New record of two cymothoid isopods (Crustacea: Malacostraca: Isopoda) from South Korea

Ji-Hun Song and Gi-Sik Min*

Department of Biological Sciences, Inha University, Incheon 22212, Republic of Korea

*Correspondent: mingsik@inha.ac.kr

Two marine isopods, *Elaphognathia sugashimaensis* (Nunomura, 1981) and *Metacirolana shijikiensis* Nunomura, 2008, have been reported for the first time in South Korea. Specimens of *E. sugashimaensis* and *M. shijikiensis* were collected using light traps from Yeongdeok-gun and Gageo-do Island in South Korea, respectively. The genera *Elaphognathia* Monod, 1926 and *Metacirolana* Kussakin, 1979 are new to South Korea. In this paper, we provide descriptions of diagnostic characteristics and illustrations of their morphologies. Additionally, the partial sequences of mitochondrial cytochrome c oxidase subunit 1 (CO1) of two species are provided as molecular characteristics.

Keywords: CO1, *Elaphognathia sugashimaensis*, Isopoda, *Metacirolana shijikiensis*, South Korea

INTRODUCTION

Recently, the number of newly recorded isopod species from South Korea has increased gradually: two new species and five unrecorded species (Song and Min, 2015a; 2015b; 2015c). In this paper, we reported two unrecorded isopod species: *Elaphognathia sugashimaensis* (Nunomura, 1981) and *Metacirolana shijikiensis* Nunomura, 2008.

The genus *Elaphognathia* Monod, 1926 (Isopoda: Cymothoida: Gnathiidae), is one of 12 genera that belong to the family Gnathiidae Leach, 1814. Currently, it comprises 23 species (Schotte, 2015). This genus is new to South Korea and diagnosed by: (1) frontal margin of cephalon, deeply excavated; (2) mandible long, cylindrical; (3) pylopod 2- or 3-articled; and (4) pereonite 1 immersed in cephalon (Cohen and Poore, 1994).

The genus *Metacirolana* Kussakin, 1979 (Isopoda: Cymothoida: Cirolanidae), is one of 64 genera that belong to the family Cirolanidae Dana, 1852. Currently, it comprises 32 species (Bruce and Schotte, 2015). This genus is also new to South Korea and diagnosed by: (1) pleonite 5 lateral margins not overlapped by those pleonite 4; (2) frontal lamina anterior margin, freely projecting; (3) maxillipedal palp slender, palp article 3 much wider and longer than article 4; and (4) uropod peduncle medial margin produced (Brusca et al., 1995; Schotte and Kensley, 2005).

Herein, we provide descriptions of the diagnostic characteristics and illustrations of morphologies of two species. In addition, the partial sequences of CO1 of these species are provided as molecular characteristics.

MATERIALS AND METHODS

Sample collection

Specimens of *E. sugashimaensis* and *M. shijikiensis* were collected using light traps from Yeongdeok-gun (36°21’N, 129°23’E) and Gageo-do Island (34°02’N, 125°07’E) in South Korea, respectively. They were preserved directly in 95% ethyl alcohol after collection. All examined specimens were deposited in the National Institute of Biological Resources (NIBR) and Inha University, South Korea.

Morphological analysis

The specimens were transferred to glycerin for dissection and then examined and dissected under a stereomicroscope (Model SZX-7, Olympus, Tokyo, Japan). Figures of dissected appendages were obtained by light microscopy with attached drawing tube (Model DM 2500; Leica, X50-630, Wetzlar, Germany). Figures of the whole body were obtained using the drawing tube attached to a stereomicroscope (Olympus SZX-12, Tokyo,
Japan). The lengths of all appendages and the whole body were measured with a stage micrometer (Model No. 11513106; Leica, Germany) and an ocular micrometer. Photographs of the whole bodies were taken with a microscope digital camera (Model eXcope K6; DIXI Science, Korea).

**DNA sequencing**

DNA was extracted from one pleopod 1 from each specimen using DNeasy Blood and Tissue Kit (Qiagen, Valencia, CA, USA) according to the manufacturer’s instructions. The DNA was amplified using PCR (polymerase chain reaction) with two primers: jgLCO1490 5′-TITCIACIAAYCAAYAARGAYATTGG-3′ and jgHCO 2198 5′-TAIACYTClGGRGTTGCRAARAAAYCA-3′ (Geller et al., 2013). PCR amplification was conducted under the following condition: 3 min at 94°C, 35 cycles at 95°C for 15 s, 42°C for 30 s, and 72°C for 60 s, and a final extension at 72°C for 7 min. PCR products were purified using the QIAquick PCR Purification Kit (Qiagen, Valencia, CA, USA) and sequenced with the ABI 3100 automated sequencer (Perkin Elmer, Foster City, CA, USA).

**RESULTS AND DISCUSSION**

Order Isopoda Latreille, 1817 동각목
Suborder Cymothoida Wägele, 1989 부채벌레아목
Family Gnathiidae Leach, 1814 큰턱벌레과 (신칭)
Genus Elaphognathia Monod, 1926
오목머리큰턱벌레속 (신칭)


스가시마오목머리큰턱벌레 (신칭) (Fig. 1)

**Synonyms.** *Gnathia sugashimaensis* Nunomura, 1981: 19, figs. 1, 2; Muller, 1989: 25, figs. 1-4.


**Material examined.** Korea: 2♂♂, Ganggu harbor, Yeo­ngdeok­gun, Gyeongsangbuk­do, 36°21′N, 129°23′E, August 27, 2014, depth 3-5 m, collected using light traps by Song J.-H.

![Fig. 1. *Elaphognathia sugashimaensis*, male. A, body, dorsal view; B, body, dorsal view, drawing; C, mandible; D, maxilliped; E, pylopod and enlargement of distal article. Scale bars: A, B = 1 mm, C-E = 0.1 mm.](image_url)
**Diagnosis.** Body (Fig. 1A, B) flattened, about 3.5 mm, almost 3.3 times as long as wide. Cephalon (Fig. 1A, B) 1.5 times as wide as long, dorsally with depressions, medially excavated, with two frontal process bearing 4 short setae distally. Eyes (Fig. 1A) with dark pigment, ommatidia small. Mandible (Fig. 1C) with triangular projection with one seta. Maxilliped (Fig. 1D) comprise five segments with plumose setae on lateral margin. Pylopod (Fig. 1E) comprise three segments, distal article minute. Pereonite 1 immersed in cephalon; pereonites 2, 3 in similar length; pereonite 4 smaller than other pereonites; pereonite 7 longest (Fig. 1A, B). Telson (Fig. 1A, B) triangular, length as long as width.

**Remarks.** *Elaphognathia sugashimaensis* was described by Nunomura (1981) based on the specimens collected from the Sugashima, Ise Bay, Japan. This species was redescribed by Muller (1989), who provided a more detailed morphological description of the cephalon, and the species has been previously reported from Japan only. *Elaphognathia sugashimaensis* is similar to *E. lucanoides* (Monod, 1926) in external features. However, *E. sugashimaensis* differs from *E. lucanoides* in having a less excavated cephalon and more robust mandible (Muller, 1989). This species is also similar to *E. discolor*. In general, the illustrations and descriptions of *E. sugashimaensis* specimens from South Korea agreed well with the illustrations and original description of Nunomura (1981) and redescription of Muller (1989).

**Habitat.** This species was found on the surface of an ascidian, *Pyura sacciformis*, at the type locality. The specimens were collected from the sandy bottom with seaweeds at a depth of 3-5 m.

**World distribution.** Japan (Nunomura, 1981; Muller, 1989), Korea.

**Deposition.** NIBR No. NIBRIV0000437276 (1 male).

**Molecular characteristic.** GenBank accession number: KX078775 (1 male).

**Identifiers.** Ji-Hun Song, Gi-Sik Min.

**Family Cirolanidae Dana, 1852**

**Genus Metacirolana Kussakin, 1979**

**2. Metacirolana shijikiensis Nunomura, 2008**

시지키톱니꼬리모래무지벌레(신칭)(Fig. 2)

**Synonyms.** *Metacirolana shijikiensis* Nunomura, 2008: 28, figs. 11, 12.

**Material examined.** Korea: 2♂♂, Gageo-do Island, Sinan-gun, Jeollanam-do, 34°02′N, 125°07′E, June 4,
2013, depth 3-5 m, collected using light traps by Lim B.-J.

**Diagnosis.** Body (Fig. 2A, B) flattened, about 3.9 mm, almost 2.3 times as long as wide. Color white in ethanol. Cephalon (Fig. 2A, B) 1.7 times as wide as long, with median rostral process. Eyes (Fig. 2A) with dark pigment, ommatidia small. Maxilliped (Fig. 2C) palp slender, third article expanded and longest. Uropod (Fig. 2D) exopod with 12 teeth and marginal setae, spine-like seta is absent; endopod with 22 teeth and marginal setae, spine-like seta is absent. Pleotelson (Fig. 2E) triangular, posterior margin serrated, provided with 24 teeth.

**Remarks.** *Metacirolana shijikiensis* was described by Nunomura (2008) based on the specimens collected from the Mouth of Shijiki Bay, off Ehonohana, Japan. This species has been previously reported from Japan only. *Metacirolana shijikiensis* is similar to *M. chemola* Schotte & Kensley, 2005 in external features. However, *M. chemola* differs from *M. shijikiensis* in having two short, stout spine-like setae and simple setae on lateral margin on uropodal exopod and one stout spine-like seta and long simple setae on lateral margin on uropodal endopod (uropodal exopod and endopod with no spine-like setae, but marginal setae in *M. shijikiensis*). This species is also similar to *M. agaricicola* Kensley, 1984. However, *M. shijikiensis* differs from *M. agaricicola* in having a convex posterior margin on pleonite 5 (trilobed margin on pleonite 5 in *M. agaricicola*). In the original description, the third article of the maxillipedal palp is not expanded and similar length to other articles. We believe that the description of the maxillipedal palp was inaccurate, because all species of the genus *Metacirolana* have an expanded article 3 on the maxillipedal palp as a generic characteristic (Brusca et al., 1995). In general, the illustrations and description of *M. shijikiensis* specimens from South Korea agreed well with the illustrations and original description of Nunomura (2008).

**Habitat.** There is no information on the habitat at the type locality. The specimens were collected from the sandy bottom with seaweeds at a depth of 3-5 m.

**World distribution.** Japan (Nunomura, 2008), Korea.

**Deposition.** NIBR No. NIBRIV0000437275 (1 male).

**Molecular characteristic.** GenBank accession number: KX078776 (1 male).

**Identifiers.** Ji-Hun Song, Gi-Sik Min.

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**References**


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