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New record of limnoriid and asellote species (Crustacea: Malacostraca: Isopoda) from South Korea

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During a scientific survey of Korean isopod fauna, we discovered two marine isopods, *Limnoria segnoides* Menzies, 1957 and *Munna japonica* Shimomura and Mawatari, 2001, which are new records to South Korea. *Limnoria segnoides* and *M. japonica* were collected by SCUBA diving from the subtidal zone of Jeju Island and Yangyang-gun in South Korea, respectively. In this paper, we provide diagnosis and illustrations of the two isopods. Additionally, we provide GenBank accession numbers of partial sequences of mitochondrial cytochrome c oxidase subunit 1 (*CO1*) of two species.

Keywords: *CO1*, *Corallina*, *Gelidium elegans*, Isopoda, *Limnoria segnoides*, *Munna japonica*, South Korea

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Introduction

To date, the genus *Limnoria* Leach, 1814 (Isopoda: Limnoriidea: Limnoriidae) comprises 53 species (Schotte, 2007a; Yoshino *et al*., 2017). Only one limnoriid species has so far been recorded from South Korea: *Limnoria rhombipunctata* Yoshino, Watabe and Ohsawa, 2017 (Song *et al*., 2017). This genus is diagnosed by the following characters: (1) antennular flagellum with 3-4 articles; (2) uropodal exopod much shorter than endopod; and (3) uropodal endopod with blunt apex, without claw (Cookson, 1991). The genus *Munna* Krøyer, 1839 (Isopoda: Asellota: Munnidae) currently comprises 78 species (Schotte, 2007b). To the best of our knowledge, no species of *Munna* has ever been recorded from South Korea. This genus is diagnosed by the following characters: (1) antennular flagellum with minute distal article, with two aesthetascs; (2) mandibular palp reaching beyond end of incisor; and (3) male pleopod 1 with acute distolateral projections (Poore, 1984).

Herein, we provide diagnosis and illustrations of morphologies of two unrecorded isopod species: *Limnoria segnoides* Menzies, 1957 and *Munna japonica* Shimomura and Mawatari, 2001. Additionally, the partial sequences of *CO1* of these species are provided as molecular characters.

Materials and Methods

Sample collection and morphological analysis

Specimens of *L. segnoides* and *M. japonica* were collected by SCUBA diving and rinsing algae from the subtidal zone of Jeju Island and Yangyang-gun in South Korea, respectively. All the steps for preservation and deposition of specimens and morphological analysis follow Song *et al*. (2017).

Genomic DNA sequencing

All the steps for DNA sequencing follow Song *et al*. (2017). In order to amplify the *CO1* region in gDNA, the mitochondrial specific primer pair for each species are as follow: Lim-F1 and Lim-R4 for *L. segnoides*; and (2) LCO1490 and HCO2198 for *M. japonica*.

Results and Discussion

Order Isopoda Latreille, 1817 등각목
Suborder Limnoriidea Brandt and Poore, 2002
부삽꼬리벌레아목 (신칭)
Superfamily Limnorioidea White, 1850
부삽꼬리벌레상과 (신칭)
Family Limnoriidae White, 1850
부삽꼬리벌레과 (신칭)

Genus *Limnoria* Leach, 1814 부삽꼬리벌레속 (신칭)

1. *Limnoria segnoides* Menzies, 1957
작은혹부삽꼬리벌레 (신칭) (Fig. 1)
Limnoria segnoides Menzies, 1957: 184, fig. 38; Roman, 1970: 163.

Material examined. South Korea: 2 females, Munseom, Seogwi-dong, Seogwipo-si, Jeju Island (33°13′40.26″N, 126°33′59.64″E); depth 10-15 m; SCUBA diving and rinsing the rhizome of *Corallina* sp. (red algae); collected by J.-H. Song on September 18, 2015.
Diagnosis. *Female*. Body (Fig. 1A, D) oblong, approximately 3.1 mm long, almost 3.2 times longer than the greatest width. Body surface covered with thin setae. Coxae of pereionites 2-7, large and well visible dorsally. Pleonite 5 approximately 0.7 times as long as pleotelson, with V-shaped carina and without node or punctum. Pleotelson (Fig. 1A, D), followed by a single node and followed posteriorly by longitudinal carinae. Mandible (Fig. 1B), lacking palp, replaced by a stout long seta; lacinia mobilis with two serrated setae. Maxilliped (Fig. 1C) with clavate-shaped epipod.
Remarks. *Limnoria segnoides* was described by Menzies (1957) based on specimens collected from Misaki, Japan. All limnorid species have a mandibular palp, except the following four species (lacking palp): *L. segnoides*; *L. bituberculata* Pillai, 1957; *L. uncapedis* Cookson, 1991; and *L. zinovae* (Kussakin, 1963). Among these species, *L. segnoides* is most similar to *L. zinovae* (Kussakin, 1963) in external features, especially in structure of pleotelson. However, *L. segnoides* differs from *L. zinovae* in having a bifid lacinia mobilis on mandible and a less elevated node on pleotelson. In general, diagnosis of *L. segnoides* from South Korea agreed well with the original description of Menzies (1957).
Habitat. Habitat information is not available for the type locality. However, the holotype was collected from a coralline algal community at low tide level in Misaki, Japan. The present specimens were also collected from

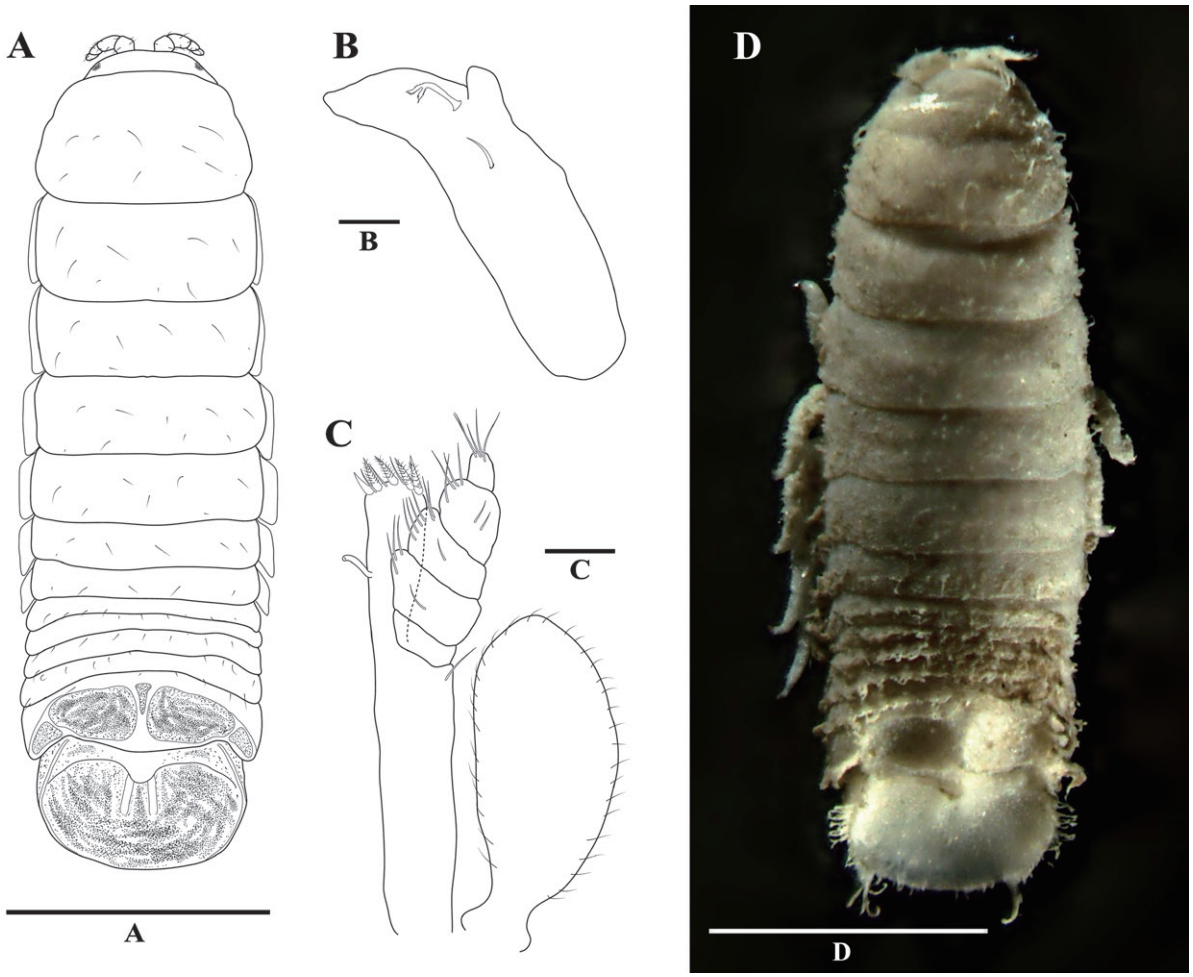

Fig. 1. *Limnoria segnoides*: A, body of female, dorsal view; B, mandible; C, maxilliped; D, body of female, photographs. Scale bars: A, D = 1 mm, B, C = 0.05 mm.

the bottom with red algae (*Corallina* sp.) at a depth of 10-15 m.

World distribution. Japan (Menzies, 1957), Madagascar (Roman, 1970), and South Korea (this study).

Deposition. NIBR No. NIBRIV0000470353 and NIBR IV0000470354 (2 females).

Molecular characters. GenBank accession numbers: KX171203 and KX171204 (2 females).

Suborder Asellota Latreille, 1802 물좀아목
Superfamily Janiroidea Sars, 1897
물좀벌레상과 (신칭)
Family Munnidae Sars, 1897 유령거미물좀과 (신칭)
Genus *Munna* Krøyer, 1839 유령거미물좀속 (신칭)

2. *Munna japonica* Shimomura and Mawatari, 2001
일본유령거미물좀 (신칭) (Fig. 2)

Munna japonica Shimomura and Mawatari, 2001: 52, figs. 3, 4.

Material examined. South Korea: 2 males, Oasis (SCUBA diving point), Namae-ri, Hyeonnam-myeon, Yangyang-gun, Gangwon-do (37°56′28.04″N, 128°47′23.95″E); depth 4 m; SCUBA diving and rinsing *Gelidium elegans* (seaweeds); collected by T. Park and Y. Eun on June 10, 2013.

Diagnosis. Male. Body (Fig. 2A, E), length approximately 2.2 mm, 1.8 times as long as width. Eyestalk stout and short. Coxae of pereionites 2-6 visible dorsally. Maxilliped (Fig. 2B), palp comprises five segments; with oval-shaped epipod. Pereiopod 1 (Fig. 2C), basis with one superodistal seta; ischium with one seta on inferodistal and superior margins, respectively; merus trapezoidal-shaped; carpus widest, with two serrate spines and three long setae on inferior margin; propodus oval-shaped, with one serrate spine and two setae on inferior margin. Pleopod 1 (Fig. 2D) with a pair of disto-laterally directed long projections and two anteroventral robust setae.

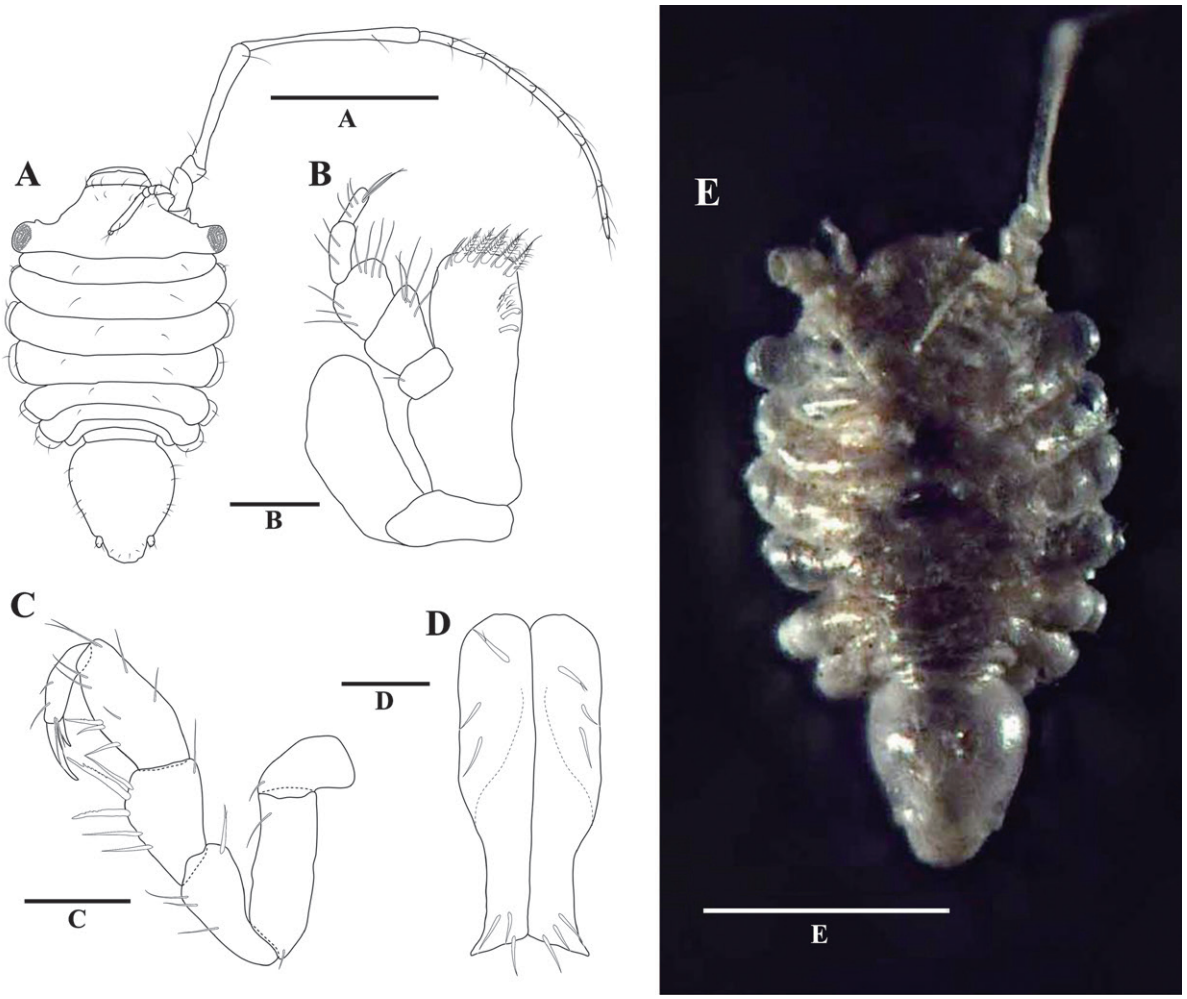

Fig. 2. *Munna japonica*: A, body of male, dorsal view; B, maxilliped; C, pereiopod 1; D, pleopod 1; E, body of male, photohraphs. Scale bars: A, E = 1 mm, B = 0.1 mm, C, D = 0.05 mm.

Remarks. *Munna japonica* was first described by Shimomura and Mawatari (2001) based on the specimens collected from Hiroshima, Japan. This species was previously reported from type locality only (Shimomura and Mawatari, 2001). *Munna japonica* is distinguished from other species of *Munna* by several characters: (1) some short fine simple setae on frontal margin of head; (2) no robust sensory setae on lateral margin of pleotelson; and (3) pleopod 1 of male with a distolaterally directed long and stout projections. In general, specimens of *M. japonica* from South Korea agreed well with the original description of Shimomura and Mawatari (2001).
Habitat. Habitat information is not available for the type locality. However, the additional specimens were collected from various seaweed communities (e.g., *Eckloniopsis radicosa*, *Gelidium amansii*) (Shimomura and Mawatari, 2001). Korean specimens of *M. japonica* were collected from the bottom with seaweed (*Gelidium elegans*) at a depth of 4 m.
World distribution. Japan (Shimomura and Mawatari, 2001), South Korea (this study).
Deposition. NIBR No. NIBRIV0000470357 and NIBR IV0000470358 (2 males).
Molecular characters. GenBank accession numbers: KX186724 and KX186725 (2 males).

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