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Three new species of *Pseudomacrochiron* Reddiah, 1966 (Copepoda, Cyclopoida, Macrochironidae) and reassignment of *Kelleria gurneyi* Sewell, 1949

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Three new species of the genus *Pseudomacrochiron* are described, two of them from Phuket, Thailand and one from both Phuket and the south coast of Korea. As distinguishing features of these new species, the caudal ramus of the female is about 4.5 times longer than wide in *Pseudomacrochiron acutirostre* n. sp. and *P. bellum* n. sp. and 1.90 times longer than wide in *P. eurydatum* n. sp.; in all the three new species the mandible bears 15 to 18 spinules along the inner margin, the maxilla bears a cusp on the concave margin of the distal lash of the maxilla, and the exopod of female leg 5 is armed with one spine plus one seta; and the ratio of the length to the width of the exopodal segment of female leg 5 is 2.17 : 1 in *P. acutirostre* n. sp., 1.80 : 1 in *P. bellum* n. sp., and 4.50 : 1 in *P. eurydatum* n. sp. *Kelleria gurneyi* Sewell, 1949 which has been remained as a *species inquirenda* is redescribed based on newly collected specimens from Kosrae Island, Micronesia, and transferred to the genus *Pseudomacrochiron* as *P. gurneyi* (Sewell, 1949) n. comb. A tabular key to distinguish twelve known species of *Pseudomacrochiron* is provided.

Keywords: Korea, Micronesia, new species, symbiotic copepods, taxonomy, Thailand

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Introduction

The genus *Pseudomacrochiron* Reddiah, 1969 is one of four genera in the family Macrochironidae Humes & Boxshall, 1996, along with *Macrochiron* Brady, 1872, *Paramacrochiron* Sewell, 1949, and *Sewellochiron* Humes, 1969 (Boxshall & Halsey, 2004).

Seven species are currently recognized as valid in the genus *Pseudomacrochiron* (WoRMS Editorial Board, 2024), not including *P. sertum* (Humes, 1978) which was transferred to this genus by Kim & Chang (2016) from the genus *Telestacicola* Humes & Stock, 1972 of the Rhynchomolgidae Humes & Stock, 1972.

Known hosts of *Pseudomacrochiron* are a hydrozoan for *P. sertum* (Humes, 1978), scyphozoans for *P. aureliae* Tang, Yasuda, Yamada & Nagasawa, 2012 and *P. stocki* Reddiah, 1969, and a stony coral for *P. pocilloporae* Kim, 2004 (Reddiah, 1969; Humes, 1978; Tang *et al*., 2012), but three species, *P. malayanse* (Sewell, 1949), *P. ornatum* (Krishnaswamy, 1952), and *P. parvum* (Scott A., 1909), were found in plankton (Scott, 1909; Krishnaswamy, 1952), and one species, *P. urostenum* Kim, 2000, was collected from stagnant water on a tidal flat (Kim, 2000).

In the present paper three new species of *Pseudomacrochiron* are described from Phuket, Thailand and the southern coast of Korea. *Kelleria gurneyi* Sewell, 1949 is redescribed based on newly collected material from Kosrae, Micronesia, and transferred to the genus *Pseudomacrochiron*.

Materials and Methods

Copepod material was sucked up with a large plastic pipette from invertebrate burrows between rocks or collected with a light trap in the night or from washings of a submerged fish trap. Sampled copepod specimens were fixed and preserved in 80% ethanol. Before microscopic observation, selected specimens were immersed in lactic acid for several minutes. Dissection was done using the reversed slide method of Humes & Gooding (1964). Drawings were made with the aid of a microscope

equipped with a drawing apparatus. Measurement of body length is from the anterior margin of the cephalosome to the posterior margin of the caudal rami, excluding the caudal setae. Measurements of appendage segments were done after dissections of appendages. In the armature formula, Roman numerals indicate spines and Arabic numerals represent setae. Morphological terminology follows Huys & Boxshall (1991) and Humes & Boxshall (1996). Type specimens have been deposited in the Marine Biodiversity Institute of Korea (MABIK), Seocheon, Korea.

Systematic Accounts

Order Cyclopoida Burmeister, 1834
Family Macrochironidae Humes & Boxshall, 1996
Genus *Pseudomacrochiron* Reddiah, 1966

***Pseudomacrochiron gurneyi* (Sewell, 1949) n. comb.**
(Figs. 1, 2)
Syn.: *Kelleria gurneyi* Sewell, 1949: 117, text-fig. 31.

Material examined. 4♀♀ collected with a light trap at night, Kosrae, Micronesia (05°21′27.17″N, 162°57′51.23″E), collected by J. Lee, 02 July 2016.

Female. Body (Fig. 1A) narrow. Body length 1.10 mm. Prosome 420 μm long. Cephalothorax longer than wide (450 × 386 μm), with blunt posterodorsal corners; dorsal suture line between cephalosome and first pedigerous somite faint. Posterolateral corners acutely pointed in second pedigerous somite, but blunt in third and fourth pedigerous somites. Third pedigerous somite with 1 dorsal tubercle in middle of posterior margin (Fig. 1A). Urosome (Fig. 1B) 5-segmented. Fifth pedigerous somite 131 μm wide, as wide as genital double-somite. Genital double-somite slightly longer than wide (140 × 131 μm), characteristically hexagonal in dorsal view, with large seta on lateral apex positioned at 45% length of double-somite; genital apertures positioned dorsally at anterior quarter; pair of oblique rows of minute spinules present on dorsal surface posterior to genital apertures. Three free abdominal somites 45 × 65, 33 × 62, and 62 × 60 μm, respectively. Caudal ramus (Fig. 1C) 4.74 times longer than wide (128 × 27 μm), about twice longer than anal somite, armed with 6 setae; outer seta naked, positioned at midlength of ramus, other setae pinnate; distal margin of ramus tapering, tipped with small pore.

Rostrum (Fig. 1D) spatulate, with almost parallel lateral margins and slightly concave distal margin. Antennule (Fig. 1E) slender, about 360 μm long, 7-segmented; armature formula 4, 13, 6, 3, 4 + aesthetasc, 2 + aesthetasc, and 7 + aesthetasc; setae thin, generally long, all of them naked. Antenna (Fig. 1F) 4-segmented, consisting of coxobasis and 3-segmented endopod; armature formula 1, 1, 2 + claw, and 5 + 2 claws; first endopodal segment ornamented with fine spinules along outer margin; claws thin, setiform, annulated in middle; third endopodal segment 3.89 times longer than wide (74 × 19 μm); all setae thin, naked.

Labrum (Fig. 1G) much wider than long, with shallow posteromedian incision. Mandible (Fig. 1H) lacking inner proximal notch; inner margin of gnathobase straight, oblique to distal lash, ornamented with 2 groups of spinules, proximal group consisting of 8 larger spinules, and distal group of 8 smaller spinules; distal lash thin, spinulose along both margins; convex margin of gnathobase with 1 small proximal seta (this seta ornamented with 2 spinules on its proximal margin and 3 spinules on distal margin) followed by 3 spinules and about 15 teeth, latter teeth getting markedly smaller from proximal to distal. Paragnath (Fig. 1I) as tapering, setulose lamella. Maxillule (Fig. 1J) lobate, bearing 3 setae and 1 setiform process; 2 apical setae spinulose; subapical seta spinulose along inner margin. Maxilla (Fig. 1K) 2-segmented; proximal segment (syncoxa) large but unarmed; distal segment (basis) with spiniform distal lash bearing 2 setiform spinules proximally on outer side; inner seta (seta I) completely fused to basis, strong, spiniform, bipinnate along its proximal half; anterior seta (seta II) naked, long, wrinkled; outer proximal seta (seta III) distinct, naked. Maxilliped (Fig. 2A) 3-segmented; first segment (syncoxa) being longest segment, but unarmed; second segment (basis) with 2 large setae, both pinnate, proximal one shorter than distal one; third segment (endopod) small, terminating in elongate, smooth, spiniform process, proximally with 2 naked setae and 1 minute setule.

Legs 1–3 biramous with 3-segmented rami (Fig. 2B, C). Leg 3 same as leg 2, except bearing 3 spines and 2 setae on third endopodal segment (Fig. 2D). Leg 4 (Fig. 2E) with 3-segmented exopod and 1-segmented endopod; endopodal segment small, 2.76 times longer than wide (47 × 17 μm), setulose along inner and outer margins, with blunt angle on outer margin; 2 distal spines 66 μm (inner) and 42 μm (outer) long. Inner coxal seta of leg 4 naked; all other setae on legs 1–4 pinnate. 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, 1, 4
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; III, I, 5	0-1; 0-2; I, II, 2
Leg 4	0-1	1-0	I-0; I-1; II, I, 5	0, II, 0

Leg 5 consisting of large dorsolateral seta on fifth pedigerous somite and free exopod (Fig. 1B); exopodal segment (Fig. 2F) small, 1.65 times longer than wide, with inner subdistal bulge, 1 cusp at distal tip, armed 2 naked setae of unequal lengths on distal margin, both se-

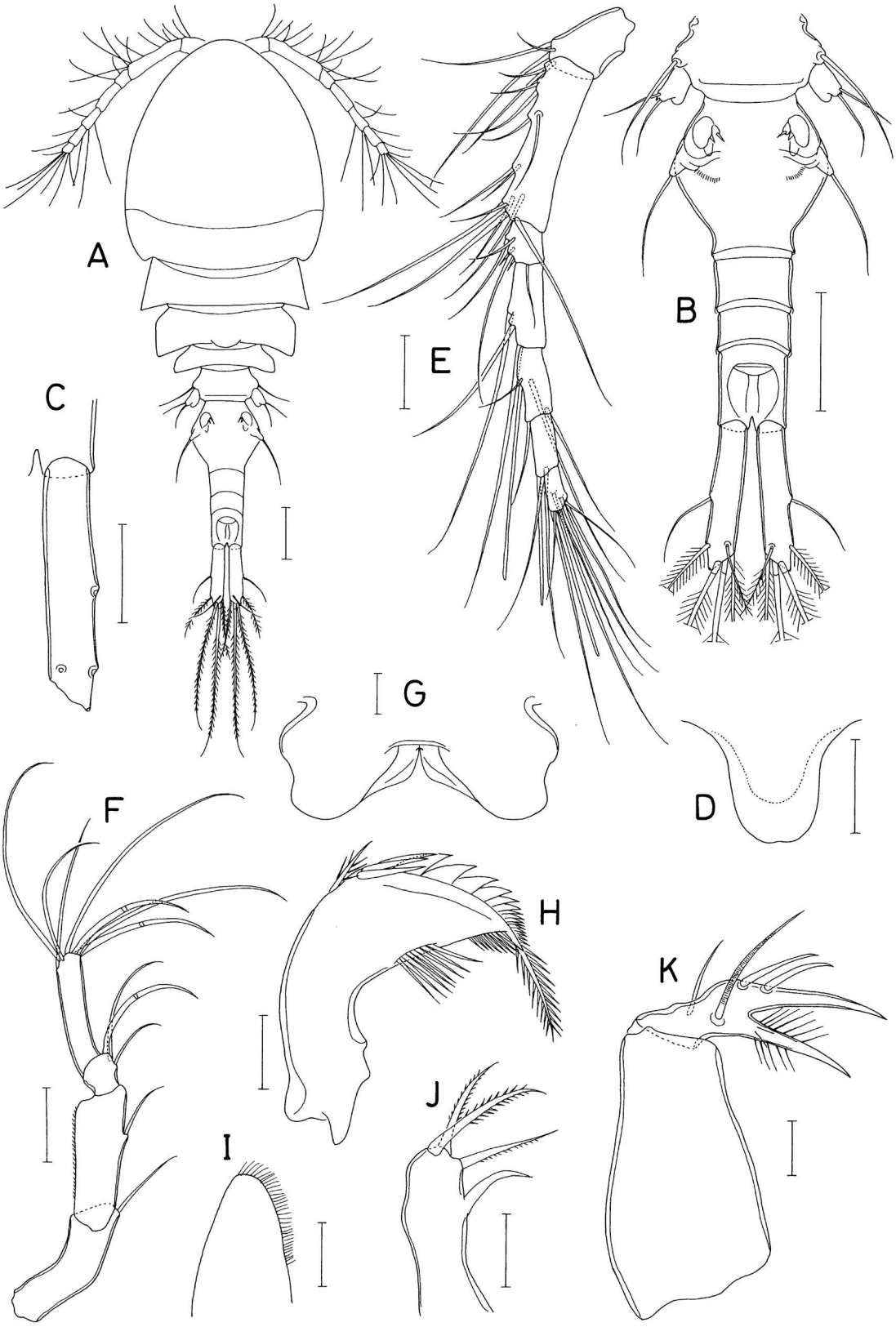


Fig. 1. *Pseudomacrochiron gurneyi* (Sewell, 1949) n. comb., female. A, habitus, dorsal; B, urosome, dorsal; C, right caudal ramus, dorsal (caudal setae omitted); D, rostrum; E, antennule; F, antenna; G, labrum; H, mandible; I, paragnath; J, maxillule; K, maxilla. Scale bars: A, B, 0.1 mm; C−F, 0.05 mm; G−K, 0.02 mm.

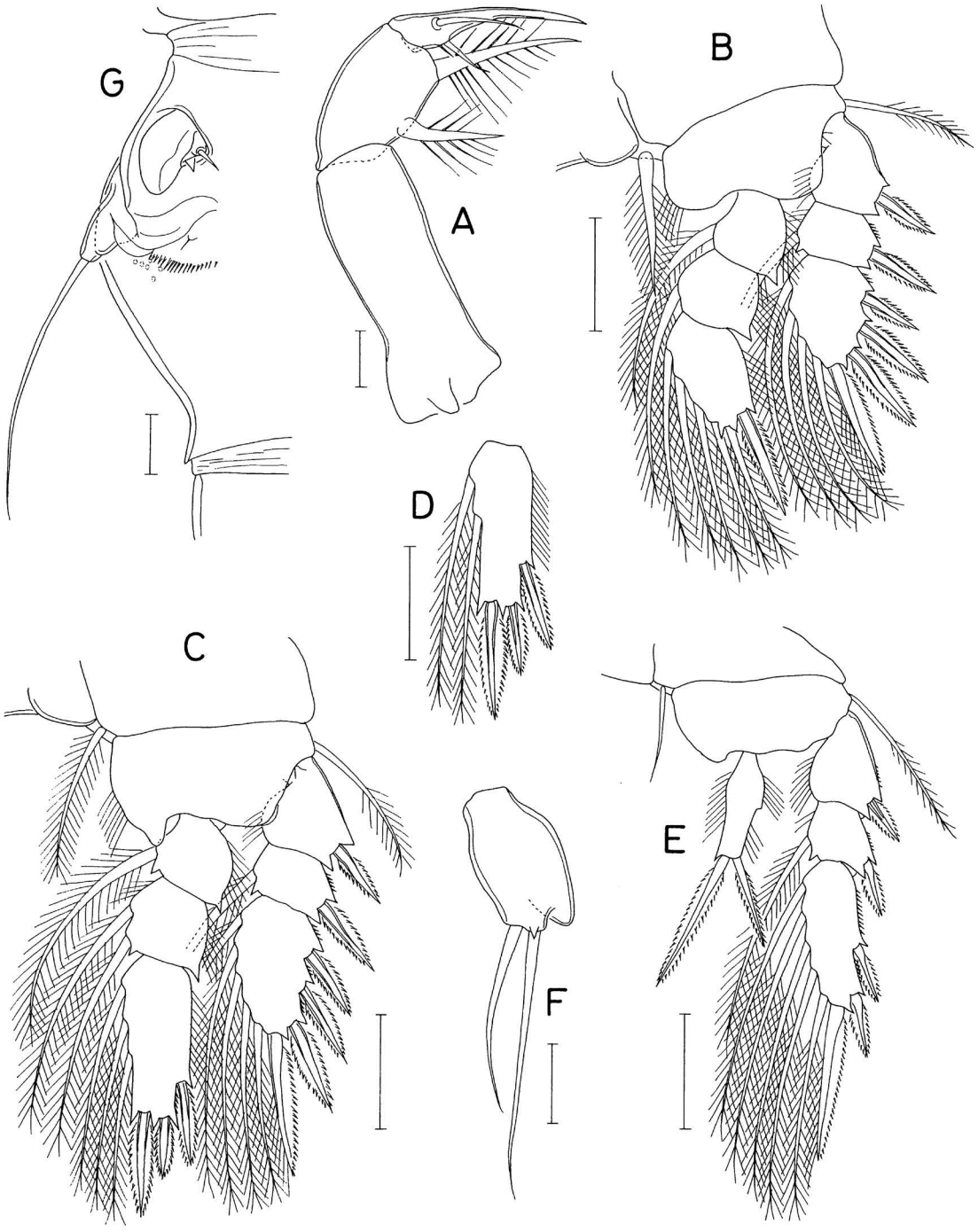


Fig. 2. *Pseudomacrochiron gurneyi* (Sewell, 1949) n. comb., female. A, maxilliped; B, leg 1; C, leg 2; D, third endopodal segment of leg 3; E, leg 4; F, exopod of leg 5; G, left side of genital double-somite, dorsal. Scale bars: A, F, G, 0.02 mm; B–E, 0.05 mm.

tae longer than segment. Leg 6 (Fig. 2G) consisting of 1 small seta, 1 cusp, and 1 posterolaterally displaced process tipped with large, naked seta.

Male. Unknown.

Remarks. *Pseudomacrochiron gurneyi* (Sewell, 1949) was originally recorded as *Kelleria gurneyi* in the family Kelleriidae by Sewell (1949) who collected it with surface tow-net, at Kurau River, Malaysia. It has never been rediscovered since the original record. Humes & Stock (1973) treated it as a species "insufficiently described or of uncertain position".

Sewell (1949) observed a single female and his descrip-

tion and illustration reveal some important taxonomic features, as follows: (1) the third pedigerous somite bears a rounded dorsal tubercle; (2) the genital double-somite is hexagonal in dorsal view and bears a large seta on each lateral apex; (3) the forms of the illustrated maxilla and maxilliped are roughly similar to those of our specimens; and (4) the exopodal segment of leg 5 bears an inner subdistal bulge, as in our specimens. Based on the sharing of the above features, we can determine that our specimens and *Kelleria gurneyi* Sewell (1949) are conspecific. According to the definitions of the families and genera of the superfamily Lichomolgoidea presented by Humes & Boxshall (1996), this species should be placed in the *Pseudomacrochiron* of the Macrochironidae, and the revised name of this species is *Pseudomacrochiron gurneyi* (Sewell, 1949) n. comb.

The maxilla of the female of *P. gurneyi* is characteristic: in its distal segment (basis) the inner seta (seta I) is transformed to a spiniform process without basal articulation, and the distal lash is ornamented only with two proximal, setiform spinules. These features of the maxilla are very unusual for the genus and thus serve as key characters of the species, along with the characteristic forms of the genital double-somite and exopodal segment of leg 5.

***Pseudomacrochiron acutirostre* n. sp.**

(Figs. 3–5)

https://zoobank.org/urn:lsid:zoobank.org:act:8D5B823D-899D-4F72-9F0F-610FC2DF21A0

Material examined. 3♀♀, 1♂ from intertidal invertebrate burrows (inhabited mainly by shrimps and polychaetes), Ko Sireh, Phuket, Thailand (approximately 07°52′26″N, 98°25′235″E), collected by I.-H. Kim & J.-S. Hong, 12 July 2015. Holotype (♀, MABIK CR00247456) and paratype (♀, MABIK CR00247457) have been deposited in the Marine Biodiversity Institute of Korea (MABIK), Seocheon. Dissected paratypes (1♀, 1♂) are kept in the collection of I.-H. Kim.

Etymology. The specific name is the combination of the Latin words *acut* (= sharp) and *rostr* (= snout), referring to the pointed rostrum of the new species.

Female. Body (Fig. 3A) narrow. Body length 1.16 mm. Prosome 723 μm long, occupying 62% of body length. Cephalothorax longer than wide (495 × 405 μm), with faint dorsal suture line between cephalosome and first pedigerous somite. Second pedigerous somite with acutely pointed posterolateral corners. Urosome (Fig. 3B) 5-segmented. Fifth pedigerous somite 118 μm wide, wider than genital double-somite. Genital double-somite distinctly longer than wide (153 × 107 μm), consisting of narrower anterior and posterior parts and roundly expanded middle part; genital apertures positioned dorsolaterally at midway of double-somite. Three free abdominal somites 36 × 62, 31 × 63, and 67 × 62 μm, respectively. Caudal ramus (Fig. 3C) 4.50 times longer than wide (117 × 26 μm), with 6 setae; outer and dorsal setae (setae II and VII) naked, other setae pinnate; outer seta (seta II) positioned at 63% region of ramus length; outer distal seta (seta III) with broad proximal half and thin distal half; 2 mid-terminal setae (setae IV and V) consisting of tape-like, broadened proximal half and thin distal half (Fig. 3B).

Rostrum (Fig. 3D) longer than wide, weakly tapering along proximal half but strongly tapering along distal half, with pointed distal apex. Antennule (Fig. 3E) 332 μm long, 7-segmented; armature formula 4, 13, 6, 3, 4 + aesthetasc, 2 + aesthetasc, and 7 + aesthetasc; all setae naked. Antenna (Fig. 3F) 4-segmented; armature formula 1, 1, 2 + claw, and 5 + 2 claws; terminal segment about 3 times longer than wide (68 × 23 μm); 2 distal claws 74 and 65 μm long, respectively.

Labrum (Fig. 3G) with broad, semicircular posterolateral lobes. Mandible (Fig. 3H) with elongate, serrate distal lash, deep inner proximal notch; inner margin of gnathobase straight, perpendicular to distal lash, with row of about 15 spinules; convex outer side of gnathobase with 1 broad proximal seta (setiform scale) bearing row of spinules along its inner margin and small teeth distally. Maxillule (Fig. 3I) lobate, armed with 3 weakly pinnate distal setae and 1 shorter, naked subdistal process. Maxilla (Fig. 3J) 2-segmented; proximal segment (syncoxa) broad, unarmed; distal segment (basis) with 3 setae; inner seta (seta I) bipinnate; anterior seta (seta II) weakly pinnate along its inner margin; outer proximal seta (seta III) vestigial; distal lash elongate, forming right angle with main axis of basis, with 1 cusp near middle of concave margin, 1 small spinule proximally (indicated by arrowhead in Fig. 3J) followed by row of teeth along convex outer margin. Maxilliped (Fig. 3K) 3-segmented; first segment (syncoxa) longest but unarmed; second segment (basis) with 2 small, naked setae on inner margin; small third segment (endopod) terminating in spiniform process, with 1 spine and 1 small seta.

Legs 1–3 (Fig. 4A–C) with 3-segmented rami. Leg 4 (Fig. 4D) with 3-segmented exopod and 1-segmented endopod. Inner coxal seta of leg 4 small and naked; other setae on legs 1–4 pinnate. Inner distal corner of basis of leg 4 with small pointed cusp (indicated by arrowhead in Fig. 4D). Leg 4 endopodal segment 68 × 23 μm, with angle on outer margin; two distal spines 46 (outer) and 68 μm (inner), respectively. Armature formula for legs 1–4 as in *P. gurneyi*.

Leg 5 (Fig. 3B) consisting of 1 small, naked dorsolateral seta on fifth pedigerous somite and free exopod; exopodal segment (Fig. 4E) gradually broadening distally, 2.17 times longer than wide (50 × 23 μm), distally armed with 1 spine (47 μm long) and 1 naked seta (37 μm long), and ornamented with patch of spinules near inner distal cor-

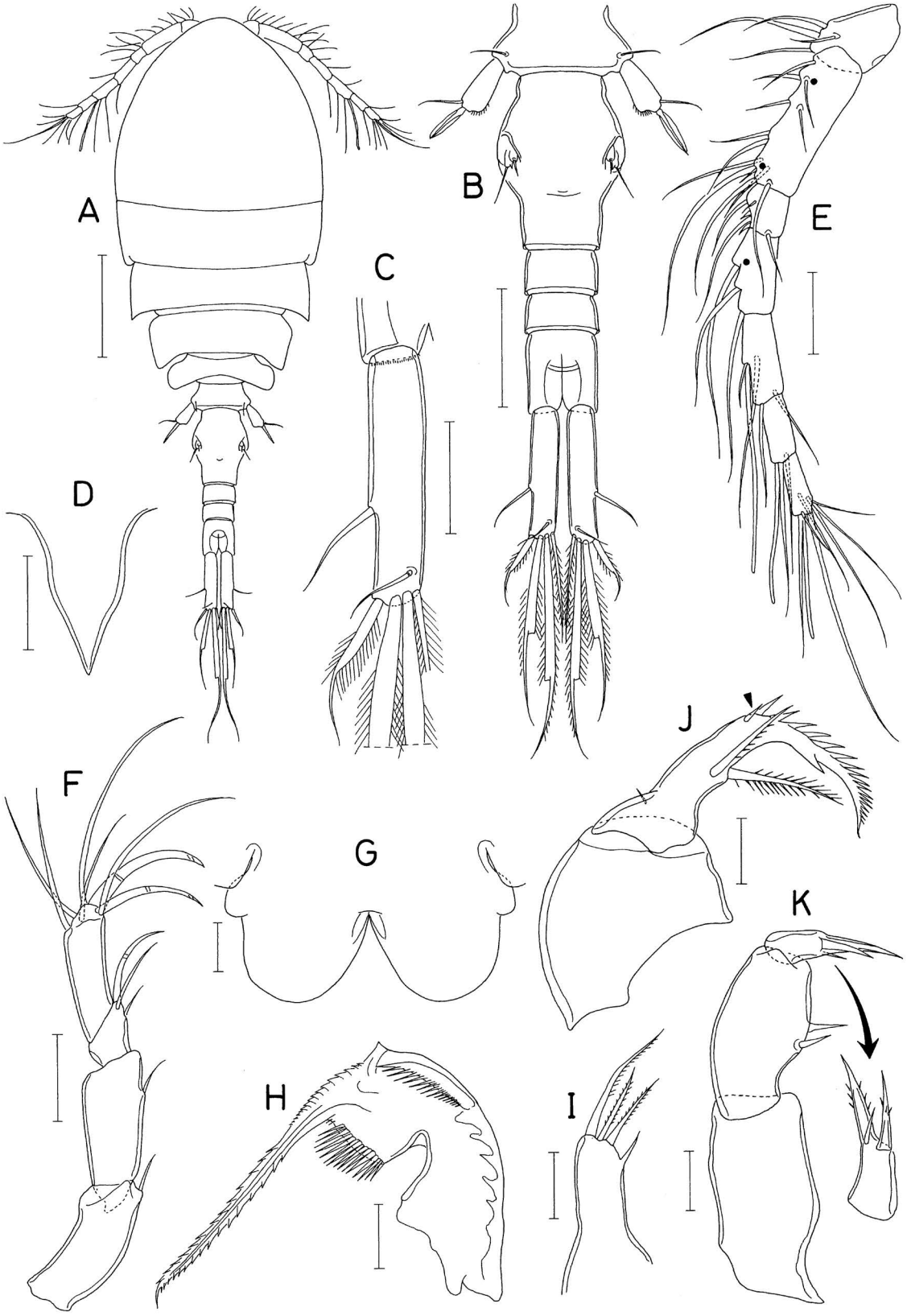


Fig. 3. *Pseudomacrochiron acutirostre* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, left caudal ramus, dorsal; D, rostrum; E, antennule; F, antenna; G, labrum; H, mandible; I, maxillule; J, maxilla; K, maxilliped. Scale bars: A, 0.2 mm; B, 0.1 mm; C–F, 0.05 mm; G–K, 0.02 mm.

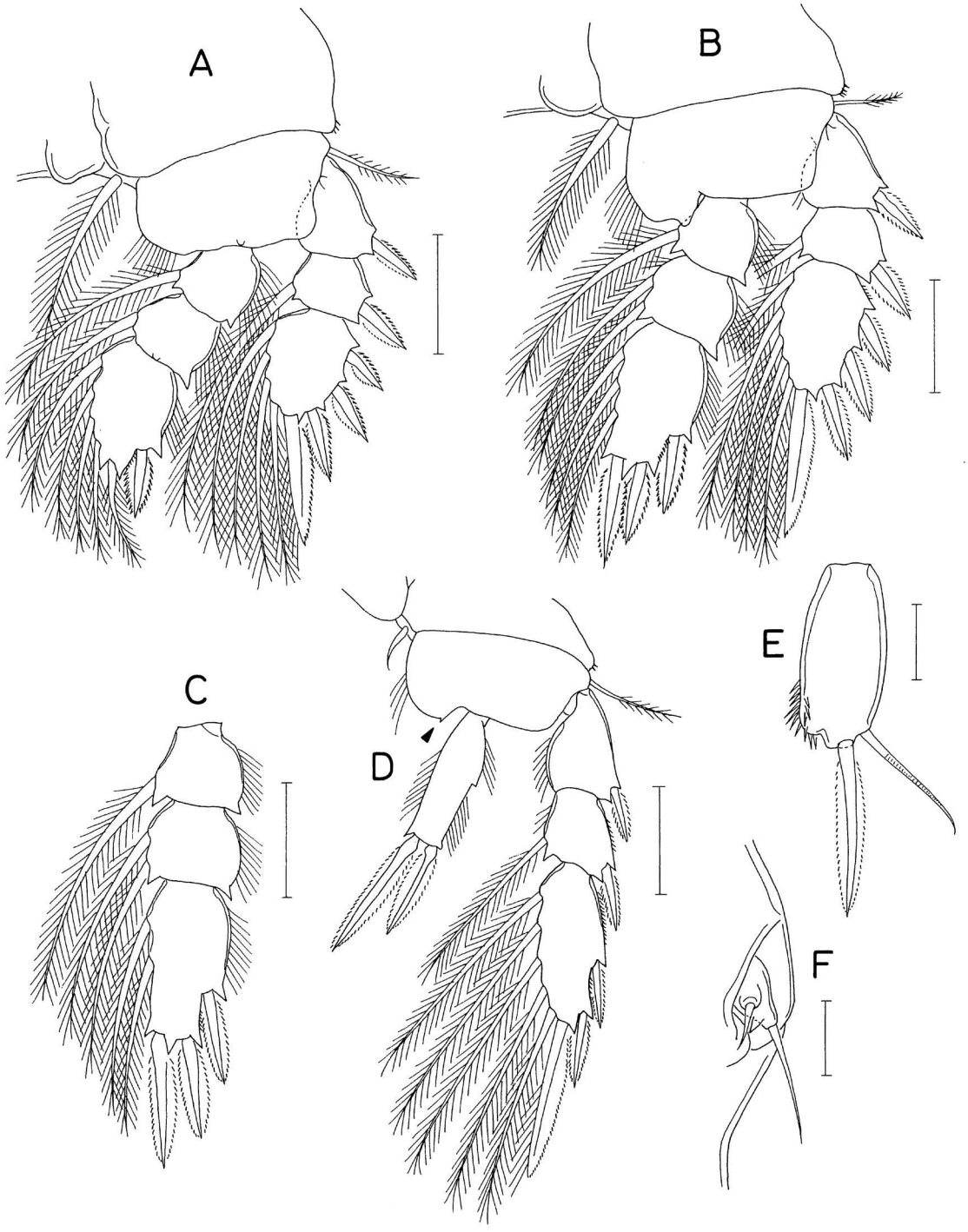


Fig. 4. *Pseudomacrochiron acutirostre* n. sp., female. A, leg 1; B, leg 2; C, endopod of leg 3; D, leg 4; E, exopod of leg 5; F, right genital aperture. Scale bars: A–D, 0.05 mm; E, F, 0.02 mm.

ner. Leg 6 (Fig. 4F) represented by 2 unequal, naked setae and 1 cusp on genital operculum.

Male. Body (Fig. 5A) similar to that of female; Body length 935 μm. Prosome 545 μm long. Cephalothorax 349 × 298 μm. Urosome (Fig. 5B) 6-segmented. Fifth pedigerous somite 88 μm wide. Genital somite subquadrate, 134 × 117 μm. Four abdominal somites 30 × 52, 29 × 48, 24 × 47, and 41 × 47 μm, respectively. Caudal ramus 4.0 times longer than wide (88 × 22 μm), armed as in female.

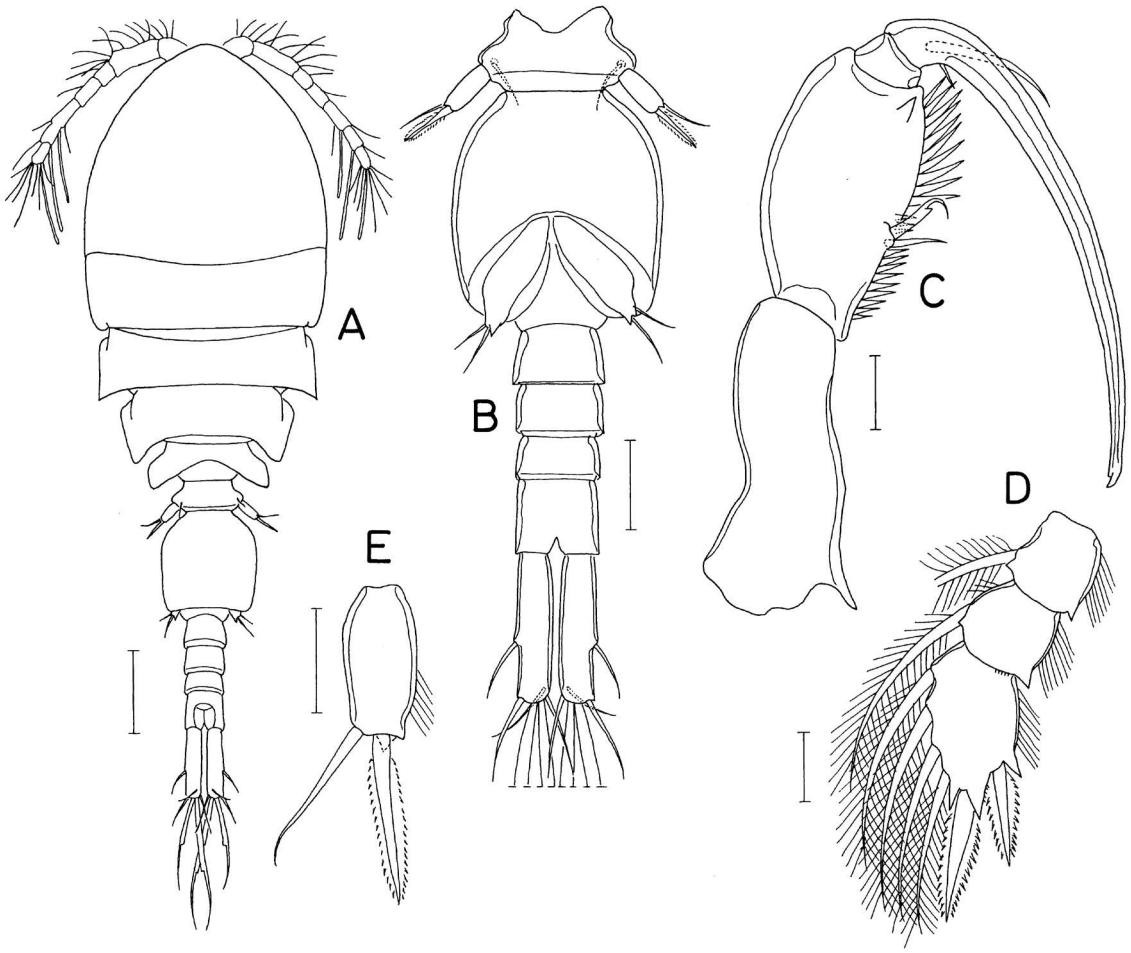


Fig. 5. *Pseudomacrochiron acutirostre* n. sp., male. A, habitus, dorsal; B, urosome, ventral; C, maxilliped; D, endopod of leg 1; E, exopod of leg 5. Scale bars: A, 0.1 mm; B, 0.05 mm; C–E, 0.02 mm.

Rostrum as in female. Antennule with 3 additional aesthetascs at opposite places of dots in Fig. 3E. Antenna as in female. Labrum, mandible, maxillule, and maxilla also as in female. Maxilliped (Fig. 5C) consisting of 3 segments and terminal claw; first segment (syncoxa) unarmed; second segment (basis) slightly inflated, armed with 2 setae on inner side (1 simple seta and 1 transformed seta bearing broadened proximal two-thirds), ornamented with 1 cusp near inner distal corner and row of spinules along inner margin; small third segment (endopod) unarmed; terminal claw elongate, gradually narrowing distally, with 2 unequal setae proximally.

Leg 1 endopod (Fig. 5D) with 2 spines and 4 setae (formula I, I, 4) on third segment. Legs 2–4 as in female. Leg 5 exopodal segment (Fig. 5E) 2.07 times longer than wide (29 × 14 μm), setulose on inner distal region, armed with 1 spine and 1 seta, both 33 μm long. Leg 6 (Fig. 5B) represented by 2 small setae on distal apex of genital operculum.

Remarks. As a diagnostic feature of *P. acutirostre* n. sp., the exopodal segment of female leg 5 is short, 2.17 times longer than wide. The new species is comparable with three congeners, *P. aureliae* Tang, Yasuda, Yamada & Nagasawa, 2012, *P. gurneyi*, and *P. urostenum* Kim, 2000, because these three species have a similarly short exopodal segment of leg 5, which is less than three times as long as wide. However, *P. acutirostre* n. sp. is distinguished from *P. aureliae* by having four spines and five setae (armature formula III, I, 5, against III, I, 4 in *P. aureliae* as described by Tang *et al*., 2012); from *P. gurneyi* by having roundly convex lateral margins of the genital double-somite (vs. the genital double-somite of *P. gurneyi* is hexagonal) and by the bearing one spine and one seta on the exopod of female leg 5 (vs. two setae in *P. gurneyi*); and from *P. urostenum* by having shorter caudal rami of the female which are 4.50 times longer than wide (vs. 6.32 times longer than wide in *P. urostenum*, according to Kim, 2000) and by having a shorter exopodal segment of

Table 1. Characteristics of *Pseudomacrochiron* species.

Species	Characters						
	1	2	3	4	5	6	7
P. aureliae	3.1	6	X	7	with notch	1.3	I+1
P. gurneyi	4.74	16	X	2	with angle	1.65	2
P. malayense	=3.7	=7	?	?	smooth	=5	2
P. ornatum	=2.5	>10	X	=15	smooth	5–6	II
P. parvum	=2	>15	+	13	with notch	3–4	II
P. pocilloporae	1.84	12	+	18	with cusp	5.46	I+1
P. sertum	2.04	numerous	X	over 25	with cusp	5.03	I+1
P. stocki	=3	=10	X	15	with cusp	=5	I+1
P. urostenum	6.32	=15	+	10	with cusp	1.63	I+1
P. acutirostre n. sp.	4.50	15	+	=15	with cusp	2.17	I+1
P. bellum n. sp.	4.48	16	+	12	smooth	1.80	I+1
P. eurydatum n. sp.	1.90	18	+	18	with cusp	4.5	I+1

Characters: 1, length/width ratio of female caudal ramus; 2, spinules on inner margin of mandible; 3, cusp on concave margin of maxilla; 4, spinules or teeth on convex margin of maxilla; 5, outer margin of leg 4 endopod; 6, length/width ratio of exopodal segment of female leg 5; 7, armature formula for exopod of female leg 5.
Symbols: + present; X absent; = approximately; > more than; ? missing data.

female leg 5 which is 47 μm long (vs. the 65 μm long in *P. urostenum*, according to Kim, 2000). The new and other species of the genus may be distinguished from one another, using Table 1.

Pseudomacrochiron bellum n. sp.

(Figs. 6, 7)

https://zoobank.org/urn:lsid:zoobank.org:act:00584991-5705-41ED-AFB4-0B006A88C1CE

Material examined. 4♀♀ from intertidal invertebrate burrows (inhabited mainly by shrimps and polychaetes), Ko Sireh, Phuket, Thailand (approximately 07°52′26″N, 98°25′235″E), collected by I.-H. Kim & J.-S. Hong, 12 July 2015. Holotype (♀, MABIK CR00247458) and paratypes (2♀♀, MABIK CR00247459) have been deposited in the Marine Biodiversity Institute of Korea (MABIK), Seocheon, Korea. Dissected paratype (♀) is retained in the collection of I.-H. Kim.

Etymology. The name *bellum* is derived from the Latin *bell* (=beautiful).

Female. Body (Fig. 6A) narrow. Body length 898 μm. Prosome 513 μm long, 0.57 times as long as body length. Cephalothorax 334×280 μm, with faint dorsal suture line between cephalosome and first pedigerous somite. All prosomal somites bearing blunt posterolateral corners. Urosome (Fig. 6B) 5-segmented. Fifth pedigerous somite 91 μm wide. Genital double-somite 1.42 times longer than wide (136×96 μm), consisting of expanded anterior half and narrower posterior half; expanded anterior part with roundly convex lateral margins; genital apertures positioned dorsolaterally at 36% region of double-somite length. Three free abdominal somites 36×53, 27×47, and 51×47 μm, respectively. Caudal ramus (Fig. 6C) 4.48 times longer than wide (94×21 μm), armed with 6 setae; outer seta (seta II) and dorsal seta (seta VII) naked, other setae pinnate; outer seta positioned at 64% region of ramus length; 2 mid-terminal setae (setae IV and V, Fig. 6B) consisting of broadened, tape-like proximal two-thirds and thin distal third.

Rostrum (Fig. 6D) longer than wide, tapering, with rounded distal apex. Antennule (Fig. 6E) 227 μm long, 7-segmented; armature formula 4, 13, 6, 3, 4+aesthetasc, 2+aesthetasc, and 7+aesthetasc; all setae naked. Antenna (Fig. 6F) 4-segmented; armature formula 1, 1, 2+claw, and 5+2 claws; second segment (first endopodal segment) ornamented with fine spinules along inner and outer margins; terminal segment (third endopodal segment) 2.56 times longer than wide (41×16 μm), ornamented with fine spinules along outer margin; 2 terminal claws almost equal in length, 49 and 48 μm long, respectively.

Labrum (Fig. 6G) with broad posteromedian incision; posterolateral lobes fringed with membrane along distal margin. Mandible (Fig. 6H) with deep inner proximal notch and elongate, serrate distal lash; inner margin of gnathobase straight, perpendicular to distal lash, with 2 rows of spinules (proximal row of 10 larger spinules and distal row of 6 small spinules); convex margin of gnathobase bearing 6–8 spinules proximally, followed by produced angle and row of small teeth. Maxillule (Fig. 6I) bearing 3 distal pinnate setae and 1 naked setiform

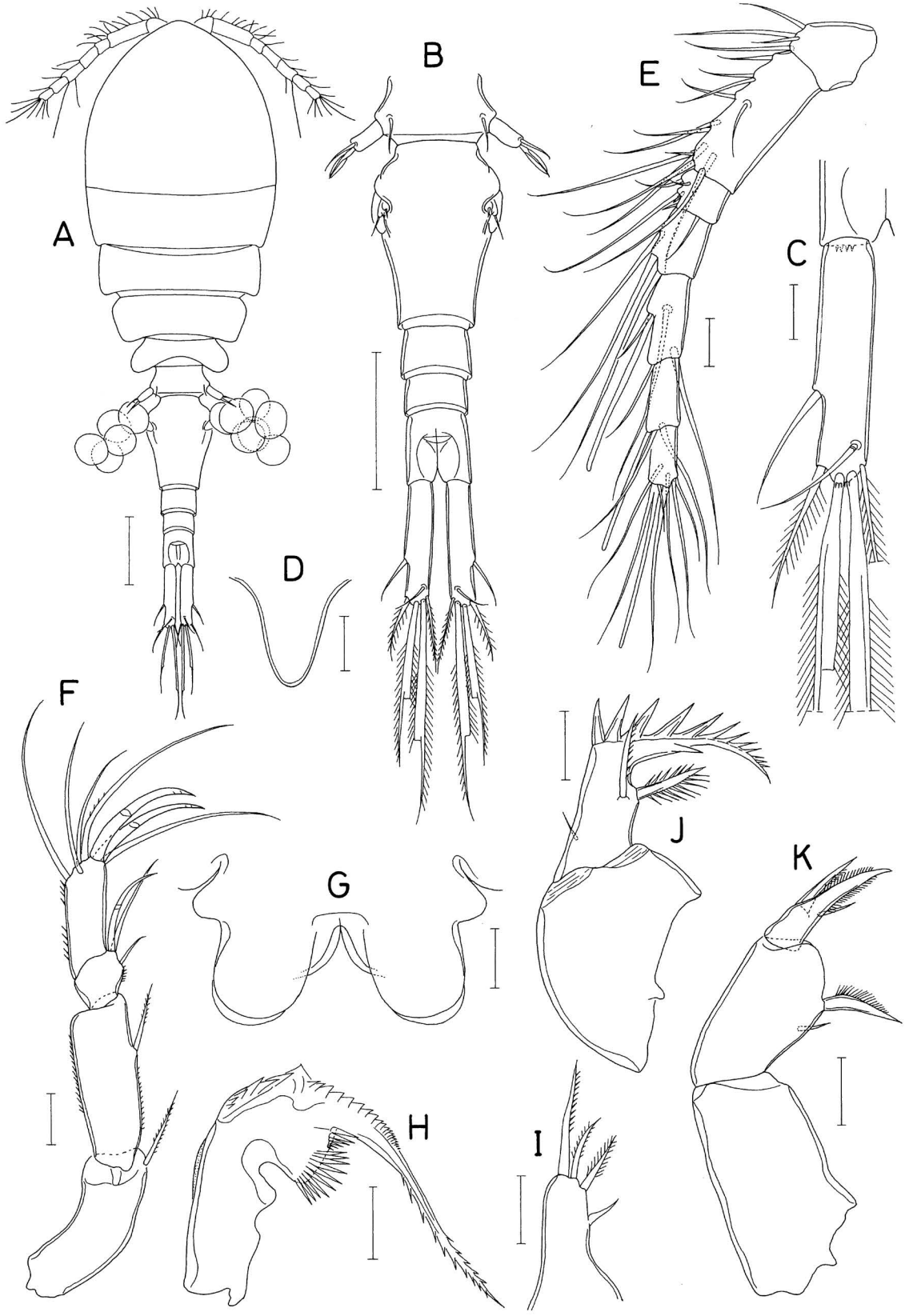


Fig. 6. *Pseudomacrochiron bellum* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, left caudal ramus, dorsal; D, rostrum; E, antennule; F, antenna; G, labrum; H, mandible; I, maxillule; J, maxilla; K, maxilliped. Scale bars: A, B, 0.1 mm; C–K, 0.02 mm.

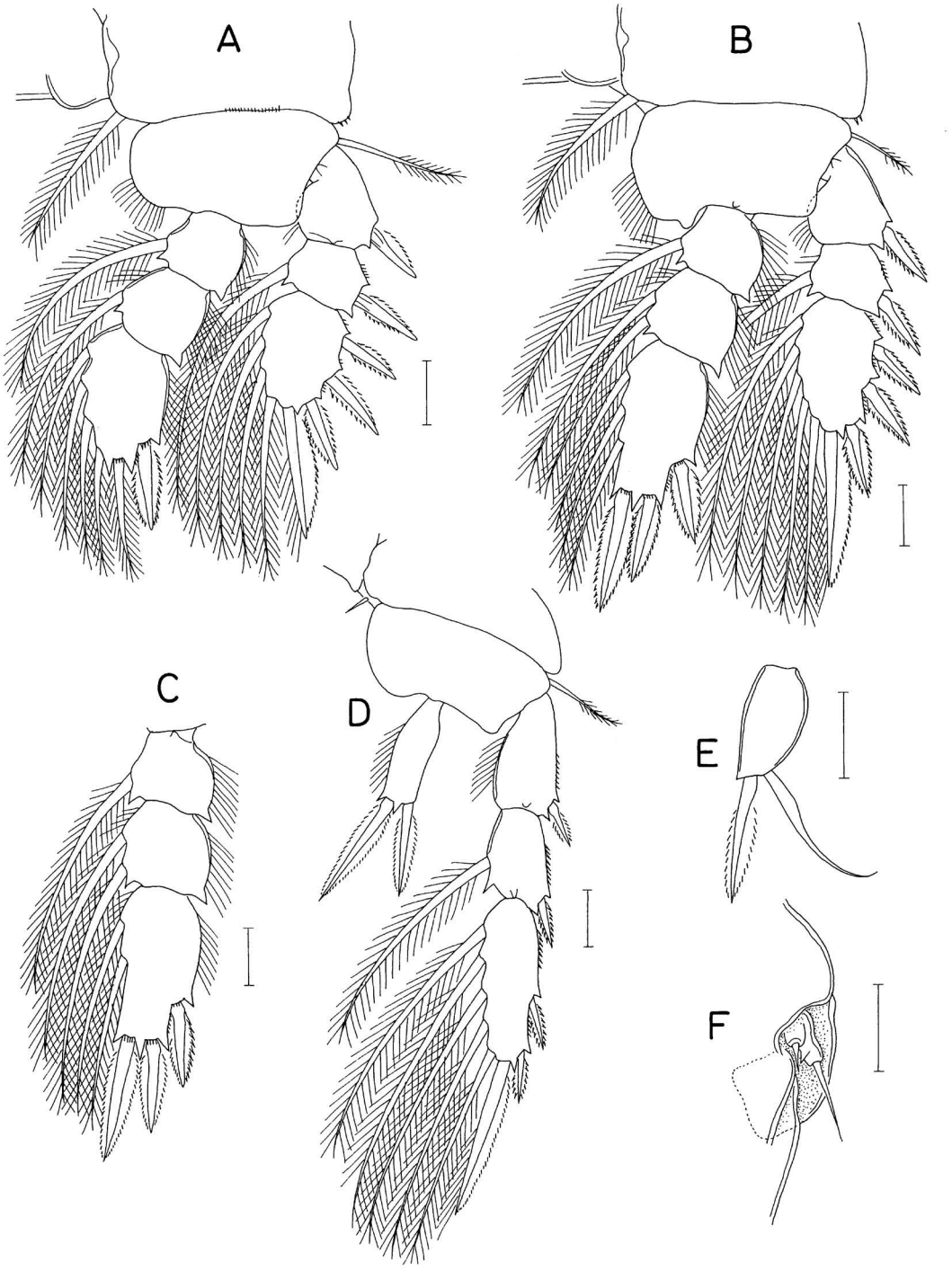


Fig. 7. *Pseudomacrochiron bellum* n. sp., female. A, leg 1; B, leg 2; C, endopod of leg 3; D, leg 4; E, exopod of leg 5; F, right genital aperture. Scale bars: 0.02 mm.

inner element. Maxilla (Fig. 6J) 2-segmented; proximal segment (syncoxa) broad, unarmed; distal segment (basis) with 3 setae (setae I–III); inner seta (seta I) strong, spiniform, spinulose along both margins; anterior seta (seta II) finely spinulose along its inner margin; outer proximal seta (seta III) rudimentary; distal lash forming right angle with main axis of basis, with 1 cusp on concave margin, more than 10 spiniform teeth along convex distal margin. Maxilliped (Fig. 6K) 3-segmented; first segment (syncoxa) unarmed; second segment (basis) with 2 very unequal

elements, proximal element as small, naked seta, distal element as spine ornamented with fine spinules along its distal margin; small third segment (endopod) terminating in large, spiniform process bearing fine spinules along both margins, with 1 small and 1 larger spiniform setae.

Legs 1–3 with 3-segmented rami (Fig. 7A–C). Leg 4 (Fig. 7D) with 3-segmented exopod and 1-segmented endopod. Leg 3 identical to leg 2, except bearing 3 spines and 2 setae on third endopodal segment (Fig. 7C). Inner coxal seta rudimentary, naked in leg 4, but all other setae on legs 1–4 distinct, pinnate. Leg 4 endopodal segment 38 × 14 μm, with smooth outer and inner margins; 2 distal spines 44 μm (inner) and 33 μm long (outer), respectively; distal margin with 1 or 2 cusps (mid-terminal one present or absent). Armature formula for legs 1–4 as in *P. gurneyi*.

Leg 5 (Fig. 6B) consisting of dorsolateral seta on fifth pedigerous somite and free exopod; exopodal segment (Fig. 7E) nearly oval, 1.80 times longer than wide (27 × 15 μm), with convex outer margin, angular inner distal corner, distally armed with 1 spine (30 μm long) and 1 naked seta (37 μm long). Leg 6 (Fig. 7F) represented by 1 small cusp and 2 unequal, naked setae on genital operculum.

Male. Unknown.

Remarks. The exopod of leg 5 of *Pseudomacrochiron* is armed distally with two elements. These elements in the female are two setae (formula 2) in *P. gurneyi* and *P. malayense* (Sewell, 1949), or two spines (formula II) in *P. ornatum* (Krishnaswamy, 1952) and *P. parvum* (Scott A., 1909), or one spine plus one seta (formula I + 1) in *P. bellum* n. sp. and other seven known species. Of the latter seven species, four (*P. pocilloporae* Kim, 2004, *P. urostenum*, *P. acutirostre* n. sp., and *P. eurydatum* n. sp.) are comparable with *P. bellum* n. sp., because these five species bear in common a distinct cusp on the concave (inner) margin of the distal lash of the maxilla (Table 1).

According to Kim (2004), *P. pocilloporae* has a short caudal ramus which is 1.84 times longer than wide (cf. 4.48 times longer than wide in *P. bellum* n. sp.) and an elongate exopodal segment of female leg 5 which is 5.46 times longer than wide (cf. 1.80 times longer than wide in *P. bellum* n. sp.). Therefore, *P. pocilloporae* is not confusable with *P. bellum* n. sp.

Pseudomacrochiron urostenum known from the Yellow Sea (Kim, 2000) differs from *P. bellum* n. sp. in the following points: (1) the distal spine on the exopod of female leg 5 is much longer than the distal nearby seta (opposite condition in *P. bellum* n. sp.), (2) the two setae on the basis (second segment) of the female maxilliped are equal in shape and size (in *P. bellum* n. sp. the proximal element is a small seta, but the distal element is a strong spine), (3) the posterolateral corners of the second pedigerous somite are acutely pointed (cf. the corners are blunt in *P. bellum* n. sp.), (4) the rostrum bears an angular distal apex (cf. distal apex is rounded in *P. bellum* n. sp.), and (5) two mid-terminal caudal setae (setae IV and V) are simple (cf. these setae broadened, tape-like along their proximal two-thirds).

Pseudomacrochiron acutirostre n. sp. was collected together with *P. bellum* n. sp. at the same locality. In this species the rostrum bears an acutely pointed distal apex, the exopodal segment of female leg 5 bears a patch of spinules, the basis of the female maxilliped is armed with two equally small setae, and the outer margin of the endopod of leg 4 bears an angle. These features are not adjustable to *P. bellum* n. sp. and serve to distinguish it from *P. bellum* n. sp.

Pseudomacrochiron bellum n. sp. is not related to *P. eurydatum* n. sp., since in the latter species the caudal ramus of the female is shorter, 1.90 times longer than wide, the exopodal segment of female leg 5 is longer, 4.50 times longer than wide, and the distal lash of the maxilla bears a cusp on the concave margin.

Pseudomacrochiron eurydatum n. sp.

(Figs. 8–11)

https://zoobank.org/urn:lsid:zoobank.org:act:0711579F-55BC-48DA-B9B6-BCBE90185924

Material examined. 14♀♀, 12♂♂ from washings of a submerged fish trap, Yeosu, south coast of Korea, collected by S. Y. Moon, 16 Sept. 2011. Holotype (♀, MABIK CR00247460) and paratypes (11♀♀, 10♂♂, MABIK CR00247461) have been deposited in the Marine Biodiversity Institute of Korea (MABIK), Seocheon. Dissected paratypes (2♀♀, 1♂♂) are kept in the collection of I.-H. Kim.

Additional material examined. One ♀ (dissected) from intertidal invertebrate burrows (inhabited mainly by shrimps and polychaetes), Ko Sireh, Phuket, Thailand (approximately 07°52′26″N, 98°25′235″E), collected by I.-H. Kim & J.-S. Hong, 12 July 2015.

Etymology. The name of the new species is derived from the Greeks *eury* (= broad) and *dato* (= distribute), referring to its occurrences at two disjunct areas, the southern coast of Korea and Phuket, Thailand.

Female. Body (Fig. 8A) narrow. Body length 1.01 mm in dissected and figured specimen. Mean body length 941 μm (908–1030 μm, n = 10). Prosome 644 μm long, 0.64 times as long as body length. Cephalothorax 412 × 354 μm, with faint dorsal suture line delimiting cephalosome and first pedigerous somite. All prosomal somites bearing blunt posterolateral corners. Urosome (Fig. 8B) 5-segmented. Fifth pedigerous somite 110 μm wide. Genital double-somite 1.75 times longer than wide (161 × 92 μm), narrower than fifth pedigerous somite, consisting of broader anterior two-thirds and narrower posterior third (63 μm wide across this region); broader anterior part with almost straight lateral margins; gen-

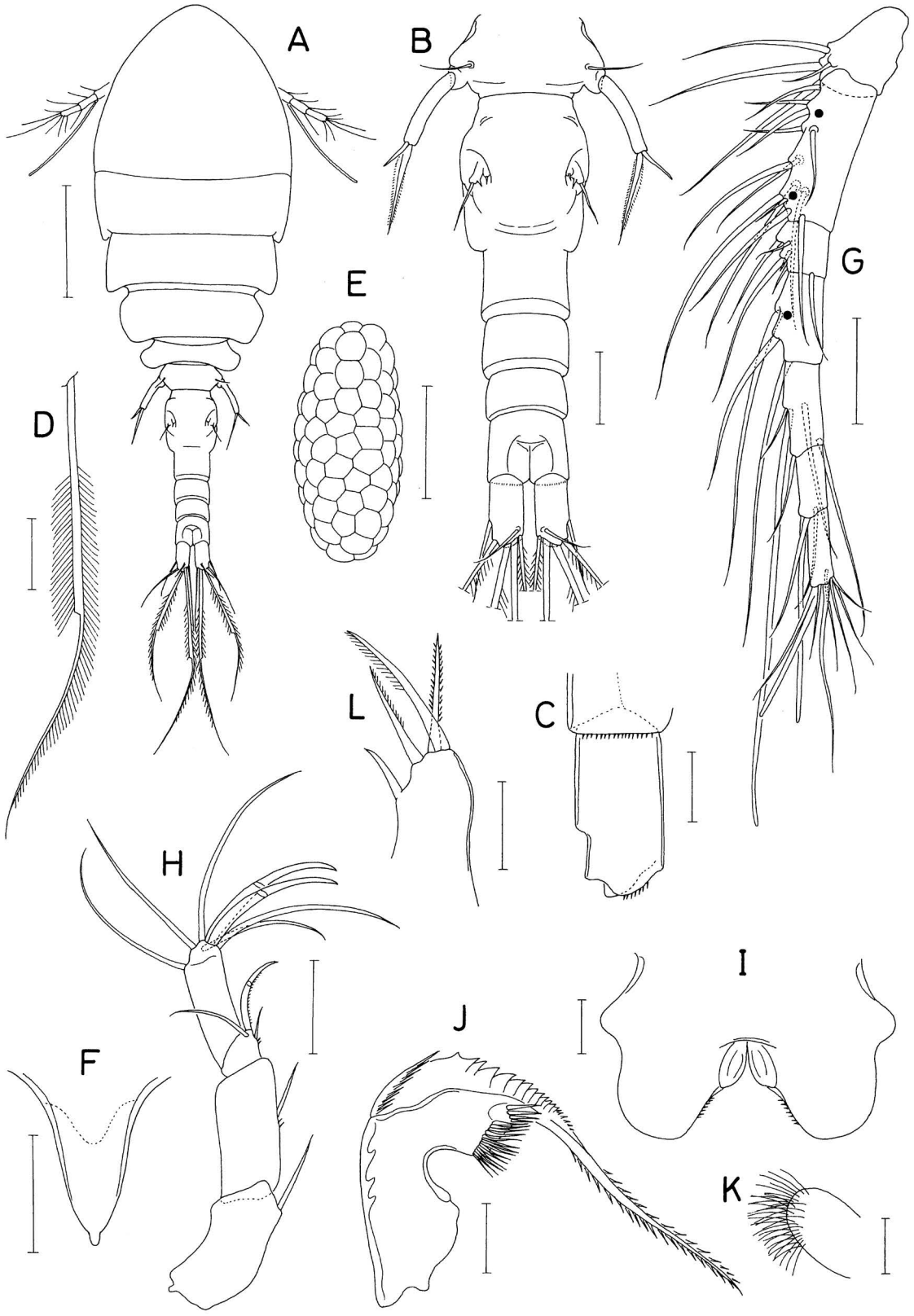


Fig. 8. *Pseudomacrochiron eurydatum* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, right caudal ramus, ventral; D, seta V of caudal ramus; E, egg sac; F, rostrum; G, antennule; H, antenna; I, labrum; J, mandible; K, paragnath; L. maxillule. Scale bars: A, E, 0.2 mm; B, D, F–H, 0.05 mm; C, I, J, L, 0.02 mm; K, 0.01 mm.

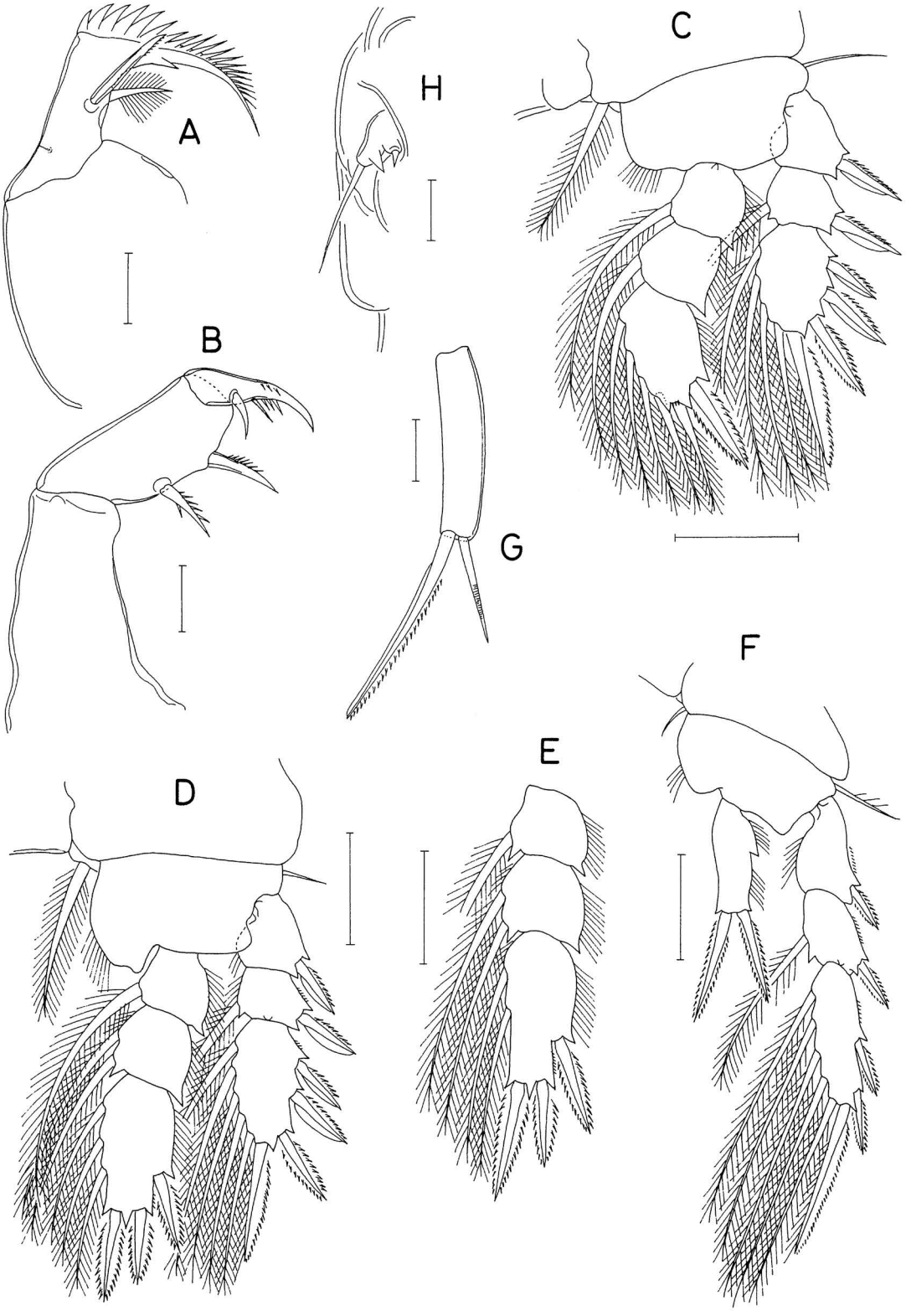


Fig. 9. *Pseudomacrochiron eurydatum* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, exopod of leg 5; H, left genital aperture. Scale bars: A, B, G, H, 0.02 mm; C–F, 0.05 mm.

ital apertures positioned dorsolaterally at anterior third of double-somite length. Three free abdominal somites 38×62, 29×58, and 45×57 μm, respectively. Anal somite with fine spinules along posteroventral margin

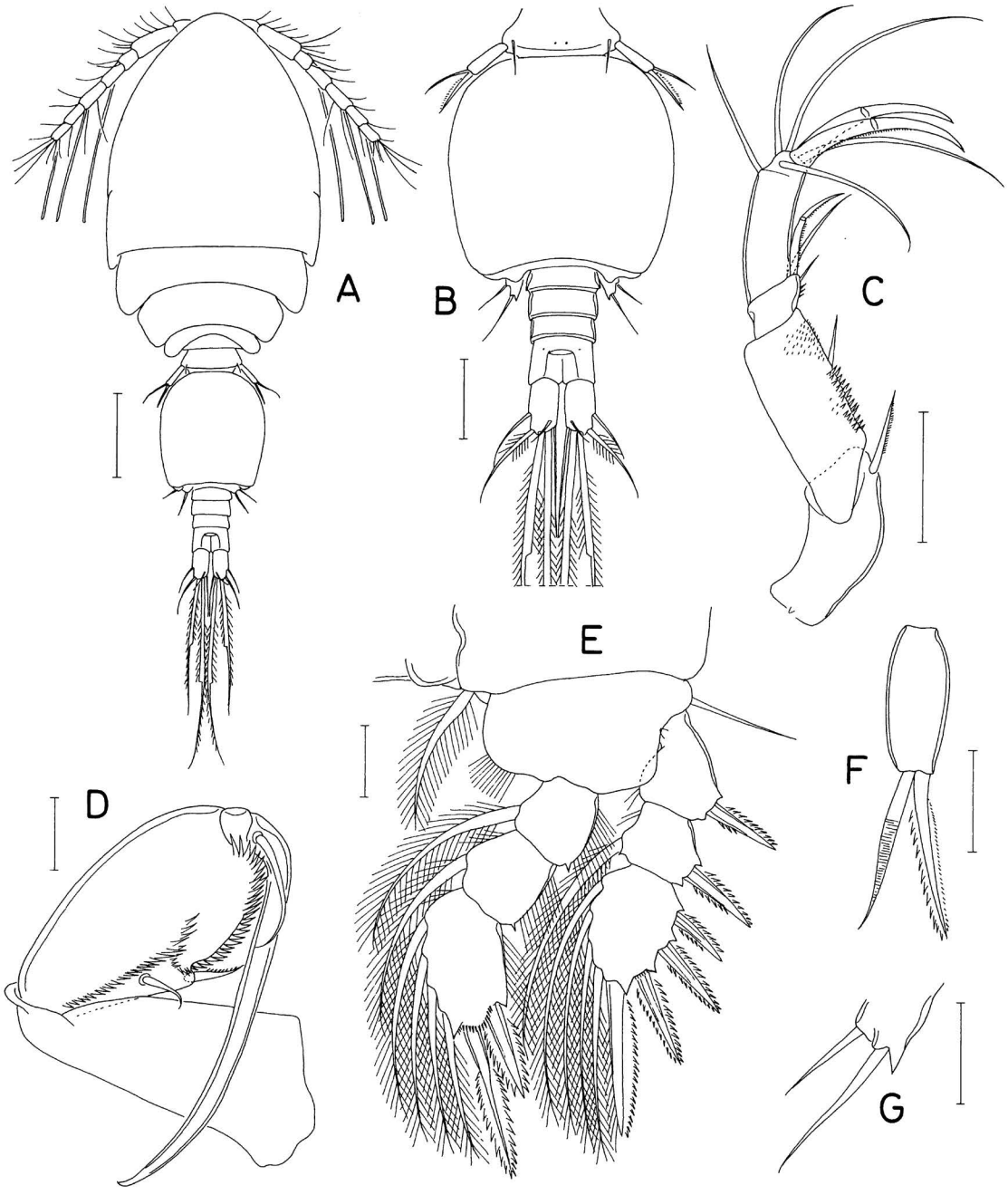


Fig. 10. *Pseudomacrochiron eurydatum* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antenna; D, maxilliped; E, leg 1; F, exopod of leg 5; G, leg 6. Scale bars: A, 0.1 mm; B, C, 0.05 mm; D–G, 0.02 mm.

(Fig. 8C). Caudal ramus (Fig. 8C) 1.88 times longer than wide (49 × 26 μm), armed with 6 setae (setae II–VII), ornamented with several fine spinules on posteroventral margin; outer seta (seta II) positioned at 65% region of ramus length; outer and dorsal setae (setae II & VII) naked, all other setae pinnate; 2 mid-terminal setae (setae IV & V) consisting of broad proximal half and thin distal half (Fig. 8D). Egg sac (Fig. 8E) fusiform, 431 × 196 μm; eggs small, 54 μm in diameter.

Rostrum (Fig. 8F) longer than wide, tapering, with nipple-shaped process at distal apex. Antennule (Fig. 8G) 282 μm long, 7-segmented; armature formula 4, 13, 6, 3, 4 + aesthetasc, 2 + aesthetasc, and 7 + aesthetasc; setae naked, relatively large; aesthetasc on fifth segment much longer than other aesthetascs or setae on antennule. Antenna (Fig. 8H) 4-segmented; armature formula 1, 1,

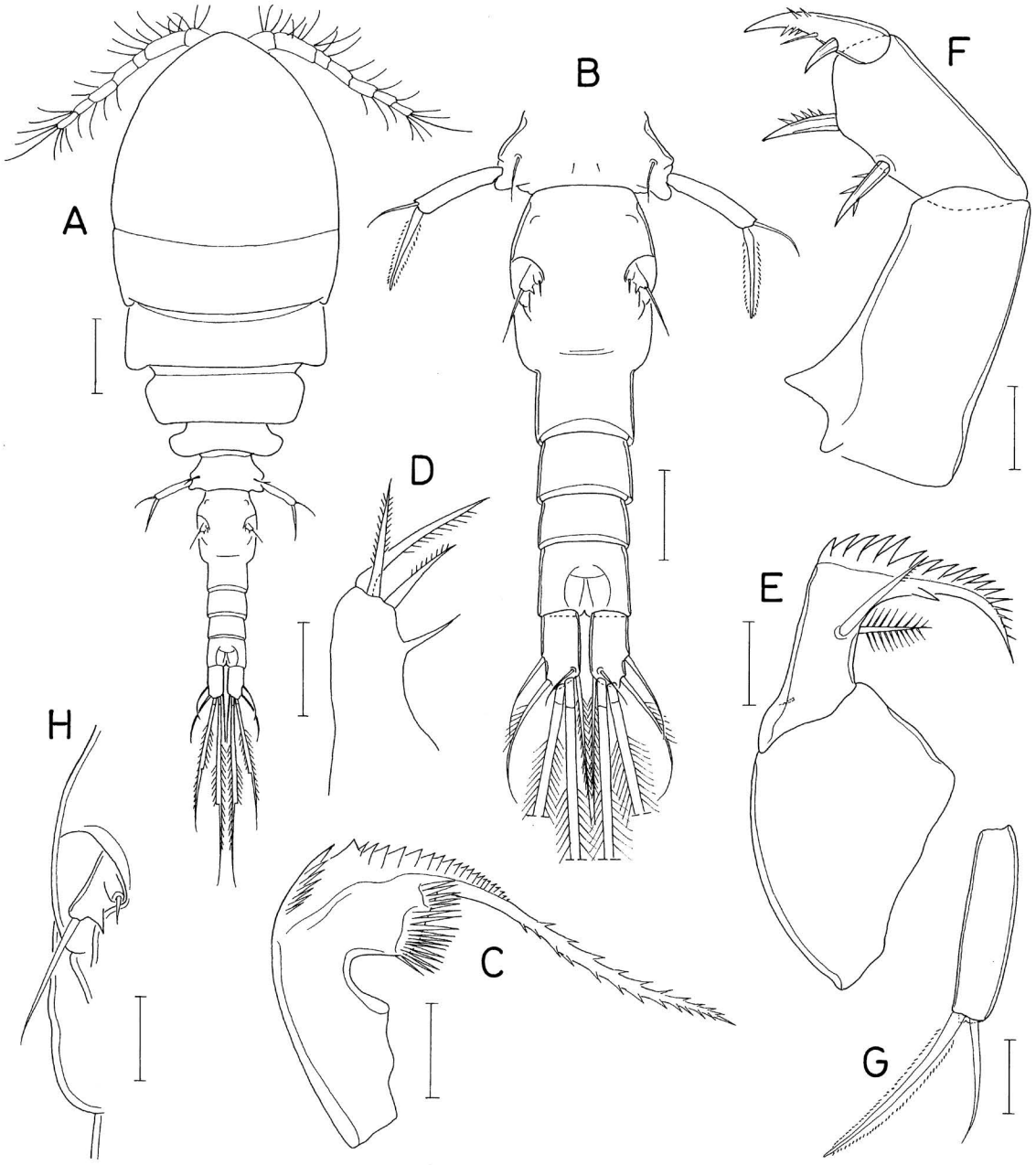


Fig. 11. *Pseudomacrochiron eurydatum* n. sp., female from Phuket. A, habitus, dorsal; B. urosome, dorsal; C, mandible; D, maxillule; E, maxilla; F, maxilliped; G, exopod of leg 5; H, left genital aperture. Scale bars: A, 0.1 mm; B, 0.05 mm; C–H, 0.02 mm.

2 + claw, and 5 + 2 claws; all setae naked; terminal segment (third endopodal segment) 2.77 times longer than wide (61 × 22 μm); 2 terminal spines almost equal in length and thickness, distinctly longer than terminal segment.

Labrum (Fig. 8I) with broad posteromedial incision, finely serrate thin membrane along inner margin of posterolateral lobes. Mandible (Fig. 8J) with broad inner proximal notch and elongate distal lash; inner margin of gnathobase with 18 spinules (proximal group of 14 spinules and distal group of 4 spinules); convex side of gnathobase with row of 8 spinules proximally, followed by row of teeth; distal lash spinulose along both margins, longer than remaining proximal part of mandible. Paragnath (Fig. 8K) as small, densely setulose lobe. Maxillule (Fig. 8L) as small lobe bearing 4 setae; distal 3 setae unequal in length, finely setulose; shortest inner margin seta naked. Maxilla (Fig. 9A) with unarmed syncoxa; basis with pinnate inner seta (seta I), longer, spiniform anterior seta (seta II), and vestigial proximal seta (seta III); distal

lash forming right angle with main axis of basis, longer than proximal part, with 1 cusp on concave margin, about 20 spinules along convex margin, proximal 6 of these spinules thick, tooth-like. Maxilliped (Fig. 9B) 3-segmented; first segment (syncoxa) longest but unarmed; second segment (basis) with 2 spines of equal length (proximal spine ornamented with 1 spinule on its proximal margin and 5 spinules on distal margin; distal spine ornamented with 7 or 8 spinules on its distal margin); small third segment (endopod) with 2 small setae, and terminating in spiniform process bearing 2 rows of 3 fine spinules.

Legs 1–3 (Fig. 9C–E) with 3-segmented rami. Leg 4 (Fig. 9F) with 3-segmented exopod and 1-segmented endopod. Inner coxal seta small, naked in leg 4, but well-developed, pinnate in legs 1–3. Outer seta on basis small, naked in legs 1–3, but feebly pinnate in leg 4. Leg 4 endopod 2.4 times longer than wide (53 × 22 μm); inner margin smooth; outer margin setulose, with 1 distinct cusp near proximal third; 2 distal spines 46 μm (outer) and 56 μm long (inner). Armature formula for legs 1–4 as in other species described in this paper.

Leg 5 (Fig. 8B) consisting of dorsolateral seta on fifth pedigerous somite and free exopod; exopodal segment (Fig. 9G) slender, almost rectangular, 4.50 times longer than wide (63 × 14 μm), with smooth margins, distally armed with 1 spine (70 μm long) and 1 seta (36 μm long). Leg 6 (Fig. 9H) represented 1 cusp, 1 small seta, and 1 longer seta on genital operculum.

Male. Body (Fig. 10A) moderately narrow. Body length 683 μm in dissected specimen. Mean body length 690 μm (638–754 μm, n = 10). Prosome 406 μm long. Cephalothorax 283 × 255 μm; dorsal suture line obscure. Urosome (Fig. 10B) 6-segmented. Fifth pedigerous somite 50 μm wide, much narrower than genital somite. Genital somite 135 × 145 μm. Four abdominal somites 16 × 48, 16 × 45, 14 × 42, and 28 × 43 μm, respectively. Caudal ramus 1.85 times longer than wide (37 × 20 μm), armed as in female.

Antennule different from that of female in having 3 additional aesthetascs at places of dots in Fig. 8G. Antenna (Fig. 10C) with numerous minute spinules on inner surface of first endopodal segment; terminal segment 2.68 times longer than wide (51 × 19 μm).

Labrum, mandible, maxillule, and maxilla as in female. Maxilliped (Fig. 10D) consisting of 3 segments and terminal claw; first segment (syncoxa) narrowing distally, unarmed; second segment (basis) inflated, armed with 2 small setae, distal one of them finely spinulose along its distal margin, ornamented with proximal and distal longitudinal rows of spinules on inner surface; small third segment (endopod) unarmed; terminal claw narrow, bearing 1 seta proximally.

Leg 1 (Fig. 10E) different from that of female in having 2 spines and 4 setae (formula I, I, 4) on third endopodal segment. Legs 2–4 as in female. Leg 5 exopodal segment (Fig. 10F) 2.42 times longer than wide (29 × 12 μm), much shorter than that of female, with convex inner and outer margins; distal spine 34 μm long, distal seta 33 μm long. Leg 6 (Fig. 10G) represented by 2 unequal setae and 1 cusp on distal apex of genital operculum.

Female from Phuket, Thailand. Body (Fig. 11A) as in type specimens in form. Body length 910 μm. Genital double-somite (Fig. 11B) shaped as in female type specimens. Caudal ramus 1.91 times longer than wide (44 × 23 μm).

Rostrum, antennule, antenna, and labrum as in type specimens. Mandible (Fig. 11C) almost identical to that of type specimens, but inner margin of gnathobase bearing proximal group of 12 spinules and distal group of 5 shorter spinules; convex side of gnathobase bearing 7 proximal spinules. Maxillule (Fig. 11D) and maxilla (Fig. 11E) as in type specimens. Maxilliped (Fig. 11F) as in type specimens, but proximal spine on basis ornamented with 1 spinule on its proximal margin and 2 spinules on distal margin; distal spine on basis ornamented with 5 spinules on its distal margin; terminal segment ornamented with 2 spinules on outer margin and 3 spinules on inner margin.

Legs 1–4 as in type specimens. Leg 5 exopodal segment (Fig. 11G) 4.08 times longer than wide (63 × 13 μm); distal spine and seta 54 and 33 μm long, respectively. Leg 6 (Fig. 11H) as in type specimens.

Remarks. As selected diagnostic features of *P. eurydatum* n. sp. for a comparison with its congeners, (1) the caudal ramus is short, with the length/width ratio less than 2.5 : 1; (2) the distal lash of the maxilla bears a cusp on its concave margin; (3) the exopodal segment of female leg 5 is elongate, more than four times as long as wide; and (4) the exopod of female leg 5 is armed with one spine and one seta. Within the genus, only a single species, *P. pocilloporae* recorded from the Pacific coast of Panama (Kim, 2004), shares the above four diagnostic features with *P. eurydatum* n. sp., thus needs to be closely compared with the new species. A careful comparison reveals that differences between the two species are very small but not neglectable, as follows: (1) the lateral margins of the expanded anterior part of the female genital double-somite are consistently straight in both Korean and Thai specimens of *P. eurydatum* n. sp., but rounded in *P. pocilloporae*; (2) the two setae on the basis of the female maxilliped are spinulose in *P. eurydatum* n. sp., but naked in *P. pocilloporae*; (3) the exopodal segment of female leg 5 of *P. eurydatum* n. sp. is shorter than that of *P. pocilloporae*, 4.50 times longer than wide (63 × 14 μm), compared to 5.47 times longer than wide (71 × 13 μm) in the latter species (Kim, 2004); (4) the two distal armature elements on the exopod of female leg 5 are very unequal in length in *P. eurydatum* n. sp. (spine 70 μm long and seta 36 μm long), whereas they are subequal in *P. pocilloporae* (spine 46 μm long and seta 42 μm long). These differences prevent

them from being treated as a same species.

The single female specimen collected at Phuket, Thailand exhibits no significant differences from the female type specimens from Korea. The only noteworthy differences are in the number of spinules on the inner and outer margins of the mandible, in the ornamentation of the spines on the basis of the maxilliped, and in the size of the exopodal segment of leg 5. These differences seem not sufficient to separate them as distinct species. The finding of this species from two remotely separated places may inform that it is widely distributed at least in the Indo-West Pacific.

Conflicts of Interest

These authors of this paper have no affiliation with any interests and is solely responsible for the paper.

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