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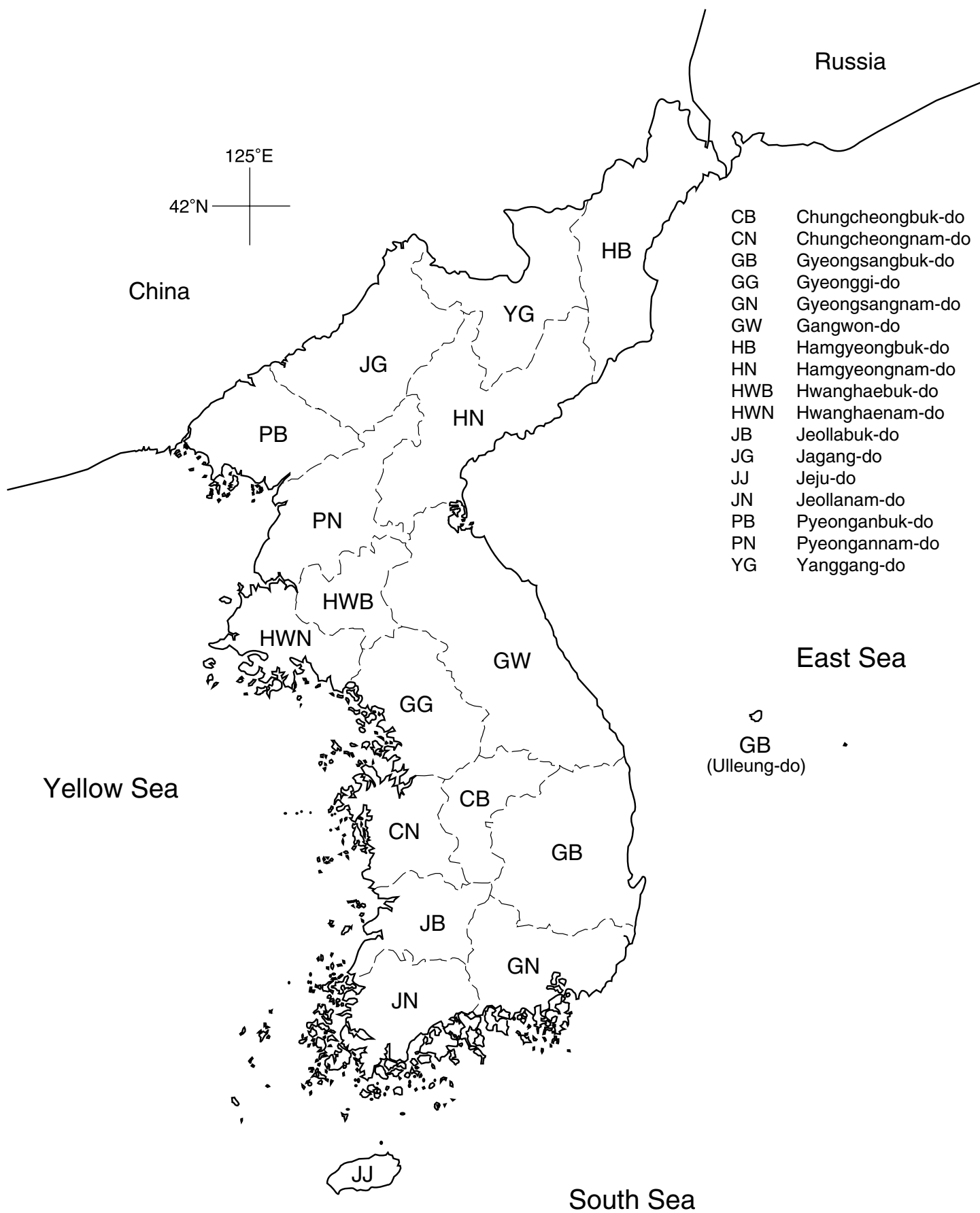
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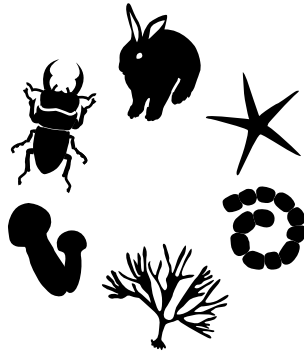
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Volume 21, Number 3

Arthropoda: Crustacea: Copepoda:

Calanoida, Cyclopoida

Marine Planktonic Copepods

Ho Young Soh

Division of Marine Technology, Chonnam National University

Yeosu, Jeollanam-do

Flora and Fauna of Korea

National Institute of Biological Resources

Ministry of Environment

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The Flora and Fauna of Korea logo was designed to represent six major target groups of the project including vertebrates, invertebrates, insects, algae, fungi, and bacteria. The book cover and the logo were designed by Jee-Yeon Koo.

Preface

In the wake of the Convention on Biological Diversity (CBD), which recognized national sovereignty over indigenous biological and genetic resources when adopted in 1992, countries around the world have been putting their best foot forward in unearthing raw biological materials reckoned as one of the crucial resources upon which national competitiveness depends to a great extent in the 21st century. Being well aware of the priority of securing and managing biological resources, the National Institute of Biological Resources (NIBR) under the Korean Ministry of Environment decided to issue *the Flora and Fauna of Korea* in an attempt to attain systematic management and comprehensive conservation of biological resources at the national level.

Endowed with diverse landscapes involving a wide range of topographic conditions, Korea is acclaimed as one of the nations with high levels of biological diversity. Purporting to establish a thorough record on national indigenous species, the NIBR embarked on the publication of *the Flora and Fauna of Korea* in Korean and English detailing those species inhabiting the Korean peninsula in 2006. Our dedication to research during the past three years led by a group of professionals in the field of systematics finally came to fruition with issuance of the first of a kind monograph for Korean animals, fungi and algae encompassing approximately 1,037 species in 158 families belonging to 9 phyla.

It is my firm belief that this very first national *the Flora and Fauna of Korea* is indeed the culmination of our persevering scientific research efforts aimed at deepening our understanding on native species and acutely identifying Korean biota. It will not only serve as an important initiative for sustainable biodiversity conservation but also a catalyst for rational and far-sighted use of biological resources.

I would like to extend my utmost gratitude to the team of over 29 professors and associated experts headed by Prof. Sook Shin of Sahmyook University for their unsparing efforts in producing this groundbreaking work. I earnestly hope that on-going publication of *the Flora and Fauna of Korea* initiated by the Ministry of Environment will significantly contribute to unveiling all Korean native species estimated up to 100,000 and expanding wise utilization of beneficial indigenous resources.



Chong-chun Kim, Ph. D.
President
NIBR

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List of Taxa

Order Calanoida

Family Acartiidae Sars, 1900

Genus *Acartia* Dana, 1846

- Acartia* (*Acartiura*) *hongii* Soh and Suh, 2000
- Acartia* (*Acartiura*) *omorii* Bradford, 1976
- Acartia* (*Acartiura*) *hudsonica* Pinhey, 1926
- Acartia* (*Odontacartia*) *ohsukai* Ueda and Bucklin, 2006
- Acartia* (*Odontacartia*) *pacifica* Steuer, 1915
- Acartia* (*Odontacartia*) *erythraea* Giesbrecht, 1889
- Acartia* (*Acanthacartia*) *sinjiensis* Mori, 1940
- Acartia* (*Acanthacartia*) *steueri* Smirnov, 1936
- Acartia* (*Acanthacartia*) *tsuensis* Ito, 1956
- Acartia* (*Acartia*) *danae* Giesbrecht, 1889
- Acartia* (*Acartia*) *negligens* Dana, 1849

Family Calanidae Dana, 1846

Genus *Cosmocalanus* Bradford and Jillett, 1974

- Cosmocalanus* *darwini* (Lubbock, 1860)

Genus *Calanus* Leach, 1816

- Calanus* *sinicus* Brodsky, 1965

Genus *Canthocalanus* A. Scott, 1909

- Canthocalanus* *pauper* (Giesbrecht, 1888)

Family Centropagidae Giesbrecht, 1893

Genus *Centropages* Kröyer, 1848

- Centropages* *abdominalis* Sato, 1913
- Centropages* *dorsispinatus* Thompson and Scott, 1903
- Centropages* *gracilis* (Dana, 1849)
- Centropages* *tenuiremis* Thompson and A. Scott, 1903

Genus *Sinocalanus* Burckhardt, 1913

- Sinocalanus* *tenellus* (Kikuchi, 1928)

Family Eucalanidae Giesbrecht, 1893

Genus *Subeucalanus* Geletin, 1976

- Subeucalanus* *mucronatus* (Giesbrecht, 1888)

Family Lucicutiidae Sars, 1902

Genus *Lucictia* Giesbrecht, 1898

- Lucicutia* *flavicornis* (Claus, 1863)

Family Metridinidae Sars, 1902

Genus *Metridia* Boeck, 1864

- Metridia* *pacifica* Brodsky, 1950

Genus *Pleuromama* Giesbrecht, 1898

Pleuromamma piseki Farran, 1929

Family Paracalanidae Giesbrecht, 1893

Genus *Calocalanus* Giesbrecht, 1888

Calocalanus pavo (Dana, 1849)

Genus *Mecynocera* Thompson, 1888

Mecynocera clausi Thompson, 1888

Family Pontellidae Dana, 1853

Genus *Calanopia* Dana, 1853

Calanopia elliptica (Dana, 1849)

Genus *Labidocera* Lubbock, 1853

Labidocera acuta (Dana, 1849)

Labidocera acutifrons (Dana, 1849)

Labidocera detruncata (Dana, 1849)

Labidocera euchaeta Giesbrecht, 1889

Labidocera kröyeri Brady, 1883

Labidocera minuta Giesbrecht, 1889

Labidocera pavo Giesbrecht, 1889

Labidocera rotunda Mori, 1929

Genus *Pontella* Dana, 1846

Pontella securifer Brady, 1883

Pontella chierchiae Giesbrecht, 1889

Pontella fera Dana, 1849

Pontella latifurca Chen and Zhang, 1965

Pontella sinica Chen and Zhang, 1965

Genus *Pontellina* Dana, 1949

Pontellina morii Fleminger and Hulsemann, 1974

Pontellina plumata (Dana, 1849)

Genus *Pontellopsis* Brady, 1883

Pontellopsis armata (Giesbrecht, 1889)

Pontellopsis regalis (Dana, 1849)

Pontellopsis yamadae Mori, 1937

Family Pseudodiaptomidae Sars, 1902

Genus *Pseudodiaptomus* Herrick, 1884

Pseudodiaptomus poplesia (Shen, 1955)

Pseudodiaptomus nihonkaiensis Hirakawa, 1983

Family Temoridae Giesbrecht, 1893

Genus *Eurytemora* Giesbrecht, 1881

Eurytemora pacifica Sato, 1913

Genus *Temora* Baird, 1850

Temora discaudata Giesbrecht, 1889

Temora turbinata (Dana, 1849)

Family Tortanidae Sars, 1902

Genus *Tortanus* Giesbrecht, 1898

Tortanus derjugini Smirnov, 1935

Tortanus dextrilobatus Chen and Zhang, 1965

Tortanus forcipatus (Giesbrecht, 1889)

Tortanus spinicaudatus Shen and Bai, 1956

Order Cyclopoida

Family Oncaeidae Giesbrecht, 1892

Genus *Oncaea* Philippi, 1843

Oncaea venusta Philippi, 1843

Oncaea venella Farran, 1929

Oncaea media Giesbrecht, 1891

Oncaea scottodicarloi Heron and Bradford-Grieve, 1995

Oncaea waldemari Bersano and Boxshall, 1994

Oncaea clevei Früchtl, 1923

Oncaea mediterranea (Claus, 1863)

Genus *Triconia* Böttger-Schnack, 1999

Triconia conifera (Giesbrecht, 1891)

Introduction

Planktonic calanoid copepods are a very abundant and diverse group among marine zooplankters. They link the lower to higher trophic levels. Because of their importance in the marine habitat, calanoid copepods have been well studied. The Calanoida now comprise 42 families in 10 superfamilies worldwide (Boxshall and Halsey, 2004). In Korean waters, 20 families, 44 genera and 118 species have been reported but it is expected that species numbers will continue to increase (Kim, 1985; Yoo et al., 1991; Kang, 1992; Ohtsuka et al., 1992; Yoo and Lee, 1994; Ministry of Education of Korea, 1994; Soh and Suh, 2000; Soh et al., 2001). On the other hand, in Korean waters, the taxonomic study of planktonic cyclopoid copepods has been confined to freshwaters (Chang and Min, 2005), and have rarely been studied in seawater (Wi et al., 2008).

This study records 53 species of planktonic calanoids and 8 cyclopoid copepods (family Oncaeidae) from Korean seawaters and provides keys to their identification.

Materials and Methods

Zooplankton samples were collected in the various regions in Korean waters using a Norpac net (0.2 mm mesh). All samples were immediately preserved in naturalized formaldehyde/sea water solution (final concentration 5%). All calanoid copepods were sorted from the samples. Specimens were dissected and mounted in CMC solution. Drawings were made with a camera lucida attached to a stereo microscope (Nikon Eclipse 80i). The body length was measured from the head to the posterior border of the left caudal ramus under a stereo microscope (Nikon SMZ 1000) using an ocular micrometer. The morphological terminology follows that of Huys and Boxshall (1991) and Boxshall and Halsey (2004). The morphological descriptions of Brodsky (1967), Bradford and Jillett (1974), Kim (1985), Nishida (1989), Kang (1992), Bradford-Grieve (1994, 1999, 2008), Soh and Suh (2000), Soh et al. (2001a, b), Mulyadi (2002), Boxshall and Halsey (2004), Moon et al. (2008), Wi et al. (2008) and Jeong et al. (2008a, b) are partly referred to. The synapomorphy of caudal setae is based on Huys and Boxshall's setal numbering system (1991). The synonymy was partially referred from the website of Razouls et al. (<http://copepods.obs-banyuls.fr>).

Abbreviations: GG, Gyeonggi-do; GW, Gangwon-do; CB, Chungcheongnam-do; JB, Jeollabuk-do; JN, Jeollanam-do; GB, Gyeongsangbuk-do; GN, Gyeongsangnam-do; JJ, Jeju-do.

Taxonomic Notes

Order Calanoida

Gin-no-yo-gak-mok (긴노요각목)

Family Acartiidae Sars, 1900

Jak-eun-no-beol-re-gwa (작은노벌레과)

Cephalosome separated from first pedigerous somite; fourth and fifth pedigerous somites fused. Urosome slender, composed of 3 free somites in female, genital somite and 1st abdominal somite comprising genital double-somite; composed of 5 free somites in male. Caudal rami symmetrical or asymmetrical, sometimes fused to anal somite. Rostrum bifurcated or absent. Naupliar eye present. Antennule 17 to 22-segmented in female and geniculate on right side only in male. Antenna biramous; basis and first endopodal segment forming elongate allobasis. Labrum large, trilobite. Mandibular gnathobasis well developed. Maxillule with weakly developed praecoxal arthrite. Maxilla with praecoxa and coxa separate. Maxilliped 4-segmented.

Swimming legs 1 to 4 biramous, typically with 3-segmented exopods and 2-segmented endopods. Spine and seta formula typically as follows:

	coxa	basis	exopodal segments	endopodal segments
leg 1	0-0	1/0-0	1-1;1-1;II or 2,1,4	0-1;1,2,3
leg 2	0-0	0-0	0-1;0-1;I,5	0-2;1,2,4
leg 3	0-0	0-0	0-1;0-1;I,5	0-2;1,2,4
leg 4	0-0	1-0	0-1;0-1;I,5	0-2/3;1,2,3

Female fifth leg with exopod either a well defined segment bearing spinous processes (as in Parahabidocera) or reduced to a curved spine (as in Acartia). Male fifth leg asymmetrical, with 1 to 3-segmented exopod.

GENERA 5 (1 in Korea), species 71 (11 in Korea).

DISTRIBUTION: Estuarine and coastal habitats in a range of tropical to polar latitudes except for *Acartia danae* Giesbrecht and *Acartia negligens* Dana which occur in open oceanic waters.

Key to the genera of family Acartiidae

1. Female fifth legs biramous; female and male left antennules 21 or 22-segmented 2
 - Female fifth legs uniramous; female and male left antennules 18 or 19-segmented 3
2. Endopod of antenna reduced, about as long as exopod; female antennules 21-segmented
 - *Acartiella*
 - Endopod of antenna elongate, much longer than exopod; female antennules 22-segmented

- *Paralabidocera*
3. Posterolateral angles of prosome expanded into wing-like processes; plumose seta of leg 5 shorter than terminal claw *Paracartia*
- Posterolateral angles of prosome rounded, not expanded; female le 5 reduced to minute lobe being single apical seta *Pteriacartia*
- Posterolateral angles of prosome rounded or pointed, not wing-like; plumose seta of leg 5 typically longer than terminal claw *Acartia*
- (Boxshall and Halsey, 2004)

REMARKS: The Acartiidae was placed in the superfamily Diaptomoidea by Andronov (1974) and Park (1986). Only the genus *Acartia* occurs in Korean waters.

Genus *Acartia* Dana, 1846

Jak-eun-no-beol-re-sok (작은노벌레속)

General features are the same as the family description.

SPECIES ca. 52 (11 in Korea).

DISTRIBUTION: estuarine and coastal habitats in a range of tropical to polar latitudes except for *Acartia danae* Giesbrecht and *Acartia negligens* Dana which occur in open oceanic waters.

Key to the species of genus *Acartia*

1. Rostrum without rostral filaments 2
- Rostrum with two rostral filaments 4
2. Last pedigerous somite with posterodorsal spines *A. hongii*
- Last pedigerous somite without posterodorsal spines 3
3. Genital double-somite length nearly equal to width; inner lobe of 3rd exopodal segment of male right 5th leg with posteriorly directed projection *A. hudsonica*
- Genital double-somite length greater than width; inner lobe of 3rd exopodal segment of male right 5th leg with two very unequal distal processes *A. omorii*
4. Terminal spine of female fifth leg distinctly denticulate in both sides at the end; first exopodal segment of male fifth leg with elongate inner process 5
- Terminal spine of female fifth leg minutely serrated in both sides at the end; first exopoda segment of male fifth leg without inner process 6
5. Posterior corner of last pedigerous somite terminated in symmetrical points in both genders
- *A. danae*
- Posterior corner of last pedigerous somite rounded with 1 or many small spines in both genders
- *A. negligens*
6. Posterior corner of last pedigerous somite rounded, with many spinules 7
- Posterior corner of last pedigerous somite terminated in pointed process, with pair of setules 8
7. Spinules on posterior corner of last pedigerous somite sparsed; proximal part of exopod of female fifth leg round; second urosomite of male with longitudinal row of spinules; terminal spine on

- right distal segment of male fifth leg short *A. sinjiensis*
- Spinules on posterior corner of last pedigerous somite sparsed; proximal part of exopod of female fifth leg with bifid projections; second urosomite of male with row of spinules along posterior margin; terminal spine on right distal segment of male fifth leg relatively long *A. tsuensis*
- Spinules on posterior corner of last pedigerous somite coarsely arrayed in a row; proximal part of exopod of female fifth leg thin; second urosomite of male longer than width; right distal segment with 3 processes in inner margin *A. steueri*
- 8. First segment of antennule with acute process in female; second and third urosomite without 2 dorsal spines *A. erythraea*
- First segment of antennule without acute process, spines and spinules in female; second urosomite of male with spinules ventrally; medial projection of second exopodal segment of male right fifth leg triangular *A. pacifica*
- First segment of antennule without acute process, with spines proximally and spinule rows distally in female; second urosomite of male without spinules ventrally; medial projection of second exopodal segment of male right fifth leg square *A. ohtsukai*

1. *Acartia (Acartiura) hongii* Soh and Suh, 2000 (Figs. 1–3)

Hong-jak-eun-no-beol-re (홍작은노벌레)

Acartia bifilosa: Shen and Bai, 1956, p. 196, pl. 7, figs. 52–54; Chen and Zhang, 1965, p. 112, pl. 49, figs. 5–8; Kim, 1985, p. 137, pl. 46, figs. f, g, pl. 47, figs. a, b; Yoo et al., 1991, p. 257, fig. 2; Shim and Choi, 1996, figs. 2–4, tables 1, 2; Yoon et al., 1998, figs. 1–5.

Acartia hongii Soh and Suh, 2000, p. 321, figs. 1–12.

Female: Body slender. Body length 1.03–1.19 mm. Prosome-Urosome ratio 3.57:1. Prosome 5-segmented; cephalosome and first pedigerous somite completely separate; fourth and fifth pedigerous somites fused, with posterodorsally a pair of setules and a row of spinules; posteromedial region without spinules. Urosome 3-segmented: genital double-somite having common genital apparatus; posteroventral region furnished with fine spinules; anterodorsal region covered with rows of fine setules; second and third segments with spinules and rows of fine setules. Caudal rami each having six setae slightly asymmetrical, right ramous slightly longer than left. Urosomites and left caudal ramous with proportions 39:19:18:25=100. Rostrum without rostral filaments; with integumental pore between paired frontal sensilla. Naupliar eye present. Fifth leg: coxae completely fused to intercoxal sclerite; basis with outer seta; exopod reduced to spine which bulbous at the base; armed with comb-like spinules along distal part of inner margin only.

Male: Body similar to female. Body length 0.79–1.04 mm. Prosome-Urosome ratio 3.15:1. Urosome 5-segmented; genital somite furnished with spinules or setules along posterior border in dorsal view; first three abdominal somites covered with spinules; anal? somite bearing setules laterally. Urosomites and left caudal ramous with proportions 15:26:17:9:15:18=100. Rostrum similar to that of female. Fifth legs asymmetrical; intercoxal sclerite completely fused to both coxae; left leg comprising basis armed with outer seta and two rows of spinules, plus 2-segmented exopod; distal exopod having heavy spine plus rod-like appendage covered with small spines distally; right leg

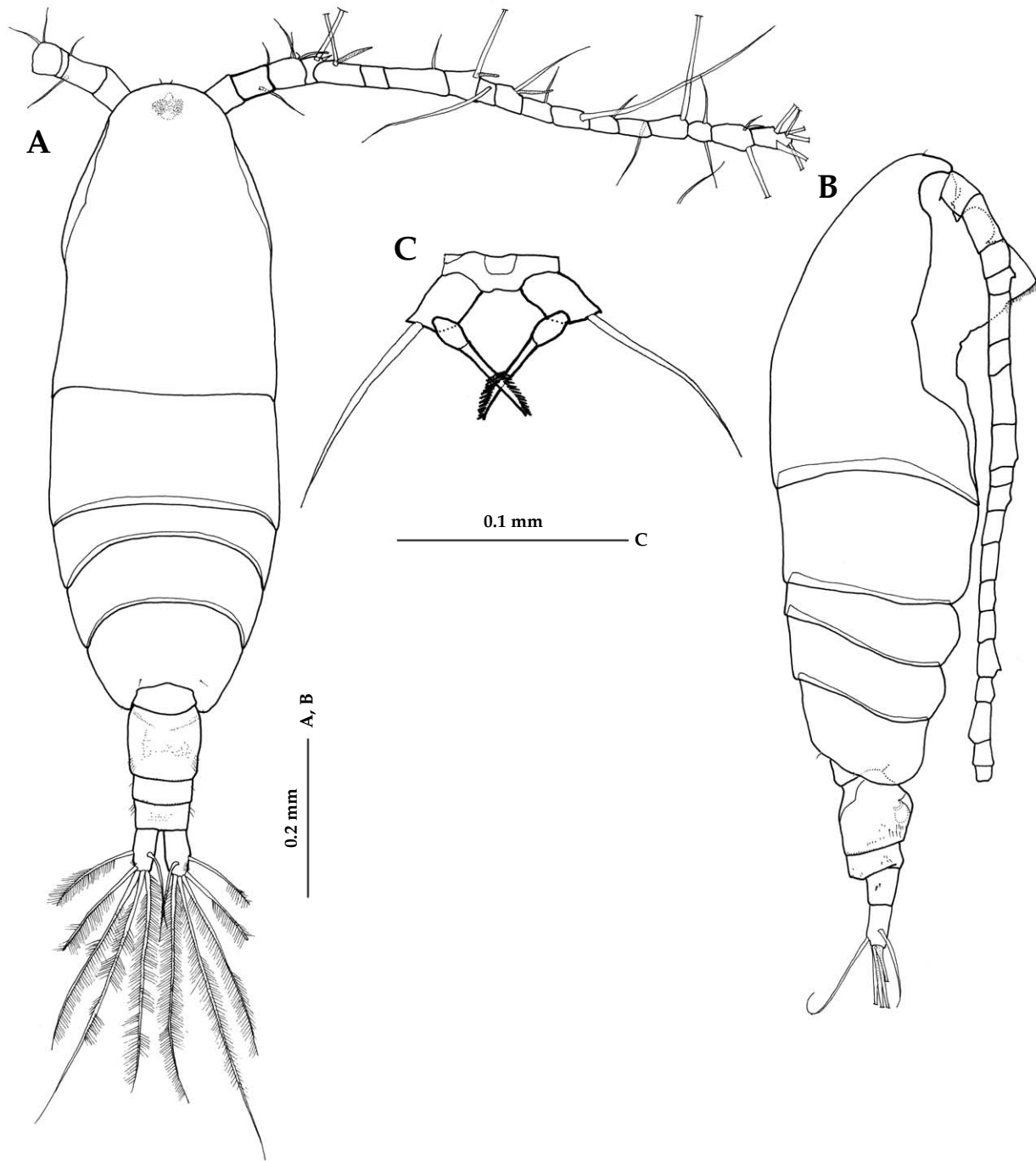


Fig. 1. *Acartia hongii*, female. A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg (cited from Soh and Suh, 2000).

comprising basis armed with outer seta, plus 3-segmented exopod; first exopodal segment with one seta, second segment with two spines on inner lobe and with one outer spine; third segment bearing two integumental pores armed with three outer spines, terminal spine, and one inner spine.

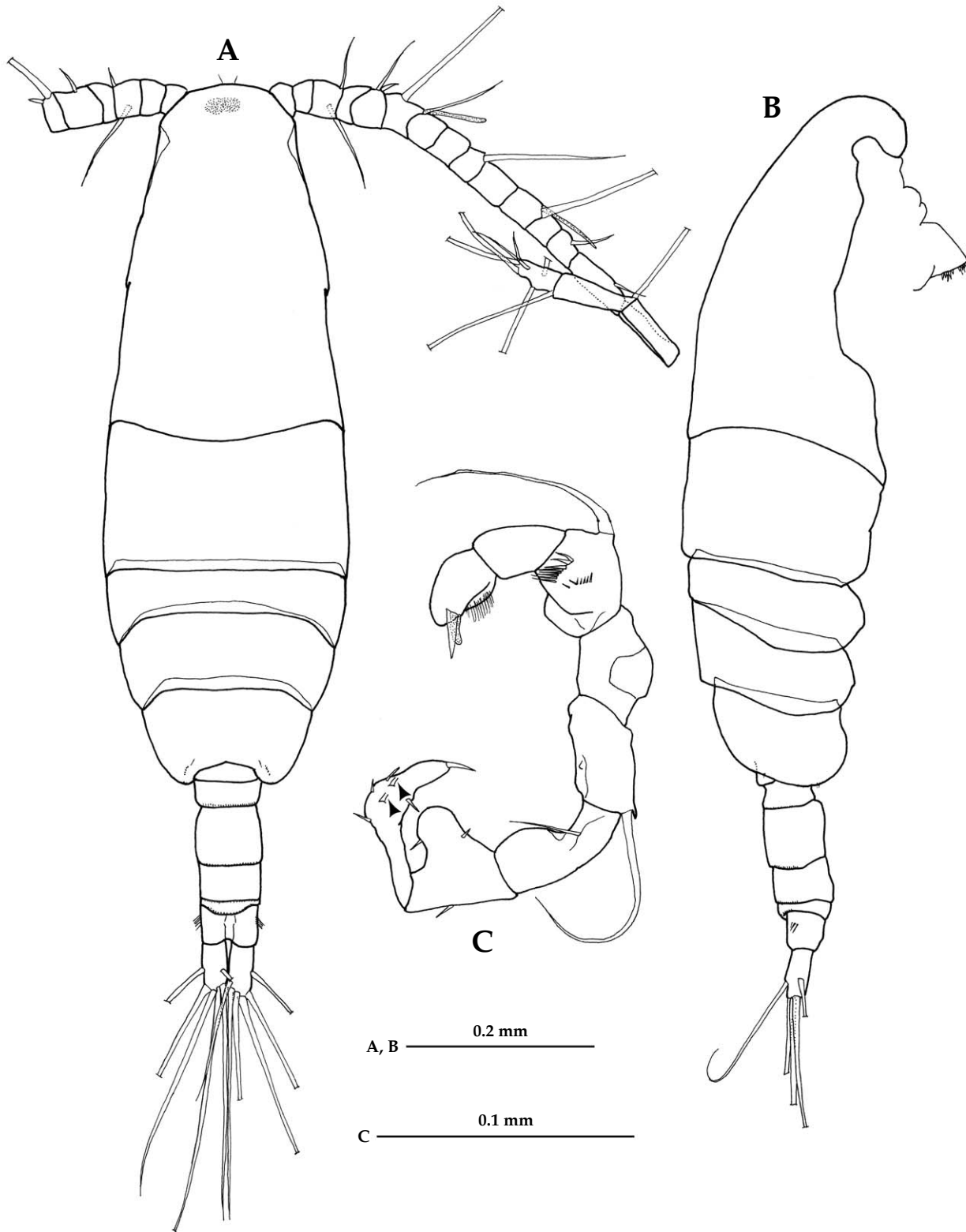


Fig. 2. *Acartia hongii*, male: A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg (cited from Soh and Suh, 2000).

DISTRIBUTION: Korea (Yellow Sea).

KOREA: JN, JB, CN, GG.

SPECIMEN EXAMINED: CNUM-ZC 1998 (Hampyung Bay, Jeollanam-do: 30.xii.1998).

ECOLOGY: *Acartia hongii* predominantly occurs in brackish waters and/or coastal waters of the Yellow Sea in winter and spring.

REMARKS: *Acartia hongii* closely resembles *A. bifilosa* Giesbrecht, 1881, but it differs from the latter in the following characteristics: (1) rostral filaments absent in both genders; (2) the female fifth leg has terminal spines toothed only on the inner side; (3) the first exopodal segment of the male right fifth leg with a long seta; (4) the distal segment of the male left fifth leg with a rod-like appendage. *A. hongii* is also closely related to *A. hudsonica* and *A. omorii* from Korean waters, but it can be distinguished by co-occurrence of the following characters: (1) the last pedigerous somite has postero-dorsal spines; (2) the allobasis of the antenna with six plus one setae; (3) the abdominal somite covered with fine spinules; (4) the last two abdominal somites nearly equal in adult females; (5) the spines of the female fifth leg toothed only on inner edge; (6) the basis of the male left fifth leg has two rows of spines; (7) the first exopodal segment of the male left leg 5 is slightly longer than the second plus third exopodal segments.

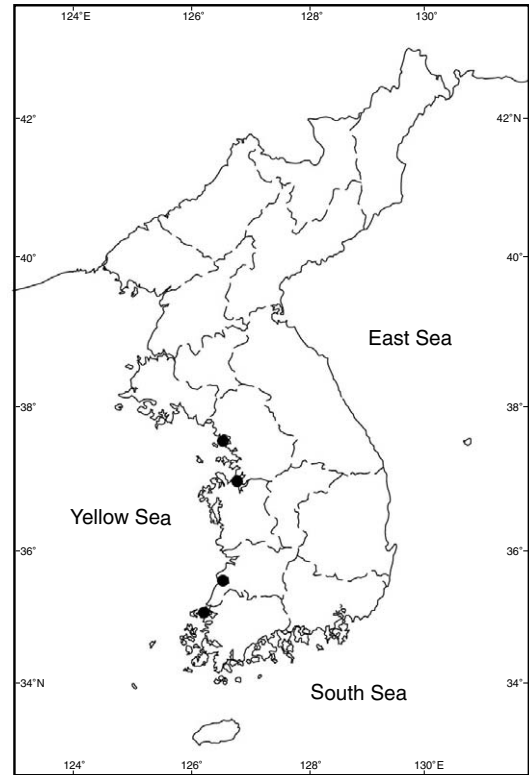


Fig. 3. Distribution of *Acartia hongii*.

2. *Acartia (Acartiura) omorii* Bradford, 1976 (Figs. 4, 5)

O-mo-ri-jak-eun-no-beol-re (오모리작은노벌레)

Acartia clausi: Mori, 1937, p. 103, pl. 50, figs. 5–7; Shen and Bai, 1956, pp. 223, 224, pl. 7, figs. 49–51; Tanaka, 1965, pp. 387, 388, fig. 244; Kim, 1985, p. 133, pl. 45, figs. a–d.

Acartia omorii Bradford, 1976, p. 173, figs. 11–13; Ueda, 1986b, p. 134, figs. f, m; Kang and Lee, 1990, p. 379, fig. 1; Yoo et al., 1991, p. 259; Chihara and Murano, 1997, p. 670, pl. 16; Barthélémy, 1999, pp. 858, 862, fig. f; Soh and Suh, 2000, p. 332; Seuront, 2005, p. 1301, tab. I, rem.

Female: Body length 0.91–1.22 mm. Last pedigerous somite rounded posteriorly. Antennules comparatively short, reaching anterior third of genital double-somite. Urosome composed of three segments. Genital segment equal to combined length of following two segment plus half length of caudal rami. Caudal rami slightly asymmetrical, right somewhat longer than the left. No spinules on last pedigerous somite or abdominal somites (some authors erroneously report the presence of spinules at these sites). Plumose lateral setae of 5th pair of legs slightly longer than apical spine, latter massive, bilaterally serrated along distal half.

Male: Body length 0.85–1.07 mm. Cephalosome bluntly rounded anteriorly. Urosome 5-segment-

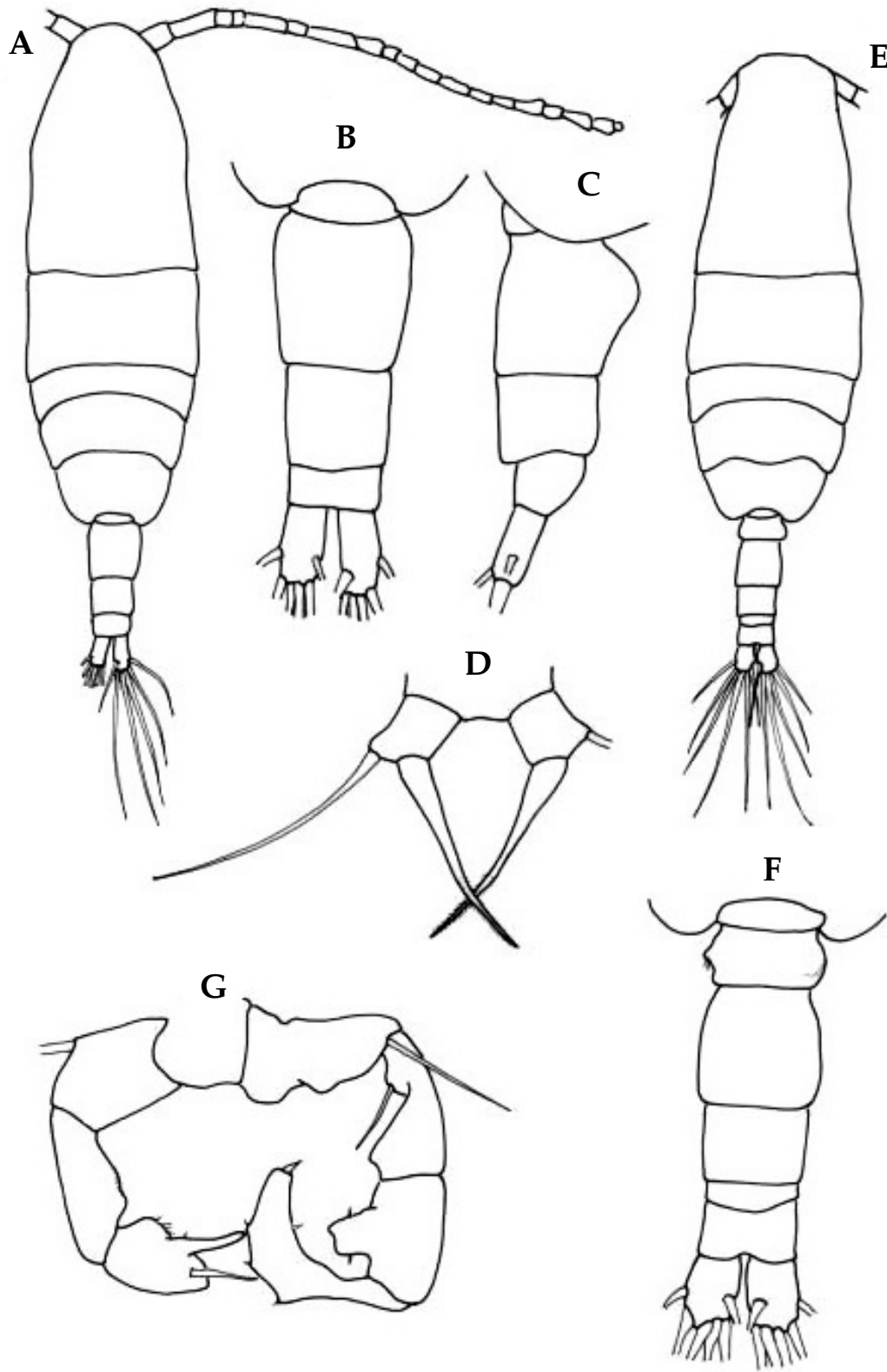


Fig. 4. *Acartia omorii*. Female: A. habitus, dorsal view; B. urosome, dorsal view; C. urosome, lateral view; D. fifth leg. Male: E. habitus, dorsal view; F. urosome, dorsal view; G. fifth leg.

ed, second segment longest, fourth very short. Right caudal ramus slightly longer than the left. Right antennule geniculate. Second and third segments of right fifth leg bearing blunt inner process; process of third segment larger than that of second, and bearing small spinule; fourth segment elongate and curved. Penultimate segment on left fifth leg bearing serrate plate; distal segment short, with terminal spine and equally long digitiform process.

DISTRIBUTION: Coasts and embayments in Korea, China, Japan.

KOREA: GW, GB, GN, JN, JB, JJ, CN, GG.

SPECIMEN EXAMINED: (Gwangyang Bay, Jeollanam-do: 30.i.2007).

ECOLOGY: *Acartia omorii* occurs predominantly in coastal waters of more than 33 psu. in winter and spring.

REMARKS: *Acartia omorii* is closely related to *A. hudsonica*. However, *A. omorii* has a relatively short genital double-somite. The inner lobe of the second exopodal segment of the male right fifth leg has two very unequal distal processes.

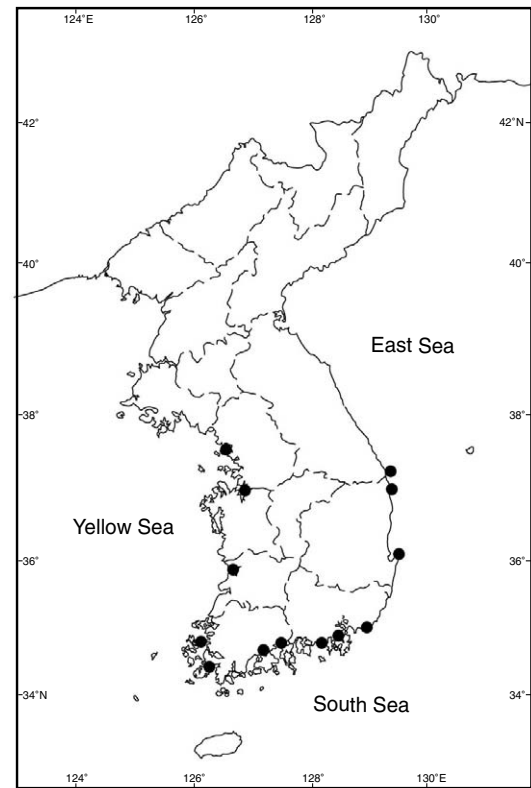


Fig. 5. Distribution of *Acartia omorii*.

3. *Acartia (Acartiura) hudsonica* Pinhey, 1926 (Figs. 6, 7)

Heo-deu-seun-jak-eun-no-beol-re (허드슨작은노벌레)

Acartia clausi hudsonica Pinhey, 1926, p. 7, figs. f, m.

Acartia clausi: Brodsky, 1950 (1967), p. 420, fig. 296; Carillo et al., 1974, p. 452, figs. in part.

Acartia sp. Bradford, 1976, p. 181, figs. 18, 19.

Acartia hudsonica: Bradford, 1976, p. 176, figs. 14–17, 33; Ueda, 1986b, p. 134, figs. f, m; Kang and Lee, 1990, p. 378, fig. 2, rem.; Yoo et al., 1991, p. 258; Chihara and Murano, 1997, p. 670, pl. 16; Barthélémy, 1999, pp. 858, 862, fig. f; Soh and Suh, 2000, p. 332.

Female: Body length 0.92–1.02 mm. Posterolateral corner of prosome usually with a few fine hairs. Genital double-somite usually with few irregular rows of very minute spinules on ventrolateral surface; posterodorsal margin without spines or spinules. Second abdominal segment usually with very minute hair-like spinules on posterodorsal margin. Anal somite naked or sometimes with some fine hairs on dorsal and lateral surfaces. Caudal rami usually with few small spines on outer posterodorsal margin, numerous fine hairs on lateral margins and a few minute hair-like spinules on distolateral margin.

Male: Body length 0.86–0.93 mm. Posterolateral corner of prosome with several hairs usually in two rows and more conspicuous than those of female. Genital somite with lateral hairs; second to

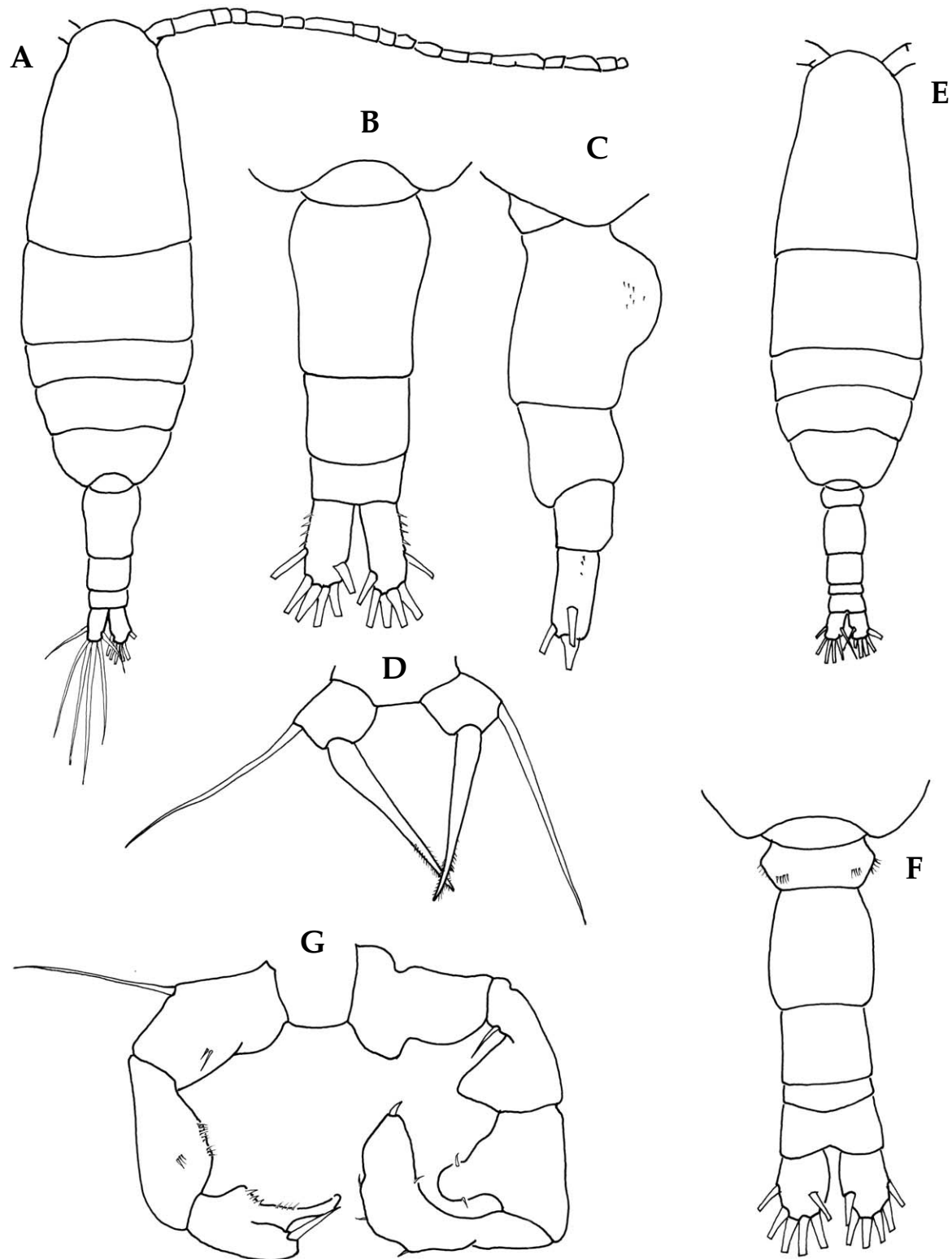


Fig. 6. *Acartia (Acartiura) hudsonica*, female. A. habitus, dorsal view; B. urosome, dorsal view; C. urosome, lateral view; D. fifth leg. Male: E. habitus, dorsal view; F. urosome, dorsal view; G. fifth leg.

fifth somites with very minute hair-like spinules on dorsal and/or lateral surfaces; fifth somites sometimes with several fine hairs on ventral surface. Caudal rami usually with a few, small spines on outer posterodorsal margin, with very minute hair-like spinules on dorsal surface, and with several fine hairs on lateral and medial margins. Second segment of left fifth leg (P5) usually with one or two small spines on anterior surface.

DISTRIBUTION: Estuaries or embayments in Pacific and Atlantic coasts.

KOREA: GB, GN, JN, JB, GG.

SPECIMEN EXAMINED: (Seomjin River estuary, Jeollanam-do: 30.v.2007).

ECOLOGY: *Acartia hudsonica* occurs predominantly in estuarine or neritic regions of less than 32 psu. in winter and spring.

REMARKS: *Acartia hudsonica* is closely related to *A. omorii*. However, *A. hudsonica* has a relatively long genital double-somite. Inner lobe of the second exopodal segment of the male right fifth leg has a posteriorly directed projection.

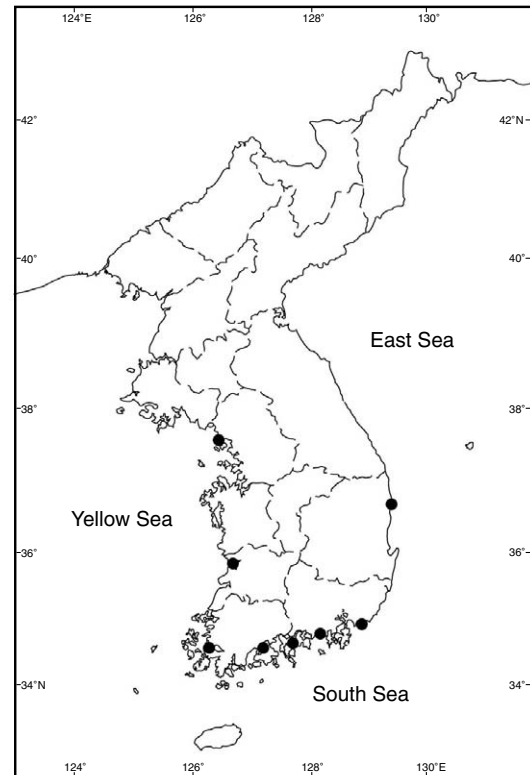


Fig. 7. Distribution of *Acartia* (*Acartiura*) *hudsonica*.

4. *Acartia* (*Odontacartia*) *ohtsukai* Ueda and Bucklin, 2006 (Figs. 8–10)

O-Cheu-ka-jak-eun-no-beol-re (오츠크작은노벌레)

Acartia pacifica: Brodsky, 1948, p. 73, pl. 24, figs. 1–6; 1950, p. 422, fig. 299; Chen and Zhang, 1965, p. 112, pl. 49, figs. 9–12; Zheng et al., 1965, p. 149, fig. 70; Lee et al., 2007, p. 147, figs. 11, 12.

Acartia ohtsukai Ueda and Bucklin, 2006, p. 78, figs. 1–4; Moon et al., 2008, p. 61, fig. 1.

Female: Body length 1.19–1.23 mm. Prosoma with no hairs except for sensilla. Rostral filaments thick and short. Fifth pedigerous somite with acute, slightly curved lateral projection and posterodorsal spine on each side; left process of one specimen bifurcated at tip. Genital double-somite as long as wide, bearing 2 dorsal spines, which nearly as long as spines on fifth pedigerous somite, along posterior margin, and ventral hairs around gonopores; one specimen bears 2 dorsal spines at each locus. Second somite with 2 dorsal spines, which twice or more as long as on genital double-somite; two specimens with 2 or 3 spines at one locus. Anal somite with hairs on posterior part of ventral surface. Caudal ramus 3 times longer than wide, with hairs proximal to lateral seta. Fifth leg: basis about 1.5 times longer than wide; lateral seta nearly as long as claw-like exopod; exopod with round, posteriorly produced lobe at its base and very fine teeth along distal half.

Male: Body length 1.03–1.05 mm. Rostral filaments thin. Fifth pedigerous somite with pointed posterior process, which smaller than in female, posterodorsal spine and posterolateral hairs on

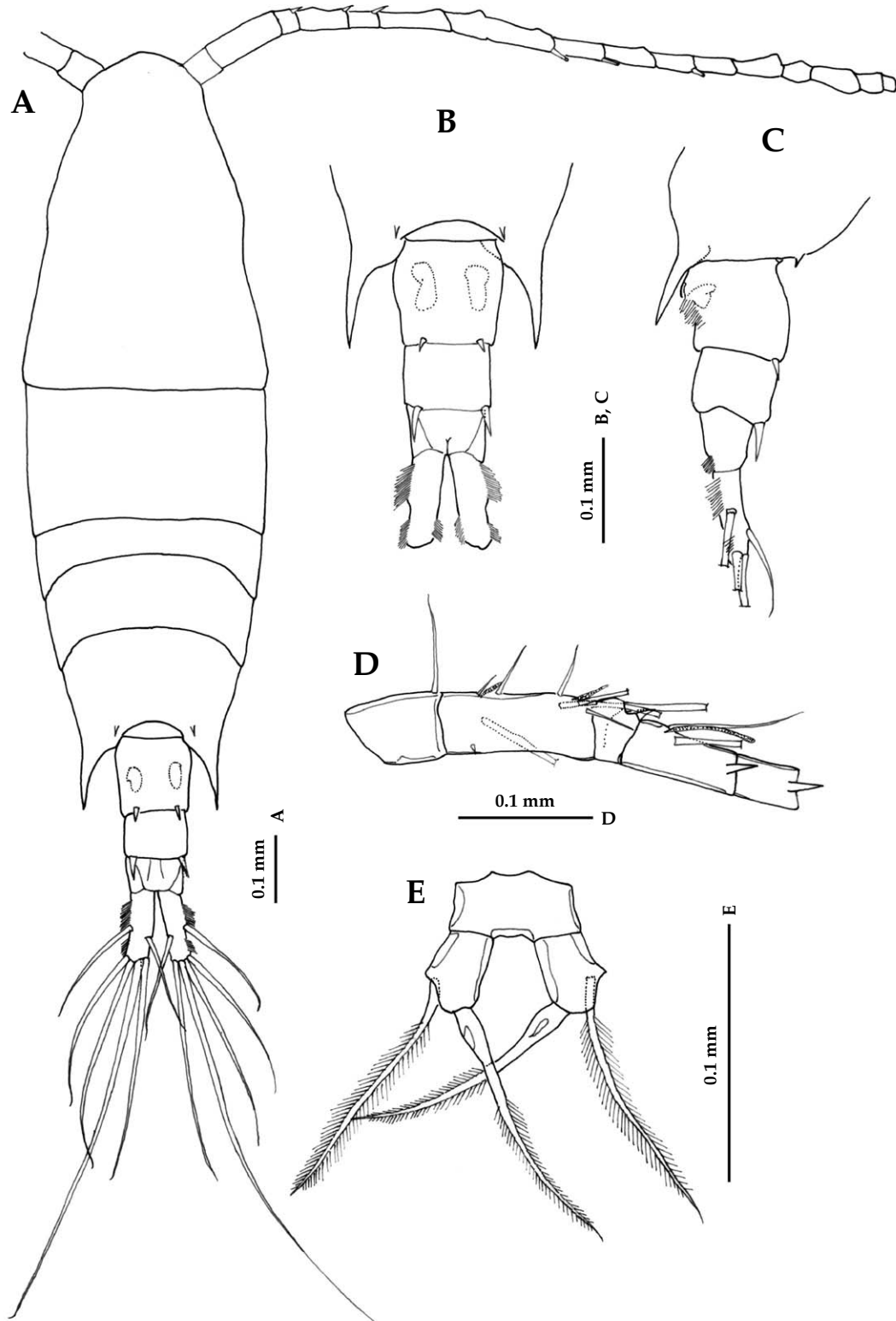


Fig. 8. *Acartia (Odontacartia) ohtsukai*, female. A. habitus, dorsal view; B. fifth pediger and urosome, dorsal view; C. fifth pediger with fifth leg and urosome, lateral view; D. second to sixth segment of left antennule, dorsal view; E. fifth leg (cited from Moon et al., 2008).

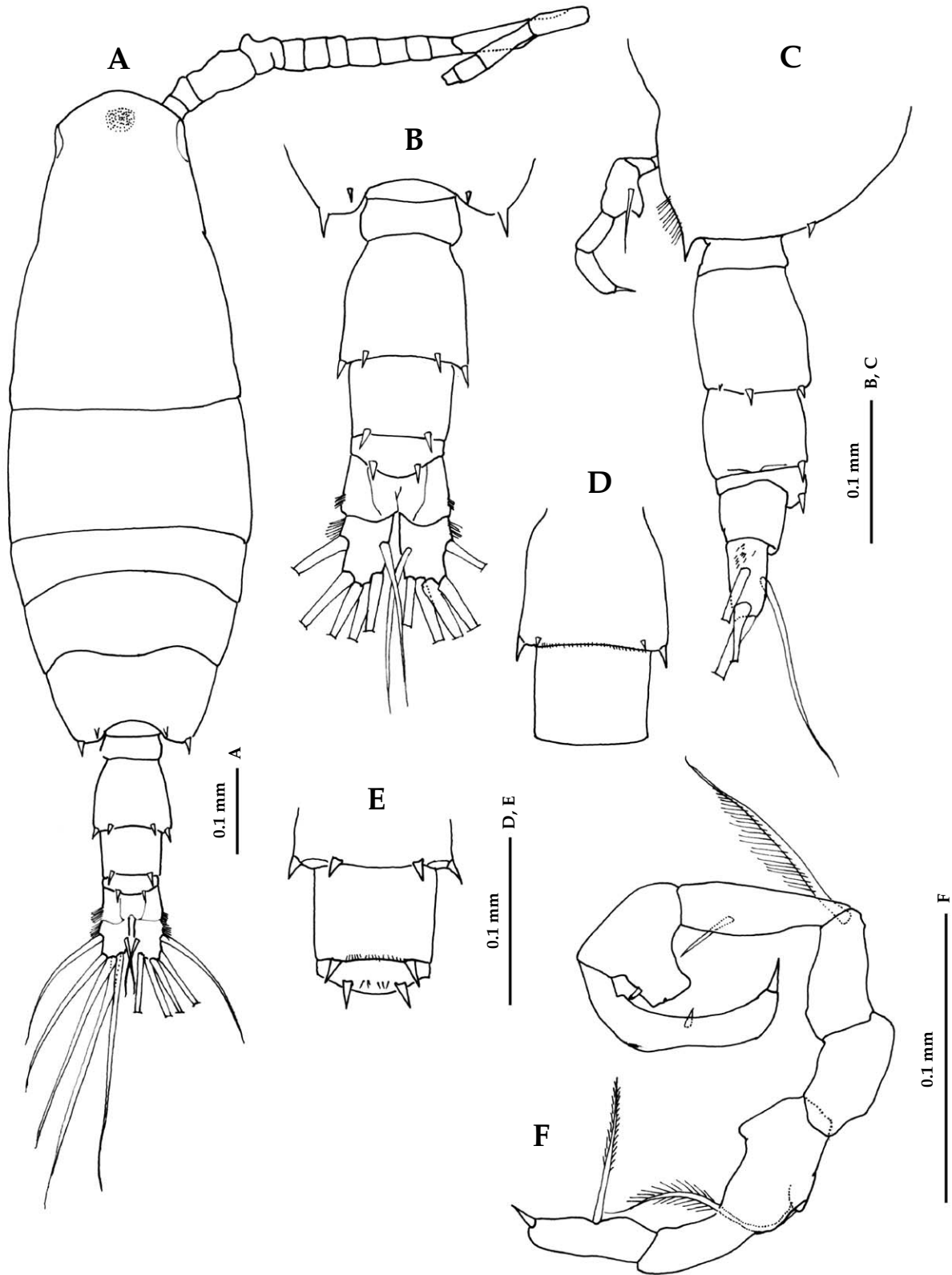


Fig. 9. *Acartia* (*Odontacartia*) *ohtsukai*, male. A. habitus, dorsal view; B. fifth pediger and urosome, dorsal view; C. fifth pediger with fifth leg and urosome, lateral view; D. second and third urosomites, ventral view; E. second to fourth urosomites, dorsal view; F. fifth leg (cited from Moon et al., 2008).

each side. Second urosomite with 2 dorsal and 2 lateral spines, and ventral row of spinules along posterior margin; lateralmost one or two of ventral spinules conspicuous but those between them very fine and sometimes absent. Third and fourth urosomites each with 2 dorsal spines; spines on third abdominal somite slightly longer than or as long as spines on fourth abdominal somite. Anal somite bearing short hairs on distolateral surface. Caudal ramus about 1.5 times longer than wide, with hairs along lateral margin proximally to lateral seta and along distal half of medial margin. Right fifth leg: second exopodal segment as long as wide, with square medial projection (Moon et al., 2008).

DISTRIBUTION: Estuaries along the continental coasts of Korea, China, Russia and the Ariake Sea of Japan.

KOREA: JN.

SPECIMEN EXAMINED: (Mankyung-Dongjin estuary, Jeollabuk-do: 30.viii.2007), (Seomjin River estuary, Jeollanam-do: 30.viii.2007).

ECOLOGY: *Acartia ohtsukai* occurs predominantly in estuarine or coastal waters of less than 32 psu. in summer.

REMARKS: *Acartia ohtsukai* is distinguished from *A. pacifica* s. str. by the following characteristics: (1) the presence of a subterminal spine on the fifth segment of the antennule and long caudal rami in female; (2) in having shorter spines on the third urosomite; (3) males having a square medial projection of the second exopodal segment of the right fifth leg and a shorter first exopodal segment of the left leg.

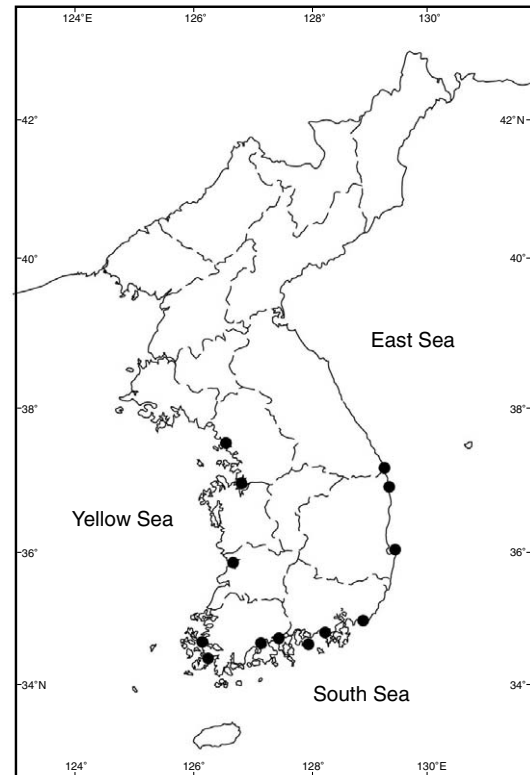


Fig. 10. Distribution of *Acartia* (*Odontacartia*) *ohtsukai*.

5. *Acartia* (*Odontacartia*) *pacifica* Steuer, 1915 (Figs. 11, 12)

Tae-pyeong-jak-eun-no-beol-re (태평작은노벌레)

Acartia pacifica Steuer, 1915, p. 379, figs. 5, 6; Steuer, 1923, p. 116, figs. 134–137; Tanaka, 1965, p. 391, fig. 247; Kim, 1987, p. 87, pl. 18, figs. g–j; Ueda, 1997, p. 672, pl. 21, fig. 15, pl. 22, fig. 15; Mulyadi, 2004, p. 146, fig. 83; Ueda and Bucklin, 2006, p. 84, fig. 5.

Acartia pacifica forma *typica*: Greenwood, 1978, p. 15, figs. 7a–c, f, i, j.

Acartia spinicauda: Mori, 1937, p. 103, pl. 50, figs. 5–7.

Female: Body length 1.19–1.21 mm. Caudal rami 2.5 times longer than wide. Lateral seta of basis of fifth leg about 2 times longer than exopod; exopod with conspicuous teeth on distal half of segment. Other characters similar to *Acartia ohtsukai*.

Male: Body length 1.03–1.16 mm. Prosoma as in female. Fifth pedigerous somite without pos-

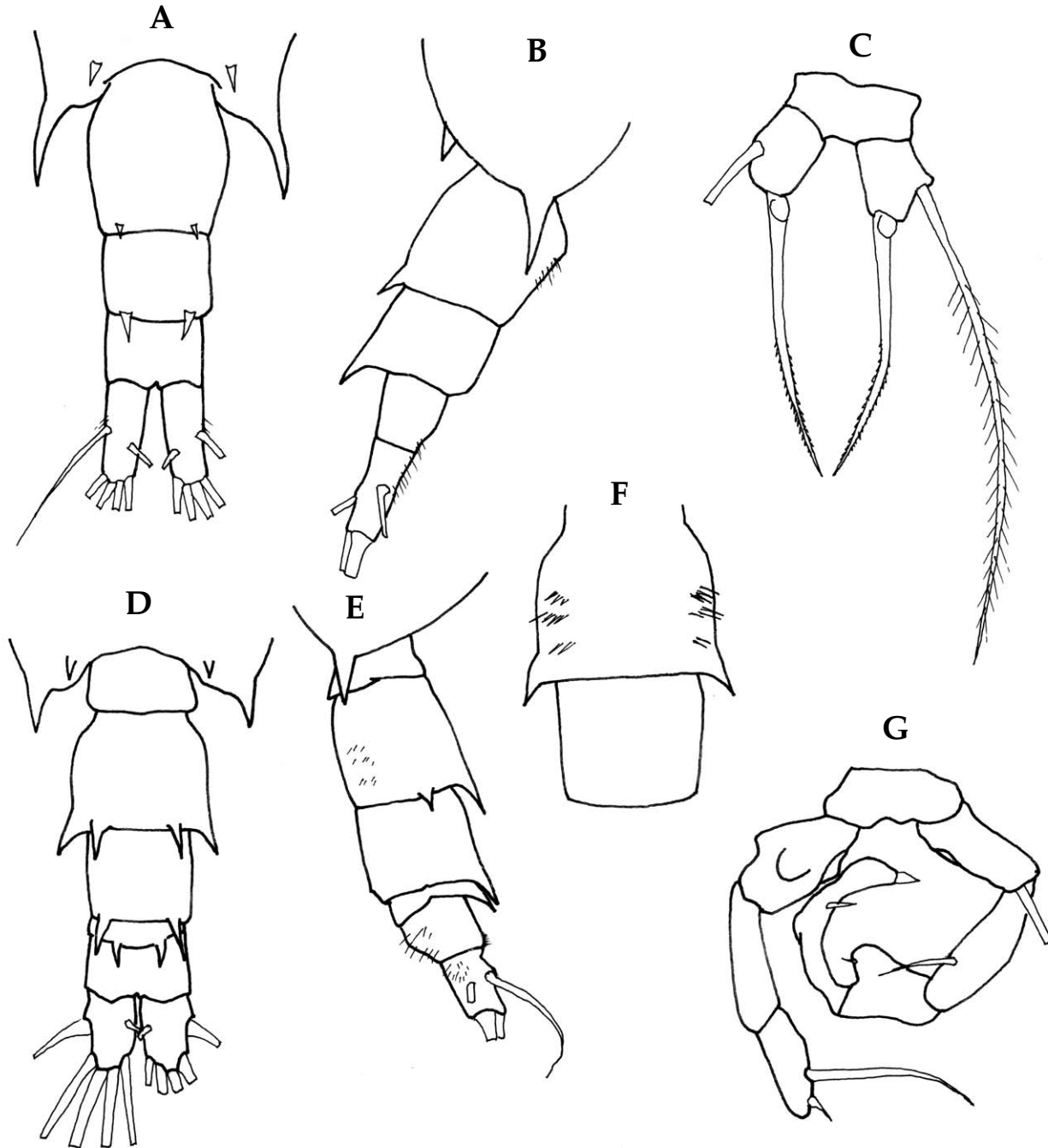


Fig. 11. *Acartia (Odontacartia) pacifica*. Female: A. fifth pediger and urosome, dorsal view; B. fifth pediger and urosome, lateral view; C. fifth leg. Male: D. fifth pediger and urosome, dorsal view; E. fifth pediger and urosome, lateral view; F. second and third urosomites, ventral view; G. fifth leg (cited from Ueda and Bucklin, 2006).

terolateral hairs on each side. First abdominal somite with 3 ventral transverse rows of 2–4 long spinules on each side and without spinules along posterior margin. Posterior spines on urosomal

somites stronger than those in *Acartia ohtsukai*; spines on second abdominal somite reaching nearly tip of spine on third segment in lateral view. Hairs on anal somite and caudal rami longer than more conspicuous than those in *Acartia ohtsukai*. Second exopodal segment of right fifth leg 1.4 times longer than wide, with round, triangular medial projection.

DISTRIBUTION: worldwide coasts more than 33 psu.

KOREA: GB, GN, JN, JB, CN, GG.

SPECIMEN EXAMINED: (Yeosu, Jeollanam-do: 30.ix. 2007).

ECOLOGY: *Acartia pacifica* commonly occurs in Korean coasts more than 32 psu. in warm seasons.

REMARKS: *Acartia pacifica* is distinguished from *A. ohtsukai* in having following characteristics: (1) a sub-terminal spine on the fifth segment of the antennule, absent and shorter caudal rami in female; (2) first antennular segment without a spine and spinules; (3) longer spines on the third urosomite; (4) a round medial projection on the second exopodal segment of the right fifth leg.

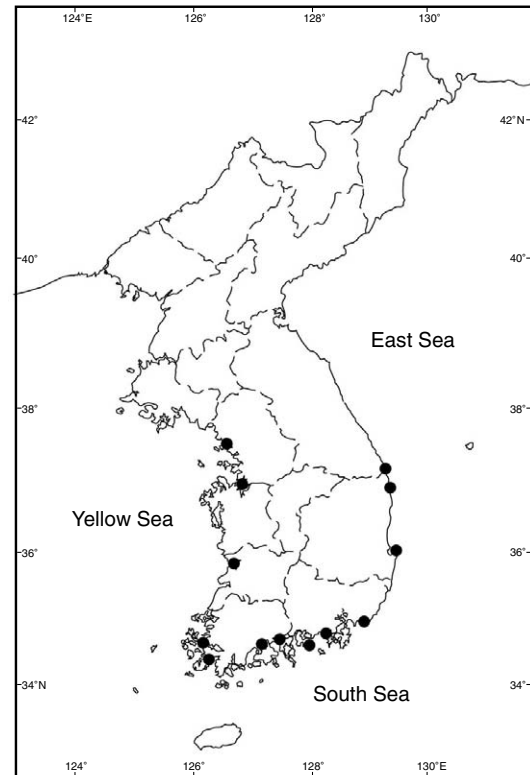


Fig. 12. Distribution of *Acartia* (*Odontacartia*) *pacifica*.

6. *Acartia* (*Odontacartia*) *erythraea* Giesbrecht, 1889 (Figs. 13, 14)

Bul-eun-jak-eun-no-beol-re (붉은작은노벌레)

Acartia erythräa Giesbrecht, 1889; 1892, pp. 508, 523, figs. f, m.

Acartia erythraea Giesbrecht, 1889, p. 26 (cited from Giesbrecht 1892), 1892, p. 508, pl. 30, figs. 5, 19, 32, pl. 43, figs. 12, 13; Giesbrecht and Schmeil, 1898, p. 155; Thompson and Scott, 1903, p. 254; A. Scott, 1909, p. 187; Mori, 1937, p. 102, pl. 50, figs. 1–4; Chen and Zhang, 1965, p. 113, pl. 50, figs. 1–6; Ueda, 1986a, p. 16, 18, figs. f, m, rem.; Chihara and Murano, 1997, p. 672, pls. 21, 22; Ferrari and Ueda, 2005, p. 341, figs. juv, f, m.

Female: Body length 1.15 mm. Posterolateral border of fifth pedigerous somite produced into strong processes, with pair of small spines dorsomedially. Genital double-somite long and wide, twice length of second urosomite, with 2–3 small spines on postero dorsal margin. Caudal rami short with transverse row of setules on dorsal surface, caudal seta relatively long. Antennule reaches to distal end of caudal rami when folded backwards, first segment with two strong spines produced distally from anterodistal margin, with smaller spine near base of these spines; segment 2, 3, and 4 with 1, 3, and 2 small spines, respectively. Terminal segment of fifth leg twice times as long as wide; terminal spine slender and curved, with finely serrated membrane.

Male: Body length 1.08 mm. Cephalosome as in female, but spine on posterodorsal border of

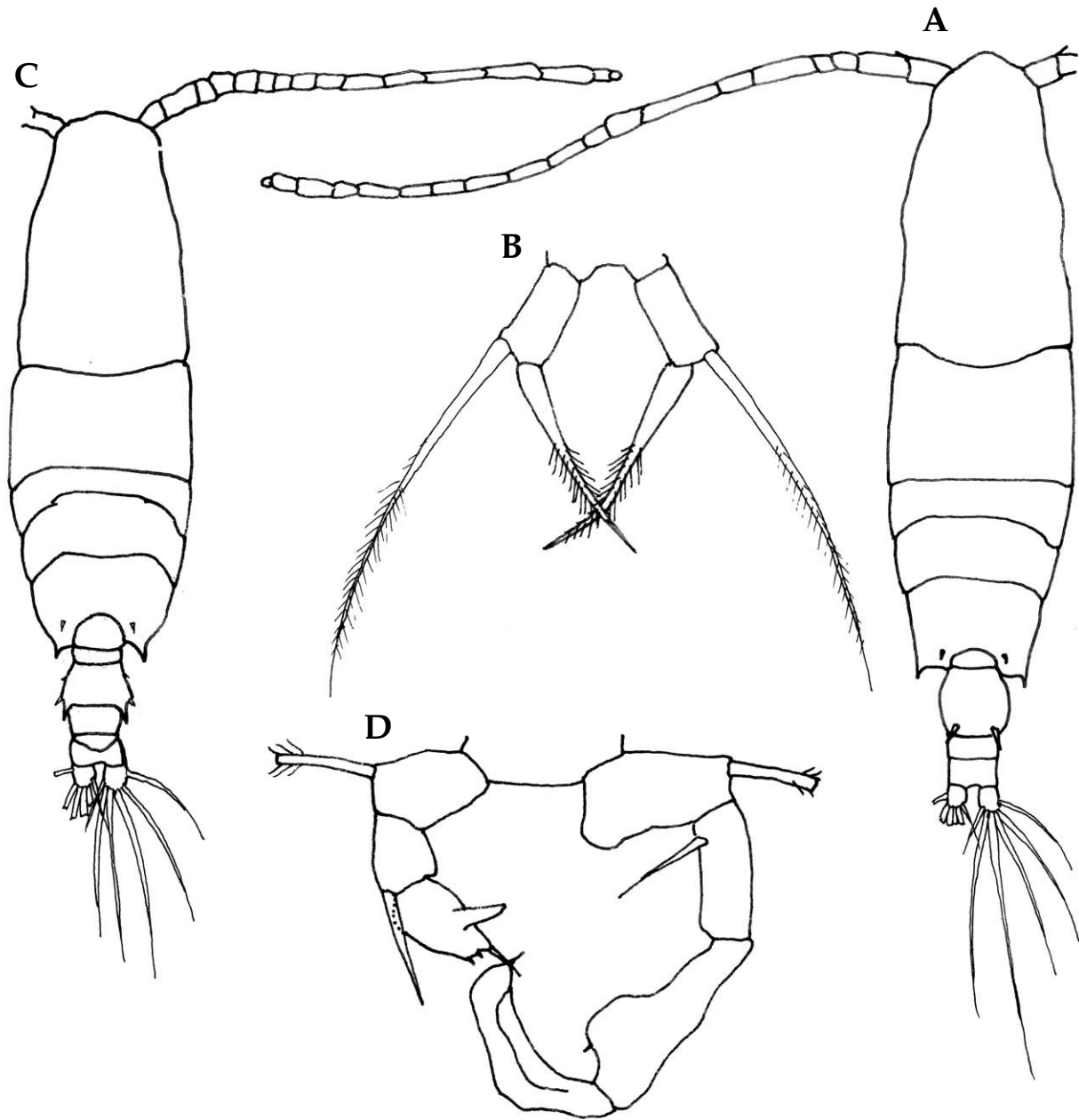


Fig. 13. *Acartia* (*Odontacartia*) *erythraea*. Female: A. habitus, dorsal view; B. fifth leg. Male: C. habitus, dorsal view; D. fifth leg.

fifth pedigerous somite slender and inner spines of same area larger than those of females. First urosomite short, with row of short hairs on lateral and posterior margins; second urosomite with tuft of hairs on anterolateral surface, and a pair of strong spiniform processes. Third and fourth urosomites each with a pair of very small spinules on posterodorsal margin; caudal rami with transverse rows of setules at base of inner dorsal seta. Third segment of right fifth leg with a protrusion on inner margin, terminal segment of left fifth leg slightly curved $2/3$ as long as seta of second

segment, with 2 subequal terminal spines, stout spine present on mid-anterior surface.

DISTRIBUTION: Coastal waters in the East China Sea, tropical waters of Pacific, Indian Ocean and Red Sea.

KOREA: GB, GN, JN, JB, CN, GG.

SPECIMEN EXAMINED: (Gamak Bay, Jeollanam-do: 30.x.2007).

ECOLOGY: *Acartia erythraea* occurs predominantly in Gamak Bay in summer, but in Korean waters it very rare.

REMARKS: *Acartia erythraea* is closely related to *A. pacifica*, but the former is distinguished by 2 pointed processes on the first segment of the antennule in the female and is without dorsal spines on the second and third urosomites in the male.

7. *Acartia (Acanthacartia) sinjiensis*

Mori, 1940 (Fig. 15)

Sin-ji-jak-eun-no-beol-re (신지작은노벌레)

Acartia sinjiensis Mori, 1940, p. 329, figs. f, m; Ueda and Hiromi, 1987, p. 230, descr. f, m, figs. f, m, rem.; Yoo et al., 1991, p. 259, fig. 5; Chihara and Murano, 1997, p. 671, pl. 20; Bradford-Grieve, 1999b, p. 217, fig. 161.

Acartia plumosa: Brodsky, 1948, 1950 (1967), p. 424, fig. 299; Ueda et al., 1983, p. 166.

Acartia iseana: Ito, 1956, p. 468.

Acartia bayli: Greenwood, 1972, p. 313, figs. f, m; 1978, p. 11.

Acartia sp.: Bayly, 1965, p. 327.

Female: Body length 0.90 mm. Posterolateral borders of fifth pedigerous somite produced into rounded processes and naked. Genital double-somite longer than urosomal somites combined. Posterior surface of urosomite each with 4 small spines. Caudal rami twice as long as wide. Antennule without any processes, reaching distal end of fifth pedigerous somite when folded backwards. Fifth leg resembles *Acartia spinicauda*. Seta on second segment shorter than terminal claw; terminal claw filamentous, swollen at base.

Male: Body length 0.80 mm. Posterolateral borders of fifth pedigerous somite rounded and naked. First urosomite symmetrical, second, third and fourth urosomites each with 4 minute spinules on dorsal surface. Inner margin of second segment of right fifth leg without notch or spine; marginal spine of terminal segment of left claw filamentous, swollen at base.

DISTRIBUTION: Brackish waters in temperate and subtropical regions of the West Pacific, Australia and Japan.

KOREA: GN, JN, GG.

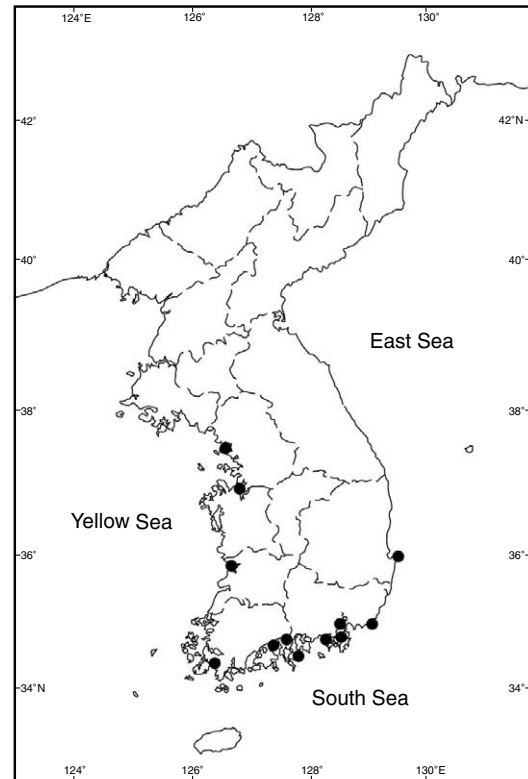


Fig. 14. Distribution of *Acartia (Odontacartia) erythraea*.

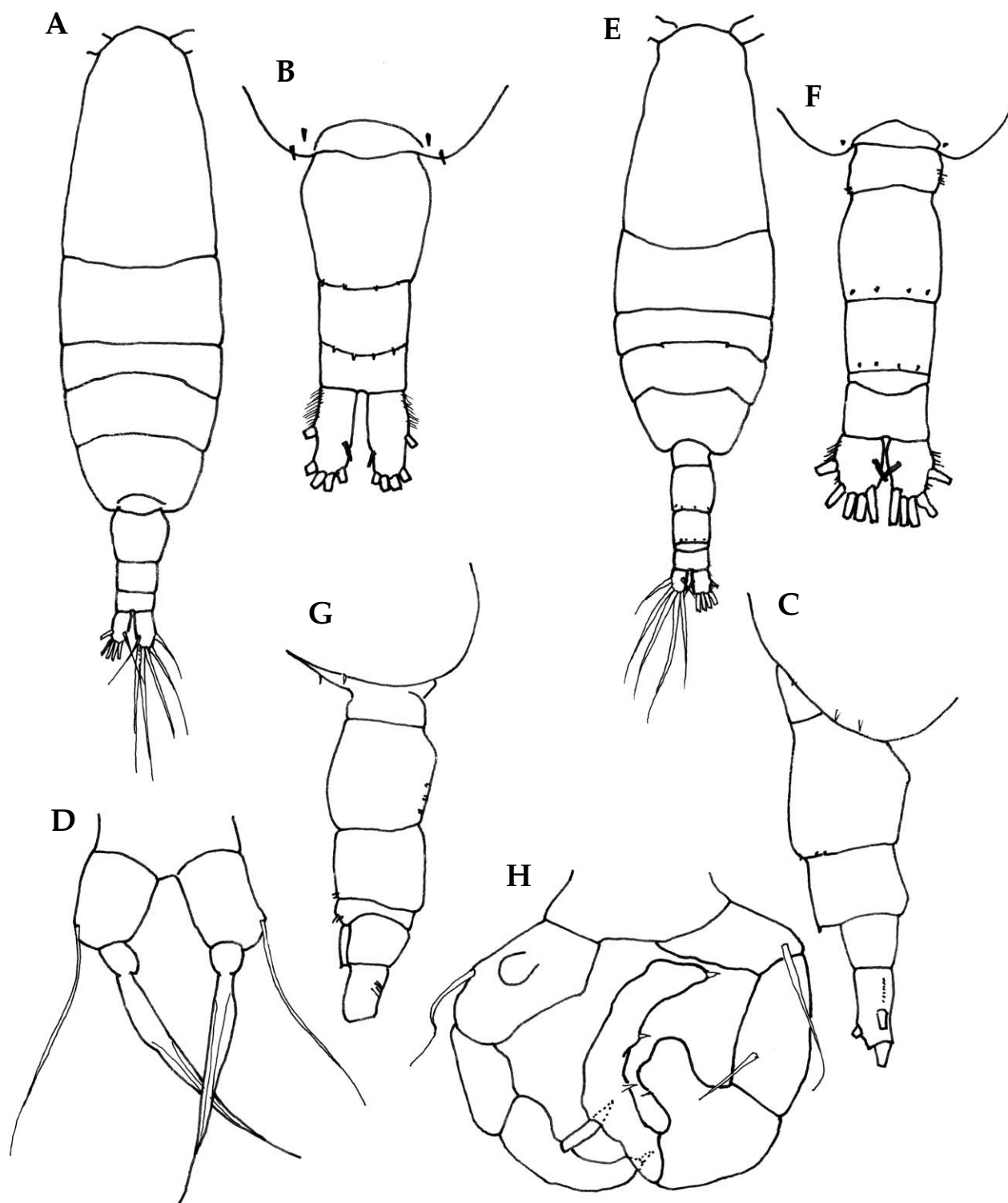


Fig. 15. *Acartia* (*Acanthacartia*) *sinjiensis*. Female: A. habitus, dorsal view; B. fifth pediger and urosome, dorsal view; C. fifth pediger and urosome, lateral view; D. fifth leg. Male: E. habitus, dorsal view; F. fifth pediger and urosome, dorsal view; G. fifth pediger and urosome, lateral view; H. fifth leg.

SPECIMEN EXAMINED: (Gamak Bay, Jeollanam-do: 30.ix.2007).

ECOLOGY: *Acartia sinjiensis* often occurs predominantly in Gamak Bay in the summer. Also, this species was often common at fishing grounds.

REMARKS: *Acartia sinjiensis* is closely related to *A. hongii*, but is easily distinguished by having rostral filaments.

8. *Acartia (Acanthacartia) steueri* Smirnov, 1936 (Figs. 16, 17)

Seu-tyu-eo-jak-eun-no-beol-re (스튜어작은노벌레)

Acartia steueri Smirnov, 1936, p. 87, figs. f, m; Brodsky, 1950 (1967), p. 425, fig. 300; Tanaka, 1965, p. 388, figs. f, m; Kos, 1985, p. 246, figs. f, m; Nishida, 1985, p. 136, figs. f, m, rem.; Chihara and Murano, 1997, p. 671, pls. 18, 19.

Female: Body length 1.10–1.70 mm. Prosoma three times length of urosome. Rostrum well defined, with two widely spaced filaments. Last pedigerous somite rounded, dorsally with oblique row of denticles at posterior corners. Genital double-somite somewhat swollen proximally, with row of spinules on posterior margin; second abdominal segment with larger spinules on posterior margin. Caudal rami symmetrical, longer than anal segment, 2.5 times as long as wide, with short marginal hairs near base of lateral setae. Apical setae of fifth pair of legs long, incurved, with very short denticles in both sides; basal setae approximately twice as long as the apical seta.

Male: Body length 0.90–1.30 mm, armature of last pedigerous somite as in female.

Second to fourth urosomites with row of spinules on posterior margins; second urosomite longest, with pair of spines ventromedially. Caudal rami shorter than in female. Fifth leg: first exopodal segment of right leg bearing one seta medially, second segment with elongate rectangular process bearing spine, third segment having 2 spines incurved; basal segment of left leg with knob; distal exopodal segment with two subequal spines terminally and 3 proximal processes on inner part.

DISTRIBUTION: Neritic or coastal waters in the Korea, China, Japan.

KOREA: GN, JJ.

SPECIMEN EXAMINED: (Geoje Island, Gyeongsangnam-do: 20.i.2009).

ECOLOGY: *Acartia steueri* occurs throughout the year in the water column, but its abundance increases mainly between fall and spring.

REMARKS: The male of *Acartia steueri* has variations in the two ventral spinules on the second urosomite. Tanaka (1965) described these elements, while Smirnov (1936) did not. Nishida (1985) suggested that the absence/presence of the ventral spinules can be variable in a local population.

9. *Acartia (Acanthacartia) tsuensis* Ito, 1956 (Figs. 18, 19)

Ji-pang-i-jak-eun-no-beol-re (지팡이작은노벌레)

Acartia tsuensis Ito, 1956, p. 470, fig. 2; Dussart and Defaye, 2002, p. 58; Chihara and Murano, 1997, p. 671, pl. 20; Lee et al., 2007, p. 147, figs. 9, 10.

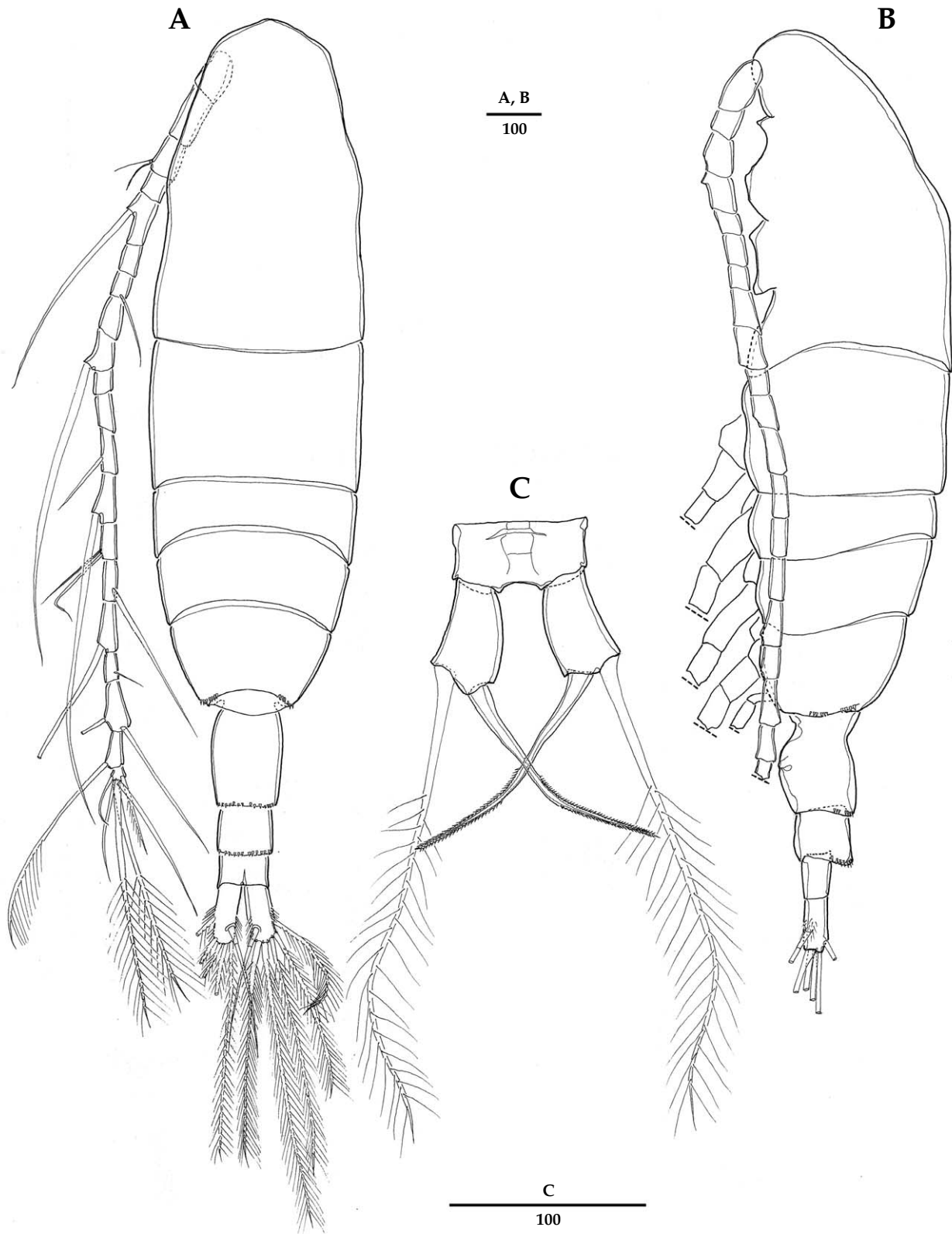


Fig. 16. *Acartia (Acanthacartia) steueri*, female. A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg.

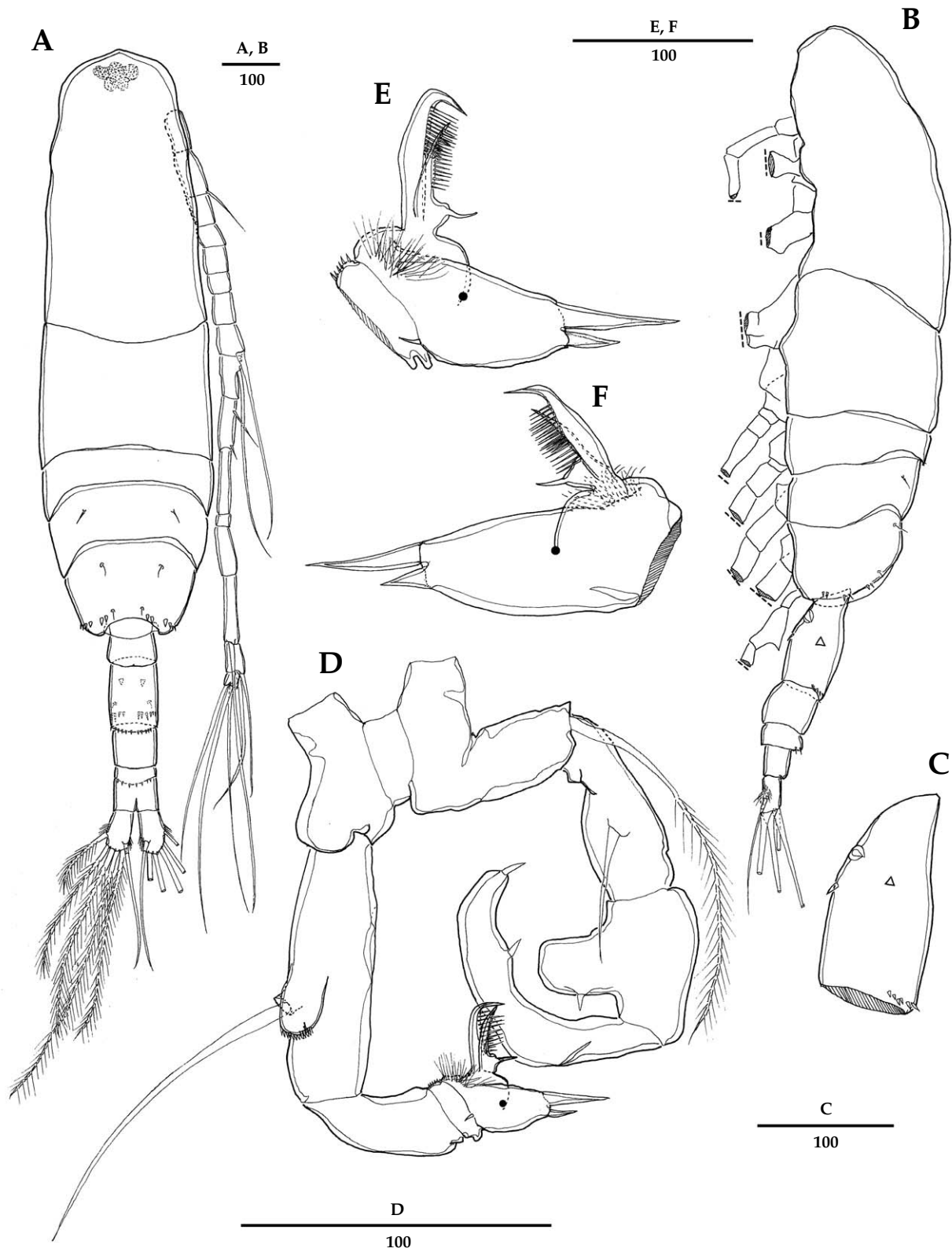


Fig. 17. *Acartia (Acanthacartia) steueri*, male. A. habitus, dorsal view; B. habitus, lateral view; C. second urosomite, left lateral view; D. fifth leg; E, F. distal segment of left fifth leg.

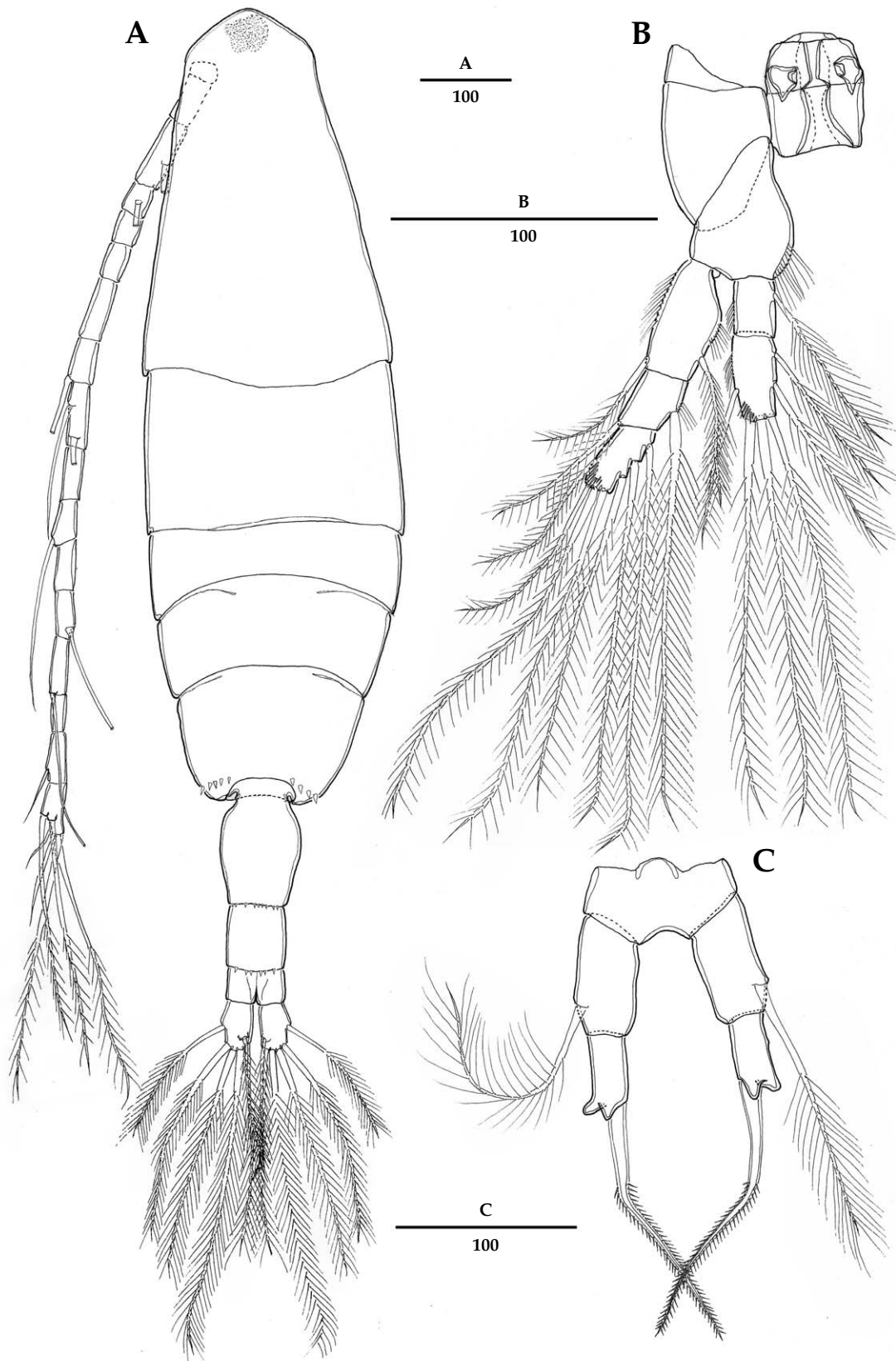


Fig. 18. *Acartia (Acanthacartia) tsuensis*, female. A. habitus, dorsal view; B. first leg; C. fifth leg.

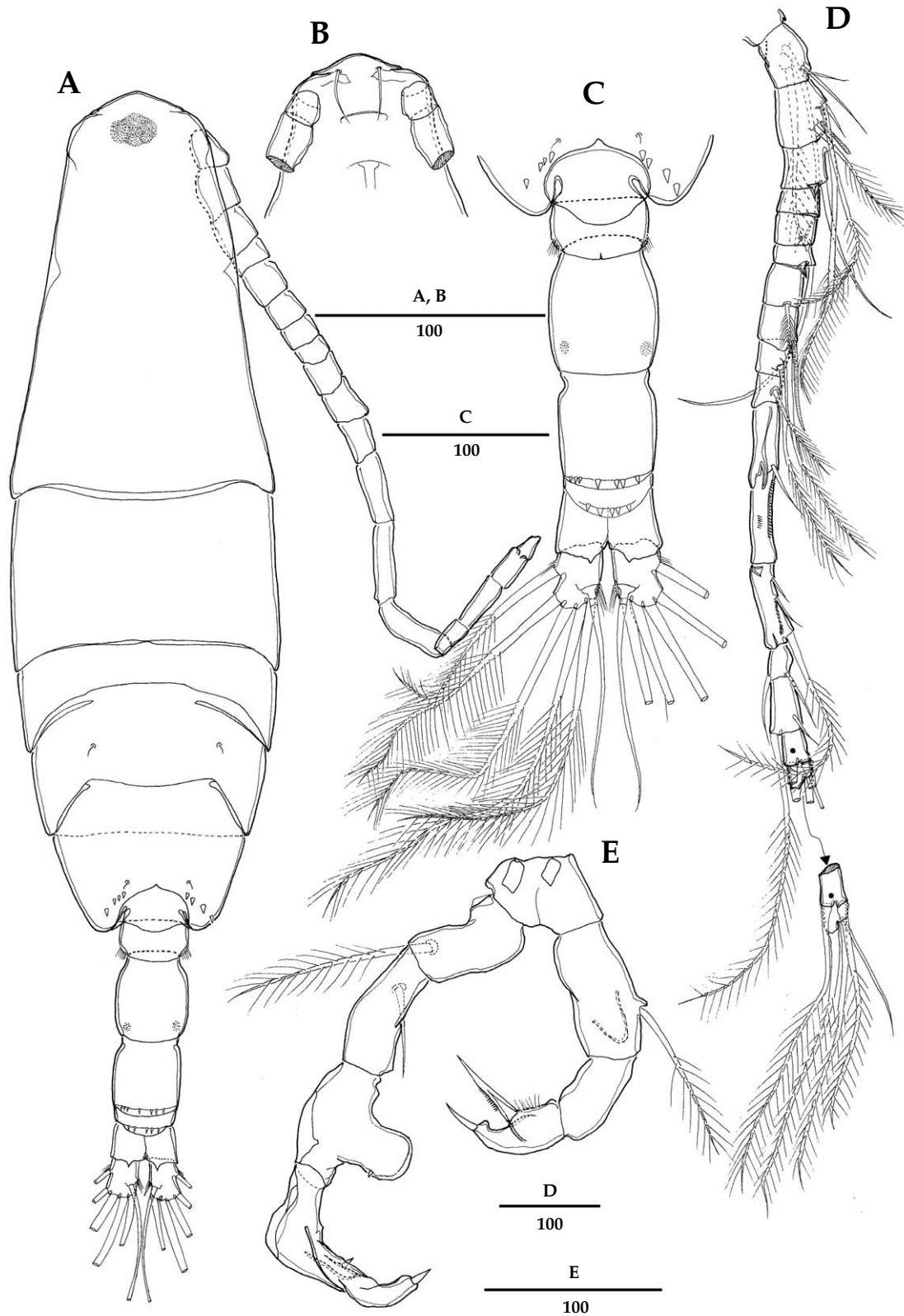


Fig. 19. *Acartia (Acanthacartia) tsuensis*, male: A. habitus, dorsal view; B. rostrum, ventral view; C. urosome, dorsal view; D. right antennule; E. fifth leg.

Female: Body length 0.9–1.1 mm. Last pedigerous somite rounded posteriorly, with 4 or 5 minute spinules. Urosome 3-segmented; genital double-somite nearly symmetrical, slightly longer than wide, with row of about 10 spinules along posterior margin; second urosomite with 6 spinules along posterior margin; caudal rami with lateral seta located in middle of lateral margin. Antennule exceeding posterior end of prosome. Endopod of first swimming leg 2-segmented. Fifth leg symmetrical; first exopodal segment with 2 projections on distolateral margin.

Male: Body length 0.8–0.95 mm. Last pedigerous somite similar to that of female. Second urosomite swollen, with tuft of setules on posterolateral corner; third and fourth urosomites with row of setules on posterior margin. First exopodal segment of right fifth leg protrudes medially; distal segment elongate with 1 small spine near middle of inner margin, 1 claw-like terminal spine and medial seta; left basis with protrusion on posterior surface and plumose seta on outer margin; distal exopodal segment hooked distally, with sharp spine terminally and stout pectinate spine near middle of inner margin.

DISTRIBUTION: Brackish waters in Korea and Japan.

KOREA: GB, GN, JJ.

SPECIMEN EXAMINED: (Ganggu estuary, Gyeongsangbuk-do: 25.x.2007).

ECOLOGY: *Acartia tsuensis* sometimes occurs predominantly in ponds for culturing fish in the summer.

REMARKS: *Acartia tsuensis* is very closely related to *A. sinjiensis*, but it is distinguishable by the shape of the caudal rami in female and the row of ventral spinules on the second urosomite in male.

10. *Acartia (Acartia) danae* Giesbrecht, 1889 (Figs. 20, 21)

Da-na-jak-eun-no-beol-re (다나작은노벌레)

Acartia danae Giesbrecht, 1889, p. 26 (cited from Giesbrecht, 1892); 1892, pp. 508, 522, 770, descr. f, fig. f; Giesbrecht and Schmeil, 1898, p. 154; A. Scott, 1909, p. 187; Sars, 1925, p. 362; Farran, 1929, p. 282; Wilson, 1932, p. 160, fig. 108; Rose, 1933, p. 276, fig. 346; Farran, 1936, p. 122; Mori, 1937, p. 102, pl. 49, figs. 5–15; Dakin and Colefax, 1940, p. 106, figs. f, m; Wilson, 1950, p. 151; Grice, 1961, p. 240, pl. 34, fig. 16; Tanaka, 1965, p. 393, fig. 248; Chen and Zhang, 1965, p. 113, pl. 50, figs. f, m; Kim, 1985, p. 138, pl. 47, figs. c–e.

Acartia (Planktacartia) danae: Steuer, 1923, p. 35, figs. f, m; Rose, 1929, p. 48; Sewell, 1932, p. 397; Vervoort, 1965, p. 195, rem.

Female: Body length 1.08–1.27 mm. Rostral filaments present. Last pedigerous somite terminated in symmetrical points, with row of minute setules. Genital double-somite and second abdominal somite with row of spinules along posterior margin; genital double-somite longer than second abdominal somite. Caudal rami with rows of spinules at posterior margin. Antennule extending as far as posterior border of caudal rami; its first segment with strong and thick spine. Basis of fifth leg 2 times longer than wide; basal outer seta 3 times longer than spine; terminal spine twice as long as its segment, denticulate at end.

Male: Body length 0.73–0.90 mm. Last pedigerous somite as in female. Genital somite with lateral hairs; second urosomite with lateral and posterodorsal spinules; third and fourth urosomites

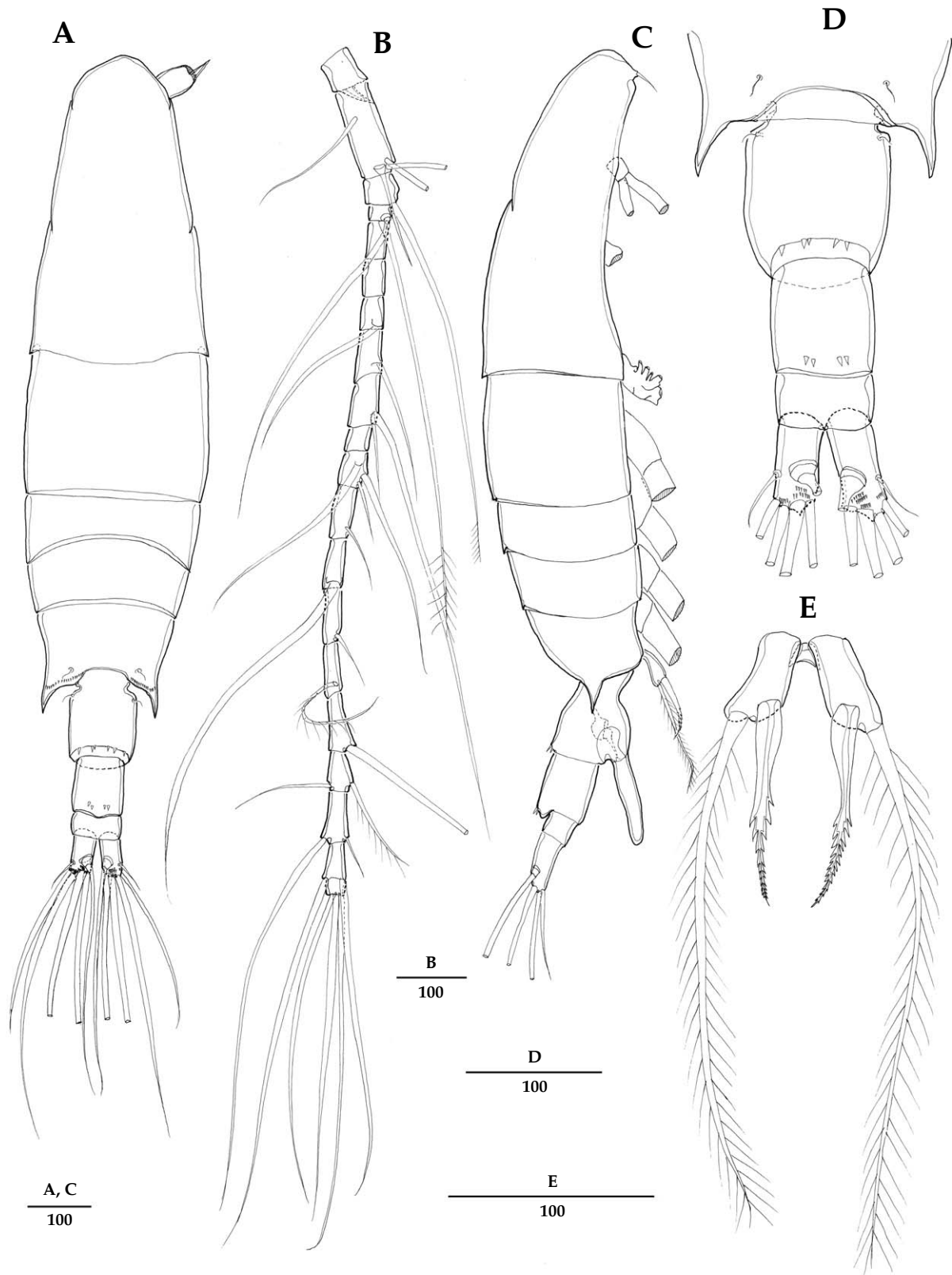


Fig. 20. *Acartia (Acartia) danae*, female. A. habitus, dorsal view; B. right antennule; C. habitus, lateral view; D. fifth pediger and urosome, dorsal view; E. fifth leg.

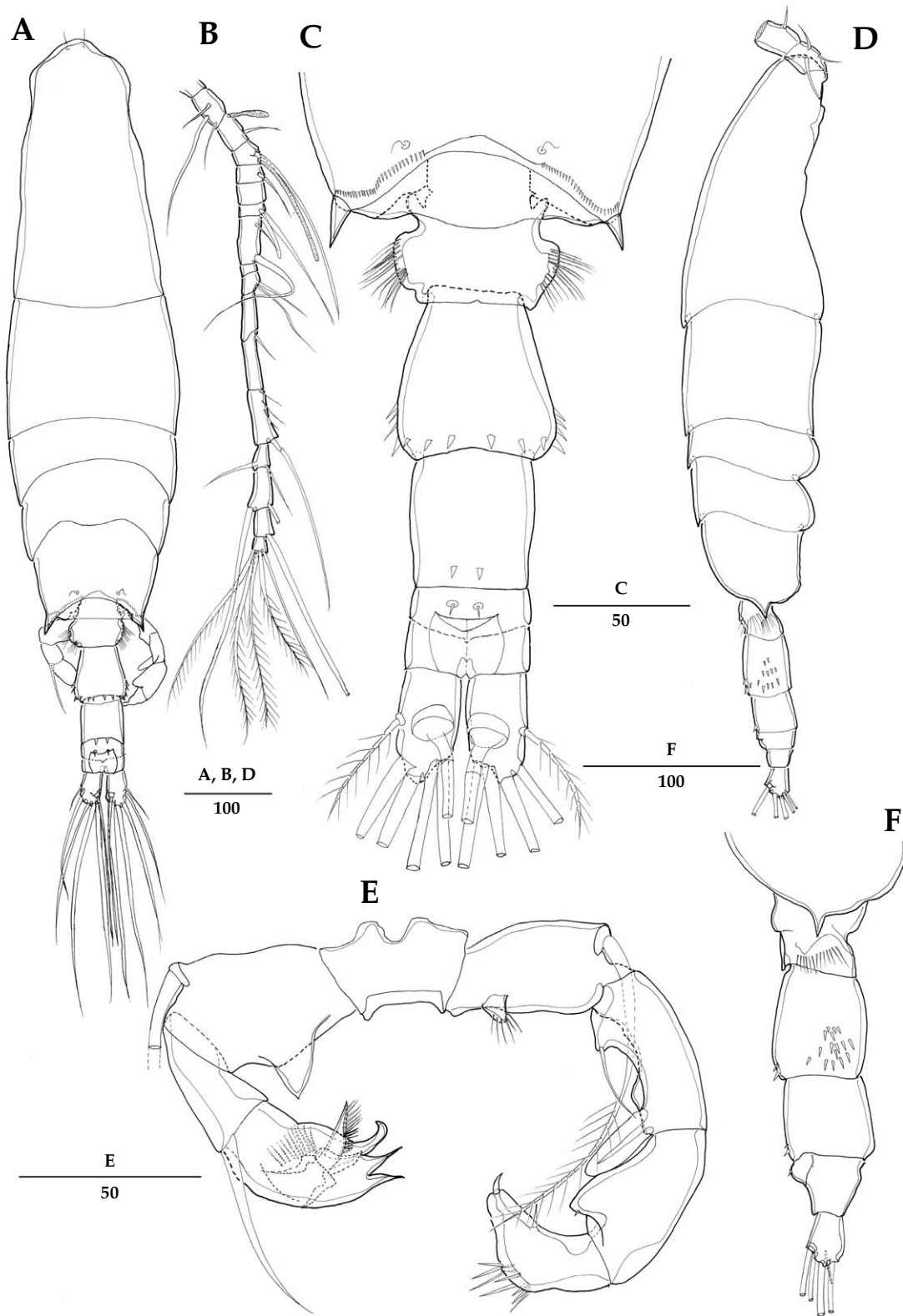


Fig. 21. *Acartia (Acartia) danae*, male: A. habitus, dorsal view; B. right antennule; C. fifth pediger and urosome, dorsal view; D. habitus, lateral view; E. fifth leg; F. fifth pediger and urosome, lateral view.

with pair of spinules. Basal segment of left fifth leg with pointed protrusion on inner medial surface and plumose seta on outer margin; distal exopodal segment with strong and stout medial spines and 3 nearly equal processes distally, innermost process hooked; first exopodal segment of right fifth leg with inner seta at proximal inner margin and elongate protrusion at distal inner margin; second segment with tiny setule on inner distal knob; distal segment with 1 inner and 1 distal spines.

DISTRIBUTION: Widespread in the tropical and subtropical Pacific, Indian, and Atlantic oceans (Steuer, 1923; Grice, 1962; Bradford-Grieve, 1999).

KOREA: GN, JN.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 20.x.2008).

REMARKS: Korean specimens show some differences from the Southwest Pacific specimens. Female and male last pedigerous somite has a row of setules on the posterior dorsal corner. Female caudal rami have 3 or 4 rows of posterior dorsal setules. Male third and fourth urosomites have a pair of setules. Male left fifth leg has 2 unequal stout medial spines and 3 distal processes on distal exopod, of which inner distal process is inside curved. Basal outer seta of male fifth leg is longer than that from the Southwest Pacific specimens (Bradford-Grieve, 1999).

11. *Acartia (Acartia) negligens* Dana, 1849 (Figs. 22, 23)

Gin-teol-jak-eun-no-beol-re (긴털작은노벌레)

Acartia negligens Dana, 1849, p. 20; Giesbrecht, 1892, pp. 508, 522, 770, fig. f; Giesbrecht and Schmeil, 1898, p. 154; A. Scott, 1909, p. 188, rem.; Wolfenden, 1911, p. 357; Sewell, 1914, p. 241; Steuer, 1923, p. 35, figs. f, m; Rose, 1933, p. 277, figs. f, m; Mori, 1937 (1964), p. 101, figs. f, m; Tanaka, 1960, p. 55, fig. f; Grice, 1962, p. 240, fig. f; Chen and Zhang, 1965, p. 114, pl. 50, figs. 11–14; Tanaka, 1965, p. 394, fig. 249; Owre and Foyo, 1967, p. 101, figs. f, m; Park, 1968, p. 569, fig. m; Crisafi and Crescenti, 1972 (1974), p. 234, figs. f, m; Dawson and Knatz, 1980, p. 8, figs. f, m; Kim, 1985, p. 139, pl. 47, figs. f, g; Chihara and Murano, 1997, p. 669 pl. 17; Bradford-Grieve et al., 1999, pp. 886, 962, fig. 163.

Acartia (Planktarticaria) negligens: Rose, 1929, p. 48; Vervoort, 1965, p. 196, rem.

Female: Body length 1.04–1.27. Rostral filaments present. Last pedigerous somite rounded at posterior corner, with single or many small spines and a range of more dorsal fine hairs. Urosome 3-segmented; genital double-somite and second abdominal somite with spinules on posterior margin. Basis of fifth leg longer than wide, with outer seta at least 5 times longer than inner spine; inner spine dentate and less than twice length of its segment.

Male: Body length 0.80–1.02 mm. Last pedigerous somite rounded. Antennule shorter than body. Second to fourth urosomites with dorsoposterior spinules. Fifth leg: basis with outer seta and process furnished with spinules; first exopodal segment of right leg with proximal spine and tongue-like distal process on inner margin; second exopodal segment with outer proximal spine and inner spine on distal knob; distal segment with 2 spines; exopod of left leg 2-segmented, first segment with outer distal seta on outer margin, distal segment with medial seta and 3 unequal or equal processes.

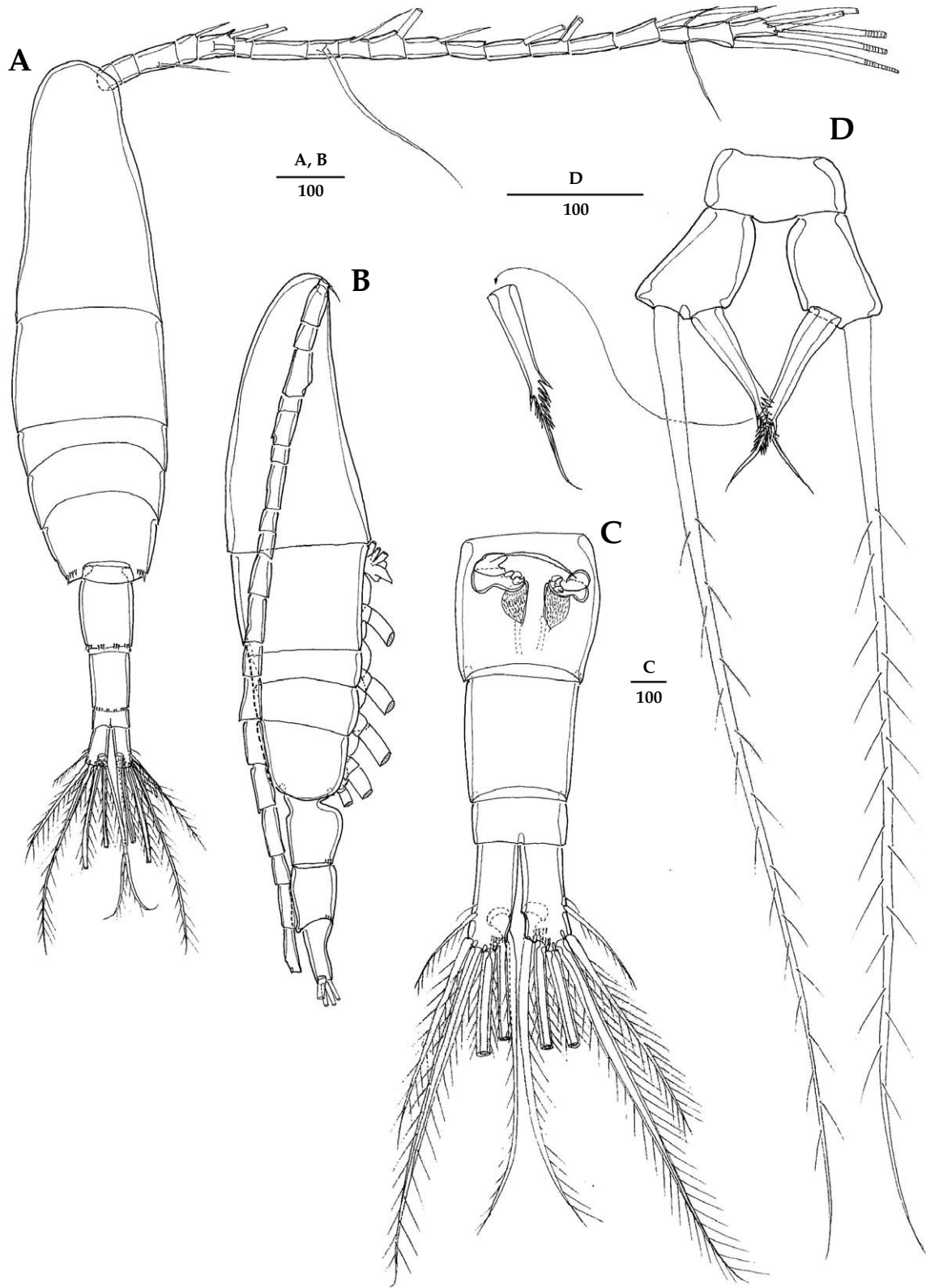


Fig. 22. *Acartia (Acartia) negligens*, female. A. habitus, dorsal view; B. habitus, lateral view; C. urosome, ventral view; D. fifth leg.

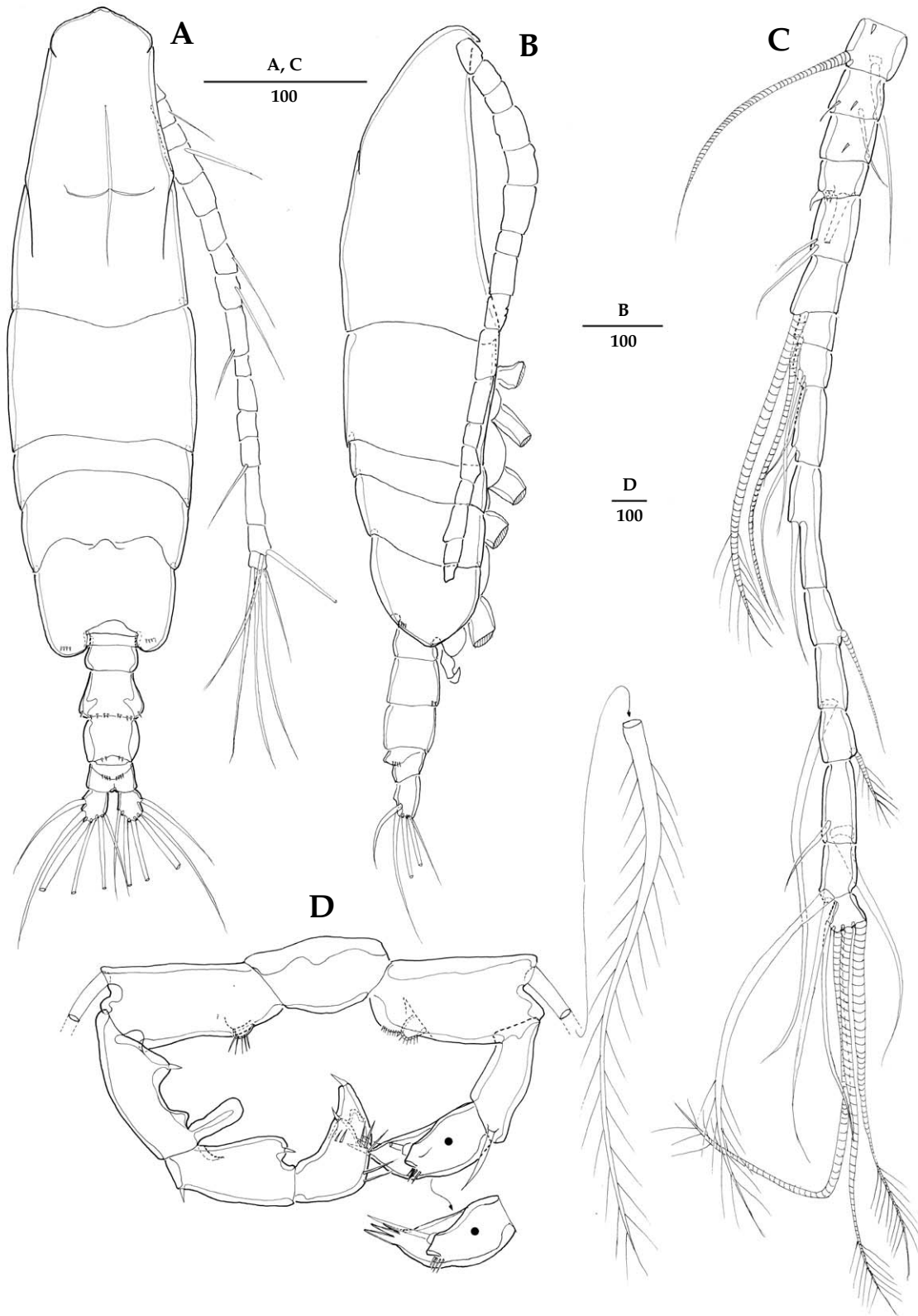


Fig. 23. *Acartia (Acartia) negligens*, male. A. habitus, dorsal view; B. habitus, lateral view; C. right antennule; D. fifth leg.

DISTRIBUTION: Tropical and subtropical waters of the Pacific, Indian, and Atlantic oceans (Steuer, 1923; Bradford-Grieve, 1999).

KOREA: GN, JN (offshore in the South Sea).

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 13.ix.2008).

REMARKS: The male from the Southwest Pacific has long posterior hairs on both sides of the last pedigerous somite. Also, it has lateral hairs on urosomites (Bradford-Grieve, 1999). However, the male from the southern sea of Korea lacks or rarely has these hairs. Also, male fifth left leg has 3 unequal processes.

Family Calanidae Dana, 1846

No-beol-re-gwa (노벌레과)

Body slender. Prosoma comprising cephalosome and 5 pedigerous somites, or with first pedigerous somite incorporated into cephalosome. Posterolateral angles of prosoma rounded. Cephalic dorsal hump present in males of most genera. Urosome of 4 free somites in female. Genital apparatus comprising common genital aperture located medially on ventral surface of genital double-somite. Urosome of 5 free somites in male; comprising genital somite and 4 free abdominal somites. Caudal rami with up to 6 setae. Rostrum divided into paired rostral filaments. Naupliar eye present. Antennule primitively 25-segmented in female and non-geniculate in male. Antenna biramous, with 2-segmented endopod and 7-segmented exopod. Mandible biramous, comprising coxa with well developed gnathobase and distal palp consisting of basis, armed 4 setae, 2-segmented endopod and 5-segmented exopod. Male mandible reduced in some genera. Maxillule biramous, with 3-segmented protopod comprising praecoxa with well developed arthrite bearing 14/15 elements including 4 on the posterior surface and 1 on anterior surface; coxa with endite bearing 4 setae and with 9 setae on epipodite; basis with outer seta, with proximal endite bearing 4 setae and distal group of 4 setae representing distal endite. Endopod 3-segmented, with setation formula of 4, 4, 7; exopod 1-segmented, armed with 11 setae. Setation sometimes reduced. Male maxillule reduced in some genera. Maxilla indistinctly 7-segmented; praecoxa and coxa incompletely fused; basis with 4 setae; free endopod indistinctly 4-segmented; segmental setation formula 3, 3, 2, 2 or reduced. Male maxilla reduced in some genera. Maxilliped 7-segmented, 5 terminal segments with 4, 4, 3, 4 and 4 setae, respectively.

Swimming legs 1 to 5 biramous, with 3-segmented rami. Spine and seta formula typically as follows:

	coxa	basis	exopodal segments	endopodal segments
leg 1	0-1	0-1	I-1;I-1;II,I,4	0-1;0-2;1,2,3
leg 2	0-1	I-0	I-1;I-1;II,I,5	0-1;0-2;2,2,4
leg 3	0-1	I-0	I-1;I-1;II,I,5	0-1;0-2;2,2,4
leg 4	0-1	1-0	I-1;I-1;II,I,5	0-1;0-2;2,2,3
Leg 5	0-0	1-0	I-0;I-1;II,I,4	0-1;0-1;2,2,2

Setation sometimes reduced. First exopodal segment of leg 2 recurved in *Neocalanus*; second

exopodal segment of leg 2 with deep invagination in *Undinula*. Female fifth leg with 3-segmented rami as for legs 1 to 4. Male fifth leg with both rami usually 3-segmented, right leg similar to other swimming legs, left leg variously modified. Male fifth leg sometimes reduced on endopod and devoid of segmentation on one or both sides (Bradford and Jillett, 1974; Nishida, 1989; Boxshall and Halsey, 2004).

GENERA: 8 (7 in Korea), species 36 (8 in Korea).

DISTRIBUTION: Worldwide.

Key to the genera of family Calanidae

1. Coxa of leg 5 with row of small teeth along inner margin 2
 - Coxa of leg 5 lacking ornamentation along inner margin 4
 2. Male left leg 5 prehensile; endopod rudimentary, lacking setae, exopod highly modified: basis of legs 2 and 3 in female ornamented with spinules on posterior surface *Cosmocalanus*
 - Neither leg 5 prehensile in male; basis of legs 2 and 3 in female lacking ornamentation of spinules on posterior surface 3
 3. Male right leg 5 with inner margin setae on third exopodal segment; seminal receptacles fused in female *Nannocalanus*
 - Male right leg 5 lacking inner setae on exopod; seminal receptacles separated in female *Calanus*
 4. Second exopodal segment of leg 2 with deep invagination in outer margin; male left leg 5 prehensile *Undinula*
 - Outer margin of second exopodal segment of leg 2 not invaginated; male left leg 5 not prehensile 5
 5. Leg 1 with inner seta on basis modified into proximally expanded spine; male mouthparts similar to those of female *Canthocalanus*
 - Inner basal seta on leg 1 plumose, not modified; male mouthparts reduced 6
 6. Spine on first exopodal segment of leg 2 with recurved spinous process just medial to outer margin; endopod of female leg 5 with 8 setae; endopod of male right leg 5 with 8 setae *Neocalanus*
 - Spine on first exopodal segment of leg 2 not recurved; endopod of female leg 5 with 6 or 7 setae; endopod of male right leg 5 with less than 7 setae 7
 7. Inner seta on first endopodal segment of leg 1 present; endopod of female leg 5 with 6 setae; endopod of male right leg 5 with 0 to 6 setae *Calanoides*
 - Inner seta on first endopodal segment of leg 1 absent; endopod of female leg 5 with 7 setae; endopod of male right leg 5 with 7 setae *Mesocalanus*
- (Bradford, 1988)

REMARKS: The Calanidae includes 8 genera: *Calanoides* Brady, *Calanus* Leach, *Canthocalanus* A. Scott, *Cosmocalanus* Bradford and Jillett, *Mesocalanus* Bradford and Jillett, *Nannocalanus* Sars, *Neocalanus* Sars, *Undinula* A. Scott (Bradford and Jillett, 1974). In Korean waters, all genera are found. The genus *Calanus* predominantly occurs in coastal waters of Korea, while other genera commonly do in the oceanic seawaters of Korea (Kim, 1985; Kang, 1992).

Genus *Cosmocalanus* Bradford and Jillett, 1974

U-ju-no-beol-re-sok (우주노벌레속)

Cephalosome and first pedigerous somite fused. Last pedigerous somite protruding posteriorly in female. Fifth leg of both sexes serrated on inner margins of coxa. Female fifth leg with 7 setae on endopod. Male fifth leg with 1-segmented, rudimentary left endopod; left exopod highly modified into prehensile organ; right leg retains primitive structure (Bradford and Jillett, 1974; Kang, 1992).

SPECIES 2 (1 in Korea).

DISTRIBUTION: Tropical to temperate waters worldwide.

12. *Cosmocalanus darwini* (Lubbock, 1860) (Figs. 24, 25)

Kku-mim-no-beol-re (꾸밈노벌레)

Undina darwini Lubbock, 1860, p. 7, pl. 29; Brady, 1883, p. 54, pl. 16, figs. 1-4, 6-14.

Calanus darwini: Giesbrecht, 1892, p. 91, pl. 6, figs. 5, 29, pl. 8, figs. 11, 37; Giesbrecht and Schmeil, 1898, p. 17; Thompson and Scott, 1903, pp. 232, 241; Farran, 1929, pp. 207, 217; Mori, 1937 (1964), p. 18, pl. 5, figs. 6-12; Madhupratap et al., 2001, figs. 4, 5.

Undinula darwini: A. Scott, 1909, p. 17, rem.; Farran, 1936, p. 78; Dakin and Colefax, 1940, p. 89, figs. f, m; Sewell, 1947, p. 18, rem. f; Wilson, 1950, p. 349 pl. 19, figs. 256-259; Tanaka, 1956a, p. 265; 1960, p. 20; 1962, p. 102, fig. 6; Grice, 1962, p. 178, pl. 2, figs. 1-9; Chen and Zhang, 1965, p. 31, pl. 4, figs. f, m; Kim, 1985, pp. 33-35, pl. 5, figs. f, m.

Cosmocalanus darwini: Bradford and Jillett, 1974, pp. 6, 13; Fleminger, 1985, p. 285, figs. m, rem. f, m; Bradford, 1988, rem., pp. 74, 76; Kang, 1992, p. 23, fig. 6; Bradford-Grieve, 1994, p. 35, figs. 13; Bradford-Grieve et al., 1999, pp. 877, 906, 907, figs. f, m; Boxshall and Halsey, 2004, p. 81, figs. f, m.

Female: Body length 2.05-2.08 mm. Cephalosome and first pedigerous somite fused; last pedigerous somite protruding posteriorly, variable but not pointed, Genital double-somite and second urosomite with row of small spines on posterior margin. Outer distal margin of third exopod segment of second to fourth legs serrated. Inner margin of coxa of fifth leg serrated.

Male: Body length 1.84-1.90 mm. Last pedigerous somite not protruding posteriorly. Fifth leg strongly modified; inner margin of coxa serrated; exopod of left leg 3-segmented, last segment transformed to forcep-form. Endopod of right fifth leg 3-segmented, each endopod with 1, 1, 5 setae (Kang, 1992; Bradford-Grieve, 1994).

DISTRIBUTION: Tropical to temperate waters worldwide.

KOREA: GN.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 13.xii.2007).

ECOLOGY: *Cosmocalanus darwini* occurs in small numbers in the waters adjacent to the Tsushima Warm Current during fall.

REMARKS: Sewell (1929) classified the female of this species into 3 forms based on the shape of

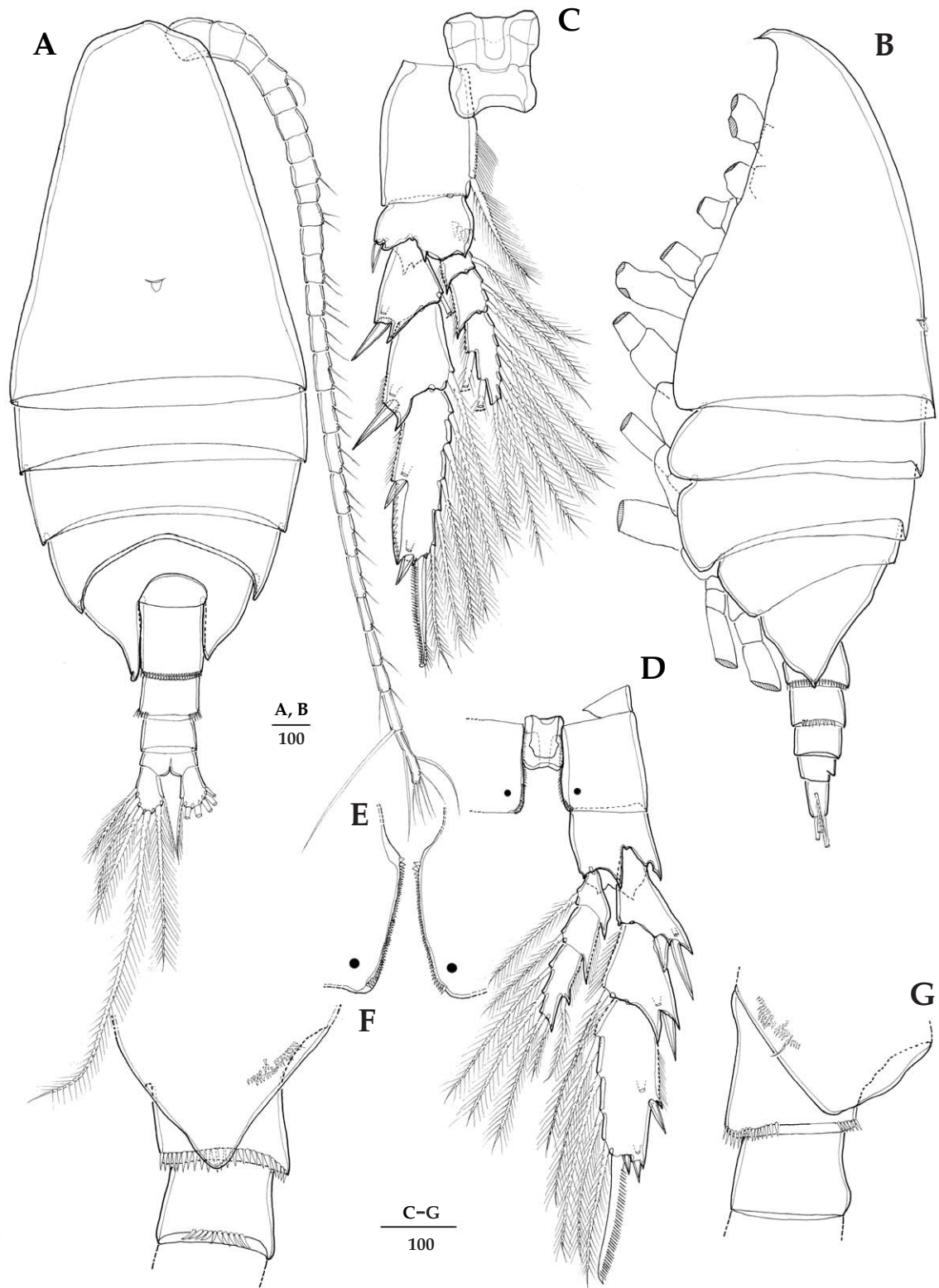


Fig. 24. *Cosmocalanus darwini*, female. A. habitus, dorsal view; B. habitus, lateral view; C. first leg; D. fifth leg; E. inner margin of coxa of fifth leg; F. last pedigerous somite and urosome, left lateral view; G. last pedigerous somite and urosome, right lateral view.

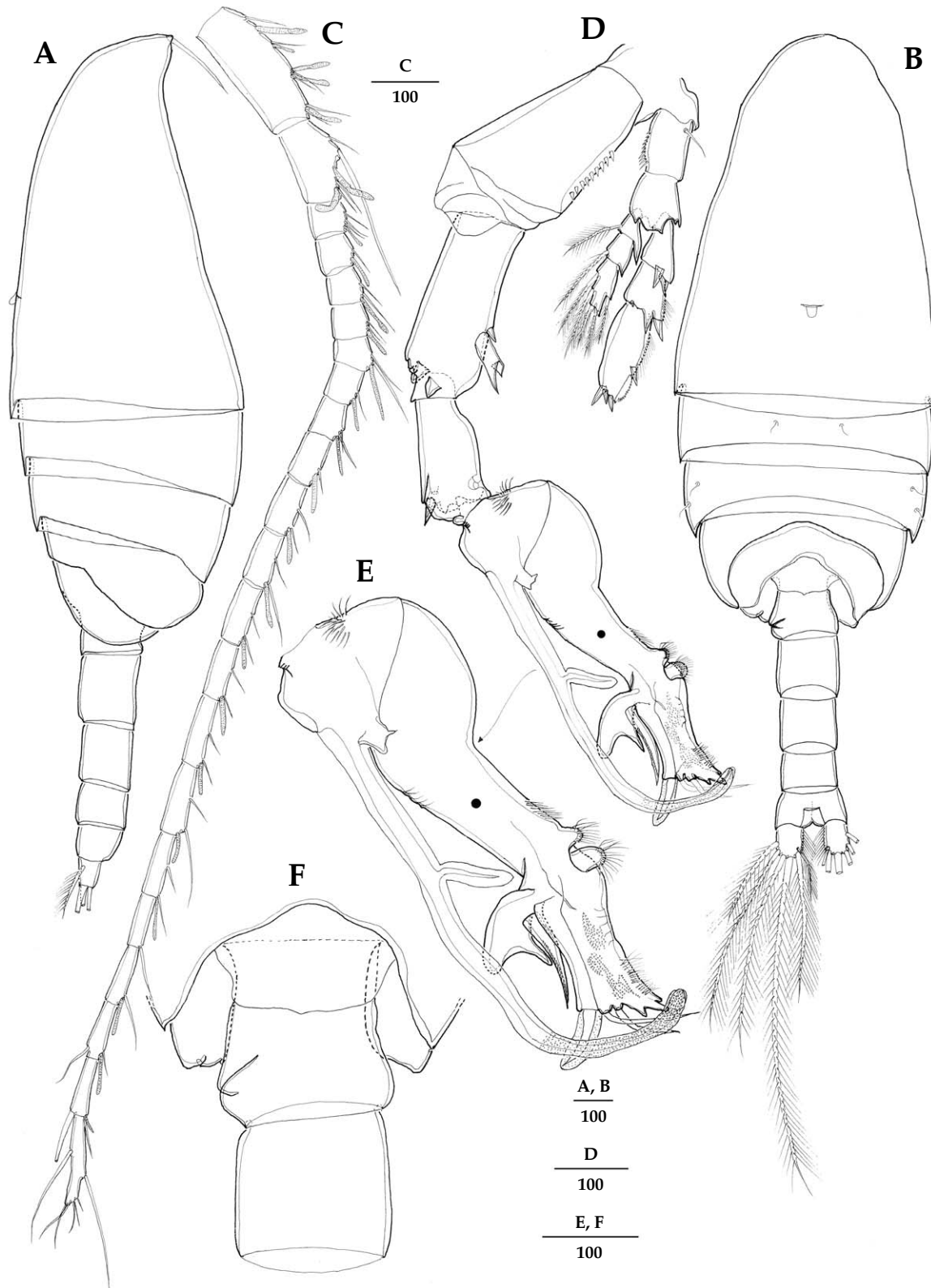


Fig. 25. *Cosmocalanus darwini*, male: A. habitus, lateral view, B. habitus, dorsal view; C. right antennule; D. fifth leg; E. second and third exopodal segment of left fifth leg; F. genital somite and second abdominal somite, dorsal view.

the fifth pedigerous somite as follows:

- 1) *U. darwini* forma *typica* is directed ventrally or round,
- 2) *U. darwini* forma *symmetrica* is symmetrical in both sides of the last pedigerous somite,
- 3) *U. darwini* forma *intermedia* is more or less triangular and rounded in the left process of the last pedigerous somite.

Grice (1962) accepted Sewell's (1929) classifications and reported 3 forms of *U. darwini* in the equatorial waters of the Pacific. Otherwise, Kim (1985) disagreed with 3 forms, and also reported only 1 form belonging to *U. darwini* forma *symmetrica* in Korean waters. Kang (1992) reported 2 different forms from Korean waters, *U. darwini* forma *symmetrica* and *U. darwini* forma *intermedia* (Kang, 1992).

Genus *Calanus* Leach, 1816

No-beol-re-sok (노벌레속)

Cephalosome anteriorly rounded in dorsal and lateral view. Urosome 4-segmented in female, 5-segmented in male. Genital double-somite slightly swollen ventrally. Antennule 22 to 25 segmented. Exopod of antenna 7-segmented. First to fifth legs with 3 segmented exopod and endopod. Male fifth leg slightly modified, left exopod longer than right exopod. Inner margin of coxa of fifth leg serrated in both sexes (Kim, 1985).

SPECIES 16 (6 in Korea).

DISTRIBUTION: Tropical to temperate waters worldwide.

13. *Calanus sinicus* Brodsky, 1965 (Figs. 27, 28)

Jung-guk-no-beol-re (중국노벌레)

Calanus sinicus Brodsky, 1948.: 1950 (1967), part., p. 90, fig. 21; Shen and Bai, 1956, part., p. 218, pl. I, figs. 1–3.

Calanus finmarchicus: Mori, 1929; Tanaka, 1956, p. 252, small forms.

Calanus helgolandicus: Mori, 1937 (1964), p. 14, figs. 1–9.

Calanus sinicus Brodsky, 1962, p. 1416 (nomen nudum); Chen and Zhang, 1965, p. 26, pl. 1, figs. 1–7; Brodsky, 1965, pp. 2, 5; Bradford, 1988, pp. 74, 76, rem.; Hulsemann, 1994, p. 1462, figs. 1, 3, 5, 7, 9, 11, 13, 15; Chihara and Murano, 1997, p. 739, pl. 67.

Female: Body length 2.7–3.0 mm. Prosoma, in dorsal view, with subparallel margins on anterior half of body. Cephalosome wide, smoothly rounded anteriorly, not forming protuberances or angles as in *C. helgolandicus*. Last pedigerous somite produced backwards into rounded protuberances posteriorly. Genital double-somite slightly more than three times as long as anal somite. Caudal rami symmetrical, only slightly longer than anal somite. Antennules longer than body by two distal segments. Coxa of female fifth legs bearing row of denticles; upper and lower parts with longer denticles than middle part.

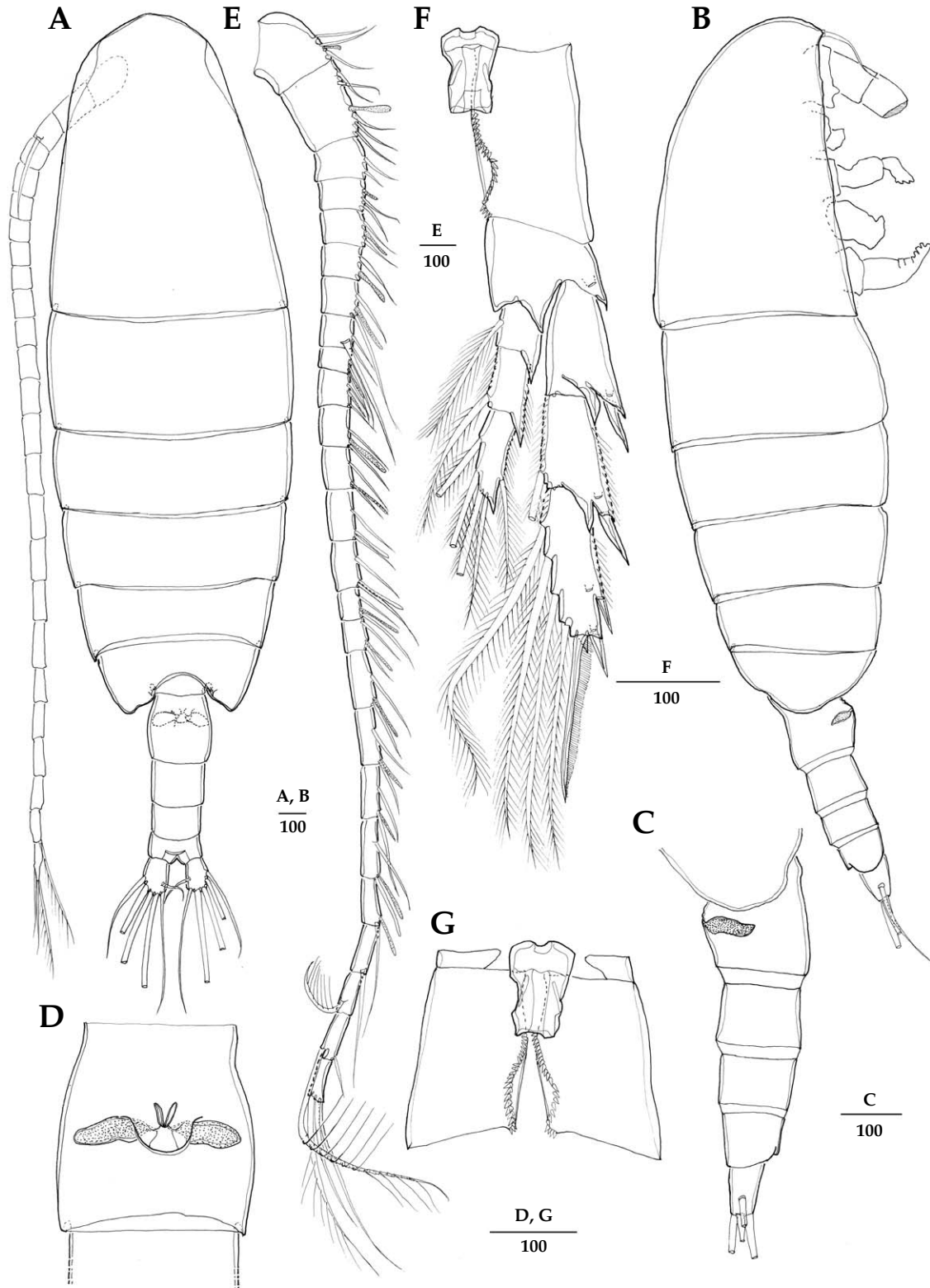


Fig. 26. *Calanus sinicus*, female. A. habitus, dorsal view; B. habitus, lateral view; C. last pedigerous somite and urosome, lateral view; D. genital double somite, ventral view; E. right antennule; F. fifth leg; G. coxa of fifth leg.

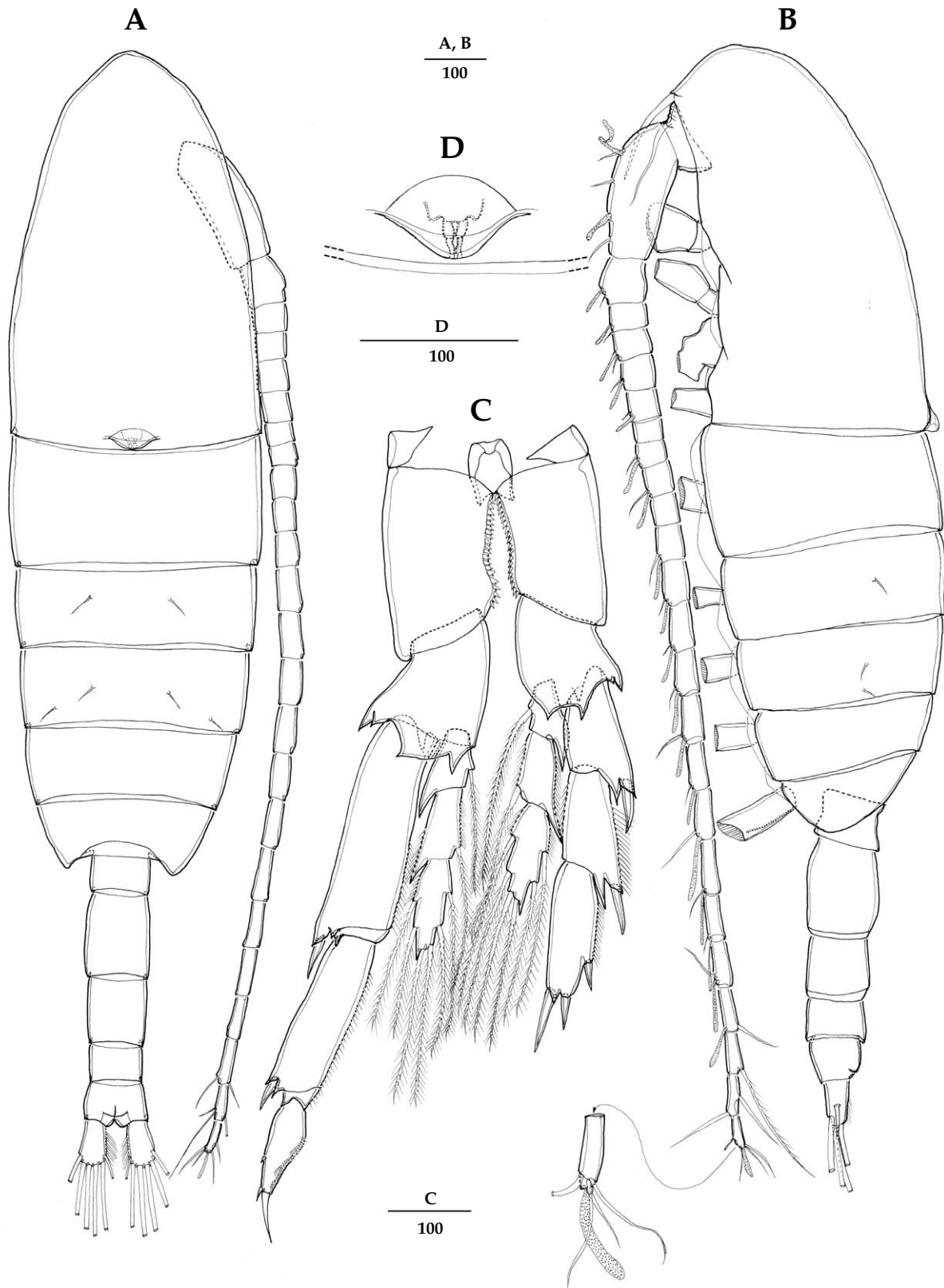


Fig. 27. *Calanus sinicus*, male: A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg; D. rostrum, ventral view.

Male: Body length 2.6–2.9 mm. Cephalosome anteriorly rounded in dorsal and lateral aspect. Second urosomite widest; posterior somite not conspicuously widened distally. Antennules slightly longer than body. Fifth legs asymmetrical, left exopod much longer than right; first exopodal segment longest, second segment narrower than first, third segment strongly produced; apex of left endopod almost never extending beyond 1/4 of upper boundary of second exopod. Coxa of fifth leg has contiguous denticles in inner margin (Brodsky, 1965; Chihara and Murano, 1997).

DISTRIBUTION: The Yellow Sea, the East Sea (Sea of Japan), the northwestern Pacific, the Sea of Okhotsk, San Francisco Bay.

KOREA: JN.

SPECIMEN EXAMINED: (Yeosu strait, Jeollanam-do: 20.viii.2006).

ECOLOGY: *Calanus sinicus* mainly occurs in the Yellow Sea Cold water and in Korean coastal waters it annually does in the cold waters.

REMARKS: *Calanus sinicus* is very closely related to *C. pacificus*, but it is easily distinguished from the following characteristics: angle of the seminal receptacle in female in lateral view; the left endopod of male fifth leg extends between 1/4 and 1/3 distance between proximal and distal border of second exopod segment (Hulsemann, 1994). However, Korean populations never extend beyond 1/4 distance between proximal and distal border of second exopod segment. It is very closely related to *P. pacificus*. In spite of the morphological characteristics, it only differ to the latter <1% in the mitochondrial DNA (mtCOI).

Genus *Canthocalanus* A. Scott, 1909

Nun-gu-seok-no-beol-re-sok (눈구석노벌레속)

Cephalosome and first pedigerous somite fused. Mouthparts similar in both sexes; maxilla with 4 setae on coxal endite. Coxal anterior margin of first leg terminates in a well-defined projection; basis with distal seta on anterior surface modified into proximally thickened spine. Second to fourth legs without modification or ornamentation. Fifth leg with inner border of coxa naked in both sexes. Female fifth bearing endopod with 7 setae. Male fifth leg with both rami 3-segmented, hardly modified on right; left endopod with only 2 terminal setae (Bradford and Jillett, 1974; Bradford-Grieve, 1994).

SPECIES 1 (1 in Korea).

DISTRIBUTION: the tropical to temperate waters of worldwide ocean.

14. *Canthocalanus pauper* (Giesbrecht, 1888) (Figs. 28, 29)

Nun-gu-seok-no-beol-re (눈구석노벌레)

Calanus pauper Giesbrecht, 1888, p. 331; 1892, p. 91, pl. 8, fig. 25; Giesbrecht and Schmeil, 1898, p. 16; Thompson and A. Scott 1903, pp. 232, 241; Farran, 1929, pp. 207, 215, rem.; Mori, 1937 (1964), p.

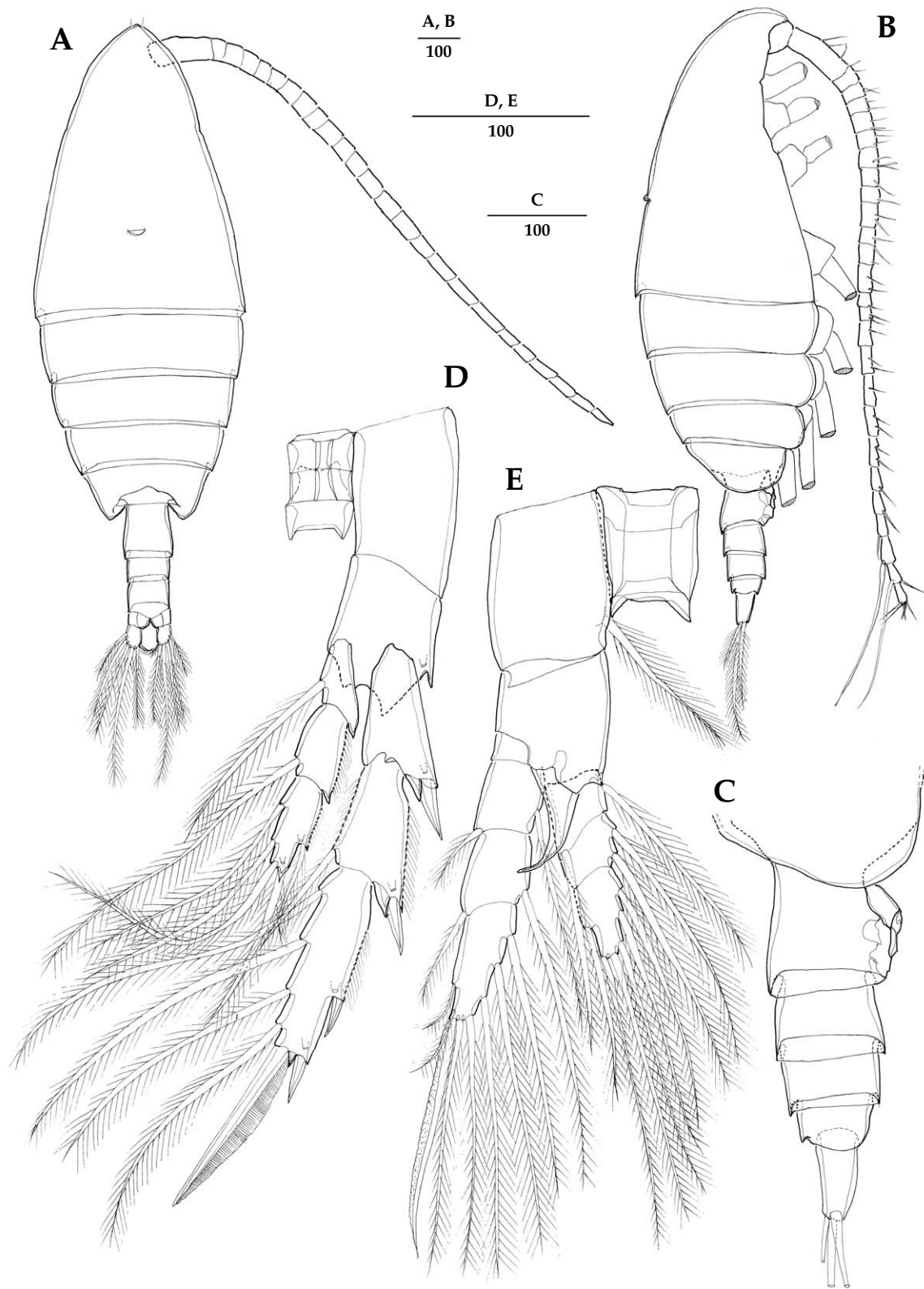


Fig. 28. *Canthocalanus pauper*, female. A. habitus, dorsal view; B. habitus, lateral view; C. urosome, lateral view; D. first leg; E. fifth leg.

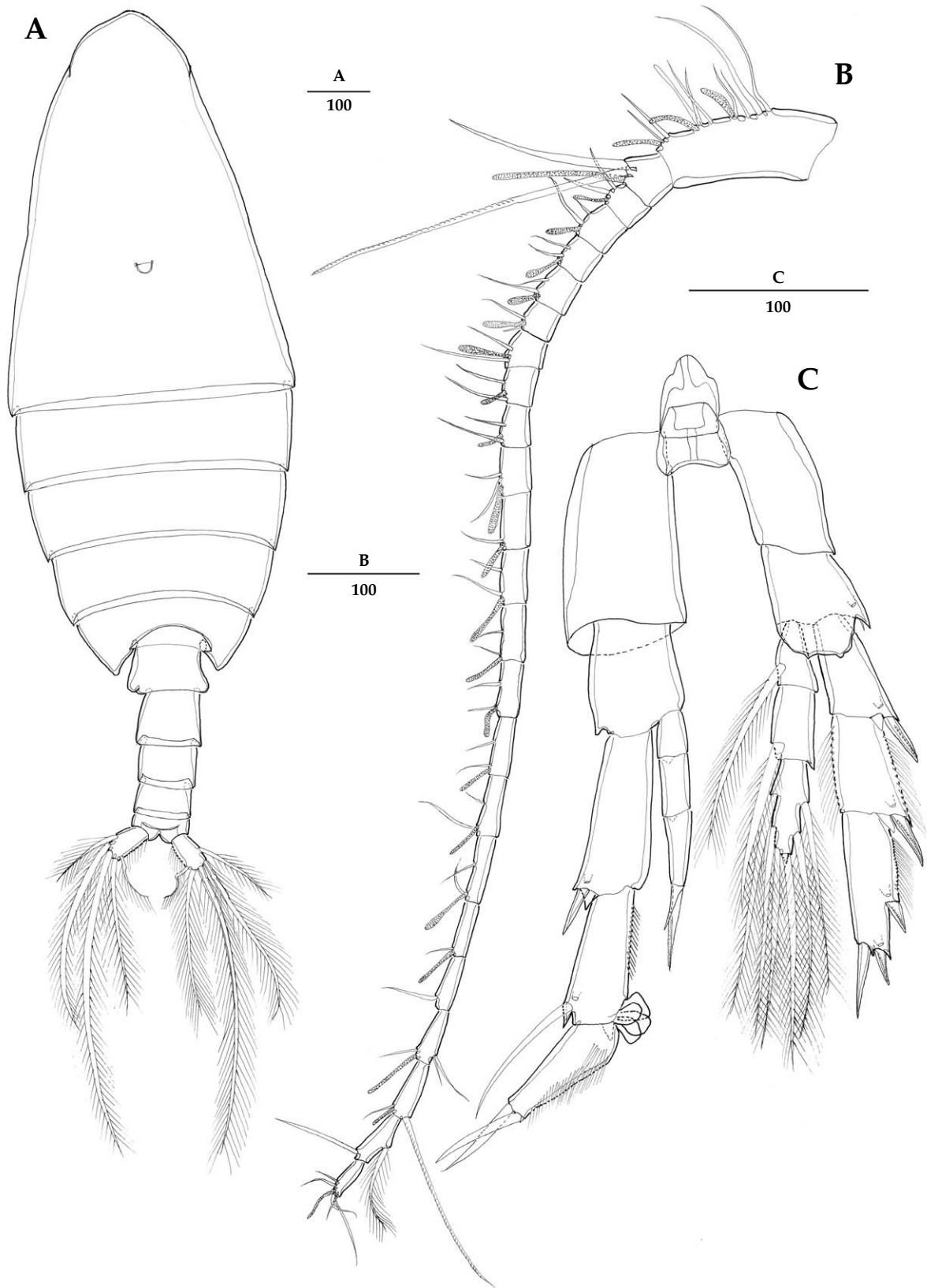


Fig. 29. *Canthocalanus pauper*, male. A. habitus, dorsal view; B. left antennule; C. fifth leg.

18, pl. 6, figs. 4–10, pl. 18; Kim, 1985, pp. 30, 31, pl. 3, figs. d–e, pl. 4, figs. a, b.

Canthocalanus pauper: A. Scott, 1909, p. 9; Sewell, 1947, p. 16; Dakin and Colefax, 1940, p. 85, fig. 100a–f; Tanaka, 1956a, p. 260; Grice, 1962, p. 177, pl. 1, figs. 9–18; Chen and Zhang, 1965, p. 29, pl. 3, figs. 1–5; Bradford and Jillett, 1974, p. 10, fig. 1a; Fleminger, 1985, pp. 276, 285, fig. m; Bradford-Grieve, 1994, p. 35, fig. 12; Bradford-Grieve et al., 1999, pp. 877, 907, figs. f, m.

Female: Body length 1.28–1.32 mm. Cephalosome and first pedigerous somite fused; lateral angles of last pedigerous somite produced into obtuse triangular shape. Antennule extending to caudal rami. Basal segment of first leg with strong, naked pyriform proximally thickened spine on its anterior surface. Inner margin of coxa of fifth leg not serrated. Endopod of fifth leg with 7 setae.

Male: Body length 1.20–1.24 mm. Cephalosome and first pedigerous somite fused; lateral angles of last pedigerous somite produced like as obtuse triangular form. Antennule extends almost to of fifth pedigerous somite. Genital somite slightly asymmetrical, distally produced on right side. Inner margins of coxae of fifth legs not serrated. In left fifth leg, first exopodal segment with short outer marginal spine, second exopodal segment with long outer marginal spine and third exopodal segment bent outward, with 2 apical setae on third segment. In right fifth leg, endopod 3-segmented, endopodal segments with 1, 1, 6 setae.

DISTRIBUTION: In the Pacific Ocean between 15° N and 15° S (Giesbrecht, 1893), in the Kuroshio Current (Mori, 1937) and north of New Zealand (Farran, 1929).

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 1.viii.2008).

ECOLOGY: *Canthocalanus pauper* commonly occurs in the Tsushima Warm Current during the summer season.

REMARKS: The present specimens conform to figures given by Mori (1964) and Bradford-Grieve (1994). However, it differs from figure of male right fifth leg given by Grice (1962) and Kang (1992) in having the second exopodal segment inflated at distal inner margin bulbous shape of left fifth leg.

Family Centropagidae Giesbrecht, 1893

Nat-no-beol-re-gwa (넋노벌레과)

Body typically small and divided into prosome and urosome. Prosome comprised of cephalosome and separate first pedigerous somite, fourth and fifth pedigerous somites separate. Posterolateral angles of prosome rounded or with expanded wing-like processes. Urosome of 2, 3, or 4 free somites in female; of 4 or 5 free somites in male. Caudal rami often elongate, with up to 6 setae. Rostrum always present, with two filaments. Naupliar eye present. Antennule 24 or 25-segmented in female, right antennule geniculate in male. Antenna biramous, with separate coxa and basis. Mandible with well developed coxal gnathobase and biramous distal palp consisting of basis. Maxillae with well developed praecoxal arthrite. Maxilla 7-segmented; praecoxa and coxa separate. Maxilliped 7-segmented.

Swimming legs 1 to 4 biramous, typically with 3-segmented rami. Spine and seta formula as follows:

	coxa	basis	exopodal segments	endopodal segments
leg 1	0-1	0-1	I-1;I-1;II,I,4	0-1;0-2;1,2,3
leg 2	0-1	0-0	I-1;I-1;III,I,5	0-1;0-2;2,2,4
leg 3	0-1	0-0	I-1;I-1;III,I,5	0-1;0-2;2,2,4
leg 4	0-1	0-0	I-1;I-1;III,I,5	0-1;0-2;2,2,3
Leg 5 (f)	0-0	0/I-0	I-0;I-1;II,I,4	0-1;0-1;2,2,2

Female fifth legs with 3-segmented rami, with large inner process on second exopod. Male fifth legs retaining form of other swimming legs in vast majority of cases; rami 2-segmented, right exopod transformed into large chela; rarely chela absent, endopod atrophied in genus *Isias*.

GENERA 14 (2 in Korea), species 110 (9 in Korea).

DISTRIBUTION: Worldwide in fresh, brackish or coastal waters.

Key to the genera of family Centropagidae

1. Caudal rami longer, 8–10 times longer than wide; posterior corner of last pedigerous somite either very short and acute, or rounded but with apical spine; genital double-somite of female symmetrical; right exopod of 5th legs of male 2-jointed, nonchelate 2
 - Caudal rami relatively short, not more than 4–5 times as long as wide; posterior corners of last pedigerous somite spiniform in the vast majority of cases; genital double-somite of female asymmetrical.; right exopod of 5th legs of male 3-jointed, chelate *Centropages*
 2. Antennary exopod longer than endopod; outer basal seta on female fifth leg lacking; basis of male fifth leg lacking inner process *Limnocalanus*
 - Antennary exopod shorter than endopod; outer basal seta on female fifth leg present; basis of male fifth leg with inner process *Sinocalanus*
- (Boxshall and Halsey, 2004)

REMARKS: The Centropagidae was placed in the superfamily Diaptomoidea by Andronov (1974) and Park (1986).

Genus *Centropages* Kröyer, 1848

Nat-no-beol-re-sok (낮노벌레속)

Cephalosome anteriorly narrowed. Posterior corners of last pedigerous somite usually with pointed process, rarely rounded. Female urosome of 3 free somites. Genital double-somite of female asymmetrical, almost always with spines and spinules. Caudal rami often asymmetrical. Genital segment of male often asymmetrical. Right antennule geniculate. Exopod and endopod of first to fourth swimming legs 3-segmented. Female fifth legs 3-segmented, symmetrical, differing from remaining pairs in presence of large inner process on second segment of exopod. Male fifth legs asymmetrical, biramous, right leg 3-segmented, with large chela, left leg 2-segmented.

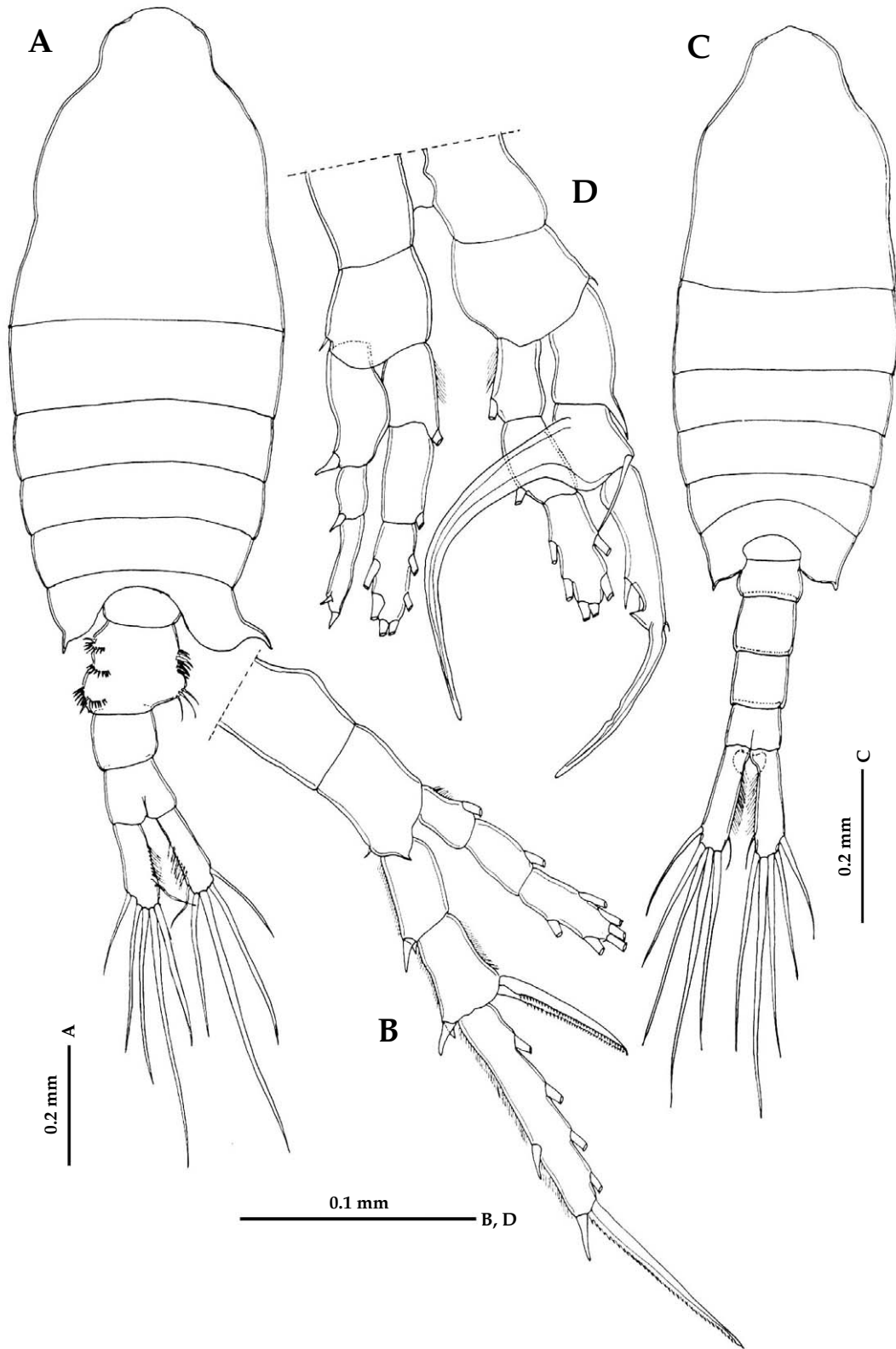


Fig. 30. *Centropages abdominalis*. Female: A. habitus, dorsal view; B. fifth leg. Male: C. habitus, dorsal view; D. fifth leg.

SPECIES ca. 29 (7 in Korea).

DISTRIBUTION: Worldwide in fresh, brackish or coastal waters.

Key to the species of genus *Cenropages*

1. Median posterodorsal hook-like process on cephalosome absent 2
 – Median posterodorsal hook-like process on cephalosome present *C. dorsispinatus*
2. Posterior corner of last pedigerous somite pointed 3
 – Posterior corner of last pedigerous somite rounded 4
3. Proximal part of caudal setae swollen; outer medial part of distal exopodal segment of male left fifth leg normal *C. tenuiremis*
 – Proximal part of caudal setae normal in shape; outer medial part of distal exopodal segment of male left fifth leg concave *C. abdominalis*
4. Second urosomite of female projected in both sides; third exopodal segment of male right fifth leg with process *C. gracilis*

15. *Centropages abdominalis* Sato, 1913 (Figs. 30, 31)

Bae-nat-no-beol-re (배낫노벌레)

Centropages abdominalis Sato, 1913, p. 26, pl. 4, figs. 63, 65, pl. 5, figs. 645, 65–68; Mori, 1937, p. 58, pl. 28, figs. 1–6; Shen and Bai, 1956, p. 187, pl. 3, figs. 17–22; Tanaka, 1963, p. 11.

Centropages mcmurricchi: Brodsky, 1950, p. 316, fig. 219; Chen and Zhang, 1965, p. 72, pl. 24, figs. 9–13.

Female: Body length 1.3–1.6 mm. Cephalosome anteriorly narrowed and round. Posterior corners of 5th pedigerous somite with asymmetrical sharp spines, right corner larger, apical point directed laterally, left corner smaller with apex directed posteriorly. Genital double-somite asymmetrical, with 3 transverse rows of spinules on left side and patch of spinules on anterior right side and more posterior group of 3 posteriorly-directed spines. Caudal rami asymmetrical, left one longer than right. Antennule longer than body by 2–3 distal segments. Fifth legs symmetrical, with process directed obliquely from the distal inner margin of second exopod of fifth legs. Process on second exopod of fifth legs longer than second exopod of fifth leg, with two rows of denticles on its dorsal surface.

Male: Body length 1.3–1.6 mm. Posterior corner of

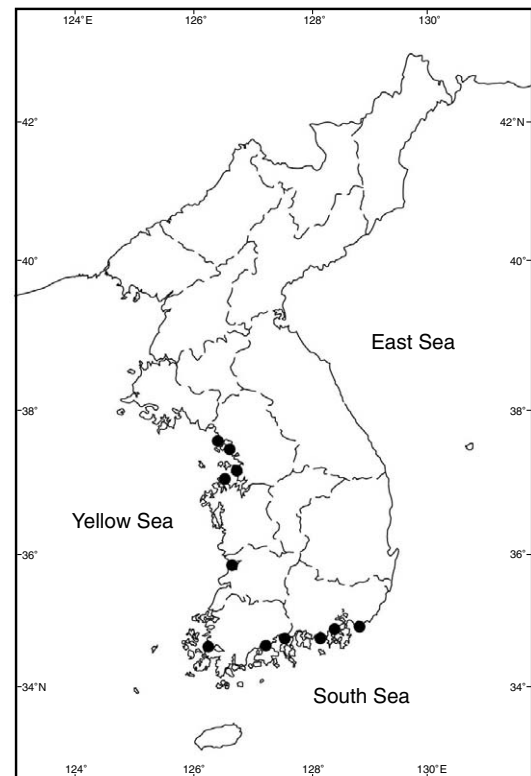


Fig. 31. Distribution of *Centropages abdominalis*.

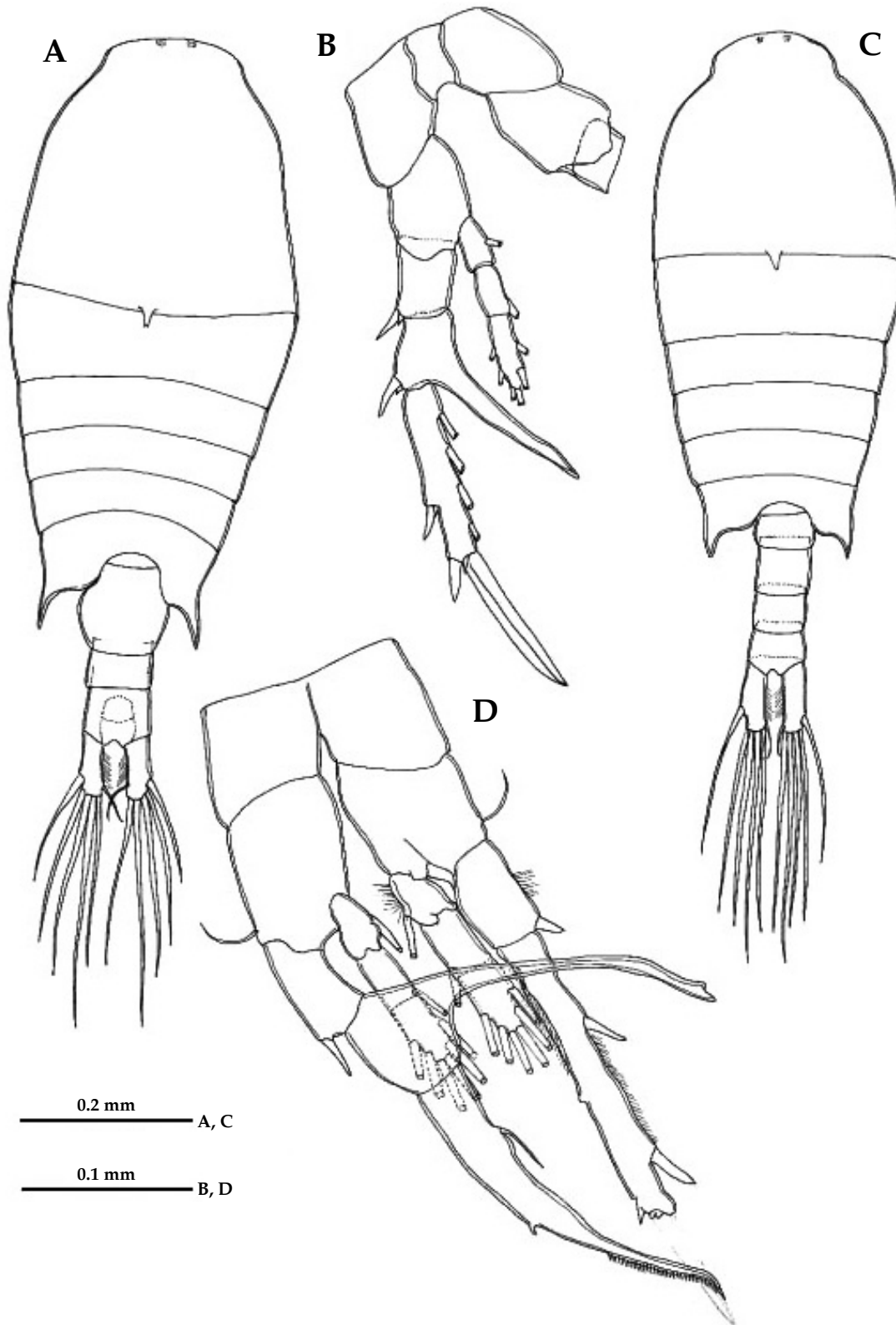


Fig. 32. *Centropages dorsispinatus*. Female: A. habitus, dorsal view; B. fifth leg. Male: C. habitus, dorsal view; D. fifth leg.

5th pedigerous somite with much shorter processes than female and symmetrical, directed posteriorly. Urosome composed of 4 free somites, second urosomite longest, first urosomite shorter, caudal rami symmetrical. Antennule longer than body with distal 2–3 joints, geniculated on right side. Fifth legs asymmetrical, second exopod of left fifth leg narrowed with depressed outer margin with two outer spines, apical spine short. Second exopod segment of right fifth leg with long, smoothly curved process, third exopod segment with short inner spine and protrusion on inner margin and with short outer spine.

DISTRIBUTION: Coastal waters of the Okhotsk Sea, Bohai Bay, the Bering Sea and the Yellow Sea.

KOREA: GN, JN, JB, CN, GG.

SPECIMEN EXAMINED: (Gwangyang Bay, Jeollanam-do: 30.ii.2006).

ECOLOGY: This species are very abundant in coastal waters in cold seasons.

REMARKS: *Centropages abdominalis* is a neritic species and occurs in coastal waters of Korea only in the cold season.

16. *Centropages dorsispinatus* Thompson and Scott, 1903 (Figs. 32, 33)

Deung-ga-si-nat-no-beol-re (등가시냇노벌레)

Centropages dorsispinatus Thompson and Scott, 1903, p. 247, figs. 19–23; Chen and Zhang, 1965, pl. 25, figs. 7–13.

Female: Length 1.1–1.3 mm. Cephalosome oval, round and slightly narrowed anteriorly. Cephalosome and first pedigerous somite, fourth and fifth pedigerous somites separated. Rostrum short, triangular with short filaments. Posterodorsal margin of head with median hook-like process directed posteriorly. Large purple spot around hook-like process. Fifth pedigerous somite slightly asymmetrical and sharply pointed. Genital double-somite swollen, with groups of hairs laterally. Third free urosomite relatively long. Caudal rami slightly asymmetrical. Inner process on second exopod segment of fifth legs smooth, elongate triangular, pointed and as long as third exopod segment of fifth leg and longer than second exopod segment of fifth leg.

Male: Length 1.0–1.1 mm. Cephalosome same as in female but posterior extensions of fifth pedigerous somite much shorter than that of female. Right antennule 18 or 19-segmented, prehensile. Fifth leg asymmetrical; left first exopod segment short, second exo-

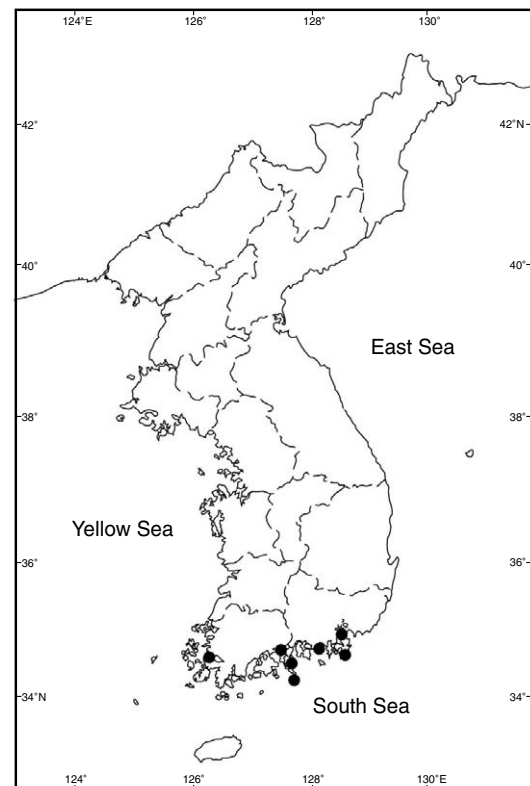


Fig. 33. Distribution of *Centropages dorsispinatus*.

pod segment long and narrow with 2 short outer spines and long and serrated apical spine; second exopod segment of right fifth leg with long, smoothly curved digit form process distally, third exopod segment with relatively long inner spine and small process on inner margin and with short outer spine, distal outer margin denticulated.

DISTRIBUTION: Along the Chinese coast of the Yellow Sea.

KOREA: GN, JN.

SPECIMEN EXAMINED: (Gwangyang bay, Jeollanam-do: 30.viii.2006).

ECOLOGY: This species occurs in small numbers in neritic or coastal waters in summer.

REMARKS: *Centropages dorssispinatus* is easily distinguished by the dorsal purple spot and dorsal hook-like process on cephalosome.

17. *Centropages gracilis* (Dana, 1849) (Figs. 34, 35)

Geu-re-i-seu-nat-no-beol-re (그레이스낫노벌레)

Hemicalanus gracilis Dana, 1849, p. 1108, pl. 78.

Centropages gracilis: Giesbrecht, 1892, pp. 305, 321, 771, figs. f, m; Giesbrecht and Schmeil, 1898, p. 57, rem. f, m; Wolfenden, 1905 (1906), p. 1013, pl. 98, fig. f; A. Scott, 1909, p. 114, rem.; Sewell, 1914, p. 223; Farran, 1936, p. 108; Mori, 1937, p. 62, figs. f, m; Dakin and Colefax, 1940, p. 92, fig. f; Sewell, 1947, p. 163, rem.; Wilson, 1950, p. 187, fig. m; Tanaka, 1963, p. 8, rem.; Chen and Zhang, 1965, p. 75, pl. 26, figs. f, m; Vidal, 1968, p. 37, f, m; Marques, 1976, p. 994, fig. m; Chihara and Murano, 1997, p. 766, pls. 83, 86; Mulyadi, 1998, p. 62, figs. f, m; Bradford-Grieve et al., 1999, pp. 884, 950, figs. f, m; Conway et al., 2003, figs. f, m, rem.

Female: Body length 1.81–1.84 mm. Cephalosome and first pedigerous somite, and fourth and fifth pedigerous somites completely separated; first to fourth pedigerous somites covered with tiny spinules on dorsal surface. Fifth pedigerous somite rounded posteriorly. Cephalosome narrow anteriorly. Urosome of 3 free somites; genital double-somite longest and widest; second urosomite with posteroventral knobs furnished with many spinules on both sides. Antennule extends beyond caudal ramus by about last 5 segments. First to fifth legs with 3-segmented endopod and exopod; first and second exopodal segments with 1 outer spine; second segment with stout inner marginal process, its length nearly equal to third segment.

Male: Body length 1.82–1.84 mm. Body form same as in female. Urosome of 5 free somites. Right antennule geniculate. First to fourth legs as in female. Fifth legs biramous, asymmetrical; distal segment of left leg with 2 curved long outer spines, blunt terminally; second exopodal segment of right leg expanded, with curved long inner process; distal segment with pronounced triangular protrusion on proximal inner margin, with distal long spine.

DISTRIBUTION: Temperate regions of the Pacific, Atlantic, and Indian Oceans.

KOREA: JN (offshore in the southern sea of Korea).

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 20.x.2008).

ECOLOGY: *Centropages gracilis* occurs infrequently in offshore waters in the South Sea of Korea during the summer and fall.

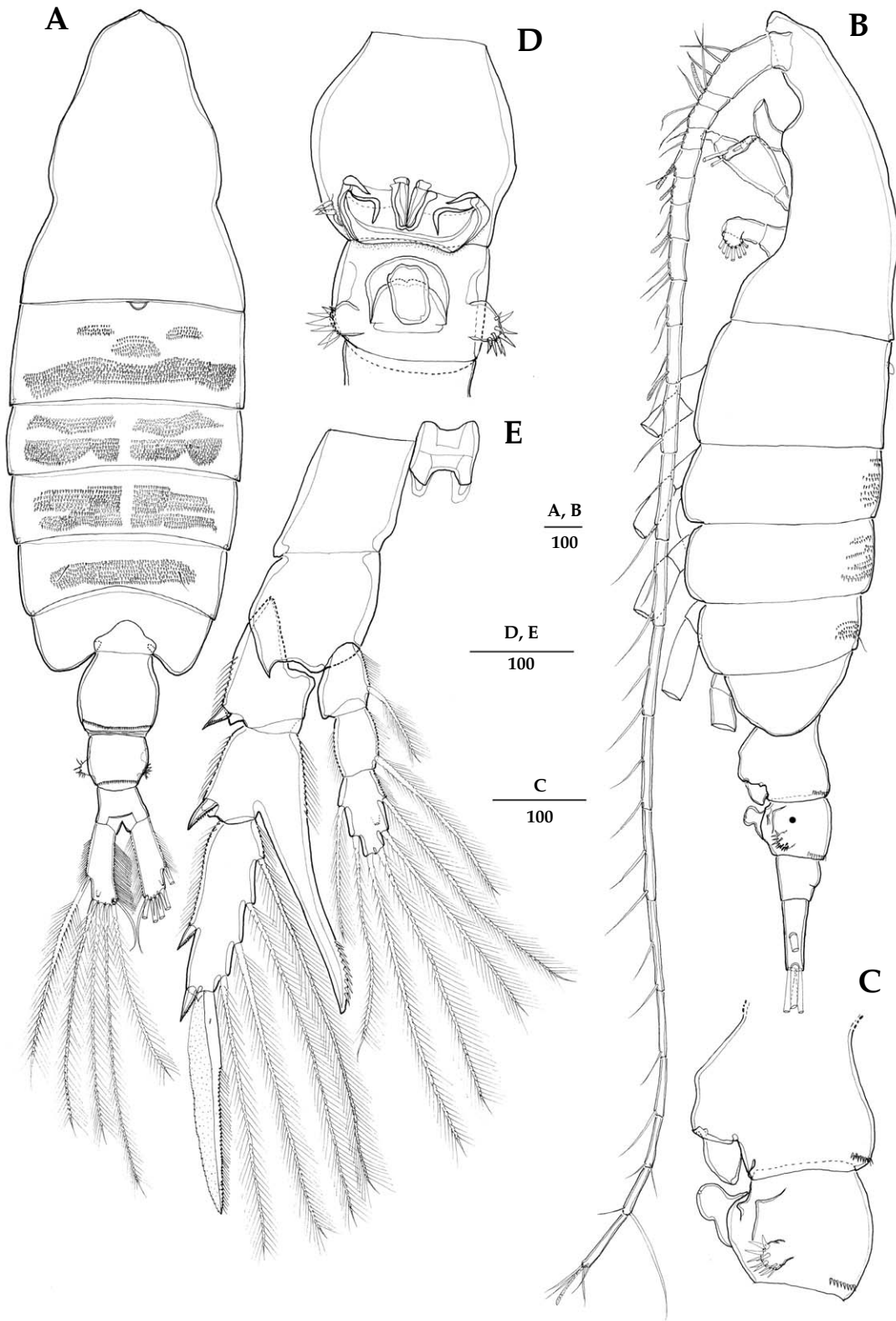


Fig. 34. *Centropage gracilis*, female. A. habitus, dorsal view; B. habitus, lateral view; C. genital double-somite and second free urosomite, lateral view; D. genital double-somite and second free urosomite, ventral view; E. fifth leg.

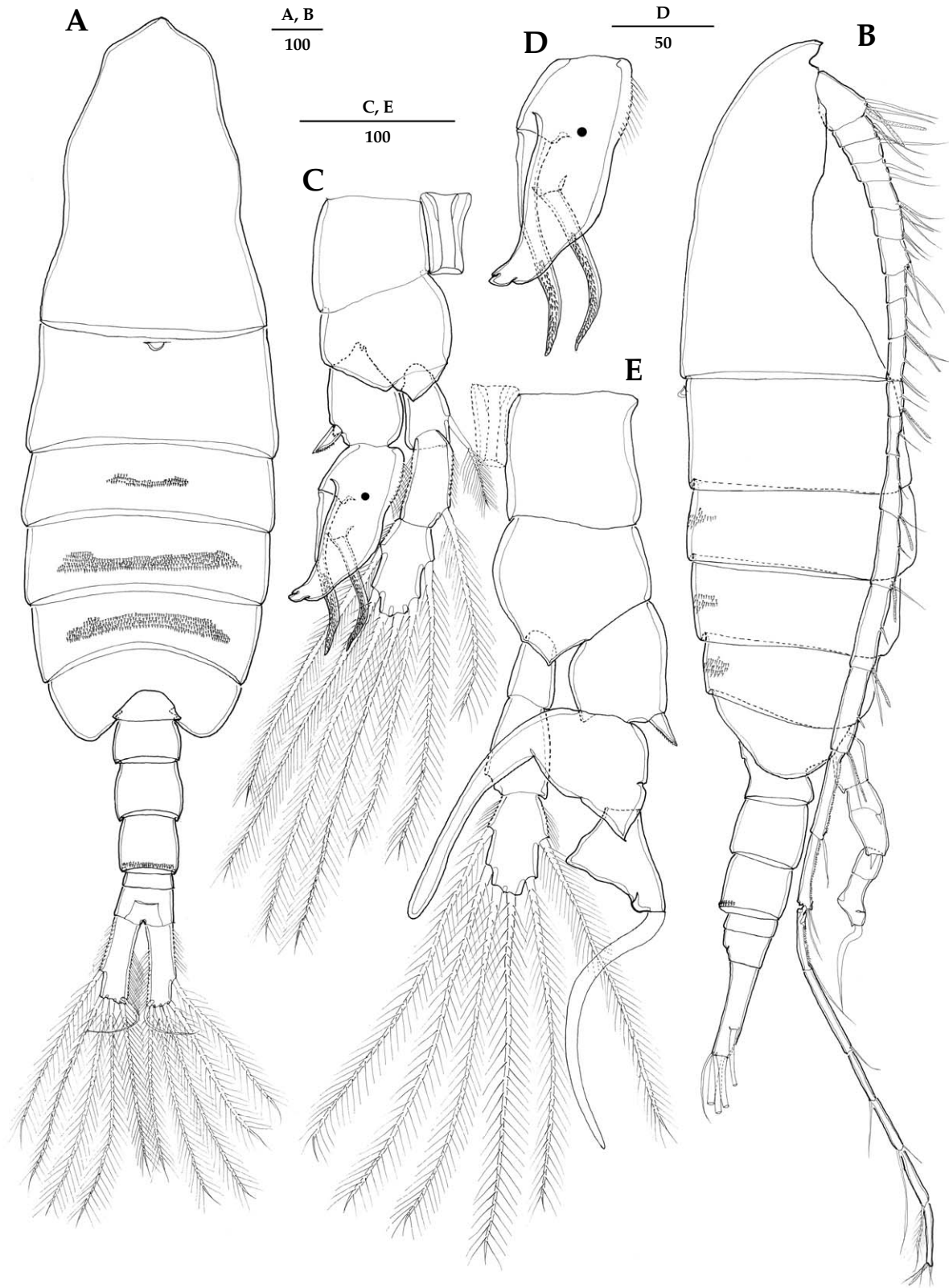


Fig. 35. *Centropages gracilis*. male. A. habitus, dorsal view; B. habitus, lateral view; C. first leg; D. distal exopod of first leg; E. fifth leg.

REMARKS: This species is recognized by the spines on both sides of the second free urosomite and by the pronounced triangular protrusion of the chela of the right fifth leg in the male. The first to fourth pedigerous somites are covered with stiff hairs and are identical with Tanaka's description (1963). However, Kang (1992) stated that this species has no stiff hairs on the pedigerous somites, although our sample locations overlapped with Kang's sampling regions.

18. *Centropages tenuiremis* Thompson and A. Scott, 1903 (Fig. 36)

Ga-neun-nat-no-beol-re (가는낮노벌레)

Centropages tenuiremis Thompson and Scott, 1903, p. 247, figs. 14–18; Brodsky, 1950, p. 317, fig. 220; Shen and Bai, 1956, p. 188, pl. 3, figs. 23, 24, pl. 4, figs. 25–31; Shen and Lee, 1963, p. 577; Chen and Zhang, 1965, p. 73, pl. 25, figs. 1–6.

Centropages arabicus Cleve, 1904, p. 371, figs. f, m.

Centropages orsinii: Mori, 1929, p. 174, pl. 6, figs. 2, 3.

Centropages kröyeri: Mori, 1929, p. 174, pl. 6, figs. 4–7.

Centropages yamadai Mori, 1934, p. 81; 1937, p. 59, pl. 28, figs. 7–12; Tanaka, 1963, p. 11, figs. f, m.

Female: Body length 1.2–1.4 mm. Cephalosome narrowed anteriorly and rounded. Cephalosome and first pedigerous somite fused. Fifth pedigerous somite with large processes. Dorsal surface of genital double-somite smooth but on ventral surface with posteriorly-directed process. Caudal rami symmetrical, 3 times longer than wide. Caudal setae short and swollen basally. Outer caudal seta on each side transformed into spine. Fifth legs asymmetrical, with 3 segmented left exopod, right exopod 2-segmented; inner process on second? exopod segment of left leg smooth, but on right with denticles.

Male: Body length 1.2–1.4 mm. Cephalosome slightly more slender than in female. Fifth? pedigerous somite asymmetrical, left process longer than that of right. Urosome composed of 4 free somites, second free urosomite longest, first urosomite shortest. Caudal rami and its setae same as in female. Antennule extending to caudal rami, right antennule geniculate. Fifth leg asymmetrical, second exopod segment on left side with short outer and apical spines; inner process of second exopod segment of right fifth leg with coarsely spinulat? outer margin, proximal part of third exopod segment broader than distal part.

DISTRIBUTION: Far Eastern waters, near Ceylon, Arabian Sea, near Borneo and North Guinea.

KOREA: GN, JN, JB, GG.

SPECIMEN EXAMINED: (Gwangyang Bay, Jeollanam-do: 8.vii.2006).

ECOLOGY: In Korean waters, this species occurs in small numbers in neritic or coastal waters in summer.

REMARKS: The geographical distribution of this species is almost same to *C. abdominalis*, but they do not occur together.

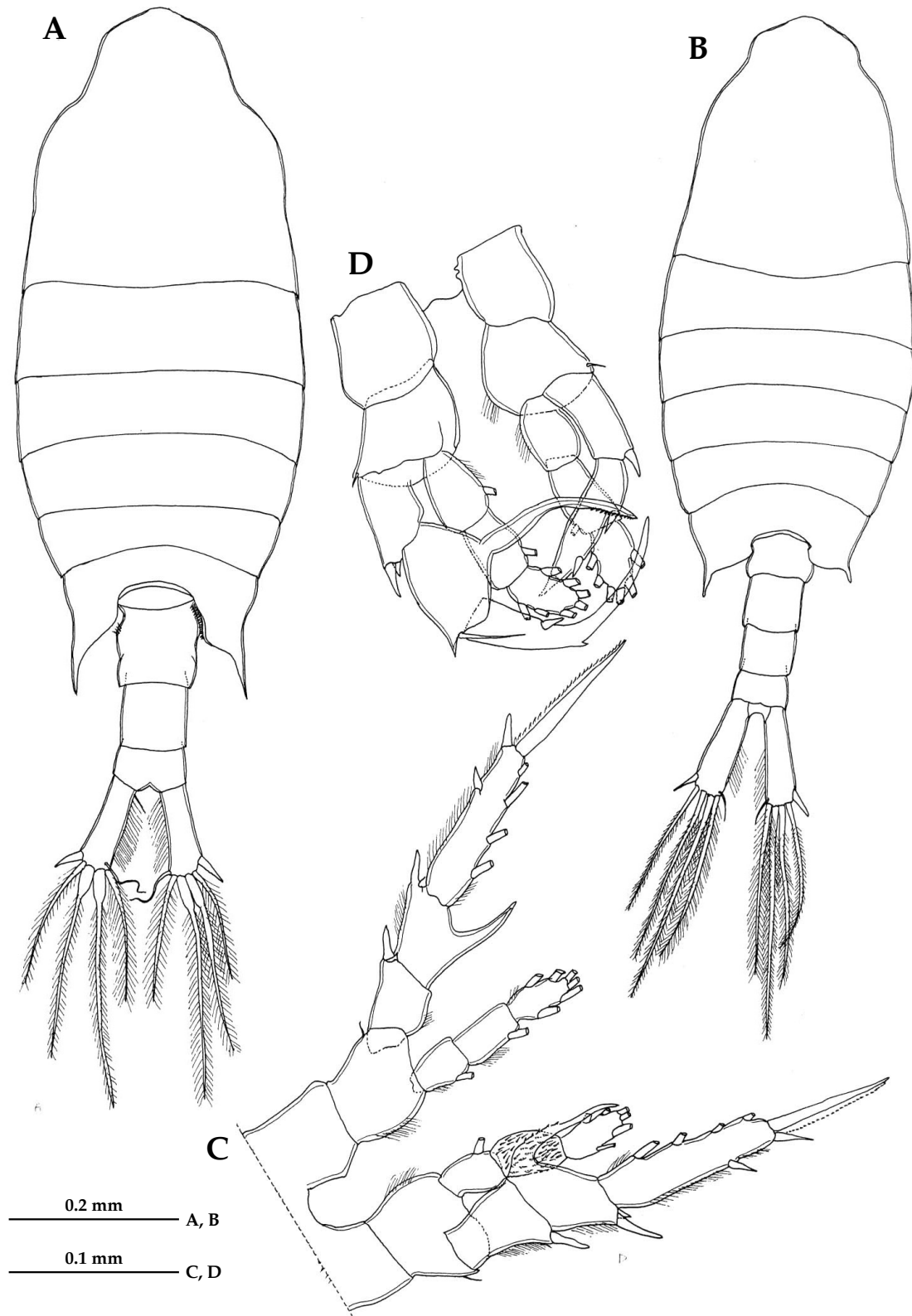


Fig. 36. *Centropages tenuiremis*. Female: A. habitus, dorsal view; C. fifth leg. Male: B. habitus, dorsal view; D. fifth leg.

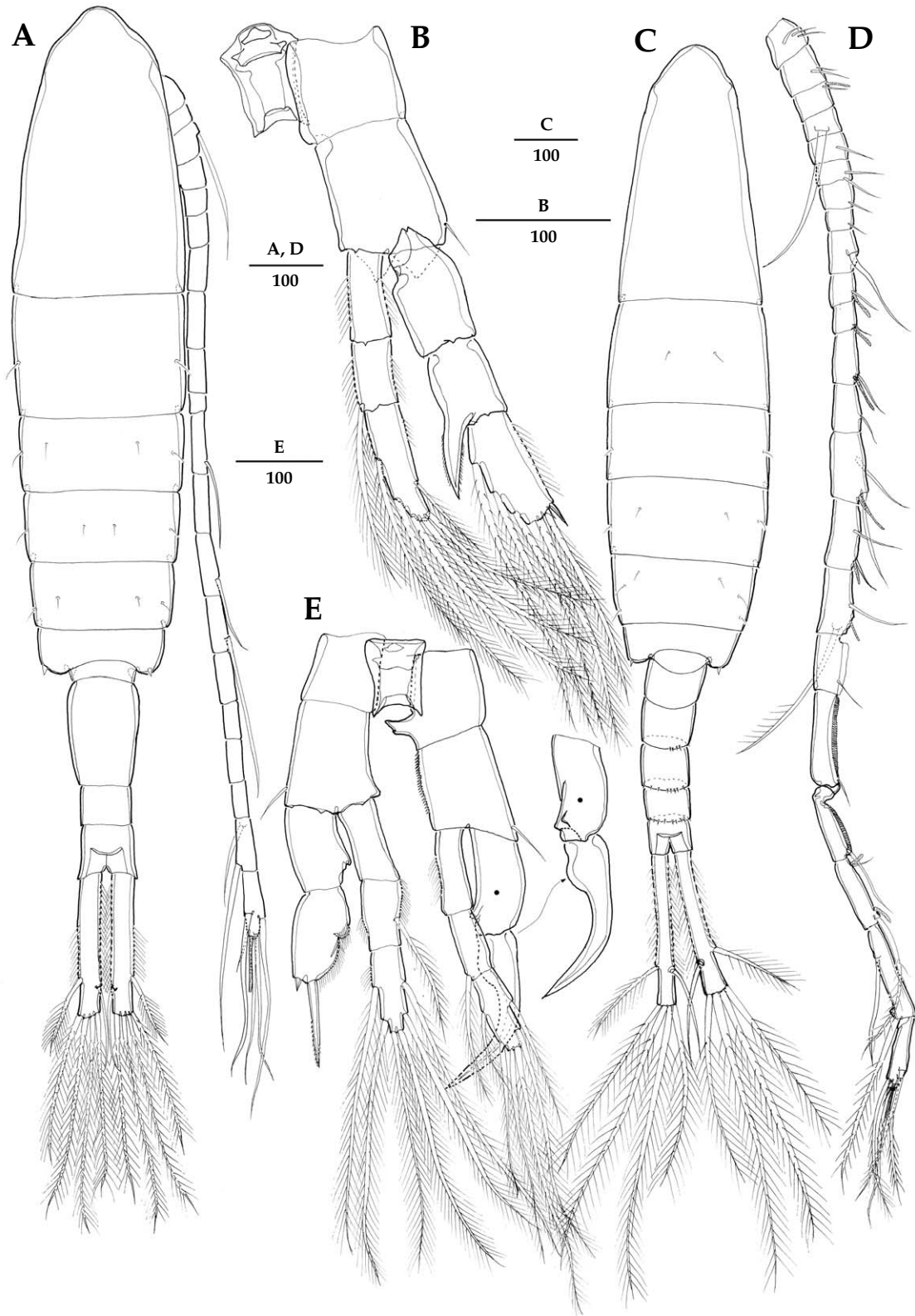


Fig. 37. *Sinocalanus tenellus*. Female: A. habitus, dorsal view; B. fifth leg. Male: C. habitus, dorsal view; D. right antennule; E. fifth leg.

Genus *Sinocalanus* Burckhardt, 1913

Gak-si-no-beol-re-sok (각시노벌레속)

Prosoma long and slender. Cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somite completely separated. Last pedigerous somite symmetrical, round posteriorly, with short spine each side. Urosome of 3 or 4 free somites in female and of 5 free somites in male. Caudal rami narrow and long. Male right antennules prehensile. Second exopodal segment of fifth leg with strong inner process in female; third exopodal segment with long apical spine and 1 or 2 short subapical spines. Exopod of male fifth leg much simpler in structure than that of *Centropages* (Kim, 1985).

SPECIES 5 (2 in Korea).

DISTRIBUTION: Brackish and fresh waters in the East Asia.

19. *Sinocalanus tenellus* (Kikuchi, 1928) (Figs. 37, 38)

Gak-si-no-beol-re (각시노벌레)

Limnocalanus sinensis var. *tenellus* Kikuchi, 1928, p. 67, pl. 18, figs. 1–8.

Sinocalanus tenellus: Smirnov, 1929, p. 320, figs. 4–9; Ueno, 1935; Shen and Song, 1979, p. 61, fig. 22; Brodsky, 1950, p. 321, fig. 224; Chen and Zhang, 1965, p. 78, pls. 28, 29, figs. 8–10; Lai and Fernando, 1981, p. 161, figs. 1, 2; Mizuno and Miura, 1984, p. 476, fig. 256; Kim, 1985, p. 99, pl. 32, figs. a–d; Chang and Kim, 1986, p. 51, pl. I, figs. 4, 5; Yoo, 1995, p. 186, fig. 128; Chihara and Murano, 1997, p. 768, pl. 87; Lee et al., 2007, p. 137, figs. 2, 3.

Female: Body length 1.2–1.4 mm. Body elongated, oval. Rostrum short. Last pedigerous somite bearing small spine at posterior corner, symmetrical. Caudal rami slightly longer than three free urosomites, somewhat widened distally. Antennules extend to middle of caudal rami. Fifth legs symmetrical: only first exopodal segment with small protuberance distally on inner margin, inner process on second exopodal segment of fifth legs longer than second segment and shorter than distal segment; third exopodal segment with long terminal spine and short subterminal spine.

Male: Body length 1.1–1.3 mm. Cephalosome same

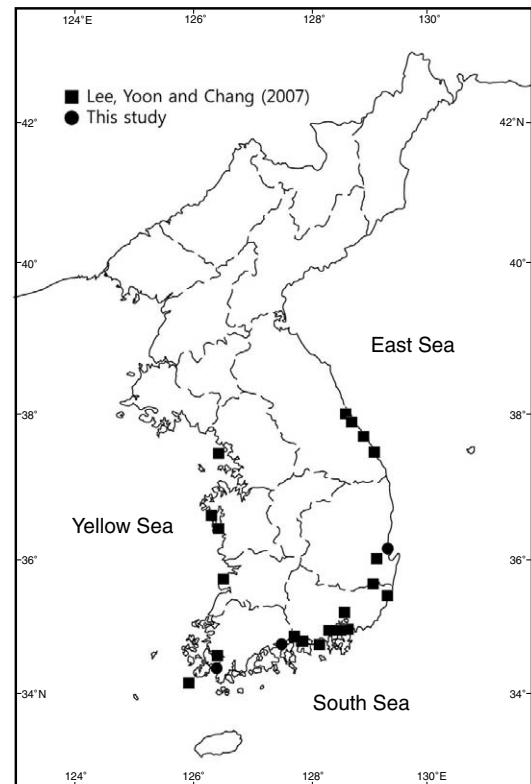


Fig. 38. Distribution of *Sinocalanus tenellus*.

as in female, but more slender. Antennules slightly exceeding caudal rami. Fifth legs asymmetrical: distal segment of left leg with hairs in inner margin and 2 subequal terminal spines, inner spine much longer; coxa of right fifth leg with protuberance at proximal inner margin, distal exopodal segment modified to stout hook of smooth surface (Brodsky, 1965; Kim, 1985).

DISTRIBUTION: Brackish waters of Korea, China and Japan.

KOREA: GB, GN, JN, JB, CN.

SPECIMEN EXAMINED: (Seomjin River estuary, Jeollanam-do: 25.vii.2006).

ECOLOGY: *Sinocalanus tenellus* predominantly occurs in the brackish waters of Korea during the summer season.

REMARKS: *Sinocalanus tenellus* shows variation in the female urosomal segmentation pattern: 3-segmented urosomites (Brodsky, 1950; Lee et al., 2007; this study) and 4-segmented urosomites (Chen and Zhang, 1965; Kim, 1985). Also, *Sinocalanus tenellus* from Korean waters has two types on coxal inner process of fifth legs: single process and bifid process. The latter is considered as *S. doerii*. However, the specimens from Korean waters have mixed characteristics between *S. tenellus* and *S. doerii*.

Family Eucalanidae Giesbrecht, 1893

Cham-no-beol-re-gwa (참노벌레과)

Cephalosome and first pedigerous somite fused; fourth and fifth somites sometimes partly fused. Posterolateral angles of prosome rounded. Urosome of 3 or 4 free somites in female. Genital apparatus comprising common genital aperture located medially on ventral surface of genital double-somite. Urosome of 5 free somites in male. Single genital aperture located ventrolaterally on posterior rim of genital somite typically on left side; rarely exhibiting reversal of asymmetry aperture on right side in some males of *Subeucalanus pileatus* (Giesbrecht). Caudal rami typically fused to anal somite at least in female; armed with up to 6 setae. Rostrum divided into paired long, rostral filaments. Naupliar eye present. Antennules longer than body, 24-segmented in female; often 23-segmented due to fusion of segments 1 and 2, as in *Subeucalanus subcrassus* (Giesbrecht), to form compound segment I-IV; symmetrical, non-geniculate in male; in *Pareucalanus attenuatus* (Dana) group male antennules 25-segmented. Antenna biramous; endopod longer than exopod. Mandible biramous, comprising coxa with well developed gnathobase and distal palp consisting of elongate basis forming main axis of limb with 5-segmented exopod. Maxillule biramous, with well developed praecoxal arthrite bearing about 14 elements; coxa with endite lacking as in *Subeucalanus*, with 9 setae on epipodite; basis with outer seta, with proximal endite bearing 4 setae and distal group of 4 or 5 setae representing distal endite. Endopod 2-segmented; exopod small and slender, 1-segmented. Maxilla 6-segmented; praecoxa and coxa separate. Maxilliped 7-segmented, reflexed at syncoxa-basis joint.

Swimming legs 1 to 4 biramous, typically with 3-segmented rami, except 2-segmented endopod on first leg. Exopod of leg 1 rarely 2-segmented. Spine and setal formula typically:

	coxa	basis	exopodal segments	endopodal segments
leg 1	0-0	0-1	0-1;0-1;II,I,4	0-1;0,2,2
leg 2	0-1	0-0	I-1;I-1;III,I,5	0-1;0-1;1,2,2
leg 3	0-1	0-0	I-1;I-1;III,I,5	0-1;0-1;1,2,2
leg 4	0-1	0-0	I-1;I-1;III,I,5	0-1;0-1;1,2,2

Third exopodal segment of first leg with only 1 outer spine in some species.

Female fifth leg absent except *Rhincalanus*. Male fifth leg asymmetrical; right leg in some species 3 or 4-segmented comprising unarmed coxa and basis and 1 or 2-segmented exopod. First exopodal segment unarmed or with outer spine, second segment with apical seta. Right leg absent in many species. Left leg typically 4-segmented, longer than right leg when present, comprising unarmed coxa and basis plus 2-segmented exopod. First exopodal segment unarmed or with outer spine, second segment often hirsute, armed with apical spine (Boxshall and Halsey, 2004).

GENERA 4 (4 in Korea), species 22 (9 in Korea).

DISTRIBUTION: Worldwide.

REMARKS: The Eucalanidae includes 4 genera: *Eucalanus* Dana, *Pareucalanus* Geletin, *Subeucalanus* Geletin (see Bradford-Grieve, 1994) and *Rhincalanus* Dana. All genera are found in Korean waters, but their abundance is very rare.

Key to the genera of family Eucalanidae

1. Female urosome of 4 free somites *Eucalanus*
– Female urosome of 3 free somites 2
2. Exopod of leg 1 with 3 segments 3
– Exopod of leg 1 with 2 segments *Rhincalanus*
3. Male fifth legs uniramous on both sides, with small right leg not extending beyond distal margin of second segment of long left leg; female maxillule with defined coxal endite bearing 4 setae; antenna with first and second exopodal segments separate *Paraeucalanus*
– Male fifth leg uniramous on left side, right leg absent; maxillule lacking defined coxal endite; antenna with first and second exopodal segments fused *Subeucalanus*
(Boxshall and Halsey, 2004)

Genus *Subeucalanus* Geletin, 1976

A-cham-no-beol-re-sok (아참노벌레속)

Cephalosome and first pedigerous somite fused, triangular anteriorly. Urosome short, of 3 or 4 free somites in female, of 5 free somites in male. Antennary endopod elongate; first and second exopodal segments separate. Basis and exopod of mandibular palp elongate; endopod small, inserted just beyond midlength on basis bearing 1 or 3 setae. Maxillule with 3 inner lobes bearing setae. First leg with 2-segmented endopod and 3-segmented exopod. Fifth leg absent in female, uniramous on both sides in male; 4-segmented in left one; right leg more or less reduced or absent (Kang, 1992; Bradford-Grieve, 1994).

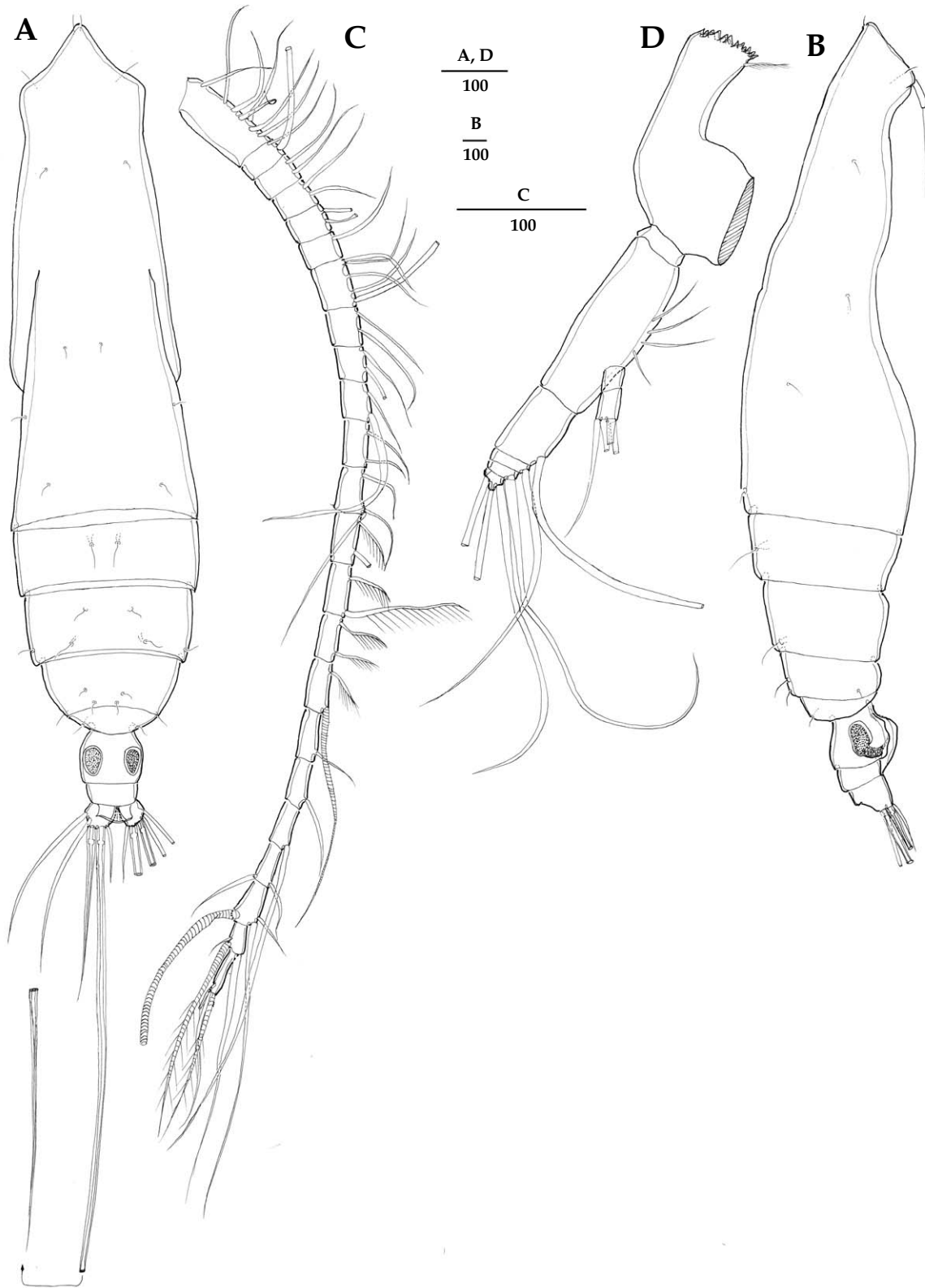


Fig. 39. *Subeucalanus mucronatus*, female. A. habitus, dorsal view; B. habitus, lateral view; C. right antennule; D. mandible.

SPECIES 8 (4 in Korea).

DISTRIBUTION: The tropical to temperate waters of worldwide ocean.

20. *Subeucalanus mucronatus* (Giesbrecht, 1888) (Fig. 39)

Ppyo-jok-a-cham-no-beol-re (뽕족아참노벌레)

Eucalanus mucronatus Giesbrecht, 1888, p. 333; 1892, p. 132, pl. 11, figs. 9, 26, 34, pl. 35, figs. 15, 35, 38; A. Scott, 1909, p. 20; Mori, 1929, p. 171, pl. 4, figs. 10, 11; Tanaka, 1935a, p. 147, pl. 3, figs. 1-4; 1956a, pl. 7, figs. 3-6; Kim, 1985, pp. 41, 42, pl. 7, fig. H, pl. 8, fig. a; Kang, 1992, p. 35, fig. 13a-g; Chihara and Murano, 1997, p. 789, pls. 99, 101.

Subeucalanus mucronatus: Bradford-Grieve, 1994, pp. 90, 99, fig. 49; Prusova, 2003, p. 62, fig. m; Conway et al., 2003, p. 166, figs. f, m, rem.; Goetze, 2003, p. 2322; Vives and Shmeleva, 2007, p. 879, figs. f, m, rem.

Female: Body length 3.28 mm. Cephalosome acutely pointed anteriorly and bent ventrally in lateral view. Genital double-somite slightly longer than wide. Caudal rami asymmetrical. Antennary first endopodal segment longer than second endopodal segment, just over 3 times as long as wide. Endopod of mandibular palp inserted at about 1/3 of distance between distal and proximal border of basis; basis without setae. Second inner lobe of maxillule absent. Basis of maxilla with 4 setae (Kang, 1992; Bradford-Grieve, 1994).

DISTRIBUTION: Tropical Indo-West Pacific Ocean (Fleminger, 1973).

KOREA: GN, JN.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 30.vii.2008).

ECOLOGY: *Subeucalanus mucronatus* is an epiplanktonic species that occurs rarely in the Tsushima Warm Current during the summer season.

REMARKS: Specimens examined in this study closely resemble the descriptions of Tanaka (1935a) and Chen and Zhang (1965).

Family Lucicutiidae Sars, 1902

Ga-si-sal-gat-no-beol-re-gwa (가시살갓노벌레과)

Cephalosome and first pedigerous somite separate, fourth and fifth pedigerous somites fused. Cephalosome with paired lateral spiniform processes in some species. Posterolateral angles of prosome rounded. Urosome of 4 free somites in female; genital apparatus comprising paired gonopores located anteriorly or around midlength on ventral surface of genital double-somite; copulatory pore located medially just posterior to gonopores. Urosome of 5 free somites in male. Single genital aperture located ventrolaterally on posterior rim of genital somite on right side. Caudal rami typically elongate with up to 5 setae, often asymmetrical with right ramus slightly shorter than left. Rostrum divided into paired rostral filaments. Naupliar eye present. Antennule

25-segmented in female, geniculate on left side only in males. Antenna biramous; with separate coxa and basis; endopod 2-segmented; exopod 8-segmented. Mandible biramous, with well developed gnathobasis and palp. Maxillule with well developed praecoxal arthrite bearing about 12 elements; coxa with endite and epipodite; basis lacking outer seta, with proximal endite bearing 3 setae and distal group of 3 or 4 setae representing distal endite; endopod 2-segmented; exopod 1-segmented. Maxilla 6-segmented; praecox and coxa separate; basis with 3 setae; endopod indistinctly 4-segmented. Maxilliped 7-segmented, comprising syncoxa, basis and 5-segmented endopod.

Swimming legs 1 to 4 biramous, with 3-segmented rami. Basis of leg 1 with cylindrical process near inner distal angle. Spine and seta formula typically:

	coxa	basis	exopodal segments	endopodal segments
leg 1	0-0	0-1	I-1;I-1;II,I,4	0-1;0-2;1,2,2 or 0-1;1,2,3/4
leg 2	0-1	0-0	I-1;I-1;III,I,5	0-1;0-2;1,2,3
leg 3	0-1	0-0	I-1;I-1;III,I,5	0-1;0-1;1,2,3
leg 4	0-1	0-0	I-1;I-1;III,I,5	0-1;0-2;1,2,3
leg 5 (f)	0-0	1-0	I-0;I-1;II,I,3	0-1;0-1;1,2,2

Female fifth leg comprising 2-segmented protopod, 2 or 3-segmented endopod and 3-segmented exopod. Setation of female tabulated above. Inner seta of second exopodal segment styliform. Male fifth leg asymmetrical; right leg biramous, with both rami typically 2-segmented, endopod 3-segmented in some species: distal segment of exopod recurved. Right leg with setal formula of exopod I-0; III, I, 0 and of endopod 0-0; 1, 2, 3. Left leg biramous, with both rami 3-segmented; basis often modified, with process on inner margin; setal formula of exopod I-0; I-0; 3 and of endopod 0-0; 0-0; 1, 2, 2. Eggs released into water (Boxshall and Halsey, 2004).

GENERA 1 (1 in Korea), species 43 (2 in Korea).

DISTRIBUTION: Epipelagic to mesopelagic zone of oceans worldwide.

REMARKS: The Lucicutiidae comprises a single genus. In Korean waters only the epipelagic species are found.

Genus *Lucicutia* Giesbrecht, 1898

Ga-si-sal-gat-no-beol-re-sok (가시살갓노벌레속)

The generic definition as in the family.

SPECIES 43 (2 in Korea).

DISTRIBUTION: Widespread epipelagic to bathypelagic inhabitant of tropical, subtropical and temperature oceans.

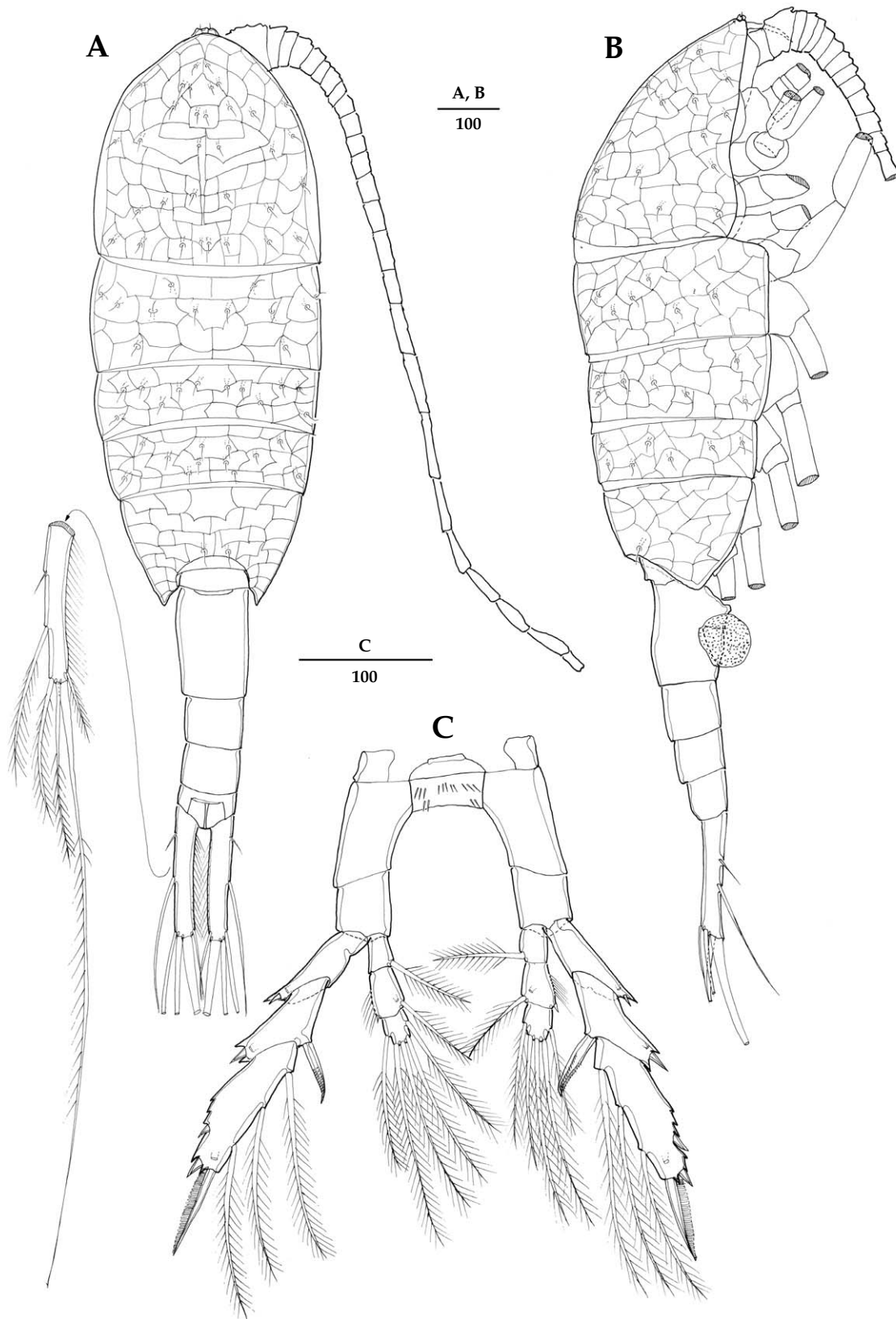


Fig. 40. *Lucicutia flavicornis*, female. A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg.

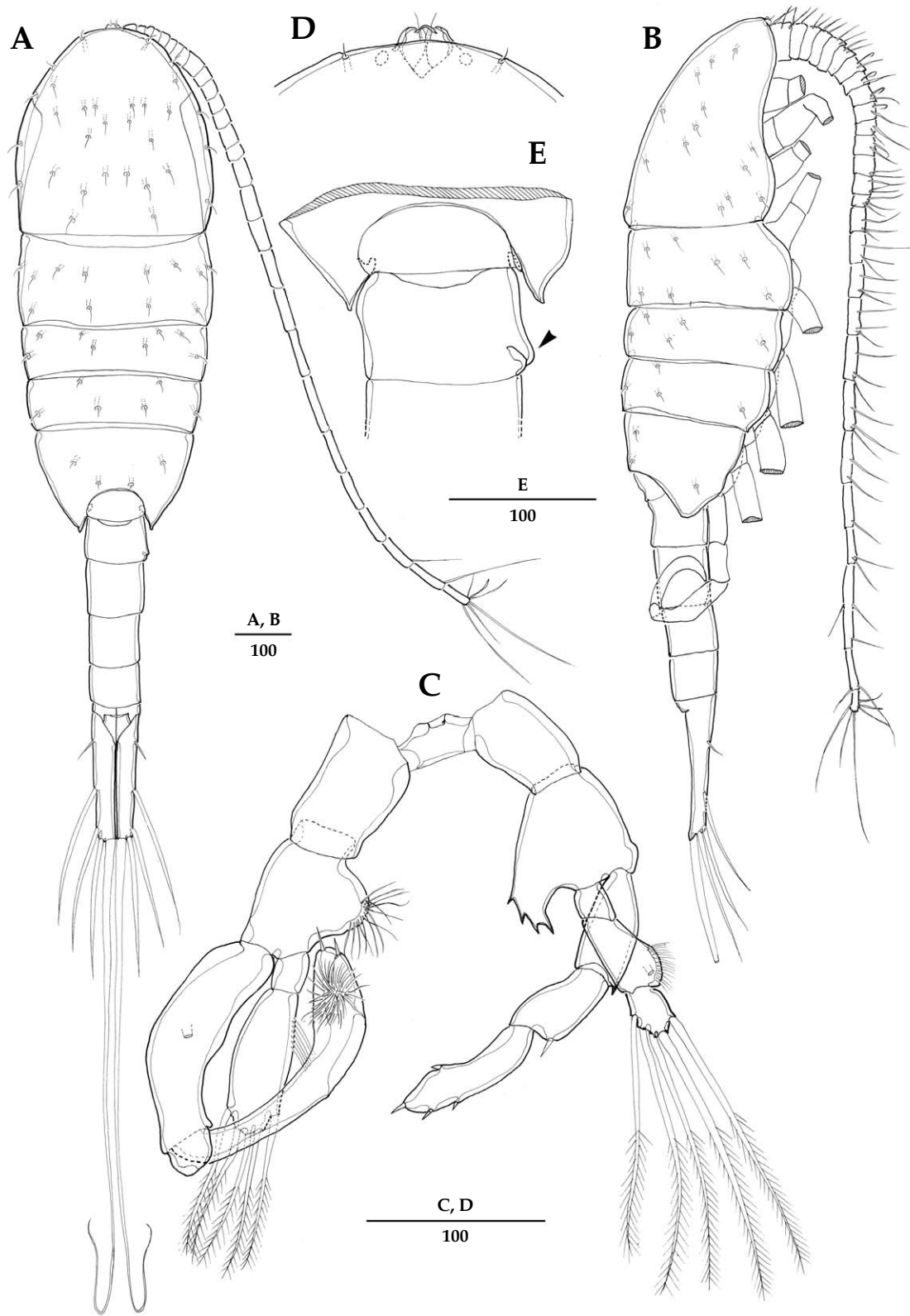


Fig. 41. *Lucicutia flavicornis*, male. A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg; D. rostrum, ventral view; E. last pedigerous somite and genital somite, dorsal view.

21. *Lucicutia flavicornis* (Claus, 1863) (Figs. 40, 41)

No-rang-ppul-ga-si-sal-gat-no-beol-re (노랑뿔가시살갓노벌레)

Leuckartia flavicornis Claus, 1863, p. 183, pl. 32, fig. 17; Brady, 1883, p. 50, pl. 15, figs. 1–9, 16.

Lucicutia flavicornis: Giesbrecht and Schmeil, 1898, p. 111, rem. f, m; Esterly, 1905, p. 180, fig. f, rem. f, m; Esterly, 1924, p. 98, fig. 1; Sars, 1925, p. 207; Farran, 1926, pp. 274, 276, figs. f, rem.; Rose, 1933a, p. 192, figs. f, m; Mori, 1937 (1964), p. 72, pl. 37, figs. 1–6; Brodsky, 1950 (1967), p. 327, fig. 226; Grice, 1962, p. 220, figs. f, m, rem.; Tanaka, 1963, p. 39, fig. 167; Chen and Zhang, 1965, p. 83f, pl. 32, figs. 7–13; Hülsemann, 1966, p. 711, figs. 12, 13, 87–91, 123–126; Bradford, 1972, p. 46, figs. Kim, 1985, p. 103, pl. 34, figs. b–g; Chihara and Murano, 1997, p. 829, tab. 5, pl. 124; Bradford-Grieve et al., 1999a, pp. 883, 945, figs. f, m; Bradford-Grieve, 1999b, p. 97, figs. 59, 60, 176, 191; Conway et al., 2003, p. 89, figs. f, m, rem.

Female: Body length 1.65–1.68 mm. Cephalosome without lateral protrusions. Apex of cephalosome with papilla. Genital boss large, placed centrally on segment. Anal somite shortest. Caudal ramus ca. 5 or 6 times as long as its width; innermost seta longest. Antennules extend to middle of caudal rami. First leg with low cylindrical process; endopod 3-segmented. Fifth leg with 3-segmented endopod and exopod; inner spine on second exopodal segment long and straight except for slight bend at tip, reaching beyond base of the first inner seta on third exopodal segment; outer margin of third exopodal segment with several teeth; endopod reaching distal margin of second exopodal segment.

Male: Body length 1.54–1.56 mm. General features as in female. Caudal rami slightly more than 5 or 6 times longer than wide, innermost terminal seta small and slender. Right fifth leg comprising coxa, basis, and 2-segmented exopod and endopod; basis inflated, bearing hairs. Left fifth leg with 3-segmented exopod and endopod; basis with large inner protuberance bearing 4 to 8 denticles.

DISTRIBUTION: In epipelagic to mesopelagic waters of the Atlantic Ocean, Mediterranean Sea, Indian Ocean, Pacific Ocean between 30° N. lat., and 3° S. lat. and near the coast of California.

KOREA: GN.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 30.vii.2008).

ECOLOGY: In Korean waters *Lucicutia flavicornis* commonly occurs in the Tsushima warm current.

REMARKS: This species is easily distinguished by very long innermost seta on the caudal rami and short anal somite.

Family Metridinidae Sars, 1902

Jul-ja-no-beol-re-gwa (줄자노벌레과)

Cephalosome and first pedigerous somite separate, fourth and fifth pedigerous somites completely fused; frontal margin usually rounded, sometimes with small process. First pedigerous somite bearing dark-pigmented spot on one side in *Pleuromamma*. Posterolateral angles of prosome usually rounded, produced into stout process in *Gaussia*. Urosome usually elongate, of 3 free somites in female. Genital apparatus variable; all genera with paired gonopores located anteriorly on ventral

surface of genital double-somite; copulatory pores paired in *Gaussia* and *Metridia*; large, unpaired copulatory pore present in *Pleuromamma*. Seminal receptacle present only in *Pleuromamma*. Urosome of 5 free somites in male; sometimes strongly asymmetrical; comprising genital somite and 4 free urosomites. Single genital aperture located ventrolaterally on posterior rim of genital somite usually on right side, sometimes on left side. Caudal rami nearly symmetrical, with 6 setae.

Rostrum divided into paired rostral filaments. Naupliar eye present. Antennule 23-segmented in female, male antennules usually geniculate on left side only, occasionally geniculate on right side only in some *Metridia* and *Pleuromamma*. Antenna biramous; with separate coxa and basis: endopod 2-segmented: exopod 7-segmented, segmental fusions. Mandible with well developed coxal gnathobase; mandibular palp consisting of basis, 2-segmented endopod and 5-segmented exopod. Maxillule with well developed praecoxal arthrite bearing about 16 elements; coxa with endite typically bearing 4 or 5 seta, and with 9 setae on epipodite; basis with outer seta, with proximal endite bearing 4 setae (rarely 7) and distal group of 5 setae (rarely 7) representing distal endite; endopod 2-segmented; exopod 1-segmented, with 11 setae. Maxilla 7-segmented; praecoxa and coxa separate or incompletely separate; basis with 4 setae: endopod 4-segmented. Maxilliped relatively short, 7-segmented; outer seta on syncoxa present in *Metridia* and *Pleuromamma*; basis with 3 setae, plus 2 setae on incorporated first endopodal segment: free endopod 5-segmented.

Swimming legs 1 to 4 biramous, with 3-segmented rami. Inner margin of first endopodal segment of leg 2 typically incised and ornamented with 1 or more hook-like spinous processes. Exopods typically large and flattened, outer margin spines small. Endopods typically small, cylindrical. Inner seta on basis of leg 1 situated on anterior surface of basis and passing across face of endopodal segment. Spine and seta formula typically as follow:

	Coax	basis	exopoda segments	endopodal segments
leg 1	0-1	1-1	I-1;I-1;II,I,4	0-1;0-2;1,2,2
leg 2	0-1	0-0	I-1;I-1;III,I,5	0-1;0-2;2,2,4
leg 3	0-1	0-0	I-1;I-1;III,I,5	0-1;0-2;2,2,4
leg 4	0-1	1-0	I-1;I-1;III,I,5	0-1;0-2;2,2,3

Female fifth legs with transverse plate formed of coxae and intercoxal sclerite; each leg uniramous, comprising basis plus 1, 2 or 3-segmented exopod; basis and first exopodal segment typically with outer seta and spine respectively, second exopodal segment with outer spine and inner seta, third segment with 2 to 4 distal elements (I-0; I-1; II,1,3 in *Metridia*); second and third exopodal segments often fused, with setation reduced. Male fifth legs asymmetrical. Right leg comprising basis with outer seta and 3-segmented exopod. Second exopodal segment with inner spinous process in some genera; third segment with 1 or 2 minute distal setae. Left leg comprising basis with outer seta and 2 or 3-segmented exopod: first exopodal segment bearing curved inner process, distal segment swollen, often curved or claw-like (Boxshall and Halsey, 2004).

GENERA 3 (2 in Korea), species 38 (5 in Korea).

DISTRIBUTION: Widespread epipelagic to bathypelagic inhabitant of tropical, subtropical and temperature oceans.

REMARKS: The Metridinidae comprises 3 genera: *Gaussia* Wolfenden, *Metidia* Boeck, *Pleuromamma* Giesbrecht in Giesbrecht and Schmeil. The latter two genera are found in oceanic waters of the South Sea and East Sea of Korea.

Key to the genera of family Metridinidae

1. Prosoma with conspicuous black or dark brown spot on one side of first pedigerous somite *Pleuromamma*
 – Prosoma lacking such spot 2
2. Posterolateral angles of prosoma produced into wing-like expansions, tapering to point; anal somite with long posterior processes located dorsolaterally to caudal rami *Gaussia*
 – Posterolateral angles of prosoma usually rounded, if pointed, then not with wing-like expansions; anal somite typically with short posterior lateral processes *Metridia*
 (Boxshall and Halsey, 2004)

Genus *Metridia* Boeck, 1864

Jul-ja-no-beol-re-sok (줄자노벌레속)

Urosome narrow, long. Caudal rami thin, long. Second to fourth swimming legs with 3 outer spines. First exopodal segment of second leg narrowed proximally, with pair of internal hooks, one larger than other. Female fifth leg 3- to 5-segmented; distal segment generally with 2 or 3 long plumose setae, but rarely with 3 inner setae, 2 terminal spines, and 1 outer spine (Chihara and Murano, 1997). Male fifth leg 5-segmented, more or less curved; distal segment of right (or left) leg slightly widened; basis of same leg with long inner curved appendage (Brodsky, 1965; Bradford-Grieve, 1999).

SPECIES 38 (5 in Korea).

DISTRIBUTION: Widespread epipelagic to bathypelagic inhabitant of tropical, subtropical and temperate oceans.

22. *Metridia pacifica* Brodsky, 1950 (Figs. 42, 43)

Tae-pyeong-jul-ja-no-beol-re (태평줄자노벌레)

Metridia sp.: Esterly, 1924, p. 96, fig. h.

Metridia pacifica Brodsky, 1950, p. 295, fig. 201; Tanaka, 1963, p. 21, fig. 159a–e.

Metridia lucens: Tanaka, 1953, p. 143.

Female: Body length 2.3–2.6 mm. Cephalosome shorter than combined length of pedigerous somites, not as vaulted as in *M. lucens*; first pedigerous somite widest. Lateral corner of last pedigerous somite produced into minor knob. Genital double-somite shorter than following two somites combined. Caudal rami as long as anal somite; width nearly uniform throughout length. Fifth legs with 2-segmented exopod; first exopodal segment with outer seta, distal segment with 3 terminal setae, of which innermost seta longest as in *M. lucens*.

Male: Body length 1.8–2.0 mm. Left (rarely right) antennule geniculate. Fifth leg asymmetrical: basal segment of right leg with long inner process slightly sigmoid and finely denticulated on one

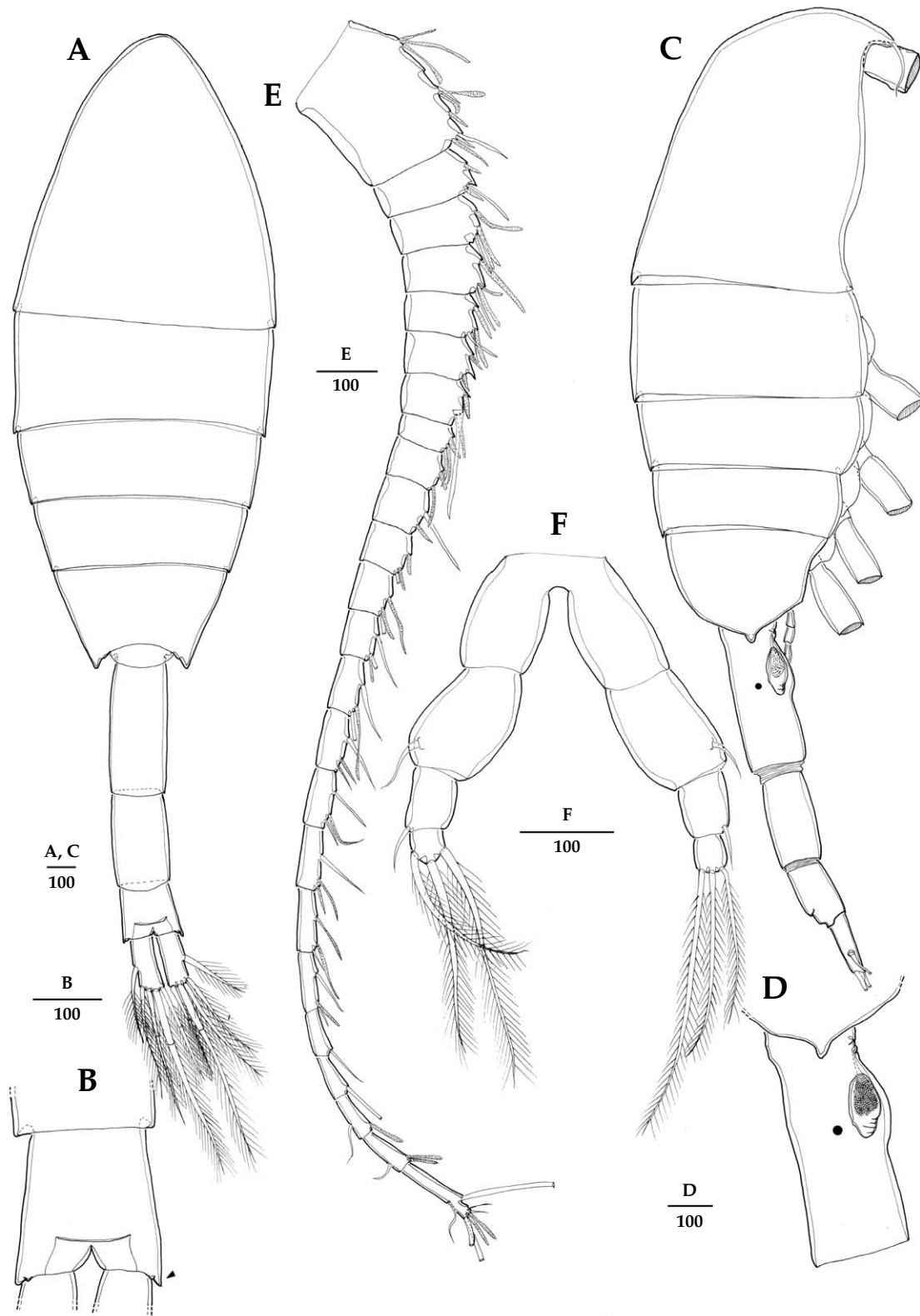


Fig. 42. *Metridia pacifica*, female. A. habitus, dorsal view; B. third urosomite anal somite, dorsal view; C. habitus, lateral view; D. genital double-somite, lateral view; E. right antennule; F. fifth leg.

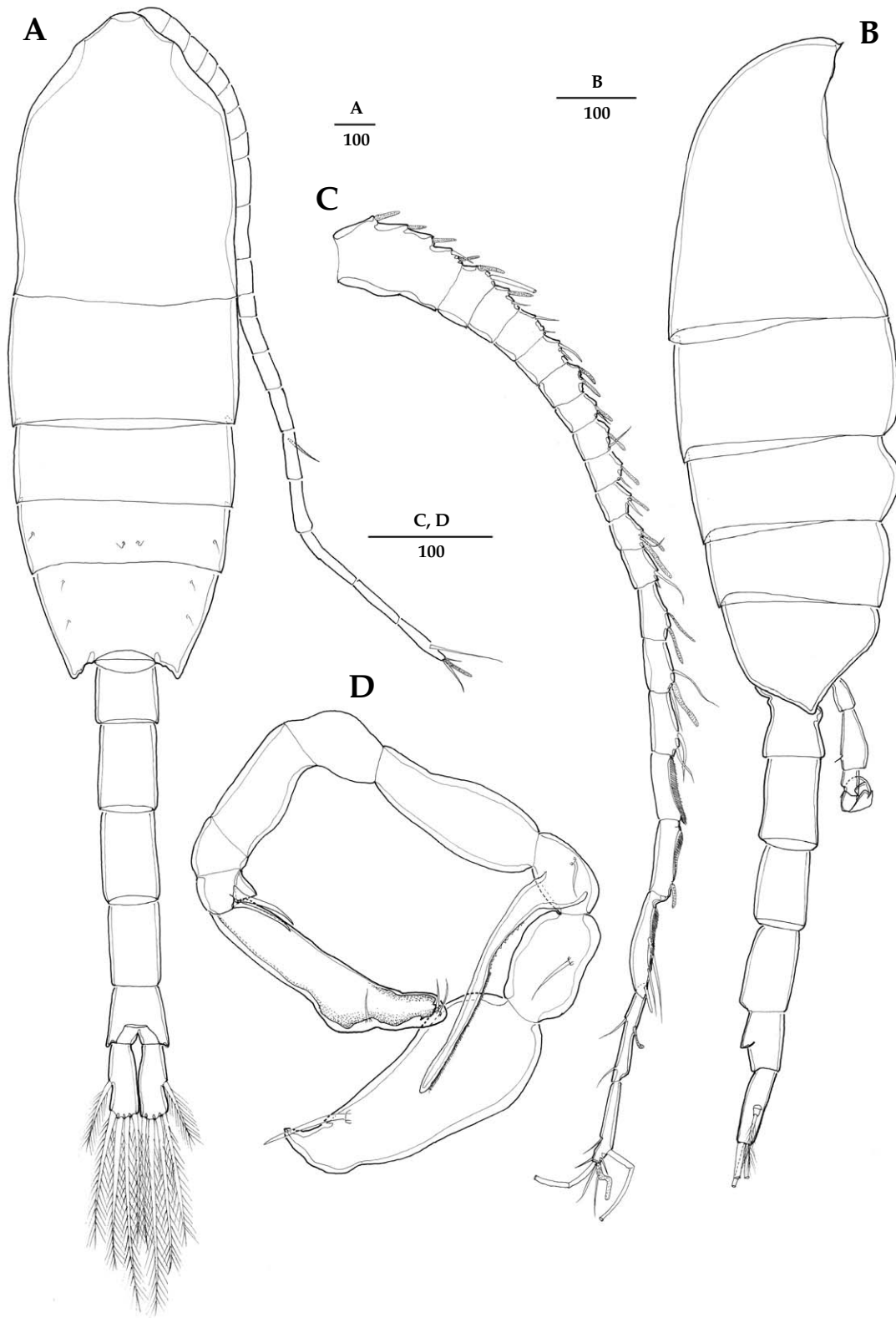


Fig. 43. *Metridia pacifica*, male. A. habitus, dorsal view; B. habitus, lateral view; C. left antennule; D. fifth leg.

side distally; exopod of right leg 2-segmented, distal segment with two tiny spines and subterminal seta; exopod of left leg 2-segmented, first segment with 2 inner setae, distal segment with 1 tiny outer and 2 terminal setae.

DISTRIBUTION: North Pacific, East Sea (Sea of Japan), Bering Sea, the southern part of the Chukchi Sea, the southernmost part of the Sea of Okhotsk, off the Californian coasts.

KOREA: GW, GB.

SPECIMEN EXAMINED: (East Sea, Gyeongsangbuk-do: 8.vii.2007).

ECOLOGY: *Metridia pacifica* commonly occurs in the East Sea during all seasons.

REMARKS: *Metridia pacifica* is very closely related to *M. lucens*, but it differs in the following: female fifth leg with 2-segmented exopod; long subterminal inner seta on distal exopodal segment of male right fifth leg.

Genus *Pleuromamma* Giesbrecht, 1898 in Giesbrecht and Schmeil

Jeot-kkok-ji-no-beol-re-sok (젓꼭지노벌레속)

Urosome shorter than in *Metridia*, often asymmetrical, with projections on somites and setal bundles. Cephalosome with short acute anterior process. Antennular proximal segments with large outer denticles. First pedigerous somite with circular, convex black spot on right or left side. Second endopodal segment of second leg with bifid inner process as in *Metridia*, but right and left legs often differ in size. Outer spine on first exopodal segment of third leg with elongate base, marked off by deep notch. Fifth leg of two types in female: with 3 free segments and 3 long setae on distal segment. Right fifth leg of male distal segment strongly curved, round, preceding segment of same leg with long curved inner spine (Brodsky, 1950; Bradford-Grieve, 1999).

SPECIES 25 (2 in Korea).

DISTRIBUTION: Widespread epipelagic to bathypelagic inhabitant of tropical, subtropical and temperature oceans.

23. *Pleuromamma piseki* Farran, 1929 (Fig. 44)

Pi-se-keu-jeot-kkok-ji-no-beol-re (피세크젓꼭지노벌레)

Pleuromamma piseki Farran, 1929, pp. 209, 261, figs. f, rem.; Rose, 1933a, p.182, figs. f, rem.; Tanaka, 1937, p. 267, fig. f; Wilson, 1950, p. 289, figs. m, rem.; Vervoort, 1957, p. 124, rem.; Owre and Foyo, 1967, p. 73, figs. f, rem.; Vilela, 1968, p. 24, figs. f, m; Bowman, 1971b, p. 36, figs. f, m, rem.; Björnberg et al., 1981, p. 642, figs. f, m; Ferrari, 1984a, p. 167, fig. f; Park and Mauchline, 1994, p. 108, fig. f; Bradford-Grieve et al., 1999a, pp. 884, 949, figs. f, m; Bradford-Grieve, 1999b, p. 122, fig. 83; Conway et al., 2003, p. 94, figs. f, m, rem.

Pleuromamma gracilis piseki Steuer, 1931, p. 6; 1932, pp. 34, 50, 77; 1933, p. 19; Tanaka, 1937, p. 267, fig. f; Dakin and Colefax, 1940, p. 85, fig. f.

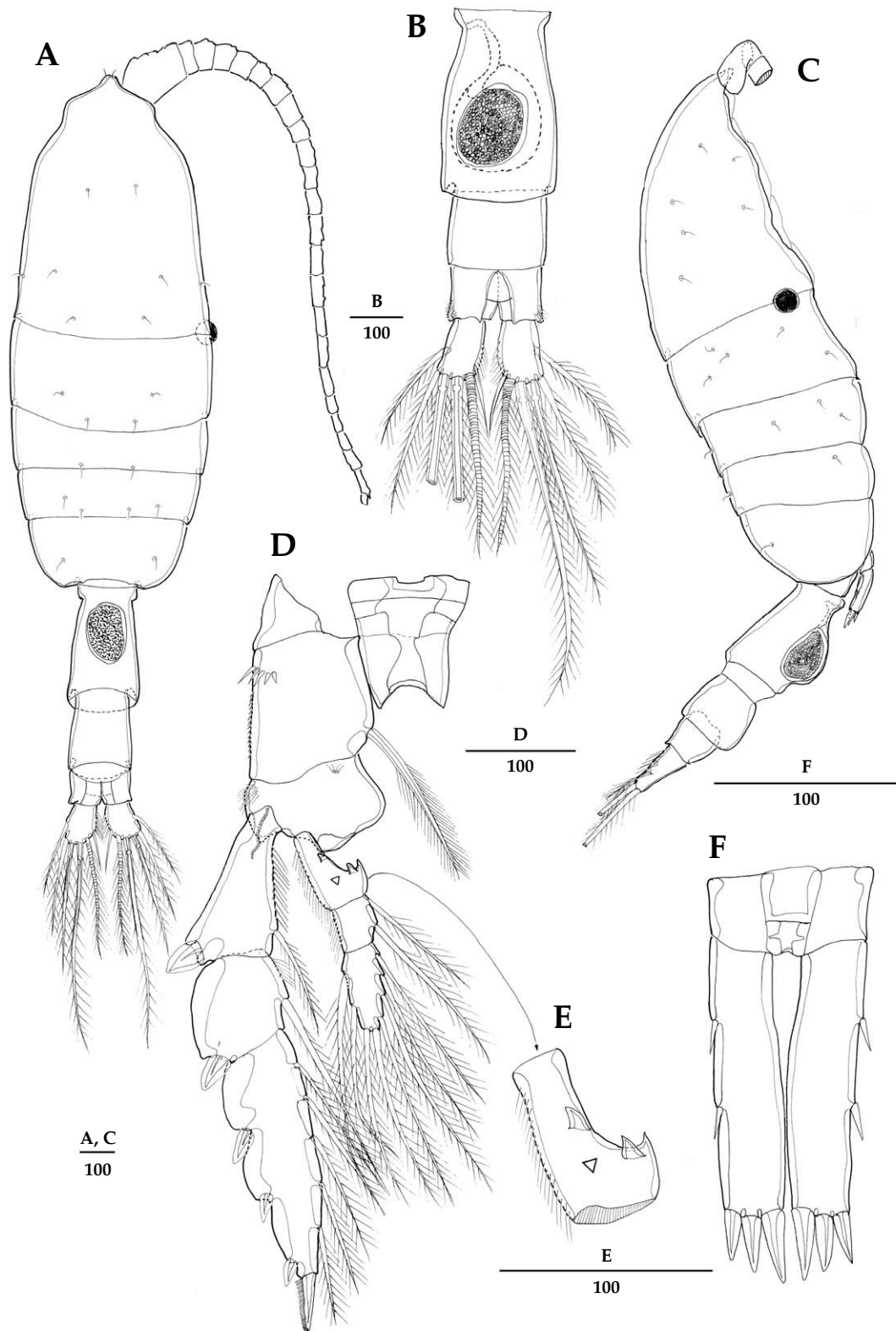


Fig. 44. *Pleuromamma piseki*, female. A. habitus, dorsal view; B. urosome, ventral view; C. habitus, lateral view; D. first leg; E. first endopod of first leg; F. fifth leg.

Female: Body length 1.6–2.0 mm. Pigment spot on right side of first pedigerous somite. Genital double-somite slightly asymmetrical, widest distally, indented on left side, with large black pigmented area around genital pore. Anal somite furnished with hairs ventrolaterally on distal part. Fifth leg uniramous, with 2 outer lateral spines and 3 short terminal spines, of which innermost spine longest and outermost spine shortest.

DISTRIBUTION: In tropical and subtropical waters of the Atlantic, Indian and Pacific oceans.

KOREA: GN.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 30.vii.2008).

ECOLOGY: *Pleuromamma piseki* is widely distributed in tropical and subtropical parts of the Atlantic, Indian and Pacific Ocean (Steuer, 1932). However, it rarely occurs in the Tsushima Warm Current in Korean waters.

REMARKS: *Pleuromamma piseki* is very closely related to *P. gracilis* and *P. borealis*, but it differs in the following characteristics: genital double-somite indented on left side; innermost spine longest among terminal spines on distal segment of female fifth leg. Chen and Zhang (1965) reported *P. gracilis* forma *piseki* from the East China Sea, but the female fifth leg on their figures shows that it is *P. gracilis*. Also, Bradford-Grieve (1999) suggested that the identity of the Southwest Pacific males is not always clear and *P. gracilis*, *P. piseki*, and *P. borealis* may have been confused.

Family Paracalanidae Giesbrecht, 1893

Gyeot-no-beol-re-gwa (결노벌레과)

Cephalosome and first pedigerous somite fused, but separated in *Mecynocera*, fourth and fifth pedigerous somites usually fused but sometimes free, as in *Bestiolina* and *Mecynocera*. Cephalic dorsal hump usually present in males. Posterolateral angles of prosome rounded. Urosome of 2 to 4 free somites in female; anal somite usually longer than any other free urosomite. Genital apparatus comprising common genital aperture. Urosome of 5 free somites in male. Single genital aperture located ventrolaterally on posterior rim of genital somite on left side. Caudal rami, often strongly divergent, with up to 6 setae. Rostrum divided into paired rostral filaments. Naupliar eye present. Antennule 23- or 25-segmented in female, non-geniculate in males. Antenna biramous, with separate coxa and basis; endopod 2-segmented; exopod 5- or 7-segmented. Setation of endopod typically reduced in males. Mandible biramous, comprising coxa with well developed gnathobase and distal palp consisting of basis, 2-segmented endopod and 5-segmented exopod. Male mandible reduced. Maxillule with well developed praecoxal arthrite bearing about 14 elements; coxa with endite bearing 3 setae and with 7 setae on epipodite; basis with outer seta, with proximal endite bearing 3 setae and distal group of 5 setae representing distal endite; endopod partly fused to basis; exopod 1-segmented. Male maxillule reduced. Maxilla with praecoxal and coxal endites bearing 6, 3, 3, 3 setae; outer seta (representing epopodite) present on coxa; basis with 3/4 setae: free endopod indistinctly segmented, bearing total of 8 setae. Male maxilla often reduced to vestige. Maxilliped 7-segmented, syncoxa, basis and 5-segmented endopod. Male maxilliped typically with reduced setation on endites, some fusion of endopodal segments, and with outer endopodal elements modified as large, reflexed, plumose setae.

Swimming legs 1 to 4 biramous, typically with 3-segmented rami, except endopod of leg 1 usually 2-segmented. Spine and seta formula typically:

	coxa	basis	exopodal segments	endopodal segments
leg 1	0-0/1	0-0/1	0/I-0/1;0-1;I/II,I,4	0-1;0,2,2 (0, 2, 1)
leg 2	0-0/1	0-0	0/I-1;I-1;II/III,I,5	0-1;0-1;1/2,2,2/3
leg 3	0-0/1	0-0	I-1;I-1;II,I,5	0-1;0-1/2;1/2,2,2/3
leg 4	0-0/1	0-0	I-1;I-1;II,I,5	0-1;0-1/2;1/2,2,2/3

Setation sometimes reduced. Spinule rows typically ornament surfaces of second and third endopodal segments of legs 1 to 4, and sometimes on second exopodal segments.

Female fifth legs fused medially to form transverse protopodal plate; uniramous; 2 to 4-segmented, often armed with setae distally; may be rudimentary or absent, as in *Acrocalanus*. Male fifth legs uniramous, highly asymmetrical; right leg short, 2 to 4-segmented; right leg sometimes rudimentary, or absent, as in *Delius*; left leg elongate, 5-segmented and slightly prehensile. Eggs released into water (Boxshall and Halsey, 2004).

GENERA 7 (6 in Korea), species ca. 78 (8 in Korea).

DISTRIBUTION: Coastal and open oceanic waters worldwide.

REMARKS: The Paracalanidae included 6 genera: *Acrocalanus* Giesbrecht, *Bestiolina* Andronov, *Calocalanus* Giesbrecht, *Delius* Andronov, *Paracalanus* Boeck, *Parvocalanus* Andronov. However, Bradford-Grieve (2008) transferred *Mecynocera clausi* Thompson, 1888 into the family Paracalanidae based on the first description of the male mouthparts. All genera, except for *Delius*, are found in Korean waters.

Key to the genera of family Paracalanidae

1. Third endopodal segment of leg 2 with formula 1, 2, 3 2
 - Third endopodal segment of leg 2 with formula 1, 2, 2 *Mecynocera*
 - Third endopodal segment of leg 2 with formula 2, 2, 3 3
 2. Outer margins of second and third exopodal segments of legs 2 to 4 ornamented with strong spinules; third endopodal segment of legs 3 and 4 with formula 2,2,3 *Acrocalanus*
 - Outer margins of second and third exopodal segments of legs 2 to 4 lacking spinular ornamentation; third endopodal segment of legs 3 and 4 with formula 1, 2, 3 *Bestiolina*
 3. Right leg 5 lacking in both sexes *Delius*
 - Fifth legs of female symmetrical; small right leg 5 present in male 4
 4. Inner seta on basis of leg 1 present; outer margin of third exopodal segment of legs 2 to 4 conspicuously serrated *Paracalanus*
 - Inner seta on basis of leg 1 absent; outer margin of third exopodal segment of legs 2 to 4 smooth 5
 5. Median keel-like hump present on cephalosome of male; rostrum with slender paired filaments; male right fifth leg 4-segmented; female fifth legs 3 or 4-segmented *Calocalanus*
 - Cephalosome of male lacking keel-like hump; rostrum bifurcate, terminating in 2 acute points; male right fifth leg 2 or 3-segmented; female fifth legs 2-segmented *Parvocalanus*
- (Boxshall and Halsey, 2004)

Genus *Calocalanus* Giesbrecht, 1888

Go-un-no-beol-re-sok (고운노벌레속)

Very small copepods less than 1.5 mm in total length. Cephalosome and first pedigerous somite fused; fourth and fifth pedigerous somites fused or separated. Female urosome short, of 2 to 4 free somites. Caudal rami sometimes asymmetrical, with 2 much thicker setae. Female antennules much longer than body. Female fifth leg symmetrical, uniramous, of 3 or 4 segments; male fifth leg symmetrical, uniramous, of 4 segments on right and 5 segments on left (Giesbrecht, 1892; Bradford-Grieve, 1994).

SPECIES ca. 50 (2 in Korea).

DISTRIBUTION: Tropical to temperate waters worldwide.

24. *Calocalanus pavo* (Dana, 1849) (Fig. 45)

Gong-jak-go-un-no-beol-re (공작고운노벌레)

Calanus pavo Dana, 1849, p. 13.

Ctenocalanus pavo: lapsus calami in Seridji and Hafferssas, 2000, tab. 1; Hopcroft et al., 1998, tab. 2, *lapsus calami*.

Calocalanus pavo: Giesbrecht, 1892, p. 175, pl. 1, fig. 13, pl. 14, fig. 15, pl. 9, figs. 3, 4, 13, 19, pl. 36, figs. 43–45; Giesbrecht and Schmeil, 1898, p. 26, rem. f, m; Thompson and Scott, 1903, pp. 233, 243; A. Scott, 1909, p. 30, rem.; Wolfenden, 1911, p. 203; Wilson, 1932, p. 39, fig. f; Rose, 1933, p. 78, figs. f, m; Mori, 1937 (1964) p. 33, pl. 13, figs. 1–3; Vervoort, 1946, p. 38, rem.; Tanaka, 1956, p. 377; Grice, 1962, p. 187, fig. f; Kasturirangan, 1963, p. 20, figs. f, m; Chen and Zhang, 1965, p. 43, fig. f; Owre and Foyo, 1967, p. 39, figs. f, m, rem.; Chen and Zhang, 1974, p. 107, fig. m; Marques, 1974, p. 13, fig. f; Dawson and Knatz, 1980, p. 4, figs. f, m; Björnberg et al., 1981, p. 626, figs. f, m; Bradford-Grieve, 1994, p. 59, figs. f, m, fig. 99; Chihara and Murano, 1997, p. 749, pl. 71; Bradford-Grieve et al., 1999a, pp. 877, 909, figs. f, m; Conway et al., 2003, p. 157, figs. f, m, rem.; Boxshall and Halsey, 2004, p. 154, fig. 34.

Female: Body length 0.80–0.84 mm. Cephalosome and first pedigerous somite fused; anteriorly head slightly protruding, nipple-like. Fourth and fifth pedigerous somite separate. Urosome of 2 free somites. Caudal rami divergent, symmetrical, with tuft of spinules on inner proximal margin. Fifth leg uniramous, symmetrical, 3-segmented; last segment gradually inflated distally, with 1 spine on outer distal margin and 4 terminal setae, with 2 rows of fine spinules.

DISTRIBUTION: Widespread in tropical, subtropical and temperate parts of all oceans (Vervoort, 1946).

KOREA: GN.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 17.viii.2008).

ECOLOGY: *Calocalanus pavo* occurs rarely in waters of the Tsushima Warm Current during the summer season.

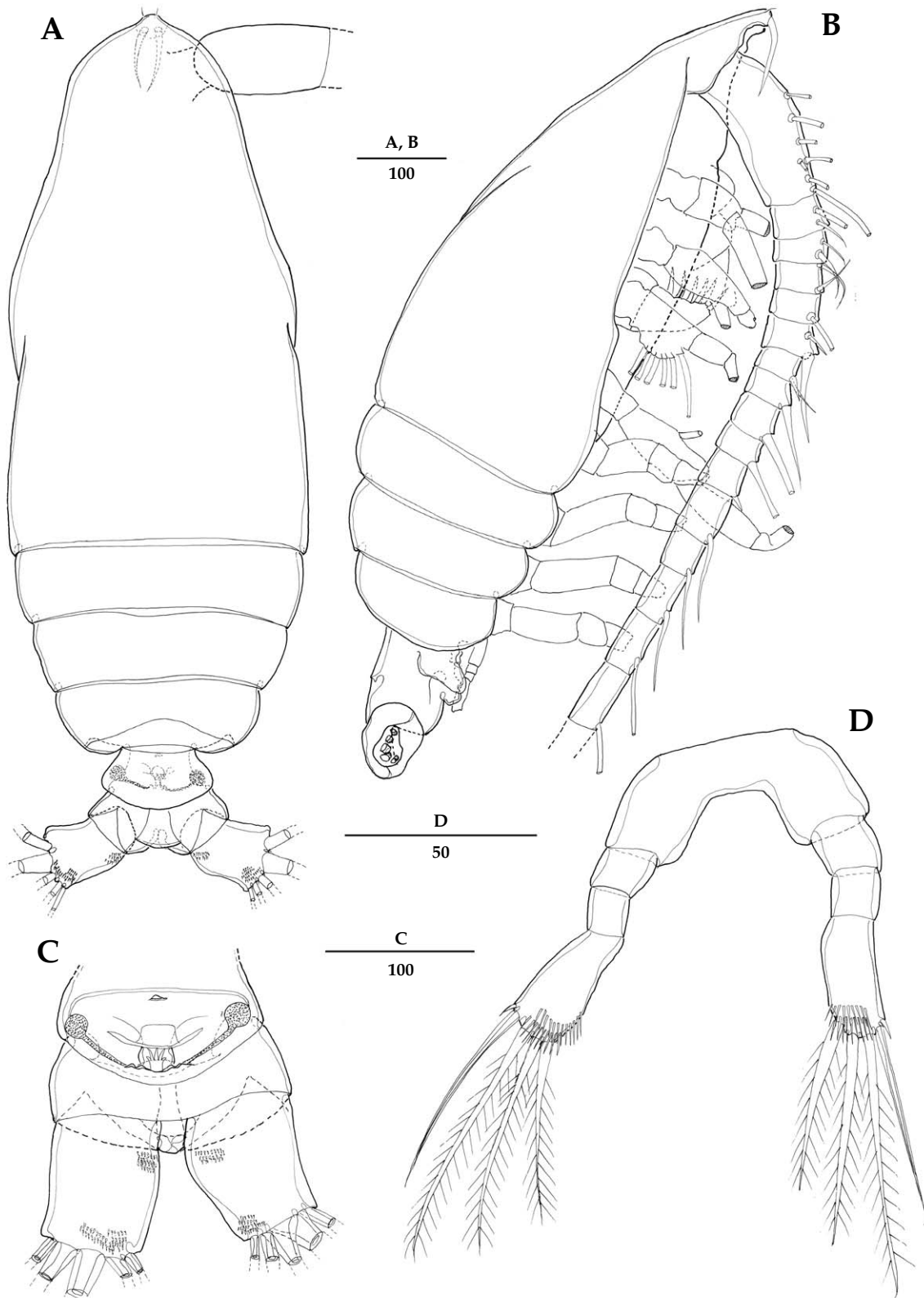


Fig. 45. *Calocalanus pavo*, female. A. habitus, dorsal view; B. habitus, lateral view; C. urosome, ventral view; D. fifth leg.

REMARKS: *Calocalanus pavo* shows a variation in the female fifth legs. Bradford-Grieve (1994) reported that *Calocalanus pavo* has 5 plumose setae (1 inner seta and 4 terminal seta) and 1 terminal spine on the distal segment of female fifth legs. However, the present specimens have only 4 terminal setae and 1 terminal spine. On the other hand, Kang (1992) showed that there is 1 spine and 3 setae on the distal segment of female fifth legs.

Genus *Mecynocera* Thompson, 1888

Gin-ppul-no-beol-re-sok (긴뿔노벌레속)

The generic definition as in the family except for the following characteristics.

Antennules symmetrically developed, neither of them geniculate; male antennary exopod with short terminal segment without 3 terminal setae; maxilliped sexually dimorphic in male, endopod with 3 enlarged plumose setae (2 outer and 1 terminal), inner seta very atrophied. Leg 1 endopod of 2-segments, exopod 3-segmented. Legs 2-4 with 3-segmented exopods and endopods, third exopodal segment of legs 2-4 with 2 outer border articulated spines. Terminal spine on third exopodal segment blade-like, not serrated. Female fifth leg uniramous bearing 3-5 segments with fused protopodal plate, but may be rudimentary; male left fifth leg elongate, slightly prehensile, 5-segmented (Bradford-Grieve, 2008).

25. *Mecynocera clausi* Thompson, 1888 (Fig. 46)

Keul-ra-u-seu-gin-ppul-no-beol-re (클라우스긴뿔노벌레)

Mecynocera clausi I.C. Thompson, 1888, p. 150, pl. 11, fig. 1-4; Giesbrecht, 1893, p. 160, pl. 5, fig. 1, pl. 11, figs. 43-45, pl. 35, figs. 21, 22; T. Scott, 1894, p. 80, figs. f, m; Giesbrecht and Schmeil, 1898, p. 23, rem. f; Esterly, 1905, p. 137, fig. f; Rose, 1933, p. 72, fig. f; Mori, 1937 (1964), p. 28, pl. 11, figs. 1-3, pl. 23, figs. 1-3; Chen and Zhang, 1965, p. 38, figs. f, m; Owre and Foyo, 1967, p. 40, fig. f; Andronov, 1970, p. 980, figs. f, m, juv., rem.; Corral Estrada, 1970, p. 135, figs. f, m, rem; Corral, 1972, pp. 37, 39, figs. f, m; Bradford, 1972, p. 34, fig. f; Bradford-Grieve, 1994, p. 71, figs. 38, 39, 87; Chihara and Murano, 1997, p. 833, pl. 125; Bradford-Grieve et al., 1999a, pp. 878, 911, figs. f, m; Boxshall and Halsey, 2004, p. 137, fig. 137; Bradford-Grieve, 2008, p. 60, figs. 1, 2.

Dolichocera tenuis: Bernard, 1958, p. 195, fig. 15a (not *Calocalanus tenuis* Farran, 1926).

Dolichocera tenuis: Bernard, 1963, p. 160 (not *Calocalanus tenuis* Farran, 1926).

Female: Body length 0.92-1.21 mm. As in the family definition. Antennule twice as long as whole body. Fifth leg uniramous, 5-segmented: coxa and basis without seta; exopod 3-segmented, first segment without setae, second segment with inner seta, third segment with 3 inner and 2 terminal setae (Giesbrecht 1892; Bradford-Grieve, 1999).

DISTRIBUTION: Widespread epipelagic inhabitant of tropical, subtropical and temperature oceans (Vervoort, 1957; Bradford-Grieve, 1999).

KOREA: GN.

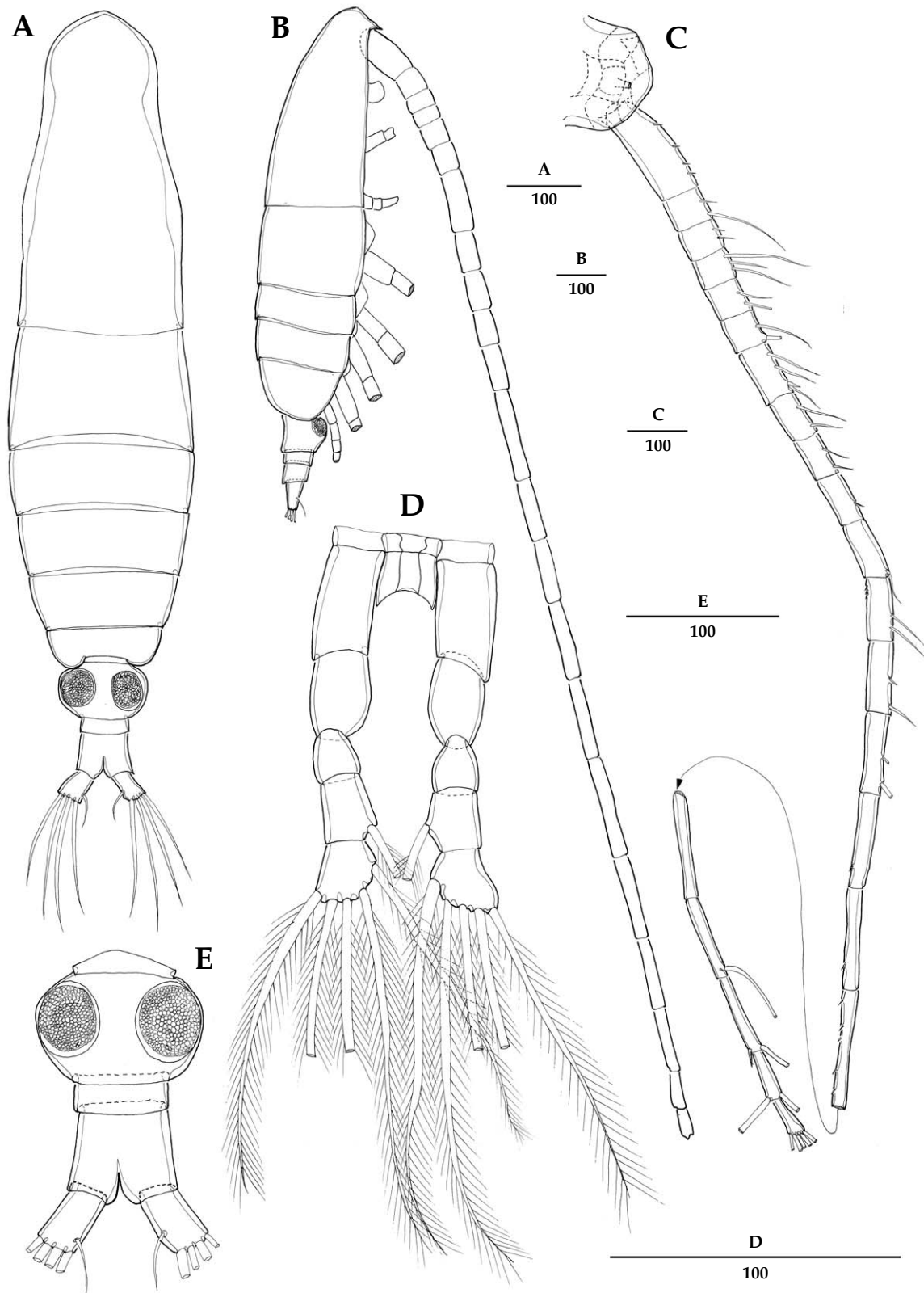


Fig. 46. *Mecynocera clausi*, female. A. habitus, dorsal view; B. habitus, lateral view; C. right antennule; D. fifth leg; E. urosome, dorsal view.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 13.xi.2006).

ECOLOGY: *Mecynocera clausi* occurs rarely in the Tsushima Warm Current during the fall season.

REMARKS: This is the first record in Korean waters, but no males were found.

Family Pontellidae Dana, 1853

Bo-teu-no-beol-re-gwa (보트노벌레과)

Cephalosome and first pedigerous somite separated; fourth and fifth pedigerous somite sometimes fused in some genera. Posterolateral angles of prosome usually with asymmetrical expansions. Cephalosome bluntly triangular anteriorly often with lateral hooks. Rostrum bifurcate, sometimes with widened base incorporating lens. Eyes almost present, large, with one or two pairs of dorsal cuticular lenses and one ventral lens. Urosome of 1 to 3 free somites in female, in male of 4- or 5 free somites. Antennule 14 to 25-segmented: right antennule of male geniculate, greatly inflated, with dentate plates and numerous bristles. Antenna biramous, endopod much larger than the exopod. Mandible uniramous: gnathobase with 5 to 7 denticles. Maxillule with well developed praecoxal arthrite. Maxilla well developed, 7-segmented. Maxilliped 6 to 8-segmented.

Swimming legs 1 to 4 with 3-segmented exopod; endopod of leg 1, 2 or 3-segmented, one of legs 2 to 4 2-segmented. Spine and seta formula typically as follows:

	coxa	basis	exopodal segments	endopodal segments
leg 1	0-1	0-0	I-1;I-1;II,1,4	0-1;0-2;1,2,3
leg 2	0-1	0-0	I-1;I-1;III,I,5	0-3;2,2,4
leg 3	0-1	0-0	I-1;I-1;III,I,5	0-3;2,2,4
leg 4	0-1	1-0	I-1;I-1;III,I,5	0-3;2,2,3

Female fifth leg with coxa and intercoxal sclerite fused to form transverse plate; endopod 1-segmented, rarely absent. Male fifth leg asymmetrical: right leg 4-segmented, subchelate, with 2-segmented exopod, rarely with rudimentary endopod; left leg 4-segmented.

GENERA 8 (5 in Korea), species 142 (22 in Korea).

DISTRIBUTION: Worldwide in tropical and warm temperate waters, usually in coastal waters and in the neuston.

Key to the genera of family Pontellidae

1. Endopod of first leg 2-segmented 2
 - Endopod of first leg 3-segmented 3
2. Cephalosome with a pair of dorsal cuticular lenses *Labidocera*
 - Cephalosome without cuticular lenses *Calanopia*
3. Fourth and fifth pedigerous somites separated; cephalosome with lateral hooks *Pontella*
 - Fourth and fifth pedigerous somites fused; cephalosome without lateral hooks 4
4. Caudal rami of female separate from anal somite; third urosomite of male with process on right side *Pontellopsis*

- Right caudal ramus and anal somite fused; third urosomal somite of male without process
 *Pontellina*

REMARKS: This family contains 8 genera: *Anomalocera* Templeton, 1837; *Calanopia* Dana 1852; *Epilabidocera* Wilson, 1932; *Ivellopsis* Claus, 1893; *Labidocera* Lubbock, 1853; *Pontella* Dana, 1846; *Pontellina* Dana, 1849; *Pontellopsis* Brady 1883 of which five genera occur in Korean waters.

Genus *Calanopia* Dana, 1853

Gin-da-ri-no-beol-re-sok (긴다리노벌레속)

Following additional characteristics are added to family definition. Prosoma with or without lateral cephalic hooks anteriorly: cephalosome and first pedigerous somite usually separate; fourth and fifth pedigerous somites completely fused. Cephalosome without dorsal cuticular lenses. Urosome of 2 free somites in female and of 5 free somites in male; caudal rami about 2–3 times as long as wide. Male right antennule geniculate, with 4-segmented terminal section. First leg has 2-segmented endopod. Female fifth leg symmetrical or slightly asymmetrical, 3 or 4-segmented, endopod absent. Male fifth leg 4-segmented on both sides, 2 distal segments of right leg forming stout chela.

SPECIES 17 (3 in Korea).

DISTRIBUTION: Principally an Indo-Pacific species except for *C. americana* Dahl, 1894, and *C. biloba* Bowman, 1957 which occur in the Atlantic Ocean, and *C. media* Gurney, 1927, recorded in the Suez Canal.

Key to the species of genus *Calanopia*

1. Urosome of 2 free somites 2 (Female)
 - Urosome of 5 free somites 4 (Male)
2. Cephalosome with lateral hooks *C. thompsoni*
 - Cephalosome without lateral hooks 3
3. Genital compound somite equal to length of next segment *C. elliptica*
 - Genital compound somite shorter than next segment *C. minor*
4. Cephalosome with lateral hooks *C. thompsoni*
 - Cephalosome without lateral hooks 5
5. Posterolateral corners of last pedigerous somite asymmetrical *C. elliptica*
 - Posterolateral corners of last pedigerous somite symmetrical *C. minor*

26. *Calanopia elliptica* (Dana, 1849) (Figs. 47, 48)

Nal-gae-bo-teu-no-beol-re (날개보트노벌레)

Pontella elliptica Dana, 1849.

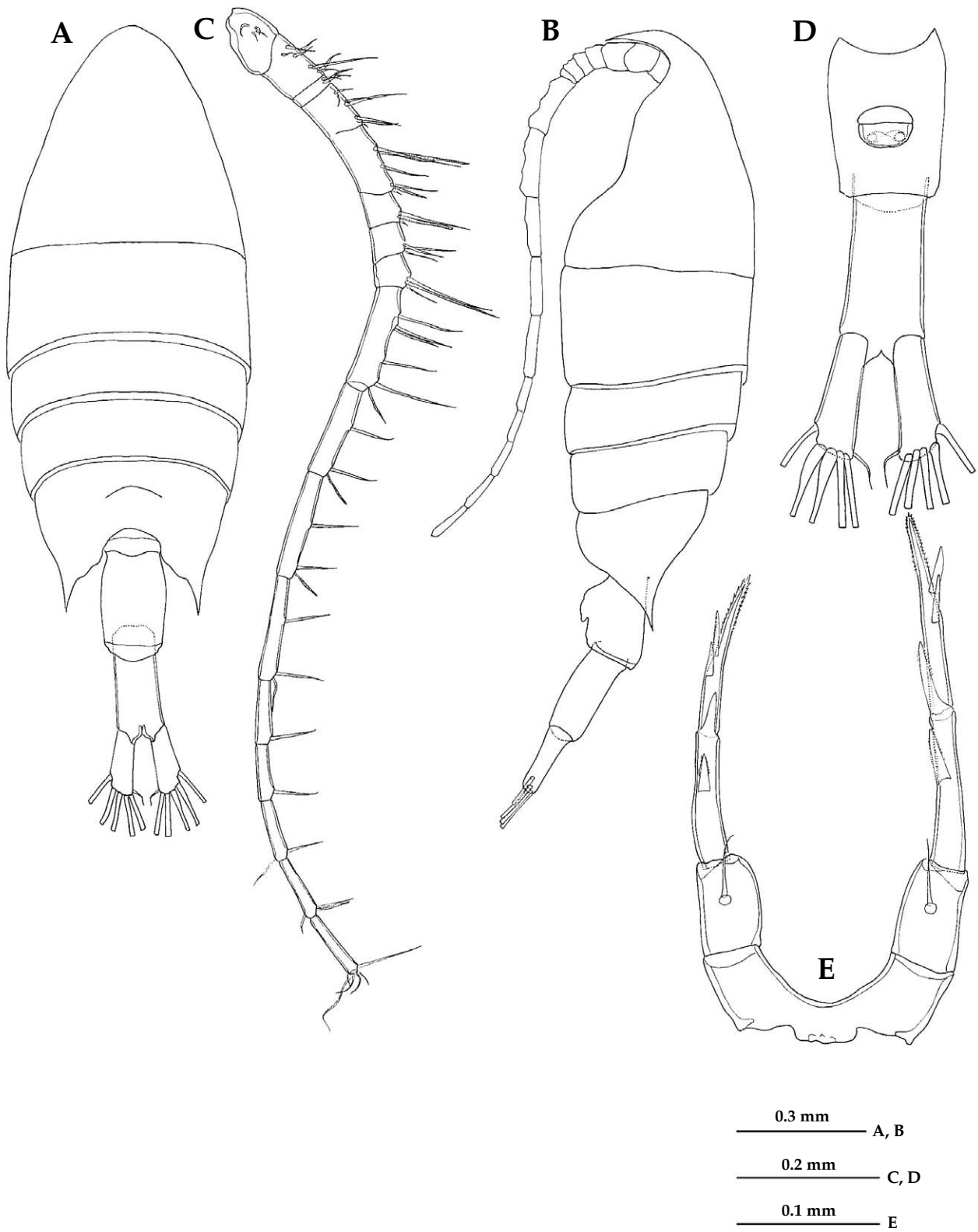


Fig. 47. *Calanopia elliptica*, female. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. urosome, ventral view; E. fifth leg.

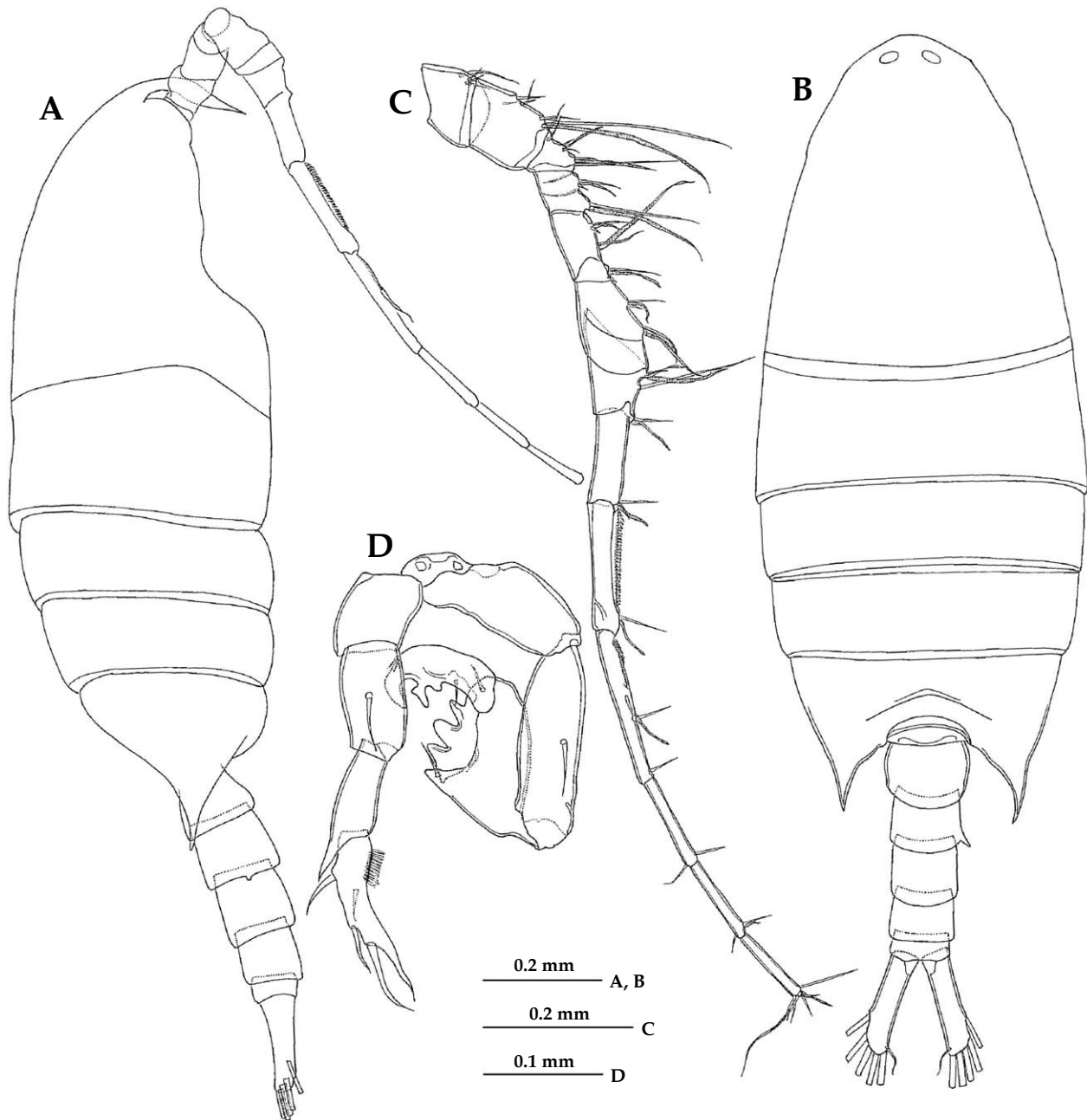


Fig. 48. *Calanopia elliptica*, male: A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. fifth leg.

Calanopia sp. Pesta, 1912a, p. 52, fig. juv.

Calanopia elliptica: Dana, 1855, pl. 79, fig. 6a, b; Brady, 1883, p. 85, pl. 34, figs. 1–9; Giesbrecht, 1892, p. 441, pl. 31, figs. 21, 23–26, 31, 32, pl. 38, figs. 42, 47; Giesbrecht and Schmeil, 1898, p. 132; Wolfenden, 1906, p. 1023; Scott A., 1909, p. 176, pl. 48, figs. 1–5; Sewell, 1912, p. 368; 1914, p. 231; 1932, p. 341; Mori, 1937 (1964), p. 89, pl. 40, figs. 3–8; Dakin and Colefax, 1940, p. 105, fig. 156a–d; Wilson,

1950, p. 175; Tanaka, 1964, p. 250; Chen and Zhang, 1965, p. 95, pl. 39, figs. 1–5; Zhang et al., 1965, p. 140, fig. 66a–g; Silas and Pillai, 1973, p. 785, fig. 3; Greenwood, 1979, p. 94; Bradford-Grieve, 1999, p. 185, fig. 134; Mulyadi, 2002, p. 41, fig. 11; Othman and Toda, 2006, p. 307, figs. 3, 4.

Female: Body length 1.8–1.89 mm. Prosome elongate: rostrum bifurcate; cephalosome anteriorly rounded without lateral hooks; fourth and fifth pedigerous somites uncompletely fused; postero-lateral angles of prosome produced pointed process, right side longer than left. Urosome of 2 free somites: genital compound somite laterally bulging; caudal rami elongate, symmetrical. Antennules symmetrical, 14-segmented. Fifth leg uniramous and asymmetrical, left leg longer than right: intercoxal sclerite and coxa fused; basis bearing plumose seta; first exopodal segment with 1 medial and 1 distal spine; second exopodal segment ending in acute process and 2 outer spines.

Male: Body length 1.76–1.78 mm. Posterolateral corners of last pedigerous somite pointed asymmetrical, right longer than left. Urosome of 5 free somites: second urosomite bearing 1 small spiniform process on right posterodistal margin; caudal rami symmetrical, long and slender. Fifth leg uniramous and asymmetrical: intercoxal sclerite and coxa divided; basis bearing single plumose seta; palm of right leg with 3 inner marginal processes which are blunt and tooth-like; thumb short, triangle-shape with 1 seta medially; finger bend with 2 inner processes and 2 outer spinules; left leg, first exopodal segment bearing stout distolateral process; distal segment bearing 3 outer spines, 1 apical process, 1 inner seta and fringed with hairs along inner margin.

DISTRIBUTION: Banka strait, Izu region, Bengal bay, Japan, China, Vietnam, Australia, warm regions of the Indian and Pacific Oceans.vii.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 30.vii.2002).

ECOLOGY: This species occurs in oceanic warm waters.

REMARKS: *Calanopia elliptica* is closely related to *C. minor*, but is distinguished by the following characteristics: (1) first and second urosomites nearly equal in length; (2) female fifth legs with 2-segmented exopods; (3) posterior processes of last pedigerous somite of the male asymmetrical, right process longer than the left; (4) male second urosomite with distolateral processes. Specimens previously identified as *C. elliptica* by Wilson (1942) from the Caribbean Sea were recognised as a separate species, *C. biloba*, by Bowman (1957).

Genus *Labidocera* Lubbock, 1853

Geol-soe-ppul-no-beol-re-sok (걸쇠뿔노벌레속)

Cephalosome with or without lateral hooks, first pedigerous somite separate; fourth and fifth pedigerous somite fused or partly fused; posterolateral corners of prosome produced into pointed lobes. Rostrum deeply bifurcate with strong filaments, lacking a lens. Eyes with a pair of dorsal cuticular lenses and a protuberant ventral eye which extends anteroventrally between rostral prongs. Urosome of 2 or 3 free somites in female and of 4 or 5 free somites in male; genital segment and caudal rami sometimes asymmetrical in female; symmetrical in male. Male right antennule with at least 4 separate segments distal to hinge between segments 18 and fused segments 19–21, the median part expanded. Swimming legs 1 to 4 with 2-segmented endopod and 3-segmented exopod. Female

fifth leg biramous, each ramus 1-segmented, endopod often rudimentary and bifurcated at apex; male right fifth leg uniramous with chela, left leg sometimes with a rudimentary endopod.

SPECIES 52 (8 in Korea).

DISTRIBUTION: Worldwide, in neritic or oceanic waters.

Key to the species of genus *Labidocera*

1. Urosome of 3 free somites 2 (Female)
 - Urosome of 5 free somites 9 (Male)
2. Cephalosome with frontal median crest 3
 - Cephalosome without frontal median crest 4
3. First urosomite with posterior process on right side *L. acutifrons*
 - First urosomite without process *L. acuta*
4. Cephalosome with lateral hooks 5
 - Cephalosome without lateral hooks 7
5. Posterolateral corners of last pedigerous somite rounded *L. minuta*
 - Posterolateral corners of last pedigerous somite with triangular process 6
6. Genital compound somite with several hooks and spines *L. kroyeri*
 - Genital compound somite with wide process on right side *L. rotunda*
7. Caudal rami broad, almost symmetrical, caudal setae short 8
 - Caudal rami asymmetrical, second caudal seta much longer than others *L. euchaeta*
8. Urosome of 2 free somites *L. pavo*
 - Urosome of 3 free somites *L. detruncata*
9. Cephalosome with median crest 10
 - Cephalosome without median crest 11
10. Posterolateral corners of last pedigerous somite symmetrical *L. acutifrons*
 - Posterolateral corners of last pedigerous somite asymmetrical *L. acuta*
11. Cephalosome with lateral hooks 12
 - Cephalosome without lateral hooks 14
12. Right posterolateral corners of last pedigerous somite bifurcated 13
 - Right posterolateral corners of last pedigerous somite with blade-like process *L. minuta*
13. Distance between two processes in right corners of last pedigerous somite broad *L. rotunda*
 - Distance between two processes in right corners of last pedigerous somite narrow *L. kroyeri*
14. Anterior head narrow, eye lenses small *L. euchaeta*
 - Anterior head broad, eye lenses large 15
15. First segment of left fifth leg relatively long *L. pavo*
 - First segment of left fifth leg short *L. detruncata*

27. *Labidocera acuta* (Dana, 1849) (Figs. 49, 50)

Ppyo-jok-geol-soe-ppul-no-beol-re (뽕죽걸쇠뿔노벌레)

Pontella acuta Dana, 1849, p. 30 (cited from Brady, 1883); Brady, 1883, p. 89, pl. 36, figs. 1–12.

Pontellina acuta: Dana, 1852, p. 1150, pl. 80.

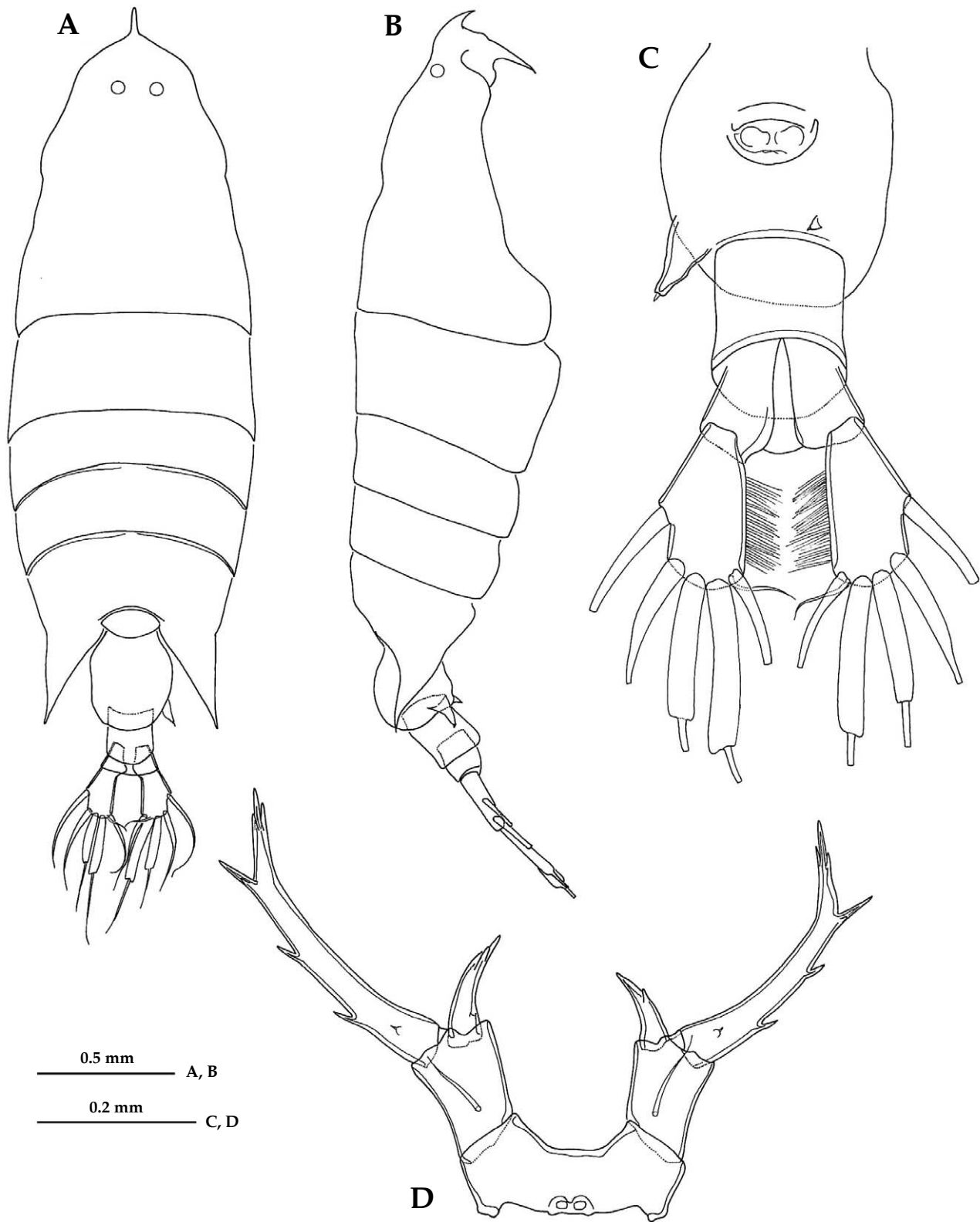


Fig. 49. *Labidocera acuta*, female. A. habitus, dorsal view; B. habitus, lateral view; C. urosome, ventral view; D. fifth leg.

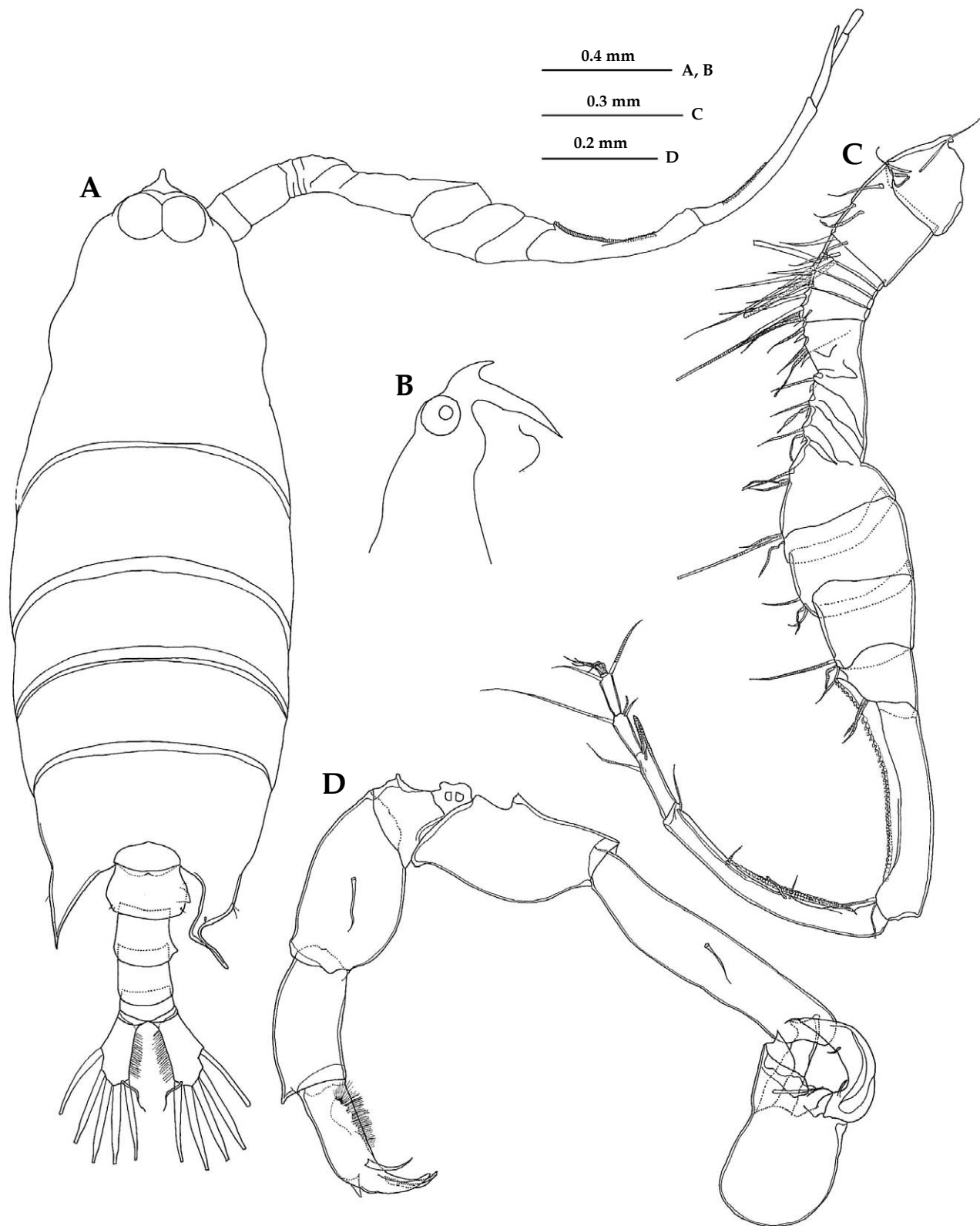


Fig. 50. *Labidocera acuta*, male. A. habitus, dorsal view; B. head, lateral view; C. antennule; D. fifth leg.

Labidocera acutum: Giesbrecht, 1892, p. 445, pl. 23, figs. 15, 44, 46, pl. 25, figs. 31, 33, pl. 41, figs. 10, 19, 20, 28, 40.

Labidocera acuta: Giesbrecht and Schmeil, 1898, p. 134; von Breemen, 1908, p. 150, fig. 168; Scott A., 1909, p. 164; Mori, 1937 (1964), p. 91, pl. 41, figs. 1–5; Wilson, 1950, p. 241, pl. 11, figs. 121, 122, pl. 12, fig. 123; Tanaka, 1964, p. 254; Chen and Zhang, 1965, p. 98, pl. 41, figs. 5–10; Zhang et al., 1965, p. 121, fig. 55; Silas and Pillai, 1973, p. 795, fig. 9; Greenwood, 1979, p. 95, figs. 1, a–d; Kim, 1985, p. 122, pl. 40, figs. e, f, pl. 41, figs. a, b; Bradford-Grieve, 1999, p. 187, fig. 135; Mulaydi, 2002, p. 49, fig. 13; Othman and Toda, 2006, p. 308, figs. 6, 7.

Female: Body length 2.98–3.44 mm. Prosome cylindrical with median crest: cephalosome without lateral hooks and with pair of lenses anteriorly; cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites uncompletely fused; posterolateral corners of prosome with sharp process which extends beyond distal margin of genital compound somite. Urosome of 3 free somites; genital compound somite asymmetrical with two conical processes in ventral view; caudal rami asymmetrical, right ramus slightly longer; the second to fourth caudal setae from outer margin proximally thickened, expanded portion gradually tapering. Fifth leg asymmetrical, right leg longer: intercoxal sclerite and coxa fused; basis bearing plumose seta; exopod with 4 outer, 3 apical and 1 inner processes; endopod bifurcated terminally.

Male: Body length 2.92–3.1 mm. Prosome similar to that of female except for well-developed dorsal eye and curved process on right side of last pedigerous somite. Urosome of 5 free somites; first urosomite with blunt process and setule on right side; second urosomite with projecting right corner; caudal rami asymmetrical, right ramus slightly larger and second to fourth caudal setae proximally thickened. Fifth leg uniramous, asymmetrical: intercoxal sclerite and coxa completely divided; basis bearing a single plumose seta; right leg forming chela; palm of chela ball-shaped with 1 claw-like outgrowth and 1 seta; finger bearing 3 setae; left first segment bearing blunt process on distal left corner; second segment bearing 1 outer process, 2 apical processes, 1 inner spine, and 1 seta and hirsute medially.

DISTRIBUTION: Australian waters: Great Barrier Reef and Moreton Bay.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 26.ix.2002).

ECOLOGY: *Labidocera acuta* is known as a neritic species but has been reported from some oceanic areas around islands (Sherman, 1963; Greenwood, 1979). In Korea waters, this species occurs over a wide temperature range from 23 to 27.5°C and salinity range from 26.6 to 31.2 psu.

REMARKS: *Labidocera acuta* is easily identified by the median crest, thickened second to fourth caudal setae in female, and the structure of the fifth legs in both genders.

28. *Labidocera acutifrons* (Dana, 1849) (Figs. 51, 52)

Gyeot-ppyo-jok-geol-soe-ppul-no-beol-re (겔뽀죽걸쇠뿔노벌레)

Pontella acutifrons Dana, 1849, p. 30; Brady, 1883, p. 91, pl. 35, figs. 1–13.

Pontellina acutifrons: Dana, 1852, p. 1149, pl. 80, fig. 11 (cited from Brady, 1883).

Labidocera acutifrons: Giesbrecht, 1892, pp. 445, 447, 454, 458, 460, pl. 23 figs. 2, 12, 20, 33, 40, 41, pl.

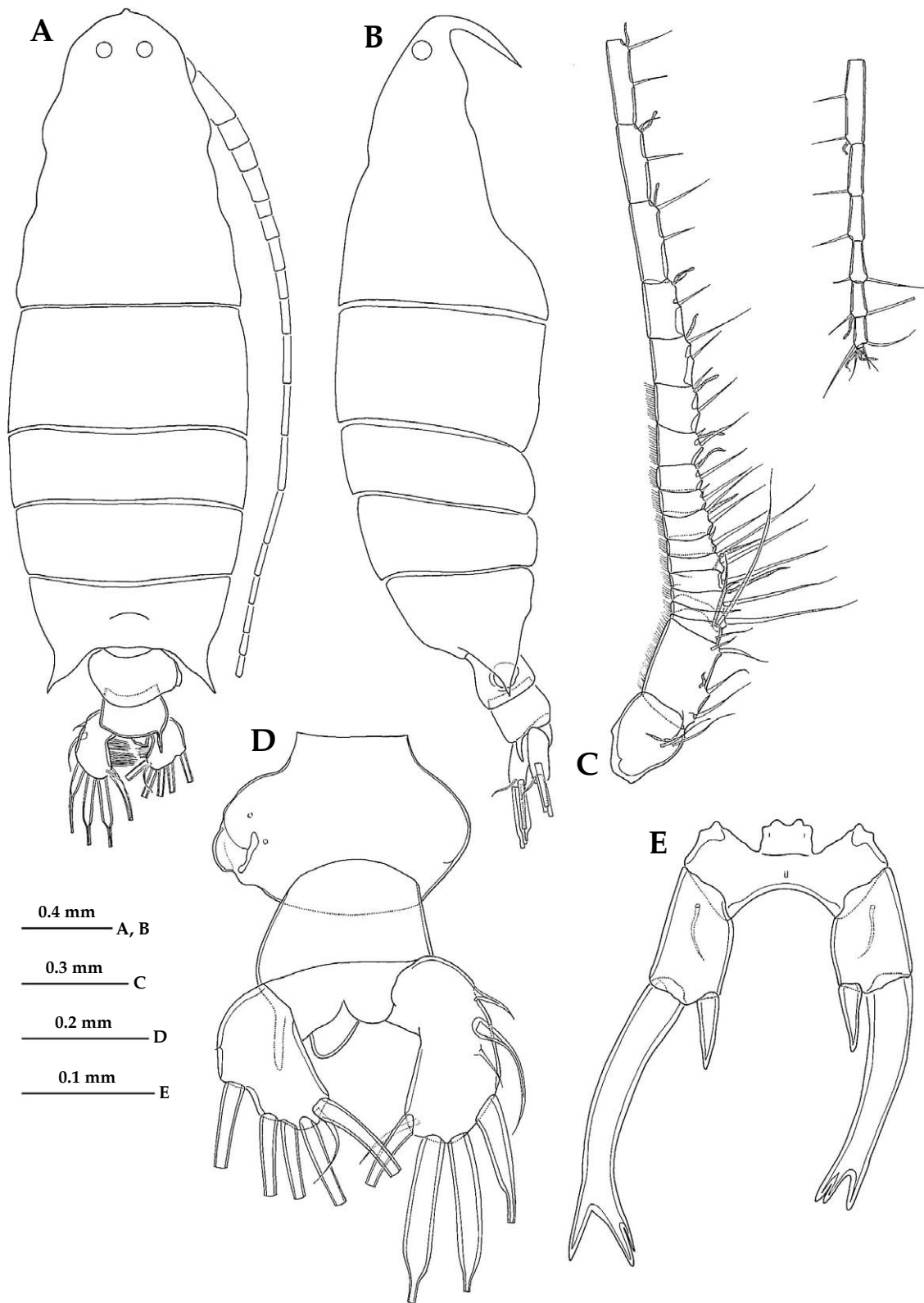


Fig. 51. *Labidocera acutifrons*, female. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. urosome, ventral view; E. fifth leg.

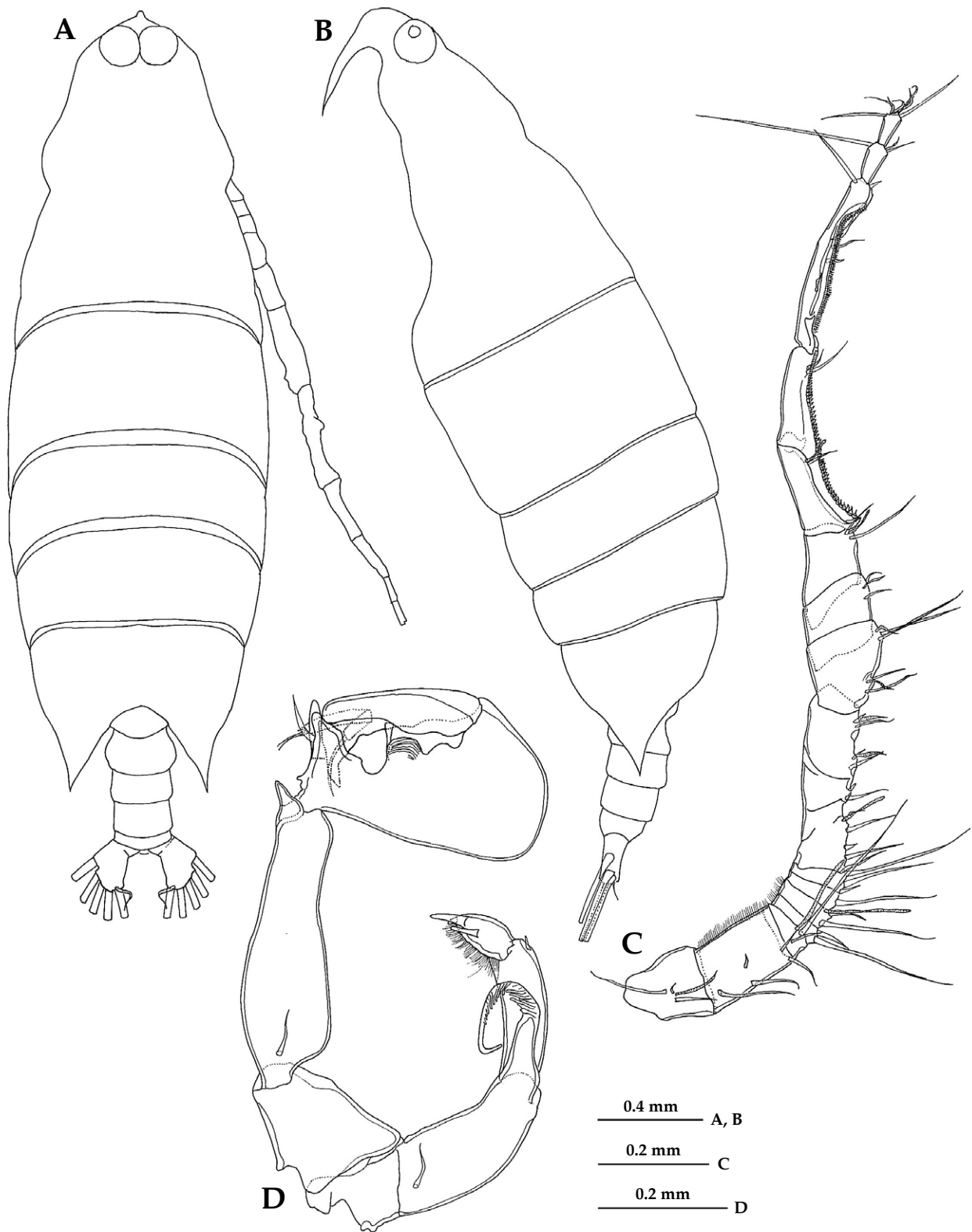


Fig. 52. *Labidocera acutifrons*, male. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. fifth leg.

41, figs. 3, 26, 41; Giesbrecht and Schmeil, 1898, p. 134; Farran, 1936, p. 116; Wilson, 1950, p. 242, pl. 11, figs. 124, 125; Tanaka, 1964, p. 253, fig. 231a–f; Knudsen and Wolff, 1965, p. 187; Silas and Pillai, 1967, p. 346; Owre and Foyo, 1967, p. 97, figs. 696, 697, 702; Silas and Pillai, 1973, p. 793, fig. 8; Greenwood, 1979, p. 97; Zheng et al., 1982, p. 73, fig. 43; Bradford-Grieve, 1999, p. 188, fig. 136.

Female: Body length 3.49–3.67 mm. Prosome cylindrical, without lateral hooks, anterior head with median crest and bifid rostrum; cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites partly fused; last pedigerous somite produced into broad acuminate process. Urosome of 3 free somites; genital compound somite onion-shaped with small lump on right side bearing genital operculum; second urosomite with dorso-posterior spine on the right side directed towards large anal flap; caudal rami strongly asymmetrical, left ramus larger than right, left ramus bearing 7 setae: 2 inner setae (seta I, II), 3 terminal setae (seta III to V) proximally thickened, 2 outer setae (seta VI, VII), right ramus with 6 setae except for the dorsal seta (seta VII). Fifth leg asymmetrical, longer on right; exopod trifold at apex; endopod represented by conical stout spine.

Male: Body length 3.45–3.53 mm. Prosome more compact than female, with well-developed dorsal lenses; cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites fully fused; posterolateral corners of last pedigerous somite symmetrical with sharp process. Urosome of 5 free somites; third urosomite larger than other segments; caudal rami symmetrical. Fifth leg uniramous, asymmetrical; right leg basis with distal triangular process, palm with bluntly rounded process on inner margin and stout thumb with 1 spine, finger with 2 digitiform processes bearing 2 setae and 1 spine; left leg rudimentary, endopod has distinctive twisted, lacinated appendage, first exopod segment bearing small process and second segment bearing 3 apical spines and inner fringe of hairs.

DISTRIBUTION: China, Japan, Hawaii, Australia, Africa, Mexico Bay.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 20.viii.2002).

ECOLOGY: This oceanic species is distributed over the whole of the tropical and subtropical Atlantic, Pacific and Indian Oceans (Knudsen and Wolff, 1965; Fleminger, 1957; 1967; Bowman, 1971; Weikert, 1975). In Korean waters, this species appears in low abundance during August in neritic waters.

REMARKS: *Labidocera acutifrons* is easily distinguished by its anterior crest, absence of lateral hooks on the cephalosome and the structure of the fifth legs of both sexes.

29. *Labidocera detruncata* (Dana, 1849) (Figs. 53, 54)

Geo-buk-deung-geol-soe-ppul-no-beol-re (거북등걸쇠빨노벌레)

Pontellina detruncata Dana, 1852, p. 1143, pl. 80.

Pontella detruncata: Brady, 1883, p. 90, pl. 26, figs. 8–15, pl. 45, fig. 20.

Labidocera detruncatum Giesbrecht, 1892, p. 445, pl. 22, figs. 14, 34, pl. 25, fig. 28, pl. 41, figs. 9, 30, 31.

Labidocera detruncata: Giesbrecht and Schmeil, 1898, p. 135; A. Scott, 1909, p. 165; Sewell, 1932, p. 359; Farran, 1936, p. 117; Mori, 1937 (1964), p. 92, pl. 42, figs. 1–6; Wilson, 1950, p. 244, pl. 16, figs.

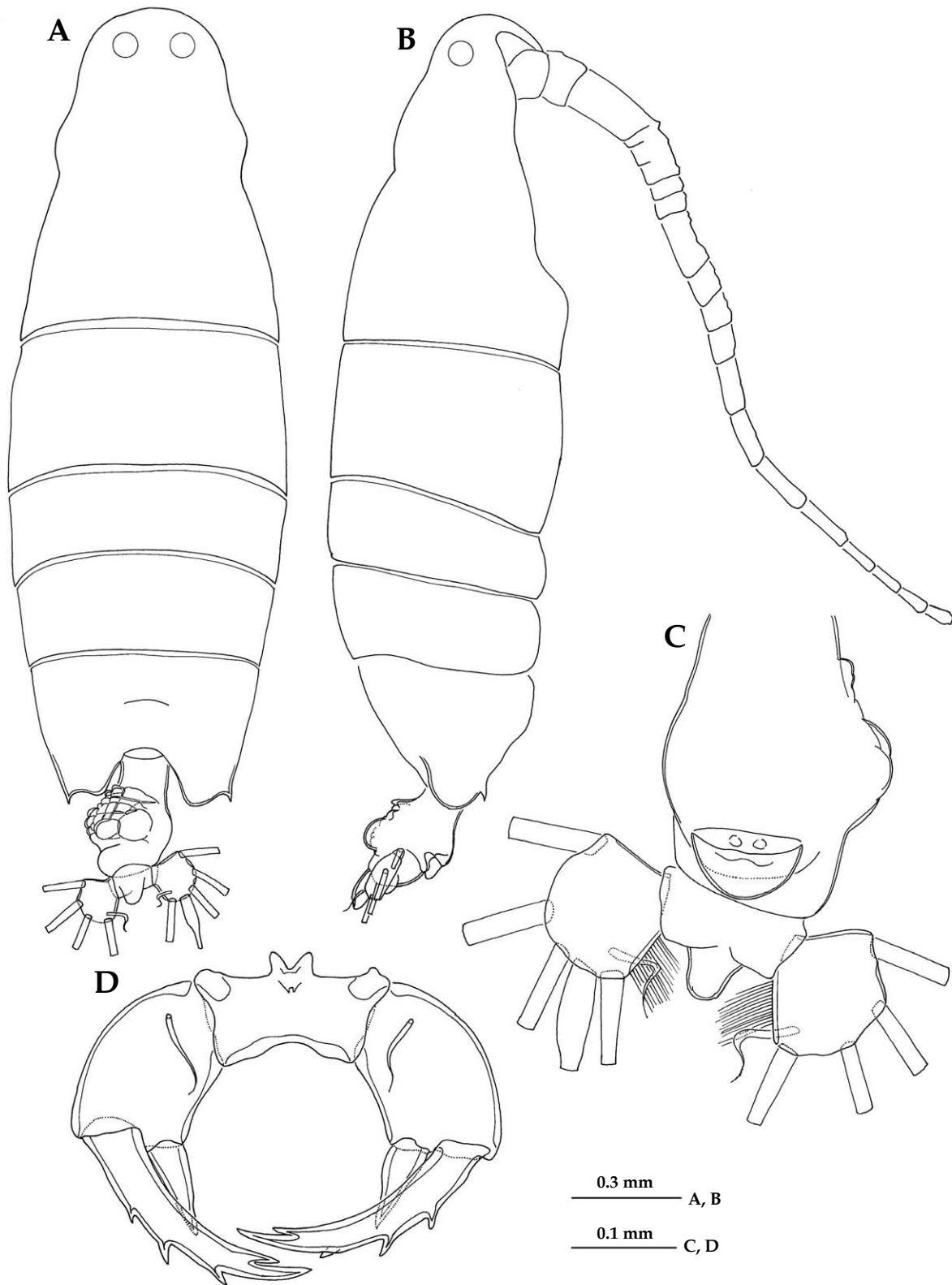


Fig. 53. *Labidocera detruncata*, female. A. habitus, dorsal view; B. habitus, lateral view; C. urosome, ventral view; D. fifth leg.

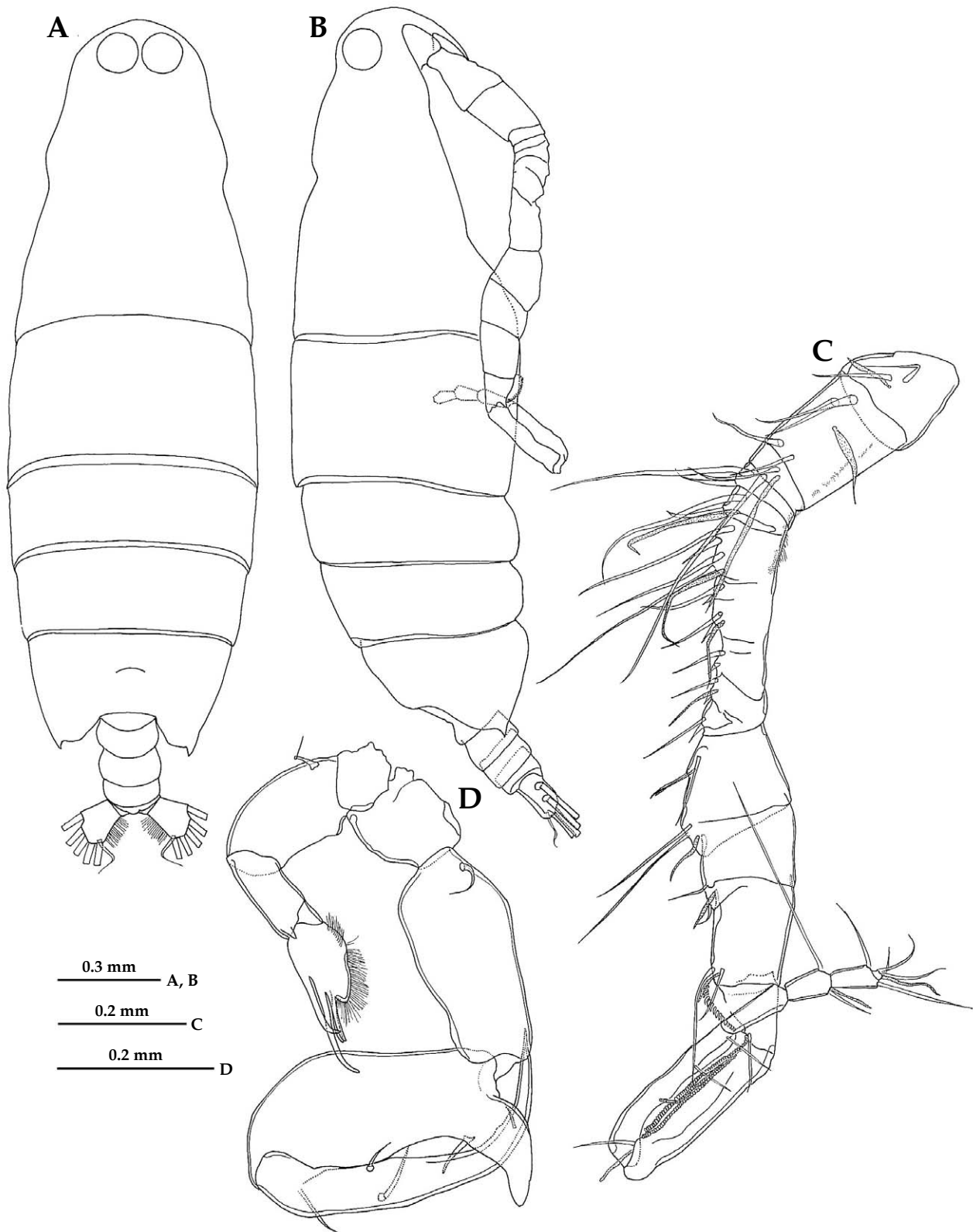


Fig. 54. *Labidocera detruncata*, male. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. fifth leg.

192, 193; Chen and Zhang, 1965, p. 101, pl. 43, figs. 1–4; Zhang et al., 1965, p. 123, pl. 57; Silas and Pillai, 1973, p. 797, fig. 10; Bradford-Grieve, 1999, p. 191, fig. 139; Mulyadi, 2002, p. 58, fig. 5f–g.

Female: Body length 2.71–2.75 mm. Prosome cylindrical, without lateral hooks: cephalosome bluntly rounded and rostrum bifid; cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites almost fused; last pedigerous somite ending on each side in a small point and bluntly rounded inner margin. Urosome of 3 free somites; genital compound somite left dorsal surface uneven and swollen; anal somite with posterior flap in center; caudal rami nearly circular, second caudal seta from inner margin swollen. Fifth leg symmetrical; exopod with 3 outer and 2 unequal apical spines; endopod stout conical spine.

Male: Body length 2.44 mm. Prosome cylindrical bearing well-developed dorsal lenses: cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites nearly fused; posterolateral corners of last pedigerous somite pointed. Urosome of 5 free somites; caudal rami symmetrical. Fifth leg uniramous, asymmetrical; right exopod 2-segmented, first segment bearing 2 spines which one is distal and the other lying at base of thumb; second segment with 3 elongate setae curved inward; left exopod 2-segmented, first segment with disto-lateral process; second segment with 4 spine-like apical processes and inner hirsute border.

DISTRIBUTION: China, Japan, Bengal Bay, Andaman Sea, Red Sea, Arabian Sea, Hachijo Island.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 19.viii.2002).

ECOLOGY: This species is an oceanic form in the Indian and Pacific Oceans.

REMARKS: The *detruncata* group proposed by Fleminger (1967) includes *L. bataviae*, *L. caudata*, *L. cervi*, *L. detruncata*, *L. farrani*, *L. jaafari*, *L. madurae*, *L. pavo*, *L. sinilobata*, and *L. tasmanica*. *L. detruncata* is easily distinguished from other species of the group: in the female 1) the dorsal surface of the genital compound somite is uneven and bulbous in shape 2) the genital operculum is located ventrally on the postero-medial border, and 3) anal somite with conspicuous posterior flap medially; in the male 1) the left fifth leg with 4 apical processes, the second outermost process longest, and 2) the first exopodal segment of the right fifth leg with broad conical thumb and the second exopodal segment without projection.

30. *Labidocera euchaeta* Giesbrecht, 1889 (Figs. 55–57)

Sen-teol-geol-soe-ppul-no-beol-re

(센털걸쇠빨노벌레)

Labidocera euchaeta Giesbrecht, 1889, p. 27, descr. f; 1892, p. 446, pl. 23, fig. 31, pl. 41, fig. 7.

Labidocera euchaeta: Giesbrecht and Schmeil, 1898, p. 135; Sewell, 1932, p. 359; Mori, 1937 (1964), p. 93, pl. 42, figs. 11–13; Wilson, 1950, p. 244, pl. 25, fig. 364; Shen and Bai, 1956, p. 189, pl. 5, figs. 32–35; Zhang et al., 1965, p. 115, pl. 52; Chen and Zhang, 1965, p. 98, pl. 40, figs. 6–10; Silas and Pillai, 1973, p. 800, fig. 11; Kim, 1985, p. 119, pl. 39, figs. c–f.

Labidocera euchaeta minor Sewell, 1932, p. 362; Silas, 1972, p. 649.

Female: Body length 2.4 mm. Prosome elongate, without lateral hooks: cephalosome rounded

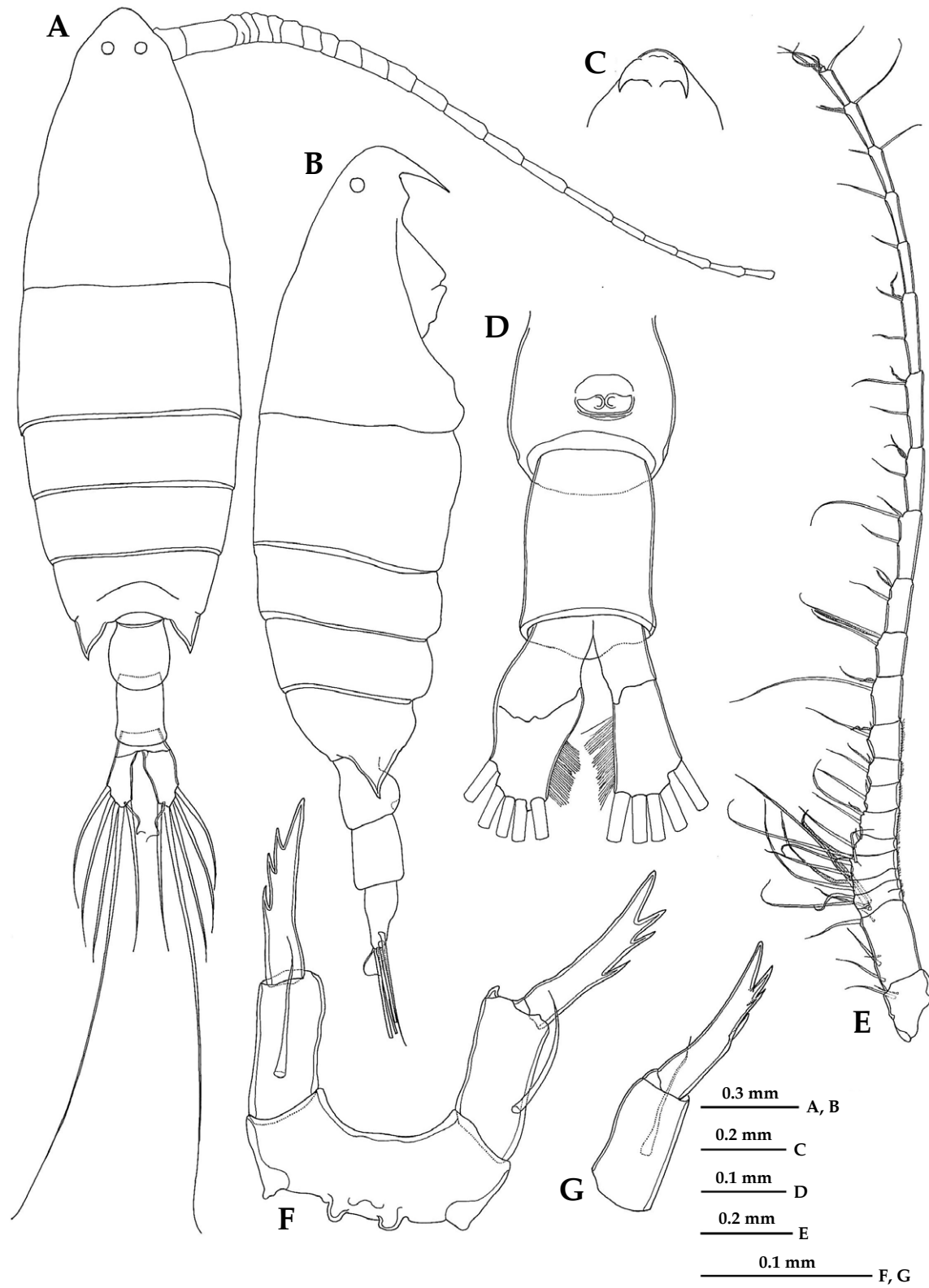


Fig. 55. *Labidocera euchaeta*, female. A. habitus, dorsal view; B. habitus, lateral view; C. rostrum, ventral view; D. urosome, ventral view; E. antennule; F, G. fifth leg.

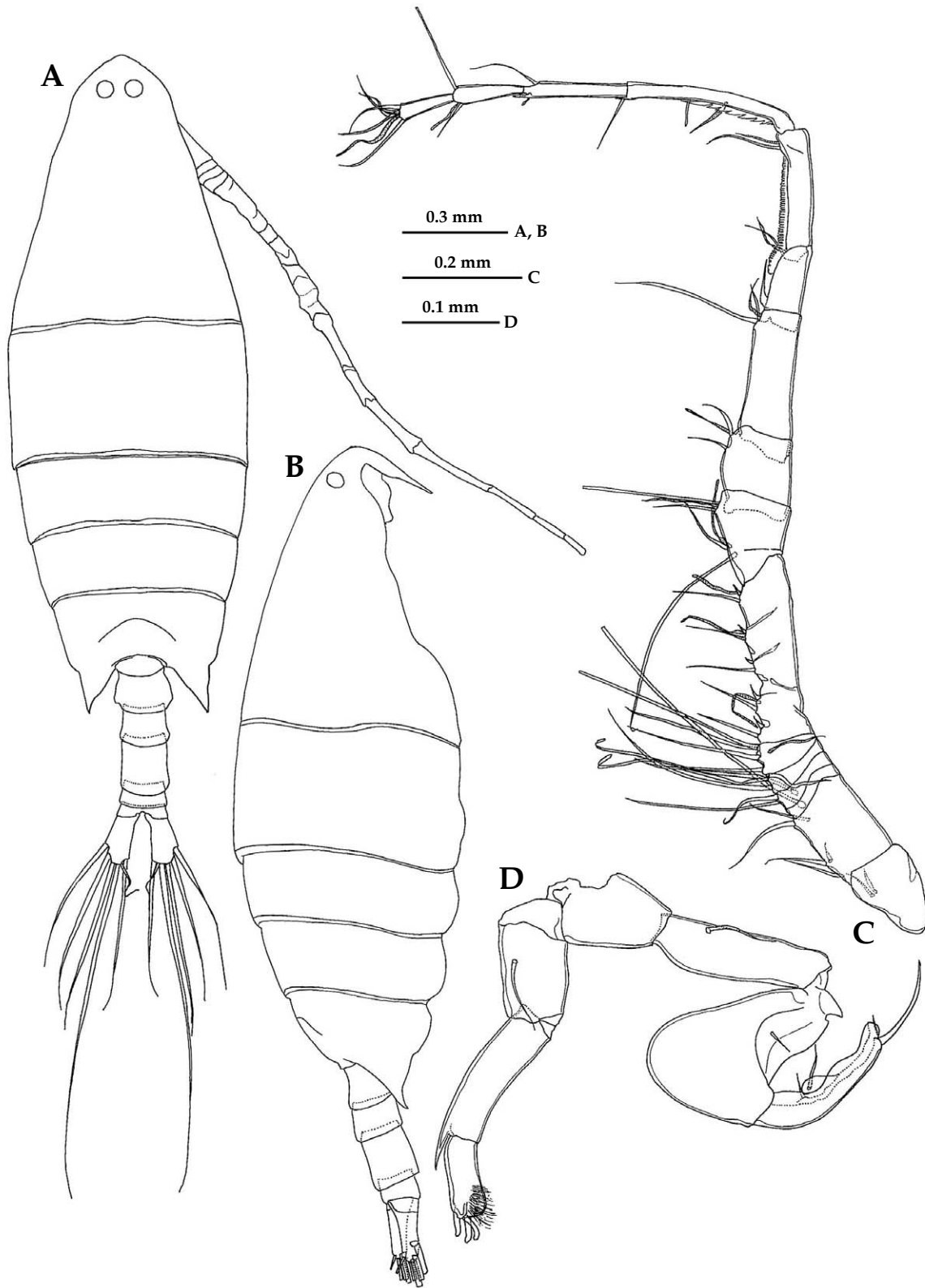


Fig. 56. *Labidocera euchaeta*, male. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. fifth leg.

and dorsal lenses small; cephalosome and first pedigerous somite perfectly separated; fourth and fifth pedigerous somites partly fused; posterolateral angles of last pedigerous somite with triangular process. Urosome of 3 free somites; genital compound somite globular; anal segment shortest; caudal rami asymmetrical, right ramus oval, second caudal seta much longer than others. Fifth leg asymmetrical: exopod with 3 apical spines; endopod rudimentary or absent.

Male: Body length 2.1–2.4 mm. Prosome similar to female: cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites partly fused; posterolateral corners of prosome terminate in acuminate process. Urosome of 5 free somites: third urosomite longest; caudal rami nearly symmetrical. Fifth leg uniramous, asymmetrical: right exopod 2-segmented; first segment broad, having seta medially, together with small triangular thumb-like process; second segment short, bluntly rounded apex with 2 inner setae, apical seta and terminal elongated spine; left exopod 2-segmented; first segment 2 times longer than second segment, with distolateral acute process; distal segment bearing 3 apical processes and inner fringing hairs.

DISTRIBUTION: Formosan Strait, Rangoon river, Japan.

KOREA: GN, JN, JB, CN, GG.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 11.iv.2002).

ECOLOGY: *L. euchaeta* is known as a neritic species and in Korean waters, it is abundant in northern coast, particularly in Kyonggi Bay during cold seasons.

REMARKS: The Korean specimens differ from *Labidocera euchaeta* Giesbrecht, 1889, illustrated by Giesbrecht (1892): (1) the processes of last pedigerous somites larger than in Giesbrecht's description; (2) in the female, the exopod of the fifth legs have unequal apical processes, while in Giesbrecht's description these processes are of equal length.

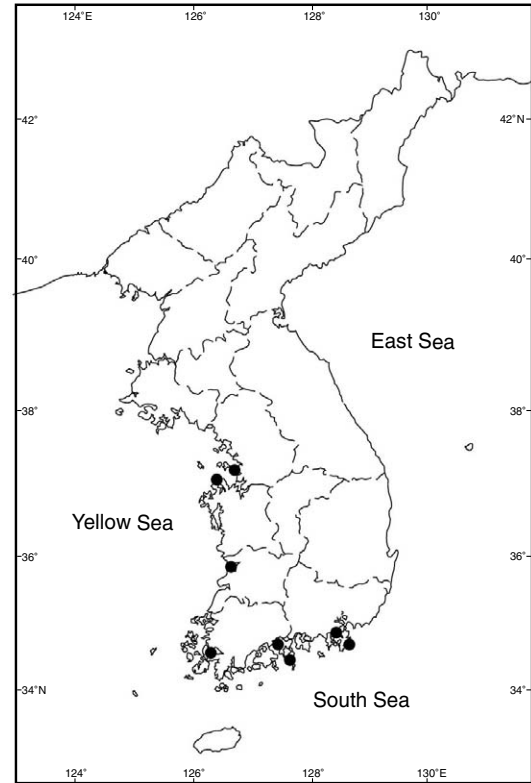


Fig. 57. Distribution of *Labidocera euchaeta*.

31. *Labidocera kröyeri* (Brady, 1883) (Fig. 58)

Keu-ro-i-eo-geol-soe-ppul-no-beol-re (크로이어걸쇠빨노벌레)

Pontella kröyeri Brady, 1883, p. 93, pl. 39, figs. 1–19.

Labidocera kröyeri: Giesbrecht, 1892, p. 446, pl. 23, figs. 13, 38, pl. 25, fig. 30, pl. 41, figs. 6, 11, 39; Giesbrecht and Schmeil, 1898, p. 135; von Breemen, 1906, p. 151; 1908, p. 151; Scott A., 1909, p. 165; Mori, 1937 (1964), p. 93, pl. 42, figs. 7–10; Wilson, 1950, p. 246; Silas and Pillai, 1973, p. 809; Greenwood 1979, p. 99, figs. 3, a–j; Fleminger and coll. 1982; Bradford-Grieve, 1999, p. 194, fig.

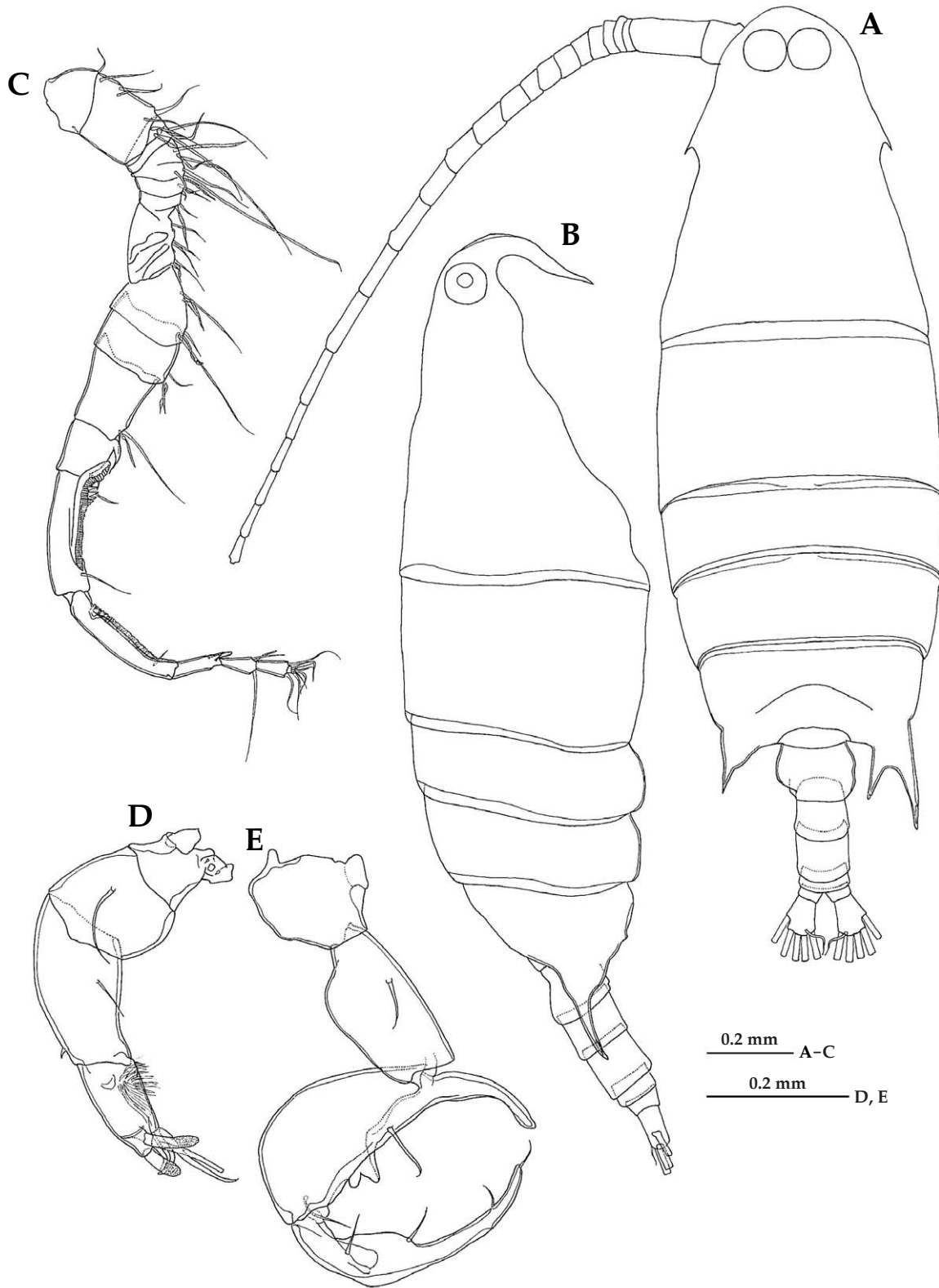


Fig. 58. *Labidocera kröyeri*, male. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D, E. fifth leg.

141; Mulyadi, 2002, p. 65, fig. 20.

Male: Body length 2.1–2.16 mm. Prosome slender: cephalosome with lateral hooks and dorsal lenses which are large and in contact with each other; cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites partly fused; posterolateral corners of prosome asymmetrical, left side with acute process and right side bifurcate outer of which longest, reaching distal of second free urosomite.. Urosome of 5 free somites: genital segment asymmetrical, left side expanded; caudal rami symmetrical. Fifth leg uniramous, asymmetrical; right exopod 2-segmented, first segment comprising palm with medial bilobed process medially, 2 setae and slender thumb, second segment elongate, finger-like with 3 inner setae and 1 distal seta; left exopod 2-segmented, first segment with disto-lateral spine and small inner seta, second segment with 2 tuberculate finger-like papillae, 1 claw-like process, 2 unequal spines and inner fringing hairs.

No female was found in Korean waters.

DISTRIBUTION: Widely distributed in the tropical and subtropical Indo-West Pacific region, the East China Sea, Indonesia, Izu region, East China Sea, Arafurca Sea, Moreton Bay, and Philippine Island.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 26.ix.2002).

ECOLOGY: This epipelagic species has been taken in the Indo-west Pacific including Moreton Bay, Australia (Greenwood, 1979).

REMARKS: *Labidocera kröyeri* is closely related to *L. rotunda*, but it is distinguished by the following characteristics: (1) the gap between the two posteriorly directed processes of the right fifth pedigerous somite narrower; (2) distal segment of male left fifth leg with a distal process. Also, *L. kröyeri* has many apparent variants (Brady, 1883). Krishnaswamy (1953) reported four types of *L. kröyeri* female. However, in Korean waters only one specimen of the male was found, so we are unable to comment on variation.

32. *Labidocera minuta* (Giesbrecht, 1889) (Fig. 59)

Jak-eun-geol-soe-ppul-no-beol-re (작은걸쇠빨노벌레)

Labidocera minutum Giesbrecht, 1889, p. 27; 1892, p. 446, pl. 23, figs. 16, 35, 36, pl. 25, fig. 32, pl. 41, figs. 8, 15, 16, 35.

Labidocera minuta: Giesbrecht and Schmeil, 1898: 137; Scott A., 1909, p. 167; Wilson, 1950, p. 247, pl. 24, figs. 356–359; Tanaka, 1964, p. 257, figs. 233, a–f; Chen and Zhang, 1965, p. 99, pl. 41, figs. 11–16; Silas and Pillai, 1973, p. 800, fig. 12; Greenwood, 1979, p. 101, pls. 5, a–g; Bradford-Grieve, 1999, p. 195, fig. 143; Othman and Toda, 2006, p. 310, figs. 10, 11.

Female: Body length 1.77–1.92 mm. Prosome elongated: cephalosome rounded with lateral hooks and small dorsal lenses; cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites partly fused; posterolateral corners of prosome rounded in dorsal view, but with ventrally directed short spine.. Urosome of 3 free somites: genital compound

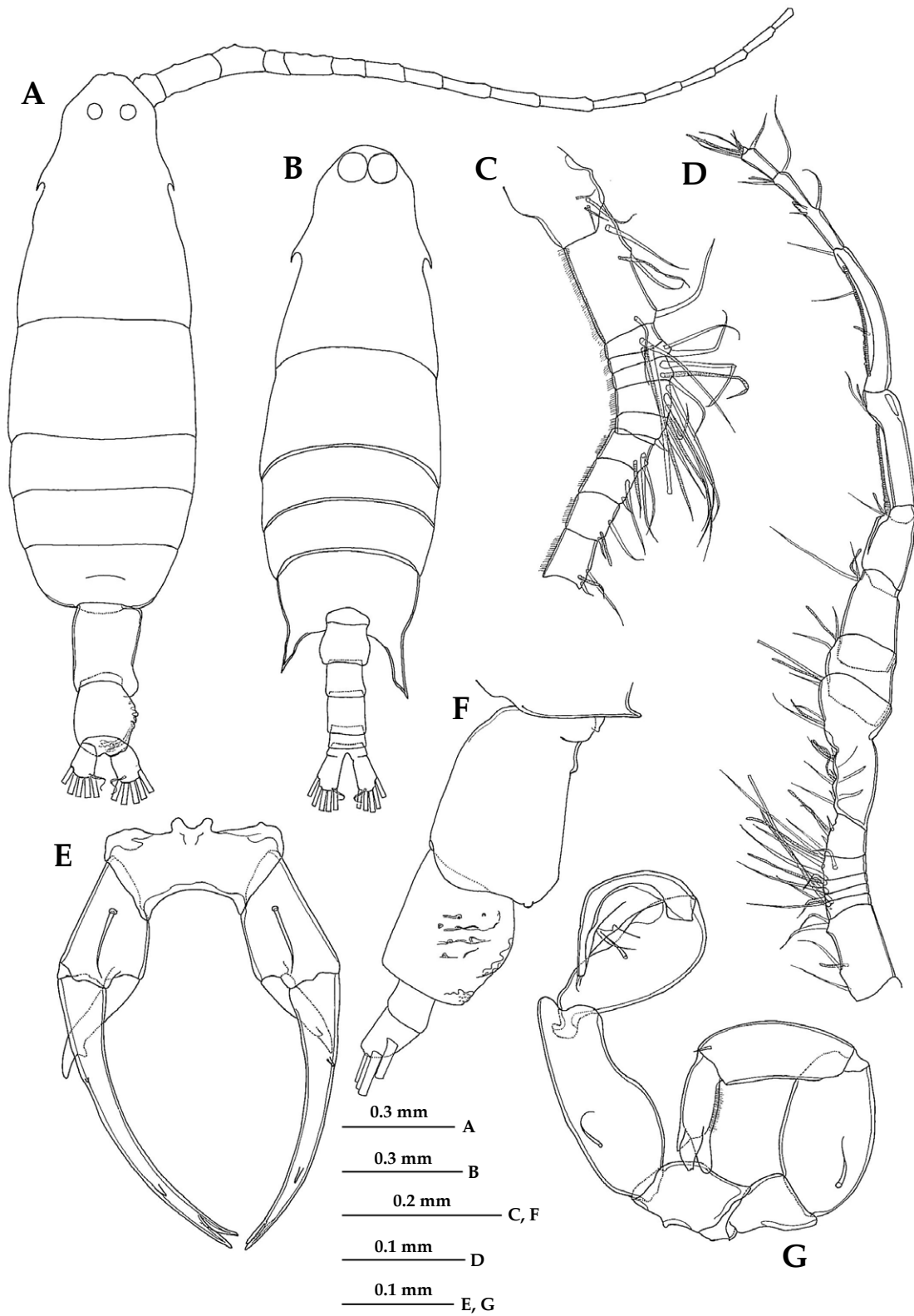


Fig. 59. *Labidocera minuta*. Female: A. habitus, dorsal view; C. antennule; E. fifth leg; F. urosome, lateral view. Male: B. habitus, dorsal view; D. antennule; G. fifth leg.

somite asymmetrical, right side with anterior and posterior projections; genital operculum located posteriorly without any process; right ventral surface of second urosomite bearing chitinous tubercles; caudal rami asymmetrical, right ramus slightly larger than left. Fifth leg slightly asymmetrical: exopod with 2 outer spinules and 2 apical spines; endopod bifurcate.

Male: Body length 1.63–1.71 mm. Prosome as in female except for large dorsal lenses placed close together. Cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites fully fused; posterolateral corners of prosome asymmetrical, left side with sharp process, right side longer ending in a blade-like process. Urosome of 5 free somites: genital segment broader than long; caudal rami symmetrical. Fifth leg uniramous, asymmetrical: right exopod 2-segmented, first segment comprising palm with bilobed process and 2 setae, second segment elongate, finger-like, with 1 transparent flap, 3 setae along inner margin and 2 apical setae; left exopod 2-segmented, first segment with small distolateral spine, second segment with 2 stout processes, 2 triangular processes and inner margin fringed with hairs.

DISTRIBUTION: Widely distributed in the tropical and subtropical Indo-West Pacific, East China Sea, Indonesian waters, Australia, Red Sea, Maldives, and Japan.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 26.ix.2002).

ECOLOGY: This epipelagic species has been taken in the Indo-west Pacific, including Moreton Bay, Australia (Greenwood, 1979).

REMARKS: *Labidocera minuta* is closely related to *L. bengalensis*, but can be distinguished by the following characteristics: in the female 1) genital double somite ca. 1.5 times longer than the second urosomite while 2.5 times longer in *L. bengalensis*, 2) the second urosomite with prominent chitinous tubercles and the latter no tubercles, 3) caudal rami asymmetrical while the latter symmetrical, and 4) fifth leg with bifurcate endopod and the latter with conical endopod; in the male 1) right posterior process of prosome extending to the second urosomite, and 2) left fifth leg with 2 pairs of stout processes in distal exopodal segment.

33. *Labidocera pavo* Giesbrecht, 1889 (Figs. 60, 61)

Gong-jak-geol-soe-ppul-no-beol-re (공작걸쇠빨노벌레)

Labidocera pavo Giesbrecht, 1889, p. 27 (cited from Giesbrecht, 1892); Giesbrecht, 1892, pp. 446, 460, 773, pl. 25, fig. 34, pl. 41, figs. 18, 38; Mori, 1932, p. 171, fig. m; Sewell, 1932, p. 365, figs. m, f; Tanaka, 1964, p. 225, rem. f, m; Brodsky, 1950 (1967), p. 409, figs. f, m; Silas and Pillai, 1973 (1976), p. 804, rem. f, m; Greenwood and Othman, 1979, p. 237, rem. f, m; Chihara and Murano, 1997, p. 868, pls. 148, 150, f, m; Ferrari and Ueda, 2005, p. 341, figs. Juv, f, m; Vives and Shmeleva, 2007, p. 509, figs. f, rem.

Female: Body length 1.92–2.52 mm. Prosome markedly long. Cephalosome without lateral hooks and pair of large lenses. Last pedigerous somite divergent distally, terminating in small acute processes. Urosome of 2 free somites: genital compound somite expanded in right side. Caudal rami very wide and free somites: setae short, curved, markedly widened at their bases. Fifth leg nearly symmetrical, with 1-segmented endopod and exopod; exopodal segment with 3

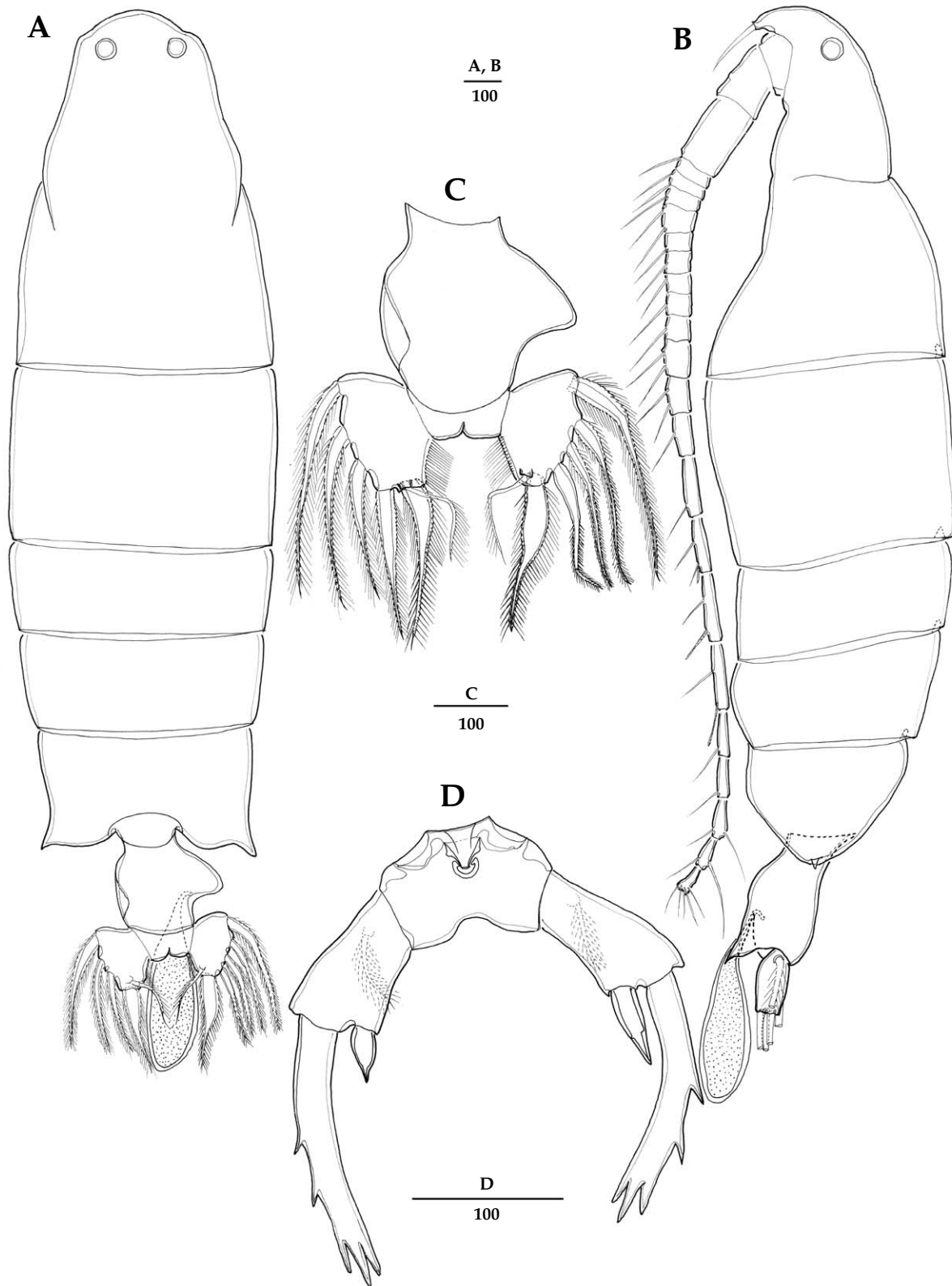


Fig. 60. *Labidocera pavo*, female. A. habitus, dorsal view; B. habitus, lateral view; C. urosome, dosal view; D. fifth leg.

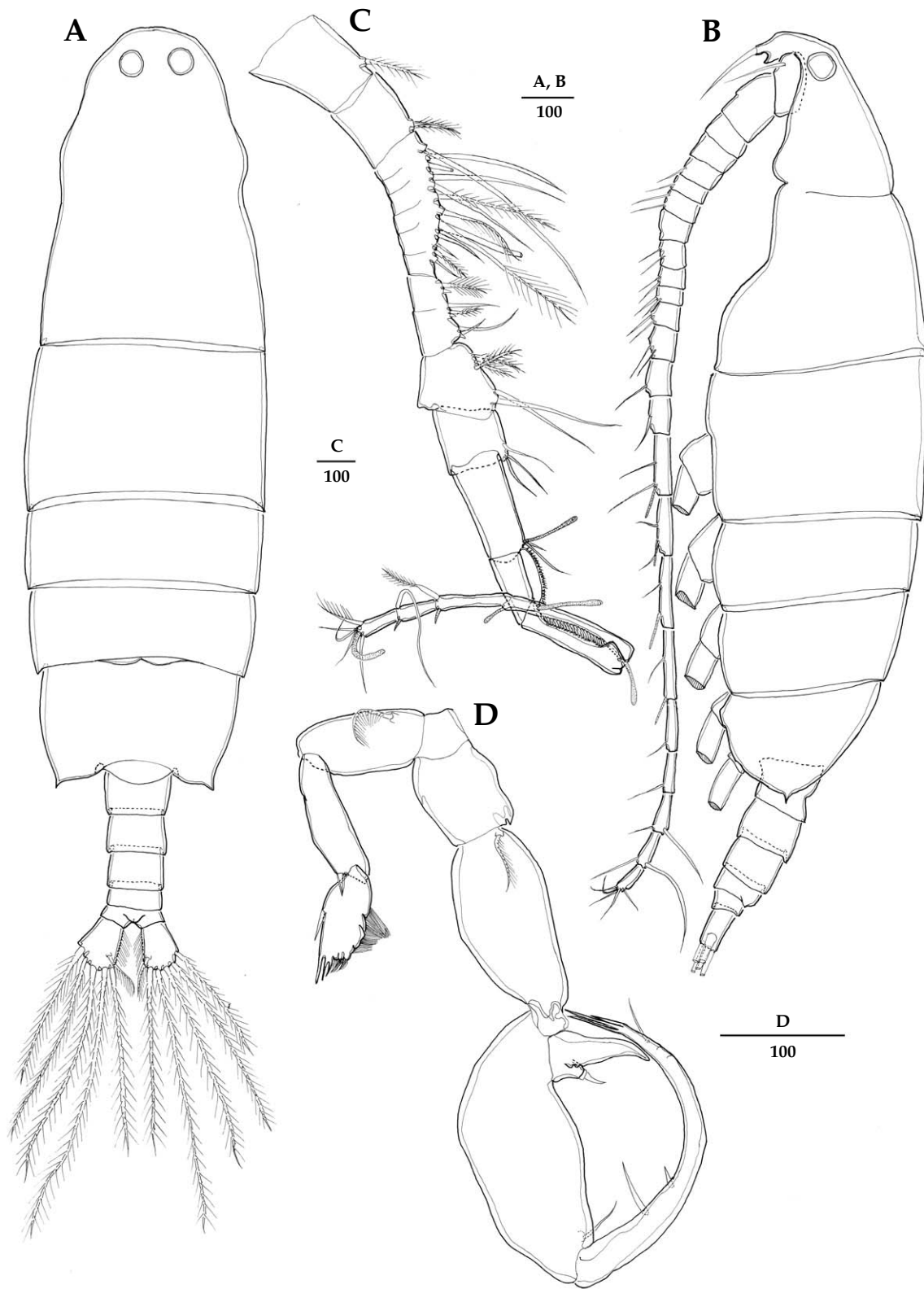


Fig. 61. *Labidocera pavo*, male. A. habitus, dorsal view; B. habitus, lateral view; C. right antennule; D. fifth leg.

terminal processes and two short outer processes.

Male: Body length 1.70–2.06 mm. Body generally as in female, but somewhat more slender. Urosome symmetrical, without any processes. Caudal rami short and distally widened; bristles almost not curved of widened distally. Dorsal lenses present. Fifth leg asymmetrical: right leg with large “chela” composed of two exopodal segments; first segment with large proximal bifid process and distal seta on inner margin, distal segment with 2 inner setae, 3 thin terminal processes, and 1 subterminal outer seta; distal segment of left leg with 3 terminal processes, 1 terminal spine, and 1 outer lateral spine (Kim, 1985).

DISTRIBUTION: East China Sea and Red Seas, near the coast of Ceylon, Sea of Arabia, the Indian coast, Chilka Lake, East Sea (Sea of Japan), Poseta Bay of East Sea.

KOREA: GN, JN, CN.

SPECIMEN EXAMINED: (Doam bay, Jeollanam-do: 30.viii.2007).

ECOLOGY: *Labidocera pavo* occurs rarely in bays or coastal waters of Korea during the summer.

REMARKS: *Labidocera pavo* is easily distinguished from other species by the following characteristics: cephalosome without median crest and lateral hooks; urosome of 2 free somites in female; genital compound somite expanded mediolaterally on right side; distal segment of male right fifth leg pointed, with medial process; first endopodal segment of male left fifth leg relatively long.

34. *Labidocera rotunda* Mori, 1929 (Figs. 62–64)

Du-ga-si-geol-soe-ppul-no-beol-re (두가시걸쇠뿔노벌레)

Labidocera rotunda Mori, 1929, pp. 177, 209, pl. 10, figs. 1–8; Fleminger et al., 1982, p. 264, figs. 4m, n, 5f, 6k–l, 7f–g, 8f; Othman and Toda, 2006, p. 314, figs. 16, 17.

Labidocera bipinnata Tanaka, 1936, p. 31, pl. 2, figs. 1–10, pl. 3, figs. 1–7; Tanaka, 1937 (1964), p. 250; Mori, 1964, p. 94, pl. 43, figs. 1–8; Brodsky, 1948, p. 66, pl. 20, figs. 1–5; Brodsky, 1950, p. 410, fig. 291; Shen and Bai, 1956, 191–2, pl. 5, figs. 36–41; Shen and Lee, 1963, p. 581; Chen and Zhang, 1965, p. 97, pl. 39, figs. 10–13, pl. 40, figs. 1–5; Silas and Pillai, 1973, p. 814.

Female: Body length 1.16–1.86 mm. Prosoma posterior corners produced into fairly long sharp processes, directed posterolaterally. Rostrum composed of two plates terminating in sharp points. Urosome of 3 free somites: genital compound segment asymmetrical, with wide process on right side and two spines on ventral surface; second urosomite bearing curved acute process on right side; anal segment very short; caudal rami asymmetrical, irregular in form, left one almost twice as large as right. Fifth legs slightly asymmetrical: right exopod with small intercalary denticle between distal pair of spiniform processes, inner margin with two to four unequal denticles; left exopod with 2 spine-like projections distally; left and right endopods with about eight denticles, each.

Male: Body length 1.26–1.76 mm. Prosoma smaller and more slender than female: last pedigerous somite asymmetrical, right side bifurcate with additional denticle between inner and outer processes. Lenses much larger than those of female. Urosome of 5 free somites; caudal rami symmetrical. Fifth legs uniramous, asymmetrical: first segment of left leg with one triangular process in outer distal corner; right leg with one process between thumb and finger, with 2 setae at

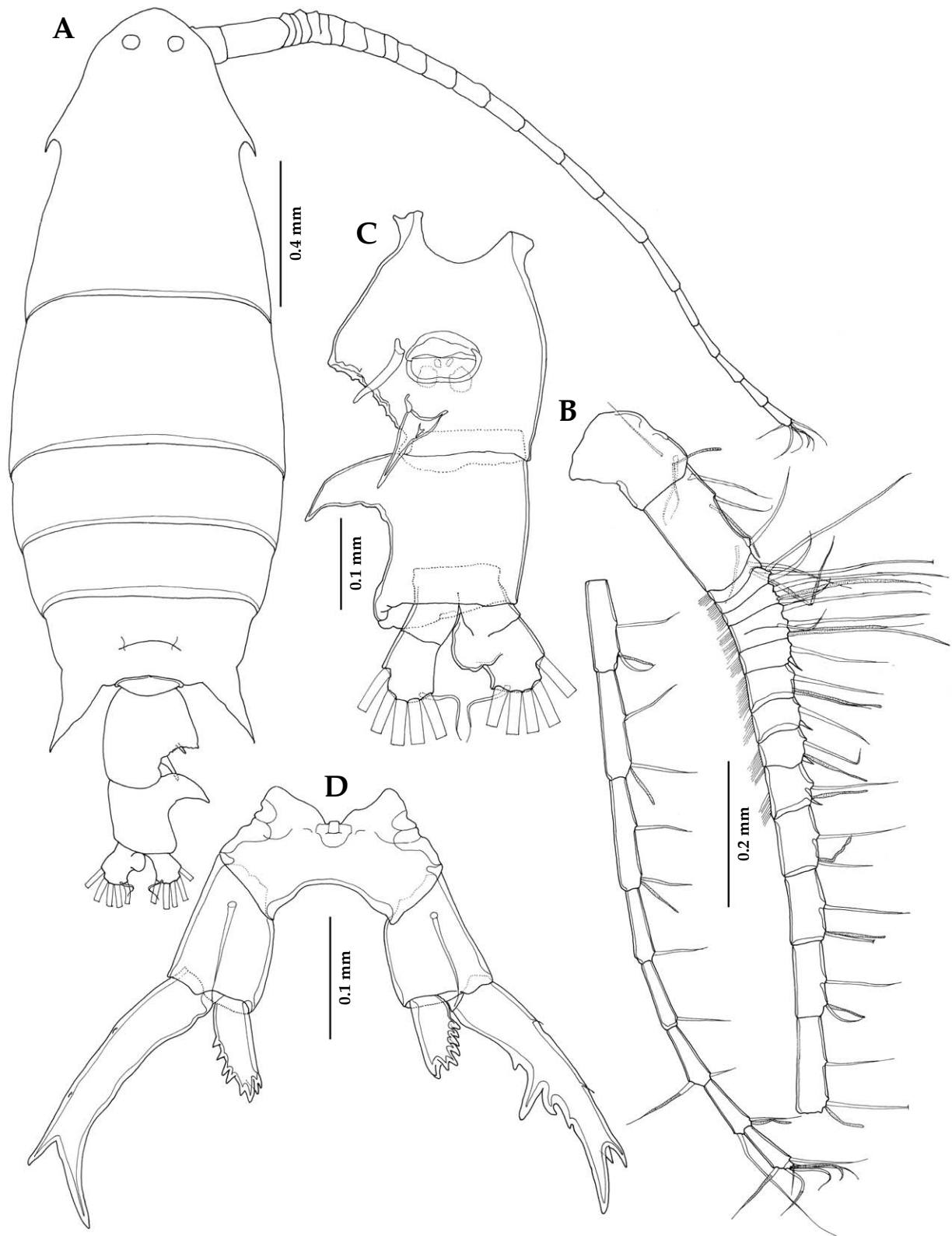


Fig. 62. *Labidocera rotunda*, female. A. habitus, dorsal view; B. antennule; C. urosome, ventral view; D. fifth leg.

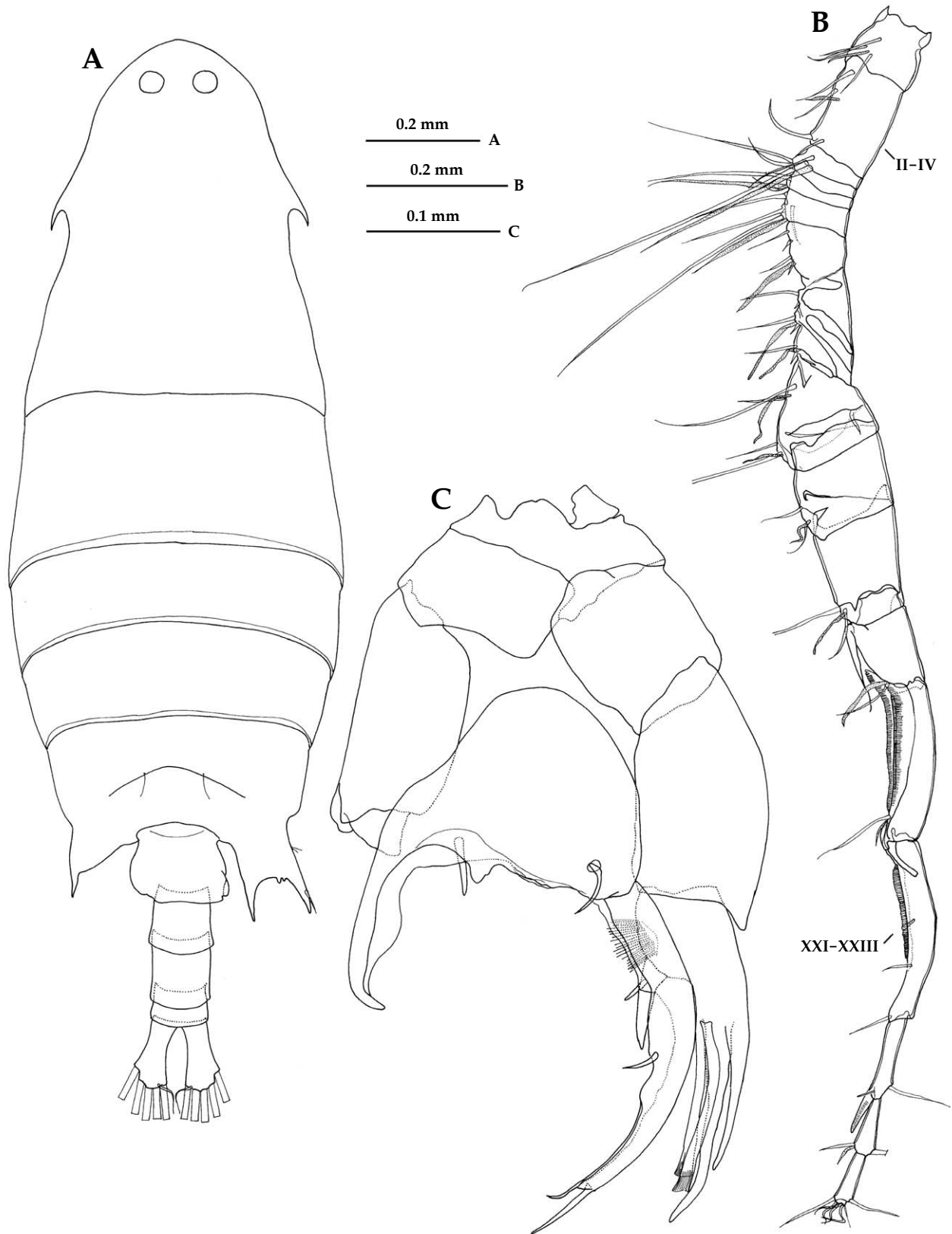


Fig. 63. *Labidocera rotunda*, male. A. habitus, dorsal view; B. right antennule; C. fifth leg.

base; finger of chela evenly curved outwardly and terminating into 2 unequal spines, furnished with 2 spines on concave surface.

DISTRIBUTION: Okhotsk Sea, China, Izu region of Japan.

KOREA: GB, GN, JN, JB, CN, GG.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 25.vii. 2002).

ECOLOGY: *Labidocera rotunda* has relatively widespread geographical distribution in inshore surface waters off eastern Asia. It mainly occurs in the coastal waters of Korea in summer.

REMARKS: *L. rotunda* was described from Pusan, Korea by Mori (1929). Tanaka (1936) described *L. bipinnata* from Sagami Bay, Japan but subsequently, Fleminger et al. (1982) pointed out *L. bipinnata* is a junior synonym of *L. rotunda*.

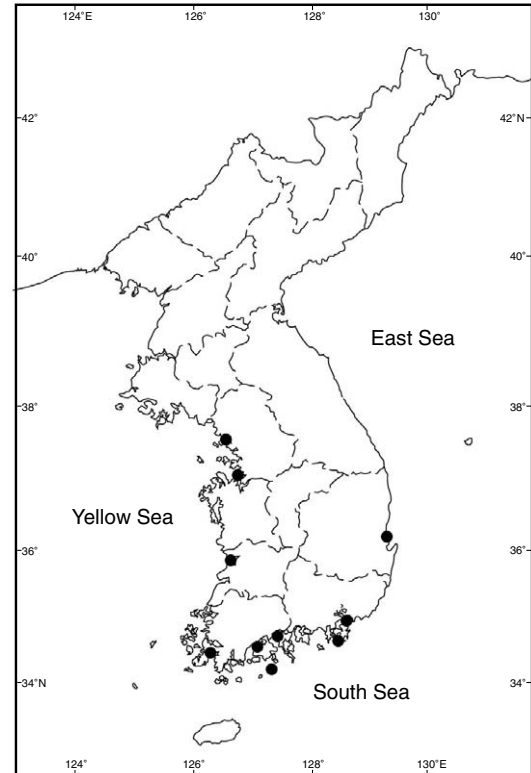


Fig. 64. Distribution of *Labidocera rotunda*.

Genus *Pontella* Dana, 1846

Bo-teu-no-beol-re-sok (보트노벌레속)

As for the family with following additional characters. Prosome robust with lateral hooks but usually without crest: cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites separate, usually produced into pointed processes, often asymmetrical and differing between the sexes. Cephalosome bluntly triangular; with pair of dorsal cuticular lenses and usually with rostral lens (larger in male) anterior to ventral eyes. Urosome of 2 or 3 free somites in female and of 4 or 5 free somites in male; caudal rami mostly asymmetrical in female. Antennule 25-segmented. Mandible with 7 pointed teeth on blade. Maxillule and maxilla as in *Labidocera*. Maxilliped with 7 segments. Exopods of legs 1–4, 3-segmented; endopod of leg 1 3-segmented, of legs 2–4, 2-segmented. Female fifth leg biramous as in *Labidocera*; male leg 5 uniramous, similar to that of *Labidocera*.

SPECIES 47 (8 in Korea).

DISTRIBUTION: principally Indo-Pacific species.

Key to the species of genus *Pontella*

1. Urosome of 1 to 3 free somites 2 (Female)
 – Urosome of 5 free somites 7 (Male)
2. Postrolateral corners of the last pedigerous somite bifurcate *P. chierchiaie*
 – Postrolateral corners of the last pedigerous somite with acutely pointed lobes 3
3. Urosome of 3 free somites 4
 – Urosome of 2 free somites 5
4. Genital compound somite with processes on right and left *P. spinicauda*
 – Genital compound somite with large process on right side only *P. sinica*
5. Caudal rami almost symmetrical *P. fera*
 – Caudal rami very asymmetrical 6
6. Genital compound somite without any process *P. latifurca*
 – Genital compound somite with process *P. securifer*
7. Postrolateral corners of the last pedigerous somite rounded 8
 – Postrolateral corners of the last pedigerous somite with acutely pointed lobes 9
8. Distal segment of right fifth leg bifurcated terminally *P. fera*
 – Distal segment of right fifth leg elongated, dilated distally *P. chierchiaie*
9. Distal segment of right fifth leg with process *P. sinica*
 – Distal segment of right fifth leg without process 10
10. Distal exopodal segment of right fifth leg with anterior swelling *P. securifer*
 – Distal exopodal segment of right fifth leg without swelling 11
11. First exopodal segment of right fifth leg with three processes *P. spinicauda*
 – First exopodal segment of right fifth leg with two processes *P. latifurca*

35. *Pontella securifer* Brady, 1883 (Figs. 65-67)

Do-kki-bae-bo-teu-no-beol-re (도끼배보트노벌레)

Pontella securifer Brady, 1883, p. 96, pl. 45, figs. 1-9; Giesbrecht, 1892, p. 461, pl. 24, figs. 9, 37, 41, 43, pl. 40, figs. 6, 14, 21, 32, 34; Scott A., 1909, p. 160; Sewell, 1932, p. 384; Farran, 1936, p. 117; Wilson, 1950, p. 297, pl. 17, figs. 207-214, pl. 28, figs. 421-425; Tanaka, 1964, p. 259, figs. 234, a-f; Knudsen and Wolff, 1965, p. 186; Chen and Zhang, 1965, p. 102, pl. 44, figs. 1-9; Silas and Pillai, 1973, p. 822, figs. 21, 22; Zheng et al., 1982, p. 75, pl. 44-1, figs. a-g, pl. 44-2, figs. h-o; Bradford-Grieve, 1999, p. 200, fig. 148; Jeong et al., 2008a, p. 92, figs. 2-5.

Pontellina (Ivellina) securifer: Claus, 1893, p. 274, pl. 5, fig. 6 (cited by Silas and Pillai, 1973).

Pontella spinipes: Wolfenden, 1905, p. 1020.

Pontella meadi: Chiba, 1956, p. 52 (cited by Razoul, 2005-2008).

Type I female: Body length 3.73-4.07 mm. Prosoma robust with lateral hooks and forehead obtusely triangular. Rostrum bifurcated, thickened basally with lenses well developed. Cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites separate; posterolateral corners of the last pedigerous somite sharply pointed, left longer than right, both inner margins swollen. Urosome of 2 free somites: genital compound somite bearing 1 sharp spine

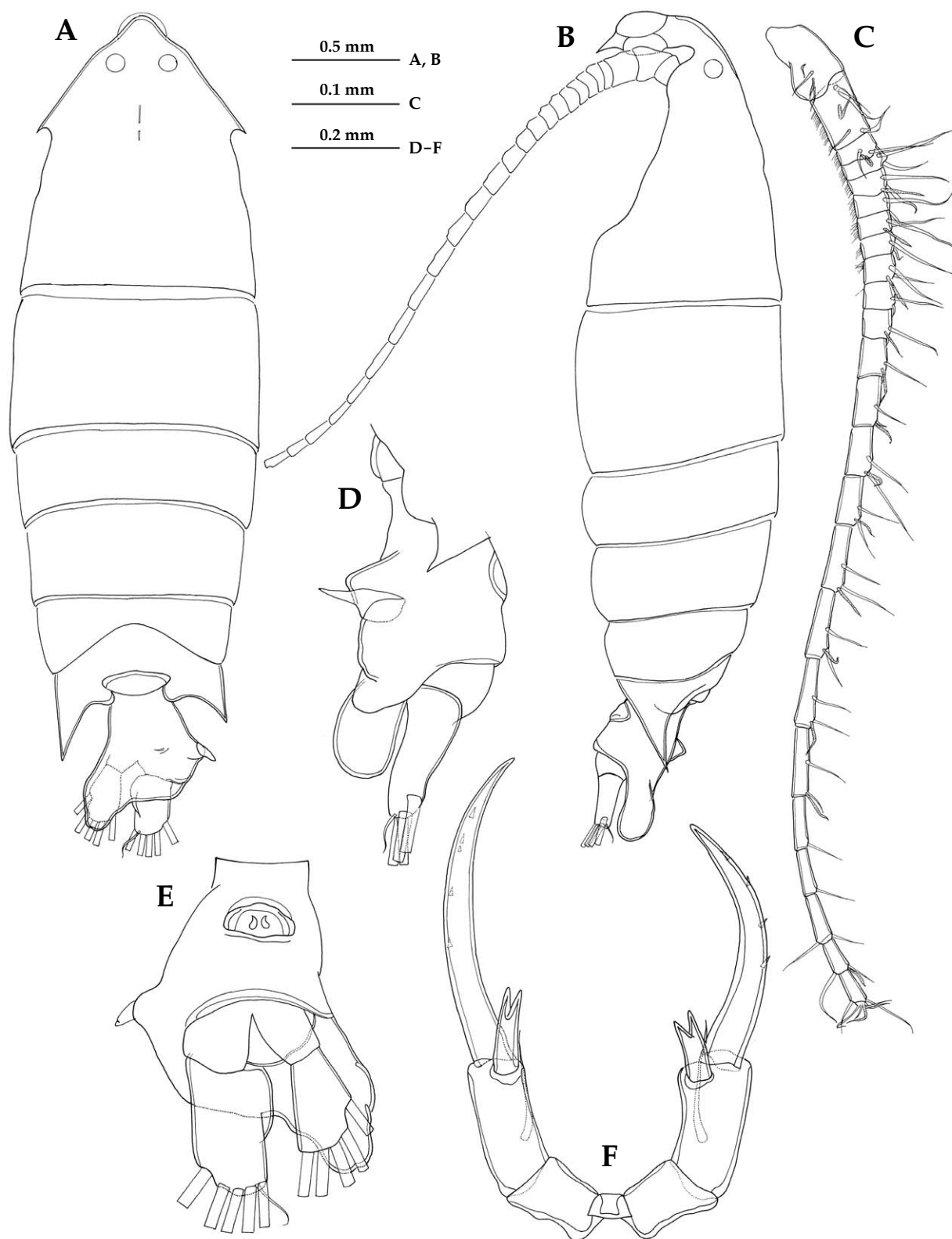


Fig. 65. *Pontella securifer*, female type I. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. urosome, lateral view; E. urosome, ventral view; F. fifth leg.

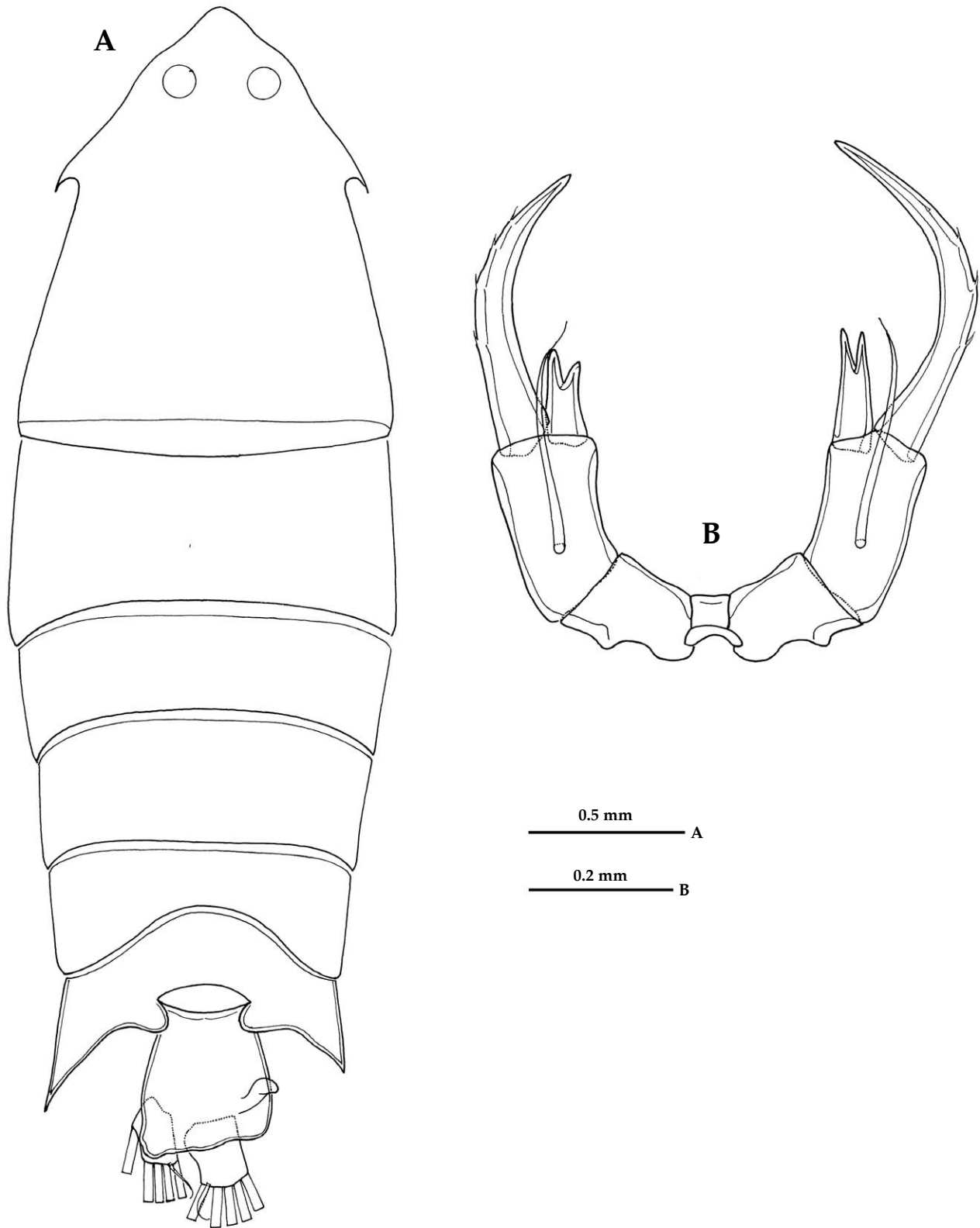


Fig. 66. *Pontella securifer*, female type II. A. habitus, dorsal view; B. fifth leg.

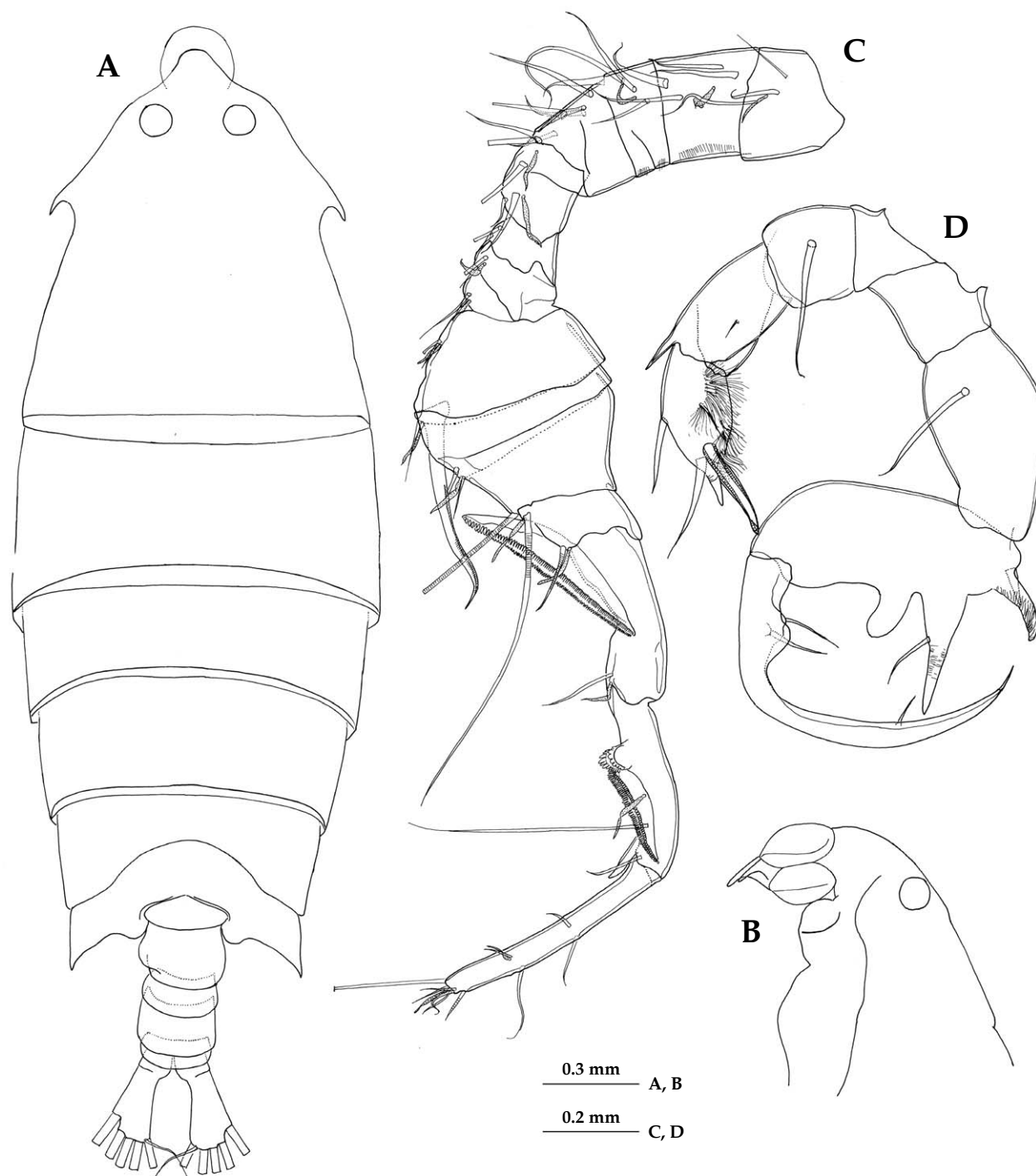


Fig. 67. *Pontella securifer*, male. A. habitus, dorsal view; B. head, lateral view; C. right antannule; D. fifth leg.

on right mediolaterally, asymmetrical and much larger than anal somite; left posterolateral process extends over left caudal ramus; caudal rami asymmetrical, right ramus wider and longer than left

one. Fifth legs biramous and asymmetrical: intercoxal sclerite and coxa divided; left leg longer than right; exopod claw-like with 4 small outer spines; endopod bifid at tip.

Type II female: Body length 3.61–3.67 mm. Rostral lens less developed than in Type I. Genital compound somite with left posterolateral process extending over half left caudal ramus and 1 bluntly process on medial right side. Fifth leg slightly asymmetrical, left leg longer than right. Other morphological characteristics of body shape and appendages very similar to type I female.

Male: Body length 3.2–3.51 mm. Prosome robust: rostrum anterior and posterior sides with 2 well-developed lenses; posterolateral corners of last pedigerous somite slightly asymmetrical, with acute triangular process. Urosome of 5 free somites: genital somite swollen on left side; caudal rami elongate and symmetrical. Fifth legs uniramous, asymmetrical and bearing single plumose seta on basis: right leg forming chela; palm of chela with a short spine proximally, 1 curved thumb-like process, 1 conical process with transversely acute spine and 1 papilla-shaped process more distally; finger of chela elongate and bent with 4 spines along inner surface; left first segment with 1 outer process at distal end and 1 medial seta; second segment bulb-shaped with 2 spines and hirsute medially; apex with 2 spines one of which has bordering membrane, and 1 short process.

DISTRIBUTION: China, Izu region, Africa, Mexico Bay.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 26.ix.2002).

ECOLOGY: *Pontella securifer* has been recorded in warm surface waters from the Atlantic, Pacific and Indian Oceans between 35° N and 50° S. It is known as an euneustonic species (Sherman, 1963; Matsuo and Marumo, 1982). In Korean waters, this species is a very rare.

REMARKS: Zheng et al. (1982) divided females from the East China Sea into 2 types by characteristic features in their habitus, genital compound somite and fifth legs: Type I: (1) the last pedigerous somite with almost symmetrical corners; (2) the genital compound somite with an acute process on the right mediolateral border and a large rounded process on the left posterodistal border; (3) the fifth legs are asymmetrical. Type II: (1) the last pedigerous somite with asymmetrical corners; (2) the genital compound somite has a small process on the right mediolateral border and left posterodistal border; (3) fifth legs almost symmetrical. Females occurring in the South Sea of Korea also have two types as in Zheng et al. (1982).

36. *Pontella chierchiae* Giesbrecht, 1889 (Figs. 68, 69)

Du-gal-rae-bo-teu-no-beol-re (두갈래보트노벌레)

Pontella chierchiae Giesbrecht, 1889, p. 28 (cited from Giesbrecht, 1892); 1892, p. 462, pl. 24, figs. 12, 27, 38, pl. 40, figs. 19, 22, 26, 35; Giesbrecht and Schmeil, 1898, p. 143; Wilson, 1950, p. 291, pl. 28, figs. 408, 409; Tanaka, 1964, p. 262, fig. 236a-j; Chen and Zhang, 1965, p. 103, pl. 44, figs. 10–15; Zheng et al., 1965, p. 129, fig. 60a–g; Kim, 1985, p. 126, pl. 42, figs. a–d; Ferrari and Ueda, 2005, p. 341, fig. 7; Jeong et al., 2008b, p. 212, figs. 6, 7.

Pontella bifurcata Tanaka, 1936, p. 33, pl. 6, figs. 2–12 (cited from Tanaka, 1964).

Pontella forcipata Tanaka, 1936, p. 34, pl. 5, figs. 3–9, pl. 6, fig. 1 (cited from Tanaka, 1964).

Female: Body length 3.19–3.58 mm. Prosome stout: rostrum without lens; posterolateral corners

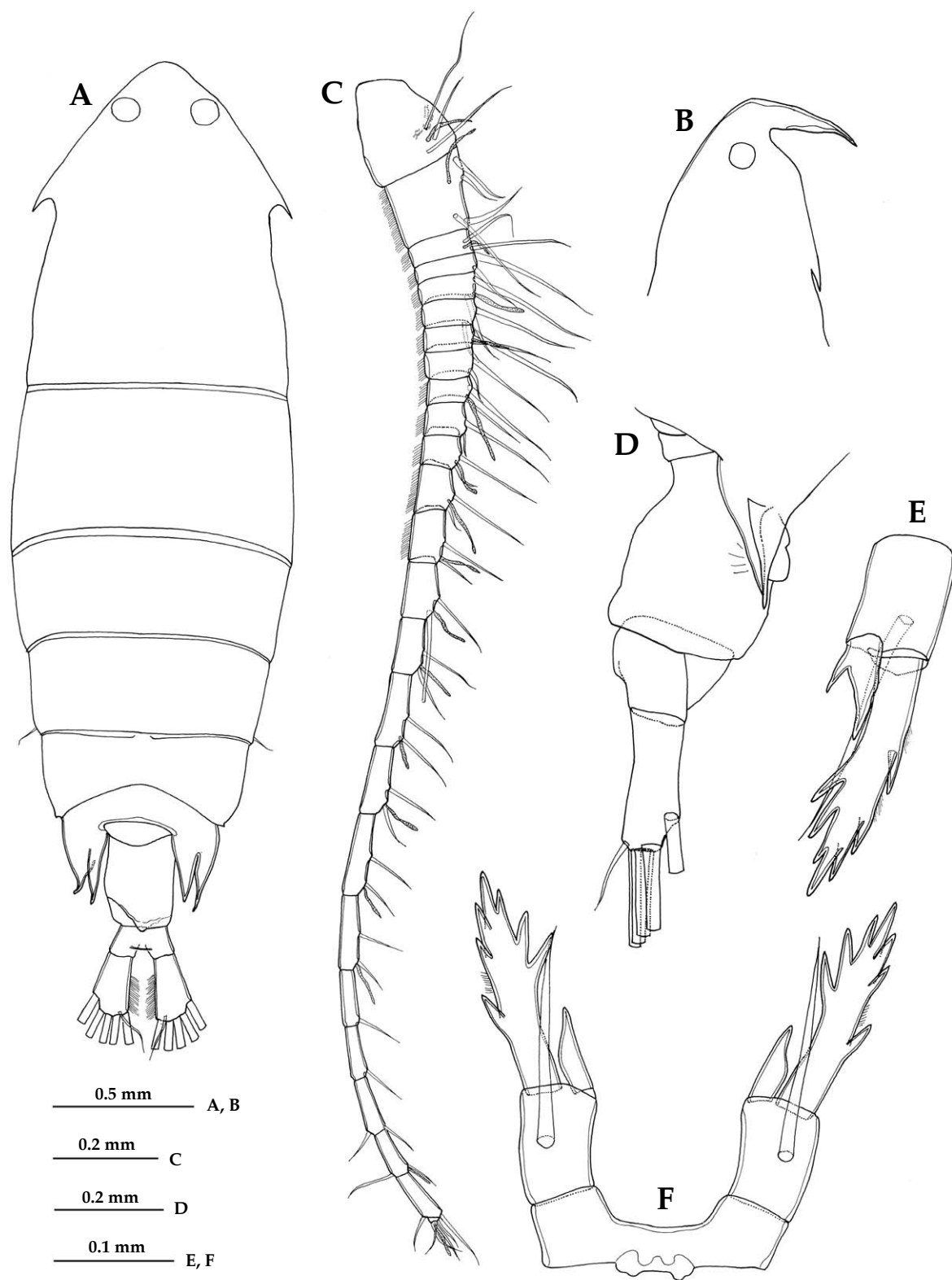


Fig. 68. *Pontella chierchiaie*, female. A. habitus, dorsal view; B. head, lateral view; C. antennule; D. urosome, lateral view; E, F. fifth leg.

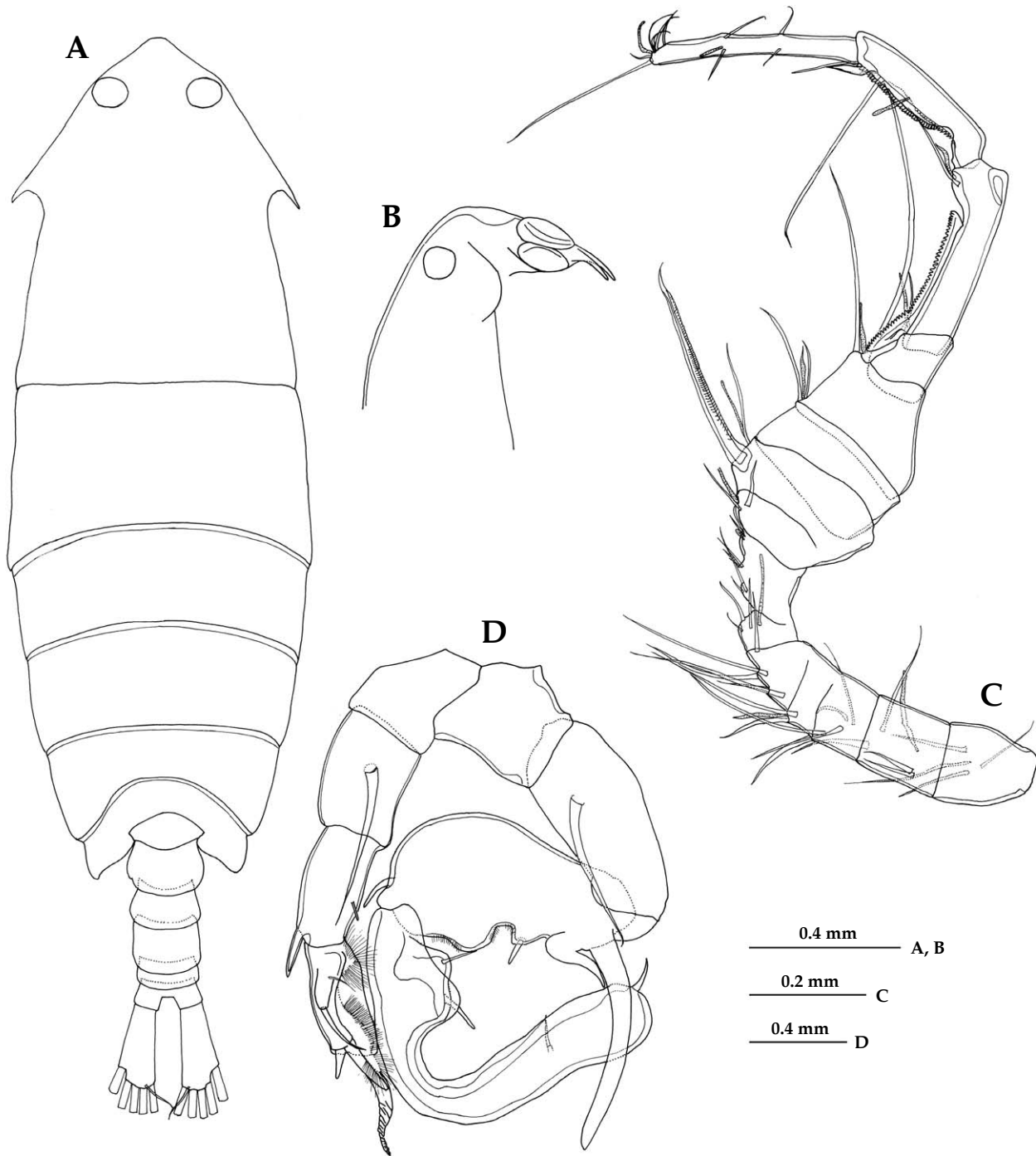


Fig. 69. *Pontella chierchiaie*, male. A. habitus, dorsal view; B. head, lateral view; C. right antennule; D. fifth leg.

of last pedigerous somite bifurcated, asymmetrical. Urosome of 2 free somites: distal margin of genital compound somite with 1 dorsal process; caudal rami slightly asymmetrical, right ramus

longer than left. Fifth leg symmetrical: intercoxal sclerite and coxa completely fused; exopod with 3 processes along each of outer and inner margins, and one apical process; endopod short, tapering to distal point.

Male: Body length 2.59–3.11 mm. Rostrum with 2 well-developed lenses; posterolateral angles of prosome bluntly rounded. Urosome of 5 free somites: genital somite swollen on left side; caudal rami elongate, symmetrical. Right fifth leg first exopod segment bearing elongate thumb-like process, 3 processes along inner margin and 1 outer spine; second segment elongated and dilated distally with 3 setae along concave surface and one terminal small spine; left first exopod segment with 1 outer distal process and 1 medial seta; second exopod segment with hirsute patch on inner margin, 2 medial spines, and with 3 terminal round-tipped spines and 1 long process with spiral markings.

DISTRIBUTION: Korea, China, Japan.

KOREA: JN, JJ.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 17.vi.2002).

ECOLOGY: *Pontella chierchiae*, an Indo-West Pacific species, has been reported as a rare species by Kim (1985) in the Korean waters but it is predominant in the South Sea of Korea between June and October, 2002.

REMARKS: *Pontella chierchiae* is easily distinguished from other species by the following characteristics: (1) the posterolateral corners of last pedigerous somite is bifurcate in the female; (2) the male right fifth leg has a distally widened second exopod segment.

37. *Pontella fera* Dana, 1849 (Fig. 70)

Neol-eun-ma-di-bo-teu-no-beol-re (넓은마디보트노벌레)

Pontella fera Dana, 1849, p. 34, pl. 82, fig. 5; Giesbrecht and Schmeil 1898, p. 144; Giesbrecht, 1892, p. 462, pl. 24, figs. 14, 31, 34, 36, pl. 40, figs. 15, 18, 27, 36; Scott A., 1909, p. 159; Sewell, 1932, p. 377; Farran, 1936, p. 118; Wilson, 1950, p. 293, pl. 28, fig. 414; Tanaka, 1964, p. 263, figs. 237, a–d; Chen and Zhang, 1965, p. 104, pl. 45, figs. 1–7; Silas and Pillai, 1973, p. 816, fig. 19; Zheng et al., 1982, p. 78, pl. 45-1, figs. a–j, pl. 45-2, figs. k–v; Kim, 1985, p. 127, pl. 42, figs. e–g; Mulyadi, 2000, p. 186, figs. 5, 6; Jeong et al., 2008b, p. 205, figs. 8, 9.

Pontellina (Eupontellina) fera: Claus, 1893, p. 273 (cited by Silas and Pillai, 1973).

Female: Body length 2.63 mm. Prosome cylindrical: last pedigerous somite produced into asymmetrical wing-like processes on posterolateral corners. Urosome of 2 free somites: genital compound somite dorsally flat, asymmetrical, with protrusion on left side; caudal rami slightly asymmetrical. Fifth legs symmetrical: intercoxal sclerite and coxa fully fused; each basis has minute process at base of plumose seta; basis and endopod completely fused; endopod short and bifid terminally; exopod with 3 processes along each of outer and inner margins, and one terminal process.

No males were found in Korean waters.

DISTRIBUTION: Korea, Red Sea, China, Yellow Sea, Izu region, Samoan Island, Great Barrier Reef, Andaman Sea, Laccadive Sea, Bengal Bay, Java Sea.

KOREA: GN, JN, JJ.

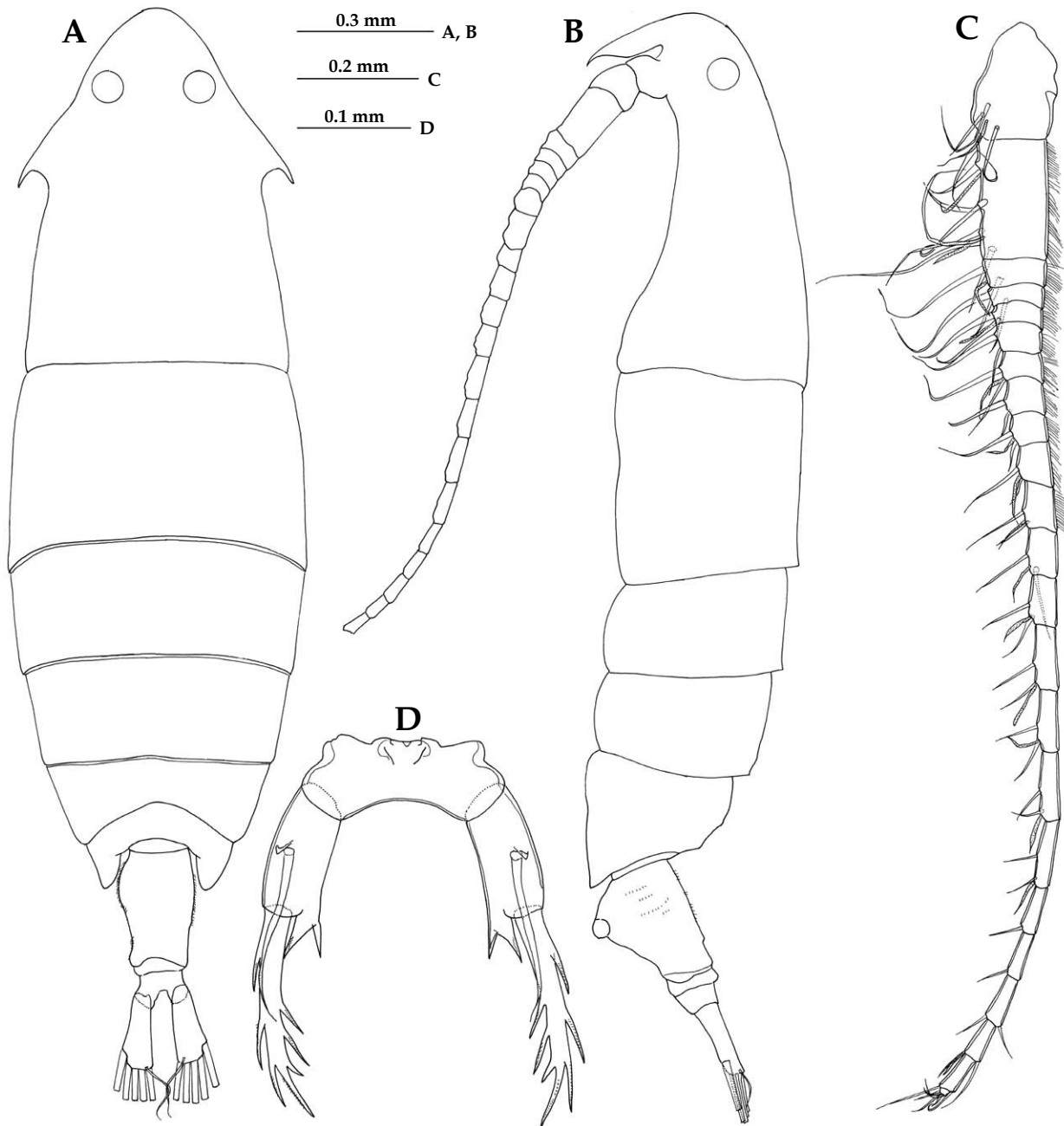


Fig. 70. *Pontella fera*, female. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. fifth leg.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 26.ix.2002).

ECOLOGY: *Pontella fera* has been recorded from the Pacific and Indian Oceans, between 40° N and 30° S. In South Sea, this species only appears during September (24°C, 31 psu) in the surface layer (0–10 cm) of oceanic area.

REMARKS: *Pontella fera* originally described from the northern areas of Samoan Islands by Dana (1849) shows the some morphological variations in the posterior corners of prosome, the genital compound somite and caudal rami of female, and fifth leg of male (Giesbrecht, 1893; Tanaka, 1964; Chen and Zhang, 1965; Silas and Pillai, 1973; Zheng et al., 1982; Mulyadi, 2000). Zheng et al. (1982) divided both sexes from the East China Sea into two types by characteristic features. These morphological differences show that two types may be separated into two species, but the decision may be pended until their molecular analysis or mating experiment is completed. The female from the South Sea of Korea belonging to type I and is very similar to Giesbrecht's original description (1893). However, it slightly differs from the latter by fusion of basis and endopod in the fifth legs (in Giesbrecht's illustration they are separated). Among previous studies, type I is identical with illustrations of *P. fera* provided by Silas and Pillai (1973) and Zheng et al. (1982) and type II is similar to figures of Chen and Zhang (1965) and Mulyadi (2000).

38. *Pontella latifurca* Chen and Zhang, 1965 (Figs. 71, 72)

Yeop-gal-kwi-bo-teu-no-beol-re (옆갈퀴보트노벌레)

Pontella latifurca Chen and Zhang, 1965, p. 105, pl. 46, figs. 1–8; Zheng et al., 1989, p. 155; Kim, 1985, p. 127, pl. 43, figs. a–f; Mulyadi, 2000, p. 190, fig. 11; Jeong et al., 2008b, p. 217, figs. 10, 11.

Female: Body length 2.83–3.72 mm. Prosome robust: rostrum biramous without lens; posterolateral corners of last pedigerous somite acutely triangular, asymmetrical, left side longer than right. Urosome of 2 free somites: genital compound somite asymmetrical, globular and dorsally swollen; genital operculum located anterior-medially; caudal rami asymmetrical, right ramus much larger and longer than left, with swollen setae. Fifth legs asymmetrical, left leg longer than right: intercoxal sclerite and coxa completely fused; exopod claw-like, twice length than endopod; endopod bifid at tip.

Male: Body length 2.72–2.94 mm. Rostrum with well-developed lenses; posterolateral corners of prosome asymmetrical, right side longer than left. Urosome of 5 free somites: genital somite swollen on left; caudal rami symmetrical, elongate. Fifth legs uniramous: intercoxal sclerite and coxa completely separated; right first exopod segment with slender process curving inwards and 2 projections along inner margin; second exopod segment elongate, bent, with 4 setae along inner surface; left first exopod segment with small posterolateral process; second exopod segment hirsute on inner margin and with minute mediolateral seta, with 1 terminal elongate spine and 3 processes which is villi, round-tip and spiral forms (Jeong et al., 2008b).

DISTRIBUTION: Pohai Bay, Korea, Java Sea.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 20.viii.2002).

ECOLOGY: Chen and Zhang (1965) originally described this species from the Gulf of Pohai, China Seas. This species was also recorded in Korean coastal waters (Kim, 1985), and off Surabaya, east Java, Indonesia (Mulyadi, 2000). In the South Sea, this species appeared from May to September.

REMARKS: *Pontella latifurca* is easily distinguished from *P. danae*-group by the following characteristics: (1) the genital compound somite is globular; (2) the caudal rami are asymmetrical; (3) the

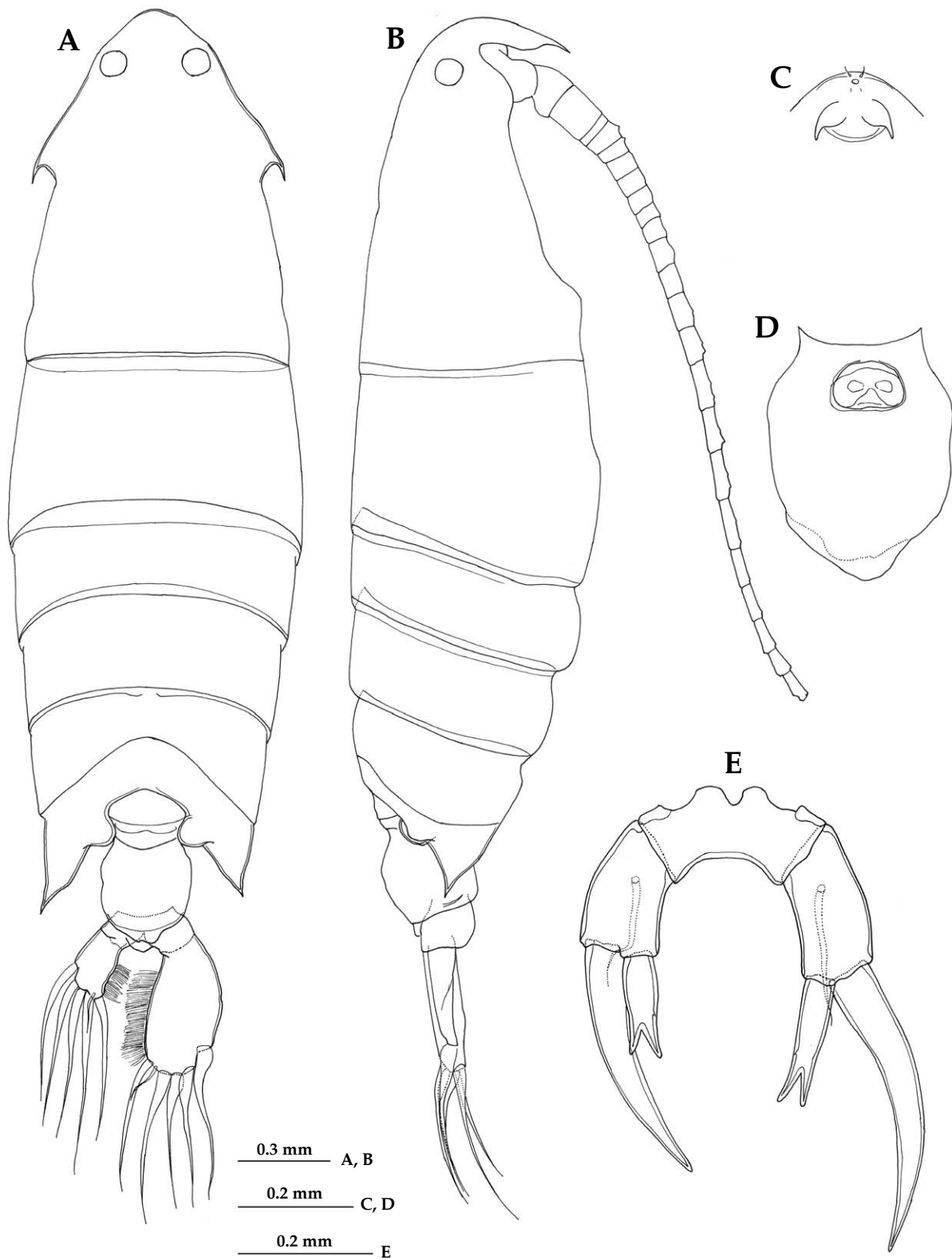


Fig. 71. *Pontella latifurca*, female. A. habitus, dorsal view; B. habitus, lateral view; C. rostrum, ventral view; D. genital compound somite, ventral view; E. fifth leg.

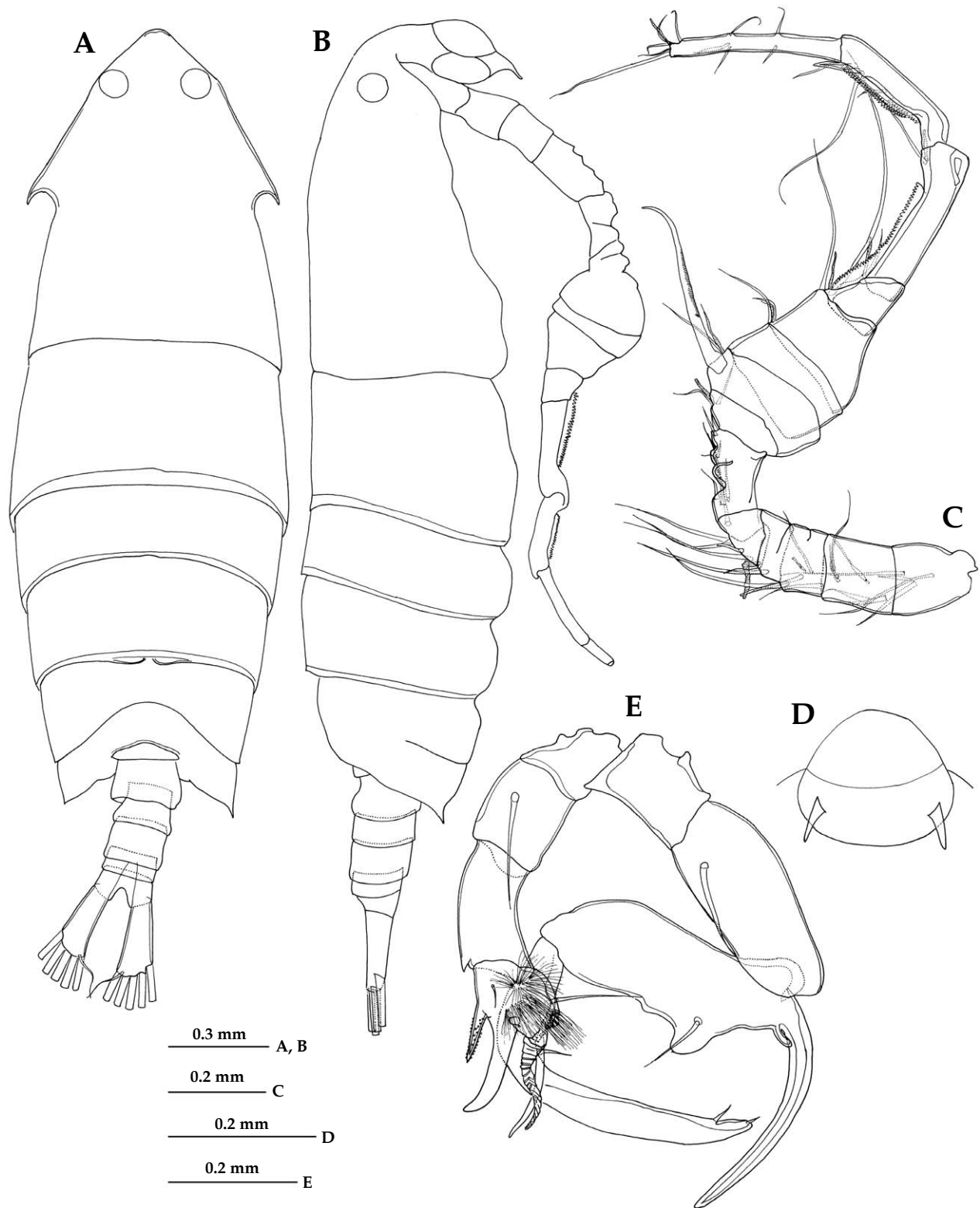


Fig. 72. *Pontella latifurca*, male. A. habitus, dorsal view; B. habitus, lateral view; C. right antennule; D. rostrum, ventral view; E. fifth leg.

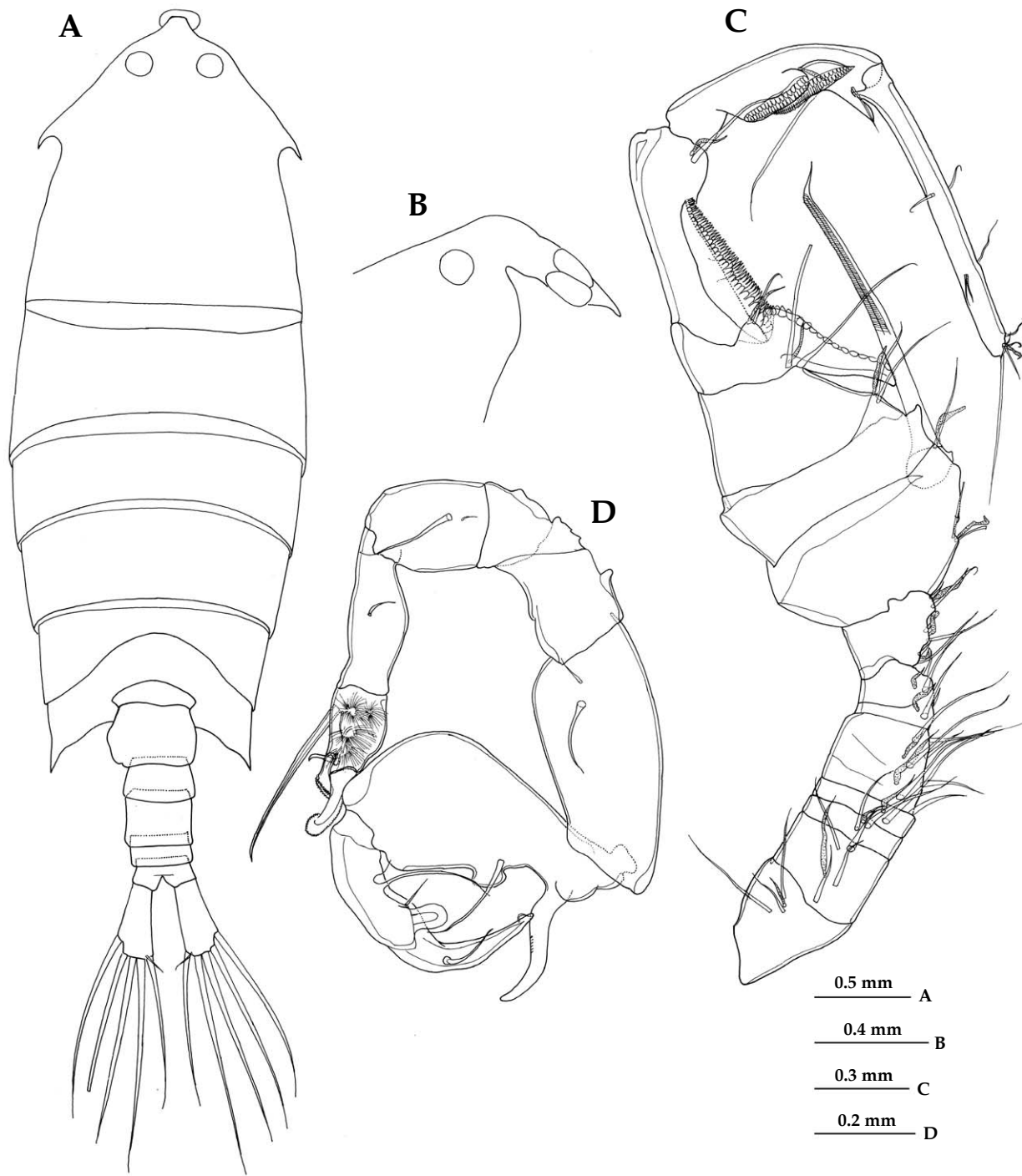


Fig. 73. *Pontellaa sinica*, male. A. habitus, dorsal view; B. head, lateral view; C. right antennule; D. fifth leg.

exopod of the female fifth legs are naked; (4) the first exopodal segment of the male right fifth legs with 2 projections; (5) the second segment of the male left fifth leg has 3 apical processes.

39. *Pontella sinica* Chen and Zhang, 1965 (Fig. 73)

Jung-guk-bo-teu-no-beol-re (중국보트노벌레)

Pontella princeps: Sewell, 1932, p. 382, fig. 127a–d; Mulyadi, 2000, p. 191, fig. 12.

Pontella sinica Chen and Zhang, 1965, p. 104, pl. 45, figs. 8–11; Zheng et al., 1982, p. 84, pl. 48, figs. a–j; Jeong et al., 2008a, p. 96, fig. 6.

Pontella sewelli Heinrich, 1987, p. 932, figs. 1, 2.

Male: Body length 4.99 mm. Prosome robust with prominent lateral hooks: dorsal lenses conspicuous and rostral lens well-developed; posterolateral corners of last pedigerous somite sharply pointed. Urosome of 5 free somites: genital somite slightly asymmetrical with lobe on left medial border; caudal rami symmetrical. Fifth legs with 2 setae on each basis: right leg, thumb-like process on first exopod segment curved inwards, inner margin of palm with bluntly rounded process and 1 seta at base; second exopod segment elongate with 4 setae along inner border and 1 plate-like process; first exopod segment of left leg bearing 1 medial seta; distal exopod segment with 1 elongated spine, 1 seta and hirsute mediolateral border; bearing 2 terminal spines of which longer spine spatulate and with crenulated margin, shorter spine truncate distally, with 1 spine at base.

No females were found in Korean waters (Jeong et al., 2008a).

DISTRIBUTION: The East China Sea, Java Sea.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 26.ix.2002).

ECOLOGY: Chen and Zhang (1965) originally described *Pontella sinica* based on 2 females in off Zhejiang (30° 30'N, 123° 15'E) and, subsequently, Zheng et al. (1982) recorded both sexes from Fujian neritic waters. Mulyadi (2000) reported this species in the Java Sea. In the South Sea, Korea it appears only in the subsurface layer (10–30 cm) during September (24°C, 31 psu).

REMARKS: *Pontella sinica* is closely related to *P. princeps* Dana, 1849, but it is distinguished by the morphology of male right fifth leg: (1) the thumb of chela terminates in a slender inwardly curved digitiform process; (2) the palm has 1 process. Among specimens from Andaman Sea (Sewell, 1932) and Java Sea (Mulyadi, 2000), previously identified as *P. princeps*, the same morphological characteristics are observed in specimens, indicating that these are *P. sinica*.

Genus *Pontellina* Dana, 1949

Jak-eun-bo-teu-no-beol-re-sok (작은보트노벌레속)

As in family definition with following additional characteristics. Relatively small pontellids, body length less than 2 mm. Prosome broadly oval-shaped without lateral hooks: fourth and fifth pedigerous somites fused; posterolateral corners of prosome produced into acuminate lobes, symmetrical. Rostrum slender elongate with flexible filaments. Ventral eye present but inconspicuous, scarcely produced, and lacking distinctive lens. Urosome of 2 free somites in female: genital compound somite with hairs on posterior border and lateral spinules; caudal rami weakly asymmetrical, right ramus fused to anal somite. Antennule symmetrical, 17-segmented in female. Fifth leg in female

with 1-segmented exopod bearing one lateral and 3 terminal setae as well as one medial setiform process fused to exopod and serrated along its medial margin; endopod 1-segmented and terminating in 1 or 2 apical spines. Male fifth leg with basis bearing large plumose posterior seta; endopods lacking; exopod 2-segmented; right leg with an elongate basis, distal segment of exopod armed with 4 short setiform processes.

SPECIES: 5 (2 in Korea).

DISTRIBUTION: Worldwide.

Key to the species of genus *Pontellina*

1. Urosome of 2 free somites 2 (Female)
 – Urosome of 5 free somites 3 (Male)
2. Posterior corners of last pedigerous somite with conspicuous spiniform process *P. plumata*
 – Posterior corners of last pedigerous somite ending in a short spiniform process *P. morii*
3. Distal segment of right fifth leg slender and digitiform *P. plumata*
 – Distal segment of right fifth leg with prominent triangular terminal spur *P. morii*

REMARKS: Fleminger and Hulsemann (1974), in their detailed review of the systematics and distribution of four sibling species of the genus *Pontellina* which was previously regarded as monotypic, give the diagnostic characters of *P. plumata* and, at the same time, described three additional species namely: *P. platychela*, *P. morii* and *P. sobrina*. Of these, *P. platychela* is known from the Atlantic Ocean and *P. sobrina* from the eastern Pacific Ocean. *P. morii* is known from the Indo-Pacific region.

40. *Pontellina morii* Fleminger and Hulsemann, 1974 (Figs. 74, 75)

Mo-ri-jak-eun-bo-teu-no-beol-re (모리작은보트노벌레)

Pontellina plumata: Mori, 1937 (1964, in part), p. 100, pl. 48, figs. 1–12; Dakin and Colefax, 1940, p. 99, fig. 139; Zhang et al., 1965, p. 138, fig. 65a–h; Chen and Zhang, 1965, p. 109, pl. 48, figs. 9, 10; Zheng et al., 1989, p. 257, fig. 172f–j.

Pontellina morii Fleminger and Hulsemann, 1974, p. 79, figs. 9, 11; Silas and Pillai, 1973, p. 851, fig. 35c–f; Greenwood 1979, p. 105, fig. 7b; Bradford-Grieve, 1999, p. 204, fig. 152; Mulyadi, 2002, p. 155, fig. 58.

Female: Body length 1.61–1.74 mm. Posterolateral corners of prosome symmetrical, ending in a short spiniform process. Genital compound somite lacking anterolateral cluster of coarse hairs which found in *P. plumata*. Endopod of fifth leg longer relative to that of *P. plumata*.

Male: Body length 1.44–1.52 mm. Posterolateral corners ending a small spiniform process. Right caudal ramus differing from that of *P. plumata* in being shorter. Right fifth leg, palm of first exopod segment with 3 inner marginal processes which are blunt and lamella-like, 2 setae and digitiform process; finger (second exopod segment) short, apex with prominent triangular spur on posterior side; left leg, first exopodal segment longer than that of *P. plumata*, bearing long distolateral spine; second exopod segment bearing 3 apical spines, 1 medial spine and fringing inner hairs.

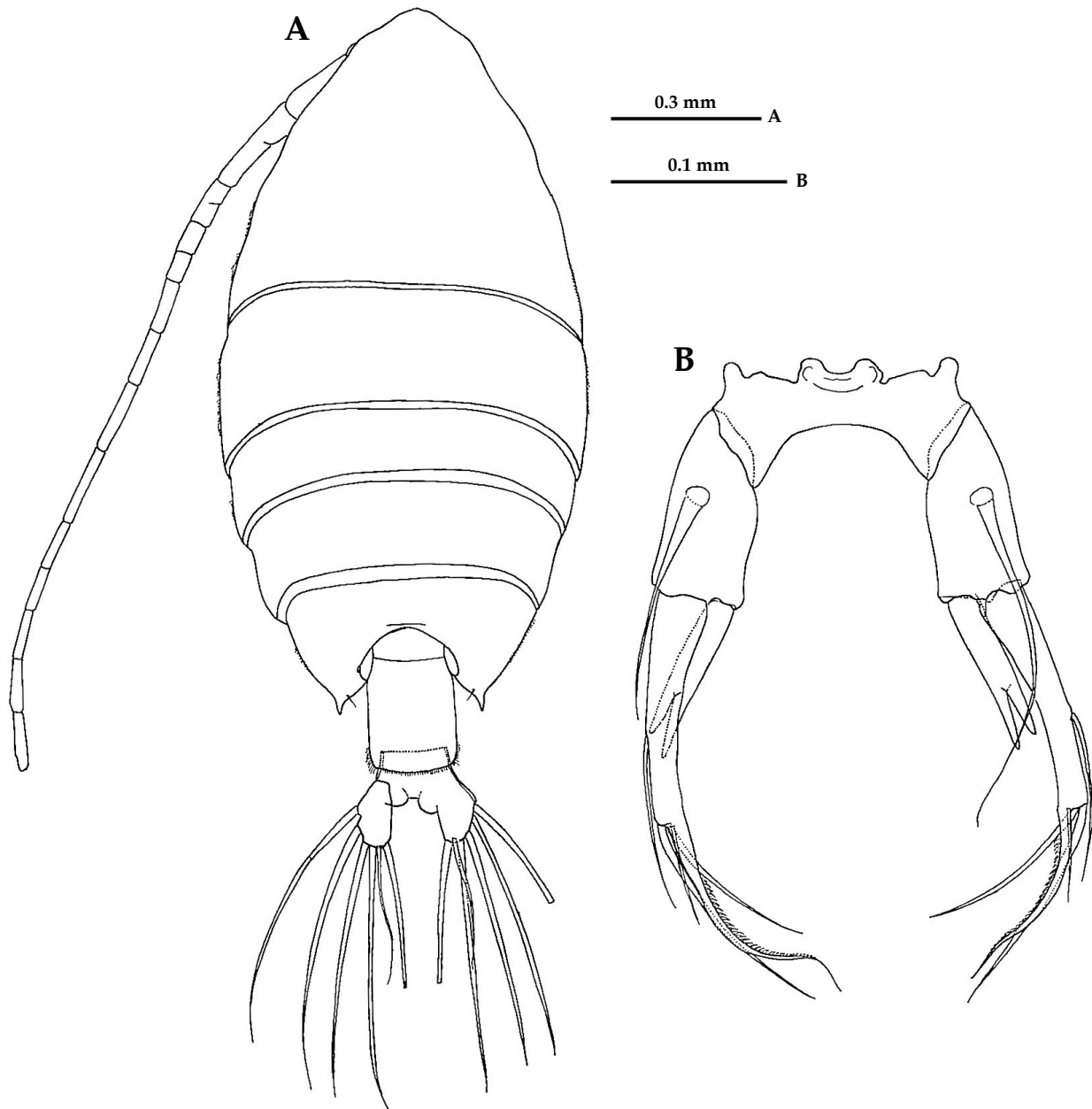


Fig. 74. *Pontellina morii*, female. A. habitus, dorsal view; B. fifth leg.

DISTRIBUTION: Tropical and subtropical regions of the Indo-Pacific region.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 26.ix.2002).

ECOLOGY: In Korean waters, *P. morii* occurs often in summer.

REMARKS: The present specimen agrees with *P. morii* very well in the following characteristics: (1) the presence of a flange-like extension on the distal segment of the male fifth leg; (2) the same setation on the female fifth leg.

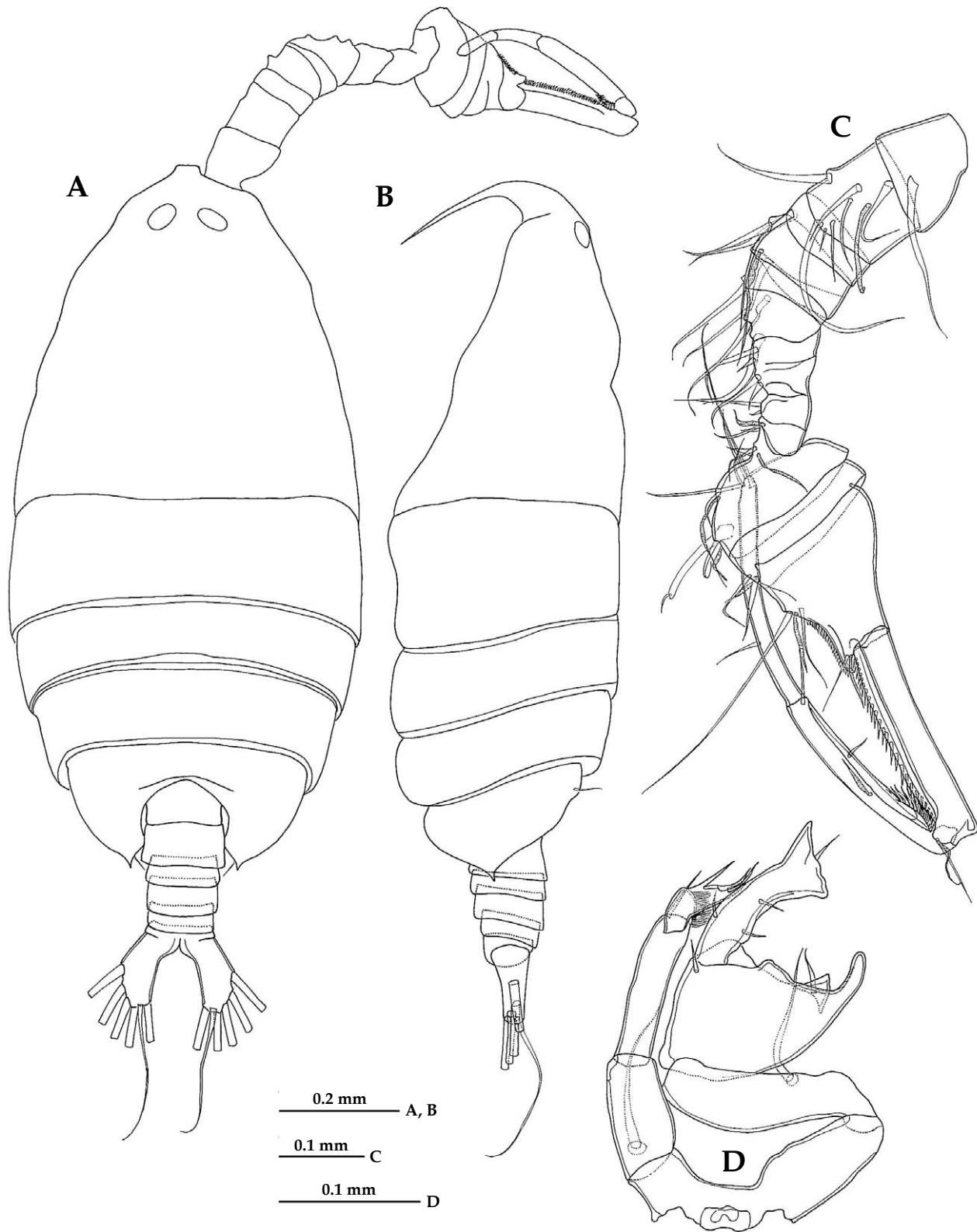


Fig. 75. *Pontellina morii*, male. A. habitus, dorsal view; B. habitus, lateral view; C. right antennule; D. fifth leg.

41. *Pontellina plumata* (Dana, 1849) (Fig. 76)

Git-jak-eun-bo-teu-no-beol-re (깃작은보트노벌레)

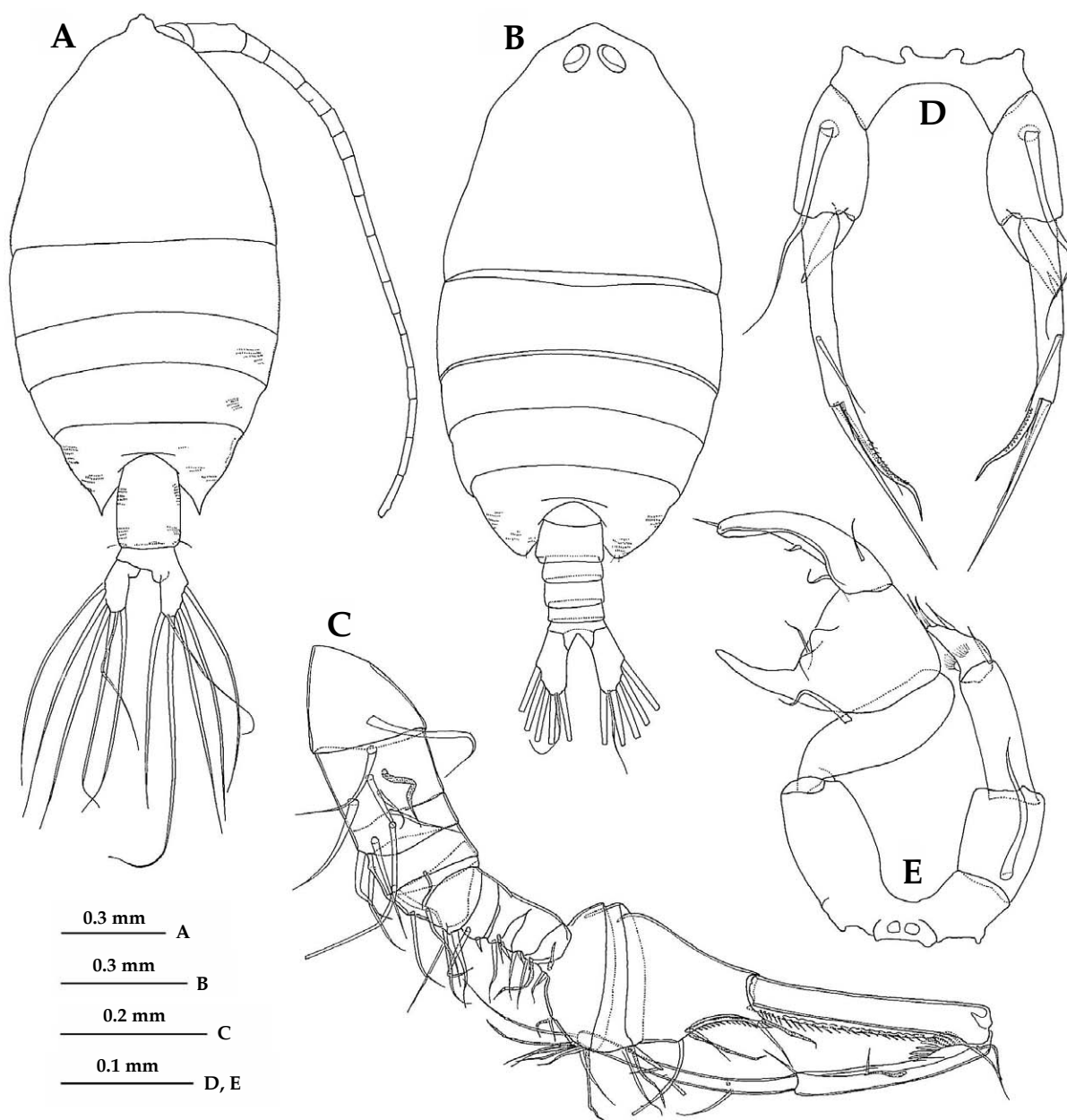
Pontella plumata Dana, 1849, p. 27; Brady (in part), 1883, p. 92, pl. 37, figs. 1–10.*Pontellina plumata*: Dana, 1853, p. 1135; 1855, pl. 79, fig. 10a–d; Giesbrecht, 1892, p. 497, pl. 4, fig. 1, pl. 25, fig. 1, 4, 6, 7, 9, 12–14, 18, 20, 21, 23–26, 36, pl. 40, fig. 49–53; Giesbrecht and Schmeil, 1898,

Fig. 76. *Pontellina plumata*. Female: A. habitus, dorsal view; D. fifth leg. Male: B. habitus, dorsal view; C. right antennule; E. fifth leg.

p. 149; Scott A., 1909, p. 175; Sewell, 1932, p. 391; Mori (1937) 1964, p. 100, pl. 47, figs. 7–11; pl. 48, figs. 1–12; Tanaka, 1964, p. 270; Knusen and Wolff, 1965, p. 190; Zhang et al., 1965 (in part), p. 138, fig. 65a–h; Chen and Zhang, 1965, p. 109, pl. 48, figs. 11, 12; Silas and Pillai, 1973, p. 847, fig. 34a–d, fig. 35a, b; Fleminger and Hulsemann, 1974, p. 71, figs. 3, 4; Bradford-Grieve, 1999, p. 205, fig. 153; Mulyadi, 2002, p. 157, fig. 59.

Pontellina morii: Greenwood 1979, p. 105, fig. 7a.

Female: Body length 1.69–1.78 mm. Cephalosome narrows anteriorly with median projection. Posterolateral corners of prosome ending in a conspicuous spiniform process. Urosome of 2 free somites: genital compound somite bearing anterolateral and posterolateral clusters of spinules on both sides; left caudal ramus appreciably longer than right ramus. Fifth leg polymorphic, endopod with one or two apical spines.

Male: Body length 1.49–1.62 mm. Posterolateral corners of prosome bluntly rounded, usually bearing one minute denticle terminally. Right fifth leg first exopod segment with 2 inner conical processes, 1 seta, and digitiform process (thumb?) on palm, second exopod segment claw-like with 1 seta terminally and 2 inner setae and 1 outer seta; left leg, first exopodal segment with slender distolateral spine and second exopod segment bearing 3 apical spines, 1 outer spine and fringing inner hairs.

DISTRIBUTION: China, Japan, Australia, Philippine Island, Africa, Hawaii Island.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 26.ix.2002).

ECOLOGY: *P. plumata* has a warm-water circumglobal distribution bounded in the north and south approximately by the subtropical convergence zones of each hemisphere (Fleminger and Hulsemann, 1974).

REMARKS: This species is readily identified by its short robust body, and by the long plumose setae on the antenna and mandible palp.

Genus *Pontellopsis* Brady, 1883

Dae-na-mu-bo-teu-no-beol-re-sok (대나무보트노벌레속)

As in family definition with following additional characteristics. Prosome widened with anterior, mid frontal protrusion; fourth and fifth pedigerous somites fused and extending posteriorly into point, often asymmetrical in male. Cephalosome without lateral hooks. Rostrum with long filaments, rostral lens absent. Urosome asymmetrical in both sexes; female with 1 or 2 free somites and male with 5 free somites, third urosomite having projection on right. Antennule 15-segmented. Maxilla with 2 large, spinous distal setae. Maxilliped 5-segmented. Legs as in *Pontella*.

SPECIES ca. 25 (4 in Korea).

DISTRIBUTION: Surface waters of tropical neritic and oceanic regions.

Key to the species of genus *Pontellopsis*

1. Urosome of 2 free somites 2 (Female)
 - Urosome of 5 free somites 5 (Male)
2. Posterolateral corners of the last pedigerous somite bluntly rounded 3
 - Posterolateral corners of the last pedigerous somite acutely pointed 4
3. Genital compound somite with process on both sides *P. yamadae*
 - Genital compound somite with 2 processes on right side *P. tenuicauda*
4. Anal somite large *P. armata*
 - Anal somite small *P. regalis*
5. Left corner of the last pedigerous somite with sharp posterior extension 6
 - Left corner of the last pedigerous somite with bluntly rounded extension 7
6. Right corner of the last pedigerous somite with stout process *P. regalis*
 - Right corner of the last pedigerous somite with thin process *P. armata*
7. Right process of the last pedigerous somite extending to anal somite *P. tenuicauda*
 - Right process of the last pedigerous somite not reaching anal segment *P. yamadae*

42. *Pontellopsis armata* (Giesbrecht, 1889) (Figs. 77, 78)

Mu-jang-dae-na-mu-bo-teu-no-beol-re (무장대나무보트노벌레)

Monops armatus Giesbrecht, 1889 (cited from Giesbrecht, 1892); 1892, p. 487, pl. 26, figs. 19, 26, 27, pl. 41, figs. 46, 47, 58.

Pontellopsis armata: Giesbrecht and Schmeil, 1898, p. 148; Scott A., 1909, p. 170; Sewell 1932, p. 385; Mori, 1937 (1964), p. 97, pl. 45, figs. 5–8; Wilson 1950, p. 304, pl. 30, figs. 450–452; Tanaka 1964, p. 269; Chen and Zhang, 1965, p. 108, pl. 48, figs. 4, 5; Silas and Pillai, 1973, p. 846, fig. 33; Zheng et al., 1982, p. 88, fig. 50a–g; Mulyadi, 2002, p. 126, fig. 46.

Female: Body length 2.37 mm. Prosoma robust, broadly rounded anteriorly with mid frontal protrusion: cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites incompletely fused; posterolateral corners of prosoma acutely pointed, symmetrical. Cephalosome without lateral hooks: rostrum with long filaments and rostral lens absent. Urosome of 2 free somites, segmentation indistinct laterally, covered with small spinules and hairs, genital compound somite with pair of transparent anterolateral setules; genital opening bearing triangular process directed to right; anal somite prolonged both anteriorly and posteriorly; caudal rami asymmetrical, left ramus longer and wider. Fifth legs symmetrical: exopod with 3 outer spinules and 3 distal spines of which middle one is longest.

Male: Body length 2.13 mm. Posterolateral angles of prosoma asymmetrical, left side with sharp process, right side with rounded lobe bearing 1 slender, long, curved process. Urosome of 5 free somites: first urosomite with 2 setae on right side; third urosomite with thumb-like process bearing a lot of small spinules at right apex; caudal rami symmetrical. Fifth legs intercoxal sclerite and left coxa fused: right coxa bearing inner seta and basis with 2 setae; palm of first exopod segment with stout digitiform process bearing 1 seta at its base; second exopod segment elongate and bent medially with 2 inner setae and 1 outer apical seta; left leg bearing single plumose seta on basis; first

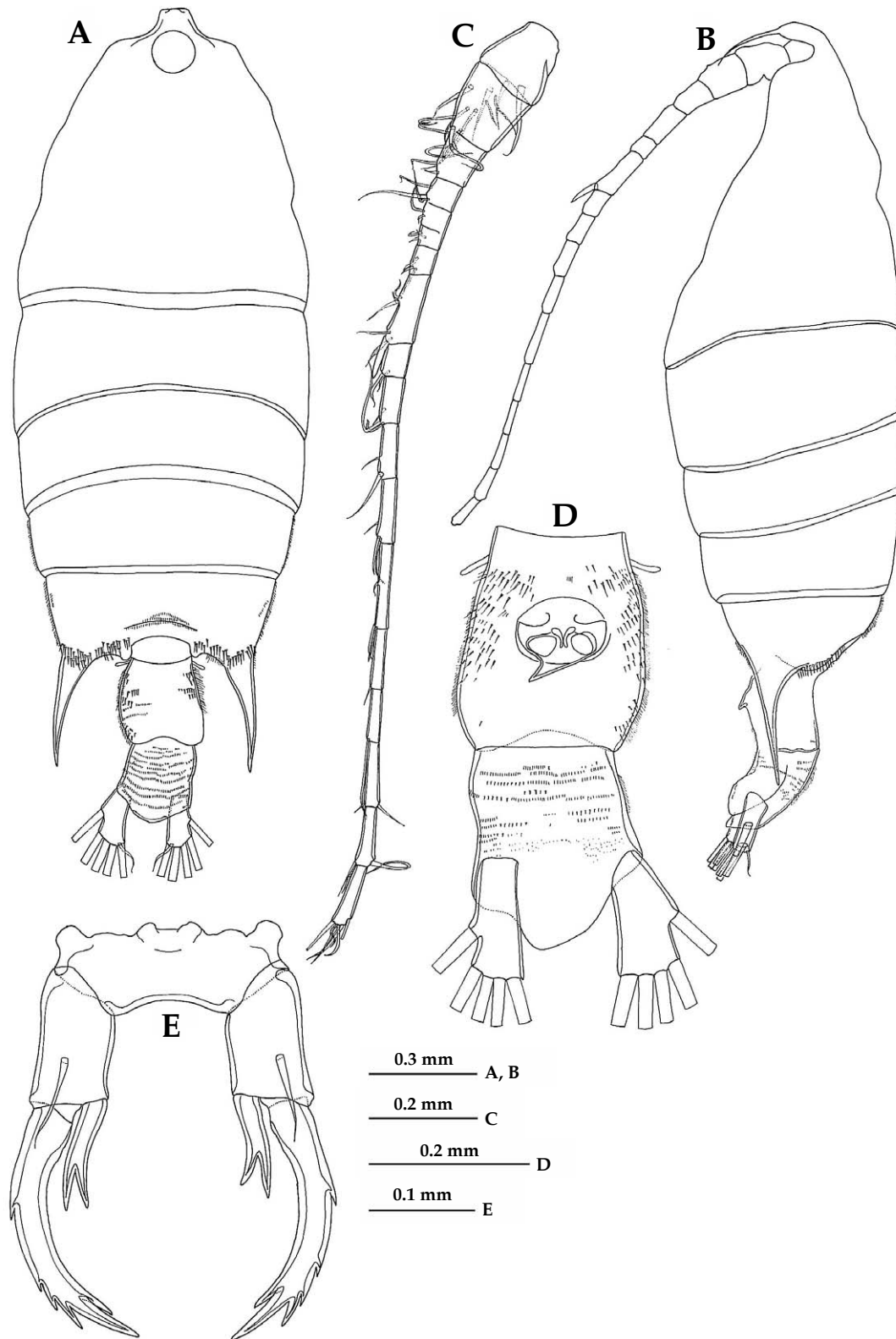


Fig. 77. *Pontellopsis armata*, female. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. urosome, ventral view; E. fifth leg.

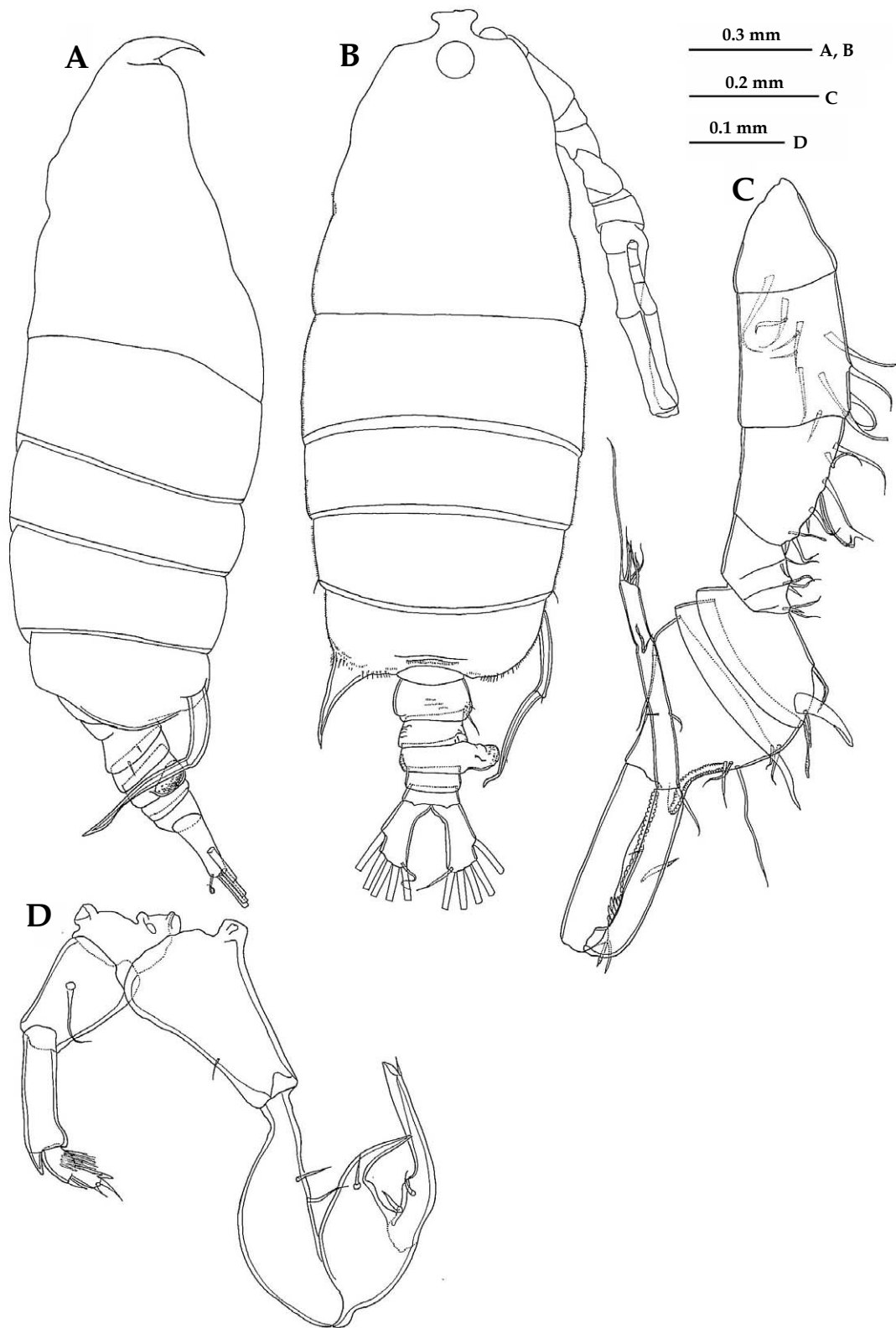


Fig. 78. *Pontellopsis armata*, male. A. habitus, lateral view; B. habitus, dorsal view; C. right antennule; D. fifth leg.

exopod segment with 1 outer spine; second exopod segment with 1 outer medial spine, inner hirsute and with 3 terminal spines.

DISTRIBUTION: Bengal Bay, Maldives and Laccadive Archipelagoes, Arabian Sea, Lombok Sea, Japan, China.

KOREA: JN.

SPECIMEN EXAMINED: (Geumho Island, Jeollanam-do: 26.ix.2002).

ECOLOGY: This species is widely distributed in Indo-west Pacific Ocean between 35° N and 35° S. In Korean waters, it sometimes occurs in summer.

REMARKS: The species is distinguished from other species of *Pontellopsis* by the following characteristics: in the female (1) its hirsute body, (2) the posterolateral corners of fifth pedigerous somite with sharp processes, (3) both anterolateral borders of the genital compound somite bearing transparent setules, (4) the presence of a triangular ventral process adjacent to the genital opening; in the male (1) the right posterolateral corner of the fifth pedigerous somite has flagellum-like process; (2) the right side of the third urosomite has a digitiform process bearing many spinules.

43. *Pontellopsis regalis* Dana, 1849 (Fig. 79)

Hwang-je-dae-na-mu-bo-teu-no-beol-re (황제대나무보트노벌레속)

Pontella regalis Dana, 1849, p. 31.

Pontella streuna (part) Brady, 1883, p. 95, pl. 45, fig. 18.

Monops regalis Giesbrecht, 1892, p. 486, pl. 1, fig. 6, pl. 26, figs. 1–9, 11, 13, 14, 20–22, 24, 29, pl. 41, figs. 50, 54, 56, 62, 64, 66–67.

Pontellopsis regalis Giesbrecht and Schmeil, 1898, p. 147; Scott A., 1909, p. 171; Farran, 1936, p. 118; Chen and Zhang, 1965, p. 107, pl. 47, figs. 5–7; Knusen and Wolff, 1965, p. 193; Park, 1968, p. 568, pl. 13, figs. 1–14; Silas and Pillai, 1973, p. 838, fig. 29; Zheng et al., 1982, p. 90, fig. 51a–i; Mulyadi, 2002, p. 141, fig. 52a, b.

Pontellopsis villosa Tanaka, 1964, p. 268, fig. 24f–g.

Female: Body length 3.28 mm. Prosoma robust with anterior projection: rostral rami slender and long; posterolateral corners of prosoma produced into triangular process, asymmetrical. Urosome of 2 free somites: genital compound somite asymmetrical, left side with digitiform process directed posteriorly, right side swollen; caudal rami symmetrical. Fifth legs symmetrical: intercoxal sclerite and coxa completely fused; exopod with 3 outer spinules, 1 inner and 2 apical processes; endopod bifid distally.

No males were found in Korean waters.

DISTRIBUTION: Coastal waters of China and Japan, Sulu Sea.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 23.ix.2002).

ECOLOGY: This species is widely distributed in offshore waters between 40° N and 40° S.

REMARKS: *Pontellopsis regalis* was originally described from the Sulu Sea (Dana, 1849) and appears to have morphologically variability in the genital compound somite of females and fifth legs of both

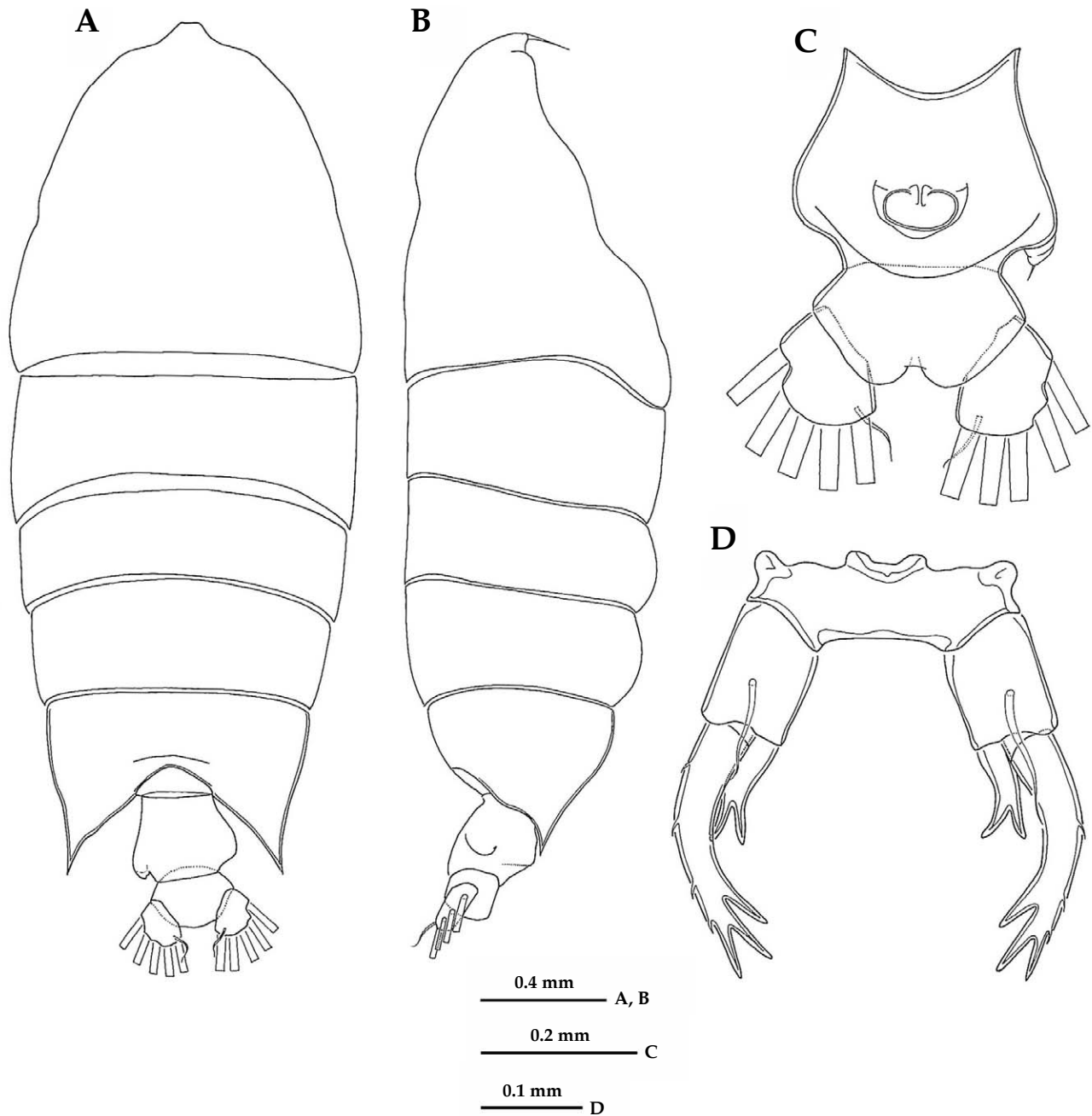


Fig. 79. *Pontellopsis regalis*, female. A. habitus, dorsal view; B. habitus, lateral view; C. urosome, ventral view; D. fifth leg.

genders (Giesbrecht, 1892; Wilson, 1950; Tanaka, 1964; Chen and Zhang, 1965; Silas and Pillai, 1973; Zheng et al., 1982). Zheng et al. (1982) divided females into 2 types by characteristic features in genital compound somite and fifth legs: type I (1) genital compound somite swollen on one side only; (2) fifth legs with 1 stout apical spine on exopod; type II (1) genital compound somite with

swelling on both sides; (2) fifth legs with 2 equal apical spines. Females occurring in the South Sea agree with Type II.

44. *Pontellopsis yamadae* Mori, 1937 (Figs. 80, 81)

Ya-ma-da-bo-teu-no-beol-re (야마다보트노벌레)

Pontellopsis yamadae Mori, 1937 (1964), p. 98, pl. 47, figs. 1–6, pl. 48, fig. 13; Tanaka, 1964, p. 269; Chen and Zhang, 1965, p. 107, pl. 46, figs. 15, 16, pl. 47, figs. 1–4; Kim, 1985, p. 130, pl. 44, figs. f, g.; Mulyadi, 2002, p. 149, fig. 55.

Female: Body length 2.31–2.82 mm. Prosome oval shape: cephalosome and first pedigerous somite completely separated; fourth and fifth pedigerous somites fully fused; posterolateral corners of prosome with bluntly rounded process. Rostrum slender and long. Urosome of 2 free somites, segmentation indistinct laterally, genital compound somite large, long with small spine on right anterolateral border and 2 dorsodistal processes; anal somite prolonged posteriorly; caudal rami almost symmetrical. Fifth leg asymmetrical, left leg longer than right; exopod with 4 outer spinules, 1 distal spine and 1 inner stout process.

Male: Body length 1.84–2.28 mm. Posterolateral angles of prosome asymmetrical, right side with long, stout process, and left side bluntly rounded. Urosome of 5 free somites: first somite with single small seta on right posterolateral margin; second and third urosomites swollen on right side with minute terminal spinules; caudal rami symmetrical. Fifth leg intercoxal sclerite and left coxa fused: right coxa and basis bearing 2 setae; palm of right first exopod segment with long, stout, thumb-like process bearing 1 seta at its base; second exopod segment elongate, curved with 2 inner setae and 2 terminal setae; left leg bearing single plumose seta on basis; first exopod segment with 1 slender outer spine; second exopod segment with inner hirsute border and 3 apical spines of which innermost one longest.

DISTRIBUTION: Coastal waters of Yellow Sea, Jeju Island, Izu region.

KOREA: JN.

SPECIMEN EXAMINED: (South Sea, Jeollanam-do: 20.viii.2002).

ECOLOGY: *Pontellopsis yamadae* is distributed in the Indo-west Pacific Ocean between 10° N and 35° N. In Korean waters, it regularly occurs in small numbers in summer.

REMARKS: Mori (1964) described this species based on 4 females and 1 male collected from the Yellow Sea (34° 18' N, 126° 25' E). The present specimen is slightly different from Mori's specimen in the absence of 1 seta on the proximal inner part of the thumb of the right male fifth leg. *P. yamadae* closely resembles *P. regalis*, but it differs in that the male of the latter has: (1) the left corner of last pedigerous somite rounded; (2) the right fifth leg has the thumb-like process of the first exopod segment which is shorter than the second exopod segment (finger) of the chela; and (3) the finger is unmodified and bears two apical setae.

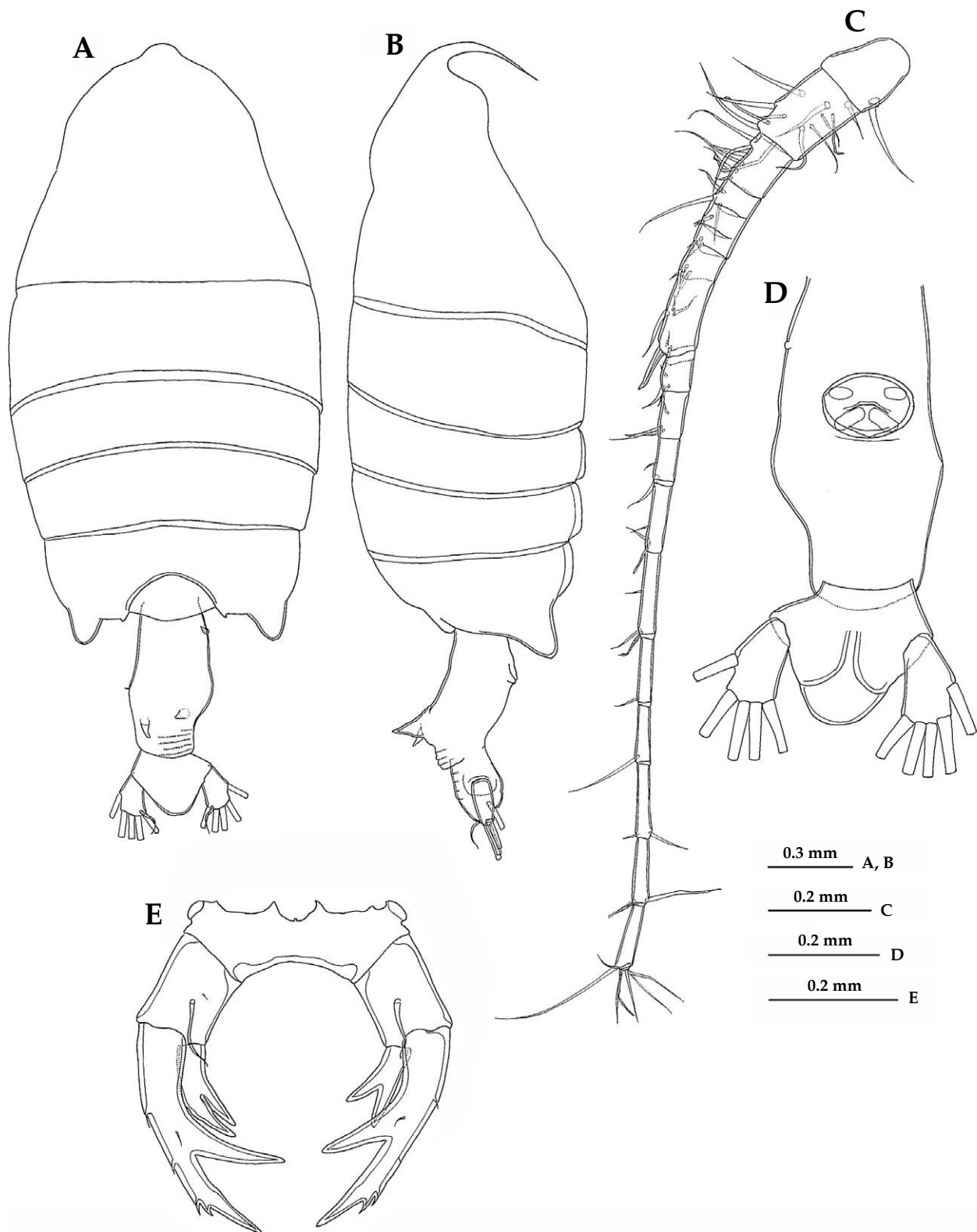


Fig. 80. *Pontellopsis yamadae*, female. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. urosome, ventral view; E. fifth leg.

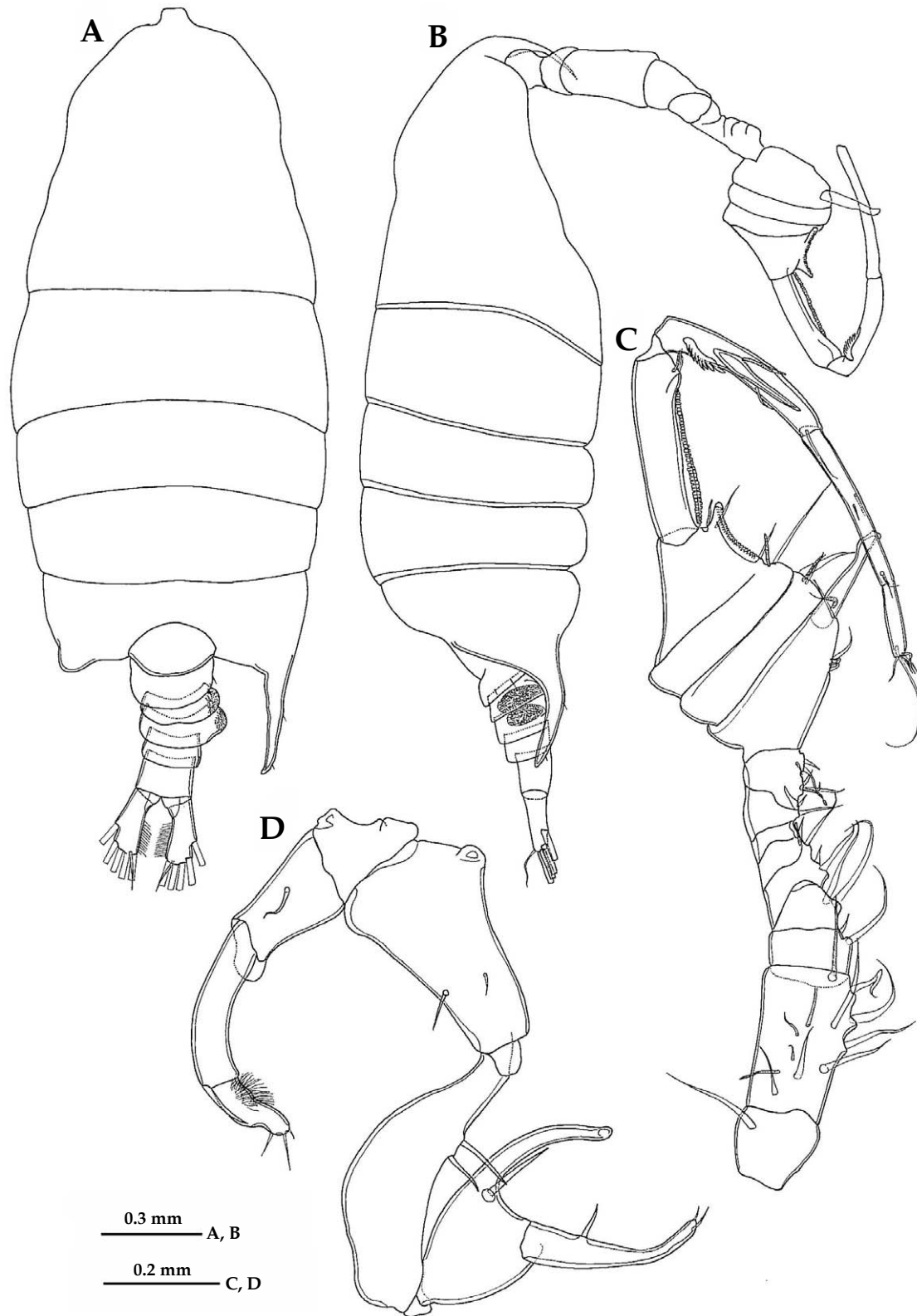


Fig. 81. *Pontellopsis yamadae*, male. A. habitus, dorsal view; B. habitus, lateral view; C. right antennule; D. fifth leg.

Family Pseudodiaptomidae Sars, 1902

Eo-ri-min-mul-gin-no-beol-re-gwa (어리민물긴노벌레과)

Cephalosome and first pedigerous somite partly or completely separate; fourth and fifth pedigerous somites usually partly or completely fused. Urosome usually of 4 free somites in female and of 5 free somites in male. Caudal rami typically elongate, with up to 6 setae. Rostrum divided into paired rostral filaments. Naupliar eye present. Antennule 20 to 25-segmented in female and geniculate on right side in male. Antenna biramous with coxa and basis fused. Mandible biramous, with well-developed gnathobase and biramous mandibular palp. Maxillule with well developed praecoxal arthrite; endopod 3-segmented, exopod 1-segmented. Maxilla with praecoxa and coxa incompletely fused. Maxilliped 6-segmented.

Spine and setal formula of swimming legs 1 to 4 as follows:

	coxa	basis	exopodal segments	endopodal segments
leg 1	0-1	0-0	I-1;0-1;II,I,3	0-1;0-1;1,2,3
leg 2	0-1	0-0	I-1;I-1;II,I,5	0-1;0-2;2,2,4
leg 3	0-1	0-0	I-1;I-1;II,I,5	0-1;0-2;2,2,4
leg 4	0-1	1-0	I-1;I-1;II,I,5	0-1;0-2;2,2,3

Female fifth legs biramous with 1-segmented endopods in *Archidiaptomus*, uniramous and 5-segmented in other genera. Male fifth legs asymmetrical, primitively biramous, uniramous due to loss of endopod in some species; right leg with 3-segmented exopod, endopod 1-segmented, often bifid; endopod sometimes absent.

GENERA 3 (2 in Korea), species 73 (5 in Korea).

DISTRIBUTION: Worldwide in tropical and temperate shallow coastal waters, in a range of salinity regimes from fully marine to fresh water.

Key to the genera of family Pseudodiaptomidae

1. Female leg 5 biramous with well developed endopod; male right antennule with 4 segments distal to geniculation *Archidiaptomus*
 – Female leg uniramous, endopod absent; male right antennule with at most 3 segments distal to geniculation 2
2. Female antennule 20 to 23-segmented; antennary exopod 4-segmented *Pseudodiaptomus*
 – Female antennule 25-segmented; antennary exopod 6-segmented *Calanipeda*

REMARKS: Walter (1986) decided that *Schmackeria* Poppe and Richard, 1890 and *Mazellina* Rose 1957 are synonyms of *Pseudodiaptomus*. He also added *Weismannella* Dahl, 1894 to this synonymy. However, Dussar and Defaye (2002) retain *Schmackeria* as a valid genus. Walter's synonymy is followed here.

Genus *Pseudodiaptomus* Herrick, 1884

Eo-ri-min-mul-gin-no-beol-re-sok (어리민물긴노벌레속)

General features same for family description.

SPECIES ca. 75 (5 in Korea).

DISTRIBUTION: Worldwide in tropical and temperate, shallow coastal waters, in a range of salinity regimes from fully marine to fresh water.

Key to the species of genus *Pseudodiaptomus*

1. Cephalosome and first pedigerous somites separated 2
 - Cephalosome and first pedigerous somites fused 3
2. Posterodorsal end of first pedigerous somite without any protuberance *P. marinus*
 - Posterodorsal end of first pedigerous somite with pair of protuberance *P. nihonkaiensis*
3. Cephalosome of female anteriorly narrow; last pedigerous somite of male without any spine dorsoposteriorly *P. poplesia*
 - Cephalosome of female anteriorly wide; last pedigerous somite of male with pair of spines dorsoposteriorly *P. inopinus*

45. *Pseudodiaptomus poplesia* (Shen, 1955) (Figs. 82–84)

Mu-reup-eo-ri-min-mul-gin-no-beol-re (무릎어리민물긴노벌레)

Schmackeria poplesia Shen, 1955, pp. 78–80, pl. 2, figs. 7–9; Chen and Zhang, 1965, p. 81, pl. 31, figs. 1–6; Shen and Song, 1979, p. 69, figs. 29, 30; Mizuno, 1984, pp. 86–88, figs. 29, 30; Dussart and Defaye, 2002, p. 42.

Pseudodiaptomus poplesia: Walter, 1986, p. 132; Walter, 1987, p. 367; Soh et al., p. 204, figs. 2, 3A, B, 4–6.

Female: Body length 2.10–2.30 mm. Anterior part of cephalosome narrowly produced in dorsal view and broadly rounded in lateral view; cephalosome and first pedigerous somite completely fused; fourth and fifth pedigerous somites completely fused; fifth pedigerous somite sinuous posteriorly, with fine rows of spinules on posterolateral corner. Naupliar eye present. Rostrum with paired filaments. Urosome of 4 free somites; genital double-somite has fine anterior spinules, with pair of ventrolateral hair-sensilla at midlength; gonopores located midventrally; genital flaps flattened; each somite except anal somite serrated along posterior margin. Caudal rami symmetrical, with six setae; outer terminal seta IV basally swollen. Fifth legs uniramous, symmetrical; intercoxal sclerite almost incorporated into both coxae with anterior and posterior spinules; basis bearing small posterior seta with medial and lateral distal spinules. Exopod 3-segmented; first segment produced at inner distal corner, with outer spine and spinules distally; second and third segments incompletely fused; second segment carrying short outer spine and larger serrate spine; third segment bearing long terminal spine and small inner element.

Male: Body length 1.60–1.80 mm. Cephalosome as in female. Posterolateral angles of last pedigerous somite rounded with few posterior spinules. Urosome of 5 free somites; genital somite

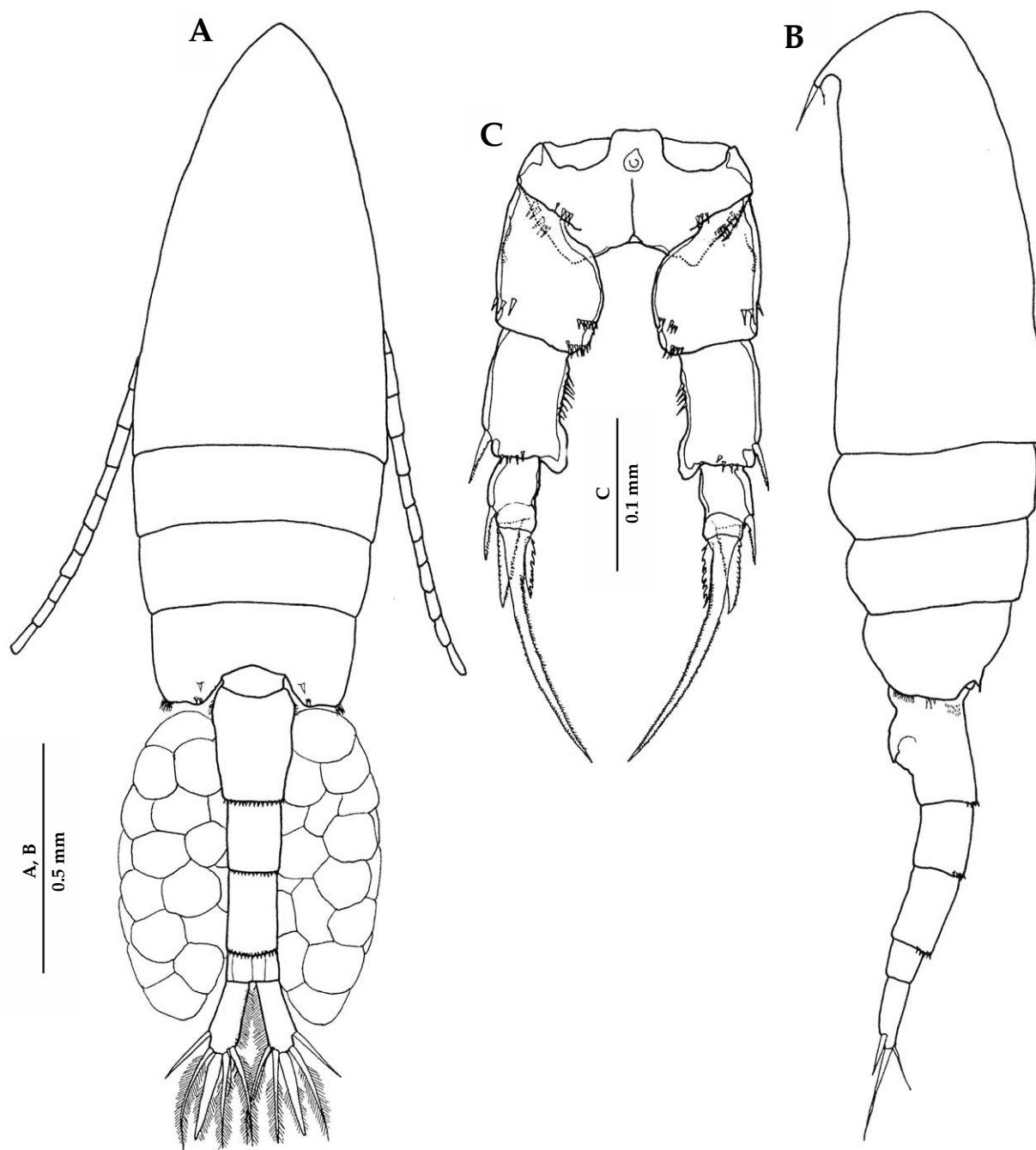


Fig. 82. *Pseudodiaptomus poplesia*, female. A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg (cited from Soh et al., 2001a).

with genital aperture on posterior, left side; second urosomite with ventral spinule row; second to fourth urosomites with spinules along posterior margin. Caudal rami symmetrical, with six setae. Fifth legs: coxae with anterior and posterior rows of fine spinules; basis of right leg with posterior large seta and two unequal spinous processes on inner margin; exopod 3-segmented, first segment

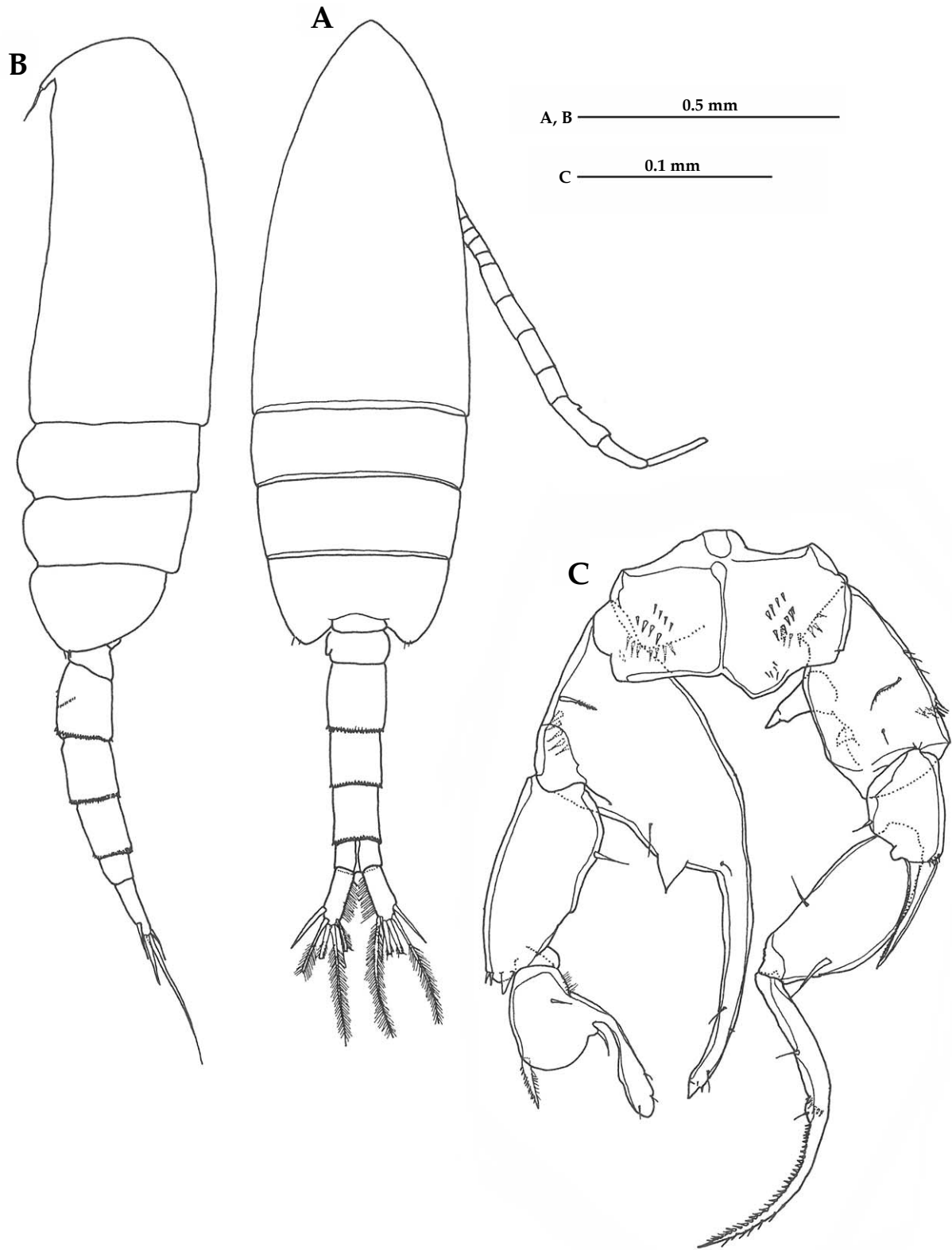


Fig. 83. *Pseudodiaptomus poplesia*, male. A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg (cited from Soh et al., 2001a).

with minute inner seta and stout outer spine, second with small inner and outer setae, third segment elongate with two inner setae and drawn out into serrated terminal spine; basis and endopod of left leg completely fused; basis with posterior seta; endopod elongate distally, medially curved with medial triangular projection to form chela and with three setules and three spinules; first exopodal segment with small distal spine, several small spinules and medial seta, second segment with one spine and one seta along outer margin, one seta on inner margin and inner distal corner produced into elongate, spatulate process bearing three minute setae (Soh et al., 2001a).

DISTRIBUTION: Estuaries around the Yellow Sea and the East China Sea.

KOREA: JN, JB, GG.

SPECIMEN EXAMINED: (Mankyung-Dongjin estuary, Jeollabuk-do: 30.xii.2004).

ECOLOGY: This species often occurs predominantly in Manjyung-Dongjin estuarine system.

REMARKS: *Pseudodiaptomus poplesia* was originally described from Chinese brackish waters (Shen, 1955) and has dimorphic males, which can be separated by the basis of the fifth leg which has a finger-like or a shoe-like shape (Chen and Zhang, 1965; Mizuno, 1984). The genetic differences between the two variants of males in the ITS regions fall within a range of ca. 1.5%, suggesting a genetic similarity.

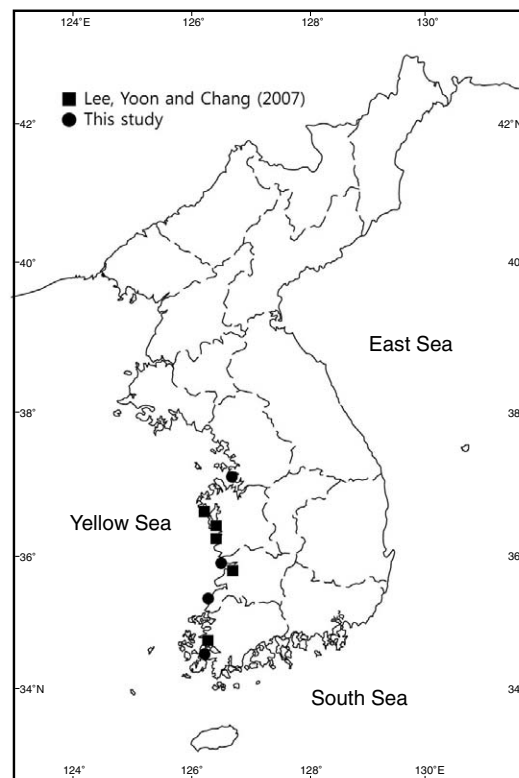


Fig. 84. Distribution of *Pseudodiaptomus poplesia*.

46. *Pseudodiaptomus nihonkaiensis* Hirakawa, 1983 (Figs. 85)

Dong-hae-eo-ri-min-mul-gin-no-beol-re (동해어리민물긴노벌레)

Pseudodiaptomus cornutus: Tanaka, 1966, p. 40, fig. 2.

Pseudodiaptomus nihonkaiensis Hirakawa, 1983, p. 65, figs. f, m, rem.; Walter, 1986, p. 133; 1986a, p. 503; 1987, p. 368; Chihara and Murano, 1997, p. 894, pl. 166; Soh et al., 2001a, p. 206, figs. f, m.

Female: Body length 1.20–1.30 mm. Prosome/Urosome ca. 2.44. Cephalosome and first pedigerous somite completely separate; fourth and fifth pedigerous somites completely fused. Cephalosome rounded anteriorly. First pedigerous somite with paired small round knobs on posterodorsal margin. Last pedigerous somite produced into triangular processes on posterior corners. Urosome of 4 free somites; genital double-somite with minute dorsolateral spinules; paired gonopores covered by broad genital operculum bearing paired posterodistal sensillae; each somite except anal somite dorsally serrated on posterior margin. Caudal rami bearing six setae, symmetrical. Appendages except antennules and fifth legs similar to female of *P. poplesia*.

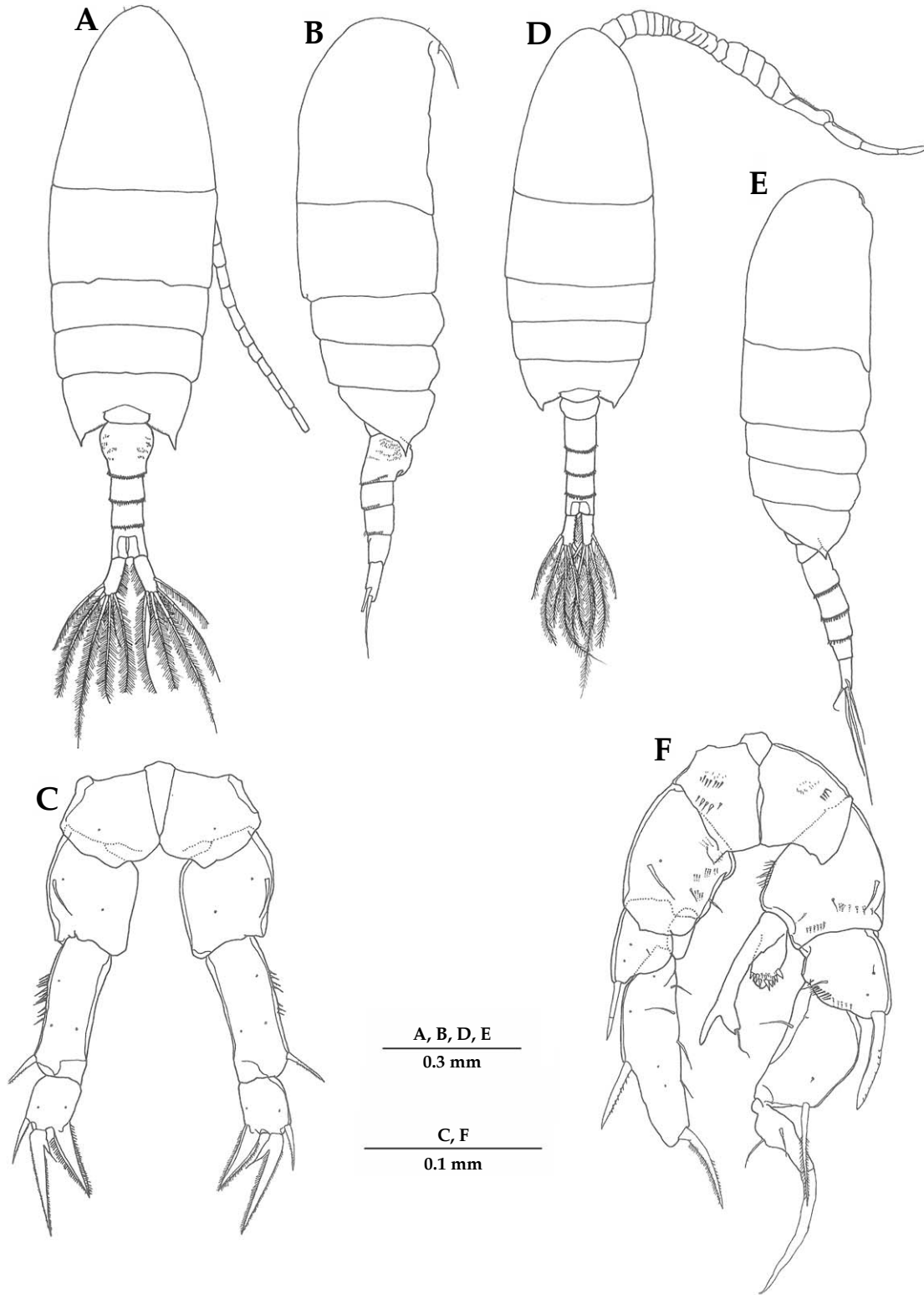


Fig. 85. *Pseudodiaptomus nihonkaiensis*. Female: A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg. Male: D. habitus, dorsal view; E. habitus, lateral view; F. fifth leg (cited from Soh et al., 2001a).

Male: Body length 1.10–1.28 mm. Prosome/urosome ca. 2.46. Segmentation of prosome as in female. Dorsal knobs on first pedigerous somite less pronounced than in female. Urosome of 5 free somites; second to fourth urosomites dorsoposteriorly serrate. Fifth leg asymmetrical; intercoxal sclerite and both coxae nearly fused, with posterior spinule rows; basis with posterior seta. Endopod of right leg bifurcate with short lamelliform process with distal spinules, and long process with spinules on thickened process; exopod 3-segment; first segment with minute inner seta and serrated outer spine, third segment bearing two minute setae and medially curved terminal spine. Left leg with endopod represented by small lamelliform plate; first exopodal segment with outer spine, second exopod segment bearing strong outer spine, medially directed terminal spine, and four small inner setae (Soh et al., 2001a).

DISTRIBUTION: High-salinity waters more than 33 psu. in northeastern Asian waters.

KOREA: JN, JJ.

SPECIMEN EXAMINED: (Hallim beach, Jeju-do: 10.iii.1998).

ECOLOGY: This species occurs predominantly in the coastal waters of Jeju.

REMARKS: *Pseudodiaptomus nihonkaiensis* is included in the *Ramosus* group and has a single egg-sac. It occurs mostly in marine habitats.

Family Temoridae Giesbrecht, 1891

Jul-ja-no-beol-re-gwa (줄자노벌레과)

Cephalosome and first pedigerous separate, fourth and fifth pedigerous somites separate. Postero-lateral margins of prosome rounded or with expanded wing-like processes. Urosome typically of 3 free somites in female; genital apparatus comprising common genital aperture located medially on ventral surface of genital double-somite. Genital operculum with elaborate ornamentation in some species. Urosome of 5 free somites in male. Single genital aperture located ventrolaterally on left posterior rim of genital somite. Male urosomite often with asymmetrical processes, as in *Epischura*. Caudal rami often elongate, armed with up to 6 setae. Rostrum divided into small rostral filaments or absent. Naupliar eye present. Antennule 24 or 25-segmented in female, geniculate on right side only in males. Antenna biramous, with separate coxa and basis: endopod 2-segmented or with first endopodal segment and basis fused to form allobasis, as in *Epischura baikalensis* Sars; compound distal segment bilobed. Mandible with well developed coxal gnathobase and distal palp; endopod 2-segmented or with proximal segment fused to basis; exopod 5-segmented. Maxillule with well developed praecoxal arthrite bearing about 12 to 15 elements; coxa with endite bearing 2 to 4 setae and distal group of 3 to 5 setae representing distal endite; endopod fused to basis proximally, only distal segment defined; setation formula 3+4, or reduced; exopod 1-segmented. Maxilla 7-segmented; praecoxa and coxa separate; basis with 1 claw-like element plus 1, 2 or 3 setae; free endopod 4-segmented. Maxillary setation often reduced. Maxilliped 7-segmented, with syn-coxa, basis, and free endopod 5-segmented.

Swimming leg 1 to 4 biramous, typically with 3-segmented exopods, endopods typically 1 or 2-segmented. Inner seta on basis of leg 1 absent. Spine and setal formula typically as follows:

	coxa	basis	exopodal segments	endopodal segments
leg 1	0-0	0-0	I-1;I-1;II,I,4	0-1;1,2,3 or 0,2,3/4
leg 2	0-1	0-0	I-1;I-1;III,I,5	0-3;1,2,3
leg 3	0-1	0-0	I-1;I-1;III,I,5	0-3;1,2,3
leg 4	0-1	0-0	I-1;I-1;III,I,5	0-3;1,2,2

Setation sometimes reduced, often by loss of outer margin spine from third exopodal segments, and by loss of outer margin element from distal endopodal segment.

Female fifth leg with coxae and intercoxal sclerite forming transverse plate; basis distinct, with outer seta. Endopod absent. Free exopod 2-segmented; first segment double (formed by fusion of first and second exopodal segments) and armed with 1 or 2 outer spines, inner margin produced into spinous process in some genera; distal exopodal segment armed with up to 2 outer margin spines and distal element, plus, in some genera, several spinous processes along inner margin. Male fifth legs asymmetrical; carried on bilobed transverse plate formed by fusion of coxae and intercoxal sclerite; right leg comprising basis with outer seta and 2 or 3-segmented exopod. Endopod absent. Exopod sometimes short, sometimes forming long curved subchela; segment typically with small marginal spines. Left leg either subchelate or chelate, with exopod opposing curved digitiform process (possibly representing endopod) on medial margin of basis. Basis distinct. Exopod 2-segmented, distal segment often distally expanded bearing spinous processes: reduced setation elements usually present (Boxshall and Halsey, 2004).

GENERA 4 (2 in Korea), species 35 (4 in Korea).

DISTRIBUTION: Coastal waters (*Temora*), estuarine and brackish waters (*Eurytemora*) and freshwaters (*Epischura* and *Heterocope*) worldwide.

REMARKS: The Temoridae includes 4 genera: *Epischura* Forbes, *Eurytemora* Giesbrecht, *Heterocope* Sars, *Temora* Baird. In Korean waters *Eurytemora* are found in estuarine and brackish waters, while *Temora* is found in neritic or coastal waters.

Key to the genera of family Temoridae

1. Female leg 5 with proximal exopodal segment produced medially into spinous process, distal segment armed with 2 setae; male leg 5 without inner process on basis of left leg *Eurytemora*
 – Female leg 5 without inner spinous process on proximal exopodal segment; male leg 5 typically with inner process on basis of left leg 2
2. Legs 1 to 4 with 2-segmented endopods *Temora*
 – Legs 1 to 4 with 1-segmented endopods 3
3. Male urosome symmetrical; female fifth leg terminating in long apical spine *Heterocope*
 – Male urosome usually strongly asymmetrical; female fifth leg without long apical spine, often with 2 short spinous processes *Epischura*
 (Boxshall and Halsey, 2004)

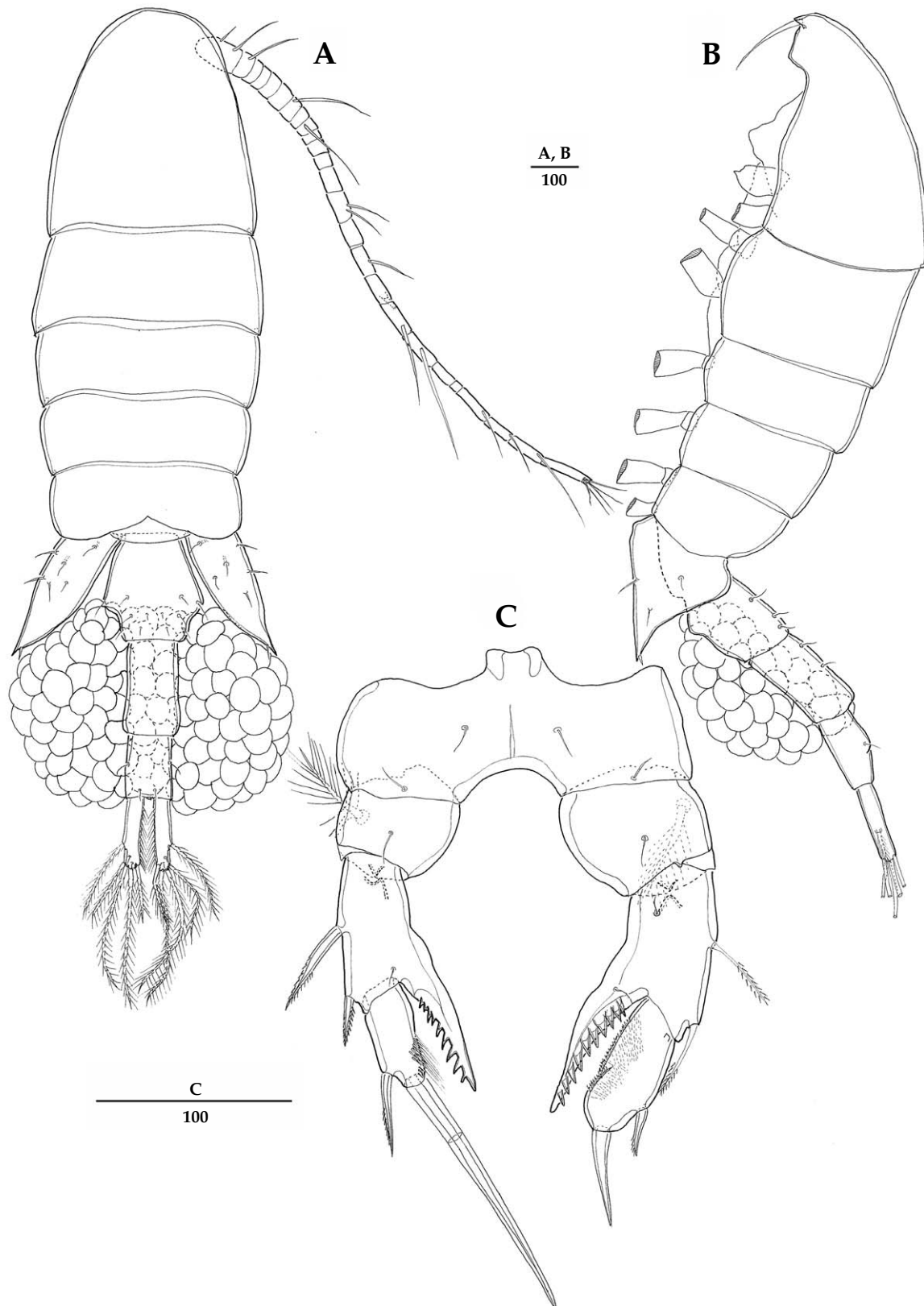


Fig. 86. *Eurytemora pacifica*, female. A. habitus, dorsal view; B. habitus lateral view; C. fifth leg.

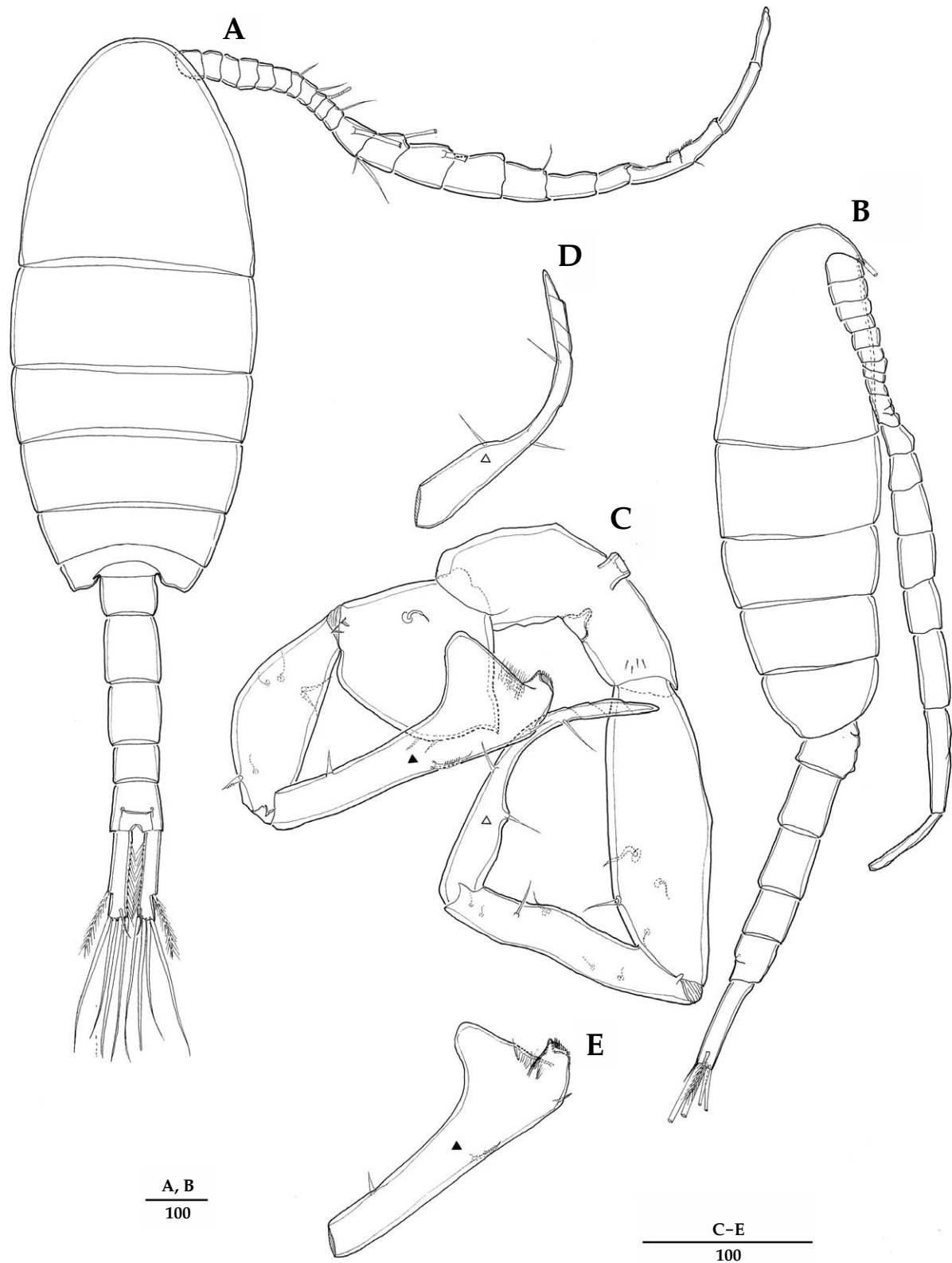


Fig. 87. *Eurytemora pacifica*, male: A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg; D. distal exopodal segment of right fifth leg; E. distal exopodal segment of left fifth leg.

Genus *Eurytemora* Giesbrecht, 1881

Neol-jap-i-ppul-no-beol-re-sok (넙잡이빨노벌레속)

Cephalosome and first pedigerous somite separate; fourth and fifth pedigerous somites separate. Last pedigerous somite posterior corner rounded in male, with large pterygoid process in female. Rostrum with two small filaments. Urosome of 3 free somites in female, comprising genital double-somite and other 2 somites; of 5 free somites in male. Caudal rami symmetrical. Antennule of female 24-segmented and symmetrical; right antennule of male geniculate, left normal. First to fourth legs with 3-segmented exopods; endopod of first leg 1-segmented, endopod of second to fourth legs 2-segmented. Female fifth legs symmetrical or asymmetrical, with 2-segmented exopods. Male fifth legs with 2 or 3-segmented exopods.

SPECIES 16 (2 in Korea).

DISTRIBUTION: Brackish and fresh waters.

47. *Eurytemora pacifica* Sato, 1913 (Figs. 86–88)

Neol-jap-i-ppul-no-beol-re (넙잡이빨노벌레)

Eurytemora pacifica Sato, 1913, p. 34, figs. 87–89; Brodsky, 1950 (1967), p. 281, fig. 190; Chen and Zhang, 1965, p. 66, pl. 21; figs. 5–9; Kim, 1985, p. 83, pl. 25, figs. e–i; Yoo, 1995, p. 175, fig. 117; Chihara and Murano, 1997, p. 917, pl. 181; Dussart and Defaye, 2002, p. 58; Lee et al., 2007, p. 140, fig. 5.

Female: Body length 1.12–1.28 mm. Last pedigerous somite with characteristic pterygoid processes, almost as long as genital double-somite. Urosome of 3 free somites: genital double-somite expanded laterally, equal in length to second and third urosomites. Caudal rami not longer than third urosomite. Fifth legs asymmetrical, uniramous; endopod absent; exopod 2-segmented; first exopodal segment bearing two outer spines and one sharp denticulate inner process, distal segment armed with lateral spine and one long apical spine; distal segment of right leg larger than corresponding segment of left leg; apical spine of left leg much larger than that of right.

Male: Body length 1.03–1.12 mm. Last pedigerous somite without pterygoid processes. Urosome of 5 free somites. Caudal rami equal in length to two posterior urosomites. Fifth legs asymmetrical, uniramous; each

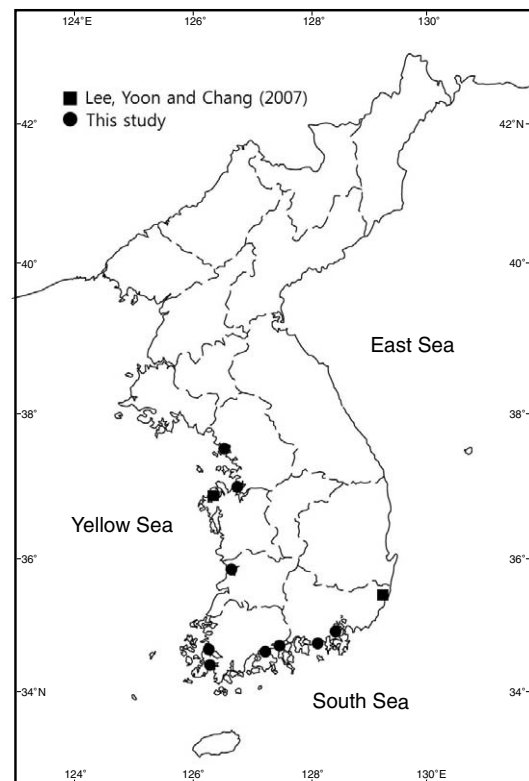


Fig. 88. Distribution of *Eurytemora pacifica*.

leg 4-segmented; distal exopodal segment of right leg elongate, slightly curved; that of left leg angular, very wide terminally, with rectangular process (Brodsky, 1950 (1967)).

DISTRIBUTION: East Sea (Sea of Japan), Arctic shores of Alaska, Bering Sea and Sea of Okhotsk.

KOREA: GW, GB, GN, JN, JB, CN, GG.

SPECIMEN EXAMINED: (Gamak bay, Jeollanam-do: 25.ii.2008).

ECOLOGY: In Korea, *Eurytemora pacifica* commonly occurs in neritic or brackish waters during November to May.

REMARKS: Specimens from Korean waters have a longer second urosomite in the female than described by Brodsky (1950 (1967)).

Genus *Temora* Baird, 1850

Jap-i-ppul-no-beol-re-sok (잡이빨노벌레속)

Cephalosome wider than pedigerous somites stout, rounded anteriorly, swollen dorsally. Rostrum with 2 thin filaments. Last pedigerous somite rounded or produced at posterior corner. Caudal rami furnished with short inner marginal hairs long, with 6 normal setae. Antennule 24-segmented in female; male right antennule 22-segmented, geniculate. First leg with 3-segmented exopod and 2-segmented endopod in both sexes. Second to fourth legs with 3-segmented exopod and 2-segmented endopod in male, with 2-segmented exopod and 2-segmented endopod in female. Fifth leg uniramous in both sexes; female fifth leg with 1-segmented exopod; male fifth leg with 2-segmented exopod in left leg and with 1-segmented exopod in right one; left basal segment expanded, protruded in inner distal margin.

SPECIES: 5 (3 in Korea).

DISTRIBUTION: Coastal waters of tropical to temperate regions worldwide.

Key to the species of genus *Temora*

1. Posterior corner of last pedigerous somite rounded *T. turbinata*
 – Posterior corner of last pedigerous somite with pointed process 2
2. Cephalosome without lateral pterygoidal process at posterior ends *T. discaudatus*
 – Cephalosome with lateral pterygoidal process at posterior ends *T. stylifera*

48. *Temora discaudata* Giesbrecht, 1889 (Figs. 89, 90)

Bi-kko-ri-jap-i-ppul-no-beol-re (비꼬리잡이빨노벌레)

Diaptomus dubius: Lubbock, 1856.

Temora discaudata Giesbrecht, 1889, p. 814 (cited from Giesbrecht, 1892); 1892, p. 328, rem.; Thompson, 1888, p. 142; Giesbrecht and Schmeil, 1898, p. 101, rem.; Brady, 1914, p. 25, figs. m, rem.); Vervoort, 1965, p. 101. A. Scott, 1909, p. 118, rem.; Mori, 1937 (1964), p. 65, figs. 9–12; Chen and Zhang, 1965,

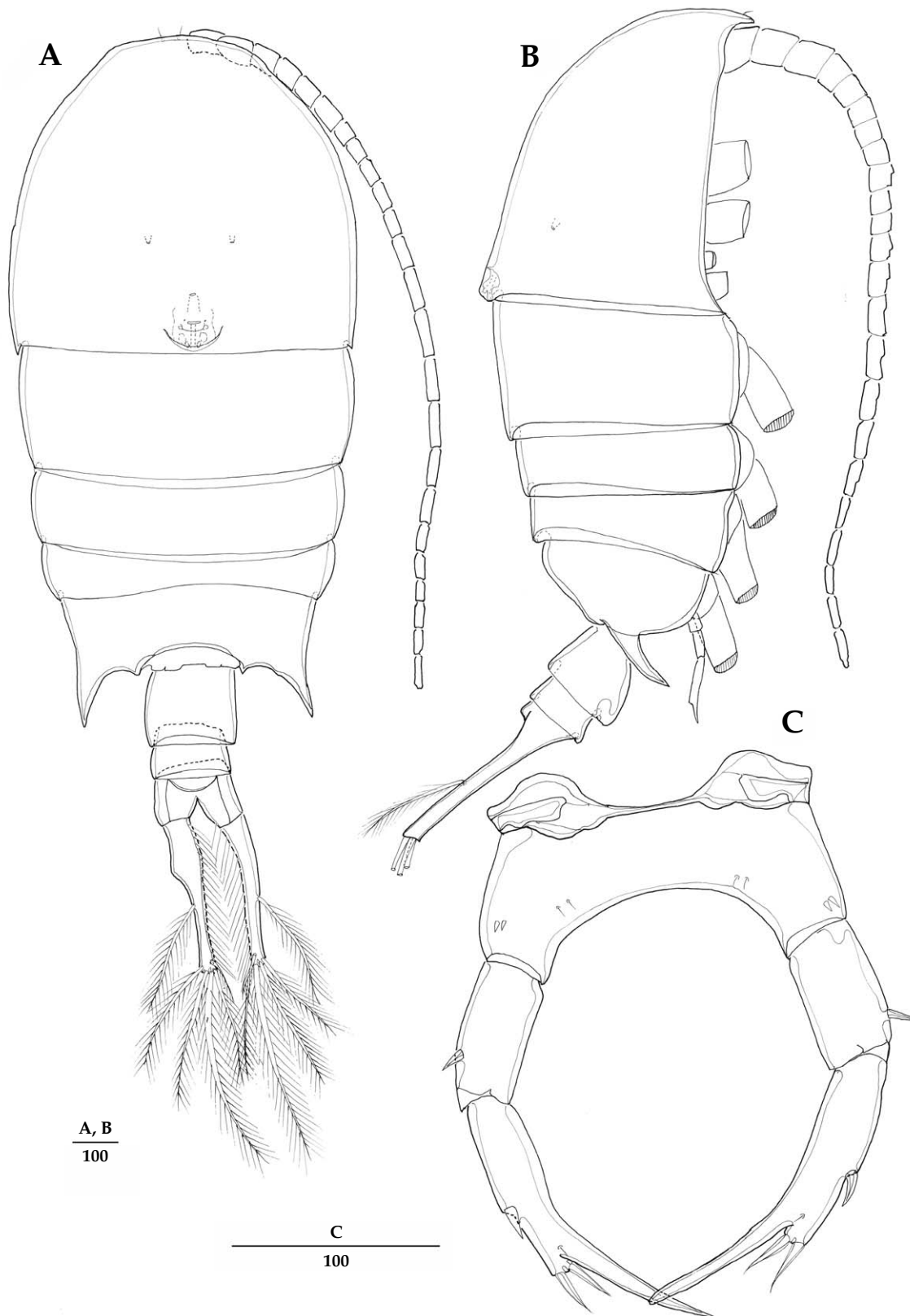


Fig. 89. *Temora discaudata*, female. A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg.

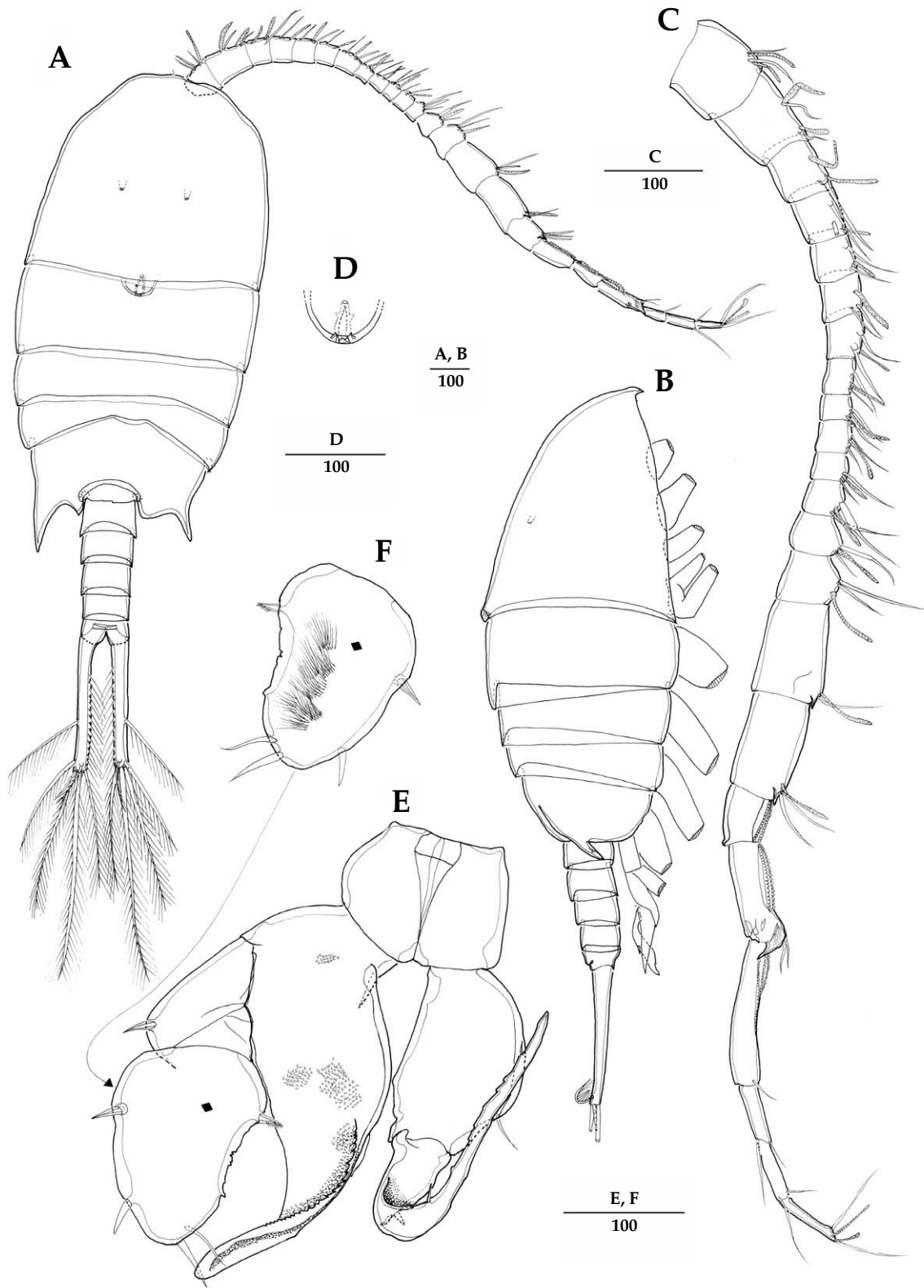


Fig. 90. *Temora discaudata*, male. A. habitus, dorsal view; B. habitus, lateral view; C. right antennule; D. dorsal hump; E. fifth leg; F. exopodal segment of left fifth leg.

p. 65, figs. f, m; Vervoort, 1965, p. 102, rem.; Kim, 1985, p. 80, pl. 24, figs. e–h; Chihara and Murano, 1997, p. 916, pl. 180, figs. f, m; Bradford-Grieve, 1999b, p. 158, figs. 111, 182, 193.

Female: Body length 1.70–2.00 mm. Cephalosome and first pedigerous somite separate, fourth and fifth pedigerous somites completely fused. Last pedigerous somite produced posteriorly. Urosome of 3 free somites; genital double-somite longest and widest among urosomites; anal somite asymmetrical. Caudal rami asymmetrical, tapering distally; left ramus wider proximally. Fifth leg symmetrical: basis with short outer spine; exopod 1-segmented, with 1 outer spine, 2 terminal spine, and strong terminal process.

Male: Body length 1.70–1.90 mm. General features as in female with following additional characters. Caudal rami long, symmetrical. Basal segment of left fifth leg plate-shape, distal part bent posteriorly; first exopod segment with short outer seta, distal segment broad, with 2 outer spines, 1 subterminal spine, 1 subterminal small seta, and 1 short inner spine. Right exopod of fifth leg 1-segmented, hook-like, and sharply bent back against outside of leg.

DISTRIBUTION: Widespread in the temperate to tropical Indo-Pacific, Mediterranean Sea, Red Sea, and North Indian Ocean (Greenwood, 1978).

KOREA: JN.

SPECIMEN EXAMINED: (Geunho Island, Jeollanam-do: 1.ix.2008).

ECOLOGY: *Temora discaudata* is commonly found in the southern waters of Korea during warm seasons, but very rarely in embayments and western coastal waters (Kim, 1985).

REMARKS: This species appears to have been confused with *T. stylifera* (Greenwood 1978; Bradford-Grieve, 1999).

49. *Temora turbinata* (Dana, 1849) (Figs. 91, 92)

Won-ppul-jap-i-ppul-no-beol-re (원뿔잡이뿔노벌레)

Calanus turbinatus Dana, 1849, p. 12 (cited from Giesbrecht, 1892).

Temora turbinata: Giesbrecht, 1892, p. 329, 338, 775, figs. f, m; Giesbrecht and Schmeil, 1898, p. 101, rem. f, m; A. Scott, 1909, p. 118, rem.; Mori, 1929, p. 175, fig. f; Wilson, 1932a, p. 106, figs. f, m; Mori, 1937 (1964), p. 64, figs. f, m; Dakin and Colefax, 1940, p. 93, figs. f, m; Tanaka, 1960, p. 49; 1963, p. 13, rem. f, m; Kasturirangan, 1963, p. 40, figs. f, m; Chen and Zhang, 1965, p. 64, figs. f, m; Gonzalez and Bowman, 1965, p. 249, figs. f, m, rem.; Marques, 1966, p. 5, figs. f, m; Owre and Foyo, 1967, p. 69, figs. f, m; Corral Estrada, 1970, p. 170, figs. f, m; Bradford, 1977, p. 131, figs. f, m, rem.; Zheng Zhong et al., 1984 (1989), p. 241, figs. f, m; Koga, 1984, p. 43, figs. f, m, juv.; Chihara and Murano, 1997, p. 916, pl. 180, f, m; Bradford-Grieve et al., 1999, pp. 885, 954, figs. f, m; Bradford-Grieve, 1999, p. 158, figs. f, m, rem., figs. 182, 193; Conway et al., 2003, p. 139, figs. f, m, rem.

Temora longicornis: T. Scott, 1894b, p. 76.

Temora tenuicauda Brady, 1899.

Temora africana Brady, 1914, p. 3.

Female: Body length 1.00–1.61 mm. Cephalosome broad, rounded anteriorly. Cephalosome and first pedigerous somite separate; fourth and fifth pedigerous somites completely fused. Last pedi-

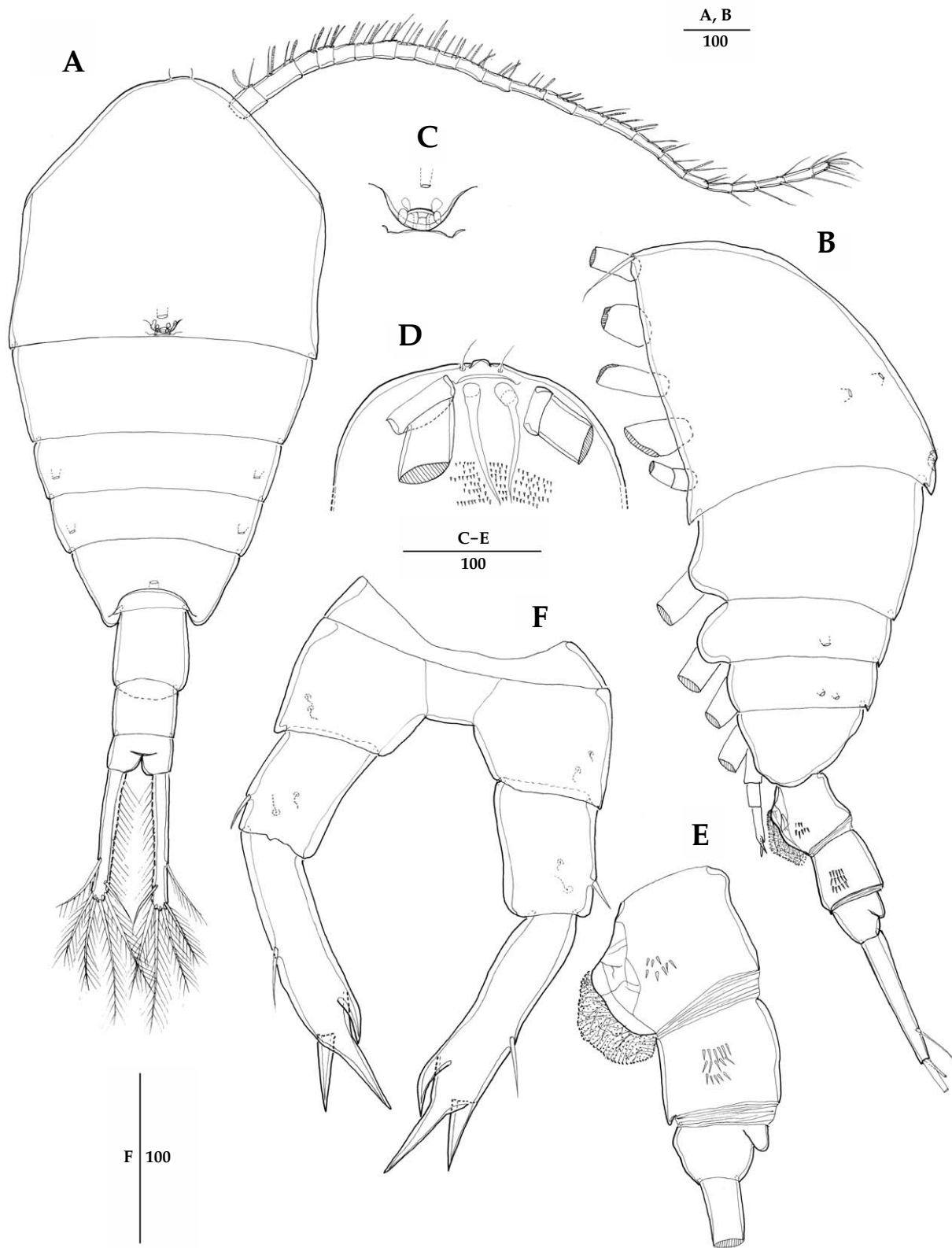


Fig. 91. *Temora turbinata*, female. A. habitus, dorsal view; B. habitus, lateral view; C. integral organ; D. rostrum, ventral view; E. urosome, lateral view; F. fifth leg.

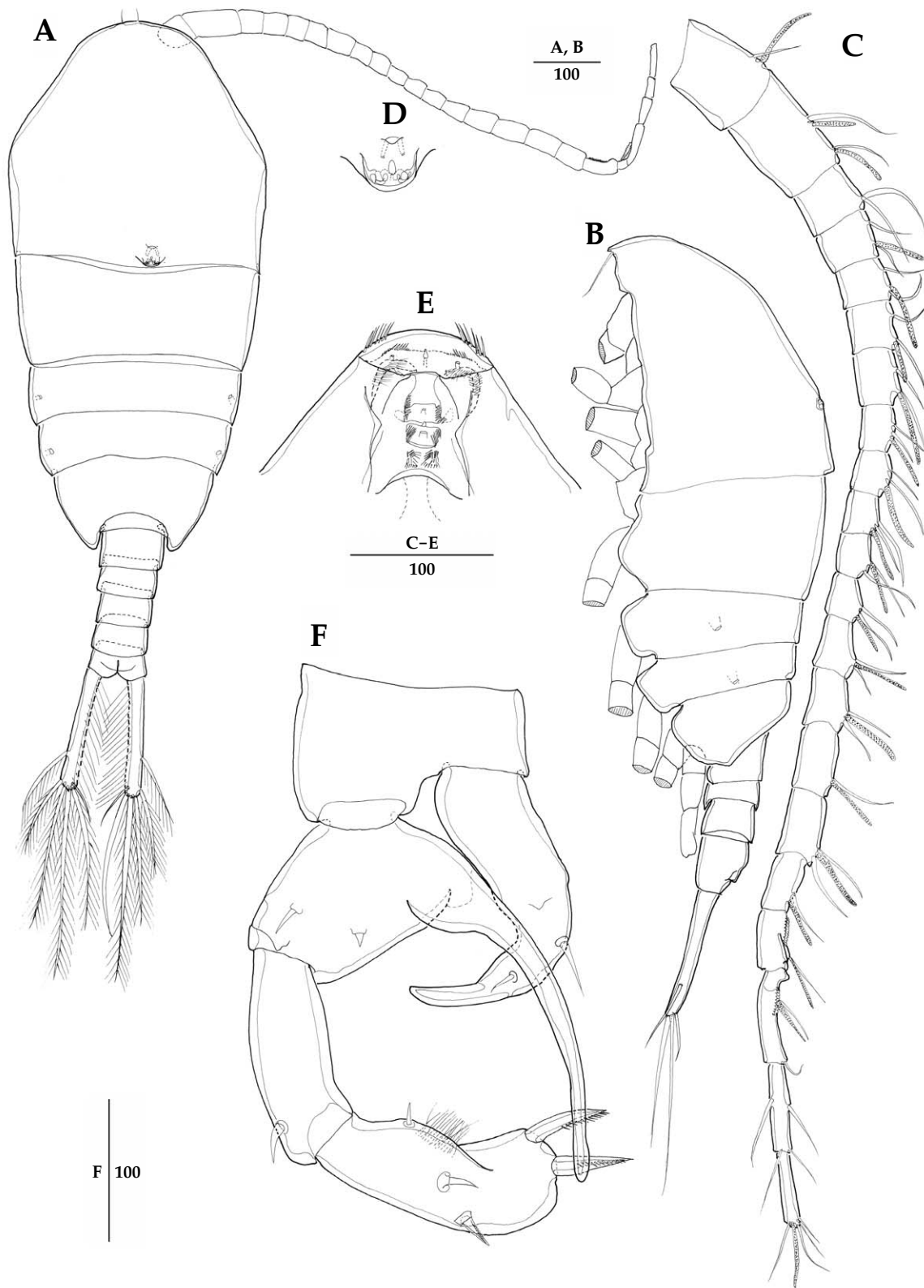


Fig. 92. *Temora turbinata*, male. A. habitus, dorsal view; B. habitus, lateral view; C. right antennule; D. dorsal hump; E. rostrum, ventral view; F. fifth leg.

gerous somite symmetrical, narrowly rounded, slightly produced posteriorly. Genital double-somite longest, anal somite shortest; genital double-somite and second urosomite with lateromedially tuft of setules. Caudal rami nearly symmetrical, 8 times longer than wide. Antennule extending to posterior border of last pedigerous somite. Fifth legs uniramous: basis with 1 outer seta; exopod 1-segmented, with 1 outer seta, 1 terminal spine, and 2 unequal terminal processes.

Male: Body length 0.93–1.56 mm. General shape of body as in female. Urosome of 5 free somites. Right antennule geniculate. Fifth leg uniramous; basal segment of left leg with long inner process and tiny medial seta and spine; exopod 2-segmented, first segment with 1 outer seta, distal segment with 2 outer spines medially, 2 terminal setae and 1 inner spine. Right fifth leg short, with 2 setae.

DISTRIBUTION: Tropical to temperate regions worldwide.

KOREA: GN, JN.

SPECIMEN EXAMINED: (Geumho Island, Jeollanam-do: 1.xi.2008).

ECOLOGY: *Temora turbinata* commonly occurs in embayments of the southern coast of Korea during summer and fall.

REMARKS: *Temora turbinata* is much larger at the cooler end of its distributional range but appears not to differ morphologically from those from tropical waters (Bradford, 1977).

Family Tortanidae Sars, 1902

Bu-pun-gin-no-beol-re-gwa (부푼긴노벌레과)

Cephalosome and first pedigerous somite separate; fourth and fifth pedigerous somites completely or incompletely fused. Posterolateral coners of prosome often developed into asymmetrical lobes. Urosome of 2 or 3 free somites in female; of 5 free somites in male. *Caudal rami* often fused to anal somite, sometimes asymmetrical, with up to 6 setae. Rostrum weakly developed. Naupliar eye conspicuous. Antennules 12 to 15 segmented in female; geniculate on right side in male. Antennary endopod longer than exopod. Mandible with well-developed gnathobase and distal palp. Maxillule 2-segmented. Maxilla protopod comprising separate praecoxa, coxa, and basis. Maxilliped reduced.

Spine and setal formula of swimming legs 1 to 4 as follows:

	coxa	basis	exopodal segments	endopodal segments
leg 1	0-1	0-0	I-1;0-1;II,I,4	0-3;1,2,3
leg 2	0-1	0-0	I-1;I-1;III,I,5	0-3;1/2,2,3/4
leg 3	0-1	0-0	I-1;I-1;III,I,5	0-3;1/2,2,3/4
leg 4	0-1	1-0	I-1;I-1;III,I,5	0-3;1,2,3

Female fifth legs with coxae and intercoxal sclerite completely fused; each leg uniramous, with 2 free segments. Male fifth legs asymmetrical; right leg 3-segmented, third segment forming subchela; left leg 4-segmented.

GENERA 1 (1 in Korea), species 32 (5 in Korea).

DISTRIBUTION: Coastal waters in tropical or temperate regions.

REMARKS: This family comprises only one genus *Tortanus*.

Genus *Tortanus* Giesbrecht, 1898

Bu-pun-gin-no-beol-re-sok (부푼긴노벌레속)

General features are same as family description.

SPECIES 32 (6 in Korea).

DISTRIBUTION: Estuaries and coastal waters of Indo-Pacific region.

Key to the species of genus *Tortanus*

1. Fourth and fifth pedigerous somites separate; left exopod of male fifth leg 2 times longer than right one *T. forcipatus*
- Fourth and fifth pedigerous somites fused 2
2. Two pointed lateral processes on third free urosomite of female present; basal segment of male right fifth leg with long strong process at inner proximal part *T. spinicaudatus*
- Single dorsolateral process on third free urosomite in female present; basal segment of male right fifth leg without process at inner proximal part; second segment of male right fifth leg larger and relatively wider *T. dextrilobatus*
- Dorsolateral process on third free urosomite in female absent; basal segment of male right fifth leg without process at inner proximal part; second segment of male right fifth leg shorter and relatively narrower *T. derjugini*

50. *Tortanus derjugini* Smirnov, 1935 (Figs. 93–95)

Deu-ru-jin-bu-pun-gin-no-beol-re (드루진부푼긴노벌레)

Tortanus derjugini Smirnov, 1935, p. 45, figs. 7–12.

Tortanus derjugini: Brodsky, 1950 (1967), p. 431, fig. 305; Chen and Zhang, 1965, pp. 117, 130, figs. f, m; Ohtsuka, 1992a (p. 264); Ohtsuka et al., 1992, p. 119, fig. m; Ohtsuka et al., 1995, p. 147, redescr., figs. f, m; Chihara and Murano, 1997, p. 925, pl. 185; Ohtsuka and Reid, 1998, pp. 788, 796, fig. m; Soh et al., 2001b, p. 1158, figs. f, m juv.

Female: Body robust, posterior cephalosome widest. Body length ranging from 1.74–1.79 mm. Prosome about 2.4 times as long as urosome. Eye large, reddish in color. Cephalosome with dorsal transverse medial groove and dorsoposterior median protuberance. Fourth and fifth pedigerous somites almost completely fused but suture line visible in lateral view, extended posterolaterally into triangular processes, distally processes slightly asymmetrical?. Urosome of 3 free somites; genital double-somite as long as wide; genital operculum located ventromedially, semicircular with mid-posterior margin slightly concave; second urosomite with posterodorsal protuberance on right;

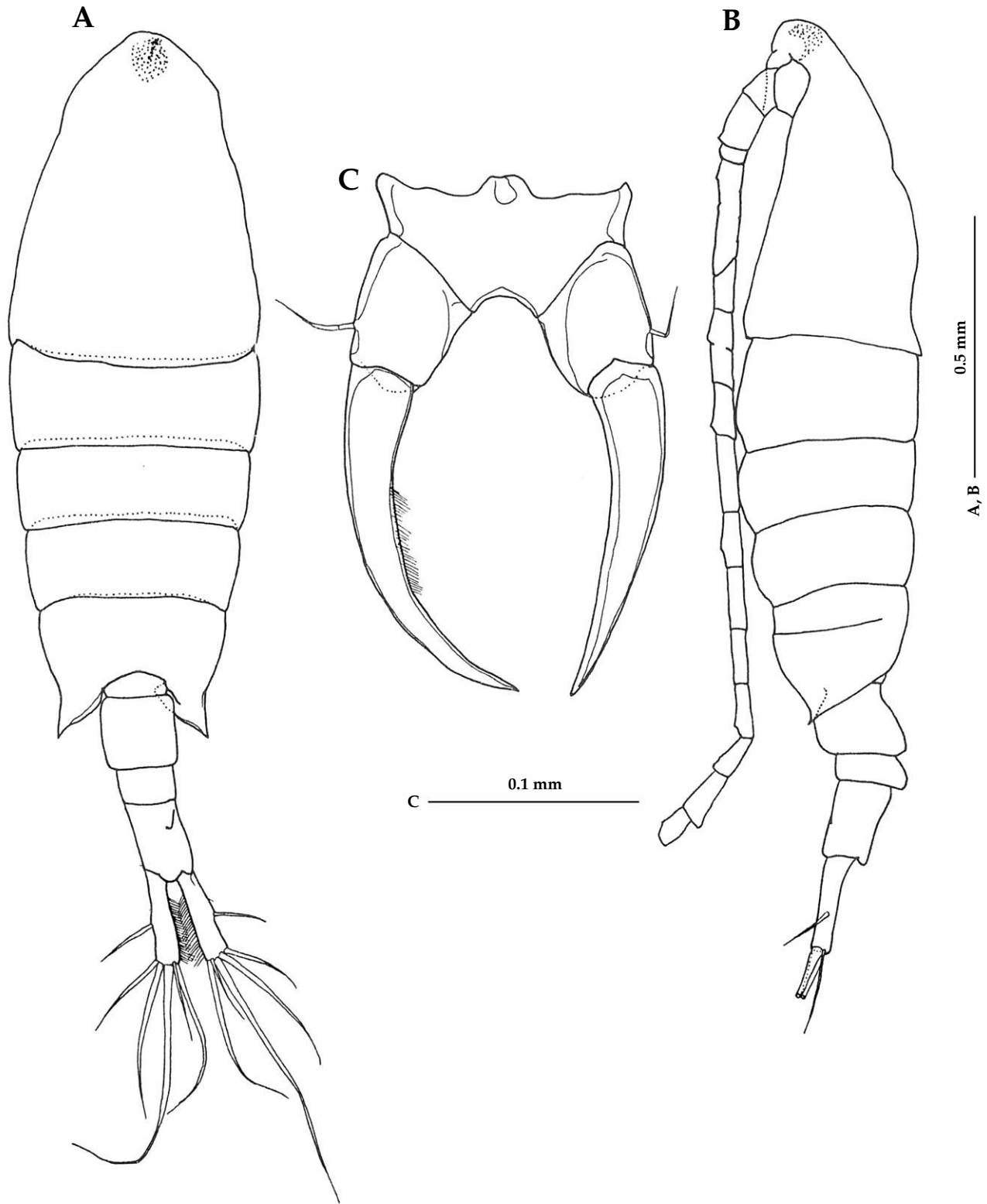


Fig. 93. *Tortanus derjugini*, female. A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg (cited from Soh et al., 2001b).

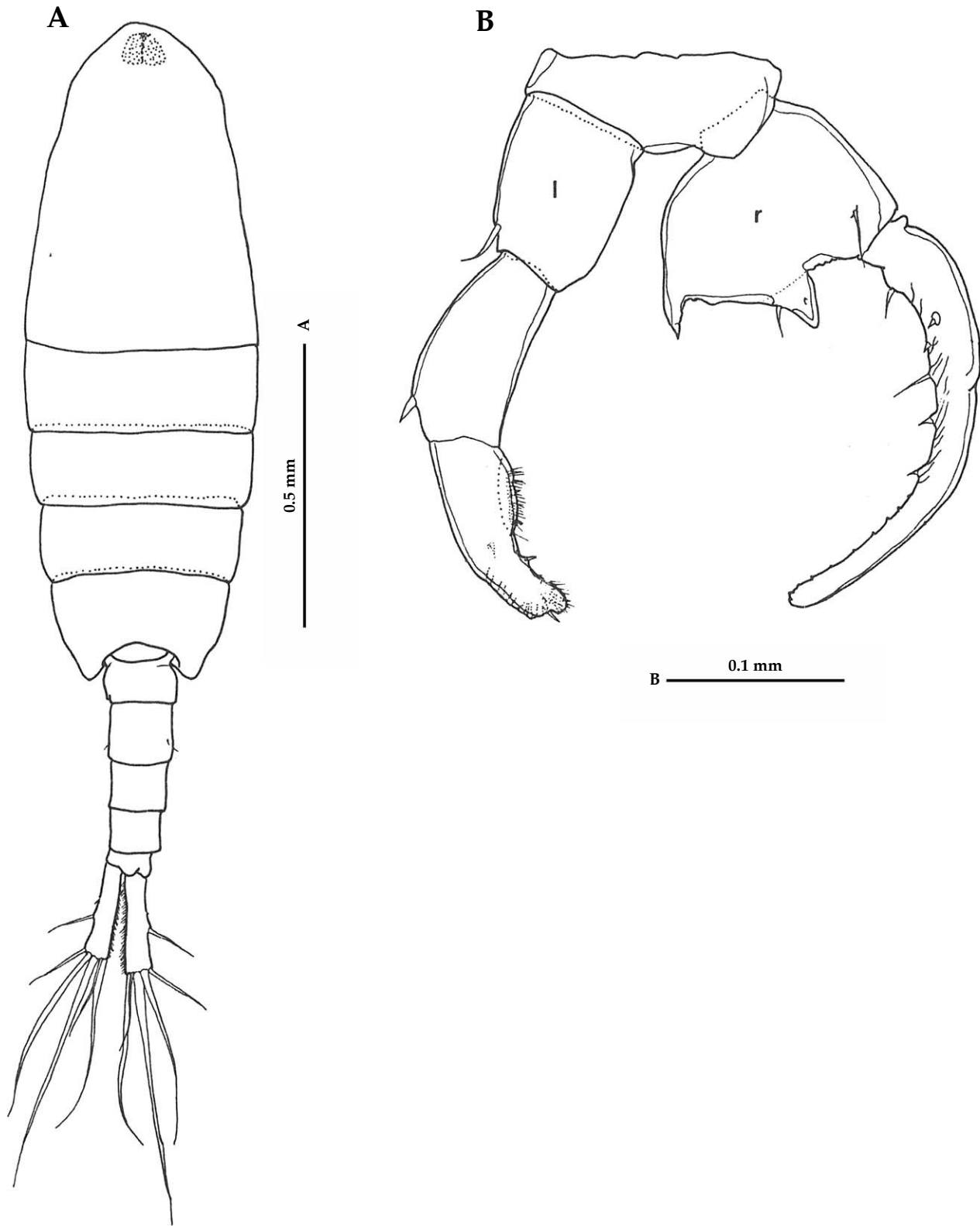


Fig. 94. *Tortanus derjugini*, male. A. habitus, dorsal view; B. fifth leg (cited from Soh et al., 2001b).

third urosomite with large, irregular dorsolateral process on anterior right side; anal somite incompletely fused with left caudal ramus and almost completely with right ramus; right caudal ramus slightly longer than than on left.

Male: Body length ranging from 1.53–1.76 mm. Prosome ca. 1.7 times as long as urosome. Fourth and fifth pedigerous somites fused; posterior corner of fifth pedigerous somite produced posteriorly into blunt process. Urosome of 4 free somites; genital somite with opening on left; second urosomite longest, with 2 relatively stout sensillae ventrolaterally; anal somite separate from caudal rami; right caudal ramus slightly longer than left; posterior half of inner borders of caudal rami fringed with hairs (Soh et al., 2001b).

DISTRIBUTION: Estuaries of Korea and China, Ariake Sea of Japan.

KOREA: JN, JB, GG.

SPECIMEN EXAMINED: (Mankyung-Dongjin estuary, Jeollabuk-do: 20.x.2004), (Seomjin River estuary, Jeollanam-do: 10.vi.2005).

ECOLOGY: This species commonly occurs in warm seasons in estuaries of the Yellow Sea and rarely in estuaries of the South Sea.

REMARKS: *Tortanus derjugini* is closely related to *T. dextrilobatus*, but it is without a process on the third urosomite. This species is endemic in northeast Asian waters.

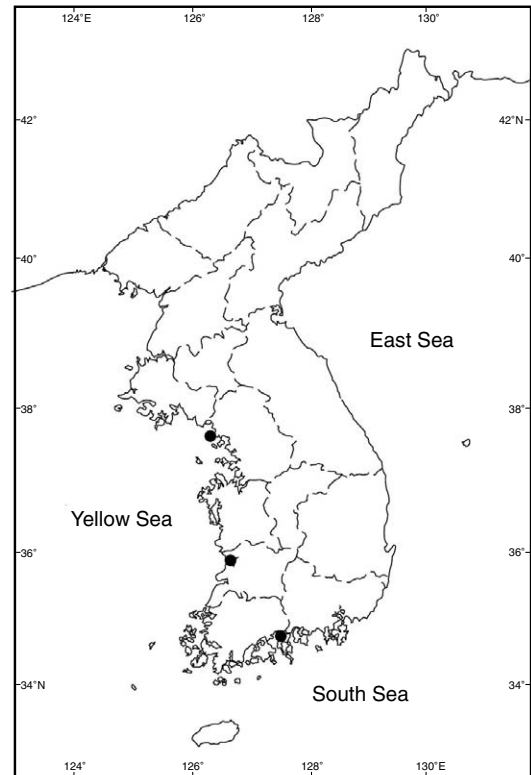


Fig. 95. Distribution of *Tortanus derjugini*.

51. *Tortanus dextrilobatus* Chen and Zhang, 1965 (Fig. 96)

Se-ip-bu-pun-gin-no-beol-re (세잎부푼긴노벌레)

Tortanus dextrilobatus Chen and Zhang, 1965, pp. 118, 128, figs. f, m; Ohtsuka et al., 1992, p. 112, figs. f, m, rem.; Ferrari and Ueda, 2005, p. 346, figs. juv, f, m.

Female: Body robust, widest at posterior end of cephalosome. Body length ranging from 1.74–1.79 mm. Prosome about 2.4 times as long as urosome. Eye large, reddish in color. Cephalosome with dorsal transverse groove medially and dorsal median protuberance posteriorly. Fourth and fifth pedigerous somites almost completely fused, but suture line visible in later view; posterior corners of fifth pedigerous somite produced posterolaterally into triangular process that are slightly asymmetrical?. Urosome of 3 free somites; genital double-somite as long as wide; genital operculum located ventromedially, semicircular with mid-posterior margin slightly concave; second urosomite with posterodorsal protuberance on right; third urosomite has large, irregular dorsolateral process on anterior right side; anal somite incompletely fused with left caudal ramus and almost completely

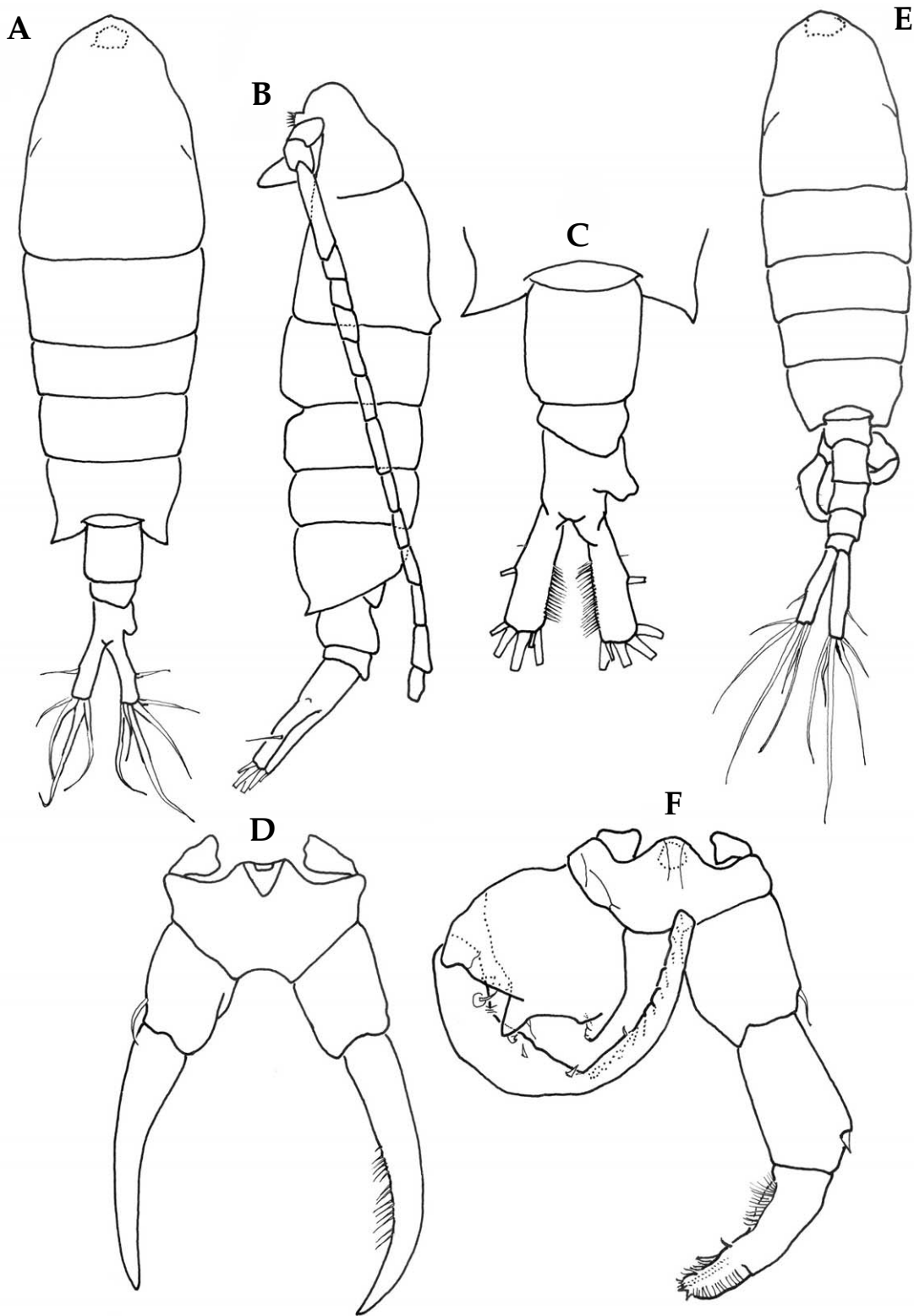


Fig. 96. *Tortanus dextrilobatus*. Female: A. habitus, dorsal view; B. habitus, lateral view; C. last pedigerous somite and urosome, dorsal view; D. fifth leg. Male: E. habitus, dorsal view; F. fifth leg (cited from Ohtsuka et al., 1992).

fused with right ramus; right caudal ramus slightly longer than left.

Male: Body much more slender than that of female. Body length ranging from 1.53–1.76 mm. Prosome ca. 1.7 times as long as urosome. Fourth and fifth pedigerous somites incompletely fused; posterior corner of fifth pedigerous somite produced posteriorly into blunt process. Urosome of 5 free somites; genital somite with opening on left; second urosomite longest, with 2 relatively stout sensilla ventrolaterally; anal somite separate from caudal rami; right caudal ramus slightly longer than left; posterior half of inner borders of caudal rami fringed with hairs (Ohtsuka et al., 1992).

DISTRIBUTION: Brackish waters of the South China Sea and the Seomjin River of Korea.

KOREA: JN.

SPECIMEN EXAMINED: (Seomjin River estuary, Jeollanam-do: 30.viii.2006).

ECOLOGY: This species is restricted to brackish waters of low salinity. Also, its distributional pattern is similar to that of other brackish calanoid copepods *Sinocalanus tenellus* in the Seomjin River, Korea and *S. sinensis* in the Ariake Sea, Japan.

REMARKS: *Tortanus dextrilobatus* is closely related to *T. derjugini*, but it is distinguished from it in the following characteristics: (1) definite development of dorsolateral process on third urosomal somite of female; (2) the chela of the right leg 5 of the male is smaller and the second segment is larger and relatively wider.

52. *Tortanus forcipatus* (Giesbrecht, 1889) (Fig. 97)

Jok-jib-ge-bu-pun-gin-no-beol-re (죽집게부폰긴노벌레)

Corynura forcipata Giesbrecht, 1889, p. 26 (cited from Giesbrecht, 1892); 1892, p. 525, pl. 31, figs. 2, 3, 5, 7, 9, 10, 12, pl. 42, figs. 34, 37.

Tortanus forcipatus: Giesbrecht and Schmeil, 1898, p. 158; Mori, 1937, p. 105, pl. 51, figs. 11–41; Wilson, 1950, p. 345; Chen and Zhang, 1965, p. 116, pl. 52, figs. 1–4; Kim, 1985, p. 145, pl. 49, figs. d–g.

Female: Body length 1.2–1.4 mm. Posterior prosome wider than pedigerous somites. Fourth and fifth pedigerous somites separated. Posterior corners of fifth pedigerous somite rounded. Anal somite and caudal rami fused. Anal somite with lamella on dorsal surface. Caudal rami asymmetrical, right ramus much wider and longer than left ramus. Fifth legs asymmetrical, left leg twice as long as right leg; three small outer spines on left terminal segment, two outer spines on right terminal segment.

Male: Body length 1.0–1.1 mm. Forehead narrower than that of female. Fourth and fifth pedigerous somites separated. Posterior corners of fifth pedigerous somite round. Caudal rami narrow, distally widened and long. Second and third segments of left fifth leg with outer spine, latter segment short. Distal segment of left fifth leg with two inner spines, one outer spine and short apical spine; second segment of right fifth leg triangular, terminal segment of same leg curved and with four inner spines, two of them distally located, remaining spines proximal.

DISTRIBUTION: Coastal waters of Korea and China, southeastern waters of Japan.

KOREA: GN, JN, GG.

SPECIMEN EXAMINED: (Gwangyang Bay, Jeollanam-do: 10.x.2005).

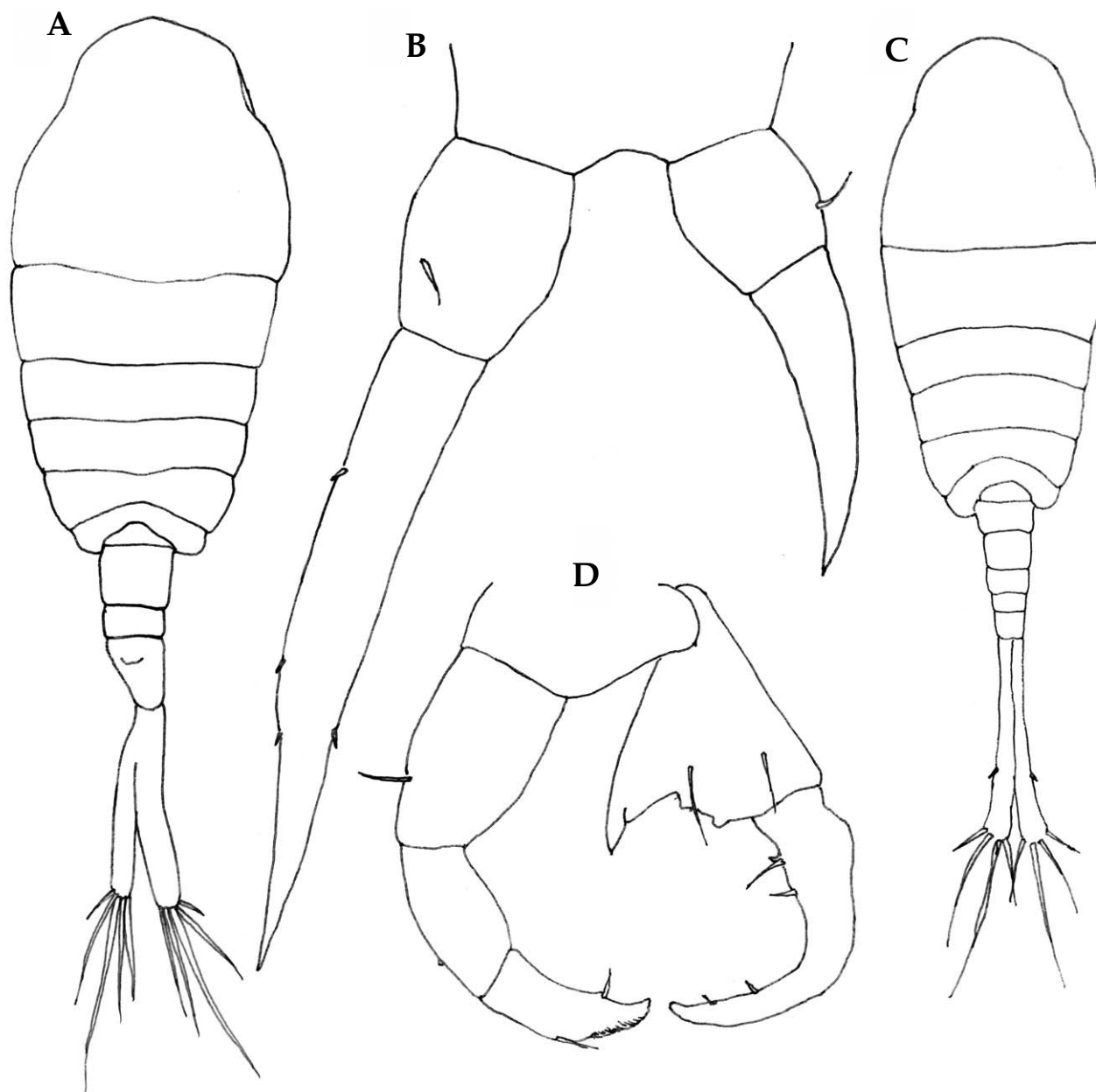


Fig. 97. *Tortanus forcipatus*. Female: A. habitus, dorsal view; B. fifth leg. Male: C. habitus, dorsal view; D. fifth leg.

ECOLOGY: This species is restricted to Far Eastern waters. In Korean waters it commonly occurs only in warm seasons.

REMARKS: *Tortanus forcipatus* is closely related to *T. gracilis*, but it is easily distinguished from the following characteristics: (1) the left exopod of the female fifth leg is 2 times longer than right exopod; (2) the medial process on the right distal exopod of the male fifth leg is absent.

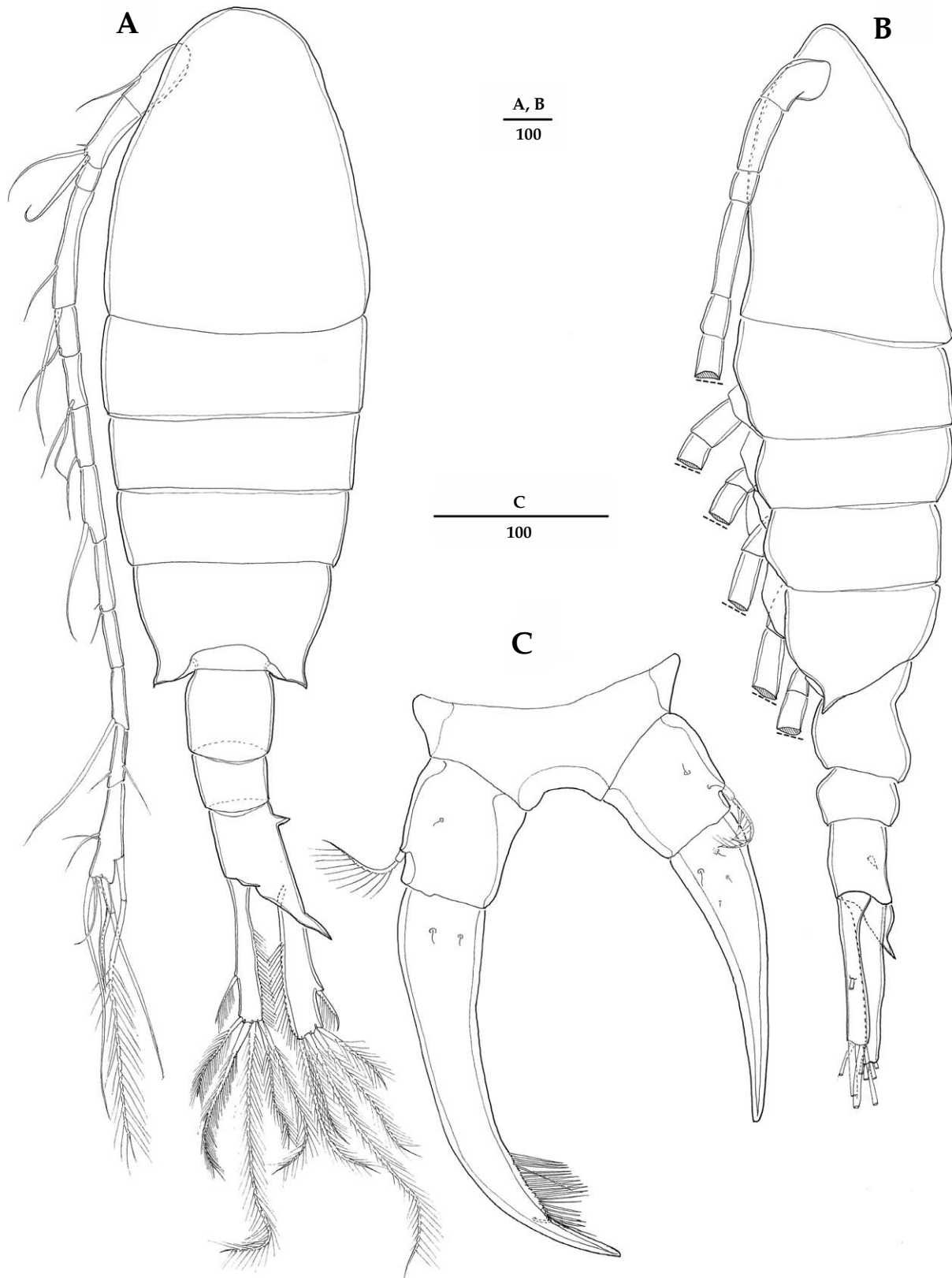


Fig. 98. *Tortanus spinicaudatus*, female. A. habitus, dorsal view; B. habitus, lateral view; C. fifth leg.

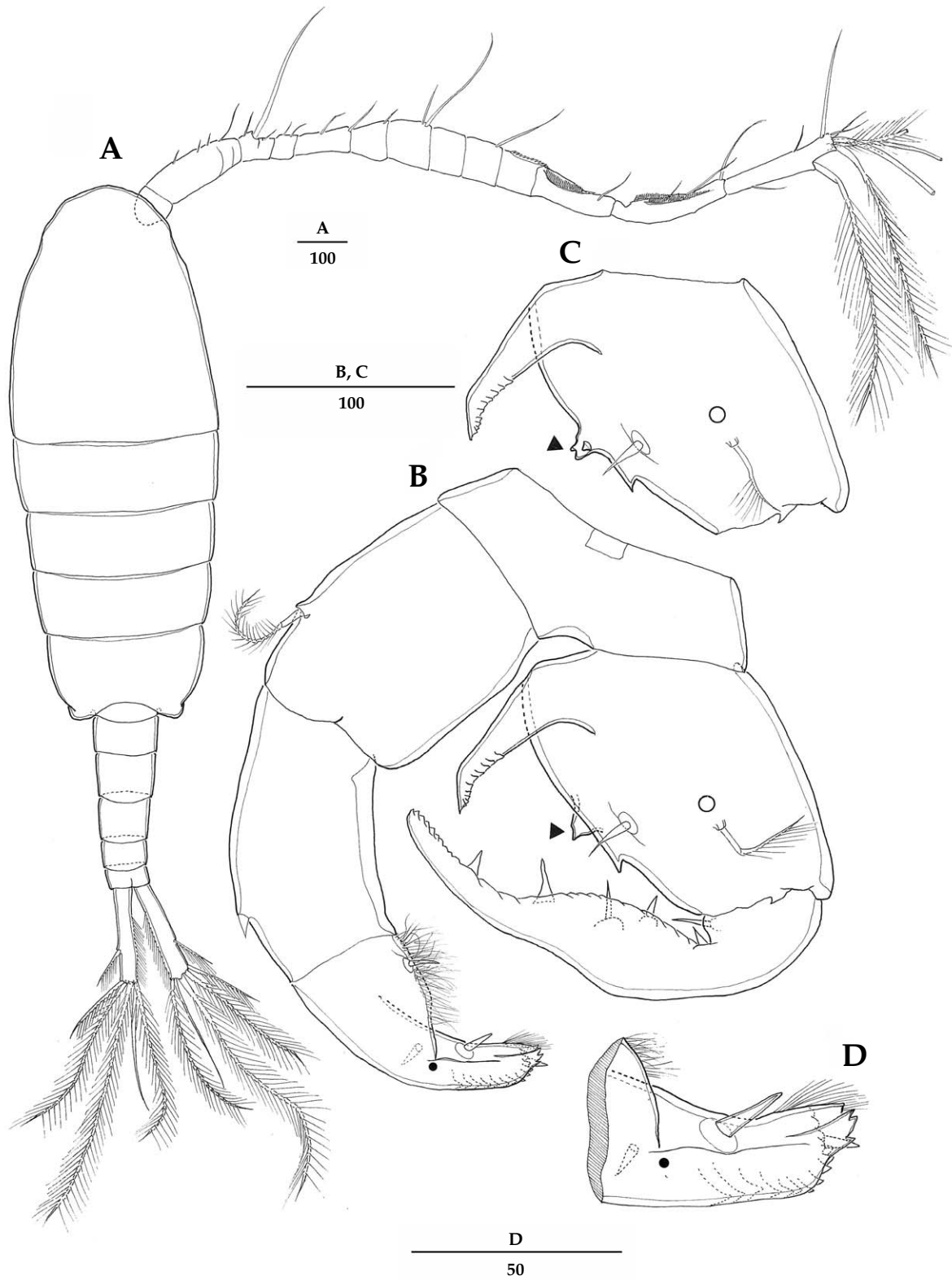


Fig. 99. *Tortanus spinicaudatus*, male. A. habitus, dorsal view; B. fifth leg; C. basis of right fifth leg; D. distal segment of left fifth leg.

53. *Tortanus spinicaudatus* Shen and Bai, 1956 (Figs. 98, 99)

Ga-si-bu-pun-gin-no-beol-re (가시부푼긴노벌레)

Tortanus spinicaudatus Shen and Bai, 1956, p. 197, pl. 6, figs. 47, 48; Chen and Zhang, 1965, p. 116, pl. 51, figs. 8–11; Kim, 1985, p. 146, pl. 50, figs. a–d.

Female: Body length 1.5–1.8 mm. Prosome elongated, oval; cephalosome anteriorly rounded; fourth and fifth pedigerous somites completely fused. Last pedigerous somite produced into short spine, nearly symmetrical. Right margin of anal somite with short proximal, posteriorly extending spine, with a short terminal spine. Caudal rami asymmetrical, right ramus much wider than left and extending well beyond left ramus. Left fifth leg larger than right, distal segment of each ramus without spine, but short hairs on part of inner margin.

Male: Body length 1.4–1.6 mm. Prosome as in female, but with rounded posterior corners. Urosome of 5 free somites, anal somite shortest. Caudal rami narrow and long, 8 times as long as wide, right ramus slightly longer than left. Distal segment of left fifth leg narrowing distally, with short inner spine on distal and proximal inner margins. Large digitiform process on inner margin of second segment of right fifth leg and with uneven outer margin; terminal segment with 6 inner spines, without outer spine, and terminal border uneven (Kim, 1985).

DISTRIBUTION: Common in coastal waters of Korea and China.

KOREA: JN.

SPECIMEN EXAMINED: (Muan bay, Jeollanam-do: 28.viii.2008).

ECOLOGY: *Tortanus spinicaudatus* is common in western coastal waters of Korea during summer and fall.

REMARKS: *Tortanus spinicaudatus* is easily distinguished from other species in that the anal somite is asymmetrical having a pointed process extending from the right distal margin.

Order Cyclopoida

Geom-mul-byeo-ruk-mok (검물벼룩목)

Family Oncaeidae Giesbrecht, 1892

Bol-rok-bae-geom-mul-byeo-ruk-gwa (볼록배검물벼룩과)

Body cyclopiform in both genders. Prosome comprising cephalosome and four free pedigerous somites. Urosome of 5 free somites in female and of 6 free somites in male. Paired genital apertures located dorsally on double-somite in female. Caudal rami comprising 6 setae and seta I absent. Rostrum small, ventrally directed. Antennule sexually dimorphic, 6-segmented in female, with long third segment; 4-segmented in male due to fusion of distal three segments of female. Antenna 3-segmented, subprehensile to prehensile. Labrum medially incised. Maxillule small, bilobed. Maxilla 2-segmented. Maxilliped with well-developed claw in both sexes. Swimming legs 1 to 4 with 3-segmented rami; endopods sometimes 2-segmented, as in *Archioncaea* (Heron and Bradford-

Grieve, 1995; Boxshall and Halsey, 2004).

GENERA 7 (2 in Korea), species ca. 103 (11 in Korea).

DISTRIBUTION: Mostly offshore worldwide.

Key to the genera of family Oncaeidae

1. Leg 5 bearing 3 setae; legs 1 to 4 with 2-segmented endopods *Archioncaea*
 – Leg 5 with at most 2 setae, or leg further reduced; legs 1 to 4 typically with 3-segmented endopods 2
2. Caudal ramus with conspicuous dorsal expansion surrounding insertion of dorsal seta 6
 – Caudal ramus without expansion on dorsal surface 3
3. Female carrying single dorsal egg sac; third endopodal segment of legs 2 to 4 lacking outer margin spine *Monothula*
 – Female carrying single dorsal egg sac; third endopodal segment of legs 2 to 4 typically with outer margin spine 4
4. Caudal ramus with seta III modified into strong spine *Spinoncaea*
 – Caudal ramus with seta III setiform 5
5. Adult females without mid-dorsal projection on second pedigerous somite; endopod of leg 4 without distal conical process between apical and outer margin spines *Oncaea*
 – Adult females with or without mid-dorsal projection on second pedigerous somite; endopod of leg 4 without distal conical process located between apical and outer margin spines *Triconia*
6. Third exopodal segment of legs 1 to 3 with II, III, III spines on outer margin *Epicalymma*
 – Third exopodal segment of legs 1 to 3 with III, II, II spines on outer margin *Conaea*
 (Boxshall and Halsey, 2004)

REMARKS: The Oncaeidae comprises 7 genera: *Archioncaea* Bottger-Schnack and Huys, *Conaea* Giesbrecht, *Epicalymma* Heron, *Monothula* Bottger-Schnack and Huys, *Oncaea* Philippi, *Spinoncaea* Bottger-Schnack, *Triconia* Bottger-Schnack (Boxshall and Halsey, 2004). In Korean waters *Oncaea* and *Triconia* are found

Genus *Oncaea* Philippi, 1843

Bol-rok-bae-geom-mul-byeo-rug-sok (볼록배검물벼룩속)

Body cyclopiform, Prosome stout or broad-oval; second pedigerous somite with (*clevis*-subgroup) or without (*venusta*-subgroup) dorsoposterior projection in female. Cephalosome without lateral lobate extensions. Genital double-somite slightly flask-shaped, not particularly swollen dorsally; abdominal somites shorter than anal somite in both genders. Anal somite with wide anal opening. Exoskeleton well or heavily chitinized, usually ornamented with numerous pores, ridges and scales.

Sexual dimorphism in segmentation and armature of antennules, antennary setae, maxilliped, genital segment and ornamentation, endopods of first to third legs (sometimes also in fourth leg), fifth and sixth, and caudal ramus. Swimming legs 1 to 4 biramous, with 3-segmented rami. Intercoxal sclerites present in legs 1 to 4. Spine and seta formula as follows:

	coxa	basis	exopodal segment	endopodal segment
leg 1	0-0	1-I	1-0;I-1;III,I,4	0-1;0-1;I,5
leg 2	0-0	1-0	1-0;I-1;III,I,5	0-1;0-2;I,II,3
leg 3	0-0	1-0	1-0;I-1;II,I,5	0-1;0-2;I,II,2
leg 4	0-0	1-0	1-0;I-1;II,I,5	0-1;0-2;I,II,1

Fifth leg small, rod- or knob-shaped, free or unsegmented, with 2 setae (Heron and Bradford-Grieve, 1995; Boxshall and Halsey, 2004).

SPECIES ca. 103 (11 in Korea).

DISTRIBUTION: Mostly offshore worldwide.

Key to the species of genus *Oncaea*

1. Second pedigerous somite with dorso-posterior projection *O. clevei*
– Second pedigerous somite without dorso-posterior projection 2
2. Caudal ramus longer than length of 2 preceding somites 3
– Caudal ramus equal to length of 2 preceding somites 4
3. Proximal element on basis of maxilliped longer than distal element *O. mediterranea*
– Proximal element on basis of maxilliped almost equal than distal element 5
4. Anal segment length approximately equal to sum of 2 preceding somites *O. media*
– Anal segment length less than sum of 2 preceding somites 6
5. Genital doubl-somite about double length of remainder of urosome *O. venella*
– Genital double-somite less than double length of remainder of urosome *O. venusta*
6. Genital double-somite with straight sclerotized ridge between genital aperture
..... *O. scottodicarloi*
7. Genital double-somite without strait sclerotized ridge between genital aperture
..... *O. waldemari*

54. *Oncaea venusta* Philippi, 1843 (Figs. 100–102)

Wi-bol-rok-bae-geom-mul-byeo-ruk (위볼록배검물벼룩)

Oncaea venusta Philippi, 1843, p. 62, tafel III, fig. 2a–d; Giesbrecht, 1893, pp. 590–604, 755, 756, 774, 789, pl. 2, fig. 5, pl. 3, fig. 7, pl. 47, figs. 2, 5, 13, 19, 39, 44, 48, 50, 54, 58; Heron and Bradford-Grieve, 1995, pp. 33, 36, figs. 14, 15; Bottger-Schnack, 2001, pp. 32–36, 36, figs. 2–6; Wi et al., 2008, pp. 185, 186, 188, figs. 1–3.

Oncaea venusta forma *typica*: Farran, 1929, pp. 284, 285, fig. 3.

Oncaea praeclara: Humes, 1988: pp. 475–485, figs. 1a, b, d, 2a–I, 3a–g, 4a–g.

Female: Body length in lateral view 0.96–1.20 mm. Exoskeleton heavily chitinitized, covered with numerous granules. Prosome 1.8 times length of urosome, excluding caudal rami, 1.4 times urosome length including caudal rami. Pleural areas of fourth pedigerous somite with rounded posterolateral corners. Proportional lengths (%) of urosomites 11.9: 59.5: 8.3: 8.3: 11.9. Proportional lengths (%) of urosomites and caudal rami 9.52: 47.6: 6.7: 6.7: 9.52: 20.0. Genital double-somite 1.35 times as long

as maximum width (in dorsal aspect) and 1.76 times as long as postgenital somites united; anterior two-thirds widest, lateral margins of genital double-somite rounded, posterior part tapering gradually. Anal somite 1.3 times wider than long; about half length of caudal rami. Anterior margin of anal opening with line of minute denticles. Caudal rami about 3 times as long as wide, with 6 elements: antero- and posterolateral setae (II, III) long, spiniform and unipinnate along medial margin; outer terminal seta (IV) long, and bipinnate; inner terminal seta (V) longest and bipinnate; terminal accessory seta (VI) more than $2/3$ length of seta (VII) about same length as posterolateral seta (III) and less than half length of terminal accessory seta, plumose and bi-articulate at base.

Antennule 6-segmented. Armature formula: 1-[3], 2-[8], 3-[5], 4-[3+ae], 5-[2+ae], 6-[6+ (1+ae)]. Antenna 3-segmented, distinctly reflexed: coxobasis with bipinnate seta at inner distal corner; endopodal segments unequal in length; first segment longer, subtriangular, anteriodistally with patch of spinules, with row of denticles along inner margin; second segment distinctly shorter; posterior surface with patch of spinules; with 4 lateral setae consisting of 2 naked setae and 2 unipinnate setae; 7 distal setae forming 5 long setae and 2 naked setae. Mandible: gnathobase with 5 elements; ventral element shorter than ventral blade, with long, fine setules along dorsal side; ventral blade strong and extensively spiniform, with row of setules on posterior part; dorsal blade strong and broad, with 3 dentiform processes along distal margin; 2 dorsal elements setiform, of which ventral element shorter, flat and densely setose, dorsalmost element longer and multipinnate. Maxillule single segmented, weakly bilobed: inner lobe (=praecoxal arthrite) with 3 elements and outer lobe with 4 elements: outermost element long, spiniform having row of spinules. Maxilla 2-segmented: syncoxa unarmed; allobasis produced distally into slightly curved claw bearing 2 rows of very strong spinules along medial margin; outer margin with strong seta extending almost to tip of allobasal claw, ornamented with few minute spinules distally; inner margin with slender pinnate seta and strong spine. Maxilliped 4-segmented, composed of syncoxa, basis, and 2-segmented endopod: syncoxa unarmed; basis extensive and robust, with 2 spiniform spinulose elements nearly equal in length and patches of long setules on inner margin; first endopodal segment without ornamentation; second segment with spinulose claw along concave margin, naked seta on outer proximal margin and unipectinate spine joined to inner margin.

Swimming leg 1: inner basal seta spiniform and minutely pinnate, length of exopod and endopod nearly equal; third endopodal segment with arrowhead-shaped process on distalmost inner seta. Distal margin of third endopodal segment of second and third legs protruding into conical projection. Outer subdistal spine of third endopodal segment of second to fourth legs nearly equal in length compared to outer distal spine, always shorter than terminal spine. Outer distal spine of third endopodal segment of fourth leg about $3/4$ length of terminal spine of third endopodal segment of fourth leg. Fifth leg with small plumose seta growing from lateral surface of somite, and small free exopod without ornamentation. Exopod slightly longer than wide, bearing 2 naked setae. Sixth leg expressed as operculum around each genital aperture with spine.

Male: Body length in lateral view 0.78–0.88 mm. Prosome 1.6 times length of urosome excluding caudal rami, 1.3 times of urosome length including caudal rami. Caudal rami about 2.3 times longer than wide, shorter than in female. Caudal setae with proportional lengths as in female except for seta VI, which is about $2/3$ the length of seta IV and 2.0 times length of caudal rami. Surface of genital flaps and ventral surface of anal somite ornamented with minute spinules. Antennule 4-segmented; distal segment corresponding to fused segments 4–6 of female. Armature formula; 1-[3], 2-[8], 3-[4], 4-[11+2ae+(1+ae)]. Antenna: coxobasis has naked, short seta at innerdistal corner; distal endopodal segment with seta III more stout than in female, seta IV spiniform and curved, both elements shorter than in female. Maxilliped 3-segmented, composed of syncoxa, basis and 1-

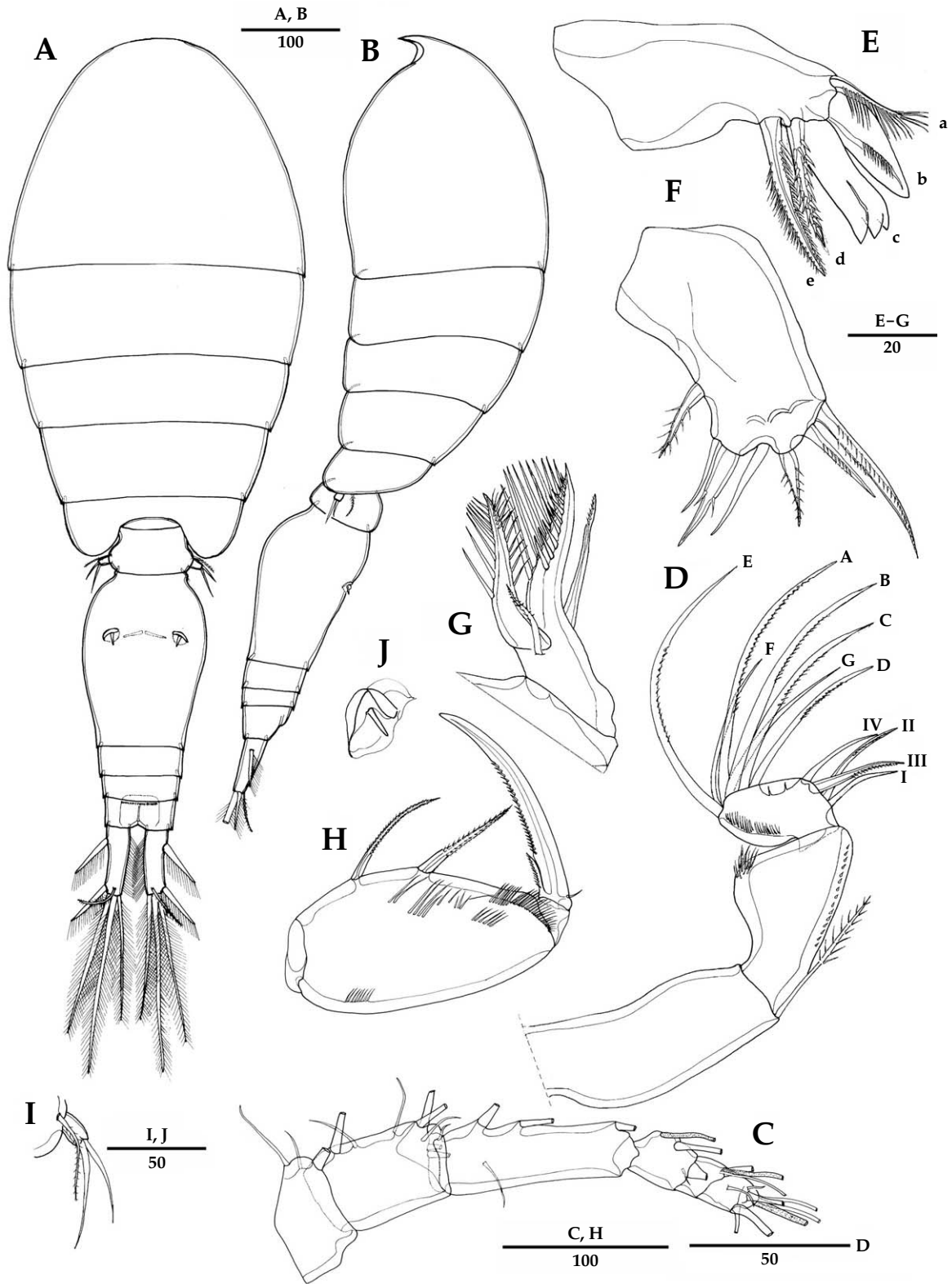


Fig. 100. *Oncaea venusta*, female. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. antenna; E. mandible; F. maxillule; G. maxilla; H. maxilliped; I. fifth leg; J. sixth leg.

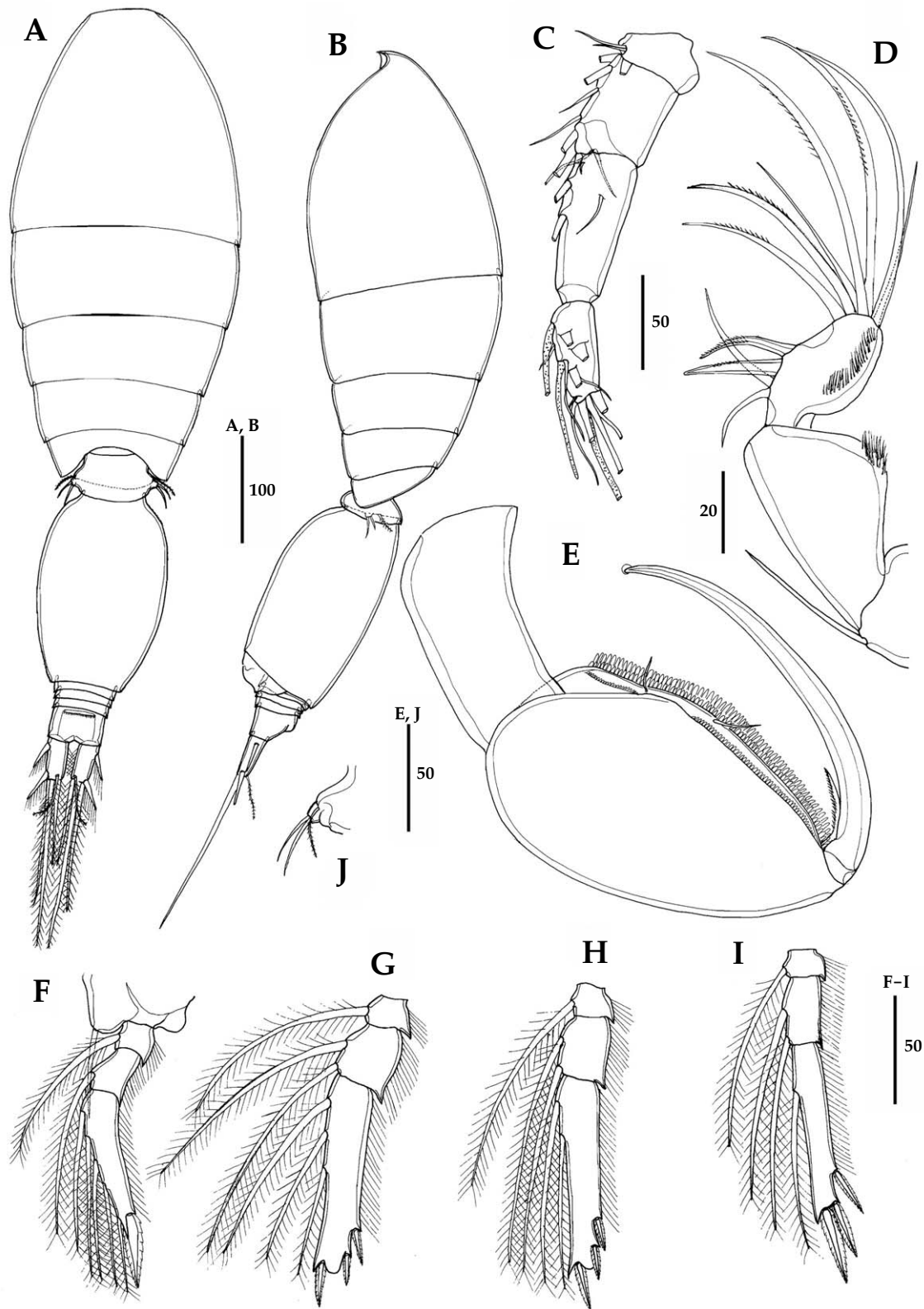


Fig. 101. *Oncaea venusta*, male. A. habitus, dorsal view; B. habitus, lateral view; C. antennule; D. antenna; E. maxilliped; F. first leg; G. second leg; H. third leg; I. fourth leg; J. fifth leg.

segmented endopod: syncoxa unarmed; basis bearing 2 small naked setae, proximal half oval-shaped, ornamented with rows of short flat spinules along inner margin and short spinules of graduated length along palmar margin; endopod stretched out into long curved claw, concave margin unornamented, with short, unipectinate spine fused to inner proximal corner of claw, tip of claw with minute hyaline apex.

Swimming legs 1 to 4 with armature and ornamentation as in female; sexual dimorphism in length ratio of outer subdistal spine and outer distal spine on third endopodal segment of second leg: outer subdistal spine elongated. Fifth leg: exopod connected to somite, length to width ratio approximately same; armature as in female. Sixth leg expressed as posterolateral flap closing off genital apertures on either side; covered by minute denticles.

DISTRIBUTION: Temperate and tropical Atlantic, pacific and Indian Ocean.

KOREA: GB, GN, JN.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 13.xi.2008).

ECOLOGY: *Oncaea venusta* is an abundant species from March to November in the sea of Jeju-Island (Bong-Cheol oh et al., 1998), the East Sea and southern sea of Korea.

REMARKS: *Oncaea venusta* Phipps, 1843 is easily distinguished from *O. venella* Farran, 1929 by the following morphological characteristics: 1) larger body lengths of 0.96 to 1.20 mm in female and of 0.78 to 0.88 in male; 2) wider prosome and urosome; 3) without dorsoposterior protrusion on second pedigerous somite of female. According to Dirk Elvers, et al. (2006), phylogenetic analysis obtained from sequence data of two DNA markers (cyt b and ITS1) indicates that these two species are distinct clades or lineages. The DNA sequences for mtCOI used in this study also revealed high level of variation within the two clades. Therefore this result supports opinions in other literature.

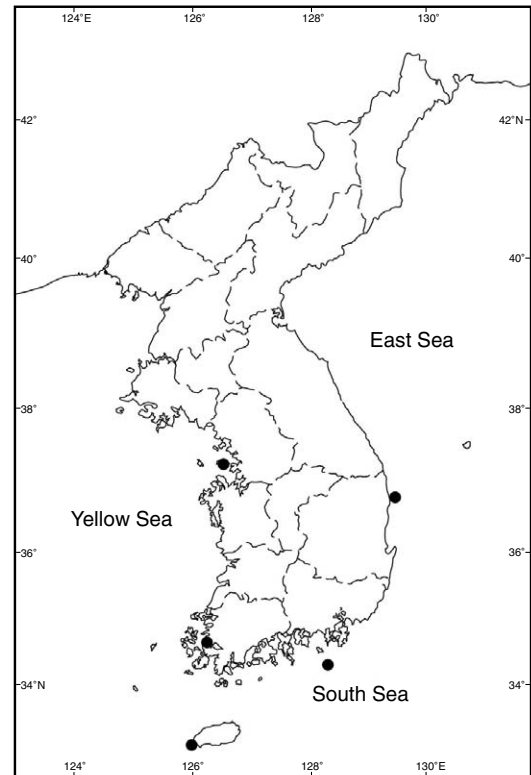


Fig. 102. Distribution of *Oncaea venusta*.

55. *Oncaea venella* Farran, 1929 (Fig. 103)

Jak-eun-bol-rok-bae-geom-mul-byeo-ruk (작은볼록배검물벼룩)

Oncaea venusta var. *venella* Farran, 1929, p. 284, fig. 33; Farran, 1936, p. 126; Boxshall, 1977, p. 127, fig. 11f.

Oncaea venella Farran, 1929, pp. 149, 150, 153, figs. 3, 4, 5e, f, 6c; Wi et al., 2008, pp. 189–191, figs. 4–6.

Female: Body length in lateral view: 0.80–0.83 mm. Body proportions different from *O. venusta*; prosome 1.8 times length of urosome, excluding caudal rami, 1.5 times urosome length including caudal rami. Second pedigerous somite forming slight dorso-posterior swelling (no projection).

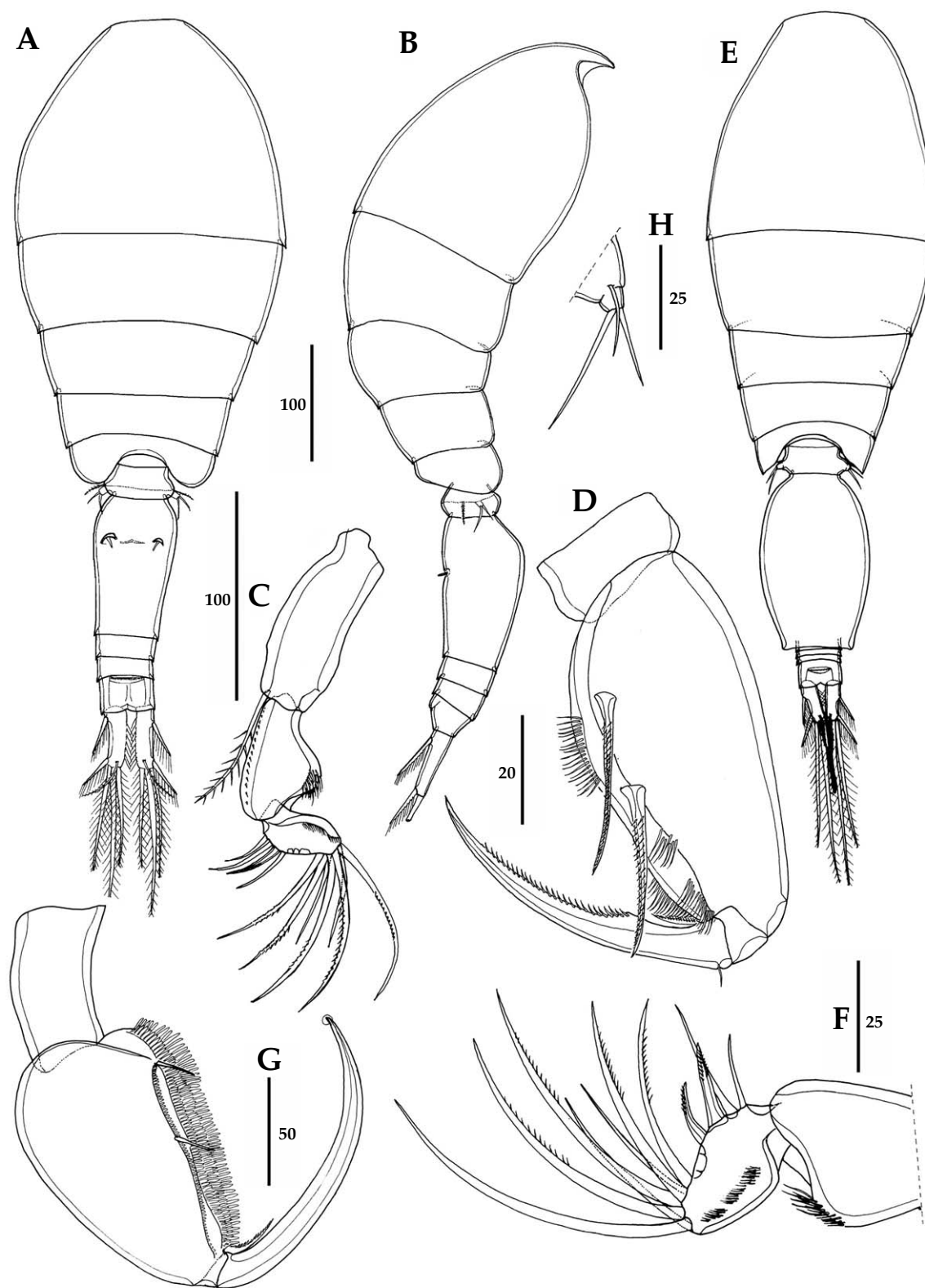


Fig. 103. *Oncaea venella*. Female: A. habitus, dorsal view; B. habitus, lateral view; C. antenna; D. maxilliped. Male: E. habitus, dorsal view; F. antenna; G. maxilliped; H. fifth leg.

Proportional lengths of urosomites similar to *O. venusta*. Genital double-somite 1.7 times as long as maximum width (in dorsal view); lateral margins of genital double-somite weakly extended anteriorly, posteriorly nearly straight. Anal somite width about 1.7 times length. Caudal rami about 3.3 times as long as wide, shorter than in *O. venusta*, outer seta longer than seta III. Antenna as in *O. venusta* except for minor differences in the ornamentation: setae II on second endopodal segment slightly longer than that of *O. venusta*. Mandible, maxillule, maxilla and maxilliped as in *O. venusta*.

Swimming legs 1-4 as in *O. venusta*, except for third endopodal segment of third and fourth legs: outer subdistal spine length shorter than outer distal spine. Fifth and sixth legs as in *O. venusta*.

Male: Body length in lateral view: 0.56–0.63 mm. Sexual dimorphism in antennule, antenna, maxilliped, endopods of first to sixth leg, caudal rami and genital segmentation. Prosome 1.8 times length of urosome, excluding caudal rami, 1.6 times of urosome length including caudal rami. Proportional lengths of urosomites similar to *O. venusta*. Length of genital double-somite 1.7 times as long as wide. Caudal rami about 3 times longer than wide, shorter than in female. Caudal setae with proportional lengths as in *O. venusta*.

Swimming legs 1-4 with armature and ornamentation as in female; distal spine of third endopodal segment of fourth leg longer than other two spines compared to that of female. Fifth leg with naked seta on lateral surface of somite, and exopod bearing 2 naked setae different in length: length to width ratio of exopod almost equal.

DISTRIBUTION: Tropical and temperate Atlantic, Gulf of Mexico, Arabian Sea, Indian Ocean, South China Sea, Great Barrier Reef, north coast of New Zealand.

KOREA: GB, GN, JN.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 8.x.2008).

ECOLOGY: *O. venella* occurs in offshore waters during spring to fall in the East Sea and southern sea of Korea.

REMARKS: Heron (2002) raised the smallest *Oncaea venusta* forma *venella* Farran, 1929, from the Northeastern Pacific, to species level s 6gs. 1-based on the following morphological characteristics: 1) the smaller body length of 0.75–0.88 mm in the female and 560–630 μ m in the male; 2) the genital double-somite is narrower; 3) the male fifth leg has naked lateral seta; 4) the second pedigerous somite somewhat swollen in lateral view (no projection). In Korean waters *O. venella* and *O. venusta* co-occur offshore during spring to fall. However, the former species was predominant in summer, while the latter species was more common in fall. During spring their abundance was almost the same.

56. *Oncaea media* Giesbrecht, 1891 (Fig. 104)

Gin-bol-rok-bae-geom-mul-byeo-ruk (긴볼록배검물벼룩)

Oncaea media Giesbrecht, 1891, p. 477, figs. 15k, 16a–k, 17a–I, 26b; Giesbrecht, 1892, pp. 591–600, 602, 603, 756, 757, 774, pl. 47, figs. 1, 29–33, 40; Tanaka, 1960, pp. 69, 70, pl. XXXI, figs. 4–9; Heron and Bradford-Grieve, 1995, p. 36, figs. 16a–k, 17a–1; Chihara and Murano, 1997, p. 980, fig. 365a–f; Böttger-Schnack, 2001, pp. 55, 56, figs. 15, 16.

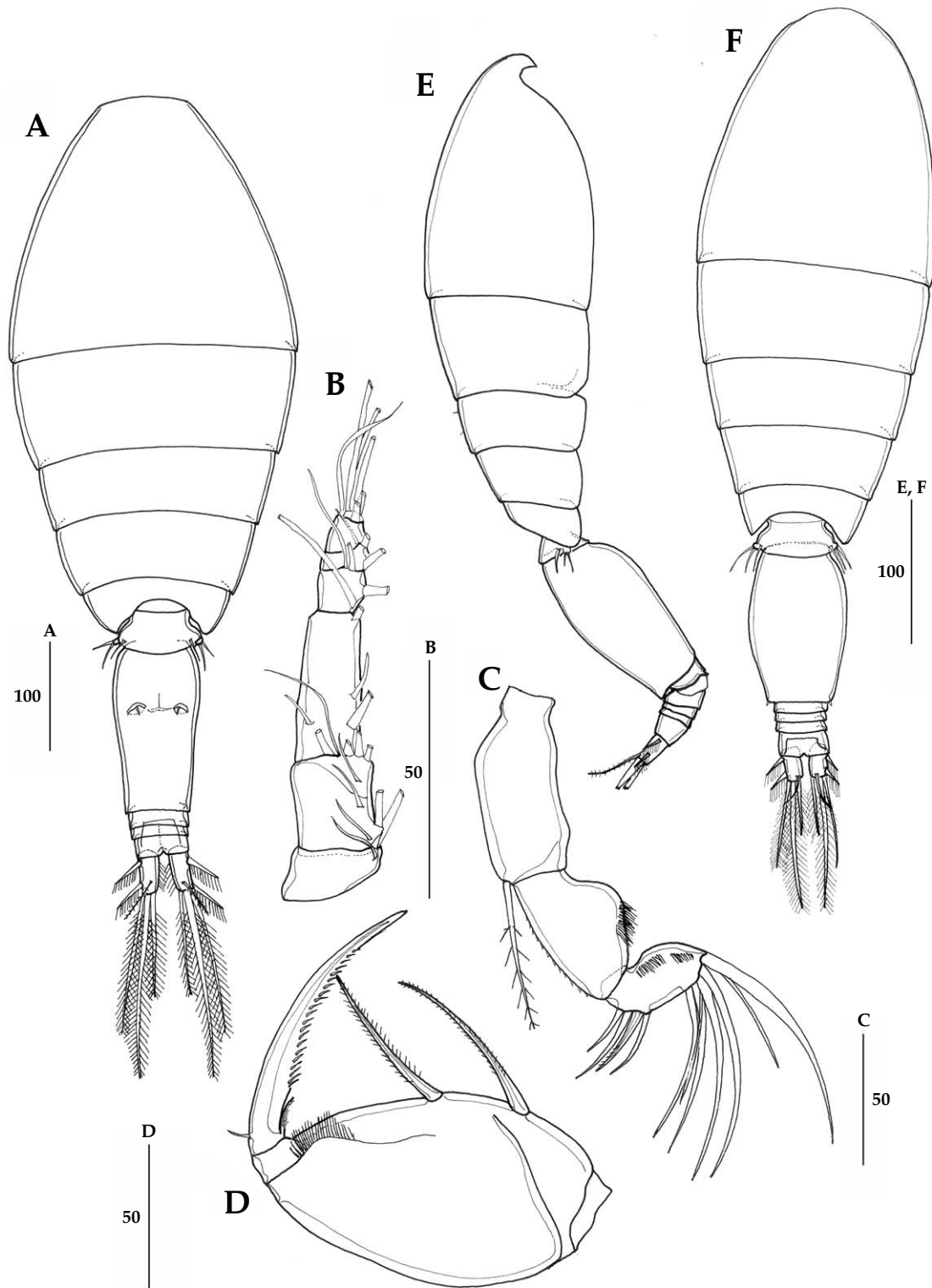


Fig. 104. *Oncaea media*. Female: A. habitus, dorsal view; B. antennule; C. antenna; D. maxilliped. Male: E. habitus, lateral view; F. habitus, dorsal view.

Female: Body length: 645 μm , range: 0.62–0.65 mm. Prosome 2.1 times length of urosome, excluding caudal rami. Pleural areas of fourth pedigerous somite with rounded posterolateral corners. Proportional lengths (%) of urosomites 16.3:69.4:6.1:5.1:8.2. Genital double-somite 1.9 times as long as maximum width (in dorsal aspect) and 2.4 times as long as postgenital somites combined. Double curved sclerotized ridge between genital apertures. Anal somite little wider than long; about 2/3 length of caudal rami. Antennule with armature as for genus. Antenna 3-segmented, coxobasis with distal inner spinulose seta; proximal inner surface with curved spine and three setae; four curved distal spines and 3 setae. Mandible similar to *O. venusta*, blade-like element with terminal dentiform proecesses. Maxilliped 4-segmented, basis robust, inner surface with 2 spiniform spinulose elements; proximal element slightly longer than distal element.

Swimming legs with armature as for genus. Fifth leg with exopod longer than wide; 2 terminal setae, the outer seta two-thirds length of inner seta; seta on body near leg. Sixth leg armed with a spine and 2 small spinous processes.

Male: Body length in lateral view: 0.54–0.59 mm. Prosome 2.2 times to length of urosome, excluding caudal rami, 1.9 times urosome length, including caudal rami. Proportional lengths (%) of urosomites (excluding caudal rami) 14:68:4.5:4.5:4.5:9. Caudal rami about as long as wide, much shorter than in female. Caudal setae with proportional lengths as in female, except for seta VI, which is about 2/3 the length of seta IV and 3 times the length of caudal ramus. Antennule with armature as for genus. Antenna as in female, except for seta on coxabasis naked and shorter than in female; lateral armature on distal endopod segment differing from female, with spiniform seta III much stouter and seta IV spiniform and curved, with row of dentiform processes along outer distal margin; both elements shorter than in female.

Swimming legs 1–4 with armature and ornamentation as in female; sexual dimorphism expressed in (1) terminal process on endopods of first leg relatively longer than in female (2) terminal conical projections on distal endopod segment of third leg (not on second leg) longer than in female and (3) reduced spine lengths in endopodal spines of second to fourth leg (by Böttger-Schnack, 2001). Exopod of fifth leg fused to somite, length of segment shorter than in female; proportional lengths of exopodal setae as in female. Sixth leg represented by posterolateral flap closing off genital aperture on either side; covered by pattern of denticles; posterolateral corners with single pointed tip.

DISTRIBUTION: Widespread between 55° N and 45° S, in Atlantic, Indian, and Pacific Oceans, Mediterranean Sea.

KOREA: GB, GN, JN.

SPECIMEN EXAMINED: (South Sea, Jeju-do: 25.iv.2008).

ECOLOGY: *O. media* is distributed throughout the entire year in the South Sea and the East Sea having the greatest abundance in September.

REMARKS: Giesbrecht (1891) recorded *O. media* from the eastern tropical Pacific, and subsequently redescribed this species from the Mediterranean in 1892. Heron & Bradford-Grieve (1995) redescribed two similar species in more detail, and separated the forms into *O. media* and a new species, *O. scottodicarloi*. *O. media* is closely related to *O. scottodicarloi*. According to Heron & Bradford-Grieve (1995), differences between females of the two species are found in (1) the proportion lengths of urosomites, (2) the form and location of the sclerotized ridge, and (3) the relative lengths of the endopod spines of fourth leg. Also, Böttger-Schnack (2001) added another characteristic separating females of the two species: the proportional length of exopodal setae on fifth leg differs in that the outer seta is relatively shorter in *O. media* than in *O. scottodicarloi*.

57. *Oncaea scottodicarloi* Heron and Bradford-Grieve, 1995 (Fig. 105)

Seu-ko-teu-bol-rok-bae-geom-mul-byeo-ruk (스코트볼록배검물벼룩)

Oncaea media: Giesbrecht, 1892, pl. 47, fig. 11; Chihara and Murano, 1997, p. 981, fig. 369a–f.*Oncaea scottodicarloi* Heron and Bradford-Grieve, 1995, p. 39, figs. 17j–r, 18a–k, 27a; Böttger-Schnack, 2001, pp. 57, 65, figs. 22, 23.

Female: Body length in lateral aspect 0.54–0.61 mm. Prosome 2.8 times length of urosome, excluding caudal rami, 2.4 times urosome length including caudal rami. Proportional lengths (%) of urosomites 10.4:63:7.6:7.1:11.9. Genital double-somite 1.5 times as long as maximum width and 2.5 times as long as postgenital somites combined; straight sclerotized ridge between genital apertures. Anal somite 1.8 times wider than long; about 3/4 length of caudal rami. Caudal ramus about 2.3 times as long as wide. Antennule with minute element on sixth segment, which was not mentioned in original account. Antenna with armament similar in number to that *T. conifera*. Mandible, dorsal blade ornamented with 5 minute dentiform process at dorsal margin. Maxillule, maxilla and maxilliped similar to *O. waldemari*.

Swimming legs 1–4 with armature as for genus and surface ornamentation similar to *O. waldemari* except for anterior face of first and second endopodal segments of first leg with stronger spinules on distal margin. Third exopodal segment of first leg with outer distal spines somewhat longer than in original account, outer endopodal spine reaching almost 1/2 length of distal spine.

Fifth leg; inner one of exopodal setae stouter and slightly shorter than outer one.

Male: Body length in lateral view 0.43–0.48 mm. Prosome 2.5 times length of urosome, excluding caudal rami, 2.2 times urosome length, including caudal rami.

Caudal rami about 1.6 times longer than wide, shorter than in female. Caudal setae with proportional lengths as in female, except for seta VI 2.6 times the length of caudal ramus, and dorsal seta VII 2/3 the length of seta VI.

Antennule with armature as for genus. Antenna with seta on coxabasis long and plumose as in female, lateral armature on distal endopod segment differing from female, element III much stouter and element IV spiniform and curved, ornamented with dentiform processes along distal margin; both element shorter than in female.

Swimming legs 1–4 with armature and ornamentation as in female. Sexual dimorphism expressed in reduced spine lengths on third endopodal segment, most obvious in third leg and in outer subdistal spine of fourth leg. Spine lengths on third endopodal segment of second leg less reduced. Exopodal segment of fifth leg not delimited from somite, shape and armature as in female, except for exopodal setae more spiniform and shorter than in female. Sixth leg covered by pattern of denticles.

DISTRIBUTION: Venezuela, Caribbean Sea, Gulf of Mexico, Florida, Sargasso Sea, the Mediterranean Sea, Black Sea, Red Sea, Gulf of Thailand, The East Sea, Great Barrier Reef, New Zealand, East Tropical Pacific.

KOREA: GN, JJ.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 8.x.2007).

REMARKS: *O. scottodicarloi* is closely related to *O. media*, *O. waldemari*, and *O. curta*. Female *O. media* can most easily be separated from the three other species by the length ratio of the urosomites, particularly of the genital double-somite, which is much longer. The three remaining species are

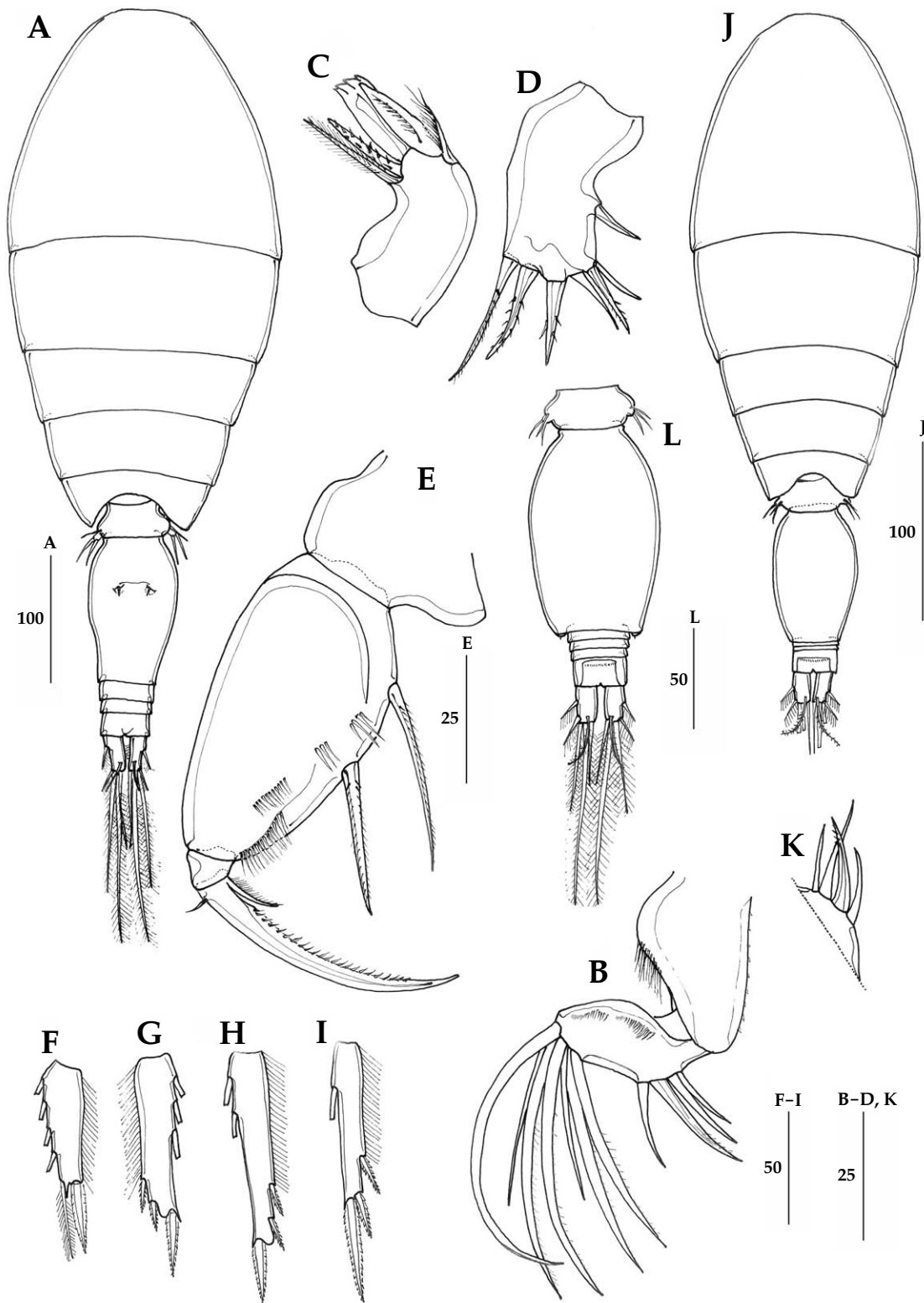


Fig. 105. *Oncaea scottodicarloi*. Female: A. habitus, dorsal view; B. antenna; C. mandible; D. maxillule; E. maxilliped; F. first leg; G. second leg; H. third leg; I. fourth leg. Male: J. habitus, dorsal view; K. lateral setae on second endopodal segment of antenna; L. urosome.

morphologically very similar, except for differences in the length ratio of urosomites, the length of exopodal seta on fifth leg and the relative lengths of the caudal setae.

58. *Oncaea waldemari* Bersano and Boxshall, 1994 (Fig. 106)

Bal-dae-ma-bol-rok-bae-geom-mul-byeo-ruk (발데마볼록배검물벼룩)

Oncaea media f. minor: Malt, 1982, p. 130, figs. 1a-i, 2a-j, 3a-z, 4a-o, 5a-h.

Oncaea waldemari Bersano and Boxshall, 1994, p. 29, figs. 1-6; Böttger-Schnack, 2001, p. 72, figs. 24-27.

Female: Body length in lateral view 0.44–0.48 mm. Prosome 2.6 times length of urosome. Exoskeleton well chitinized. Prosome 2.7 times length of urosome, excluding caudal rami, 2.2 times urosome length including caudal rami. Proportional lengths (%) of urosomites 10: 55.9:10.6:8.6:14.9. Genital double-somite 1.7 times as long as maximum width and 1.7 times as long as postgenital somites combined. Anal somite shorter than caudal rami. Caudal ramus about 2.2 times as long as wide. Seta VII distinctly longer than seta III. Antennule with armature formula as for genus, additional denticles on proximal part of outer (exopodal) margin. Mandible with surface of coxa unornamented; armature elements as for *O. venusta*, but dorsal blade with 2 additional dentiform processes along dorsal margin. Proximal basal seta of maxilliped slightly longer than distal one.

Swimming legs 1–4 with armature as for genus. Fifth leg with small exopodal segment delimited from somite. Exopod slightly longer than wide, bearing 2 naked setae nearly equal in length, inner one spiniform. Small naked seta arising from lateral surface of somite.

Male: Body length 0.34–0.36 mm. Caudal rami about 1.4 times longer than wide, shorter than in female. Surface of genital flaps ornamented with several rows of small spinules and area of minute pits. Antenna third spiniform element on lateral armature somewhat stouter than in female and fourth element curved and ornamented with vestigial dentiform processes along distal margin. Seta on coxobasis long and plumose as in female. Maxilliped similar to *O. venusta*. Exopodal segment of fifth leg not delimited from somite, setae slightly shorter than in female. Posterolateral flap of sixth leg covered by pattern of denticles; posterolateral corners rounded, generally with bifid tips.

DISTRIBUTION: Norway, North Sea, Baltic Sea, Ireland, English Channel, Brazil-Argentina, East Sea, Mediterranean Sea, Red Sea, Indian Ocean.

KOREA: GN.

SPECIMEN EXAMINED: (South Sea, Gyeongsangnam-do: 8.x.2007).

ECOLOGY: Unknown.

REMARKS: The body length of *O. waldemari* varies considerably in different geographic regions (by Böttger-Schnack, 2001). The records of *O. waldemari*, from very distant localities in tropical and temperate regions of the three great oceans, indicate a world-wide distribution of this species. Both sexes of *O. waldemari* occur in the lower epipelagic zone. According to Böttger-Schnack, 2001, differences between *O. waldemari* and *O. scottodicaloi* include the relative lengths of endopodal spines on fourth leg, which are shorter in *O. waldemari*. Males of *O. waldemari* can be separated from those of *O. media* by the sexually dimorphic coxobasal seta of the antenna.

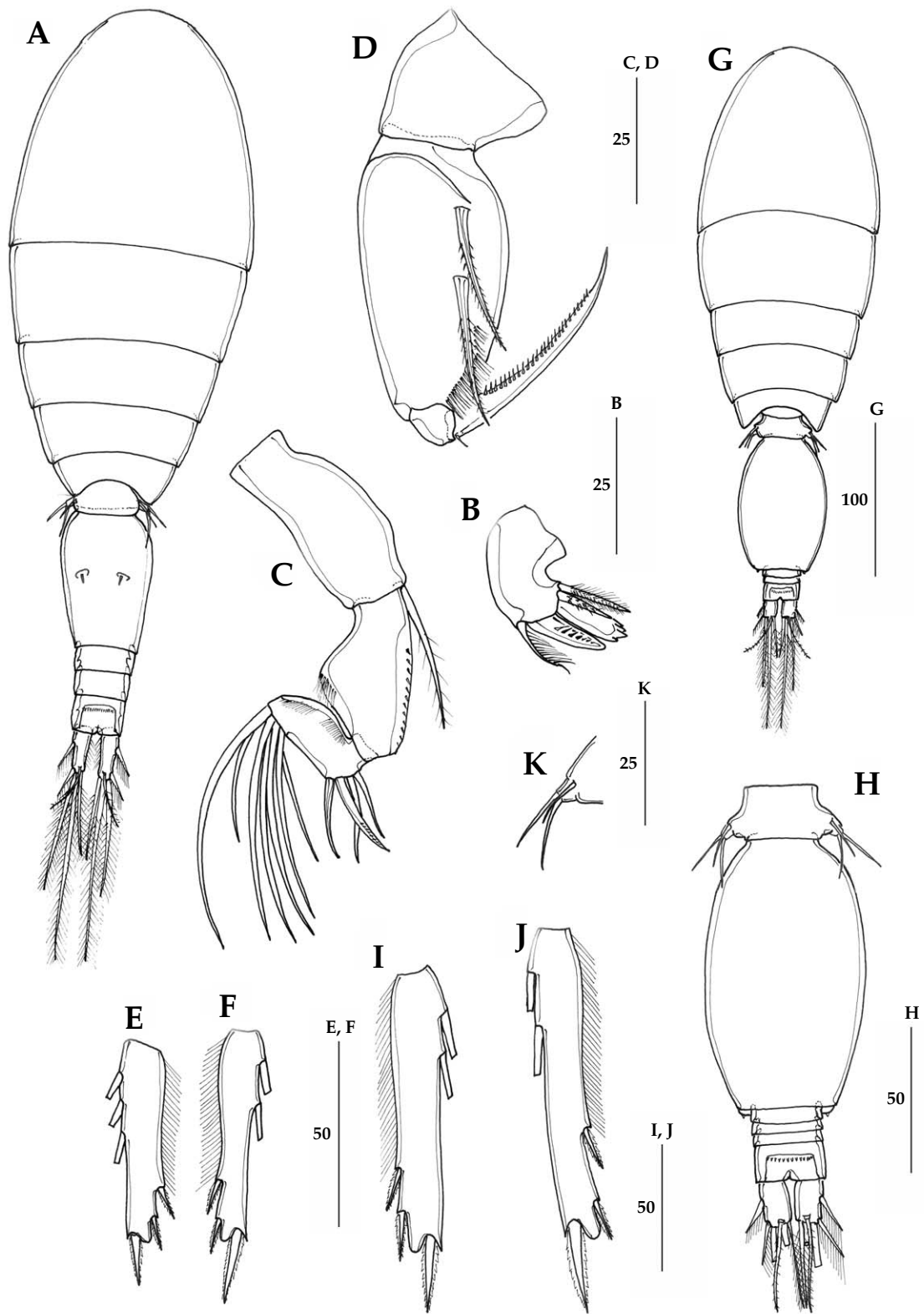


Fig. 106. *Oncaea waldemari*. Female: A. habitus, dorsal view; B. mandible; C. antenna; D. maxilliped; E. second leg; F. third leg. Male: G. habitus, dorsal view; H. urosome; I. second leg; J. third leg; K. fifth leg.

59. *Oncaea clevei* Früchtl, 1923 (Fig. 107)

Keu-ri-beu-bol-rok-bae-geom-mul-byeo-ruk (크리브볼록배검물벼룩)

Oncaea conifera: Cleve, 1901, p. 8.*Oncaea clevei* Früchtl, 1923, p. 455, figs. 19–22, only female; Früchtl, 1924, pp. 22, 89, figs. 14, 15, 60–70; Chihara and Murano, 1997, p. 979, fig. 361a, d, f; Böttger-Schnack, 2001, p. 60, figs. 17–21.

Female: Body length in lateral view 0.64–0.66 mm. Prosome 2.1 times length of urosome, excluding caudal rami, 1.8 times urosome length including caudal rami. Genital double-somite almost rectangular in dorsal aspect, 1.5 times as long as maximum width and 1.6 times as long as postgenital somites combined: anterior quarter of margin of genital double-somite rounded, posteriorly slightly tapering. Paired genital apertures located very close to dorsolateral margin; armature represented by 1 spine. Crescent-shaped sclerotized ridge between genital apertures. Anal somite 1.5 times wider than long; slightly shorter than caudal rami. Caudal ramus about 2.3 times as long as wide. Seta VI more than 4/5 length of seta IV and 2.5 times longer than caudal ramus; seta VII about half length of seta VI and longer than seta III. Inner margin of somite with few long setules. Antenna similar to *O. venusta*, except for coxobasis which has less surface ornamentation and seta III on second endopod segment bipinnate. Mandible as in *O. venusta*, except for third element ornamented with 4 dentiform processes halfway along dorsal margin.

Swimming legs with armature as for genus and surface ornamentation similar *O. venusta*. Endopodal and exopodal spine lengths mainly *O. venusta*, except for terminal spines on endopods of first leg, second leg and fourth leg relatively longer, particularly in fourth leg, extending more than half the length of distal endopodal segment. Second leg with outer subdistal spine reaching insertion of outer distal spine. Inner basal seta on first leg naked; outer basal seta on third leg plumose. Fifth leg comprising small naked seta arising from lateral surface of somite, and free unornamented segment representing exopod. Exopod slightly longer than wide, bearing 2 spiniform, naked, straight seta, equal in length.

Male: Body length in lateral view 0.43–0.47 mm. Prosome 2.0 times the length of urosome, excluding caudal rami, 1.8 times urosome length, including caudal rami. Caudal rami about 1.8 times longer than wide, shorter than in female. Caudal setae with proportional lengths as in female, except for seta VI, which is about 3/5 the length of seta IV; seta VII longer than in female, reaching about 2/3 length of seta VI. Antenna as in female, except for seta on coxobasis naked and shorter than in female; lateral armature on distal endopod segment differing from that of female, with element III being much stouter and element IV spiniform and distinctly curved; both elements shorter than in female.

Fifth leg exopod not delimited from somite, general shape and armature as in female, except for exopodal setae shorter than in female. Sixth leg covered by pattern of denticles

DISTRIBUTION: The Red Sea, the northern Arabian Sea, The Mediterranean Sea, the Indian Ocean, The East Sea, the Gulf of Thailand, the Central Tropical Pacific, Australia, New Zealand, South Africa. and the central Red Sea. Abundances are greatest during winter and least during summer and autumn.

KOREA: GB, JJ.**SPECIMEN EXAMINED:** (South Sea, Jeju-do: 13.xi.2008).**ECOLOGY:** *O. clevei* is abundant during September to November in the South Sea and East Sea.

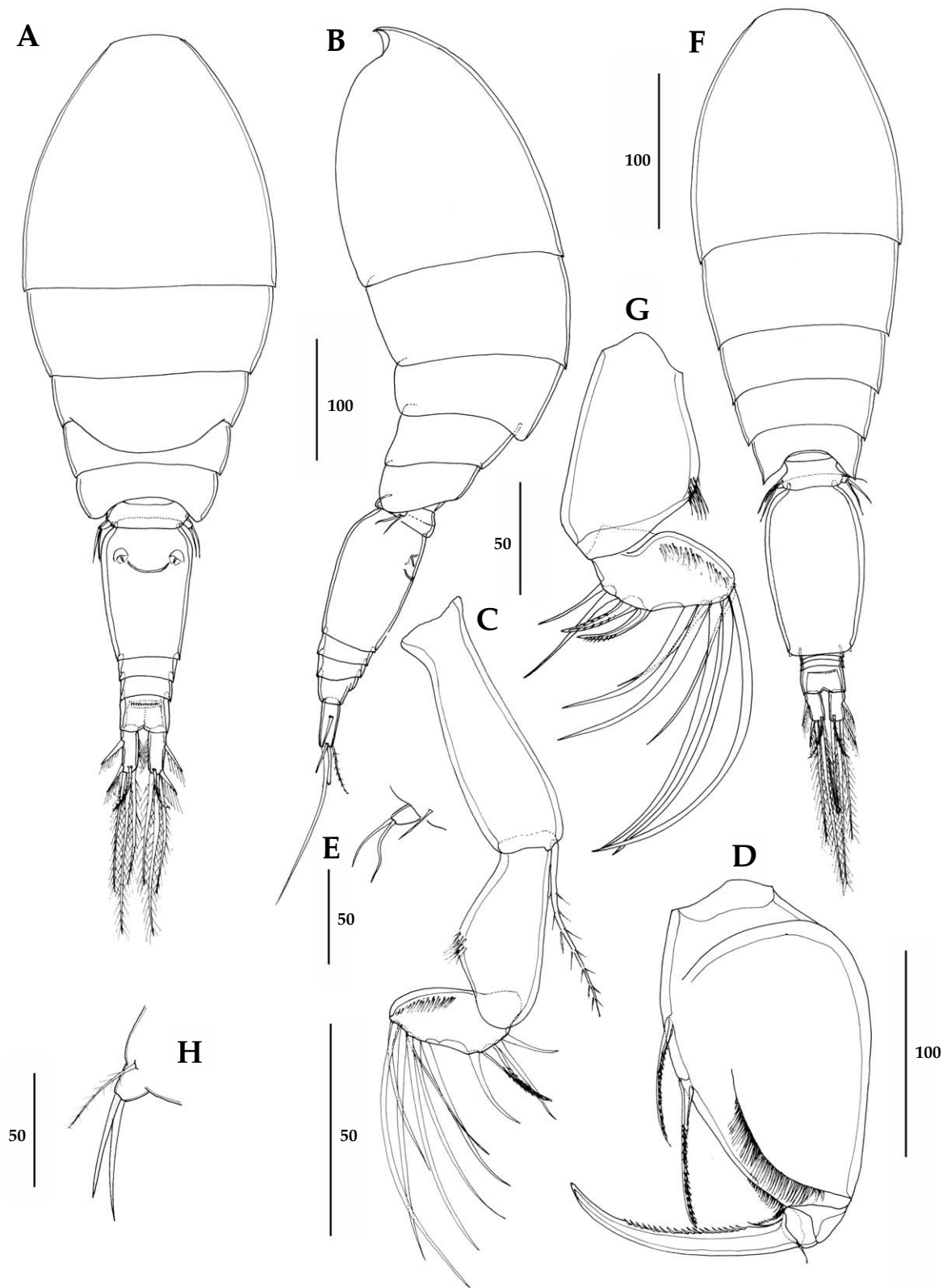


Fig. 107. *Oncaea clevei*. Female: A. habitus, dorsal view; B. habitus, lateral view; C. antenna; D. maxilliped; E. fifth leg. Male: F. habitus, dorsal view; G. antenna; H. fifth leg.

REMARKS: The original description of Fröchl (1923, 1924) included a typical characteristic: a crescent-shaped sclerotization between the genital apertures on the female urosome. The hump is a sexually dimorphic character, which is not found in males. The second pedigerous somite has a conspicuous dorso-posterior projection viewed in lateral aspect. The genital double-somite is almost rectangular viewed in dorsal aspect. The anal somite is slightly shorter than the caudal rami. The mandible blade ornamented with 4 dentiform processes. The maxillule, maxilla and maxilliped mainly as in *O. venusta*.

60. *Oncaea mediterranea* (Claus, 1863) (Fig. 108)

Ji-jung-hae-bol-rok-bae-geom-mul-byeo-ruk (지중해볼록배검물벼룩)

Antaria mediterranea Claus, 1863, p. 159, tafel XXX, figs. 1–7.

Oncaea mediterranea: Giesbrecht, 1892, pp. 591, 602, 774; Heron and Bradford-Grieve, 1995, p. 32, fig. 13a–d; Böttger-Schnack and Huys, 1997, pp. 140, 145, figs. 1–5.

Female: Body length in lateral view 1.20–1.28 mm. Prosome 1.9 times length of urosome, excluding caudal rami, 1.5 times urosome length including caudal rami. Pleural areas of fourth pedigerous somite with elongated and constricted posterolateral corners. Proportional lengths (%) of urosomites are 13:59:7.5:7:13. Ratio of urosomites and caudal rami are about 4:1. Paired genital apertures located at about midlength on genital double-somite. Anal somite 1.25 times wider than long; about 2/3 the length of caudal rami. Anterior margin of anal opening (vestigial anal operculum) with transverse row of minute denticles. Caudal ramus about 3.75 times as long as wide. Mandible, dorsal blade strong and broad, with four dentiform processes around distal margin.

Swimming legs 1–4 biramus, with 3-segmented rami. Spine and setal formula same as genus. Inner basal seta on leg 1 long, spiniform and naked. Terminal spine of leg 1 exp-1 equal in length (leg 1) or shorter than (leg 2–4) distal exopod segment. Outer subdistal spine of endopod equal in length to distal spine in legs 2–4.

P 5. Exopod slightly longer than wide, bearing stout curved seta and smaller slender seta inserted subdistally; surface covered with minute denticles.

Male: Body length in lateral aspect 0.74–0.83 mm. Sexual dimorphism in antennules, antenna, maxilliped, legs 5–6, caudal ramus and genital segmentaon. Proportional lengths (%) of urosomites (excluding caudal rami) 30:69:3:2:3:11. Caudal rami 2.3 times longer than wide, markedly shorter than in female. Caudal setae with proportional lengths as in female. Antenna as in female, except for lateral armature on distal endopod segment, with third spiniform element being much stouter than in female and shorter than 2 adjacent setae. Legs 1–4 (Figs. 11J–K) with armature as in female; variable number of spinules on conical projection of endopods of legs 2 and 3. Exopod of fifth leg not delimited from somite, general shape and armature as in female; small plumose seta arising from lateral surface of somite as in female. Sixth leg covered by pattern of denticles; posterolateral corners protruding laterally.

DISTRIBUTION: Widespread between 65°N and 60°S, in Atlantic, Indian, and Pacific Oceans, Mediterranean Sea. Small form known from tropical and temperate North Atlantic, Gulf of Mexico, coast of Brazil, south of New Zealand.

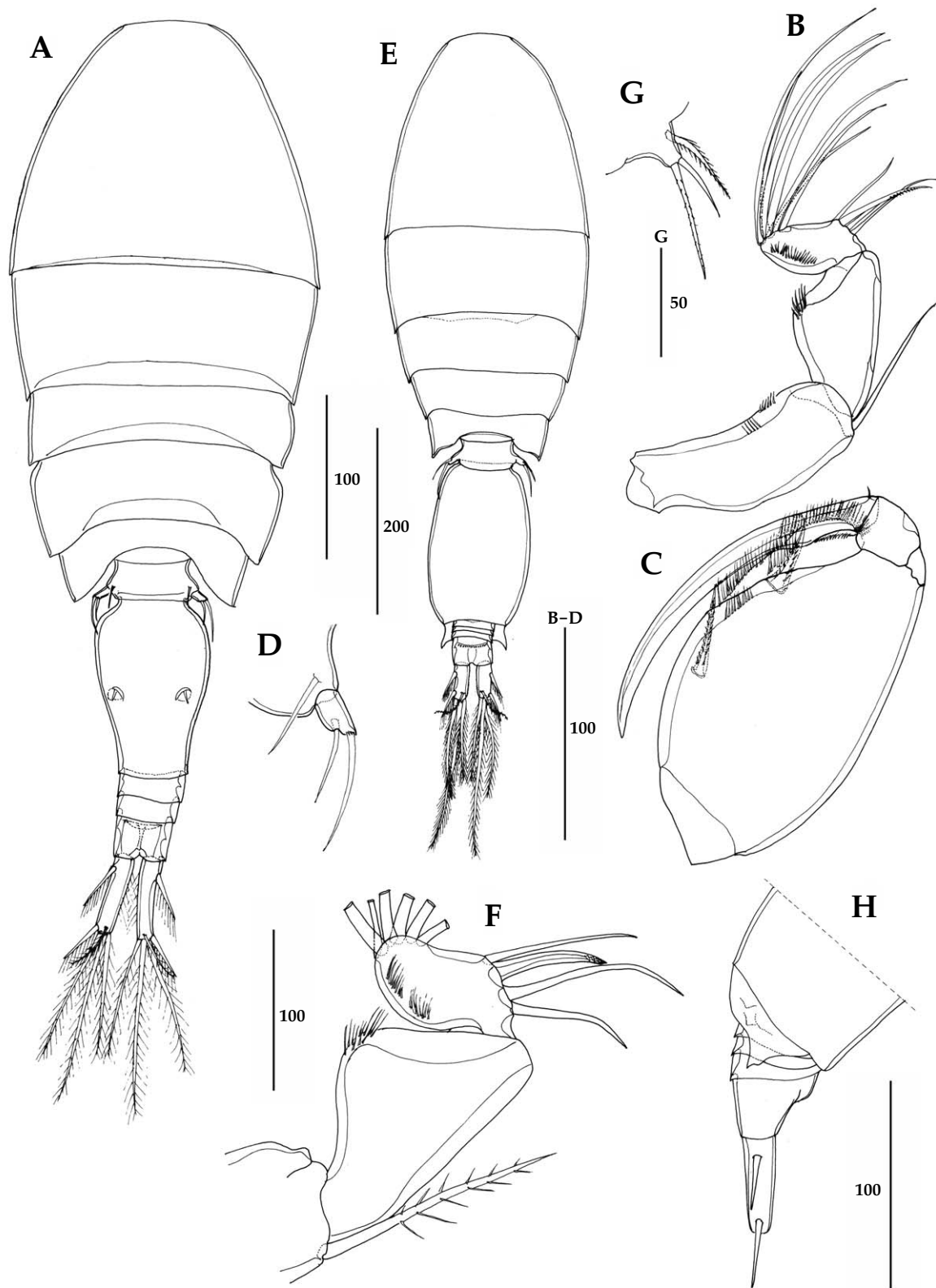


Fig. 108. *Oncaea mediterranea*. Female: A. habitus, dorsal view; B. antenna; C. maxilliped; D. fifth leg. Male: E. habitus, dorsal view; F. antenna; G. fifth leg; H. sixth leg.

KOREA: GB, GN.

SPECIMEN EXAMINED: (South Sea Gyeongsangnam-do: 13.xi.2008).

ECOLOGY: *O. mediterranea* occurs only in the South Sea during August to December. A slight increasing in abundance was observed on October.

REMARKS: Claus (1863) provided the original description of *Antaria mediterranea* from Messina, and later identified two size groups on re-examination of the original material. In the Korean waters, *O. mediterranea* exhibits two forms in both sexes: a smaller, slender form and a larger, robust form. These forms differ only in the general appearance and in the length:width ratio of the caudal ramus in the females. Differences in the males could not be found. Böttger-Schnack (1997) suggested that the question of whether these two forms are separate species might be settled using alternative methods such as breeding experiments or ribosomal RNA sequencing.

Genus *Triconia* Böttger-Schnack, 1999

Se-ppul-geom-mul-byeo-ruk-sok (세뿔검물벼룩속)

Body cyclopiform, prosome elongate-oval. Second pedigerous somite with (*conifera*-subgroup) or without (*similis*- and *dentipes*-subgroup) dorsoposterior projection in female. Cephalosome without lateral lobate extensions. Genital double-somite of female barrel- or flask-shape, not particularly swollen dorsally. First and second post-genital somites shorter than anal somite. Anal somite with wide operculum: with small spinules. Second to fourth legs with conical processes on distal endopodal segment. Swimming leg armature formula as for genus *Oncaea* Philippi, 1843. Sexual dimorphism in antennule segmentation and armature, maxilliped, genital segmentation and ornamentation, fifth and sixth legs; sometimes in antenna, endopods of second and third legs and caudal ramus.

SPECIES ca. 21 (4 in Korea).

DISTRIBUTION: Mostly offshore worldwide.

61. *Triconia conifera* (Giesbrecht, 1891)-Red Sea type (Fig. 109)

Sot-eun-se-ppul-geom-mul-byeo-ruk (솟은세뿔검물벼룩)

Oncaea conifera Giesbrecht, 1891, p. 477; Giesbrecht, 1892, pp. 591, 755, 774, 789, pl. 2, fig. 10, pl. 47, figs. 4, 16, 21, 23, 28, 34–38, 42, 55, 56; Farran, 1936, p. 127, figs. 25a, d, 26a; Moulton, 1973, fig. 4Aa, e, i, fig. 4b, m, q, u; Heron and Bradford-Grieve, 1995, p. 229, figs. 4, 5a–h.

Triconia conifera: Böttger-Schnack, 1999, pp. 54, 56, figs. 6–8.

Female: Body length in lateral view 0.98–1.06 mm. Prosome about twice as long as urosome; third segment with moderate dorsoposterior projection in lateral view; fifth segment with rounded lateroposterior corner in lateral view. Urosomite 1 with faint transverse sclerotised line dorsoposteriorly; genital double-somite tapered in lateral view; genital apertures located just anterior to midregion of dorsal surface. Caudal rami approximately equal in length to anal somite or longer,

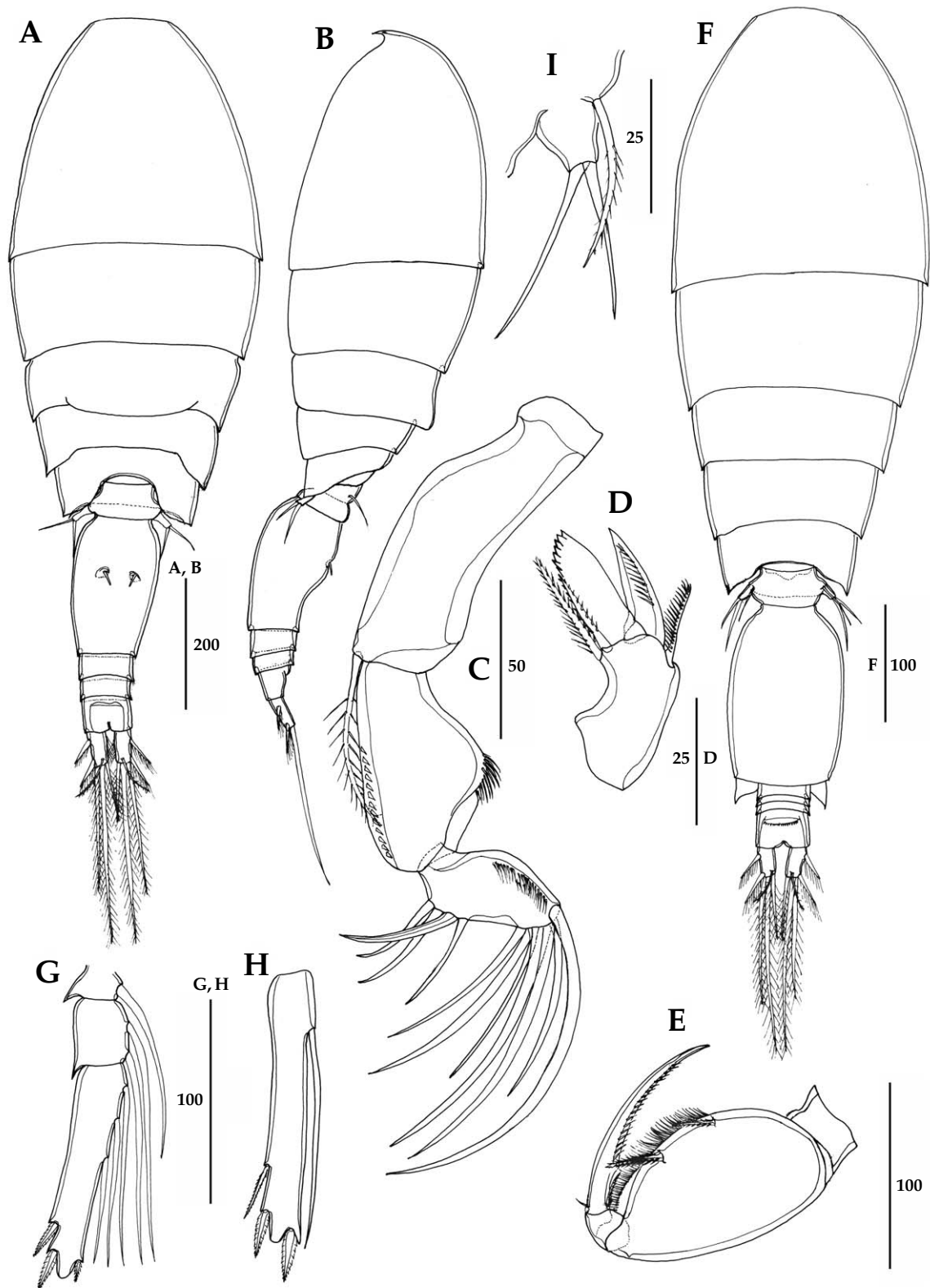


Fig. 109. *Triconia conifera*-Red Sea type. Female: A. habitus, dorsal view; B. habitus, lateral view; C. antenna, D. mandible, E. maxilliped. Male: F. habitus, dorsal view; G. second leg, H. fourth leg, I. fifth leg.

approximately 3.0 times as long as wide. Distal endopodal segment of Fourth legs with terminal conical projection. Rostral area with thickened, rounded posteroventral margin. Mandible as for *O. venusta*, except for third element with dentiform processes along distal margin and along distal two-third of dorsal margin; dorsal elements setiform, the shorter element flat and densely setose, the longer element multipinnate. Maxilliped 4-segmented, basis robust, inner surface with 2 spines: proximal spine longer than distal spine.

Swimming legs 1–4 with serrate, hyaline flanges on spines. Endopods of legs 2–4 with conical process between second and terminal spines. Fifth leg with free segment, exopod, about 3 times as long as wide; 2 terminal setae, inner twice the length of outer; ratio of length of outer seta to that of segment 1.3:1. P 6 represented by operculum closing off each genital aperture; armed with a spine and a short spinule.

Male: Body length in lateral view 0.62–0.70 mm. Prosoma lacking dorsal projection. Caudal rami relatively shorter than in female, 1.3 times longer than wide. Surface of genital flaps ornamented with several rows of small spinules. Third endopodal segment of second to fourth leg with slightly reduced spine lengths, most obvious on outer subdistal and outer distal spine of third endopodal segment of fourth leg, being relatively shorter by about 20% as compared to female. Exopod of fifth leg not delimited from somite, shorter than in female, length ratio between inner and outer exopodal seta smaller than in female. Sixth leg represented by posterolateral flap closing off genital aperture on either side; covered by pattern of spinules.

DISTRIBUTION: Widespread between 65°N and 45°S in Atlantic, Indian, and Pacific Oceans, Mediterranean Sea, tropical and temperate North Atlantic, Gulf of Mexico, Great Barrier Reef, and New Zealand. Form A is known from tropical and temperate North Atlantic.

KOREA: GN.

SPECIMEN EXAMINED: (East Sea, Gyeongsangnam-do: 8.x.2007).

ECOLOGY: Unknown.

REMARKS: *Triconia conifera* shares a typical characteristic for all *Triconia* Böttger-Schnack, 1999: a conical process on distal endopodal segments of swimming legs 2–4. In addition, this genus has three sub-groups: the *conifera*-subgroup, the *similis*-subgroup and the *dentipes*-subgroup (Böttger-Schnack, 1999). Females of the *conifera*-subgroup, are characterized by the presence of a dorsoposterior projection on the second pedigerous somite (Böttger-Schnack, 1999). According to Heron & Bradford-Grieve (1995), *T. conifera* is closely related to *T. quadrata*. But *T. quadrata* can be readily distinguished from *T. conifera* by the more robust oval appearance, especially in the lateral view of the genital double-somite, as well as by other characters, such as the size of the terminal conical projections on the distal endopodal segments of second and third legs.

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