

Two New Species of Freshwater *Gammarus* (Crustacea, Amphipoda, Gammaridae) from South Korea

Lee, Kyung Sook and Seo, In Soon

(Department of Biology, College of Natural Sciences, Dankook University,
Ch'ungnam 330-180, Republic of Korea)

한국 담수산 *Gammarus*(Crustacea, Amphipoda, Gammaridae)의 2신종

이 경 숙 · 서 인 순
(단국대학교 자연대학 생물학과)

적 요

Kim과 Lee(1977) 그리고 Lee and Kim(1980)이 *Gammarus sobaegensis*의 변이종으로 취급했던 우이동에서 채집된 type 2, 제주도에서 채집된 type 7 그리고 경기도 왕방산에서 채집된 type 3을 재검토한 결과 각각 독립된 종으로 확인되어 각각 *G. kyonggiensis*와 *G. wangbangensis*로 명명한다. 이로써 한국 담수산 *Gammarus*는 총 8종이 된다.

Key words: *Gammarus*, Amphipoda, taxonomy, Korea.

INTRODUCTION

After the first report of Uéno (1940a) about Korean freshwater gammarid amphipods, there have been several contributions (Uéno, 1940b, 1966; Kim and Lee, 1977; Lee and Kim, 1980; Lee, 1986). In 1980, Lee and Kim newly reported four species and separated seven geographical variation types of *G. sobaegensis* from South Korea. The specimens of variation type 2, type 3 and type 7 collected from various localities were reexamined and found that their characters were not variation of *G. sobaegensis* but stable enough

이 논문은 1986-1988년도 한국과학재단의 연구비 지원에 의한 것의 일부임.

to be treated as distinct new species. These two new species are named *G. kyonggiensis* (type 2 and type 7) and *G. wangbangensis* (type 3) and are fully described and illustrated. The localities where they were collected are shown in Figure 1. The taxonomic characters are based on Pinkster (1970, 1971, 1972 and 1983), Karaman and Pinkster (1977), and Pinkster and Scholl (1984).

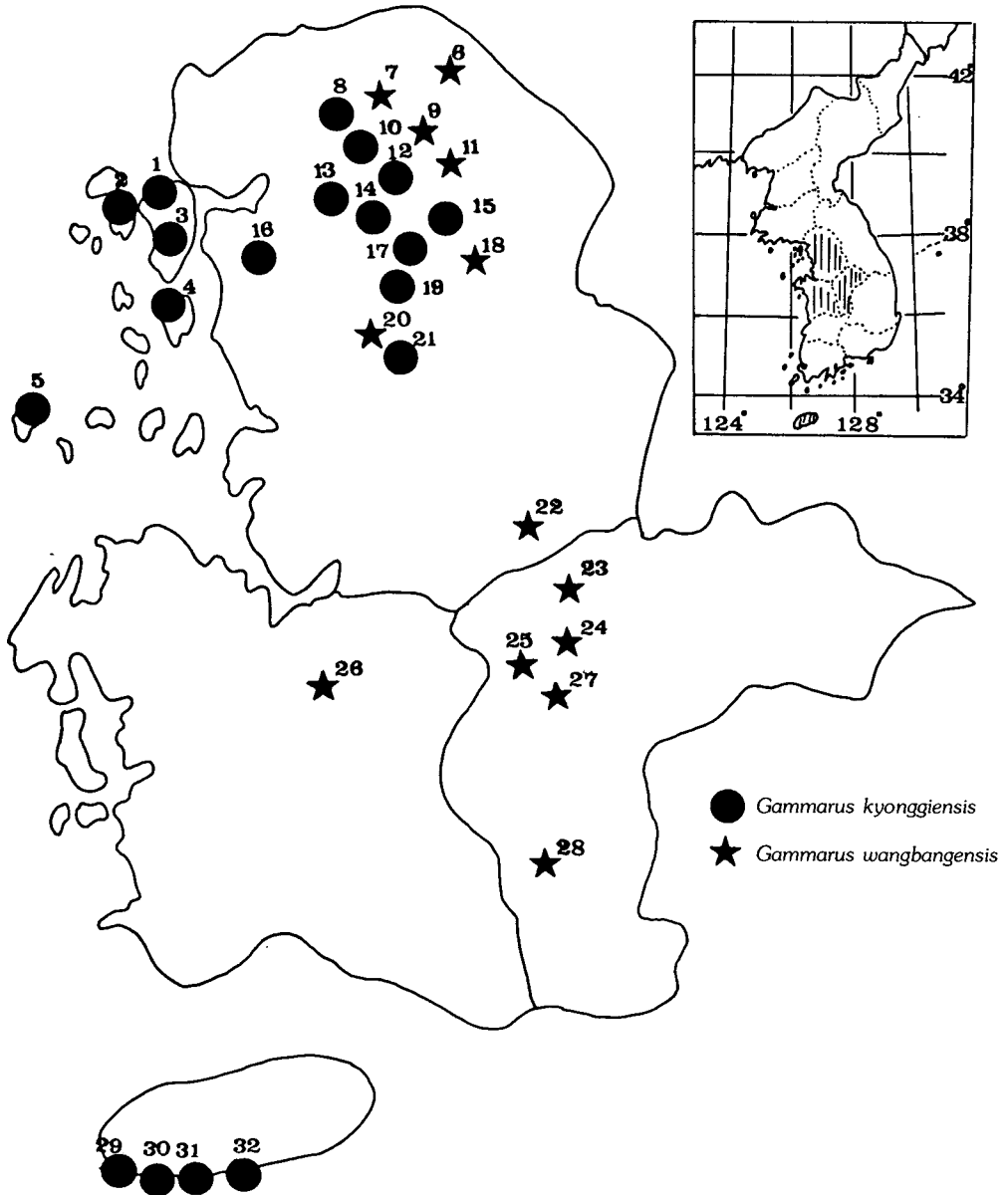


Fig. 1. A map showing the localities where the materials were collected, whereas the distribution of these new species.

MATERIALS AND METHODS

The specimens of freshwater gammarid amphipods examined were collected mainly from mountain streams at 32 localities of Kyōnggi-do, Ch'ungch'ōngnam-do, Ch'ungch'ōngbuk-do and Chejudo provinces in South Korea mostly during the period from January 1985 to April 1990, and deposited in the Department of Biology, Dankook University. Samplings were made chiefly from fallen leaves in spring runs which are relatively low temperature even on summer days. All the observed appendages were mounted on glass slides with polyvinyl lactophenol. Body length was measured from the apex of the rostrum along the dorsal margin to the posterior limit of urosomite 3. The characters were examined at 100X or 400X magnification of a light microscope and 30X or 64X magnification of a stereomicroscope. Figures were drawn by using a drawing tube and a camera lucida. All the specimens are deposited in the Department of Biology, Dankook University.

LOCALITIES

1, Hwagea, Kanghwado, Kanghwa-ūp, Kanghwa-gun; 2, Kyodongdo, Kyodong-myōn, Kanghwa-gun; 3, Chōndeungsa, Kanghwado, Kanghwa-ūp, Kanghwa-gun; 4, Yōngjongdo, Ongjin-gun; 5, Tōkchōkdo, Ongjin-gun; 6, Kiji 1-ri, Shinbuk-myōn, P'och'ōn-gun; 7, Kache 2-ri, Shinbuk-myōn, P'och'ōn-gun; 8, Sambang-ri, P'opwon-ūp, P'aju-gun; 9, Sungbang-dong, Shinbuk-myōn, P'och'ōn-gun; 10, Punsu 1-ri, Kwngt'an-myōn, P'aju-gun; 11, Wangbangsan, P'och'ōn-gun; 12, Yongmi-ri, Kwangt'an-myōn, P'aju-gun; 13, Chori-myōn, P'aju-gun; 14, Yongmi 4-ri, Kwangt'an-myōn, P'aju-gun; 15, Iryong-ri, Changhūng-myōn, Yangju-gun; 16, Puch'ōn-shi, Kyōnggi-do; 17, Pyōkche-ri, Pyōkche-ūp, Koyang-gun; 18, Pongyongsa, Namyangju-gun; 19, Uidong, Tobong-gu, Seoul; 20, Umyōnsan, Pangbae-dong, Kwanak-gu, Seoul; 21, Kwanaksan, Shillim-dong, Kwanak-gu, Seoul; 22, Shinjong-ri, Puknae-myōn, Yōju-gun; 23, Yuch'ōn 1-gu, Kūmwang-ūp, Ŭmsōng-gun; 24, Kamgok -ri, Kamgok-myōn, Ŭmsōng-gun; 25, Kumgok-ri, Mansūng-myōn, Chinch'ōn-gun; 26, Anseo-dong, Ch'ōnan-shi; 27, Munbaek-myōn, Chinch'ōn-gun; 28, Ilshin-ri, Och'ang-myōn, Ch'ōngwon-gun; 29, Andōk, Chejudo; 30, Kangjung, Chejudo; 31, Jungbangp'okpo, Chejudo; 32, Ch'ōnggiyōnp'oko, Ch'ōnggikyo, Chejudo.

SYSTEMATIC ACCOUNT AND DESCRIPTIONS

Superclass Crustacea Pennant, 1777
 Class Malacostraca Latreille, 1806
 Order Amphipoda Latreille, 1816
 Suborder Gammaridea Latreille, 1803
 Family Gammaridae Leach, 1813
 Genus *Gammarus* Fabricius, 1775

1. *Gammarus kyonggiensis*, n. sp.

(Fig. 2,3)

Gammarus sp. (second group): Kim and Lee, 1977 (pp. 32-34, figs.2-4).

Gammarus sobaegensis Lee and Kim, 1980 (type 2, pp. 47-51, fig. 3.; type 7, pp. 47-52, fig.8).

Gammarus sobaegensis leei Karaman, 1984 (p. 145).

Materials examined: Holotype: 1 ♂ (DGKH 0001), Kwanaksan, Shillim-dong, Kwanak-gu (body length:

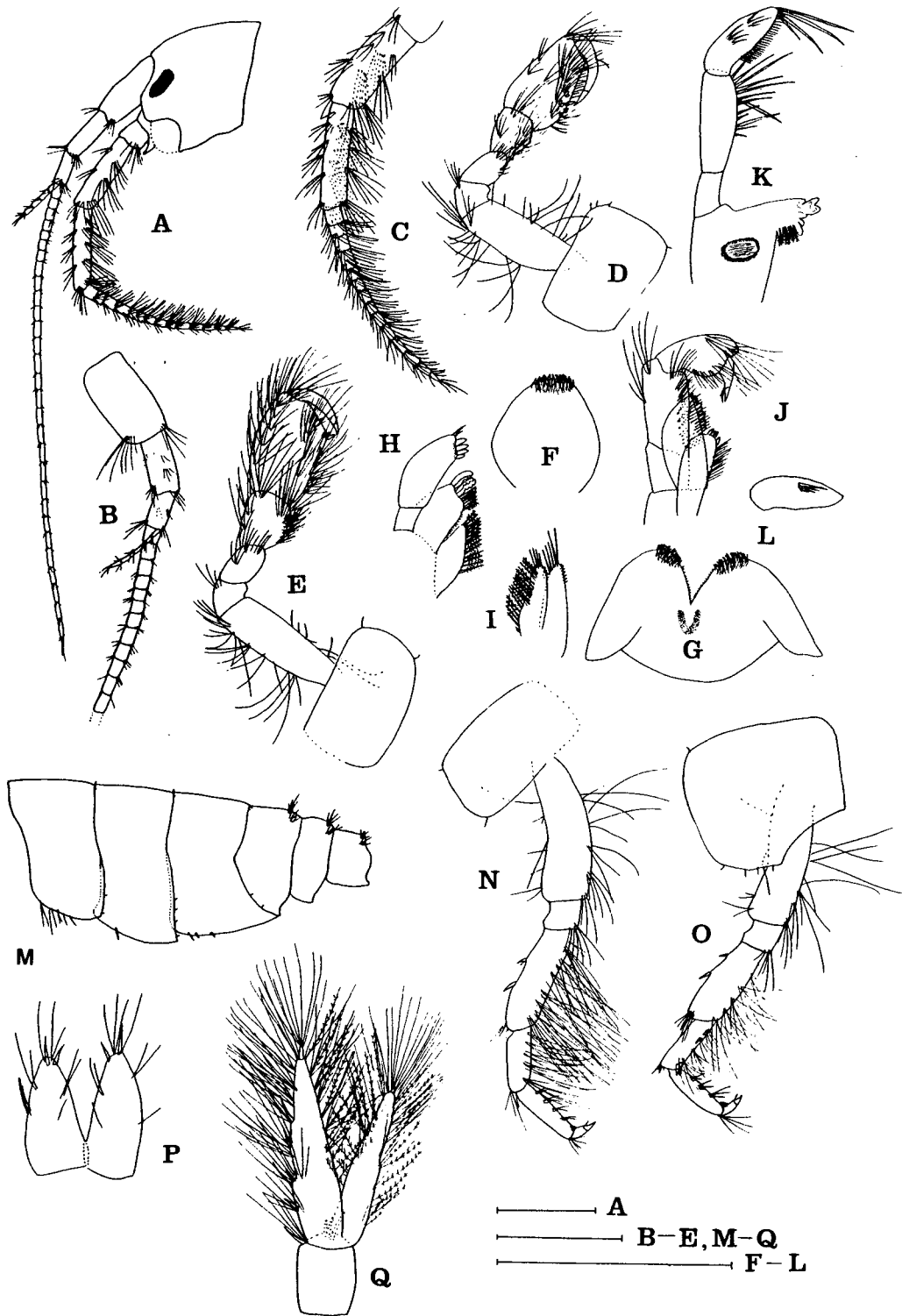


Fig. 2. *Gammarus kyonggiensis*, n. sp. holotype male (10.3mm), A head (paratype male); B, antenna 1; C, antenna 2; D, gnathopod 1; E, gnathopod 2; F, upper lip; G, lower lip; H, maxilla 1; I, maxilla 2; J, maxilliped; K, mandible and mandibular palp, inner face; L, third segment of mandibular palp, outer face; M, meta- and urosome (paratype male); N, pereopod 3; O, pereopod 4; P, telson; Q, uropod 3. Scale bars = 1mm.

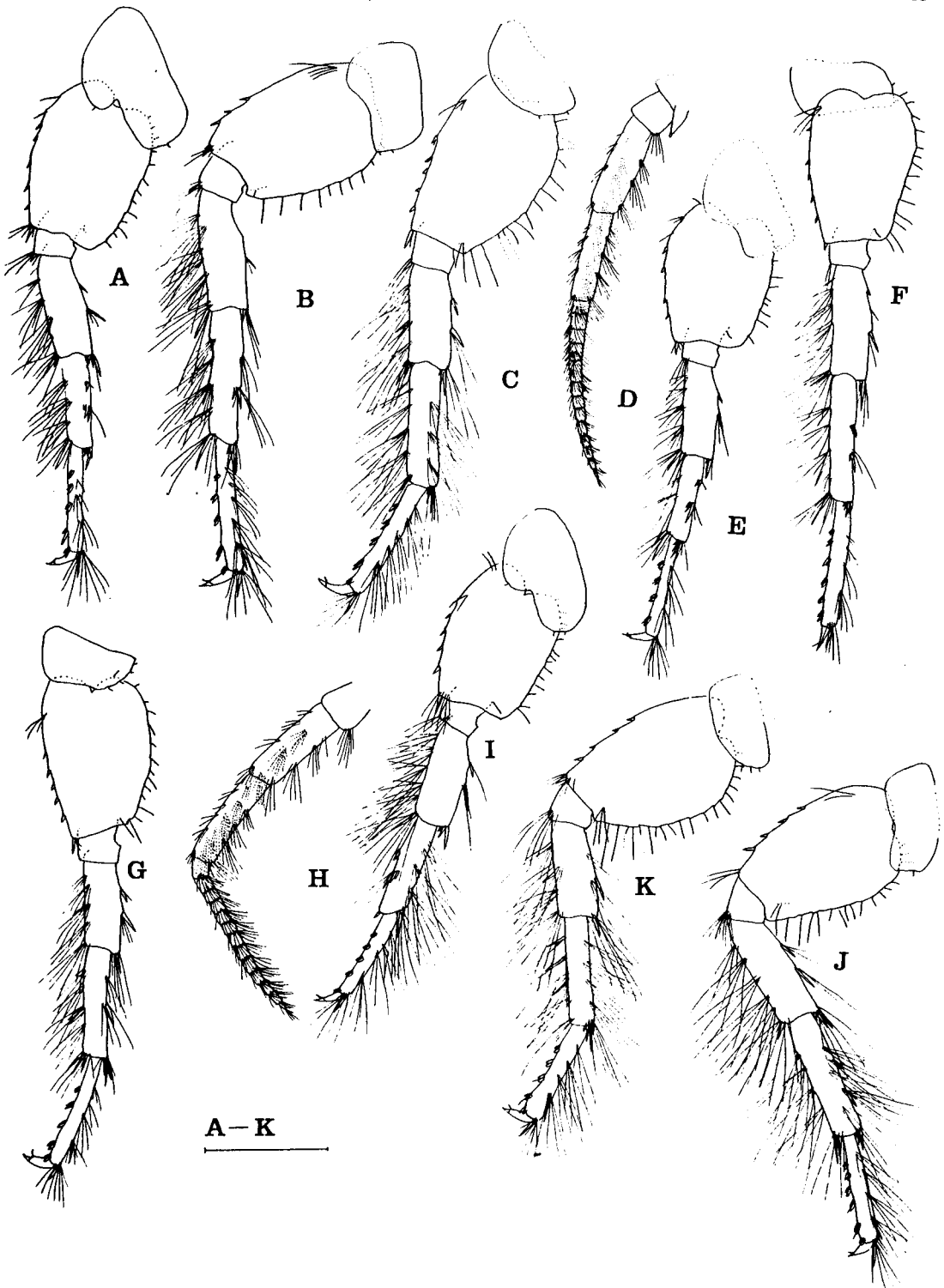


Fig. 3. *Gammarus kyonggiensis*, n. sp. A-C, holotype male (10.3mm). A, pereopod 5; B, pereopod 6; C, pereopod 7; D-G, paratype male from P'aju-gun; D, antenna 2; E, pereopod 5; F, pereopod 6; G, pereopod 7; H-K, paratype male from Chejudo; H, antenna 2; I, pereopod 5; J, pereopod 6; K, pereopod 7. Scale bar = 1mm.

10.3mm), Jan. 14, 1990 (I.S. Seo). Paratypes: 17 ♂♂, 29 ♀♀ (DGKP 0002), collection data as holotype; 57 ♂♂, 48 ♀♀ (DGKP 0003), Punsu -ri, P'aju-gun, Jun. 23, 1987 (K.B. Yang); 96 ♂♂, 48 ♀♀ (DGKP 0004), Yongmi 4-ri, Kwant'an-myŏn, P'aju-gun, Jun. 23, 1987 (K.B. Yang); 13 ♂♂, 7 ♀♀ (DGKP 0005), Yongmi-ri, Kwant'an-myŏn, P'aju-gun, Jun. 23, 1987 (K.B. Yang); 15 ♂♂, 22 ♀♀ (DGKP 0006); Sambang-ri, P'opwon-ŭp, Paju-gun, Nov. 3, 1986 (H.C. Chon); 92 ♂♂, 113 ♀♀ (DGKP 0007), Chori-myŏn, P'aju-gun, Jun. 23, 1987 (K.B. Yang); 20 ♂♂, 39 ♀♀ (DGKP 0008), Iryong-ri, Changhŭng-myŏn, Yangju-gun, Feb. 28, 1987 (K.S. Lee); 17 ♂♂, 18 ♀♀ (DGKP 0009), Kyodongdo, Kyodong-myŏn, Kanghwa-gun, Aug. 22, 1988 (H.M. Choi); 26 ♂♂, 44 ♀♀ (DGKP 0010), Pyŏkche-ri Pyŏkche-ŭp, Koyang-gun, Jun.23, 1987 (K.B. Yang); 23 ♂♂, 7 ♀♀ (DGKP 0011), Hwagaesa, Kanghwado, Kanghwa-ŭp, Kanghwa-gun, Jul. 15, 1986 (K.S. Lee); 13 ♂♂, 10 (6 ovi.) ♀♀ (DGKP 0012), Chŏndeungsa, Kanghwado, Kanghwa-ŭp, Kanghwa-gun, May. 18, 1978 (Kang); 38 ♂♂, 4 (16 ovi.) ♀♀ (DGKP 0013), Tŏkchŏkdo, Ongjin-gun, May. 13, 1976 (K.S. Lee); 13 ♂♂, 18 ♀♀ (DGKP 0014), Tŏkchŏkdo, Ongjin-gun, Sep. 23, 1989; 7 ♂♂, 10 ♀♀ (DGKP 0015), Tŏkchŏkdo, Ongjin-gun, Jun. 9, 1973 (H.S. Kim); 43 ♂♂, 21 ♀♀ (DGKP 0016), Puch'ŏn-shi, Kyŏnggi-do, Jun. 20, 1987' (P.J. Jeon); 62 ♂♂, 81 (45 ovi. 3 juve.) ♀♀ (DGKP 0017), Uidong, Tobong-gu, Seoul. Jun. 20, 1976 (Y.S. Rho); 9 ♂♂, 5 ♀♀ (DGKP 0018), Uidong, Tobong-gu, Seoul, Apr. 16, 1977; 7 ♂♂, 4 ♀♀ (DGKP 0019), Uidong, Tobong-gu, Seoul, 5. 13, 1978; 7 ♂♂, 2 ♀♀ (DGKP 0020), Uidong, Tobong-gu, Seoul, May. 1983; 26 ♂♂, 14 ♀♀ (DGKP 0021), Kwanaksan, Shillim-dong, Kwanak-gu, Seoul, Sep. 20, 1987 (I.S. Seo); 16 ♂♂, 11 ♀♀ (DGKP 0022), Yŏngjongdo, Ongjin-gun, Jun. 25, 1988 (Y.M. Kim); 7 ♂♂, 25 (ovi.) ♀♀ (DGKP 0023), upper Ch'ŏngikyo, Chejudo, Jun. 5, 1977 (Y.S. Rho); 7 ♂♂, 19 (7 juve.) ♀♀ (DGKP 0024), Jungbang'pokpo, Chejudo, Jun. 5, 1977 (H.Y. Jung); 38 ♂♂, 45 ♀♀ (DGKP 0025), upper Ch'ŏngikyo, Chejudo, Aug. 15, 1985; 43 ♂♂, 16 ♀♀ (DGKP 0026), Ch'ŏngiyŏnp'okpo, Chejudo, May. 4, 1987; 23 ♂♂, 46 ♀♀ (DGKP 0027), Kangjung, Chejudo, Jan. 15, 1985; 46 ♂♂, 26 ♀♀ (DGKP 0028), Andŏk, Chejudo, Sep. 13, 1986; 43 ♂♂, 40 ♀♀ (DGKP 0029), Ch'ŏngiyŏnp'okpo, Chejudo, May. 4, 1987; 22 ♂♂, 12 ♀♀ (DGKP 0030), Ch'ŏngikyo, Chejudo, Feb. 11, 1987; 9 ♂♂, 6 ♀♀ (DGKP 0031), upper Ch'ŏngikyo, Chejudo, Apr. 25, 1990 (Y.K. Kim).

Diagnosis: Segment 2 of pereopod 7 with very long setules on posterior margin. Anterior margins of peduncle segment 4 and 5 of antenna 2 with three and four tufts of setae, respectively.

Description of male (holotype): Antenna 1 (Fig. 2B) half as long as body length; peduncle segment 1 longer than peduncle segments 2 and 3; interior margin of peduncle segment 3 with two tufts of short setae; main flagellum and accessory flagellum with 34 and 5 segments, respectively. Antenna 2 (Fig. 2C) shorter than antenna 1; peduncle segments 4 and 5 with three longitudinal rows; interior, anterior and posterior margins of peduncle segment 4 with three, three and four tufts of setae, respectively, and length of setae on anterior margin longer than diameter of peduncle segment; interior, anterior and posterior margins of peduncle segment 5 with six, four and six tufts of setae, respectively, and length of these setae longer than diameter of peduncle segment 5; flagellum with 14 segments. Inner face of lower lip (Fig. 2G) with convex surface of horseshoe shaped. Segment 6 of gnathopod 1 (Fig. 2D) pyriform in shape, with 11 small spines on distal surface near palm; palm of segment 6 oblique, with one strong spine on medial part. Gnathopod 2 (Fig. 2E) quadrangular in shape, and segment 6 with three small spines on distal surface near palm; palm of segment 6 with three small spines on distal surface near palm; palm of segment 6 transverse, with one strong spine on medial part. Segment 2 of pereopod 5 (Fig. 3A) rather slender, with 13 setules on posterior margin; anterior margins of segments 4 and 5 with five and four tufts of setae, respectively; length of these setae longer than diameter of segments 4 and 5. Segment 2 of pereopod 7 (Fig. 3C) with 14 very long

setules on posterior margin and two long setae near posterodistal corner; segment 4 with five tufts of setae on anterior margin, length of longest setae among tufts of setae longer than diameter of segment 4; segment 5 with 5 tufts of setae densely on anterior margin, and length of these setae two times as long as diameter of segment 5. Inner ramus of uropod 3 (Fig. 2Q) almost 4/5 as long as outer ramus, and inner and outer margins of inner ramus with plumose setae; inner margin of outer ramus with plumose setae, and outer margin with simple setae. Each lobe of telson (Fig. 2P) with two groups of long setae along outer margin and with two groups of setae along inner margin.

Description of female (paratype): Smaller than male. Setae on peduncle segments of antenna 2 longer than those of male, but setae of pereopods 5-7 shorter than those of male. Segment 6 of gnathopods 1, 2 and uropod 3 smaller than those of male.

Variability: Within this species the number of tufts of setae and the length of setae of A2, P5, P6 and P7 are somewhat variable. Type 7 (Chejudo) by Lee and Kim (1980) is similar to type 2 (Uidong), but the number of tufts of setae of P5, P6 and P7 are more numeral than the other sites. The length of setae of A2, P5, P6 and P7 of the specimens from Uidong, Kwangt'an-myŏn is shorter than the length of those from Chjudo, Kwanaksan, Puch'ŏn, respectively.

Remarks: This species is similar to *G. sobaegensis* Lee and Kim, 1980 in most characteristics including setation of gnathopods, setation of pereopods 3, 4, uropod 3 and shapes of epimeral plates, but differs in the following characters: (1) Setae tufts of antenna 2 in this species fewer than *G. sobaegensis*. (2) Setation of pereopods 6 and 7 in this species denser and longer than *G. sobaegensis*.

Etymology: The distribution of this new species is dominant to Kyŏnggi-do at present. *G. kyonggiensis* is named according to Kyŏnggi-do.

2. *Gammarus wangbangensis* n. sp.

(Fig. 4,5)

Gammarus sobaegensis Lee and Kim, 1980 (type 3, pp. 47-51, fig.4).

Material examined: Holotype: 1 ♂ (DGWH 0001), Sungbangdong, Shinbuk-myŏn, P'och'ŏn-gun (body length; 11mm), Oct. 31, 1986 (K.S. Lee). Paratype: 48 ♂♂, 80 ♀♀ (DGWP 0002), collection data as holotype; 32 ♂♂, 52 (19 ovi.) ♀♀ (DGWP 0003), Sungbang-dong, Shinbuk-myŏn, P'och'ŏn-gun, Nov. 21, 1986 (H.C. Cheon); 43 ♂♂, 25 ♀♀ (DGWP 0004), Wangbangsan, P'och'ŏn-gun, Mar. 19, 1978 (K.S. Lee); 3 ♂♂ (DGWP 0005), Wangbangsan, P'och'ŏn-gun, Nov. 23, 1986 (H.C. Cheon); 20 ♂♂, 19 ♀♀ (DGWP 0006), Kiji 1-ri, Shinbuk-myŏn P'och'ŏn-gun, Nov. 21, 1986 (H.C. Cheon); 13 ♂♂, 55 ♀♀ (DGWP 0007), Wangbangsan, P'och'ŏn-gun Nov. 21, 1986 (K.S. Lee and H.C. Cheon); 27 ♂♂ 40 ♀♀ (DGWP 0008), Kache 2-ri Shinbuk-myŏn, P'och'ŏn-gun. Nov. 21, 1986 (H.C. Cheon); 1 ♂, 4 ♀♀ (DGWP 0009), Umyŏnsan, Pangbae-dong, Kwanak-gu. Seoul, Sep. 6, 1987 (K.S. Lee); 6 ♂♂, 17 ♀♀ (DGWP 0010), Anseo-dong, Ch'ŏnan-shi, Jun. 23, 1987 (I.S. Seo); 37 ♂♂, 64 ♀♀ (DGWP 0011), Kamgok-ri, Kamgok-myŏn, Ŭmsŏng-gun, Mar. 14, 1987 (U.S. Chong); 24 ♂♂, 58 ♀♀ (DGWP 0012), Kamgok-ri, Kamgok-myŏn Ŭmsŏng-gun, Mar. 14, 1987 (I.S. Seo); 51 ♂♂, 60 ♀♀ (DGWP 0013), Yuch'ŏn 1-gu, Kumwang-ŭp, Ŭmsŏng-gun, Jul. 10, 1987 (I.S. Seo); 26 ♂♂, 8 ♀♀ (DGWP 0014), Yuch'ŏn 1-gu Kumwang-ŭp, Ŭmsŏng-gun, Jul. 8, 1987 (I.S. Seo); 16 ♂♂, 9 ♀♀ (DGWP 0015), Kumgok-ri, Mansung-myŏn, Chinch'ŏn-gun, Mar. 1980 (J.R. Lee); 20 ♂♂, 25 (ovi.) ♀♀ (DGWP 0016), Munbaek-myŏn, Chinch'ŏn-gun, Oct. 1978 (J.R. Lee); 66 ♂♂, 22 (10 ovi.) ♀♀ (DGWP 0017), Ilshin-ri, Och'ang-myŏn, Ch'ŏngwon-gun, Oct. 1978 (J.R. Lee); 64 ♂♂, 71 ♀♀ (DGWP 0018), Ilshin-ri, Och'ang-myŏn, Ch'ŏngwon-gun, Mar. 1980 (K.S. Lee); 28 ♂♂, 16 ♀♀ (DGWP 0019), Shinjong-ri, Puknaemyŏn, Yŏju-gun, Jul. 1, 1987 (I.S. Seo); 12 ♂♂, 3 (10 ovi.) ♀♀ (DGWP 0020), Pongyongsa, Namyangju-

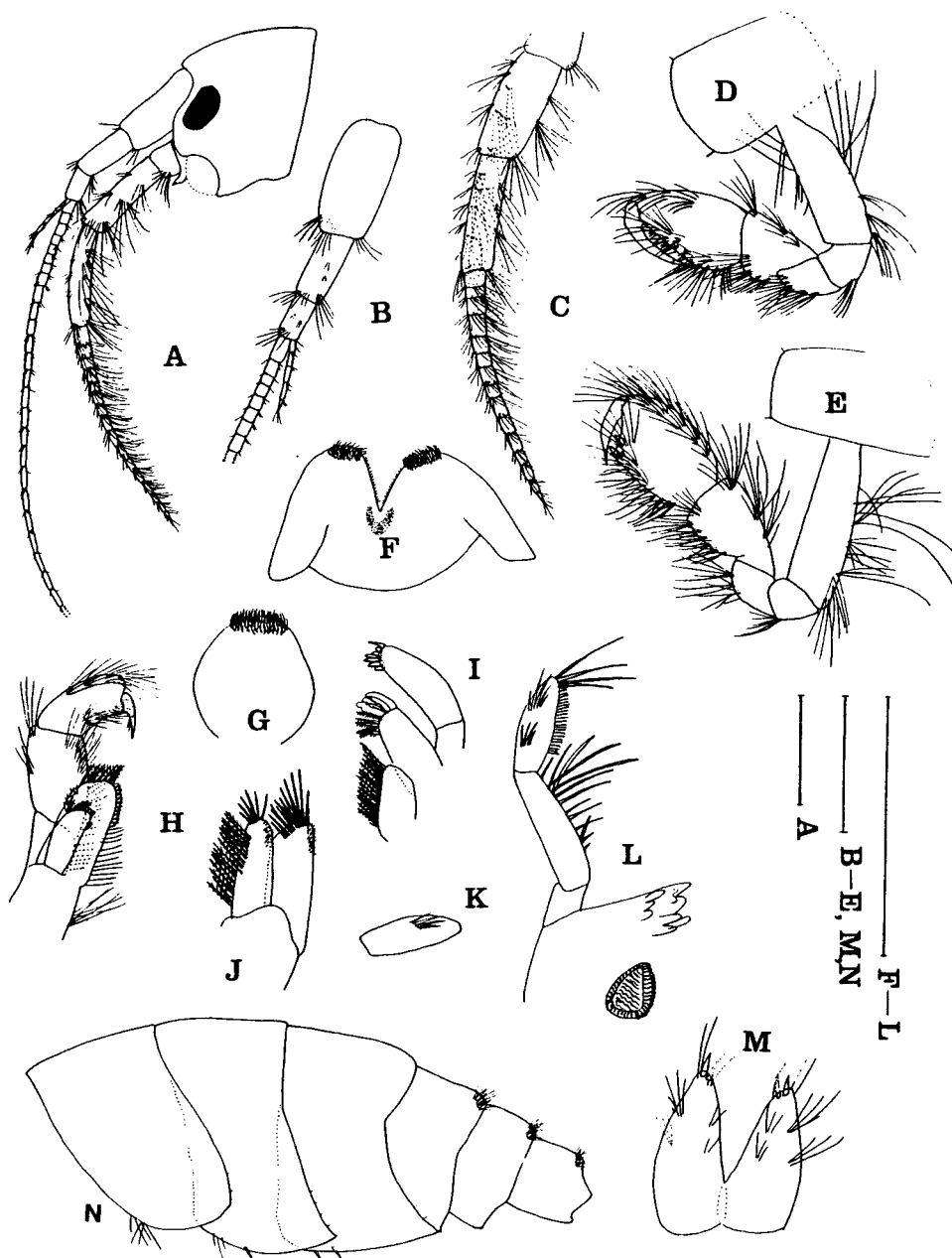


Fig. 4. *Gammaurs wangbangensis*, n. sp. holotype male (11.0mm). A, head (paratype male); B, antenna 1; C, antenna 2; D, gnathopod 1; E, gnathopod 2; F, lower lip; G, upper lip; H, Maxilliped; I, maxilla 1; J, maxilla 2; K, third segment of mandibular palp, outer face; L, mandible and mandibular palp, inner face; M, telson; N, meta- and urosome (paratype male). Scale bars = 1mm.

gun, Mar. 29, 1987 (H.C. Cheon); 31 ♂♂, 40 ♀♀ (DGWP 0021), Ilshin-ri, Och'ang-myŏn, Ch'ŏngwon-gun Jul. 15, 1987 (K.S. Lee); 3 ♂♂, 1 ♀ (DGWP 0022), Kumgok-ri, Mansung-myŏn, Chinch'ŏn-gun, Mar. 10, 1988.

Diagnosis: Outer margin of outer ramus of uropod 3 mixed with plumose setae. Anterior margin of

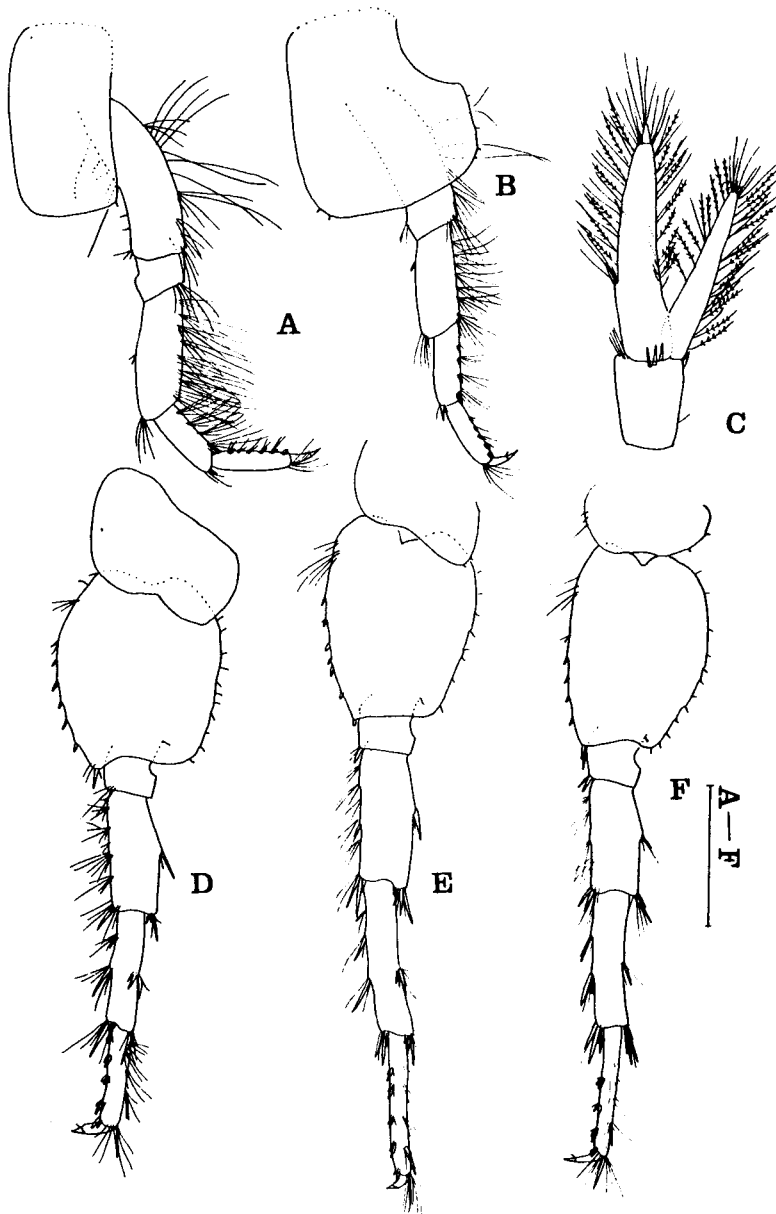


Fig. 5. *Gammarus wangbangensis*, n. sp. holotype male (11.0mm). A. pereopod 3; B. pereopod 4; C. uropod 3; D. pereopod 5; E. pereopod 6; F. pereopod 7. Scale bar = 1mm.

peduncle segments 4 and 5 of antenna 2 with three and five tufts of setae, respectively, and length of these setae longer than diameter of segments.

Description of male (holotype): antenna 1 (Fig. 4B) half as long as body length; interior margin of peduncle segment 2 with two tufts of short setae; main flagellum and accessory flagellum with 29 and 5 segments, respectively. Peduncle segments 4 and 5 of antenna 2 (Fig. 4C) with three longitudinal rows; interior, anterior and posterior margins of peduncle segment 4 with three, three and four tufts of setae, respectively, and the length of these setae on interior margin two times of diameter of peduncle segment;

interior, anterior and posterior margins of peduncle segment 5 with five, five and five tufts of setae, respectively, and longest length of these setae on interior margin two times of diameter of peduncle segment; flagellum with 15 segments. Inner face of lower lip (Fig. 4F) with convex surface of horseshoe shaped. Segment 6 of gnathopod 1 (Fig. 4D) pyriform in shape and with 10 small spines on distal surface near palm; palm of segment 6 oblique, with one strong spine on medial part. Gnathopod 2 (Fig. 4E) quadrangular in shape, and segment 6 with three small spines on distal surface near palm; palm of segment 6 transverse, with one strong spine on medial part. Segment 2 of pereopod 5 (Fig. 5D) less slender, with 11 short setules on posterior margin; anterior margins of segments 4 and 5 with six and three tufts of setae, respectively, and these setae shorter than diameter of segments 4 and 5. Segment 2 of pereopod 7 (Fig. 5F) with 11 short setules on posterior margin; segment 4 with five tufts of setae on anterior margin, and length of setae shorter than diameter of segment 4; segment 5 with three tufts of setae with spines. Inner ramus of uropod 3 (Fig. 5C) almost 6/7 as long as outer ramus; inner and outer margins of inner and outer ramus with plumose setae. Posterior corner of epimeral plate 1 (Fig. 4N) always rounded and posterior corner of epimeral plates 2 and 3 pointed (sharp).

Description of female (paratype): Smaller than male. Setation of peduncle segments of antenna 2 longer than male. Propodi of gnathopods relatively smaller than male.

Remarks: The present species is remarkably different from *Gammarus sobaegensis* Lee and Kim, 1980 in following characters: (1) setation of antenna 2 in this species similar to *G. kyonggiensis*. (2) outer margin of outer ramus of uropod 3 with plumose setae in this species, whereas without plumose setae in *G. sobaegensis* and *G. kyonggiensis*. (3) posterior corner of epimeral plate 2 in this species is pointed, whereas posterior corner weakly pointed in *G. sobaegensis*.

Etymology: *G. wangbangensis* is named according to Wangbangsan, its first collecting place.

ACKNOWLEDGEMENTS

The authors appreciate deeply to Dr. H.I. Lee of Yun-Sei University for reading the manuscript and giving many helpful suggestions. We also appreciate to Dr. S. Pinkster of Zoological Institute, Amsterdam University, Netherland, who allowed the first author to examine many type specimens.

ABSTRACT

Lee and Kim (1980) reported seven geographical variation types of *G. sobaegensis* from South Korea. Extensively reexamining the specimens of variation type 2, type 3 and type 7 collected at various localities, the authors found that three of them were not variation types but distinct new species, and named *G. kyonggiensis* and *G. wangbangensis*. These two new species are fully described with illustrations and their distribution is also given.

REFERENCES

- Karaman, G. S. and S. Pinkster, 1977. Freshwater *Gammarus* species from Europe North Africa and adjacent regions of Asia (Crustacea-Amphipoda) part I. *Gammarus pulex*-group and related species. *Bijdr. Dierk.*, **47** (1): 1-97, 38 figs.

- Karaman, G. S., 1984. Remarks to the Freshwater *Gammarus* species (FAM, Gammaridae) from Korea, China, Japan and some adjacent regions (contribution to the knowledge of the Amphipoda 134). *Glasnik Odeljenja Prirodnih Nauka* 4, 139-160.
- Kim, H. S. and K. S. Lee, 1977. A systematic study on the amphipods in Korea, II. On the geographical distribution and variation of species of freshwater *Gammarus* (Crustacea; Amphipoda, Gammaridae) *Korean J. Zool.*, **20** (1): 29-40.
- Lee, K. S., 1986. Systematic Study of Amphipoda (Crustacea) in Korea. VI. *G. hoonsooi*, a new species of freshwater gammarid (Gammaridae) from South Korea. *Korean J. Zool.*, **29** (3): 164-168.
- Lee, K. S. and H. S. Kim, 1980. On the geographical distribution and variation of freshwater *Gammarus* in Korea, including description of four new species. *Crustaceana. Suppl.*, **6**: 44-67.
- Pinkster, S., 1970. Redescription of *Gammarus pulex* (Linnaeus, 1758) based in neotype material (Amphipoda). *Crustaceana*, **18** (2): 177-186.
- Pinkster, S., 1971. Members of the *Gammarus pulex*-group (Crustacea-Amphipoda) from North Africa and Spain, with Description of A new species from Morocco. *Bull. Zool. Mus. Univ. Amsterdam*, **2** (7): 45-61.
- Pinkster, S., 1972. On members of the *Gammarus pulex*-group (Crustacea-Amphipoda) from Western Europe. *Bijdr. Dierk.*, **42**: 164-191, 7 figs.
- Pinkster, S., 1983. The value of morphological characters in the taxonomy of *Gammarus*. *Beaufortia*, **33** (2): 15-28.
- Pinkster, S. and A. Scholl, 1984. *Gammarus orinos* n. sp. from the Massif Central (France): its genetic and morphological distinction from *Gammarus ibericus* Margalef, 1951 (Crustacea, Amphipoda). *Bijdr. Dierk.*, **54** (1): 139-146.
- Uéno, M., 1940a. Some freshwater amphipods from Manchoukuo, Corea and Japan. *Bull. Biogeogr. Soc. Japan*, **10** (4): 63-85.
- Uéno, M., 1940b. Freshwater Amphipoda of Manchoukuo. *Rept. Limnobiol. Surv. Kwantung and Manchoukuo, Dairen*, 311-322 (In Japanese).
- Uéno, M., 1966. Results of the speleological survey in South Korea, 1966. II. Gammarid Amphipoda found in subterranean waters of South Korea. *Bull. Nat. Sci. Mus. Tokyo*, **9** (4): 501-535.

RECEIVED: 9 OCTOBER 1990

ACCEPTED: 26 OCTOBER 1990