

Three Copepod Parasites (Crustacea) of the Surfperch *Ditrema temmincki* Bleeker (Pisces) from Korea

Il-Hoi Kim

(Department of Biology, Kangreung National University, Kangreung 210-702, Korea)

ABSTRACT

New and rare species of copepod parasites of the surfperch *Ditrema temmincki* Bleeker are reported from Korean seas. Two of them, each belonging to *Colobomatus* of Poecilostomatoida and *Caligus* of Siphonostomatoida, are described as new species. The latter species is very peculiar in bearing the single-segmented exopod in leg 4. *Caligus tanago* Yamaguti, an incompletely known species, is also described from the same fish host.

Key words: Copepoda, *Colobomatus*, *Caligus*, new species, Korea.

INTRODUCTION

Records on copepod parasites of Korean fishes are very scarce, despite that 1827 species of copepods are currently known to be parasites of fishes in the world (Humes, 1994). The surfperch *Ditrema temmincki* Bleeker occurs commonly in the coastal waters of Far East. This fish is known to harbor three species of parasitic copepods in Japan (Ho, 1983); they are *Bomolochus decapteri* Yamaguti, *Allela ditrematis* (Yamaguti) and *Caligus tanago* Yamaguti. The former two species are very common on the surfperch in Korea (unpublished). On the other hand, *C. tanago* has never been reported again on this fish since the original description by Yamaguti (1939). Recently the author could find this copepod as well as other two new species on the surfperch from the seas around Korea. This report is to describe these new and rare copepods.

The materials examined in this study were all collected by the author. In order to collect the copepods the host fishes were agitated in diluted alcohol solution. The washings were then examined

under the dissecting microscope, from which the copepods were sorted out. The copepod specimens were fixed with 4% formaldehyde solution for about one day, and then preserved in 80% alcohol. The dissecting and measuring of the specimens were done after soaking the specimens in lactic acid for at least one day. The drawings were made with the aid of a camera lucida. The body lengths mentioned in the descriptions are measured from the frontal tip of the cephalothorax to the ends of caudal rami, excluding the setae on the caudal rami, of the specimens. Type specimens will be deposited in the U.S. National Museum of Natural History, Smithsonian Institution. Dissected paratypes and other specimens are kept in the collection of the author.

DESCRIPTIONS

Order Poecilostomatoida Thorell, 1859

Family Philichthyidae Bassett-Smith, 1899

***Colobomatus similis*, new species (Figs. 1-3)**

Type specimens. Holotype female, allotype male, and paratypes (4 females and 9 males), from washings of head region of 30 hosts caught off Chungmu in Korea Strait. Holotype, allotype and undissected paratypes (3 females and 8 males) will be deposited in the U.S. National Museum of Natural History, Smithsonian Institution. Dissected 2 paratypes are kept in the collection of the author.

Female. Body vermiform as Fig. 1A and B, without segmentation. Total length of dissected specimen 3.55 mm, including processes. Lengths of other three measured specimens 4.15 mm (holotype), 3.76 mm, and 2.87 mm, respectively. Cephalosome with 3 frontal processes: 2 frontolateral and 1 ventromedial ones (Fig. 1C), the latter distinctly shorter than other 2 and directed anteroventrally. These processes armed with papillary spinules (Fig. 1D) around tip, as in other 3 pairs of processes. First pedigerous somite discernible by weak constrictions anteriorly and posteriorly. Fused second and third somites, being broadest part of body, convex dorsally, with 2 pairs of dorsolateral processes; both pairs erected upwards; frontal ones larger than posterior ones; region of posterior processes being widest part of body; posterior part of this somite behind posterior processes becoming narrowed; all of these 4 processes tipped by spinules. Next region of body (? fourth + fifth pedigerous somites) without processes or armatures. Genital complex (or fused sixth and genital somites) with a pair of ventrally curved lateral processes. Genital area as in Fig. 1F, with 1 small seta. Abdomen behind genital area 1.05 mm long. Caudal rami divergent (Fig. 1E), 263 μm long, each with spinules around tip and several small setae, one of the latter on inner margin distinctly larger.

Antennule (Fig. 1G) unsegmented, with 22 setae. Antenna absent. No leg discernible.

All mouth organs enclosed in oral sheath. Mandible (Fig. 1I) tapering towards apex and terminated with 2 processes. Maxillule absent. Maxilla (Fig. 1H) armed distally with about 8 denticles (or spinules) and 1 setae. Maxilliped (Fig. 1J) curved near apex, unarmed, but terminated by acute process.

Male. Body (Fig. 2A) narrow, cylindrical, not transformed, 11-segmented, with clear segmentation. Length of dissected largest specimen 1.62 mm. Cephalosome rounded at apex, 275 \times 243 μm . Second pedigerous somite with distally curved posterolateral processes (Fig. 2A and B). Genital

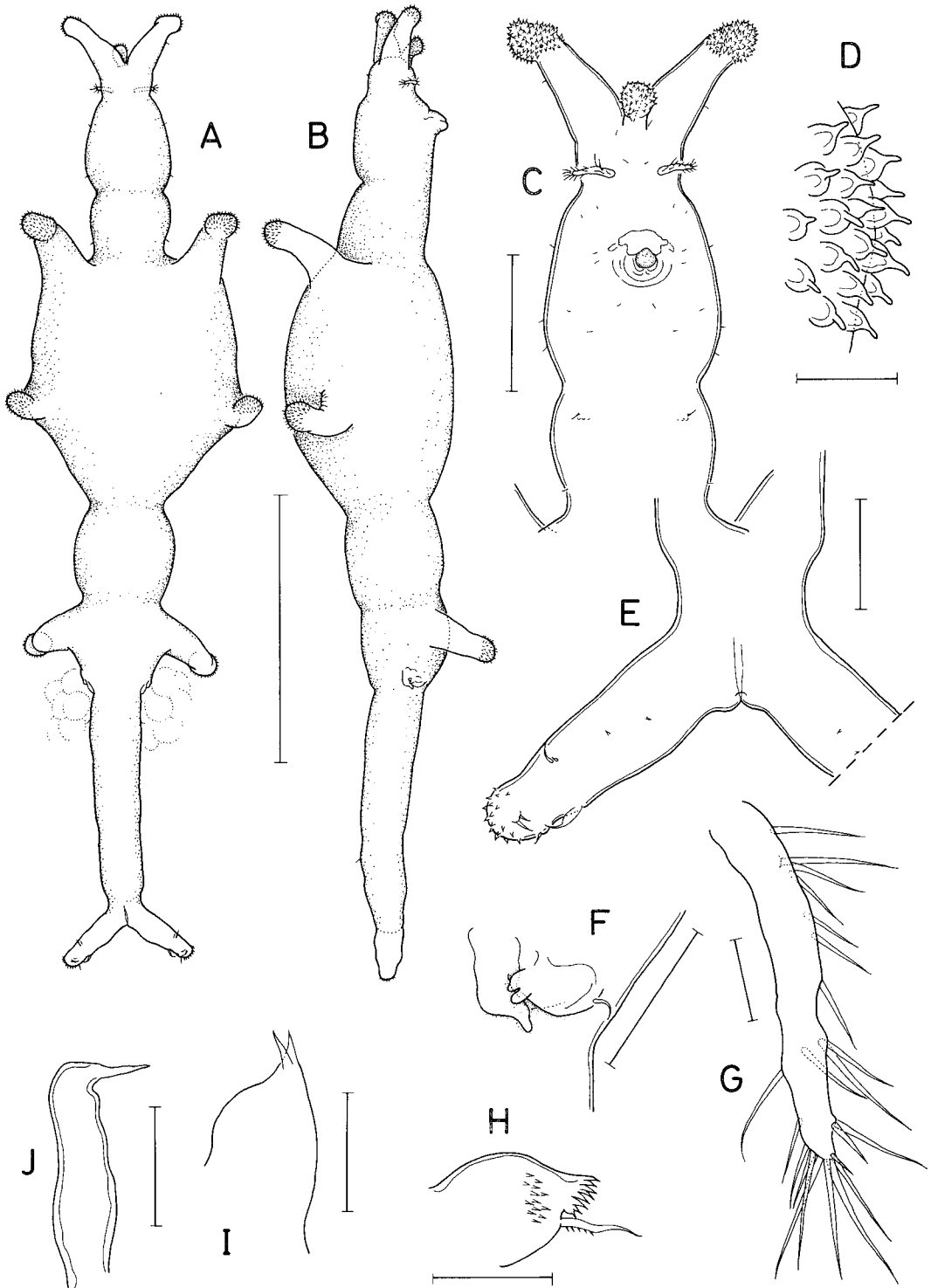


Fig. 1. *Colobomatus similis*, n. sp., female: A, habitus, dorsal; B, same, lateral; C, cephalic region, ventral; D, spinules on processes on body; E, caudal ramus, dorsal; F, genital area; G, antennule; H, maxilla; I, mandible; J, maxilliped. Scales: A, B = 1 mm; C = 0.25 mm; D, 0.02 mm; E, F = 0.1 mm; G-J = 0.02 mm.

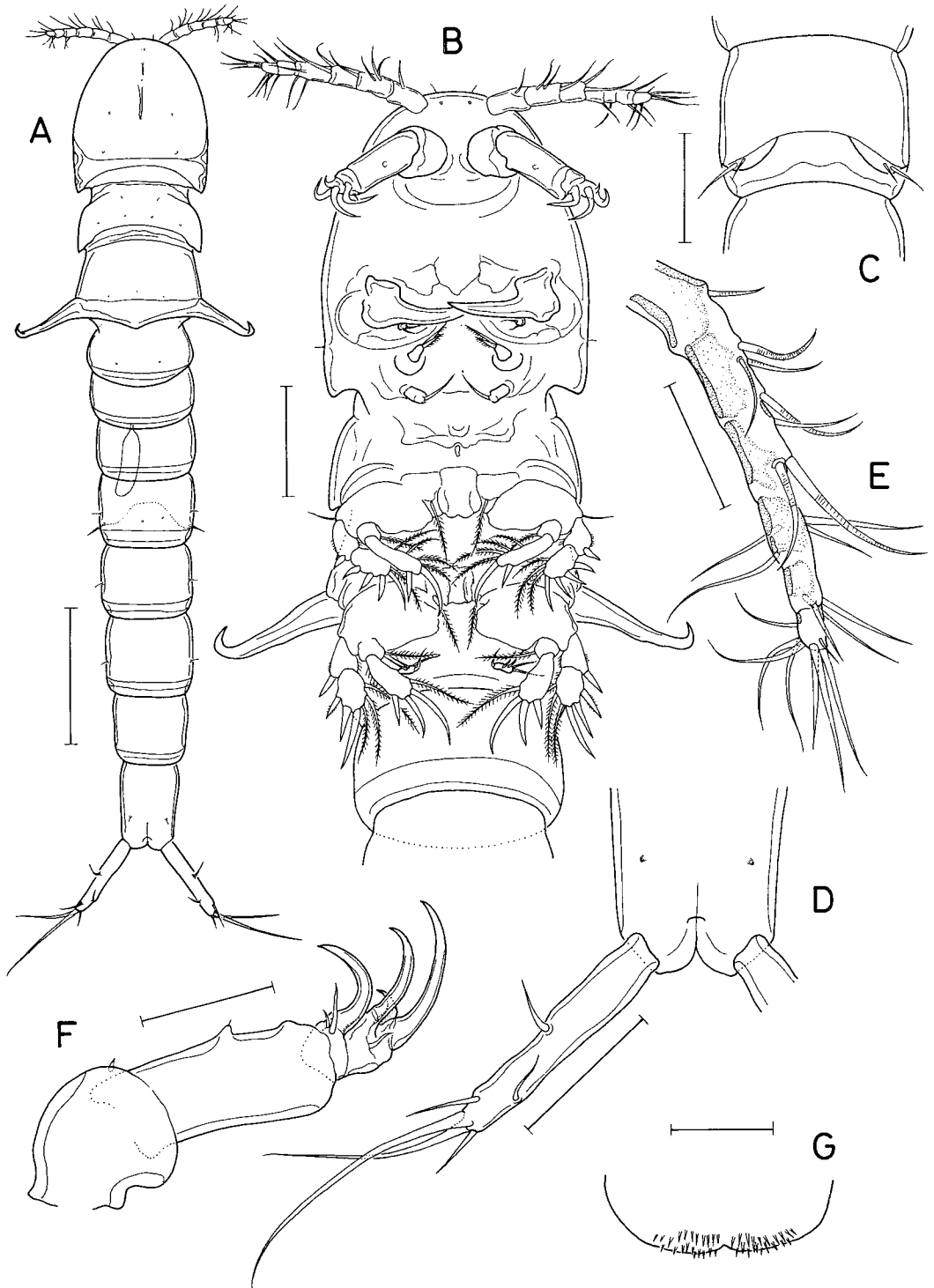


Fig. 2. *Colobomatus similis*, n. sp., male: A, habitus, dorsal; B, anterior part of body, ventral; C, genital somite, ventral; D, caudal ramus, dorsal; E, antennule; F, antenna; G, labrum. Scales: A = 2 mm; B-D = 0.1 mm; E, F = 0.05 mm; G = 0.025 mm.

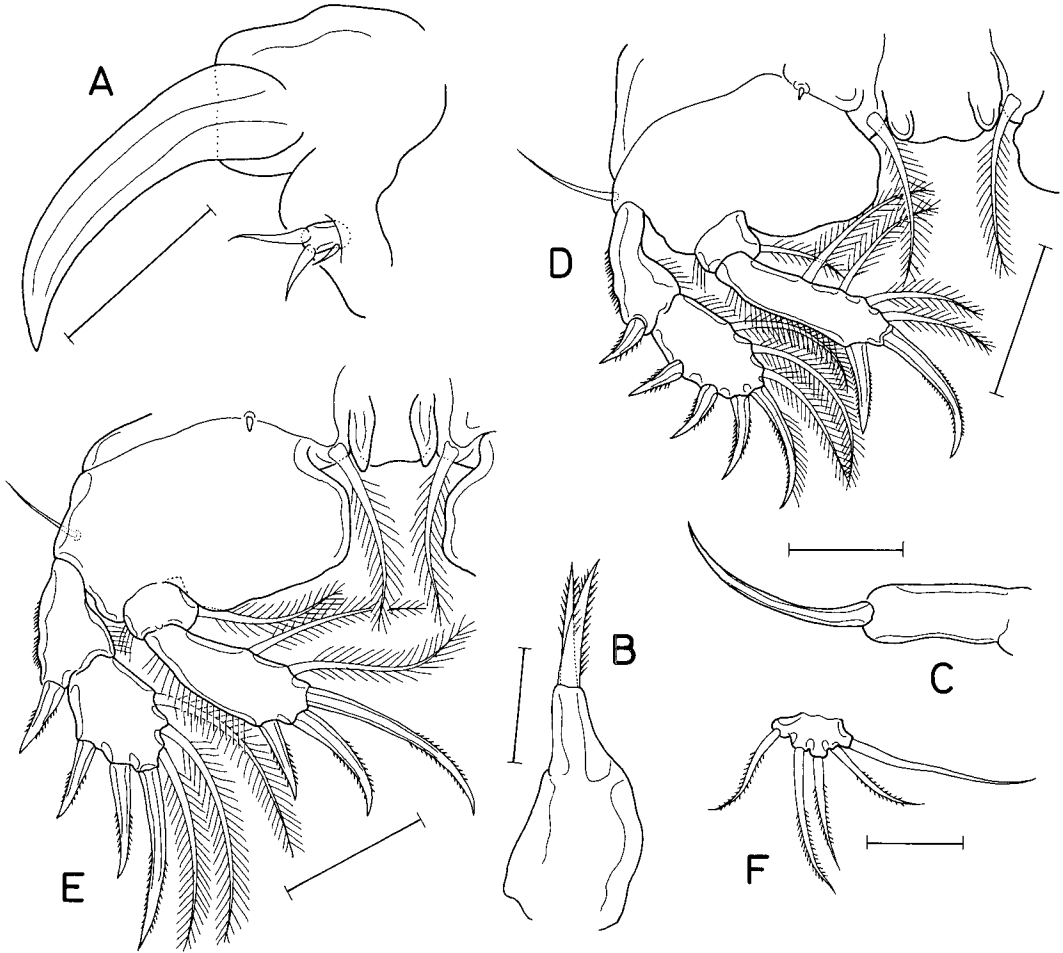


Fig. 3. *Colobomatus similis*, n. sp., male: A, mandible and maxillule; B, maxilla; C, maxilliped; D, leg 1; E, leg 2; F, leg 3. Scales: A, D, E = 0.05 mm; B, C, F = 0.025 mm.

somite (Fig. 2C) $130 \times 173 \mu\text{m}$. Four abdominal somites gradually narrowed. Anal somite longer than wide, $173 \times 108 \mu\text{m}$. Caudal rami divergent, $158 \times 30 \mu\text{m}$ (about 5.3:1), each with 3 terminal, 1 subterminal, and 2 lateral setae (Fig. 2D).

Rostrum not developed. Antennule (Fig. 2E) indistinctly 6-segmented, with setal formula: 1, 4, 3, 4, 3, and 8. All setae glabrous. Antenna (Fig. 2F) 4-segmented. First segment expanded distally, with 1 small inner distal setule. Longest second segment unarmed, but with 1 minute setule on small process placed near midlength of inner margin. Third segment very short, with 1 strongly curved claw and 2 unequal setae. Fourth segment with 2 terminal claw of extremely unequal size, 1 subterminal claw, and 1 small seta.

Labrum (Fig. 2G) with spinules near posterior margin, and weak posteromedian constriction. Mandible consisting of simple, strong hook and its base (Fig. 3A). Maxillule with 2 distal and 1 smaller lateral setae (Fig. 3A). Maxilla (Fig. 3B) tapering towards tips, distally with 2 thick, spiniform setae. Maxilliped (Fig. 3C) digitiform, with 1 strong spiniform seta on apex.

Leg 1 (Fig. 3D) and leg 2 (Fig. 3E) biramous, with both of them carrying 2-segmented rami.

Armature formula of these 2 legs as follows:

Leg 1: coxa 0-1; basis 1-0; exp. I-0; III, I, 3; enp. 0-1; II, 4

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

Leg 3 (Fig. 3F) 1-segmented, wider than long, with 5 setae. Leg 4 absent. Leg 5 represented by 2 setae on each genital flap (Fig. 2C).

Etymology. The specific name *similis* refers to its similarity to *C. embiotocae*.

Remarks. According to Ho (1983) the genus *Colobomatus* had been known of 33 species until that time. Since then 7 more species have been added to this genus: 3 species by Cressey and Schotte (1983), and the remaining 4 each by Essafi *et al.* (1983, 1984) and West (1983, 1985). Thus this genus comprises now 41 nominal species, including the new species. The members of this genus have in female various body shapes and processes on body.

C. similis n. sp. resembles *C. embiotocae* Noble, Collard and Wilkes, 1969 from the eastern Pacific. Both species have features in common such as the similar body form, the spinules on body processes, the similar caudal rami of females bearing the prominent seta on inner margin, and the almost identical morphology of males, including the leg armatures. Moreover these two species are the parasites of related hosts: *C. similis* on the surfperch *Ditrema temmincki*, and *C. embiotocae* on the nine species of American surfperches of the same family, Embiotocidae (Noble *et al.*, 1969). *C. similis* differs from *C. embiotocae* in having more longer body processes, the unsegmented body and antennules (body and antennules are segmented in *C. embiotocae*), and the three cephalic processes (only 2 cephalic processes in *C. embiotocae*).

In Far Eastern seas only 4 species of *Colobomatus* have been recorded. They are *C. mylionus* described by Fukui (1965), and *C. pupa*, *C. exilis* and *C. fusiformis* described by Izawa (1974). Only one of them, *C. mylionus* which was re-described by Byrnes and Cressey (1986), have three frontal processes on cephalosome as in the new species. The new species is, however, easily distinguished from *C. mylionus*, as the latter has the tapering body processes, the constrictions on abdomen, and the different armature formula of male leg 2.

Order Siphonostomatoida Thorell, 1859

Family Caligidae Dana, 1852

***Caligus latus*, new species (Figs. 4 and 5)**

Type specimens. Holotype female and 5 female paratypes from washings of skin of 10 *Ditrema temmincki*, at a fish market of Chungmu (the fishes were caught in Korea Strait), on September 1994. The holotype and undissected paratypes (4 females) will be deposited in the U.S. National Museum of Natural History, Smithsonian Institution. Dissected paratype is kept in the collection of the author.

Other material examined. One female (dissected) from skin of 1 host at a fish market in Kangreung (the fish was caught from the Sea of Japan), on 25 January 1990.

Female. Body (Fig. 4A) rather translucent, 2.84 mm long, with weak pigments on periphery. Cephalothorax 1.71 mm long and 1.53 mm wide. Lunules large, well developed. Lateral zone narrow, with unforked cuticular rib on ventral surface. Posterior sinus deep. Thoracic zone broad; posterior margin of thoracic zone extending beyond posterior ends of lateral zones. Fourth pedigerous somite extremely short, 412 μm wide, and fused with genital complex, leaving no

demarcation, nor constriction between them. Posterolateral areas of fourth pedigerous somite near base of leg 4 distinctly notched. Genital complex quadangular, with round corners, 0.71×1.05 mm, about 1.5 times wider than long, distinctly wider than thoracic zone of cephalothorax; mid-posterior margin near base of abdomen slightly projected posteriorly.

Abdomen (Fig. 4B) 1-segmented, cylindrical, attached to posteroventral side of genital complex, $360 \mu\text{m}$ long (or $303 \mu\text{m}$ long when measured along lateral margin), $230 \mu\text{m}$ wide, with parallel lateral margins. Caudal ramus directed posteriorly, $147 \times 92 \mu\text{m}$ or about 1.6 time longer than wide, with straight, parallel lateral margins. Six setae on caudal ramus plumose; 2 outer setae $50 \mu\text{m}$ (proximoventral one) and $80 \mu\text{m}$ (distal one), respectively; 3 terminal setae $253 \mu\text{m}$, $257 \mu\text{m}$, $217 \mu\text{m}$ from outer to inner, respectively; inner dorsal seta $67 \mu\text{m}$ long.

Antennule (Fig. 4C) 2-segmented; first segment with 27 setae; posterodistal corner unarmed; terminal segment with 12 setae and 2 aestatacs. Antenna (Fig. 4D) relatively small; first segment unclear; second segment with stout posterior process; third segment $163 \mu\text{m}$ long, without adhesion process, with inner distal area roundly protruded; fourth segment with 1 setule near base; claw very weakly curved, characteristically short, only $83 \mu\text{m}$ long, about half as long as preceding segment. Postantennary process (Fig. 4E) relatively weakly curved, $147 \mu\text{m}$ long, with stout tip, and with 1 setule and 1 branched setule on base, and 1 branched posterior setule.

Mouth tube short and directed ventrally. Mandible with 12 teeth distally as usual. Maxillule (Fig. 4F) consisting of papilla bearing 3 setae and stout tine. Maxilla (Fig. 4G) long and slender; lacertus $235 \times 58 \mu\text{m}$; brachium very slender, $326 \times 23 \mu\text{m}$, with flabellum at distal one-third; calamus $105 \mu\text{m}$ and canna $82 \mu\text{m}$. Maxilliped (Fig. 4H) with nearly straight corpus of $314 \times 81 \mu\text{m}$; shaft distinctly slender, $105 \mu\text{m}$ long, with inner distal seta; claw $65 \mu\text{m}$ long. Sternal furca (Fig. 4I) consisting of rather broad, truncate tines bearing broad flanges.

Leg 1 (Fig. 5A) with sympod bearing 2 setae and 1 setule. Exopod 2-segmented; first segment with 1 spiniform seta near outer distal corner and row of setules on inner margin; second segment with 3 large setae on inner margin and on oblique terminal margin (Fig. 5B) with 3 spines (inner 2 spines with long hyaline accessory process, without serration along margins) and 1 seta (plumose only on outer side). Endopod rudimentary, with its tip rounded.

Leg 2 (Fig. 5C) with 3-segmented rami. Exopod with armature formula I-1, I-1, II, I, 5; spines of first 2 proximal segments large, with crenulated flange along outer margin; proximal spine on terminal segment minute. Endopod with armature formula 0-1, 0-2, 6.

Leg 3 (Fig. 5D) with sympod bearing relatively small adhesion pad on outer proximal area. Exopod 3-segmented; first segment with large flange on outer distal margin, 1 setule, and large spine having lateral flange (Fig. 5E). Second and third segments with armature formula I-1, III, 4. Endopod 2-segmented; first segment with 1 seta; second segment with 6 setae.

Leg 4 (Fig. 5F) extremely slender. Sympod $275 \mu\text{m}$ long, with basal third distinctly narrower than remaining distal two-thirds. Exopod characteristically 1-segmented, $380 \times 30 \mu\text{m}$, very slender, terminally expanded, with 3 setae. These setae consisting of one ($108 \mu\text{m}$) located on distal 40% of outer margin, subterminal smaller one ($75 \mu\text{m}$), and terminal largest one ($156 \mu\text{m}$); each seta ornamented with pecten near base; a minute pore and duct visible at outer margin just distal to base of proximal seta (Fig. 5G).

Leg 5 (Fig. 5H) consisted of 2 lobes on posterolateral corners; anterior lobe smaller, with 1

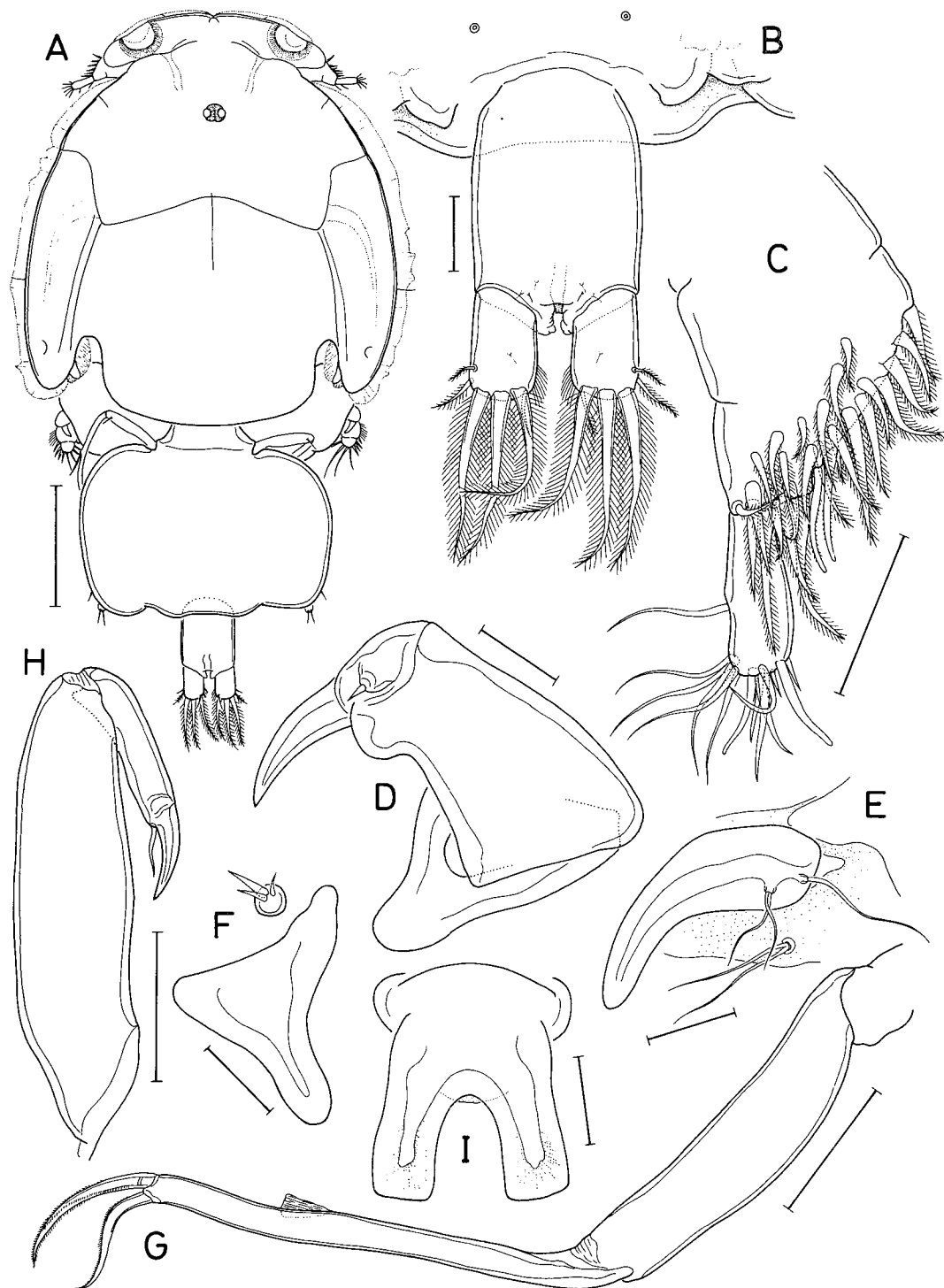


Fig. 4. *Caligus latus*, n. sp., female: A, habitus, dorsal; B, abdomen, ventral; C, antennule; D, antenna; E, postantennary process; F, maxillule; G, maxilla; H, maxilliped; I, sternal furca. Scales: A = 0.5 mm; B, C, G, H = 0.1 mm; D-F, I = 0.05 mm.

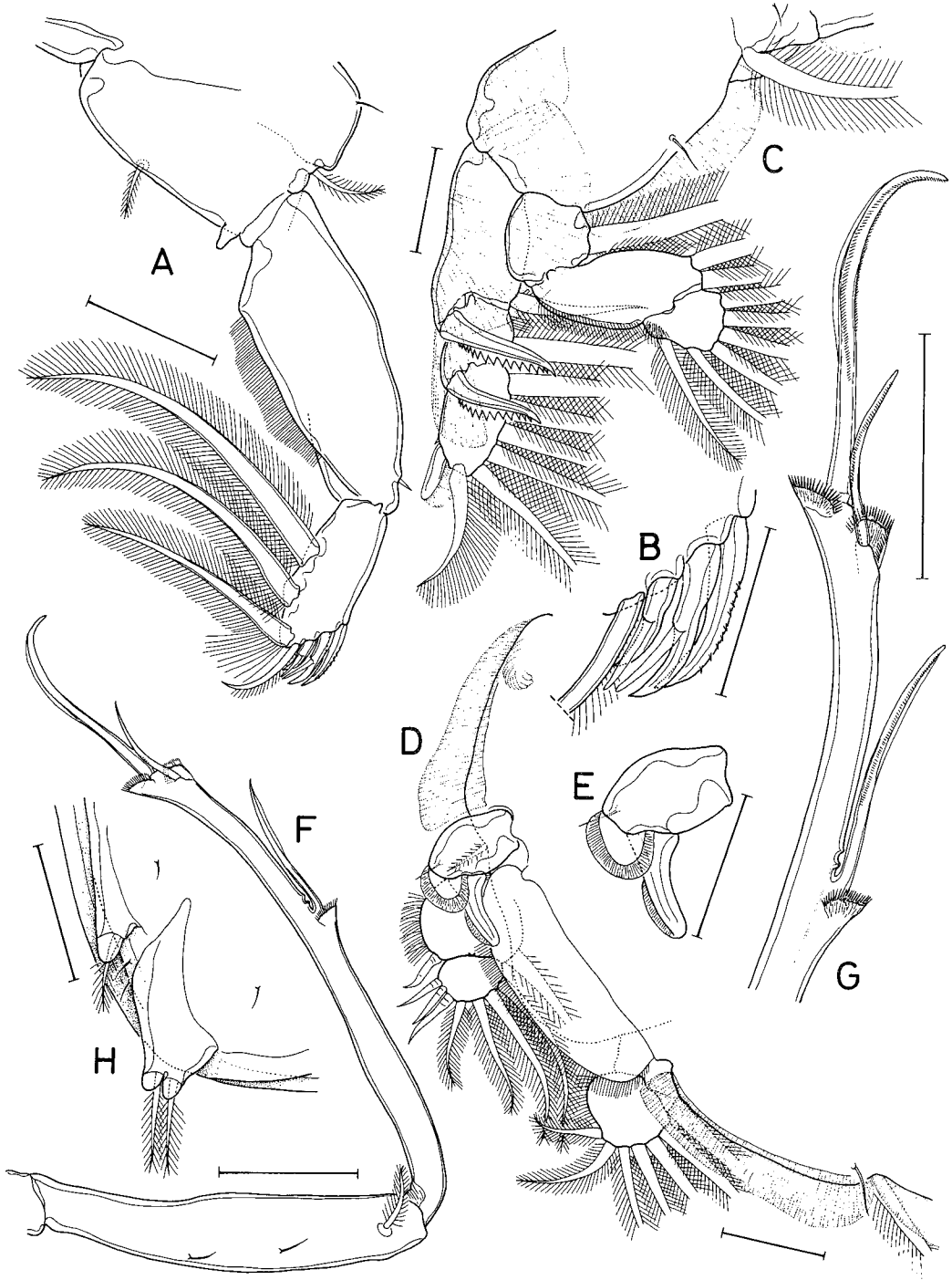


Fig. 5. *Caligus latus*, n. sp., female: A, leg 1; B, distal spines of leg 1; C, leg 2; D, leg 3; E, proximal segment of leg 3 exopod; F, leg 4; G, distal part of leg 4; H, area of leg 5. Scales: A, C-H = 0.1 mm; B = 0.05 mm.

subterminal plumose seta; posterior lobe distally bilobed, with 2 subterminal plumose setae.

Male. Unknown.

Etymology. The specific name *latus* (= wide) is a Latin, alluding the wide genital complex of the new species.

Remarks. *Caligus latus* n. sp. is peculiar in having extremely slender leg 4 which has only 1-segmented exopod bearing 3 setae. Only another example of 1-segmented exopod of leg 4 is found in *Caligus nebeae* Shen, 1957 known from China, which is, otherwise, not related to the new species, because the latter species has very long abdomen and stout leg 4 carrying 5 setae on exopod.

Caligus cordiventris Shiino, 1952 may be selected as another relative. This species, known from Japan (Shiino, 1952), bears, as the new species, slender female leg 4 carrying only 3 setae, crenulated spines on exopod of leg 2, and similar leg 5. In spite of these similarities, *C. cordiventris* can not be confused with *C. latus*, because the former species has 3-segmented exopod of leg 4.

***Caligus tanago* Yamaguti, 1939 (Figs. 6 and 7)**

Material examined. Two females, in the gill chamber of a single host caught by hook at Kyukp'o, in the southwestern coast of Korea of the Yellow Sea, 2 October 1990.

Female. Body (Fig. 6A) relatively slender, 2.82 mm long, with maximum width of 1.28 mm. Cephalothorax circular, 1.27×1.28 mm, or as long as wide. Lunules distinct. Thoracic zone of cephalothorax extended beyond posterior margin of lateral zones. Fourth pedigerous somite distinctly narrower than thoracic zone, $447 \mu\text{m}$ wide. Genital complex nearly quadrangular but with rounded corners, $740 \times 910 \mu\text{m}$, or 1.23 time wider than long. Egg sac 1.05×0.27 mm.

Abdomen long and cylindrical, 1-segmented, $550 \times 255 \mu\text{m}$. Caudal ramus (Fig. 6B) $149 \times 98 \mu\text{m}$ (1.52:1); outer margin almost straight; inner margin convex, with setules; Three terminal setae 195, 245, $225 \mu\text{m}$ long, respectively, from outer to inner ones; innermost seta small, $75 \mu\text{m}$ long; two outer setae 120 and $30 \mu\text{m}$, respectively. Setae, except for innermost seta and outer smaller one, plumose.

Antennule (Fig. 6C) 2-segmented. First segment with 25 plumose setae, 2 naked setae on anterior margin, and 1 pointed process near posterodistal corner. Terminal segment with 12 setae and 2 aesthetascs. All setae glabrous. Antenna (Fig. 6D) 3-segmented; first segment without process; second segment unarmed; terminal segment longest, with 2 spiniform setae near base, and terminated by long, curved claw. Postantennary process (Fig. 6E) relatively small, with short base.

Mandible with 12 terminal teeth. Maxillule (Fig. 6F) consisting of papilla bearing 3 setae, and $151 \mu\text{m}$ long, posterior process. Maxilla (Fig. 6G) with lacertus of $233 \times 63 \mu\text{m}$; brachium slightly longer than lacertus, $256 \times 28 \mu\text{m}$, with flabellum at distal third; calamus and canna relatively broad. Maxilliped (Fig. 6H) with glabrous corpus of $330 \times 133 \mu\text{m}$; shaft gradually narrower distally, with inner distal seta; claw strong and arched. Sternal furca (Fig. 6I) 156 m long, with 2 broad tines; each tine with wide flanges.

Leg 1 (Fig. 6J) with vestigial endopod tipped with 2 tiny spinules. Exopod 2-segmented. First segment relatively slender, about 3 times longer than wide, with row of setules on inner margin and spine near outer distal corner. terminal segment with 3 large setae on inner margin; terminal margin oblique, with 4 unarmed, setiform spines.

Leg 2 (Fig. 7A) with 3-segmented rami. Exopod with armature formula I-1, I-1, II,I,5. Endopod with armature formula 0-1, 0-2, 6; outer surface of distal 2 segments setiferous.

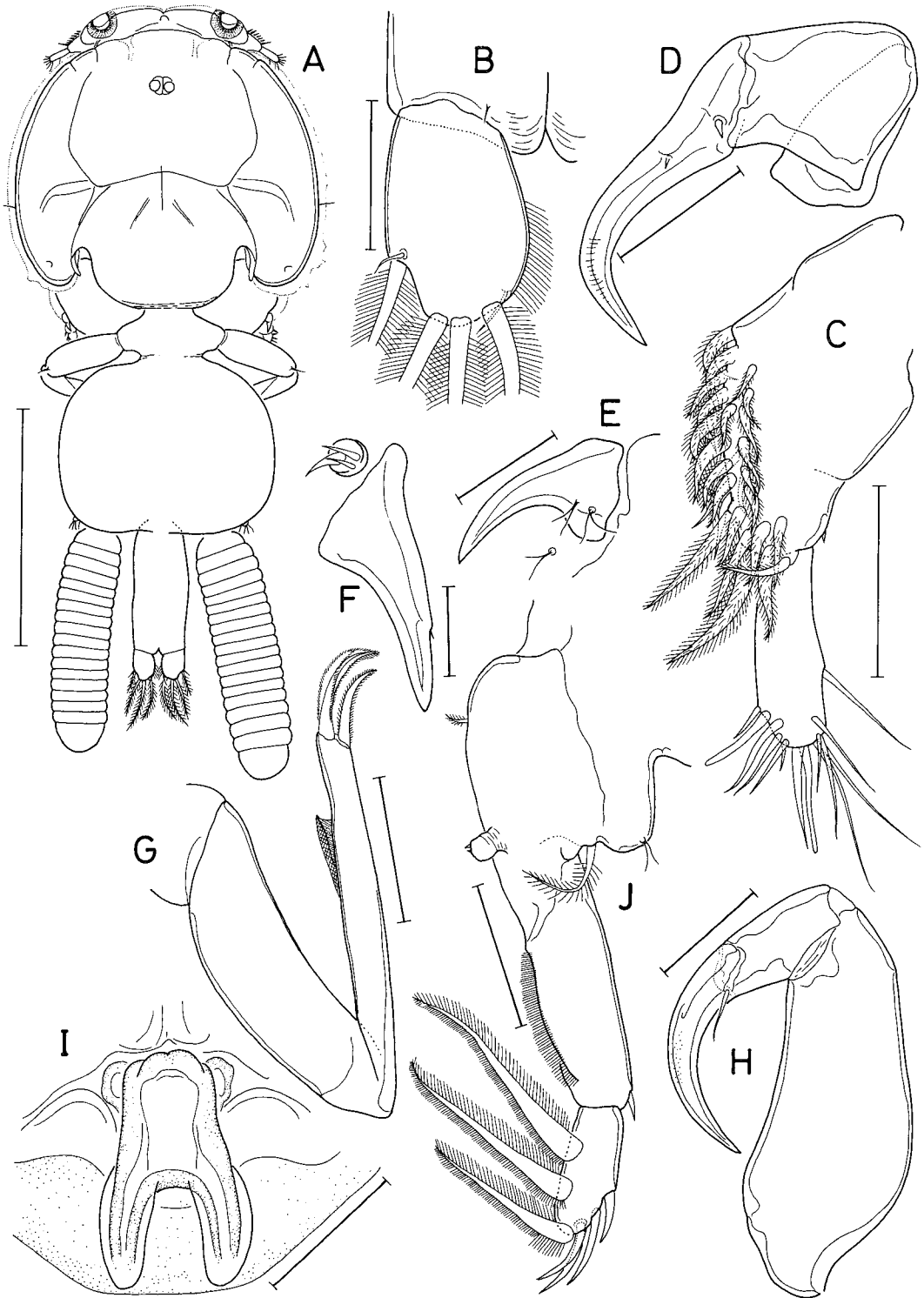


Fig. 6. *Caligus tanago* Yamaguti, female: A, habitus, dorsal; B, caudal ramus, ventral; C, antennule; D, antenna; E, postantennary process; F, maxillule; G, maxilla; H, maxilliped; I, sternal furca; J, leg 1. Scales: A = 1 mm; B-D, G-J = 0.1 mm; E, F = 0.05 mm.

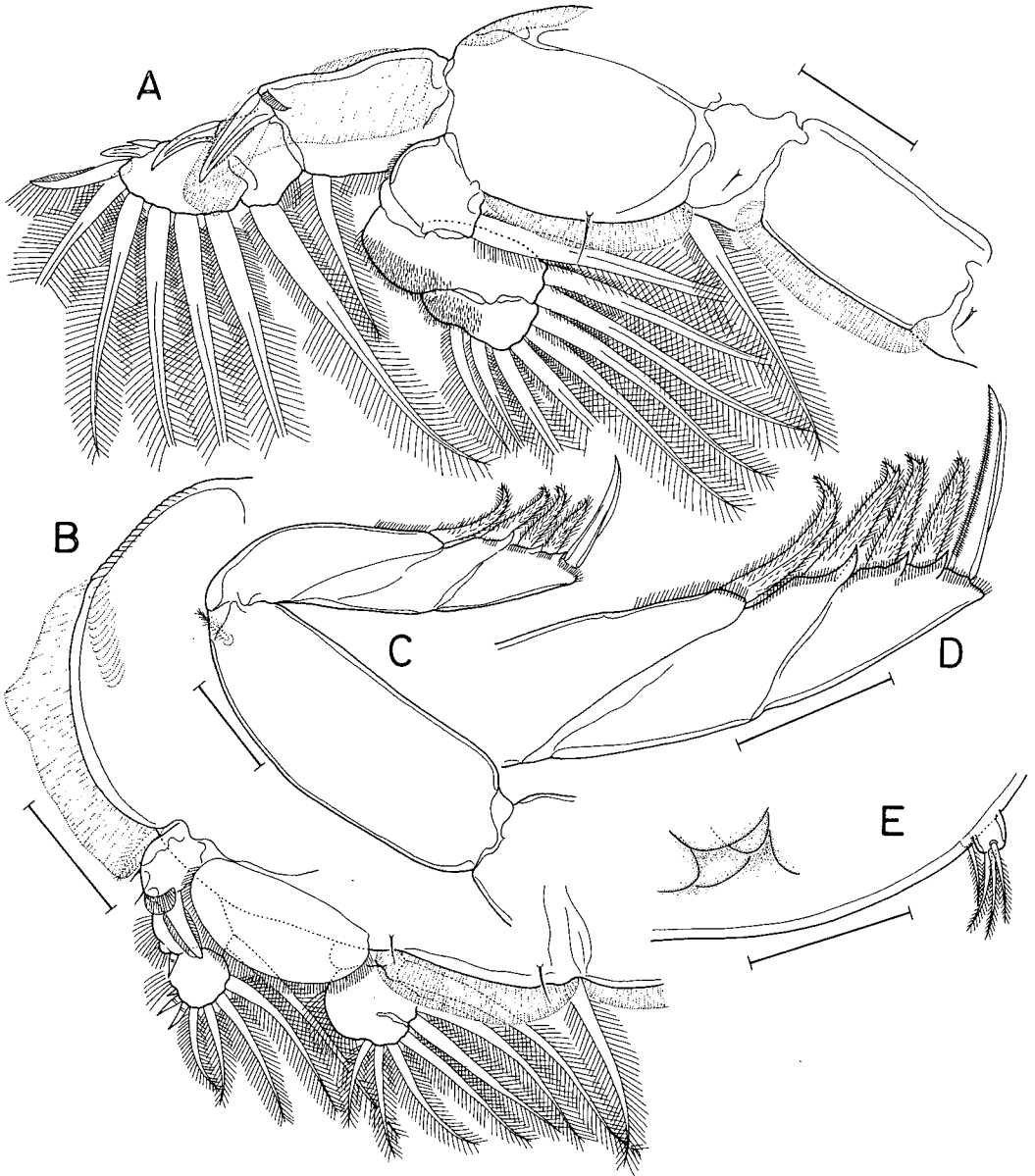


Fig. 7. *Caligus tanago* Yamaguti, female: A, leg 2; B, leg 3; C, leg 4; D, distal part of leg 4; F, genital area. Scales: 0.1 mm in all.

Leg 3 (Fig. 7B) with corrugation on outer proximal surface of sympod. Exopod 3-segmented; first segment with 2 setules on outer margin and flange outer distally; larger exopodal spine slightly longer than second segment, with flanges on both sides; second segment with 1 outer spine and 1 inner seta; terminal segment with 3 spines (proximal one distinctly smaller than other two) and 4 setae. Endopod 2-segmented, with armature formula 0-1, 6; terminal segment with a trace of segmentation on inner side, dividing proximal 2 and distal 4 setae.

Leg 4 (Fig. 7C) with robust sympod of $358 \times 135 \mu\text{m}$. Exopod $365 \times 84 \mu\text{m}$, and 3-segmented,

with armature I, I, III; terminal segment triangular, with pointed end (Fig. 7D); first four spines pinnate, but terminal spine flanged with membrane on inner margin; outer margin with 3 pointed processes at bases of second to fourth spines.

Leg 5 being a papilla tipped by 3 setae and 1 independent seta close to papilla (Fig. 7E).

Male. Unknown.

Remarks. Since the original description by Yamaguti (1939), this species has never been rediscovered from *Ditrema temmincki*, although 4 other fish species have been known from Japan as the hosts of this copepod (Ho, 1983). This fact lead Ho (1983) to consider that *D. temmincki* would not a real host of *Caligus tanago* and Yamaguti's finding on *D. temmincki* might be an incidental. Therefore the present rediscovery of *Caligus tanago* from *D. temmincki* in the Yellow Sea confirms that they have a sound parasite-host relationship. It should be noted that both species of *Caligus* recorded in this report have been found from washings of the hosts. A number of previous trials by the author with naked eyes to find any sea louse on the surfperches had been yielded no good result. Thus it is certain that these sea lice have perfect camouflage with their translucent body.

Caligus tanago resembles closely *C. platytarsis* Bassett-Smith, 1898 (Ho, 1982). It may be distinguished from the latter by the different shape of genital complex, the stouter abdomen, and the less blunt tines of sternal furca.

REFERENCES

- Byrnes, T. and R. Cressey, 1986. A redescription of *Colobomatus mylionus* Fukui from Australian *Acanthopagrus* (Sparidae) (Crustacea: Copepoda: Philichthyidae). Proc. Biol. Soc. Wash., **99**(3): 388-391.
- Cressey, R.F. and M. Schotte, 1983. Three new species of *Colobomatus* (Copepoda: Philichthyidae) parasitic in the mandibular canals of haemulid fishes. Proc. Biol. Soc. Wash., **96**(2): 189-201.
- Essafi, K., A. Raibaut and K. Boudaoud-Krissat, 1983. *Colobomatous steenstrupi* (Richiardi, 1876) and *Colomomatus mulli* n. sp. (Copepoda: Philichthyidae), parasitic on fish of the genus *Mullus* (Mullidae) in the western Mediterranean. Syst. Parasitol., **5**: 135-142.
- Essafi, K., P. Carbal and A. Raibaut, 1984. Copepodes parasites de poissons des Iles Kerkennah (Tunisie meridionale). Archs. Inst. Pasteur. Tunis, **61**(4): 475-523.
- Fukui, T., 1965. On some parasitic copepods of Japan. Researches on Crustacea, 2. The Carcinological Society of Japan, pp. 60-65 (in Japanese).
- Ho, J.-S., 1983. Copepod parasites of Japanese surfperches: their inference on the phylogeny and biogeography of Embiotocidae in the Far East. Ann. Rep. Sado Mar. Biol. Stat., Niigata Univ., **13**: 31-62.
- Humes, A.G., 1994. How many copepods? Hydrobiologia, **292/293**: 1-7.
- Izawa, K., 1974. On three new species of *Colobomatus* (Cyclopoida: Philichthyidae) parasitic on Japanese fishes. Publ. Seto Mar. Biol. Lab., **21**(5/6): 335-343.
- Noble, E.R., S.B. Collard and S. N. Wilkes, 1969. A new philichthyid copepod parasitic in the mucous canals of surfperches (Embiotocidae). J. Parasitol., **55**(2): 435-442.
- Shiino, S.M., 1952. Copepods parasitic on Japanese fishes. 1. On the species of *Caligus* and *Lepeophtheirus*. Rep. Fac. Fish. Pref. Univ. Mie, **1**(2): 79-113.

- West, G.A., 1983. A new philichthyid copepod parasitic in whiting (*Sillago* spp.) from Australian waters. J. Crust. Biol., **3**(4): 622-628.
- West, G.A., 1985. A new philichthyid copepod parasitic in mullet from Australian waters. Crustaceana, **49**(2): 193-199.
- Yamaguti, S., 1939. Parasitic copepods from fishes of Japan. Part 5, Caligoida, III. Vol. Jubil. Prof. S. Yoshida, **2**: 443-487.

RECEIVED: 26 July 1995

ACCEPTED: 4 August 1995

망상어에 기생하는 요각류 신종 및 희귀종의 기재

김 일 회

(강릉대학교 생물학과)

요 약

한국산 망상어에 기생하는 요각류 2 신종, 즉 Poecilostomatoida 목에 속하는 *Colobomatus similis* n. sp.와 Siphonostomatoida 목에 속하는 *Caligus latus* n. sp.를 기재하였다. 후자는 넷째 다리의 외지가 1마디로 되어 있어서 매우 특이하다. *Caligus tanago* Yamaguti도 과거에 불완전하게 기록되었기에 재 기재하였다.