

Two New Thalestrid Harpacticoids (Copepoda, Harpacticoida, Thalestridae) from Korea

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Two new harpacticoid species of family Thalestridae are described on the basis of the specimens collected from the shallow sublittoral sand bottom or seagrasses of rocky shore in South Korea. *Dactylopusia pauciarticulata* n. sp. is discernible from its 19 congeners by the 6-articulated antennule. *Paradactylopodia koreana* n. sp. most resembles *P. striata* Kunz, 1973 of its seven congeners, but obviously distinguished from it by the shape of male leg 2 endopod.

The Korean thalestrid harpacticoids had not been studied until recently, when Ho and Hong (1988) described two new species, *Amenophia orientalis* and *Parathalestris infestus*, which were suspected to make galls and pinholes on the brown seaweed (*Undaria pinnatifida*), one of the common cultivating seagrass in Korea. Thereafter, we redescribed two species of genus *Eudactylopus*, *E. spectabilis* and *E. andrewi* (Chang and Song, 1995). Furthermore, Yoo and Lee (1995) reported *Paradactylopodia serrata* Lang, 1965 from western coast of Korea, but it turned out to be a mis-identification and will be described as a new species in this paper.

The present paper deals with two species of family Thalestridae each belonging to genera *Dactylopusia* and *Paradactylopodia*, occurred abundantly and frequently on sublittoral sand bottom or between algal bed of rocky shore around the coast of South Korea.

Collections were made with a dipnet of no. 10 mesh size or a light trap. Specimens were dissected, figured and measured in lactophenol on the Cobb's aluminum hole slide. Figures were made with the aid of a camera lucida. Numbers of material examined count only the specimens dissected and mounted.

Descriptions

Family Thalestridae Sars, 1905 *sensu* Lang, 1948
Subfamily Dactylopodinae Lang, 1936
Genus *Dactylopusia* Norman, 1903

Dactylopusia pauciarticulata n. sp.
(Figs. 1 and 2)

Type specimens: 15 ♀♀, 6 ♂♂, Chungmun, Cheju I. (33°14'21"N, 126°25'12"E), 24 Jan. 1994. Holotype (♀) and paratypes (5 ♀♀, 2 ♂♂) will be deposited in the U. S. National Museum of Natural History, Smithsonian Institution. Other dissected (3 ♀♀, 2 ♂♂) and undissected (6 ♀♀, 2 ♂♂) paratypes are deposited in the collection of the authors.

Additional material examined: 2 ♀♀, Chonbu, Ullung I., 2 Mar. 1995; 1 ♀, Taeha-ri, Ullung I., 4 Mar. 1995; 1 ♀ (ovi.), Pyonggok, 21 July 1995; 1 ♀ (ovi.), Changsa, 22 Nov. 1993; 1 ♀, 1 ♂, Wolpo, 25 June 1990; 1 ♂, Songjong, Pusan, 16 Jan. 1993; 1 ♀, Songjong, Pusan, 26 Jan. 1993; 1 ♀, Songjong, Pusan, 16 Sep. 1993; 2 ♀♀, Pangjukpo, 3 May 1995; 2 ♀♀, 1 ♂, Manripo, 31 Jul. 1995; 1 ♀, 2 ♂♂, Hallim, Cheju I., 5 Apr. 1994.

Female: Body (Fig. 1A) 0.56-0.62 mm long, excluding rostrum and caudal setae, and broadest near posterior margin of cephalothorax, tapering behind. Rostrum a little protruding anteroventrally, defined at its base, broadly rounded in front with a minute sensory hair in each side. Prosome oblong. Cephalothorax protruding, as long as succeeding 3 thoracic somites combined; posterior margins of thoracic somites bare. Genital double somite (Fig. 1B) fully fused with transverse suture on ventral side, and with a line of subdivision on dorsal surface. Genital area as in Fig. 1B. Each abdominal somite bearing 1 row of setules on outer-distal corner, and hyaline frill with 1 row of setules on posterior margin. Anal somite bearing 1 row of setules on distal edge. Furcal ramus about 2 times wider than long; inner terminal seta stout, but not so swollen at its base.

Antennule (Fig. 1C) 6-articulated with 1 aesthetasc on tip of third segment which is formed by fusion of

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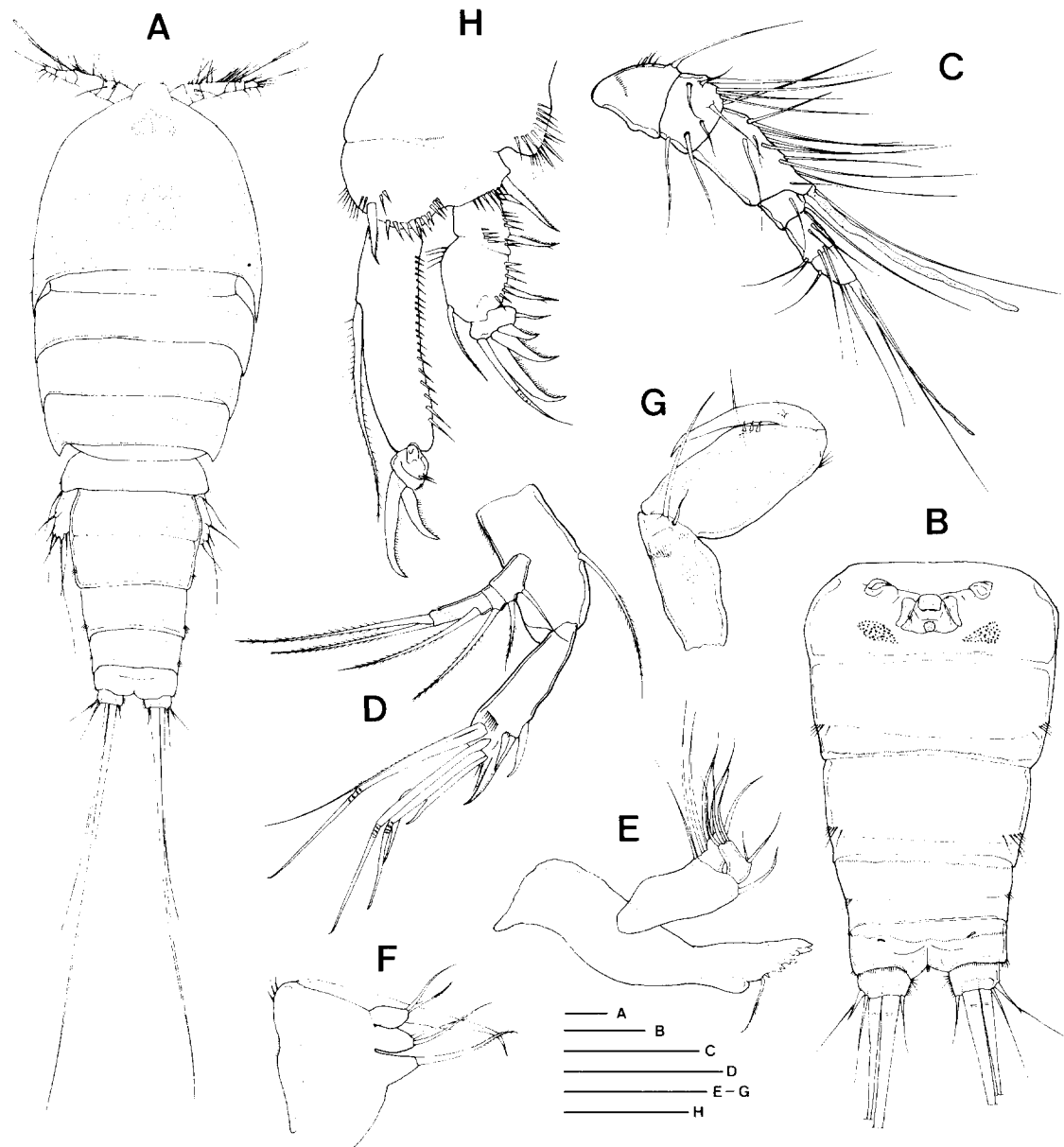


Fig. 1. *Dactylopusia pauciariculata* n. sp., female. A, Habitus (dorsal). B, Urosome (ventral). C, Antennule. D, Antenna. E, Mandible. F, Maxilla. G, Maxilliped. H, Leg 1. Scale bars=0.05 mm.

segments, thus appearing as big and robust; last and penultimate segment each formed by fusion of 2 segments. Exopod of antenna (Fig. 1D) distinctly 3-segmented; proximal segment bearing 2 setae, middle one 1 seta, distal one 1 inner + 2 apical setae; distal segment markedly slender. Endopod a little swollen distally, with 1 plumose seta, 4 geniculate setae, 1 slender seta and 3 spines.

Exopod and endopod of mandible (Fig. 1E) well-developed, both 1-segmented and bearing 5 setae. Praecoxal arthrite of maxillula with 2 setae on surface, 2 spiniform setae near end of dorsal edge, and 5 unguiform terminal setae; coxa bearing 3 setae medi-

ally, with epipodite represented by a strong seta; exopodite narrowed distally with 3 terminal setae; endopod with 4 slender setae. Syncoxa of maxilla (Fig. 1F) bearing 3 endites of similar lengths, each furnished with 1, 2 and 2 setae, counting distad; allobasis with 1 endite transformed into a long claw. Maxilliped (Fig. 1G) chelate; basis oblong, with 1 slender and 1 strong seta on distal edge; anterior margin of first endopodite nearly smooth, with 1 seta and a few spinules near inner distal edge; second endopodite with 1 stout claw and 2 minute setules.

Exopod and endopod of all leg 1-4 3-segmented. First endopodal segment of leg 1 (Fig. 1H) much

longer than exopod, with 1 stout plumose seta on proximal third to quarter of inner margin; second segment with several sharp spinules outerdistal edge; distal segment bearing 2 pectinate claws. Second exopodal segment a little enlarged, with 1 inner seta; distal one short and broadened, bearing 5 geniculate spines or arched claws in total. First endopodal segments of leg 2-4 (Fig. 2A-C), each with 1 inner seta; second endopodal segments each with 2 inner setae, of which proximal one bare and slender, especially that of leg 2 mostly pointing downward. The ornamentation of legs 2-4 are as follows (Roman numerals indicating spines and Arabic numerals representing setae):

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

Distal end of baseoendopod in leg 5 (Fig. 2D) not reaching tip of exopod; baseoendopod not confluent in its base, bearing 5 spines with a demarcation on apex of distal margin. Exopod rather oblong, tapering posteriorly, about 1.42 times as long as broad; inner margin swollen; bearing 6 setae in total.

Male: Disteromedian spine on basis of leg 1 as shown in Fig. 2E. Distal endopodal segment of leg 2 (Fig. 2F) with 1 downward slender inner setae, 2 strong plumose inner setae, 2 apical setae, and an inwardly hooked seta. Leg 3 and leg 4 nearly same in shape with female's. Distal end of baseoendopod in leg 5 (Fig. 2G) not reaching exopod, bearing 3 setae, inner one of which apart from other two; baseoendopod confluent at its proximal half; exopod much broader than long with 6 setae in total. Leg 6 represented by a small plate bearing 3 slender setae.

Remarks: The genus *Dactylopusia* Norman comprises 19 species or subspecies. The present new species is the first species bearing 6-articulated antennules against its congeners with 7-9 articulated ones, as suggested by the specific name, *pauciarticulata*.

This species appears most close to *D. crassipes* Lang, 1965 from California in the armature of the antennal exopod (setation of 2-1-3) and the plesiomorphic character state of sexually modified leg 2 endopod in male, that is, somewhat less transformed structure and ornamentation as in female's. However, it is obviously distinguished from *D. crassipes* by having the small leg 5 exopod of female (while it is the big foliaceous one much exceeding baseoendopod in *D. crassipes*), and the strong inner setae on the distal endopodal segment of male leg 2 (while both inner middle and distal setae minimized in *D. crassipes*).

Though this species is somewhat similar in the antennal exopod to *D. longyearbyenensis* Mielke, which was described on the basis of male specimens only from Spitzbergen (Mielke, 1974), but differs from the latter in bearing the 6 marginal setae on leg 5 exopod against 7 setae in *D. longyearbyenensis*, and the non-metamorphosed outerdistal seta of male leg 2 endopod against the serrated spinous seta in *D. longyearbyenensis*.

Genus *Paradactylopodia* Lang, 1948

Paradactylopodia koreana n. sp.

(Figs. 3 and 4)

Paradactylopodia serrata (not Lang, 1965) *sensu* Yoo and Lee, 1995 (p. 41, fig. 10)

Type specimens: 12 ♀♀, 8 ♂♂, Chungmun, Cheju I. (33°14'21"N, 126°25'12"E), Feb. 20, 1995. Holotype (♀) and paratypes (3 ♀♀, 1 ♂♂) will be deposited in the U. S. National Museum of Natural History, Smithsonian Institution. Other dissected (3 ♀♀, 6 ♂♂) and undissected (5 ♀♀, 1 ♂♂) paratypes are deposited in the collection of the authors.

Additional material examined: 2 ♀♀ (1 ovi.), 1 ♂♂, Namae, 8 May 1993; 1 ♀, Chodong, Ullung I., 7 Apr. 1995; 2 ♀♀, 1 ♂♂, Taeha-ri, Ullung I., 4 Mar. 1995; 1 ♀ (ovi.), Tonggumi, Ullung I., 17 Aug. 1995; 1 ♀, 1 ♂♂, Pyonggok, 21 July 1995; 1 ♀, Changsa, 22 Nov. 1993; 1 ♀, 1 ♂♂, Hwajin, 10 Nov. 1995; 1 ♂♂, Songjong, Pusan, 26 Jan. 1993; 2 ♀♀ (1 ovi.), Sochon, 5 Mar. 1992; 1 ♀, 1 ♂♂, Aewol, Cheju I., 20 Oct. 1995.

Female: Body (Fig. 3A) robust and stumpy, tapering behind 0.56-0.62 mm long excluding rostrum and furcal setae; broadest near posterior margin of cephalothorax, about 0.23 mm wide. Rostrum prominent and defined at base. Prosome oval. Cephalothorax protruding, a little longer than sum of next 3 thoracic somite; posterior margins of thoracic somites bare. Genital double somite (Fig. 3B) fully fused with transverse suture. Next two abdominal somites bearing 1 row of spinules on ventral surfaces. Anal somite with a few sharp spinules on inner middle of ventral surface and 1 row of setules on distal edge. Anal operculum triangular with 1 row of fine setules on its posterior margin. Furcal ramus very short, about 1.5 times wider than long; inner terminal seta stout, mostly swollen at base; several long setules on inner distal edge of ramus.

Antennule (Fig. 3C) of 6 segments with 1 aesthetasc on tip of third article which is partly fused, thus shown big and robust. Exopod of antenna (Fig. 3D) distinctly 3-segmented; proximal segment bearing 2 setae, middle one 1 seta, distal one 1 inner + 3 apical setae; endopod a little swollen distally, with 6 geniculate or plumose setae, 1 slender seta and 3 outer spines.

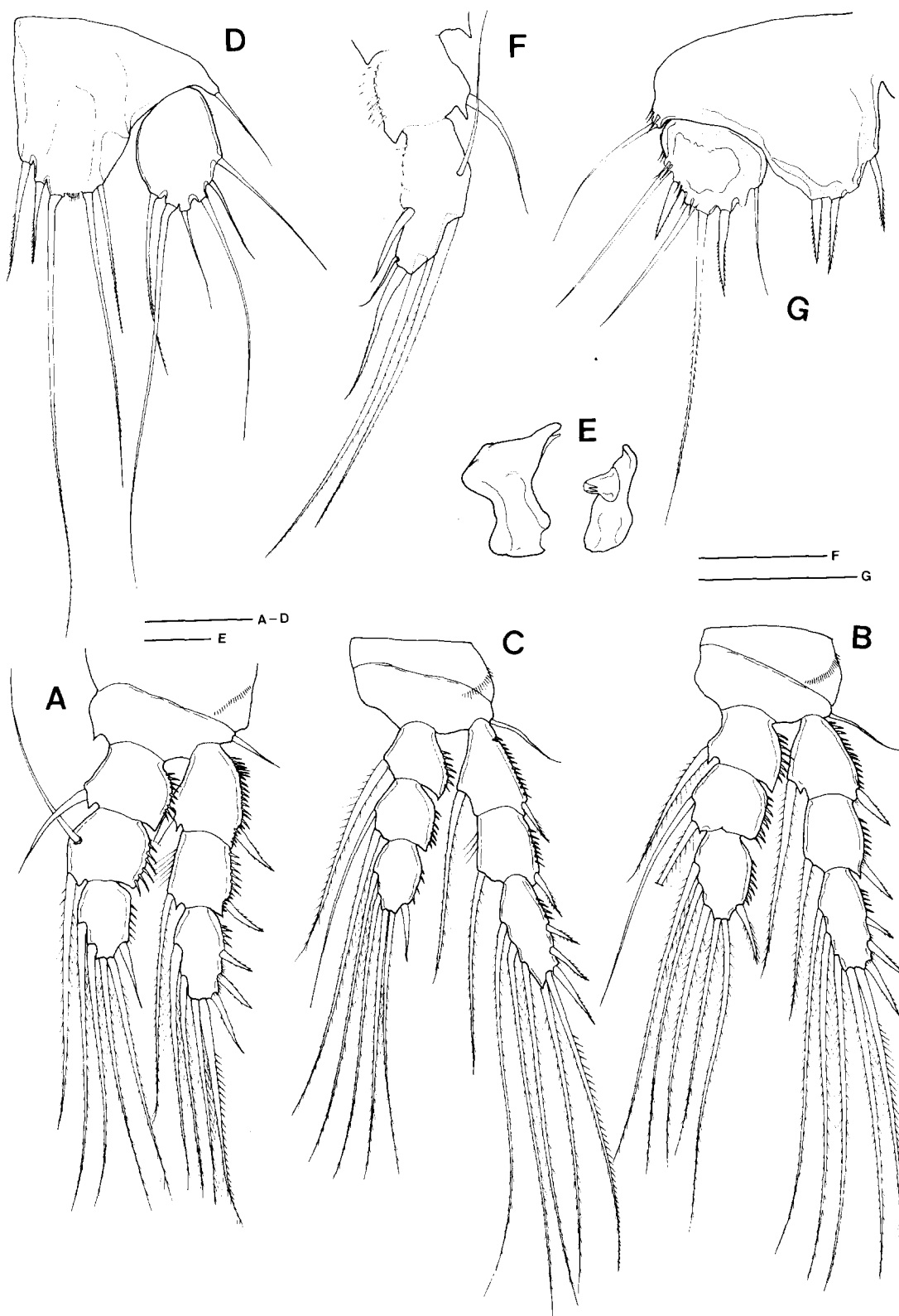


Fig. 2. *Dactylopusia pauciarticulata* n. sp., female. A-D, Legs 2-5. Male. E, Disteromedian spine on the basis of leg 1 in different positions. F, Endopod of leg 2. G, Leg 5. Scale bars=0.01 mm (E) and 0.05 mm (A, B, C, D, F, G).

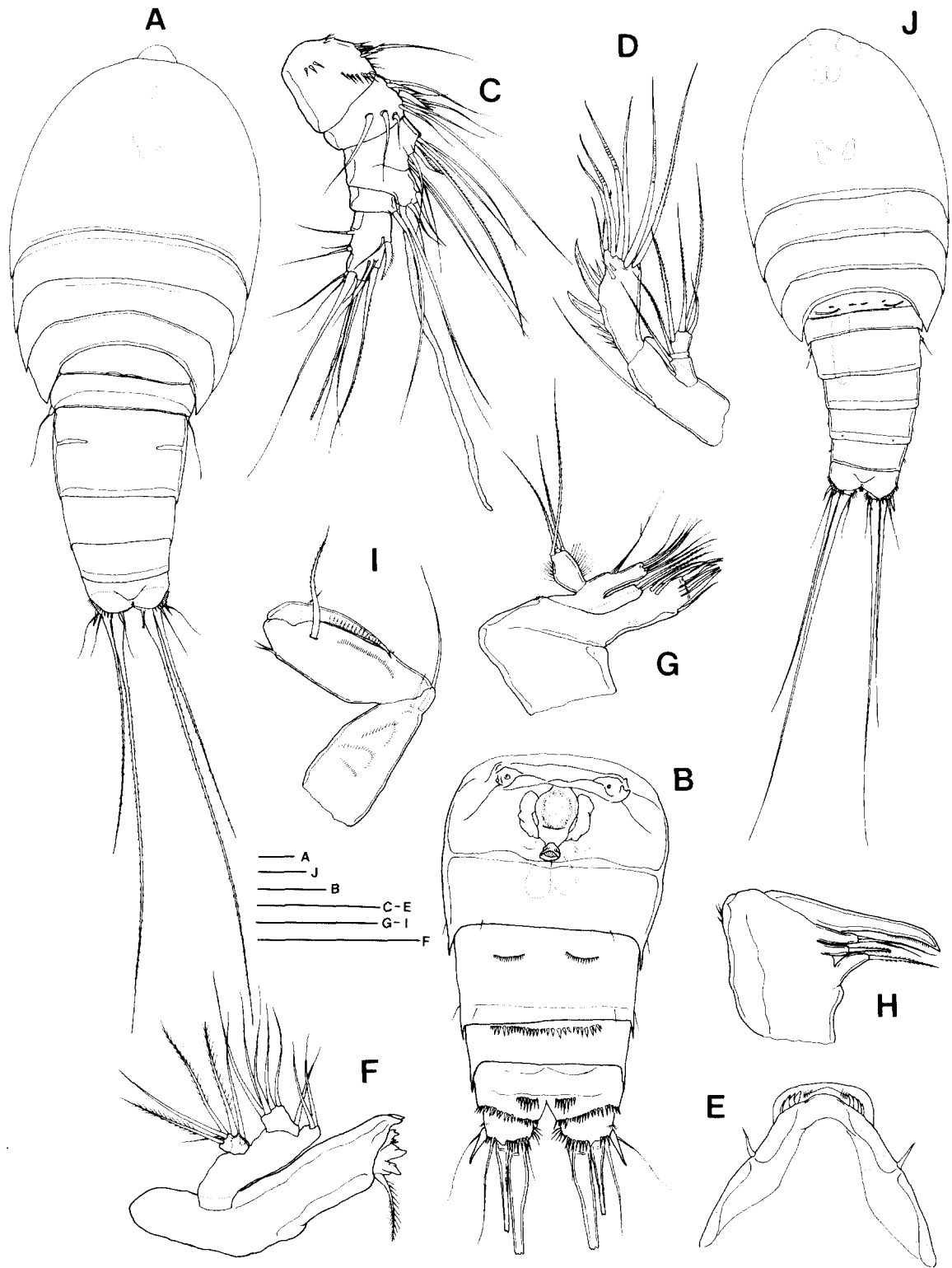


Fig. 3. *Paradactylopodia koreana* n. sp., female. A, Habitus (dorsal). B, Urosome (ventral). C, Antennule. D, Antenna. E, Labrum. F, Mandible. G, Maxillula. H, Maxilla. I, Maxilliped. Male. J, Habitus (dorsal). Scale bars=0.05 mm.

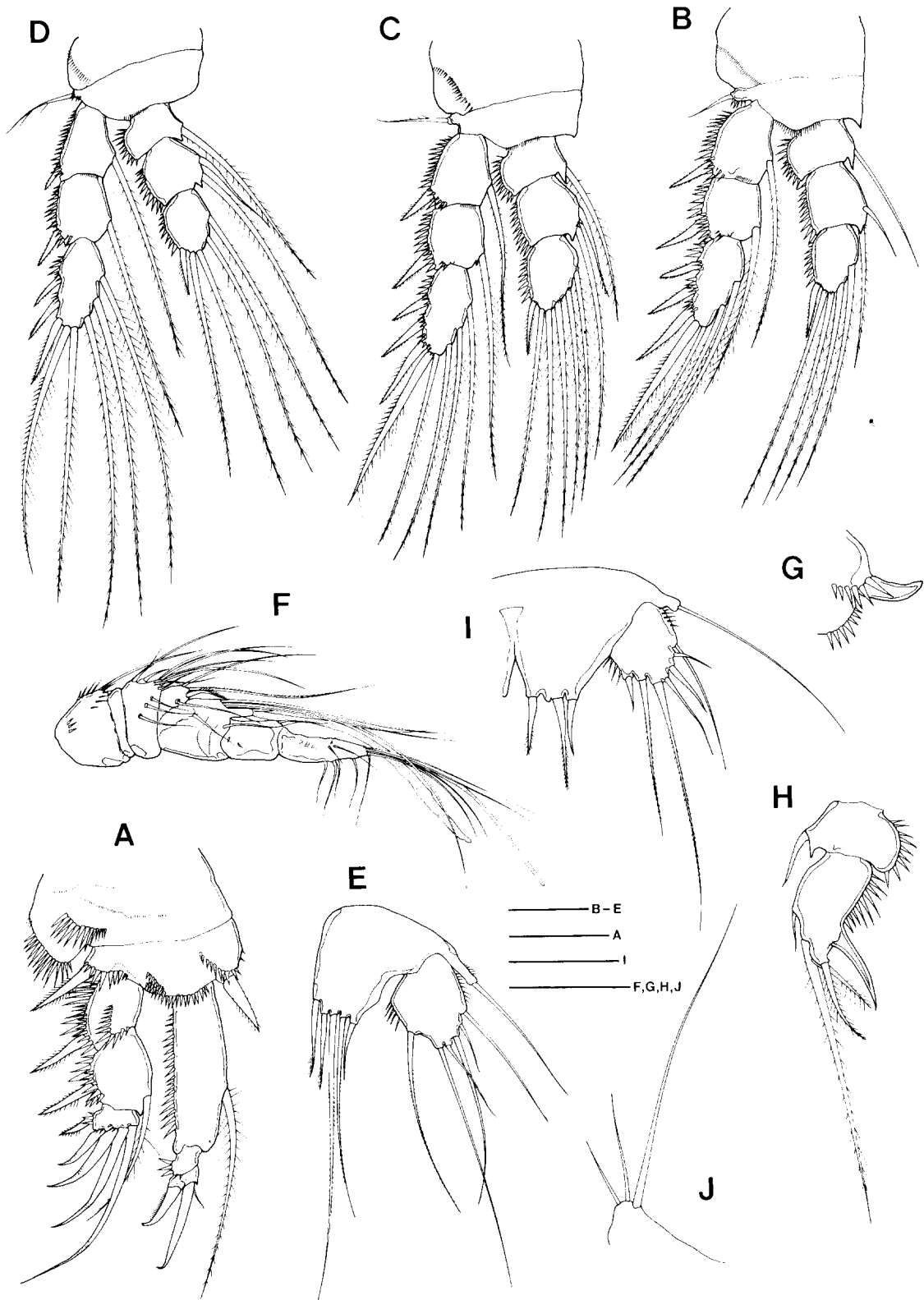


Fig. 4. *Paradactylopodia koreana* n. sp., female. A-E, Legs 1-5. male. F. Antennule. G. Disteromedian spine on the basis of leg 1. H. Endopod of leg 2. I. Leg 5. Scale bars=0.05 mm.

Labrum as in Fig. 3E. Exopod and endopod of mandible (Fig. 3F) well-developed, each 1-segmented, with 6 and 4 setae respectively. Praecoxal arthrite of maxillula (Fig. 3G) with 2 setae on surface, 2 spiniform seta near end of dorsal edge, and 5 unguiform terminal setae; exopodite enlarged with 3 apical setae. Syncoxa of maxilla (Fig. 3H) bearing 3 endites, each furnished with 1, 1 and 2 setae, counting distad; allobasis with 1 endite transformed into a blunt claw.

Maxilliped (Fig. 3I) subchelate; basis oblong, with 1 slender seta and 1 strong seta on distal edge; anterior margin of first endopodite with 1 row of spinules and 1 plumose seta near inner distal edge; second endopodite with 1 stout claw and 1 minute seta.

Exopod and endopod of legs 1-4 with 3 segments. First endopodal segment of leg 1 (Fig. 4A) a little longer than exopod, with 1 stout seta at place a little distal to middle of inner margin; second segment with 3 sharp spinules on outerdistal edge; distal segment bearing 2 arched claws with 1 slender seta. Second exopodal segment a little prolonged, with 1 inner distal seta; distal one bearing 5 geniculate or arched spines in total. First endopodal segments of legs 2-4 (Fig. 4B-D) each with 1 inner seta; second endopodal segments each with 2 inner setae, proximal one bare and short. The ornamentation of legs 2-4 as follow (Roman numerals indicating spines and Arabic numerals representing setae):

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

Distal end of leg 5 baseoendopod (Fig. 4E) a little exceeding midway of exopod; baseoendopod bearing 5 spines, issuing nearly same plane except innermost one; exopod rather oblong, tapering posteriorly, about 1.38 times as long as broad, with 1 seta on distal third of inner margin, 2 apical setae and 3 outer setae; both sides of exopod furnished with setules.

Male: Disteromedian spine on basis of leg 1 as shown in Fig. 4G. Distal endopodal segment of leg 2 (Fig. 4H) with 1 slender + 1 stout inner setae, 2 plumose apical setae, and inwardly hooked spine. Leg 3 and leg 4 nearly same in shape with female's. Distal end of baseoendopod in leg 5 (Fig. 4I) slightly exceeding exopod, bearing 3 short setae; baseoendopod confluent at its proximal half; exopod much broader than long with 7 setae in total. Leg 6 (Fig. 4J) represented by a small plate bearing 3 slender setae.

Remarks: Seven species are currently recognized in

the genus *Paradactylopodia* Lang, 1948. The present new species obviously resembles to its 4 congeners of *P. latipes*, *P. brevicornis*, *P. serrata*, and *P. trioculata* reviewing the criteria traditionally used (Lang, 1948, 1965; Kunz, 1983): (1) The furcal ramus is wider than long, (2) The distal segment of leg 4 exopod with 8 setae or spines in total, (3) The intermediate segment of female leg 2 endopod with 2 inner setae. The five congeners above-mentioned have been generally classified into two groups, that is, *latipes*-group and *brevicornis*-group according to whether the basal part of median caudal seta is swollen or not. However, the character used subsequently may show wide range of morphological variation, as in our specimens and therefore has led to some confusion, and it may be necessary to re-evaluate the character.

The most important diagnostic feature of the genus *Paradactylopodia* seems to be the extent of sexual dimorphism in male leg 2 endopod. When considering the above character, *P. koreana* n. sp. most resembles *P. striata* Kunz in the basic scheme of contour with the outer spinous process hooked and the weak inner seta, but obviously distinguished from *P. striata* in the details, bearing 2 distal setae against only one in the latter.

P. serrata Lang from Californian coast is superficially similar to the present species, but quite easily discernible from the latter in having the serrated and strongly curved spinous process of male leg 2 endopod, the protruding baseoendopod of female leg 4, and the armature of leg 5 exopod in male. Yoo and Lee (1995) once reported *P. serrata* from western coast of Korea, however, we consider their identification was certainly erroneous, judging from the figures and description they supplied, which are clearly coincided with the present new species in spite of their inadequacy.

Variation: Outstandingly consistent were the characters of the armature or the shape of antennule, antennal exopod, male leg 2 endopod, and leg 5 both of male and female, but the wide range of morphological variation was observed in the median caudal seta, although most specimens (32 individuals/ total 38 specimens examined) showed it more or less swollen.

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Two New Thalestrid Harpacticoids from Korea

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