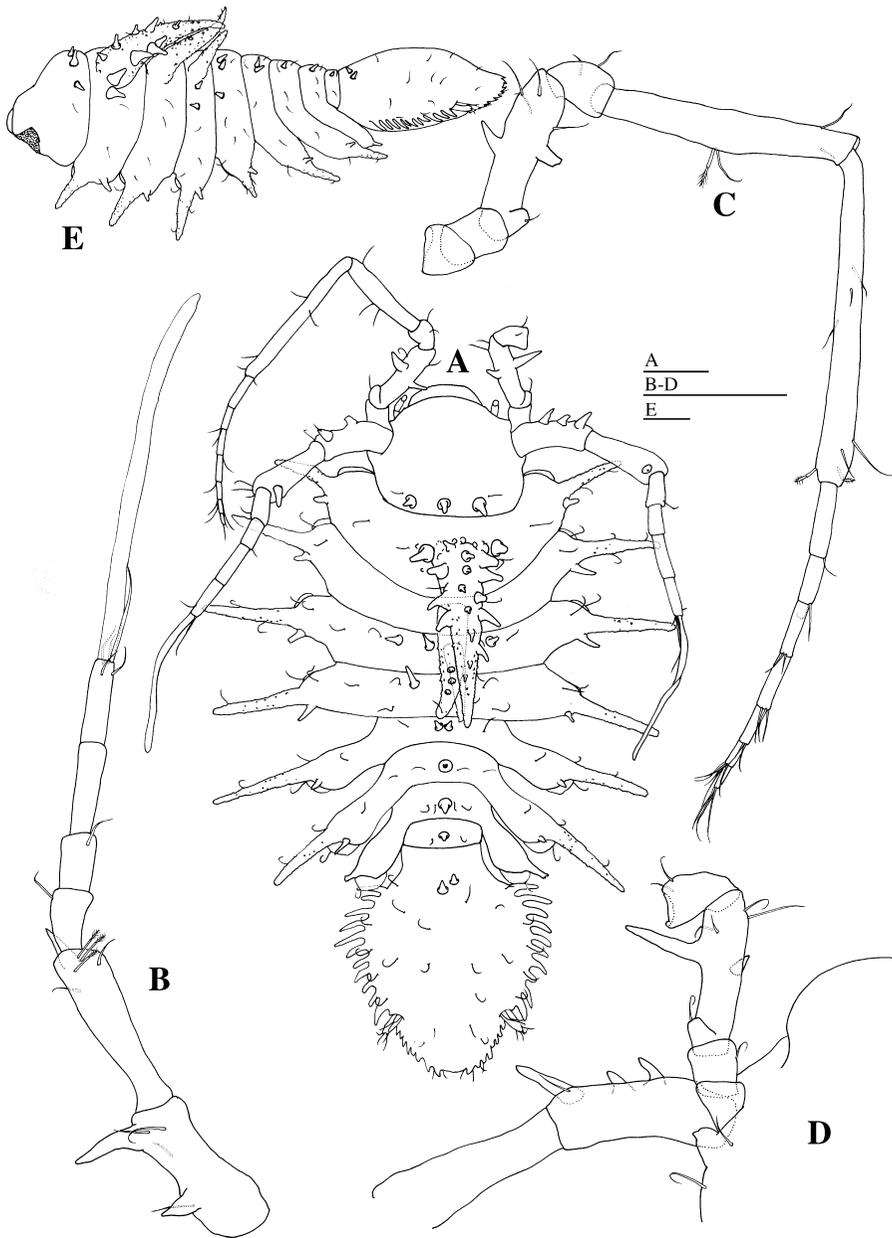


Fig. 26. *Spinogonium decoratum* gen., sp. nov. Holotype, male (KMNH IvR 500,389). A, habitus, dorsal view; B, left antennula, ventral view; C, left antenna, ventral view; D, right part of head, antennula and antenna, ventral view; E, habitus, lateral view. Scale bars: 100 μ m.

ple seta dorsally; propodus 1.1 length of carpus, with 1 simple seta, 2 robust setae and short fringe of scales on ventral margin, 1 simple seta distomedially and dorsodistally; dactylus with 2 subapical and 2 apical simple setae, unguis and

supplementary claw. Pereopod 2 (Fig. 27G) with basis bearing 1 simple seta dorsally; ischium 0.8 length of basis, with 2 simple setae dorsodistally and 2 simple setae ventrally; merus half length of ischium, with 1 simple seta dorsally and 3 simple

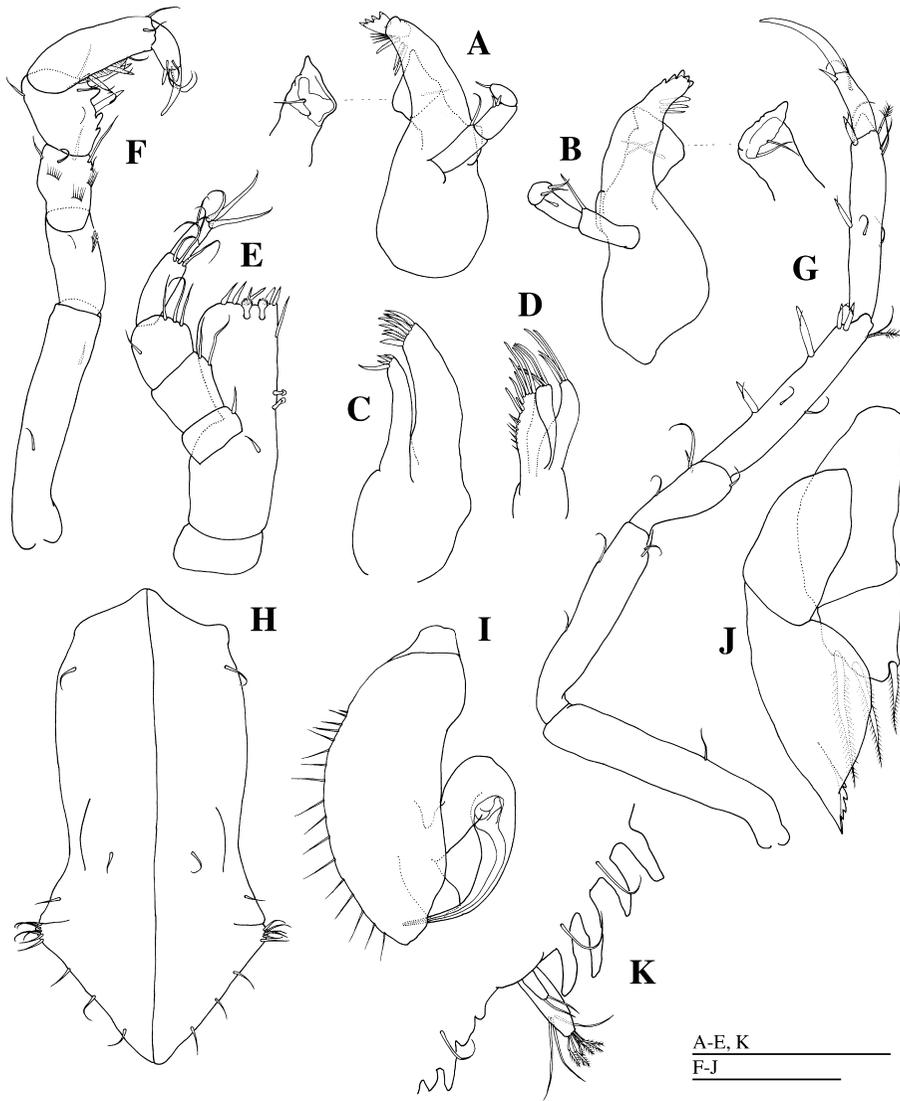


Fig. 27. *Spinogonium decoratum* gen., sp. nov. Holotype, male (KMNH IvR 500,389). A, left mandible, lateral view and detail of the molar process; B, right mandible, lateral view and detail of the molar process; C, left maxillula, ventral view; D, left maxilla, ventral view; E, right maxilliped, ventral view; F, left pereopod 1, medial view; G, right pereopod 2, medial view; H, pleopod 1, ventral view; I, right pleopod 2, ventral view; J, right pleopod 3, ventral view; K, right uropod, dorsal view. Scale bars: 100 μ m.

setae ventrally; carpus 2.1 length of merus, with 2 simple setae and 1 broom seta dorsally, 1 simple seta medially, and with 4 robust setae ventrally; propodus as long as carpus, with 3 simple setae and 1 broom seta dorsally, 2 robust setae and 1 simple seta ventrally, and with 1 simple seta medially; dactylus with 2 subapical setae, unguis and supplementary claw. Pereopods 2 to 7

slightly increasing in length posteriorly.

Pleopod 1 (Fig. 27H) with lateral lobes at level of 0.7 of its length; lateral lobe 0.3 times of total width of single ramus of pleopod; distal projection 0.3 times of total length of pleopod, acuminate. Pleopod 2 (Fig. 27I) with protopod 2.3 times longer than wide, with 17 simple setae on lateral margin; second article of endopod moder-

ately short, not reaching distal margin of protopod. Pleopod 3 (Fig. 27J) with row of 4 denticles on second article of exopod.

Uropod (Fig. 27K) with endopod bearing 1 simple seta ventrally, 2 simple setae medially and 6 broom setae apically; exopod with 2 simple setae apically.

Remarks. The two new species here assigned to *Spinogonium* gen. nov. can be differentiated as follows: the middorsal projection on the pereonite 1 is more strongly elongate in *S. spinosum* than in *S. decoratum*, and the surface of the projection is smooth in *S. spinosum*, while spinulose in *S. decoratum*; the pereonite 7 is laterally unarmed in *S. spinosum*, but it is armed with prominent projections laterally in *S. decoratum*; the pleotelson is pointed apically in *S. spinosum*, rather than rounded in *S. decoratum*.

Etymology. The specific name “*decoratum*” is a Latin adjective meaning “decorated”, referring to the presence of a prominent middorsal projection on the pereonite 1, which is ornamented with many spines, granules and setae.

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