

## DESCRIPTION OF TWO NEW SPECIES OF RARE GENERA (NEMATODA: DORYLAIMOIDEA) FROM RAJASTHAN, INDIA

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**Summary.** Two new species of nematodes collected from soil around roots of weeds and *Phaseolus* sp. are described and illustrated. *Torumanawa shinensis* sp. n. is characterized by L = 1.4-1.6 mm,  $a = 42.2-54.2$ ,  $b = 4.3-4.8$ ,  $c = 38.2-50.3$ ,  $c' = 1.3-2.0$ , V = 50.1-52.5, expanded lip region, ventrally curved odontophore, amphidelphic females with unsclerotised vagina, and convex-conoid tail with slight dorsal depression near rounded tip. *Mylodiscus magnus* sp. n. is characterized by L = 0.85-1.0 mm,  $a = 32.5-32.8$ ,  $b = 3.7-4.4$ ,  $c = 33.8-42.1$ ,  $c' = 1.4-1.5$ , V = 47.9-50.9, odontostyle 9-10  $\mu$ m long, abrupt pharyngeal expansion, pre-rectum length 1.2 times anal body diameter, and tail longer than one anal body diameter.

**Key words:** *Mylodiscus magnus* sp. n., taxonomy, *Torumanawa shinensis* sp. n.

The genus *Torumanawa* Yeates, 1967 belongs to the family Aporcelaimidae Heyns, 1965, and the genus *Mylodiscus* Thorne, 1939 to the family Qudsianematidae Jairajpuri, 1965 of superfamily Dorylaimoidea de Man, 1876. Andr ssy (1976) considered *Torumanawa* as a synonym of *Aporcelaimus* Thorne and Swanger, 1936. Das *et al* (1969) reported the resemblance of *T. litoralis* to *Discolaimoides* and discussed the peculiar arrangement of pharyngeal gland nuclei. Thorne (1939) proposed *Mylodiscus* under the family Actinolaimidae Thorne, 1939. However, Coomans and Loof (1978) placed this genus under the family Discolaimidae due to lateral glands, abrupt pharyngeal expansion, far back position of the dorsal pharyngeal gland, unsclerotized vagina and short rounded tail. Shaheen and Ahmad (2004) published *Mylodiscus nanus* as a first report from Costa Rica.

During a survey, nematode specimens belonging to undescribed species of the genera *Torumanawa* and *Mylodiscus* were found. They are described hereafter as *T. shinensis* n. sp. and *M. magnus* n. sp.

### MATERIALS AND METHODS

The nematodes were extracted from the soil samples using sieving and decanting and modified Baerman's funnel techniques. For light microscopy (LM) observation, nematodes were fixed in 4% formaldehyde, processed to anhydrous glycerin and mounted on glass slides. Measurements and drawings were made using a drawing tube mounted on a Nikon Eclipse E600 microscope and photographs were taken using a Nikon digital camera DS - Fi1.

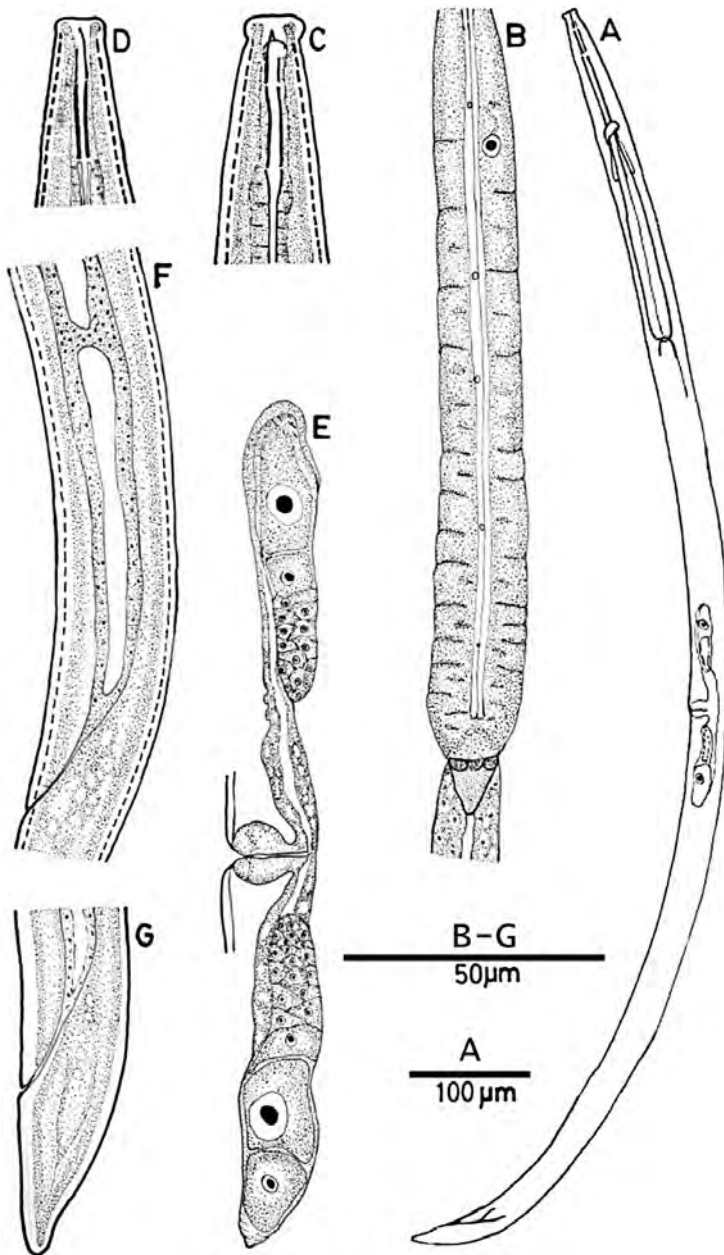
### DESCRIPTIONS

#### *TORUMANAWA SHINENSIS* n. sp. (Table I; Figs 1 and 2)

*Female.* Small-sized-species. Body ventrally curved upon fixation, tapering towards both extremities. Cuticle thick, 1.5-2.0  $\mu$ m at mid body, 4-5  $\mu$ m at tail. Outer cuticle smooth, inner cuticle with fine transverse striations over entire body length. Lateral hypodermal chord one sixth of body diameter. Hypodermal glandular organs present but not distinct. Lip region expanded, set off from body contour. Lips separate, lip papillae not protruding beyond their contours. Odontostyle about one lip region diameter long; aperture 32-36% of odontostyle length. Guide ring single, 5-6  $\mu$ m posterior from anterior end. Odontophore ventrally curved, 1.2-1.7 times length of odontostyle. Nerve ring encircles slender part of pharynx at 27.8-32.4% of pharyngeal length. Pharyngeal expansion gradual, expanded part of pharynx occupies 51.4-53.2% of total pharyngeal length. Cardia conoid, 9-11  $\times$  7-9  $\mu$ m in dimension, with three glands. Location of pharyngeal gland nuclei as follows: DO = 55.2-58.4%; S<sub>1</sub>N<sub>1</sub> = 65.1-68.2%; DN = 51.6-55.3%; S<sub>1</sub>N<sub>2</sub> = 75.2-78.3%; S<sub>2</sub>N = 86.2-86.8%.

Reproductive system didelphic, amphidelphic. Ovaries 51-80  $\mu$ m long, reflexed dorsally. Uterus distinct in muscular and glandular part, 51-55  $\mu$ m long. Oviduct 53-62  $\mu$ m long. Uterus and oviduct separated by a sphincter. Vulva a horizontal slit. Vagina a third to a half of corresponding body diameter long; *pars proximalis vaginae* 8-9  $\mu$ m long and 9-11  $\mu$ m wide; *pars refringens vaginae* absent; *pars distalis vaginae* 5-6  $\mu$ m long. Pre-rectum 3.3-5.2 and rectum 0.8-1.1 times anal body diameter in length. Tail convex-conoid with rounded terminus and slight dorsal depression at tip.

*Male.* Not found.

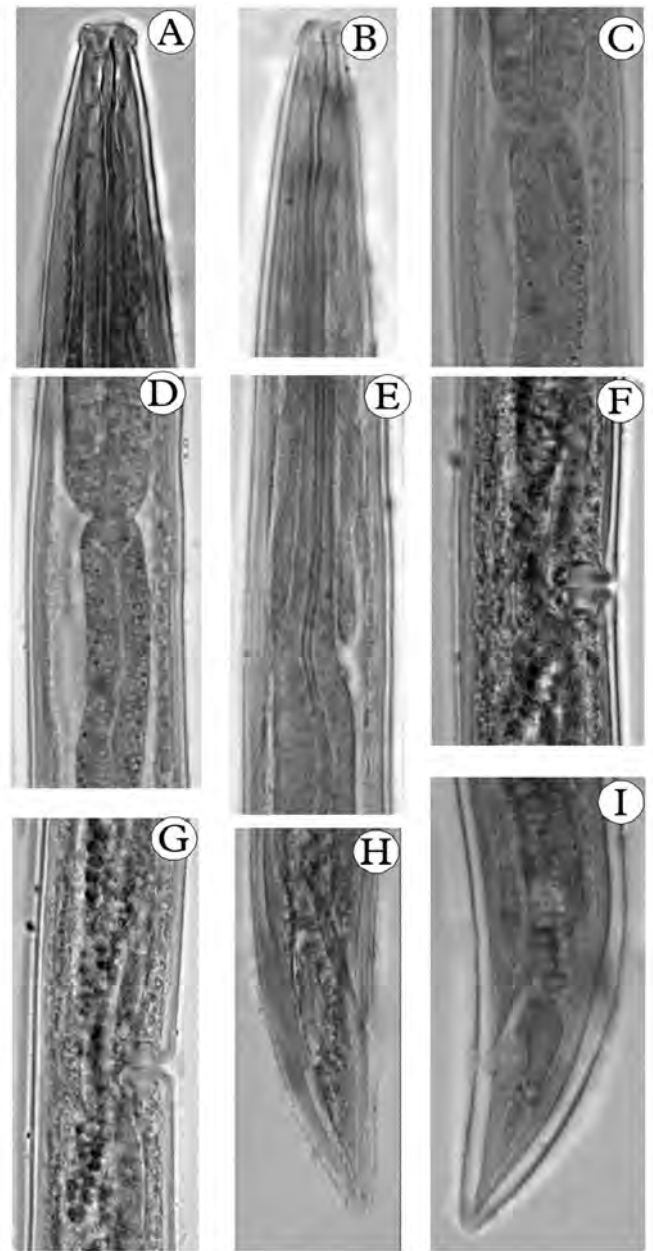


**Fig. 1.** *Torumanawa shinensis* sp. n. A: Entire female; B: Expanded part of pharynx; C-D: Anterior end; E: Female reproductive system; F: Pre-rectum; G: Posterior end.

*Type habitat and locality.* Collected from soil around roots of shin (grass) weeds in the Bharatpur, of district Rajasthan, India.

*Type specimens.* Collected by first author in September, 2005. Holotype female along with two paratype females mounted on slide No. IV/2079. Three paratype females mounted on slide No. IV/2080. The type specimens are deposited in the National Zoological Collection (NZC) of Desert Regional Station, Jodhpur, Rajasthan, India.

*Diagnosis and relationship.* *Torumanawa shinensis* sp.



**Fig. 2.** *Torumanawa shinensis* sp. n. A-B: Anterior end; C-D: Cardiac region; E: Pharyngeal region; F-G: Female reproductive system; H-I: Posterior end.

*n.* is characterized by having a small sized body; conspicuously striated inner cuticle; expanded lip region; single guide ring; ventrally curved odontophore; female reproductive system amphidelphic; ovaries reflexed; pre-rectum 3.3-5.3 times anal body diameter in length; tail convex conoid with rounded terminus and slight dorsal depression at tip. *Torumanawa shinensis* sp. n. comes close to *T. wabapensis* Yeates, 1967 but differs in having greater  $a$  and  $c'$  values; shorter odontostyle; ventrally curved odontophore; unsclerotised vagina; more posteriorly situated DO,  $S_1N_1$ ,  $S_1N_2$  pharyngeal nuclei and tail with dorsal depression at tip ( $a = 27-44$ ;  $c' = 0.6-0.9$ ; odontostyle = 12-15  $\mu\text{m}$  long; odontophore

**Table I.** Morphometric characteristics of *Torumanawa shinensis* sp. n. Measurements are in  $\mu\text{m}$ , except L in mm, and in the form: mean  $\pm$  standard deviation (range).

Character	Holotype ♀	Paratype (n = 5) ♀♀
L	1.61	1300 $\pm$ 570.4 (1.4 - 1.6)
<i>a</i>	57.5	48.4 $\pm$ 4.7 (42.2 - 54.2)
<i>b</i>	4.3	4.5 $\pm$ 0.2 (4.3 - 4.8)
<i>c</i>	50.3	44.1 $\pm$ 5.3 (38.2 - 50.3)
<i>c'</i>	1.3	1.6 $\pm$ 0.2 (1.3 - 2.0)
V	50.4	51.1 $\pm$ 0.9 (50.1 - 52.5)
G1	8.2	7.3 $\pm$ 0.3 (7.1 - 7.9)
G2	7.8	7.8 $\pm$ 0.5 (7.2 - 8.1)
Maximum body diameter	40	31.8 $\pm$ 3.3 (28 - 36)
Lip region height	5.0	4.3 $\pm$ 0.5 (4.0 - 5.0)
Lip region diameter	11	10.1 $\pm$ 1.1 (9 - 12)
Odontostyle length	11	11.3 $\pm$ 0.5 (10 - 12)
Odontophore length	16	16.1 $\pm$ 0.9 (15 - 17)
Nerve ring from anterior end	108	103.2 $\pm$ 6.8 (96 - 112)
Pharynx length	366	341.3 $\pm$ 24.1 (295 - 366)
Vagina length	18	14.5 $\pm$ 2.8 (12 - 18)
Pre-rectum	76	97.3 $\pm$ 22.7 (72 - 136)
Rectum	18	22.3 $\pm$ 2.6 (19 - 25)
Tail length	32	35 $\pm$ 3.3 (31 - 40)
Anal body diameter	23	22.1 2.3 (20 - 26)

straight; vagina sclerotised; DO = 49%,  $S_1N_1 = 75\%$ ,  $S_1N_2 = 66\%$  and tail convex-conoid without dorsal depression at tail tip in *T. wabapuensis* Yeates, 1967). *Torumanawa shinensis* sp. n. further differs from *T. litoralis* Das *et al.*, 1969 in having smaller body length; smaller *b* and *c* values; smaller odontostyle; curved odontophore; unsclerotised vagina and tail with dorsal depression at tip (L = 2.0-2.3 mm; *b* = 5.3-5.8; *c* = 61-79; odontostyle = 12-13  $\mu\text{m}$ ; odontophore straight; vagina

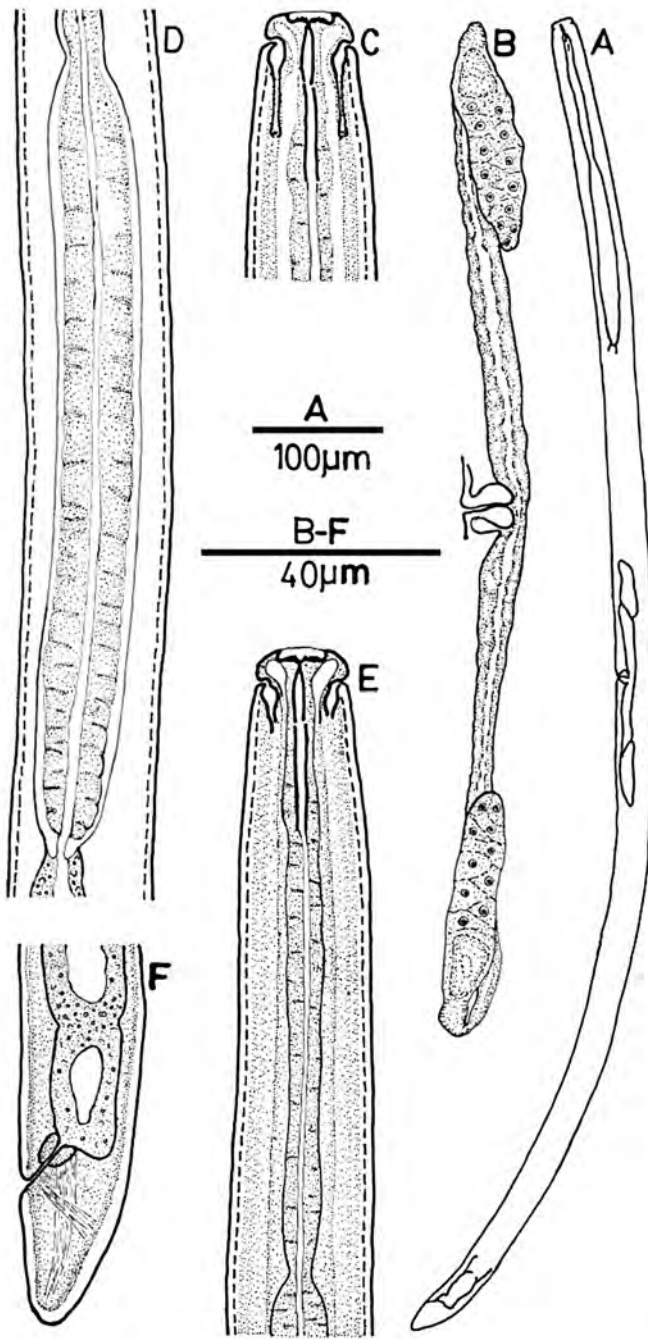
sclerotised and tail convex-conoid without dorsal depression at tail tip in *T. litoralis* Das *et al.*, 1969).

**MYLODISCUS MOGNUS sp. n.**  
(Table II; Figs 3 and 4)

*Female.* Body moderately long, almost straight upon fixation, tapering towards both extremities. Cuticle 1.0-1.5  $\mu\text{m}$  thick, with fine transverse striae. Lateral hypo-

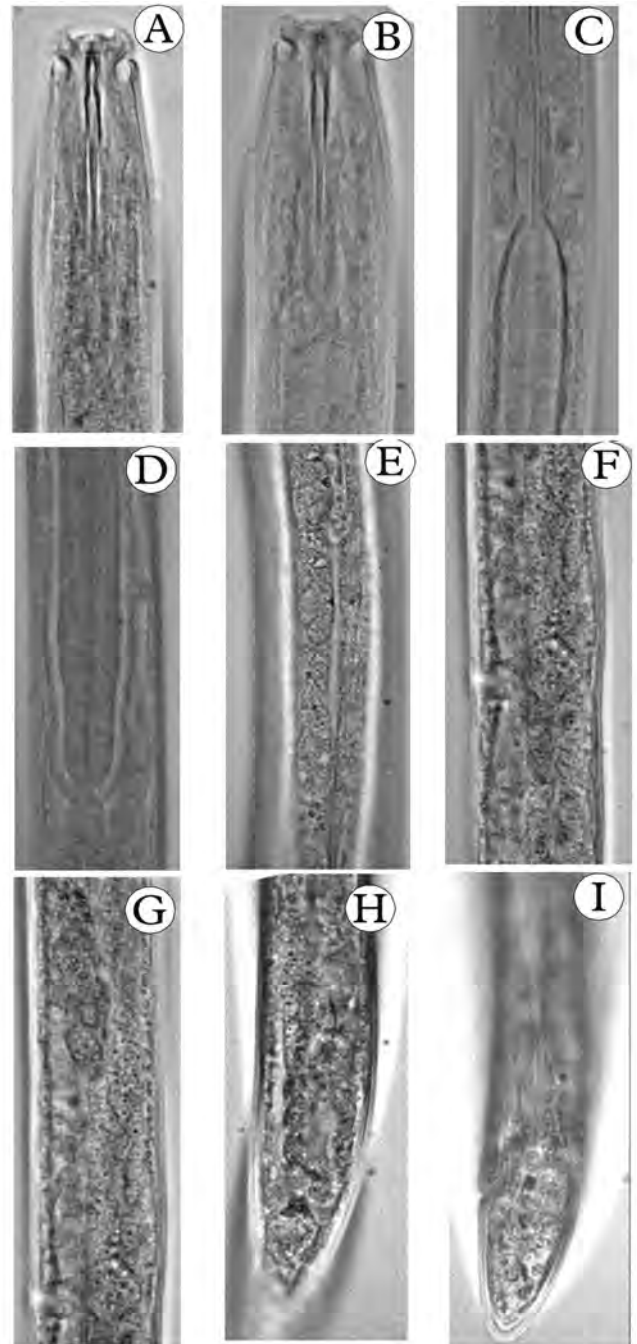
**Table II.** Morphometric characteristics of *Myلودiscus mognus* sp. n. Measurements are in  $\mu\text{m}$ , except L in mm.

Character	Holotype ♀	Paratype (n = 2) ♀♀	Juvenile (J3) (n = 1)
L	1.052	0.82 - 0.85	0.81
<i>a</i>	37.5	32.5 - 32.9	30.9
<i>b</i>	4.4	3.7 - 4.0	3.8
<i>c</i>	42.1	33.8 - 34.2	33.5
<i>c'</i>	1.4	1.4 - 1.5	1.4
V	47.9	49.3 - 50.9	-
G1	7.7	7.9 - 8.1	-
G2	8.2	8.1 - 8.4	-
Maximum body diameter	28	25 - 26	25
Lip region height	5.0	5.0 - 5.6	5.0
Lip region diameter	16	13 - 15	14.0
Odontostyle length	9.0	9.0 - 10.0	9.0
Odontophore length	16	17 - 18	16
Nerve ring from anterior end	76	65 - 70	67
Pharynx length	238	203 - 229	205
Vagina length	9.0	10 - 11	-
Pre-rectum	21	18 - 21	18
Rectum	11	10 - 10	10
Tail length	25	24 - 25	24
Anal body diameter	17	16 - 17	17



**Fig. 3.** *Mylodiscus magnus* sp. n. A: Entire female; B: Female reproductive system; C: Anterior end; D: Expanded part of pharynx; E: Anterior part of pharynx; F: Posterior end.

dermal chords a quarter of body diameter at mid-body. Lateral hypodermal organs well developed, arranged in a single row on each side of the body: 26 in pharyngeal region; 33 between vulva and anus, and 4 in tail region. Lips distinct. Lip region set off from body contour, with inner sclerotised, minutely dentate, bowl-shaped plate. Amphids stirrup-shaped. Odontostyle simple, with thickened tip, shorter than lip region diameter. Guide ring double, 3.0-4.0  $\mu\text{m}$  from anterior end. Pharynx abruptly enlarges at mid-point. Expanded part of pharynx occupies 50.7-55.6% of entire pharyngeal length



**Fig. 4.** *Mylodiscus magnus* sp. n. A-B: Anterior end; C-D: Pharyngeal region; E: Hypodermal glands; F-G: Female reproductive system; H-I: Posterior end.

and is enveloped in distinct pharyngeal sheath. Cardia tongue-shaped, 11-13  $\times$  6-7  $\mu\text{m}$  in dimension. Nerve ring situated at 30.5-31.9% of pharyngeal length. Pharyngeal gland nuclei locations: DO = 54.4%; S<sub>1</sub>N<sub>1</sub> = 70.7%; DN = 51.8%; S<sub>1</sub>N<sub>2</sub> = 75.5%; S<sub>2</sub>N = 87.3%. Reproductive system amphidelphic. Both genital branches are equally developed. Ovaries 43-47  $\mu\text{m}$  long, reflexed. Oocytes arranged in multiple rows in germinal zone. Uterus a narrow tube, 24-28  $\mu\text{m}$  long, connecting with 45-48  $\mu\text{m}$  long oviduct without sphincter. Vulva a transverse slit. Vagina about one third of the corresponding

body diameter; *pars proximalis vaginae* 6-7  $\mu\text{m}$  long and 4-5  $\mu\text{m}$  wide; *pars refringens vaginae* absent; *pars distalis vaginae* 2-3  $\mu\text{m}$  long. Pre-rectum 1.2 anal body diameters long. Rectum 0.5 times pre-rectum length. Tail longer than one anal body diameter, dorsally convex-conoid, with broadly rounded tip.

*Male.* Not found.

*Type habitat and locality.* Collected from soil around roots of moong (*Phaseolus* sp.) in the Dholpur, of district Rajasthan, India.

*Type specimens.* The type specimen was collected by the first author in September, 2005. Holotype female, mounted on slide No. IV/2088, is deposited in the National Zoological Collection (NZC) of Desert Regional Station, Jodhpur, Rajasthan, India.

*Diagnosis and relationship.* *Mylodiscus magnus* sp. n. is characterized by having moderately long body; bowl-shaped lip region; small odontostyle; double guide ring; distinct hypodermal glandular organs; amphidelphic females, vagina not sclerotized; pre-rectum 1.2 anal body diameters long, and tail dorsally convex-conoid with broadly rounded tip. *Mylodiscus magnus* sp. n. differs from *M. nanus* Thorne, 1939 in having a shorter body length; smaller *a*, *c* and *V* values; greater *b* and *c'* values, pharyngeal sheath distinct, and smaller pre-rectum compared to anal body diameter ( $L = 1.1\text{-}1.8\text{ mm}$ ;  $a = 24\text{-}29$ ;  $b = 3.1\text{-}4.1$ ;  $c = 46\text{-}72$ ;  $c' = 0.7\text{-}0.9$ ;  $V = 55\text{-}59$ ; pha-

ryngeal sheath not observed and pre-rectum length twice anal body diameter in *M. nanus* Thorne, 1939).

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