

# Copepods of the Family Artotrogidae (Siphonostomatoida) from Korea, with Descriptions of Eight New Species

Jimin Lee<sup>1</sup>, Il-Hoi Kim<sup>2,\*</sup>

<sup>1</sup>Ocean Climate Response-Ecosystem Research Department, Korea Institute of Ocean Science & Technology, Busan 49111, Korea

<sup>2</sup>Korea Institute of Coastal Ecology, Bucheon 14449, Korea

## ABSTRACT

Nine copepod species of the family Artotrogidae Brady, 1880 are described or redescribed from Korea. Included new species are two in the genus *Artotrogus* Boeck, 1859, one each in the genera *Bradypontius* Giesbrecht, 1895, *Cryptopontius* Giesbrecht, 1899, *Neopontius* Scott T., 1898 and *Chejupontius* n. gen., and two in the genus *Sewellopontius* Ummerkutty, 1966. *Chejupontius* n. gen. resembles *Ascidipontius* Kim I. H., 1996, *Pulcicrogus* Kim I. H., 1998, and *Sewellopontius* in having reduced armature of leg 1, but is distinguished from these and other genera of the family by the large, mediolaterally expanded protopod of leg 5 and by a combination of characters exhibited in leg 1 that the first exopodal segment lacks an inner seta, the second exopodal segment lacks an outer spine, the third exopodal segment is armed with three spines plus one to three setae, and the second endopodal segment is armed with a single inner seta. *Pteropontius cristatus* Giesbrecht, 1895 known previously only from the Mediterranean Sea is redescribed, based on a newly collected specimen from Korea, and *P. trimerus* Kim I. H., 1996 is removed to the genus *Sewellopontius*. A short note is given for the epibiotic suctorian *Thecacineta calix* (Schroder, 1907) which was found attached to the antennule of a new copepod species.

**Keywords:** *Chejupontius* n. gen., *Artotrogus*, *Bradypontius*, *Cryptopontius*, *Sewellopontius*, *Pteropontius*, *Neopontius*, new species, suctorian epibiont

## INTRODUCTION

The siphonostomatoid family Artotrogidae Brady, 1880 currently consists of 112 species in 22 genera (Walter and Boxshall, 2023). They generally live in shallow seas (Humes, 1987), with some exceptions of deep-water species such as *Abyssopontius altus* Stock, 1985 and *Artogordion ridgeus* Ivanenko, Bandera and Conradi, 2018, both discovered in depths of more than 2000 m (Ivanenko et al., 2018). Most species of the Artotrogidae have been recorded from washings or dredged material of general invertebrate collections, and few specimens have been found on identified hosts (Boxshall and Halsey, 2004). In Korea, Kim (1996, 1998) described 18 species in seven genera of the Artotrogidae. Most of these species were found from external washings of coral-like bryozoans and the hedgehog-like tunicate *Halocynthia igaboja* (Oka, 1906). The present paper describes eight new species and one

new record of artotrogid species discovered in Korea during the last decade.

## MATERIALS AND METHODS

Copepod samples studied in the present work were collected by SCUBA on the coast of Jeju Island, Korea. Collected copepods were fixed in 10% formalin for several hours and then preserved in 70% ethanol. Before microscopic observation selected copepods were immersed in lactic acid for about 10 minutes. Dissections were performed using the reverse slide method of Humes and Gooding (1964). Drawings were made with the aid of a drawing apparatus equipped on the light microscope. Dissected appendages are mounted with Hoyer's mounting medium. Body lengths were measured along the middle axis of body from anterior apex of the cephalothorax

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**\*To whom correspondence should be addressed**  
Tel: 82-32-624-2030, Fax: 82-32-624-2039  
E-mail: [ihkim@gwnu.ac.kr](mailto:ihkim@gwnu.ac.kr)

to the distal margin of caudal rami, excluding caudal setae. The lengths of the appendage segments are the average of the longest and shortest margins. In the armature formulae of legs, Roman numerals indicate spines and Arabic numerals represent setae. Type specimens have been deposited in the Honam National Institute of Biological Resources (HNIBR), Mokpo, Korea. Seven specimens of the suctorian *Thecacineta calix* attached to antennules of one male of described species have also been deposited in the same institute.

## SYSTEMATIC ACCOUNTS

Subclass Copepoda Milne Edwards, 1840  
Order Siphonostomatoida Burmeister, 1835  
Family Artotrogidae Brady, 1990  
Genus *Artotrogus* Boeck, 1859

### *Artotrogus muricatus* n. sp. (Figs. 1, 2)

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**Material examined.** Holotype (intact ♀, HNIBRIV2394), intact paratypes (2♀♀, HNIBRIV2395), and dissected paratype (♀) from washings of calcareous algae, at Munseom, Seogwipo, Jeju Island, 33°13'35.5"N, 126°33'45.3"E, depth 25.1 m, 20 Jul 2022, coll. T. W. Jung, H. K. Kim, and J. G. Kim. Holotype and intact paratypes have been deposited in the Honam National Institute of Biological Resources (HNIBR), Mokpo, Korea. Dissected paratypes are retained in the collection of I.-H. Kim.

**Etymology.** The specific name *muricatus* is derived from *muricat* (Latin meaning "pointed"), indicating to the pointed posterolateral processes of the genital double-somite.

**Female.** Body (Fig. 1A) discoid, dorsoventrally flattened, circular in dorsal view. Body length 1.70 mm in dissected and figured specimen (1.65 mm in holotype); maximum body width 1.63 mm. Prosoma consisting of cephalothorax and 2 metasomites (second and third pedigerous somites). Cephalothorax shorter than wide, 1.13 mm long measured along midline; anterior apex slightly pronounced as rostral region; posterolateral corners projected, pointed. First and second metasomites 1.05 and 0.64 mm wide, respectively. Fourth pedigerous somite lacking. Urosome (Fig. 1B) small, 5-segmented, consisting of fifth pedigerous somite, genital double-somite, and 3 free abdominal somites. Fifth pedigerous somite short, 202 µm wide. Genital double-somite 136 × 236 µm, dorsally with strongly projected, conical posterolateral processes extending to anterior third of anal somite. First and second free abdominal somites short, 18 × 159 and 18 × 173 µm, respectively. Anal somite broadened distally, 90 × 250 µm. Caudal

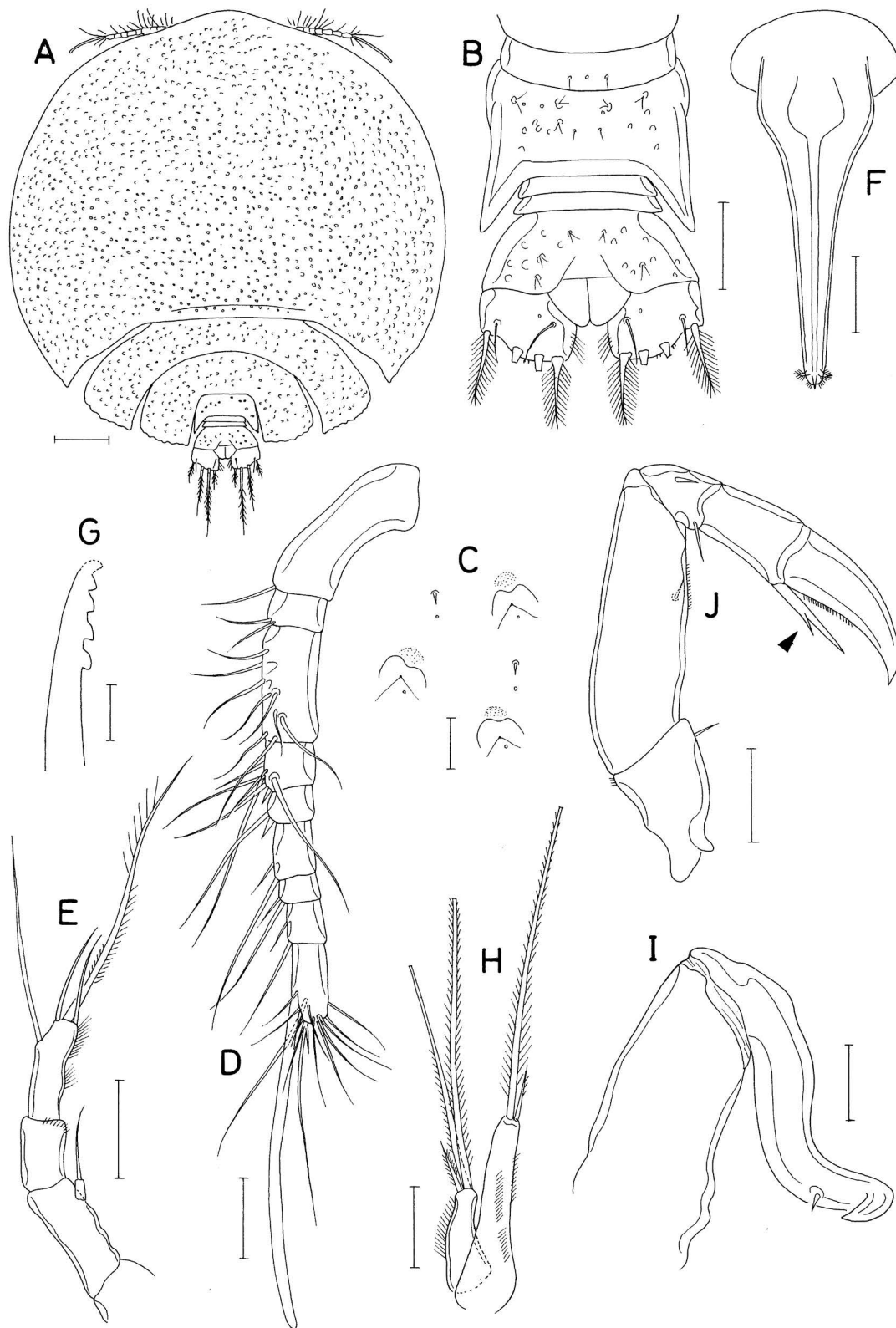
ramus 0.7 times as long as wide (77 × 110 µm), armed with 6 setae and ornamented with several setules on inner margin and several minute spinules along posterior margin; 2 dorsal setae small, naked, other 4 distal setae pinnate. Dorsal surface of prosoma, genital double-somite and anal somite ornamented with numerous pits; each pit (Fig. 1C) bearing paired sensilla and minute pore.

Rostrum not prominent, represented by ventral broad ridge on rostral region of cephalothorax. Antennule (Fig. 1D) small, 348 µm long, 9-segmented; armature formula 1, 2, 9, 7, 2, 2, 2, 2, and 14 + aesthetasc; all setae thin, naked; first segment longest and third segment second longest; three of distal setae on terminal segment fused at bases. Antenna (Fig. 1E) consisting of coxa, basis, exopod, and 2-segmented endopod; coxa short, unarmed; basis longest segment, unarmed; exopod small, tipped with 1 naked seta; first endopodal segment 35 × 23 µm, unarmed but with fine setules distally; second endopodal segment 2.94 times longer than wide (53 × 18 µm), armed with 4 setae (3 distal and 1 inner subdistal) and ornamented with fine setules on outer margin; longest middle of 3 distal setae pinnate, as long as sum of antennal segments.

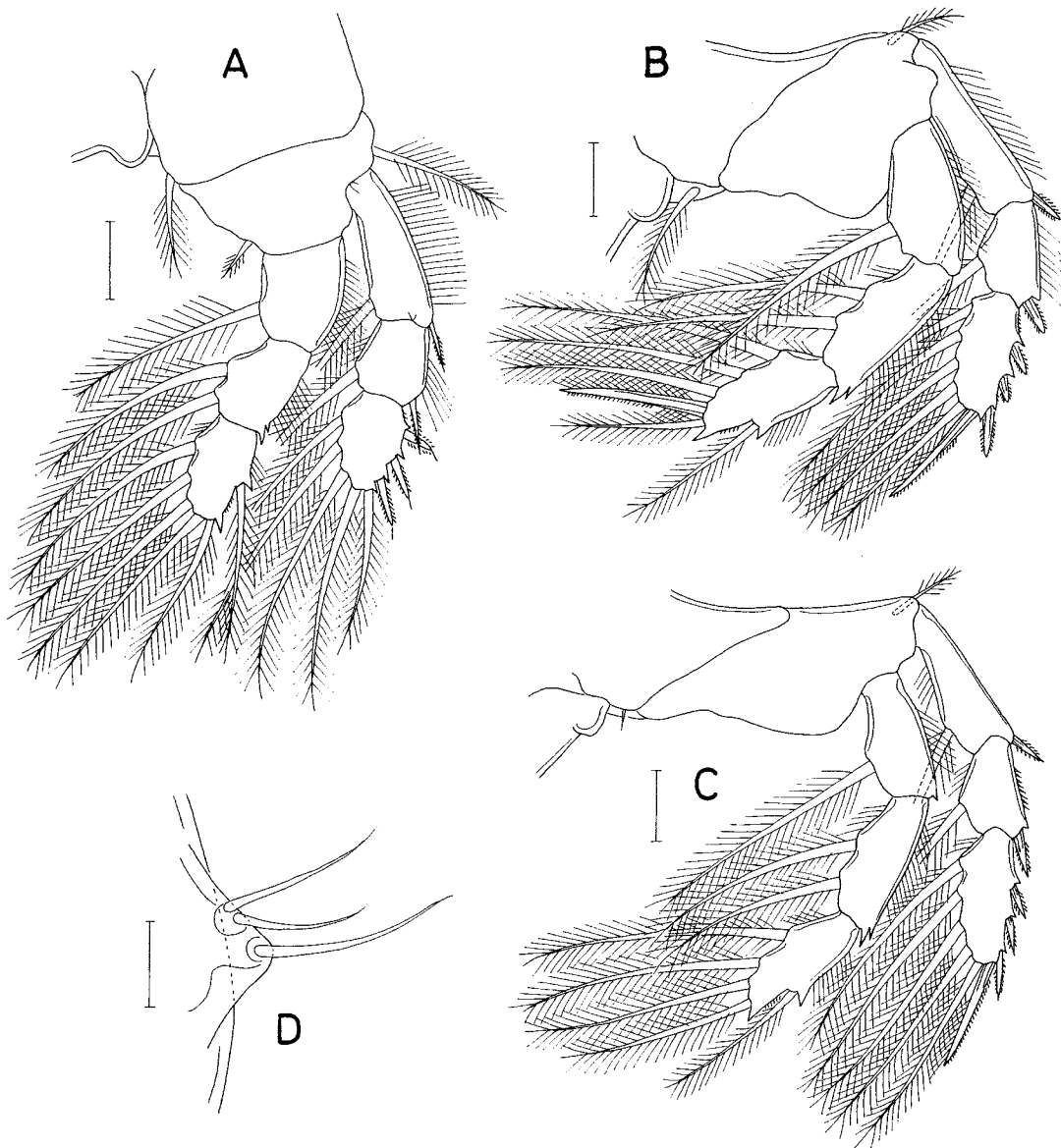
Oral siphon (Fig. 1F) 485 µm long, extending to insertions of maxillipeds. Mandible (Fig. 1G) represented by stylet bearing 5 blunt teeth distally. Maxillule (Fig. 1H) bilobed; inner lobe (precoxal endite) 129 µm long, distally with 2 unequal setae and longitudinal rows of setules; outer lobe (palp) 65 µm long, half as long as inner lobe, distally with 1 small and 2 long setae, and lateral row of setules. Maxilla (Fig. 1I) robust, 2-segmented; proximal segment (syncoxa) unarmed; distal segment (basis) strongly curved, with 1 small seta subdistally. Maxilliped (Fig. 1J) 4-segmented, consisting of syncoxa, basis, and 2-segmented endopod; syncoxa with 1 small, naked seta subdistally on inner margin; basis with 1 small seta and minute spinules on subdistal region of inner margin; first endopodal segment short, with 2 small setae; second endopodal segment 106 µm long, broadened distally, with 1 large distal spiniform seta characteristically bearing 1 auxiliary spinule in middle (indicated by arrowhead in Fig. 1J); terminal claw broad, orange in color, 181 µm long, with minute spinules along proximal half of inner margin.

Legs 1–3 (Fig. 2A–C) biramous, with 3-segmented exopod and endopod. Leg 4 absent. Outer spines on first and second exopodal segments of leg 1 slender, setiform. Second endopodal segment of legs 1–3 bearing bicuspid outer distal corner. Inner coxal seta of leg 3 rudimentary. Armature formula for legs 1–3 as follows:

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



**Fig. 1.** *Artotrogus muricatus* n. sp., female. A, Habitus, dorsal; B, Urosome, dorsal; C, Sensilla in pits of tergite of cephalothorax; D, Antennule; E, Antenna; F, Oral siphon; G, Tip of mandibular stylet; H, Maxillule; I, Maxilla; J, Maxilliped. Scale bars: A=0.2 mm, B, F, I=0.1 mm, C=0.02 mm, D, E, H, J=0.05 mm, G=0.01 mm.



**Fig. 2.** *Artotrogus muricatus* n. sp., female. A, Leg 1; B, Leg 2; C, Leg 3; D, Leg 5, ventral. Scale bars: A–C=0.05 mm, D=0.02 mm.

Leg 5 (Fig. 2D) represented by 3 naked setae (one of them separated from remaining 2) on ventrolateral prominence of fifth pedigerous somite. Leg 6 represented by 2 unequal setae on genital operculum.

**Male.** Unknown.

**Remarks.** As a significant diagnostic feature of *Artotrogus muricatus* n. sp., its third endopodal segment of leg 3 is armed with five setae (formula 1, 2, 2; not with six armature elements). This armature condition is shared with two other species in the genus *Artotrogus*, i.e., *A. halocynthiae* Kim, 1996 and *A. sarsi* Kim, 1996 (Table 1). Unlike *A. muricatus* n. sp., *A. halocynthiae* has rounded (vs. pointed in the new

species) posterolateral processes of the female genital double-somite and a shorter oral siphon which extends before insertions of the maxillipeds (vs. extends to the insertions of the maxillipeds in the new species). *Artotrogus sarsi* is the replacement name of *A. orbicularis* sensu Sars, 1915 (Kim, 1996), whose caudal ramus of the female is as long as wide (vs. distinctly shorter than wide in the new species) and the posterolateral processes of the female genital double-somite are truncated, as figured by Sars G.O. (1915). It is noticeable that *A. orbicularis* sensu Giesbrecht, 1899 also has the same armature formula (1, 2, 2) of the third endopodal segment of leg 3, as in the above three species. However, *A. orbicu-*

**Table 1.** Characteristics of species of *Artotrogus*

Species	Characters									Reference
	1	2	3	4	5	6	7	8	9	
<i>A. acutus</i>	Pointed	8	10	1st	mxpd	×	1,1+I,3	1,1+I,3	1	Kim (1996)
<i>A. gladiator</i>	–	–	10	–	leg 1	×	1,2,3	1,2,3	×	Giesbrecht (1899)
<i>A. haikungae</i>	Lobe	8	11	1st	Before mxpd	×	1,1+I,3	1,2,3	1	McKinnon (1988)
<i>A. halocynthiae</i>	Round	9	12	1st	Before mxpd	+	1,1+I,3	1,2,2	2	Kim (1996)
<i>A. incidentus</i>	Angle+lobe	8	–	2nd	Over mxpd	+	1,2,3	1,2,3	1	Kim (1996)
<i>A. latifurcatus</i>	–	–	11	–	mxpd	×	–	1,2,3	2	Nicholls (1944)
<i>A. orbicularis</i>	Blunt	9	–	1st	Over mxpd	–	–	1,2,3	–	Boeck (1859)
<i>A. rotundus</i>	Round	9	12	1st	Over mxpd	+	1,1+I,3	1,2,3	2	Kim (1996)
<i>A. sardae</i>	Lobe	8	–	2nd	Before mxpd	+	1,1+I,3	1,1+I,3	×	McKinnon (1988)
<i>A. sarsi</i>	Truncate	9	–	1st & 3rd	mxpd	+	1,1+I,3	1,2,2	2	Sars (1915)
<i>A. gordonii</i>	Pointed	8	–	1st	Before mxpd	+	1,1+I,3	1,1+I,3	1	Kim (2009)
<i>A. muricatus</i> n. sp.	Pointed	9	–	1st	mxpd	+	1,1+I,3	1,2,2	1	This study
<i>A. parmatus</i> n. sp.	Taper round	9	12	1st	Over mxpd	+	1,1+I,3	1,2,3	2	This study

Characters: 1, shape of posterolateral processes of female genital double-somite; 2, segments of female antennule; 3, segments of male antennule; 4, longest segment of female antennule; 5, approach of distal tip of oral siphon; 6, presence or absence of inner distal seta on basis of leg 1; 7, armature formula of third endopodal segment of leg 2; 8, armature formula of third endopodal segment of leg 3; 9, number of outer distal dentiform process(es) on second endopodal segment of leg 1.

+, present; ×, absent; –, unknown; mxpd, maxilliped.

*laris* sensu Giesbrecht appears not to belong to *A. orbicularis* Boeck, 1859, because the latter species has six setae (formula 1, 2, 3) on the third endopodal segment of leg 3 (as illustrated by Boeck, 1859), nor belong to other known species of *Artotrogus*, because Giesbrecht (1899) illustrated leg 1 having no inner distal seta on the basis.

The most characteristic feature of *A. muricatus* n. sp. seems to lie in the maxilliped, as the inner distal seta on the distal endopodal segment is peculiar in bearing a subsidiary spinule in the middle. In *Artotrogus* this form of the seta has not been reported yet. The distally broadened distal endopodal segment of the same appendage is also a characteristic feature.

#### *Artotrogus parmatus* n. sp. (Figs. 3–5)

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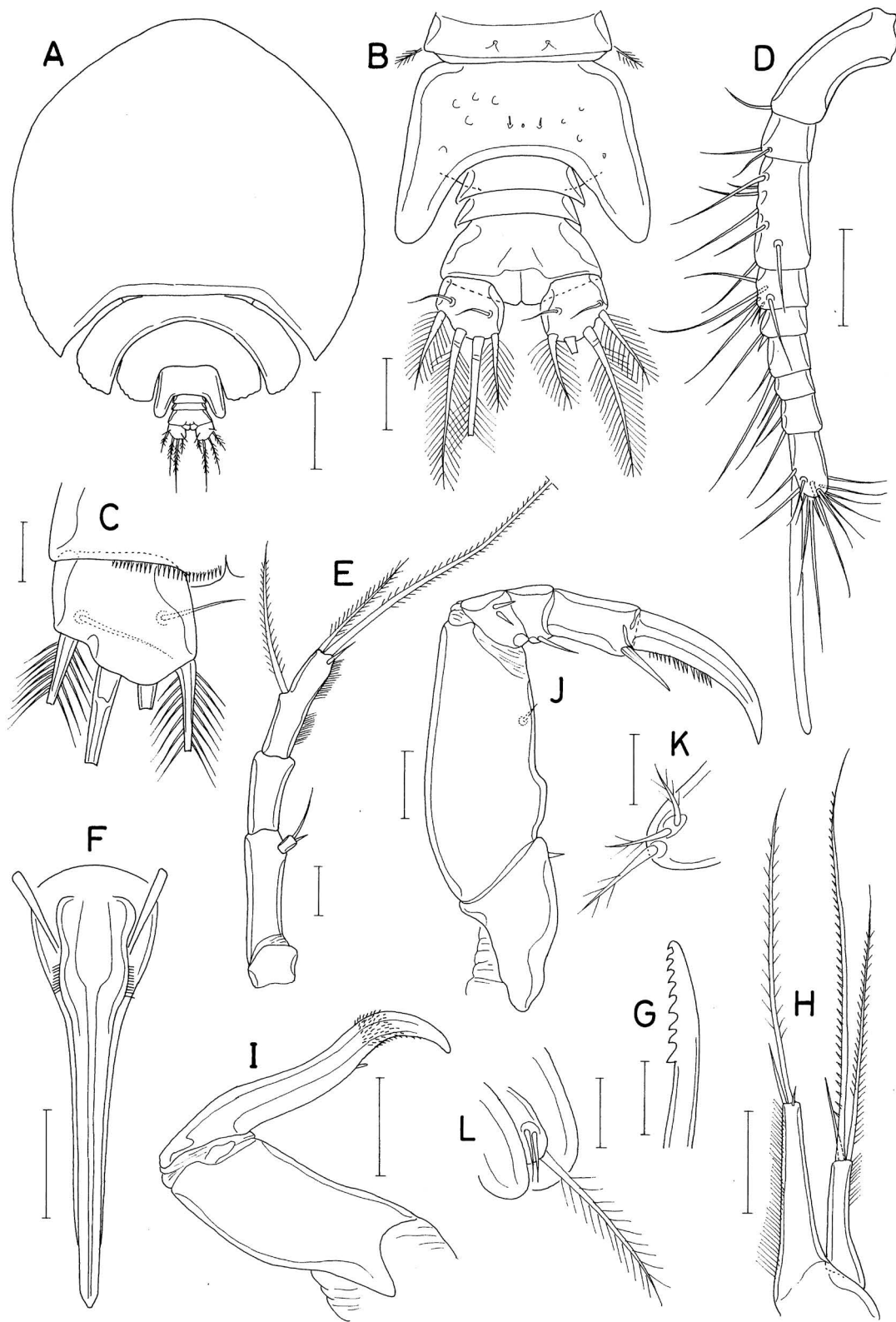
**Material examined.** Holotype (♀, dissected and mounted on a slide, HNIBRIV7704) and paratype (♂, dissected and mounted on a slide, HNIBRIV7705) from washings of calcareous algae, at Munseom, Seogwipo, Jeju Island, 33°13'35.5"N, 126°33'45.3"E, depth 25.1 m, 20 Jul 2022, coll. T. W. Jung, H. K. Kim, and J. G. Kim.

**Etymology.** The name is derived from the Latin *parm* (= a small shield), alluding to the shield-shaped body of the new species.

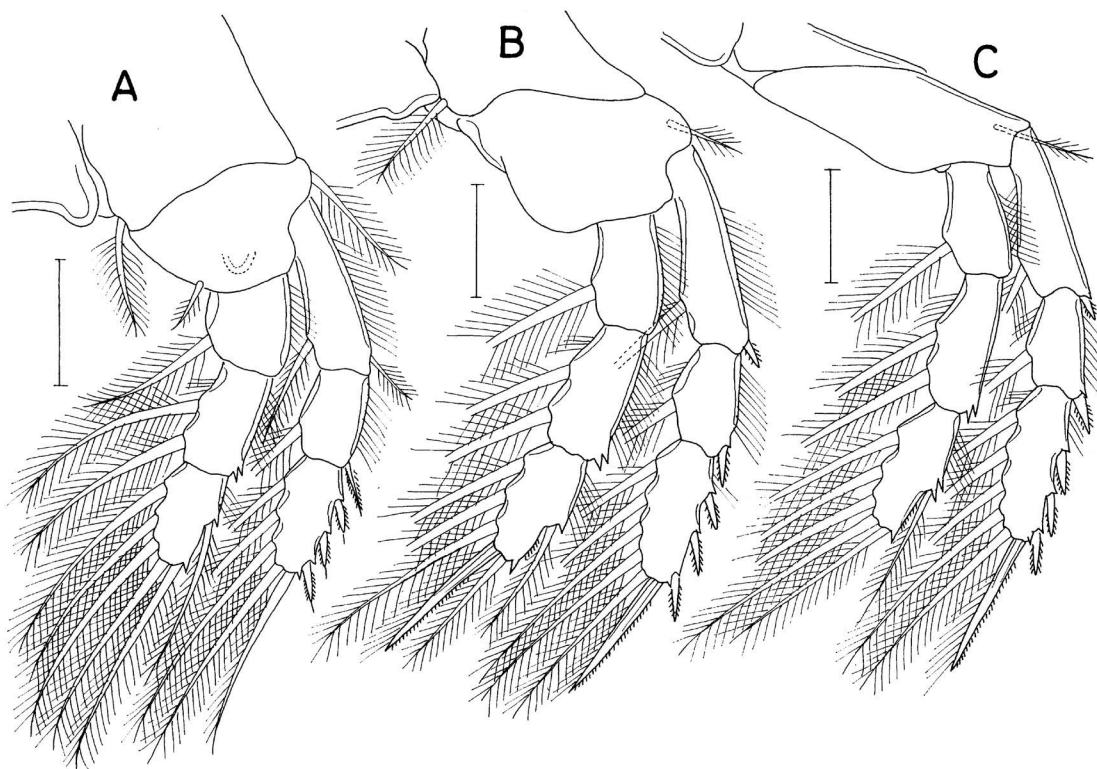
**Female.** Body (Fig. 3A) discoid, dorsoventrally flattened, circular in dorsal view. Body length 1.11 mm; maximum width

0.93 mm. Prosoma consisting of cephalothorax and 2 metasomites. Cephalothorax 727 μm long along midline, with slightly pronounced anterior apex and pointed posterolateral corners. Two metasomites 588 and 379 μm wide, respectively. Fourth pedigerous somite absent. Dorsal surface of prosomal somites ornamented with numerous small pits. Urosome (Fig. 3B) 5-segmented; fifth pedigerous somite 133 μm wide. Genital double-somite 68 × 183 μm, dorsally with large, blunt posterolateral processes extending to middle of proximal third of anal somite. Three free abdominal somites 23 × 92, 17 × 91, and 53 × 115 μm, respectively. Anal somite with fine spinules on posteroventral margin (Fig. 3C). Caudal ramus (Fig. 3C) 0.90 times longer than wide (44 × 49 μm), armed with 6 setae; 2 dorsal setae naked; other 4 setae on distal margin pinnate with thick setules; inner and posterior margins smooth, lacking spinules or setules.

Rostrum not developed. Antennule (Fig. 3D) 257 μm long, 9-segmented; armature formula 1, 2, 7, 7, 2, 2, 2, 2, and 14 + aesthetasc; first to third segments 73, 22, and 57 μm long, respectively; all setae naked and thin; 3 of distal setae and 2 of subdistal setae on terminal segment fused at bases, respectively. Antenna (Fig. 3E) slender; coxa short, unarmed; basis longest; exopod small, tipped with 2 setae of unequal lengths; first endopodal segment 32 × 28 μm, unarmed and unornamented; second endopodal segment about 3.7 times longer than wide (48 × 13 μm), armed with 4 setae (3 distal and 1 inner) and ornamented with fine setules on outer margin.



**Fig. 3.** *Artotrogus parmatus* n. sp., female. A, Habitus, dorsal; B, Urosome, dorsal; C, Right caudal ramus, ventral; D, Antennule; E, Antenna; F, Oral siphon; G, Tip of mandibular stylet; H, Maxillule; I, Maxilla; J, Maxilliped; K, Leg 5, ventral; L, Leg 6. Scale bars: A=0.2 mm, B, D, H, J=0.05 mm, C, E, K, L=0.02 mm, F, I=0.1 mm, G=0.01 mm.



**Fig. 4.** *Artotrogus parmatus* n. sp., female. A, Leg 1; B, Leg 2; C, Leg 3. Scale bars: A–C=0.05 mm.

Oral siphon (Fig. 3F) 410  $\mu$ m long, extending slightly over insertions of maxillipeds; proximal region with about 10 minute spinules on each lateral margin. Mandibular stylet bearing 9 teeth distally (Fig. 3G); palp absent, Maxillule (Fig. 3H) bilobed; inner lobe about 88  $\mu$ m long, tipped with 3 setae (155, 30, and 8  $\mu$ m long, respectively); outer lobe 56  $\mu$ m long, also tipped with 3 setae (201, 134, and 41  $\mu$ m long, respectively). Maxilla (Fig. 3I) as usual for genus; distal segment as subchela bearing 1 small seta on convex margin and group of minute spinules subdistally. Maxilliped (Fig. 3J) consisting 5 segments and terminal claw; armature formula 1, 1, 2, 1, 1 + claw; second segment (basis) with blunt inner protuberance proximally; terminal segment 64  $\mu$ m long; terminal claw orange in color, 133  $\mu$ m long, with row of spinules along proximal half of inner margin.

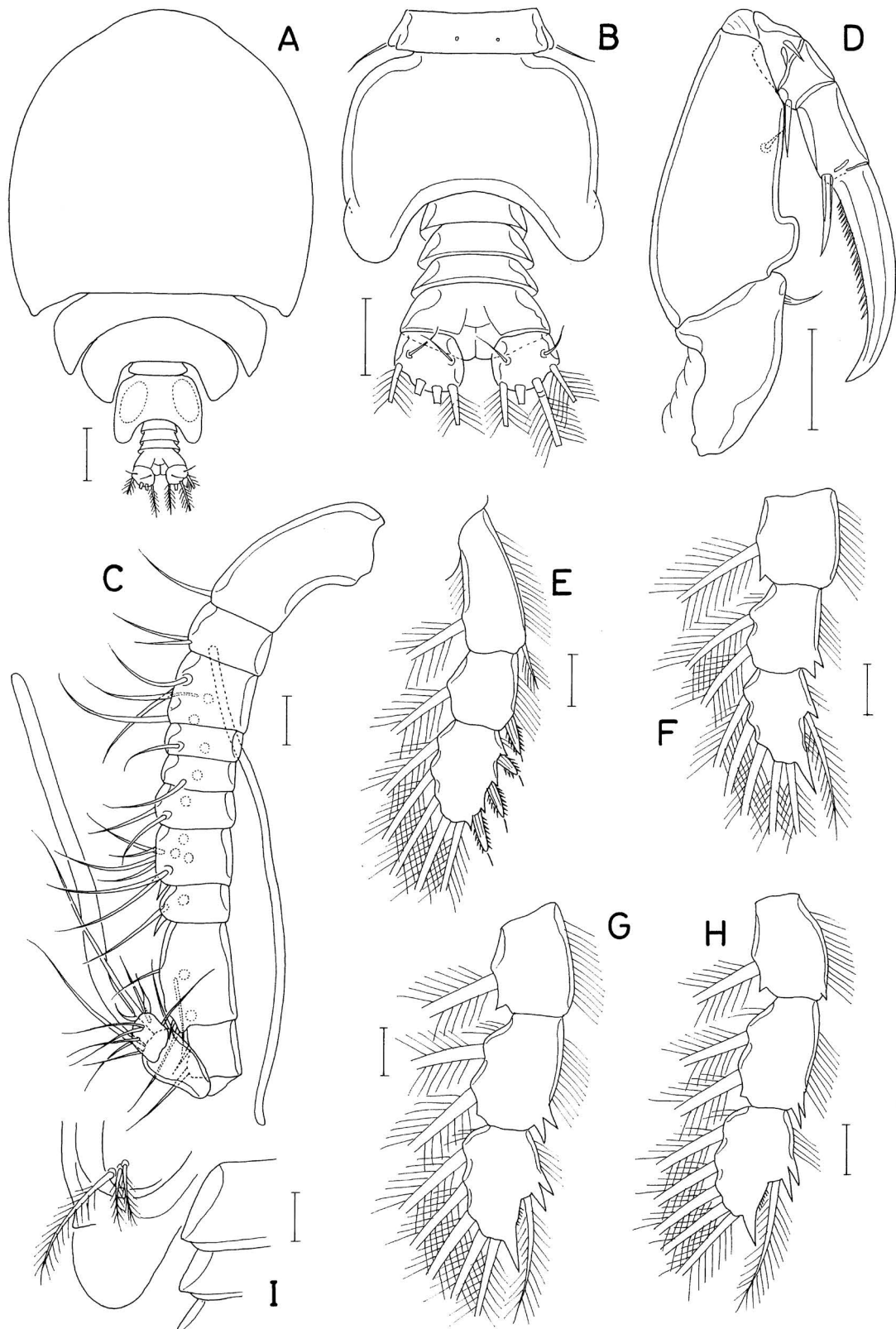
Legs 1–3 (Fig. 4A–C) biramous, with 3-segmented exopod and endopod. Leg 4 absent. Second endopodal segment of legs 1–3 with bicuspid outer distal corner. First exopodal segment of leg 1 bearing outer seta (rather than spine); outer spine on second exopodal segment of same leg setiform. Leg 3 lacking inner coxal seta; third endopodal segment with bicuspid outer process in middle. Armature formula for legs 1–3 as follows:

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

Leg 5 (Fig. 3K) represented by small ventrolateral lobe bearing 3 small pinnate setae. Leg 6 (Fig. 3L) represented by 1 larger pinnate seta and 2 small naked setae on genital operculum.

**Male.** Body (Fig. 5A) narrower than in female. Body length 0.93 mm. Cephalothorax 554  $\times$  542  $\mu$ m, almost as long as wide, with blunt posterolateral corners. Urosome (Fig. 5B) 6-segmented. Fifth pedigerous somite 106  $\mu$ m wide. Genital somite 91  $\times$  167  $\mu$ m (length 135  $\mu$ m when measured from anterior margin to distal margin of posterolateral lobes), with blunt posterolateral lobes; distal apex of these lobes extending to posterior margin of second abdominal somite. Caudal ramus armed and formed as in female.

Antennule (Fig. 5C) 12-segmented, geniculate between 10th and 11th segments; armature formula 1, 2 + aesthetasc, 4 + 2 aesthetascs, 1 + aesthetasc, 1 + aesthetasc, 2 + aesthetasc, 7 + 3 aesthetascs, 2 + aesthetasc, 4 + 2 aesthetascs, 2, 2 + aesthetasc, and 10; all setae naked; 2 of distal setae fused basally. Antenna as in female. Oral siphon, mandibular stylet,



**Fig. 5.** *Artotrogus parmatus* n. sp., male. A, Habitus, dorsal; B, Urosome, dorsal; C, Antennule; D, Maxilliped; E, Leg 1 exopod; F, Leg 1 endopod; G, Leg 2 endopod; H, Leg 3 endopod; I, Leg 6. Scale bars: A=0.1 mm, B, D=0.05 mm, C, E-I=0.02 mm.



maxillule, and maxilla as in female. Maxilliped (Fig. 5D) armed as in female, but inner proximal protuberance more prominent than in female.

Legs 1–3 with same armature formula as in female. First exopodal segment of leg 1 with outer seta as in female, but outer element on second exopodal segment being distinct spine, not setiform (Fig. 5E). Outer distal process on third endopodal segment of legs 1–3 (Fig. 5F–H) enlarged, much developed than in female. Third endopodal segment of leg 2 bearing bicuspid outer process in middle (Fig. 5G).

Leg 5 as in female. Leg 6 (Fig. 5I) represented by 1 larger and 2 small setae on genital operculum, all of these setae pinnate.

**Remarks.** The antennule of the *Artotrogus parmatius* n. sp. is 9-segmented in the female. This segmentation of the female antennule is shared with five congeners, *A. halocynthiae* Kim, 1996, *A. muricatus* n. sp., *A. orbicularis* A. rotundus Kim I. H., 1996, and *A. sarsi*. *Artotrogus sarsi*, *A. halocynthiae*, and *A. muricatus* n. sp., are distinctly separated from the new species, since they have only five (not six) setae on the third endopodal segment of leg 3 (Table 1). According to the original illustration of *A. orbicularis* given by Boeck (1859), the second exopodal segment of leg 3 (pl. 1, fig. 9) lacks an outer spine, a prominent feature of *A. orbicularis* which allows this species to be clearly differentiated from the new species and other congeners. *Artotrogus parmatius* n. sp. closely resembles *A. rotundus*. A careful comparison of these species has revealed differences between them, as follows: (1) the posterolateral processes of the genital double-somite (and genital somite in the male) are broad and lobate in *A. rotundus* (vs. much narrower in the new species); (2) the third segment of the female antennule is armed with 10 setae in *A. rotundus*, but with seven setae in the new species; (3) the outer element on the first exopodal segment of leg 1 is a spine in *A. rotundus* but is a pinnate seta in the new species; (4) leg 3 has an inner coxal seta in *A. rotundus*, but lacks the seta in the new species; and (5) the distal process of the third endopodal segment of male leg 1 of *A. rotundus* is much more elongated than in the new species.

Two species of *Artotrogus*, *A. gladiator* (Giesbrecht, 1899) and *A. latifurcatus* Nicholls, 1944 are known only by the male, but the males of these species are easily distinguished from that of *A. parmatius* n. sp., because the antennule of the male is 10-segmented in the former and 11-segmented in the latter, compared to the 12-segmented condition in the new species.

Genus *Cryptopontius* Giesbrecht, 1899

***Cryptopontius bilobatus* n. sp. (Figs. 6–8)**

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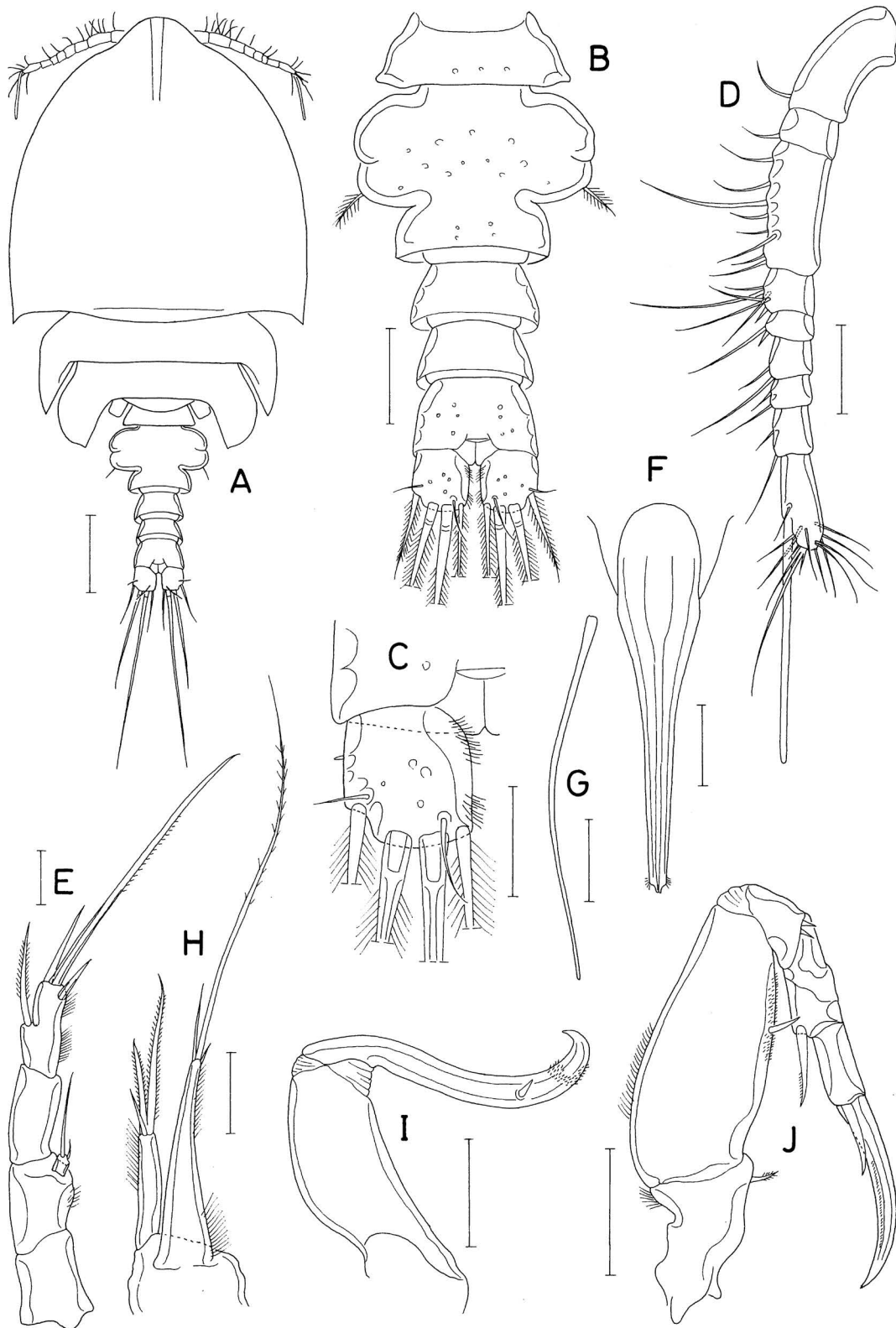
**Material examined.** Holotype (♀, HNIBRIV2382), intact paratypes (3♀♀, 1♂♂, HNIBRIV2383), and dissected paratypes (1♀, 1♂) from washings of algae, at Chuja Island, 33°52'2.4"N, 126°18'45"E, depth 28.9 m, 21 Jun 2022, coll. T.W. Jung. Holotype and intact paratypes have been deposited in the Honam National Institute of Biological Resources (HNIBR), Mokpo, Korea. Dissected paratypes are retained in the collection of I.-H. Kim.

**Etymology.** The name *bilobatus* is a Latin compound word formed from *bi* (= two) and *lobat* (= lobed), referring to the laterally bilobed genital somite of the new species.

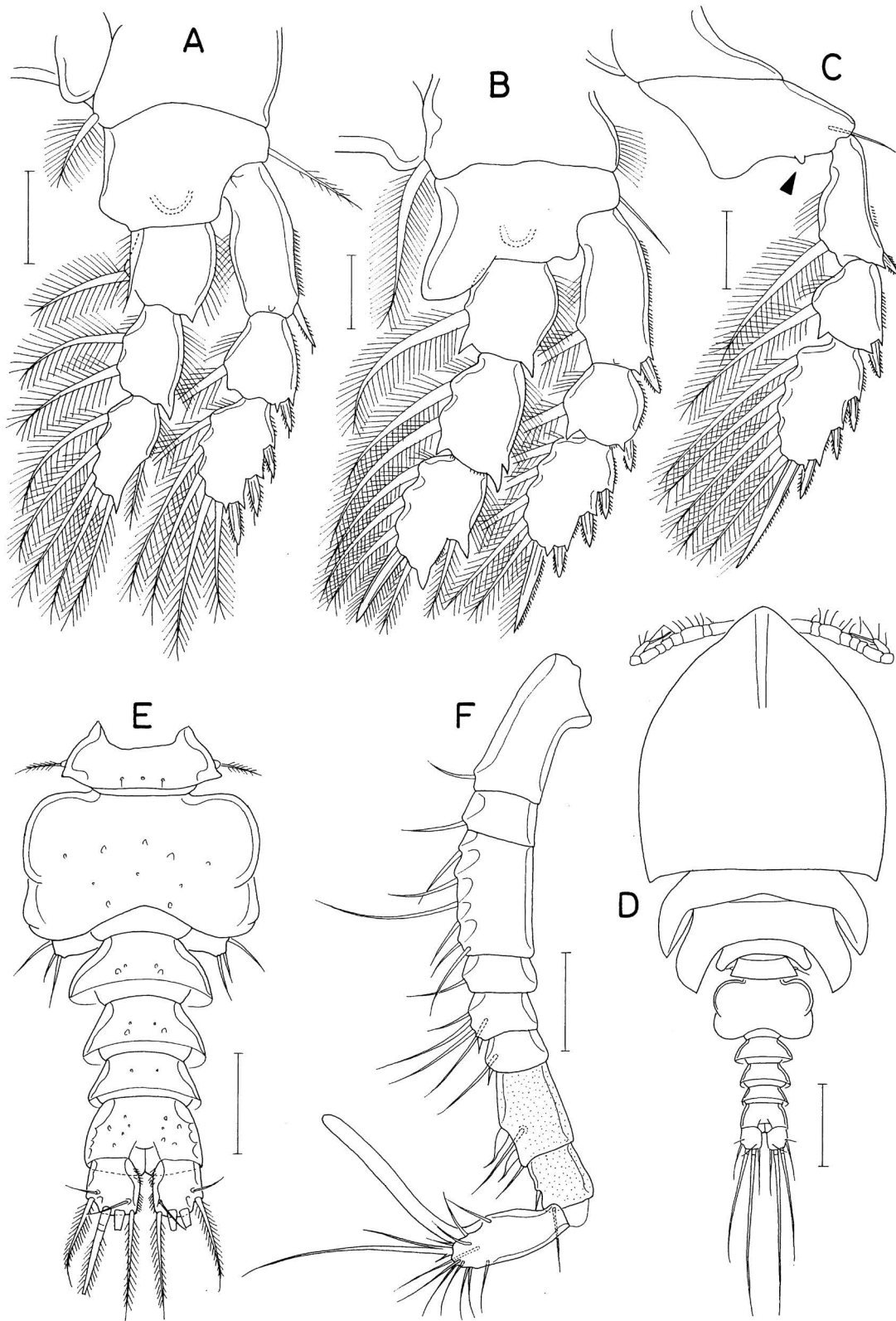
**Female.** Body (Fig. 6A) moderately broad, dorsoventrally depressed. Body length 1.50 mm in figured and described specimen. Prosome consisting of cephalothorax and 3 metasomites (second to fourth pedigerous somites), but fourth pedigerous somite markedly reduced. Cephalothorax 790 × 790 μm, as long as wide, with pronounced anterior apex (as rostral region), short dorsomedian keel along anterior fourth, and weakly projected but acutely pointed posterolateral corners. Epimera of second pedigerous somite tapering posteriorly, with acutely pointed distal apex. Epimera of third pedigerous somite with angular medio-distal corner. Urosome (Fig. 6B) 5-segmented. Fifth pedigerous somite 205 μm wide, tapering laterally. Genital double-somite 190 μm long, consisting of laterally expanded anterior 70% (257 μm wide across this region) and narrower posterior 30% (163 μm wide across this region); lateral margin of expanded anterior region bilobed. Three free abdominal somites 68 × 136, 59 × 123, and 80 × 134 μm, respectively. Anal somite bearing smooth posteroventral margin. Caudal ramus (Fig. 6C) 1.08 times longer than wide (64 × 59 μm), armed with 7 setae including rudimentary proximal outer seta (seta I) and ornamented with 2 tufts of setules on inner margin; 2 dorsal setae (setae II and VII) small and naked; other 4 setae on distal margin pinnate; posteroventral margin of ramus smooth.

Rostrum small, semicircular. Antennule (Fig. 6D) 318 μm long, 9-segmented; armature formula 1, 1, 8, 6, 2, 2, 2, 2, and 14 + aesthetasc; all setae naked and small; 3 of distal setae fused at bases; third segment longest. Antenna (Fig. 6E) rather stout; coxa 32 μm long, unarmed; basis 30 μm long, bearing few setules on outer margin; exopod small, tipped with 2 very unequal setae; first endopodal segment 33 μm long, unarmed; second endopodal segment 32 × 15 μm, armed with 1 inner and 3 distal setae and ornamented with setules on outer margin; longest one of distal setae 109 μm long, bearing minute spinules on outer margin.

Oral siphon (Fig. 6F) 475 μm long, extending slightly over insertions of maxillipeds. Mandibular stylet (Fig. 6G) bearing minute denticles distally (denticles hardly visible). Maxillule



**Fig. 6.** *Cryptopontius bilobatus* n. sp., female. A, Habitus, dorsal; B, Urosome, dorsal; C, Left caudal ramus, dorsal; D, Antennule; E, Antenna; F, Oral siphon; G, Mandibular stylet; H, Maxillule; I, Maxilla; J, Maxilliped. Scale bars: A=0.2 mm, B, F, G, I, J=0.1 mm, C, D, H=0.05 mm, E=0.02 mm.



**Fig. 7.** *Cryptopontius bilobatus* n. sp. Female (A-C): A, Leg 1; B, Leg 2; C, Leg 4. Male (D-F): D, Habitus, dorsal; E, Urosome, dorsal; F, Antennule. Scale bars: A-C, F=0.05 mm, D=0.2 mm, E=0.1 mm.

(Fig. 6H) bilobed; inner lobe 128  $\mu\text{m}$  long, tipped with 3 setae including setule-like one (longest seta 242  $\mu\text{m}$  long, feebly pinnate); outer lobe also tipped with 3 setae, 2 pinnate longer ones of them 98 and 60  $\mu\text{m}$  long, respectively. Maxilla (Fig. 6I) with smooth proximal segment; distal segment, as slender curved claw, bearing 1 small seta at distal two-thirds and group of minute spinules at subdistal region. Maxilliped (Fig. 6J) 6-segmented, with armature formula 1, 1, 2, 0, 1, and 1 + claw; first segment (syncoxa) with tuft of setules at outer distal corner; second segment (basis) gradually narrowing distally, ornamented with row of setules on proximal half of outer margin and granule-like fine spinules on distal half of inner margin; terminal segment (fourth endopodal segment) 62  $\mu\text{m}$  long; terminal claw 164  $\mu\text{m}$  long, 2.56 times longer than terminal segment.

Legs 1 (Fig. 7A), 2 (Fig. 7B) and 3 biramous, with 3-segmented exopod and endopod. Leg 4 (Fig. 7C) uniramous, with 3-segmented exopod; endopod lacking. Outer seta on basis of legs 2–4 small and naked. First exopodal segment of leg 1 lacking inner seta. Second endopodal segment of legs 2 and 3 with bicuspid outer distal corner. Leg 4 lacking inner seta on coxa; basis with small, nipple-shaped process (indicated by arrowhead in Fig. 7C) in middle of distal margin. Armature formula for legs 1–4 as follows:

	Coxa	Basis	Exopod	Endopod
Leg 1	0-1	1-1	I-0; I-1; III, 2, 3	0-1; 0-2; 1, 2, 3
Legs 2 & 3	0-1	1-0	I-1; I-1; III, I, 5	0-1; 0-2; 1, 1+I, 3
Leg 4	0-0	1-0	I-1; I-1; III, I, 5	Lacking

Leg 5 (Fig. 8A) consisting of tapered outer process (transformed protopod) and 1-segmented exopod; outer process bearing several denticles on ventral surface and tipped with 1

pinnate seta; exopod about 1.5 times longer than wide, distally with 2 unequal, weakly pinnate setae. Leg 6 (Fig. 8B) represented by 2 setae (small naked seta and larger pinnate seta) on genital operculum.

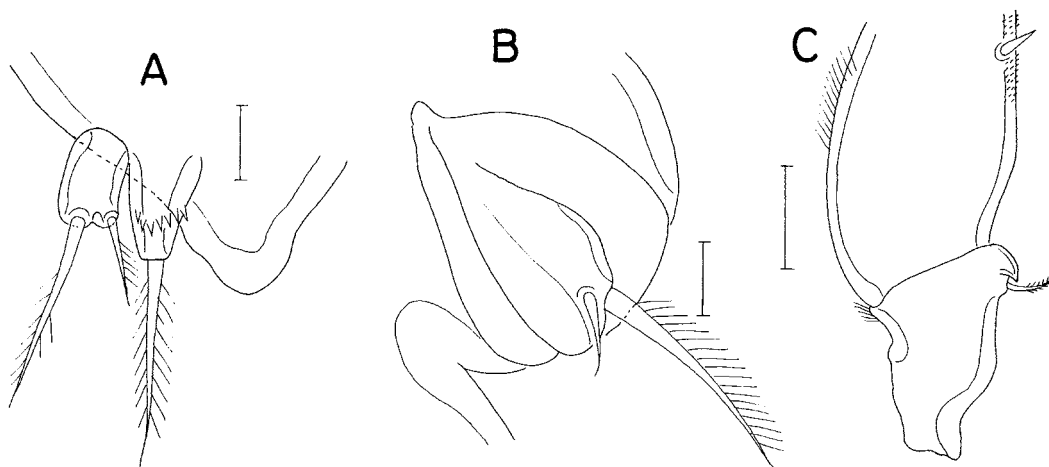
**Male.** Body (Fig. 7D) narrower than that of female. Body length of dissected specimen 1.33 mm. Cephalothorax 643  $\times$  600  $\mu\text{m}$ , slightly longer than wide, with anteriorly projected rostral region and pointed posterolateral corners. Fourth pedigerous somite clearly visible in dorsal view of body. Urosome (Fig. 7E) 6-segmented. Fifth pedigerous somite 159  $\mu\text{m}$  wide. Genital somite 147  $\times$  232  $\mu\text{m}$ , roughly rectangular, with bilobed lateral margins. Four abdominal somites 64  $\times$  143, 55  $\times$  123, 45  $\times$  120, and 68  $\times$  116  $\mu\text{m}$ , respectively. Each abdominal somite broadened posteriorly. Caudal ramus 1.08 times longer than wide (56  $\times$  52  $\mu\text{m}$ ), armed with 6 setae; proximal outer seta (seta I) absent.

Rostrum as in female. Antennule 9-segmented as in female, geniculate between terminal and penultimate segments; first segment longest; seventh and eighth segments brownish; armature formula 1, 1, 6, 1, 5, 2, 4, 2, and 14 + aesthetasc; all setae naked; 2 of 4 setae on seventh segment flame-shaped. Antenna as in female.

Oral siphon, mandibular stylet, maxillule, and maxilla as in female. Maxilliped slightly different from that of female in having blunt, claw-like process at inner distal corner of first segment (Fig. 8C).

Legs 1–4 as in female, but distal process of third endopodal segment of leg 2 more developed than in female. First exopodal segment of leg 1 lacking inner seta, as in female. Leg 5 as in female. Leg 6 represented by 3 naked setae on genital operculum (Fig. 7E).

**Remarks.** The most significant characteristic feature of *Cryptopontius bilobatus* n. sp. is the absence of an inner seta on



**Fig. 8.** *Cryptopontius bilobatus* n. sp. Female (A, B): A, Leg 5, ventral; B, Leg 6. Male (C): C, Proximal part of maxilliped. Scale bars: A, B=0.02 mm, C=0.05 mm.

the first exopodal segment of leg 1. This feature allows the new species to be readily differentiated from all congeners, except *C. brevifurcatus* Giesbrecht, 1899, which has no inner seta on the same segment, either, as illustrated by Giesbrecht (1899). However, *C. brevifurcatus* differs from the new species, as it has blunt posterolateral corners (pointed in the new species) of the cephalothorax, straight lateral margins (bilobed in the new species) of the genital somite, a longer second segment of the antennule (the second segment is short in both sexes of the new species), an extremely slender distal segment (basis) of the maxilla (not so slender in the new species), a 10-segmented male antennule (9-segmented in the new species), and multiple aesthetascs on the male antennule (only a single aesthetasc in the new species).

*Cryptopontius bilobatus* n. sp. may be compared with its congeners in a different way. The new species has a 9-segmented antennule in both sexes. About a half of existing species of *Cryptopontius* are known to have a 9-segmented antennule in the female, as in the new species, and a half of existing species are known to have 8-, 10-, 11-, or 12-segmented antennule in the male. Six remaining species can be comparable further with the new species, as the male antennule of these species is 9-segmented, as in the new species, or unknown of its segmentation. These six species are: *C. longipes* Nicholls, 1944, *C. paracapitalis* Eiselt, 1962, *C. tenuis* Giesbrecht, 1899, *C. graciloides* Ummerkutty, 1962, *C. phyllogorgius* Farias, Neves and Johnsson, 2020, and *C. proximus* Nicholls, 1944. First three of these species are separable from the new species and other three congeners by having three spines plus four setae (formula III, 2, 2, rather than III, 2, 3 as in the new species) on the third exopodal segment of leg 1. *Cryptopontius phyllogorgius* and *C. proximus* are also separable from the new species, because the former species has no inner distal seta on the basis of leg 1 and five (not six) armature elements on the third endopodal segment of the same leg (Farias et al., 2020), and the latter species has only a single (not two) inner seta on the second endopodal segment of leg 1. The remaining *C. graciloides* does not resemble the new species in having the genital double-somite which is much wider than long, with convex lateral margins, the extremely slender oral siphon, and two spines plus four setae (formula I, II, 3; not I, 1 + I, 3 as in the new species) on the third endopodal segment of leg 2 (Ummerkutty, 1962). These differences seem to be sufficient to differentiate the new species from *C. graciloides*, although the latter species was incompletely described.

#### ***Chejupontius* n. gen.**

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**Diagnosis.** Body dorsoventrally flattened, with solid exoskeleton. Prosome consisting of cephalothorax and second to fourth pedigerous somites. Cephalothorax large, with parallel lateral margins. Fourth pedigerous somite small, hardly visible in dorsal view of body. Urosome 5-segmented in female, 6-segmented in male. Caudal ramus short, with 6 setae. Antennule 9-segmented in both sexes; large aesthetasc present on terminal segment in female, but on penultimate segment in male. Antenna with small exopod and 2-segmented endopod. Oral siphon thin, extended to middle of genital double-somite. Mandible as thread-like stylet. Maxillule bilobed; inner lobe longer than outer lobe, each lobe tipped with 3 setae. Maxilla 2-segmented; second segment as slender subchela. Maxilliped consisting of syncoxa, basis, and 4-segmented endopod. Legs 1–3 with 3-segmented rami. Leg 4 with 3-segmented exopod; endopod absent. Leg 1 basis with large inner distal seta; exopod lacking inner seta on first exopodal segment, nor outer spine on second exopodal segment; second endopodal segment with 1 inner seta; third exopodal segment armed with 3 spines and 1 to 3 setae; third endopodal segment armed with 1 spine and 1 to 3 setae. Leg 5 consisting of protopod and free exopod; left and right protopods connected to each other; each protopod, plate-like, with large, tapering inner expansion; exopod rather well-developed, with 3 setae.

**Type species.** *Chejupontius variabilis* n. gen. n. sp. (by original designation).

**Etymology.** The name of the new genus is derived from Cheju Island (= Jeju Island), the type locality of the type species and *pont* (Greek, the sea). Gender masculine.

**Remarks.** The structure of leg 4 is a key character in the taxonomy of the family Artotrogidae, and the same leg 4 of *Chejupontius variabilis* n. gen. n. sp. is uniramous, with the 3-segmented exopod, lacking an endopod. In the Artotrogidae this form of the leg is exhibited in six genera: *Ascidipontius* Kim I. H., 1996; *Cryptopontius* Giesbrecht, 1899; *Dyspontius* Thorell, 1859, *Pteropontius* Giesbrecht, 1895; *Pulcitra* Kim I. H., 1998; and *Sewellopontius* Ummerkutty, 1966 (Boxshall and Halsey, 2004). The genus *Pteropontius* is characterized by the 2-segmented exopod and endopod of leg 1, therefore cannot accommodate *C. variabilis* n. gen. n. sp. In the genera *Cryptopontius* and *Dyspontius* the first and second exopodal segments of leg 1 are completely armed with outer spine and inner seta. Accordingly, these two genera cannot accommodate *C. variabilis* n. gen. n. sp., either.

The reduction of the setation on the first and second exopodal segments of leg 1 occurs in *C. variabilis* n. gen. n. sp. and the remaining three genera. The genus *Ascidipontius* has an unarmed second exopodal segment of leg 1 (Kim, 1996) and the genus *Sewellopontius* has the well-developed wing-like epimera on the genital double-somite (or on the genital somite in the male) (Ummerkutty, 1966; this study). Therefore, the

**Table 2.** Comparison of three related genera of the Artotrogidae

Characters	<i>Ascidipontius</i> Kim I. H., 1996	<i>Pulicitrogus</i> Kim I. H., 1998	<i>Chejupontius</i> n. gen.
Body form	Dorsoventrally depressed	Laterally compressed	Dorsoventrally depressed
Segments of antennule	8 (♀, ♂)	10 (♀, ♂)	9 (♀, ♂)
Armature of 2nd exopodal segment of leg 1	0-0	0-1	0-1
Armature of 3rd exopodal segment of leg 1	II, 3	II, 1, 2	II, I, 3 or II, I, 2 or II, I, 1
Armature of 2nd endopodal segment of leg 1	0-1	0-2	0-1
Armature of 3rd endopodal segment of leg 1	0, 2 or 0, 3	0, 4	0, 1+I, 2 or 0, I, 2 or 0, I, 1
Leg 5 protopod	Without process	Without process	With large inner process
Leg 5 exopod	Rudimentary	Developed	Developed
Setae on ♂ leg 5	3	5	3

new species cannot be assigned to these genera. In the type and only species of the genus *Pulicitrogus*, *P. compressus* Kim I. H., 1998, the first exopodal segment of leg 1 is armed with an outer spine but lacks an inner seta (formula I-0; this feature is shared with *Ascidipontius* and *C. variabilis* n. gen. n. sp.) and the second exopodal segment of the same leg is armed with an inner seta but lacks an outer spine (formula 0-1; this feature is shared with *Sewellopontius* and *C. variabilis* n. gen. n. sp.). Although both of these features of *Pulicitrogus compressus* are shared with *C. variabilis* n. gen. n. sp., *C. variabilis* n. gen. n. sp. cannot be placed in a same genus with *P. compressus*, because in the latter species the second endopodal segment of leg 1 bears two inner setae (formula 0-2; compared to 0-1 in *C. variabilis* n. gen. n. sp., *Ascidipontius*, and *Sewellopontius*), the third exopodal segment of leg 1 is armed with two spines and three setae (formula II, 3; cf. II, I, 1 or II, I, 2, or II, I, 3 in *C. variabilis* n. gen. n. sp.), and the prosome is laterally compressed (cf. dorsoventrally flattened in *C. variabilis* n. gen. n. sp.). *Chejupontius variabilis* n. gen. n. sp. has a characteristic leg 5; its protopod is plate-like, bearing a large, tapering mediolateral expansion which is very unusual for the family. Therefore, the establishment of a new genus is needed to accommodate *C. variabilis* n. gen. n. sp. The differences between *Chejupontius* n. gen. and its two related genera are summarized in Table 2.

***Chejupontius variabilis* n. gen. n. sp. (Figs. 9–11)**

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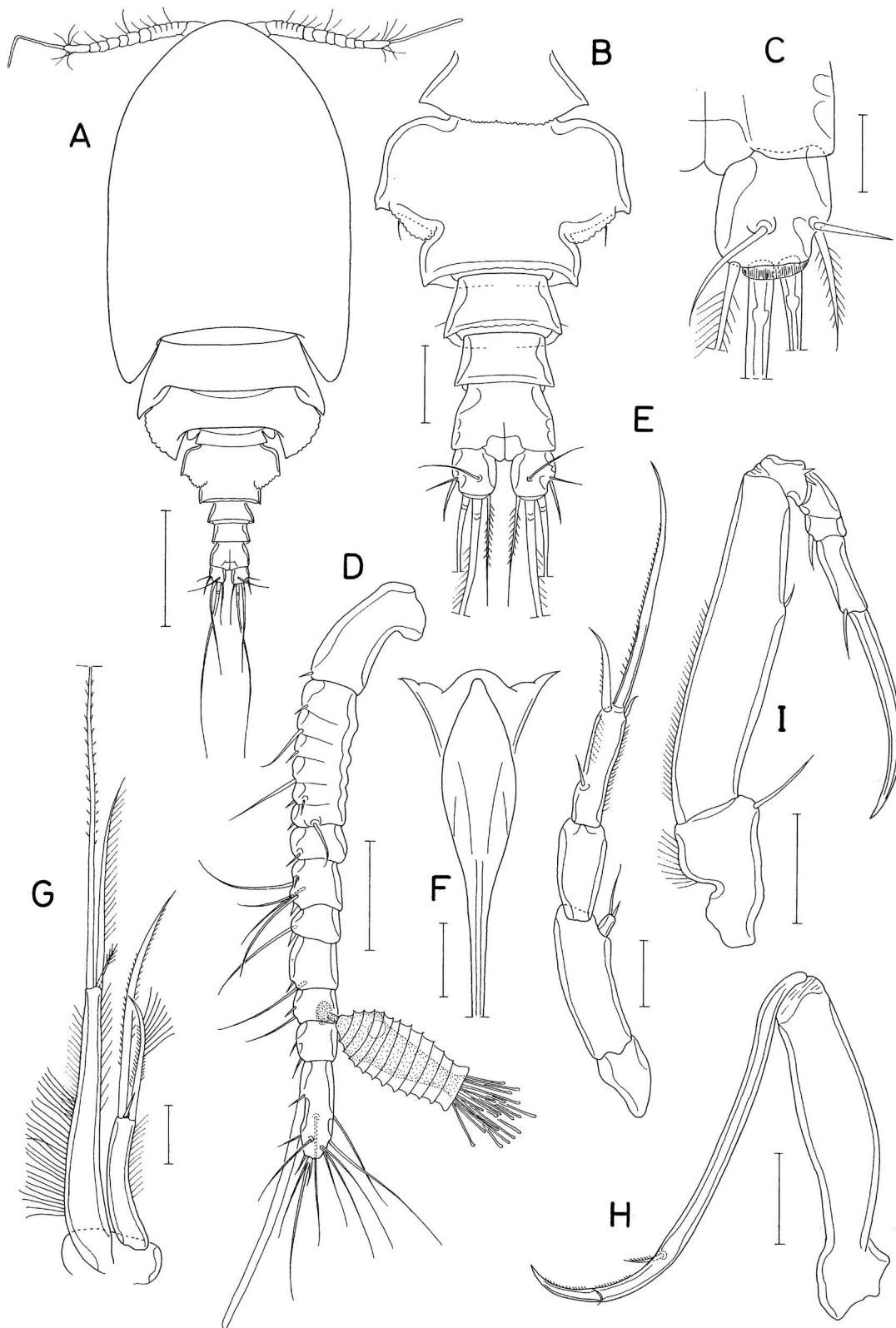
**Material examined.** Holotype (intact ♀, HNIBRIV7706), intact paratypes (1♀, 3♂♂, HNIBRIV7707), and dissected paratypes (3♀♀, 5♂♂) from bottom sediments, depth 16 m, SCUBA, 33°32'51.6"N, 126°50'22.9"E, Handong-ri, Gujwa, Jeju Island, Korea, 30 Aug 2017, coll. J.G. Kim. Intact type specimens have been deposited in the Honam National Insti-

tute of Biological Resources (HNIBR), Mokpo, Korea. Dissected paratypes are retained in the collection of I.-H. Kim.

**Etymology.** The specific name *variabilis* refers to the variable armature of the third exopodal and endopodal segments of leg 1.

**Female.** Body (Fig. 9A) dorsoventrally flattened, with solid, translucent exoskeleton. Body length 980 µm in dissected largest specimen, 840 µm in smallest specimen. Prosome 722 µm long, consisting of cephalothorax and second to fourth pedigerous somites. Cephalothorax large, 563 × 422 µm (length measured along middle axis), lacking dorsal suture line between regions of cephalosome and first pedigerous somite, with parallel lateral margins; posterolateral parts of cephalothorax extended posteriorly, reaching middle of second pedigerous somite, with blunt apex. Second pedigerous somite (first metasomite) distinctly narrower than cephalothorax, with tapering, narrow, distally pointed epimera bearing oblique lateral margins. Third pedigerous somite broadened distally, with weakly crenate lateral margins and angular posterolateral corners. Fourth pedigerous somite small, almost invisible in dorsal view of body. Urosome (Fig. 9B) 5-segmented. Fifth pedigerous somite (first urosomal somite) 110 µm wide, laterally tapering, with pointed lateral apex. Genital double-somite wider than long (106 × 168 µm), consisting of broadened anterior three-quarters and narrower posterior quarter (105 µm wide across this area), with lateral angle at about 60% region of double-somite length followed by oblique, weakly crenate, posterolateral margins of broadened anterior part. Three abdominal somites 38 × 76, 32 × 65, and 44 × 68 µm, respectively. Caudal ramus (Fig. 9C) short, as long as wide (29 × 29 µm), with membrane-fringed distal margin, armed with 6 setae (3 distal, 1 dorsal, and 2 lateral); 2 lateral setae (setae II and III) positioned close to each other, slightly posterior to midlength of ramus; seta V longest, 304 µm long, seta IV second longest, 148 µm long.

Rostrum represented by small ridge between bases of anten-



**Fig. 9.** *Chejupontius variabilis* n. gen. n. sp., female. A, Habitus, dorsal; B, Urosome, dorsal; C, Right caudal ramus, dorsal; D, Antennule attached by the epibiotic suctorian *Thecacineta calix*; E, Antenna; F, Oral siphon; G, Maxillule; H, Maxilla; I, Maxilliped. Scale bars: A=0.2 mm, B, D, F, H, I=0.05 mm, C, E, G=0.02 mm.

nules. Antennule (Fig. 9D) 268  $\mu\text{m}$  long, 9-segmented, but second segment subdivided into 6 regions by 5 partial sutures on anterodorsal surface; armature formula 1, 8, 1, 6, 2, 2, 2, 2, and 13 + aesthetasc; all setae naked, thin, generally short; aesthetasc located at proximal third of terminal segment; 3 distal-most setae on terminal segment fused at base. Antenna (Fig. 9E) consisting of coxa, basis, small exopod, and 2-segmented endopod; coxa short, unarmed; basis 45  $\times$  17  $\mu\text{m}$ , unarmed; exopod 1.5 times longer than wide (6  $\times$  4  $\mu\text{m}$ ), distally with 2 small, unequal setae; first endopodal segment 30  $\times$  15  $\mu\text{m}$ , broadened distally; second endopodal segment 3.6 times longer than wide (36  $\times$  10  $\mu\text{m}$ ), with 1 lateral seta at proximal third and distally with 1 elongated spine (78  $\mu\text{m}$  long) and 2 setae (27 and 8  $\mu\text{m}$  long, respectively).

Oral siphon (Fig. 9F) elongated, slender, extended to middle of genital double-somite. Mandible represented by thread-like stylet, without visible teeth. Maxillule (Fig. 9G) bilobed; both lobes slender and setulose; inner lobe (precoxal endite) 96  $\times$  14  $\mu\text{m}$ , much longer than outer lobe, tapering distally, tipped with 3 very unequal setae, one of them rudimentary; outer lobe (palp) 45  $\times$  9  $\mu\text{m}$ , tipped with 3 very unequal setae (2 large and 1 rudimentary). Maxilla (Fig. 9H) slender, 2-segmented; proximal segment (syncoxa) unarmed; distal segment (basis) thin, curved along distal third, subdistally with 1 seta and tipped with claw. Maxilliped (Fig. 9I) consisting of syncoxa, basis, and 4-segmented endopod; armature formula 1, 1, 2, 0, 1, 1 + claw; syncoxa and basis ornamented with fine setules along outer margin; seta on basis small, positioned at distal third on inner margin; fourth endopodal segment 36  $\mu\text{m}$  long, terminal claw arched, 97  $\mu\text{m}$  long.

Legs 1, 2 (Fig. 10A, H), and 3 with 3-segmented rami. Armature of third exopodal segment (Fig. 10B–D) and third endopodal segment (Fig. 10E–G) of leg 1 variable. Leg 4 (Fig. 10I) with 3-segmented exopod, lacking endopod. Basis of legs 1–4 with pointed mid-distal process between bases of rami. Inner distal seta on basis of leg 1 extending over distal margin of first endopodal segment. Leg 3 same as leg 2 in armature. Armature formula for legs 1–4 as follows:

	Coxa	Basis	Exopod	Endopod
Leg 1	0-1	1-1	I-0; 0-1; II, I, 3 (or II, I, 2 or II, I, 1)	0-1; 0-1; 1, I, 2 (or 0, I, 2 or 0, I, 1)
Legs 2 & 3	0-1	1-0	I-1; I-1; III, I, 5	0-1; 0-2; 1, 1 + I, 3
Leg 4	0-1	1-0	I-1; I-1; III, I, 4	Lacking

Leg 5 (Fig. 10J) consisting of protopod and free exopod; left and right protopods fused to each other, both not articulated from somite, each with large, plate-like, tapering medio-distal expansion and weakly pinnate outer seta; exopodal segment distinctly articulated from protopod, 2.0 times longer than wide (22  $\times$  11  $\mu\text{m}$ ), with 3 equal, naked setae (1 on lateral

margin and 2 on distal margin). Leg 6 represented by 1 small seta on genital operculum (Fig. 9B).

**Male.** Body (Fig. 11A) very similar in form to that of female. Body length 1.07 mm in largest dissected specimen. Prosome length 773  $\mu\text{m}$ . Cephalothorax 600  $\times$  430  $\mu\text{m}$ . Prosomal somites as in female. Urosome (Fig. 11B) 6-segmented. Genital somite (second urosomal somite) much wider than long (91  $\times$  161  $\mu\text{m}$ ), with small, semicircular, crenate posterolateral epimera. Four abdominal somites 40  $\times$  106, 37  $\times$  87, 33  $\times$  77, and 53  $\times$  77  $\mu\text{m}$ , respectively, each somite broadened distally. Genital and first to third urosomal somites bearing crenate membranous fringe along posterior margin. Caudal ramus wider than long (32  $\times$  35  $\mu\text{m}$ ),

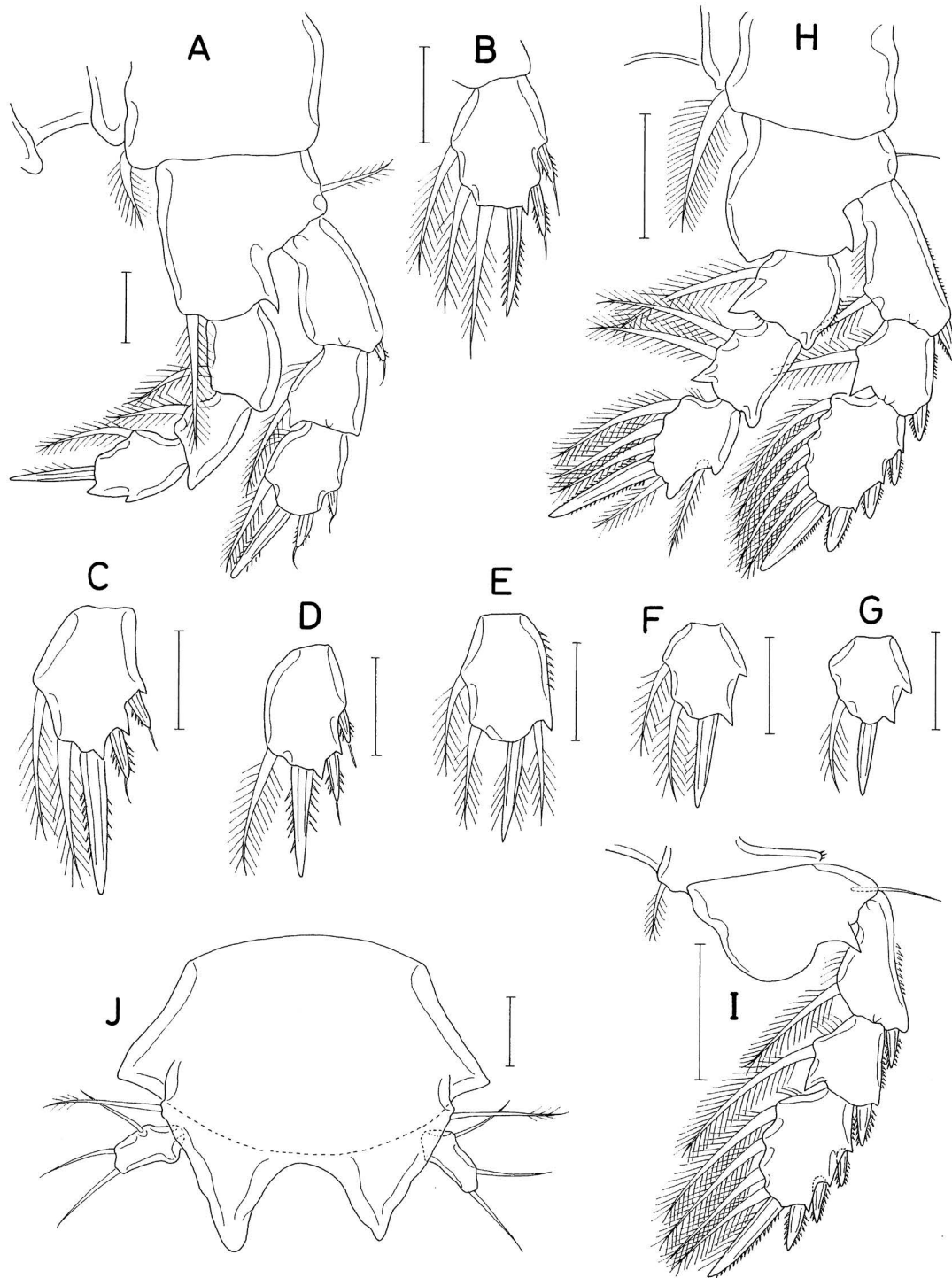
Rostrum as in female. Antennule (Fig. 11C) not geniculate, 9-segmented, but second segment subdivided into 6 parts as in female; armature formula 1, 8, 1, 6, 2, 3, 2, 2 + aesthetasc, and 11 + spine; sixth segment with 1 cusp on anterior margin near base of second seta; 3 distal-most setae on terminal segment fused at bases, as in female; aesthetasc on penultimate segment constricted in middle. Antenna as in female.

Oral siphon, mandible, maxillule, maxilla, maxilliped as in female. Leg 1 as in female; first exopodal segment lacking inner seta; third exopodal and endopodal segment variable in armature. Legs 2–5 as in female. Leg 5 protopod with more pronounced, elongated inner expansion; exopodal segment 23  $\times$  12  $\mu\text{m}$ , with 3 pinnate setae. Leg 6 (Fig. 11D) represented by 3 setae (1 large and 2 small) and 1 strong, tapered process on genital operculum.

**Remarks. The variability of armature of leg 1:** The third exopodal and endopodal segments of leg 1 of *Chejupontius variabilis* n. gen. n. sp. exhibit extreme variability in the armature (Fig. 10A–G). The armature of leg 1 was observed in four females (four pairs of leg 1) and five males (five pairs of leg 1). As a result, the armature formula of the third exopodal segment was II, I, 3 (in two instances in the female and four instances in the male) or II, I, 2 (in one instance in the female but none in the male) or II, I, 1 (in five instances in the female and six instances in the male). The armature formula of the third endopodal segment was 0, 1 + I, 2 (in two instances in the female and four instances in the male) or 0, I, 2 (in two instances in the female and three instances in the male) or 0, I, 1 (in four instances in the female and three instances in the male). One female and one male exhibited the variability of the armature between left and right leg 1 within an individual. However, no variability was observed on legs 2–4 and other segments of leg 1.

**The association of the suctorian *Thecacineta calix*:** A half of the examined specimens of *C. variabilis* n. gen. n. sp. were attached by the epibiotic suctorian *Thecacineta calix* (Schroder, 1907). Each infested copepod was found to have one to seven suctorians attached to its antennules (Fig. 1D).

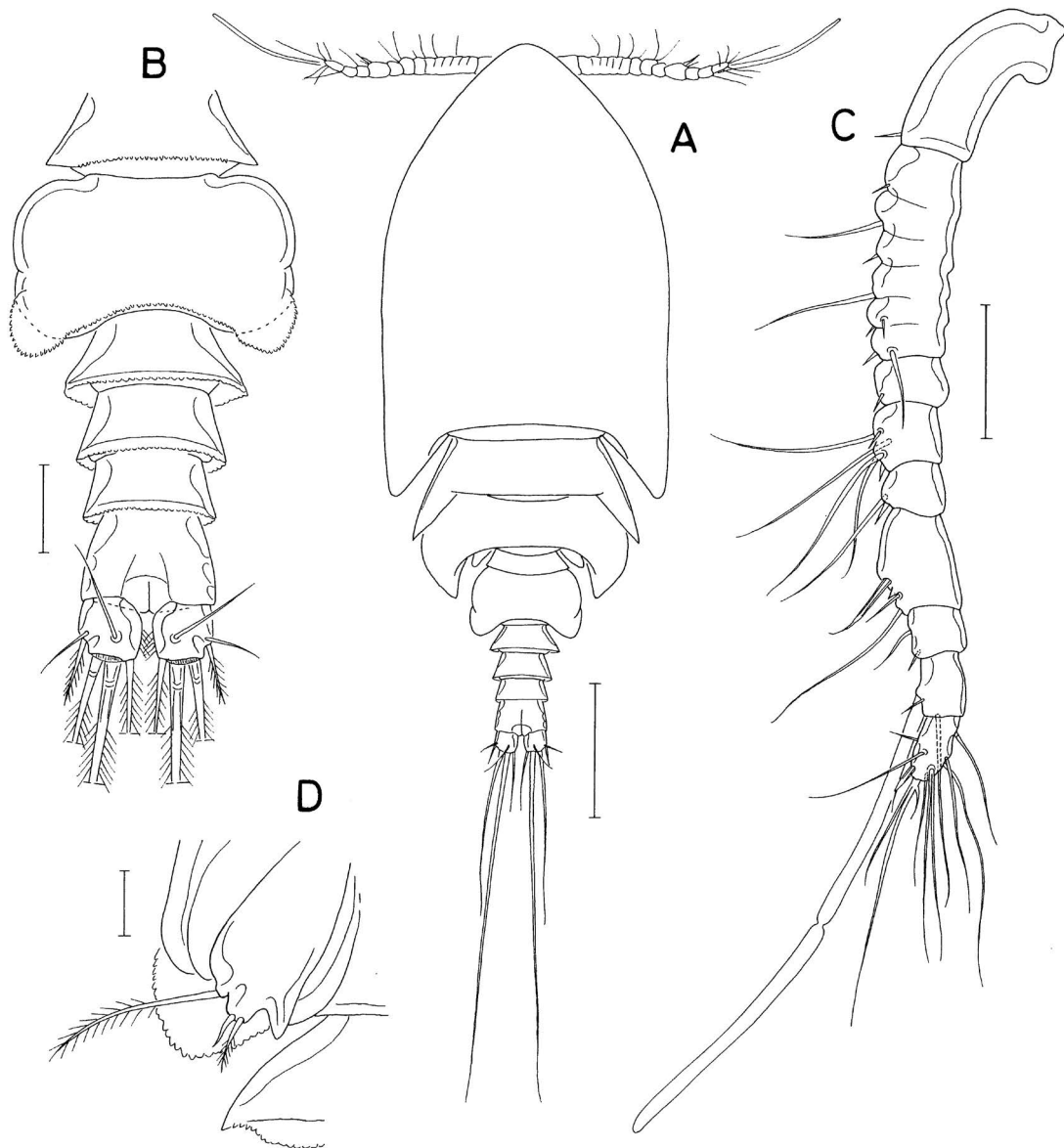




**Fig. 10.** *Chejupontius variabilis* n. gen. n. sp., female. A, Leg 1; B-D, Third exopodal segment of leg 1; E-G, Third endopodal segment of leg 1; H, Leg 2; I, Leg 4; J, Fifth pedigerous somite and leg 5 pair, ventral. Scale bars: A-G, J=0.02 mm, H, I=0.05 mm.

*Thecacineta calix* has already been known as a cosmopolitan epibiont found on harpacticoid copepods, halacarid mites, and nematodes (Chatterjee et al., 2014, 2019). This ciliate is

new to Korean fauna and recorded for the first time from the siphonostomatoid copepod. The measurements of the figured specimen (Fig. 1D) are as follows: length of lorica 65  $\mu$ m;



**Fig. 11.** *Chejupontius variabilis* n. gen. n. sp., male. A, Habitus, dorsal; B, Urosome, dorsal; C, Antennule; D, Leg 6. Scale bars: A=0.2 mm, B, C=0.05 mm, D=0.02 mm.

width of lorica 31  $\mu\text{m}$ ; width of lorica aperture 22  $\mu\text{m}$ ; lorica with 11 transverse annular ridges; length of stalk 6  $\mu\text{m}$ ; number of tentacles 19; and diameter of macronucleus 8  $\mu\text{m}$ .

#### Genus *Sewellopontius* Ummerkuty, 1966

**Remarks.** The discovery of two new species of *Sewellopontius* in the present paper enables us to better define the genus and its allied genus *Pteropontius* Giesbrecht, 1895. Noticed major differences between the two genera lie in (1) the segmentation of the female antennule which is 8-segmented in *Pteropontius* but 9-segmented in *Sewellopontius*, (2) the seg-

mentation of the endopod of the antenna which is single-segmented in *Pteropontius* but 2-segmented in *Sewellopontius*, (3) the segmentation of the endopod of leg 2 which is 2-segmented or more reduced in *Pteropontius* but 3-segmented in *Sewellopontius*, and (4) the number wings on the genital double-somite which is generally two-paired in *Pteropontius* (except *P. quartus* Sewell, 1949 whose genital double-somite has a single pair of wings) but single-paired in *Sewellopontius*. Although *Pteropontius trimerus* Kim (1996) has a 2-segmented exopod in leg 1 as in general for *Pteropontius*, it should be removed to *Sewellopontius*, since it exhib-

its the above four character states of the latter genus, with a new combination as *Sewellopontius trimerus* (Kim, 1996) n. comb.

***Sewellopontius pterophorus* n. sp. (Figs. 12–14)**

lsid:zoobank.org:act:35118FCF-EAE1-48FF-8DAA-E2998E7090F0

**Material examined.** Holotype (intact ♀, HNIBRIV7708), intact paratype (1♂, HNIBRIV7709), and dissected paratypes (1♀, 1♂) from washing of the bryozoan *Bantariella bocki* (Silén, 1942), 33°13'39.57"N, 126°35'58.85"E, near Munseom, off Seogwipo in Jeju Island, depth 54.7 m, 26 May 2022, coll. T. Lee. Intact type specimens have been deposited in the Honam National Institute of Biological Resources (HNIBR), Mokpo, Korea. Dissected paratypes are retained in the collection of I.-H. Kim.

**Etymology.** The specific name *pterophorus*, a combination of the Greek words *pter* (= winged) and *phor* (= carry), refers to the presence of the wing-like epimera on the female genital double-somite.

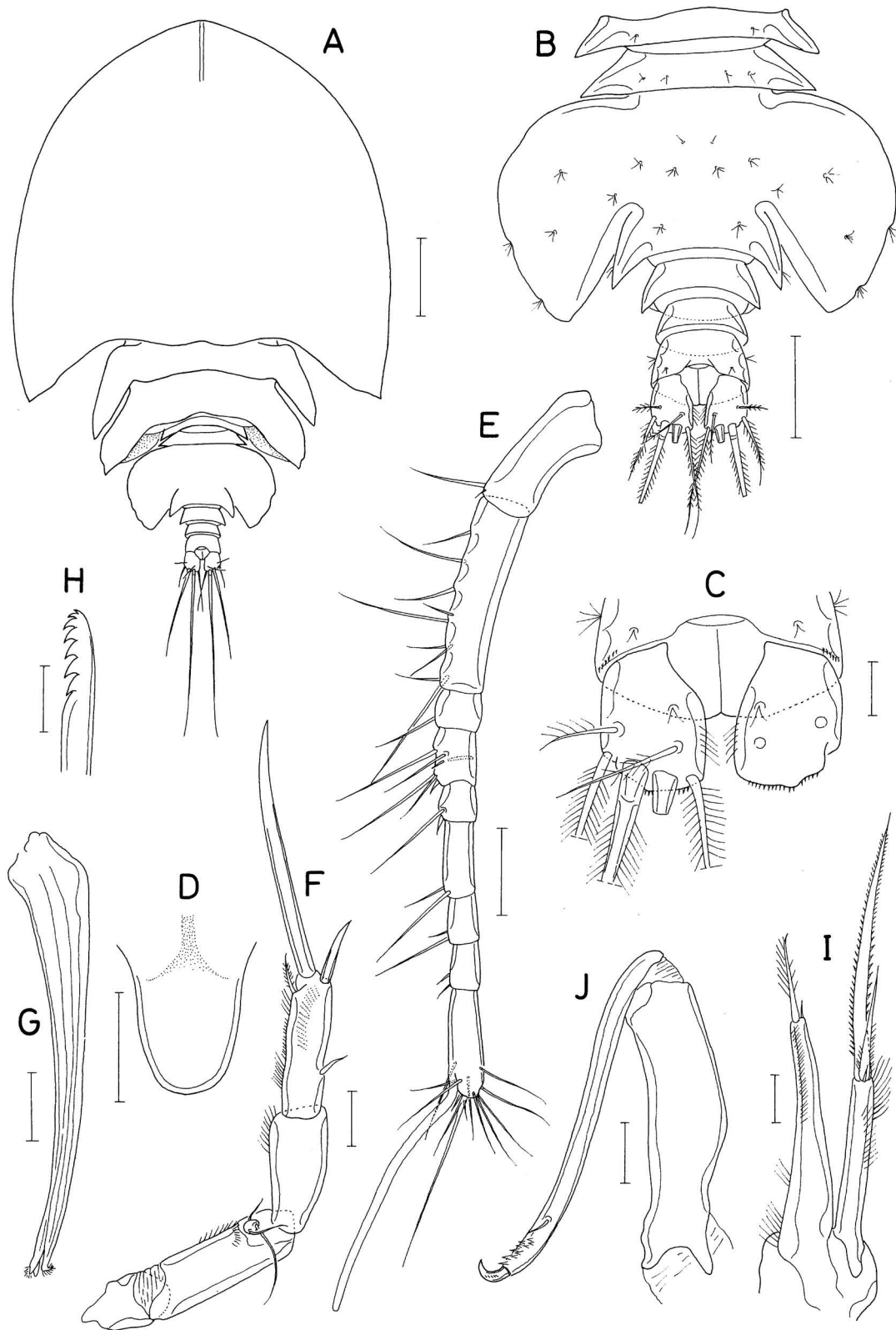
**Female.** Body (Fig. 12A) dorsoventrally flattened, with relatively thin exoskeleton. Body length 1.45 mm in dissected specimen (1.35 mm in holotype). Dorsal surface of exoskeleton with sparsely scattered pits each bearing 3 or 4 sensilla (Fig. 12B). Prosome consisting of cephalothorax and second to fourth pedigerous somites. Cephalothoracic shield broad, wider than long (848 × 1,000 μm), with short dorsal keel at anterior apical region; posterolateral regions tapering, distally pointed, extended beyond posterior margin of second pedigerous somite but before posterior margin of third pedigerous somite. Widths of second to fourth pedigerous somites 552, 539, and 238 μm, respectively, measured across posterolateral apices of epimera of each somite. Second pedigerous somite only slightly wider than half width of cephalothorax. Epimera of second pedigerous somite directed posterolaterally, distinctly narrower than those of third pedigerous somite. Fourth pedigerous somite small, barely visible in dorsal view, only slightly wider than fifth pedigerous somite. Urosome (Fig. 12B) 5-segmented, consisting of fifth pedigerous somite, genital double-somite, and 3-segmented abdomen. Fifth pedigerous somite 232 μm wide, with acutely pointed lateral apices. Genital double-somite 170 μm long along its midline, consisting of extremely broadened anterior two-thirds and narrower posterior third; broad anterior part 393 μm wide, with large, wing-like epimera; posterior part of these epimera extended over posterior margin of first free abdominal somite; narrower posterior part of double-somite 168 μm wide, with acutely pointed posterolateral extension; genital aperture positioned ventrally. Three abdominal somites 38 × 116, 31 × 90, and 59 × 98 μm, respectively. Caudal ramus (Fig. 12C) 1.32 times

longer than wide (54 × 41 μm), armed with 6 pinnate setae and ornamented with several setule on inner margin and row of minute spinules along posteroventral margin.

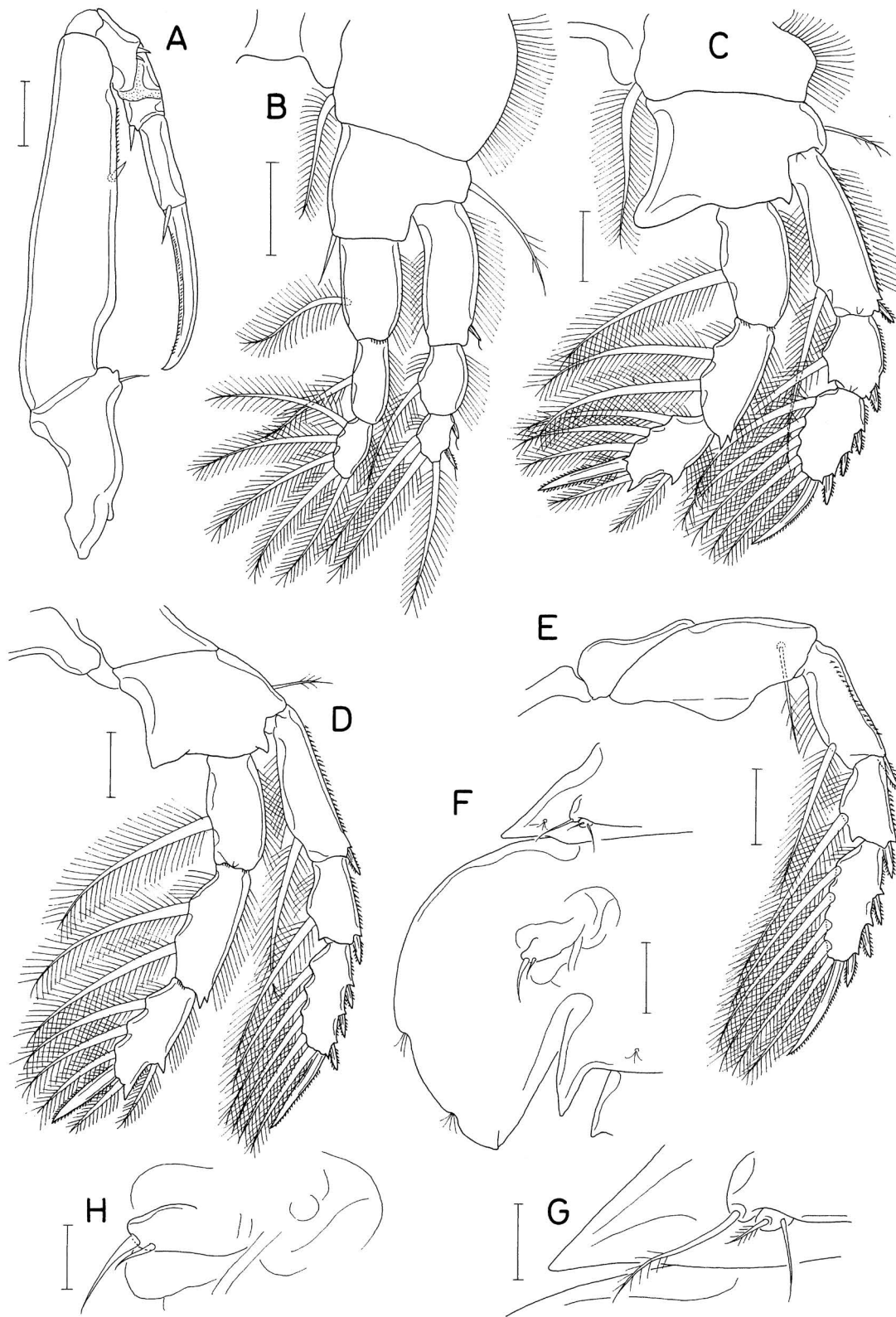
Rostrum (Fig. 12D) well-developed, longer than wide, with spatulate distal apex. Antennule (Fig. 12E) slender, 414 μm long, 9-segmented; armature formula 1, 9, 1, 6, 2, 2, 2, 2, and 13 + aesthetasc; all setae naked; first segment with 1 small additional setule (vestige of seta); fourth segment with rudiment of articulation on one surface; aesthetasc on terminal segment curved at basal region; 3 distal-most setae on terminal segment fused at base, posterior one of them minute. Antenna (Fig. 12F) consisting of coxa, basis, rudimentary exopod, and 2-segmented endopod; exopod papilliform, bearing 3 setae (1 small and 2 larger); first endopodal segment 45 × 22 μm, unarmed, but ornamented with setules on distal part of outer margin; second endopodal segment 3.60 times longer than wide (54 × 15 μm), armed with 1 seta at proximal third of inner margin, 1 seta at subdistal region of outer margin, 1 large terminal spine (95 μm long), and 1 smaller subdistal spine (25 μm long), and ornamented with rows of setules and minute spinules.

Oral siphon (Fig. 12G) 650 μm long, not flexible, extended to intercoxal plate of leg 1. Mandible represented by thread-like stylet bearing 7 teeth at distal region (Fig. 12H). Maxillule (Fig. 12I) biramous; inner lobe (precoxal endite) narrowing distally, about 90 μm long, tipped with 2 setae (larger one 36 μm long), one of them setule-like; outer lobe (palp) 68 μm long, distinctly shorter than inner lobe, tipped with 3 unequal setae (2 larger ones 114 and 45 μm long, respectively), smallest one of them setule-like; both inner and outer lobes ornamented with setules. Maxilla (Fig. 12J) 2-segmented; proximal segment unarmed; distal segment slender, longer than proximal segment, with 1 seta near distal fifth, several spinules at region distal to seta, and short terminal claw, the latter articulated from segment. Maxilliped (Fig. 13A) 6-segmented; first segment (syncoxa) with 1 small seta and 1 nipple-shaped tubercle at inner distal corner; second segment (basis) with 1 small setae at distal third and row of minute spinules along distal third of inner margin; endopod with 2, 0, 1, and 1 seta, respectively, on first to fourth segments; terminal claw 135 μm long, 1.90 times longer than fourth segment.

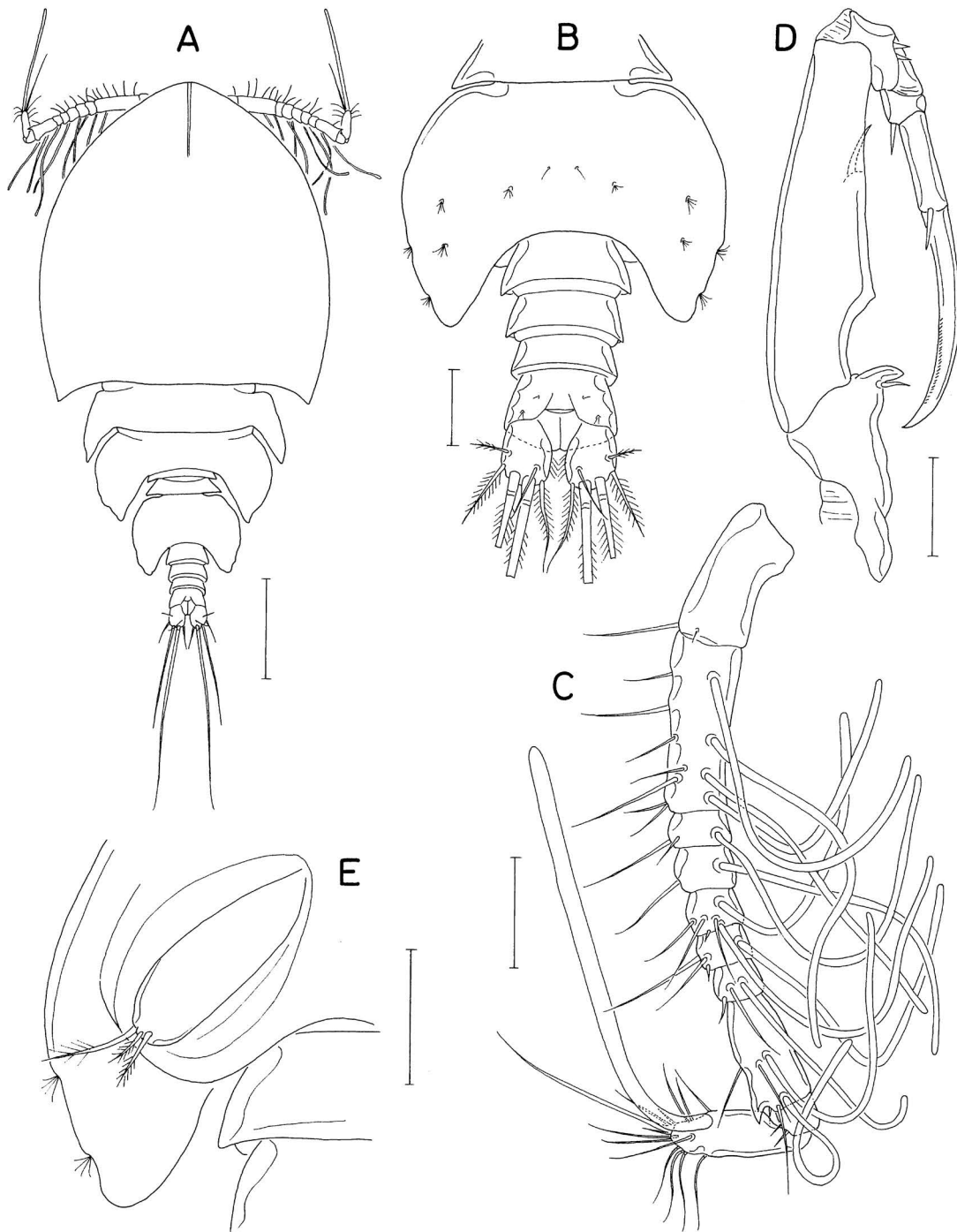
Legs 1–3 (Fig. 13B–D) with 2-segmented protopod and 3-segmented rami. Leg 4 (Fig. 13E) uniramous, with 2-segmented protopod and 3-segmented exopod. Inner coxal seta absent in legs 3 and 4. Outer margin of coxa of legs 1 and 2 with densely arranged setules, but naked in leg 3 and 4. In leg 1, outer margin of first and second exopodal segments with setules; first exopodal segment lacking inner seta; second exopodal segment lacking outer spine. Basis of legs 2 and 3 with produced inner distal corner. Outer margin of exopods of legs 2–4 ornamented with fine spinules; first exopodal



**Fig. 12.** *Sewellopontius pterophorus* n. sp., female. A, Habitus, dorsal; B, Fourth pedigerous somite and urosome, dorsal; C, Caudal rami; D, Rostrum, ventral; E, Antennule; F, Antenna; G, Oral siphon, left; H, Tip of mandibular stylet; I, Maxillule; J, Maxilla. Scale bars: A=0.2 mm, B, D, G=0.1 mm, C, F, I=0.02 mm, E, J=0.05 mm, H=0.01 mm.



**Fig. 13.** *Sewellopontius pterophorus* n. sp., female. A, Maxilliped; B, Leg 1; C, Leg 2; D, Leg 3; E, Leg 4; F, Right side of fifth pedigerous somite and genital double-somite, ventral; G, Leg 5; H, Genital area. Scale bars: A-F=0.05 mm, G, H=0.02 mm.



**Fig. 14.** *Sewellopontius pterophorus* n. sp., male. A, Habitus, dorsal; B, Urosome, dorsal; C, Antennule; D, Maxilliped; E, Genital aperture. Scale bars: A=0.2 mm, B-E=0.05 mm.

segment of leg 2 with additional setules. Spines on exopods small, those of leg 1 bearing subdistal flagellum. Second endopodal segment of legs 2 and 3 with bicuspid outer distal corner. Armature formula for legs 1-4 as follows:

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

Leg 5 (Fig. 13F, G) consisting of 1 outer seta tipped on small lobe and small, lobate exopod tipped with 2 small setae. Leg 6 (Fig. 13F, H) represented by 2 small setae on genital aperture.

**Male.** Body (Fig. 14A) similar to that of female, but narrower. Body length 1.10 mm in dissected and figured paratype (1.05 mm in intact paratype). Cephalic shield longer than wide,  $614 \times 590 \mu\text{m}$ ; posterolateral corners slightly produced. Second and third pedigerous somites as in female in form, 409 and  $359 \mu\text{m}$  wide, respectively. Urosome (Fig. 14B) 6-segmented. Fifth pedigerous somite  $147 \mu\text{m}$  wide. Genital somite  $100 \times 217 \mu\text{m}$ , with broad epimera as in female. Four abdominal somites  $39 \times 86$ ,  $30 \times 79$ ,  $23 \times 71$ , and  $51 \times 76 \mu\text{m}$ , respectively. Caudal ramus 1.17 times longer than wide ( $41 \times 35 \mu\text{m}$ ).

Rostrum as in female. Antennule (Fig. 14C) 10-segmented, geniculate between penultimate and terminal segments; second to eighth segments with 1 to 4 long aesthetascs; eighth segment with pointed, dentiform process at anterodistal corner; armature formula 1, 7 + 4 aesthetascs, 2 + aesthetasc, 1 + aesthetasc, 4 + 2 aesthetascs, 3 + aesthetasc, 2 + aesthetasc, 4 + 2 aesthetascs, 2, and 14 + aesthetasc; all setae naked. Antenna as in female.

Oral siphon, mandible, maxillule, and maxilla not different from those of female. Maxilliped (Fig. 14D) segmented and armed as in female, but first segment (syncoxa) with strong process at inner distal corner, and proximal quarter of inner margin of second segment (basis) angularly pronounced.

Legs 1–5 as in female. Leg 6 (Fig. 14E) represented by 3 small setae on genital operculum.

**Remarks.** *Sewellopontius pterophorus* n. sp. can be assigned to the genus *Sewellopontius* with confidence, since the new species and the type species of the genus, *S. rectiangulus* Ummerkuty, 1966, exhibit numerous morphological features in common, such as the similar body form, the same number of the antennular segments (nine in the female and ten in the male), the similar form of the genital double-somite (genital somite in the male) bearing the broad wing-like epimera, the similar length of the oral siphon extending to the insertion of leg 1, and in particular the same, reduced armature on distal exopodal segments of leg 1 (lacking an outer spine on the second segment and the presence of two spines plus three setae on the third segment). Nevertheless, they cannot be considered the same species, because in *S. rectiangulus* (1) the rostrum is conical, according to the description of Ummerkuty (1966) (cf. spatulate in *S. pterophorus* n. sp.), (2) the first exopodal segment of leg 1 lacks an outer spine (cf. this spine is present in the new species), (3) the cephalothorax is only slightly wider than second pedigerous somite (cf. markedly wider in the new species), and (4) the first antennular segment

of the male bears an aesthetasc (cf. absent in the new species). These differences justify the establishment of *S. pterophorus* as a new species. *Sewellopontius rectiangulus* was found from washings of dredged sea weeds in the Gulf of Mannar, India (Ummerkuty, 1966). The body length of *S. rectiangulus* was recorded as 1.22 mm in the female and 0.83 mm in the male.

It is notable that *S. pterophorus* n. sp. is very similar to *Dyspontius alatus* Kim, 2016 in the body form and, in particular, in having the winged genital double-somite in the female. However, they belong to different genera bearing different armature of leg 1. For examples, *D. alatus* has an inner seta (cf. the inner seta absent in *Sewellopontius*) on the first exopodal segment and two spines plus four setae (cf. two spines plus three setae in *Sewellopontius*) on the third exopodal segment of leg 1.

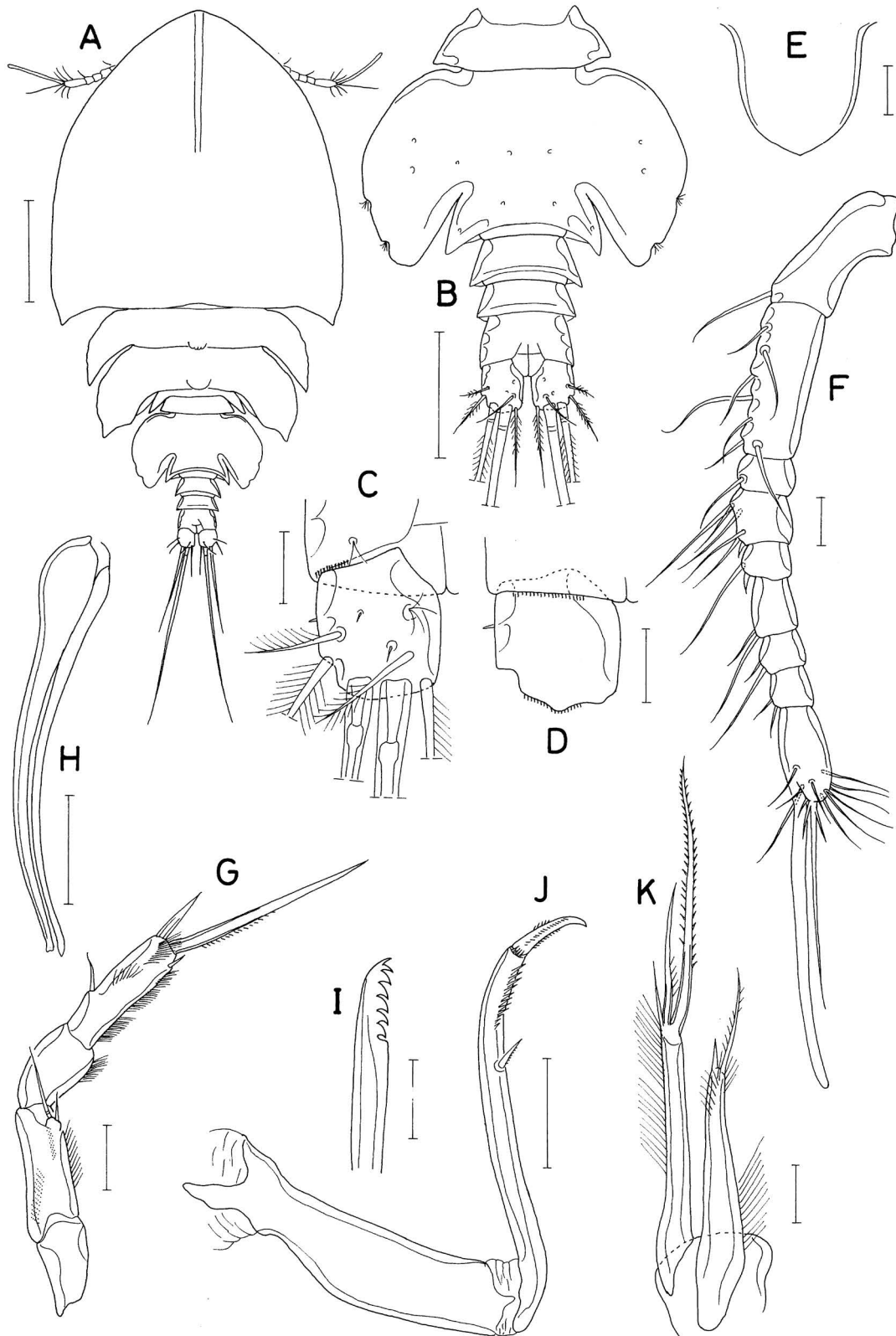
#### *Sewellopontius macrochelatus* n. sp. (Figs. 15, 16)

Isid:zoobank.org:act:073323CB-5BC0-4A20-9D0B-388D28C869B7

**Material examined.** Holotype (♀, dissected and mounted on a slide, HNIBRIV2415) from washings of calcareous algae, at Munseom, Seogwipo, Jeju Island,  $33^{\circ}13'35.5''\text{N}$ ,  $126^{\circ}33'45.3''\text{E}$ , depth 25.1 m, 20 Jul 2022, coll. T. W. Jung, H. K. Kim, and J. G. Kim. Holotype has been deposited in the Honam National Institute of Biological Resources (HNIBR), Mokpo, Korea.

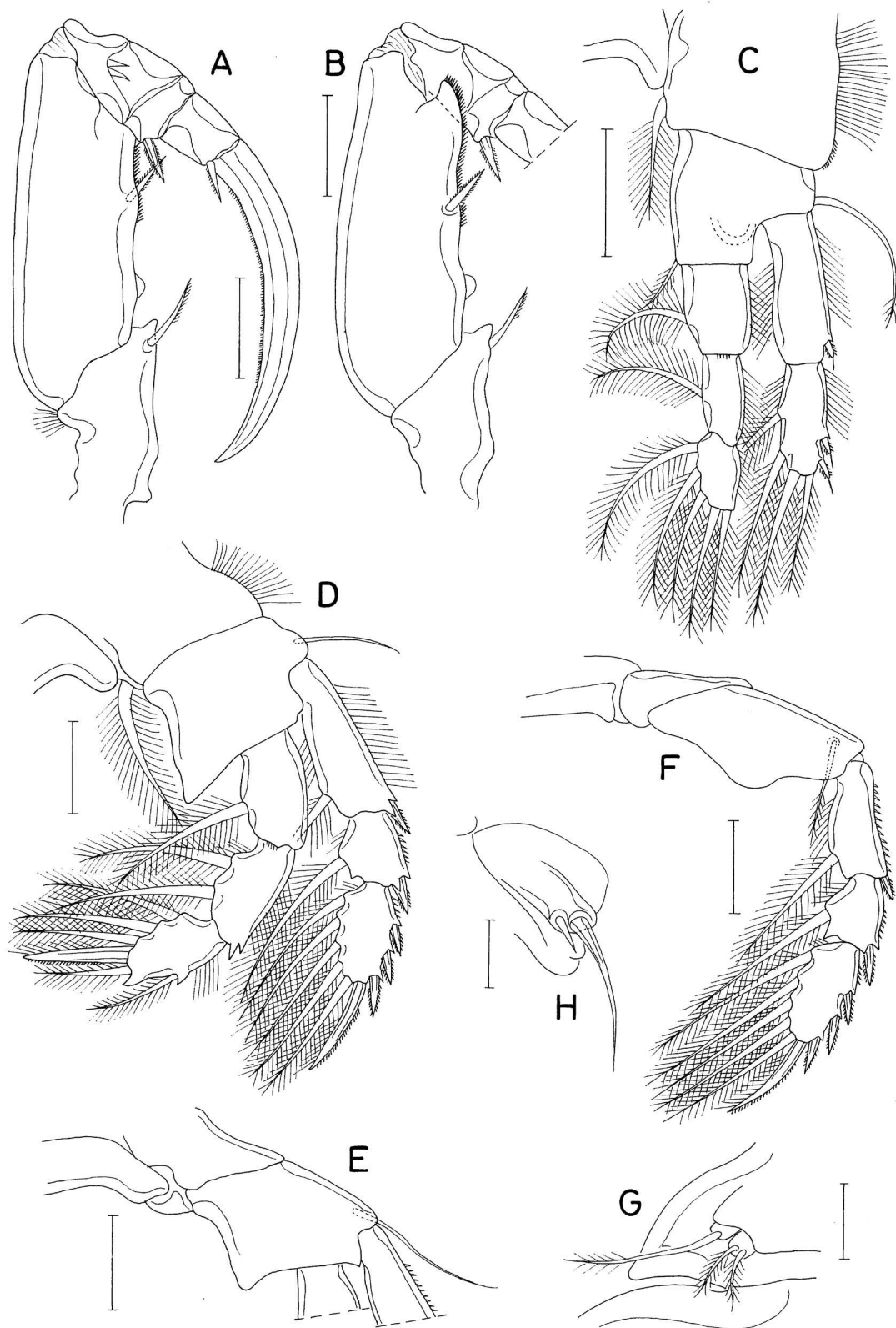
**Etymology.** The name is a combination of the Greek words *macro* (= large) and *chela* (= a claw), referring to the enlarged terminal claw of the maxilliped of the new species.

**Female.** Body (Fig. 15A) moderately broad. Body length 1.06 mm. Prosome  $750 \mu\text{m}$  long, consisting of cephalothorax and second to fourth pedigerous somites; fourth pedigerous somite reduced, barely visible in dorsal view of body. Cephalothorax  $590 \times 577 \mu\text{m}$ , with dorsal keel along anterior half of midline. All prosomal somites with pointed posterolateral corners. Second and third pedigerous somites 436 and  $395 \mu\text{m}$  wide, respectively; each somite bearing small dorsal tubercle in middle near posterior margin. Urosome (Fig. 15B) 5-segmented. Fifth pedigerous somite  $138 \mu\text{m}$  wide, with pointed lateral apex. Genital double-somite  $133 \times 254 \mu\text{m}$ , consisting of laterally expanded anterior 80% and narrower posterior 20% ( $122 \mu\text{m}$  wide at this region). Broad anterior region of genital double-somite bearing flattened lateral wing on both sides; posterior part of these wings extended beyond posterior margin of double-somite; each lateral margin of wings bearing 2 tufts of minute sensilla; posterolateral corners of narrower posterior region of double-somite conically produced posteriorly, with pointed distal apex. Three free abdominal



**Fig. 15.** *Sewellopontius macrochelatus* n. sp., female. A, Habitus, dorsal; B, Urosome, dorsal; C, Left caudal ramus, dorsal; D, Right caudal ramus, ventral; E, Rostrum, ventral; F, Antennule; G, Antenna; H, Oral siphon, left; I, Tip of mandibular stylet; J, Maxilla; K, Maxillule. Scale bars: A=0.2 mm, B, H=0.1 mm, C-G, K=0.02 mm, I=0.01 mm, J=0.05 mm.





**Fig. 16.** *Sewellopontius macrochelatus* n. sp., female. A, Maxilliped, ventral; B, Maxilliped, dorsal (claw omitted); C, Leg 1; D, Leg 2; E, Protopod of leg 3; F, Leg 4; G, Leg 5, ventral; H, Leg 6. Scale bars: A-F=0.05 mm, G, H=0.02 mm.

somites  $36 \times 87$ ,  $27 \times 78$ , and  $43 \times 73 \mu\text{m}$ , respectively. Dorsal and ventral posterior margins of anal somite with row of minute spinules (Fig. 15C, D). Caudal ramus (Fig. 15C, D) 1.15 times longer than wide ( $38 \times 33 \mu\text{m}$ ), armed with 7 setae (including rudimentary seta I on proximal outer margin) and 2 dorsal setules. Posteroventral margin of caudal ramus with row of minute spinules (Fig. 15D).

Rostrum (Fig. 15E) well-developed, as long as wide, with angular distal apex. Antennule (Fig. 15F)  $260 \mu\text{m}$  long, 9-segmented; armature formula 1, 7, 1, 6, 2, 2, 2, 2, and  $14 +$  aesthetasc; second segment longest, and first segment second longest; all setae naked; 3 distal setae on terminal segment fused at bases. Antenna (Fig. 15G) consisting of coxa, basis, exopod, and 2-segmented endopod; coxa unarmed; basis  $40 \times 17 \mu\text{m}$ , with 3 rows of minute setules; exopod lobate, not articulated from basis, tipped with 2 unequal setae; first endopodal segment  $25 \times 17 \mu\text{m}$ , unarmed, but with setules on outer margin; second endopodal segment 3.08 times longer than wide ( $40 \times 13 \mu\text{m}$ ), armed with 4 setae (3 on distal margin and 1 on proximal third of inner margin) and ornamented with rows of fine setules; largest seta on distal margin  $67 \mu\text{m}$  long, with fine spinules on proximal half.

Oral siphon (Fig. 15H)  $390 \mu\text{m}$  long, extending over insertions of maxilliped, weakly curved dorsally. Mandibular stylet (Fig. 15I) bearing 7 teeth apically. Maxillule (Fig. 15K) bilobed; both lobes slender; inner lobe  $73 \mu\text{m}$  long, tipped with 2 setae, smaller one spinule-like; outer lobe  $85 \mu\text{m}$  long, typically slightly longer than inner lobe, tipped with 3 unequal setae, lengths of these setae 94, 48, and  $22 \mu\text{m}$ , respectively. Maxilla (Fig. 15J) slender, 2-segmented; proximal segment (syncoxa) unarmed; distal segment (basis)  $159 \mu\text{m}$  long, longer than proximal segment, terminated in claw, with 1 seta at distal third and longitudinal row of spinules between claw and seta. Maxilliped (Fig. 16A, B) 6-segmented, consisting of syncoxa, basis, and 4-segmented endopod; syncoxa with 1 seta and nipple-shaped process at inner distal region; basis on inner margin with 1 short membrane proximally, 1 seta near middle, row of fine spinules along distal half, and crest-like extension distally (Fig. 16B); endopod with armature formula 2, 0, 1, 1 + claw; terminal segment short,  $32 \mu\text{m}$  long; terminal claw, arched, unusually large,  $165 \mu\text{m}$  long, about 5 times longer than terminal segment, with fine spinules along concave inner margin.

Leg 1 (Fig. 16C) with 2-segmented exopod and 3-segmented endopod; first exopodal segment lacking inner seta. Legs 2 (Fig. 16D) and 3 with 3-segmented exopod and endopod. Leg 3 lacking inner coxal seta (Fig. 16E), otherwise similar to leg 2. Leg 4 (Fig. 16F) with 3-segmented exopod, lacking endopod; inner coxal seta absent. Armature formula for legs 1–4 as follows:

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

Leg 5 (Fig. 16G) represented by 2 lobes on ventrolateral surface of fifth pedigerous somite; outer lobe (protopod) tipped with 1 pinnate and inner lobe (exopod) tipped with 2 smaller pinnate setae. Leg 6 (Fig. 16H) represented by 2 unequal, naked setae on genital operculum.

**Male.** Unknown.

**Remarks.** In the genus *Sewellopontius* the segmentation and armature of the exopod of leg 1 vary with species and serve as diagnostic taxonomic characters. *Sewellopontius macrochelatus* n. sp. resembles *S. trimerus* (Kim, 1996) in having the 2-segmented exopod of leg 1, compared to the 3-segmented exopod in *S. rectiangulus* and *S. pterophorus* n. sp. *Sewellopontius macrochelatus* n. sp. is, however, not confusable with *S. trimerus*, as it has six armature elements on the distal exopodal segment of leg 1 in contrast to the presence of five armature elements (formula II, 3) in *S. trimerus* and nine armature elements on the third exopodal segment of leg 4 in contrast to eight armature elements (formula II, I, 5) in *S. trimerus*.

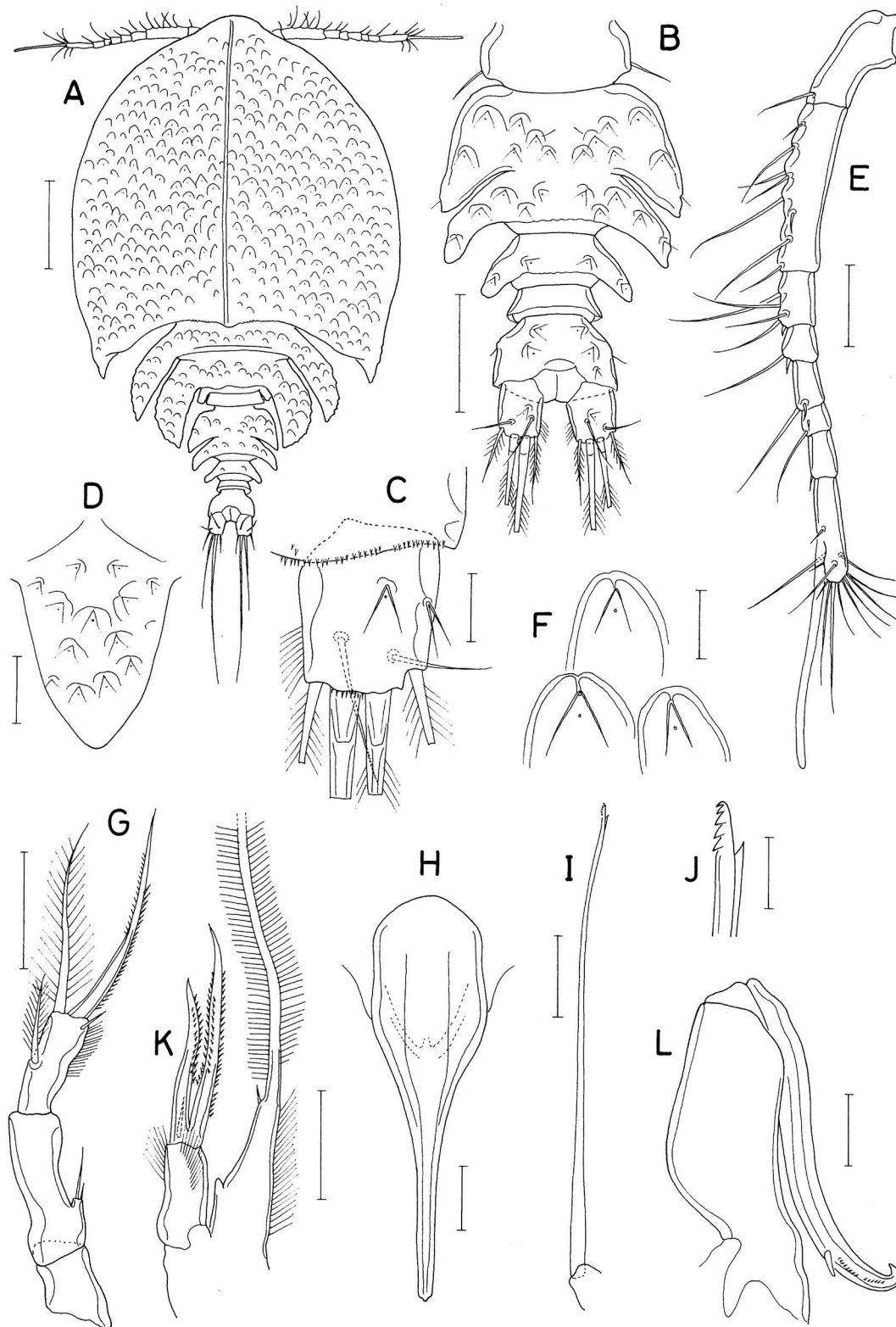
The most outstanding morphological feature of *S. macrochelatus* n. sp. seems to be the markedly enlarged terminal claw of the maxilliped, which is about five times longer than the terminal segment, in contrast to the much smaller terminal claw which is at most three times longer than the terminal segment in three congeners. The four species of *Sewellopontius* may be differentiated using the following key.

#### Key to species of *Sewellopontius*

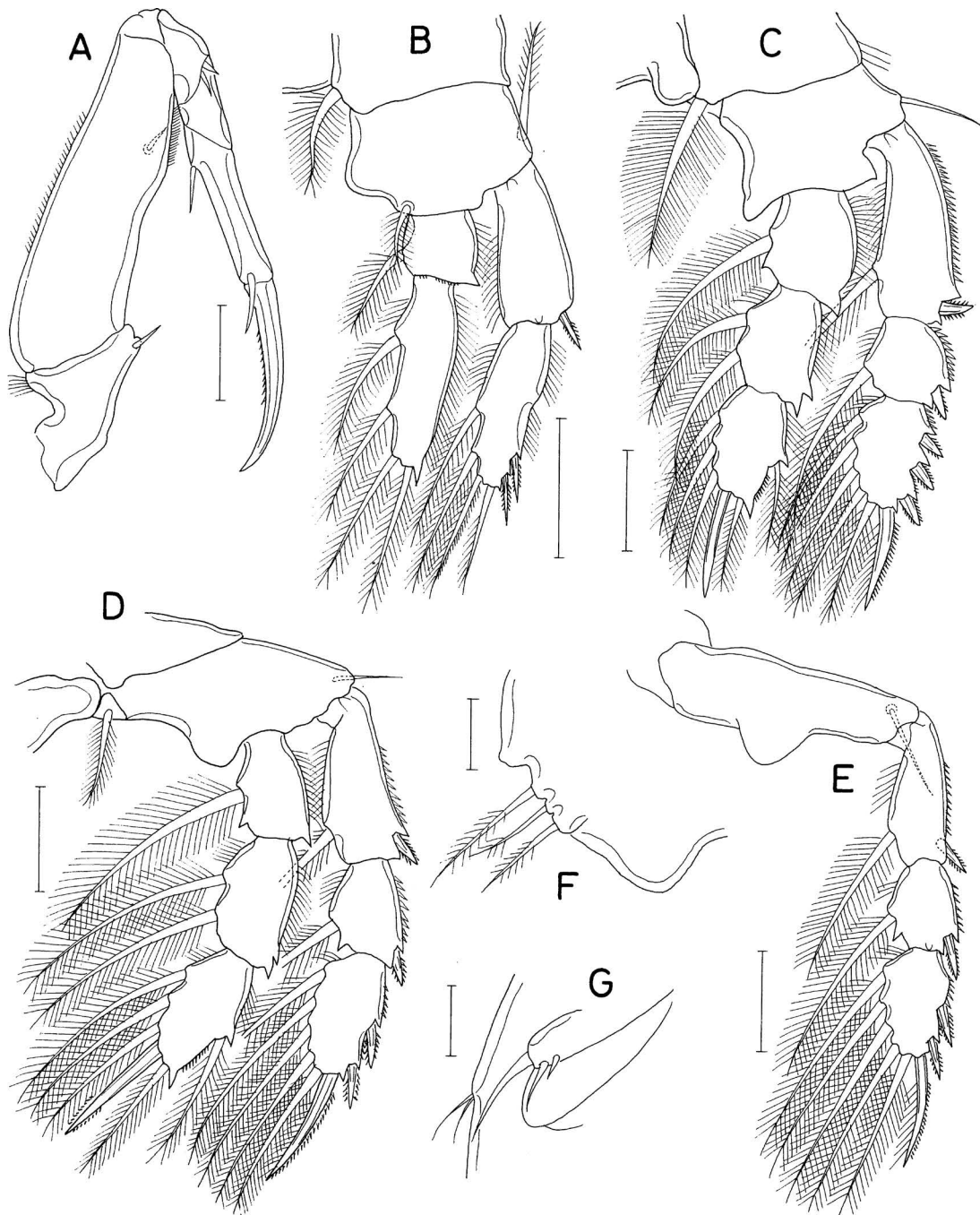
1. Leg 1 exopod 3-segmented ..... 2
- Leg 1 exopod 2-segmented ..... 3
2. First exopodal segment of leg 1 lacking outer spine .....  
..... *S. rectiangulus* Ummerkutty, 1966
- First exopodal segment of leg 1 with outer spine .....  
..... *S. pterophorus* n. sp.
3. Third exopodal segment of legs 3 and 4 armed with 3 spines and 5 setae; inner lobe of maxillule longer than outer lobe ..... *S. trimerus* (Kim, 1996)
- Third exopodal segment of legs 3 and 4 armed with 4 spines and 5 setae; inner lobe of maxillule shorter than outer lobe ..... *S. macrochelatus* n. sp.

Genus *Pteropontius* Giesbrecht, 1895

***Pteropontius cristatus* Giesbrecht, 1895 (Figs. 17, 18)**



**Fig. 17.** *Pteropontius cristatus* Giesbrecht, 1895, female. A, Habitus, dorsal; B, Urosome, dorsal; C, Left caudal ramus, ventral; D, Rostrum, ventral; E, Antennule; F, Ornaments on dorsal surface of cephalothorax; G, Antenna; H, Oral siphon; I, Mandibular stylet; J, Distal part of mandibular stylet; K, Maxillule; L, Maxilla. Scale bars: A=0.2 mm, B=0.1 mm, C, F=0.02 mm, D, E, G-I, K, L=0.05 mm, J=0.01 mm.



**Fig. 18.** *Pteropontius cristatus* Giesbrecht, 1895, female. A, Maxilliped; B, Leg 1; C, Leg 2; D, Leg 3; E, Leg 4; F, Leg 5; G, Genital aperture. Scale bars: A–E=0.05 mm, F, G=0.02 mm.

**Material examined.** 1♀ (dissected and mounted on a slide; HNIBRIV7488) from washings of invertebrates collected at Ulleung Island, 37°50'23.19"N, 130°50'49.94"E, SCUBA, depth 19.7 m, 27 Sep 2022, coll. T. W. Jung, J. G. Kim, H. K. Kim, Y. Choi, and C. J. Lee. The specimen has been deposited in the Honam National Institute of Biological Resources

(HNIBR), Mokpo, Korea.

**Female.** Body (Fig. 17A) dorsoventrally flattened. Body length 1.21 mm. Prosome consisting of cephalothorax and second to fourth pedigerous somites. Cephalothorax 715 × 757 μm, with distinct dorsal keel along entire midline, pointed posterolateral processes, and slight rostral prominence.

Second pedigerous somite much narrower than cephalothorax. Fourth pedigerous somite small barely visible in dorsal view of body. Urosome (Fig. 17B) 5-segmented. Fifth pedigerous somite 130  $\mu\text{m}$  wide. Genital double-somite 127  $\times$  210  $\mu\text{m}$ , bearing 2 pairs of wing-like epimera, posterior pair of them narrower than anterior pair. First to third free abdominal somites 45  $\times$  132, 25  $\times$  82, and 73  $\times$  107  $\mu\text{m}$ , respectively. First free abdominal somite bearing wing-like epimera. Caudal ramus (Fig. 17C) quadrangular, 1.20 times longer than wide (49  $\times$  41  $\mu\text{m}$ ), armed with 6 setae. Dorsal surface of body including rostrum and caudal rami with numerous ornamentations; each ornamentation consisting of pair of sensilla and minute pore within pit (depression) (Fig. 17F).

Rostrum (Fig. 17D) shield-shaped, tapering distally, longer than wide (150  $\times$  115  $\mu\text{m}$ ). Antennule (Fig. 17E) slender, 355  $\mu\text{m}$  long, 8-segmented; armature formula 1, 8, 5, 2, 2, 2, 1, and 13 + aesthetasc; all setae small and naked; second segment longest. Antenna (Fig. 17G) 3-segmented, consisting of coxa, basis, and 1-segmented endopod; syncoxa unarmed; basis 64  $\mu\text{m}$  long; exopod represented by small tubercle tipped with 2 small setae at proximal third of basis; endopod 45  $\mu\text{m}$  long, armed with 4 unequal setae; 2 large distal setae 95  $\mu\text{m}$  (outer spiniform, spinulose seta) and 82  $\mu\text{m}$  long (inner pinnate seta).

Oral siphon (Fig. 17H) 316  $\times$  90  $\mu\text{m}$ , extending to insertions of maxilliped, consisting of broadened proximal third and narrow distal two-thirds. Mandible (Fig. 17I) represented by thin stylet of 290  $\mu\text{m}$  long, bearing 5 minute teeth distally (Fig. 17J). Maxillule (Fig. 17K) bilobed; inner lobe (precoxal endite) about 68  $\times$  27  $\mu\text{m}$ , tapering distally, with 1 tubercle at proximal third of outer margin and distally 1 small seta and 1 large, pinnate seta; outer lobe (palp) rectangular, 45  $\times$  21  $\mu\text{m}$ , distally armed with 2 strong, spiniform setae and 1 small seta. Maxilla (Fig. 17L) 2-segmented; proximal segment (syncoxa) unarmed; distal segment (basis) forming subchela, strongly recurved at distal region, with 1 seta at distal quarter and row of minute spinules at region distal to seta. Maxilliped (Fig. 18A) consisting of syncoxa, basis, and 3-segmented endopod; armature formula 1, 1, 2, 0, and 2 + claw; basis ornamented with row of fine spinules along outer margin and another row of minute spinules along distal third of inner margin; terminal claw about 1.35 times longer than terminal segment, with minute spinules along concave margin.

Leg (Fig. 18B) with 2-segmented rami. Legs 2 and 3 (Fig. 18C, D) 3-segmented rami. Leg 4 (Fig. 18E) uniramous, with 3-segmented exopod. Exopod of leg 1 slightly longer than endopod. Leg 3 different from leg 2 in having 3 spines and 5 setae on third exopodal segment. Leg 4 lacking inner coxal seta; basis with large, semicircular process in middle of distal margin. Armature formula for legs 1–4 as follows:

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

Leg 5 (Fig. 18F) represented by 3 weakly pinnate setae on ventrolateral surface of fifth pedigerous somite. Leg 6 (Fig. 18G) represented by 3 small, naked setae on genital operculum.

**Male.** Not collected.

**Remarks.** This species has been known only in the Mediterranean Sea, as an associate of sponges (Stock, 1965). A single examined specimen collected in Korean waters exhibits no significant difference from the Giesbrecht's (1899) record for European material. The body form and the segmentation and armature of the antennule, antenna, and legs are not different between Korean material and the illustrations of Giesbrecht. Stock (1965) reported that the endopod of leg 1 of his specimens was 3-segmented. Stock's specimens probably belong to a different species, but their taxonomic identity cannot be determined at present, because he illustrated leg 1 only with a short descriptive note.

Genus *Bradypontius* Giesbrecht, 1895

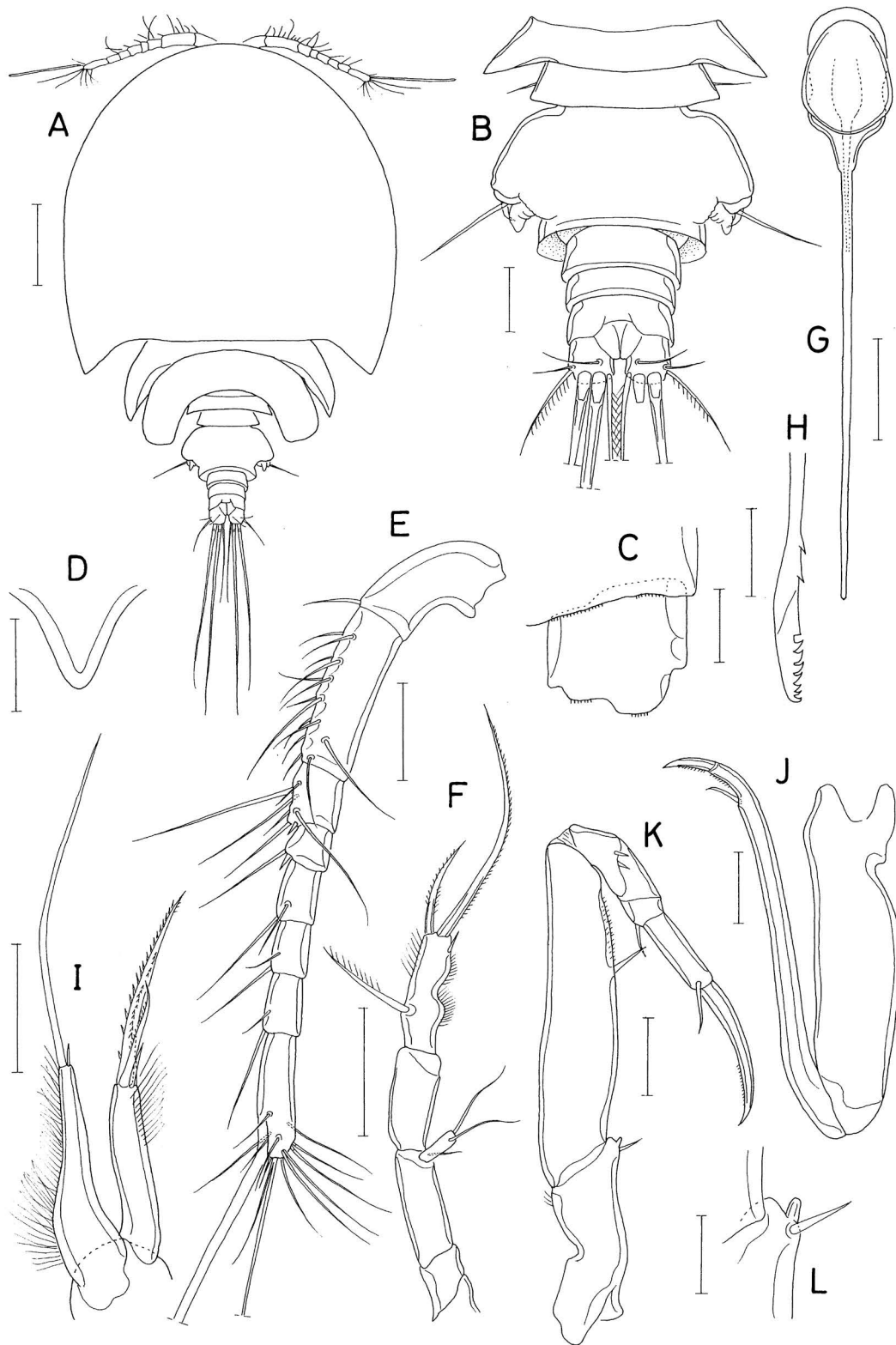
***Bradypontius culicis* n. sp. (Figs. 19, 20)**

lsid:zoobank.org:act:7D26DD2F-732B-4A4E-AE7B-A2D975E7DB6A

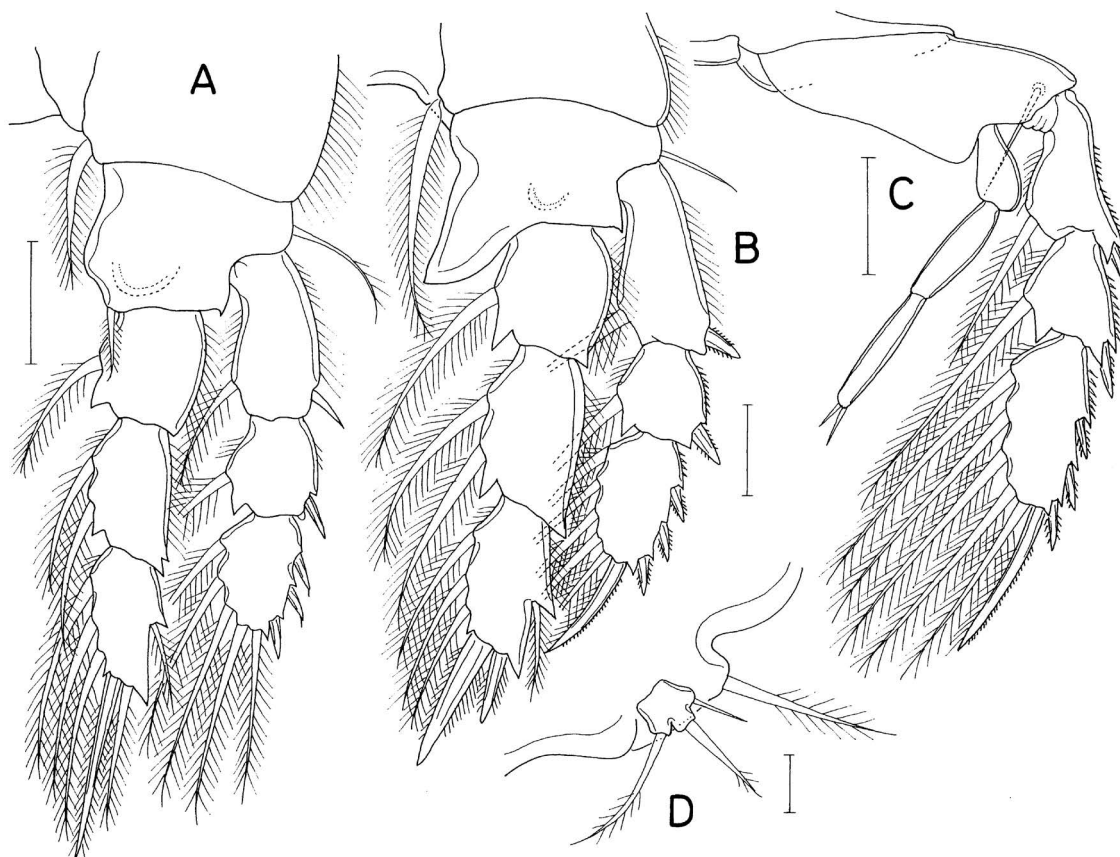
**Material examined.** Holotype ( $\text{♀}$ , dissected and mounted on a slide; HNIBRIV7710) from washings of invertebrates, at Munseom, Seogwipo, Jeju Island, 33°13'35.5"N, 126°33'45.3"E, depth 28.1 m, 4 Apr 2023, coll. T. Lee. Holotype has been deposited in the Honam National Institute of Biological Resources (HNIBR), Mokpo, Korea.

**Etymology.** The specific name *culicis* is the genitive form of *Culex* (the generic name of mosquitos), which is derived from the name of the type locality, Munseom, meaning a mosquito-laden islet.

**Female.** Body (Fig. 19A) broad, dorsoventrally flat. Body length 1.18 mm. Prosoma consisting of cephalothorax and second to fourth pedigerous somites. Cephalothorax large. Wider than long, 727  $\times$  818  $\mu\text{m}$ , with tapering, distally pointed posterolateral processes. Epimera of second pedigerous somite arched, narrowing distally, with pointed posterodistal tip. Epimera of third pedigerous somite arched, but not narrowing distally, with broad distal margin. Fourth pedigerous somite small, with pointed lateral apices (Fig. 19B). Urosome (Fig. 19B) 5-segmented, occupying about 24% of body length. Fifth pedigerous somite 160  $\mu\text{m}$  wide. Genital double-somite much



**Fig. 19.** *Bradypontius culicis* n. sp., female. A, Habitus, dorsal; B, Fourth pedigerous somite and urosome, dorsal; C, Left caudal ramus, ventral; D, Rostrum, ventral; E, Antennule; F, Antenna; G, Oral siphon; H, Distal part of mandibular stylet; I, Maxillule; J, Maxilla; K, Maxilliped; L, Inner distal part of maxillipedal syncoxa. Scale bars: A=0.2 mm, B, D-F, I-K=0.05 mm, C, L=0.02 mm, G=0.1 mm, H=0.01 mm.



**Fig. 20.** *Bradypontius culicis* n. sp., female. A, Leg 1; B, Leg 2; C, Leg 4; D, Leg 5. Scale bars: A-C=0.05 mm, D=0.01 mm.

wider than long,  $102 \times 224 \mu\text{m}$ , consisting of broad anterior 83% and narrower posterior 17% ( $142 \mu\text{m}$  across this region). Three free abdominal somites  $34 \times 102$ ,  $24 \times 93$ , and  $36 \times 91 \mu\text{m}$ , respectively. Anal somite with minute spinules along posteroventral margin (Fig. 19C). Caudal ramus (Fig. 19C) wider than long ( $36 \times 38 \mu\text{m}$ ), with 6 setae; setae II and VII naked, other 4 setae pinnate.

Rostrum (Fig. 19D) small, conical. Antennule (Fig. 19E)  $334 \mu\text{m}$  long, 8-segmented; armature formula 1, 14, 7, 2, 2, 2, and 13 + aesthetasc; second segment longest; first and terminal segments equal in length; all setae thin and naked; 2 distal setae on terminal segment fused at base. Antenna (Fig. 19F) consisting of coxa, basis, 1-segmented exopod, and 2-segmented endopod; basis  $43 \mu\text{m}$  long; exopod  $16 \times 5 \mu\text{m}$ , distinctly articulated from basis, with 3 small setae (1 lateral and 2 distal); proximal endopodal segment  $39 \mu\text{m}$  long, unarmed; distal endopodal segment  $46 \mu\text{m}$  long, armed with 4 setae (1 on proximal inner margin, 2 distal, and 1 small subdistal); distal longest seta  $96 \mu\text{m}$  long.

Oral siphon (Fig. 19G)  $565 \mu\text{m}$  long, extending between maxilliped and leg 1, consisting of expanded proximal part

( $88 \mu\text{m}$  wide) and thin distal part ( $9 \mu\text{m}$  thick). Mandible (Fig. 19H) represented by stylet bearing 9 teeth distally (2 distally directed proximal teeth and 7 recurved distal teeth). Maxillule (Fig. 19I) bilobed; inner lobe  $90 \mu\text{m}$  long, tipped with 1 long ( $127 \mu\text{m}$  long) and 1 small seta; outer lobe  $64 \mu\text{m}$  long, tipped with 3 unequal setae, longest one of latter  $74 \mu\text{m}$  long, spiniform. Maxilla (Fig. 19J) consisting of syncoxa and basis; syncoxa unarmed; basis slender, longer than syncoxa, with 1 seta subdistally, terminated by claw. Maxilliped (Fig. 19K) consisting of syncoxa, basis and 4-segmented endopod; syncoxa bearing 1 seta and 1 digitiform process at inner distal corner (Fig. 19L); basis with 1 seta at 60% region of inner margin and minute spinules on inner margin distal to seta; endopod armed with 2, 0, 1, and 1 seta on first to fourth segments, respectively; terminal claw  $96 \mu\text{m}$  long, 1.71 times longer than terminal segment.

Legs 1 (Fig. 20A), 2 (Fig. 20B), 3, and 4 (Fig. 20C) biramous, with 3-segmented rami. Outer spine on first exopodal segment of leg 1 setiform. Leg 2 with strongly produced inner distal process on basis. Leg 3 with same armature formula as in leg 2, but inner distal process of basis less prominent. Leg 4

lacking inner seta on coxa; 3 endopodal segments slender, 38, 51, and 58  $\mu\text{m}$  long, respectively, from proximal to distal; first and second endopodal segments unarmed; third endopodal segment tipped with 2 small, naked setae, each 12  $\mu\text{m}$  (inner) and 17  $\mu\text{m}$  (outer) long. Armature formula for legs 1–4 as follows:

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

Leg 5 (Fig. 20D) consisting of 1 dorsal seta on fifth pedigerous somite and free exopod; exopodal segment small, slightly wider than long ( $9 \times 10 \mu\text{m}$ ), armed with 3 setae (1 small, naked dorsal, 1 terminal, and 1 ventral). Leg 6 (Fig. 19B) represented by 1 seta and 1 short, curved, spiniform seta on genital operculum.

**Male.** Unknown.

**Remarks.** In the genus *Bradypontius* five species have been known to have slender endopod with unarmed first and second segments of leg 4, as in *Bradypontius culicis* n. sp. These five species are *B. cubensis* Varela, 2012, *B. inermis* Nicholls, 1944, *B. ovatus* Nicholls, 1944, *B. pichoni* Stock, 1966, and *B. serratipes* Nicholls, 1944. Of these five, *B. pichoni* is most closely related to *B. culicis* n. sp., as both the two species have in common 8-segmented female antennule and no inner seta on the coxa of leg 4.

According to the original description of *B. pichoni* by Stock (1966), (1) the second segment of the female antennule has a trace of a proximal subdivision which is absent in *B. culicis* n. sp.; (2) the third endopodal segment of leg 1 bears six setae (vs. one spine plus five setae in *B. culicis* n. sp.); (3) the posterodistal corners of the epimera of the third pedigerous somite are pointed, as Stock illustrated (vs. the corners are blunt in *B. culicis* n. sp.); (4) the first and second segments of the female antennule is armed with two and 12 setae, respectively (vs. armed with one and 14 setae, respectively, in *B. culicis* n. sp.); (5) the inner distal spine on the third endopodal segment of leg 2 is elongated, distinctly longer than the third endopodal segment (vs. the spine is as long as the third endopodal segment in *B. culicis* n. sp.); and (6) the inner distal corner of the maxillipedal syncoxa bears one seta only, as illustrated by Stock (vs. one seta and a digitiform process in *B. culicis* n. sp.). These differences are minor, but not negligible.

Genus *Neopontius* Scott T., 1898

***Neopontius rectus* n. sp. (Figs. 21, 22)**

Isid:zoobank.org:act:0181E873-3A31-4630-9F84-157FFE0481C1

**Material examined.** Holotype (♀, dissected and mounted on a slide; HNIBRIV7711) from washing of invertebrates, Supseom, Seogwipo, Jeju Island, 33°13'39.6"N, 126°35'58.9"E, depth 50 m, SCUBA, 27 May 2022, coll. T. Lee.

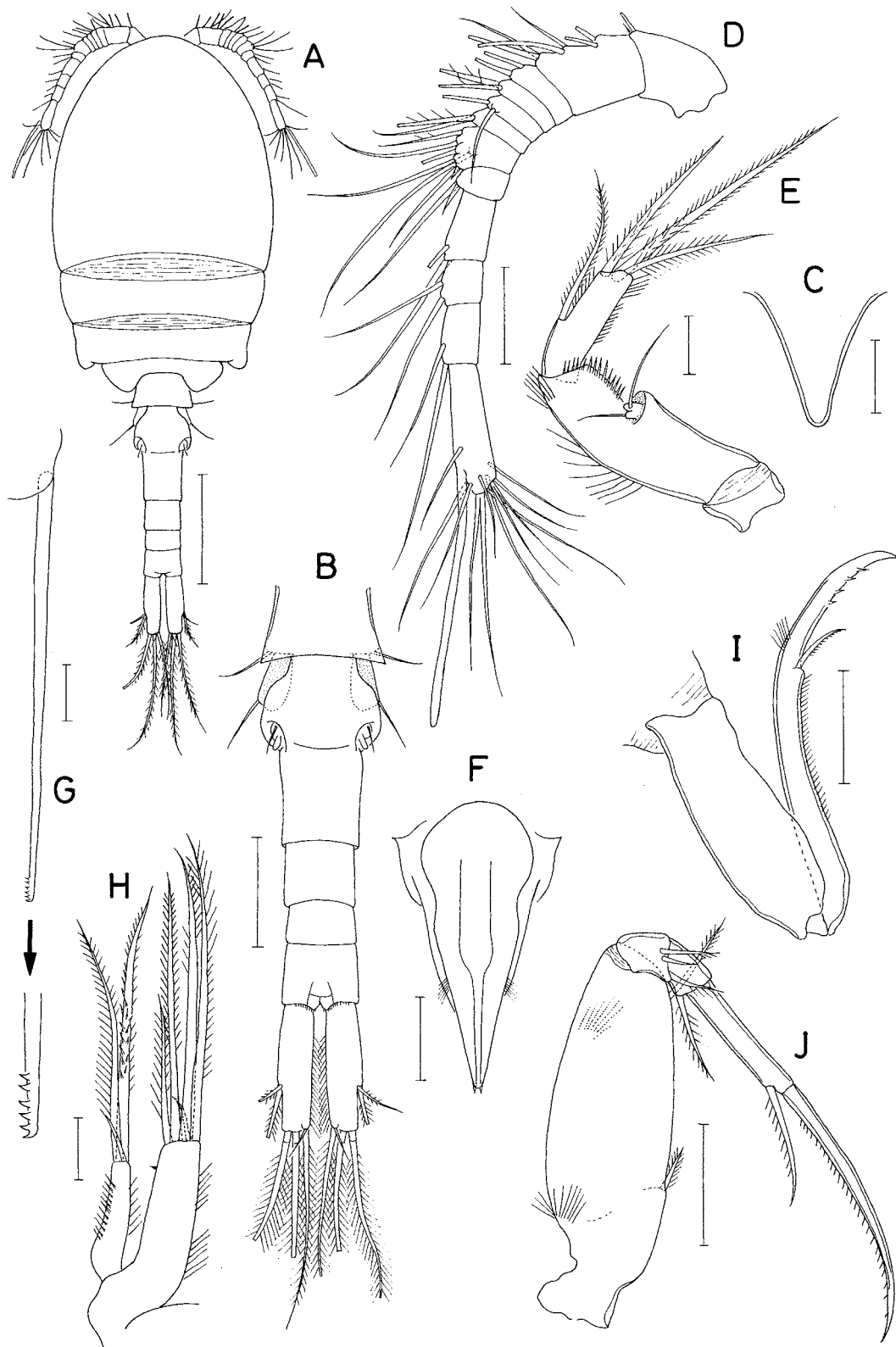
**Etymology.** The name *rectus* (Latin, "straight") refers to the unusually straight body of the examined specimen.

**Female.** Body (Fig. 21A) narrow. Body length 1.11 mm. Prosome  $632 \times 409 \mu\text{m}$ , distinctly longer than wide. Cephalothorax 440  $\mu\text{m}$  long, longer than wide. Third pedigerous somite bearing semicircular, lobate posterolateral corners in dorsal view of body. Fourth pedigerous somite with deeply concave posterior margin. Urosome (Fig. 21B) 5-segmented. Fifth pedigerous somite 113  $\mu\text{m}$  wide, with pointed posterolateral apices. Genital double-somite 1.58 times longer than wide ( $172 \times 109 \mu\text{m}$ ), consisting of laterally expanded proximal half and narrower distal half; genital apertures positioned dorsolaterally at posterior region of expanded anterior half. Three free abdominal somites  $54 \times 65$ ,  $36 \times 64$ , and  $54 \times 71 \mu\text{m}$ , respectively. Anal somite with minute spinules along postero-dorsal and posteroventral margins. Caudal ramus 3.58 times longer than wide ( $118 \times 33 \mu\text{m}$ ), more than twice longer than anal somite, armed with 6 setae and ornamented with setules on inner margin; setae II and III positioned at same place at 63% region of lateral margin of ramus; dorsal seta (seta VII) small and naked, other setae pinnate.

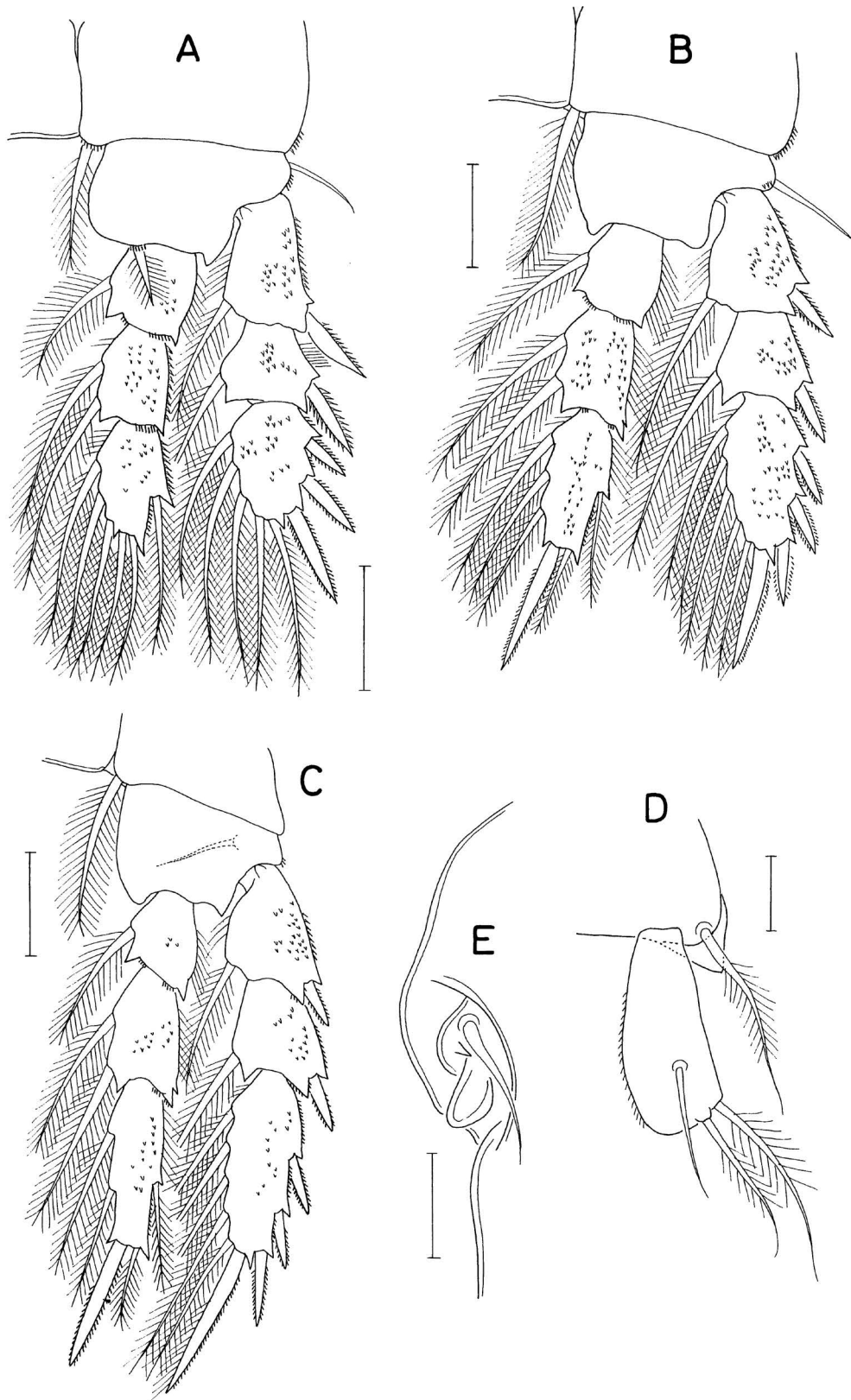
Rostrum (Fig. 21C), distinct, tapering, longer than wide, with blunt distal apex. Antennule (Fig. 21D) curved, 12-segmented; armature formula 1, 6, 2, 2, 2, 2, 7, 2, 2, 2, 2, and 12 + aesthetasc; first segment with 1 small additional setule (vestige of seta); setae easily-broken, some of them weakly pinnate; terminal segment longest. Antenna (Fig. 21E) consisting of coxa, basis, small exopod, and 1-segmented endopod; coxa short, unarmed; basis longest segment, with setules on mid-region of inner margin and inner subdistal region, and spinules on distal region of outer margin; exopod as small lobe bearing 2 setae; endopod lacking spine or claw, but with 4 large setae, 1 on inner margin and 3 distally.

Oral siphon (Fig. 21F) attenuated distally,  $175 \times 68 \mu\text{m}$ , extending to maxilliped insertions, bearing several minute setules at distal third of lateral margins. Mandible (Fig. 21G) represented by slender, straight stylet, 156  $\mu\text{m}$  long, bearing 6 teeth at distal region. Maxillule (Fig. 21H) bilobed; inner lobe about 59  $\mu\text{m}$  long, distally with 5 setae (including rudimentary one), longest one of them 97  $\mu\text{m}$  long; outer lobe 38  $\mu\text{m}$  long, armed distally with 1 small and 2 large setae, longest one 88  $\mu\text{m}$  long. Maxilla (Fig. 21I) consisting of syncoxa and subchela-basis; syncoxa unarmed and unornamented; basis about 1.5 times longer than syncoxa, slender, with 1 seta at 60% region, and 4 denticles on distal region of concave margin. Maxilliped (Fig. 21J) 4-segmented; first segment formed by fusion of syncoxa and basis, with 2 setae on inner margin,





**Fig. 21.** *Neopontius rectus* n. sp., female. A, Habitus, dorsal; B, Urosome, dorsal; C, Rostrum, ventral; D, Antennule; E, Antenna; F, Oral siphon; G, Mandibular stylet; H, Maxillule; I, Maxilla; J, Maxilliped. Scale bars: A=0.2 mm, B=0.1 mm, C, D, F, I, J=0.05 mm, E, G, H=0.02 mm.



**Fig. 22.** *Neopontius rectus* n. sp., female. A, Leg 1; B, Leg 2; C, Leg 4; D, Leg 5, ventral; E, Left genital aperture, dorsal. Scale bars: A-D=0.05 mm, E=0.02 mm.

one at region of inner distal corner of original syncoxa, the other at subdistal region of inner margin; endopod slender, 3-segmented, with 3, 1, and 1 seta, respectively; terminal endopodal segment 55 µm long; terminal claw markedly elongated, 115 µm long, with fine spinules along concave margin.

Legs 1 (Fig. 22A), 2 (Fig. 22B), 3, and 4 (Fig. 22C) biramous, with 3-segmented rami. Anterior surface of exopodal and endopodal segments of swimming legs with small, granule-like spinules. Inner coxal seta well-developed in swimming legs; outer seta on basis naked. Inner distal seta on basis of leg 1 stiff, spiniform. Outer seta on basis of leg 4 characteristically position on dorsal surface and directed medially. Armature formula for legs 1–4 as follows:

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

Leg 5 (Fig. 22D) consisting of dorsolateral, pinnate seta on fifth pedigerous somite, and free exopod. Exopodal segment bulbous, broadened distally, armed with 3 setae, one of them naked, positioned on ventral surface at distal third of exopod length, other 2 setae pinnate, positioned at outer region of distal margin, and ornamented with fine spinules along convex inner margin. Leg 6 (Fig. 22E) represented by 1 seta and 1 dentiform spinule on genital operculum.

**Male.** Unknown,

**Remarks.** The genus *Neopontius* has been represented by three known species, *N. angularis* Scott T., 1898, *N. dilatatus* Sars G. O., 1916, and *N. sivertseni* Wiborg, 1964 all from the Atlantic Ocean. *Neopontius rectus* n. sp. is easily differentiated from the three species in the genus by its two outstanding features: the endopod of the antenna is single-segmented, in contrast to the 2-segmented condition in the three congeners and the syncoxa and basis of the maxilliped are fused to form a compound segment, in contrast to the free syncoxa and basis in the three congeners. Although *N. angularis* appears to be most close to the new species in the body form and in having a 12-segmented female antennule and a similar proportional dimension of the caudal ramus, it is not confusable with the new species in having pointed posterolateral corners of the third pedigerous somite and a pointed mediodistal process on the exopodal segment of female leg 5, in addition to the absence of the two above-mentioned outstanding features of *N. rectus* n. sp.

## ORCID

Jimin Lee: <https://orcid.org/0000-0001-9004-8275>

Il-Hoi Kim: <https://orcid.org/0000-0002-7332-0043>

## CONFLICTS OF INTEREST

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

## ACKNOWLEDGMENTS

We thank Dr. T. Lee, Samyook University and five zoologists (Drs., T.W. Jung, H.K. Kim, J.G. Kim, Y. Choi, and C.J. Lee) of Honam National Institute of Biological Resources (HNIBR) for providing us with copepod samples they collected for this study. This study was supported by a grant from the Honam National Institute of Biological Resources (HNIBR), funded by the Ministry of Environment (MOE) of the Republic of Korea (HNIBR202201211 and HNIBR202301210) to I.-H. Kim. The specimens of *Pteropontius cristatus* Giesbrecht, 1895 were collected with support of the research program (HNIBR202301105) of the Honam National Institute of Biological Resources.

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Received August 28, 2023  
 Revised September 18, 2023  
 Accepted September 26, 2023