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Copepods (Cyclopoida) Associated with Compound Ascidians (Tunicata) from Korea, with Descriptions of Nine New Species

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ABSTRACT

Ten species of copepods, including nine new species, associated with compound ascidians are recorded from Korean waters. Nine new species can be characterized by their major diagnostic features, as follows: *Botryllophilus pentamerus* n. sp. by having a five-annulated abdomen; *B. paucisetatus* n. sp. by the presence of four and three setae on the exopods of right and left leg 1, respectively; *Haplostoma quadridens* n. sp. by the presence of four lobes on the labrum and one seta plus four spines on the exopods of legs 1−4; *H. paucidens* n. sp. by the presence of only two spines on the distal segment of the antenna; *Enterocola horridus* n. sp. by having five setae on the antenna, no seta on the caudal ramus, and two setae on leg 5; *E. longicaudatus* n. sp. by having long caudal rami which are more than three times as long as wide; *Thoracodelphys bisetata* n. sp. by the presence of only two setae on the basis of the maxillule; *T. cerasta* n. sp. by the presence of a large, horn-like process on the distal margin of the basis of leg 2; and *Unimeria hirsuta* n. sp. by having three setae on the terminal segment of the maxilla. *Zygomolgus didemni* (Gotto, 1956) previously known only from European waters is reported from Korean waters, with a redescription and illustrations.

Keywords: symbiotic copepods, taxonomy, ascidian hosts

INTRODUCTION

Ascidians (Tunicata) are major hosts of symbiotic copepods. In a series of papers Kim and Boxshall (2020a, 2020b, 2021a, 2021b) recently described more than 290 new species of copepods from ascidian hosts, illustrating the enormous diversity of symbiotic copepods associated with ascidians.

In Korea, Kim (2012) compiled 35 species of ascidicolous copepods living in Korea. These copepods consist of 29 species recorded previously from Korea and six species new to Korean fauna. *Bonnierilla namhaesius* Choi and Hong, 1994 which was described as an associate of the solitary ascidian *Halocynthia roretzi* (Von Drasche, 1884) from the southern coast (Choi and Hong, 1994) was omitted in that compilation. However, *B. namhaesius* exhibits no meaningful difference from *B. curvicaudata* Ooishi, 1963 and is synonymized here with the latter species. Three other species of the above 35 have since been changed in the validity or taxonomic position, as follows: Kim (1998, 2012) recorded *Enterocola sydnii* Chattton and Harant, 1924 from Korea, but a detailed examination in the present study of Korean samples of "*E. sydnii*" has revealed that they are not the same species as *E. sydnii*. The Korean material is described as a new species in the present paper based on newly collected specimens. *Demoixys fusiforma* Ooishi, 1972 was transferred by Kim and Boxshall (2020b) to a new genus *Ademoixys* that they established to accommodate *D. fusiforma*, with the revised name *Ademoixys fusiforma* (Ooishi, 1972). Kim and Moon (2011) described *Pachypygus spinosus* as a new species, but Kim and Boxshall (2020b) have recognized it as an invalid species, because it was described on the basis of a juvenile.

In the present paper nine new species of copepods associated with compound ascidians are described from Korea. *Zygomolgus didemni* (Gotto, 1956) is redescribed as a new record of Korea fauna.

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MATERIALS AND METHODS

The copepod specimens examined in this study were collected mostly from the shallow water of Korean coasts during the last decade. In the field, the collected compound ascidians (usually a mixture of several species) were placed in a bucket containing diluted sea water with half fresh water for about an hour and then sediments in the bucket were filtered with a net. The filtrates were preserved in 80% ethanol and later in the laboratory the copepods were sorted out from the filtrates. In some cases the collected compound ascidians were fixed and preserved in 80% ethanol immediately after the collection and later in the laboratory the ascidian colonies were teared apart and the copepods were picked out among ascidian zooids. Prior to microscopic observation, the copepods were immersed in lactic acid for at least 10 min and then dissected. Dissected appendages were observed using the reverse slide method of Humes and Gooding (1964) and are mounted with Hoyer's medium. Type specimens have been deposited in the National Institute of Biological Resources (NIBR), Incheon or Honam National Institute of Biological Resources (HNIBR), Mokpo, Korea.

SYSTEMATIC ACCOUNTS

Order Cyclopoida Burmeister, 1834
Family Botrolliphilidae Sars, 1921
Genus *Botryllophilus* Hesse, 1864

***Botryllophilus pentamerus* n. sp. (Figs. 1–3)**

Type material. Holotype (♀, dissected and mounted on a slide; HNIBRIV2006) from a compound ascidian collected by SCUBA, depth 54.7 m, near Munseom, off Seogwipo in Jeju Island, Korea (approximately 33°13′N, 126°34′E), 26 May 2022, coll. T. Lee. The type specimen has been deposited in the HNIBR, Mokpo.

Female. Body (Fig. 1A) slightly asymmetrical, with broader anterior and narrower posterior parts. Body length 1.96 mm. Anterior part slightly compressed, consisting of cephalosome and first to fifth pedigerous somites. Cephalosome distinctly defined, but other somites of anterior part indistinctly defined. Posterior part (Fig. 1B) slightly directed to left or right side, comprising genital somite and abdomen consisting of 5 annulations. Genital somite wider than long, gradually narrowing posteriorly; genital apertures located dorsally. Abdomen indistinctly annulated; fourth annulation shortest. Caudal ramus (Fig. 1C) 1.34 times longer than wide (110 × 82 μm) (length measured along longer ventral margin), armed with 4 claws distally and 1 dorsal and 1 lateral setae; lengths of claws 45, 82, 50, and 35 μm respectively from dorsal to ventral; all claws bluntly tipped, with several minute spinules at tip.

Rostrum (Fig. 1E) triangular, wider than long. Antennule (Fig. 1E) short, indistinctly 3-segmented; first segment very broad; armature formula 14 (including 5 small ones), 2, and 11 + aesthetasc; all setae naked. Right and left antennae showing no difference; each (Fig. 1F) consisting of coxobasis and 2-segmented endopod; coxobasis unarmed, longest segment; first endopodal segment short and unarmed; second endopodal segment about 3.8 times longer than wide (114 × 30 μm), armed with 8 blunt setae (3 inner and 5 distal), and ornamented with row of minute spinules near outer distal corner; all setae naked.

Labrum (Fig. 1G) subtriangular with well-sclerotized lateral margins and soft ventral inflation bearing tapering lobe distally. Mandible (Fig. 1H) consisting of coxa and palp; medial margin of coxal gnathobase bearing 4 teeth distally (distalmost with minute spinules along its proximal margin) and finely spinulose proximally; palp unsegmented, armed with 3 outer setae (exopodal setae) proximally, 2 subdistal setae, and 4 distal setae; small, outer subdistal and outer distal setae naked, other setae pinnate. Maxillule (Fig. 1I) consisting of precoxa, coxa, and palp; precoxa with 5 setae on arthrite; coxa indistinctly defined, with 1 small seta tipped on lobate epipodite; palp consisting of basis and endopod; basis with 2 medial setae, 3 outer setae, and 1 outer distal tubercle; endopod incompletely defined from basis, with 3 setae distally. Maxilla (Fig. 1J) obscurely 3-segmented and armed with 10 setae (6 larger and 4 smaller). Maxilliped (Fig. 1K) 4-segmented, subchelate; consisting of syncoxa, basis, and small, 2-segmented endopod bearing terminal claw; syncoxa large, unarmed, but ornamented with patch of fine spinules near inner distal corner; basis with 2 small setae subdistally; first endopodal segment unarmed; second endopodal segment with 2 small setae (1 inner and 1 distal); terminal claw as long as segment.

Legs 1–4 (Figs. 2A–D, 3A–E) biramous; each leg asymmetrical between right and left members; coxae lacking inner element; bases with outer seta, 1 or 2 rows of minute spinules on inner side; basis of leg 1 with tuft of setules at inner distal surface. Endopods of legs 3 and 4 incompletely 2-segmented. Numbers of setae on rami of legs 1–4 as follows:

	Right exopod	Right endopod	Left exopod	Left endopod
Leg 1	7	8	7	8
Leg 2	7	9	6	9
Leg 3	9	7	10	7
Leg 4	11	6	11	6

Leg 5 (Fig. 2E) elongated, 3.1 times longer than its proxi-

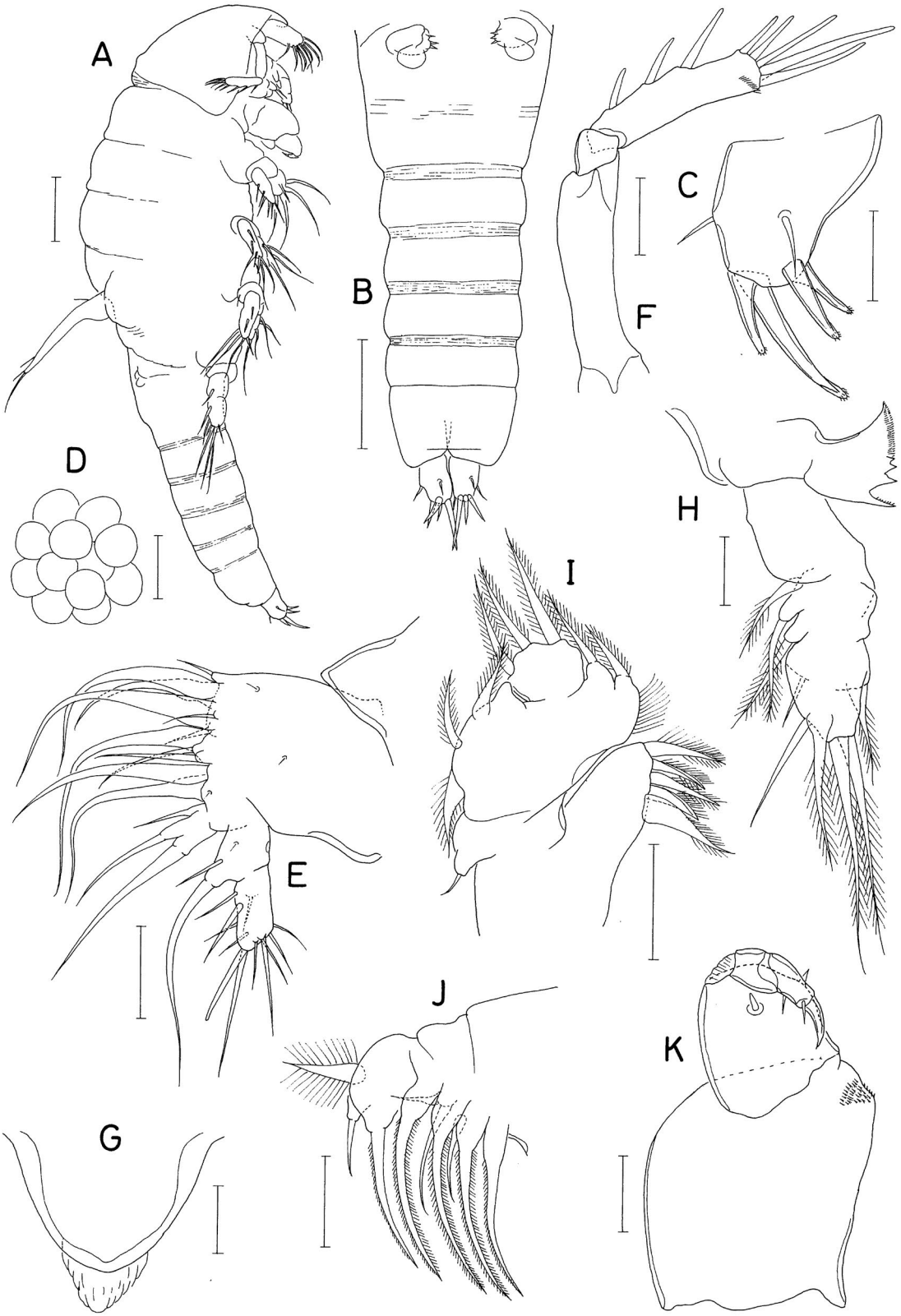

Fig. 1. *Botryllophilus pentamerus* n. sp., female. A, Habitus, right; B, Urosome, dorsal; C, Right caudal ramus, outer; D, Egg sac; E, Rostrum and antennule; F, Antenna; G, Labrum; H, Mandible; I, Maxillule; J, Maxilla; K, Maxilliped. Scale bars: A, D=0.2 mm, B=0.1 mm, C, E–K=0.05 mm.

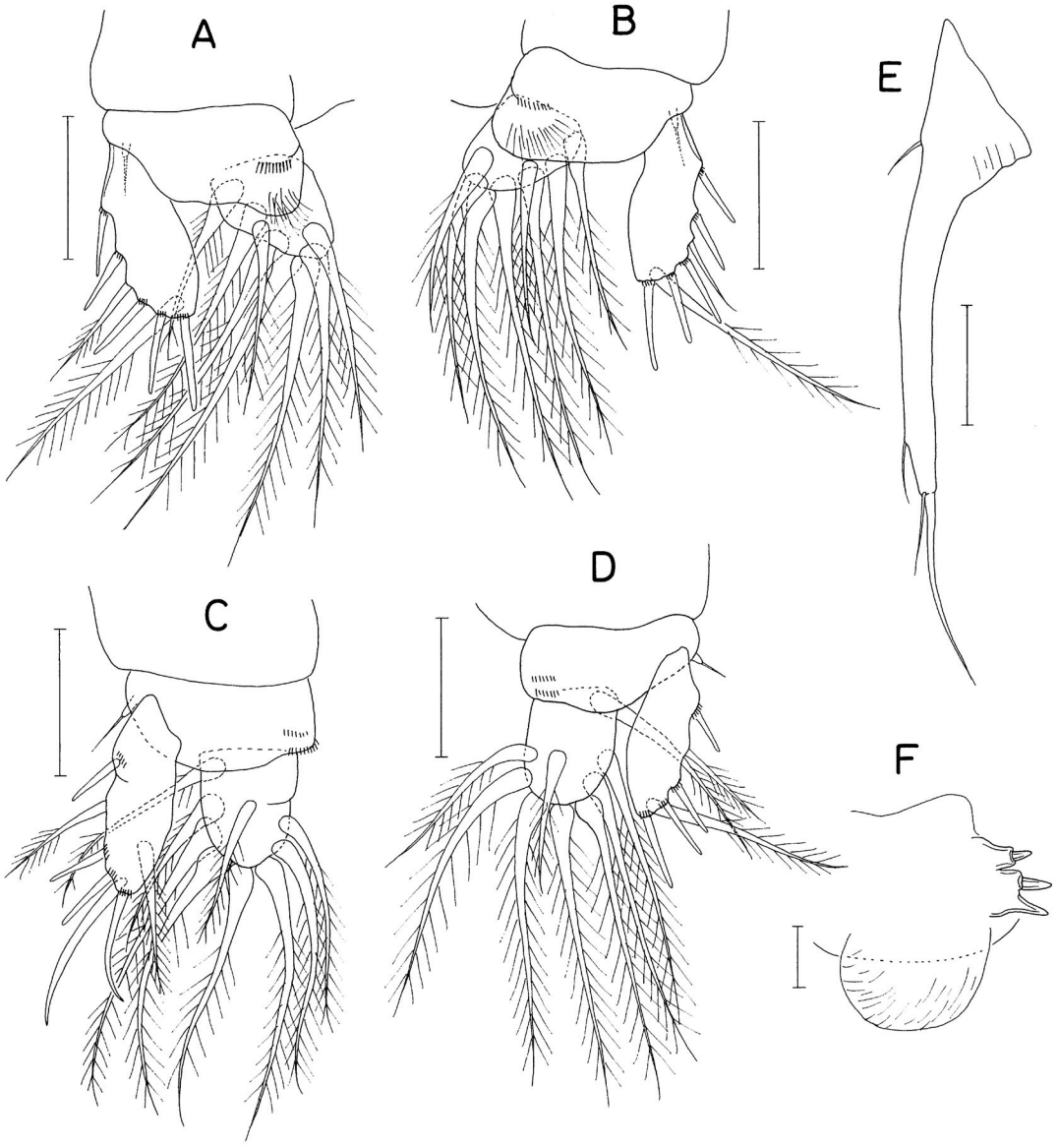

Fig. 2. *Botryllophilus pentamerus* n. sp., female. A, Right leg 1; B, Left leg 1; C, Right leg 2; D, Left leg 2; E, Leg 5; F, Genital aperture. Scale bars: A–E = 0.1 mm, F = 0.02 mm.

mal width (400 × 127 μm), almost straight, armed with 4 naked setae (3 small and 1 large); proximal seta positioned at 26% of dorsal margin length; subdistal seta at 89% of dorsal margin length; 2 distal setae 68 and 170 μm long, respectively. Leg 6 (Fig. 2F) represented by 2 small spines and 1 spiniform process on genital operculum.

Male. Unknown.

Etymology. The specific name of the new species is derived from the Greeks *pent* (five) and *mero* (a part), referring to the female abdomen divided into five annulations.

Remarks. *Botryllophilus pentamerus* n. sp. has five annulations (segments-like parts) in the female abdomen and this number of annulations is shared only with *B. antarcticus* Kim I.H. and Boxshall, 2021. These two species are, however, not confusable with each other, as they have very different leg armature. The leg armature is the most reliable character in the classification of *Botryllophilus* (Kim and Boxshall, 2021a). Within the genus, the new species has the largest known number of armature elements (setae and spines) on swimming legs. For example, the number of setae on the exopod of leg 4 is 11, which is compared to nine, the largest previously known number of armature elements recorded in the *B. macropus*

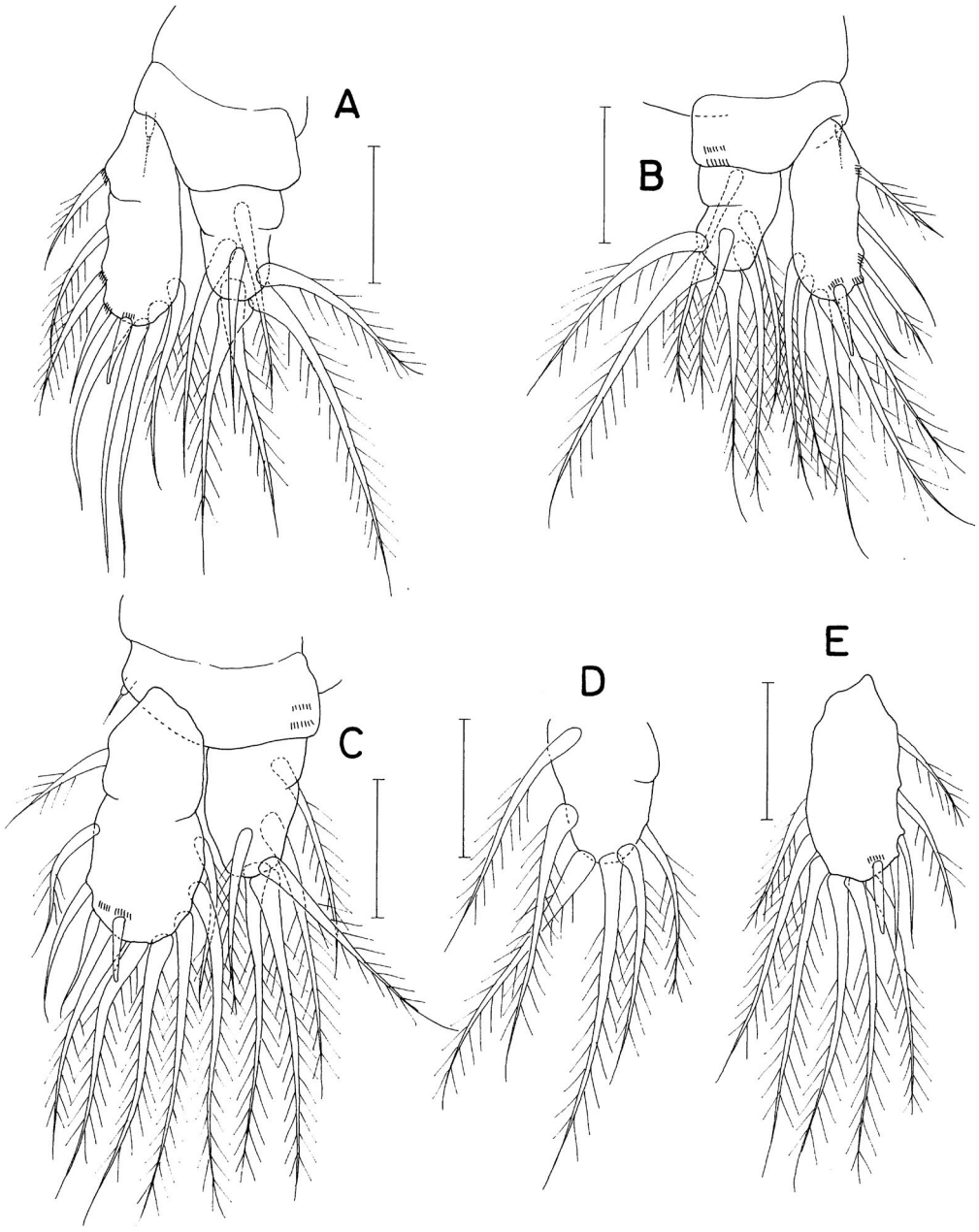

Fig. 3. *Botryllophilus pentamerus* n. sp., female. A, Right leg 3; B, Left leg 3; C, Right leg 4; D, Endopod of left leg 4; E, Exopod of left leg 4. Scale bars: 0.1 mm.

Canu, 1891 (Kim and Boxshall, 2021a). The presence of ten setae on the exopod of left leg 3 of the new species is also the largest number of armature elements on the same exopod in the genus. These excessive setations of legs 3 and 4 clearly characterize *B. pentamerus* n. sp. within the genus.

Botryllophilus paucisetatus n. sp. (Figs. 4, 5)

Type material. Holotype (♀, dissected and mounted on a slide; HNIBRIV2007) from a compound ascidian collected by SCUBA, depth 54.7 m, near Munseom, off Seogwipo in Jeju Island, Korea (approximately 33°13′N, 126°34′E), 26 May 2022, coll. T. Lee. The type specimen has been deposited in the HNIBR, Mokpo.

Female. Body (Fig. 4A) slightly asymmetrical, consisting of broader anterior part and narrower, cylindrical posterior part. Body length 1.85 mm. Anterior part unsegmented, lacking

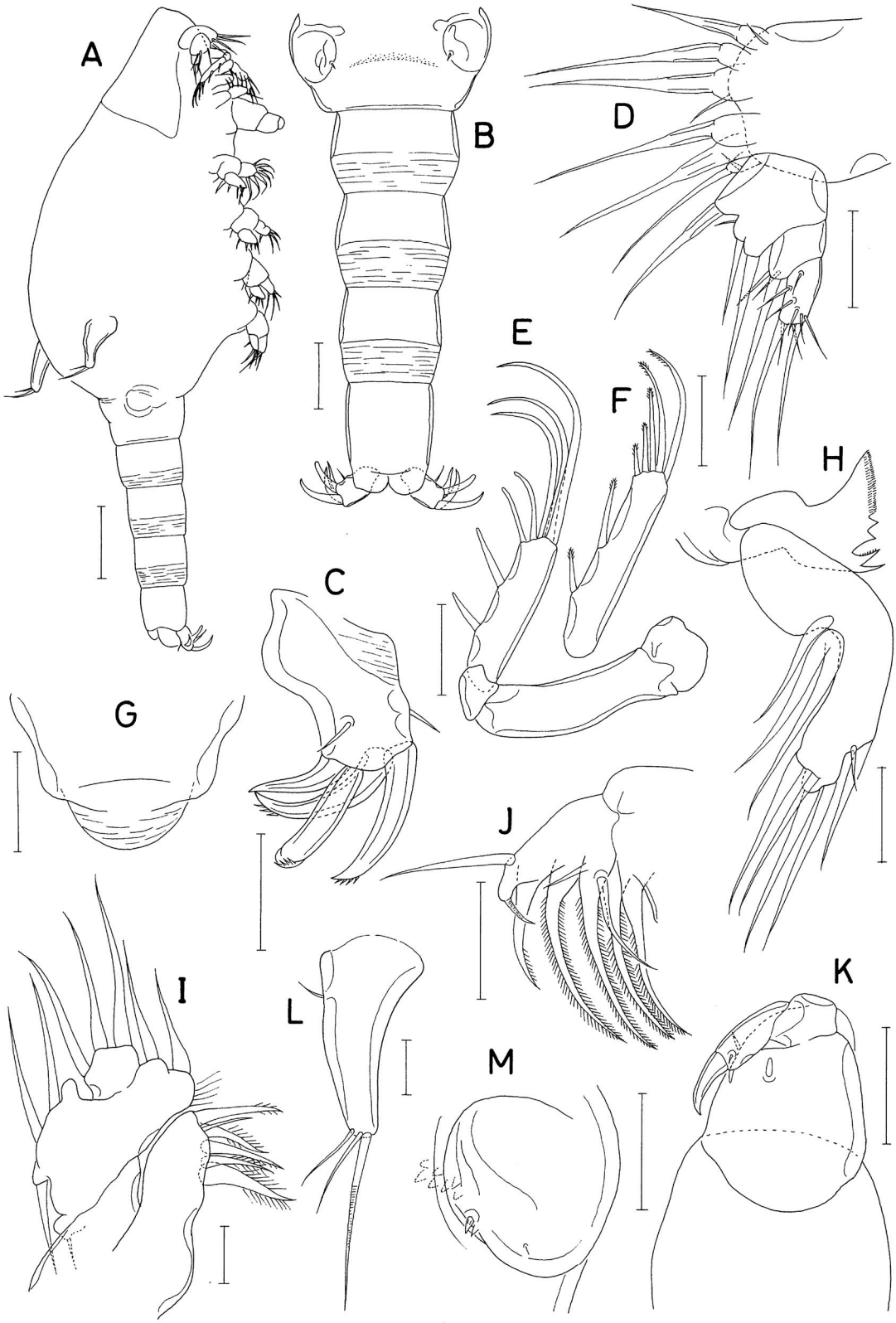

Fig. 4. *Botryllophilus paucisetatus* n. sp., female. A, Habitus, right; B, Urosome, dorsal; C, Left caudal ramus, outer; D, Antennule; E, Left antenna; F, Distal segment of right antenna; G, Labrum; H, Mandible; I, Maxillule; J, Maxilla; K, Maxilliped; L, Leg 5; M, Genital aperture. Scale bars: A=0.2 mm, B=0.1 mm, C–H, J–M=0.05 mm, I=0.02 mm.

any trace of segmentation, but with well-defined cephalic shield. Posterior part (Fig. 4B) consisting of genital somite and 4-segmented abdomen. Genital somite 315 μm wide, much wider than long, indistinctly defined from anterior part; genital aperture positioned dorsolaterally. Four abdominal somites 127 × 200, 148 × 179, 147 × 160, and 170 × 136 μm, respectively. Caudal rami directed ventrolaterally; each ramus (Fig. 4C) 1.28 times longer than wide (73 × 57 μm) (length measured along ventral margin), armed with 4 distal claws and 2 subdistal setae; ventral margin protruded; 4 distal claws, 69, 65, 61, and 42 μm, respectively, from dorsal to ventral; third dorsal claw rounded at tip; first to third dorsal claws with several spinules near tip; shortest ventral claw acutely pointed; 2 subdistal setae positioned on same plane.

Rostrum absent. Antennule (Fig. 4D) short, 4-segmented; armature formula 8, 5, 3, and 10; 6 larger setae on first segment bearing inflated bases; all setae naked. Left antenna (Fig. 4E) consisting of coxa, basis, and 2-segmented endopod; 3 proximal segments unarmed; terminal (second endopodal segment) 3.96 times longer than wide (91 × 23 μm), armed with 7 setae (2 inner and 5 distal); 3 outer distal setae longer than segment, pointed at tip, other 4 shorter setae bluntly tipped. Terminal segment of right antenna (Fig. 4F) longer than that of left antenna, 4.96 times longer than wide (114 × 23 μm); all setae finely spinulose at tip; distal setae distinctly shorter than those of left antenna.

Labrum (Fig. 4G) with well-sclerotized lateral margins and soft ventral inflation. Mandible (Fig. 4H) consisting of coxa and palp; medial margin of coxal gnathobase bearing 4 teeth distally and finely spinulose proximally; second distal tooth with minute spinules along proximal margin; palp unsegmented, armed with 3 outer setae (exopodal setae) proximally, 2 subdistal setae, and 4 distal setae; all setae naked. Maxillule (Fig. 4I) consisting of precoxa, coxa, and palp; precoxa with 6 setae (including 1 thin, naked seta) on arthrite; coxa indistinctly defined, with 1 small seta tipped on lobate epipodite; palp consisting of basis and endopod; basis with 2 medial setae, 3 outer setae, and 1 outer distal tubercle; endopod incompletely defined from basis, with 3 setae distally; all setae on palp naked. Maxilla (Fig. 4J) 2-segmented and armed with 2 setae on proximal segment and 7 setae on distal segment. Maxilliped (Fig. 4K) 4-segmented; consisting of syncoxa, basis, and small, 2-segmented endopod bearing terminal claw; syncoxa large, unarmed; basis with 2 small setae subdistally; first endopodal segment unarmed; second endopodal segment with 2 small setae (1 distal and 1 subdistal); terminal claw as long as segment.

Legs 1−4 (Fig. 5A−H) biramous; each leg asymmetrical between right and left members; protopods unsegmented, lacking inner element, but with outer seta and several minute spinules near inner distal corner except smooth protopods in right leg 2 and left leg 4; exopods unsegmented; leg 1 endopod 2-segmented, other endopods unsegmented, or with trace of segmentation; exopods of right legs armed with spines only; exopods of left legs and endopods of swimming legs armed with setae, except 1 spine on second endopodal segment of right leg 1 and 2 distal spines on endopod of right leg 4; all spines and some of setae tipped with several spinules. Innermost distal spine on exopod of right leg 4 inflated in middle. Numbers of spines (Roman numerals) and setae (Arabic numerals) on rami of legs 1−4 as follows:

	Right exopod	Right endopod	Left exopod	Left endopod
Leg 1	IV	1; I + 3	3	5
Leg 2	VI	8	5	8
Leg 3	V	7	4	7
Leg 4	V	II + 3	4	5

Leg 5 (Fig. 4L) tapering, 1.82 times longer than its proximal width (173 × 95 μm), armed with 4 naked setae (3 small and 1 large); proximal seta positioned at 23% length of dorsal margin; other 3 setae positioned at distal apex; larger outer distal seta 165 μm long, all other setae shorter than half length of largest seta. Leg 6 (Fig. 4M) represented by 1 small spine and 1 spiniform process on genital operculum; 7 small spiniform tubercles visible inside of genital operculum.

Male. Unknown.

Etymology. The specific name of the new species *paucisetatus* is derived from the Latins *pauc* (few) and *seta* (bristle), alluding to the relatively few armature elements on the rami of legs.

Remarks. Contrary to the case of *B. pentamerus* n. sp., the number of armature elements on leg 1 of *B. paucisetatus* n. sp. is the fewest among the existing species of *Botryllophilus*, which characterizes the new species, as follows: (1) the exopod of right leg 1 is armed with four armature elements, compared to five which is the previously known fewest number (in *B. nudisetatus* Kim I.H. and Boxshall, 2021); (2) the endopod of right leg 1 is armed with five armature elements, compared to seven, the previously known fewest number (as in *B. curtipes* Kim I.H. and Boxshall, 2021 and *B. nudisetatus*); (3) the exopod of left leg 1 is armed with three armature elements, compared to five, the previously known fewest number, as in nine existing species; and (4) the endopod of left leg 1 is armed with five armature elements, compared to seven, the previously known fewest number (as in *B. millari* Ooishi, 2014 and *B. nudisetatus*). Kim and Boxshall (2021a) recorded the number of armature elements on legs 1−4 of all valid species of *Botryllophilus*.

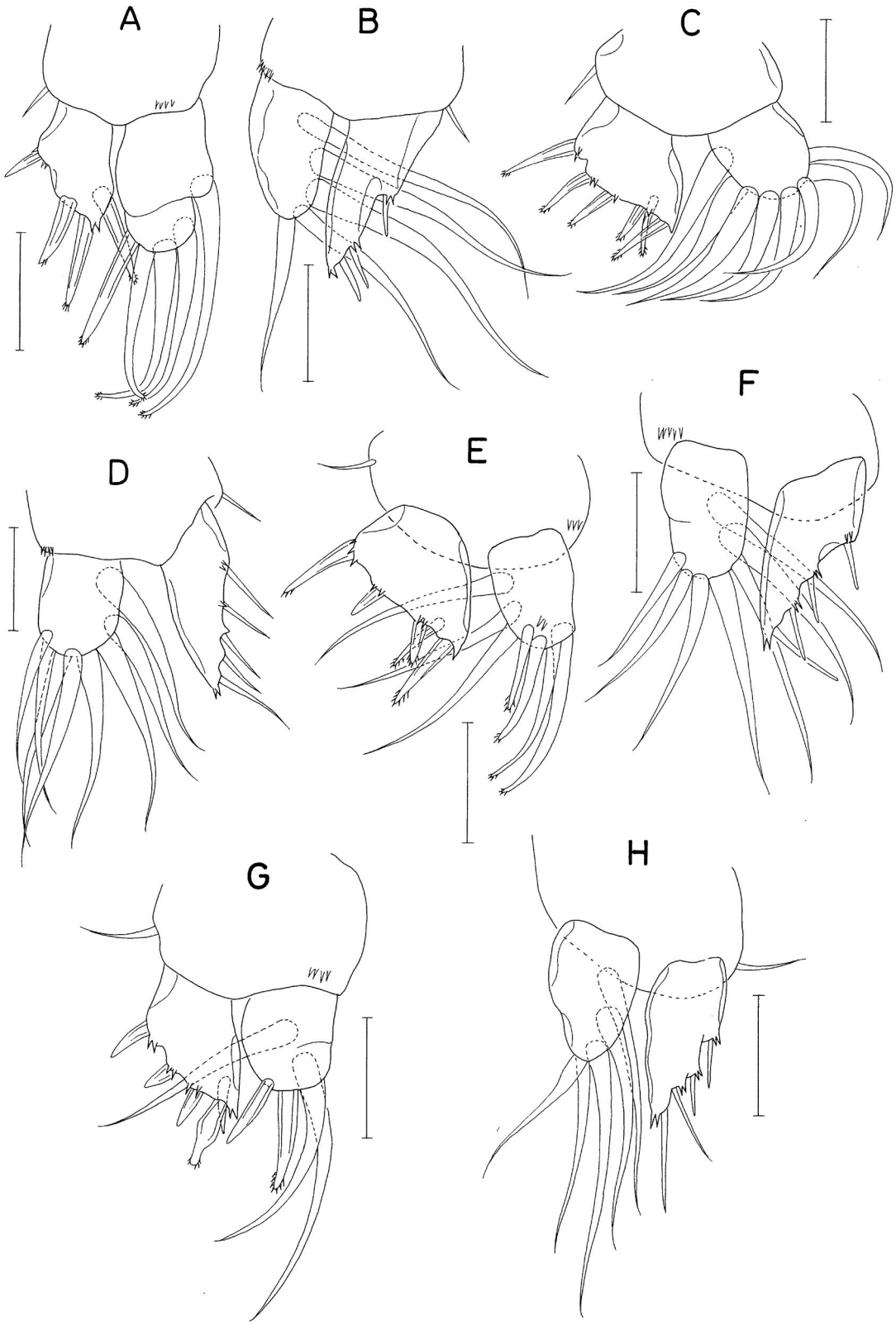

Fig. 5. *Botryllophilus paucisetatus* n. sp., female. A, Right leg 1; B, Left leg 1; C, Right leg 2; D, Left leg 2; E, Right leg 3; F, Left leg 3; G, Right leg 4; H, Left leg 4. Scale bars: 0.05 mm.

Genus *Haplostoma* Canu, 1886

***Haplostoma quadridens* n. sp. (Figs. 6, 7)**

Type material. Holotype (intact ♀, NIBRIV0000286638), intact paratypes (8 ♀♀, NIBRIV0000286639), and dissected paratype (♀, figured) from an unidentified ascidian (white in color) epizoic on the solitary ascidian *Styela clava* Herdman collected as a bycatch of fisheries, at Hupo Fishing Port, Uljin-gun, Korea (36°40′36″N, 129°27′36″E), 20 Feb 2013, coll. I.-H. Kim. Intact type specimens have been deposited in the NIBR, Incheon, Dissected paratype is kept by I.H. Kim.

Additional material. 4 ♀♀ from a compound ascidian epizoic on the solitary ascidian *Styela clava* collected as a bycatch of fisheries, at Sacheon Fishing Port, Gangneung (37°50′14″N, 128°52′38″E), 26 Apr 2012, coll. I.-H. Kim.

Female. Body (Fig. 6A, B) grub-shaped, unsegmented, consisting of cylindrical prosome and short urosome. Body length of dissected and figured specimen 1.50 mm; maximum width 0.48 mm measured at region of leg 4. Prosome 1.25 × 0.48 mm, gradually broadening posteriorly, with small tubercle ventrolaterally at posterior region (Fig. 6B, C). Cephalosome not defined from first pedigerous somite. Metasomites defined only by weak constrictions; last metasomite consisting of fused fourth and fifth pedigerous somites. Genitoabdomen (Fig. 6C, D) unsegmented, 200 × 215 μm, consisting of broad genital region and narrower abdominal region. Caudal rami (Fig. 6E) not defined from abdomen, strongly tapering posterolaterally, wider than long, armed with 3 unequal setae and 2 unequal, stout spines.

Rostrum absent (Fig. 6F). Antennule (Fig. 6G) strongly tapering, unsegmented, armed with 16 setae. Antenna (Fig. 6H) 2-segmented; proximal segment unarmed; distal segment 2.50 times longer than wide (30 × 12 μm), longer than proximal segment, armed with 4 large, conical spines.

Labrum (Fig. 6I) with minute spinules along posterior margin and 4 large lobes on posteroventral surface; lateral lobe on each side distally bilobed. Mandible (Fig. 6F, I) slightly longer than wide, tipped with 2 small setae. Maxillule (Fig. 6F) represented by small seta. Maxilla absent. Maxilliped (Fig. 7A) tapering distally, 4-segmented; first segment unarmed; second segment armed with 2 small, transparent setae; third segment unarmed, obscurely defined from second and fourth segments; fourth segment unarmed; terminal claw with small, transparent seta on inner margin.

Legs 1–4 consisting of protopod, exopod and endopod, with same armature (Fig. 7B, C); protopods unarmed; exopods incompletely demarcated from protopod, armed with 1 proximal seta and 4 simple spines; endopods represented by broad, rounded protuberance. Leg 5 (Fig. 6B–D) as small lobe, much wider than long, bearing 1 dorsal and 2 distal setules. Leg 6 (Fig. 6C, D) represented by 1 spine and 1 spiniform process on genital operculum; 8 small internal denticles present near leg 6.

Male. Unknown.

Etymology. The specific name *quadridens* is a noun derived from Latin words *quadri* (four) and *dens* (tooth), and alludes to the presence of four dentiform spines on the exopods of legs 1–4.

Remarks. In the genus *Haplostoma*, the form of the labrum and the armature of legs are important taxonomic characters. The labrum of *Haplostoma quadridens* n. sp. has two bilobed lateral lobes and two simple inner lobes. This form of the labrum is shared with three species in *Haplostoma*: *H. eruca* (Norman, 1869), *H. kimi* Seo and Lee, 2001, and *H. laticaudatum* Kim I.H. and Boxshall, 2021 (Seo and Lee, 2001; Ooishi and O'Reilly, 2004; Kim and Boxshall, 2021a). The exopods of legs 1–4 of *H. quadridens* n. sp. have one proximal seta plus four outer spines each and this armature condition is shared with two species: *H. ambiguum* Ooishi and Illg, 1977 and *H. pingue* Kim I.H. and Boxshall, 2021. Thus, *H. quadridens* n. sp. is the only species in the genus having both character states and can be differentiated from all congeners.

***Haplostoma paucidens* n. sp. (Figs. 8–10)**

Type material. Holotype (intact ♀, NIBRIV0000286640), allotype (intact ♂, NIBRIV0000286641), intact paratypes (12 ♀♀, 2 ♂♂, NIBRIV0000286642), and dissected paratypes (2 ♀♀, 1 ♂) from an unidentified compound ascidian, intertidal, Anpo-ri, Hwayang-myeon, Yeosu, Korea (34°37′56″N, 127°38′01″E), 10 Apr 2012, coll. S.Y. Moon. Intact type specimens have been deposited in the NIBR, Incheon; dissected paratypes are retained in the collection of I.-H. Kim.

Female. Body (Fig. 8A, B) eruciform, unsegmented, consisting of cylindrical prosome and short genitoabdomen. Body length of figured specimen 2.62 mm; maximum width 614 μm across fourth pedigerous somite. Prosome slightly curved dorsally; cephalosome and 4 metasomites defined by constrictions between them; last metasomite consisting of fused fourth and fifth pedigerous somites. Genitoabdomen (Fig. 8C) unsegmented, triangular, 190 × 283 μm (not including caudal rami), with transverse sclerotization band on dorsal surface between genital and abdominal regions; genital apertures large, located dorsolaterally; abdominal region strongly tapering. Caudal rami (Fig. 8D, E) not articulated from abdomen, longer than wide, armed with 5 setae (1 large lateral, 2 distal, 1 papilliform middle, and 1 papilliform subdistal).

Rostrum absent (Fig. 8G). Antennule (Fig. 8H, I) strongly tapering, unsegmented, armed with 16 to 18 small, blunt setae.

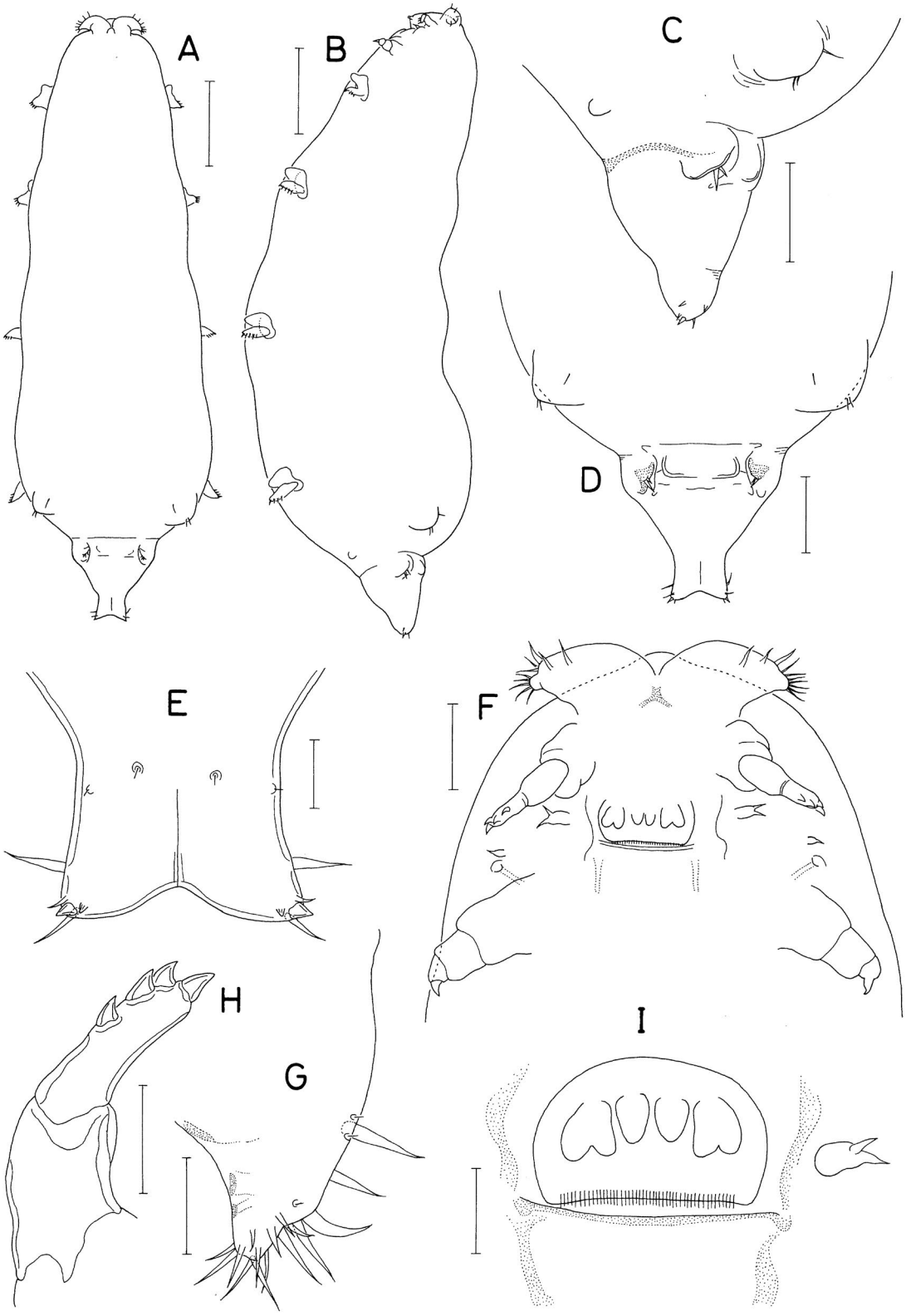

Fig. 6. *Haplostoma quadridens* n. sp., female. A, Habitus, dorsal; B, Habitus, left; C, Urosome, left; D, Urosome, dorsal; E, Abdominal region, dorsal; F, Cephalic region, ventral; G, Antennule; H, Antenna; I, Labrum and left mandible. Scale bars: A, B = 0.2 mm, C, D = 0.1 mm, E, G–I = 0.02 mm, F = 0.05 mm.

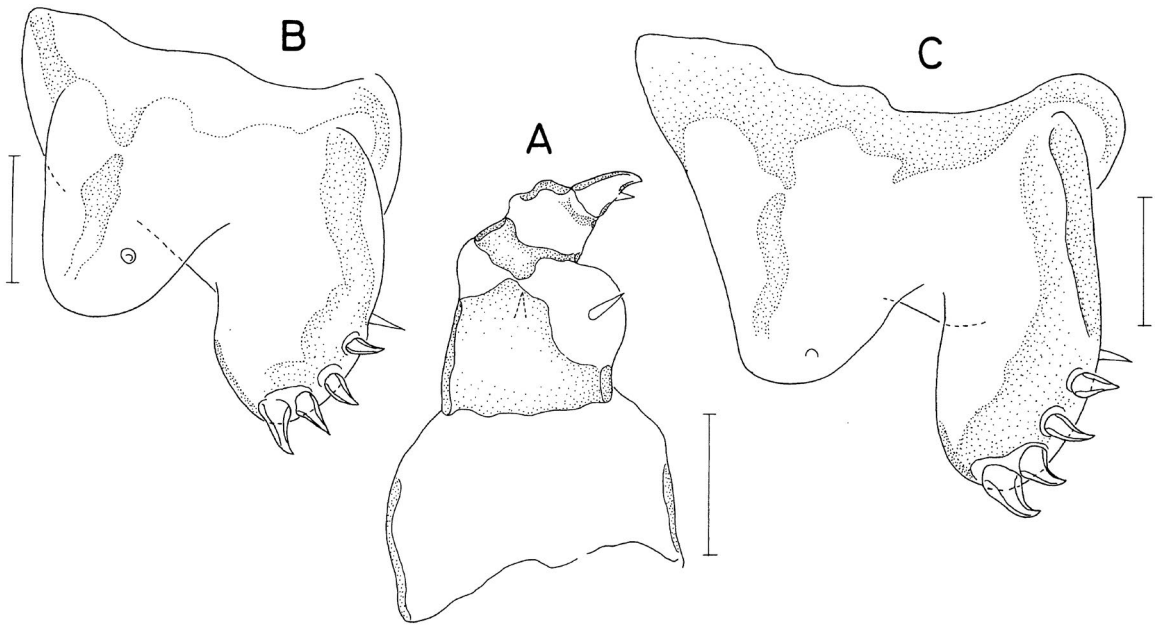

Fig. 7. *Haplostoma quadridens* n. sp., female. A, Maxilliped; B, Leg 1; C, Leg 2. Scale bars: 0.02 mm.

Antenna (Fig. 8J) 2-segmented; proximal segment expanded, unarmed; distal segment about twice longer than wide, shorter than proximal segment, armed with 2 conical spines (1 distal and 1 subdistal) and ornamented with several spinules near base of each spine.

Labrum (Fig. 8K) simple, lacking any lobe or ornamentation. Mandible, maxillule, and maxilla absent (Fig. 8G). Maxilliped (Fig. 9A) 2-segmented; first segment unarmed, consisting of fused 3 segments, with blunt tubercle tipped with 1 small papilla on original second segment; second segment small, unarmed; terminal claw acutely pointed at tip.

Legs 1–4 consisting of protopod, exopod and endopod, with same armature (Fig. 9B, C); protopods unarmed; both rami not articulated from protopod; exopods armed with 1 small proximal seta and 1 conical distal spine, and ornamented with several spinules on outer margin and near base of distal spine; endopods represented by broad, rounded protuberance bearing 2 or 3 small papillae. Leg 5 (Figs. 8A, B, 9D) as broad lobe, much wider than long, bearing 2 unequal setae at apex. Leg 6 (Figs. 8C, 9E) represented by 2 spines on genital operculum; 4 small internal denticles present near leg 6 (Fig. 9E).

Male. Body (Fig. 9F) cyclopiform, narrow, clearly segmented, with well-defined prosome and urosome. Body length of dissected specimen 2.02 mm. Maximum width 512 μm across cephalothorax. Cephalothorax 586 μm long, with dorsal suture line between cephalosome and first pedigerous somite. Three metasomites (second to fourth pedigerous somites) gradually narrowing posteriorly. Urosome 6-segmented. Genital somite wider than long (231 × 266 μm), consisting of globular anterior four-fifths and narrowed distal fifth. Four free abdominal somites 105 × 133, 119 × 105, 133 × 84, and 84 × 81 μm, respectively. Caudal rami (Fig. 9G) close to each other, 3.46 times longer than wide (142 × 41 μm), armed with 5 armature elements consisting of 2 setae near middle, 1 spine on subdistal outer margin, and 2 distal elements (distal elements detached in all examined specimens).

Rostrum absent. Antennule (Fig. 9H) 212 μm long, 4-segmented; armature uncertain due to their detachments; first segment expanded, with numerous (more than 100) aesthetascs. Antenna (Fig. 9I) 3-segmented; first segment (coxa) short, unarmed; second segment (basis) 154 μm long, unarmed; third segment (endopod) elongated, slender, 215 μm long, armed with 2 conical spines (1 distal and 1 subdistal).

Labrum, mandible, maxillule, and maxilla absent. Maxilliped (Fig. 9J) consisting of 4 segments and terminal claw; all segments unarmed; first and second segments expanded; second segment with patch of minute spinules on proximal inner margin; third and fourth segments small; terminal claw as long as fourth segment.

Legs 1–4 (Fig. 10A–D) biramous, consisting of coxa, basis, exopod and endopod. Inner coxal seta absent in legs 1 and 2 but present in legs 3 and 4; basis of leg 1 lacking outer seta; exopods 3-segmented; endopods 2-segmented in legs 1 and 4, but 3-segmented in legs 2 and 3. Endopod of leg 1 modified. Setae on coxa and rami of legs blunt at tip, naked or feebly pinnate. Armature formula for legs 1–4 as follows:

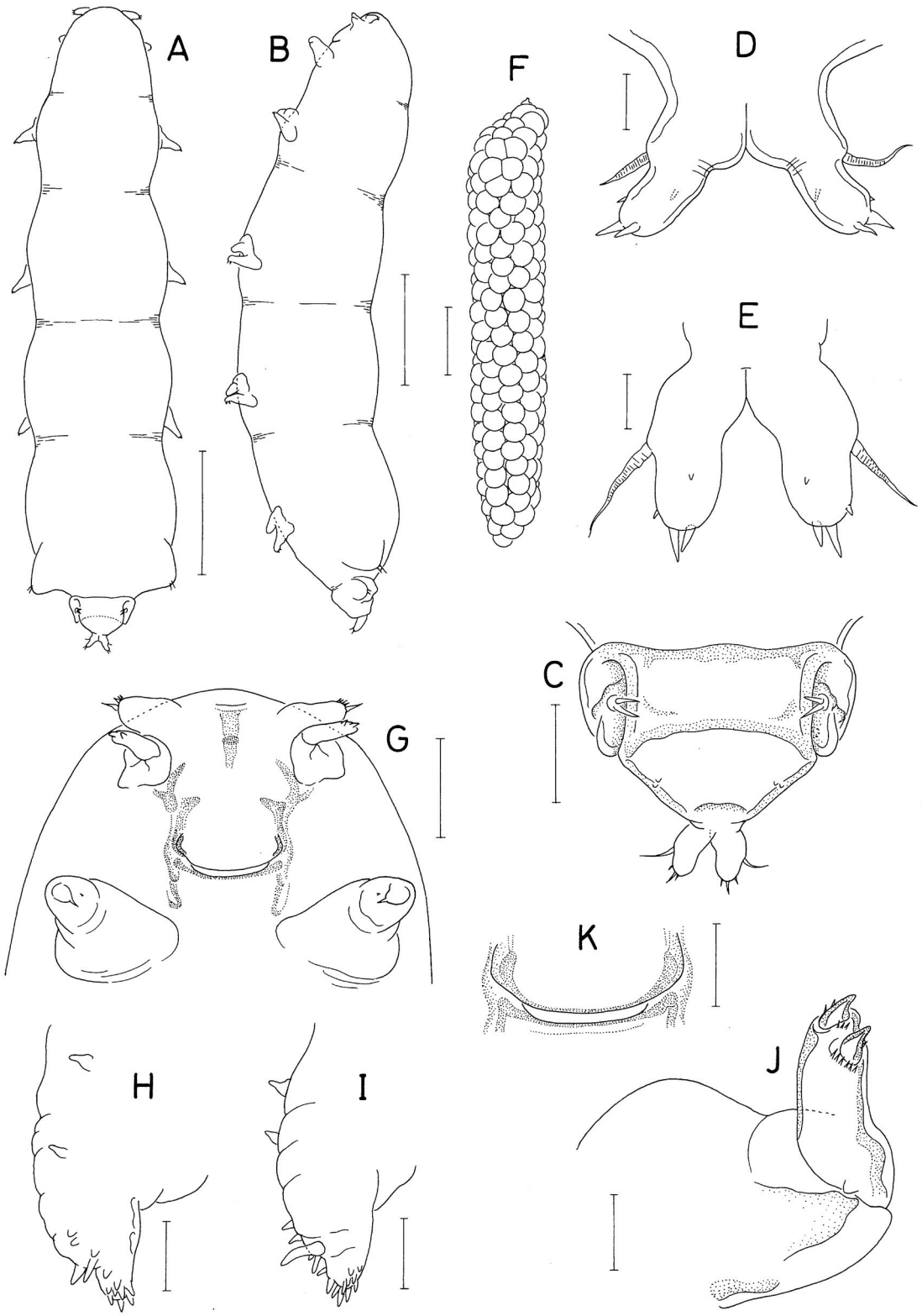

Fig. 8. *Haplostoma paucidens* n. sp., female. A, Habitus, dorsal; B, Habitus, left; C, Urosome, dorsal; D, Abdomen, ventral; E, Abdomen, dorsal; F, Egg sac; G, Cephalic region, ventral; H, I, Antennules; J, Antenna; K, Labrum. Scale bars: A, B, F = 0.5 mm, C, G = 0.1 mm, D, E, H–J = 0.02 mm, K = 0.05 mm.

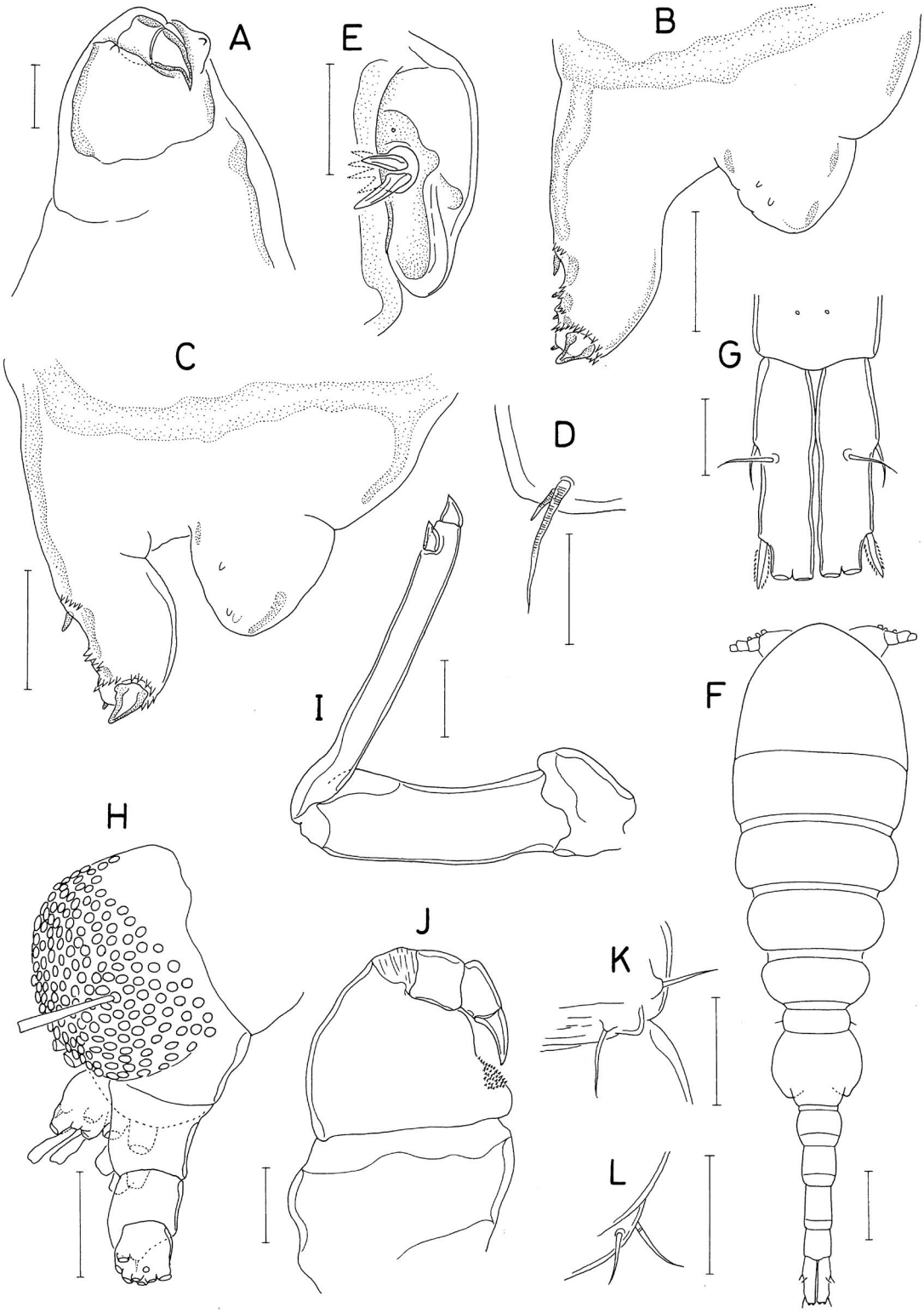

Fig. 9. *Haplostoma paucidens* n. sp. Female: A, Maxilliped; B, Leg 1; C, Leg 2; D, Leg 5; E, Genital aperture. Male: F, Habitus, dorsal; G, Caudal rami, dorsal; H, Antennule; I, Antenna; J, Maxilliped; K, Leg 5; L, Leg 6. Scale bars: A=0.02 mm, B–E, G–L=0.05 mm, F=0.2 mm.

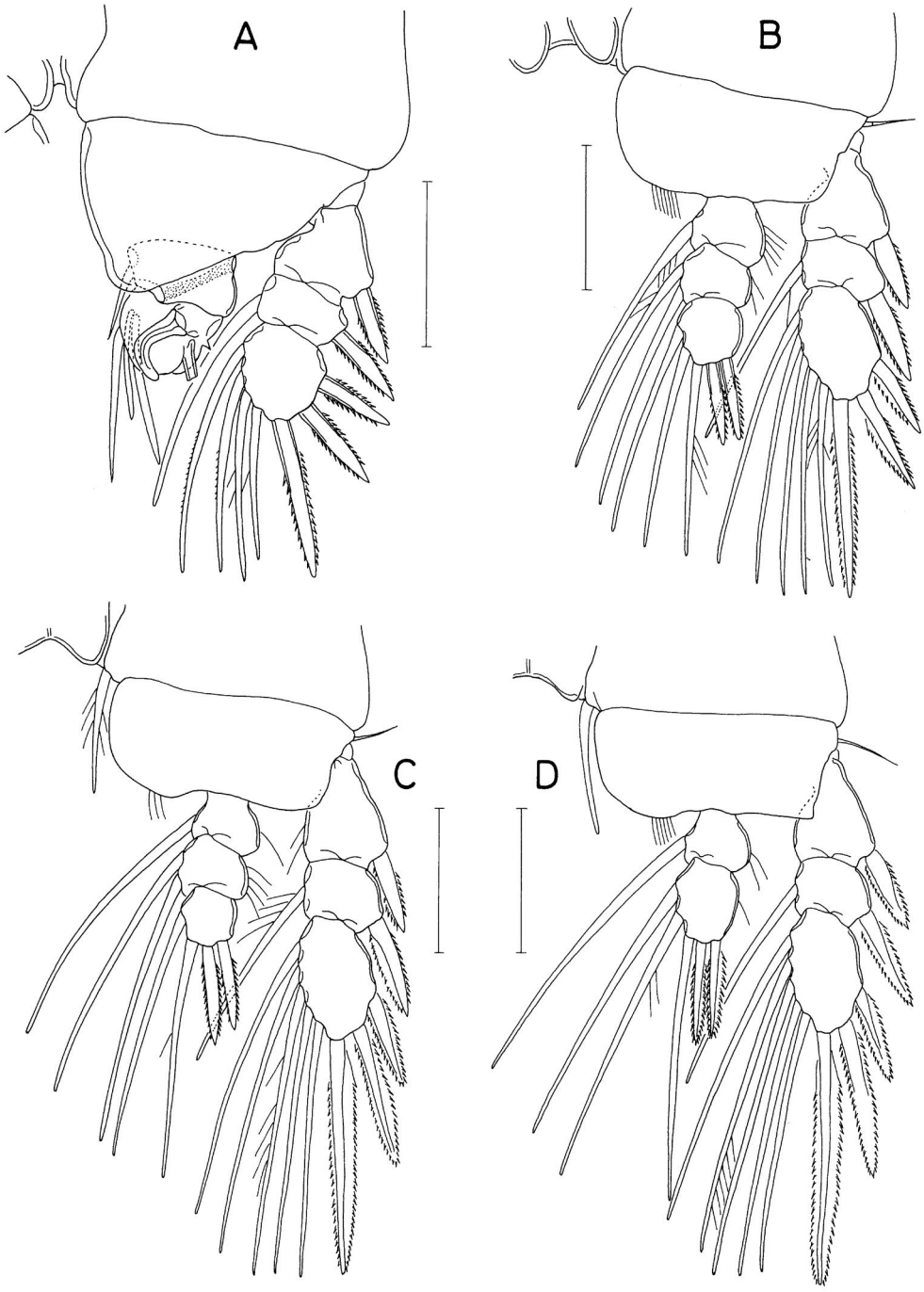

Fig. 10. *Haplostoma paucidens* n. sp., male. A, Leg 1; B, Leg 2; C, Leg 3; D, Leg 4. Scale bars: 0.1 mm.

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

Leg 5 (Fig. 9K) represented by 2 lobes, each with 1 small seta. Leg 6 (Fig. 9L) represented by 2 small setae on genital operculum.

Etymology. The specific name *paucidens* is the combination of Latin words *pauci* (= few) and *dens* (tooth), referring to the reduced number of spines on the antenna and legs.

Remarks. *Haplostoma paucidens* n. sp. possesses two outstanding features, each of which differentiates the new species from all congeners. One is the possession of only a single distinct spine on the exopods of legs 1–4. This is contrasted to the armature of other species, because known numbers of spines on the exopods of female swimming legs in *Haplostoma* are four or five in leg 1, three or four in leg 2, and two to five in legs 3 and 4. The other outstanding feature of the new species is the presence of only two spines on the distal segment of the antenna, in contrast to four spines or setae on the same segment in hitherto described species of *Haplostoma*, with an exception of three spines in *H. gibberum* (Schellenberg, 1922). The absence of a mandible in the female also is characteristic, which is the feature shared only with *H. dudleyae* Ooishi, 1998 known in Florida, Unites States. However, the latter species is not related to the new species in other respects, for example the exopods of legs 1–4 of the Floridan species have 5, 4, 4, and 4 spines, respectively (Ooishi, 1998).

In *Haplostoma* the males are known in six species (Ooishi, 2004). The endopod of leg 1 of the male of these species shows the species-specific form and armature. *Haplostoma paucidens* n. sp. uniquely has a strong hook-like spine, in additional to three simple and one truncated seta, on the second segment of the endopod of leg 1. The antenna of the male of *H. paucidens* n. sp. also shows characteristic features, as its distal segment is elongated and carries only two stout spines.

Family Enteropsidae Aurivillius, 1885
Genus *Enterocola* van Beneden, 1860

***Enterocola horridus* n. sp. (Fig. 11)**
Entericola sydnii: Kim, 1998: 799, fig. 392.

Type material. Holotype (intact ♀, NIBRIV0000286643), intact paratypes (15 ♀♀, NIBRIV0000286644), and dissected paratypes (2 ♀♀) from the compound ascidian *Aplidium pliciferum* (Redikorzev, 1927), intertidal, Anpo-ri, Hwayang-myeon, Yeosu, Korea (34°37′56″N, 127°38′01″E), 25 Jun 2013, coll. I.-H. Kim. Holotype and intact paratypes have been deposited in the NIBR, Incheon. Dissected paratypes are retained in the collection of I.-H. Kim.
Additional material. 9 ♀♀ from *A. pliciferum*, Nogok Fishing Port, Samcheok (37°12′00″N, 129°20′37″E), depth 40 cm, 21 Jun 2022, coll. I.-H. Kim.
Female. Body (Fig. 11A, B) eruciform, consisting of trunk and small genitoabdomen. Body length of dissected specimen 1.11 mm. Cephalosome wider than long, defined from metasome by neck-like constriction between them. Trunk unsegmented, incorporating fifth pedigerous somite, with 4 pairs of distinct tergal folds; tergal folds of fourth pedigerous somite close to each other. First to fourth pedigerous somites each with pair of interpodal protrusions on ventral surface between left and right legs (Fig. 11J–L). Genitoabdomen (Fig. 11C) obscurely 4-segmented in ventral view, but unsegmented in dorsal view, covered with rows of minute spinules; anal prominence distinct. Caudal rami tapering, unarmed, 1.26 times longer than wide (73 × 58 μm), indistinctly articulated from anal somite.

Rostrum not developed. Antennule (Fig. 11D) leaf-like, strongly tapering distally, unsegmented, 71 × 55 μm, armed with 12 small, unequal setae, one of them positioned subdistally and all others on distal margin. Antenna (Fig. 11E) lamellate, about 170 × 74 μm, unsegmented, with short partial articulation on outer (lateral) surface, armed with 5 naked setae; medial seta (seta I) shortest, 24 μm long, positioned at distal third of medial margin; 4 other setae (setae II–V) 65, 69, 65, and 53 μm long, respectively, from medial to lateral; setae II and III closed to each other; distal region of antenna tapering mediodistally, with oblique distal margin.

Labrum (Fig. 11F) with patch of spinules at proximal region of ventrolateral surface and elongate, spinulose palp on each side. Mandible very similar to labral palp, but narrower, densely spinulose. Maxillule consisting of precoxa (Fig. 11H) and palp (Fig. 11G); precoxa comprising endite bearing 1 spinulose seta, about 15 setules, and highly sclerotized, bifurcate distal part bearing 1 tubercle in middle; palp palm-like, armed with 1 naked and 5 spinulose setae. Maxilla (Fig. 11I) 2-segmented; proximal segment (syncoxa) with mediodistal endite bearing thick spinulose element; distal segment distally bifurcate, with small, transparent seta proximally on posterior surface. Maxilliped absent.

Legs 1–4 each consisting of 2-segmented protopod and 1-segmented rami; coxa unarmed; basis with small outer seta. Exopods of legs 1 (Fig. 11J), 2 and 4 (Fig. 11L) shorter than endopodal segment, with small claw-like distal tip indistinctly demarcated by rudimentary suture. Exopod of leg 3 (Fig. 11K) evenly tapering, with blunt tip. Leg 1 endopod 89 × 40 μm, rectangular; 2 distal setae subequal in length, 78 (mediodistal) and 71 μm (laterodistal) long, both setae shorter than endopodal segment. Endopodal segments and their distal setae of legs 2–4 gradually shortened, but proportional lengths of segment and setae similar to that of leg 1. Leg 5 (Fig. 11M) lamellate, distinctly wider than long (160 × 200 μm), with 2 small setae on distal margin and ornamented with rows on minute spinules on convex outer surface; distance between these setae 114 μm.
Male. Unknown.
Etymology. The specific name *horridus* is a Latin meaning "rough", referring to the presence of minute spinules on the abdomen, antenna and legs.
Remarks. Kim and Boxshall (2021a) recognized 35 species as valid in the genus *Enterocola*. The armature condition of the

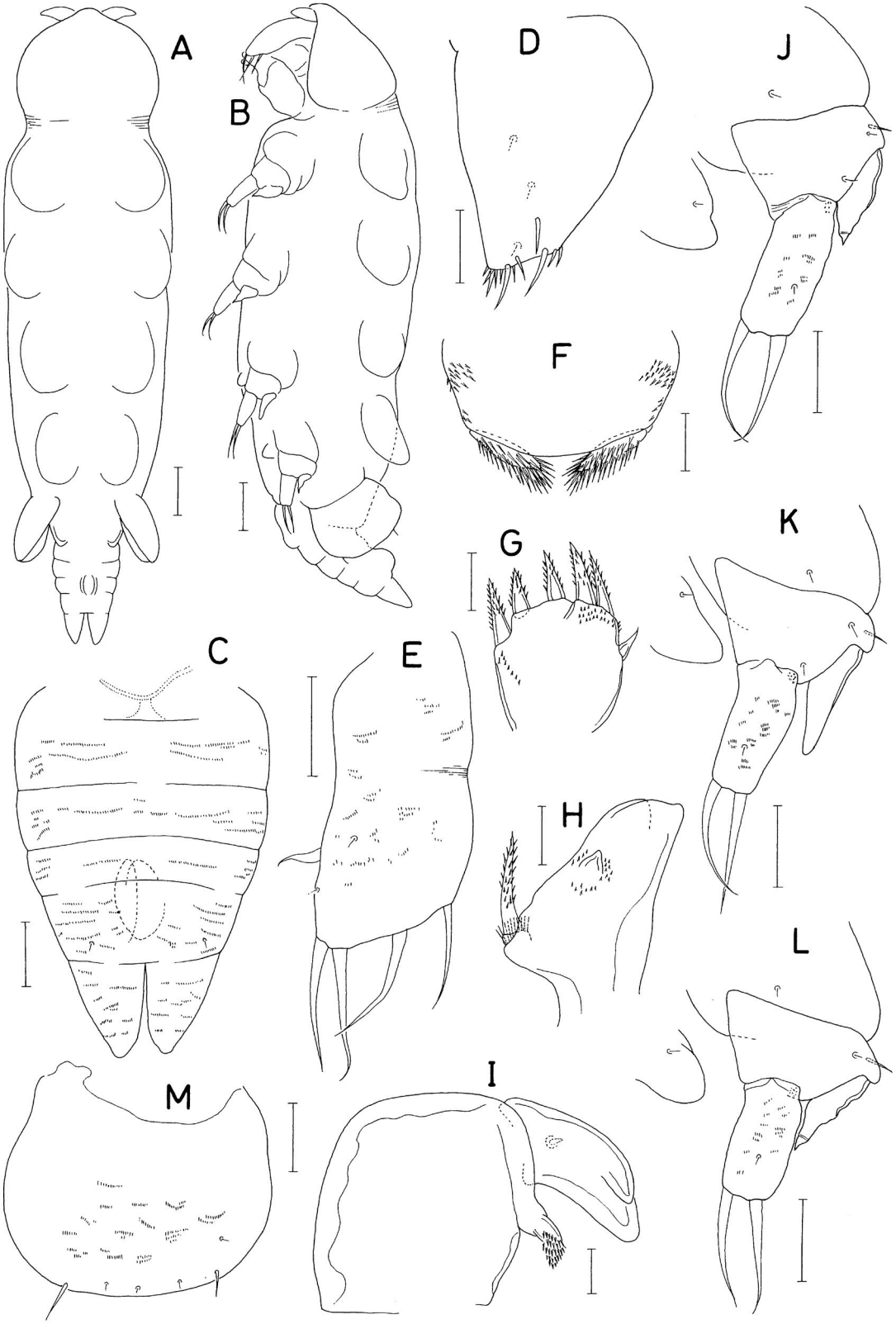

Fig. 11. *Enterocola horridus* n. sp., female. A, Habitus, dorsal; B, Habitus, left; C, Urosome, ventral; D, Antennule; E, Antenna; F, Labrum; G, Palp of maxillule; H, Precoxa of maxillule; I, Maxilla; J, Leg 1; K, Leg 3; L, Leg 4; M, Leg 5. Scale bars: A, B = 0.1 mm, C, E, J–M = 0.05 mm, D, F–I = 0.02 mm.

antenna serves an important taxonomic character in the genus *Enterocola*. In having the five setae on the antenna *E. horridus* n. sp. can be compared with seven congeners: *E. adnatus* Ooishi, 2014; *E. curticauda* Kim I.H. and Boxshall, 2021; *E. laticeps* Illg and Dudley, 1980; *E. mabulensis* Kim I.H. and Boxshall, 2021; *E. oligosetosus* Kim I.H. and Boxshall, 2021; *E. parapterophorus* Marchenkov and Boxshall, 2005; and *E. tuberculatus* Kim I.H. and Boxshall, 2021. As differential characters of the *E. horridus* n. sp., (1) the trunk has tergal folds (tergal folds absent in *E. adnatus* and *E. laticeps*); (2) the caudal rami are present (absent in *E. adnatus* and *E. curticauda*); (3) the caudal seta is absent (present in *E. curticauda*, *E. laticeps*, and *E. oligosetosus*); (4) legs 1–4 bear a pair of interpodal protrusions (absent or only a single interpodal protrusion present in seven congeners); (5) in leg 1 endopod, the laterodistal seta is slightly shorter than the mediodistal seta (the laterodistal seta is distinctly shorter than the mediodistal seta in six congeners, except *E. laticeps*); and (6) leg 5 is armed with two setae, as in *E. adnatus* and *E. laticeps* (leg 5 is unarmed in five congeners). Therefore, the new species is readily distinguished from the seven congeners, as they exhibit at least two different character states from the new species.

Kim (1998) reported *E. sydnii* Chatton and Harant, 1924 as an associate of *Aplidium pliciferum* in Korea. This Korean copepod material belongs to *E. horridus* n. sp. *Enterocola sydnii* is distributed in European waters.

Enterocola longicaudatus n. sp. (Figs. 12, 13)

Type material. Holotype (intact ♀; HNIBRIV2008) and dissected paratype (♀) from washings of a mixture of compound ascidians on the wall of Ingu Fishing Port, depth 50 cm, Yangyang, Korea (37°58′10″N, 128°45′47″E), 14 Apr 2019, coll. I.-H. Kim. Holotype has been deposited in the HNIBR, Mokpo. Dissected paratype is kept in the collection of I.-H. Kim.

Female. Body (Fig. 12A) eruciform, curved dorsally, consisting of trunk and small genitoabdomen. Body length of dissected paratype 1.59 mm. Trunk unsegmented, incorporating fifth pedigerous somite, with 3 pairs of distinct tergal folds on regions of legs 2 to 4. Interpodal protrusion absent in legs 1–4. Genitoabdomen unsegmented, with distinct anal prominence. Caudal rami (Fig. 12B) 3.33 times longer than wide (160 × 48 μm), indistinctly articulated from anal somite, gradually narrowing distally; caudal seta absent.

Rostrum not developed. Antennule (Fig. 12C) unsegmented, 2.0 times longer than wide (64 × 32 μm), widest in middle, strongly tapering along distal third, armed distally with 5 setae (1 larger and 4 equally small); larger seta characteristically bifurcate. Antenna (Fig. 12D) lamellate, 2.35 times longer than wide (148 × 63 μm), unsegmented, but with trace of articulation in middle; distal half slightly narrower than proximal half; distal margin rounded, armed with 5 naked setae; lengths of setae I–V (medial to lateral) 20, 24, 21, 30, and 40 μm, respectively; setae I and II broadened.

Labrum as in general for genus, with broad, spinulose palp (Fig. 12E). Mandible (Fig. 12F) narrower than labral palp, densely spinulose. Maxillule (Fig. 12G) consisting of precoxa and palp; precoxa comprising endite bearing 1 spinulose seta, more than 20 setules and highly sclerotized, bifurcate distal part; palp (Fig. 12H) palm-like, armed with 1 naked and 5 spinulose setae. Maxilla (Fig. 12I) 2-segmented; proximal segment (syncoxa) with mediodistal endite bearing thick spinulose element; distal segment (basis) distally bifurcate, with small, transparent seta proximally on posterior surface. Maxilliped absent.

Legs 1–4 (Figs. 12J, 13A–C) consisting of 2-segmented protopod and 1-segmented rami; coxa unarmed; basis with minute outer seta in legs 2 and 3, but unarmed in legs 1 and 4. Exopods shorter than endopodal segments. Exopods of legs 1–3 with patch of minute spinules at proximal region of outer side; exopod of leg 4 abruptly narrowed along distal third. Endopodal segments of legs 1–4 73 × 27, 51 × 24, 74 × 30, and 59 × 29 μm, respectively. Endopods with 2 greatly unequal distal setae; mediodistal setae on endopods of legs 1–4 about 3 times longer than laterodistal setae, 61, 73, 73, and 65 μm long, respectively; laterodistal setae on endopods 20, 25, 24, and 23 μm long, respectively. Leg 5 (Fig. 12K) lamellate, distinctly wider than long (113 × 209 μm), unarmed and unornamented.

Male. Unknown.

Etymology. The specific name of the new species refers to its long caudal rami.

Remarks. Three diagnostic features of *E. longicaudatus* n. sp. serve to easily differentiate it from congeners: (1) the caudal ramus is more than three times longer than wide; (2) the antenna is armed with five setae; and (3) the laterodistal seta of endopods of legs 1–4 is markedly shorter than the mediodistal seta. The first feature is shared with five congeners (*E. bilamellatus* Sars, 1921; *E. dicaudatus* Marchenkov and Boxshall, 2005; *E. quadriseta* Kim I.H. and Boxshall, 2021; *E. robustus* Kim I.H. and Boxshall, 2021; and *E. tuberculatus*). The second feature is shared with eight congeners, as mentioned in the remarks of *E. horridus* n. sp. The third feature is shared with five congeners (*E. australis* Kim I.H. and Boxshall, 2021; *E. cuniculus* Ooishi, 2014; *E. horridus* n. sp.; *E, laticeps*; and *E. petiti* Guille, 1964). All of these congeners share at most one of the above three features with the new species, except *E. tuberculatus* which shares two. In *E. tuberculatus* which is known in Papua New Ginea, the body is small, 0.76 mm long, the trunk has a dorsal tubercle on the region of the first pedigerous somite, and the laterodistal setae

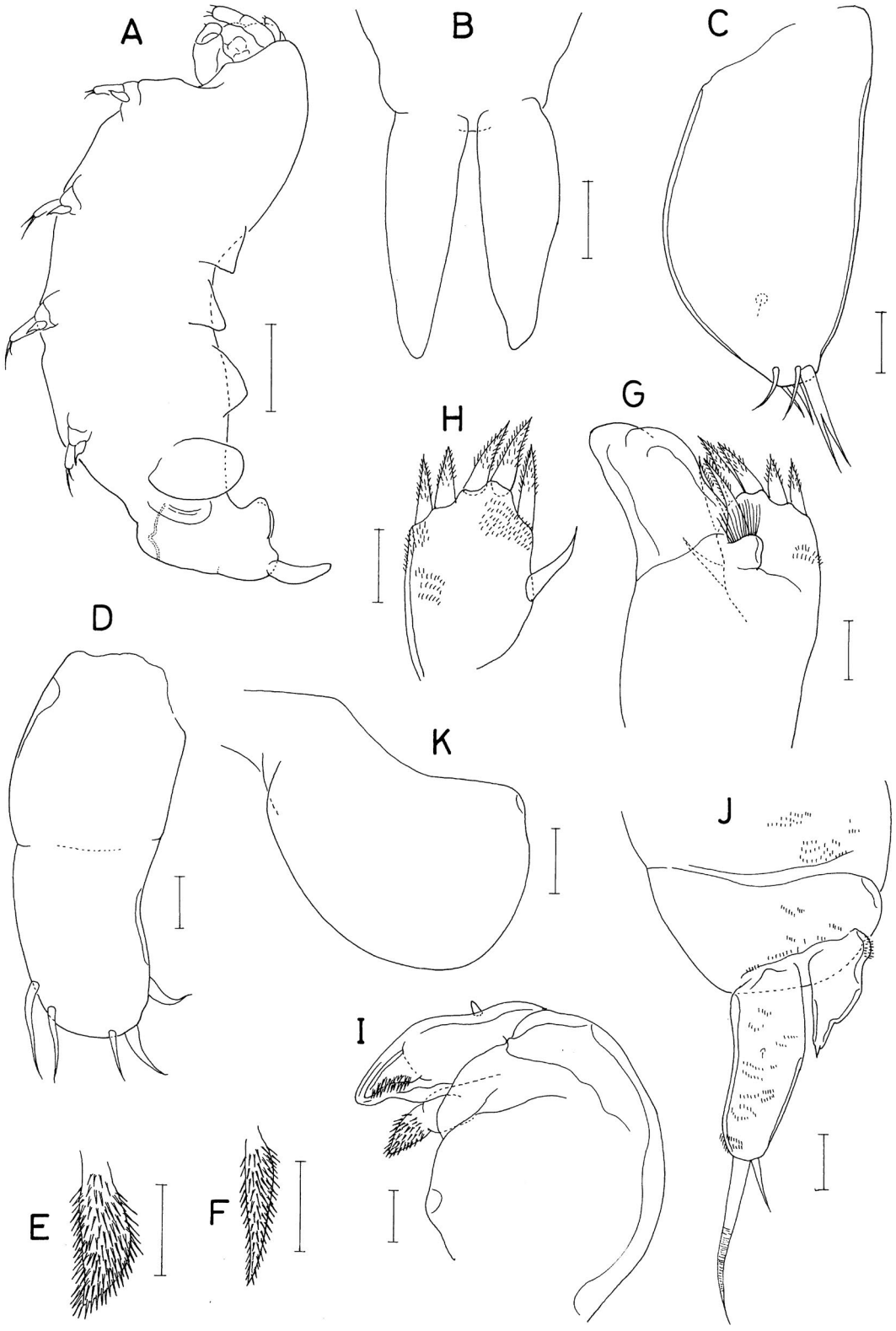

Fig. 12. *Enterocola longicaudatus* n. sp., female. A, Habitus, left; B, Caudal rami; C, Antennule; D, Antenna; E, Palp of labrum; F, Mandible; G, Palp of maxillule; H, Precoxa of maxillule; I, Maxilla; J, Leg 1; K, Leg 5. Scale bars: A=0.2 mm, B, K=0.05 mm, C, E, F=0.01 mm, D, G–J=0.02 mm.

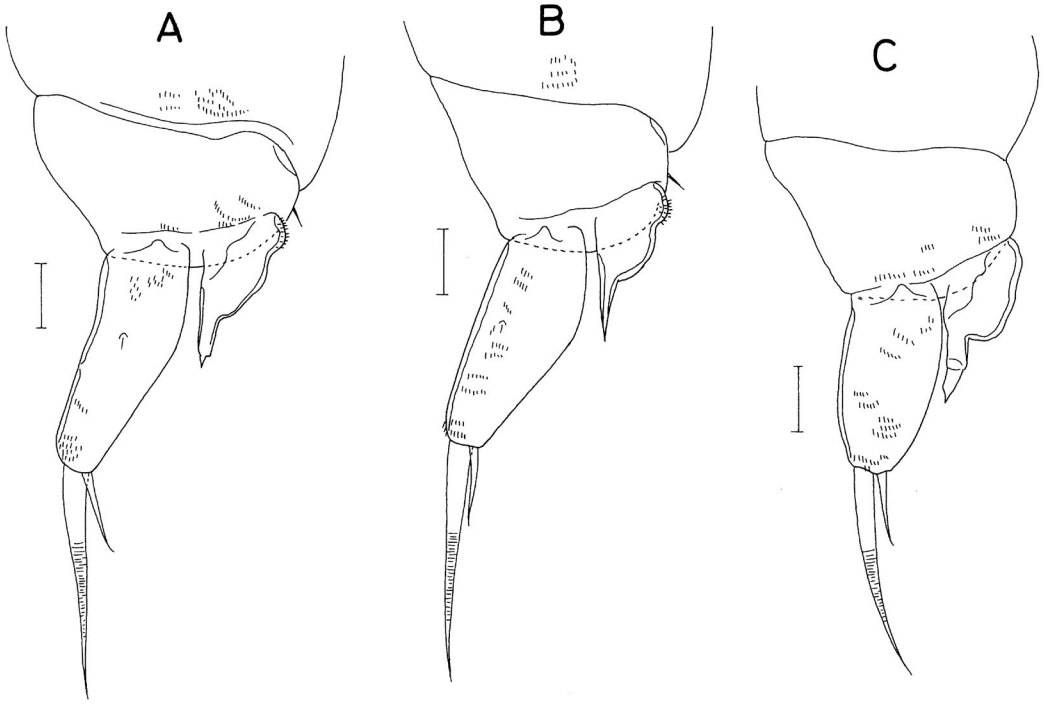

Fig. 13. *Enterocola longicaudatus* n. sp., female. A, Leg 2; B, Leg 3; C, Leg 4. Scale bars: 0.02 mm.

on the endopods of legs 1–4 are longer or as long as endopodal segments (Kim and Boxshall, 2021a). These are additional differences of *E. tuberculatus* from the new species.

Family Notodelphyidae Dana, 1853
Genus *Thoracodelphys* Stock, 1967

***Thoracodelphys bisetata* n. sp. (Figs. 14, 15)**

Type material. Holotype (intact ♀, NIBRIV0000286645), intact paratypes (14 ♀♀, NIBRIV0000286646), and dissected paratypes (2 ♀♀) from washings of a mixture of compound ascidians, depth about 1 m, Tongyeong Fishing Port, Gyeongsangnam-do, Korea (34°50′20″N, 128°25′03″E), 29 Sep 2012, coll. I.-H. Kim. Intact type material has been deposited in the NIBR, Incheon, Korea. Dissected paratypes (2 ♀♀) are retained in the collection of I.-H. Kim.

Female. Body (Fig. 14A) with convex dorsal margin and almost straight ventral margin in lateral view, consisting of expanded prosome and narrow, cylindrical urosome. Body length of dissected and figured specimen 1.19 mm. Prosome stout, 0.95 mm long, consisting of well-defined cephalosome and unsegmented metasome. Metasome forming brood pouch, incorporating fifth pedigerous somite, with 3 traces of articulations dorsally. Urosome (Fig. 14B) directed posteroventrally, 5-segmented, consisting of genital and 4 abdominal somites. Genital somite 48 × 171 μm; 4 abdominal somites 65 × 125, 67 × 110, 67 × 104, and 67 × 94 μm, respectively. Anal somite narrowing distally, with deep posteromedian incision and fine spinules on posteroventral margin (Fig. 14C). Caudal rami slender, widely separated from each other; each ramus (Fig. 14C) 4.35 times longer than wide (100 × 23 μm), armed with 6 setae; outer proximal and dorsal setae located at 36 and 65% of ramus length, respectively; 4 distal setae unequal in length, longest one more than half as long as ramus.

Rostrum (Fig. 14D) small, semicircular. Antennule (Fig. 14E) small, stout, 118 μm long, 7-segmented, tapering from second to distal segments; armature formula 3, 12, 6 + aesthetasc, 3, 2 + aesthetasc, 3 + aesthetasc, and 7 + 2 aesthetascs; setae naked, densely arranged, many of them large. Antenna (Fig. 14F) 4-segmented; proximal 3 segments unarmed; terminal segment (second endopodal segment) about 3.3 times longer than wide (62 × 19 μm), armed with 5 setae (arranged as 1, 1, and 3) plus l terminal claw; proximal seta large, as long as segment, extending over terminal claw.

Labrum (Fig. 14G) strongly tapering, with narrow, setulose posterior margin and posteromedian lobe. Mandible (Fig. 14H) with 5 teeth and 1 small seta on coxal gnathobase; distalmost tooth acutely pointed, with minute spinules along its proximal margin; basis with 1 seta at mediodistal corner; exopod with 5 setae, distalmost shortest; endopod armed with 2 and 5 setae on first and second segments, respectively. Maxil-

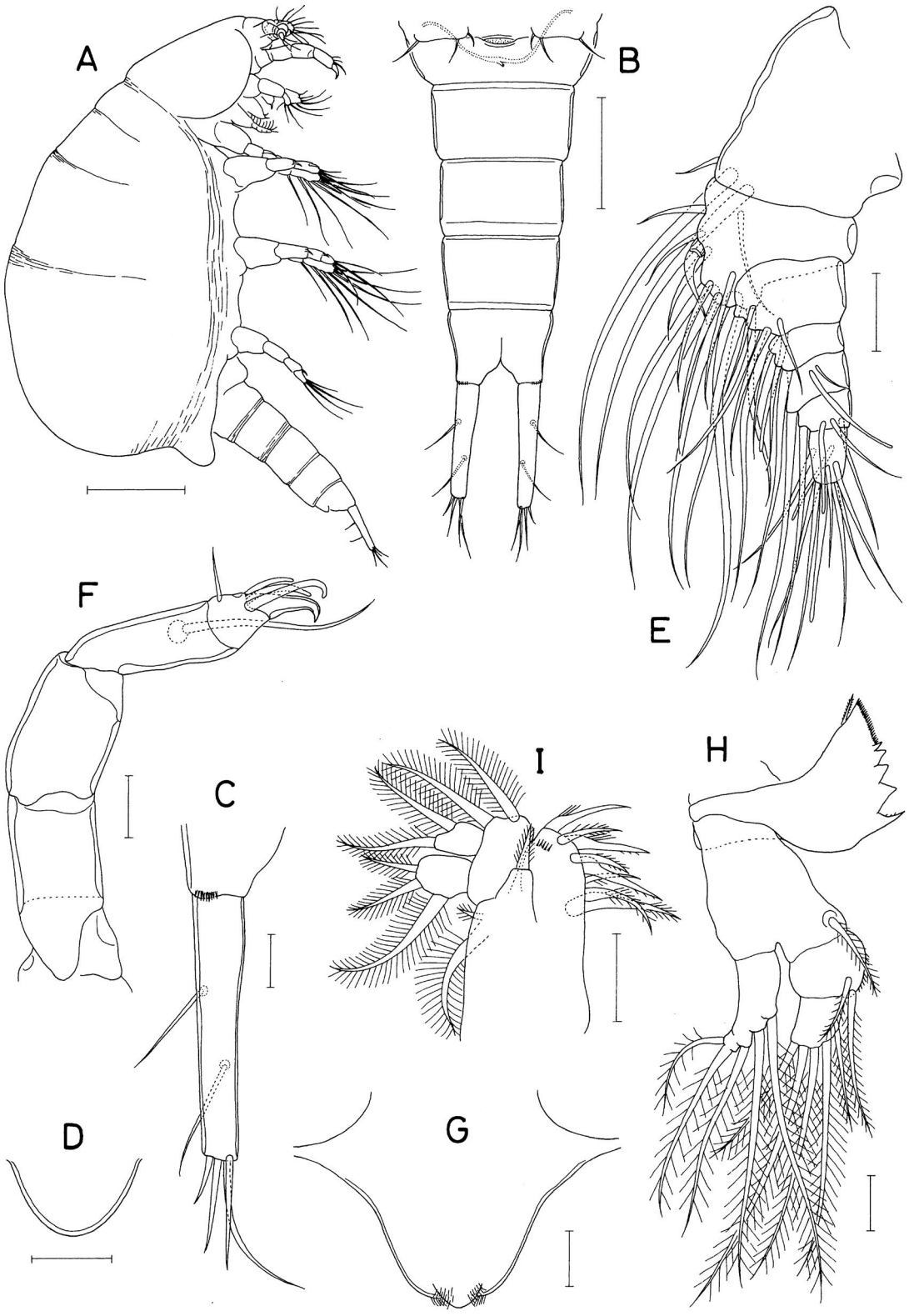

Fig. 14. *Thoracodelphys bisetata* n. sp., female. A, Habitus, right; B, Urosome, ventral; C, Right caudal ramus, ventral; D, Rostrum; E, Antennule; F, Antenna; G, Labrum; H, Mandible; I, Maxillule. Scale bars: A = 0.2 mm, B = 0.1 mm, C–I = 0.02 mm.

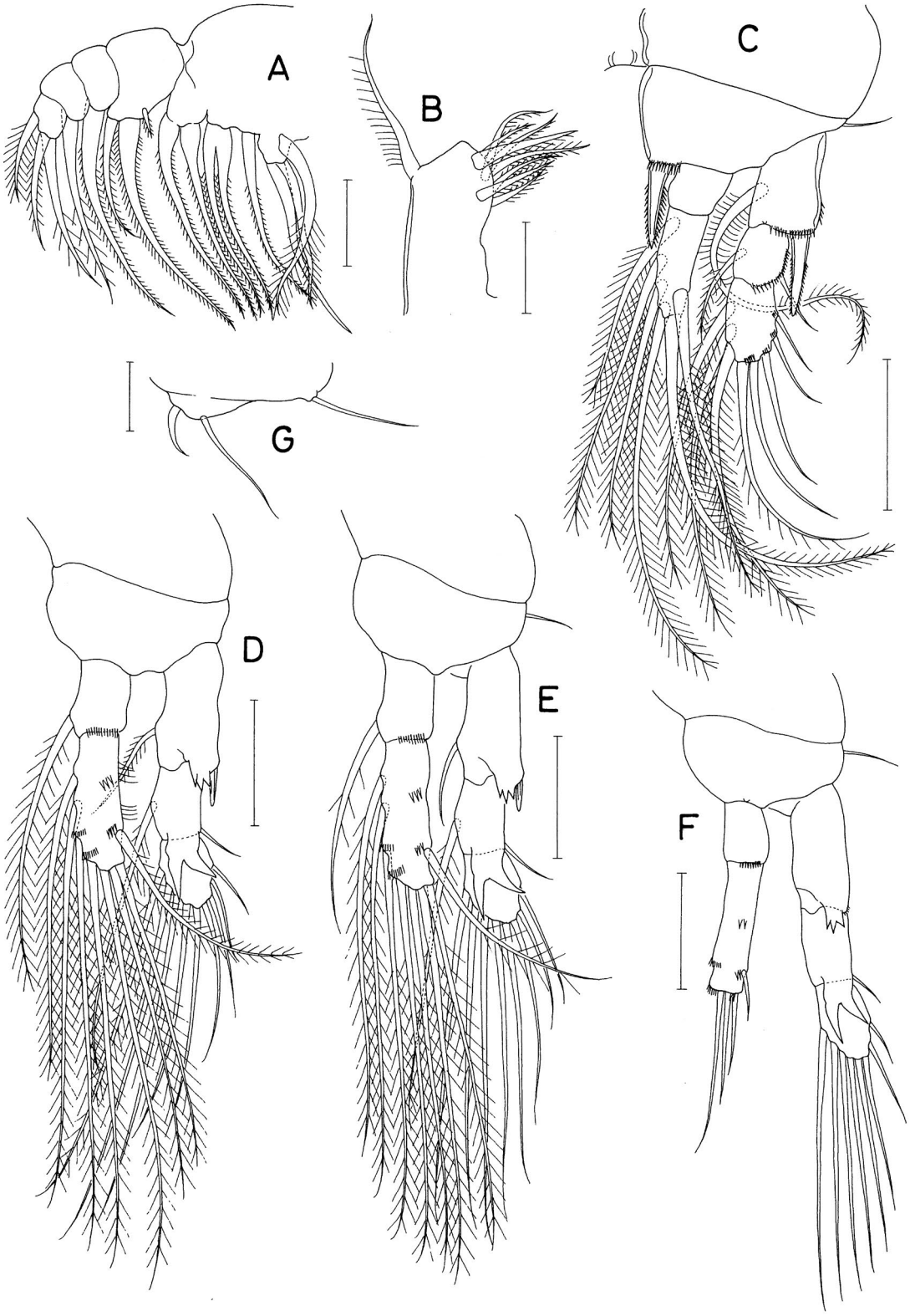

Fig. 15. *Thoracodelphys bisetata* n. sp., female. A, Maxilla; B, Maxilliped; C, Leg 1; D, Leg 2; E, Leg 3; F, Leg 4; G, Leg 5. Scale bars: A, B, G=0.02 mm, C–F=0.05 mm.

lule (Fig. 14I) bearing 8 setae on precoxal arthrite, 1 on coxal endite; 2 on epipodite, 2 on basis, 3 on exopod, and 2 on endopod; distal setae on epipodite extremely unequal. Maxilla (Fig. 15A) 5-segmented; syncoxa with 8 setae arranged as 3, 1, 2, and 2 on first to fourth endites, respectively; basis with 3 setae, distal seta less than half length of middle seta; endopod 3-segmented with 1, 1, and 3 setae on first to third segments, respectively. Maxilliped (Fig. 15B) unsegmented, with oblique distal margin, armed with 8 setae on medial margin and 1 seta at outer corner.

Legs 1−4 (Fig. 15C−F) biramous, with 3-segmented exopods and 2-segmented endopods. Inner seta absent on coxa of legs 1−4. Inner distal spine on basis of leg 1 as large as outer spine on first exopodal segment, both spinulose along margins. First exopodal segment of legs 1−3 bearing outer spine; same segment of leg 4 lacking outer spine. First exopodal segment of legs 2−4 bearing trifurcate outer distal process; second exopodal segment of legs 2−4 with bifurcate, large outer distal proces. First and second exopodal segments of leg 4 lacking inner seta. First endopodal segment unarmed in legs 1 and 4. Armature formula for legs 1−4 as follows:

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

Leg 5 (Fig. 15G) represented by 3 small setae, 2 of them tipped on small lobe (exopod). Leg 6 not seen.

Male. Unknown.

Etymology. The name of the new species refers to the presence of two medial setae on the basis of the maxillule.

Remarks. The genus *Thoracodelphys* currently contains eight species (WoRMS Editorial Board, 2022). *Thoracodelphys bisetata* n. sp. is distinguished from its eight congeners by two distinctive morphological features. Firstly, the basis of the maxillule bears only two setae on the medial margin in contrast to three setae present in all congeners. Secondly, the first exopodal segment of legs 2−4 bears the tricuspid outer distal process, in contrast to the absence of a process in *T. tertius* Kim I.H. and Boxshall, 2020 and *T. caledonica* Kim I.H. and Boxshall, 2020, unicuspid in *T. chelipus* Stock, 1967, *T. quadriseta* Kim I.H. and Boxshall, 2020, *T. depressa* Kim I.H. and Boxshall, 2020, and *T. papuensis* Kim I.H. and Boxshall, 2020, and bicuspid in *T. uniseta* Stock and Humes, 1970 and *T. longiseta* Kim I.H. and Boxshall, 2020 (Stock, 1967; Stock and Humes, 1970; Kim and Boxshall, 2020b). The first exopodal segment of leg 4 of *T. bisetata* n. sp. lacks an outer spine, which is an additional diagnostic feature, as this feature is shared only with *T. depressa*. The latter species has an unarmed second exopodal segment of leg 4, which is an outstanding feature of that species within the genus.

Thoracodelphys cerasta n. sp. (Figs. 16, 17)

Type material. Holotype (intact ♀; HNIBRIV2009), intact paratypes (3 ♀♀; HNIBRIV2010), and dissected paratypes (2 ♀♀) from washings of a mixture of compound ascidians on the wall of Yangpo Fishing Port, Pohang, Korea (35°52′53″N, 129°31′21″E), depth 50 cm, 23 Jun 2022, coll. I.-H. Kim. Intact type material has been deposited in the HNIBR. Dissected paratypes are kept in the collection of I.-H. Kim.

Female. Body (Fig. 16A) with convex dorsal margin and almost straight ventral margin in lateral view, consisting of expanded prosome and narrow, cylindrical urosome. Body length of dissected and figured specimen 1.61 mm. Prosome 1.11 mm long, consisting of well-defined cephalosome and unsegmented metasome. Metasome forming brood pouch, incorporating fifth pedigerous somite, with 2 traces of articulations dorsally. Urosome (Fig. 16B) directed posteroventrally, 5-segmented, gradually narrowing distally, consisting of genital somite and 4 abdominal somites. Genital somite 65 × 205 μm; 4 abdominal somites 122 × 168, 112 × 138, 90 × 122, and 71 × 105 μm, respectively. Anal somite distally narrowing, unornamented, with deep posteromedian incision. Caudal rami slender, widely separated from each other; each ramus (Fig. 16C) 5.43 times longer than wide (125 × 23 μm), armed with 6 small setae; outer proximal and dorsal setae located at 28 and 70% of ramus length, respectively; all setae small; 4 distal setae 19, 28, 20, and 15 μm, respectively, from inner to outer.

Rostrum (Fig. 16D) short, with transparent, semicircular apical lobe. Antennule (Fig. 16E) small, stout, 127 μm long, 6-segmented, tapering from second to distal segments; armature formula 3, 14, 11, 3 + aesthetasc, 4 + aesthetasc, and 7 + aesthetasc; second segment partially divided into 2 parts each bearing 6 and 8 setae; setae densely arranged, all naked. Antenna (Fig. 16F) 4-segmented; coxa short, unarmed; basis with 1 minute seta at outer distal corner; first endopodal segment 42 × 31 μm, unarmed; second endopodal segment (terminal segment) 2.6 times longer than wide (52 × 20 μm), armed with 7 setae (arranged as 3, 1, and 3) plus 1 terminal claw; terminal claw longer than half length of segment.

Labrum (Fig. 16G) with setulose posterior margin and small posteromedian lobe. Mandible (Fig. 16H) with 5 teeth and 1 small seta on coxal gnathobase; distalmost tooth acutely pointed, with minute spinules along its proximal margin; basis with 1 seta at mediodistal corner; exopod with 4 setae, 2 inner ones distinctly longer than outer 2; endopod incompletely articulated from basis, armed with 3 and 7 setae on first and second segments, respectively; endopodal segments

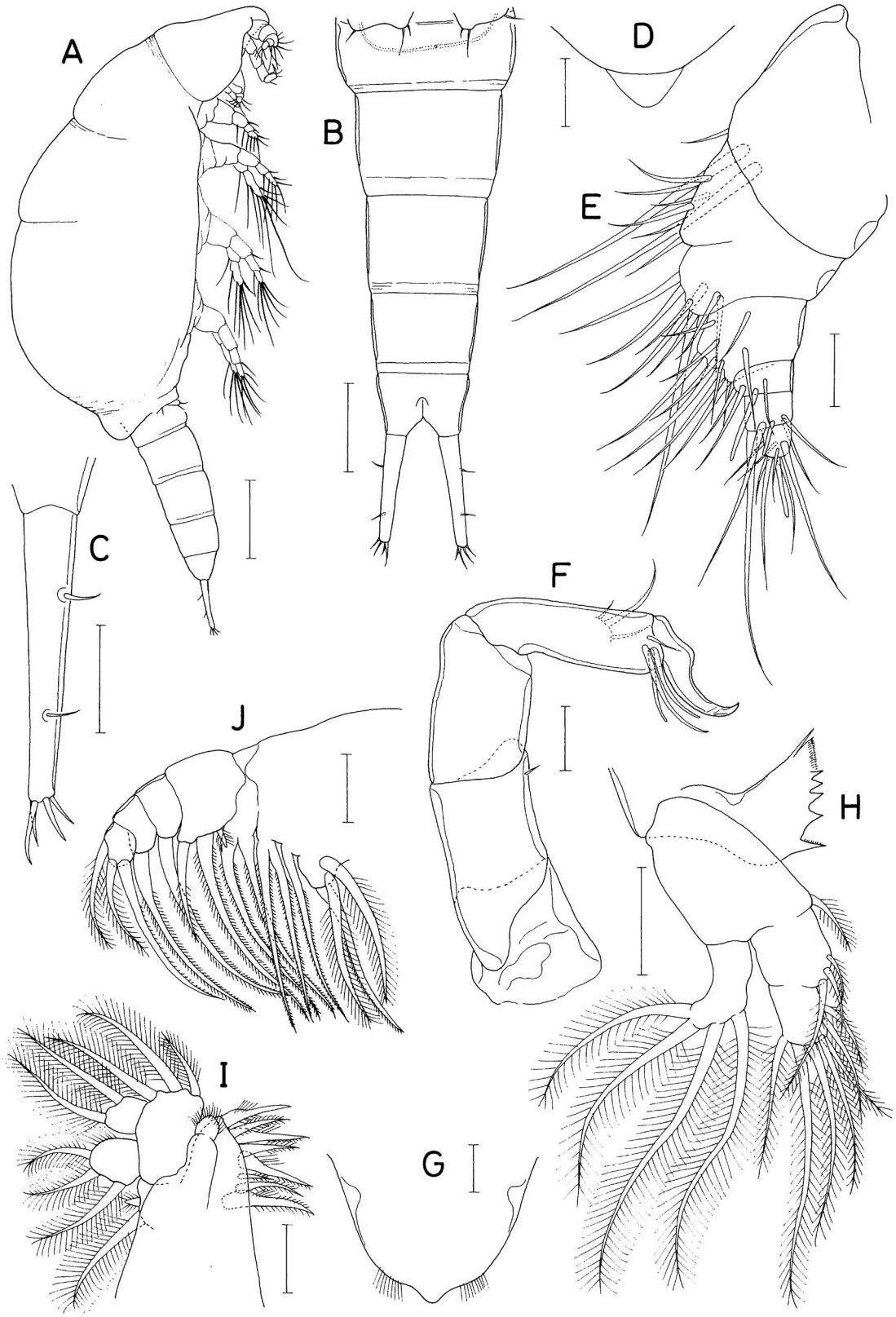

Fig. 16. *Thoracodelphys cerasta* n. sp., female. A, Habitus, right; B, Urosome, ventral; C, Right caudal ramus, dorsal; D, Rostrum; E, Antennule; F, Antenna; G, Labrum; H, Mandible; I, Maxillule; J, Maxilla. Scale bars: A=0.2 mm, B=0.1 mm, C, H=0.05 mm, D–G, I, J=0.02 mm.

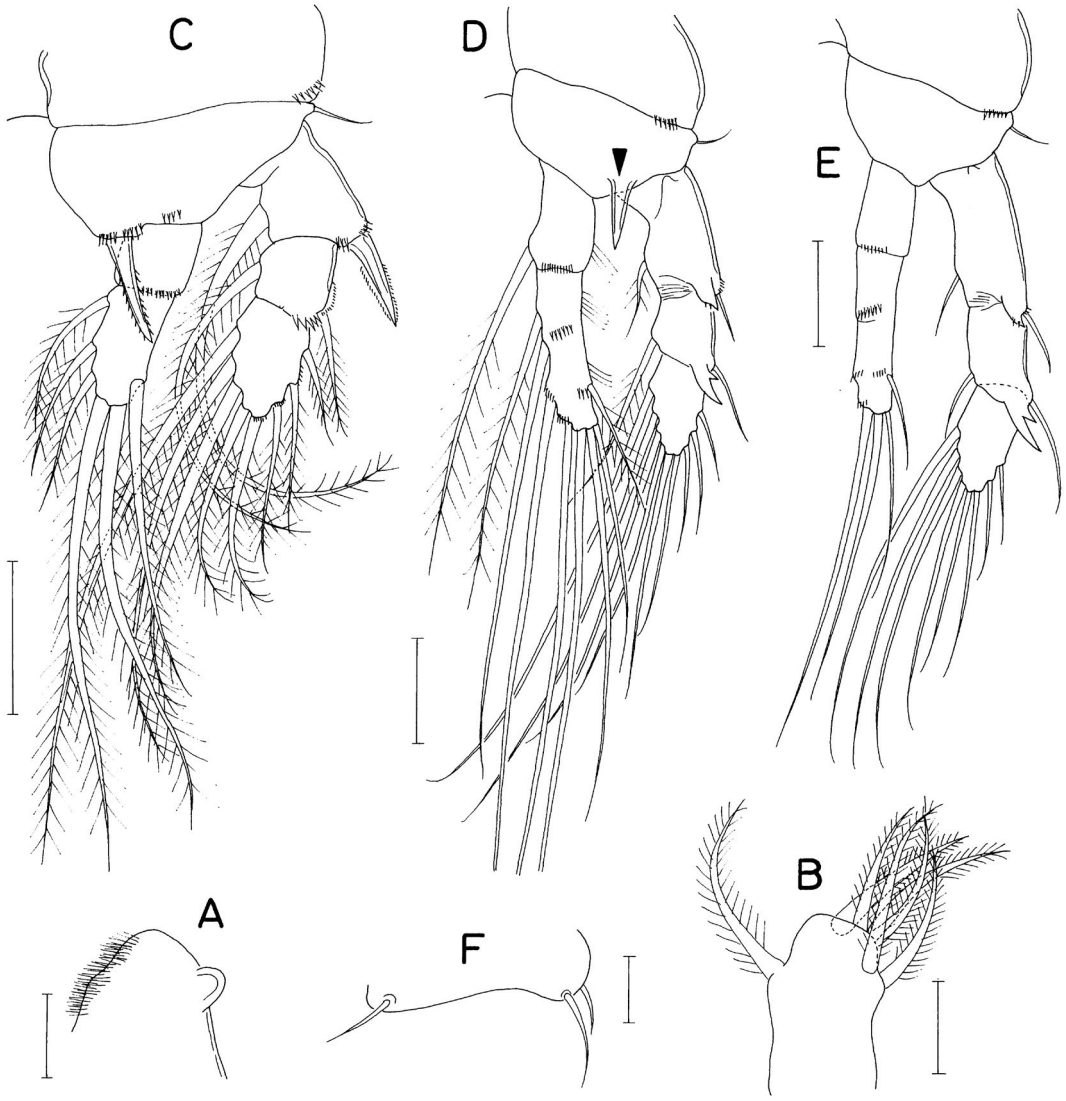

Fig. 17. *Thoracodelphys cerasta* n. sp., female. A, Paragnath; B, Maxilliped; C, Leg 1; D, Leg 2; E, Leg 4; F, Leg 5. Scale bars: A, B, F = 0.02 mm, C–E = 0.05 mm.

indistinctly articulated from each other. Paragnath (Fig. 17A) as small lobe bearing setules on inner surface and semicircular lobe on outer margin. Maxillule (Fig. 16I) bearing 8 setae on precoxal arthrite, 1 circular seta on coxal endite; 2 on epipodite, 3 on basis, 3 on exopod, and 2 on endopod. Maxilla (Fig. 16J) 5-segmented; syncoxa with 8 setae arranged as 3, 1, 2, and 2 on first to fourth endites, respectively; basis with 3 unequal setae, distal seta less than half length of middle seta; endopod 3-segmented, with 1, 1, and 3 setae on first to third segments, respectively. Maxilliped (Fig. 17B) unsegmented, armed with 6 setae on mediodistal margin and 1 seta at outer margin.

Legs 1, 2 (Fig. 17C, D), 3 and 4 (Fig. 17E) biramous with 3-segmented exopods and 2-segmented endopods. Inner seta absent on coxa of legs 1–4. Inner distal spine on leg 1 basis extending over distal margin of first endopodal segment. All exopodal segments of legs 2–4 with setae only. First endopodal segment unarmed in legs 1 and 4. Leg 2 characteristically with 1 strong, horn-like process on distal margin of basis between bases of rami (indicated by arrowhead in Fig. 17D). Leg 3 with same armature formula as that of leg 2, but spiniform process absent on basis. First exopodal segment of legs 2–4 with claw-like outer distal process, each with 2 or 3 spinules on its medial margin. Second exopodal segment of legs 2–4 with unequally bifurcate outer distal process. Armature formula for legs 1–4 as follows:

	Coxa	Basis	Exopod	Endopod
Leg 1	0-0	1-I	I-1; 1-1; 3, 1, 4	0-0; 1, 2, 3
Legs 2 & 3	0-0	1-0	1-1; 1-1; 3, 2, 4	0-1; 1, 3, 4
Leg 4	0-0	1-0	1-1; 1-1; 2, 2, 4	0-0; 1, 2, 1

Leg 5 (Fig. 17F) represented by 3 small setae (2 inner and 1 outer) on short and broad lobe. Leg 6 not seen.

Male. Unknown.

Etymology. The name of the new species is derived from the Greek *Cerast* (= horned), alluding to the presence of a strong, horn-like process on the basis of leg 2.

Remarks. *Thoracodelphys cerasta* n. sp. can be easily distinguished from other species in the genus by a prominent morphological feature: the presence of the strong, horn-like process on the basis of leg 2. No species in the *Thoracodelphys* has ever been recorded to have this kind of process on the same region. The setation of the endopod of the mandible (three setae on the first segment and seven setae on the second) in the new species is also unique within the genus, since in all of congeners the setation is two setae on the first segment and five setae on the second segment. These two distinctive features allow *T. cerasta* n. sp. to be clearly distinguished from other species of the genus.

Genus *Unimeria* Kim I.H. and Boxshall, 2020

***Unimeria hirsuta* n. sp. (Figs. 18, 19)**

Type material. Holotype (intact ♀; HNIBRIV2011) and dissected paratype (♀) from washings of a mixture of compound ascidians on the wall of Ingu Fishing Port, Yangyang, Korea (37°58′10″N, 128°45′47″E), depth about 50 cm, 15 Apr 2019, coll. I.-H. Kim. Holotype has been deposited in the HNIBR, Mokpo. Dissected paratype is kept in the collection of I.-H. Kim.

Female. Body (Fig. 18A) densely covered with fine setules, consisting of unsegmented, bulbous prosome and small, unsegmented urosome. Body length (prosome length) of dissected and figured specimen 2.96 mm (holotype 3.25 mm long). Prosome gradually broadening posteriorly, with convex posterior margin. Cephalosome obscurely defined by slight lateral constriction. Urosome (Fig. 18B, C) much wider than long (243 × 407 μm), well-defined from prosome, directed ventrally, perpendicular to prosome, inserted into posteroventral surface of brood pouch, with short dorsal margin and long, strongly convex ventral margin (Fig. 18C); abdominal region obscurely defined from genital region by slight constriction. Caudal ramus (Fig. 18D) not articulated from urosome, lobate, wider than long, and armed with 6 naked setae.

Rostrum (Fig. 18E) tapering, as long as wide, densely covered with setules, with round distal margin. Antennule (Fig. 18F) unarmed but heavily ornamented with setules, 357 × 195 μm, unsegmented, strongly tapering, with attenuated distal end. Antenna (Fig. 18G) 3-segmented; coxa and basis unarmed; endopod 4.0 times longer than wide (180 × 45 μm), longer than basis, armed with 6 (or 7) small setae (1 or 2 at proximal 40% on inner margin, 2 subdistal, and 3 distal); terminal claw rudimentary, 12 μm long, not longer than distal setae (Fig. 18H).

Labrum (Fig. 18I) strongly tapering, with rounded, setulose posterior apex. Mandible (Fig. 18J) with coxal gnathobase bearing straight, pectinate medial margin; palp biramous, both rami not articulated from basis; exopod with 4 setae; first endopodal segment with 2 setae on medial margin and 2 setules on distal region of basis + first endopodal segment; second endopodal segment obscurely defined from first, with 4 setae. Maxillule (Fig. 19A) as single lobe bearing 10 densely plumose setae (medial 3 shorter than others). Maxilla (Fig. 19B) incompletely 3-segmented; armed with 4, 1, and 3 setae on first to third segments, respectively. Maxilliped absent.

Legs 1, 2 (Fig. 19C, D), 3, and 4 (Fig. 19E) biramous, unsegmented with digitiform rami covered with setules; rami lacking any trace of articulation; endopods shorter than exopods. Protopodal region with outer seta (original outer seta of basis). Leg 3 similar to leg 2, but smaller. Setae on rami hardly distinguishable from setules. Exopods of legs 1−4 armed with 0, 3, 3, and 3 setae, respectively. Endopods of legs 1−4 armed with 1, 2, 2, and 1 seta, respectively. All setae small and naked. Leg 4 distinctly smaller than anterior legs.

Leg 5 (Fig. 18C) represented by 2 small setae near posteroventral margin of prosome.

Male. Unknown.

Etymology. The specific name *hirsuta* (from Latin *hirsut* meaning "hairy") of the new species refers to its hairy body.

Remarks. Kim and Boxshall (2020b) established the genus *Unimeria* to accommodate *U. longipedata*, the only species of the genus known from New Caledonia. The derived character states of this genus recognized by Kim and Boxshall are: the urosome is small and unsegmented, the medial margin of mandibular coxa is pectinate, the maxillule is very reduced, represented by a lobe bearing setae, the maxilliped is absent, the swimming legs are unsegmented but retain elongate rami, and leg 5 is absent. *Unimeria hirsuta* n. sp. exhibits most of these derived states, except the presence of leg 5, although it is vestigial, represented only by two small setae. The new species is very close to the type species, but distinguishable from the latter. Noticeable differences of *U. hirsuta* n. sp. from *U. longipedata* are: (1) the body is bulbous, compared to the rather elongate body in *U. longipedata*; (2) the caudal ramus is lobate, rather than tapered in *U. longipedata*; (3) the rostrum is evenly narrowing distally, rather than abruptly narrowing in distal half in *U. longipedata*; (4) the antenna is not divided, rather than bipartite by a constriction in *U. longipe-*

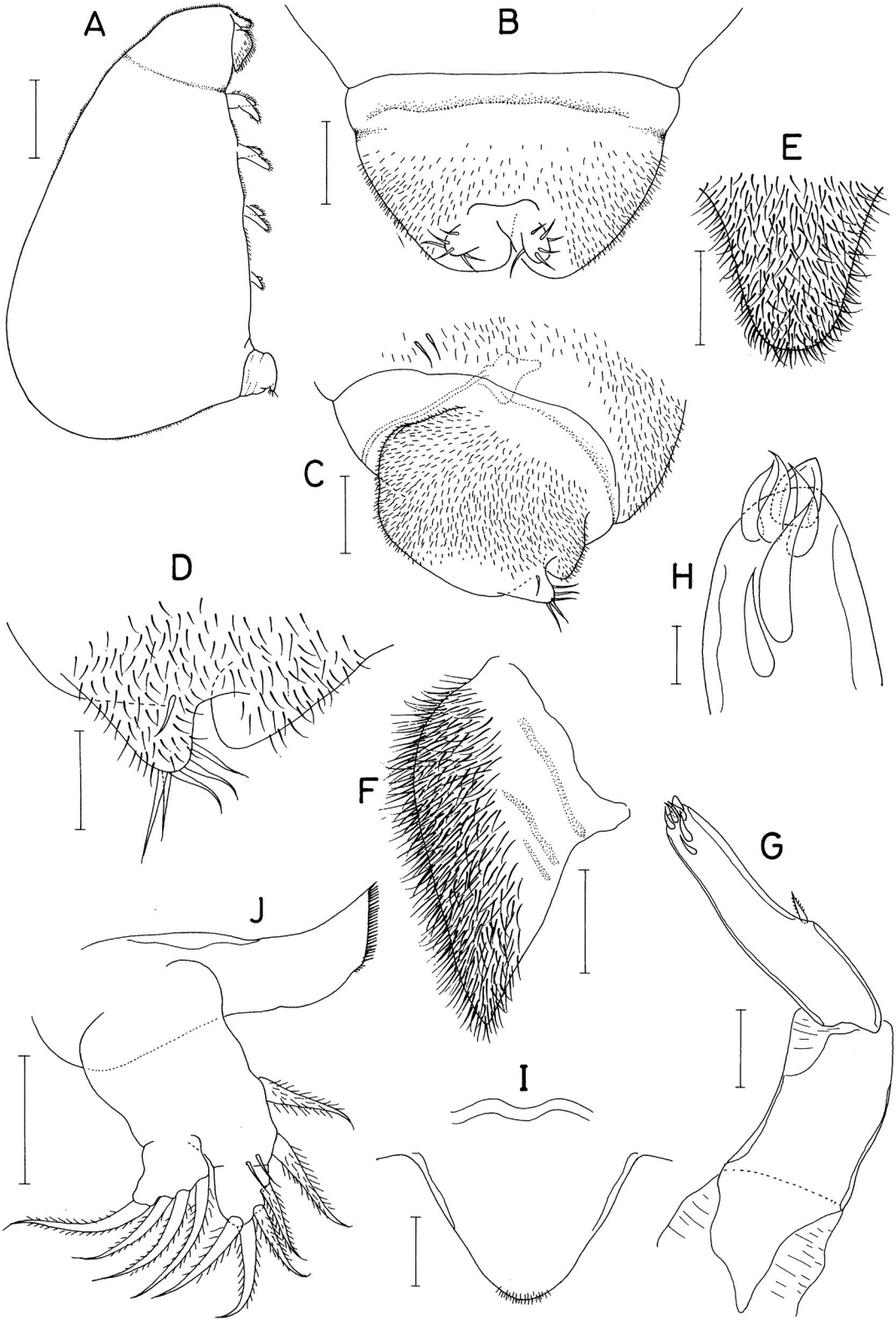

Fig. 18. *Unimeria hirsuta* n. sp., female. A, Habitus, right; B, Urosome, dorsal; C, Urosome, left; D, Distal part of urosome, left; E, Rostrum; F, Antennule; G, Antenna; H, Distal part of antenna; I, Labrum; J, Mandible. Scale bars: A = 0.5 mm, B, C, F = 0.1 mm, D, E, G, I, J = 0.05 mm, H = 0.01 mm.

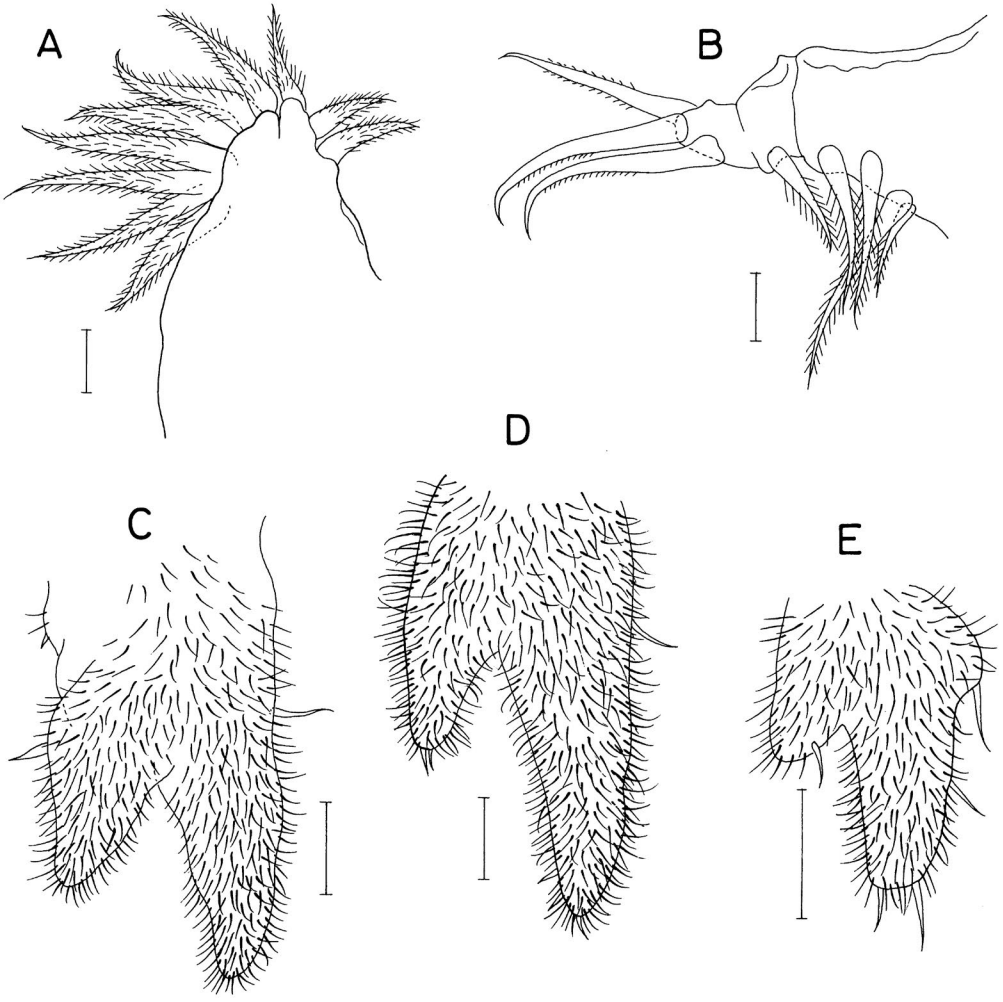

Fig. 19. *Unimeria hirsuta* n. sp., female. A, Maxillule; B, Maxilla; C, Leg 1; D, Leg 2; E, Leg 4. Scale bars: A, B=0.02 mm, C–E=0.05 mm.

data; and (5) the terminal segment of the maxilla is armed with three setae, rather than two setae as in *U. longipedata*.

Family Lichomolgidae Kossmann, 1877
Genus *Zygomolgus* Humes and Stock, 1972

***Zygomolgus didemni* (Gotto, 1956) (Figs. 20–22)**

Material examined. 40 ♀♀, 3 ♂♂ from washings of a mixture of compound ascidians, depth about 1 m, Janseungpo Port, Geoje Island, Korea (34°51′55″N, 128°43′47″E), 15 Jul 2012, coll. I.-H. Kim (21 ♀♀, 1 ♂ have been deposited in the NIBR, Incheon: 1 ♀ NIBRIV0000286649; 1 ♂ NIBR IV0000286650, and 20 ♀♀ NIBRIV0000286651); 1 ♀ from an unidentified compound ascidian epizoic on the solitary ascidian *Chelyosoma siboja* Oka, Sacheon Fishing Port, Gangneung (37°50′14″N, 128°52′38″E), 26 Feb 2011, coll. I.-H. Kim; 1 ♀ from a compound ascidian (white in color) epizoic on the solitary ascidian *Styela clava* Herdman, Hupo Fishing Port, Uljin-gun (36°40′36″N, 129°27′36″E), 20 Feb 2013, coll. I.-H. Kim.

Female. Body (Fig. 20A) cyclopiform, gradually narrowing posteriorly. Body length of figured specimen 1.33 mm. Cephalothorax globular, 529 × 538 μm, with dorsal suture line between cephalosomal and first pedigerous regions. All prosomal somites with rounded lateral corners. Urosome (Fig. 20B) 5-segmented. Fifth pedigerous somite 150 μm wide. Genital double-somite 154 × 163 μm, expanded laterally, consisting of broader anterior two-thirds and narrower posterior third. Genital apertures large, positioned dorsolaterally near middle of double-somite. Three abdominal somites 50 × 83, 38 × 81, and 73 × 90 μm, respectively. Anal somite gradually widened

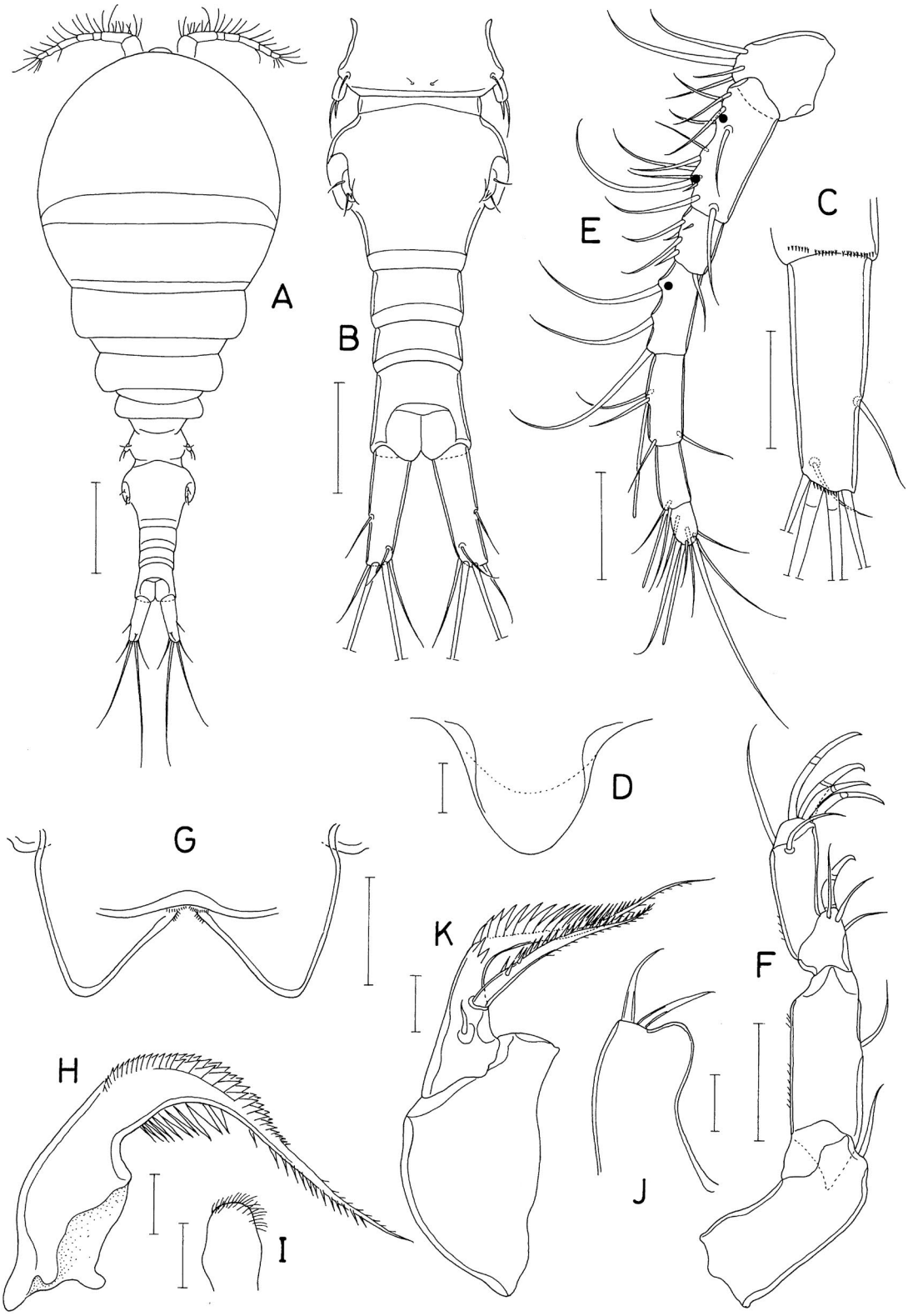

Fig. 20. *Zygomolgus didemni* (Gotto, 1956), female. A, Habitus, dorsal; B, Urosome, dorsal; C, Left caudal ramus, ventral; D, Rostrum; E, Antennule; F, Antenna; G, Labrum; H, Mandible; I, Paragnath; J, Maxillule; K, Maxilla. Scale bars: A = 0.2 mm, B = 0.1 mm, C, E–G = 0.05 mm, D, H–K = 0.02 mm.

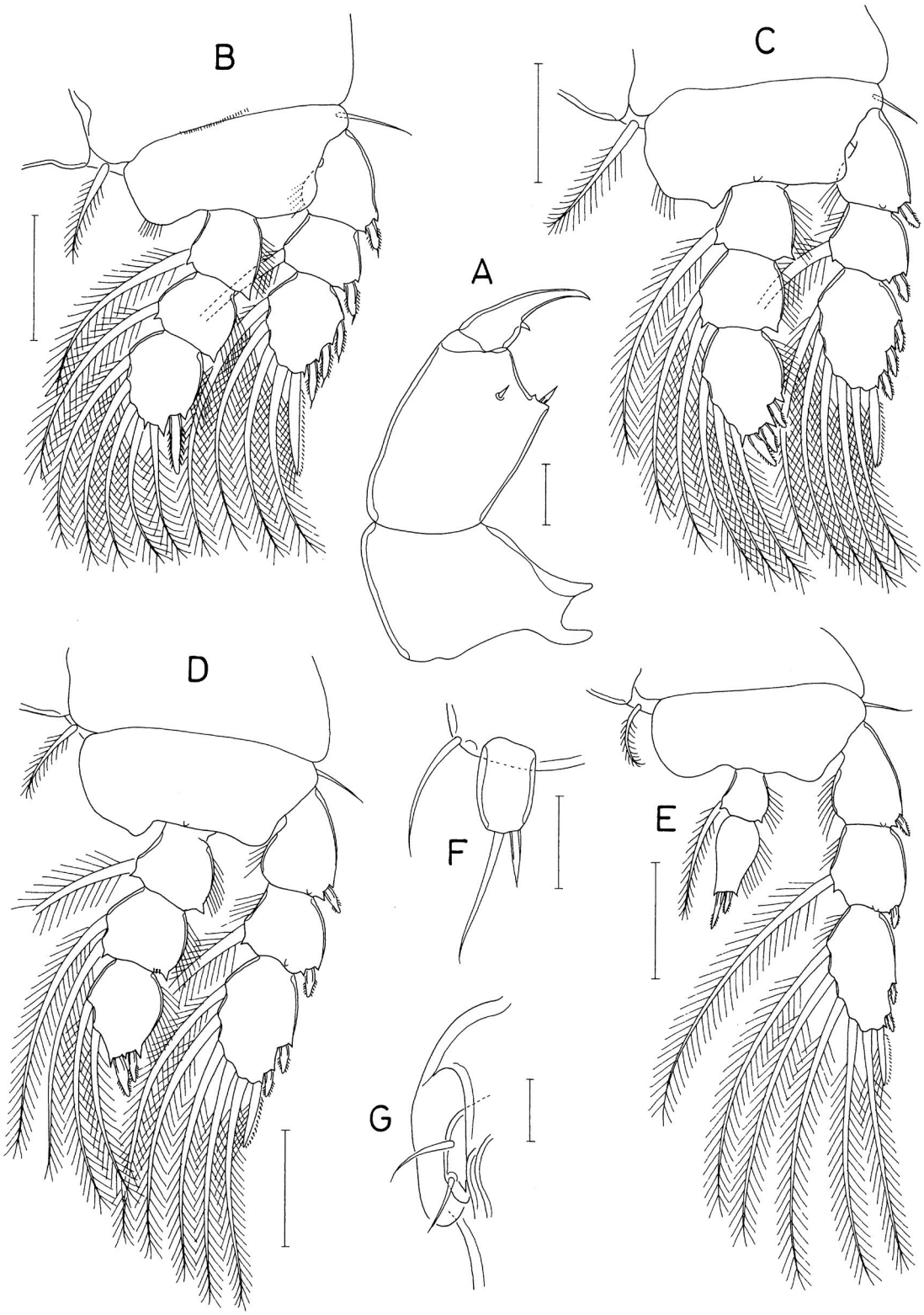

Fig. 21. *Zygomolgus didemni* (Gotto, 1956), female. A, Maxilliped; B, Leg 1; C, Leg 2; D, Leg 3; E, Leg 4; F, Leg 5; G, Genital aperture. Scale bars: A, F, G = 0.02 mm, B–E = 0.05 mm.

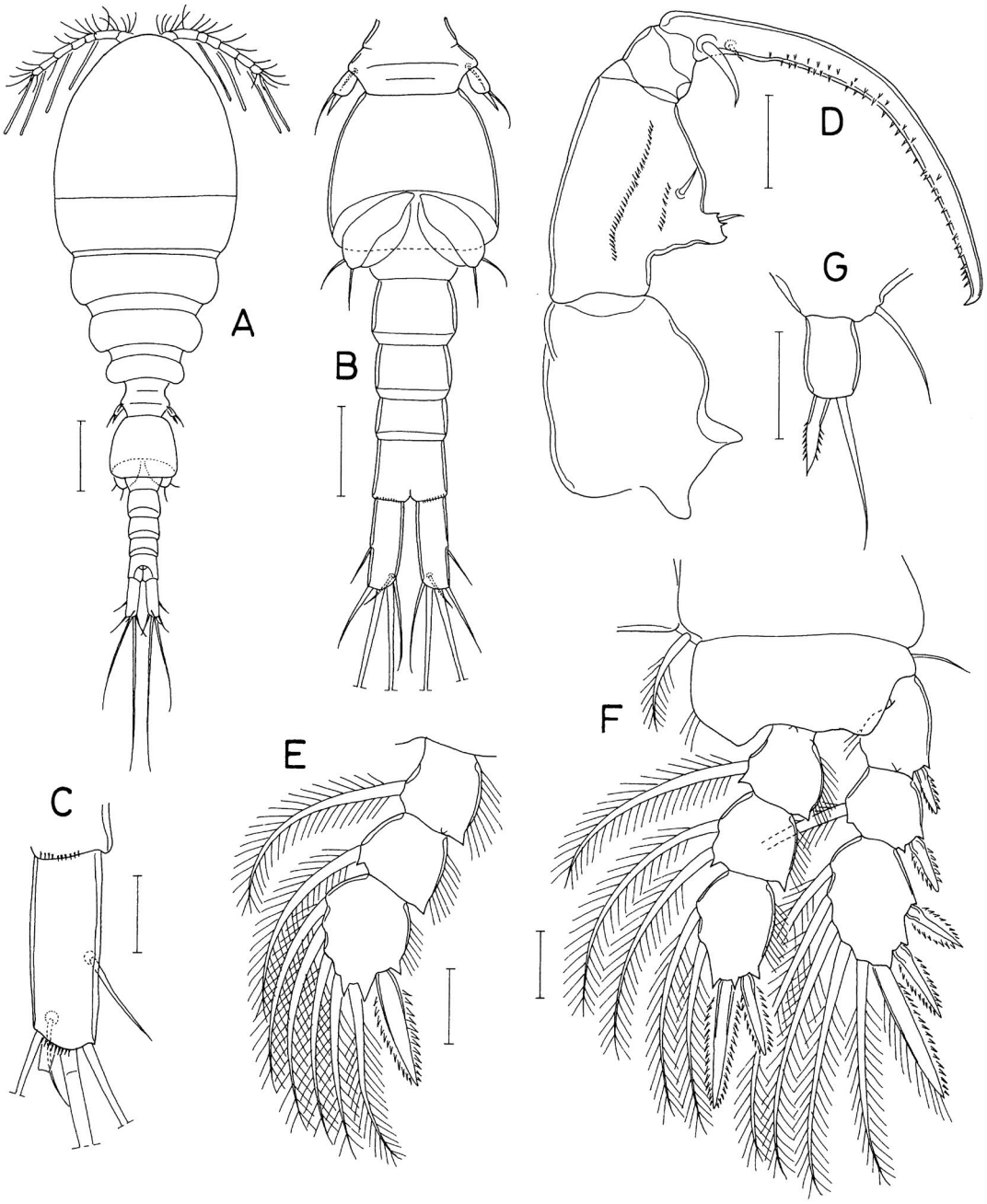

Fig. 22. *Zygomolgus didemni* (Gotto, 1956), male. A, Habitus, dorsal; B, Urosome, ventral; C, Left caudal ramus, ventral; D, Maxilliped; E, Endopod of leg 1; F, Leg 3; G, Leg 5. Scale bars: A = 0.1 mm, B = 0.05 mm, C–G = 0.02 mm.

posteriorly, with row of minute spinules along posteroventral margin. Caudal ramus (Fig. 20C) narrowing distally, 2.86 times longer than wide (100 × 35 μm), with 6 naked setae and ornamented with row of minute spinules along ventrodistal margin; lateral seta positioned at 61% of ramus length.

Rostrum (Fig. 20D) distinct, as long as wide, with rounded distal margin. Antennule (Fig. 20E) 255 μm long, 7-segmented; armature formula 4, 13, 6, 3, 4 + aesthetasc, 2 + aesthetasc, and 7 + aesthetasc; all setae naked. Antenna (Fig. 20F) 4-segmented; armature formula: 1, 1, 3 + claw, and 2 + 4 claws; terminal segment 2.50 times longer than wide (50 × 20 μm); 4 terminal claws slightly unequal in length and thickness; second segment (coxobasis) with minute spinules on outer margin.

Labrum (Fig. 20G) with tapering posterior lobes, broad median incision; inner proximal region of lobes bearing minute spinules. Mandible (Fig. 20H) slender, with obscure inner notch; gnathobase gently curved, with elongate, spinulose distal lash, about 10 unequal spinules along inner margin, and 2 rows of broad spinules along convex outer margin. Paragnath (Fig. 20I) as small lobe bearing setulose apical region. Maxillule (Fig. 20J) lobate, armed with 2 equal, naked distal setae and rounded inner distal protrusion. Maxilla (Fig. 20K) 2-segmented; proximal segment (syncoxa) broad and unarmed; distal segment (basis) strongly curved at base of distal lash, with 2 setae; inner seta (seta I) large, spiniform, bearing spinules along distal margin and minute spinules along proximal margin; distal lash elongated, with large spinules along its distal margin. Maxilliped (Fig. 21A) 3-segmented; first segment (syncoxa) unarmed; second segment (basis) with 2 small setae, one of them positioned on protrusion of inner margin; third segment (endopod) tapering, with claw-like distal part and 1 small seta on inner margin.

Legs 1–3 (Fig. 21B–D) with 3-segmented rami. Leg 4 (Fig. 21E) with 3-segmented exopod and 2-segmented endopod. Inner coxal seta of legs 1–4 distinct, pinnate. Outer seta on basis of legs 1–4 small and naked. Third exopodal segment of leg 3 with 3 spines and 5 setae (formula II, I, 5) as in leg 4. Third endopodal segment of leg 3 with 2 spines and 2 setae (formula 0, II, 2). Endopod of leg 4 small; distal segment tapering, its 2 distal spines unequal in length, inner one about twice as long as outer one. Armature formula for legs 1–4 as follows:

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

Leg 5 (Fig. 21F) consisting of 1 dorsolateral seta on fifth pedigerous somite and small exopod; exopodal segment nearly rectangular, 1.75 times longer than wide (21 × 12 μm), with slightly convex lateral margins and distally with 1 setiform inner spine (13 μm long) and 1 naked outer seta (30 μm long). Leg 6 (Fig. 21G) represented by 2 naked setae and 1 small spinule on genital operculum.

Male. Body (Fig. 22A) narrower than that of female. Body length 0.84 mm. Urosome (Fig. 22B) 6-segmented. Fifth pedigerous somite 72 μm wide. Genital somite 108 × 97 μm, broadened distally. Four abdominal somites 37 × 48, 31 × 43, 23 × 40, and 34 × 43 μm, respectively. Caudal ramus (Fig. 22C) 2.74 times longer than wide (52 × 19 μm), armed and ornamented as in female.

Rostrum as in female. Antennule with 3 additional aesthetascs, 2 on second and 1 on fourth segments, as indicated by dark spots in Fig. 20E. Antenna as in female.

Labrum, mandible, maxillule, and maxilla as in female. Maxilliped (Fig. 22D) 4-segmented; first segment unarmed; second segment with large protrusion on inner margin, with 2 small setae (one of them on apex of protrusion) and 1 long and 1 short, longitudinal rows of minute spinules; third segment small and unarmed; fourth segment as long claw, bearing 2 unequal setae proximally and scattered, dentiform spinules along inner margin.

Legs 1–4 segmented and armed as in female, but distal spine on third endopodal segment of leg 1 distinctly larger than that of female (Fig. 22E). Spines on legs 2–4 also larger than those of female (Fig. 22F).

Remarks. *Zygomolgus didemni* (Gotto, 1956) has been known only from the European waters as an associate of the ascidian *Didemnum maculosum* (Milne Edwards, 1841). The examined Korean specimens have exhibited no meaningful difference from the original description of this species (Gotto, 1956), although the European and Korean populations are distantly separated geographically. The key character of this species, i.e., the presence of two spines and two setae (formula 0, II, 2) on the third endopodal segment of leg 3, is exhibited in the Korean material. The presence three spines and five setae (formula II, I, 5) on the third exopodal segment of leg 3 is also a characteristic, as this feature is observable only in *Z. didemni* and *Z. curtiramus* (Bocquet and Stock, 1962) within the genus. The proportional dimension of the caudal ramus and the shapes of the antenna, mandible, maxillule, and maxilliped of the Korean specimens are not significantly different from the original description of *Z. didemni*, which leads us to determine the Korean specimens to be *Z. didemni*.

Zygomolgus dentatus Kim, 2006 is another species of the genus known in Korea as an associate of a compound ascidian (Kim, 2006). Kim and Boxshall (2021b) also reported this from the Mediterranean Sea.

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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REFERENCES

Choi SD, Hong SY, 1994. A new species of *Bonnierilla* (Copepod, Cyclopoida, Notodelphyidae) parasitic on *Halocynthia roretzi* (V. Drasche) from the Kamak Bay, Korea. Journal of Fish Pathology, 7:83-94.

Gotto RV, 1956. A new ascidicolous copepod: *Lichomolgus didemni*, sp. nov. Journal of the Linnean Society, Zoology, 42: 600-602. https://doi.org/10.1111/j.1096-3642.1956.tb02219.x

Humes AG, Gooding RU, 1964. A method for studying the external anatomy of copepods. Crustaceana, 6:238-240. https://doi.org/10.1163/156854064X00650

Kim IH, 1998. Illustrated encyclopedia of fauna and flora of Korea. Vol. 38. Cirripedia, symbiotic Copepoda, and Pycnogonida. Ministry of Education, Seoul, pp. 1-1038 (in Korean).

Kim IH, 2006. *Zygomolgus dentatus* n. sp. (Copepoda, Poecilostomatoida, Lichomolgidae) from Korea, with synonymization of the genus *Lichomolgides* with *Zygomolgus*. Integrative Biosciences, 10:169-173.

Kim IH, 2012. Ascidicolous copepods. Invertebrate fauna of Korea. Vol. 21. No. 20. National Institute of Biological Resources, Incheon and Ministry of Environment, Seoul, pp. 1-138.

Kim IH, Boxshall GA, 2020a. A revision of the family Archinotodelphyidae Lang, 1949 (Copepoda: Cyclopoida: Oithonida), with the recognition of 15 new species. Zootaxa, 4801:1-56. https://doi.org/10.11646/zootaxa.4801.1.1

Kim IH, Boxshall GA, 2020b. Untold diversity: the astonishing species richness of the Notodelphyidae (Copepoda: Cyclopoida), a family of symbiotic copepods associated with ascidians (Tunicata). Megataxa, 4:1-660. https://doi.org/10.11646/megataxa.4.1.1

Kim IH, Boxshall GA, 2021a. Copepods (Cyclopoida) associated with ascidian hosts: Ascidicolidae, Buproridae, Botryllophilidae, and Enteropsidae, with descriptions of 84 new species. Zootaxa, 4978:1-286. https://doi.org/10.11646/zootaxa.4978.1.1

Kim IH, Boxshall GA, 2021b. Copepods associated with Ascidian hosts (Tunicata): Intramolgidae and Lichomolgidae, with descriptions of four new genera and 13 new species. Zootaxa, 5013:1-75. https://doi.org/10.11646/zootaxa.5013.1.1

Kim IH, Moon SY, 2011. Eight new species of ascidicolous copepods from the eastern coast of Korea (Crustacea, Copepoda, Cyclopoida). Ocean Science Journal, 46:23-46. https://doi.org/10.1007/s12601-011-0003-1

Ooishi S, 1972. Notodelphyid copepods associated with compound ascidians in Akkeshi Bay, Japan. Publications of the Seto Marine Biological Laboratory, 19:303-325. https://doi.org/10.5134/175727

Ooishi S, 1998. *Haplostoma dudleyae* sp. nov. (Cyclopoida: Ascidicolidae), parasitic in *Eudistoma olivaceum* from the Indian River in southern Florida. Journal of Marine Systems, 15:273-279. https://doi.org/10.1016/S0924-7963(97)00068-7

Ooishi S, 2004. Female and male *Haplostoma brevicauda* (Copepoda: Cyclopoida: Ascidicolidae), living in compound ascidians. Journal of Crustacean Biology, 24:422-439. https://doi.org/10.1651/C-2465

Ooishi S, O'Reilly MG, 2004. Redescription of *Haplostoma eruca* (Copepoda: Cyclopoida: Ascidicolidae) living in the intestine of *Ciona intestinalis* from the Clyde Estuary, Scotland. Journal of Crustacean Biology, 24:9-16. https://doi.org/10.1651/C-2415

Schellenberg A, 1922. Neue Notodelphyiden des Berliner und Hamburger Museums mit einer Übersicht der ascidienbewohnenden Gattungen und Arten. Mitteilungen aus dem Zoologischen Museum in Berlin, 10, Teil II:275-298.

Seo IS, Lee KS, 2001. *Haplostoma kimi*, a new species and a redescription of *Haplostomella halocynthiae* (Fukui) from Korea (Copepoda: Cyclopoida: Ascidicolidae). Proceedings of the Biological Society of Washington, 114:229-236.

Stock JH, 1967. Report on the Notodelphyidae (Copepoda, Cyclopoida) of the Israel South Red Sea Expedition. Israel South Red Sea Expedition, 1962, Reports, 27:1-126.

Stock JH, Humes AG, 1970. On four new notodelphyid copepods, associated with an octocoral, *Pararythropodium fulvum* (Forskål), in Madagascar. Zoologischer Anzeiger, 184:193-212.

WoRMS Editorial Board, 2022. World Register of Marine Species. VLIZ. Accessed 25 Jul 2022, <http://www.marinespecies.org>.

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