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TWO NEW FRESHWATER SPECIES OF THE GENUS *JESOGAMMARUS* (CRUSTACEA: AMPHIPODA: ANISOGAMMARIDAE) FROM CHINA

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***ABSTRACT.* –** Two new freshwater species of the genus *Jesogammarus* collected from north China are reported. *Jesogammarus (J.) fontanus*, new species, is diagnosed by mandibular palp article 1 with three distal spines and uropod 3 foliaceous. *Jesogammarus (J.) hebeiensis*, new species, differs from the congeneric species in mandibular palp article 1 with two to three distal spines, uropod 3 lanceolate and telson longer than maximum basal width.

KEY WORDS. – China, freshwater, *Jesogammarus*, new species.

INTRODUCTION

The genus *Jesogammarus* Bousfield, 1979 is known from the North Pacific rim regions. Morino (1985) revised this genus, and amended *Annanogammarus* Bousfield and *Jesogammarus* Bousfield as two subgenera of the genus *Jesogammarus*. Up to now, 14 species of the genus *Jesogammarus* have been described, of which 12 species were reported from Japan by Morino (1984, 1985, 1993), Tomikawa & Morino (2003) and Tomikawa et al. (2003) and two species were from Korea by Lee & Seo (1990, 1992). In China, *Jesogammarus annandalei* (Tattersall) was recorded by Tattersall (1922) from Lake Taihu (Jiangsu Province) and Shanghai, although another record of *Jesogammarus annandalei* (Tattersall) by Shen (1954) is doubted by Morino (1985).

On examining the Amphipoda collections deposited in the Institute of Zoology, Chinese Academy of Sciences (IZCAS), two new *Jesogammarus* species were found. In the present paper, a detailed description of these two new species: *Jesogammarus (J.) fontanus*, new species, and *Jesogammarus (J.) hebeiensis*, new species, is given and differences to related species are discussed.

MATERIALS AND METHODS

Appendages were dissected and mounted on glass slides (see Holsinger, 1967). Drawings were made with a drawing tube mounted on an Olympus BX41 compound microscope. All holotypes examined are deposited at IZCAS. Parts of the paratypes are deposited at the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research, National University of Singapore.

TAXONOMY

Jesogammarus (Jesogammarus) fontanus, new species
(Figs. 1-4)

***Material examined.* –** Holotype – male (IZCAS-I-A0085), 9.3 mm, Linfen City (36.05°N, 111.31°E), Shanxi Province, 28 Feb.1985.

Paratype – 1 female, same data as for holotype.

***Diagnosis.* –** Peduncular article 1 of antenna 1 without posterodistal spine. Mandibular palp article 1 with three distal spines. Pleonites 1-3 without dorsomarginal spine. Outer ramus of uropod 2 with marginal spine. Uropod 3 foliaceous, inner ramus about one-forth of outer ramus. Telson longer than maximum basal width.

***Description.* –** Male, body length 9.3 mm. Eyes medium in size and reniform (Fig. 1A). Antenna 1 (Fig. 1E) distinctly longer than antenna 2, peduncular articles 1-3 in length ratio 1 : 0.71 : 0.45, with some setae on posterior margins; flagellum with 28 articles, most with aesthetascs; accessory flagellum with five articles. Antenna 2 (Fig. 1D): peduncular article 4 about as long as article 5, both with short setae along posterior and anterior margins; flagellum with 13 articles, proximal 8 articles cup-calceolate.

Upper lip subrounded (Fig. 1K), with minute setae. Left mandible (Fig. 1O): incisor with five teeth; lacinia mobilis

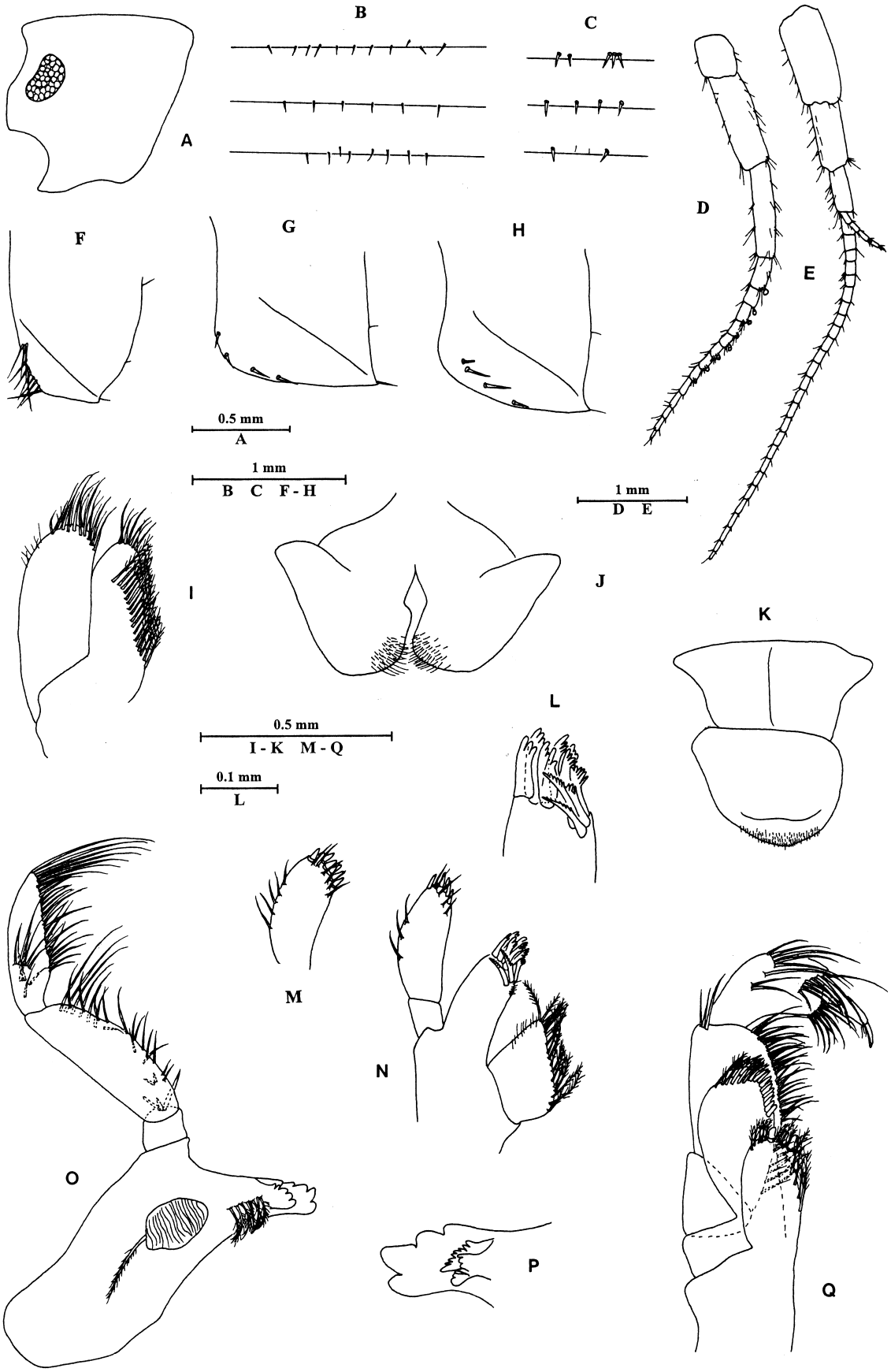

Fig. 1. *Jesogammarus (Jesogammarus) fontanus*, new species, holotype, male. A. head, B. pleonites, C. urosomites, D. antenna 2, E. antenna 1, F. epimeral plate 1, G. epimeral plate 2, H. epimeral plate 3, I. maxilla 2, J. lower lip, K. upper lip, L. outer plate of maxilla 1, M. right palp of maxilla 1, N. left maxilla 1, O. left mandible, P. right mandible, Q. maxilliped.

with five weak dentitions; molar with one seta; article 1 of palp with three spines on distal margin, article 2 with 12 marginal setae, nine submarginal setae and one pair of spines, article 3 about 83% of article 2 in length, with four A-setae, one group of 5 B-setae. Right mandible (Fig. 1P): incisor with four teeth; lacinia mobilis bifurcate. Lower lip (Fig. 1J): inner lobes absent. Maxilla 1 (Figs. 1L-N): inner plate with 17 plumose setae; outer plate with 11 serrated spines; article 2 of left palp with five apical spines accompanied by four setae and three setae on outer margin; article 2 of right palp with six apical stout spines accompanied by six setae and five setae on outer margin. Maxilla 2 (Fig. 1I): inner plate with 17 facial setae. Maxilliped (Fig. 1Q): inner plate with three apical stout spines, outer plate with a row of slender spines on medial margin and seven apical pectinate setae.

Coxal plate 1 weakly dilated distally (Fig. 2A), with two setae on postero-proximal margin, anterior corner with two setae, posterior corner with one stiff seta; coxal plates 2-3 subrectangular (Figs. 2B, 3A), posteroproximal margin bare; coxal plate 4 (Fig. 3B) excavated on posterior margin, with three spines; anterior lobe of coxal plates 5-6 (Figs. 3C, D) with one seta, posterior lobe with four setae; posterior margin of coxal plate 7 (Fig. 3E) with three setae. Coxal gills 2-5 (Figs. 3K-N) with two accessory lobes, accessory lobes of respective gills 2-4 subequal to each other, posterior lobe of gill 5 longer than anterior one; coxal gills 6-7 (Figs. 3O, P) with one accessory lobe.

Gnathopod 1 (Figs. 2A, C, D): basis with long setae on anterior and posterior margins; propodus broad, palm weakly oblique, with 13 and 10 peg spines on inner and outer margins, respectively; dactylus with one seta on outer margin. Gnathopod 2 (Figs. 2B, E): basis with longer setae on posterior margin than that of gnathopod 1; propodus more slender than that of gnathopod 1, with eight and seven peg spines on inner and outer palmar margins, respectively; dactylus with one seta on outer margin and one seta at hinge of nail.

Pereopods 3 and 4 similar (Figs. 3A, B, F, G). Bases with short setae on anterior margins and long setae on posterior margins, merus to propodus with slender spines and short setae on posterior margins, dactyli with one plumose seta on outer margin and one or two setae at hinge of nail.

Pereopods 6 and 7 longer than pereopod 5 (Figs. 3C-E, H-J). Bases with six to eight spines on anterior margins; posterior margin weakly concaved in pereopods 5 and 6, slightly expanded in pereopod 7, with a row of stiff setae; pereopods 6 and 7 with one spine on posterodistal corner. Merus and carpus with groups of spines along anterior and posterior margins. Dactyli with one plumose seta on outer margin and one seta at hinge of nail.

Pleonites 1-3 (Fig. 1B): posterodorsal margins with eleven, six and eight marginal setules, respectively. Epimeral plate 1 (Fig. 1F): lower margin horizontal, with 12 setae on anterior corner, posterodistal corner weakly acuminate, posterior margin with three setules; plate 2 (Fig. 1G) ventrally with four submarginal spines, posterior margin with two setules; plate 3 (Fig. 1H) with four spines on ventral margin, posterior margin with two setules. Pleopods 1-3 subequal in length (Fig. 2I), with dorsal and marginal setae, bearing two retinacula accompanied by three setae; inner ramus a little longer than outer ramus, both armed with plumose setae.

Urosomites 1-3 flat (Fig. 1C), urosomite 1 with two and three spines on dorsal margin, urosomite 2 with four evenly spaced spines, urosomite 3 with two spines laterally and two short setae medially. Uropod 1 (Fig. 2G): peduncle longer than both rami, with marginal spines and one basofacial spine; inner and outer ramus with two marginal spines, respectively. Uropod 2 (Fig. 2H): peduncle with three spines on each side, outer ramus with one spine on outer margin, inner ramus with two spines on outer margin. Uropod 3 (Fig. 2F): peduncle with seven distal spines; outer ramus foliaceous, with three groups of spines on outer margin, five groups of spines on inner margin accompanied by four plumose setae, terminal article about one-sixth of proximal article; inner ramus about one-fourth of outer ramus in length, with one spine and one plumose seta on outer margin.

Telson cleft (Fig. 2J), longer than maximum basal width, with one apical spine, left lobe with one distolateral spine.

Female – Body length 9.6 mm, ovigerous. Coxal plates 1-4 (Figs. 4A-D) with a row of setae on posteroproximal margins, inner faces with some long setae; coxal plates 5-7 (Figs. 4I-K) with three to five long setae on lower margins.

Gnathopod 1 (Fig. 4G): propodus ovate, palm oblique, with nine simple spines on posterodistal corner. Gnathopod 2 (Fig. 4H): propodus subrectangular, with four simple spines on inner margin and three pectinate spines on outer margin. Bases of pereopods 5-7 (Figs. 4I-K) with a row of long setae on posterior margins, inner faces with groups of long setae, pereopod 6 with one slender spine on posterodistal corner, pereopod 7 with two spines on posterodistal corner. Oostegites 2-5 broad (Fig. 4E), with many marginal setae.

Etymology. **–** The epithet *fontanus* refers to the biotope.

Remarks. **–** *Jesogammarus (J.) fontanus*, new species, is very similar to *Jesogammarus (J.) spinopalpus* Morino, 1985, in: (1) peduncular article 1 of antenna 1 without spine, (2) palp article 1 of mandible with three distal spines, (3) strong sexual dimorphism on the bases 5-7 and coxal plates 1-4, (4) uropod 2 with a marginal spine on outer ramus, and (5) elongate telson. The new species differs from *J. (J.) spinopalpus* by (1) medium sized eyes (small eyes in *spinopalpus*), (2) urosomite 1 with two and four spines on posterodorsal margin (four singularly inserted spines in *spinopalpus*), and (3) uropod 3 foliaceous (slender in *spinopalpus*).

Jesogammarus (J.) fontanus is also similar to *J. (J.) hinumensis* Morino, 1993 in (1) weakly setose antenna 2, (2) spinose palp article 1 of mandible, (3) gills short accessory lobes and (4) setose pleonites. *J. (J.) fontanus* is distinguished from *J. (J.) hinumensis* by (1) medium sized eyes (large eyes

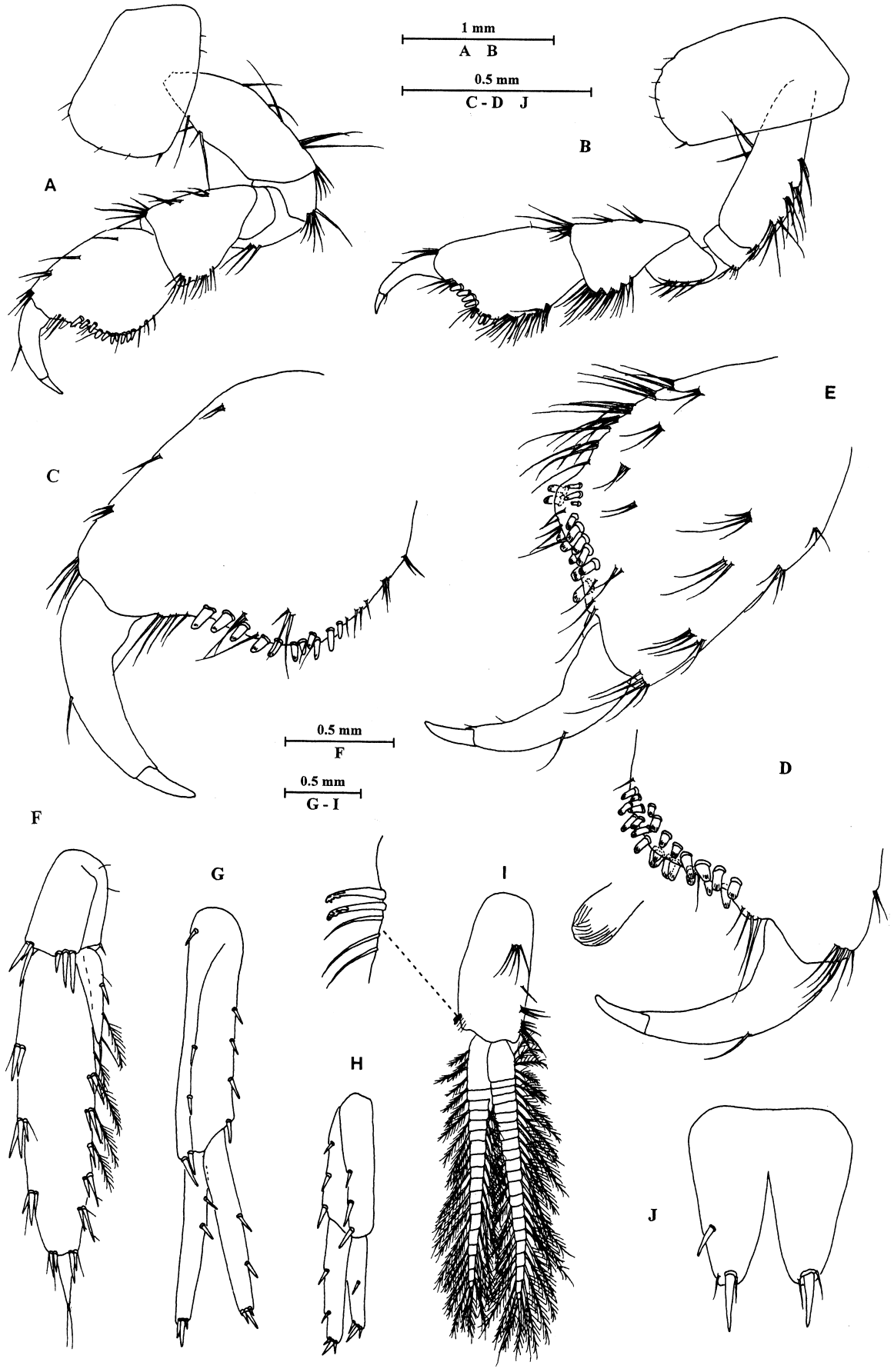

Fig. 2. *Jesogammarus (Jesogammarus) fontanus*, new species, holotype, male. A. gnathopod 1, B. gnathopod 2, C. propodus of gnathopod 1, D. propodus of gnahtopod 1 (inner face), E. propodus of gnathopod 2, F. uropod 3, G. uropod 1, H. uropod 2, I. pleopod 1, J. telson.

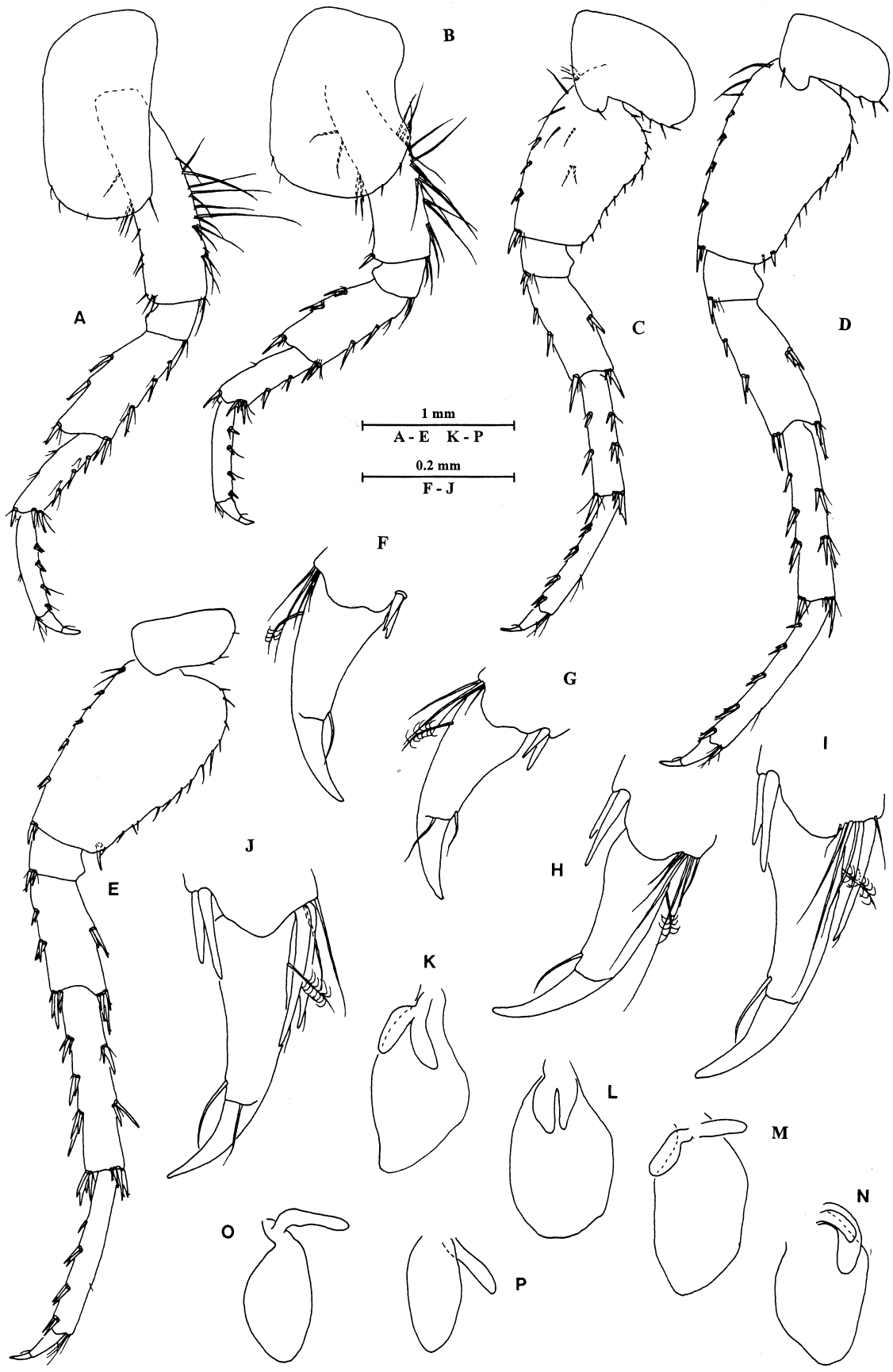

Fig. 3. *Jesogammarus (Jesogammarus) fontanus*, new species, holotype, male. A. pereopod 3, B. pereopod 4, C. pereopod 5, D. pereopod 6, E. pereopod 7, F. dactylus of pereopod 3, G. dactylus of pereopod 4, H. dactylus of pereopod 5, I. dactylus of pereopod 6, J. dactylus of pereopod 7, K. coxal gill of gnathopod 2, L. coxal gill of pereopod 3, M. coxal gill of pereopod 4, N. coxal gill of pereopod 5, O. coxal gill of pereopod 6, P. coxal gill of pereopod 7.

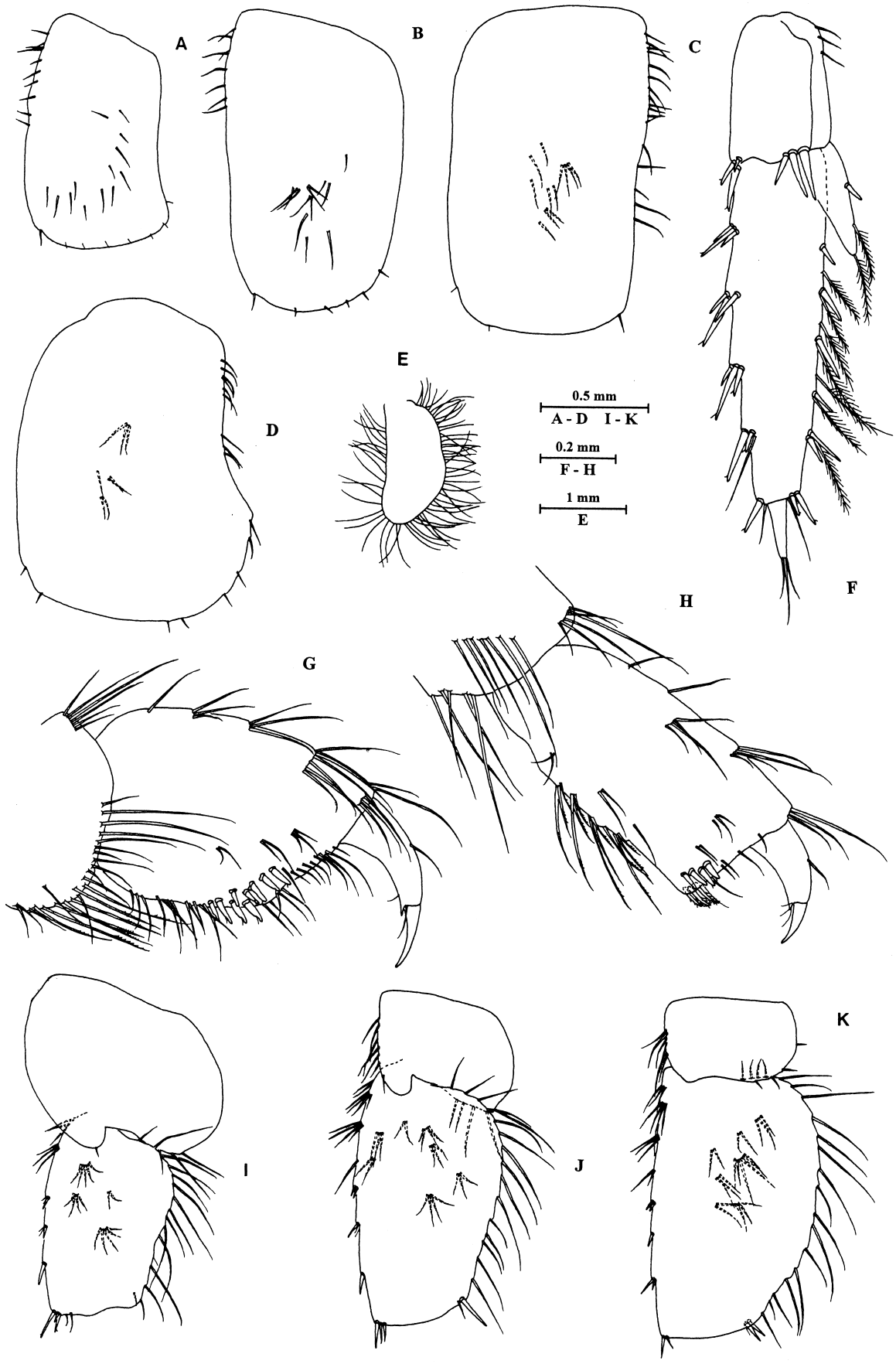

Fig. 4. *Jesogammarus (Jesogammarus) fontanus*, new species, paratype, female. A. coxal plate 1 (inner face), B. coxal plate 2 (inner face), C. coxal plate 3, D. coxal plate 4, E. oostegite of gnathopod 2, F. uropod 3, G. propodus of gnathopod 1, H. propodus of gnathopod 2, I. basis of pereopod 5, J. basis of pereopod 6, K. basis of pereopod 7.

in *hinumensis*), (2) peduncular article 1 of antenna 1 without posterodistal spine (one spine in *hinumensis*), (3) pleonites 1-3 with 8-12 setae (1-2 setose in *hinumensis*), and (4) uropod 3 foliaceous (slender in *hinumensis*), (5) pereopods of female with setation only in basis (basis to carpus setation in *hinumensis*).

***Habitat.* –** This new species is collected from a drinking well in Linfen City. The drinking well water temperature is between 4-7°C throughout the year.

Jesogammarus (Jesogammarus) hebeiensis, new species
(Figs. 5-8)

***Material examined.* –** Holotype – male (IZCAS-I-A0087), 13.2 mm, Lake Baiyangdian (38.5°N, 115.55°E), Hebei Province, coll. Shuqiang Li, 19 Mar.1989.

Paratypes – 19 males (IZCAS), 10 males (ZRC), same data as for holotype.

***Diagnosis.* –** Mandibular palp article 1 with two distal spines. Pleonites 1-3 without dorsomarginal spine. Inner lobes of lower lip distinct. Uropod 3 lanceolate, inner ramus about one-third of outer ramus. Telson longer than maximum basal width.

***Description.* –** Male, body length 13.2 mm. Head (Fig. 5A): eyes medium in size, inferior antennal sinus distinct. Antenna 1 (Fig. 5D): peduncular articles 1-3 in length ratio 1: 0.82: 0.53, with several short setae, peduncular article 1 lacking or with one posterodistal spine; flagellum with 29 articles, most with aesthetascs; accessory flagellum with five articles. Antenna 2 (Fig. 5E): peduncular articles 4 and 5 subequal in length, with some short setae; flagellum with 16 articles, with calceoli.

Upper lip subrounded (Fig. 5G), with minute setae. Mandibles (Figs. 5M, L): left incisor with five teeth; lacinia mobilis with four dentitions; molar with one seta; article 1 of palp with two or three spines distally, article 2 with five submarginal spines and nine marginal setae and 12 submarginal setae, article 3 about 85% of article 2 in length, with four groups of A-setae; right incisor with four teeth; lacinia mobilis bifurcate. Lower lip (Fig. 5F): inner lobes distinct. Maxilla 1 asymmetrical (Figs. 5I, J), inner plate with 20 plumose setae; outer plate with 11 serrated spines; article 2 of left palp with seven slender spines accompanied by five stiff setae; article 2 of right palp with six distal spines accompanied by five setae, and three setae on outer margin. Maxilla 2 (Fig. 5K): inner plate with a diagonal row of 18 plumose setae on inner face. Maxilliped (Fig. 5H): inner plate with one subapical spine and three apical spines; outer plate with a row of spines and several pectinate setae.

Coxal plates 1-3 subrectangular (Figs. 6A-C), with short setae on lower margins, coxal plates 2-3 with three to five setae on posterior margins; coxal plate 4 (Fig. 6D)excavated on posterior margin, with two setae on anterior corner and eight setae on posterior margin; anterior lobe of coxal plate 5 (Fig. 7A) with one seta, posterior lobe with four stiff setae on lower margin; coxal plate 6 (Fig. 7B) with two setae on anterior margin and four stiff setae on posterodistal corner; coxal plate 7 (Fig. 7C) with four long setae on anterior margin and six short setae on posterior margin. Coxal gills 2-7 (Figs. 7K-P), accessory lobes of respective gills 2-4 subequal to each other in length; anterior lobe of gill five longer than posterior lobe.

Gnathopod 1 (Figs. 6A, E): basis with long setae on anteroproximal and posterior margins; palm of propodus with eight and 11 peg spines on inner and outer margins, respectively; dactylus with one seta on outer margin. Gnathopod 2 (Figs. 6B, F): basis similar to that of gnathopod 1; palm of propodus with eight and nine peg-shaped spines on inner and outer margins, respectively; dactylus with one seta on outer margin.

Pereopod 3 (Figs. 6C, G): basis with long setae on posterior margin; merus to propodus with groups of spines on posterior margins; dactylus with one plumose seta on outer margin and two setae at hinge of nail. Pereopod 4 (Figs. 6D, H): the armature of pereopod 4 similar to that of pereopod 3.

Pereopod 6 longer than pereopods 5 and 7 (Figs. 7A-F). Posterior margin of basis weakly sinuated in pereopod 5, expanded in pereopod 7, bearing a row of 18 short setae; inner face of bases of pereopods 6 and 7 with two posterodistal spines; merus to propodus with clusters of spines on anterior margins; dactyli slender, with one plumose seta on outer margin.

Pleonites 1-3 (Fig. 5B): posterodorsal margins with four, ten and four marginal setules, respectively. Epimeral plates weakly acuminated posteriorly, with a setule on posterodistal corner. Plate 1 (Fig. 7G) with 16 setae on anteroventral corner; plate 2 (Fig. 7H) with four submarginal spines and two marginal spines; plate 3 (Fig. 7I) with six spines on anterior ventral margin. Pleopods 1-3 subequal (Figs. 8A-C), peduncles with many setae on outer margins; both rami armed with plumose setae.

Urosomites without humps (Fig. 5C), urosomite 1 dorsomarginally with two clusters of four spines, urosomite 2 with one-two-one-one spines, urosomite 3 with one pair of lateral spines and two pairs of medial setae. Uropod 1 (Fig. 8D): peduncle with marginal spines and one basofacial spine; inner ramus with three spines on inner margin; outer ramus with one spine and two spines on outer and inner margins, respectively. Uropod 2 (Fig. 8E): peduncle with four and three spines on outer and inner margins, respectively; inner ramus with three spines and one spine on inner and outer margins, respectively; outer ramus shorter than inner ramus, with one spine on each side. Uropod 3 (Fig. 8F): peduncle with eight distal spines; inner ramus less than one-third of outer ramus in length, with two marginal spines and one distal spine; outer ramus lanceolate, with four groups of spines on outer margin, inner margin with five spine clusters and some plumose setae, terminal article about one-sixth times as long as proximal article.

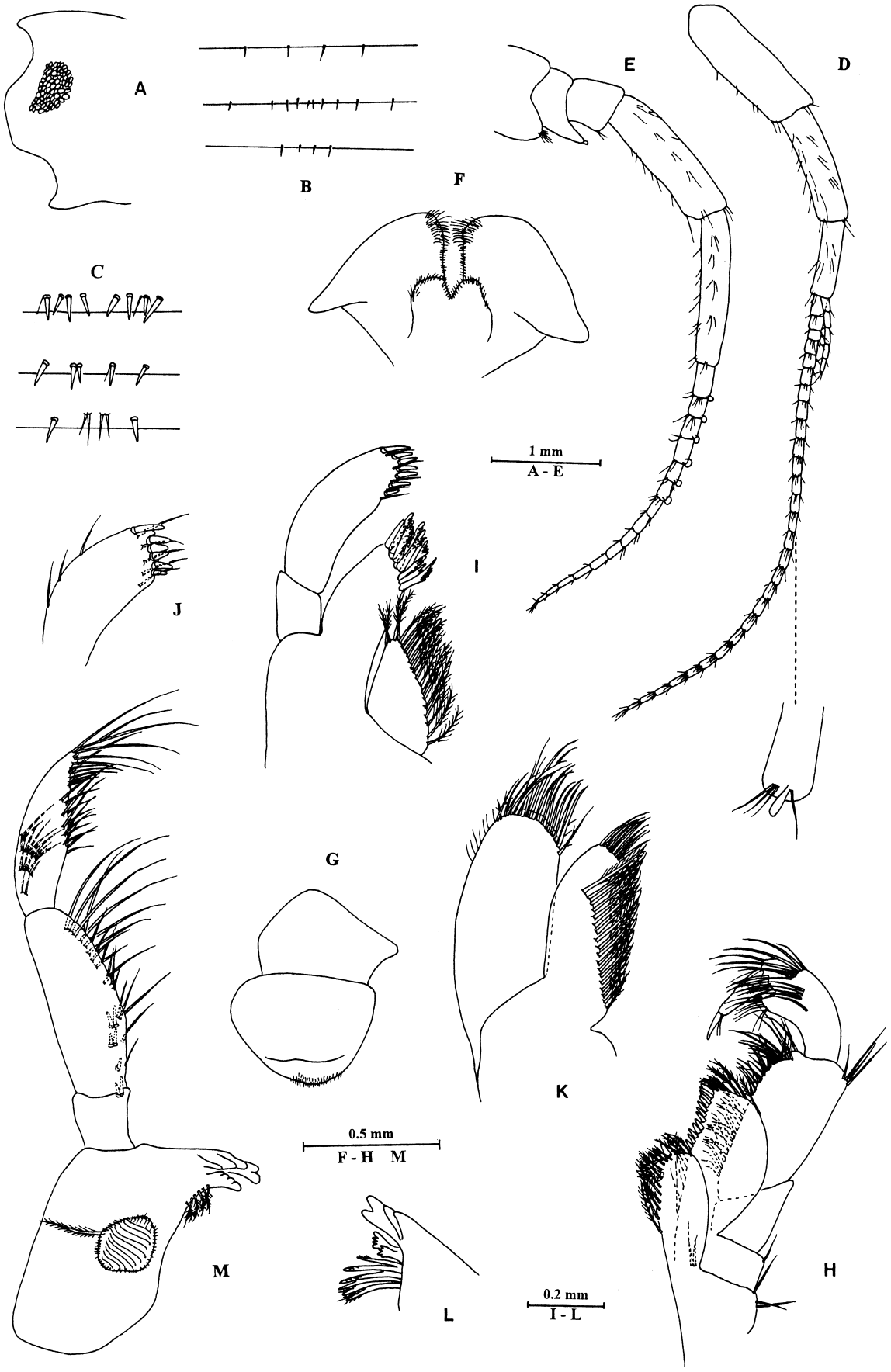

Fig. 5. *Jesogammarus (Jesogammarus) hebeiensis*, new species, male. A. head, B. pleonites (dorsal view), C. urosomites, D. antenna 1, E. antenna 2, F. lower lip, G. upper lip, H. maxilliped, I. left maxilla 1, J. palp of right maxilla 1, K. maxilla 2, L. incisor of right mandible, M. left mandible.

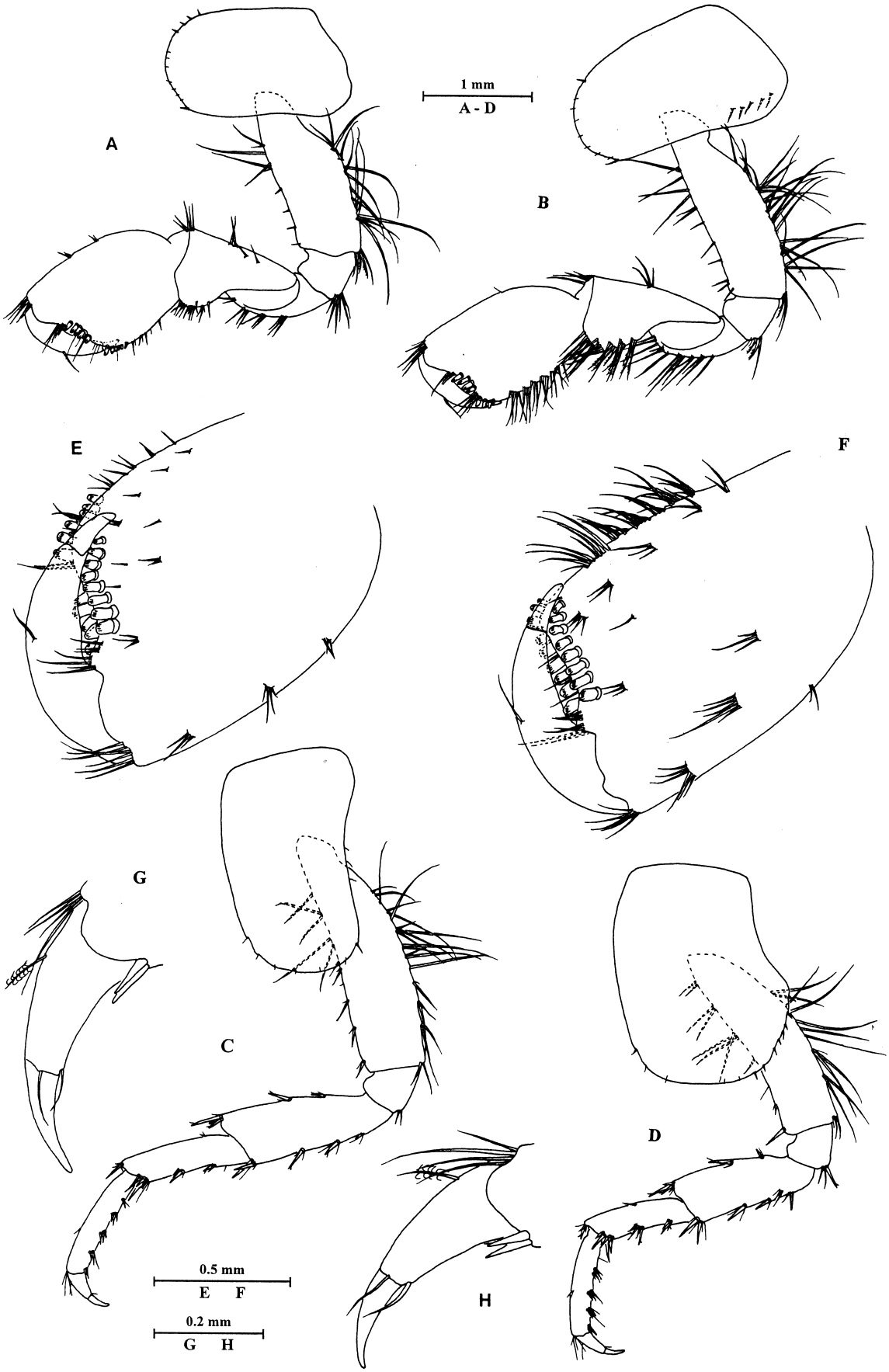

Fig. 6. *Jesogammarus (Jesogammarus) hebeiensis*, new species, male. A. gnathopod 1, B. gnathopod 2, C. pereopod 3, D. pereopod 4, E. propodus of gnathopod 1, F. propodus of gnathopod 2, G. dactylus of pereopod 3, H. dactylus of pereopod 4.

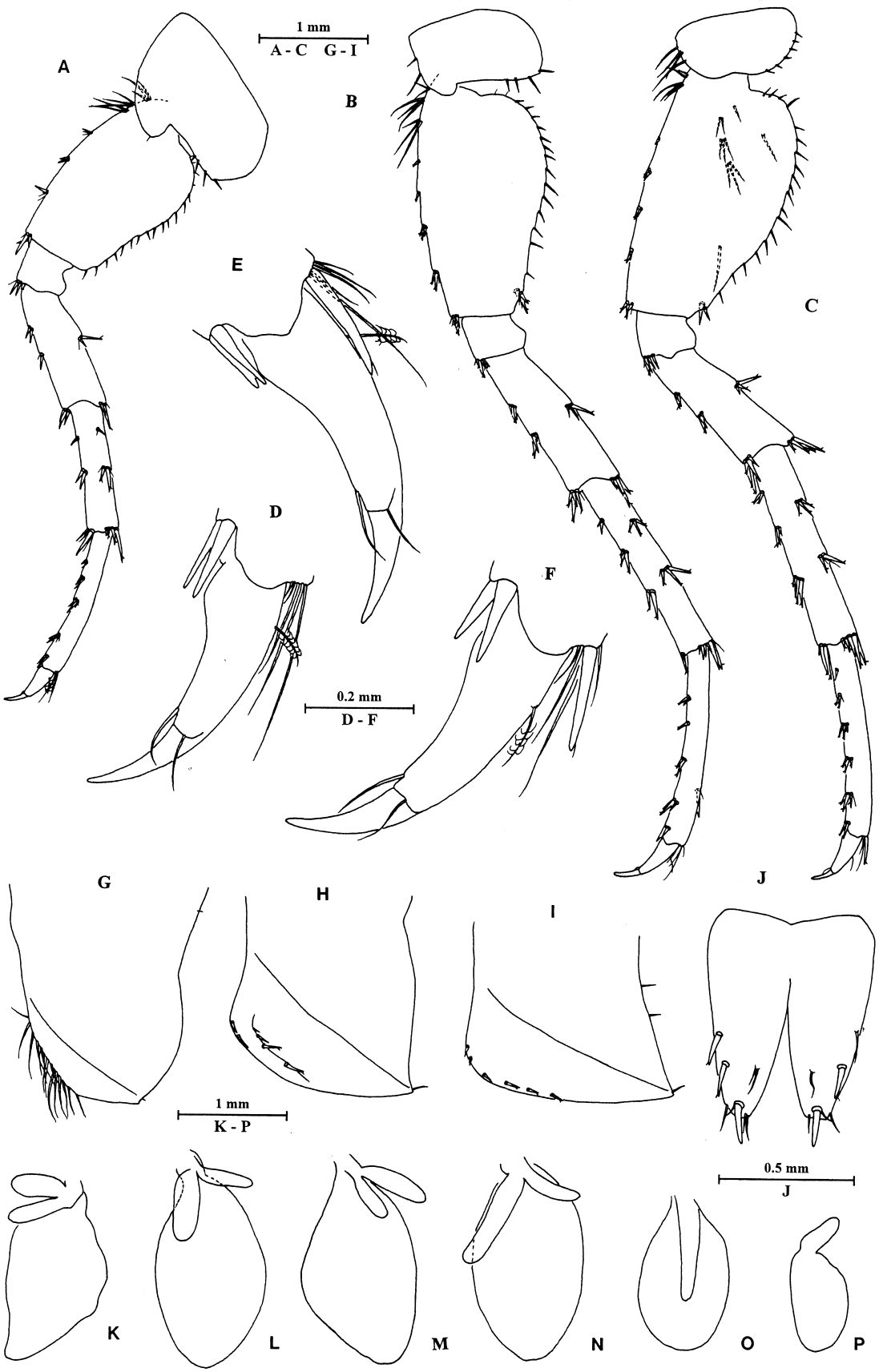

Fig. 7. *Jesogammarus (Jesogammarus) hebeiensis*, new species, male. A. pereopod 5, B. pereopod 6, C. pereopod 7, D. dactylus of pereopod 5, E. dactylus of pereopod 6, F. dactylus of pereopod 7, G. epimeral plate 1, H. epimeral plate 2, I. epimeral plate 3, J. telson, K. coxal gill of gnathopod 2, L. coxal gill of pereopod 3, M. coxal gill of pereopod 4, N. coxal gill of pereopod 5, O. coxal gill of pereopod 6, P. coxal gill of pereopod 7.

Telson deeply cleft (Fig. 7J), longer than maximum basal width, bearing distal and distolateral spines.

***Etymology.* –** The species is named for the type locality, Hebei Province.

***Variation.* –** Pednucular article 1 of antenna 1 with one posterodistal spine in 21% specimens, and with posterodistal setae in 79% specimens. Mandibular palp article 1 with two distal spines in 42% specimens, and with three distal spines in 58% specimens.

***Remarks.* –** *Jesogammarus (J.) hebeiensis*, new species, is very closely related with *J. (J.) fontanus*, new species, in: (1) peduncular article 1 of antenna 1 without distal spine, (2) spinose palp article 1 of mandible, and (3) outer ramus of uropod 2 with marginal spines. *J. (J.) hebeiensis* differs from *J. (J.) fontanus* by (1) inner lobes of lower lip distinct, (2) bases of pereopods 5-7 with more setae on posterior margin, and (3) inner ramus of uropod 3 about one-third of outer ramus in length, outer ramus lanceolate, and inner margin of outer ramus with four to six plumose setae (inner ramus about one-fourth of outer ramus, outer ramus foliaceous, and inner margin of outer ramus with about 10 plumose setae in *fontanus*).

Jesogammarus (J.) hebeiensis is similar to *J. (J.) fujinoi* Tomikawa & Morino, 2003 in (1) the distinct inner lobe of lower lip, (2) the armature of epimeral plates 1-3, and (3) pleonites 1-3 without dorsal spine. *J. (J.) hebeiensis* differs from the latter by (1) peduncular article 1 of antenna 1 without distal spines (one spine in *fujinoi*), (2) mandibular palp article 1 with two to three distal spines (unarmed in *fujinoi*), (3) outer ramus of uropod 2 with marginal spines (marginally bare in *fujinoi*), and (4) telson longer than maximum basal width (shorter than basal maximum width).

Jesogammarus (*J.*) *fontanus* and *J.* (*J.*) *hebeiensis* seem to compose a spinopalpus cluster with two Japanese species: *J.* (*J.*) *spinopalpus* Morino, 1985 and *J.* (*J.*) *hinumensis* Morino, 1993 in sharing spines on mandibular palp article 1, setose pleonites, sexually dimorphic setation in pereopods 5-7 (not confirmed in *hebeieneis*), and elongate telson. The further study of relationship among these four species is necessary.

***Habitat.* –** This new species occurs in Lake Baiyangdian, about 100 km south of Beijing. Lake Baiyangdian consists of 141 small lakes, covers 366 square kilometers and is thought to be the largest freshwater lake in North China. Lake Baiyangdian was dried several times in the last 15 years because of too much reservoirs in up streams. Attempt to collect female specimens of current species are failed for two times.

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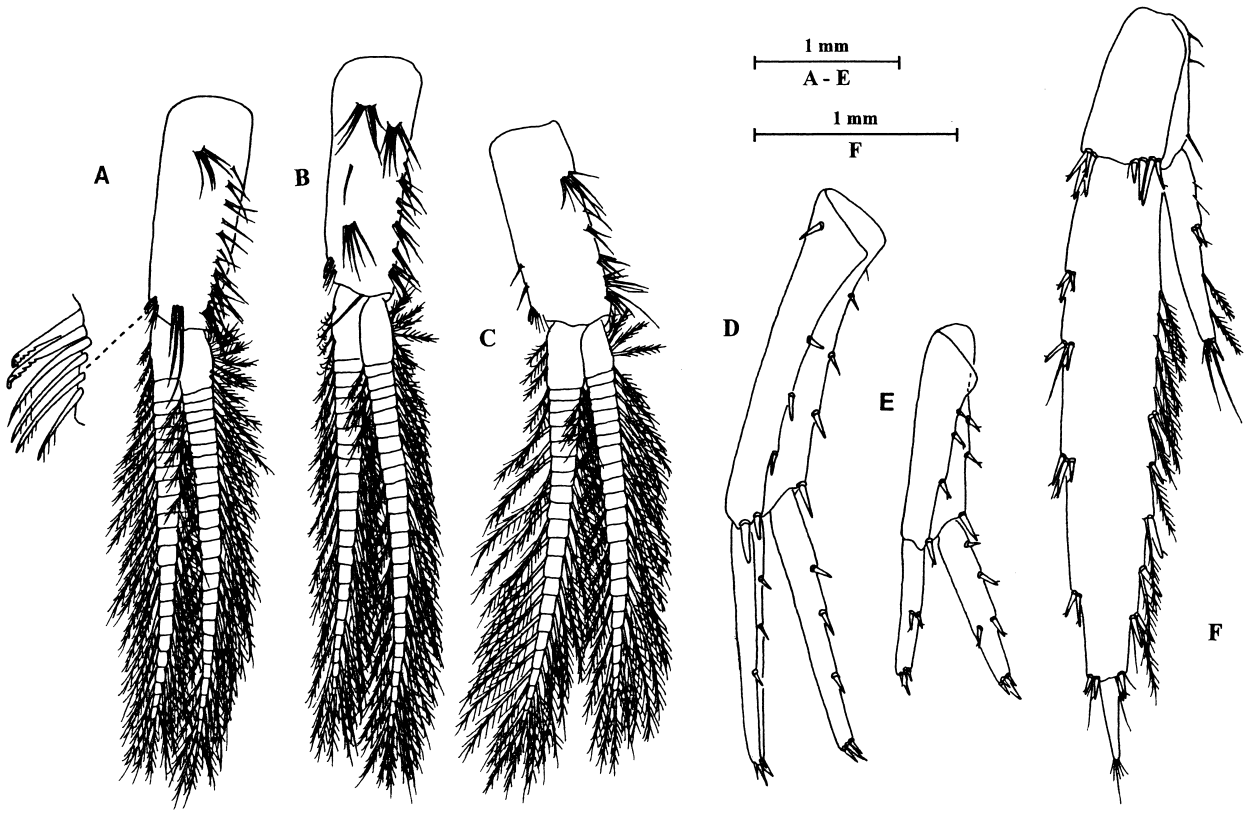

Fig. 8. *Jesogammarus (Jesogammarus) hebeiensis*, new species, male. A. pleopod 1, B. pleopod 2, C. pleopod 3, D. uropod 1, E. uropod 2, F. uropod 3.

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