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The Marine Amphipod Crustaceans of Ulreung Island, Korea: Part I

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This study on the four families (Ampithoidae, Corophiidae, Dulichiidae, and Ischyroceridae) of amphipods of Ulreung Island was based on the materials collected at eight localities in Ulreung Island. Eleven species of nine genera in four families were identified. Of these, four (*Sunamphithoe sineplumosa, Podocerus ulreungensis, P. hoonsooi,* and *Ventojassa dentipalma*) were new to science. All eleven species were new records for Ulreung Island. Six species were described and illustrated. The keys to all eleven species and higher taxa were provided.

KEY WORDS: Crustacea, Amphipoda, Ulreung Island, Korea

The marine amphipod fauna of Korea has been poorly known. At present, in Gammaridea, 91 species in 28 families have been reported from Korea (Kim, 1991). While, in Caprellidea, 26 species of five genera in one family were recorded in Korean waters (Lee, 1988).

Kim and Kim (1988) reported *Ampithoe lacertosa* Bate, 1858 and *Peramphithoe baegryeongensis* Kim and Kim, 1988 from Ch'ŏnbu. They also reported *Ampithoe valida shimizuensis* Stephensen, 1944 from Sadong. Therefore, only three species of amphipods have been reported from Ulreung Island.

The aim of this study is to provide a source for the identification of the species of benthic Amphipoda in Ulreung Island. This study is the first part of a series of publication dealing with the species of marine amphipods from Ulreung Island. We list the keys to suborders and families of amphipods from Ulreung Island in the present paper. The species belonging to four families (Ampithoidae, Corophiidae, Dulichiidae, and Ischyroceridae) were dealt in this study.

Materials and Methods

This study was based on the materials collected, during the period from July 1989 to August 1990, at eight localities in Ulreung Island (Fig. 1). Specimens were collected largely by formalin wash method (Barnard, 1979). In the laboratory, the amphipods were sorted out under a high power stereoscopic microscope and preserved in 70% alcohol. All specimens collected from shallow subtidal zone were taken by scuba divers. In addition to materials mentioned above, many materials were obtained from fishing nets.

The body length was measured from the tip of rostrum to the base of the telson, along the dorsal margin of the body. The "Material Examined" section lists all specimens examined. The classification of superfamily and family levels was based on Barnard (1973), and Bowman and Abele (1982). All materials examined were deposited in the Department of Molecular Biology, Seoul National University.

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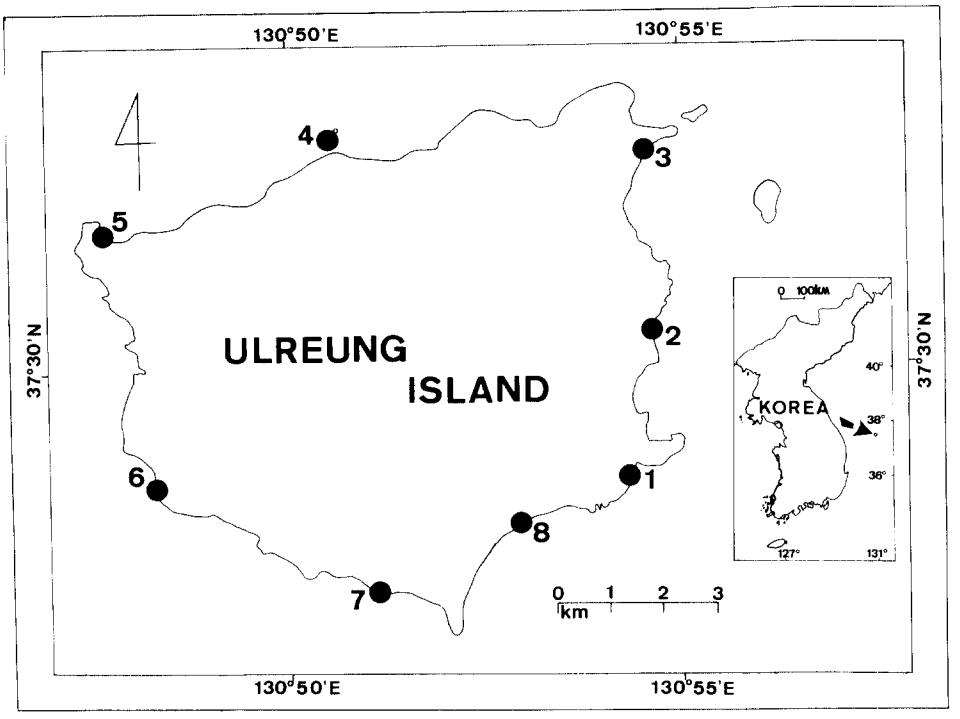

Fig. 1. The map showing the localities where the materials were collected. 1, Dodong(도동); 2, Naesujŏn(내수전); 3, Sŏmmok(섬목); 4, Hyŏlam(혈암); 5, Taepungch'wi(대풍취); 6, Kulam(굴암); 7, Tonggumi(통구미); 8, Sadong(사동).

Systematic Accounts and Descriptions of Species

Superclass Crustacea Pennant, 1777
Class Malacostraca Latreille, 1806
Subclass Eumalacostraca Grobben, 1892
Superorder Peracarida Calman, 1904
Order Amphipoda Latreille, 1816

Key to Suborders of Amphipoda from Ulreung Island

Abdomen vestigial, usually lacking large pleopods or uropods, except for vestiges not exceeding two pairs ..... Caprellidea
Abdomen well developed, with six segments or their gross vestiges apparent ..... Gammaridea

Suborder Gammaridea Latreille, 1803

Key to Families of Marine Gammaridea from Ulreung Island

1. Telson entire 2
   Telson cleft 10
2. Coxa 1 much smaller than coxa 2 or absent 3
   Coxa 1 not distinctly smaller than coxa 2 ··· 4
3. Coxa 4 enlarged, not excavate posteriorly; gnathopod 1 not carpochelate and always present ..... Stenothoidae
   Coxa 4 normal, excavate posteriorly; gnathopod 1 carpochelate or absent ·····Anamixidae
4. Telson plate-like 5
   Telson fleshy, dorsoventrally thickened ····· 7
5. Ganathopod 1 carpochelate ··· Leucothoidae
   Gnathopod 1 not carpochelate 6
6. Gnathopod 1 extremely elongate; dactyl absent ·····Colomastigidae
   Gnathopod 1 not extremely elongate; dactyl present ..... Pleustidae
7. Urosomite 1 elongate, more than two times as long as urosomite 2 ..... Dulichiidae
   Urosomite 1 not elongate, less than two times

as long as urosomite 2 8
8. Uropod 3 biramous; rami with hooked tips or denticles or reccurved spines 9
Uropod 3 biramous or uniramous; rami without hooked tips or denticles or recurved spines ..... Corophiidae
9. Anterior lobes of lower lip notched or medially excavate ..... Ampithoidae
Anterior lobes of lower lip not notched or not excavate ..... Ischyroceridae
10. Gnathopods 1,2 with large, subsimilar raptorial article 6 11
Gnathopods 1,2 feeble or, if enlarged, gnathopod 2 larger than gnathopod 1 ..... Eusiridae
11. Body subcylindrical ..... Eophliantidae
Body not subcylindrical 12
12. Uropod 3 uniramous ..... Hyalidae
Uropod 3 biramous ..... Melitidae

Family Ampithoidae Stebbing, 1899

Key to Genera of Ampithoidae from Ulreung Island

1. Mandible lacking palp..... *Sunamphithoe*
Mandible bearing palp 2
2. Palm of gnathopod 1 oblique ..... *Ampithoe*
Palm of gnathopod 1 transverse .....*Peramphithoe*

Genus *Ampithoe* Leach, 1814

Key to Species of *Ampithoe* from Ulreung Island

Palm of male gnathopod 2 oblique and with cleft region ..... *A. ramondi*
Palm of male gnathopod 2 transverse and with one quadrate hump on middle part ..... *A. valida valida*

1. *Ampithoe ramondi* Audouin, 1826

Amphithoë ramondi Audouin, 1826, p. 93, pl. 11, fig. 6.
Amphithoe ramondi.-Krapp-Schickel, 1978, pp. 1-4, figs. 1, 2; 1982, pp. 98, 101, figs. 66, 67; Myers, 1985, p. 27, fig. 17.
Ampithoe ramondi.-Barnard, 1965, pp. 25-27, fig. 15; 1970, p. 50, figs. 18, 19; Rabindranath, 1972, pp. 162-164, 166, figs. 1, 2; Nagata, 1965, p. 315, fig. 38 D; Kim and Kim, 1988, p. 121, fig. 9.
Amphithoe intermedia Walker, 1904, pp. 290, 291, pl. 7, fig. 46.
Ampithoe Vaillanti Lucas, 1849, figs. 341, 342 (cited from Chevreux and Fage, 1925); Chevreux and Fage, 1925, pp. 333, 334, figs. 341, 342.
Ampithoe divisura Shoemaker, 1933, pp. 255, 256, fig. 8.

Material Examined.-2♂♂, 1♀ (ovig.), Kulam, July 11, 1989; 1♂, 1♀, Tonggumi, July 12, 1989; 2♀♀ (ovig.), Naesujŏn, July 13, 1989; 2♂♂, 6♀♀ (3 ovig.), Hyŏlam, July 14, 1989; 2♀♀ (1 ovig.), Taepungch'wi, July 15, 1989; 1♂, 5♀♀ (1 ovig.), Sŏmmok, July 16, 1989.

Type Locality.-Egypt.

Distribution.-Cosmopolitan in tropical and subtropical seas.

2. *Ampithoe valida valida* Smith, 1873, new status

Amphithoe valida Smith, 1873, p. 563 (cited from Barnard, 1965); Paulmier, 1905, pp. 164-165, fig. 34.
Ampithoe valida.-Alderman, 1936, p. 68; Barnard, 1954, pp. 34-35, fig. 31; 1965, pp. 34-36, figs. 22-23; Nagata, 1960, p. 176, pl. 16, figs. 97-98; Bousfield, 1973, pp. 180-181, pl. LV, fig. 1; Conlan and Bousfield, 1982a, pp. 46-50, fig. 3; Kim and Kim, 1987, pp. 4-5, fig. 3; Kim and Kim, 1988, p. 109, fig. 2, B.

Material Examined.-2♂♂, 2♀♀, Kulam, July 11, 1989.

Remarks.-*Ampithoe shimizuensis* Stephensen, 1944 was ranked as a subspecies of *A. valida*-*A. valida shimizuensis*-by Kim and Kim (1988). Automatically, *A valida* Smith, 1873 ranked as nominate subspecies of *A. valida*-*A. valida valida.*

Type locality.-Vineyard Sound.

Distribution.-Pacific Occan-Korea, British Columbia, Washington, Oregon. California, Japan; Atlantic Ocean-Long Island, New Jersey, New England.

Genus *Peramphithoe* Conlan and Bousfield, 1982

3. *Peramphithoe orientalis* (Dana, 1853)

Amphithoe (*sic*) *orientalis* Dana, 1853, pp. 937-939, pl. 64, fig. 2.

Ampithoe orientalis.-Stebbing, 1906, p. 641; Barnard, 1955, pp. 26-28, fig. 14; 1970, p. 50, fig. 17; Nagata, 1965, p. 315, fig. 38c.

Peramphithoe orientalis.-Conlan and Bousfield, 1982a, p. 60; Kim and Kim, 1988, pp. 131, 132, fig. 15.

Material Examined.-2♂♂, Hyŏlam, July 14, 1989; 3♂♂, Sŏmmok, July 16, 1989.

Type Locality.-Manilla, Philippine Islands.

Distribution.-Korea, Philippine, Hawaii, Japan.

Genus *Sunamphithoe* Bate, 1857

4. *Sunamphithoe sineplumosa*, new species (Figs. 2-4)

Material Examined.-Holotype: ♂, body length: 10.1 mm, Sadong, July 17, 1989. Allotype: ♀, body length: 12 mm, Sadong, July 17, 1989. Paratypes: 16♂♂, 36♀♀ (8 ovig.), collection details same as holotype; 9♂♂, 30♀♀, Sŏmmok, July 16, 1989; 4♂♂, Hyŏlam, July 14, 1989.

Description of holotype male.-Distal part of lateral cephalic lobe (Fig. 2A) rounded. Eye black in alcohol, moderate in size and round in outline.

Antenna 1 (Fig. 2A) longer and slenderer than antenna 2; article 1 1.3 times as long as article 2; flagellum composed of 31 segments. Antenna 2 stronger than antenna 1; ventral margins of articles 3-5 not densely lined with plumose setae; articles 4, 5 almost equal in length; the first segment of flagellum almost two times as long as the second one, flagellum composed of eight segments, densely lined with normal setae.

Mandible (Fig. 2C, D) with incisor bearing seven teeth; lacinia mobilis of left mandible armed with six teeth, lacinia mobilis of right one with five teeth; spine row with seven or eight serrate spines; palp absent. Apical lobules of lower lip (Fig. 2B) well separated from medial lobules. Inner plate of maxilla 1 (Fig. 2E) without seta; outer plate with eight serrate spines on apex; article 2 of palp with four spinules on apex and outer subapical margin. Inner plate of maxilla 2 (Fig. 2F) narrower than outer plate; apex of outer plate slightly truncate. Inner plate of maxilliped (Fig. 2G) with transverse apex, with one spine on apex; outer plate armed with 14 serrate spines from apex to inner medial margin and with five setae on outer margin.

Article 5 of gnathopod 1 (Fig. 3A) shorter than article 6; palm transverse, slightly concave, and produced distally; dactyl overlapping palm. Article 6 of gnathopod 2 (Fig. 3B) long and narrowing toward distal part; palm corresponding to ventral margin and slightly concave, and proximal part broad and slightly lobated, with setae from medial to distal part; dactyl curved, reaching to about distal 1/3 of palm.

Pereopods 3, 4 (Fig. 3C, D) equal in length. In pereopods 3, 4, article 4 moderately produced dorsally; articles 4-6 equal in length. Article 2 of pereopod 5 (Fig. 3E) with five spines on dorsal margin, almost as long as wide; article 6 with five spines on dorsal margin, locking spines composed of two normal spines. Pereopod 6 (Fig. 3F) slightly shorter than pereopod 7 (Fig. 3G). In pereopods 6, 7, article 2 with two or three spines along dorsal margin; article 6 with six or seven spines along dorsal margin, locking spines composed of two normal spines.

Peduncle of uropod 1 (Fig. 4B) longer than inner ramus; inner and outer margins of dorsal surface with four or five spines; inner ramus longer than outer one, with spines on apex and inner margin of dorsal surface; outer ramus with spines on apex and outer margin of dorsal surface; peduncular process reaching to almost middle of inner ramus. Peduncle of uropod 2 (Fig. 4C) shorter than inner ramus, with two spines on distal parts of dorsal outer surface; inner ramus longer than outer one, with spines on apex and inner margin of dorsal surface; outer ramus with spines on apex, and inner and outer margins of dorsal surface. Peduncle of uropod 3 (Fig. 4D) about 1.5 times as long as outer ramus, with four spines on dorsal surface distally, and with setae on inner part of dorsal surface; outer ramus with only two strong recurved spines; inner ramus with five spines and setae on apex and subapical surface.

Telson (Fig. 4E) broadly triangular, broader than

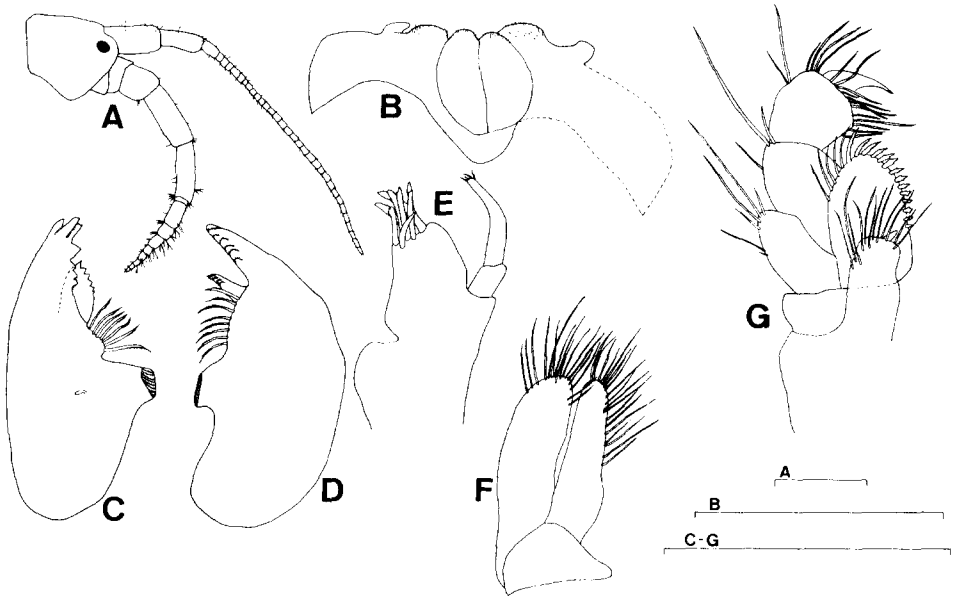

Fig. 2. *Sunamphithoe sineplumosa,* new species, holotype male, body length: 10.1 mm: A, head and antennae; B, lower lip; C, left mandible; D, right mandible; E, right maxilla 1; F, left maxilla 2; G, left maxilliped. Scale bars: A = 1 mm; B-G = 0.5 mm.

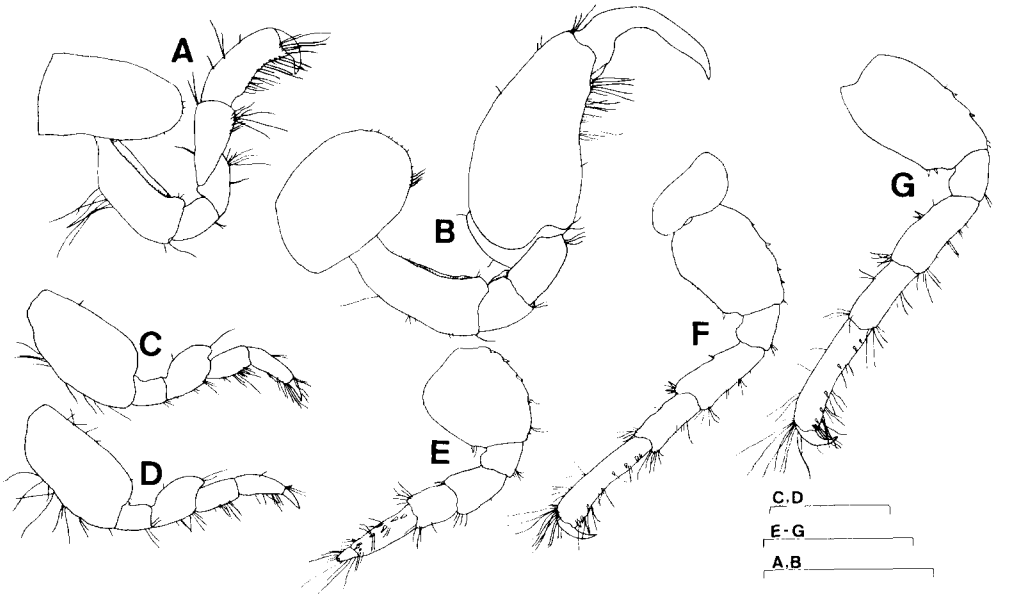

Fig. 3. *Sunamphithoe sineplumosa,* new species, holotype male, body length: 10.1 mm: A, right gnathopod 1; B, right gnathopod 2; C, right pereopod 3; D, right pereopod 4; E, right pereopod 5; F, right pereopod 6; G, right pereopod 7. Scale bars = 1 mm.

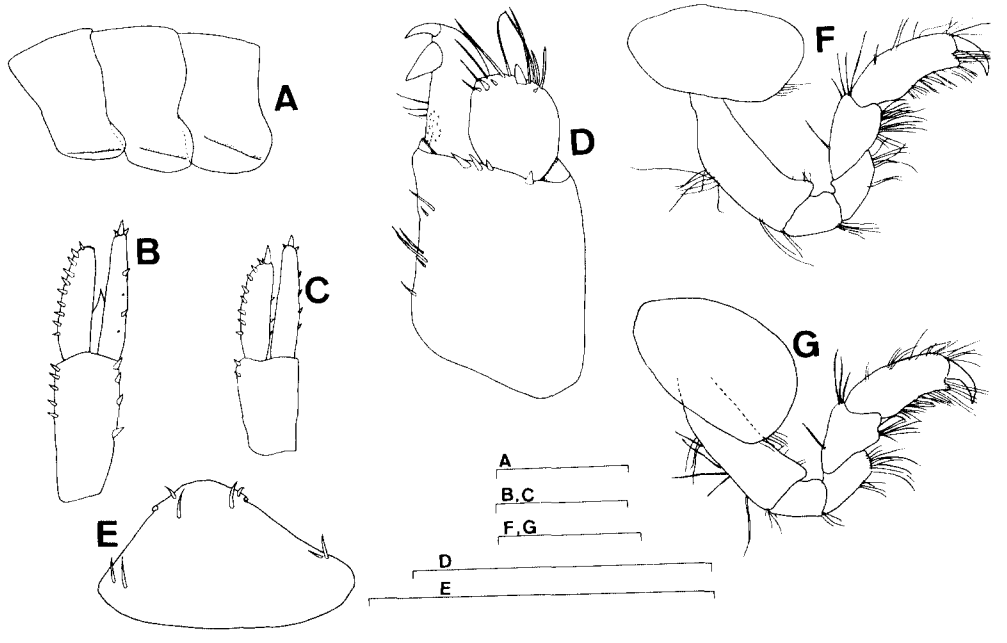

Fig. 4. *Sunamphithoe sineplumosa*, new species, holotype male, body length: 10.1 mm: A, pleonal epimera 1-3; B, right uropod 1; C, right uropod 2; D, right uropod 3; E, telson. Allotype female, body lenght: 12 mm: F, right gnathopod 1; G, right gnathopod 2. Scale bars: A, F, G = 1 mm; B-E = 0.5 mm.

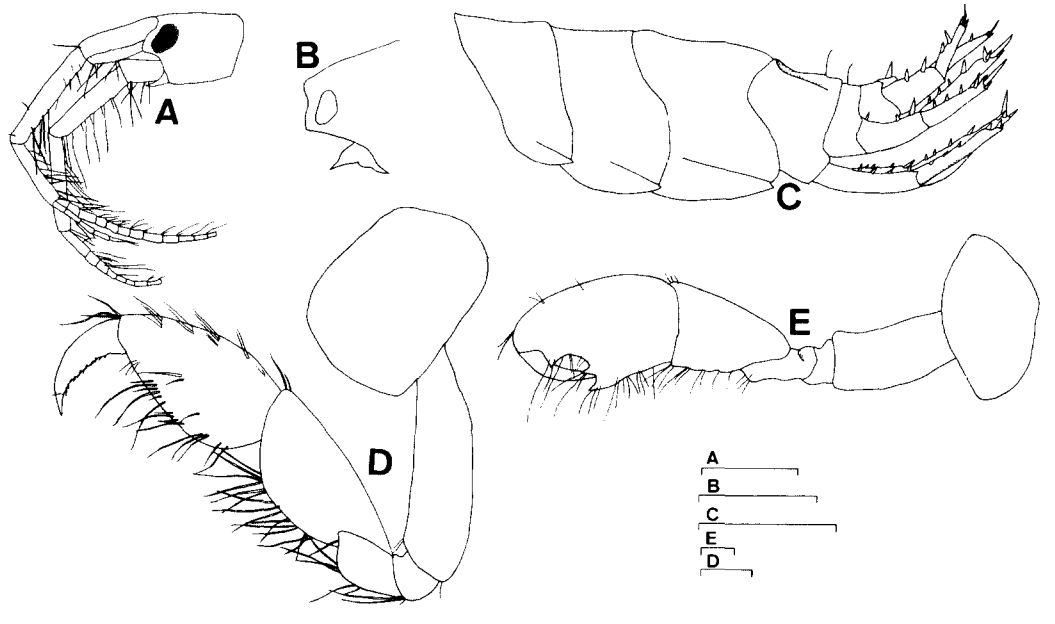

Fig. 5. *Gammaropsis japonicus* (Nagata, 1961), male, body lenght: 3.5 mm: A, head and antennae; B, distal part of head and epistome; C, lateral view of left pleonites, urosomites, and uropods; D, left gnathopod 1; E, left gnathopod 2. Scale bars: A-C = 0.5 mm; D, E = 0.1 mm.

long, with two setae on distal and lateral parts of dorsal surface on both sides.

Pleonal epimera 1-3 (Fig. 4A) with lateral ridges; posteroventral corner and ventral margin rounded.

Description of allotype female.-Palm of gnathopod 1 (Fig. 4F) transverse, slightly sinuous. Palm of gnathopod 2 (fig. 4G) transverse, concave, and produced distally.

Remarks.-The present species is very closely related to *Sunamphithoe plumosa* Stephensen, 1944 in the shape of article 6 of male gnathopod 2. But, this new species is easily distinguished from *s. plumosa* by the following characteristics: (1) The palm of male gnathopod 2 of this new species is slightly concaved, while in S. plumosa, that part straight; (2) The palm of male gnathopod 1 of the present species is more produced distally than that of *S. plumosa;* (3) The appendages (antenna 2, article 6 of male ganthopod 2, and pereopods 6, 7) of *s. plumosa* are densely lined with plumose setae, while in this new species those appendages are not lined with plumose setae.

Habitat.-Among algae.

Etymology.-The specific name is from the Latin *sine* (without) + *plumosa* (feathered), referring to the lack of plumose setae on the appendages of this species.

Family Corophiidae Dana, 1849

Key to Genera of Corophiidae from Ulreung Island

Male gnathopod 1 complexly subchelate ..... *Aoroides*

Male gnathopod 1 not subchelate ··· *Gammaropsis*

Genus Aoroides Walker, 1898

5. *Aoroides columbiae* Walker, 1898

Aoroides columbiae Walker, 1898, p. 285, pl. 16, figs. 7-10 (cited from Colan and Bousfied, 1982b); Barnard, 1969b, pp. 89, 90; 1970, pp. 68-70, figs. 31, 32; Nagata, 1960, p. 175, pl. 16, fig. 94; 1965, p. 309; Colan and Bousfield, 1982b, pp. 89-92, figs. 6-8; Kim and Kim, 1987, pp. 6, 7, fig. 4.

Aoroides californica Alderman, 1936, pp. 63-66, figs. 33-38.

Material Examined.-1♂, Hyŏlam, July, 14, 1989.

Type Locality.-Puget Sound.

Distribution.-Korea (Cheju Island, Ulreung Island), Japan, Hawaii, Alaska, Washington, Oregon.

Genus *Gammaropsis* Liljeborg, 1855

6. *Gammaropsis japonicus* (Nagata, 1961) (Figs. 5-7)

Eurystheus japonicus Nagata, 1961, pp. 32, 34, fig. 1; 1965, pp. 311, 312, fig. 36.

Gammaropsis japonicus.-Barnard, 1969a, pp. 271, 272; Kim and Choe, 1987, p. 380.

Material Examined.-3♂♂, 4♀♀, Hyŏlam, July, 14, 1989; 1♂, 3♀♀, Taepungch'wi, July 15, 1989; 2♀♀, Sŏmmok, July 16, 1989; 1♀ (ovig.), Naesujŏn, July 13, 1989.

Description of male (body length: 3.5 mm).-Rostrum (Fig. 5A) inconspicuous, anterior margin between rostrum and lateral cephalic lobe moderately concave; lateral cephalic lobe moderately produced with rounded tip. Eye moderate in size, reniform, central dark region surrounded by several white and oval ommatidia.

Antenna 1 (fig. 5A) almost same as long as antenna 2; article 1 shorter than article 3, with one spinule on ventral margin distally; article 2 1.5 times as long as article 3; flagellum shorter than peduncle, composed of 12 segments; accessory flagellum five-segmented. Article 2 of antenna 2 produced actuely ventrodistally; article 4 almost same as long as article 5 and about 2.5 times as long as article 3.

Epistome (Fig. 5B) produced over upper lip acutely, tip of produced part not reaching to tip of lateral cephalic lobe. Mandible (Fig. 6A) with incisor bearing two blunt teeth; lacinia mobilis armed with two teeth; spine row with six spines; palp triarticulate, article 2 slightly longer than article 3. Outer lobe of lower lip (fig. 6B) much longer than inner lobe. Inner plate of maxilla 1 (Fig. 6C) with eight setae on inner margin and with one spinule on apex; palp biarticulate, article 2 with six spines on apex and two setae on dorsal surface subapically. Outer plate of maxilla 2 (Fig. 6D)

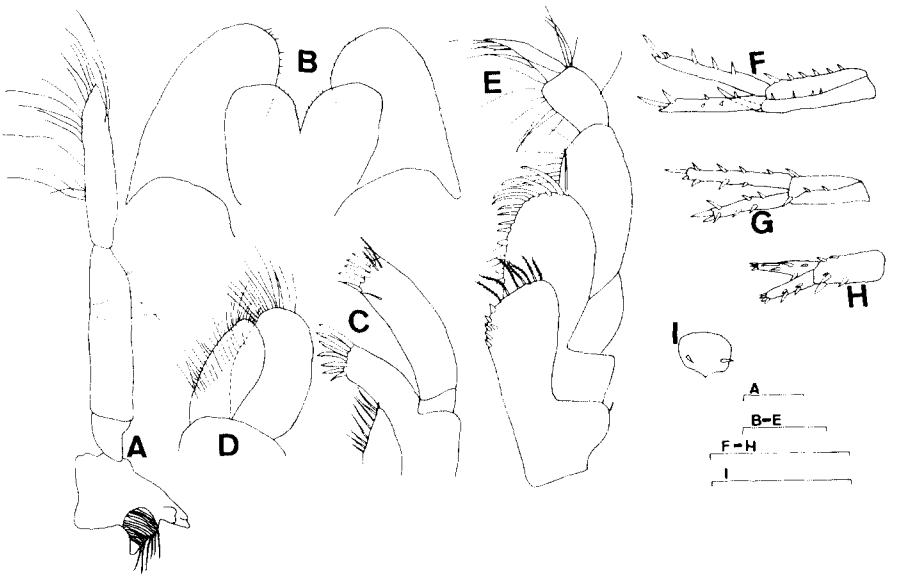

Fig. 6. *Gammaropsis japonicus* (Nagata, 1961), male, body lenght: 3.5 mm: A, left mandible; B, lower lip; C, right maxilla 1; D, right maxilla 2; E, right maxilliped; F, right uropod 1; G, right uropod 2; H, right uropod 3; I, dorsal view of telson. Scale bars: A-E = 0.1 mm; F-I = 0.5 mm.

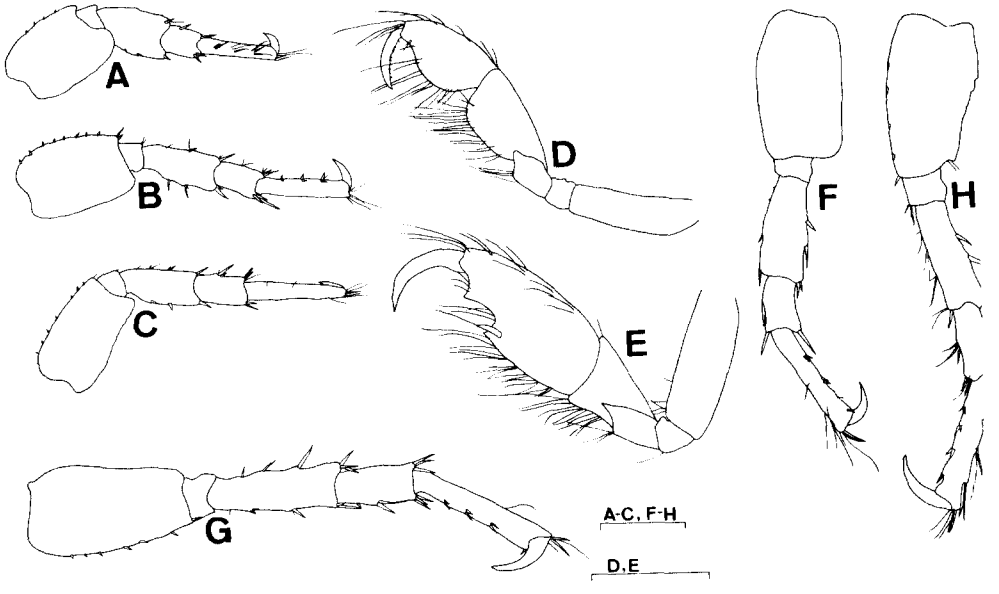

Fig. 7. *Gammaropsis japonicus* (Nagata, 1961), male, body length: 3.5 mm: A, right pereopod 5; B, right pereopod 6; C, right pereopod 7. Female, body length: 6 mm; D, left gnathopod 1; E, left gnathopod 2; F, right pereopod 5; G, left pereopod 6; H, left pereopod 7. Scale bars = 0.5 mm.

larger than inner plate; facial setae on inner plate composed of 14 setae. Inner plate of maxilliped (Fig. 6E) with six spines on inner margin and six plumose setae on apex; outer plate with 12 spines from inner medial margin to apex and with one long seta from outer margin subapically; palp four-articulate, article 3 shorter than article 4, article 4 with four long setae on inner margin from medial to distal part.

Article 5 of gnathopod 1 (Fig. 5D) longer than article 6. Palm and ventral margin of article 6 continuously rounded. Ventral margin of dactyl armed with several denticulations.

Article 2 of gnathopod 2 (Fig. 5E) almost same as long as article 5 and dorsal margin lobated distally. Dorsal margin of article 5 slightly shorter than dorsal margin of article 6. Palm oblique, almost same as long as ventral margin, and with three teeth, of which one tooth on the joint point with dactyl strongest and longest.

Article 2 of pereopod 5 (Fig. 7A) rather broad, ventral margin lobed distally. Pereopod 6 (Fig. 7B) almost same as long as pereopod 5; article 2 rather narrower than article 2 of pereopod 3. Article 2 of pereopod 7 (Fig. 7C) rather narrow, and dorsal and ventral margins almost parallel, and ventral margin slightly serrate and concave.

Uropod 1 (Fig. 6F) not reaching to tip of uropod 2; peduncle almost same as long as rami, dorsal surface with four or six spines on both margins, peduncular process reaching to middle part of inner ramus. Inner ramus slightly longer than outer one, with three spines on outer margin and apex. Outer ramus with two spines on inner and outer margins, and three spines on apex.

Peduncle of uropod 2 (Fig. 6G) shorter than rami, with two spines on outer margin of dorsal surface and one spine on each margin of dorsal surface distally. Inner ramus slightly longer than outer ramus; each ramus with three or four spines on each margin and two spines on apex.

Peduncle of uropod 3 (Fig. 6H) almost same as long as rami, with two spines on each margin of dorsal surface. Each ramus with spine on dorsal surface and apex.

Telson (Fig. 6I) as long as wide and with two spines on dorsal surface.

Pleonal epimera 1-3 (Fig. 5C) with lateral ridges; posteroventral corner of each pleonal epimeron produced backward; posterior margins of pleonal epimera 1-3 roundly convex of which one of pleonal epimeron 3 strongly produced.

Urosomites 1-2 (Fig. 5C) with two blunt teeth on dorsal margin distally, and with two setae over those teeth.

Description of female (body length: 6 mm).-Differing from male in the following characters: Article 2 of gnathopod 2 (Fig. 7E) slender; article 5 much shorter than that of male gnathopod 2; palm shorter than ventral margin of article 6, with two teeth, these teeth separated by deeply concave part, and bearing one strong spine near the defining tooth.

Ventral margin of article 2 of pereopod 5 (Fig. 7F) not lobated distally, rather narrower than that of male. Article 2 of pereopod 6 (Fig. 7G) slender. Article 2 of pereopod 7 (Fig. 7H) slender and ventral margin serrate and rather concave.

Habitat.-Among algae.

Type Locality.-Hiroshima Pref., Seto Inland Sea.

Distribution.-Korea (Peakryong Island, Ulreung Island), Japan.

Family Dulichiidae Dana, 1849
Genus *Podocerus* Leach, 1814

Key to Species of *Podocerus* from Ulreung Island

Dorsal teeth commencing in head ··· *P. hoonsooi*
Dorsal teeth commencing in pereonite 7
..... *P. ulreungensis*

7. *Podoceurs ulreungensis*, new species (Figs. 8, 9)

Material Examined.-Holotype: ♂, body length: 5.68 mm, Hyŏlam, July 14, 1989. Paratypes: eight specimens, collection details same as holotype; 3♂♂, 2♀♀, and two juveniles, Tonggumi, July 12, 1989; 2♂♂, Taepungch'wi, July 15, 1989; 1♀ (ovig.), Naesujŏn, July 13, 1989; 1♂, Sŏmmok, July 16, 1989.

Description of male.-Lateral cephalic lobe (Fig. 8A) sharply produced; anterior margin between rostrum and lateral cephalic lobe relatively con-

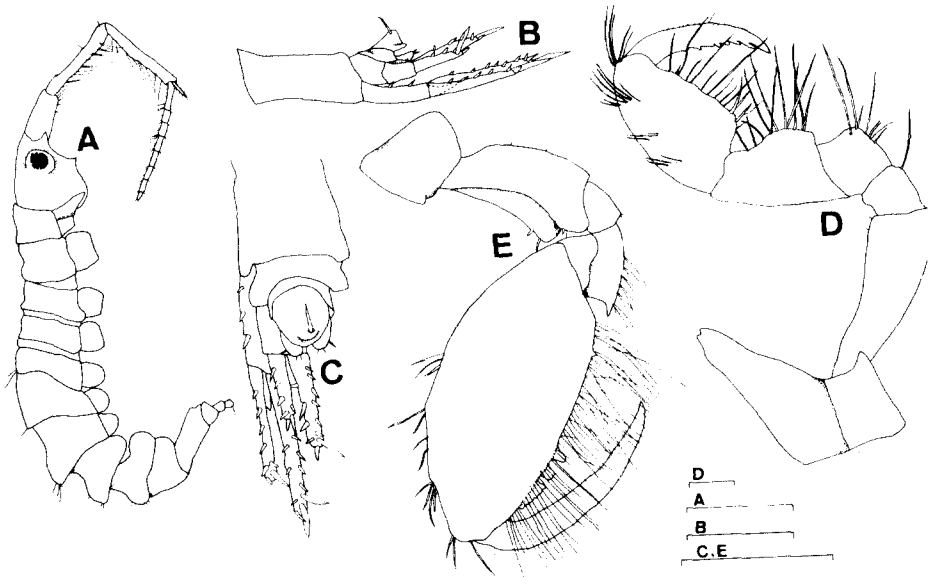

Fig. 8. *Podocerus ulreungensis*, new species, holotype male, body length: 5.68 mm: A, lateral view of body; B, lateral view of left urosomites and uropods; C, dorsal view of urosomites and uropods; D, right gnathopod 1; E, left gnathopod 2. Scale bars: A = 1 mm; B, C, E = 0.5 mm; D = 0.1 mm.

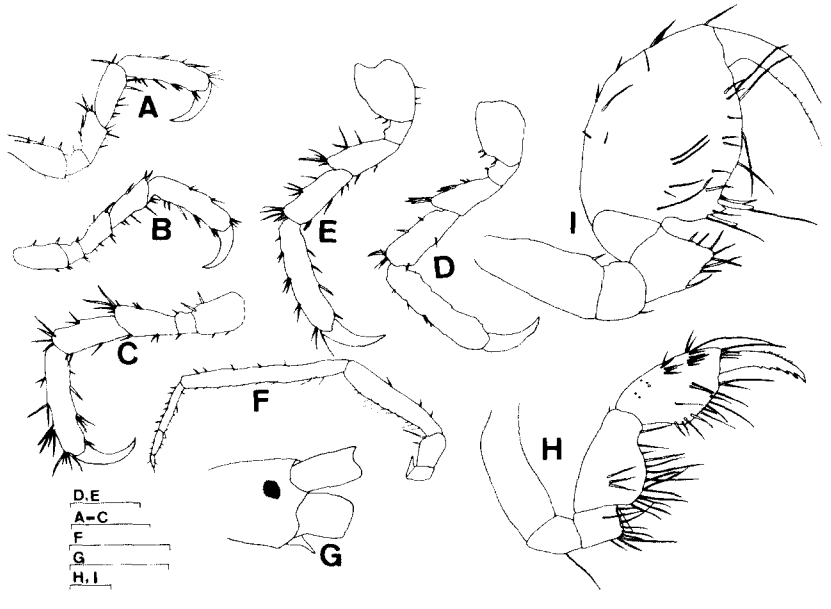

Fig. 9. *Podocerus ulreungensis*, new species, holotype male, body length: 5.68 mm: A, right pereopod 3; B, right pereopod 4; C, right pereopod 5; D, right pereopod 6; E, right pereopod 7. Paratype male, body length: 5.3 mm: F, left antenna 2. Paratype female, body length: 4 mm: G, head; H, right gnathopod 1; I, right gnathopod 2. Scale bars: A-E, G = 0.5 mm; F = 1 mm; G, H = 0.1 mm.

cave deeply; anteroventral corner of head sharply produced. Lateral ocular bulge moderately produced; eye with distinct core of dark pigment.

Antenna 1 slender, densely setose on ventral margin; flagellum almost same as long as peduncular articles 1, 2 combined, composed of seven to eight segments. Accessory flagellum medium in length, composed of one long segment tipped with subcoalesced segment 2.

Antenna 2 robust; ventral margin of peduncular article 4 slightly expanded medially; peduncular article 5 about 1.5 times as long as article 4; flagellum about 0.56 times as long as peduncular article 5, composed of three segments.

Coxa of gnathopod 1 (Fig. 8D) strongly produced forward; ventral margin strongly concave and terminated with one strong projection posteriorly. Article 5 with truncate, rectangular lobe on ventral margin. Article 6 moderately expanded; palm oblique, separated from ventral margin of article 6, and armed with long setae and three slender spines.

Article 2 of gnathopod 2 (Fig. 8E) strongly bilobed dorsodistally. Article 4 with sharp projection on ventrodistal corner. Article 6 tumid, egg shaped; palm long, not clearly separated from ventral margin of article 6, densely lined with long setae, and defined with one weak tooth; palm with one large castellated tooth and two round teeth on joint point with dactyl. Dactyl fitting palm.

Article 2 of pereopods 3-7 (Fig. 9A-E) with obsolescent lobations on dorsal and ventral margins.

Uropod 1 (Fig. 8C) with interramal process; outer ramus about 0.8 times as long as inner ramus; terminal spines on both rami not elongated. Uropod 2 lacking interramal process; outer ramus about 0.67 times as long as inner ramus; terminal spines on both rami not elongated. Uropod 3 lacking rami, with one slender spine and two setae.

Telson (Fig. 8C) oval in shape, dorsal lobe not strongly produced, with two long spines.

Pereonites 1-4 (Fig. 8A) with sinuses on dorsal margins medially. Dorsal processes on pereonites 5, 6 inconspicuous, dorsodistal corners of pereonites 5, 6 with long setae. Pereonite 7 and each pleonites 1, 2 with one round dorsal process bearing setae and one sinus on dorsal margin medially.

Description of female.-Differing from male in following characteristics: Lateral ocular bulge (Fig. 9G) inconspicuous; palm of gnathopod 1 (Fig. 9H) without spine; article 4 of gnathopod 2 (Fig. 9I) strongly produced with round tip ventrodistally, with several spines, and palm rather convex, without tooth on distal part and defined with one strong tooth and three strong spines.

Remarks.-Previous reports on the species of *Podocerus* indicated that the distributional pattern of dorsal pocesses on the pereonites and pleonites is varied among specimens in a species in this genus. But, our specimens show rather fixed distributional pattern of dorsal processes (Fig. 8A).

The following three species resemble the present species in the palmar shape of male gnathopod 2 and the distrubutional pattern of dorsal processes on peronites and pleonites. However, these species are distinguished from the present species by several charaters which were indicated in each of three species:

Podocerus cristatus (Thomson, 1879): Male gnathopod 2 has two or three palmar teeth near finger hinge. But, the first tooth from the finger hinge is the strongest and longest and palm is not defined with one tooth.

Podocerus wanganui Barnard, 1972: Male gnathopod 2 has three palmar teeth near finger hinge and palm is defined with one weak tooth. But, article 5 of male gnathopod 1 is short and palm bearing several spines.

Podocerus talegus levuensis Myers, 1985: Male gnathopod 2 has three palmar teeth near finger hinge and palm is defined with one weak tooth. But, The shape of article 6 of male gnathopod 2 is rather circular and the defining tooth on palm of male gnathopod 2 is long, and ventral margin of article 6 of male gnathopod 2 is clearly separated from palm.

Etymology.-The specific name *ulreungensis* is based on the Ulreung Island where the type specimens were collected.

8. *Podocerus hoonsooi*, new species
(Figs. 10-12)

Material Exanmined.-Holotype: ♂, body length: 6.3 mm, Hyŏlam, July 14, 1989. Paratypes: nine specimens, collection details same as holotype; 10 specimens, Tonggumi, July 12, 1989; 10 specimens, Taepungch'wi, July 15, 1989.

Description of hologype male.-Lateral cephalic lobe (Fig. 10A) truncated distally; anterior margin between rostrum and lateral cephalic lobe moderately concave. Lateral ocular bulge moderately produced; eye with distinct core of dark pigment.

Antenna 1 (Fig. 10B) slender, densely setose on ventral margin; flagellum almost same as long as peduncular article 3, composed of four segments. Accessory flagellum medium in length, composed of one long segment, tipped with subcoalesced segment 2.

Antenna 2 (Fig. 10C) densely lined with setae on ventral margin, robust; peduncular article 4 with slightly concave ventral margin; peduncular article 5 about 1.4 times as long as article 4; flagellum shorter than peduncular article 4, composed of two segments, of which the first segment long and second segment about 1/3 times as long as first segment, and distal part of second segment armed with four spines.

Coxa of gnathopod 1 (Fig. 10D) strongly produced forward; ventral margin slightly concave. Article 5 with truncate, rectangular lobe on ventral margin. Article 6 moderately expanded; palm oblique, separated from ventral margin of article 6, and lined with long setae.

Article 2 of gnathopod 2 (Fig. 11A) strongly bilobed dorsodistally. Article 4 with strong projection with very sharp tip on ventrodistal corner. Article 6 elongated, inner part of lateral surface densely covered with long bundles of setae; dorsal margin armed with five bundles of slender spines; palm and ventral margin of article 6 not separated by tooth or hump, palm nearly straight and with one small tooth near finger hinge and one small spine on medial part. Dactyl not fitting palm.

Article 2 of pereopods 3-7 (Fig. 11B-F) with obsolescent lobation on dorsal and ventral margins.

Uropod 1 (Fig. 11G) without interramal process; outer ramus about 0.75 times as long as inner ramus; terminal spines on both rami elongated. Uropod 2 without interramal process; outer ramus about 0.67 times as long as inner ramus; terminal spines on both rami elongated. Uropod 3 lacking rami, with spines and setae.

Telson (Fig. 11G; fig. 12A) oval in shape, dorsal lobe not strongly produced and with five strong spines and setae.

Head (Fig. 10A) with one elevated process; dorsal margin of pereonite 1 with two elevated processes and each dorsal margin of pereonites 2-6 with one elevated process; pereonite 7 and each pleonites 1, 2 with one round dorsal tooth and one paired dorsolateral lobe; those teeth not strongly and sharply elevated.

Description of female.-Differing from male in following characteristics: Article 2 of pereopods 5-7 (Fig. 12B-D) with strong lobations on ventral margins. Article 5 of gnathopod 1 (Fig. 12E) about same as long as article 6; palm and ventral margin of article 6 separated by one ventral lobe, palm shorter than that of male; dactyl overlapping palm. Article 4 of gnathopod 2 (Fig. 12F) rather strong, not sharply produced on ventrodistal corner; article 6 rather dilatant toward distal part, subquadrate in shape; palm and ventral margin of article 6 separated by one ventral lobe, palm and ventral margin of article 6 almost equal in length; palm transverse, covered with setae and one strong spine on distal part; dactyl fitting palm.

Remarks.-The following two species resemble the present species in the palmar shape of male gnathopod 2 and the distributional pattern of dorsal processes on pereonites and pleonites. But, these species are distinguished from this new species by characters which were indicated in each of two species:

Podocerus danae (Stebbing, 1888): The dorsal teeth on head, pereonites, and pleonites 1, 2 are strongly and sharply elevated. Article 6 of male gnathopod 2 is greatly elongated, and dorsal and ventral margins of article 6 are nearly parallel. Article 6 of female gnathopod 2 is strongly elongated and palm bearing three strong teeth.

Podocerus hystrix Stebbing, 1910: Palm of male

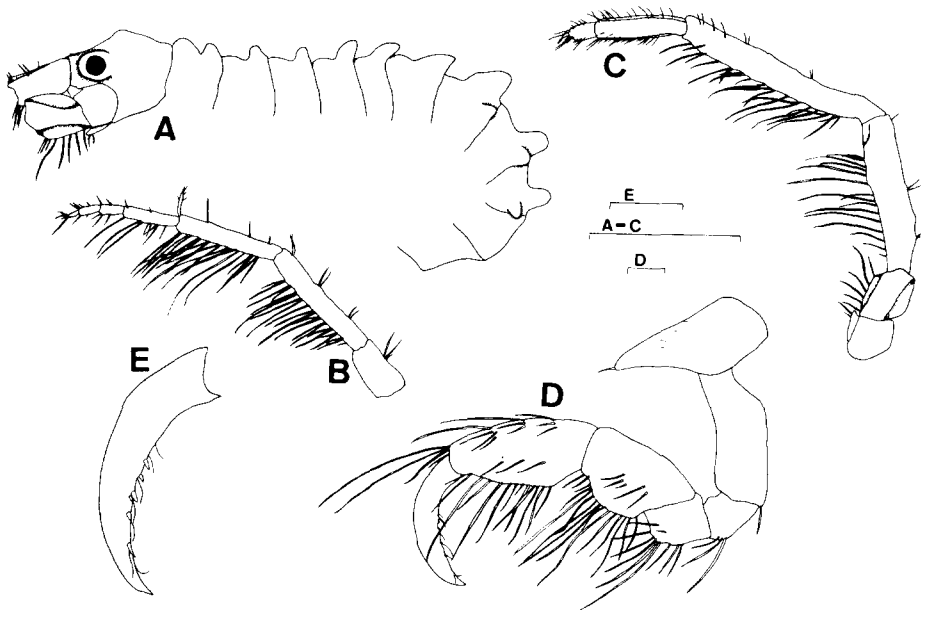

Fig. 10. *Podocerus hoonsooi,* new species, holotype male, body length: 6.3 mm: A, lateral view of body; B, left antenna 1; C, left antenna 2; D, left gnathopod 1; E, dactyl of gnathopod 1. Scale bars: A-C = 1 mm; D, E = 0.1 mm.

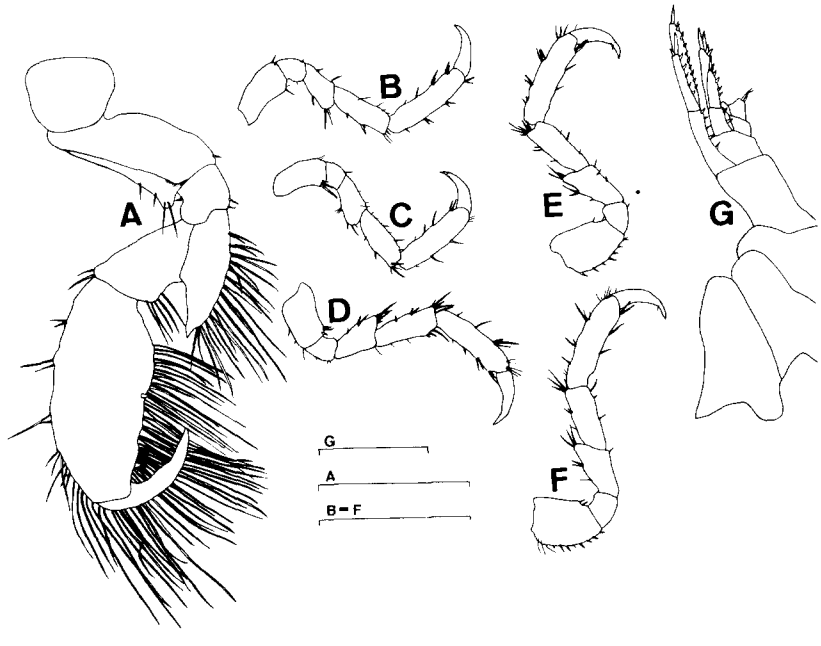

Fig. 11. *Podocerus hoonsooi,* new species, holotype male, body length: 6.3 mm: A, left gnathopod 2; B, left pereopod 3; C, left pereopod 4; D, left pereopod 5; E, left pereopod 6; F, left pereopod 7; G, lateral view of right pleonites, urosomites, and uropods. Scale bars: B-F = 1 mm; A, G = 0.5 mm.

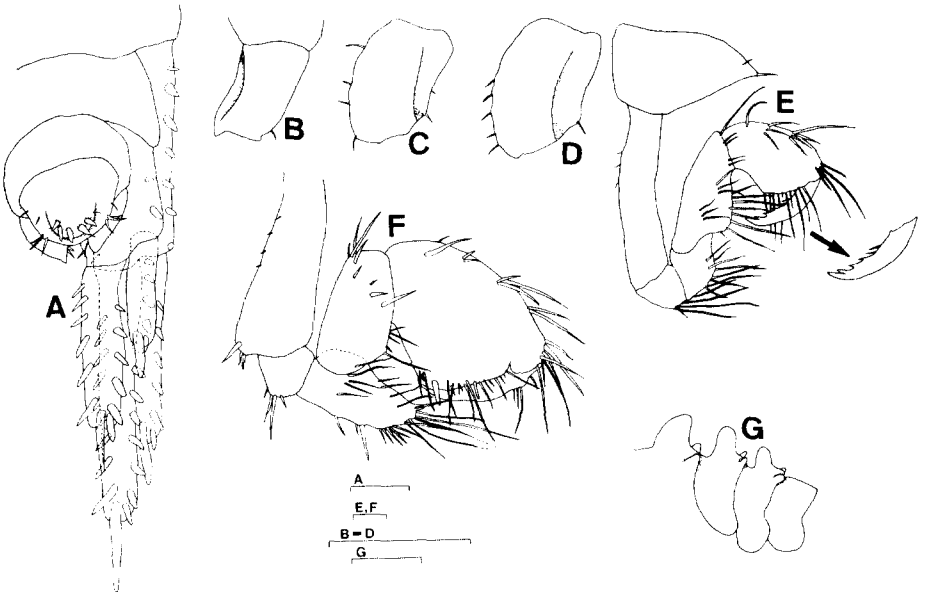

Fig. 12. *Podocerus hoonsooi*, new species, holotype male, body length: 6.3 mm: A, dorsal view of uropods and telson. Female, body length: 6.7 mm: B-D, article 2 of pereopods 5-7 respectively; E, right gnathopod 1; F, right gnathopod 2; G, lateral view of left pleonites. Scale bars: A, E, F = 0.1 mm, B-D, G = 0.5 mm.

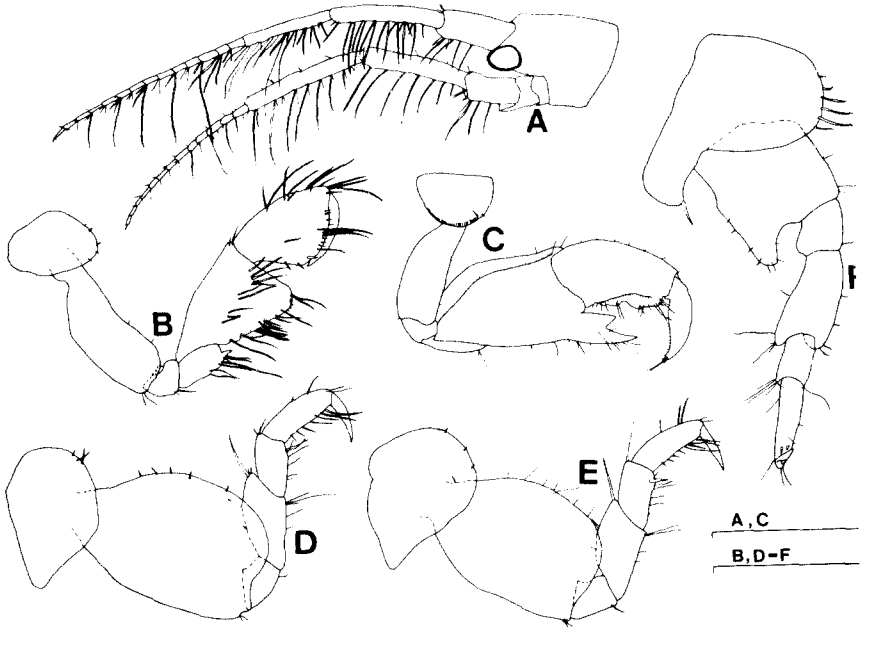

Fig. 13. *Ericthonius pugnax* (Dana, 1852), male, body length: 8 mm: A, head and antennae; B, right gnathopod 1; C, right gnathopod 2; D, right pereopod 3; E, right pereopod 4; F, right pereopod 5. Scale bars: A, C = 1 mm; B, D-F = 0.5 mm.

gnathopod 2 bearing defining tooth.

Etymology.-The specific name *hoonsooi* is in honor of Dr. Hoon Soo Kim, who has contributed a great deal to the knowledge of Korean Crustacea.

Family Ischyroceridae Stebbing, 1899

Key to Genera of Ischyroceridae from Ulreung Island

1. Uropod 3 uniramous ..... *Ericthonius*
   Uropod 3 biramous 2
2. Outer ramus of uropod 3 with 2-3 distolateral reverted denticles ..... *Jassa*
   Outer ramus of uropod 3 with hooked apex and apical setules ..... *Ventojassa*

Genus *Ericthonius* Milne Edwards, 1830

9. *Ericthonius pugnax* (Dana, 1852) (Figs. 13, 14)

Pyctilus pugnax Dana, 1852, p. 213 (cited from Dana, 1853); 1853, pp. 975, 976, pl. 67, figs. 4a-d.

Ericthonius pugnax.-Stebbing, 1906, p. 672; Hurley, 1954, pp. 445, 446, 448-450, fig. 5; Nagata, 1965, fig. 40; Ledoyer, 1986, pp. 628, 629, fig. 239.

Ericthonius brasiliensis.-Irie, 1956, p. 4, figs. 5, 1-2 [Not *Ericthonius brasiliensis* (Dana, 1853)].

Material Examined.-4♂♂, 3♀♀, Sŏmmok, July 16, 1989; 2♂♂, 1♀, Naesujŏn, July 12, 1989; 1♂, Taepungch'wi, July 15, 1989; 1♀, Kulam, July 11, 1989.

Description of male.-Lateral cephalic lobe (Fig. 13A) roundly produced, triangular in shape. Eye large and round.

Antennae 1, 2 almost equal in length, and peduncular articles with setae on ventral margins. Peduncular article 1 of antenna 1 with one or two slender spines on ventral margin distally; flagellum of antenna 1 composed of about 14 segments. Peduncular article 3 of antenna 2 with one slender spine on ventral margin distally; flagellum of antenna 2 composed of about 13 segments.

Article 4 of gnathopod 1 (Fig. 13B) produced distally with sharp lobe; article 5 triangular in shape, larger than article 6, and distal margin broad, slightly concave, almost as long as ventral margin; article 6 dilatant toward distal part, palm almost as long as ventral margin of article 6, palm lined with spinules and setae; dactyl fitting palm.

Article 5 of gnathopod 2 (Fig. 13C) large and strong, dilatant toward distal part; distal margin broad, concave, with one stout, long tooth on ventrodistal corner distally and with one tooth on inner distal margin near one tooth on ventrodistal corner. Article 6 of gnathopod 2 rectangular in shape; dorsal margin convex and almost as long as dorsal margin of article 5; ventral margin with one or two concave part on proximal part and one strong, broad tubercle on distal part. Dactyl of gnathopod 2 stout, curved; ventral margin almost as long as ventral margin of article 6.

Pereopods 3, 4 (Fig. 13C, E) equal in size. In pereopods 3, 4, article 2 broadly expanded; article 3 with two spinules on dorsal margin; article 4 with one spinule on ventral margin. Article 2 of pereopod 5 (Fig. 13F) strongly produced on ventrodistal corner with round lobe, this lobe overreaching to distal margin of article 3; locking spines on dorsal margin of article 6 composed of two spines; dactyl with two hooks on ventral margin. Pereopods 6, 7 (Fig. 14A, B) almost equal in length, article 2 of pereopod 7 slenderer and longer than that of pereopod 6. In pereopods 6, 7, locking spines on dorsal margin of articles 6 composed of two spines; dorsal margin of dactyl serrate and ventral margin with two hooks.

Peduncles of uropods 1, 2 (Fig. 14D, E) longer than rami, with spines on inner and outer margins of dorsal surface; inner margin of peduncle of uropod 1 minutely serrate; rami of uropods 1, 2 almost equal in length, weakly spinose, and inner and outer margins minutely serrate. Peduncle of uropod 3 (Fig. 14F) with several setae on dorsal surface; distal part of ramus with about three minute hooks and one spinule on outside.

Telson broad, with setae and several rows of sharp denticles.

Description of female.-Differing from the males in the following characteristics: Article 5 of gnathopod 2 (Fig. 14I) produced ventrodistally with convex lobe which reaching to distal end of ventral

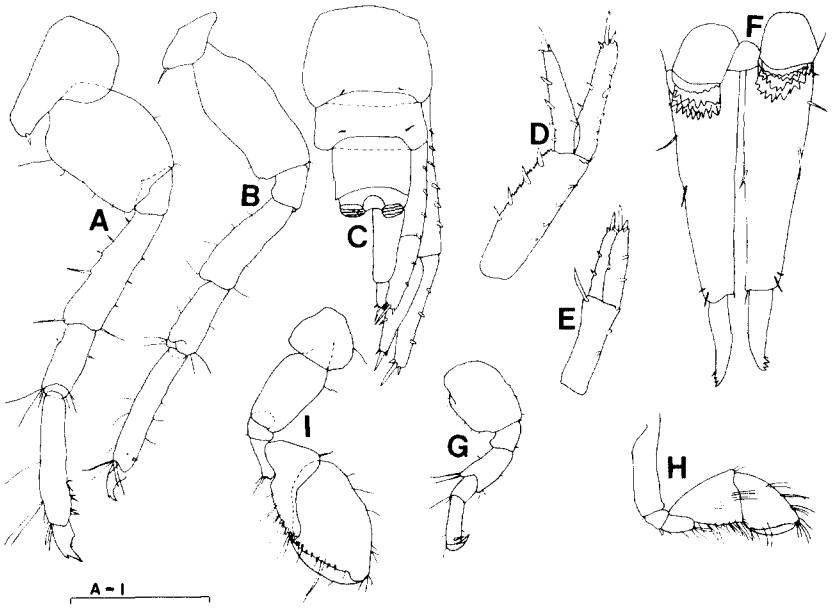

Fig. 14. *Ericthonius pugnax* (Dana, 1852), male, body length: 8 mm: A, right pereopod 6; B, right pereopod 7; C, dorsal view of urosomites, uropods, and telson; D, left uropod 1; E, left uropod 2; F, dorsal view of uropod 3 and telson. Female, body length: 6.8 mm: G, right pereopod 5; H, right gnathopod 1; I, right gnathopod 2. Scale bars = 0.5 mm.

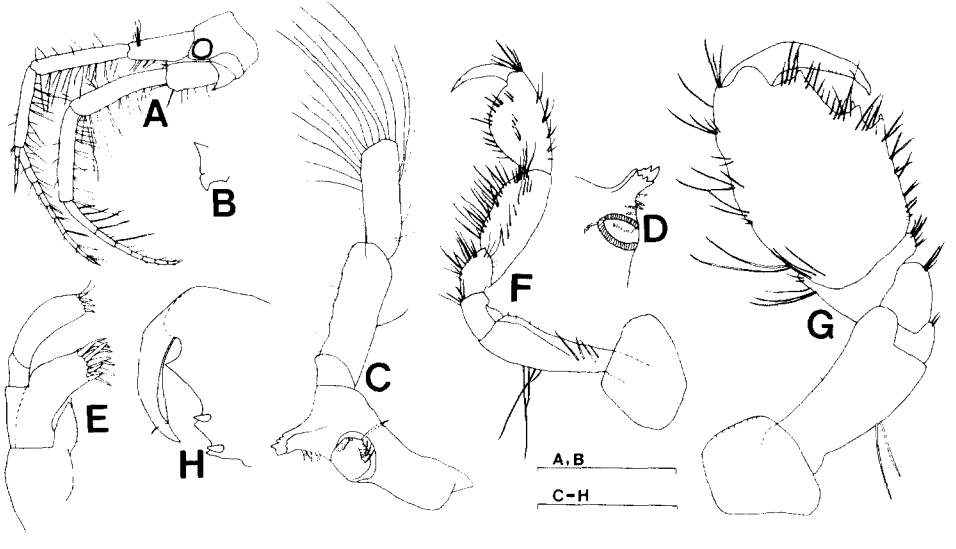

Fig. 15. *Ventojassa dentipalma*, new species, holotype female, body length: 6.3 mm: A, head and antennae; B, epistome; C, right mandible; D, distal part of left mandible; E, left maxilla 1; F, left gnathopod 1; G, outer view of right gnathopod 2; H, inner view of palm and dactyl of right gnathopod 2. Scale bars: A, B = 1 mm; C-H = 0.5 mm.

margin of article 6, ventral margin of this lobe covered with setae and four or five spines; palm of article 6 lined with setae and small spines. Ventrodistal corner of article 2 of pereopod 5 not produced as one of male, and similar to shape of ones of pereopods 6, 7 of male.

Remarks.-*Ericthonius pugnax* (Dana, 1852) is very closely related to *Ericthonius brasiliensis* (Dana, 1853). But, *E. pugnax* is distinguished from *E. brasiliensis* in the shape of ventrodistal lobe of article 2 of male pereopod 5 (*E. pugnax*: lobe is strongly produced and overreaching to the distal margin of article 3; *E. brasiliensis*: lobe is angular, not produced.), according to the remarks of Pirlot (1938, 1939), Hurley (1954), and Ledoyer (1986).

The present male specimens have constant shape of ventrodistal lobe of article 2 of male pereopod 5 (Fig. 13F) regardless of the difference of body length.

In the shape of ventrodistal lobe of article 2 of pereopod 5, the specimens which were reported as *E. brasiliensis* by Irie (1956) [Fig. 5-2I] are certainly assigned to *E. pugnax*.

Type locality.-East Indies, in the Sooloo Sea.

Distribution.-Korea, Japan, Sooloo Sea, Madagascar, New Zealand.

Genus *Jassa* Leach, 1814

10. *Jassa falcata* (Montagu, 1808)

Cancer (Gammarus) falcatus Montagu, 1808, p. 100 (cited from Sexton and Reid, 1951).

Podocerus falcatus.-Bate, 1862, p. 255; Sars, 1895, pp. 594, 595, pl. 212.

Podocerus odontonyx Sars, 1895, pp. 597, 598, pl. 213, fig. 2.

Jassa falcata.-Sexton and Reid, 1951, pp. 30-47, pls. 4-30; Barnard, 1969b, pp. 155, 157, 158, 159, figs. 38, 39; Nagata, 1965, p. 315; Lincoln, 1979, p. 550, fig. 264; Bousfield, 1973, pp. 190, 191, pl. LVIII, fig. 2; Ledoyer, 1986, pp. 632, 634, fig. 240; Kim and Kim, 1987, pp. 6, 7 figs. 5A-C.

Material Examined.-8♀♀ (5 ovig.), Hyŏlam, July 14, 1989; 18 specimens, Taepungch'wi, July 15, 1989; 35 specimens, Sadong, July 17, 1989; five specimens, Sŏmmok, July 16, 1989; 15 specimens, Naesujŏn, July 12, 1989; 1♂, 1♀, Dodong, July 11, 1989.

Type locality.-Devonshire.

Distribution.-Widely distributed in shallow waters of all oceans except in high polar region.

Genus *Ventojassa* Barnard, 1970

11. *Ventojassa dentipalma*, new species (Figs. 15-17)

Material Examined.-Holotype: ♀, body length: 6.3 mm, Hyŏlam, July 14, 1989. Paratypes: 56 specimens, collection details same as holotype; 34 specimens, Taepungch'wi, July 15, 1989; 16 specimens, Sŏmmok, July 16, 1989.

Description of holotype female.-Lateral cephalic lobe (Fig. 15A) short and triangular in shape. Eye large and circular.

Antenna 1 shorter than antenna 2; peduncular article 3 much longer than peduncular article 1; flagellum composed of nine segments; accessory flagellum composed of four segments, of which terminal segment very small. Gland cone of antenna 2 long and sharp, and reaching to proximal 1/5 of prduncular article 3.

Epistome (Fig. 15B) sharply produced. Mandibles (Fig. 15C, D) with incisor bearing four or five teeth; lacinia mobilis armed with three or four teeth; spine row composed of four denticulate spines; molar lacking flake, molar of right mandible with three setules and one long plumose seta; palp tri-articulate, article 3 shorter than article 2 and not expanded. Inner plate of maxilla 1 (Fig. 15E) with one seta on inner margin subapically; outer plate with 10 spines on apex; article 2 of palp with four spines and two setae on apex.

Article 5 of gnathopod 1 (Fig. 15F) 1.2 times as long as article 6; article 6 strongly expanded distally, palm obliquely rounded.

Article 2 of gnathopod 2 (Fig. 15G, H) with a long lobe on dorsodistal corner, this lobe overreaching to distal margin of article 3; article 5 narrow, with one seta on ventral lobe; article 6 slightly dilatant toward distal part; palm of article 6 oblique, with a tooth on proximal part and a tooth on distal part, margin between two teeth slopes steeply, and with a tooth defining palm; in inner view, two strong spines guiding the two teeth on distal part of palm; dactyl fitting palm.

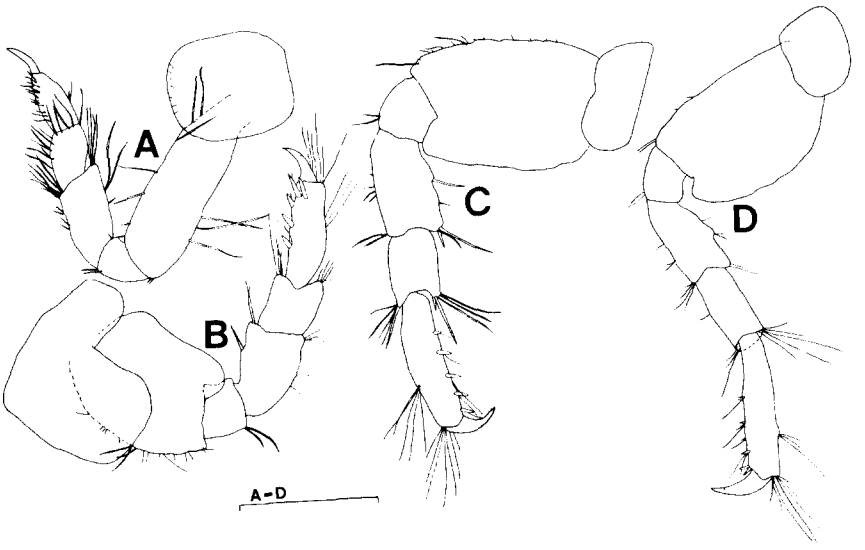

Fig. 16. *Ventojassa dentipalma*, new species, holotype female, body length: 6.3 mm: A, left pereopod 3; B, left pereopod 5; C, left pereopod 6; D, left pereopod 7. Scale bars = 0.5 mm.

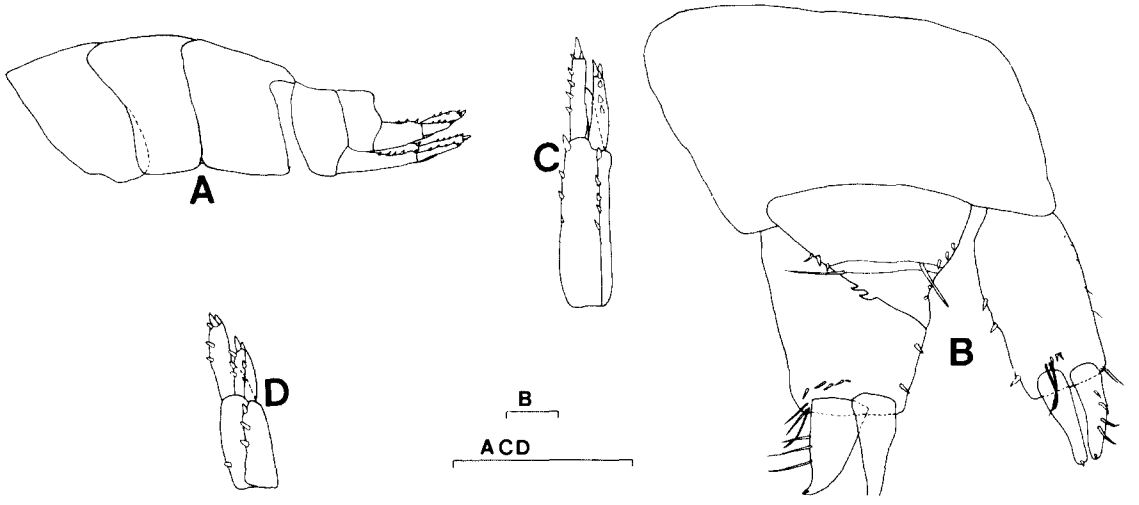

Fig. 17. *Ventojassa dentipalma*, new species, holotype female, body length: 6.3 mm: A, lateral view of right pleonites, urosomites 1, 2, and uropods 1, 2; B, dorsal view of uropod 3 and telson; C, left uropod 1; D, left uropod 2. Scale bars: A = 1 mm; B = 0.1 mm; C, D = 0.5 mm.

Article 2 of pereopod 3 (Fig. 16A) slender, not expanded; article 4 slender, not produced dorsodistally. Pereopod 5 (Fig. 16B) shorter than pereopod 6; dorsal margin of article 2 lined with setae; dorsal margin of article 6 with three long spines and two locking spines. Pereopod 6 (Fig. 16C) shorter and stronger than pereopod 7; dorsal margin of article 6 with four relatively long spines and two locking spines. Article 6 of pereopod 7 (Fig. 16D) slenderer than that of pereopod 6; dorsal margin of article 6 with three small spines and two small locking spines.

Uropods 1, 2 (Fig. 17C, D) without setae. In uropods 1, 2, peduncle longer than rami; interramal processes well developed, reaching to proximal 80% and 75% of outer rami of uropods 1, 2, respectively; outer ramus shorter than inner ramus. Peduncle of uropod 3 (Fig. 17B) much longer than rami, with two or three spines on inner margin and several setae on dorsal margin distally; outer ramus with one hook on apex and subterminal knob and one tiny setule on knob and three or four long, wire-like setae on outer margin; inner ramus with one setule on apex.

Telson triangular in shape, with one pair of hooks on lateral margins distally, and one long seta and three small setae on lateral margins proximally.

Pleonal epimera 1-3 (Fig. 17A) with one notch on posteroventral corners, of which one of pleonal epimeron 3 strongest.

Male.-Like female.

Variations.-The present specimens show variations in the number of segments of accessory flagellum (3-5) and number of setae on the outer margin of outer ramus of uropod 3 (1-4). One juvunile specimen (body length: 2.3 mm), the smallest specimen, bearing accessory flagellum which composed of three segments and outer margin of outer ramus of uropod 3 is lined with one seta. One large female specimen (body length: 7 mm), the largest specimen, has accessory flagellum which composed of five segments.

Remarks.-The four species have been known in the genus *Ventojassa* until now. Among these four species, the present species is very closely related to *Ventojassa ventosa* (Barnard, 1962), reported from California, Hawaiian Islands, Madagascar and Fiji, in the shape of female gnathopod 2. But, this new species differs from *V. ventosa* in the following characteristics: (1) Body length of the present species is longer than that of *V. ventosa* [the present species: up to 7 mm; *V. ventosa*: 4 mm (holotype)]; (2) The palm of female gnathopod 2 of the present species has stouter teeth than that of *V. ventosa*; (3) The dorsal margin of article 6 of pereopod 6 bearing stouter and longer spines than that of *V. ventosa*; (4) Accessory flagellum of the present species is composed of more segments than that of *V. ventosa* (the present species: 3-5 segments; *V. ventosa*: 2-3 segments); (5) The interramal processes of uropods 1, 2 of the present species are longer than those of *V. ventosa* (Hawaiian population); (6) The outer margin of outer ramus of uropod 3 bearing more setae than that of *V. ventosa* (the present species: 3-5 setae; *V. ventosa*: 0-3 setae).

Habitat.-Among algae.

Etymology.-The male gnathopod 2 of this species has palm bearing sharp teeth. The specific name is from the Latin *dentis* (tooth) + *palma* (palm).

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울릉도 해역의 단각류(갑각류)I

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울릉도의 해양 단각류상을 조사하기 위하여 조사기간인 1989년 7월부터 1990년 8월 사이에 울릉도 해안의 8개 지소에서 채집한 단각류 표본들 중에서 Ampithoidae, Corophiidae, Dulichiidae, Ischyroceridae등 4과에 속하는 것들을 동정한 결과 9속, 11종의 목록이 얻어졌다. 이 중에서 4종(*Sunamphithoe sineplumosa, Podocerus ulreungensis, P. hoonsooi, Ventojassa dentipalma*)은 신종이었고, 보고되는 11종 모두가 울릉도에서 처음 기록되는 것들이었다. 6종을 기재하고 그림을 작성하였다. 모든 종과 상위 분류군들에 대한 검색표들을 제시하였다.