

# First report of *Mesorhabditis microbursaris* (Nematoda: Rhabditida: Mesorhabditidae) from Korea

Jiyeon Kim<sup>1</sup> and Taeho Kim<sup>2,\*</sup>

<sup>1</sup>Animal & Plant Research Department, Nakdonggang National Institute of Biological Resources, Sangju 37242, Republic of Korea

<sup>2</sup>Animal Resources Division, National Institute of Biological Resources, Incheon 22689, Republic of Korea

\*Correspondent: thk0817@gmail.com

*Mesorhabditis microbursaris* (Steiner, 1926) Sudhaus, 2011, belonging to the family Mesorhabditidae (Rhabditomorpha), is newly reported from South Korea. During a survey of small streams, *M. microbursaris* was isolated from sedimentary soil samples. The genus *Mesorhabditis* Osche, 1952 nematodes are distributed all over the world and are mostly found from terrestrial habitats, however are sometimes found in freshwater. At present, 34 valid species have been recorded from *Mesorhabditis*; however, only three species have been reported from South Korea. *Mesorhabditis microbursaris* exhibits morphological characters of other congeneric species, including shorter distance between vulva and anus than the distance between anus and tail, rudimentary bursa with narrow velum and short genital papillae, shorter spicules than tail and conical tail. However, this species can be distinguished from other *Mesorhabditis* species by its morphometric characters and three pairs of bursal papillae. Details of the morphological characteristics and morphometrics of *M. microbursaris* are described and illustrated based on optical microscopy.

Keywords: *Mesorhabditis microbursaris*, Mesorhabditidae, nematode, new record, Korea

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## INTRODUCTION

Members of the genus *Mesorhabditis* Osche, 1952, belonging to the family Mesorhabditidae Andr ssy, 1976, are distributed worldwide and mostly occur in terrestrial habitats such as soil and decaying organic matter like fallen leaves; however, they are sometimes found in freshwater (Andr ssy, 1983; 2005; Nicholas, 1998). Taxonomy of this group has been debated with *Bursilla* Andr ssy, 1976 nematodes (Abolafia and Pe a-Santiago, 2009). Andr ssy (1976) separated the genus *Bursilla* from *Mesorhabditis* based on some differences in males: well developed bursa and many number of genital papillae in *Mesorhabditis* versus rudimentary bursa and lesser number of genital papillae in *Bursilla*. Zeidan and Geraert (1989) also separated these two group as valid genera, and Andr ssy (2005) proposed the subfamily Bursillinae. Sudhaus (2011) synonymised *Bursilla* with *Mesorhabditis* and proposed two groups (*Monhystera* group and *Spiculigera* group) within the genus *Mesorhabditis*.

To date, 34 species in the genus *Mesorhabditis* have been reported worldwide (Sudhaus, 2011), but only three

have been previously recorded in Korea: *M. inarimensis* (Meyl, 1953) Dougherty, 1955; *M. minuta* Bostr m, 1991; and *M. vernalis* (Andr ssy, 1982) Sudhaus, 2011 (Kim and Park, 2019). During a survey of small streams in South Korea, *M. microbursaris* was collected and isolated from sediment samples. In this study, we provide detailed descriptions of the morphological characteristics and morphometrics of Korean isolates of *M. microbursaris*.

## MATERIALS AND METHODS

Sediment samples were collected from small streams in Anseong-si, Gyeonggi-do, South Korea (GPS coordinates: 37 00'05.1"N, 127 09'54.9"E). Nematode specimens were extracted from the sediment samples by sieving using the Baermann funnel method (Baermann, 1917). Each nematode specimen was transferred to 2 mL of water in a 15 mL tube, and 4 mL of 80 C TAF (2% triethanolamine and 7% formaldehyde) was quickly added for fixation. The fixed nematodes were processed to dehydrated glycerin

as described by Seinhorst's (1959) method and mounted in pure glycerin on permanent HS-slides (Shirayama *et al.*, 1993). The morphological characteristics of the nematodes were observed under an optical microscope (BX-51; Olympus, Tokyo, Japan) equipped with differential interference contrast (DIC), and morphometric characteristics were measured using a CoolSnap Photometrics color CCD digital camera (MP5.0-RTV-R-CLR-10; Photometrics, Tucson, AZ, USA) and the program QCapture Pro 5 (QImaging, Surrey, Canada). Females and males are described separately and denoted by the symbols ♀ and ♂, respectively.

## SYSTEMATIC ACCOUNTS

Class Chromadorea Inglis, 1983  
 Order Rhabditida Chitwood, 1993  
 Infraorder Rhabditomorpha De Ley and Blaxter, 2002  
 Family Mesorhabditidae Andr ssy, 1976  
 Genus *Bursilla* Andr ssy, 1976

***Mesorhabditis microbursaris* (Steiner, 1926) Sudhaus, 2011 (Table 1, Fig. 1)** 작은짧은날개선충 (신칭)  
*Bursilla microbursaris* (Steiner, 1926) Andr ssy, 1983: 77.  
*Rhabditis microbursaris* Steiner, 1926: 355–357, pl. 1, figs. 1–6.  
*Tricephalobus microbursaris* (Steiner, 1926) Osche, 1952.  
*Rhabditis franseni* Fuchs, 1933.

**Material examined.** 4♀♀ and 1♂♂, South Korea: Gyeonggi-do, Anseong-si, Gongdo-eup, Yongdu-gil, 03 Nov 2018, extracted by sieving and the Baermann funnel method from freshwater and sediment samples. Voucher specimens were deposited in the Nakdonggang National Institute of Biological Resources (slide Nos. NNIBRIV74482–74485 for females and NNIBRIV74486 for males), Korea.

**Measurements.** Detailed morphometrics for female and male *M. microbursaris* are given in Table 1.

**Description.** Female: Body length 435–487 µm long, slightly curved ventrad after fixation (Fig. 1A). Cuticle annulated; annuli 1.2–1.5 µm wide and 0.7–1.3 µm thick at mid-body. Lateral field with five incisures occupying 15.9–19.0% of body width at mid-body, fading out in the phasmid region. The lip region well off-set, 7.3–7.7 µm in diameter; six spherical lips, each ending in a setiform papilla (Fig. 1B). Transversal, oval-shaped amphidial apertures present. Stoma typical of the group, 2.1–2.3 lip region diameter long; cheilostom short; gymnostom-promesostegostome tubiform; metastegostom bearing well-developed glottoid apparatus. Pharynx typical of the group; corpus 1.6–2.0 times isthmus length, procorpus cylindrical, metacarpus swollen; isthmus narrower than corpus; basal bulb ovoid with well-developed valves, 1.5–1.8 times as long as its width; cardia conoid, surrounded by intestinal tissue. Nerve ring located at the isthmus, at 61.9–66.2% of pharynx length. Excretory pore position at the isthmus-basal bulb junction, at 70.9–75.4% of pharynx length. Deirids inconspicuous. Reproductive system monodelphic-prodelphic (Fig. 1C). Vagina 0.3 times as long as body diameter. Postuterine sac absent. Uterus length 1.1–1.7 times body diameter. Ovary directed posteriorly, without flexures. Rectum 1.8–2.2 times length of anal body diameter. Tail elongated conoid with pointed terminus. Phasmids located in anus region, 4.0–18.8% of tail length (Fig. 1D).

Male: General morphology similar to that of females (Fig. 1F). Body length 316.2 µm long. Cuticle annuli 1.2 µm wide and 0.7 µm thick at mid-body. Lip region 6.0 µm in diameter. Stoma 2.2 lip region diameter long. Corpus 1.7 times isthmus length. The nerve ring was located at 61.3% of the pharynx length. Excretory pore position at 63.3% of pharynx length. Genital system monorchic. Testis reflexed dorsal anteriorly. Spicules fused distally, 18.6 µm long, 1.1 times anal body diameter; manubrium

**Table 1.** Morphometrics of *Mesorhabditis microbursaris*.

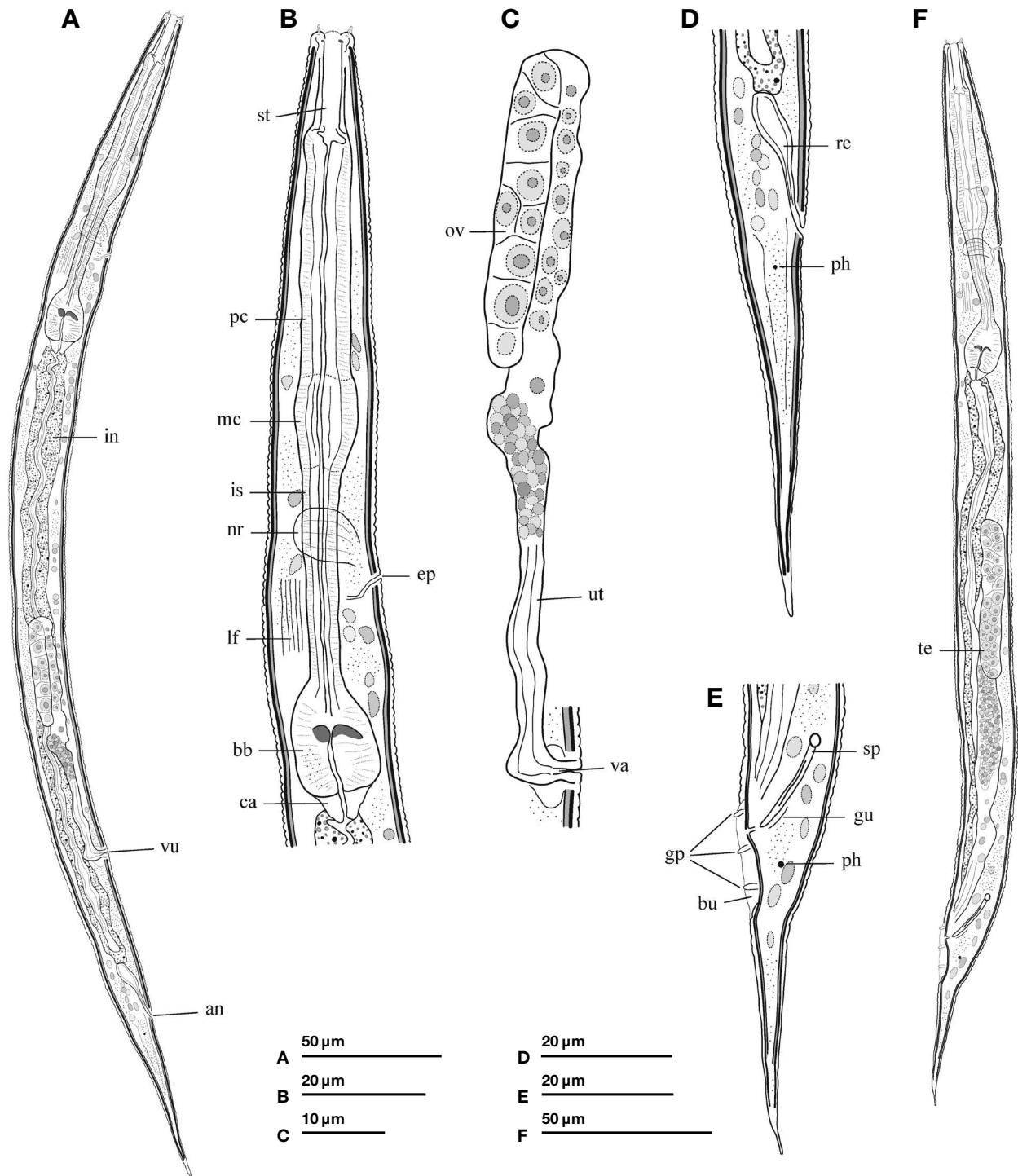
Characteristic	<i>Mesorhabditis microbursaris</i>	
	♀, n=4	♂, n=1
L	461.0±23.3 (435.1–486.9)	316.2
a	21.3±0.7 (20.4–21.9)	18.1
b	3.7±0.2 (3.4–3.8)	3.1
c	6.9±0.2 (6.6–7.0)	6.0
c'	5.9±0.5 (5.5–6.6)	4.8
V (%)	72.4±1.7 (70.6–74.7)	0.0
G (%) / T (%)	23.6±2.3 (21.3–25.9)	40.9
Body width	21.7±1.5 (20.5–23.8)	17.5
Pharynx length	125.9±1.7 (124.6–128.4)	101.9

Table 1. Continued.

Characteristic	<i>Mesorhabditis microbursaris</i>	
	♀, n=4	♂, n=1
Tail length	66.8±3.4 (61.8–69.8)	52.3
Anal width	11.3±1.1 (10.3–12.6)	10.9
Lips region width	7.5±0.2 (7.3–7.7)	6.0
Stoma length	16.7±0.4 (16.3–17.1)	13.3
Stoma diameter	3.0±0.2 (2.8–3.2)	2.6
Stoma/lips region width	2.2±0.1 (2.1–2.3)	2.2
Stoma/stoma diameter	5.5±0.4 (5.1–6.1)	5.1
Corpus	54.4±2.3 (52–57.1)	44.6
Procorpus	37.8±0.6 (37.2–38.7)	29.2
Metacarpus	16.6±2.6 (13.3–19.6)	15.4
Isthmus	30.3±1.4 (29.1–32.0)	25.9
Bulbus	22.1±1.2 (20.5–23.3)	16.6
Bulbus width	13.7±0.5 (13.2–14.3)	10.5
Bulbus/bulbus width	1.6±0.1 (1.5–1.8)	1.6
Corpus:isthmus	1.8±0.1 (1.6–2.0)	1.7
Nerve ring from anterior end	80.2±2.6 (77.1–83.0)	61.3
Excretory pore from anterior end	92.1±3.7 (88.9–96.1)	63.3
Nerve ring (% pharynx)	63.7±1.8 (61.8–66.2)	60.2
Excretory pore (% pharynx)	73.2±2.3 (70.9–75.4)	62.1
Vulva from anterior end	334.1±23.0 (314.6–363.5)	–
Vulva to anus	60.8±4.8 (56.7–66.8)	–
Vulva to anus / tail	0.9±0.1 (0.8–1.0)	–
Reproductive tract length	109.1±15.9 (94.8–123.2)	129.3
Vagina	6.2±0.5 (5.7–6.6)	–
Uterus	30.2±5.6 (25.0–35.1)	–
Oviduct	53.2±14.3 (36.2–67.0)	–
Spermatheca	20.5±6.1 (16.7–29.6)	–
Ovary	55.7±14.5 (38.7–70.7)	–
Vagina/body width	0.3±0.0 (0.2–0.3)	–
Uterus/body width	1.4±0.3 (1.0–1.7)	–
Oviduct/body width	2.4±0.6 (1.7–3.1)	–
Spermatheca/body width	0.9±0.2 (0.7–1.2)	–
Spicules	–	18.6
Spicules/anal body width	–	1.1
Gubernaculum	–	5.7
Gubernaculum/anal body width	–	0.3
Spicules/gubernaculum	–	3.3
Rectum	21.8±1.2 (20.5–23.2)	–
Rectum/anal width	1.9±0.2 (1.7–2.2)	–
Phasmid	3.4±0.7 (2.7–4.1)	3.9
Phasmid (% tail)	5.0±1.0 (3.9–6.0)	7.5
Lateral field width	3.6±0.4 (3.3–3.9)	1.9
Lateral field width/body width (%)	17.5±2.2 (15.9–19.0)	10.9
Cuticle thickness	1.0±0.3 (0.7–1.3)	0.7
Annule width	1.3±0.1 (1.2–1.5)	1.2

All measurements are in  $\mu\text{m}$  and in the form: mean  $\pm$  standard deviation (range).

L, Body length; a, body length/body diameter; b, body length/distance from anterior to base of esophageal glands; c, body length/tail length; c', tail length/diameter at anus region; V, % distance of vulva from anterior end/body length



**Fig. 1.** *Mesorhabditis microbursaris* (Steiner, 1926) Sudhaus, 2011. A, Entire female; B, Female neck region; C, Female reproductive system; D, Female posterior region; E, Entire male; F, Male posterior region. an, anus; bb, basal bulb; bu, bursa; ca, cardia; ep, excretory pore; gp, genital papillae; gu, gubernaculum; in, intestine; is, isthmus; lf, lateral field; mc, metacarpus; nr, nerve ring; ov, ovary; pc, procorpus; ph, phasmid; re, rectum; sp, spicule; st, stoma; te, testis; ut, uterus; va, vagina; vu, vulva.

rounded; calamus narrower than manubrium; lamina thin. Gubernaculum thin, 5.7 μm long, 0.3 times anal body diameter. Tail elongated conical with pointed terminus. Bur-

sa strongly reduced with three (1 + 1 + 1) pairs of papillae (Fig. 1E).

**Distribution.** Germany, India, Korea, South Africa, Su-

dan.

**Habitat.** Soil and freshwater.

**Remarks.** Morphological characters of the specimens described in this study generally agree with the original descriptions of *M. microbursaris* except some minor differences; thinner female body ( $a = 20.5\text{--}21.9$  vs.  $14\text{--}18$ ), longer pharynx ( $b = 3.5\text{--}3.8$  vs.  $4.0\text{--}5.1$  in female and  $3.1$  vs.  $5.1\text{--}6.2$  in male) and longer tail ( $c = 6.6\text{--}7.0$  vs.  $8\text{--}11$  in female and  $6.1$  vs.  $10\text{--}11$  in male) (Steiner, 1926). On the other hand, the present population male has three pairs of genital papillae similar to the original description, however Sudan population males have five pairs of genital papillae (Zeidan and Geraert, 1989). The specimens differ in some minor morphometric values compare to India population; male (presence vs. absence) and body length ( $435\text{--}486\ \mu\text{m}$  vs.  $535\text{--}763\ \mu\text{m}$ ), value  $a$  ( $20.5\text{--}21.9$  vs.  $13.1\text{--}17.1$ ),  $b$  ( $3.5\text{--}3.8$  vs.  $4.0\text{--}5.3$ ) and  $c'$  ( $5.5\text{--}6.6$  vs.  $3.6\text{--}4.2$ ) in female (Mahboob and Jahan, 2021). *Mesorhabditis microbursaris* is reported here for the first time in South Korea.

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