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Amphipod (Crustacea: Malacostraca) fauna of the continental shelf region in the Southern Sea of Korea

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A faunal study on the marine amphipods at eight sites of the continental shelf region in the Southern Sea, Korea was conducted from 16−17 August 2022. In this study, 26 amphipod species in 19 genera and 14 families were found. Among these 14 families, the family Ampeliscidae with six species showed the highest abundance, followed by the family Caprellidae with five species. Amphipods were collected using conical nets, MOCNESS nets, SM grabs, and trawls. When using the SM Grab for collecting benthic sediment, 15 out of a total of 26 amphipod species were surveyed, indicating the highest diversity of amphipod species. Out of the total 26 species, four identified species (*Ampelisca pygmaea* Schellenberg, 1938; *Byblis longiflagelis* Ren, 1998; *Caprella iniquilibra* Mayer, 1903; *Primno latreillei* Stebbing, 1888) and five unidentified species (*Themisto* sp., *Liljeborgia* sp., *Dulichiella* sp., *Cranocephalus* sp., *Primno* sp.) are newly recorded in Korean fauna. These newly recorded species are fully illustrated and compared with related species. We provide a list amphipod fauna in Southern Sea of Korea including figures and tables.

Keywords: Amphipoda, continental shelf, Korean water, new record, taxonomy

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Introduction

The Yellow Sea, the South Sea, and the East Sea of the Korean Peninsula exhibit distinct undersea topography, leading to variation in the fauna found in these regions. The South Sea is geographically linked to the Yellow Sea, with the southwestern area bordering the East China Sea having greater depth. It is characterized by a maximum depth of 198 meters and an average depth of about 71 meters. The sediment in the South Sea continental shelf area is mainly composed of mud and sand deposits. The major macrobenthic communities are dominated by polychaete annelids and ampeliscid amphipods (Seo and Choi, 2010).

Amphipods inhabit various marine environments, including coastal areas, continental shelf, estuaries, and deep-sea regions, and can inhabit a wide range of temperatures, allowing them to thrive in tropical, temperate, and even cold seas, including polar regions. Amphipods play a significant role in marine ecosystems, with a high number of individuals and biomass. They are essential prey for a variety of marine predators, including whales, fish, and seabirds (Budnikova and Blokhin, 2012; Blanchard *et al*., 2019; Daly *et al*., 2021), thus connecting the food chain in marine ecosystems (Padovani *et al*., 2012; Havermans *et al*., 2019). Amphipods, constituting a large group of marine invertebrates, are highly sensitive to environmental change (Navarro-Barranco *et al*., 2017; Dauvin, 2018). They are also used in ecological indices such as the AMBI index (Borja *et al*., 2000), BENTIX index (Simboura and Zenetos, 2002), and BOPA index (Dauvin and Ruellet, 2007), often in conjunction with polychaete annelids, to assess the ecological status of benthic communities.

Amphipod study in Korea has typically been conducted in intertidal zones and along the coast. While several biological surveys have been conducted on the southern continental shelf of Korea (Yoon *et al*., 2005; Jeong *et al*., 2006; Seo and Choi, 2010), there has been no research to date that accurately delineated the taxonomic specifications of amphipod species. In this study, we investigated marine amphipods in the continental shelf area from Yeosu to Geomundo Island on the southern coast of Korea. This study represents the first in-depth ecological and taxonomic study of an amphipod fauna in the continental shelf region of the Southern Sea, Korea.

Materials and Methods

Specimens were collected by SM grab (width and len-

gth: 0.5 m), conical net (mouth diameter: 0.6 m, mesh size: 200 μm), MOCNESS net (mouth area: 1 m^2, mesh size: 200 μm), and trawl dredging from the subtidal waters at eight sites along the continental shelf in the Southern Sea, Korea during the period from 16–17 August 2022 (Figs. 1, 2, Table 1). The specimens were fixed with 95% ethanol for preservation and later dissected in glycerol on Cobb's aluminum hollow slides. Permanent mounts were made using polyvinyl lactophenol with lignin pink added. Pencil drawing and measuring were performed with the aid of a drawing tube, mounted on an SZX 12 stereomicroscope (Olympus) and BX 51 interference contrast compound microscope (Olympus). Line drawings were produced using the program Clip Studio. Body length was measured from the tip of the rostrum to the posterior end of the urosome, along the dorsal parabolic line of the body. Specimens are deposited at the Marine Biodiversity institute of Korea (MABIK) in Seocheon, Korea and the Department of Biological Science, Dankook University (DKU), Cheonan, Korea.

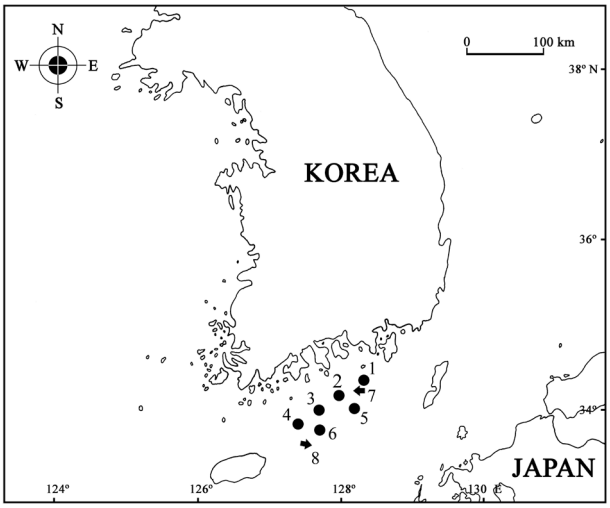


Fig. 1. Map showing collecting site. 1, Site 1; 2, Site 2; 3, Site 3; 4, Site 4; 5, Site 5; 6, Site 6; 7, Site 7 (trawl 1); 8, Site 8 (trawl 2).

Results

Subphylum Crustacea Pennant, 1777 갑각아문
Class Malacostraca Latreille, 1806 연갑강
Order Amphipoda Latreille, 1816 단각목
Family Ampeliscidae Krøyer, 1842 안경옆새우과
Genus *Ampelisca* Krøyer, 1842 안경옆새우속

1. *Ampelisca alatopedunculata* Ren, 2006
더듬이안경옆새우 (Fig. 11A)



Fig. 2. Collecting methods. A, SM grab; B, Conical net; C, MOCNESS net; D, trawl net.

Table 1. Details of sampling localities.

Date	Site	Methods	Latitude (N)	Longitude (E)	Dept (m)
16 Aug. 2022	St. 1	Conical net, SM grab	34°25′48″	128°17′42″	52
17 Aug. 2022	St. 2	Conical net, SM grab	34°16′01″	127°56′21″	61
17 Aug. 2022	St. 3	Conical net, SM grab	34°05′35″	127°39′45″	53
17 Aug. 2022	St. 4	Conical net, SM grab	33°54′55″	127°22′46″	79
17 Aug. 2022	St. 5	Conical net, SM grab, MOCNESS net	34°07′03″	128°10′23″	85
17 Aug. 2022	St. 6	Conical net, SM grab, MOCNESS net	33°51′30″	127°42′15″	92
16 Aug. 2022	St. 7	Trawl	from 34°19′26″ to 34°19′05″	from 128°16′17″ to 128°12′20″	57–65
17 Aug. 2022	St. 8	Trawl	from 33°41′25″ to 33°40′39″	from 127°28′53″ to 127°31′24″	93–95

Material examined. 1 ind., Site 5, 17 August 2022; 8 inds., Site 6, 17 August 2022.
Distribution. Korea (Jejudo Island, west and south coasts), China, Japan, Vietnam.

2. *Ampelisca cyclops* Walker, 1904
짧은다리안경옆새우 (Fig. 11B)

Material examined. 10 inds., Site 5, 17 August 2022.
Distribution. Korea (west and south coasts), China, Japan, Malaysia, Thailand.

3. *Ampelisca naikaiensis* Nagata, 1959
나이카안경옆새우 (Fig. 11C)

Material examined. 40 inds., Site 6, 17 August 2022.
Distribution. Korea (west and south coasts), China, Japan.

4. *Ampelisca pygmaea* Shellenberg, 1938
꼬마안경옆새우 (신칭)* (Figs. 3, 4, 11D)
Ampelisca pygmaea Shellenberg, 1938: 10, Fig. 4; Ledoyer, 1978: 211, Fig. 3; Ren, 2006: 121, Fig. 40.

Material examined. 2♀♀, Site 4, 17 August 2022.
Description. Female (MABIK CR00254533): Body (Figs. 3A, 11D) smooth, 5.6 mm long: Head (Fig. 3A) subtriangular; rostrum short; two paired eyes are composed of corneal lens, one pair located behind rostrum, the other located to ventral margin of cephalic lobe.

Right mandible (Fig. 3B), incisor with 6 blunt teeth; lacinia mobilis with 5 tiny blunt teeth; molar truncate, accessory setal row of 7 setae between lacinia mobilis and molar; palp well developed, triarticulate, mandibular palp article 2 characteristically swollen.

Gnathopod 1 (Fig. 3C), coxa expended ventrally, with plumose setae ventrally, ventral margin rounded with a notch posteroventrally; basis narrowing proximally, anterior margin with short marginal setae, proximal half with long simple setae, posterior margin with 8 simple long setae and row of marginal robust setae; carpus elongate, width 0.36 times length, twice as propodus, with several setae on each margin; propodus subovate, palm subchelate; dactylus broad, falcate.

Gnathopod 2 (Fig. 3D) similar to gnathopod 1, but coxa elongate and narrowed distally; carpus and propodus more elongated than those of gnathopod 1; dactylus falcate; length ratio of articles 2–7 = 1.00 : 0.19 : 0.31 : 0.73 : 0.30 : 0.15.

Pereopod 3 (Fig. 3E), coxa slender, subrectangular, similar to that of gnathopod 2; basis with marginal setae anteriorly, 4 long simple setae posteriorly; merus elongate, posterodistal corner expanded distally with plumose setae; carpus subrectangular, posterior margin with simple setae, 2 plumose setae posteromedially; propodus subovate, with 6 robust setae posteromarginally, dactylus elongate; length ratio of articles 2–7 = 1.00 : 0.17 : 0.65 : 0.29 : 0.28 : 0.37.

Pereopod 4 (Fig. 3F) subsimilar to pereopod 3, but more setose; coxa subquadrate, posterior margin with posteroproximal excavation, ventral margin setose; basis distal half of posterior margin setose, with 4 robust setae distally; merus both margins with plumose setae, posterodistal quarter with robust setae; carpus posterior margin with 2 long robust setae, 4 plumose setae posteromedially; propodus with 5 robust setae posteromarginally; dactylus falcate, slightly longer than propodus; length ratio of articles 2–7 = 1.00 : 0.20 : 0.81 : 0.29 : 0.24 : 0.27.

Pereopod 5 (Fig. 4A), coxa bilobate; basis roundly expanded anteriorly and posteroproximally, anterior margin with marginal robust setae and 5 plumose setae; carpus slightly expanded posterodistally with 4 robust setae, anterodistal corner with 1 robust seta; propodus club shaped; length ratio of articles 2–6 = 1.00 : 0.18 : 0.33 : 0.48 : 0.41.

Pereopod 6 (Fig. 4B) similar to pereopod 5, but coxa much smaller, basis subcircular, expanded both margin-

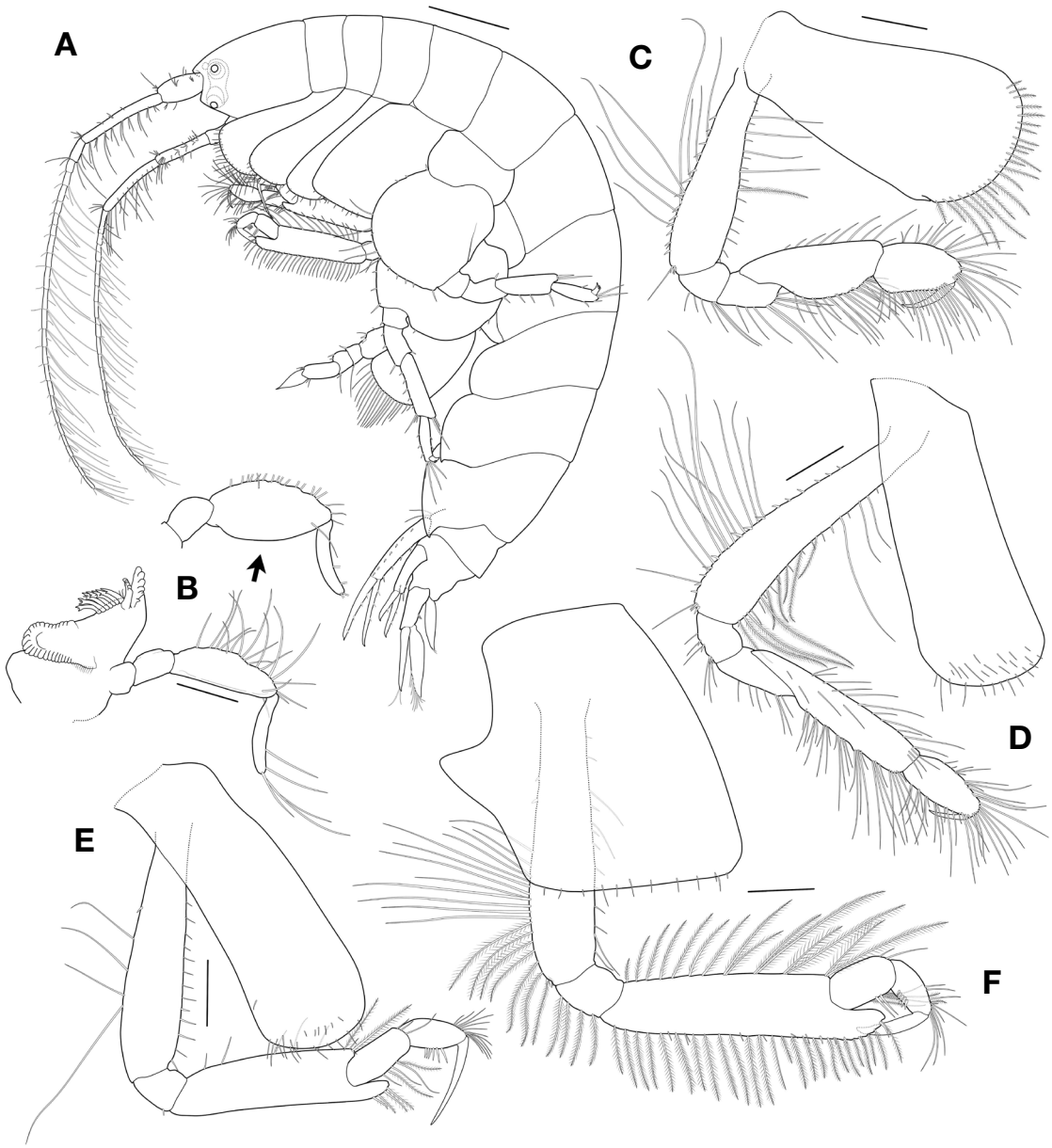


Fig. 3. *Ampelisca pygmaea* Shellenberg, 1938, adult female A, habitus; B, mandible and mandibular palp; C, gnathopod 1; D, gnathopod 2; E, pereopod 3; F, pereopod 4. Scale bars: A = 0.5 mm; B = 0.1 mm; C–F = 0.2 mm.

ally; length ratio of articles 2–6 = 1.00 : 0.17 : 0.26 : 0.50 : 0.38.

Pereopod 7 (Fig. 4C), basis expanded posteroventrally, posterodistal lobe not reaching distal end of ischium, with marginal plumose setae; ischium subovate, with 2 robust setae anteriorly; dactylus foliaceous; length ratio of articles 2–7 = 1.00 : 0.25 : 0.11 : 0.12 : 0.26 : 0.27.

Uropod 1 (Fig. 4D), peduncle rectangular, slightly longer than rami, with 4 dorsolateral, 7 dorsomedial, and 8 ventrolateral robust setae; rami slightly shorter than peduncle, outer ramus slender, subequal to inner one.

Uropod 2 (Fig. 4E) short, peduncle rectangular, 1.1 times as long as inner ramus; both rami dorsomedially serrulate.

Uropod 3 (Fig. 4F), peduncle much shorter than rami; both rami subequal in length, outer ramus slender, medial margin serrate, with 3 marginal setae; inner ramus distal half with plumose setae.

Telson (Fig. 4G) subovate, narrowing distally, about 0.6 times as long as wide, deeply cleft, each lobe with dorsal and apical setae.

Distribution. Korea (south coast), China, Russia, Indo-

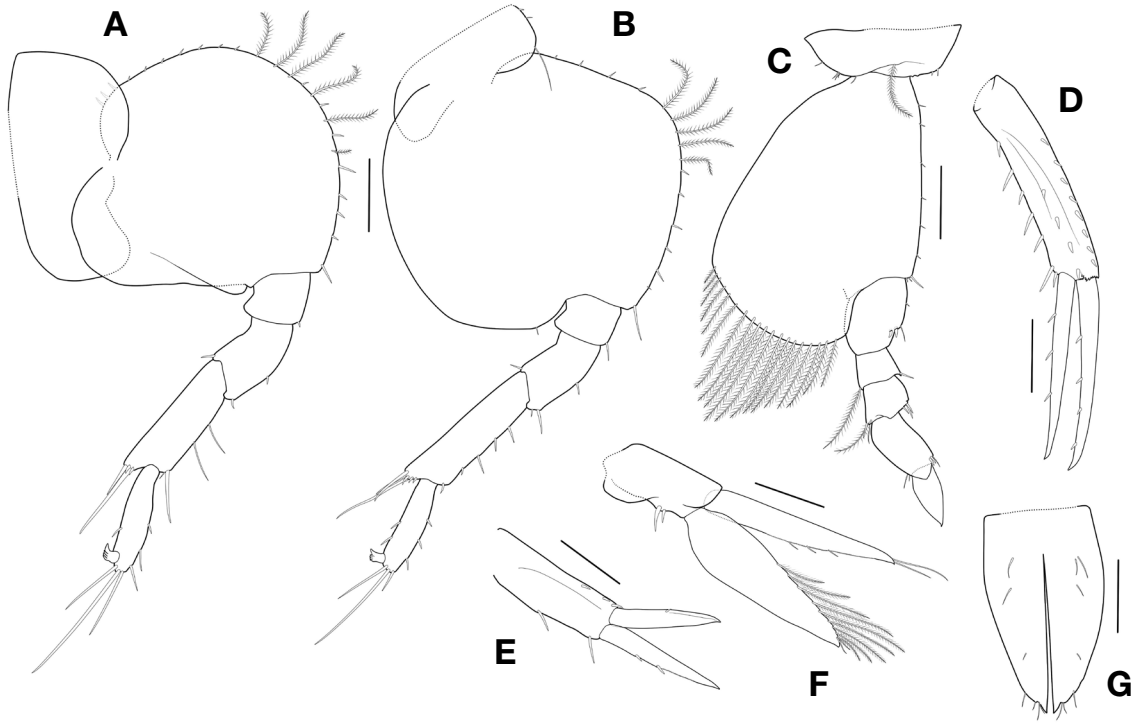


Fig. 4. *Ampelisca pygmaea* Shellenberg, 1938, adult female. A, pereopod 5; B, pereopod 6; C, pereopod 7; D, uropod 1; E, uropod 2; F, uropod 3; G, telson. Scale bars: A–G = 0.2 mm.

nesia, Vietnam.

Remarks. In the genus *Ampelisca*, degree of projection of rostrum, shape of the cephalic lobe, and the variation of number and location of lens-shaped eyes are different depending on the species. *Ampelisca pygmaea* belongs to a group with two lens-shaped eyes, the second pair located on the ventral margin of the cephalic lobe. Among the species of genus *Ampelisca*, *A. pygmaea* is morphologically distinguished from other *Ampelisca* species by having following three characteristics: (1) mandibular palp, article 2 broadly expended (vs. generally thin except for *A. ceratophoculata*, *A. hainanensis*, etc.); (2) pereopods 3, 4, meri expended posterodistally (vs. generally unexpanded or weak to that extent of *A. pygmaea*); and (3) uropod 3, rami shape (slender outer ramus; leaf-shaped inner ramus with plumose setae) (Schellenberg, 1938; Ren, 2006). As Ren noted, individuals found in the South China Sea differ from those in other regions by having shorter antennae and concave posteroventral margin of pereopod 6 basis. Our Korean specimen is 5.6 mm long, which is larger than the individuals reported from the Bismarck-Archipelago by Shellenberg (1938) and the Indian Ocean by Ledoyer (1978), but in good agreement with the original description by Schellenberg (1938).

Genus *Byblis* Boeck, 1871 비블리스속

5. *Byblis japonicus* Dahl, 1944
일본비블리스안경옆새우 (Fig. 11E)

Material examined. 7 inds., Site 4, 17 August 2022.
Distribution. Korea (Jejudo Island, west and south coasts), China, Japan, Vietnam.

6. *Byblis longiflagelis* Ren, 1998
긴더듬이안경옆새우 (신칭)* (Figs. 5, 6, 11F)
Byblis longiflagelis Ren, 1998: 177, Figs. 8, 9 (cited from Ren, 2006); Ren, 2006: 167, Fig. 56.

Material examined. 1♂, Site 4, 17 August 2022; 1♂, Site 6, 17 August 2022.
Description. Male (MABIK CR00254534): Body (Figs. 5A, 11F) smooth, 11.1 mm long: Head (Fig. 5A) longer than pereonites 1 and 2 combined; rostrum short; corneal lens of eyes two paired, one pair located on upper distal end, the other located on apex of anterior cephalic lobe.

Gnathopod 1 (Fig. 5B), coxa gradually expended anteroventrally, ventral margin serrated, with plumose setae; basis elongate, subrectangular, with 5 long setae and 1 robust seta on posterior margin; carpus elongate, about twice length of propodus, with unequal setae on posterior margin; propodus elongate-ovate, palm subchelate; dactylus falcate, with a nail.

Gnathopod 2 (Fig. 5C) similar to gnathopod 1, but coxa

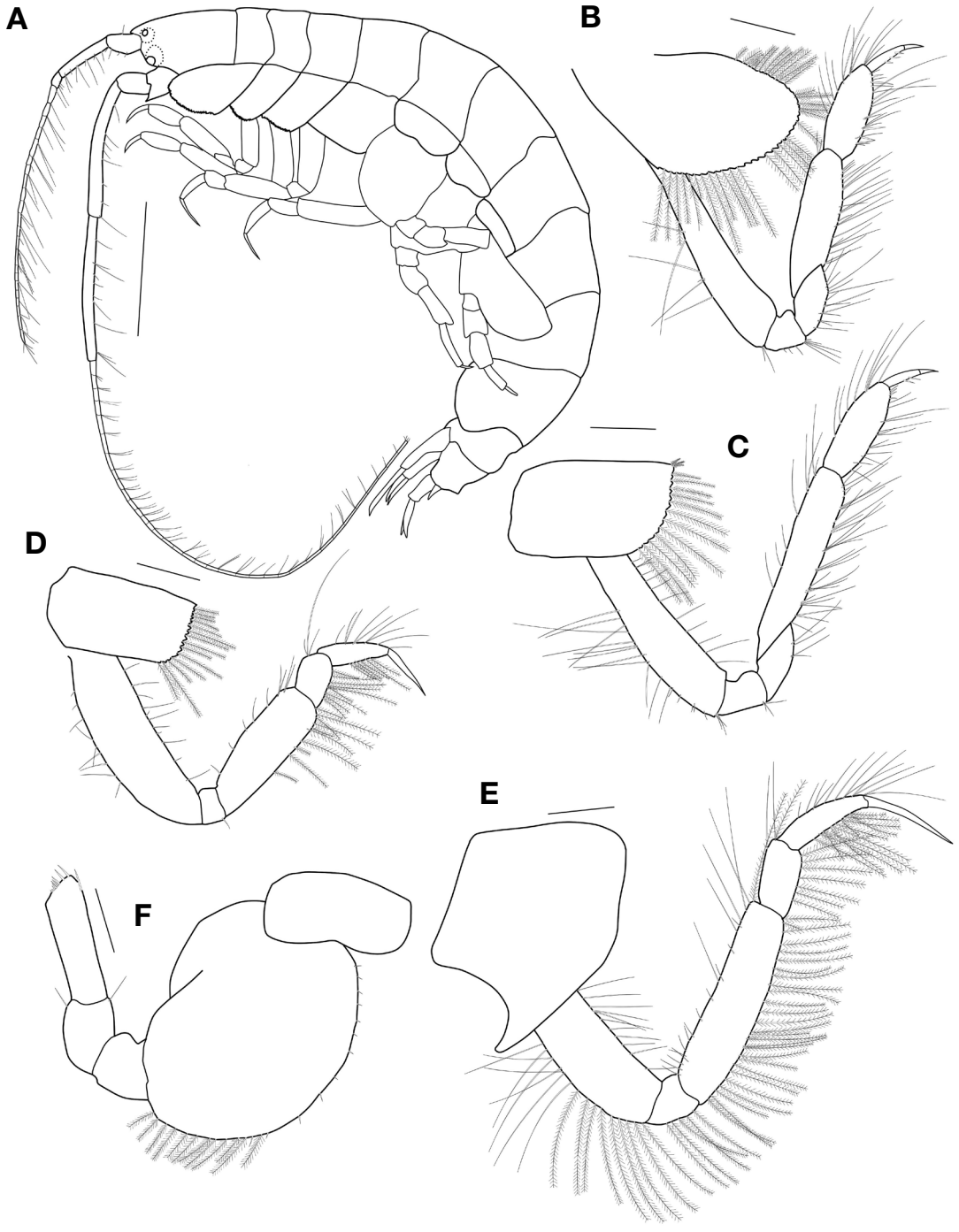


Fig. 5. *Byblis longiflagelis* Ren, 1998, adult male. A, habitus; B, gnathopod 1; C, gnathopod 2; D, pereopod 3; E, pereopod 4; F, pereopod 5. Scale bars: A = 1.0 mm; B–F = 0.2 mm.

subquadrate and smaller; carpus and propodus more elongated than those of gnathopod 1; length ratio of articles 2–7 = 1.00 : 0.19 : 0.31 : 0.73 : 0.30 : 0.15.

Pereopod 3 (Fig. 5D), coxa similar to coxa 2; basis with simple setae on both margins; merus elongate, with plumose setae on distal half of posterior margin; carpus short, with 3 setae on anterodistal margin and 10 plumose setae on posterior margin; propodus slender, with several clusters of setae on anterior margin and 6 plumose setae on posterior margin; dactylus elongate and acute; length ratio of articles 2–7 = 1.00 : 0.17 : 0.65 : 0.29 : 0.28 : 0.37.

Pereopod 4 (Fig. 5E), coxa subquadrate, posterior mar-

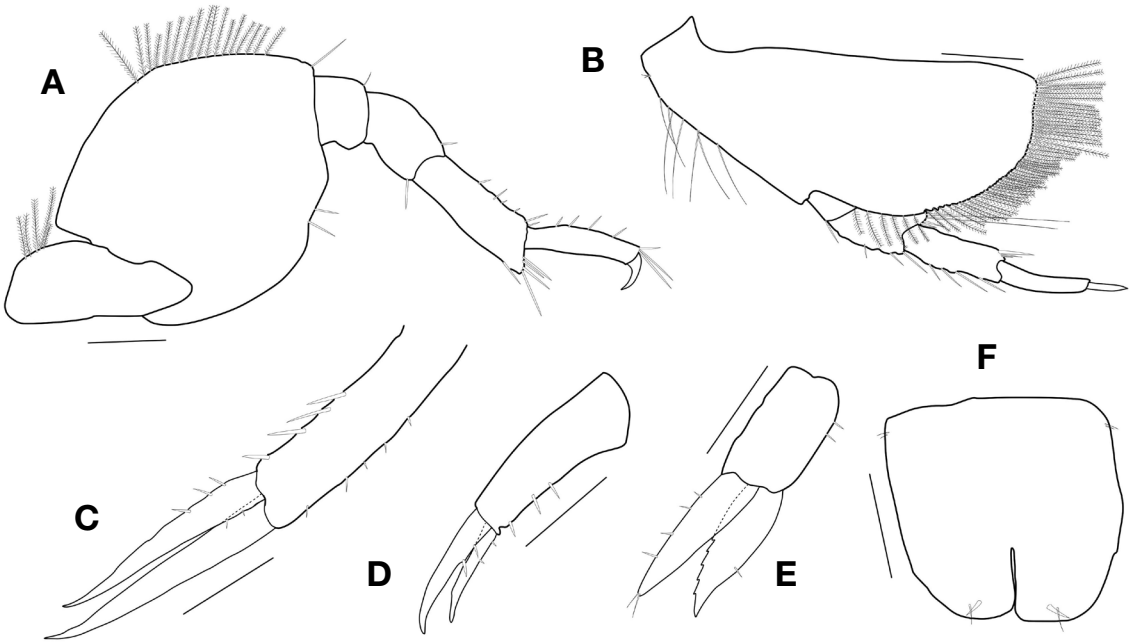


Fig. 6. *Byblis longiflagelis* Ren, 1998, adult male. A, pereopod 6; B, pereopod 7; C, uropod 1; D, uropod 2; E, uropod 3; F, telson. Scale bars: A–E = 0.2 mm; F = 0.1 mm.

gin with posteroproximal excavation, posterior tooth subacute and produced backward; basis and merus subrectangular, with a row of simple setae on anterior margin, simple and plumose setae on posterior margin; merus to propodus subrectangular, slender, with plumose setae along posterior margins; length ratio of articles 2–7 = 1.00 : 0.20 : 0.81 : 0.29 : 0.24 : 0.27.

Pereopod 5 (Fig. 5F), coxa weakly bilobate; basis subovate, broadly expanded, with 12 plumose setae and 12 robust setae on anterior margin, posterior lobe somewhat produced; carpus subrectangular, with 9 robust setae on distal margin and 1 robust seta on anterodistal corner.

Pereopod 6 (Fig. 6A) similar to pereopod 5, except coxa 6 with plumose setae anteroventrally and posterior lobe of basis weakly produced.

Pereopod 7 (Fig. 6B), basis expanded posteroventrally, ventral margin slightly serrated, with densely plumose setae, posterodistal lobe extending far beyond distal end of merus; length ratio of articles 2–7 = 1.00 : 0.15 : 0.18 : 0.28 : 0.23 : 0.09.

Uropod 1 (Fig. 6C), peduncle subrectangular, subequal to outer ramus in length, with 5 dorsolateral and 5 ventrolateral robust setae; outer ramus longer than inner ramus.

Uropod 2 (Fig. 6D) short; peduncle subrectangular, longer than rami; outer ramus longer than inner ramus.

Uropod 3 (Fig. 6E), peduncle shorter than rami; both rami subequal in length, inner margin of inner ramus serrated.

Telson (Fig. 6F) quadrangular, with distally rounded corners, cleft not reaching to the middle, each lobe with 2 short setules on outer proximal margin, 1 short seta, and 1 robust seta subapically.

Distribution. Korea (south coast), China.

Remarks. Ren noted that *Byblis longiflagelis* is morphologically similar to *B. orientalis* by the following features: (1) antenna 2 elongate, overreaching body end; (2) telson trapezoid (Ren, 2006). However, *B. longiflagelis* is distinguished from *B. orientalis* (different characters of *B. orientalis* in brackets) by the following features: (1) lower eyes located on ventral corner of anterior cephalic lobe (vs. located on distal margin of anterior cephalic lobe); (2) coxae 1–3 angled anterodistally, ventral margins serrated (vs. roundish anterodistally, ventral margins smooth); (3) coxa 4 posterior tooth moderately attenuated and subacute (vs. posterior tooth not attenuated); (4) pereopods 3, 4, dactyli longer than propodi (vs. dactyli subequal or shorter than propodi); and (5) pereopod 7, carpus subequal to propodus in length (vs. carpus shorter than propodus in length) (Ren, 2006). In Korea, *B. japonica* is already known in the genus. However, *B. longiflagelis* can be easily distinguished from *B. japonica* as follows: (1) antenna 2 longer than body length (vs. shorter than body length), (2) coxae 1–3 ventral margins serrated (vs. ventral margins smooth). Our Korean specimens are in good agreement with the description by Ren (2006).

Family Ampithoidae Boeck, 1871 참옆새우과

Genus *Ampithoe* Leach, 1814 참옆새우속

7. *Ampithoe lacertosa* Spence Bate, 1858
태평양참옆새우 (Fig. 11G)

Material examined. 2 inds., Site 7, 16 August 2022.
Distribution. Korea (Jejudo Island, west, south, and east coasts), Japan, The Pacific, U.S.A.

Family Atylidae Lilljeborg, 1865 날씬옆새우과
Genus *Kamehatylus* J.L. Barnard, 1970
곁납작붙은꼬리옆새우속

8. *Kamehatylus japonicus* (Nagata, 1961)
곁납작붙은꼬리옆새우 (Fig. 11H)

Material examined. 3 inds., Site 6, 17 August 2022.
Distribution. Korea (south and east coasts), Indonesia, New Caledonia, Japan.

Family Caprellidae Leach, 1814 바다대벌레과
Genus *Caprella* Lamarck, 1801 바다대벌레속

9. *Caprella decipiens* Mayer, 1890
짧은마디더듬이민다리바다대벌레 (Fig. 12A)

Material examined. 1 ind., Site 7, 16 August 2022.
Distribution. Korea (Jejudo Island, west, south, and east coasts), Japan, Russia.

10. *Caprella iniquilibra* Mayer, 1903
나도가슴가시바다대벌레 (신칭)* (Figs. 7–9, 12B, C)

Caprella iniquilibra Mayer, 1903: 105, pl. 4, Figs. 17–19.
Caprella (*Caprella*) *iniquilibra* Arimoto, 1976: 82, Figs. 41, 42.

Material examined. 9♂♂, 17♀♀, Site 8, 17 August 2022.
Description. Male (MABIK CR00254535): Body (Figs. 7A, 12B) slender and smooth, 5.4 mm long. Head (Fig. 7A) smooth without process; eye small and round; pereonite 1 fused with head, suture present; pereonites 2 with a projection ventrally between gnathopod 2; pereonites 3, 4 with elongated gills; pereonites 5 longest; length ratio of pereonites 2–7 = 1.00 : 0.98 : 0.95 : 1.32 : 0.42 : 0.30.

Antenna 1 (Fig. 7B) slender, 0.74 times body length; peduncular article 1 shortest, with several short setae; length ratio of peduncular articles 1–3 = 1.00 : 2.12 : 1.33; flagellum 13-articulate, 1.38 times peduncle, each article

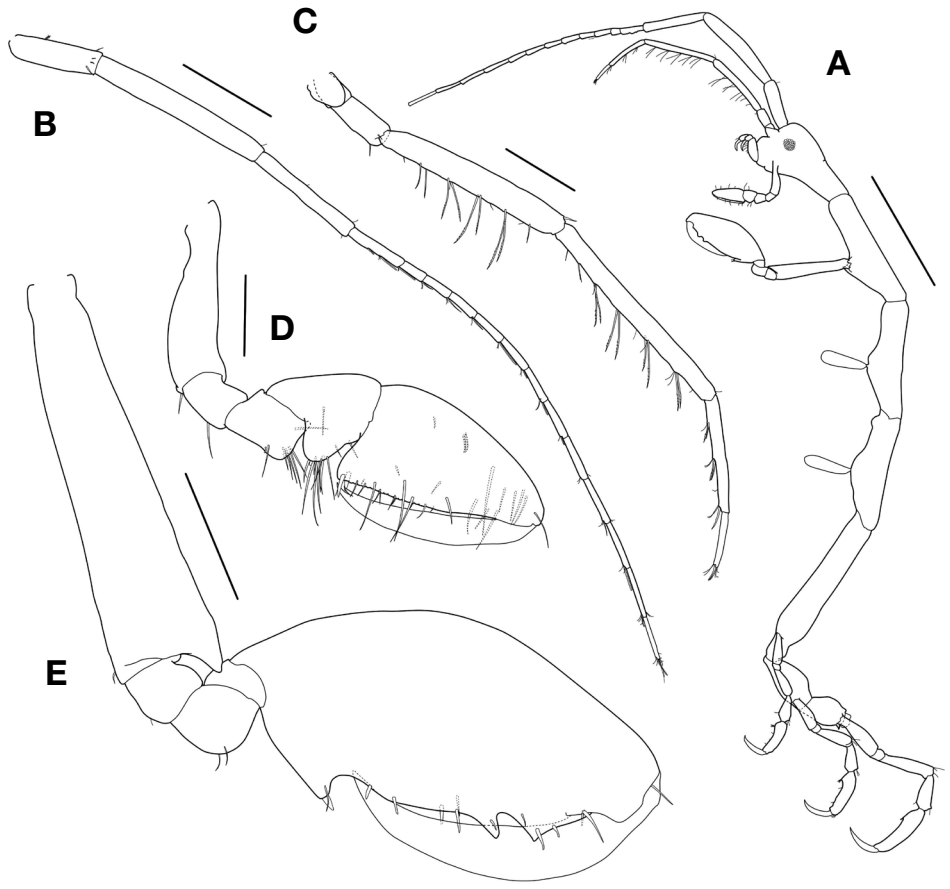


Fig. 7. *Caprella iniquilibra* Mayer, 1903, adult male. A, habitus; B, antenna 1; C, antenna 2; D, gnathopod 1; E, gnathopod 2. Scale bars: A = 1.0 mm; B, E = 0.2 mm; C = 0.4 mm; D = 0.1 mm.

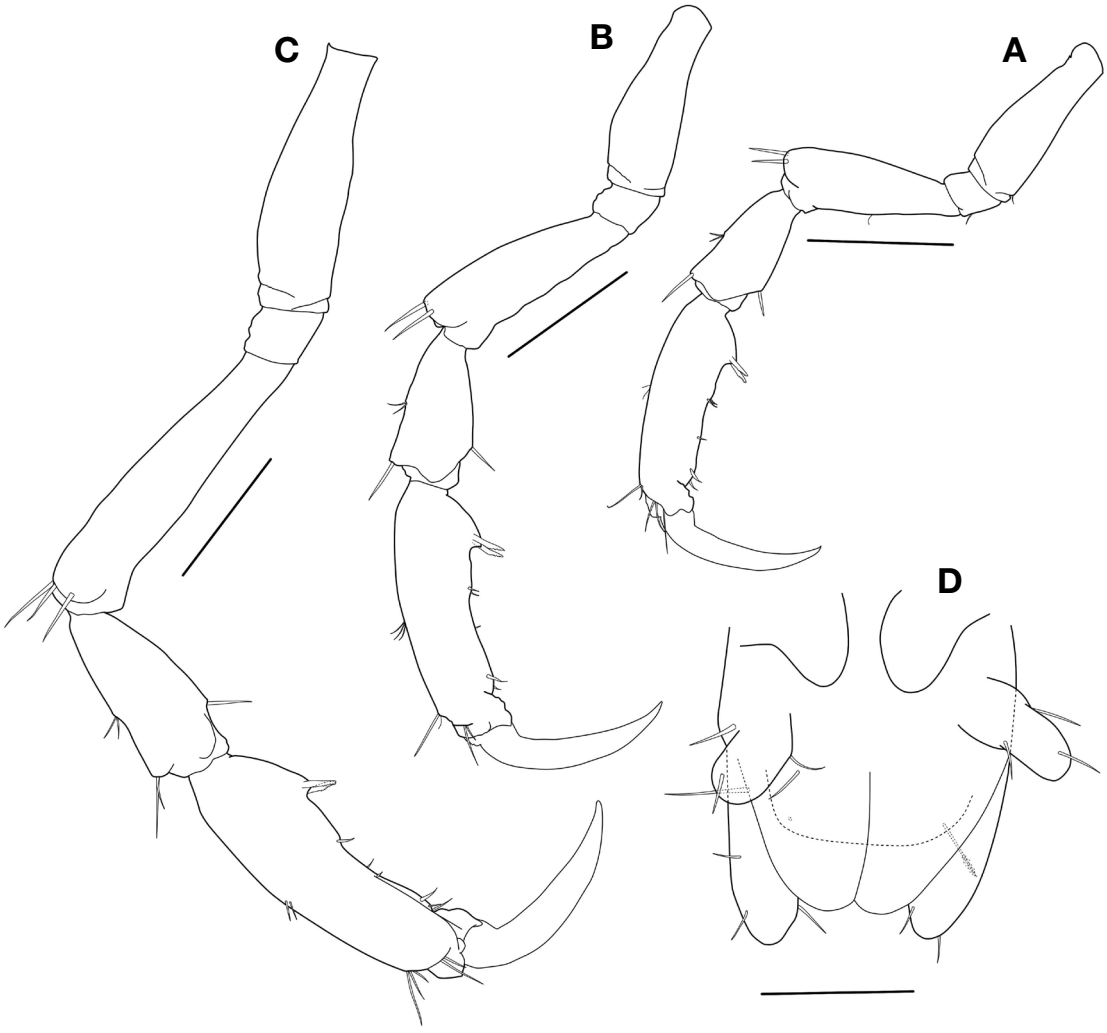


Fig. 8. *Caprella iniquilibra* Mayer, 1903, adult male. A, pereopod 5; B, pereopod 6; C, pereopod 7; D, abdomen. Scale bars: A–C = 0.2 mm; D = 0.05 mm.

with 1 aesthetasc ventrodistally.

Antenna 2 (Fig. 7C) much shorter than antenna 1; peduncular articles 4, 5 and flagellum article 1 with swimming setae ventrally; length ratio of peduncular articles 3–5 = 1.00 : 4.02 : 4.48; flagellum biarticulate, 0.74 times peduncular articles 5.

Gnathopod 1 (Fig. 7D) small; basis expanded posteriorly; carpus subtriangular, with expending rounded lobe and long simple setae ventrally; propodus subtriangular, narrowing distally, palm slightly convex, with unequal setae, proximal projection conspicuously provided; dactylus falcate, fitting palm; length ratio of 6 articles = 1.00 : 0.31 : 0.45 : 0.65 : 1.24 : 1.32.

Gnathopod 2 (Fig. 7E) attached to midposterior portion of pereonite 2; basis elongate, subequal to propodus, with a projection on anterodistal portion; propodus elongate, width 0.49 times length, palm with triangular projection near distal margin, poison tooth situated nearly triangular projection, with 1 robust (grasping) seta, unequal simple setae on palmar margin; length ratio of 6 articles = 1.00 : 0.14 : 0.17 : 0.07 : 1.02 : 0.77.

Pereopod 5 (Fig. 8A) elongate and ordinary; propodus, palm with a pair of robust (grasping) setae; length ratio of 6 articles = 1.00 : 0.19 : 0.94 : 0.71 : 1.26 : 1.12.

Pereopod 6 (Fig. 8B) similar to pereopod 5, but merus more elongated than that of pereopod 5; length ratio of 6 articles = 1.00 : 0.21 : 1.03 : 0.74 : 1.37 : 1.08.

Pereopod 7 (Fig. 8C) similar to pereopod 6, but merus more elongated than that of pereopod 6; length ratio of 6 articles = 1.00 : 0.22 : 1.20 : 0.73 : 1.25 : 0.87.

Abdomen (Fig. 8D) with a pair of appendages and lobes, plumose setae dorsally.

Female (DKUAMP202305): Body (Figs. 9A, 12C) 6.5 mm long, generally as in male, but pereonites 3, 4 with

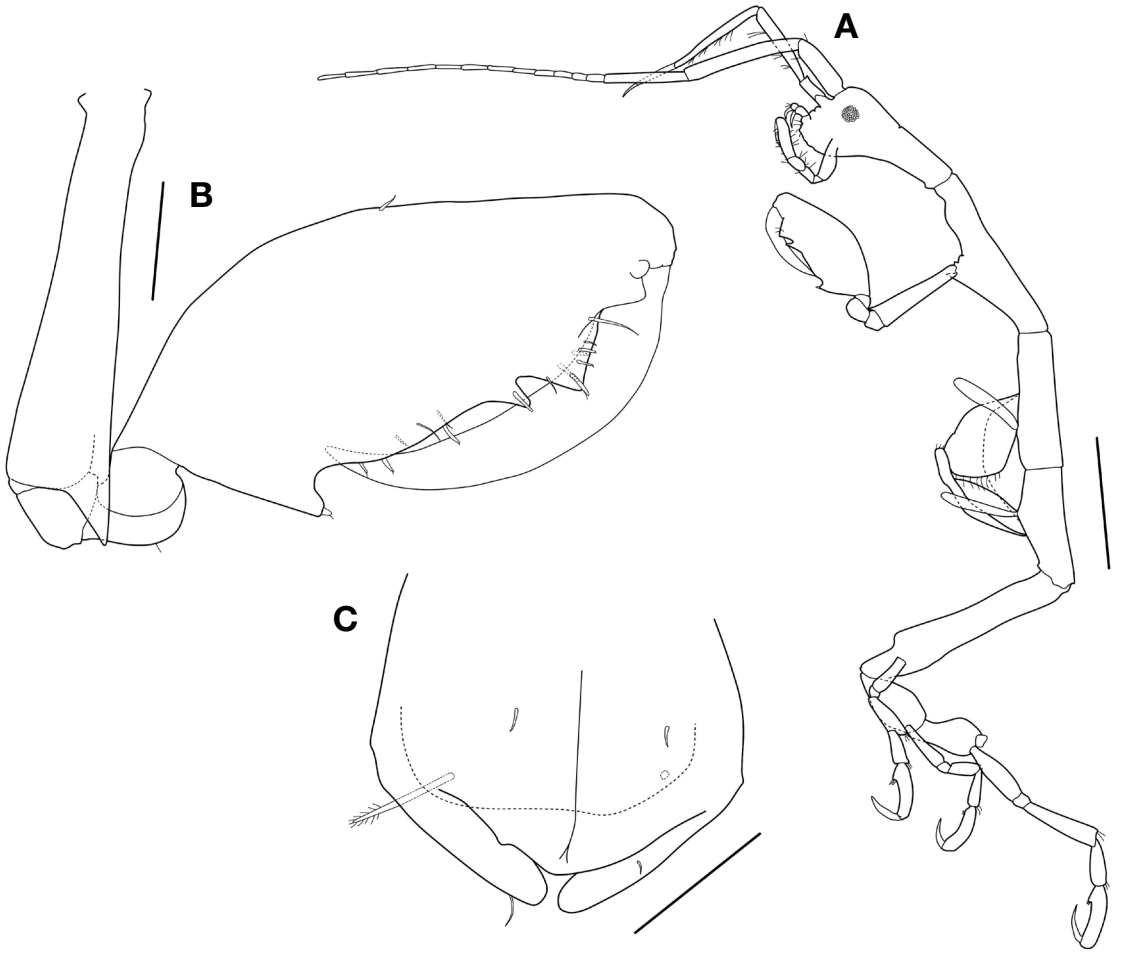


Fig. 9. *Caprella iniquilibra* Mayer, 1903, adult female. A, habitus; B, gnathopod 2; C, abdomen. Scale bars: A = 1.0 mm; B = 0.2 mm; C = 0.05 mm.

rounded brood pouches.

Gnathopod 2 (Fig. 9B) similar to that of male, but basis slender than that of male.

Abdomen (Fig. 9C) similar to that of male, but without appendages.

Distribution. Korea (south coast), Japan.

Remarks. *Caprella iniquilibra* is morphologically similar to *C. equilibra* by the following features: (1) antenna 1, length ratio of peduncular articles 1–3; (2) pereonite 2 with a projection midventrally between gnathopod 2; (3) gnathopod 2, propodus oval (Mayer, 1882; Stebbing, 1888; Arimoto, 1976). However, *C. iniquilibra* is distinguished from *C. equilibra* (different characters of *C. equilibra* in brackets) by the following features: (1) head smooth and round, without angular projection in front (vs. with angular projection in front), (2) pereonite 5 longest (vs. pereonite 2 longest), (3) gnathopod 2, basis subequal to propodus in length (vs. shorter than propodus). *Caprella iniquilibra* is also similar to *C. simplex* but can be distinguished (different characters of *C. simplex* in brackets) by the following features: (1) pereonite 5 longest and smooth (vs. pereopod 2 longest, pereonite 5 with a pair of projections), (2) antenna 1 shorter than body length (vs. subequal to body length), (3) pereopods 5–7, propodi with robust (grasping) setae (vs. without robust (grasping) setae).

Caprella iniquilibra was first described by Mayer (1903) with a type locality in the Korea straits. However, upon checking the coordinates, it was collected in the waters of Japan, far from Korea. Subsequently, *C. iniquilibra* has been recorded in Japan (Arimoto, 1976), but there is no record of it being found in Korea. Our Korean specimens are in good agreement with Mayer's (1903) description.

11. *Caprella verrucosa* Boeck, 1871
흑등바다대벌레 (Fig. 12D)

Material examined. 1 ind., Site 5, 17 August 2022.

Distribution. Korea (Jejudo Island, west, south, and east coasts), Japan, U.S.A.

Genus *Protogeton* Mayer, 1903
두아가미원시바다대벌레속

12. *Protogeton incertus* Mayer, 1903
두마디원시바다대벌레 (Fig. 12E)

Material examined. 2 inds., Site 3, 17 August 2022.
Distribution. Korea (south coast), China.

Genus *Pseudoproto* Mayer, 1903
의원시바다대벌레속

13. *Pseudoproto fallax* Mayer, 1903
세아가미의원시바다대벌레 (Fig. 12F)

Material examined. 21 inds., Site 6, 17 August 2022.
Distribution. Korea (Jejudo Island, south coast), Australia, China, Japan.

Family Cyproideidae J.L. Barnard, 1974
넓은마디옆새우과
Genus *Cyproidea* Haswell, 1880
참넓은마디옆새우속

14. *Cyproidea liodactyla* Hirayama, 1978
참넓은마디옆새우 (Fig. 12G)

Material examined. 1 ind., Site 4, 17 August 2022.
Distribution. Korea (Jejudo Island, south coast), Japan.

Family Hyperiidae Dana, 1852 하늘옆새우과
Genus *Themisto* Guérin, 1825

15. *Themisto* sp. (Fig. 12H)

Material examined. 8 inds., Site 2, 17 August 2022; 50 inds., Site 3, 17 August 2022; 100 inds., Site 4, 17 August 2022.

Family Leucothoidae Dana, 1852 공생옆새우과
Genus *Leucothoe* Leach, 1814

16. *Leucothoe spinicarpa* (Abildgaard, 1789)
긴손가락공생옆새우 (Fig. 13A)

Material examined. 1 ind., Site 8, 17 August 2022.
Distribution. Korea (Jejudo Island, south and east coasts), worldwide.

Family Liljeborgiidae Stebbing, 1899 릴예보옆새우과
Genus *Liljeborgia* Spence Bate, 1862 릴예보옆새우속

17. *Liljeborgia* sp. (Fig. 13B)

Material examined. 2 inds., Site 7, 16 August 2022.

Family Maeridae Krapp-Schickel, 2008
마에라옆새우과

Genus *Quadrimaera* Krapp-Schickel and Ruffo, 2000

18. *Quadrimaera pacifica* (Schellenberg, 1938)
태평양멜리타옆새우 (Fig. 13C)

Material examined. 1 ind., Site 4, 17 August 2022.
Distribution. Korea (Jejudo Island, south and east coasts), China, Indonesia, Japan, Hawaii, Micronesia, South Africa, Southern Polynesia.

Family Melitidae Bousfield, 1973 멜리타옆새우과
Genus *Abludomelita* Karaman, 1981
별난멜리타옆새우속

19. *Abludomelita japonica* (Nagata, 1965)
별난멜리타옆새우 (Fig. 13D)

Material examined. 2 inds., Site 2, 17 August 2022; 1 ind., Site 5, 17 August 2022.
Distribution. Korea (Jejudo Island, south and east coasts), Japan.

Genus *Dulichiella* Stout, 1912

20. *Dulichiella* sp. (Fig. 13E)

Material examined. 110 inds., Site 7, 16 August 2022.

Family Photidae Boeck, 1871 꼬리다리옆새우과
Genus *Gammaropsis* Lilljeborg, 1855

21. *Gammaropsis japonica* (Nagata, 1961)
극동육질꼬리옆새우 (Fig. 13F)

Material examined. 50 inds., Site 8, 17 August 2022.
Distribution. Korea (Jejudo Island, west, south, and east coasts), China, Japan.

Genus *Photis* Krøyer, 1842

22. *Photis bronca* Jung, Coleman and Yoon, 2019
돌기손이형꼬리다리옆새우 (Fig. 13G)

Material examined. 5 inds., Site 5, 17 August 2022.
Distribution. Korea (Jejudo Island, south coast).

Family Phrosinidae Dana, 1852 공머리옆새우과
Genus *Primno* Guérin-Méneville, 1836

23. *Primno latreillei* Stebbing, 1888
작은공머리옆새우 (신칭)* (Figs. 10, 13H)
Primno latreillei Stebbing, 1888: 1445, pl. 179A; Bowman, 1978: 13, Fig. 9.

Material examined. 2우우, Site 6, 17 August 2022.
Description. Female (MABIK CR00254536): Body (Figs. 10A, 13H) slender, 5.0 mm long: Head (Fig. 10A) longer than pereonites 1 and 2 combined; rostrum short,

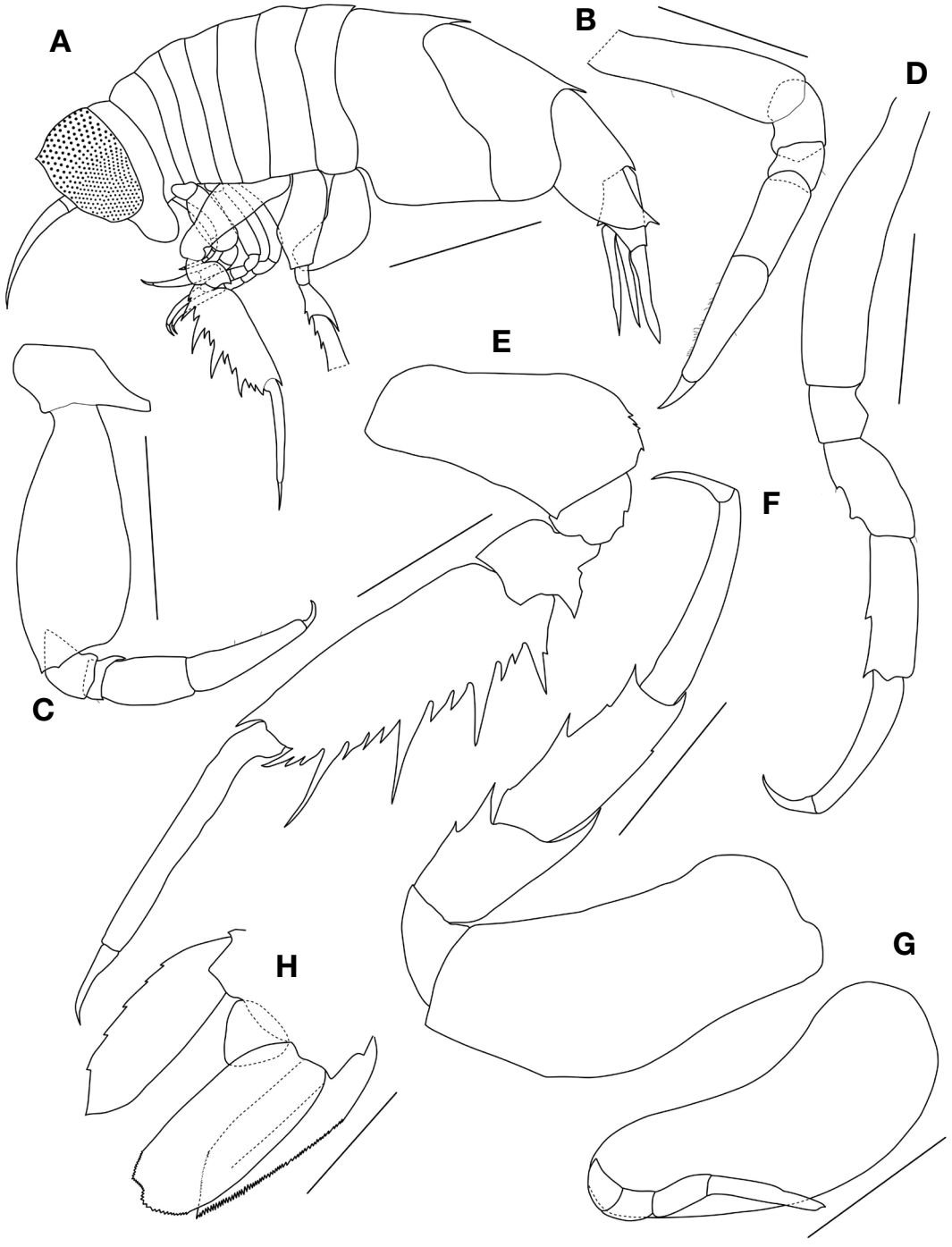


Fig. 10. *Primno latreillei* Stebbing, 1888, adult female. A, habitus; B, gnathopod 1; C, gnathopod 2; D, pereopod 3; E, pereopod 5; F, pereopod 6; G, pereopod 7; H, urosome. Scale bars: A = 1 mm; B, C = 0.2 mm; D, F, G = 0.3 mm; E, H = 0.4 mm.

pointed; eyes covered almost part of head.

Gnathopod 1 (Fig. 10B), basis subrectangular, elongate, with 1 setule on anterior margin; merus short, length subequal to width, with 1 setule on posterior margin; propodus elongate, narrowing distally, with 17 setules on anterior margin; dactylus falcate.

Gnathopod 2 (Fig. 10C), coxa trapezoidal, expended anterodistally; basis elongate-ovate, posterior margin slightly curved, about twice as long as broad; carpus subrectangular; propodus slender, narrowing distally, with 2 setules on anterior margin; dactylus falcate; length ratio of articles 2–7 = 1.00 : 0.18 : 0.06 : 0.32 : 0.50 : 0.12.

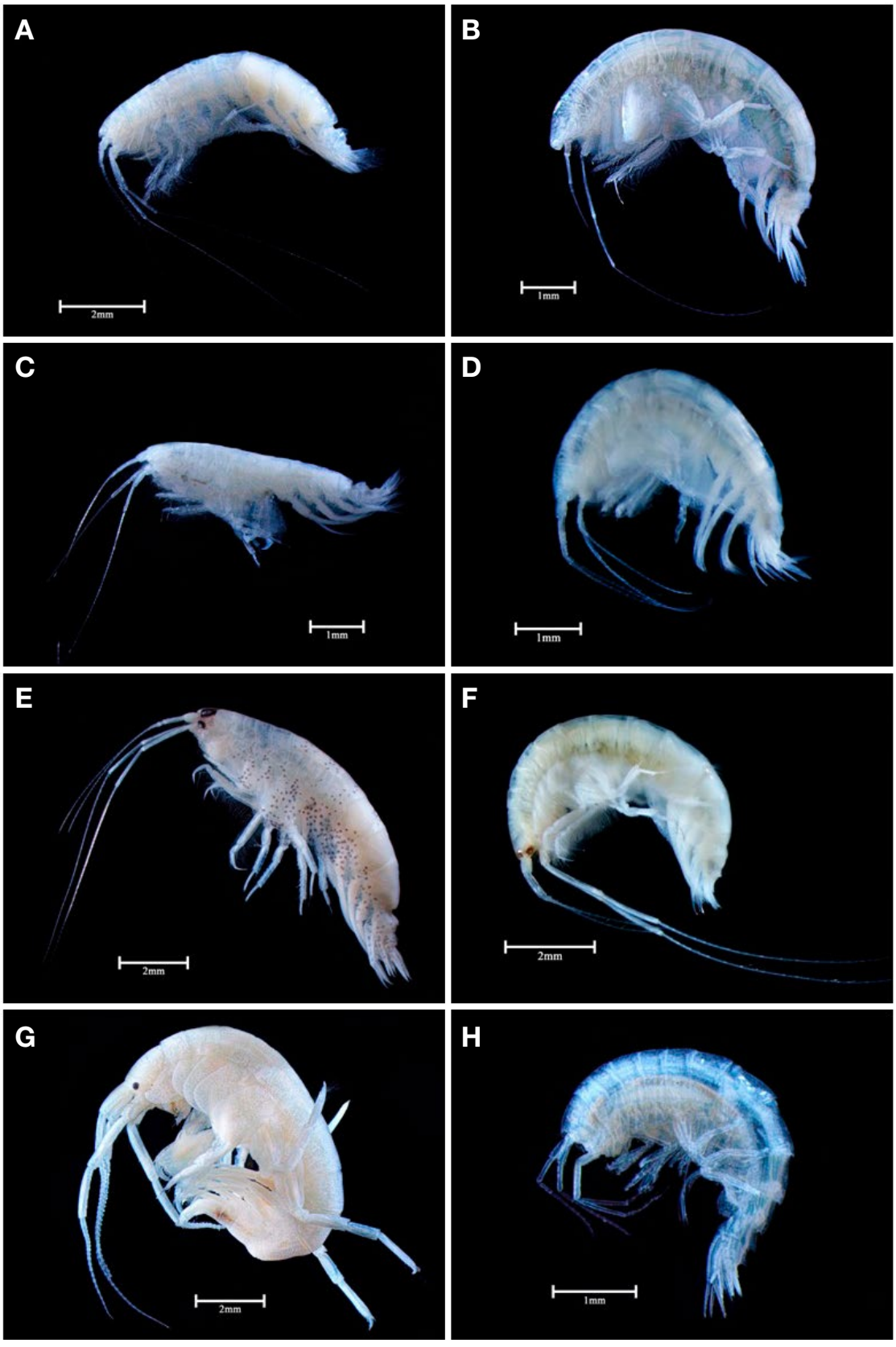


Fig. 11. A, *Ampelisca alatopedunculata*; B, *Ampelisca cyclops*; C, *Ampelisca naikaiensis*; D, *Ampelisca pygmaea*; E, *Byblis japonicus*; F, *Byblis longiflagelis*; G, *Ampithoe lacertosa*; H, *Kamehatylus japonicus*.

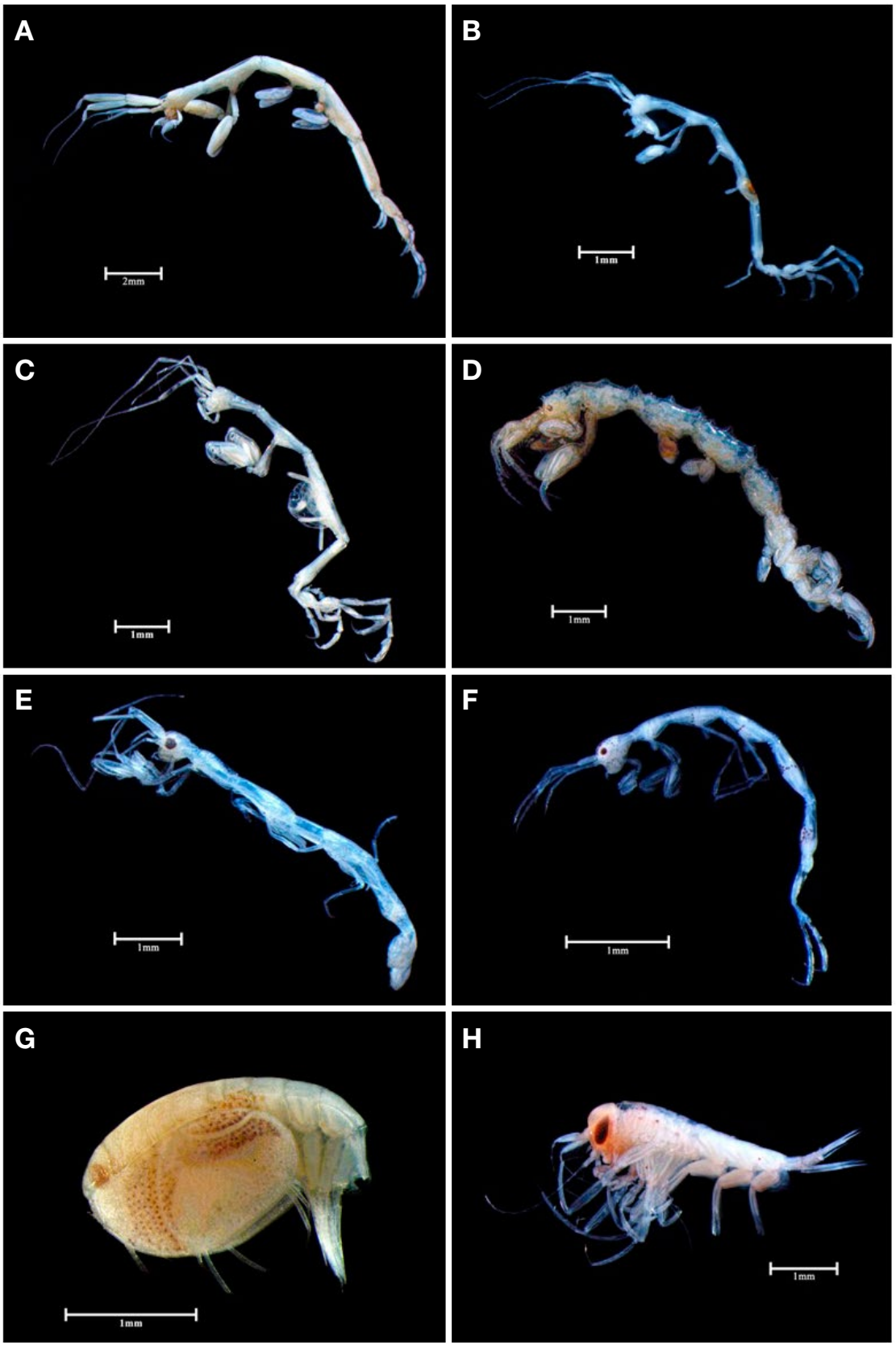


Fig. 12. A, *Caprella decipiens*; B, *Caprella iniquilibra*, male; C, *Caprella iniquilibra*, female; D, *Caprella verrucosa*; E, *Protogeton incertus*; F, *Pseudoproto fallax*; G, *Cyproidea liodactyla*; H, *Themisto* sp.

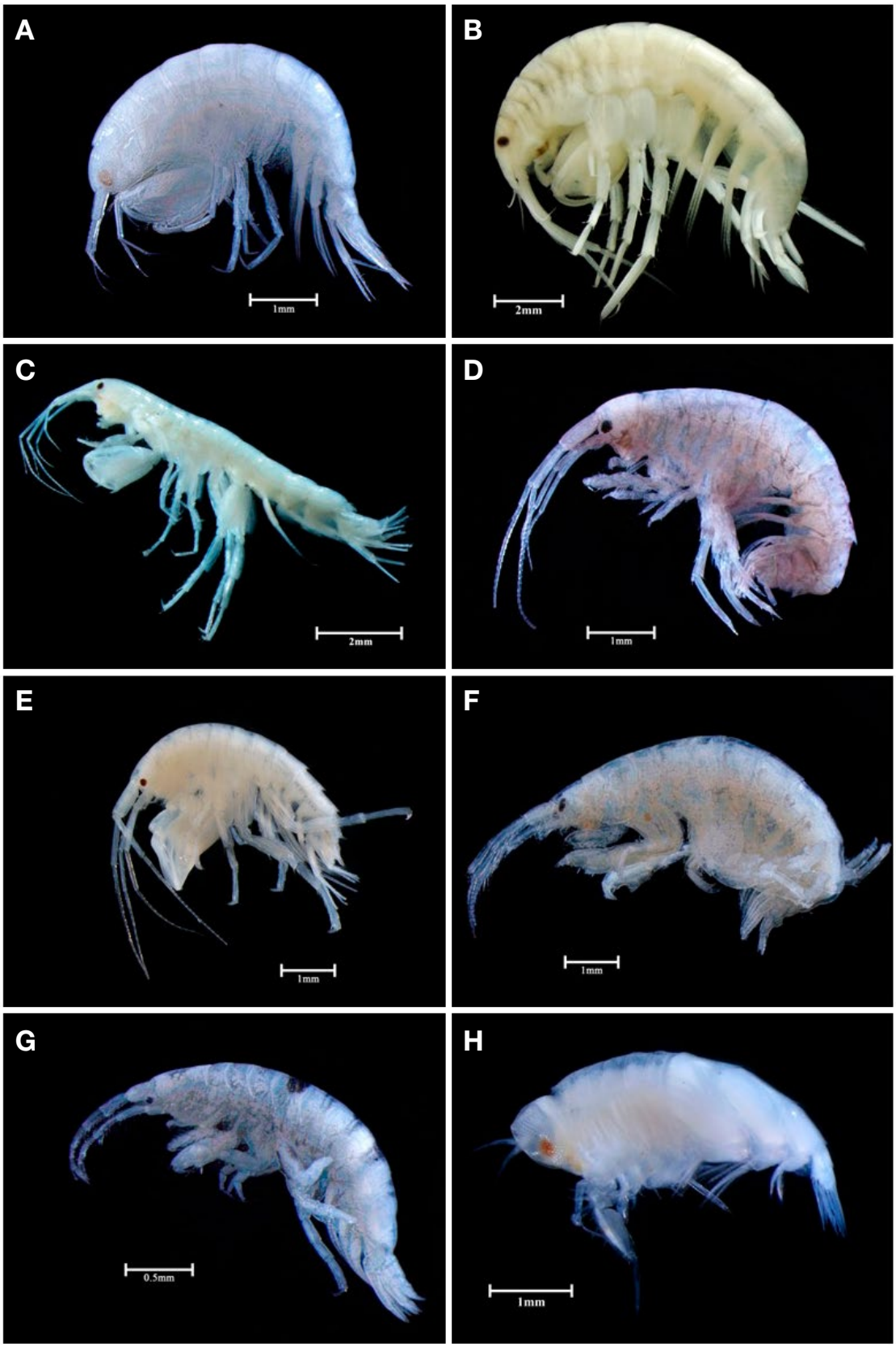


Fig. 13. A, *Leucothoe spinicarpa*; B, *Liljeborgia* sp.; C, *Quadrimaera pacifica*; D, *Abludomelita japonica*; E, *Dulichiella* sp.; F, *Gammaropsis japonica*; G, *Photis bronca*; H, *Primno latreillei*.

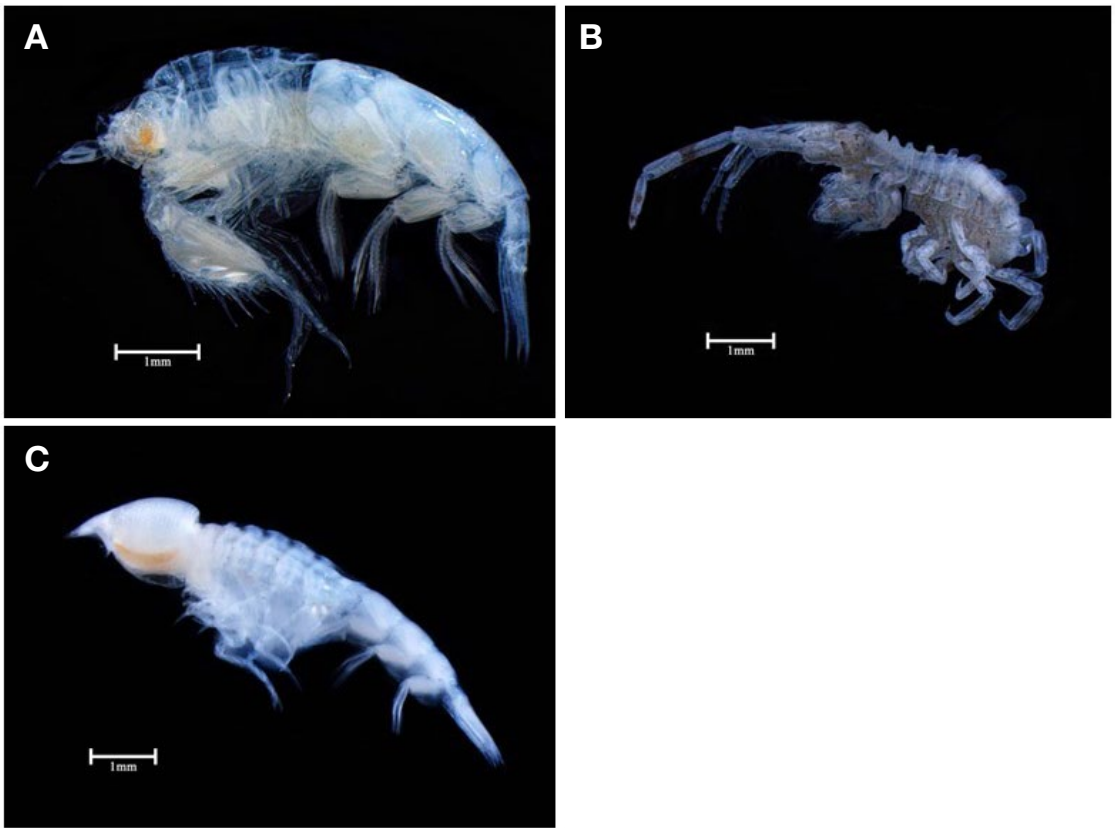


Fig. 14. A, *Primno* sp.; B, *Podocerus hoonsooi*; C, *Cranocephalus* sp.

Pereopod 3 (Fig. 10D), basis slender, elongate, width 0.2 times length, unarmed; merus subrectangular, with 2 teeth on posterior margin; carpus subrectangular, with 2 teeth on posterior margin; propodus slender, elongate; dactylus elongate; length ratio of articles 2–7 = 1.00 : 0.18 : 0.33 : 0.48 : 0.52 : 0.22.

Pereopod 4 similar to pereopod 3, but slightly more elongated.

Pereopod 5 (Fig. 10E), basis moderate, width about 0.5 times length, anterodistal margin with serration, produced posterodistally; merus with a large triangular process midanteriorly; carpus characteristic in form, with 14 teeth on anterior margin, proximal, fourth, seventh, and eleventh teeth elongate, length of elongate teeth subequal to width of carpus; propodus slender, elongate, subequal to carpus; dactylus falcate; length ratio of articles 2–7 = 1.00 : 0.20 : 0.45 : 1.11 : 1.07 : 0.35.

Pereopod 6 (Fig. 10F), basis moderate, convex midanteriorly, width 0.5 times length; merus with 2 teeth on anterior margin and 1 large tooth on posterodistal margin; carpus subrectangular, with 2 teeth on anterior margin and 1 tooth on posterodistal margin; propodus slender, elongate, unarmed; length ratio of articles 2–7 = 1.00 : 0.23 : 0.32 : 0.51 : 0.68 : 0.22.

Pereopod 7 (Fig. 10G), basis elongate-ovate, concave midanteriorly, elongate, about 1.5 times to the following articles combined; ischium to dactylus reduced, unarmed; length ratio of articles 2–7 = 1.00 : 0.12 : 0.11 : 0.15 : 0.23 : 0.11.

Uropod 1 (Fig. 10H) laterally serrulate, slightly longer than uropod 2.

Uropod 2 (Fig. 10H) with 5 serrations laterally, subequal to uropod 3.

Uropod 3 (Fig. 10H), subrectangular, serrulate, notched apically.

Telson (Fig. 10H) small, subtriangular, unarmed.

Distribution. Korea (Jejudo Island, south and east coasts), Australia, Mexico, U.S.A.

Remarks. *Primno latreillei* Stebbing, 1888 is one of the smaller species within the genus *Primno* and is morphologically similar to *P. johnsoni* Bowman, 1978. *Primno johnsoni* was considered a junior synonym of *P. latreillei* by Vinogradov *et al.* (1982) and Zeidler examined specimens among those identified as *P. johnsoni* in the Australia (Zeidler, 1992; 1998). Within the morphological range of *P. johnsoni*, Zeidler synonymized the specimens with *P. latreillei* (Zeidler, 2004). Stebbing attached the most importance to the morphology of pereopods 5 and

7 in *P. latreillei*. These two species are morphologically similar in the following features: (1) pereopod 5 carpus, length of elongate teeth on anterior margin subequal to width of carpus; (2) pereopod 5 carpus, row of teeth on anterior margin with one of the elongate teeth proximally (Bowman, 1978; Zeidler, 2004). However, *P. latreillei* is distinguished from *P. johnsoni* (different characters of *P. johnsoni* in brackets) by the following features: (1) gnathopod 1, propodus without robust seta (vs. with 2 robust setae medially), (2) pereopod 7, basis length more than 1.5 times length of following articles combined (vs. basis length about 1.2 times length of following articles combined), and (3) uropod 3 with well-developed apical notch (vs. without apical notch). Our Korean specimens are in good agreement with the description of Bowman (1978).

24. *Primno* sp. (Fig. 14A)

Material examined. 4 inds., Site 6, 17 August 2022.

Family Podoceridae Leach, 1814 긴배옆새우과
Genus *Podocerus* Leach, 1814

25. *Podocerus hoonsooi* Kim and Kim, 1991
등뿔긴배옆새우 (Fig. 14B)

Material examined. 3 inds., Site 4, 17 August 2022; 35 inds., Site 8, 17 August 2022.
Distribution. Korea (Jejudo Island, south and east coasts).

Family Oxycephalidae Dana, 1852 뾰족머리옆새우과
Genus *Cranocephalus* Bovallius, 1890

26. *Cranocephalus* sp. (Fig. 14C)

Material examined. 1 ind., Site 5, 17 August 2022.

Conclusion

To date, 251 marine amphipod species belonging to 119 genera in 49 families have been recorded in Korea (National Marine Biodiversity Institute of Korea, 2023). Of the total 251 species, 206 species (82%) have been found in the intertidal and shallow sublittoral zones. This suggests that taxonomic research on Korean marine amphipods has focused on shallow waters, with relatively little exploration in deeper waters. This study revealed a total of 26 amphipod species belonging to 19 genera and 14 families at eight sites on the continental shelf region in the Southern Sea. The number of species found in this study represents about 10% of the total number of marine amphipod species recorded in Korea. Although the number of surveyed species is relatively small compared to the total number, it is noteworthy that taxonomic research on Korean amphipods has been conducted in the relatively deep waters of the southern coasts sublittoral zone, despite the limited number of species.

In this amphipod faunal study, SM grab, conical net, MOCNESS net, and trawl dredging were used to collect amphipods (Fig. 2, Table 1), each serving a specific purpose in the survey. Through the survey using the SM grab method, the highest number of 15 amphipod species were collected. The survey using the trawl method resulted in the collection of eight amphipod species, along with seaweeds, discarded fishing gear, and various invertebrates dragged along with the net. The survey of pelagic hyperiid amphipods using conical net and MOCNESS net results in a total of four species (Table 2). This survey method exhibited low species diversity compared to other methods, which seems to be due to the sparse abundance and density of pelagic species.

As a result of investigating the occurrence ratio of amphipod species, among the 26 species belonging to 14 families, the highest occurrence ratio was observed in the family Ampeliscidae, with six species (23%). The second-highest occurrence was found in the family Caprellidae, with five species (19%) (Fig. 15).

The collection sites surveyed using SM grab had depths of 52–92 meters, and the bottom sediment was composed of fine mud and sand. Among the 15 species surveyed using the SM grab, six species (40%) belonging to the family Ampeliscidae exhibited the highest diversity, and all six species were only confirmed to inhabit the areas surveyed using the SM grab (Tables 1, 2). In the intertidal zone and the shallow ocean, species belonging to the families Ampithoidae and Caprellidae, which live based on algae, appear dominant (Kim *et al*., 2005; Kim *et al*., 2023). On the other hand, it was observed that species belonging to the family Ampeliscidae, which live based on softbottom, dominate in the subtidal zone with relatively deeper depths.

Among the 26 species, four species (*Ampelisca pygmaea* Schellenberg, 1938; *Byblis longiflagelis* Ren, 1998; *Caprella iniquilibra* Mayer, 1903; *Primno latreillei* Stebbing, 1888) are newly recorded in Korea with significant implications. Additionally, five unidentified species (*Cranocephalus* sp., *Dulichiella* sp., *Liljeborgia* sp., *Primno* sp., *Themisto* sp.) belonging to five genera and five families were added to the Korean fauna. Out of the total 26 species, nine species are newly recorded or potential new species that have not been recorded in Korean waters. This highlights the necessity for further research on amphipods in Korean sublittoral zones. Among these, five species, whose details have not been clarified in this paper, are planned to be accurately documented through future research as potential new species or newly recorded species of Korea.

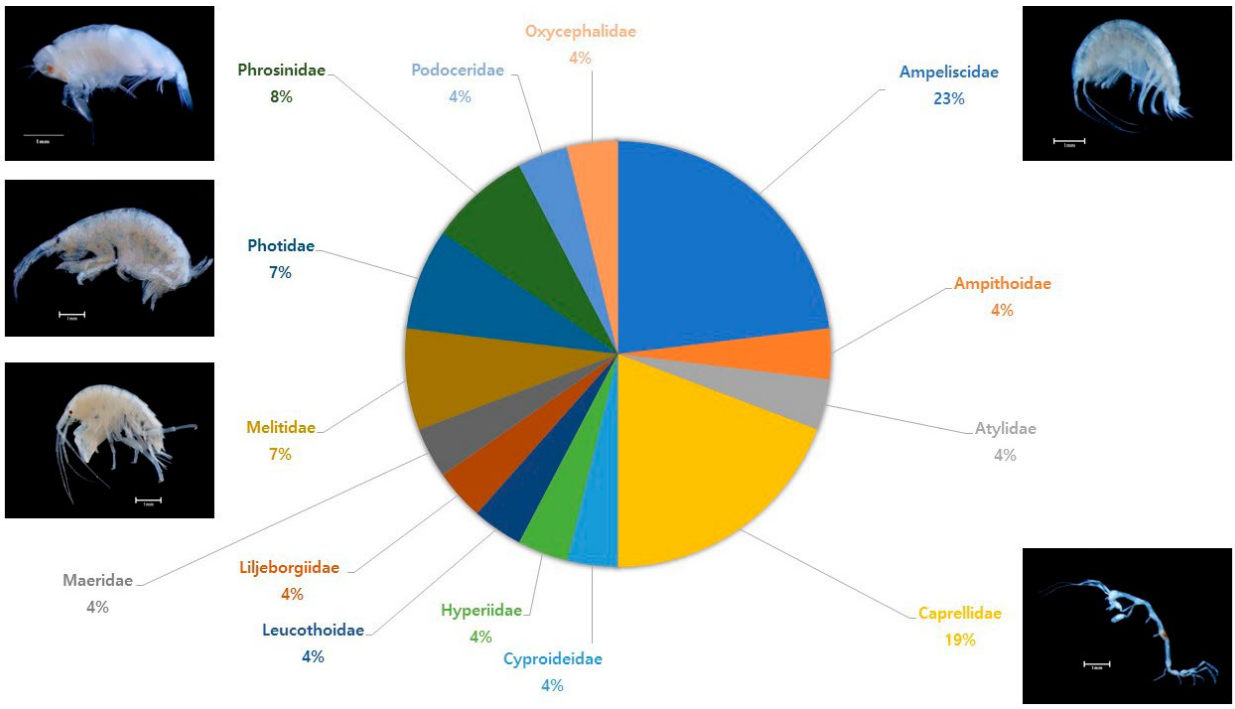


Fig. 15. The proportion of species in each family to the total number of species.

Table 2. Collection methods for the amphipod species in southern sea of Korea.

No.	Speices	SM Grab	Conical net	MOCNESS net	Trawl	No.	Speices	SM Grab	Conical net	MOCNESS net	Trawl
1	*Ampelisca alatopedunculata*	●				14	*Cyproidea liodactyla*	●			
2	*Ampelisca cyclops*	●				15	*Themisto* sp.		●	●	
3	*Ampelisca naikaiensis*	●				16	*Leucothoe spinicarpa*				●
4	*Ampelisca pygmaea*	●				17	*Liljeborgia* sp.				●
5	*Byblis japonicus*	●				18	*Quadrimaera pacifica*	●			
6	*Byblis longiflagelis*	●				19	*Abludomelita japonica*	●			
7	*Ampithoe lacertosa*				●	20	*Dulichiella* sp.				●
8	*Kamehatylus japonicus*	●				21	*Gammaropsis japonicus*				●
9	*Caprella decipiens*				●	22	*Photis bronca*	●			
10	*Caprella iniquilibra*				●	23	*Primno latreillei*		●		
11	*Caprella verrucosa*	●				24	*Primno* sp.		●		
12	*Protogeton incertus*	●				25	*Podocerus hoonsooi*	●			●
13	*Pseudoproto fallax*	●				26	*Cranocephalus* sp.			●	

Conflicts of Interest

The author of this paper has no affiliation with any interests and is solely responsible for the paper.

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References

Arimoto, I. 1976. Taxonomic studies of caprellids (Crustacea, Amphipoda, Caprellidae) found in the Japanese and adjacent waters. Special Publications from the Seto marine Biological Laboratory 3:1-229.

Blanchard, A.L., N.L. Demchenko, L.A Aerts, S.B. Yazvenko, V.V. Ivin, I. Shcherbakov and H.R. Melton. 2019. Prey biomass dynamics in gray whale feeding areas adjacent to northeastern Sakhalin (the Sea of Okhotsk), Russia, 2001-2015. Marine Environmental Research 145:123-136.

Borja, A., J. Franco and V. Pérez. 2000. A marine biotic index to establish the ecological quality of soft-bottom benthos within European estuarine and coastal environments. Marine Pollution Bulletin 40(12):1100-1114.

Bowman, T.E. 1978. Revision of the pelagic amphipod genus *Primno* (Hyperiidea: Phrosinidae). Smithsonian Contributions to Zoology 275:1-23.

Budnikova, L.L. and S.A. Blokhin. 2012. Food contents of the eastern gray whale *Eschrichtius robustus* Lilljeborg, 1861 in the Mechigmensky bay of the Bering Sea. Russian Journal of Marine Biology 38(2):149-155.

Daly, E.A., R.D. Brodeur, C.A. Morgan, B.J. Burke and D.D. Huff. 2021. Prey selectivity and diet partitioning of juvenile salmon in coastal waters in relation to prey biomass and implications for salmon early marine survival. North Pacific Anadromous Fish Commission Tech. Rep 17:53-56.

Dauvin, J.C. 2018. Twenty years of application of Polychaete/Amphipod ratios to assess diverse human pressures in estuarine and coastal marine environments: A review. Ecological Indicators 95:427-435.

Dauvin, J.C. and T. Ruellet. 2007. Polychaete/amphipod ratio revisited. Marine Pollution Bulletin 55(1-6):215-224.

Havermans, C., H. Auel, W. Hagen, C. Held, N.S. Ensor and G.A. Tarling. 2019. Predatory zooplankton on the move: *Themisto* amphipods in high-latitude marine pelagic food webs. In Advances in Marine Biology 82:51-92.

Jeong, S.B., D.J. Hwang, Y.J. Kim, H.H. Shin, Y.H. Yoon, H.Y. Soh and E.H. Kim. 2006. Species composition of the catches collected by a bottom trawl in the southern waters of Yellow Sea in summer, 2003 to 2005. Bulletin of the Fisheries Science Institute Yosu National University 14:23-36.

Kim, K.W., X. Zhang, J.H. Choi, J. Kim, S.Y. Shin and Y.H. Kim. 2023. Amphipods (Crustacea: Malacostraca) fauna from Chujado Island in Korea. Journal of Species Research 12(1):1-26.

Kim, Y.H., Y. Eun and K.S. Lee. 2005. Amphipods (Gammaridea and Caprellidea) fauna of Jindo Island in Korea. Animal Systematics, Evolution and Diversity (nspc5): 1-11.

Ledoyer, M. 1978. Amphipodes gammariens (Crustacea) des biotopes cavitaires organogenes recifaux de l'ile Maurice. Ocean Indien 8(3):197-332.

Mayer, P. 1882. Die Caprelliden des Golfes von Neapel und der Angrenzenden Meeres-Abschnitte. Fauna und Flora Golfes von Neapel. Monogr 6:1-201.

Mayer, P. 1903. Die Caprelliden der Siboga-Expedition. Siboga Expeditie 34:1-160.

National Marine Biodiversity Institute of Korea. 2023. National list of marine species. II. Marine invertebrates. Namu Publishing Co.

Navarro-Barranco, C., C.L. McNeill, C.E. Widdicombe, J.M. Guerra-García and S. Widdicombe. 2017. Long-term dynamics in a soft-bottom amphipod community and the influence of the pelagic environment. Marine Environmental Research 129:133-146.

Ren, X. 2006. Crustacea, Amphipoda, Gamaridea I. Fauna Sinica Invertebrata 41:1-558.

Padovani, L.N., M.D. Viñas, F. Sánchez and H. Mianzan. 2012. Amphipod-supported food web: *Themisto gaudichaudii*, a key food resource for fishes in the southern Patagonian Shelf. Journal of Sea Research 67(1):85-90.

Schellenberg, A. 1938. Litorale amphipoden des tropischen Pazifiks. K. svenska Vetensk Akad. Handl 16(6):1-105.

Seo, J.Y. and J.W. Choi. 2010. The macrozoobenthic community at the expected sand excavation area in the southern continental shelf of Korea. Journal of the Korean Society of Oceanography 15(2):68-71.

Simboura, N. and A. Zenetos. 2002. Benthic indicators to use in ecological quality classification of Mediterranean soft bottom marine ecosystems, including a new biotic index. Mediterranean Marine Science 3(2):77-111.

Stebbing, T.R.R. 1888. Report on the Amphipoda collected by H.M.S. Challenger during the years 1873-1876. Report on the Scientific Results of the Voyage of H.M.S. Challenger during the years 1873-76. Zoology 29:1-1737.

Vinogradov, M.E., A.F. Volkov and T.N. Semenova. 1982. Amfipody-Giperiidy (Amphipoda: Hyperiidea) Mrovogo Okeanea. Akademiya Nauk SSSR, Opredeliteli po Faune SSSR 132. Leningrad 1-492.

Yoon, Y.H., J.S. Park, H.Y. Soh and D.J. Hwang. 2005. On the marine environment and distribution of phytoplankton community in the Northern East China Sea in early summer 2004. Journal of the Korean Society for Marine Environmental Engineering 8(2):100-110.

Zeidler, W. 1992. Hyperiid amphipods (Crustacea: Amphipoda: Hyperiidea) collected recently from eastern Australian waters. Records of the Australian Museum 44(1):85-133.

Zeidler, W. 1998. Pelagic amphipods (Crustacea: Amphipoda: Hyperiidea) collected from eastern and south-eastern Australian waters by the C.S.I.R.O. research vessel 'Warreen' during the years 1938-41. Records of the South Australian Museum. Monograph Series 4:1-143.

Zeidler, W. 2004. A review of the families and genera of the hyperiidean amphipod superfamily Phronimoidea Bowman & Gruner, 1973 (Crustacea: Amphipoda: Hyperiidea). Zootaxa 567(1):1-66.

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