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Two Newly Recorded Monogonont Rotifers from Gyodongdo Island, Korea

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ABSTRACT

Two monogonont rotifers, *Brachionus bidentatus* Anderson, 1889 and *Scaridium montanum* Segers, 1995, were identified during a survey on Gyodongdo Island, Korea. The specimens were collected from freshwater habitats using a 50 μm plankton net. The morphological characteristics of the Korean *B. bidentatus* specimens correspond well with previous descriptions, particularly with the anterolateral spines being the longest among the six anterior spines and unique patterns of dorsal lorica facets. The Korean *S. montanum* specimens resemble the morphological data of previous studies, exhibiting rami without alulae and consistent trophi characteristics. This study presents the morphological diagnoses of two new records from Korea, supplemented by scanning electron microscopy images of the habitus and trophi for each species.

Keywords: *Brachionus*, Monogononta, Rotifera, *Scaridium*, SEM

INTRODUCTION

The genus *Brachionus* Pallas, 1766, with 78 recognized species to date, is one of the most commonly encountered genera among monogonont rotifers (Jersabek and Leitner, 2013; Jersabek et al., 2018). Species within this genus inhabit a wide range of aquatic environments, from freshwater to saltwater, and are distributed worldwide (Segers, 2007). *Brachionus* is a well-studied genus among monogonont rotifers, with extensive research conducted on its taxonomy, phylogeography, genetics, and reproductive biology (Michaloudi et al., 2018; Wen et al., 2019; Seudre et al., 2020; Yang et al., 2022). Furthermore, *Brachionus* species are used as model organisms in experimental studies and as a food source in aquaculture (Ahmed et al., 2024; Byeon et al., 2024). Prior to this study, 18 species of *Brachionus* had been recorded in Korea. Among them, *B. koreanus* Hwang, Dahms, Park and Lee, 2013, was the first monogonont species that was newly described from Korea (Hwang et al., 2013; National Institute of Biological Resources, 2023).

The genus *Scaridium* Ehrenberg, 1830 is monotypic within the family Scaridiidae Manfredi, 1927, and comprises seven species to date (Segers, 1995; Jersabek and Leitner, 2013). Among these, *S. bostjani* Daems and Dumont, 1974, *S. elegans* Segers and De Meester, 1994, and *S. longicaudum* (Müller, 1786) exhibit cosmopolitan distributions. In contrast, the other four species are restricted to their type localities or have been recorded in only a few areas (Segers, 2007). Manfredi (1927) established the monotypic family Scaridiidae for the genus *Scaridium*. However, *Scaridium* was subsequently considered a subtaxon within the family Notommatidae Hudson and Gosse, 1886, where it remained for several decades (Koste, 1978; Koste and Shiel, 1991). Later, Segers (1995) reinstated Scaridiidae as a separate family, distinguishing it from Notommatidae based on its protrusible trophi and distinct corona characteristics. Prior to the present study, only a single species of *Scaridium*, *S. longicaudum*, was recorded in Korea (Chung et al., 1992).

In this study, we identified two monogonont rotifers, *Brachionus bidentatus* Anderson, 1889 and *Scaridium montanum* Segers, 1995, as newly recorded species in Korea, based on specimens collected from Gyodongdo Island. The diagnoses of both species were supplemented with scanning electron microscopy (SEM) images of their habitus and trophi.

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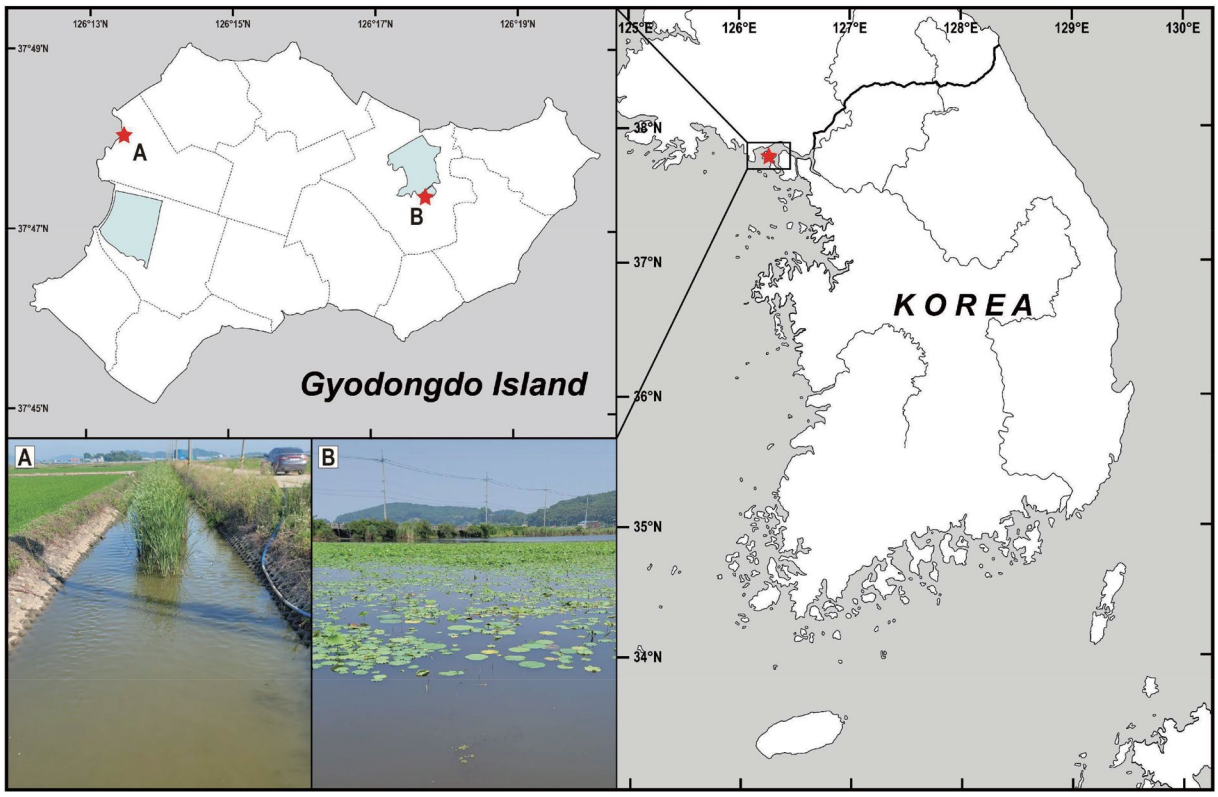

Fig. 1. Maps and habitats showing the collection sites of rotifers examined in this study. A, Irrigation canal, the collecting site of *Brachionus bidentatus* Anderson, 1889; B, Reservoir, the collecting site of *Scaridium montanum* Segers, 1995.

MATERIALS AND METHODS

Rotifer specimens were collected from two sites on Gyodongdo Island on April 8 and June 19, 2024 (Fig. 1). The specimens were collected using a plankton net with a mesh size of 50 μm and immediately fixed in 95% ethanol. For optical microscopy and permanent slide preparation, ethanol was gradually substituted with 100% glycerol. The specimens were then mounted on slide glasses and sealed with Eukitt Quick-hardening mounting medium (03989; Sigma-Aldrich, USA) and clear nail polish.

The trophi and whole-body specimens were prepared for SEM observations according to the method described by Yang and Min (2024). The specimens were gold-coated using a Cressington Sputter Coater 108 auto (Cressington Scientific Instruments, UK), and examined using a JSM-6390LV scanning electron microscope (Jeol, Japan) at an accelerating voltage of 10−15 kV. All specimens examined in this study were deposited at the collection of the National Institute of Biological Resources (NIBR), Korea.

SYSTEMATIC ACCOUNTS

Phylum Rotifera Cuvier, 1817
Class Eurotatoria De Ridder, 1957
Subclass Monogononta Plate, 1889
Order Ploima Hudson and Gosse, 1886
Family Brachionidae Ehrenberg, 1838
Genus *Brachionus* Pallas, 1766

[1]***Brachionus bidentatus* Anderson, 1889 (Fig. 2)**

Brachionus bidentatus Anderson, 1889: 357, pl. 21, fig. 13.
Brachionus furculatus Thorpe, 1891: 302, pl. 6, fig. 3.
Brachionus bakeri var. *areolatus* Daday, 1902: 205, fig. 1.
Brachionus furculatus var. *inermis* Rousselet, 1906: 398, pl. 14, fig. 4.
Brachionus furculatus var. *testudinarius* Jakubski, 1912: 547, figs. 6, 7.
Brachionus jirovci Bartoš, 1946: 146, fig. 1.

Material examined. Female, 3 glycerol permanent slides

Korean name: [1]*양끝가시완미윤충 (신칭)

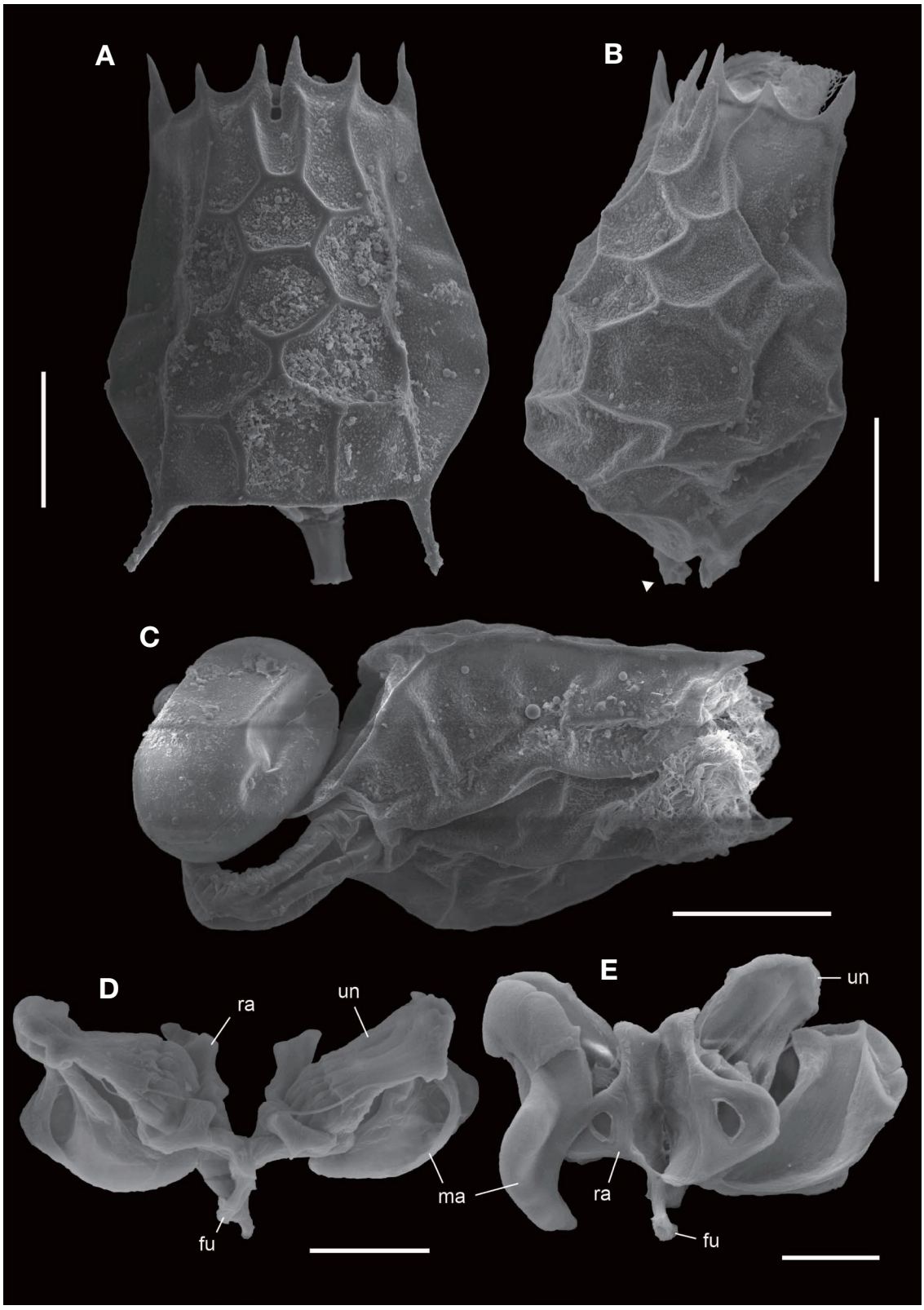

Fig. 2. Scanning electron microscopy images of *Brachionus bidentatus* Anderson, 1889. A, Habitus, dorsal view; B, Habitus, lateral view, an arrow marks the caudal spines; C, Habitus, ventral view; D, Trophi, ventral view; E, Trophi, dorsal view. fu, fulcrum; ma, manubria; ra, rami; un, unci. Scale bars: A–C = 50 μm, D, E = 10 μm.

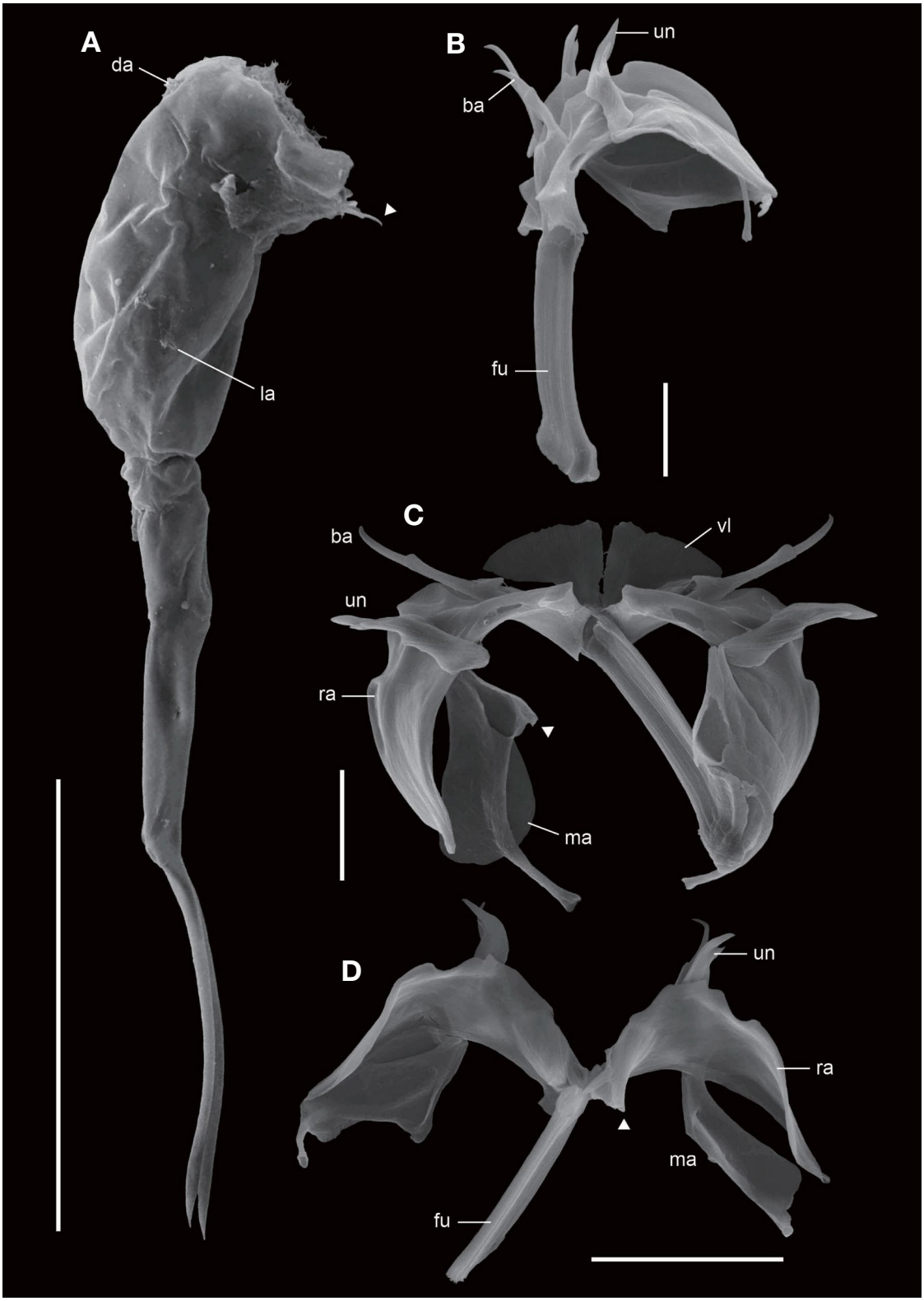

Fig. 3. Scanning electron microscopy images of *Scaridium montanum* Segers, 1995. A, Habitus, lateral view, an arrow marks the protruded basal apophysis; B, Trophi, lateral view; C, Trophi, posteroventral view, an arrow marks the posteroventral projection of manubria; D, Trophi, dorsal view, an arrow marks the rami without alulae. ba, basal apophysis; da, dorsal antenna; fu, fulcrum; la, lateral antenna; ma, manubria; ra, rami; un, unci; vl, ventral lamella. Scale bars: A = 100 μm, B, C = 10 μm, D = 20 μm.

(NIBRIV0000922337–9); 2 SEM preparations (NIBRIV 0000922340–1). Irrigation canal in Gyodongdo Island, Ganghwa-gun, Incheon-si, Korea (37°48′02.7″N, 126°13′28.7″E), 19 Jun. 2024 (Fig. 1A). Collected by Hee-Min Yang.

Diagnosis. Rigid lorica, 159–189 μm in length, 113–140 μm in width (n = 5). Dorsal lorica with six anterior spines; anterolateral spines longest (Fig. 2A). Deep U-shaped sulcus between median spines. Surface of dorsal lorica with symmetrical polygonal facets (Fig. 2A, B). Anterior median facet vertically elongated rectangular, flanked by pentagonal facets. Middle section with hexagonal and pentagonal facets arranged vertically, flanked by hexagonal facets. Two large heptagonal facets in posteromedian. Posterior median facet pentagonal, flanked by square facets. Anterior margin of ventral lorica smooth or slightly concave medially (Fig. 2C). Symmetrical caudal spines occasionally present (Fig. 2A). Foot opening spines present (Fig. 2B). Trophi malleate type (Fig. 2D, E). Fulcrum short and stubby. Each uncus with five teeth (Fig. 2D).

Distribution. Cosmopolitan (Segers, 2007).

Remarks. Among *Brachionus* species with six anterior spines, *B. bidentatus* is closely related to *B. quadridentatus* Hermann, 1783, sharing a well-developed ventral lorica and foot opening spines (Koste, 1978). This species can be distinguished from *B. quadridentatus* and other *Brachionus* species with six anterior spines by the relative length of its anterolateral spines. *Brachionus bidentatus* exhibits a distinct spine length pattern, with the lateral spines being the longest, followed by the median and submedian spines. In contrast, *B. quadridentatus* and most other species with six anterior spines have the median spines as the longest (Koste, 1978).

The facet pattern on the dorsal lorica of Korean specimens corresponds well with previous descriptions (Jakubski, 1912; Guerrero-Jiménez et al., 2013), as do the length and width of the lorica (Anderson, 1889; Koste, 1978). Regarding caudal spines, *B. bidentatus* has been reported to possess one or two spines, or none (Koste, 1978). In the Korean specimens examined in this study, two symmetrical spines or none were observed.

Family Scaridiidae Manfredi, 1927

Genus *Scaridium* Ehrenberg, 1830

[1]***Scaridium montanum*** **Segers, 1995 (Fig. 3)**

Scaridium montanum Segers, 1995: 97, figs. 19, 20, 24–29; Zhuge, 1997: 119, pl. 35, fig. 2a–e.

Material examined. Female, 3 glycerol permanent slides (NIBRIV922331–3); 3 SEM preparations (NIBRIV922334–6). Reservoir in Gyodongdo Island, Ganghwa-gun, Incheon-si, Korea (37°47′22.7″N, 126°17′41.4″E), 8 Apr 2024 (Fig. 1B). Collected by Hee-Min Yang.

Diagnosis. Body soft-loricated, 290–321 μm in length (n = 6). Head separated from trunk by transverse fold. Trophi partially protruding from mouth. Dorsal antenna at middle of head; pair of lateral antennae at mid-trunk. Foot comprising three pseudosegments: first pseudosegment shortest, 11–12 μm in length; second foot pseudosegment 28–30 μm in length; third pseudosegment longest, 59–60 μm in length. Two toes symmetrical, spear-shaped, elongated in parallel, 94–100 μm in length (Fig. 3A). Trophi virgate type (Fig. 3B–D). Fulcrum thick, slightly curved ventrally in lateral view; thin, rod-shaped in dorsoventral view (Fig. 3B, D). Rami with elongated, large basal apophysis; alulae absent. Posterolateral ends of rami angulated; distal ends triangular (Fig. 3C, D). Each uncus apically twisted, bearing a large tooth and an accessory tooth (Fig. 3B). Manubria curved posteriorly, with thin lamellae. Posteroventral projections small, rounded, or truncated (Fig. 3C). Ventral lamellae fan-shaped (Fig. 3C).

Distribution. Albania, France (Segers, 1995), China (Zhuge, 1997), Korea.

Remarks. The genus *Scaridium* comprises seven species: *S. bostjani*; *S. elegans*; *S. elongatum* Segers, 1996; *S. grande* Segers, 1995; *S. longicaudum*; *S. montanum* and *S. neglectum* Segers, 1997 (Jersabek and Leitner, 2013). *Scaridium montanum* is easily distinguished from congeners by the absence of rami alulae (Segers, 1995, 1996, 1997). The morphological characteristics of the examined Korean specimens correspond well with the original description (Segers, 1995), except for the lengths of the third pseudosegment and toes. In the Korean specimens, the third pseudosegment and toes measured 59–60 μm and 94–100 μm, respectively, which were smaller than the ranges reported in the original description, 67–77 μm for the third pseudosegment and 110–126 μm for the toes. All other body measurements were aligned with the original description. To date, this species has been recorded only in the Palearctic region. To our knowledge, this is the second record of *S. montanum* in East Asia, after a record from China (Zhuge, 1997).

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CONFLICTS OF INTEREST

Taeseo Park, the editor of the Animal Systematics, Evolution and Diversity, was not involved in the editorial evaluation or decision to publish this article. The remaining author has declared no conflicts of interest.

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