

Taxonomic Study on the Digonont Rotifers of Korea

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ABSTRACT

The rotifers collected from various terrestrial habitats, such as mosses, lichens, dry detritus and temporary pools after rain were investigated. Five species and/or subspecies in two families of digonont rotifers were identified: *Rotaria tardigrada*, *Macrotrachela quadricornifera quadricornifera*, *Macrotrachela quadricornifera scutellata*, *Adineta vaga minor*, *Adineta steineri*. All these are new to Korean fauna. This is the first taxonomic study on the Korean digonont rotifers.

Key words: taxonomy, digonont rotifers, Belloidea, Korea

INTRODUCTION

Since Song and Kim (1989) started taxonomic studies on Korean rotifers, many taxonomic works have been performed (see Song and Kim, 1992) and all these resulted in a species record of about 170 from Korea. But all these works were concentrated on monogonont species and only two philodinid species were reported by the ecological studies without description (see Song, 1989).

Bdelloids must be identified in live state, but it's very difficult. And it's almost impossible to identify preserved specimens without narcotization. Unfortunately, no reliable anesthetic has been found. The hot water fixation is sometimes successful (Harring and Myers, 1922; Koste and Shiel, 1986; Turner, 1988) and we used this method for the present study. This may explain the poor record of bdelloid rotifers not only from Korea, but throughout the world.

For a taxonomic study on digonont rotifers from Korea, specimens were collected from moss, lichens, dry detritus and temporary pools after rain in the campus of Kangnung National University located in Kangnung-city, Kangwon-do from Nov. 16, 1994 to Dec. 13, 1995 by the present authors. We examined the specimens both alive and preserved after narcotization (Ricci and Melone, 1984) or hot water fixation.

As a result, *Rotaria tardigrada*, *Macrotrachela quadricornifera quadricornifera*, *M. quadricornifera scutellata*, *Adineta vaga minor*, and *A. steineri* were identified. All these are newly reported from Korea.

The classification scheme is based on Nogrady *et al.* (1993).

SYSTEMATIC ACCOUNTS

Class Digononta Plate, 1889 쌍소(雙巢)강

Order Bdelloidea Hudson and Gosse, 1886 질형(蛭形)목

Family Philodinidae Bryce, 1910 선(旋)윤충과

Genus *Rotaria* Scopoli, 1777 참윤충속(신칭)

1. *Rotaria tardigrada* (Ehrenberg, 1832) 완보참윤충(신칭) (Fig. 1m)

Rotifer tardigradus Ehrenberg, 1832, p. 145 (cited from Koste and Shiel, 1986).

Rotifer tardus Ehrenberg, 1838, p. 490, Taf. 1x, fig. 8 (cited from Hudson and Gosse, 1886); Hudson and Gosse, 1886, vol. 1, p. 105, pl. 10, fig. 1.

Rotaria tardigrada: Donner, 1965, p. 170, Fig. 125a-d; Bartoš, 1959, p. 264, Obr. 45D, H; Koste and Shiel, 1986, p. 780, figs. 12: 1a-b, 13: 1a-d.

Material examined. 12 females, temporary pool after rain, 16 Nov. 1994; 15 females, temporary pool after rain, 19 July 1995; 9 females, temporary pool after rain, 9 Aug. 1995; 15 females, mosses and lichens, 13 Dec. 1995.

Description. Proboscis (rostrum) long; length 2.5 times longer than width; 2 red eyes present; pigment granules present behind eyespots. Body length 495-550 μm . Trunk 101-114 μm wide and tapering gradually to foot; trunk 6-segmented, mostly yellowish brown and covered with detritus. Dorsal antenna 2-segmented and long. Foot 5-segmented with 3 toes; ventral toes (34-35 μm long) 2-2.5 times longer than dorsal one (14-16 μm long) and all 2-segmented and curved dorsally. Spurs 39-45 μm long, longer than ventral toes and with 1-2 constrictions at middle part. Trophi 30 μm long; unci with 2/2 strong teeth. Littoral, occurring between plants and in detritus.

Distribution. Cosmopolitan.

Remarks. This species is easily recognized by its trunk heavily covered with detritus. Spurs and ventral toes are long and bent toward each other, which make grasping motion when the animal crawls.

Genus *Macrotrachela* Milne, 1886 큰관윤충속(신칭)

2. *Macrotrachela quadricornifera quadricornifera* Milne, 1886 네뿔큰관윤충(신칭) (Fig. 1e-h)

Macrotrachela quadricornifera quadricornifera Milne, 1886, p. 139, tab. 1, Obr. 4 (cited from Bartoš, 1959); Bartoš, 1959, p. 228, Obr. 38A, B, F, H, I; Donner, 1965, p. 116, Fig. 87a-d; Donner, 1970, p. 244, Abb. 22; Haigh, 1966, p. 199, Fig. 2l-m.

Callidina quadricornifera: Hudson and Gosse, 1889, p. 10.

Material examined. 20 females, dry detritus, 12 Oct. 1995; 10 females, mosses, lichens and dry detritus, 13 Dec. 1995.

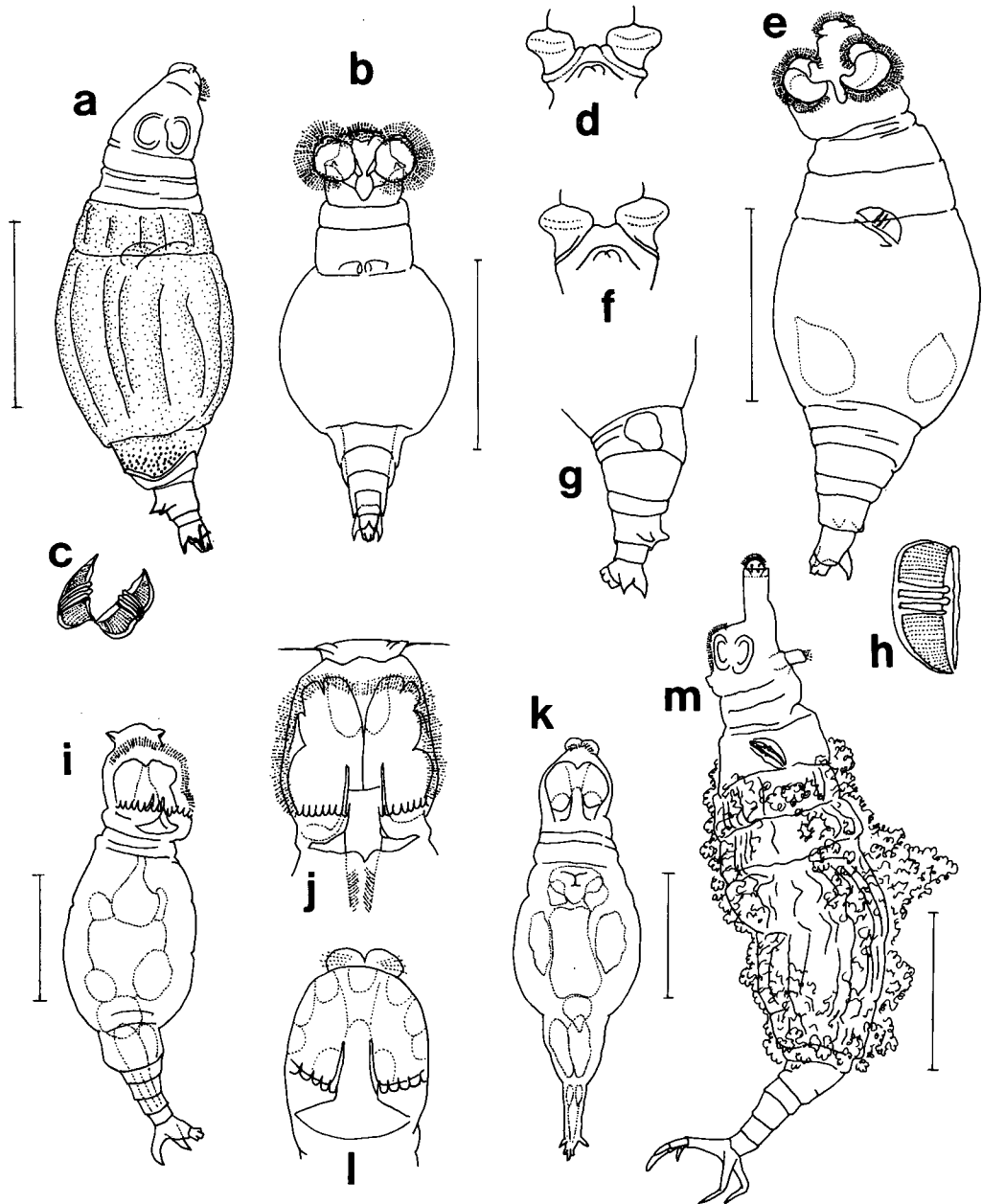


Fig. 1. a-d, *Macrotrachela quadricornifera scutellata* Schulte, 1954: a, dorsal view; b, ventral view; c, trophi; d, head (dorsal view, live specimen). e-h, *Macrotrachela quadricornifera quadricornifera* Milne, 1886: e, ventral view; f, head (dorsal view, live specimen); g, foot and toes (dorsal view); h, trophi. i-j, *Adineta steineri* Bartos, 1951: i, ventral view; j, head. k-l, *Adineta vaga minor* Bryce, 1893: k, ventral view; l, head. m, *Rotaria tardigrada* (Ehrenberg, 1832), whole animal (ventro-lateral view). (Scale bars: a, b, e, m = 100 μ m; i, k=50 μ m)

Description. Eye absent. Body length 310-328 μ m. Trunk 96-114 μ m wide, slightly broader than cingulum; trunk 6-segmented, yellowish to brown and with smooth integument. Sensilla present on

center of trochus disc, with very small base. Upper lip slightly concave. Sulcus wide, about 1/2 of trochus disc width. Dorsal antenna 2-segmented and long. Tooth index 2+1/1+2. Foot with 3 toes; 2 short, blunt and conical processes present on first foot segment and these processes one of each base width apart; spurs 12-15 μm long, longer than these processes; outer margin of spur slightly convex and inner margin swollen in proximal part. Oviparous. Egg lemon-shaped, with 1 small bump at each poles, and with smooth surface. Occurring in mosses, lichens and dry detritus.

Distribution. Cosmopolitan.

Remarks. The present genus *Macrotrachela* is new to Korean fauna. According to Sládeček (1983), *Macrotrachela* species are useful as indicators of water quality. Ten species of present genus were classified as indicators of oligosaprobity and scored equal to the maximum indicative weight (= 5) (Ricci, 1987).

3. *Macrotrachela quadricornifera scutellata* Schulte, 1954 방패꼬리네뿔큰관윤충 (신칭)
(Fig. 1a-d)

Macrotrachela quadricornifera var. *scutellata* Schulte, 1954, p. 605, Abb. 31.

Macrotrachela quadricornifera scutellata: Donner, 1965, p. 119, Fig. 88a-d.

Material examined. 10 females, mosses, lichens and dry detritus, 13 Dec. 1995.

Description. Eye absent. Body length 240-277 μm . Trunk finely granulated and 96 μm wide; 6-segmented and posterodorsal part of third trunk segment extended and forming highly granulated semicircular plate with thick rim. Sensilla present on center of trochus disc, with slightly protruding base. Upper lip 3-lobed dorsally. Sulcus wide, about 3/5 of trochus disc width. Dorsal antenna 2-segmented and long. Foot with 3 toes; 2 sharp, long and conical processes present on first foot segment and these processes apart from each other one of each base width; spurs 10-12 μm long, much longer than these processes; outer margin of spur convex and inner margin swollen like shoulder in proximal part. Tooth index 2+1/1+2. Oviparous. Egg elliptical, with smooth surface.

Distribution. Cosmopolitan.

Remarks. This subspecies is apparently different from *M. quadricornifera quadricornifera* in many characteristics, such as the state of integument surface, shape of upper lip, shape and size of spurs and processes on first foot segment, and egg shape (see each description above). These two subspecies are occasionally found at the same time. This is disobedient to the subspecies definition given by Mayr and Ashlock (1991, p. 43), but, bdelloids reproduce exclusively by parthenogenesis and the standard biological meaning of 'species' cannot be applied. Ricci (1987) considered the distribution of *M. quadricornifera* and its six subspecies (*ligulata* Berzins, *loricata* Donner, *rigida* Milne, *quadricorniferoides* Bryce, *scutellata* Schulte, and *vanoyei* Schepens). None of these is limited to any particular region or habitat, except *M. quadricornifera vanoyei* which has been reported only from Belgium. Further studies should be carried out with populations of *M. quadricornifera* to distinguish them on the parameters other than morphological ones.

Family Adinetidae Bryce, 1910 납작머리윤충과 (신칭)

Genus *Adineta* Hudson, 1886 납작머리윤충속 (신칭)

4. *Adineta vaga minor* Bryce, 1893 작은떠돌이납작머리윤충 (신칭) (Fig. 1k-l)

Adineta vaga minor Bryce, 1893, p. 146 (cited from Bartoš, 1959); Bartoš, 1959, p. 308, Obr.

56C, G, F, 57K, L; Donner, 1965, p. 274, Fig. 200b-g; Brauer, 1912, p. 31, figs. 50, 51a, b.

Material examined. 5 females, dry detritus, 8 Aug. 1995; 10 females, temporary pool after rain, 25 Sep. 1995; 8 females, dry detritus, 12 Oct. 1995; 10 females, mosses, lichens and dry detritus, 13 Dec. 1995.

Description. Eyes absent. Body 196-328 μm long. Trunk 54-74 μm wide and tapering gradually to foot. Head oval, flat and wide, 3/4 of its length; rostrum lamella with 2 short and rather wide auricles; corona ventral and non-retractable; rake apparatus present anterior to mouth and with 5 sharp claws pointing forward; sharp and long (about 4 times longer than claws on rake apparatus) spine-like projection just under each rake apparatus. Foot 5-segmented; spurs 6-6.3 μm long and conical; 3 toes shorter than spurs.

Distribution. Cosmopolitan.

Remarks. *A. vaga minor* is distinguished from the other subspecies of *A. vaga* by the following characteristics (Donner, 1965): (1) This subspecies has short and pointed spurs, (2) Body length ranges from 200 to 500 μm , and (3) Transverse folds between body segments are not clear. *Adineta* species are easily recognized by their flat heads and peculiar movement. While other bdelloids creep like leeches, they slide without retraction of head. Only feet move telescopically when they slide forward. The present family Adinetidae is new to Korean fauna.

5. *Adineta steineri* Bartoš, 1951 슈타이너납작머리윤충 (신칭) (Fig. 1i-j)

Adineta steineri: Donner, 1965, p. 270, Fig. 198h-i.

Material examined. 10 females, dry detritus, 8 Aug. 1995; 5 females, temporary pool after rain, 25 Sep. 1995; 3 females, dry detritus, 12 Oct. 1995; 2 females, mosses, lichens and dry detritus, 13 Dec. 1995.

Description. Eyes absent. Body 222-316 μm long. Trunk 54-78 μm wide. Head oval, flat and thumb-shaped; head 48-61 μm long and 35-45 μm wide; rostrum with short lateral auricles each bearing long single sensillae; corona ventral and non-retractable; rake apparatus present anterior to mouth and with 8 sharp claws pointing forward; sharp and long (about 4 times longer than claws on rake apparatus) spine-like projection just under each rake apparatus. Posterior part of third segment of trunk abruptly tapered to preanal segment and preanal segment trapezoid in outline. Foot 5-segmented; spurs 15-20 μm long, bull's horn-shaped and bowed posteriorly; 3 toes much shorter than spurs.

Distribution. Cosmopolitan.

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한국산 쌍소(雙巢) 윤충류에 대한 계통분류학적 연구

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요약

1994년 11월부터 1995년 12월까지 강릉대학교 인근의 이끼, 지의류, 부니질, 비온 후 형성된 물 웅덩이 등에서 채집된 쌍소 윤충류를 동정한 결과 *Rotaria tardigrada*, *Macrotrachela quadricornifera quadricornifera*, *Macrotrachela quadricornifera scutellata*, *Adineta vaga minor*, *Adineta steineri*의 2과 2종 및 3아종들이 확인되어 이들을 모두 재기재하고 도판을 작성하였다. 이것은 한국 최초의 쌍소 윤충류에 대한 분류학적 기록이다.