

## ***Modiolicola avdeevi*, a New Sabelliphilid Copepod (Poecilostomatoida) from a Bivalve in the Sea of Japan**

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### **ABSTRACT**

A new species of Copepoda, *Modiolicola avdeevi* (Poecilostomatoida, Sabelliphilidae) associated with the bivalve *Modiolus difficilis* Kuroda and Habe in the Sea of Japan, is described. Although resembling close to *Modiolicola bifidus* Tanaka, 1961 in the body form, the new species is distinguished from *M. bifidus* by the more slender antenna, stouter caudal rami and more slender leg 5.

Key words: *Modiolicola*, new species, Copepoda, Sabelliphilidae, Sea of Japan.

### **INTRODUCTION**

The copepods belonging to the genus *Modiolicola* have been found in the bivalve mollusks and comprise eight described species. The genus characterized by the 4-segmented antenna bearing 3 terminal claws and the setation of endopods of third and fourth legs each bearing armature formula 0-1; 0-2; IV, 2 and 0-1; 0-1; II, respectively. In the report on the parasitic copepods from bivalve mollusks of the Possiet Bay, Russia, Avdeev (1977) recorded *Modiolicola bifidus* Tanaka from the bivalve *Modiolus difficilis* Kuroda and Habe. A close comparison between the species he described as *M. bifidus* and the original description (Tanaka, 1961), and the specimens of real *M. bifidus* from the Korean seas resulted in a conclusion that Avdeev was not dealing with *M. bifidus*, but a different species unknown until now. Since then the author have been tried to collect *Modiolus difficilis* so as to find this copepod species from this bivalve. Recently, at last, enough specimens of this copepod were collected from the Sea of Japan, and enabled the author to make the following description.

The specimens were examined and measured after soaking in lactic acid. The drawing were made with the aid of a camera lucida.

Sabelliphilidae Gurney, 1927

***Modiolicola avdeevi*, new species (Figs. 1-3)**

Syn.: *Modiolicola bifidus*: Avdeev, 1977, p. 34, figs. 1-19.

**Type specimens.** Holotype (ovigerous female), allotype male, and paratypes (16 females and 12 males) collected from the mantle cavity of a bivalve *Modiolus difficilis* Kuroda and Habe (10 individuals) caught by a fishing net in the Sea of Japan, near Gajin (about 20 km north of Sokcho), 10 December 1994. Holotype, allotype and undissected paratypes (14 females and 11 males) will be deposited in the U. S. National Museum of Natural History, Smithsonian Institution. Dissected paratypes (2 females and 1 male) are kept in the collection of the author.

**Female:** Body of largest specimen (Fig. 1A) 1.60 mm long, excluding setae on cudal rami. Prosome 5-segmented, 877  $\mu\text{m}$  long and 600  $\mu\text{m}$  wide; cephalothorax weakly divided into cephalosome and first pedigerous somite. Nauplian eye dark brown and distinct. Rostrum semicircular, with rounded posterior tip. Urosome (Fig. 1B) 5-segmented. First urosomal somite 165  $\mu\text{m}$  wide, slightly narrower than genital complex. Genital complex 275  $\times$  178  $\mu\text{m}$ , about 1.5 times as long as wide, with weak constriction just posterior to genital area; posteroventral margin fringed with crenulated membrane. Genital area (Fig. 1C) large, positioned dorsolaterally in midlength of genital complex. First to third abdominal somites gradually shorter and narrower, 100  $\times$  120  $\mu\text{m}$ , 75  $\times$  95  $\mu\text{m}$ , and 63  $\times$  85  $\mu\text{m}$ , respectively. Posteroventral margin of first 2 abdominal somites fringed with crenulated membrane (Fig. 1D), but that of anal somite with row of small spinules. Caudal ramus 98  $\times$  32  $\mu\text{m}$  (3.06:1), with 6 naked setae; lateral seta 45  $\mu\text{m}$  long, located at proximal 45% of the ramus; posteroventral margin of caudal ramus armed with minute spinules.

Antennule (Fig. 1E) 7-segmented, 380  $\mu\text{m}$  long, curved between fifth and sixth segments, with armature formula: 4, 13, 6, 3, 4 + 1 aesthetasc, 2 + 1 aesthetasc, and 7+1 aesthetasc. First 2 setae on first segment and tenth seta on second segment remarkably larger.

Antenna (Fig. 1F) long, slender, 360  $\mu\text{m}$  long, 4-segmented, with armature formula: 1, 1, 2, and 4 + 3 claws. First segment shortest but broadest. Terminal 3 segments nearly same in length, and terminal 2 segments distinctly narrower. Terminal segment slightly widened distally, with inner one of claws distinctly slender.

Labrum (Fig. 1G) with broad, membranous flange on posterior margin of each side. Mandible (Fig. 1H) as a slender, bipectinate flap. Palp not discernible. Maxillule (Fig. 1I) armed with 4 setae. Maxilla (Fig. 2A) 2-segmented; second segment with 1 seta, and terminated as long flap armed with spinules on convex margin. Maxilliped (Fig. 2B) small and 3-segmented; first segment glabrous; second segment with 2 identical setae; terminal segment acutely tapering, with 1 small subterminal seta.

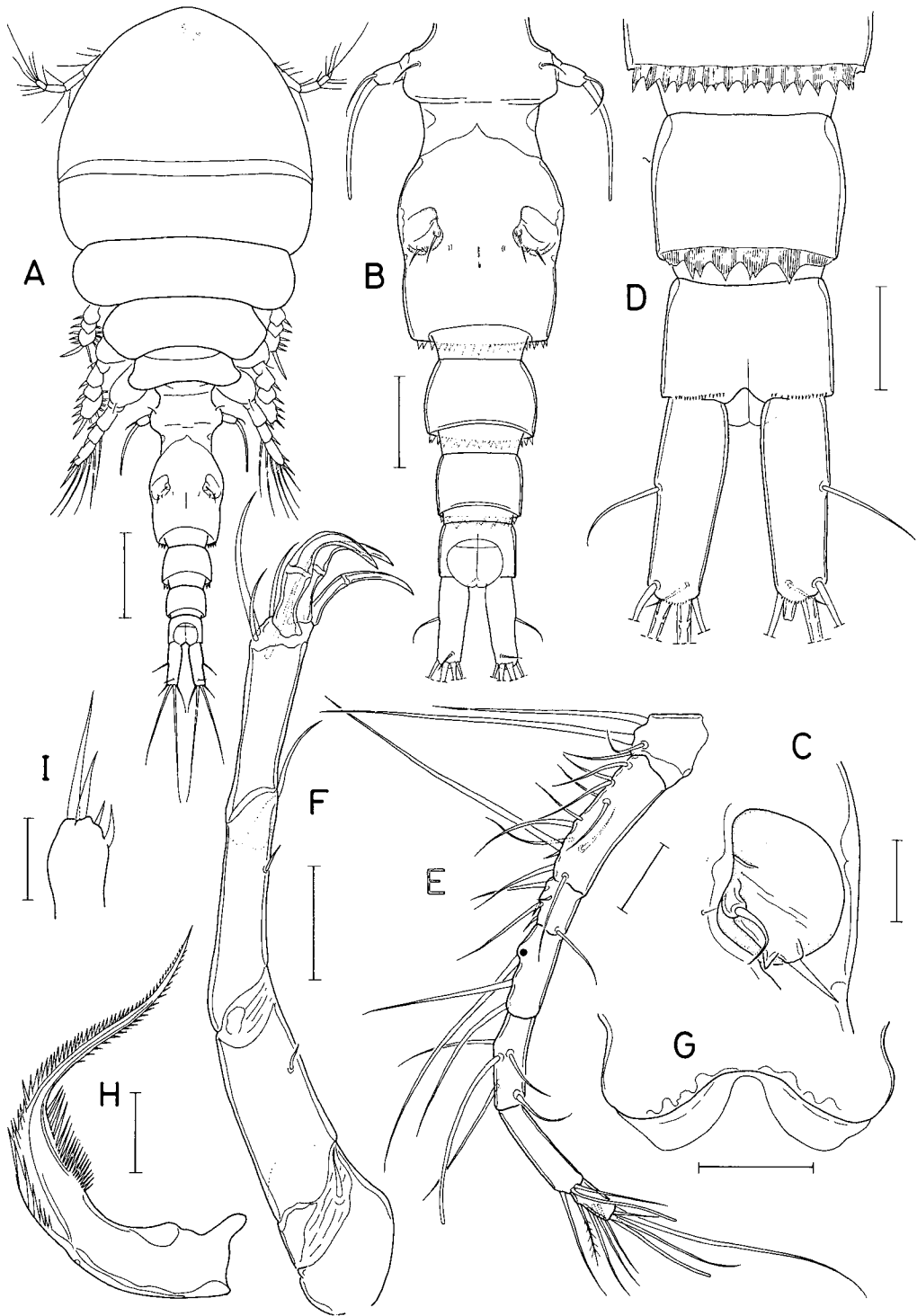
Leg 1 (Fig. 2C), leg 2 (Fig. 2D), leg 3, and leg 4 (Fig. 2E) with 3-segmented rami. Armature formula of legs 1-4 as follows (Roman numerals represent spine, and Arabic ones setae):

Leg 1: coxa 0-1; basis 1-0; exp. I-0; I-1; III, I, 5; enp. 0-1; 0-1; I, 5

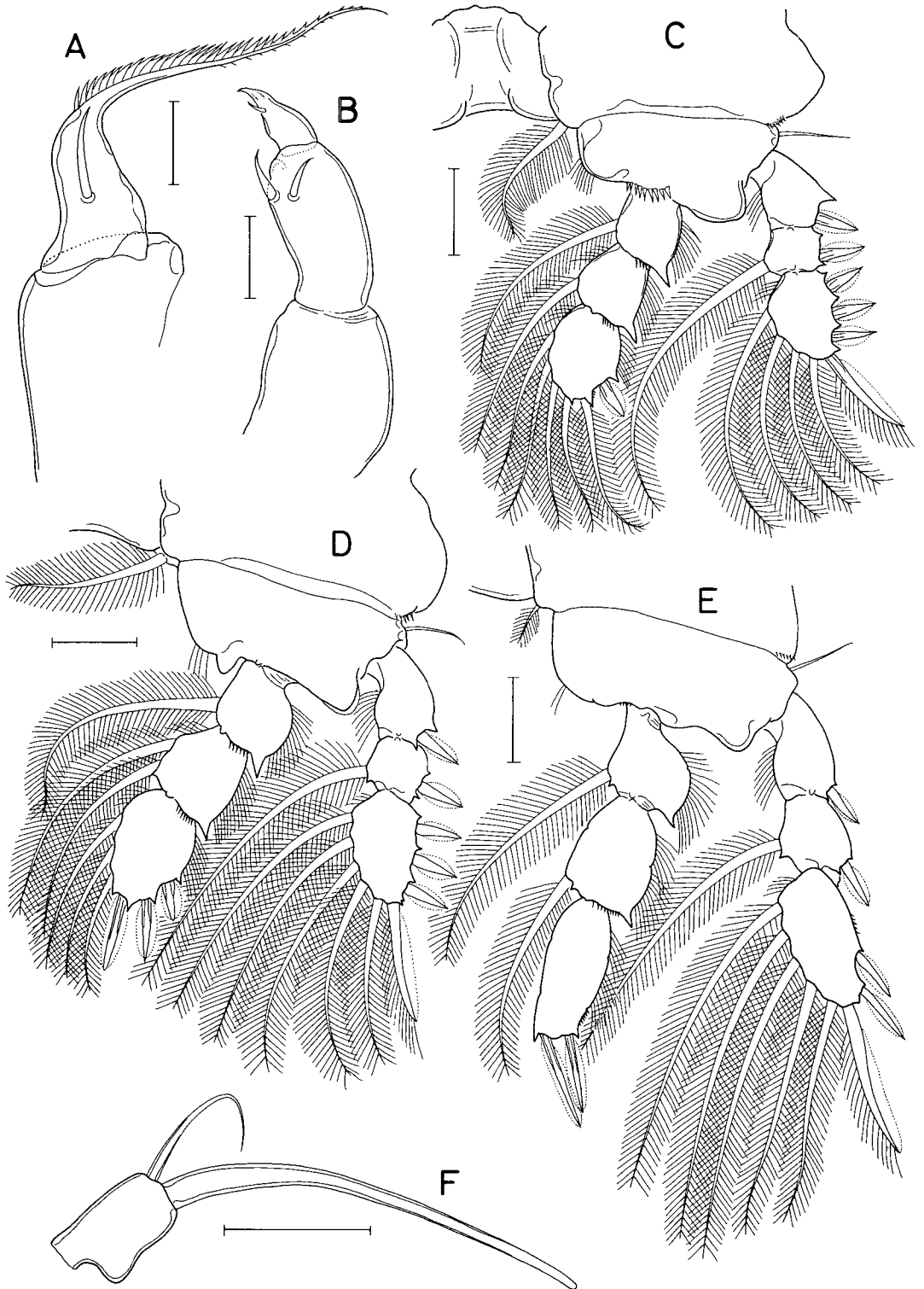
Leg 2: coxa 0-1; basis 1-0; exp. I-0; I-1; III, I, 5; enp. 0-1; 0-2; III, 3

Leg 3: coxa 0-1; basis 1-0; exp. I-0; I-1; III, I, 5; enp. 0-1; 0-2; IV, 2

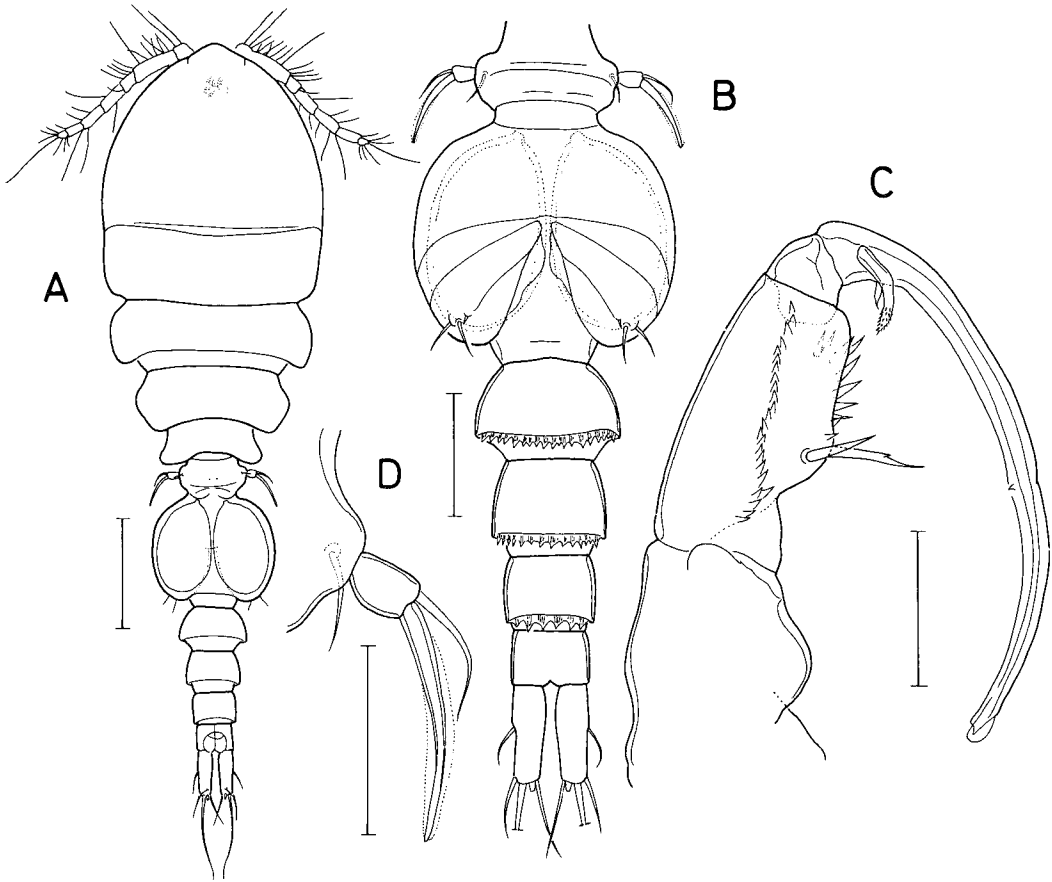
Leg 4: coxa 0-1; basis 1-0; exp. I-0; I-1; II, I, 5; enp. 0-1; 0-1; II



**Fig. 1.** *Modiolicola avdeevi*, new species, female: A, habitus, dorsal view; B, urosome, dorsal; C, right genital area; D, posterior part of urosome, ventral; E, antennule; F, antenna; G, labrum; H, mandible; I, maxillule. Scales: A = 0.2 mm; B = 0.1 mm; C, H, I = 0.025 mm; D-G = 0.05 mm.



**Fig. 2.** *Modiolicola audeevi*, new species, female: A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, leg 4; F, leg 5. Scales: A, B = 0.025 mm; C-F = 0.05 mm.



**Fig. 3.** *Modiolicola avdeevi*, new species, male: A, habitus, dorsal; B, urosome, ventral; C, maxilliped; D, leg 5. Scales: A, 0.2 mm; B = 0.1 mm; C, D = 0.05 mm.

Leg 5 (Fig. 2F) 1-segmented,  $38 \times 23 \mu\text{m}$  (1.65:1), with proximal expansion on posterior side, and with very narrowed base; terminal armature consisting of 1 long ( $130 \mu\text{m}$ ) spine and 1 anterior seta ( $50 \mu\text{m}$ ), both of them glabrous.

**Male:** Body of largest specimen (Fig. 3A) 1.35 mm long, with more slender prosome than in female. Cephalosome  $400 \mu\text{m}$  wide. Urosome (Fig. 3B) 6-segmented. First urosomal somite  $117 \mu\text{m}$  wide, with rounded lateral margins. Genital somite circular,  $200 \times 212 \mu\text{m}$ , slightly wider than long. Four abdominal somites gradually narrower,  $78 \times 117 \mu\text{m}$ ,  $78 \times 93 \mu\text{m}$ ,  $62 \times 75 \mu\text{m}$ , and  $45 \times 65 \mu\text{m}$ , respectively. Posteroventral margin of first 3 abdominal somites fringed with crenulated membrane. Caudal ramus  $83 \times 28 \mu\text{m}$  (about 3:1).

Third segment of antenna with 2 inner distal setae. Maxilliped as Fig. 3C. Fourth segment fused with claw, bearing 1 small and 1 larger setae, the latter bent, and distally stout, with fine spinules. Claw with minute spinule in the midlength.

Leg 5 (Fig. 3D)  $19 \times 13 \mu\text{m}$ , bearing 1 seta ( $37 \mu\text{m}$ ) and 1 spine ( $62 \mu\text{m}$ ) on free segment, the latter fringed with membrane on both margins, without proximal expansion.

Other characters as in female.

**Etymology.** The specific name, *avdeevi*, is taken in honour of Dr. G.B. Avdeev who first found this copepod.

**Remarks.** At first glance *Modiolicola avdeevi*, new species, closely resembles *M. bifidus* Tanaka, 1961 in the body form, and in the shape of genital complex in particular and caudal rami, of female. Such resemblance between the two might lead Avdeev (1977) to identify his specimens as *M. bifidus*. However, a comparison of dissected appendages of both species reveals prominent differences between the two. The major difference lies in the shape of antenna which is long and slender in *M. avdeevi* but is shorter and stouter in *M. bifidus*. The distal three segments of the antenna are nearly same in length in *M. avdeevi*, while in *M. bifidus* the second segment is the longest and followed by the fourth and the third segments. Further differences are found from a comparison of Korean materials (Ho and Kim, 1991) in the caudal rami which are about three times longer than wide (about four times in *M. bifidus*) and in the fifth leg which is 1.65 times longer than wide (about 1.36 times in *M. bifidus*).

Since the revision of lichomolgid copepods by Humes and Stock (1973), two more species have been added to the genus *Modiolicola*, excluding the new species. They are *M. gracilicaudus* Avdeev, 1977 which was also recorded in Korea (Ho and Kim, 1991) and *M. peronidius* Avdeev, 1987, both of them reported from the Sea of Japan. It is noticeable that *M. peronidius* is almost identical to *M. bifidus* in every morphological details, with the only exception that *M. peronidius* bear, according to Avdeev's original description, two spines and four setae (II, 4) on the endopodal third segment of leg 2. However, this setation is very unusual or questionable for *Modiolicola*, because, as far as I am aware, no sabelliphilid species, nor lichomolgid species, shows such setation. Therefore, *M. peronidius* need to be confirmed for its leg armature, otherwise, the name is thought to be a junior synonym of *M. bifidus*.

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동해의 털담치(이매패류)에 공생하는 요각류 1신종, *Modiolicola avdeevi*

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요 약

동해에 서식하는 이매패류인 털담치(*Modiolus difficilis*)에 공생하는 요각류 1신종 *Modiolicola avdeevi*를 기재하였다. 이 종은 외견상 *Modiolicola bifidus*와 매우 유사하나 두 종의 대측각, 꼬리돌기, 다섯째 다리의 형태를 비교하면 이들은 명백히 다른 종이다.