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A newly recorded species of the genus *Phronima* (Amphipoda, Hyperiidea, Phronimidae) from off Jeju Island, Korea

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A newly recorded species, *Phronima solitaria* Guérin-Méneville, 1844, belonging to the family Phronimidae Rafinesque, 1815, was collected during a pelagic zooplankton survey in the Jeju Sea of Korea. This species is characterized by the presence of a strong single protuberance on the carpus of pereopod 5. *Phronima solitaria* is morphologically similar to *P. atlantica* Guérin-Méneville, 1836, and *P. sedentaria* (Forskål, 1775), however, it is distinguished from other congeneric species by the length of pleonite 1 compared to pereonite 7, the single protuberance on the carpus of pereopod 5, and the subequal lengths of both rami on all uropods. In the present study, a newly recorded species is illustrated and compared to related species. A key to species of the family Phronimidae from Korean waters is also provided.

Keywords: hyperiid, Korea, new record, *Phronima solitaria*, taxonomy

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Introduction

The family Phronimidae Rafinesque, 1815, is group of pelagic amphipods that occur as abundant crustacean zooplankton in pelagic communities (Bowman, 1960; Bowman and Gruner, 1973; Vinogradov, 1999). Phronimidae can be distinguished from other families within Phronimoidea by the distinctly subchelated pereopod 5 and the lanceolate rami of all uropods (Zeidler, 2004). This family includes 11 species in two genera (Horton *et al*., 2024). The genus *Phronima* Latreille, 1802 consists of 10 species and was established by Latreille (1802) with *P. sedentaria* (Forskål, 1775) as its type species.

The genus *Phronima* is morphologically similar to the genus *Phronimella* Claus, 1871 as both have large dorsal and small ventrolateral eyes that occupy most of the head, a fused coxa with pereonite, and a small, rounded telson. However, *Phronima* is distinguished by its separated pereonites 1−2, pereopod 5 ending in a distinct broad subchela, and a well-developed uropod 2 (Zeidler, 2004).

Research on Korean hyperiid amphipods was initiated by Yoo but had not been actively conducted for over 25 years (Yoo, 1972; 1995). Recently, Shin and Lim recorded two species, *Phronima atlantica* and *Oxychephalus clausi*, in Korea (Shin and Lim, 2020). To date, only three species, *Phronima atlantica* Guérin-Méneville, 1836, *P. sedentaria* (Forskål, 1775), and *Phronimella elongata* (Claus, 1862), from the genera *Phronima* and *Phronimella*, belonging to the family Phronimidae, have been recorded in Korea (Yoo, 1972; Shin and Lim, 2020). In this paper, we add a newly recorded species of the genus *Phronima* to the Korean hyperiid amphipod fauna. This study also provides a key to species of the family Phronimidae from Korean waters.

Materials and Methods

Specimens were collected with a MOCNESS net from subtidal waters of the South Sea, Korea (Fig. 1). The specimens were fixed in 95% ethanol and dissected in glycerol on Cobb's aluminum hole slides. The materials were examined under stereoscopic (Olympus SZX 10) and compound microscopes (Olympus BX 51), and drawings and measurements were made with the aid of a drawing tube. Body length was measured from the end of the rostrum to the end of the urosome, along the dorsal parabolic line of the body. The examined specimens are deposited at the National Institute of Biological Resources (NIBR) in Incheon, Korea and the Department of Biological Science, Dankook University (DKU) in Cheonan, Korea.

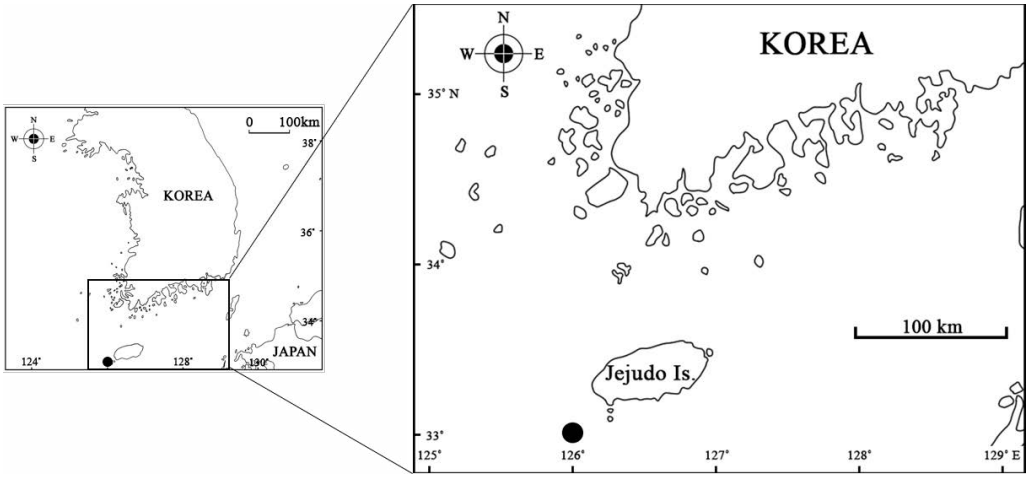


Fig. 1. Distribution of the *Phronima solitaria* (●: Jeju sea).

Systematic accounts

Order Amphipoda Latreille, 1816
Suborder Hyperiidea Edwards, 1830
Superfamily Phronimoidea Rafinesque, 1815
Family Phronimidae Rafinesque, 1815
Genus *Phronima* Latreille, 1802
영리옆새우속 (신칭)

***Phronima solitaria* Guérin-Méneville, 1844 (Figs. 2, 3)**
외돌기영리옆새우 (신칭)
Phronima solitaria Guérin-Méneville, 1844: 21; Shih, 1969: 16, fig. 3; Zeidler, 2004: 12.
Phronima custos Bate, 1862: 318, pl. 51.
Phronima megalodous Stebbing, 1888: 1353, pl. 162.
Phronima atlantica var. *solitaria* Vosseler, 1901: 23, pl. 2.

Material examined. 1♀, dissected (appendages on one slide), NIBRIV0000920259, 2♀, DKUAMP202504, Jeju sea, 32°59′53″N, 125°59′43″E, 14 Jun 2019, by MOCNESS net, collected by SH Choo.

Description. Adult female (NIBRIV0000000000), body (Figs. 2, 3A) 17.1 mm long, dorsally smooth. Head subequal in length to pereonites 1–2 combined; eyes well developed, large ommatidia cover dorsal and lateral margins of head and small ommatidia cover ventral and lateral margins. Antennae 1 reduced to two articles. Pereonite 3–4 anterior margin with triangular process. Pleonite 1 length 0.69 × pereonite 7; pleonites 1–3, posteroventral corners pointed.

Gnathopod 1 (Fig. 3B) carpochelate; basis relatively long, slender; ischium short, length 0.17 × basis, posterior margin with a setule; merus trapezoidal, length 1.29 × basis, posterior margin with 2 setules, middle of posterior margin serrated; carpus subchelate, length 1.81 × merus, posterior margin produced and reaching half of propodus, projection serrated, distal corner with a robust setule; propodus narrowing distally, length 0.89 × carpus, anterior margin with 5 setule; dactylus short, length 0.17 × propodus.

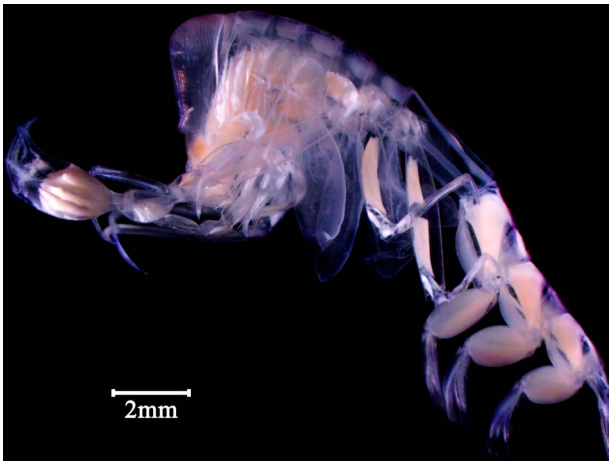


Fig. 2. *Phronima solitaria* Guérin-Méneville, 1844, adult female, 17.1 mm, habitus. Scale bar = 2.0 mm.

Gnathopod 2 (Fig. 3C) carpochelate; basis subrectangular, relatively long, slender; merus trapezoidal, 1.24 × ischium, posterior margin with 2 setules, posterodistal corner serrated; carpus subchelate, length 1.86 × merus, anterior margin with a setule, posterior margin produced, anterior margin of projection serrated; propodus subrectangular, slender, length 1.28 × carpus; dactylus short, falcate, length 0.11 × propodus.

Pereopod 3 (Fig. 3D) slender; ischium subquadrate, length 0.22 × basis, anterior margin concave, posterior margin with 3 setules; merus length 1.95 × ischium, anterior margin with 3 setae, posterior margin with 6 setules; carpus subrectangular, length 1.68 × merus, anterior mar-

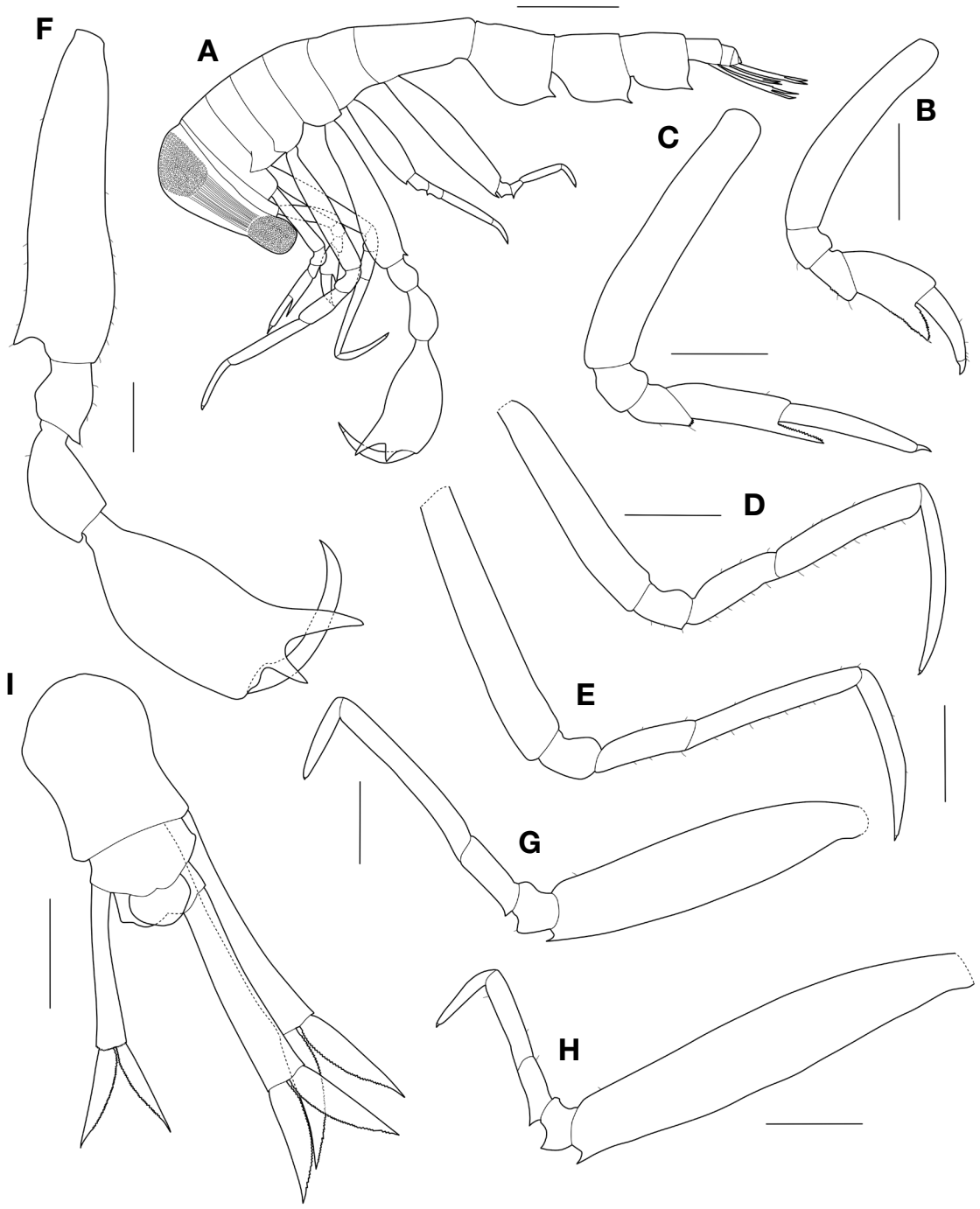


Fig. 3. *Phronima solitaria* Guérin-Méneville, 1844, adult female, 17.1 mm. A, habitus; B, gnathopod 1; C, gnathopod 2; D, pereopod 3; E, pereopod 4; F, pereopod 5; G, pereopod 6; H, pereopod 7; I, uropods 1–3 and telson. Scale bars: A = 3 mm, B–H = 1.0 mm, I = 2.0 mm.

gin with 4 setules, posterior margin with 8 setules; propodus slender, narrowing distally, length 0.94 × carpus.

Pereopod 4 (Fig. 3E) similar to pereopod 3, but slightly elongated.

Pereopod 5 (Fig. 3F) enlarged, subchelate; basis subrectangular, slightly widening distally, anterior margin with 8 setules, posterior margin with 6 setules, posterodistal margin with distinct process; ischium length 0.14 × basis, anterior margin with 4 setules, anterodistal margin with acute process, posterior margin convex; merus length 1.69 × ischium, posterior margin strongly curved; carpus characteristic in form, longer than wide, length

1.99 × merus, anterior margin slightly convex, distomesial portion with single protuberance, protuberance narrow, strong, slightly shorter than carpal process, carpal process strongly produced; propodus slender, narrow, falcate, length 0.82 × carpus.

Pereopod 6 (Fig. 3G), basis subrectangular, with small acute process anterodistally, posterior margin with a setule; ischium subquadrate, length 0.14 × basis, with midanterior process; merus subrectangular, length 1.64 × ischium, with minute anteroproximal process; carpus subrectangular, length 2.56 × merus; propodus narrowing distally, length 0.48 × carpus.

Pereopod 7 (Fig. 3H) similar to pereopod 6, but basis more elongated and propodus shorter than those of pereopod 6.

Uropod 1 (Fig. 3I), peduncle subrectangular, unarmed; outer ramus 0.54 × peduncle, medial margin with serration; inner ramus slightly longer than outer ramus.

Uropod 2 (Fig. 3I) shorter than uropod 1, peduncle subrectangular, inner margin with serration; outer ramus 0.61 × peduncle, medial margin with serration; inner ramus similar to outer ramus in shape and length.

Uropod 3 (Fig. 3I) subequal to uropod 1, peduncle subrectangular, slightly widening distally; outer ramus 0.63 × peduncle, medial margin with serration; inner ramus similar to outer ramus in shape and length.

Telson (Fig. 3I) small, entire, subtriangular, unarmed.

Distribution. Worldwide.

Remarks. *Phronima solitaria* Guérin-Méneville, 1844 is similar to *P. atlantica* Guérin-Méneville, 1836 and *P. sedentaria* (Forskål, 1775) in having pereopod 3 shorter than pereopod 5. However, *P. solitaria* can be distinguished from its congeners by the following features (different characteristics of *P. atlantica* and *P. sedentaria* in brackets): 1) head length subequal to pereonites 1–3 combined (vs. subequal to pereonites 1–4 combined in *P. sedentaria*); 2) pleonite 1 length 0.69 × pereonite 7 (vs. length 0.84 × pereonite 7 in *P. sedentaria*); 3) pereopod 5, carpal protuberance single (vs. bifid in *P. atlantica*); 4) pereopod 5, carpal protuberance as strong as the carpal process (vs. weaker in both *P. atlantica* and *P. sedentaria*); and 5) uropods 1–3, both rami subequal in length (vs. uropod 2, outer ramus longer than inner ramus in *P. atlantica* and *P. sedentaria*). Our specimens are accorded with the previous descriptions provided by Guérin-Méneville (1844) and Shih (1969).

Key to species of the family Phronimidae from Korean waters

1. Pereonites 1 & 2 separate; uropod 2 well-developed ··· 2
– Pereonites 1 & 2 partially fused; uropod 2 rudimentary or absent ····· *Phronimella elongata* (Claus, 1862)
2. Pereopod 5, carpal protuberance bifid ····· ····· *Phronima atlantica* Guérin-Méneville, 1836
– Pereopod 5, carpal protuberance single····· 3
3. Head subequal length to pereonites 1–3 combined; uropod 2, both rami subequal in length ····· ····· *Phronima solitaria* Guérin-Méneville, 1844
– Head subequal length to pereonites 1–4 combined; uropod 2, outer ramus longer than inner ramus ····· ····· *Phronima sedentaria* (Forskål, 1775)

Conflicts of Interest

These authors of this paper have no affiliation with any interests and is solely responsible for the paper.

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