A New Record of *Symmius caudatus* (Crustacea, Isopoda, Chaetiliidae) from Korea, with the First Description of Male

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ABSTRACT

A chaetiliid isopod, *Symmius caudatus* Richardson, 1904 is newly recorded from Korea with detailed description and illustrations. This species is characterized by the following features: head has well-defined ocular lobes anteriorly projecting; all pereonites do not have any projections dorsally; maxillule has 2 long plumose and 1 short denticulate setae on inner lobe; propodus of pereopod 1 has 11 stout circumplumose setae on ventral margin in female; and pereopod 7 is ambulatory. In this paper, we present the descriptions and illustrations of mature and juvenile males, which have not been known from previous studies, as well as those of female. We also suggested a revised diagnosis of the genus *Symmius*.

Keywords: Isopoda, Korea, male, morphology, *Symmius*, taxonomy

INTRODUCTION

The family Chaetiliidae Dana, 1849 is divided into 12 genera with 44 species (Poore and Bruce, 2012). This family can be recognized from their congeners by the following features: pereopods 1 to 3 are subchelate and the biramous uropods are operculiform (Shimomura, 2008). Among genera in this family, the genus *Symmius* Richardson, 1904 is a small taxon comprising five species (*Symmius caudatus* Richardson, 1904 from Japan; *Symmius planus* Nunomura, 1984 from Japan; *Symmius philippinensis* Poore, 1991 from Philippines; *Symmius azumai* Nunomura, 2008 from Japan; and *Symmius yamaguchiensis* Shimomura, 2008 from Japan and Korea) that can be distinguished from other chaetiliids by body shape, laterally expanded ocular lobes, and prehensile pereopods 4–6 (Richardson, 1904; Nunomura, 1984, 2008; Poore, 1984, 1991; Shimomura, 2008; Song and Min, 2015).

Among *Symmius* species, *S. caudatus*, the type species of the genus, was first described from Japanese waters based on female specimens by Richardson (1904) without description of the male. Since the original description was made, any information of male has not been accumulated in this species (Richardson, 1904; Poore, 1984).

During the study on the marine isopod fauna of Korea, we found *S. caudatus*, previously not recorded in Korea, with materials of male as well as female. In this paper, we newly reported *S. caudatus* in Korea with descriptions and illustrations of mature and juvenile males. We also provided a revised diagnosis of the genus *Symmius*, including the information of male.

The materials of *S. caudatus* were collected from intertidal zone using a sieve with mesh size of 1 mm and subtidal zone by a light trap and SCUBA diving. These materials were fixed in 95% ethyl alcohol and transferred to the laboratory. After sorting the materials, observation of their habitus and appendages was conducted under a stereomicroscope (Olympus SZH-ILLD, Japan) and a light microscope (Nikon Eclipse 80i, Japan) each equipped with a drawing tube. Measurements and drawings of specimens were carried out with the aid of a drawing tube. Specimens examined in this study were deposited at the National Institute of Biological Resources (NIBR) and Chosun University in Korea.
SYSTEMATIC ACCOUNTS

18Order Iopoda Latreille, 1817
20Family Chaetiliidae Dana, 1849
38Genus Symmius Richardson, 1904
Symmius Richardson, 1904: 39; Poore, 1984: 76.

Diagnosis. Head, posterior margin partly immersed in pereonite 1, with well-defined ocular lobes; eyes small. Pereonites 5–7 with coxal plates. Pleonites composed of 2 segments, completely free. Pleotelson without suture line, tapering posteriorly. Pereopods 1–6 subchelate. Pereopod 7 much shorter than other pereopods, incomplete during juvenile stage. Antennule, flagellum articles with sexual dimorphism; aesthetascs of flagellum articles positioned at distal end in female or on lateral margin in male. Uropods operculiform; rami overlapped each other and subequal in length.

48Symmius caudatus Richardson, 1904 (Figs. 1–6)
Symmius caudatus Richardson, 1904: 40; Poore, 1984: 76.

Material examined. Korea: 2 males, 1 juvenile male (NIBR IV0000825771), 1 ovigerous female, Jeollanam-do: Wando-gun, Bogil-myeon, Buhwang-ri, 34°10ʹ25ʺN, 126°33ʹ21ʺE, 25 Jul 2017, depth 0–0.5 m; 1 female, Nohwa-eup, Docheong-ri, 34°11ʹ18ʺN, 126°33ʹ36ʺE, 26 May 2017, depth 4 m, light trap; 1 juvenile female, Sinan-gun, Heuksan-myeon, Hongdo-ri, 34°10ʹ09ʺN, 126°33ʹ21ʺE, 19 Jun 2018, depth 10 m, SCUBA diving.

Description of female. Body (Fig. 1A, B) 2.6 times as long as wide, dorsoventrally flattened; length 11.12 mm; integument smooth. Head 0.48 times longer than wide, with straight anterior margin; posterior margin partly immersed in pereonite 1; well-defined ocular lobes anteriorly projecting; 1 projection on mid-dorsal surface; small eyes positioned to ocular lobes (Fig. 1A). Each pereonites without projection on dorsal side; pereonites 2 and 3 broadest; pereonites 1–4 equal in length, with blunt anterior and posterior corners; pereonites 5–7 sequentially shorter in length (Fig. 1A, B). Coxal plates of pereonites 1–4 fused to thoracic segments, whereas those of pereonites 5–7 separated (Fig. 1A, B). Pleon almost half length of pereon; pleonites without dorsal projection; pleotelson tapering posteriorly, with rounded apex (Fig. 1A, B).

Antennule (Fig. 1C) reaching to ocular lobes, composed of 3 peduncular and 3 flagellar articles; peduncular article 1 with 1 simple setae distally; article 2 subequal to article 1 in length, with 1 bifid seta, 1 palsea seta, 3 simple setae on lateral margin, article 3 about as long as article 2, with 2 bifid and 2 simple setae laterally and 1 palmate seta distally; flagellar article 1 elongate clavate-shaped, 1.9 times longer than peduncular article 3, with 2 simple seta laterally, 2 simple setae and 3 aesthetascs distally; articles 2 and 3 minute; article 2 with 1 simple seta; article 3 with 1 simple seta and 1 aesthetasc distally.

Antenna (Fig. 1D) similar to antennule in length, consisted of 5 peduncular and 3 flagellar articles; peduncular article 3 2 times longer than article 2, with several simple setae and 1 tri-branched seta on lateral margin; article 4 0.7 times longer than article 3 with simple setae laterally; article 5 as long as article 4, with simple and bifid setae laterally, 2 palmate setae distally; flagellar article 1 0.7 times longer than peduncular article 5, with simple setae laterally and distally; articles 2 and 3 minute, with simple setae on distal end.

Left mandible (Fig. 2A) with lacinia mobilis composed of 1 cusp and 3 pectinate setae; incisor with 5 cusps; spine row of 7 spines fused to lacinia mobilis. Right mandible (Fig. 2B) with lacinia mobilis consisted of 3 cusps and 3 pectinate setae; incisor composed of 4 cusps, spine row of 8 spines fused to lacinia mobilis.

Maxillule (Fig. 2C), inner lobe with 2 long and 1 short serrate setae; outer lobe with 8 stout simple and 4 robust denticulate setae.

Left maxilla (Fig. 2D), inner lobe with 7 plumose setae, mesial and outer lobes with 2 denticulate setae. Right maxilla (Fig. 2E), inner lobe with 7 plumose setae and 1 simple seta; mesial lobe with 3 denticulate setae; outer lobe with 2 denticulate setae.

Maxilliped (Fig. 2F), endite reaching halfway along palp article 2, with 1 coupling hook laterally and 5 plumose setae distally; palp articles 4-segmented, strongly produced on inner distal angle; palp article 2 with 13 simple setae on inner distal angle, article 3 with 10 simple setae on inner distal angle and 2 simple outer distal angle; article 4 with 8 simple setae distally.

Pereopods with numerous fine setae, decreasing lengths from basis to carpus; pereopod 7 much shorter than other pereopods (Fig. 3A–G). Pereopod 1 (Fig. 3A), basis with long simple setae and 1 tri-branched seta on both lateral margins; ischium 0.5 times longer than basis, with long simple setae laterally; merus almost half length of ischium, with simple setae on lateral margin and 1 stout circumplumose seta on posterodistal angle; carpus with 6 stout circumplumose setae on posterior margin; propodus robust, with 11 stout circumplumose setae on palm, several long simple setae on anterior margin; dactylus with simple setae laterally, 2 claws and several simple setae distally. Pereopods 2–7 (Fig. 3B–G), base with simple and tri-branched setae; ischia and meri with long

Korean name: 18등각목, 20두엽벌레과, 38창벌레속, 48창벌레(신칭)
Fig. 1. *Symmius caudatus*, female. A, Habitus, dorsal view; B, Habitus, lateral view; C, Antennule; D, Antenna. Scale bars: A-D = 1 mm.
plumose setae laterally; carpi triangular, with stout circumplumose setae on posterodistal angle and simple setae on posterior margin; propodi slender than propodus of pereopod 1, with simple setae on lateral margin, teeth on posterior margin.

Pleopods (Fig. 4A–E) consecutively longer from pleopod 1 to 5; pleopod 3–5 similar to each other, with 2-articulated exopod. Pleopod 1 (Fig. 4A), protopod oval to rectangular, with 5 coupling hooks laterally; rami longer than plumose setae in length, with long plumose setae marginally; endopod longer than exopod. Pleopod 2 (Fig. 4B) similar to 1; protopod rectangular; rami with long plumose setae marginally; exopod shorter than endopod. Pleopod 3 (Fig. 4C), protopod rectangular; rami with sub-acute apex; exopod with several plumose setae distally; endopod slightly longer than exopod. Pleopods 4 and 5 (Fig. 4D, E), protopod almost square; rami with acute apex; exopod with several plumose setae distally, endopod shorter than exopod.

Uropod (Fig. 4F), protopod 3 times longer than width, with simple setae along with inner margin, 2 simple setae on distally; rami subequal in length and overlapped each other; endopod with plumose setae laterally; exopod with plumose setae apically.

**Description of male.** Body (Fig. 5A, B) 2.8 times as long as wide, dorsoventrally flattened; length 9.5 mm; integument smooth. Antennule (Fig. 5C), flagellum articles fused into uni-segment, with several aesthetasc. Pereopod 1 (Fig. 5D), propodus with 8 circumplumose setae. Pereopod 7 (Fig. 5E) without circumplumose setae on carpus. Pleopod 2 (Fig. 5F) with appendix masculina 3 times longer than endopod, with acute apex. Penes (Fig. 5G) rectangular to oval-shape, with a concavity at middle region.

**Description of juvenile male.** Body (Fig. 6A, B) 2.3 times as long as wide, dorsoventrally flattened; length 7.6 mm; integument smooth. Pleopod 2 (Fig. 6C) with appendix masculine about 1.5 time longer than endopod, with ambiguous unguis.

**Distribution.** Japan, Korea (present study).

**Remarks.** *Symmius caudatus* Richardson, 1904 was recently
Fig. 3. *Symmius caudatus*, female. A, Pereopod 1; B, Pereopod 2; C, Pereopod 3; D, Pereopod 4; E, Pereopod 5; F, Pereopod 6; G, Pereopod 7. Scale bar: A-G = 1 mm.
Fig. 4. *Symmius caudatus*, female. A, Pleopod 1; B, Pleopod 2; C, Pleopod 3; D, Pleopod 4; E, Pleopod 5; F, Uropod. Scale bars: A–F=1 mm.
Fig. 5. *Symmius caudatus*, male. A, Habitus, dorsal view; B, Habitus, lateral view; C, Antennule; D, Pereopod 1; E, Pereopod 7; F, Pleopod 2; G, Penes. Scale bars: A, B, D, E = 1 mm, C, F, G = 0.5 mm.
**Fig. 6.** *Symmius caudatus*, Juvenile male. A, Habitus, dorsal view; B, Habitus, lateral view; C, Pleopod 2; D, Pereopod 7. Scale bars: A–D = 1 mm.
redescribed by Poore (1984) with detailed illustrations. It is known that this species shows several characteristic features in terms of the projecting anterior angle, absence of the mid-dorsal projections on dorsal surface, numbers of stout circum-plumose setae on the propodus of pereopod 1 and setae on the inner lobe of maxillule, and the shape of the maxilliped (Richardson, 1904; Poore, 1984). Korean materials are well accorded with previous descriptions of *S. caudatus* in most characteristic features mentioned above. Concerning to the morphology of pereopod 7, however, Korean materials show a distinct difference from the previous report with Japanese materials by Poore (1984): Korean materials have pereopod 7 with unguis while Poore (1984) described that without unguis. Unfortunately, Richardson (1904) presented too insufficient information of pereopod 7, only with simple description and drawing of it, to recognize the presence of unguis in the original description. So, taxonomic meaning of this difference found between Korean and Japanese materials is still in question and merits further study with the type material.

Korean materials of *S. caudatus* are most similar to *S. yamaguchiensis* in terms of the morphology of ambulatory pereopod 7. However, this two species can be distinguished from each other by the following features: the morphology of anterior margin of the head (strongly projecting anterior angle in *S. caudatus* vs. not or slightly projecting anterior angle in *S. yamaguchiensis*) and the presence of middorsal projections on the dorsal surface (absence in *S. caudatus* vs. presence in *S. yamaguchiensis*) (Shimomura, 2008; Song and Min, 2015).

In the present study, Korean materials of *S. caudatus* were collected from relatively shallow waters (from intertidal to subtidal zones at depth 0–10 m) compared to the previous reports of Japanese materials from deep sea at depth 108–127 m (Richardson, 1904; Poore, 1984).

**ACKNOWLEDGMENTS**

This study was supported by the research funds from Chosun University (2017) and the National Institute of Biological Resources (NIBR), funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR 201801202).

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Received June 25, 2018
Revised September 20, 2018
Accepted October 8, 2018