New records of three monogonont and seven bdelloid rotifers from Korea

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INTRODUCTION

An average of 700 rotifers can exist per gram on mosses growing on soil or rock. Terrestrial and wetland rotifers live in the water film surrounding bryophytes. Bryophytes provide a moist film of water for at least part of the year. By virtue of their ability to enter cryptobiosis, rotifers, together with tardigrades and free-living nematodes, make up major groups of meiofauna that commonly live in the film of water on the bryophyte surface (Glime, 2017).

A taxonomic study of rotifers found from mosses, leaf litter, soil, and wetland at six different locations yielded new Korean records of three monogonont and seven bdelloid rotifers (Table 1). These 10 new Korean records belong to six genera, Habrotrocha Bryce, 1910, Lecane Nitzsch, 1827, Macrotrachela Milne, 1886, Otostephanos Milne, 1916, Scepanotrocha Bryce, 1910 and Testudinella Bory de St. Vincent, 1826, in four families, Habrotrochiidae Bryce, 1910, Lecanidae Bartoš, 1959, Philodinidae Ehrenberg, 1838, and Testudinellidae Harring, 1913. The genus Scepanotrocha is new to the Korean fauna. Nine species-level and two subspecies-level taxa have been validly described in the genus Scepanotrocha in the world so far (Donner, 1965; Jersabek and Leitner, 2013), and the present study newly reported two Scepanotrocha species, S. corniculata, and S. simplex, from Korea.

The result of the present study increased the number of the Korean bdelloids and monogononts records to 144 and 159, respectively, species-/subspecies-level taxa (Song, 2018; Song and Lee, 2020).

Here the diagnostic characteristics and photomicrographs are provided for each rotifer. A partial sequence of mitochondrial cytochrome c oxidase subunit 1 gene (mtCOX1) for S. simplex is presented.

Keywords: Korea, new records, rotifera, taxonomy, terrestrial habitats
**Table 1. List of species and sampling localities.**

<table>
<thead>
<tr>
<th>Locality</th>
<th>GPS coordinates</th>
<th>Sampling date</th>
<th>Habitat</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gyeongpo wetland area, Gangneung-si,</td>
<td>37°47′19.9″N, 128°53′49.8″E</td>
<td>Oct. 21, 2018</td>
<td>Wetland</td>
<td>Testudinella brevicaudata</td>
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<tr>
<td>Gangwon-do</td>
<td></td>
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<tr>
<td>2. *Galcheon-ri, Seo-myeon, Yangyang-gun,</td>
<td>37°54′3.0″N, 128°30′6.4″E</td>
<td>June 20, 2020</td>
<td>Mosses and leaf litter</td>
<td>Habrotrocha sceanotrochoidea(^1), Lecane opias</td>
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<tr>
<td>Gangwon-do</td>
<td></td>
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<tr>
<td>3. *Galcheon-ri, Seo-myeon, Yangyang-gun,</td>
<td>37°54′3.0″N, 128°30′6.4″E</td>
<td>Aug. 1, 2020</td>
<td>Leaf litter and mosses on rocks</td>
<td>Otostephanos auriculatus auriculatus(^2), Lecane perpusilla</td>
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<tr>
<td>Gangwon-do</td>
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<tr>
<td>4. *Galcheon-ri, Seo-myeon, Yangyang-gun,</td>
<td>37°54′3.0″N, 128°30′6.4″E</td>
<td>Aug. 1, 2020</td>
<td>Mosses</td>
<td>Otostephanos torquatus amoenus(^3), Scepanotrocha corniculata(^1)</td>
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<tr>
<td>5. Gyeongpo Wetland, Uijeong-dong,</td>
<td>37°47′32.0″N, 128°54′14.2″E</td>
<td>June 3, 2021</td>
<td>Leaf litter and soil</td>
<td>Habrotrocha tripus(^4), Scepanotrocha simplex(^1)</td>
</tr>
<tr>
<td>Gangneung-si, Gangwon-do</td>
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<td></td>
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<tr>
<td>6. Daegwallyeong, Hoenggye-ri, Pyeongchang-gun,</td>
<td>37°40′58.0″N, 128°45′41.6″E</td>
<td>June 6, 2021</td>
<td>Mosses and soil</td>
<td>Macrotrachela decora(^1)</td>
</tr>
<tr>
<td>Gangwon-do</td>
<td></td>
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</tbody>
</table>

\(^*\)Sampling sites are located within a 50-meter radius.
\(^1\)New to Asia.

...poration, ON, Canada). The photographs were used for illustrations. Measurements were made using GIMP 2.8 (the GNU Image Manipulation Program). The specimens were killed 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 the preparation of permanent mounts, we used the method of Stemberger (1979). The classification scheme is based on those of Melone and Ricci (1995) as well as Segers (2002) for bdelloids, and De Smet (1997) as well as Nogrady and Pourriot (1995) for monogononts. Jakovenko et al. (2013) is partially referred to for the scheme of measurements.

DNA was extracted from one specimen of *S. simplex* using Extract-N-Amp\(^TM\) Tissue PCR Kit (Sigma-Aldrich, MO, USA) following the manufacturer’s instructions. mtCOX1 was amplified following the procedures described in Jakovenko et al. (2013) with some modifications (Song and Lee, 2020). Sequencing was outsourced to Macrogen (Seoul, Korea) using universal primers LCO 1490 and HCO2198 (Folmer et al., 1994). The quality of the sequence was checked by eye using FinchTV 1.4.0 (http://www.geospiza.com/finchtv).

**RESULTS AND DISCUSSION**

Phylum Rotifera Cuvier, 1817 움 dựng물문
Class Eurotatoria De Ridder, 1957 진윤충강
Subclass Monogononta Plate, 1889 단소아강
Superorder Pseudotrocha Kutikova, 1970 위섬모관상목
Order Plaoma Hudson and Gosse, 1886 유영목
Family Lecanidae Bartoš, 1959 술잔윤충속

Genus *Lecane* Nitzsch, 1827 술잔윤충속

1. *Lecane opias* (Harring and Myers, 1926) (Fig. 1) 작은뿔외발술잔윤충 (신청)

*Monostyla opias* Harring and Myers, 1926, p. 411, pl. 45, figs. 5, 6; Koste and Shiel, 1990, p. 9, fig. 4: 2.

*Lecane (Monostyla) opias*: Koste, 1978, pp. 257, 258, pl. 84, figs. 8a, b.

*Lecane opias*: Koste, 1962, p. 111, figs. 23a, b; Segers, 1995, p. 188, fig. 482.

**Material examined.** Two specimens found from mosses and leaf litter at Galcheon-ri, Seo-myeon, Yangyang-gun, Gangwon-do, 37°54′3.0″N, 128°30′6.4″E, 20 June 2020.

**Diagnosis.** Anterolateral corners slightly pointed. Dorsal plate much wider than ventral plate medially; much shorter than ventral plate. Ventral plate about twice as long as wide; with wavy lateral margins. Head aperture margins mostly coincident and slightly wavy. Foot pseudosegment not projecting. Toe single and without accessory claws; lateral margins rather parallel until distal third and abruptly tapering to spiny end; three times as long as wide.

**Measurements.** Dorsal plate width 42 μm. Dorsal plate length 57 μm. Ventral plate width 35 μm. Ventral plate length 62 μm. Toe length 19 μm.

**Remarks.** This species is presumably cosmopolitan (Segers, 1995). In Asia, it has been reported from Iran (Hakimzadeh Khoei et al., 2011) and Thailand (Savatanalinton and Segers, 2005) before the present study.

The Korean specimens have rather small spines on anterolateral corners, which are similar to those in the original illustrations as well as in the German specimens reported by Koste (1962). The toes of the Korean spe-
cimens were rather thicker and shorter than those of most of the specimens previously reported, and most similar to those of the German specimens (Koste, 1962) in the general morphology.

**World distribution.** Presumably cosmopolitan.

**Deposition.** Deposited in the collection of the Nakdong-gang National Institute of Biological Resources, Sangju-si, Gyeongsangbuk-do, Korea (NNIBR202025251V5980).

2. *Lecane perpusilla* (Hauer, 1929) (Fig. 2)

코마외발술잔윤충(신칭)

*Monostyla perpusilla* Hauer, 1929, pp. 156, 157, figs. 14a, b.


*Lecane (Monostyla) subulata f. perpusilla:* Koste, 1978, p. 243, pl. 81, fig. 1b.

*Lecane perpusilla:* Segers, 1995, p. 152, fig. 385.

**Material examined.** Four specimens sorted out from leaf litter and mosses on rocks at Galcheon-ri, Seo-myeon, Yangyang-gun, Gangwon-do, 37°54′3.0″N, 128°30′6.4″E, 1 August 2020.

**Diagnosis.** Anterolateral corners obtusely angulated. Dorsal plate wider than ventral plate; slightly shorter than ventral plate; with smooth margins. Ventral plate longer...
than wide; with smooth margins. Head aperture margins mostly coincident and slightly convex. Sulci not deep. Foot pseudosegment short and not projecting. Toe single and without accessory claws; lateral margins rather parallel until proximal third and gradually tapering to pointed end; with long and incompletely separated claws.

**Measurements.** Dorsal plate width 70 μm. Dorsal plate length 77 μm. Ventral plate width 60 μm. Ventral plate length 80 μm. Toe length 31 μm.

**Remarks.** This species has been reported from Africa, Europe, North America and Southeast Asia before the present study and is presumably cosmopolitan (Segers, 1995; 2007).

The general morphology of the Korean specimens agrees well with that of the previously reported specimens including the original description except the shape of the toe. The lateral margins of toe of the Korean specimens are rather gradually tapering to the end, while those of most of the other specimens are angulated on either side of the base of the claw. The Austrian specimen reported by Jersabek (1996) had the toe which was most similar to that of the Korean specimens.

**World distribution.** Presumably cosmopolitan.

**Deposition.** Deposited in the collection of the Nakdonggang National Institute of Biological Resources, Sangju-si, Gyeongsangbuk-do, Korea (NNIBR202020525IV5981).

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3. *Testudinella brevicaudata* Yamamoto, 1951 (Fig. 3)

*Testudinella brevicaudata* Yamamoto, 1951, p. 161, figs. 10–12; Koste, 1988, p. 131, fig. 35; Sharma, 1990, p. 31, fig. 3; Sharma and Khan, 2016, p. 8, fig. 18.

**Material examined.** One specimen found at Gyeongpo wetland area, Gangneung-si, Gangwon-do, 37°47′19.9″N, 128°53′49.8″E, 21 October 2018.

**Diagnosis.** Lorica dorsoventrally flattened and slightly elliptical in dorsal/ventral view. Anterodorsal margin slightly concave and with a small and low triangular lobe medially. Anteroventral margin slightly concave and with V-shaped median notch. Anteroventral and anterodorsal margins coincide except the median areas. Foot opening at the end of ventral plate. Posterior part of loria extended and forming a short and tubular sheath around foot opening; posteroventral margin of the sheath protruding beyond the posterior margin of loria.

**Measurements.** Lorica width 117 μm. Lorica length 134 μm. Head aperture width 50 μm. Foot opening width 18 μm.

**Remarks.** This species has been reported from Argentina, Brazil, Cambodia, India, Thailand, Vietnam and West Africa since the original description from Japan by Yamamoto (1951) (Sharma, 1990; Sanoamuang, 1998; Koste, 1999).

The general morphology of the Korean specimen is consistent with the original description. The shape of the anterior margins and the sheath around the foot opening has some variation (Jersabek and Leitner, 2013). The morphology of the anterior margins and the posteroventral sheath of the Korean specimen was most similar to those of specimens reported by Koste (1988) as well as Sharma and Khan (2016).

**World distribution.** Argentina, Brazil, Cambodia, India, Japan, Thailand, Vietnam and Korea.

**Deposition.** Deposited in the collection of the National Institute of Biological Resources, Incheon, Korea (ZCIVIV 0000002806).

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![Fig. 3. Testudinella brevicaudata Yamamoto, 1951. A, B. loria in different focal planes (Scales: A, B = 50 μm).](image-url)
4. *Habrotrocha scepanotrochoidea*  
De Koning, 1947

Material examined. Two specimens found from mosses and leaf litter at Galcheon-ri, Seo-myeon, Yangyang-gun, Gangwon-do, 37°54′3.0″N, 128°30′6.4″E, 20 June 2020.

**Diagnosis.** Many long cilia under rostral lamella. Rostral lamella with shallow median notch. Corona much narrower than cingulum. Sulcus very narrow and shallow. Upper lip consisting of two parts; upper one arched, transparent, and much lower than sulcus base; lower one thicker than upper one, arched and slightly bilobed. A small projection right beneath sulcus base dorsally. Each corner of cingulum protruding laterally. Cingulum pad narrower than cingulum. Teeth 7/7.


**Remarks.** This species has been reported from Austria, Belgium, Germany and New Zealand (Donner, 1951; 1965; Schulte, 1954; Haigh, 1968) after the description from the Netherlands by De Koning (1947).

There is some variation in the feeding head morphology of this species. The morphology of the feeding head of the Korean specimens is similar to that in the original description in that corona is much narrower than cingulum, and each corner of cingulum has lateral protrusion; however, the upper lip of the Korean specimen is arched and much lower than sulcus base, while that of the original description is slightly lower than the trochal discs and with small projection medially. The morphology of the feeding head of the Korean specimens is most similar to that of the Austrian specimen (Fig. 7K) reported by Donner...
The pharyngeal tube of the European specimens was twice as long as trophi length and with loop medially, while that of the Korean specimen is as long as trophi length and without median loop.

**World distribution.** Austria, Belgium, Germany, New Zealand, the Netherlands and Korea.

**Deposition.** Deposited in the collection of the Nakdong-gang National Institute of Biological Resources, Sangju-si, Gyeongsangbuk-do, Korea (NNIBR2020525IV5979).

5. *Habrotrocha tripus* (Murray, 1907) (Fig. 5)

5. *Habrotrocha tripus* (Murray, 1907) (Fig. 5)

*Callidina tripus* Murray, 1907, p. 99, figs. 5–7.


**Material examined.** One specimen sorted out from leaf litter and soil at Gyeongpo Wetland, Unjeong-dong, Gangneung-si, Gangwon-do, 37°47′32.0″N, 128°54′14.2″E, 3 June 2021.

**Diagnosis.** Body slightly granulated. Corona narrower than cingulum. Sulcus very narrow and trochal discs almost attached each other. Upper lip much lower than trochal discs; arched and round medially; without any projections. Cingulum pad slightly wider than cingulum. Trunk plump and spindle-shaped in feeding. Rump gradually tapering to foot. Foot with four pseudosegments. Spurs conical and with narrow interspace; inner margins with slight hump proximally. Dorsal toe extended in feeding.


**Remarks.** One of the diagnostic characteristics of *Habrotrocha tripus* (Murray, 1907) is the dorsal toe which always remains extended. In the Korean specimen, the dorsal toe was not always extended, but it protruded often even during feeding (Fig. 5B, C). In bdelloids, toes usually stretch out during their creeping movement, not in feeding.

The upper lip of the Korean specimen had round and broad median lobe, while that of the type specimen had rather narrow median lobe. The general morphology of feeding head of the Korean specimen was most similar to that of the specimen reported by Donner (1965) except the small median projection on the upper lip (Donner, 1965, Fig. 35a).

This species has been reported from Europe, South America, New Zealand (Donner, 1965) and Turkey (Kaya et al., 2009). The present study is the first Asian record of this species.

**World distribution.** Europe, Korea, New Zealand, South America and Turkey.

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**Fig. 5.** *Habrotrocha tripus* (Murray, 1907). A. feeding head, dorsal view; B. feeding habitus, ventral view (an arrow pointing at the dorsal toe); C. foot, spurs and toes, ventral view (an arrow pointing at the dorsal toe) (Scales: A, C = 20 μm; B = 50 μm).
Deposition. Deposited in the collection of the Nakdong-gang National Institute of Biological Resources, Sangju-si, Gyeongsangbuk-do, Korea (NNIBR2021523IV481).

Genus Otostephanos Milne, 1916 고리관윤충속

6. Otostephanos auriculatus auriculatus (Murray, 1911) (Fig. 6) 작은귀고리관윤충 (신칭)

Habrotrocha auriculata Murray, 1911, p. 16, pl. 2, figs. 8a, b.

Otostephanos auriculatus auriculatus: Donner, 1965, pp. 98, 99, figs. 74g, h.

Material examined. One specimen sorted out from leaf litter and mosses on rocks at Galcheon-ri, Seo-myeon, Yangyang-gun, Gangwon-do, 37°54′3.0″N, 128°30′6.4″E, 1 August 2020.

Diagnosis. Rostrum short. Rostral lamella bilobed and with wide median interspace between them; interspace slightly bilobed. Corona much wider than cingulum. Papilla on trochal disc rather big. Upper lip with narrow and high median lobe; median lobe triblobed anterioly; as high as trochal discs. Fine ring between corona and upper lip disconnected laterally. Teeth 10/10. Two strong longitudinal folds running from the posterior part of trunk to rump dorsally.


Remarks. The species of Otostephanos has a fine ring between trochal discs and upper lip. In Otostephanos a. auriculatus, the fine ring is disconnected laterally (Donner, 1965; Murray, 1911).

The general morphology of the Korean specimen agrees well with the original description. Otostephanos a. auriculatus differ from the other subspecies, O. auriculatus bilobatus Hauer, 1939, by the following characteristics: (1) the median lobe of the upper lip is triblobed anteriorly in O. a. auriculatus, while it is bilobed in O. a. bilobatus, and (2) the median lobe of the upper lip of O. a. bilobatus is much narrower than that of the upper lip of O. a. auriculatus.

This subspecies has been recorded from Africa, Australia, Europe, New Zealand and Pacific Islands (Donner, 1965; Ricci et al., 2003; Iakovenko et al., 2013), and is newly reported from Asia by the present study.

World distribution. Africa, Australia, Europe, Korea, New Zealand and Pacific Islands.

Deposition. Deposited in the collection of the National Insti-
titute of Biological Resources, Incheon, Korea (KDELIV 000003121).

7. *Otostephanos torquatus amoenus* Milne, 1916 (Fig. 7)

삼엽긴수염고리관윤충 (신칭)


*Otostephanos torquatus amoenus*: Donner, 1965, p. 100, figs. 72j, l.

**Material examined.** Three specimens sorted out from mosses at Galcheon-ri, Seo-myeon, Yangyang-gun, Gangwon-do, 37°54′3.0″N, 128° 30′6.4″E, 1 August 2020.

**Diagnosis.** Body finely granulated and brownish. Rostrum short. Rostral lamella bilobed and with narrow median interspace between them. Corona as wide as or slightly narrower than cingulum. Sulcus very narrow. Upper lip arched and with triblobed median lobe; median lobe rimmed; much lower than trochal discs. Fine ring between corona and upper lip without disconnection. Spurs conical and with narrow interspace.


**Remarks.** The most prominent difference between *Otostephanos torquatus amoenus* and *O. t. torquatus* (Bryce, 1913) appears in the morphology of the upper lip. The median lobe of the upper lip is simply arched in *O. t. torquatus*, while it is triblobed in *O. t. amoenus*. *Otostephanos t. torquatus* has been reported from Korea by Song (2015).

This subspecies has been reported from Austria, Czech Republic, Poland and Ukraine (Donner, 1965; Iakovenko et al., 2013) after the description from South Africa (Milne, 1916). The present study is the first report of this subspecies from Asian fauna.

**World distribution.** Austria, Czech Republic, Korea, Poland, Ukraine and South Africa.

**Deposition.** Deposited in the collection of the National Institute of Biological Resources, Incheon, Korea (KDELIV 000003105).

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Fig. 7. *Otostephanos torquatus amoenus* Milne, 1916. A. feeding, dorsal view; B. feeding, dorsal view; C. creeping, ventral view (Scales: A–C = 50 μm).
Genus *Scepanotrocha* Bryce, 1910  두건관윤충속 (신칭)

8. *Scepanotrocha corniculata* Bryce, 1910 (Fig. 8)

작은뿔두건관윤충 (신칭)
*Scepanotrocha corniculata* Bryce, 1910, pp. 79, 80, pl. 2, fig. 2; Donner, 1965, pp. 102, 103, figs. 78k–n; Donner, 1980, p. 134, figs. 3a, b.

**Material examined.** One specimen sorted out from mosses at Galcheon-ri, Seo-myeon, Yangyang-gun, Gangwon-do, 37°54′3.0″N, 128°30′6.4″E, 1 August 2020.


**Remarks.** The present study is the first report of the genus *Scepanotrocha* Bryce, 1910 from Korea. Most of the *Scepanotrocha* species have the hood-like membranous expansion of the upper lip. In *Scepanotrocha corniculata*, the upper lip expanded to hood-shaped membrane with shallow median notch as well as bird-beak like lateral processes (Bryce, 1910).

This species has been reported from several countries in Europe (Donner, 1965; Zullini and Ricci, 1980; Velasco, 1990) and New Zealand (Shiel and Green, 1996) before the present study, and is new to the Asian fauna.

**World distribution.** Europe, Korea and New Zealand.

**Deposition.** Deposited in the collection of the National Institute of Biological Resources, Incheon, Korea (KDELIV 0000003120).

9. *Scepanotrocha simplex* De Koning, 1947 (Fig. 9)

단일두건관윤충 (신칭)
*Scepanotrocha simplex* De Koning, 1947, p. 186, pl. 1, fig. 2; Donner, 1965, pp. 103, 104, fig. 78j.

**Material examined.** Two specimens sorted out from leaf litter and soil at Gyeongpo Wetland, Unjeong-dong, Unjeong-dong, Gangneung-si, Gangwon-do, 37°47′32.0″N, 128°54′14.2″E, 3 June 2021.

**Diagnosis.** Corona much narrower than cingulum. Sulcus very narrow. Pedicel very short. Median lobe of upper lip long semicircle-shaped; anterior margin of median lobe rather flat and with a small projection medi ally; as high as trochal discs; covers more than half of corona. Cingulum pad with parallel lateral margins. Pharyngeal tube as long as trophi in feeding. Spurs conical and without interspace; inner margin slightly plump proximally.

**Measurements.** Corona width 21 μm. Cingulum width 24 μm. Cingulum pad width 29 μm. Greatest trunk width in feeding 63 μm. Spur length 7.7 μm.

**Remarks.** The hood-like membranous expansion of the...
upper lip is semicircular, with a small median projection, and covering the corona completely in the original description of this species, while it is much smaller in the Korean specimens, and looks like a long semicircle-shaped median lobe on the upper lip. The median lobe is as high as the trochal discs and covers more than half of corona.

The feeding head shape of the Korean specimen was most similar to that of a variety reported from Austria (Donner, 1965, Fig. 78j).

*Scepanotrocha simplex* has been reported from Austria, Belgium, Greece and New Zealand (Donner, 1965) after its description from the Netherlands by De Koning (1947). It is reported from Asia for the first time by the present study.

Partial mtCOX1 was amplified using DNA extracted from one specimen of *Scepanotrocha simplex*. One sequence (616 bp in length) was obtained and submitted to GenBank under accession number MZ677126.

**World distribution.** Austria, Belgium, Greece, Korea and New Zealand.

**Deposition.** Deposited in the collection of the National Institute of Biological Resources, Incheon, Korea (VSJAIV 0000000545).

Family Philodinidae Ehrenberg, 1838 선윤충과
Genus *Macrotrachela* Milne, 1886 큰관윤충속

**10. Macrotrachela decora** (Bryce, 1912) (Fig. 10)

고운큰관윤충 (신칭)
*Callidina decora* Bryce, 1912, pp. 369, 370, fig. 3.

**Material examined.** Two specimens found from mosses and soil at Daegwallyeong, Hoenggye-ri, Pyeongchang-gun, Gangwon-do, 37°40'58.0"N, 128°45'41.6"E, 6 June 2021.

**Diagnosis.** Rostrum short. Rostral lamella wider than head end and bilobed; each lobe round. Corona much wider than cingulum. Pedicel very short. Sulcus width about a half of pedicel width; two fingertip-shaped processes on sulcus base medially. Upper lip arched and lower than sulcus base. Pharyngeal tube slightly longer than trophi length. Rump gradually tapering to foot and with rim posteriorly. Foot very short and with 4 pseudosegments; much narrower than rump. Spurs conical, very short, and with narrow interspace. Three toes; toe separation not clear.

**Measurements.** Total length in creeping 239 μm. Corona width 52 μm. Cingulum pad width 41 μm. Greatest trunk width in creeping 59 μm. Spur length 4.6 μm.

**Remarks.** Bryce (1912) wasn’t sure about the toe structure in his original description of this species. He speculated that the toes were absent or modified to a sucker-like
disc, in which case this species would properly belong to the genus *Mniobia* Bryce, 1910. However, he tentatively placed this species in the genus *Macrotrachela* pending further examination. In the Korean specimen, the toes were not clearly separated from each other, and looked like a triangular tube (Fig. 10E), which is different from the adhesive disc or two stumpy papillae that the *Mniobia* species usually have instead of three or four toes. Therefore, the placement of this species in the genus *Macrotrachela* seems to be more plausible.

One of the most important diagnostic characteristics of this species is the two fingertip-shaped processes on sulcus base, which are clearly observed on the sulcus base of the Korean specimens (Fig. 10C, D).

This species has been reported from Czech Republic, Sweden (Donner, 1965), New Zealand (Haigh, 1963) and Turkey (Ustaoğlu, 2015) after the description from the United Kingdom (Scotland) by Bryce (1912). It is new to Asia.

**World distribution.** Czech Republic, Korea, New Zealand, Sweden, United Kingdom and Turkey.

**Deposition.** Deposited in the collection of the National Institute of Biological Resources, Incheon, Korea (VSJAIV 0000000402).

**Acknowledgements**

We are very grateful to the reviewers and the editor for their efforts and invaluable comments. This work was supported by a grant from the National Institute of Biological Resources (NIBR), funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR201901201, NIBR202002204) as well as the project on the Survey and discovery of Freshwater animal and plant of the Nakdonggang National Institute of Biological Resources (NNIBR 2020-01201, NNIBR2021-01201) (M.O. Song).

**References**


Submitted: August 12, 2021
Revised: September 27, 2021
Accepted: September 27, 2021