

# Three Miraciid Copepods (Harpacticoida, Miraciidae) from South Korea

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## ABSTRACT

Three harpacticoid species of the family Miraciidae are reported from neritic and brackish waters in Korea: *Amphiascus kawamurai* Ueda and Nagai, 2005, *Schizopera clandestina* (Klie, 1924) and *Schizopera neglecta* Akatova, 1935. *Amphiascus kawamurai* is newly recorded from Korea. Redescription is provided with the systematic accounts and illustrations of them.

**Key words:** *Amphiascus kawamurai*, brackish, Copepoda, Harpacticoida, Korea, Miraciidae, neritic, taxonomy

## INTRODUCTION

The family Miraciidae Dana, 1846 is predominantly marine harpacticoid family, but containing several freshwater species, most of them in the genus *Schizopera* (Pesce, 2009). Recently, Willen (2000) identified the traditional planktonic miraciids as representing a terminal clade originating within the family Diosaccidae Sars, 1906, a large and diverse family of typically benthic copepods (Boxshall and Halsey, 2004). The Miraciidae currently comprises more than 360 species of 53 genera, most of which were transferred from the Diosaccidae by the priority of the former.

In Korea, seven species belonging to the Miraciidae have been recorded as yet, including two *Schizopera* species, *S. clandestina* (Klie, 1924) and *S. neglecta* Akatova, 1935, just listed in the "List of Animals in Korea" (KSSZ, 1997); *Amonardia normani* (Brady, 1872) from estuarine and neritic waters around Jindo Is. by Song and Chang (1995); *Dactylopodamphiascopsis latifolius* (Sars, 1909) and *Diosaccus ezoensis* Ito, 1974 obtained from macroalgae on rocky shores by Song et al. (1999); *Amphiascoides coreanus* Lee, Soh and Suh, 2007 described from Sangju-ri Beach at Namhae Is., middle of the southern coast of Korea by Lee et al. (2007); *Amonardia coreana* Song, Rho and Kim, 2007 from cultivated brown seaweeds, *Undaria pinnatifida*, at Kijang coast near Busan by Song et al. (2007).

As an additional result from serial faunistic studies on brackish copepods (see Lee and Chang, 2008 for details), a miraciid species, *Amphiascus kawamurai* Ueda and Nagai, 2005, is newly recorded from a coastal swamp and a tidal pool in the eastern coast of South Korea. Furthermore, as the two *Schizopera* species, *S. clandestina* and *S. neglecta*, have

been neither described nor illustrated in Korea yet, so I herein provide the redescription of the three miraciid species with the systematic accounts and illustrations.

## MATERIALS AND METHODS

Materials are the samples collected from 24 localities (Fig. 1), and stocked in the specimen room of the Department of Biological Science, Daegu University, Korea since August, 1986. Collections were made mostly from coastal swamps, estuaries and neritic waters with a dipnet of 64  $\mu$ m mesh. Copepods were fixed and stored in 4% buffered formalin.

After treatment in a solution of 20% glycerin-80% ethyl alcohol for 1-2 days, specimens were dissected in lactic acid, and the dissected parts were placed in lactophenol on H-S slide, a recent variation of Cobb slide. Mounted specimens were observed using a differential interference contrast microscope (Olympus BX-51) equipped with Nomarski optics. All drawings were made with the aid of a camera lucida. Measurements were done with a digital camera for microscope (Cool SNAP 5.0M, Roper Scientific Co., U.S.A.) and a calibration software QCapture Pro (ver. 5.0, Media Cybernetics Inc., U.S.A.).

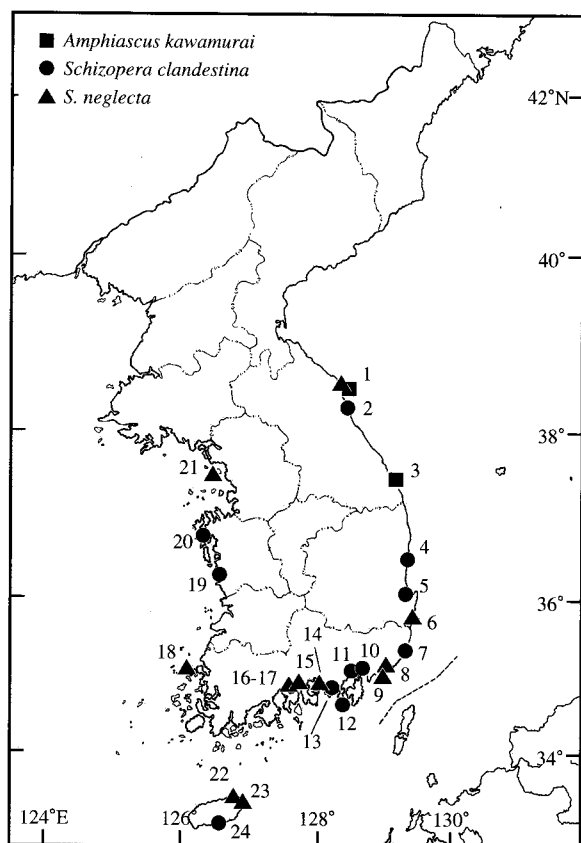
Some specimens examined are deposited as the voucher specimens in the National Institute of Biological Resources, Incheon, Korea (NIBR). The specimen numbers in the "Material examined" section of each species are registered in the database of NIBR.

The descriptive terminology applied to segmentation and setation of body appendages is adopted from Boxshall and Halsey (2004). Abbreviations are used in the text: enp 1-3 or exp 1-3, the first to third endopodal or exopodal segments of each leg. Sewell's system is adopted for seta/spine armature of legs 1-4, where setae are denoted by Arabic numerals, and

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**Fig. 1.** A map showing localities in South Korea. 1, Hwajinpo, Goseong; 2, Cheongchoho Lake, Sokcho; 3, Yonghwa Beach, Samcheok; 4, Obo-ri, Yeongdeok; 5, estuary of Hyeongsangang River, Pohang; 6, estuary of Daejongcheon Stream, Gyeongju; 7, estuary of Hoiyacheon Stream, Ulsan; 8, Ulsukdo delta, Nakdong River, Busan; 9, Jinudo Islet, Busan; 10, Ungcheon, Jinhae; 11, Jindong, Masan; 12, Hansando Island, Tongyeong; 13, Daebangjin-gulhang, Samcheonpo; 14, estuary of Gasancheon Stream, Sacheon; 15, estuary of Gwangogcheon Stream, Hadong; 16, estuary of Sueocheon Stream, Gwangyang; 17, Jinwol, Gwangyang; 18, Imjado Island, Sinan; 19, Muchangpo, Boryeong; 20, Taeaeon; 21, Yeongjongdo Island, Incheon; 22, Yongcheon-gul cave, Gujwa, Jeju Island; 23, Seongsanpo, Jeju Island; 24, Jungmun, Jeju Island.

spines by Roman numerals (cf. Huys and Boxshall, 1991, fig. 1.5.7).

## SYSTEMATIC ACCOUNTS

Family Miraciidae Dana, 1846

<sup>1</sup>\*Genus *Amphiascus* Kessler, 1913

<sup>2</sup>\**Amphiascus kawamurai* Ueda and Nagai, 2005

(Figs. 2, 3)

*Amphiascus kawamurai* Ueda and Nagai, 2005, p. 249, figs. 1-5.

**Material examined.** 11 ♀♀ (5 ovi.), 3 ♂♂, Hwajinpo (lagoon), Goseong, 29 Feb. 2007 (S.B. Huh); 9 ♀♀ (3 ovi.) (1 ♀, NIBR0000006819), 2 ♂♂, Yonghwa beach (salt marsh), Samcheok, 29 Feb. 2007 (S.B. Huh).

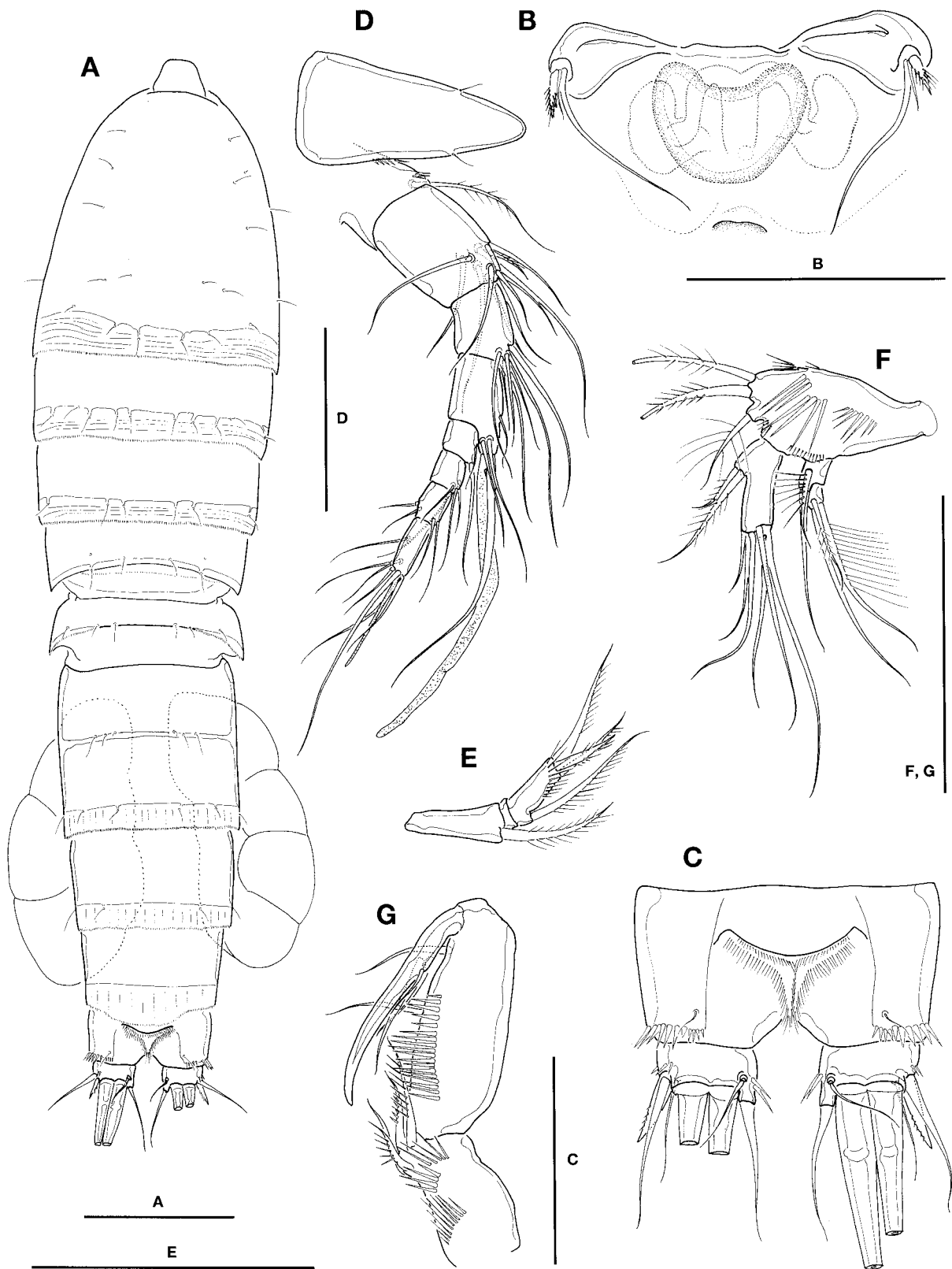
**Description. Female:** Body (Fig. 2A) 630-720 μm in length, slender, cylindrical, tapering posteriorly, without clear distinction between prosome and urosome. All prosomites and urosomites with hyaline membrane crenulated along posterior margin, bearing 4-10 sensillae along posterior margin dorsally except for anal somite. Outer distal margin of each prosomites not protruded. Rostrum well developed, much protruding, pointing downward, tapering distally, defined at base (Fig. 2A, D). Cephalothorax bell-shaped, a little longer than next 3 prosomites combined; integumental depression (nuchal organ) absent.

Urosomites without spinule row along posterior margin both dorsally and ventrally. Genital double-somite not completely fused, with transverse line of fusion dorsolaterally and ventrolaterally. Genital apparatus (Fig. 2B) comprising genital apertures medially fused to form a narrow gonopore; laterally protruded a little, bearing 3 setae (1 long naked, 1 short naked, and 1 short spiniform setae) representing leg 6; median copulatory pore posterior to large kidney-shaped seminal receptacle. Genital double-somite and next urosomite furnished with 4 papillary sensillae along posterior margin ventrally. Anal somite armed with about 10-12 sharp spinules dorsally along posterior margin, 14-16 spinules ventrally. Anal operculum well developed, nearly semicircular, with fine setules along its posterior margin (Fig. 2C).

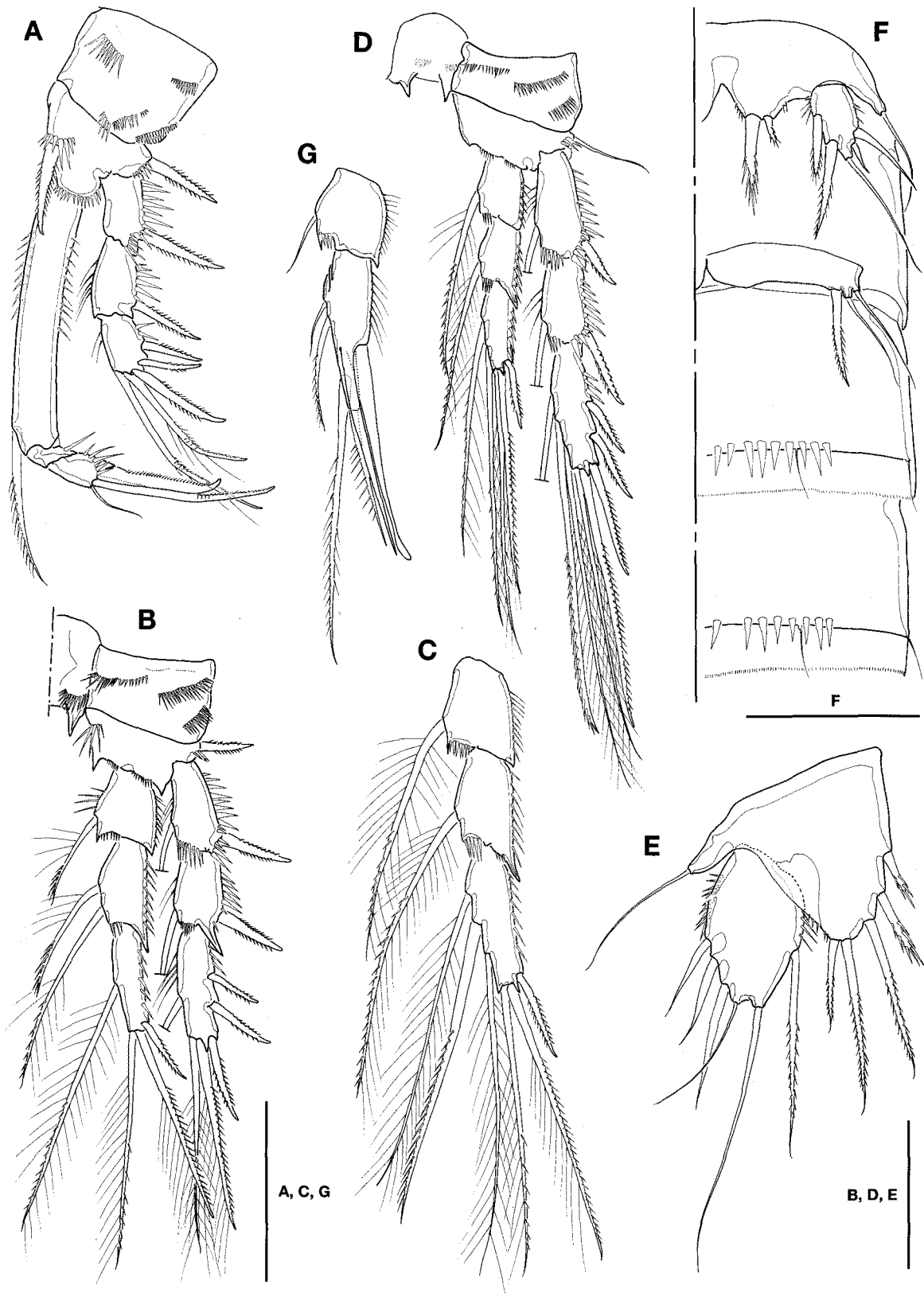
Caudal rami much shorter (about 0.6-0.7 times) than wide, armed with spinule row inner distally; dorsal face rather smooth (Fig. 2C). Lateral caudal setae (caudal setae I and II) developed, locating near distal corner of lateral margin; caudal setae I short, spiniform. Outer caudal seta (caudal seta III) slender, naked, much shorter than inner caudal seta, situated beneath outer terminal caudal seta (caudal seta IV). Outer terminal caudal seta well developed, naked, without secondary setules, a little longer than half the inner terminal caudal seta (caudal seta V). Inner terminal caudal seta naked, nearly as long as urosomite, not strongly swollen at its base. Both terminal caudal setae with fracture plane. Inner caudal seta (caudal seta VI) naked, often slightly curved inward at its base. Dorsal caudal seta (caudal seta VII) short, situated at inner distal corner of caudal ramus, just anterior to base of inner caudal seta.

Antennule (Fig. 2D) 8-segmented; segment 2 stout, elon-

<sup>1</sup>\*쌍낭장수노벌레속 (신칭), <sup>2</sup>\*쌍낭장수노벌레 (신칭)



**Fig. 2.** *Amphiascus kawamurai* Ueda and Nagai, female. A, Habitus, dorsal; B, Genital field; C, Anal somite and caudal rami, dorsal; D, Rostrum and antennule, dorsal; E, Antennary exopod; F, Mandibular palp; G, Maxilliped. Scale bars=100  $\mu$ m (A), 50  $\mu$ m (B-G).



**Fig. 3.** *Amphiascus kawamurai* Ueda and Nagai. A-E, Female: A, Leg 1; B, Leg 2; C, Leg 3 endopod; D, Leg 4; E, Leg 5. F-G, Male: F, Urosome and legs 5-6 (right), ventral; G, Leg 2 endopod. Scale bars=50  $\mu$ m.

gate; segment 4 bearing 1 long aesthetasc, about 1.3 times as long as next segments combined; last segment with 1 aesthetasc apically. Setal formula: 1-[1], 2-[11], 3-[7], 4-[4+1 aesthetasc], 5-[2], 6-[4], 7-[4], 8-[7+1 aesthetasc]. Antenna, enp 1 bearing 1 naked seta on medial margin proximally; enp 2 bearing 3 outer or outer distal spines, 4 terminal geniculate setae and 2 small inner distal setae. Antennary exopod (Fig. 2E) 3-segmented, exp 1 about 2.5-3 times longer than broad, with 1 seta inner distally; exp 2 minute, lacking seta; exp 3 elongate, with 1 proximal and 3 distal setae. Mandibular palp (Fig. 2F) 1-segmented, broadened distally, armed with 3 setae and setule row inner distally; endopodite bearing 8 setae in total (2 inner proximal+6 distal); exopodite 2-segmented, with 1 proximal and 1 inner distal setae on proximal segment, and 3 apical setae on distal segment. Maxillule with praecoxal arthrite bearing 7 elements distally with 2 pinnate setae posteriorly, and 2 setae on frontal surface; coxal endite cylindrical, bearing 2 setae; endopod and exopod each bearing 4 and 2 setae. Maxilliped (Fig. 2G) subchelate; syncoxa protruded inner distally with 3 setae; basis pectinate with 16-18 long spinules along inner margin, bearing 2 fine naked setae on inner margin; endopod elongate, forming 1 strong and curved claw, flanking 2 setae as accessory armature.

Leg 1 (Fig. 3A), both exopod and endopod 3-segmented; coxa armed with 1 row of spinules at outer distal corner; basis with 1 spiniform seta inner distally; enp 1 much longer than exopod; with 1 inner seta distally; enp 2 small, lacking inner seta; enp 3 bearing 2 spiniform setae apically with 1 slender seta inner distally; exp 2 without inner seta; exp 3 with 3 outer spines and 2 long geniculate setae distally. Legs 2-4, both exopods and endopods 3-segmented; intercoxal sclerites with paired hook-like projections posteriorly; enp 1 bearing 1 inner seta; exp 3 armed with 3 outer spines. Leg 3 enp 2 (Fig. 3C) with only 1 inner seta. Seta/spine armature of legs 2-4 as follows:

Leg 2 basis I-0 exp I-1; I-1; III,2,1 enp 0-1; 0-2; I,2,1

Leg 3 basis 1-0 exp I-1; I-1; III,2,1 enp 0-1; 0-1; I,2,3

Leg 4 basis 1-0 exp I-1; I-1; III,2,3 enp 0-1; 0-1; I,2,2

Leg 5 (Fig. 3E) situated ventrolaterally; baseoendopod a little protruded, its posterior tip slightly exceeding middle of exopod, with conspicuous hyaline part inside outer edge, bearing 5 spiniform setae. Exopod oval, elongated, about 1.6 times as long as wide, bearing 1 inner, 2 apical, 3 outer setae, with spinules along both inner and outer margins.

*Male*: Body about 530  $\mu\text{m}$  in length, somewhat smaller and more slender than female. Sexual dimorphism shown in antennule, inner projection on male leg 1 basis, endopod of leg 2, leg 5 and leg 6. Urosomites 3-4 (first and second abdo-

minal somites) each with spinule row along posterior margin ventrally (Fig. 3F). Antennule subchirocerate, 10-segmented. Leg 2 endopod (Fig. 3G) 2-segmented; enp 1 with 1 inner seta; enp 2 modified, bearing 3 inner, 1 apical, 2 outer distal spiniform setae. Leg 5 (Fig. 3F) baseoendopod bearing 2 setae on weak inner expansion, outer spiniform seta much shorter (less than 1/3 times) than inner one; exopod somewhat oval with 5 setae in total, including 1 spiniform inner proximal and 2 naked outer distal setae. Leg 6 (Fig. 3F) represented by 1 innermost spine and 2 outer setae on outer distal corner of genital operculum.

*Distribution*. Japan, Korea.

*Ecology*. This species was described from a tank for laver cultivation on the shore of Ariake Bay, Kyushu, western Japan by Ueda and Nagai (2005). *Amphiascus kawamura* was supposed to graze the fouling diatoms on oyster shells for laver cultivation. In Korea, this species occurred from a tidal pool and salt marshes in the eastern coast.

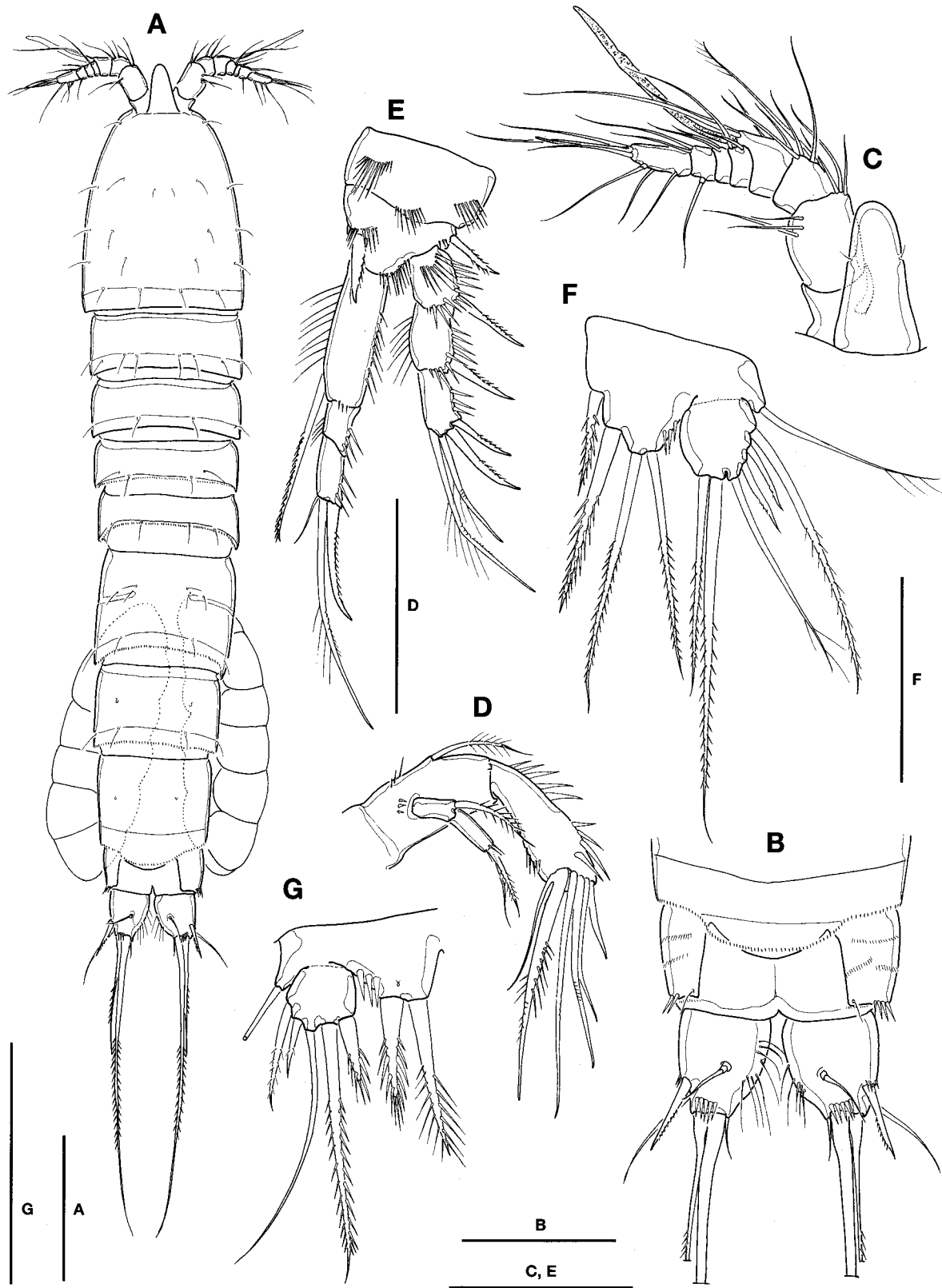
*Remarks*. The present species belongs to the *pacificus* group of the genus *Amphiascus* Kessler in bearing a seta on exp 1 of antenna, leg 1 exp 2 lacking medial seta, and only one medial seta on leg 3 exp 2. Among six congeneric species of the group (cf. Ueda and Nagai, 2005), *A. kawamura* most resembles *A. parvus* Sars, 1906 from North Sea and *A. undosus* Lang, 1965 from the Californian coast of U.S.A. However, *A. kawamura* is different from the former species by the elongate leg 5 exopod with a spinule row on medial margin and the absence of spinule row on ventrolateral surface of genital somite, moreover, from the latter by the elongate leg 5 exopod, normal terminal caudal seta not strongly swollen and undulating at its base, and very short outer seta on baseoendopod of male leg 5.

Korean specimens coincide well with the original description (Ueda and Nagai, 2005), except for an additional seta on the proximal segment of mandibular exopodite. As a result of close re-examination of the topotypes from Japan, the seta was consistently shown in all the specimens examined, under the differential interference contrast microscope with high-power resolution at 1,000x magnification with oil immersion after dissection of mandibular palp. In the Korean specimens examined, two variations were found: an individual had 3 setae (not 4 setae) on the distal segment of antennary exopod in one side; the hook-like projections on the posterior margins of intercoxal sclerites of legs 2-4 are highly variable both in size and shape.

Genus *Schizopera* Sars, 1905

<sup>1</sup>\**Schizopera clandestina* (Klie 1924) (Figs. 4, 5)  
*Amphiascus clandestinus* Klie, 1924, p. 335, figs. 1-6.

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**Fig. 4.** *Schizopera clandestina* (Klie). A-F, Female: A, Habitus, dorsal; B, Anal somite and caudal rami; C, Antennule; D, Antenna; E, Leg 1; F, Leg 5, frontal. G, Male Leg 5, frontal. Scale bars=100  $\mu$ m (A), 50  $\mu$ m (B-G).

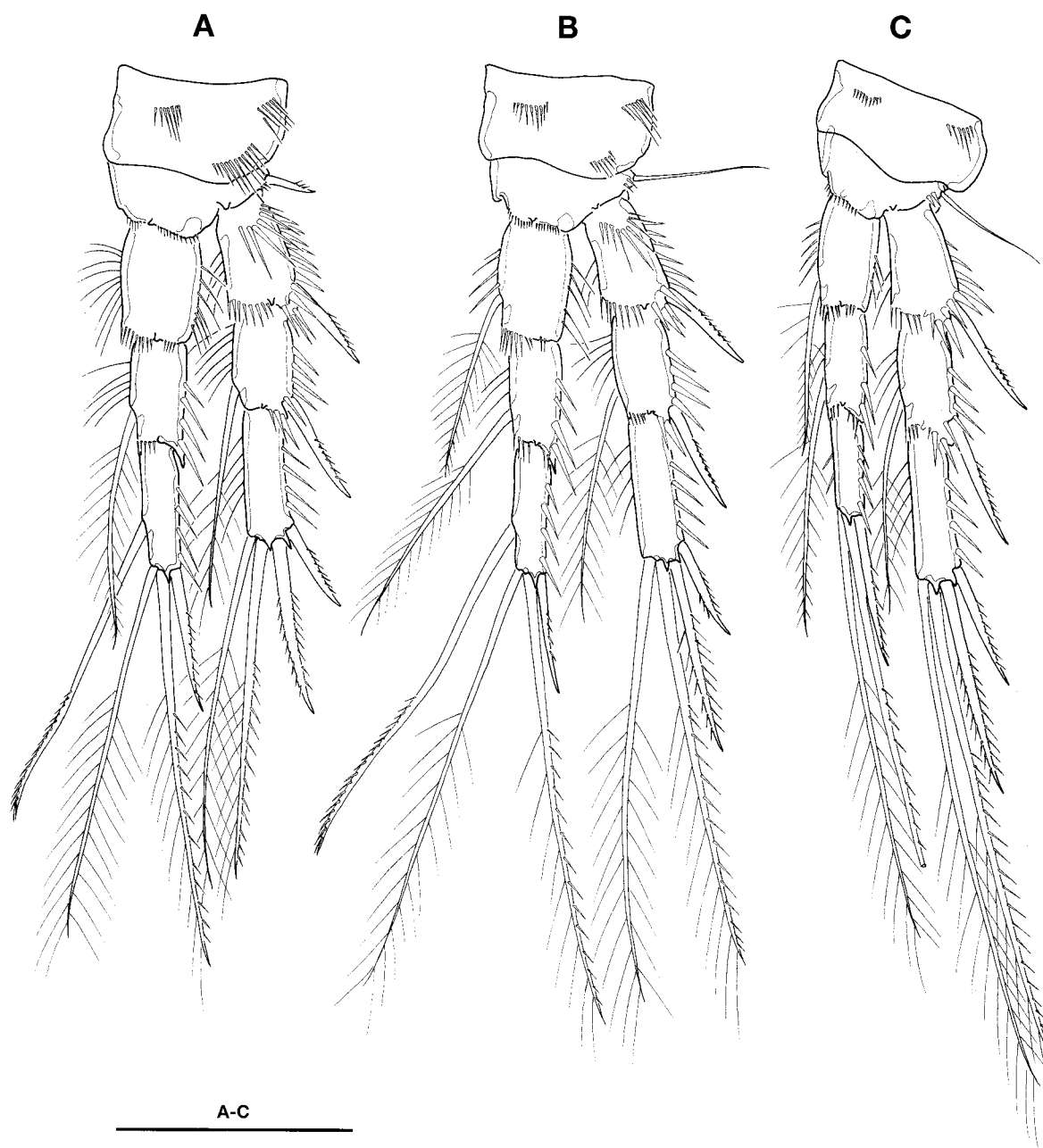


Fig. 5. *Schizopera clandestina* (Klie), female. A, Leg 2; B, Leg 3; C, Leg 4. Scale bar=50  $\mu$ m.

*Schizopera longicauda* Gagn, 1924, p. 335; Pesta, 1932, p. 63, fig. 69.

*Schizopera subterranea* Lang, 1948, p. 752, fig. 305(7).

*Schizopera clandestina*: Kunz, 1937, p. 100; Lang, 1948, p. 748, fig. 304; Borutzky, 1952, p. 120; Noodt, 1953, p. 11, figs. 22-26; Dussart, 1967, p. 197, fig. 72; Tai and Song, 1979, p. 192, fig. 101; Apostolov and Marinov, 1988, p. 192, fig. 73, 1a-e.

*Material examined*. 7 ♀♀ (1 ovi.) (1 ♀, NIBR0000005987),

1 ♂, Cheongchoho Lake (lagoon), Sokcho, 28 Dec. 2006 (C.Y. Chang and J.M. Lee); 1 ♀, 1 ♂, Namsan-ri (well at salt farm), Taean, 1 May 1992 (C.Y. Chang); 2 ♀♀, Muchangpo (salt marsh), Boryeong, 1 May 2007 (C.Y. Chang and H.J. Yoon); 5 ♀♀ (1 ovi.), 2 ♂♂, Obo-ri (estuary of a streamlet), Yeongdeok, 4 Nov. 2005 (H.S. Lee); 6 ♀♀, 4 ♂♂, estuary of Hyeongsangang R., Pohang, 24 Sep. 2005 (H.W. Lim); 1 ♀, 1 ♂, same locality, 10 Jan. 2005 (C.Y. Chang); 2 ♀♀, estuary of Hoiyacheon Str. (Seosaenggyo Br.), Ulsan, 24 Sep. 2006 (S.B. Lim and S.Y. Cho); 5 ♀♀, 8

♂♂, Ungcheon (estuarine marsh), Jinhae, 24 Jun. 2007 (C.Y. Chang); 2♀♀ (ovi.), Jukjeon tidal embankment (salt marsh), Jindong, Masan, 3 Jun. 2007 (S.J. Lim); 2♀♀, Je-seungdang (ditch), Hansando Is., Tongyeong, 20 Aug. 1987 (C.Y. Chang); 2♀♀, estuary of Gasancheon Str., Chukdong, Sacheon, 26 Apr. 2007 (C.Y. Chang, J.M. Lee and H.J. Yoon); 4♀♀ (1 ovi.), 1♂, estuary of Gwangogcheon Str., Hadong, 26 Apr. 2007 (C.Y. Chang, J.M. Lee and H.J. Yoon); 1♀, 1♂, estuary of a streamlet, Harye, Jungmun, Jeju Is., 12 Jan. 2007 (C.Y. Chang and J.M. Lee).

*Description. Female:* Body (Fig. 4A) slender, elongate, narrowing posteriorly, 580-670  $\mu\text{m}$ . long. Sensillae scattered on dorsal surface of cephalothorax and posterior margin of prosomites. Urosomites with hyaline membrane along posterior margin, without spinule row both dorsally and ventrally. Genital double-somite not completely fused, subdivided by transverse chitinous rib dorsolaterally and ventrolaterally. Anal operculum convex, with minute hairs along posterior margin.

Caudal rami (Fig. 4B) about 1.3 times longer than wide; inner margin swollen with setule row; 4-5 spinules along posterior margin of ramus dorsally. Lateral caudal seta short, stout, spiniform, situated at outer distal corner of ramus, much shorter than outer caudal seta. Outer caudal seta slender, a little longer than ramus. Outer terminal caudal seta 2/5 times shorter than inner one, a little swollen at its base, without fracture plane.

Rostrum (Fig. 4C) prominent, much protruding anteriorly, nearly reaching to distal margin of second segment of antennules, tapering distally to round tip, bearing paired sensillae at about distal third of lateral margin, defined at base. Antennule (Fig. 4C) 8-segmented, short and blunt, its tip not reaching to middle of cephalothorax; segment 2 elongate, while segments 5-7 short, sum of them nearly as long as last segment; aesthetasc on segment 4 very long, about 1.8 times longer than sum of segments 5-8. Antenna (Fig. 4D), exopod 2-segmented, bearing 1 seta on proximal segment and 2 apical setae on distal segment.

Leg 1 (Fig. 4E), both endopod and exopod 3-segmented; seta on inner distal corner of coxa spiniform, reaching to proximal third of enp 1; enp 1 much shorter than exopod, slightly not reaching to middle of exp 3; exp 2 not elongated, without inner seta; exp 3 a little shorter than exp 2, armed with 2 outer spines and 2 geniculate setae. Legs 2-4 (Fig. 5A-C) swimming legs; both endopods and exopods 3-segmented; exp 2 with 1 inner seta; exp 3 with 2 outer spines. Legs 2-3 each with 1 inner seta on enp 1. Leg 4 endopod much shorter than exopod; last segment bearing 1 spine and 2 setae distally. Seta/spine ornamentation of legs 2-4 as fol-

lows:

Leg 2 basis I-0 exp I-0; I-1; II,2,0 enp 0-0; 0-1; I,2,1

Leg 3 basis I-0 exp I-0; I-1; II,2,0 enp 0-1; 0-1; I,2,1

Leg 4 basis I-0 exp I-0; I-1; II,2,0 enp 0-1; 0-1; I,2,0

Leg 5 (Fig. 4F) lacking intercoxal sclerite. Baseoendopod and exopod incompletely fused (nearly fused in frontal view, while faintly divided on caudal surface). Endopodal lobe of baseoendopod a little protruding, slightly not reaching to tip of exopod, bearing 4 setae. Exopod suboval, about 1.2-1.3 times longer than wide, with 6 setae, second one from inner margin longest, while second from outer margin of short.

Ovigerous female carrying a pair of long egg sacs lateroventrally, each usually containing 10-16 eggs.

*Male:* Leg 5 (Fig. 4G), baseoendopod not protruding, its tip not reaching to tip of exopod, bearing 2 spiniform setae, inner one a little longer than outer one; exopod broader than long, bearing 5 setae, second one from inner margin pinnate, longest, while second from outer margin naked, minute.

*Distribution.* Germany, Italia, North Africa, Bulgaria, Black Sea, China, Korea.

*Ecology.* This species occurs frequently in various brackish waters, especially small, eutrophicated estuarine marshes.

*Remarks.* In European specimens, the baseoendopod and exopod of male leg 5 are most often ("le plus souvent") confluent (cf. Dussart, 1967: 197), while they are usually subdivided in the Korean specimens.

This species is one of the most frequent species in the brackish waters of Korea, often occurs parapatrically with the next species *S. neglecta* in South Korea (cf. Fig. 1).

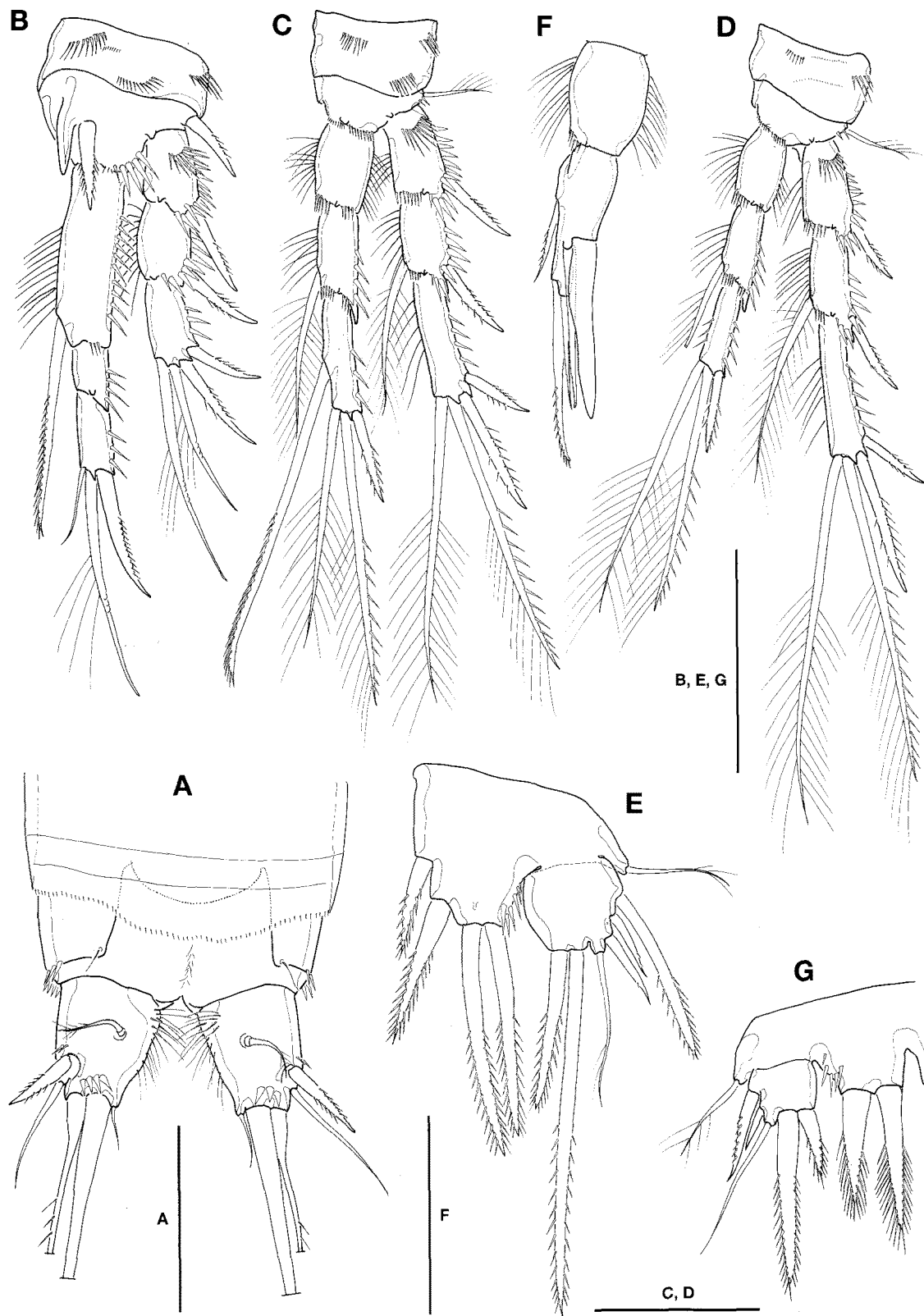
#### <sup>1</sup>*Schizopera neglecta* Akatova 1935 (Fig. 6)

*Schizopera neglecta* Akatova, 1935, p. 324, figs. 13-18; Lang, 1948, p. 751, fig. 305(4); Monchenko, 1967, p. 370, figs. 2-4; Tai and Song, 1979, p. 194, fig. 102; Apostolov and Marinov, 1988, p. 194, figs. 73, 3a-2, 74, 1a-b.

*Material examined.* 1♀, 1♂, Yeongjongdo Is. (reed marsh), 22 Mar. 1996 (H.S. Rho); 1♀ (ovi.), Hwajinpo, Goseong, 1 Mar. 2005 (C.Y. Chang, J.M. Lee and J.M. Jeon); 8♀♀, 2♂♂, estuary of Daejongcheon Str., Daebon, Gyeongju, 15 May 1996 (C.Y. Chang and H.S. Rho); 1♀ (ovi.) (NIBR 0000005988), Ulsukdo Is., estuary of Nakdong R., Busan, 28 Oct. 2006 (H.J. Ji, J.S. Park and S.Y. Yang); 2♀♀ (ovi.), Jinudo Is. (ditch on the beach), Busan, 8 Aug. 1986 (S.M. Yoon); 1♀ (NIBR0000006818), 1♂, Daebangjin-gulhang (harbor), Samcheonpo, 2 Sep. 2006 (C.Y. Chang); 1♀, 1♂, estuary of Sueocheon Str., Gwangyang, 2 Feb. 2005 (C.Y. Chang and J.M. Lee); 2♀♀, Jinwol (reed marsh), Gwangyang, 2 Feb. 2005 (H.W. Lim); 4♀♀, 1♂, Jongdal-ri (coas-

<sup>1</sup>\*민짜갈래장수노벌레





**Fig. 6.** *Schizopera neglecta* Akatova. A-E, Female: A, Anal somite and caudal rami, dorsal; B, Leg 1; C, Leg 3; D, Leg 4; E, Leg 5. F-G, Male: F, Leg 2 endopod; G, Leg 5, frontal. Scale bars=50  $\mu$ m.

tal swamp and ditch), Seongsanpo, Jeju Is., 25 Jan. 2003 (C.Y. Chang and J.M. Lee); 1♂, Yongcheon-gul cave, Gujwa, Jeju Is., 17 Aug. 2008 (J.M. Lee and Y.G. Choi).

**Description.** *Female:* Body about 620 µm long. Similar to preceding species in general appearances. Caudal rami about 1.2-1.3 times longer than wide; inner margin relatively straight with setule row (Fig. 6A). Leg 1 enp 1 a little shorter than exopod. Legs 3-4 enp 1 lacking inner seta (Fig. 6C, D). Leg 3 enp 3 typically bearing 1 stout, spiniform inner seta. Seta/spine armature of legs 2-4 often variable, as follows:

Leg 2 basis I-0 exp I-0; I-1(0); II,2,0  
enp 0-1; 0-1; I,2(1),1

Leg 3 basis I-0 exp I-0; I-1(0); II,2,0  
enp 0-0; 0-1; I,2(1),1

Leg 4 basis I-0 exp I-0; I-1(0); II,2,0  
enp 0-0; 0-1; I,2(1),0

Leg 5 (Fig. 6E) exopod nearly circular, as long as wide. Baseopod bearing 4 setae; exopod with 6 setae, second one from inner margin longest, while second and third one from outer margin minute.

*Male:* Leg 2 endopod (Fig. 6F) modified, 2-segmented; both sides of enp 1 a little swollen with marginal hairs; distal segment bearing 1 big spinous process outer subdistally, 1 pinnate seta apically, 2 setiform setae between them, 1 short seta on inner margin.

Leg 5 (Fig. 6G), baseopod not protruding, nearly reaching to posterior margin of exopod, bearing 2 stout spiniform setae, inner one 1.2-1.3 times longer than outer one. Exopod oblong, about 1.5 times broader than long, bearing 5 setae, second one from inner margin longest, while second from outer margin minute; outermost seta rather pinnate, stronger than that of preceding species.

**Distribution.** Korea, China, Caspian Sea, Black Sea, Russia, Bulgaria, Rumania.

**Ecology.** This species is known as euryhaline. In the original description (Akatova, 1935), eight collection stations showed the salinity ranging from 4.38 to 40.66‰. In Korea, this species was mostly collected from coastal marshes and estuarine waters. Oviparous females were found in spring and autumn in South Korea.

**Remarks.** This species is distinguished from *S. clandestina* by the absence of inner seta on legs 3-4 enp 1 in both sexes and the rather straight inner margin of caudal rami.

Lang (1965) used the setation of legs 3-4 exp 2 as a key character between *S. clandestina* and *S. baltica* Lang, 1965 in both sexes. However, in the present species, Korean specimens show variability in the seta/spine armature of legs 2-4, that is, the inner seta commonly lacking on exp 2 in one side (asymmetrical setation) or in both sides, moreover, the inner distal seta on enp 3 is also frequently reduced, as shown in the seta/spine formula above. In contrast, the setation on

legs 3-4 enp 1, one of the decisive characters between the two *Schizopera* species from Korea, is highly consistent. Only one male from 28 individuals examined has an inner seta on leg 4 enp 1 in one side only.

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