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A NEW SPECIES OF *XOUTHOUS* THOMSON (COPEPODA: HARPACTICOIDA: PSEUDOTACHIDIIDAE), WIDELY DISTRIBUTED IN THE KOREAN WATERS

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Abstract.— A new species of the genus *Xouthous* Thomson, 1883, previously known as *Idomene*, obtained from the 1995–2015 collections, from the coasts of the Korean Peninsula, is described and illustrated. To date 16 valid species of the genus including *X. yeonghooni* **sp. nov.** presented herein, have been reported from the Antarctic, Atlantic, Indian, and Pacific oceans. The new species can be easily distinguished from its congeners by the combination of the following characters: 7-segmented female antennule; antenna with 2 exopodal segments; mandibular exopod with 2 lateral strong spines and 4 distal plumose setae; exp-3 of P2–P4 with 2 strong pectinate spines; and P5 baseoendopod with truncate margin, and spatulate and parallel-sided setae. In addition to the description of the new species from Korea, comparisons to 5 closely related congeners ("palisade group") from the Indian Ocean are also included. Finally, a mini-review on the global distribution of the genus, with a taxonomic revisit to *X. laticaudatus sensu* Kim (2014), is provided. The new species described herein is the first record of *Xouthous* from East Asia.

Key words.— Biodiversity, Pseudotachidiinae, meiofauna, taxonomy, Pacific

INTRODUCTION

The family Pseudotachidiidae Lang, 1936 was raised to family rank from the subfamily Pseudotachidiinae Lang 1936, previously placed in the family Thalestridae Sars, 1905, by Willen (1999, 2000) in the course of reviewing the Thalestridimorpha Lang, 1948. The family is known as a large taxon comprising 4 subfamilies and 29 genera with worldwide distribution, and as the most abundant taxon from deep-sea sediments in the Angola Basin and the Antarctic Weddell Sea (Willen 2005, 2008). However, only very few pseudotachidiid studies were dedicated to the Korean fauna so far. They yielded 3 species of Donsiellinae Lang, 1944 [*Donsiella bisetosa* Hicks, 1988, *D. limnoriae* Stephensen, 1936 (Kim 2014), and *Pseudonsiella longicaudata* Kim et Kim, 1997 (Kim and Kim 1997, Lee *et al*. 2012), all the three species were washed from decaying wood infested by the isopod, *Limnoria*], 2 species of Danielsseniinae Huys et Gee in Huys *et al*., 1996 [*Sentiropsis coreana* Kim *et al*. 2011 from a shallow sand beach (Kim *et al*. 2011), and *Xylora*

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longiantennulata Kim et Kim, 1997 washed from decaying wood (Kim and Kim 1997, Lee *et al*. 2012)], and 1 species of Pseudotachidiinae [*Xouthous laticaudatus* (Thompson et Scott, 1903) washed from algae (Kim 2014)].

The genus *Xouthous* Thomson, 1883, previously known as *Idomene* Philippi, 1843 was re-established by Huys (2009), with *X. novaezealandiae* Thomson, 1883 collected from Dunedin, New Zealand as its type species. Huys (2009) listed 16 *Xouthous* species, which agrees with that provided by Wells (2007). However, he excluded *Idomene forficata* Philippi, 1843 from the species list of Wells (2007) and included one new species, *X. sarsi* Huys, 2009 for *Idomene forficata sensu* Sars (1906). Most recently, Huys (2016) reviewed the genus *Xouthous* in greater detail (now enclosing 15 species), and included an updated key to the species. Huys (2016) allocated 3 species, *X. antarcticus* (Giesbrecht, 1902), *X. coronatus* (T. Scott, 1894), type species of *Idomenella*, and *X. intermedius* (Lang, 1934) into the genus *Idomenella* T. Scott, 1906. Huys (2016) also relegated 2 species, *X. ferrieri* (T. Scott, 1912) and *X. pusillus* (Brady, 1910) as species *incertae sedis* within the Pseudotachidiidae and added three new species, *X. andamanensis* Huys, 2016 for *X. maldivae* Sewell, 1940 *sensu* Wells and Rao (1987), *X. namibiensis* Huys, 2016 for *X. pectinatus* (Scott et Scott, 1898) *sensu* Kunz (1963), and *X. wellsi* Huys, 2016 for *X. laticaudatus* (Thompson et Scott, 1903) *sensu* Wells (1967). In addition, he reinstated *X. aemula* (Thomson et Scott, 1903), which had formerly been designated as species *incertae sedis* by Wells (2007). Here, we investigated all *Xouthous* materials collected from various habitats of the Korean waters (sand, mud, algae, invertebrates, etc.) from 1995 to 2015 and kept in the collection of Seoul National University. A widely distributed new species was obtained and identified. It is described in full and compared with closely related congeners. Specific identity of the Korean findings of *X. laticaudatus* (Thompson et Scott, 1903) *sensu* Kim (2014) is also discussed. The present record is the fourth from the Pacific and increases the number of known species of the genus to sixteen.

Materials and methods

Samples were collected from macroalgal beds using a light trap, sandy or muddy bottoms by SCUBA diving, macroalgae rinsing or various invertebrates rinsing (bryozoans, molluscs, ascidians, etc.) in the Korean waters including Jeju Island, during the period of 20 years, from 1995 to 2015 (Fig. 1). All specimens were fixed in 95% ethanol. In the laboratory, the samples were thoroughly rinsed on a 38 μm sieve to collect the meiofauna. Harpacticoid copepods were sorted under an Olympus SZ11 (Tokyo, Japan) stereo microscope. Specimens were then cleaned and dissected in lacticacid. Dissected appendages were mounted on slides in lactophenolas a mounting medium, and the slide preparations were sealed with transparent nail varnish. All drawings were prepared using a drawing tube on an Olympus BX53 (Tokyo, Japan) differential interference contrast microscope equipped with Nomarski optics.

The descriptive terminology is adopted from Huys and Boxshall (1991) and Huys *et al*. (1996). Abbreviations used in the description of taxon are: ae, aesthetasc; exp, exopod; enp, endopod; P1–P6, first to sixth thoracopod; exp(enp)-1(2, 3) to denote the proximal (middle, distal) segment of a ramus. The term acrothek is the trifid seta complement found on the distal antennulary segment. Scale bars are in micrometer (μm). All type specimens are deposited in the collection of the Natural Institute of Biological Resources (NIBR), Incheon, Korea. Additional materials were stored in Seoul National University, Seoul, Korea.

Taxonomy

Order **Harpacticoida** Sars, 1903
Family **Pseudotachidiidae** Lang, 1936
Subfamily **Pseudotachidiinae** Lang, 1936
Genus ***Xouthous*** Thomson, 1883

Xouthous yeonghooni sp. nov.
[Korean name: Yeong-Hoon-K-Su-To-S-No-Beol-Re]
(Figs 2–7)

Locus typicus. Myungsa, Goeje Island, Korea (34°43'38"N, 128°36'02"E) at 4 m depth, using a light trap.

Type material. Adult female holotype (NIBRIV0000848284), Myungsa, Goeje Island, Korea, coll. Dr. Sung Joon Song, 11 April 2011, and male allotype (NIBRIV0000848283), both fully dissected and distributed over 16 and 13 slides, respectively. Paratypes: five females and seven males, not dissected, ethanol preserved in one vial (NIBRIV0000848282).

Additional material. 1 female, 4 males (1 juv.), 1 May 1995, same as type locality; 1 female, 1 male, 3 May 1995, Dongho-ri, Goeje (34°48'25"N, 128°35'02"E); 6 (2 ovi.) females, 1 male, 15 Jun. 1996, Sungsanpo Beach, Jeju Is. (33°27'42"N, 126°56'19"E); 1 female, 26 Jul. 1997, Guryongpo 6-ri, Pohang city (35°59'34"N, 129°34'01"E); 1 (ovi.) female, 1 male, 8 Oct. 1998, Gampo, Gyeongju city (35°44'37"N, 129°29'08"E) from sea grass, *Phyllospadix iwatensis* Makino, 1931; 1 female, 3 May 2000, Hagosu-dong, Udo (33°30'48"N, 126°57'31"E), Jeju Is.; 4 (2 ovi.) females, 13 Oct. 2000,

Daebon-ri, Gampo, Gyeongju city (35°44'22"N, 129°29'04"E); 1 male, 8 Nov. 2000, Udo, Jeju Is. (33°30'08"N, 126°56'34"E); 1 female, 23 Feb. 2001, Chaguido, Jeju Is. (33°18'29"N, 126°09'04"E); 3 females, 1 male, 17 Aug. 2001, Chaguido, Jeju Is. (33°18'29"N, 126°09'04"E) from ascidians rinsing; 3 females, 4 males, 23 Feb. 2001, Chaguido, Jeju Is. (33°18'29"N, 126°09'04"E) from bryozoans; 1 female, 1 male, 21 Aug. 2000, Moonseom, Jeju Is. (33°13'39"N, 126°34'03"E) from holdfast of brown alga, *Ecklonia cava* Kjellman, 1885; 4 females, 3 males, 12 Oct. 2002, Supseom, Jeju Is. (33°13'48"N, 126°35'44"E) from bryozoans; 7 females, 5 males, 28 Oct. 2005, Moonseom, Jeju Is. (33°13'39"N, 126°34'03"E) from gastropods; 1 female, 22 Oct. 2007, Yeongok, Gangneung city (37°51'43"N, 128°51'36"E), 25 m depth, sandy bottom; 2 females, 12 Dec. 2007, ditto; 5 females, 28 Apr. 2009, same as type locality, using a light trap; 2 females and 6 males, 19 Jun. 2009, Mongsanpo, Taean, (36°39'45"N, 126°17'09"E) from tidal pool; 3 female, 2 males, 7 Apr. 2011, same as type locality; 3 females, 3 males, 18 May 2012, Hongdo Is., Gyungnam (34°32'09"N, 128°43'57"E) from algae; 1 female, 17 Aug. 2012, Patseom, Namhae, (34°44'19"N, 128°03'37"E) from ascidian; 5 females, 2 males, 8 Nov. 2012, Haegando Is., Tongyeong city (34°51'57"N, 128°28'01"E) from *Ulva* sp.; 7 (1 ovi.) females, 2 males, 27 Apr. 2013, Jongdal-ri, Jeju Is. (33°28'58"N, 126°54'20"E) from algae; 1 female, 30 Jun. 2014, Sondeok, Tongyeong city (34°54'08"N, 128°25'27"E); 2 females, 8 Oct. 2014, Yeonmyung-ri, Tongyeong city (34°46'37"N, 128°23'46"E); 2 females, 2 males, 22 Dec. 2014, Sadeung, Tongyeong city (34°54'54"N, 128°30'57"E); 1 female, 9 May 2015, Yeonmyung-ri, Tongyeong city (34°46'37"N, 128°23'46"E); 3 females, 1 male, 6 Jul. 2015, ditto.

Etymology. The species is named after Dr. Yeong-Hoon Kang, an ichthyologist of Korea, who first introduced the taxonomic world to the first author (SJS) in 1987.

Differential diagnosis. *Xouthous yeonghooni* sp. nov. is similar to *X. aemula* and *X. wellsi* in having 7-segmented antennule (female), 2-segmented antennal exopod (female and male), and truncate P5 baseoendopod (female) with spatulate and parallel-sided setae. However, the new species is easily distinguished from those species by the 2 strong spines (heavily pectinate) on exp-3 of P2–P4 in both sexes and the female P5 exopod much longer than baseoendopod.

Description of female (holotype). Habitus shield-shaped. Total body length 430–645 μm (mean=534,

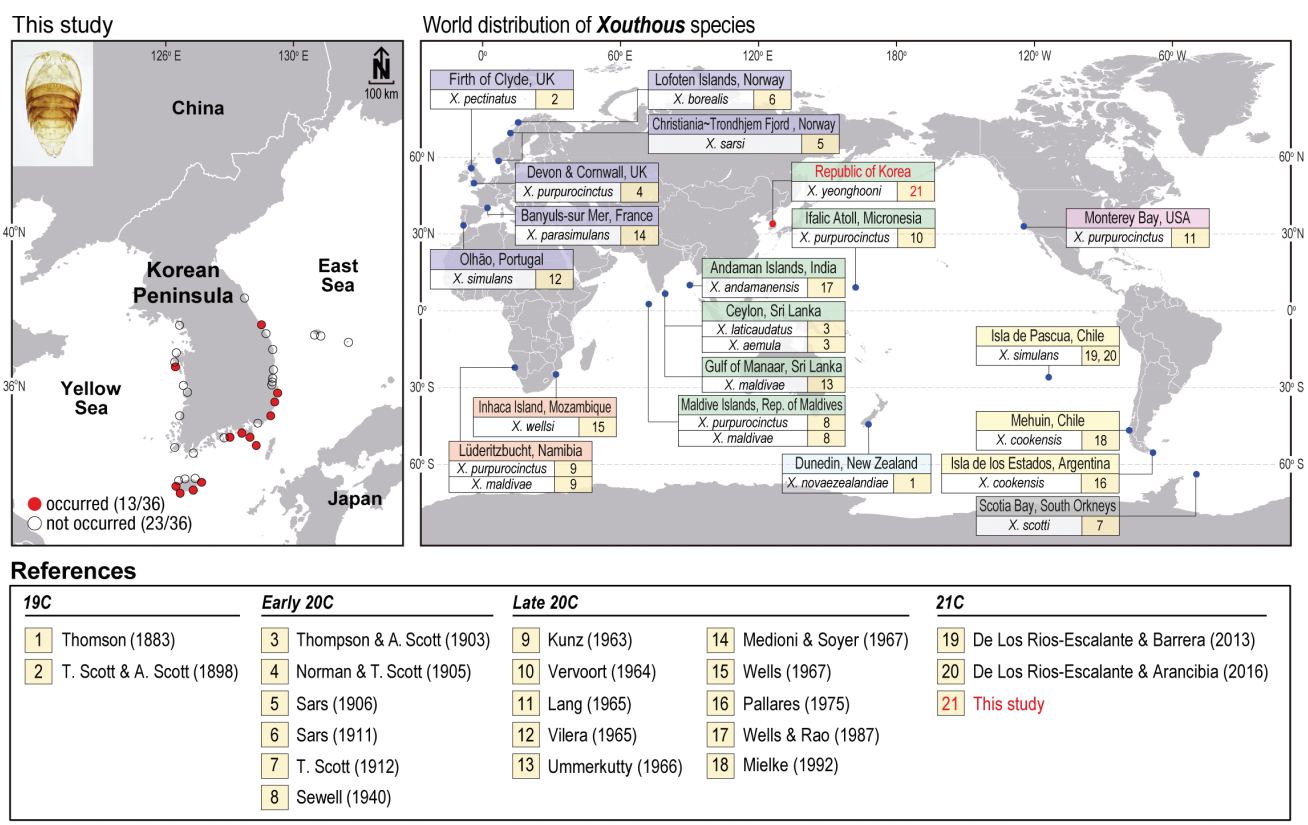

Figure 1. Map showing the study area and sampling locations in the Korean waters, with the occurrence of *Xouthous yeonghooni* sp. nov. (this study), and the worldwide distribution of the genus *Xouthous*.

n=11), measured from the anterior margin of the rostrum to the posterior margin of the caudal rami. Urosome gradually tapering posteriorly. Cephalothorax wider than long, with few integumental sensilla on surface as in Fig. 2; posterior border smooth without ornamentation. Pedigerous somites dark red in colour, with smooth border line and with small granules along posterior surface.

Urosome (Figs 2A, 6A) 5-segmented, comprising P5-bearing somite, genital-double somite, 2 free abdominal somites, and anal somite. Genital double-somite (Figs 2A, 6A) about 2.0 times wider than long, with transverse surface ridges dorsally and laterally, representing original segmentation. P6 (Fig. 6A) represented by 1 small seta on single plate over gonopores. Two small pores on genital double-somite midventrally. Third and fourth urosomites with 2 crenulate lines ventrally. Anal somite (Fig. 6A) with deep cleft medially, ventrally with a pore on surface and a setule row along posterior margin. Caudal ramus (Figs 4D, 6A) about 1.28 times wider than long, with 2 setular rows on inner surface and 3 outer distal setules; setae I and II bare, seta III with a little swollen base, setae IV–VI situated distally, and seta VII tri-articulate on inner surface.

Antennule (Fig. 7A) 7-segmented; segment1 small, with bipinnate seta distally, and with 2 setular rows on proximal surface and along outer margin; segment 2 longest; segment 4 with aesthetasc fused to a bare seta on pedestal distally; segment 6 shortest. Setal formula as follows: 1-[1 bipinnate], 2-[9 bipinnate], 3-[7 bipinnate], 4-[5 bipinnate + ae (1 bare+ae)], 5-[2 bipinnate + 1 bare], 6-[4 bare], 7-[5 bare + acrothek (2 bare + ae)].

Antenna (Fig. 7B, C) 3-segmented, comprising coxa, allobasis (fused basis and first endopodal segment), and free endopodal segment. Coxa small, without ornamentation. Allobasis longer than endopod and bearing an abexopodal seta, with 2 spinular rows on inner margin and on posterior surface. Endopod with 3 longitudinal spinular rows (1 anterior and 2 posterior) and 1 transverse hyaline frill subapically. Subdistal armature (Fig. 7C) consisting of 1 serrate spine, 1 pinnate spine, 1 pinnate seta, and 6 spinules; distal armature consisting of 1 pinnate spine, 4 geniculate setae, and 1 pinnate seta. Exopod 2-segmented and slightly shorter than endopod; proximal segment short with 2 bipinnate setae, distal one with a setule row distally, 2 lateral bipinnate and 2 distal bipinnate setae.

Mandible (Fig. 3A) with well-developed gnathobase bearing several bicuspidate teeth distally and 1 long seta in dorsal corner as figured; anterior surface with a long setule row. Palp comprising basis and 1-segmented exopod and endopod. Basis ornamented with long and short setule rows on anterior surface, and with 4 long plumose setae. Exopod slightly shorter than endopod, with 2 lateral strong spines and 4 distal plumose setae. Endopod with 2 lateral plumose setae, and 1 plumose and 6 bare setae distally.

Maxillule (Fig. 3B). Praecoxa without ornamentation. Arthrite well-developed, with 11 distal spines/setae, 1 posterior and 2 anterior surface setae. Coxa with a posterior setule row subdistally, and with 2 lateral and 5 distal plumose setae. Basis with a setule row subdistally, with 1 bare and 2 lateral and 4 distal plumose setae. Exopod with 2 setule lines on inner margin and with 2 lateral and 2 apical plumose setae. Endopod slightly shorter than exopod, with a setule line along outer margin, and with 3 plumose setae.

Maxilla (Fig. 3C). Syncoxa without ornamentation, and with 3 endites; proximal endite divided from syncoxa, with 1 proximal apical seta arising from bulb-like pedestal bearing small spinules and 2 long setules, and 2 long setae; middle and distal endites fused to syncoxa and with 2 and 3 long setae, respectively. Allobasis

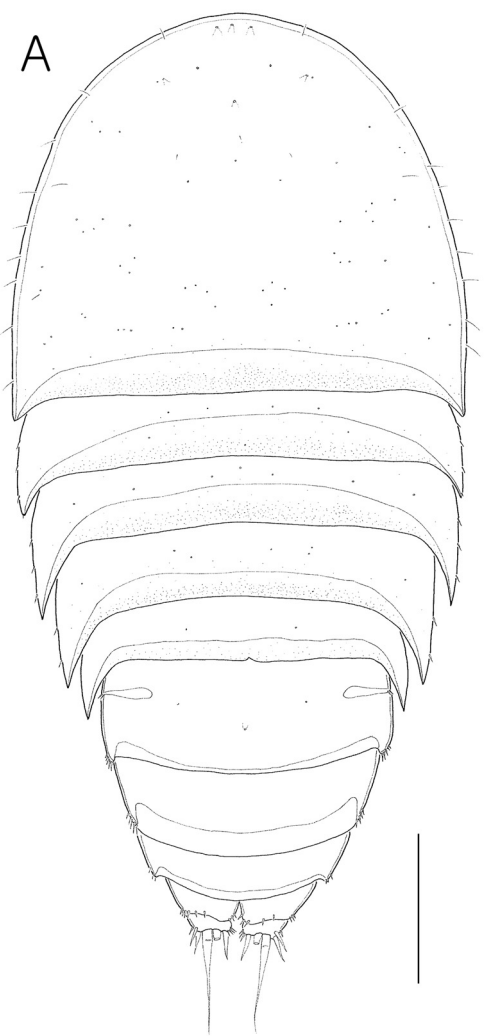

Figure 2. *Xouthous yeonghooni* sp. nov. holotype female. (A) habitus, dorsal. Scale bar: 0.1 mm.

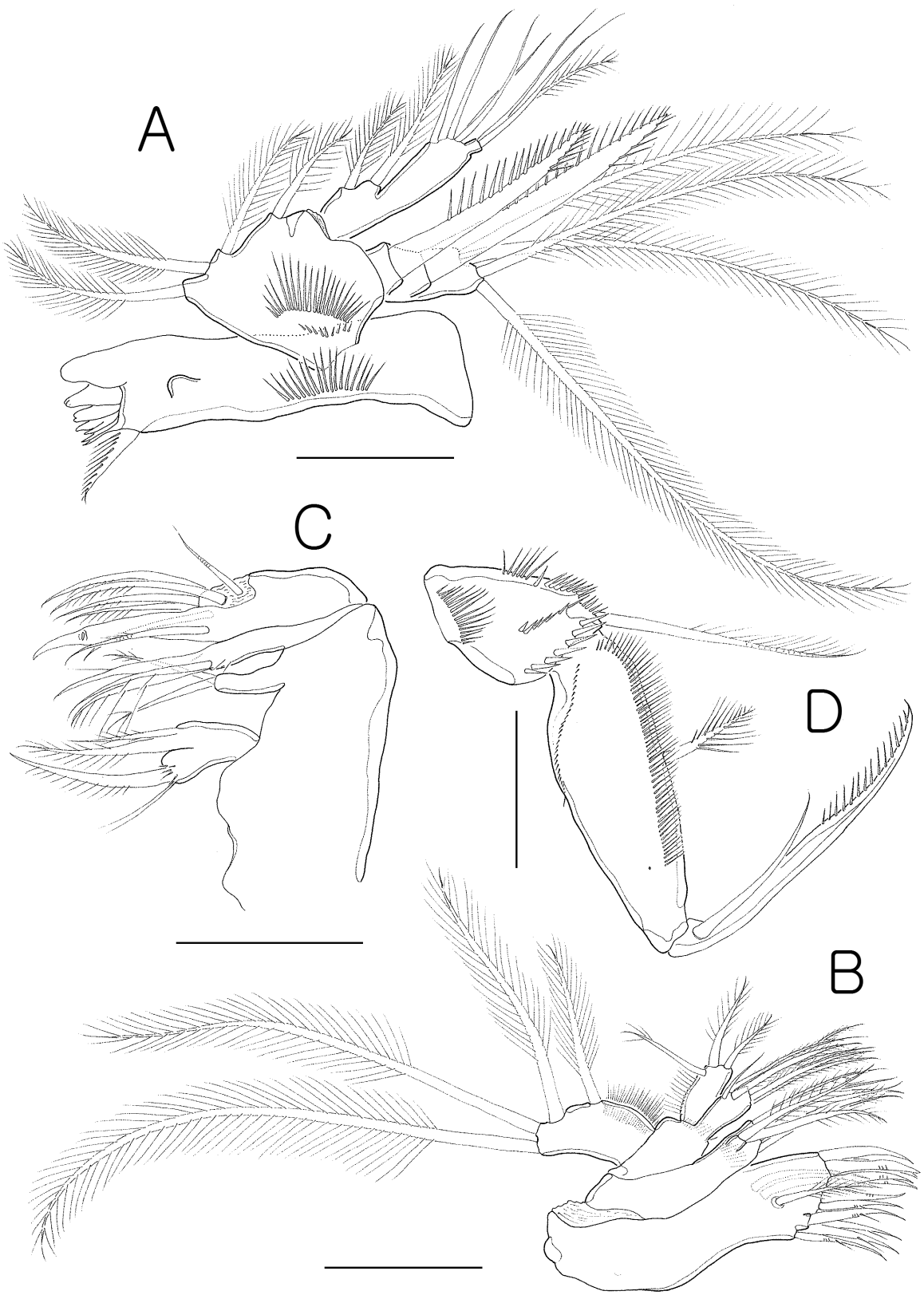

Figure 3. *Xouthous yeonghooni* sp. nov. holotype female. (A) mandible; (B) maxillule; (C) maxilla; (D) maxilliped. Scale bars: 0.03 mm.

drawn out into strong claw with 2 accessory setae; Endopod represented by 5 pinnate setae.

Maxilliped (Fig. 3D). Well-developed, subchelate. Syncoxa with spinular rows as depicted, and with 1 long uniplumose seta distally. Basis elongated with strong spinular row along palmar margin and an outer spinular row proximally, with 1 plumose seta on palmar margin. Endopod represented by a slender claw, which is unipinnate at its distal half; accessory armature consisting of 1 long bare seta.

P1 (Fig. 4A). Coxa ornamented with 2 spinular rows along outer margin and on anterior surface, several minute spinules near outer distal angle, and a small pore on anterior surface. Basis with 1 bipinnate inner and 1 plumose outer seta, with spinules at insertion of both setae and on inner surface, and a pore on anterior surface. Exopod 3-segmented, much shorter than enp-1; exp-1 with outer spinules, and 1 outer bipinnate spine; exp-2 slightly longer than exp-1, with outer spinules, 1 outer bipinnate spine, and 1 plumose inner seta; exp-3 shortest, with outer and distal spinules, and with 2 geniculate setae being plumose at their distal halves and 3 uniplumose setae distally. Endopod 2-segmented; enp-1 large and broad, ornamented with spinular rows as shown and 1 pore on anterior surface in distal fourth, and with 1 long plumose inner seta in proximal third; distal segment much smaller than enp-1, about 2.7 times as long as broad, with few spinules on outer distal corner, 1 bipinnate seta laterally, 1 bare seta, 1 geniculate, and 1 biserrate claw distally.

P2 (Fig. 4B, Table 1). Praecoxa very small and unarmed. Coxa wider than long with 5 spinular rows and 1 pore on anterior surface. Basis much wider than long, with spinules on outer and distal margins, 1 long setule row between exopod and endopod, and with 1 bipinnate outer spine. Exopod 3-segmented, all segments subequal in length; exp-1 with spinules on outer margin and 1 short setule row distally, with 1 bipinnate outer spine and 1 bipinnate inner seta; exp-2 with outer spinules and 1 short setule row distally, with 1 bipinnate outer spine and 1 plumose inner seta; exp-3 with spinules on outer and distal margins, 2 strong spines (heavily pectinate on inner side and pinnate outer side) and 1 bipinnate outer spine, 1 bipinnate and 1 plumose seta distally, and 2 plumose inner setae. Endopod 3-segmented, swollen and much longer than exopod; enp-1 shortest, with outer spinules and 1 plumose inner seta; enp-2 with outer spinules and 2 plumose inner setae; enp-3 longest, with spinules on outer and distal margins, 1 subapical pore on anterior surface, 1 outer bipinnate spine, 1 plumose seta and 1 bipinnate spine distally, and 2 inner plumose setae.

P3 (Fig. 5A, B, Table 1). Coxa wider than long, with 4 spinule/setule rows and 1 pore. Basis much wider than long, with outer spinules and several small spinules between exopod and endopod, 1 pore, and 1 outer bare seta. Exopod 3-segmented; all three segments similar to those of P2, except for 3 plumose inner setae on exp-3. Endopod 3-segmented, swollen and as long as exopod; enp-1 similar to that of P2; enp-2 with outer spinules and 1 plumose inner seta; enp-3 longest, with spinules on outer and distal margins, and 2 spinule rows posteriorly, 1 subapical pore on anterior surface, 1 bipinnate outer spine, 1 plumose seta and 1 bipinnate distal spine, and 3 plumose inner setae.

P4 (Fig. 5C, Table 1). Coxa wider than long with 3 spinule/setule rows and 1 pore. Basis wider than long, with spinules near outer seta and setule row between exopod and endopod, 1 pore on outer surface, and with 1 bare outer seta. Exopod 3-segmented; exp-1 strongly narrowed as depicted, with outer spinules near bipinnate outer spine, fine setules along distal margin, and 1 plumose inner seta; exp-2 and exp-3 as in P2. Endopod 3-segmented, as long as exopod; enp-1 shortest, with outer spinules and 1 plumose inner seta; enp-2 with outer spinules and 1 plumose inner seta; enp-3 longest, with spinules on outer and distal margins, 1 outer bipinnate spine, 1 plumose seta and 1 bipinnate spine distally, and 2 plumose inner setae.

P5 (Fig. 4C) with completely separated baseoendopod and exopod. Baseoendopod broad, with 5 oblique setular rows on inner surface, 1 bigger setular row proximally, and 2 tiny setular rows distally, and with 5 strong distal spines; outer basal plumose seta with long "lash" distally as depicted. Exopod clearly protruding beyond apical margin of baseoendopod, with 5 bipinnate spines: 2 outer, 2 distal, and 1 inner spines.

Description of male (allotype). Total body length 379–597 μm (mean=518, n=6), measured from anterior margin of rostrum to posterior margin of caudal rami (Fig. 6B). Urosome gradually tapering posteriorly. Cephalothorax wider than long, with few sensilla on dorsal surface as shown in Fig. 6A; posterior border smooth without ornamentation. Pedigerous somites dark in colour as in female, with smooth border line and with small granules on dorsal surface.

Urosome (Fig. 6B) 6-segmented, comprising P5-bearing somite, genital somite, 3rd to 5th urosomites, and anal somite. Genital somite to 5th urosomite with distal setular rows laterally and dorsally; 5th urosomite with strong teeth in middle.

P6 (Fig. 6C) represented by 2 bare setae and 1 strong bipinnate spine bearing big setules on both sides.

Table 1. Setal formula of swimming legs of *Xouthous yeonghooni* sp. nov.

Thoracopod	Exopod	Endopod
P2	1 1 223	1 2 221
P3	1 1 323	1 1 321
P4	1 1 323	1 1 221

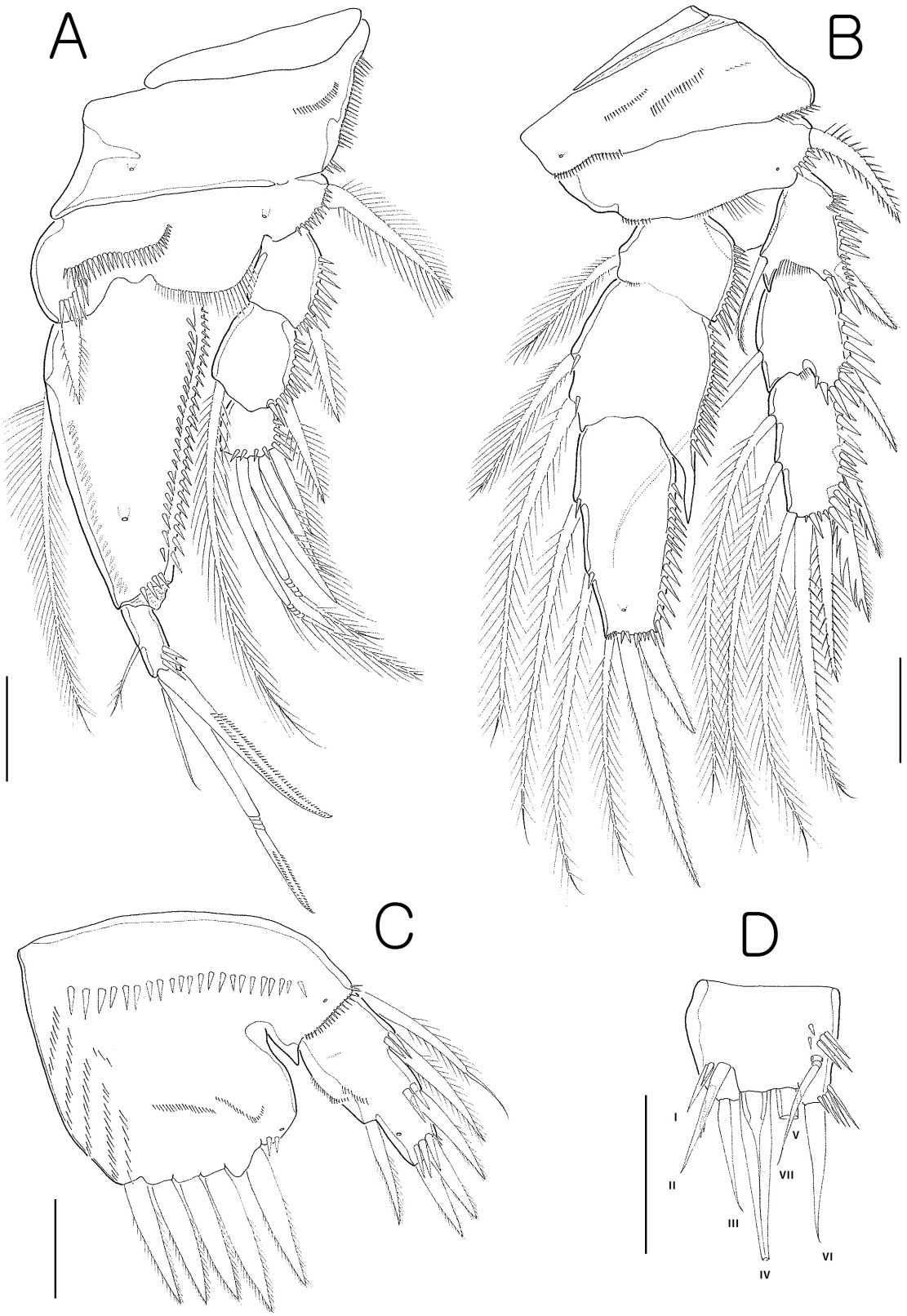

Figure 4. *Xouthous yeonghooni* sp. nov. holotype female. (A) P1; (B) P2; (C) P5; (D) caudal ramus, dorsal. Scale bars: 0.03 mm.

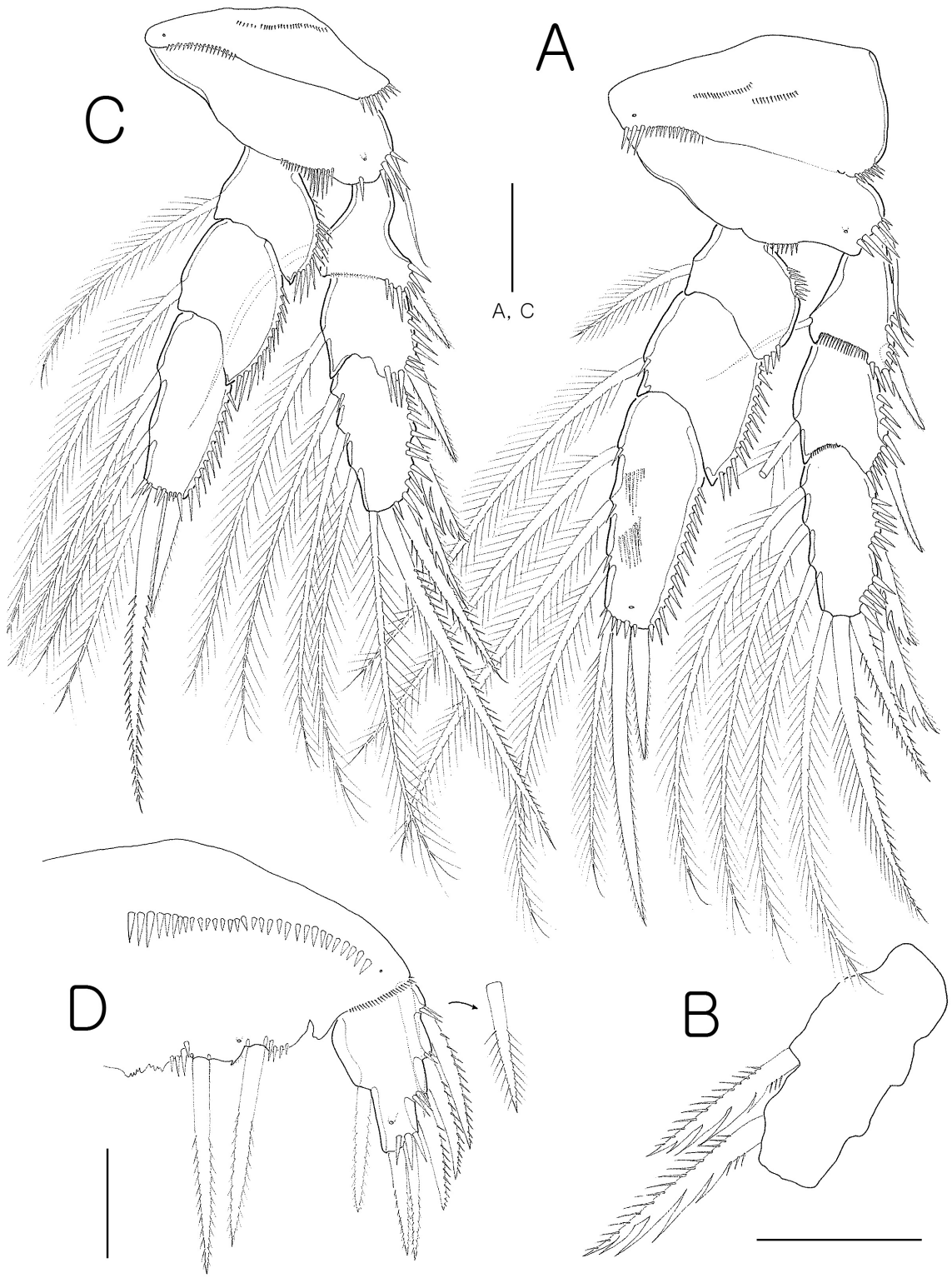

Figure 5. *Xouthous yeonghooni* sp. nov. (A–C) holotype female, (D) allotype male. (A) P3; (B) P3 exopod, distal segment, right; (C) P4; (D) P5. Scale bars: 0.03 mm.

Antennule (Fig. 7D) 7-segmented; chirocer, with geniculation between segments 4 and 5; segment 1 with 2 spinular rows on anterior surface and 1 bare seta; segment 2 shortest with 1 plumose seta; segment 3 with 6 setae anteriorly and 5 setae posteriorly; segment 4 small with 3 bare setae, 1 short pinnate seta, and 1 aesthetasc; segment 5 with 2 bare setae; segment 6 much swollen with 9 bare setae and 1 aesthetasc; segment 7 elongate with 1 bare seta.

Antenna, mouth appendages, and P1, P2, P4 as in female.

P3 (Fig. 5B). Exopod as long as endopod. Exopod as in female, except for 2 heavily pectinate outer spines slightly bigger than those of female.

P5 (Fig. 5D) with separated baseoendopod and exopod. Baseoendopod confluent, with strong setule row on anterior surface, with 2 long bipinnate distal setae accompanied by setules around each seta; with outer basal bipinnate seta. Exopod much longer than wide, with 6 bipinnate setae, 3 outer, 2 distal, and 1 inner setae.

Distribution. Korea (all coasts including Jeju Island, Fig. 1).

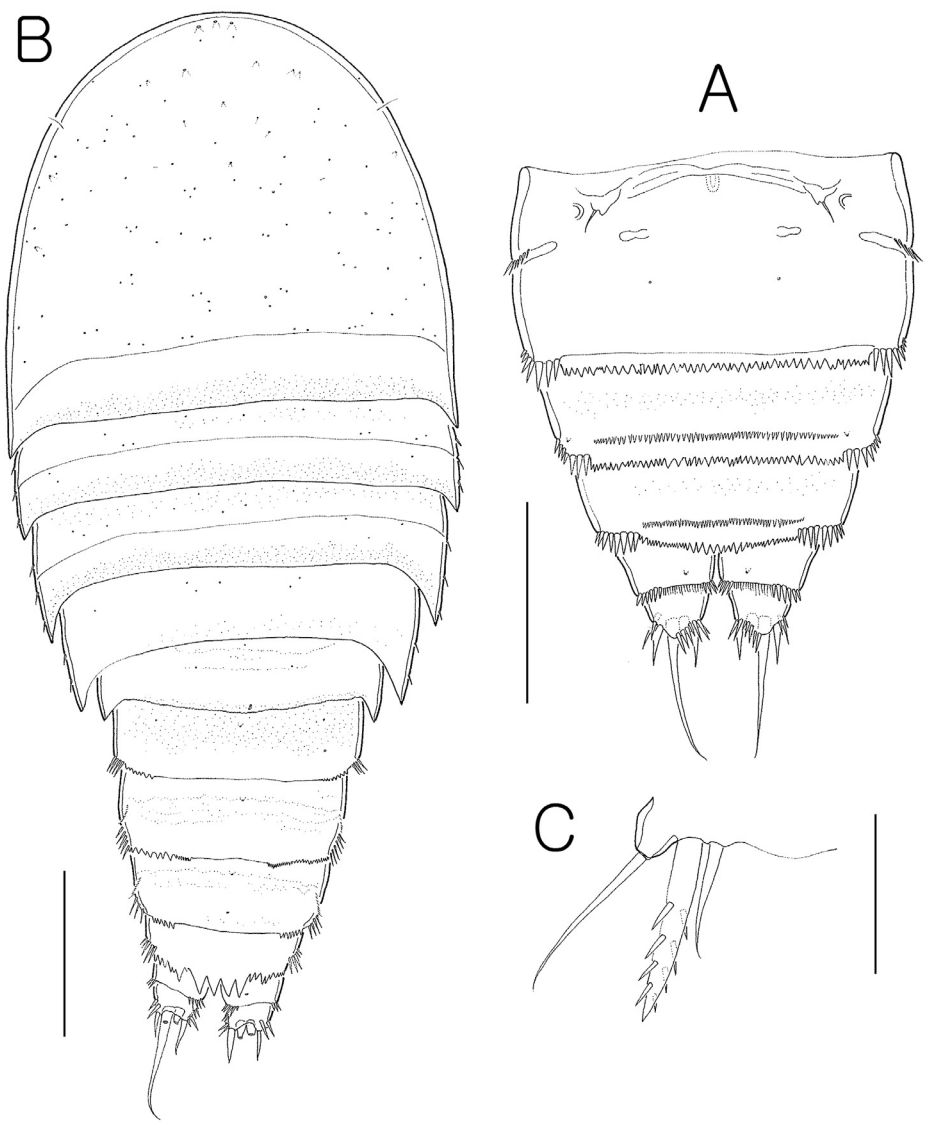

Figure 6. *Xouthous yeonghooni* sp. nov. (A) holotype female, (B–C) allotype male. (A) urosome, ventral (excluding P5-bearing somite); (B) habitus, dorsal; (C) P6. Scale bars: 0.1 mm (A, B), 0.03 mm (C).

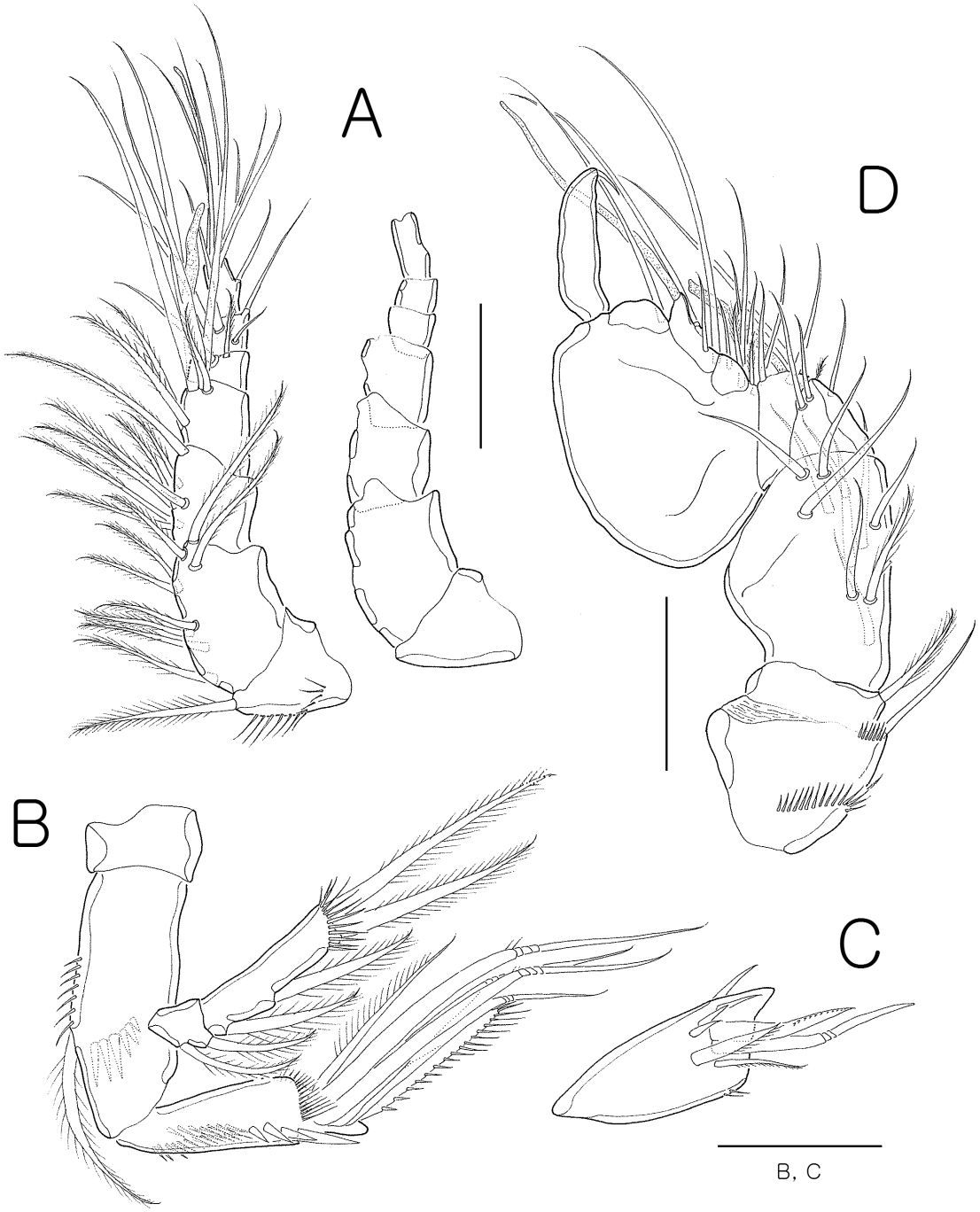

Figure 7. *Xouthous yeonghooni* sp. nov. (A–C) holotype female, (D) allotype male. (A) antennules; (B) antenna; (C) antennal endopod, ventral; (D) antennule. Scale bars: 0.03 mm.

Discussion

The new species, *Xouthous yeonghooni* is the 16th species to be placed in the genus *Xouthous* based on the following characteristics: dorsoventrally depressed body, very small and almost vestigial rostrum, 7-segmented antennule, P1 enp-1 longer than exopod, 3-segmented P2–P4 exopod, and P2–P4 exp-3 with 7, 8, 8 setae/spines.

Huys (2016) provided a new identification key to the species of *Xouthous* and divided the genus into two groups based on the body shape (teardrop-shaped vs shield-shaped), presence of colour pattern on pedigerous somites 2–4, and the number of segment of

P1 endopod (2 vs 3). *Xouthous yeonghooni* sp. nov. belongs to the "guttiform group", having the tear drop-shaped body form, dark redcolour on pedigerous somites 2–4, and a 2-segmented P1 endopod.

Within the "guttiform group"the new species along with 5 closely related congeners belong to the "palisade group" defined herein. All the six species share the characters as follows: 2-segmented antennal exopod, 2-segmented P1 endopod, P1 endopod with 2 claws and 2 setae (the character state is unknown in *X. aemula*), P5 baseoendopod in female with truncate distal margin, and spatulate and parallel-sided setae/spines (see Table 2). In all of these species female has 5 setae/spines on P5 exopod, while in *X. wellsi* the innermost seta is fused to the exopod; this seta is separated from the segment in other species. P5 exopod is much longer than baseoendopod in *X. andamanensis*, *X. maldivae*, and *X. yeonghooni* sp. nov., while *X. aemula* and *X. laticaudatus* have short exopod. The new species has several oblique setular rows on the inner surface of P5 baseoendopod, similarly to *X. aemula*, *X. andamanensis*, and *X. laticaudatus* (*X. purpurocinctus sensu* Norman and Scott, 1905 from Devon and Cornwall, England, and *X. purpurocinctus sensu* Lang, 1965 from Monterey Bay, U.S.A. as well), while *X. maldivae* has no oblique setular rows on the inner surface, and *X. wellsi* has two oblique rows on the outer surface, exceptionally. In Wells' illustration (1967) of *X. wellsi*, male P5 has 6 setae on exopod and 2 setae on baseoendopod, the same as in the present new species. However, the outer seta on the baseoendopod is longer than the inner one in *X. wellsi*, while the inner seta is slightly longer than the outer one in *X. yeonghooni*.

Species of *Xouthous* including the new species usually have a 7-segmented antennule, while 6-segmented antennules appear in *X. laticaudatus, X. maldivae* and *X. andamanensis*. Almost all species in the genus have been described and illustrated before the 1980s, and the mouthparts characters (especially the

Table 2. Morphological characteristics of the species within "palisade group" of *Xouthous*

	X. aemula	*X. wellsi*	*X. laticaudatus*	*X. maldivae*	*X. andamanensis*	*X. yeonghooni* sp. nov.
Female body length	0.4 mm	?	0.6 mm	0.60–0.62 mm	0.55 mm	0.43–0.65 mm
Male body length	–	?	–	–	–	0.38–0.60 mm
No. of A1 segments	7	7	6	6	6	7
Mandibular exopod	2 ssp + 4 pls	–	2 ssp + 4 pls	2 ssp + 3 pls	2 ssp + 4 pls	2 ssp + 4 pls
No. of setae on P5 (♀) exp/benp	5/5	5/5	5/5	5/5	6/5	5/5
innermost seta on P5 (♀) exp	separated	fused	separated	separated	separated	separated
length of P5 (♀), exp vs. benp	<	≈	<<	>>	>>	>>
No. of setae on P5 (♂) exp/benp	–	5/2	–	–	–	5/2
Distribution	Gulf of Manaar (Indian)	Mozambique (Indian)	Gulf of Manaar, Addu Atoll of Maldive Archipelago (Indian)	Maldive Islands, Gulf of Manaar (Indian)	Andaman Islands (Indian)	Korea (Pacific)
Habitat	pearl oyster washing	Detritus sand, 5 m depth	pearl oyster washing	weed washing in	algal sands rich detritus, fine to medium sands, mixture of siliceous and coralline particles	algal bed, invertebrates rinsing, tidal pool etc. 1–20 m depth
References	Thompson and Scott (1903)	Wells (1967)	Thompson and Scott (1903); Sewell (1940)	Sewell (1940); Ummerkutty (1966)	Wells and Rao (1987)	Present study

ssp: strong spine, pls: plumose seta, exp: exopod, benp: baseoendopod

mandibular palp) have received some attention only recently. *Xouthous yeonghooni* sp. nov., similarly to *X. aemula*, *X. laticaudatus*, *X. andamanensis*, *X. purpurocinctus sensu* Vervoort (1964) from Ifalik Atoll, Micronesia, and *X. purpurocinctus sensu* Lang (1965), has 2 strong spines and 4 plumose setae on mandibular exopod. *Xouthous maldivae* has 2 spines and 3 setae, *X. scotti* shows 3 spines and 3 setae, and *X. cookensis* presents 2 spines and 5 setae. In our species,the outer strong spine is larger than the inner one (Fig. 3A), and this same state occurs in *X. purpurocinctus sensu* Lang (1965).

In addition, the new species is the only representative of the genus, which has 2 strong outer spines, heavily pectinate on the inner side and pinnate on the outer side, on exp-3 of P2–P4 in both sexes (Figs 4B, 5A–C). Similar spines with a strong pectinate structure were found in some species of the genus *Peltidium* Philippi, 1839, viz. on the second inner seta of female P5 exopod in *P. proximum* Nicholls, 1941 (Nicholls 1941: Fig. 7) and in *P. angulatum* Thompson et Scott, 1903 *sensu* Wells and Rao, 1987 (Wells and Rao 1987: Fig. 39g), on A2 exp-2 (outermost seta) and female P5 exopod (second inner setae) in *P. nichollsi* Geddes, 1968 (Geddes 1968: Fig. 6B, G), and on the P5 exopod (second inner seta) of female and male in *P. quinque setosum* Song et Yun, 1999 (Song and Yun 1999: Figs. 2E, 3C).

Kim (2014) reported the occurrence of *X. laticaudatus* in algal bed in Gijang (southern Korea), presenting 3 poor photographs (P1, P2, and P5) and inaccurate information. According to his short description, the species identified as *X. laticaudatus* has 7-segmented A1, 4-segmented antennal exopod, 3-segmented P1 endopod swollen at its basis, 2 inner setae on the second endopodal segment of P3–P4, and fused P5 rami. The 4-segmented state of the antennal exopod and fused P5 rami, however, do not occur in the genus *Xouthous*. Also, the original description of *X. laticaudatus* (see Thompson and Scott 1903) differs from the Korean specimen in several characters: A2 exopod has 2 segments with 2 and 4 setae, respectively, A1 has 6 segments, P1 exopod is reaching middle of enp-1, P1 endopod has 2 segments and enp-1 is much wider than enp-2, P3–P4 enp-2 has 1 seta each, as in all congeners of the genus, P5 has discrete rami (not fused), with much smaller exopod, and spatulate baseoendopod setae with small spines distally. Therefore, the Korean record of *X. laticaudatus sensu* Kim (2014) is highly doubtful and should be removed from the list of the Korean harpacticoid fauna, similarly to other Korean records of *Bicorniphontodes bicornis* (A. Scott, 1896) (listed as *Laophontodes bicornis* A. Scott, 1896), *Paralaophontodes psammophilus* (Soyer, 1975) and *Algensiella boitanii* Cottarelliet Baldari, 1987 listed by Kim (2013) (see Lee and Huys 2019: p. 334, 367).

Representatives of the genus *Xouthous* are known from the Atlantic (8 species), Indian (5 species), Pacific (4 species), and Southern Ocean (1 species from Antarctic) (Fig. 1). *Xouthous purpurocinctus* (Atlantic, Indian, and Pacific) and *X. simulans* (Atlantic and Pacific) were found in more than one ocean. In the Pacific Ocean, *X. novaezealandiae* was recorded from Otago harbor, New Zealand, *X. purpurocinctus* was reported from Ifalik Atoll, Micronesia (Vervoort 1964) and Monterey Bay, U.S.A. (Lang 1965), *X. simulans* is known from Isla de Pascua (De Los Rios-Escalante and Barrera 2013; De Los Rios-Escalante and Arancibia 2016), and *X. yeonghooni* sp. nov. is widely distributed along the coasts of the Korean Peninsula and Jeju Island.

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