

Two New Records of Genus *Campylaspis* (Crustacea: Cumacea: Nannastacidae) from the Southern Sea, Korea

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ABSTRACT

Two *Campylaspis* species, *C. amblyoda* Gamô, 1960 and *C. reticulata* Gamô, 1960, are redescribed as new to Korean cumacean fauna. *Campylaspis amblyoda* is characterized by having a carapace with five or six pairs of pellucid spots on dorsal surface, a pair of projections near proximal portion of frontal lobe, and lacking sulcus on lateral portion. *Campylaspis reticulata* is easily distinguished from its congeners by having a pair of broad sulcus and several large reticulations on lateral portion of carapace. The collected Korean specimens were congruent with the original descriptions, except for several minor differences. Herein, we add two *Campylaspis* species to the Korean cumacean fauna. The female of *C. reticulata* is described for the first time. A key to the Korean *Campylaspis* species is also provided.

Keywords: taxonomy, redescription, two new records, Korea

INTRODUCTION

The family Nannastacidae Bate, 1866 is currently composed of 26 genera and approximately 470 species worldwide (Gerken, 2012; WoRMS, 2017). Of this family, genus *Campylaspis* Sars, 1865 is the largest group. It is characterized by having vaulted carapace, truncate mandible with cuneate pars molaris, broad pars incisiva, three articulated maxilliped 1, propodus of maxilliped 2 frequently with one or more large spines or stout setae distally, and tridentate dactylus (Jones, 1974, 1984). To date, 170 species of genus *Campylaspis* have been reported worldwide, including 12 new species recorded recently by Gerken (2012). In comparison, only three Korean *Campylaspis* species have been recorded: *C. orientalis* Calman, 1911, *C. pumila* Gamô, 1960, and *C. fusiformis* Gamô, 1960 from Korean southern waters (Calman, 1911; Lee and Lee, 1999; Lee et al., 2012). In this study, *C. amblyoda* Gamô, 1960 and *C. reticulata* Gamô, 1960 are redescribed and illustrated as new to Korean cumacean fauna. The female of *C. reticulata* is recorded for the first time. As a result, five species belonging to ge-

nus *Campylaspis* are reported from Korea. A key to Korean *Campylaspis* species is provided in the present paper.

MATERIALS AND METHODS

The specimens were collected from the exclusive economic zone in the southern sea (SEEZ), Korea, by rectangular dredge from 12 Mar to 1 Apr 2008. The specimens were fixed in 10% formalin, after examination preserved in 70–80% ethanol. The specimens were dissected in glycerol on cobb's aluminum hollow slide. Drawings and measurements were performed with the aid of a drawing tube under a stereomicroscope (Model SZX12; Olympus, Japan) and light microscope (Model BX51; Olympus). Body length was measured from the anterior tip of the carapace to the posterior end of the pleonite 6. The lengths of the appendages were measured along the mid-line of each appendage and excluded the inflated outer angle. The materials are deposited at the National Institute of Biological Resources (NIBR), Incheon, Korea, and the Department of Life Sciences, Dan-

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SYSTEMATIC ACCOUNTS

Order Cumacea Kröyer, 1846

Family Nannastacidae Bate, 1866

Genus *Campylaspis* Sars, 1865

¹**Campylaspis amblyoda* Gamô, 1960 (Figs. 1–3)

Campylaspis amblyoda Gamô, 1960: 377, figs. 11, 12; 1963: 87; 1967: 256.

Material examined. Korea: 2♂♂, SEEZ st. 1, 34°12'05" N, 128°22'40"E, 12 Mar 2008, Song SJ, cat no. NIBRIV0000299399; 1♀, SEEZ st. 2, 34°12'35"N, 128°22'55"E, 1 Apr 2008, Song SJ, cat no. DKUCUM 201801.

Description. Subadult male (cat no. NIBRIV0000299399): body (Fig. 1A, B) calcified, 3.9 mm in length, excluding uropods. Carapace (Fig. 1A, B) very vaulted, subequal to half of body length, 1.56 times as long as width, 1.88 times as long as depth, with 5–6 pairs of pellucid spots on dorsal portion and a pair of projections near proximal portion of frontal lobe, without sulcus on lateral portion; posterior portion very extended to rear, covering up pereonite 1 to 3; surface pitted, covered with large alveolate sculpture; antennal notch slightly concave, and anterolateral corner round, smooth; pseudorostral lobes truncate, slightly longer than ocular lobe in length; ocular lobe round, shorter than its width, with 3 lenses. Pereon (Fig. 1A, B) 0.29 times as long as carapace length and slightly shorter than 1/6 body length; pereonite 4 to 5 visible in dorsal view. Pleon (Fig. 1A) 0.73 times as long as cephalothorax length.

Antenna 1 (Fig. 1C), peduncle 3-articulated; article 1 1.55 times as long as article 2, with numerous hair-like setae on medial and lateral margins, 2 complex pedunculated and 3 simple setae distally; article 2 equal to length of article 3, with 2 simple setae on lateral margin and 3 complex pedunculated setae on medial corner; article 3 with 1 complex pedunculated and 1 long simple setae on distal margin. Main flagellum 3-articulated; article 1 longest, unarmed; article 2 with 1 aesthetasc and 1 small simple setae on distal margin; article 3 with 1 aesthetasc, 1 complex pedunculated, 1 small simple, and 1 long simple setae on terminal margin. Accessory flagellum unarticulated, slightly shorter than article 3 of main flagellum in length, with 1 complex pedunculated and 3 simple setae.

Maxilliped 3 (Fig. 1D), basis shorter than remaining articles combined, with numerous hair-like setae medially, 2

plumose setae on medial corner, and 2 long plumose and 1 small simple setae on lateral corner; ischium with 1 simple seta medially; merus very stout and large, 3.30 times as long as ischium, with 11 teeth and 8 small simple setae medially, 2 plumose setae on lateral surface, and 1 large tooth and 1 plumose seta on lateral corner; carpus 0.41 times as long as merus, with 6 teeth, 3 plumose and 2 small simple setae medially, several hair-like setae on lateral surface, and 1 tooth and 1 long plumose setae laterally; propodus subequal to length of carpus, with 3 plumose setae medially, several hair-like setae on lateral surface and lateral margin, and 1 plumose and 1 small simple setae laterodistally; dactylus 0.66 times as long as propodus, with 1 small simple seta laterally, 5 simple setae terminally.

Pereopod 1 (Fig. 1E), basis slightly longer than remaining articles combined, with 1 small simple seta anteriorly, numerous hair-like and 1 small simple setae posteriorly, and 2 plumose setae posterodistally; ischium with 2 teeth and 1 plumose seta posteriorly; merus 11 times as long as ischium, with 2 plumose setae anteriorly, and 3 plumose and 2 simple setae posteriorly; carpus 0.61 times as long as merus, with 2 plumose setae anteriorly, 3 plumose and 2 simple setae posteriorly; propodus 0.84 times as long as carpus, with 2 plumose and 1 simple setae anteriorly, and 2 plumose and 2 simple setae posteriorly; dactylus 0.79 times as long as propodus, with 6 simple setae.

Pereopod 2 (Fig. 1F), basis shorter than remaining articles combined, anterior margin serrated, with 7 small simple and 1 plumose setae anteriorly, several hair-like setae posteriorly, and 1 plumose seta posterodistally; ischium unarmed; merus 2.98 times as long as ischium, with 1 plumose seta anteriorly, and 1 plumose and 1 broken setae posterodistally; carpus 1.81 times as long as merus, with numerous hair-like and 7 simple setae anteriorly, and 6 simple and 1 plumose setae posteriorly; propodus 0.27 times as long as carpus, with 1 small simple seta posteriorly and 1 complex pedunculated seta mediodistally; dactylus very long, 5.53 times as long as propodus, with 12 small simple setae on surface and 1 plumose and 1 simple setae terminally.

Pereopod 3 (Fig. 2A), basis longer than remaining articles combined, with 5 small simple setae anteriorly, 1 plumose seta posteroproximally, several hair-like, 2 small simple, and 2 plumose setae posteriorly; ischium with 2 simple setae posterodistally; merus 2.64 times as long as ischium, with 1 simple and 1 broken setae posterodistally; carpus 1.85 times as long as merus, with 1 plumose seta anteriorly, 1 long simple and 1 simple setae anterodistally, and 1 small simple seta posteriorly; propodus 0.32 times as long as carpus, with 1 long simple seta anterodistally; dactylus 0.61

Korean name: ¹*큰머리꼬마올챙이새우(신칭)

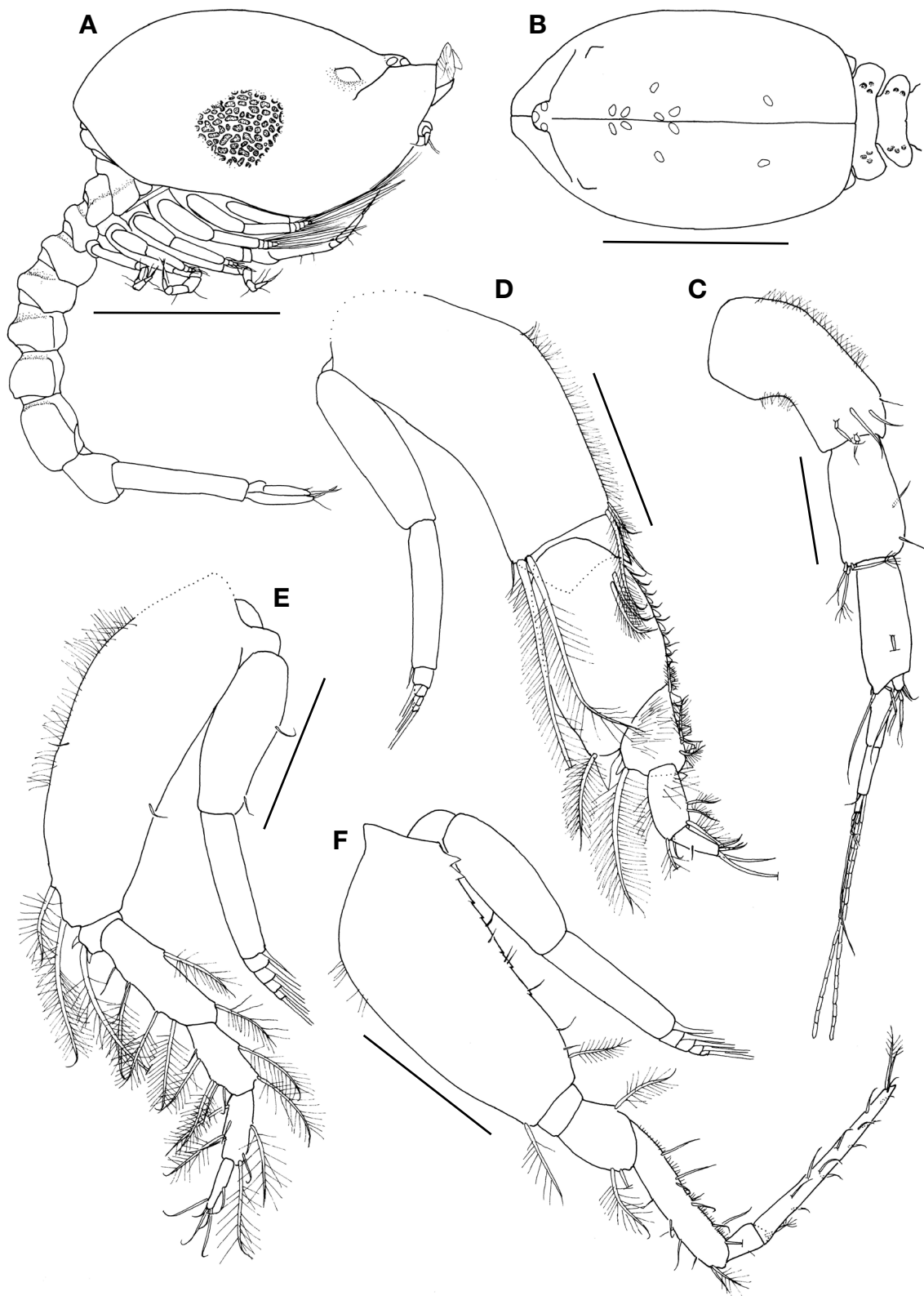


Fig. 1. *Campylaspis amblyoda* Gamô, subadult male. A, Habitus, lateral; B, Cephalothorax, dorsal; C, Antenna 1; D, Maxilliped 3; E, Pereopod 1; F, Pereopod 2. Scale bars: A, B=1 mm, C=0.1 mm, D-F=0.3 mm.

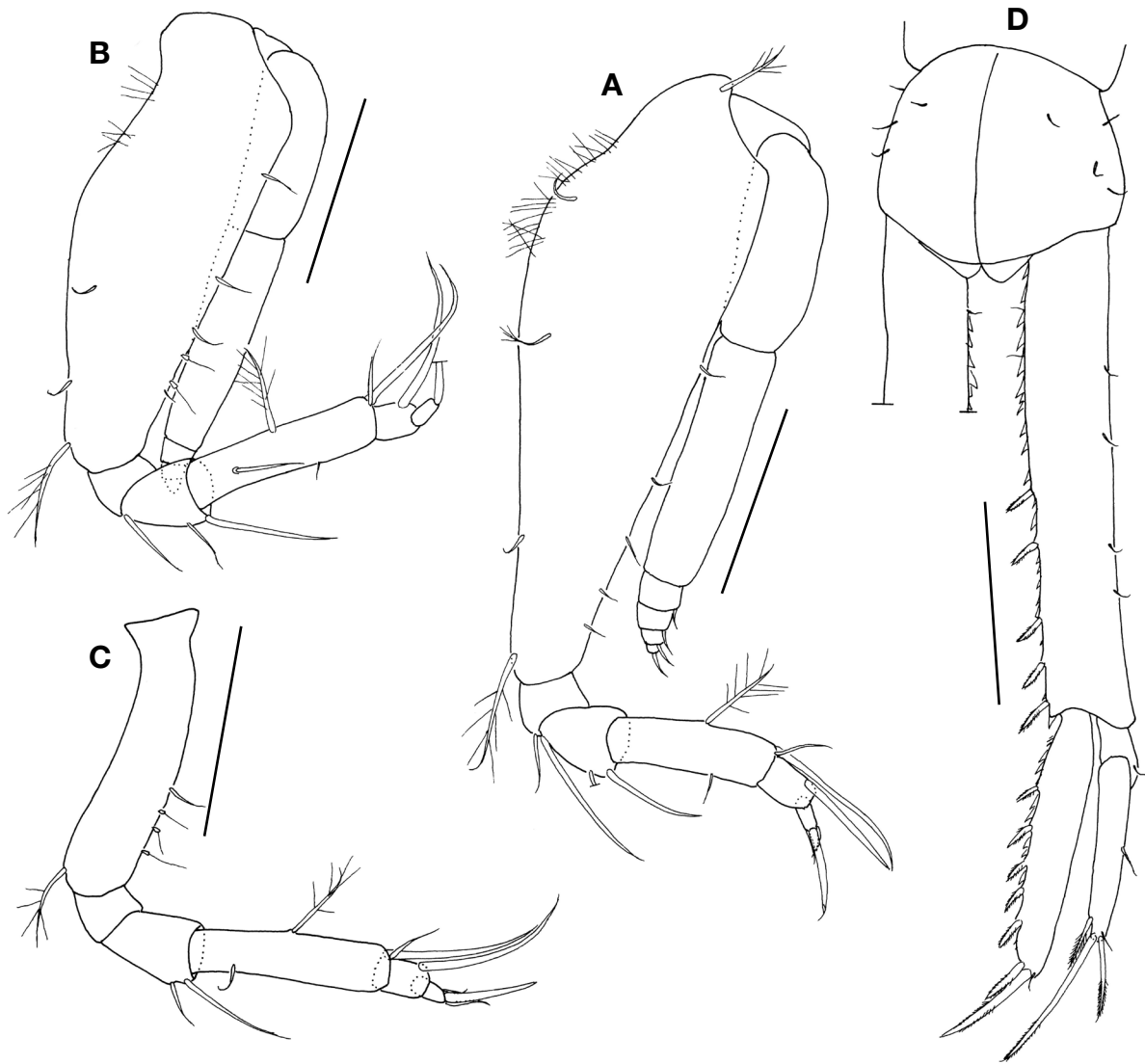


Fig. 2. *Campylaspis amblyoda* Gamô, subadult male. A, Pereopod 3; B, Pereopod 4; C, Pereopod 5; D, Pleotelson and uropod, dorsal. Scale bars: A-C=0.2 mm, D=0.3 mm.

times as long as propodus, with 1 long simple and 2 small simple setae terminally.

Pereopod 4 (Fig. 2B), basis longer than remaining articles combined, with 4 small simple and 2 complex pedunculated setae anteriorly, several hair-like, 2 small simple, and 1 plumose setae posteriorly; ischium unarmed; merus 3.18 times as long as ischium, with 3 simple setae posteriorly; carpus 2.09 times as long as merus, with 1 small simple, 3 simple, and 1 plumose setae; propodus 0.22 times as long as carpus, with 1 simple seta anterodistally; dactylus 0.69 times as long as propodus, with 1 broken seta terminally.

Pereopod 5 (Fig. 2C), basis shorter than remaining articles combined, with 1 plumose seta anterodistally, and 1

simple and 3 complex pedunculated setae posteriorly; ischium unarmed; merus 2.36 times as long as ischium, with 1 simple and 1 long simple setae anterodistally; carpus 2.08 times as long as merus, with 1 small simple seta anteriorly, 1 plumose seta posteriorly, and 1 simple and 1 long simple setae on posterior corner; propodus 0.27 times as long as carpus, with 1 long simple seta posterodistally; dactylus 0.61 times as long as propodus, with 1 long simple and 2 small simple setae terminally.

Uropod (Fig. 2D), peduncle 2.23 times as long as pleotelson, medial margin serrated, with 2 hair-like and 5 small microserrated setae, 4 small simple setae laterally; endopod unarticulated, 0.55 times as long as peduncle, medial mar-

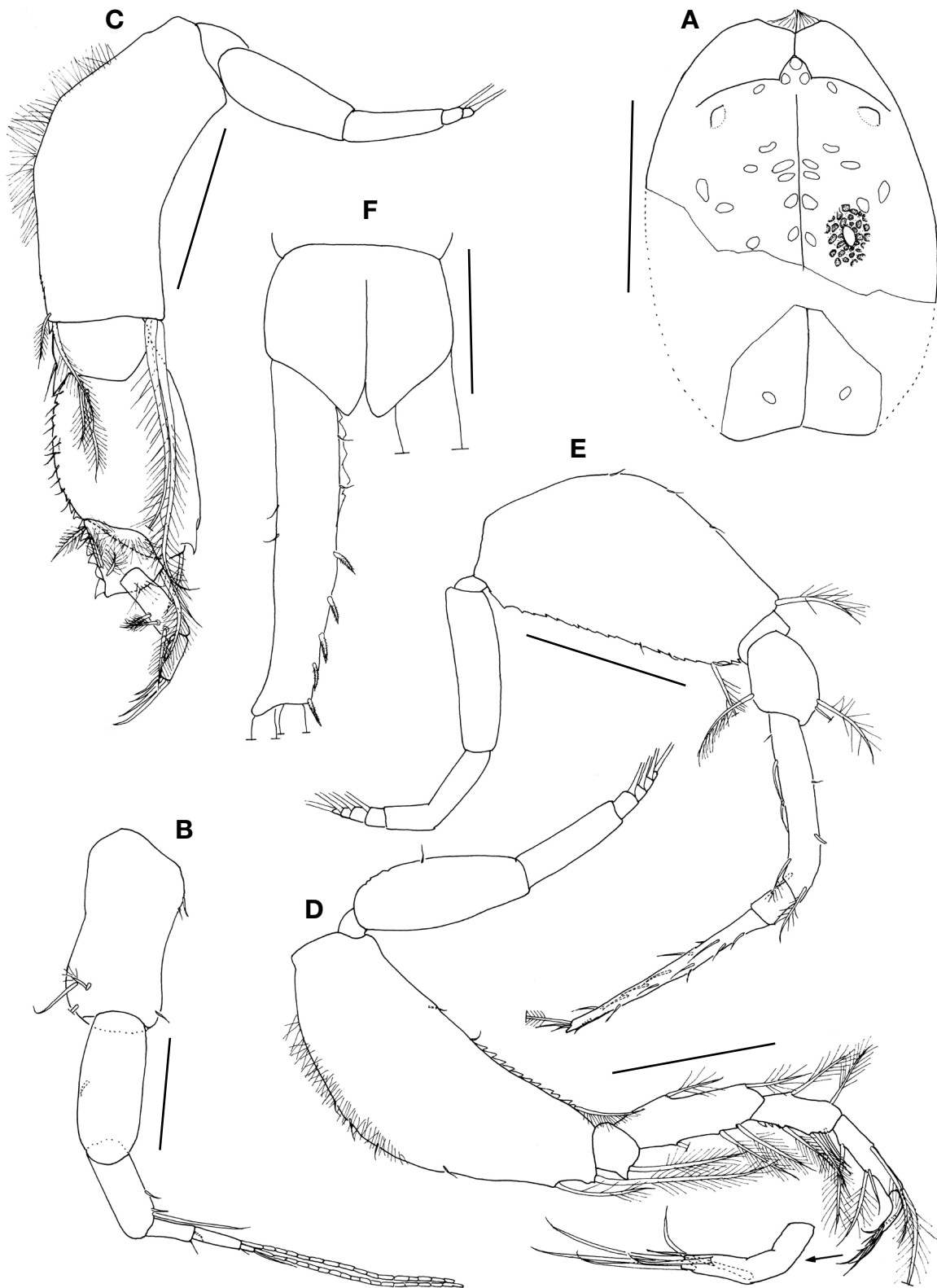


Fig. 3. *Campylaspis amblyoda* Gamô, adult female. A, Carapace (broken), dorsal; B, Antenna 1; C, Maxilliped 3; D, Pereopod 1; E, Pereopod 2; F, Pleotelson and uropod, dorsal. Scale bars: A=1 mm, B=0.1 mm, C-F=0.3 mm.

gin serrated, with 5 small microserrated setae, and 1 small simple and 2 stout microserrated setae terminally; exopod biarticulated, 0.81 times as long as endopod, article 1 with 1 small simple seta laterodistally; article 2 with 2 small simple setae laterally, 1 plumose seta mediodistally, and 2 microserrated setae terminally (one of them very long).

Adult female (cat no. DKUCUM 201801): carapace (Fig. 3A) part of specimen broken, shape and sculpture of carapace almost same as in subadult male, but dorsal surface with about 11 pairs of pellucid spots.

Antenna 1 (Fig. 3B), peduncle 3-articulated; article 1 1.30 times as long as article 2, with 1 complex pedunculated and 2 simple setae on near lateral corner, and 3 small simple setae on medial margin; article 2 1.57 times as long as article 3, with 1 small simple seta on medial surface; article 3 with 2 small simple and 1 long simple setae mediodistally. Main flagellum 3-articulated; article 1 with 2 small simple setae on distal margin; article 2 with 1 small simple seta and 1 aesthetasc on distal margin; article 3 with 1 simple seta and 1 aesthetasc on terminal margin. Accessory flagellum apparently absent.

Maxilliped 3 (Fig. 3C), basis shorter than remaining articles combined, with numerous hair-like setae medially, 1 tooth and 2 plumose setae on near medial corner, and 2 long plumose setae on lateral corner; ischium with 1 large tooth and 1 simple seta mediodistally; merus very stout and large, 2.72 times as long as ischium, with 4 teeth and 12 small simple setae medially, 2 plumose setae on lateral surface, and 1 large tooth and 1 plumose seta on near lateral corner; carpus 0.43 times as long as merus, with 6 teeth, 1 small simple and 3 plumose setae medially, several hair-like setae on lateral surface, and 1 long plumose seta laterodistally; propodus 1.14 times as long as 3 plumose setae medially, several hair-like setae on lateral surface; dactylus 0.60 times as long as propodus, with 4 simple setae terminally.

Pereopod 1 (Fig. 3D), basis subequal to length of remaining articles combined, anterior distal margin serrated, with 2 small simple and 1 plumose setae anteriorly, numerous hair-like and 4 small simple setae posteriorly, and 1 plumose and 1 long plumose setae posterodistally; ischium with 1 tooth and 1 long plumose seta posterodistally; merus 3.11 times as long as ischium, with 2 plumose setae anteriorly, and 3 plumose setae posteriorly; carpus 0.59 times as long as merus, with 2 plumose setae anteriorly, and 3 teeth, 2 plumose and 2 simple setae posteriorly; propodus 1.13 times as long as carpus, with 2 plumose setae anteriorly, and 2 plumose and 1 simple setae posteriorly; dactylus with 6 simple setae.

Pereopod 2 (Fig. 3E), basis shorter than remaining articles combined, anterior margin serrated, with 3 small simple and

1 plumose setae anterodistally, 3 small simple setae posteriorly, and 1 plumose seta posterodistally; ischium unarmed; merus 6.19 times as long as ischium, with 1 plumose seta anteriorly, and 1 plumose and 1 broken setae posteriorly; carpus 2.08 times as long as merus, with 1 small simple, 3 simple, and 1 plumose setae anteriorly, and 1 small simple, 1 simple, and 1 plumose setae posteriorly; propodus 0.23 times as long as carpus, unarmed; dactylus very long, 5.56 times as long as propodus, with 14 small simple setae on surface, and 2 small simple and 1 plumose setae terminally.

Uropod (Fig. 3F), peduncle 1.91 times as long as pleotelson, medial proximal margin serrated, with 2 hair-like and 5 small microserrated setae medially, and 2 small simple setae on lateral margin.

Distribution. Korea (South Sea), Japan (Sagami Bay).

Remarks. *Campylaspis amblyoda* is most similar to *C. angularis* in that without sulcus on the lateral portion of carapace. However, this species is distinguished from *C. angularis* by a combination of the following features (*C. angularis* condition in parentheses): (1) carapace with a pair of projections near proximal portion of frontal lobe (vs. without projection); (2) in female, posterior portion of carapace is extended to pereonite 5 (vs. extended to pereonite 3); and (3) in female, uropodal peduncle with five small microserrated setae medially (vs. with five fine hairs). In addition, setae patterns are apparent in antenna 1, maxilliped 3, and pereopods 1–5. In general, Korean *C. amblyoda* specimens conform to the original description of Gamô (1960) from Japanese waters. However, some age variations are found between our subadult male specimens and the original description provided by Gamô (1960) (original descriptions in parentheses): (1) dorsal portion of the carapace with 5–6 pairs of pellucid spots (vs. 12 pairs of pellucid spots); (2) length of uropodal peduncle 2.2 times as long as pleotelson (vs. 3.0 times as long as pleotelson); and (3) medial margin of uropodal peduncle with five small microserrated setae (vs. with seven plumose setae).

¹**Campylaspis reticulata* Gamô, 1960 (Figs. 4, 5)

Campylaspis reticulata Gamô, 1960: 369, figs. 1, 2; 1963: 80; 1967: 257; 1968: 192, fig. 7.

Material examined. 1♀, Korea: SEEZ st. 2, 34°12'35" N, 128°22'55"E, 1 Apr 2008, Song SJ, cat no. NIBRIV 0000299454.

Description. Subadult female (cat no. NIBRIV0000299454): body (Fig. 4A) calcified, 2.1 mm long, excluding uropods. Carapace (Fig. 4A, B) somewhat vaulted, slightly shorter than half of body length, 1.47 times as long as width, 1.81

Korean name: ¹*곰보고랑꼬마올챙이새우 (신칭)

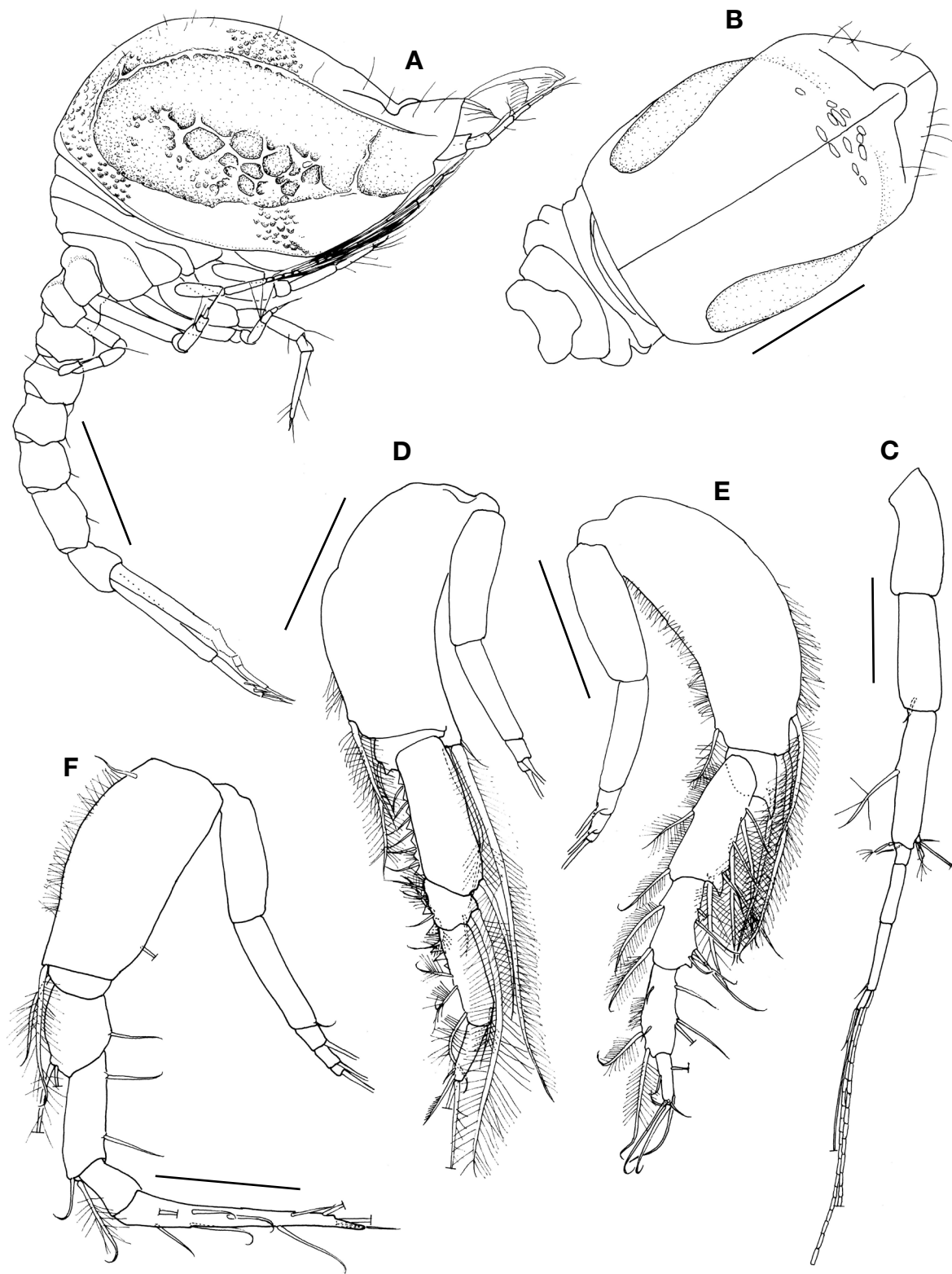


Fig. 4. *Campylaspis reticulata* Gamô, subadult female. A, Habitus, lateral; B, Cephalothorax, dorsal; C, Antenna 1; D, Maxilliped 3; E, Pereopod 1; F, Pereopod 2. Scale bars: A, B=0.5 mm, C=0.1 mm, D-F=0.2 mm.

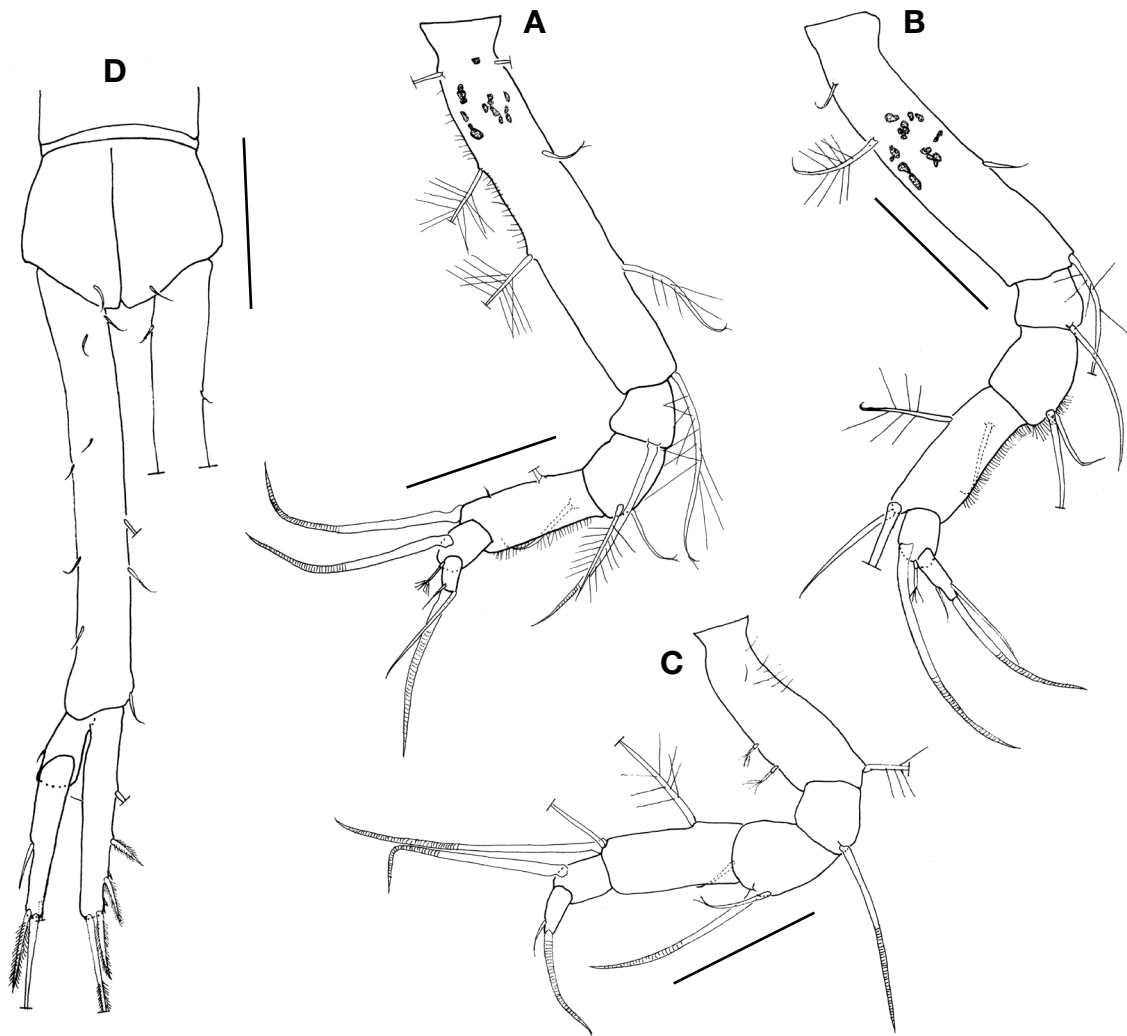


Fig. 5. *Campylaspis reticulata* Gamô, subadult female. A, Pereopod 3; B, Pereopod 4; C, Pereopod 5; D, Pleotelson and uropod, dorsal. Scale bars: A-C=0.15 mm, D=0.2 mm.

times as long as depth, with numerous long hair-like setae, 6–7 of pairs pellucid spots on dorsal portion, a pair of broad sulcus, several large reticulations on lateral portion; posterior portion extended slightly to rear, pereonite 1 to 5 exposed in dorsal view; surface faintly pitted; antennal notch concave, anterolateral corner angular and smooth; pseudorostral lobes truncate, subequal to length of ocular lobe; ocular lobe round, shorter than its width, without lens. Pereon (Fig. 4A, B) 0.37 times as long as carapace length and subequal to 1/7 body length. Pleon (Fig. 4A) 0.57 times as long as cephalothorax length.

Antenna 1 (Fig. 4C), peduncle 3-articulated; article 1 subequal to length of article 2, unarmed; article 2 shorter than article 3, with 1 small simple seta mediodistally; article 3 with 1 plumose seta medially, 1 complex pedunculated and

1 small simple setae on distal margin. Main flagellum 4-articulated; article 1 and article 2 unarmed; article 3 longest, with 1 small simple seta mediodistally and 1 aesthetasc on distal margin; article 4 with 1 aesthetasc, 1 small simple and 1 long simple setae on terminal margin. Accessory flagellum unarticulated, very minute, with 1 complex pedunculated, 2 small simple, and 1 long simple setae.

Maxilliped 3 (Fig. 4D), basis shorter than remaining articles combined, with several hair-like setae medially, 2 plumose setae on near medial corner, lateral corner inflated, with 2 long plumose and 1 small simple setae; ischium with 1 tooth and 1 simple seta on near medial corner; merus 5.75 times as long as ischium, with 7 teeth and 6 simple setae medially and 1 long plumose seta on lateral corner; carpus 0.28 times as long as merus, with 2 teeth, 3 simple and 2

plumose setae medially, 1 simple seta on medial surface, and 1 long plumose seta on lateral corner; propodus 2.31 times as long as carpus, with 3 teeth and 3 plumose setae medially and 1 plumose seta laterodistally; dactylus 0.59 times as long as propodus, with 1 small simple, 1 plumose, and 2 terminal setae.

Pereopod 1 (Fig. 4E), basis shorter than remaining articles combined, with numerous hair-like setae on anterior and posterior margins, 1 plumose seta anterodistally, and 2 long plumose setae posterodistally; ischium with 1 tooth and 1 long plumose seta posterodistally; merus 2.87 times as long as ischium, with numerous hair-like and 2 plumose setae anteriorly, 3 simple and 3 long plumose setae posteriorly, and 1 tooth and 1 long plumose seta on posterior corner; carpus 0.73 times as long as merus, with 2 plumose setae anteriorly and 5 simple setae posteriorly; propodus subequal to length of carpus, with hair-like, 2 small simple, and 2 plumose setae anteriorly and 3 simple setae posteriorly; dactylus 0.58 times as long as propodus, with 7 simple setae.

Pereopod 2 (Fig. 4F), basis shorter than remaining articles combined, with 1 broken seta anteriorly, numerous hair-like and 1 simple setae posteriorly, and 1 plumose seta on posterior corner; ischium with 1 plumose seta on posterior corner; merus 3.14 times as long as ischium, with 1 simple seta anteriorly and 1 broken and 1 plumose setae posterodistally; carpus 1.36 times as long as merus, with 2 simple setae anteriorly and 1 simple and 1 plumose setae on posterior corner; propodus 0.55 times as long as carpus, unarmed; dactylus 4.34 times as long as propodus, with 8 simple setae on surface, terminal margin pointed, with 2 simple setae.

Pereopod 3 (Fig. 5A), basis longer than remaining articles combined, with numerous hair-like, 1 simple, and 2 plumose setae anteriorly, 2 simple and 1 plumose setae posteriorly, and 1 plumose seta on posterior corner; ischium with 1 long annulate seta on near posterior corner; merus 1.41 times as long as ischium, with 1 simple and 1 plumose setae posterodistally; carpus 1.52 times as long as merus, with 1 broken and 1 small simple setae anteriorly, 1 long annulate seta on anterior corner, 1 simple seta on medial surface, and numerous hair-like setae posteriorly; propodus 0.45 times as long as carpus, 1 long annulate seta anteriorly and 1 complex pedunculated seta on distal margin; dactylus 0.62 times as long as propodus, with 1 long simple, 1 small simple, and 1 long annulate setae terminally.

Pereopod 4 (Fig. 5B), basis shorter than remaining articles combined, with 1 small simple and 1 plumose setae anteriorly, 1 small simple seta posteriorly, and 1 plumose seta on posterior corner; ischium with 1 long simple seta on posterior corner; merus 1.92 times as long as ischium, with numerous hair-like and 2 simple setae posterodistally; carpus 1.46 times as long as merus, with 1 plumose seta an-

teriorly, 1 long simple and 1 long annulate setae on anterior corner, 1 simple seta on medial margin, and numerous hair-like posteriorly; propodus 0.43 times as long as carpus, 1 long annulate and 1 complex pedunculated setae distally; dactylus subequal to length of propodus, with 1 simple seta anterodistally, 1 long simple seta posterodistally, and 1 long annulate setae terminally.

Pereopod 5 (Fig. 5C), basis shorter than remaining articles combined, with several hair-like setae on proximal surface, 1 plumose seta anterodistally, and 2 complex pedunculated setae posteriorly; ischium with 1 long annulate seta anterodistally; merus 1.38 times as long as ischium, with 1 simple and 1 long annulate setae anterodistally and 1 simple seta mediolaterally; carpus 1.28 times as long as merus, 1 plumose seta posteriorly and 1 broken and 1 long annulate setae on posterior corner; propodus 0.42 times as long as carpus, with 1 long annulate seta posterodistally; dactylus subequal to length of propodus, with 1 small simple seta posterodistally and 1 annulate seta terminally.

Uropod (Fig. 5D), peduncle 2.52 times as long as pleotelson, with 4 small simple setae medially, 2 small simple on dorsal surface, and 3 small simple setae laterally; endopod unarticulated, subequal to half of peduncle, with 3 small microserrate and 2 small simple setae medially, 1 hair-like seta laterally, and 2 microserrate setae terminally; exopod biarticulated, subequal to length of endopod, article 1 with 1 small simple seta laterodistally, article 2 with 1 broken seta mediolaterally, 1 simple seta laterally, and 2 microserrate setae terminally.

Distribution. Korea (South Sea), Japan (Sagami Bay).

Remarks. In the original description, only the male of *C. reticulata* was described (Gamô, 1960). Fortunately, a female specimen was collected in the present study. There is no doubt that this specimen belong to *C. reticulata* due to the following characters: (1) shape and sculpture of carapace almost the same; (2) length ratio of appendages such as antenna 1, pereopods 1–5, pleotelson, and uropod are similar. However, several differences were found between these collected specimens and the original description provided by Gamô (1960) (original descriptions in parentheses): (1) antero-lateral of carapace are smooth (vs. angles); (2) there are several large reticulations on the lateral portion (vs. there are large reticulations on the posterior portion). In addition, setae patterns of appendages are slightly different. These differences might be result of sexual variation.

Key to the Korean *Campylaspis* species

- 1. Carapace with sulcus on both sides 2
- Carapace without sulcus on both sides 3
- 2. Sulcus very broad, decorated with numerous reticulate sculptures *C. reticulata*

- Sulcus narrow, not decorated 4
- 3. Carapace without structure, medial margin of uropod peduncle unarmed *C. orientalis*
- Carapace with a pair of projections near proximal portion of frontal lobe, medial margin of uropod peduncle serrated, with 5 small microserrated setae *C. amblyoda*
- 4. Dactylus of pereopod 2 more than 3 times as long as carpus, only with 20 simple setae on surface *C. fusiformis*
- Dactylus of pereopod 2 less than 3 times as long as carpus, with 1 plumose and 10 simple setae on surface *C. pumila*

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