

Five new records of monogonont rotifers from Korea

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Rotifers collected from Duung and Gyeongpo wetlands in Korea were investigated. Five species belonging to five genera in four families of monogonont rotifers were identified: *Cephalodella ventripes* (Dixon-Nuttall), *Dicranophorus grandis* (Ehrenberg), *Lecane undulata* Hauer, *Taphrocampa selenura* Gosse, and *Testudinella emarginula* (Stenroos). All these species are new to the Korean fauna, even though they have very wide or cosmopolitan distributions. The present study is the first report on the genus *Taphrocampa* Gosse from Korea. The taxonomy and distribution of each new Korean record are briefly discussed here. The diagnostic characteristics, photomicrographs and the deposition of voucher specimen are provided for each new Korean record.

Keywords: Korea, monogonont rotifers, new records, wetlands

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INTRODUCTION

A taxonomic study of rotifers collected from Duung (30 April 2017) and Gyeongpo (15 October 2017) wetlands yielded five new Korean records of monogonont rotifers. These five new Korean records belong to five genera in four families, *Cephalodella* Bory de St. Vincent, 1826, *Dicranophorus* Nitzsch, 1827, *Lecane* Nitzsch, 1827, *Taphrocampa* Gosse, 1851, and *Testudinella* Bory de St. Vincent, 1826. The genus *Taphrocampa* is new to the Korean fauna.

Although the five Korean new records are probably cosmopolitan or cosmopolitan (Jersabek and Leitner, 2013), they are still new to Korea. This implies that further taxonomic studies on monogonont rotifers are required in Korea. Since Song and Kim (1989) began taxonomic studies of Korean monogononts, 36 species/subspecies have been reported to date (Song, 2015; 2017). The result of the present study brought the record of Korean monogononts to 41 species/subspecies, which were studied taxonomically. Since 115 species/subspecies of monogononts were reported as parts of ecological surveys before Song and Kim (1989) (Song, 1989), a total of 156 species/subspecies of monogononts has been recorded from Korea so far. Considering that more than 2,000 species of monogononts have been described globally to date, the Korean record covers only about 8% of world records of monogononts, clearly showing the urgent need for more taxonomic studies of rotifers in Korea.

Here the taxonomy and distribution of each new Korean

record are briefly discussed. The diagnostic characteristics and photomicrographs are provided for each rotifer.

MATERIALS AND METHODS

Samples were collected from Duung and Gyeongpo wetlands on April 30 and October 15, 2017, respectively. The rotifers were isolated from samples according to previously described methods (Song, 2014; Song and Lee, 2017). All of the living or fixed rotifers were examined and identified under a light microscope with a magnification of $\times 400$ to $\times 600$. The photography and motion records of specimens were performed using an Infinity 2 digital camera (Lumenera Corporation, ON, Canada). Measurements were made by using GIMP 2.8 (the GNU Image Manipulation Program). The specimens, except *Lecane* and *Testudinella* species, were fixed with head, foot, and toes extended, by using the boiling water fixation method (Edmondson, 1959) instead of narcotization as previously described (Song and Min, 2015). For preparation of permanent mounts, the method of Stemberger (1979) was used as previously mentioned (Song and Lee, 2017).

The classification scheme is based on those of De Smet (1997) and Nogrady and Pourriot (1995).

RESULTS AND DISCUSSION

Phylum Rotifera Cuvier, 1817 율형동물문

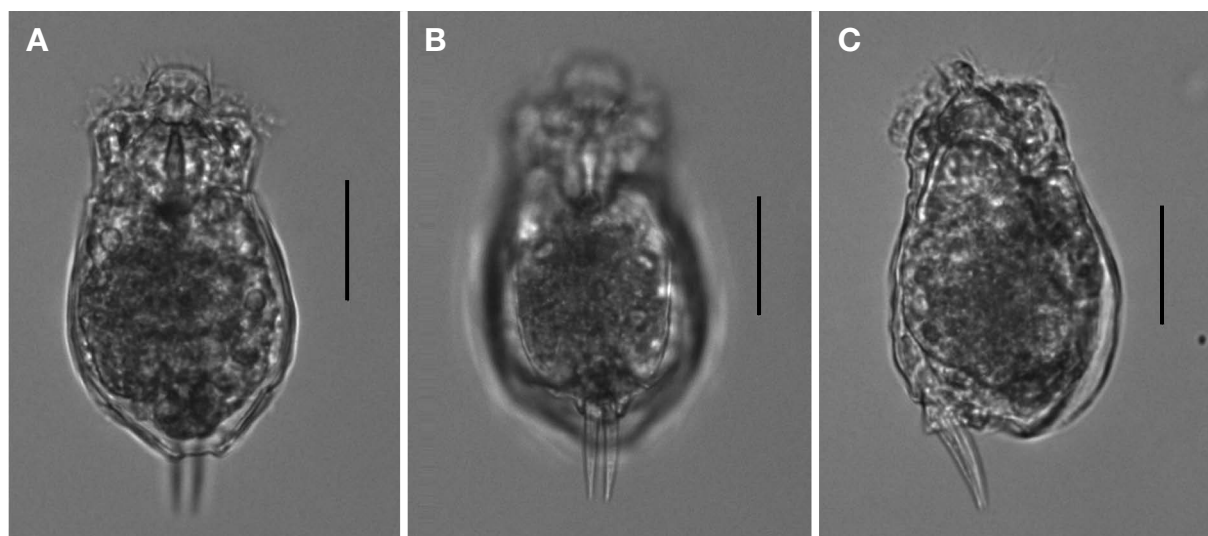


Fig. 1. *Cephalodella ventripes* (Dixon-Nuttall, 1901). A. dorsal view; B. ventral view; C. lateral view (Scales: A-C = 25 μ m).

Class Eurotatoria De Ridder, 1957 진운충강
Subclass Monogononta Plate, 1889 단소아강
Superorder Pseudotrocha Kutikova, 1970
위섬모관상목
Order Ploima Hudson and Gosse, 1886 유영목
Family Notommatidae Remane, 1933 몽치윤충과
Genus *Cephalodella* Bory de St. Vincent, 1826
거두윤충속

1. *Cephalodella ventripes* (Dixon-Nuttall, 1901) (Fig. 1)
복족거두윤충 (신칭)

Diaschiza ventripes Dixon-Nuttall, 1901, pp. 25-26, pl. 2, figs. 1-3.

Cephalodella ventripes: Haring and Myers, 1924, p. 484, pl. 28, fig. 5; Nogrady and Pourriot, 1995, pp. 139-140, fig. 188.

Material examined. Three specimens found in Gyeongpo wetland area, Gangneung-si, Gangwon-do, 37°47'19.9"N, 128°53'49.8"E, 15 Oct. 2017.

Diagnosis. Body short, chunky, convex dorsally and oval in dorsal view. Plates and sulci of lorica distinct. End of dorsal lorica protruding beyond distal end of foot pseudosegment. Foot small and ventral. Toes short, about 1/5 of total body length and slightly curved forward. Trophi type A. Fulcrum spatulated distally. Double cervical eyes.

Measurements. Total body length 95.5-104 μ m. Toe length 22-23 μ m. Trophi length 27 μ m.

Remarks. This species is usually found in the littoral periphyton of most standing fresh waters. It is occasionally found in athalassic saline and coastal brackish waters (Jersabek and Leitner, 2013). The Korean specimens were found at Gyeongpo wetland area, which is brackish.

This species is cosmopolitan and has been reported in

Asia from Cambodia (Min *et al.*, 2011), India (Sharma and Sharma, 2005), Iran (Kordbacheh and Rahimian, 2012), and Thailand (Sanoamuang *et al.*, 1995).

World distribution. Cosmopolitan.

Deposition. Deposited in the collection of the Nakdong-gang National Institute of Biological Resources, Sangju-si, Gyeongsangbuk-do, Korea (NNIBR2018113IV954, NNIBR2018113IV955, NNIBR2018113IV957).

Genus *Taphrocampa* Gosse, 1851 주름관윤충 (신칭)

2. *Taphrocampa selenura* Gosse, 1887 (Fig. 2)
반원발톱주름관윤충 (신칭)

Taphrocampa selenura Gosse, 1887, p. 1, pl. 1, fig. 1; Weber, 1898, pp. 436-437, pl. 17, figs. 14-15; Haring and Myers, 1924, pp. 454-456, pl. 24, figs. 5-9; Nogrady and Pourriot, 1995, pp. 150-152, fig. 203.

Material examined. One specimen found in Gyeongpo wetland area, Gangneung-si, Gangwon-do, 37°47'19.9"N, 128°53'49.8"E, 15 Oct. 2017.

Diagnosis. Body vermiform, plicated like accordion and tapering slightly to foot. Corona oblique with auricles. Foot covered by broad and long tail; tail much longer than foot; tail separated from trunk by indentation. Toes long, slender and bow-shaped in dorsal view. Trophi asymmetrical; right ramus with eight teeth, while left ramus with one tooth, lamella, and then two teeth; left uncus with two teeth, while right uncus with three teeth.

Measurements. Total body length 138 μ m. Toe length 13.2 μ m.

Remarks. In the genus *Taphrocampa* Gosse, 1851, only three valid species are recognized, *T. clavigera* Stokes, 1896, *T. annulosa* Gosse, 1851, and *T. selenura* Gosse,

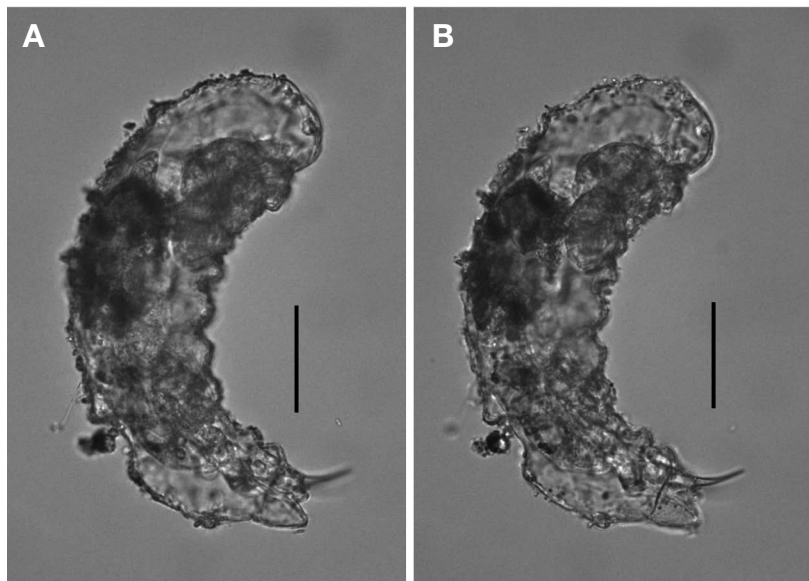


Fig. 2. *Taphrocampa selenura* Gosse, 1887. A, B. lateral view (Scales: A, B = 25 μ m).

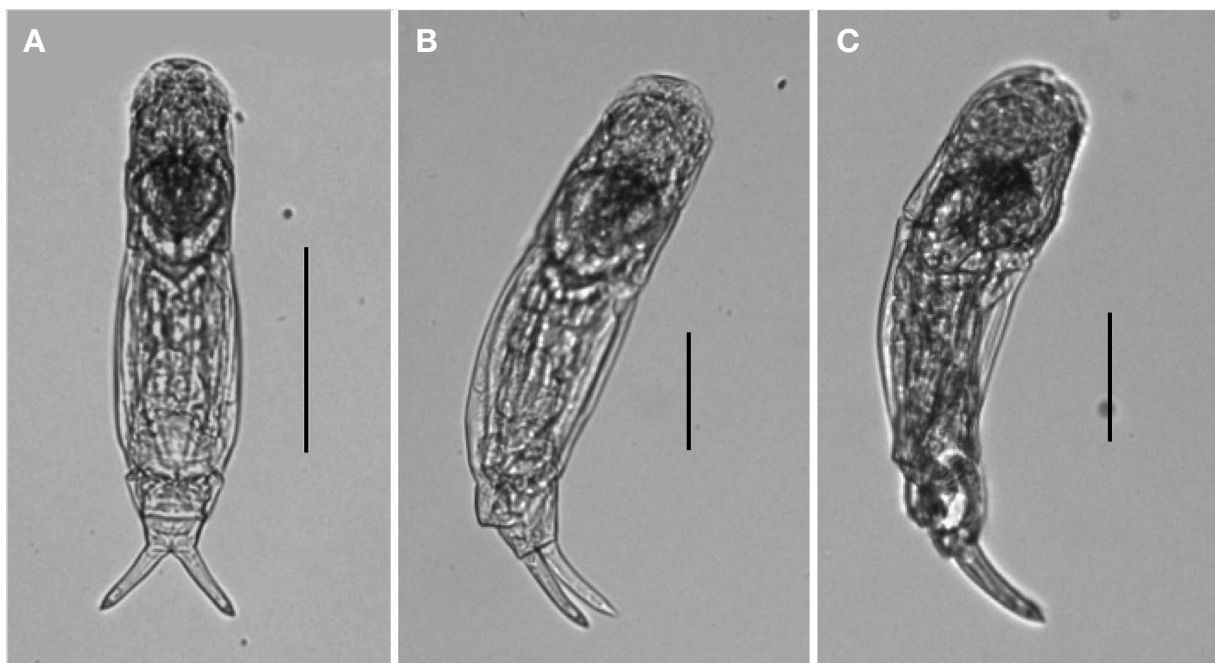


Fig. 3. *Dicranophorus grandis* (Ehrenberg, 1832). A. dorsal view; B. dorsolateral view; C. lateral view (Scales: A = 100 μ m; B, C = 50 μ m).

1887. *Taphrocampa* species are easily recognized by their oblique corona with auricles and vermiform bodies which are stretchable and plicated like an accordion. The present study is the first report on the species as well as the genus *Taphrocampa* from Korea. In Asia, this species has previously been reported from Cambodia (Meas and Sor, 2014), India (Segers *et al.*, 1994), Japan (Sudzuki, 1975) and Laos (Segers and Sanoamuang, 2007).

World distribution. Probably cosmopolitan.

Deposition. Deposited in the collection of the National Institute of Biological Resources, Incheon, Korea (FKR UIV0000000916).

Family Dicranophoridae Harring, 1913 돼지코윤충과
Genus *Dicranophorus* Nitzsch, 1827 돼지코윤충속

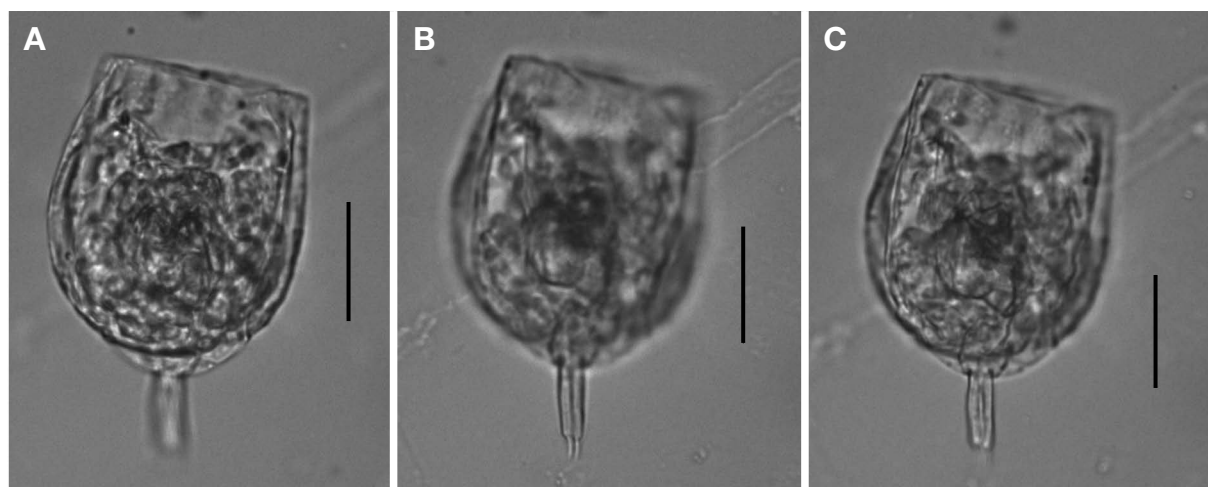


Fig. 4. *Lecane undulata* Hauer, 1938. A. dorsal view; B, C. ventral view (Scales: A-C = 25 μ m).

3. *Dicranophorus grandis* (Ehrenberg, 1832) (Fig. 3)

큰돼지코윤충 (신칭)

Diglena grandis Ehrenberg, 1832, p. 137.

Dicranophorus grandis: Harring, 1913, p. 36; Koste, 1978, p. 468, pl. 170, figs. 1a-c; De Smet, 1997, pp. 67-68, figs. 139-144; Koste and Zhuge, 1998, pp. 200-202, figs. 14a-c.

Material examined. One specimen found in Duung wetland, Sindu-ri, Wonbuk-myeon, Taean-gun, Chungcheongnam-do, 36°50'10.1"N 126°11'45.5"E, 30 April 2017.

Diagnosis. Two small black eye spots. Head about 1/3 of total length. Rostrum short, round anteriorly and decurved. Trunk with lateral sulci. Foot short, truncated cone-shaped and composed of one pseudosegment. Toes stout, 1/4-1/5 of total length, slightly tapering then abruptly tapering to tips at about 1/5 or 1/6 of toe length distally. Base of rami with triangular alula. Inner margin of rami with 7-9 shearing teeth.

Measurements. Total body length 269 μ m. Toe length 46.5 μ m. Trophi length 55.3 μ m.

Remarks. Among the species of genus *Dicranophorus* Nitzsch, 1827, only two species, *Dicranophorus epicharis* Harring and Myers, 1928 and *Dicranophorus forcipatus* (Müller, 1786) have been reported from Korea before the present study (Song and Jin, 2000; Song and Kim, 1989).

Even though *D. grandis* is probably cosmopolitan because it has been reported from Europe, Africa, Eastern Mediterranean, America, and Australia (De Smet, 1997; Jersabek and Leitner, 2013), it is new to Korea. In Asia, *D. grandis* has been recorded from China (Zhuge *et al.*, 1998), Thailand (Sa-Ardrit *et al.*, 2013), and Vietnam (Trinh Dang *et al.*, 2015).

World distribution. Africa, America, Australia, Eastern

Mediterranean, Europe.

Deposition. Deposited in the collection of the Nakdong-gang National Institute of Biological Resources, Sangjusi, Gyeongsangbuk-do, Korea (NNIBRIV7).

Family Lecanidae Lemane, 1933 술잔윤충과

Genus *Lecane* Nitzsch, 1827 술잔윤충속

4. *Lecane undulata* Hauer, 1938 (Fig. 4)

물결술잔윤충 (신칭)

Lecane undulata Hauer, 1938, p. 526, figs. 49a-c; Segers, 1995, pp. 129-130, figs. 322-326.

Lecane inopinata undulata: Koste and Tobias, 1990, p. 99, fig. 13b.

Material examined. One specimen found in Gyeongpo wetland area, Gangneung-si, Gangwon-do, 37°47'19.9"N, 128°53'49.8"E, 15 Oct. 2017.

Diagnosis. Dorsal plate anteriorly narrower and medially wider than ventral plate. Dorsal plate shorter than ventral plate. Ventral plate longer than wide. Anterior margins rather straight. Without any processes anterolaterally. Lateral sulci deep. Foot pseudosegment not projecting. Prepedal fold oval. Coxal plates rounded. Toes fused basally and bearing completely separated short claws.

Measurements. Dorsal plate length 62 μ m. Dorsal plate width 55 μ m. Ventral plate length 64 μ m. Ventral plate width 46 μ m. Toe length 17 μ m. Claw length 5 μ m.

Remarks. *Lecane undulata* is very similar to *L. inopinata* Harring and Myers, 1926; however, the toes are fused over about 40-70 % of their length in *L. inopinata*, while they are fused only basally in *L. undulata*.

Lecane undulata is probably cosmopolitan because it has been reported from seven out of the eight large biogeographical regions (Palearctic, Afrotropical, Oriental,

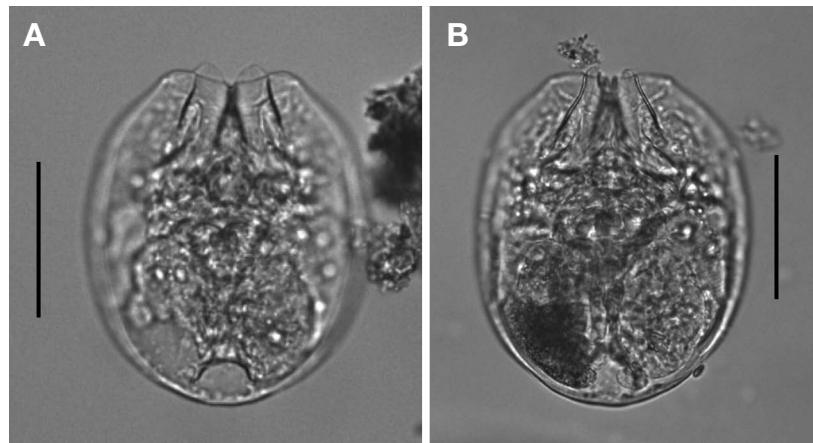


Fig. 5. *Testudinella emarginula* (Stenroos, 1898). A. ventral view; B. dorsal view (Scales: A = 25 µm; B = 50 µm).

Nearctic, Neotropical, Australian, and Pacific) (Segers, 2007; Jersabek and Leitner, 2013). This species is still new to the Korean fauna, and has been reported from China (Huang *et al.*, 2017), India (Sharma, 2014), Laos (Segers and Sanoamuang, 2007), Thailand (Sanoamuang *et al.*, 1995; Chittapun, 2011), and Vietnam (Trinh Dang *et al.*, 2015) in Asia.

World distribution. Probably cosmopolitan.

Deposition. Deposited in the collection of the National Institute of Biological Resources, Incheon, Korea (FKR UIV0000000703).

Superorder Gnesiotrocha Kutikova, 1970

참섬모관상목

Order Flosculariacea Remane, 1933 소화윤충목

Family Testudinellidae Bartoš, 1959 접시윤충과

Genus *Testudinella* Bory de St. Vincent, 1826

접시윤충속

5. *Testudinella emarginula* (Stenroos, 1898) (Fig. 5)

빗살주름접시윤충 (신칭)

Pterodina emarginula Stenroos, 1898, pp. 168-169, pl. 2, figs. 31-32; Von Hofsten, 1923, pp. 868-869, fig. 11.

Testudinella incisa emarginula: Koste, Janetzky and Vareschi, 1993, p. 137, figs. 27a-b.

Testudinella emarginula: Carlin, 1939, pp. 32-34, fig. 9a.

Material examined. Five specimens in Gyeongpo wetland area, Gangneung-si, Gangwon-do, 37°47'19.9"N, 128°53'49.8"E, 15 Oct. 2017.

Diagnosis. Lorica dorsoventrally flattened and slightly elliptical. Anterodorsal margin slightly bilobed and with inverted V-shaped fold medially; two parallel oblique folds outside median fold. Anteroventral margin bilobed medially and median lobes protruding beyond anterodorsal margin. Foot opening at posterior part of ventral plate.

Cross section boomerang-shaped; convex dorsally and concave ventrally.

Measurement. Lorica length 55.7-119.7 µm. Lorica width 46.4-95.5 µm. Foot opening width 8.6-18.9 µm.

Remarks. *Testudinella emarginula* is periphytic and epibenthic in stagnant and running freshwater, and in paddy fields, athalassic saline and coastal brackish waters. The Korean specimens were found at Gyeongpo wetland area, which is brackish.

Even though this species is cosmopolitan, it is new to the Korean fauna. In Asia, it has been reported from India (Sharma, 2014), Laos (Segers and Sanoamuang, 2007), Pakistan (Ejaz *et al.*, 2017), and Thailand (Segers *et al.*, 2004; Chittapun *et al.*, 2007).

Distribution. Cosmopolitan.

Deposition. Deposited in the collection of the Nakdong-gang National Institute of Biological Resources, Sangju-si, Gyeongsangbuk-do, Korea (NNIBR2018113IV956, NNIBR2018113IV959, NNIBR2018113IV960).

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