

## A NEW SPECIES OF *DORYLAIMUS* DUJARDIN, 1845 (NEMATODA: DORYLAIMIDAE) FROM WEST BENGAL, INDIA

D. Sen, A. Chatterjee and B. Manna\*

<sup>1</sup> Zoological Survey of India, M - Block, New Alipore, Kolkata - 700 053, West Bengal, India

\* Parasitology Laboratory, Department of Zoology, University of Calcutta, 35, Ballygunge Circular Road, Kolkata - 700 019

**Summary.** A small population of *Dorylaimus bengalensis* sp. n. was collected from the soil around the roots of guava at South 24-Parganas district, West Bengal, India. *Dorylaimus bengalensis* sp. n. is characterized by its unique body length (2.8-3.5 mm), which shows similarity only with *D. geraerti* Baqri et Jana, 1986. In the genus, the body length of the longest females ranges between 6.5 and 7.5 mm (*D. gigas* Kleynhans, 1970) and that of the smallest species is 2.2 mm (*D. siddiqii* Ahmad et Jairajpuri, 1982) or 2.3 mm (*D. carinatus* Thorne et Swanger, 1936). The minimum and maximum body lengths of females of all other species vary between 3.1 and 6.4 mm, except *D. thornei* Andrassy, 1969 (2.7-2.8 mm). The males of *D. bengalensis* sp. n. are characterized by the number and arrangement of ventro-median supplements with an adanal pair. The new species comes closest to *D. geraerti* Baqri et Jana, 1986 but can be differentiated by different body ratios (a, c, and c'), tail length, spicule length and different number and arrangement of ventro-median supplements. A single female specimen of the proposed new species had an abnormal short tail.

**Key words:** *Dorylaimus bengalensis* sp. n., description, *Psidium guajava*, taxonomy.

Andrássy (1988) thoroughly reviewed the superfamily Dorylaimoidea de Man, 1876 and synonymised many species whilst also transferring many from one genus to another on the basis of morphological similarities and dissimilarities. He also opined that, in its general appearance, *Laimydorus* Siddiqi, 1969 greatly resembles *Dorylaimus* Dujardin, 1845, but the cuticle is devoid of longitudinal ridges and also comes closer to *Mesodorylaimus* Andrassy, 1959 in some respects, especially the smaller species. Baqri and Jana (1986) described *Dorylaimus geraerti* from the soil around roots of brinjal (*Solanum melongena* L.) from Narendrapur, South 24-Parganas, close to the area referred to in the present report within the same block. Baqri and Jana (1986) remarked that *D. geraerti* shows a certain relationship with the genus *Ichiodorylaimus* Andrassy, 1969 in having both contiguous and few spaced supplements, but they placed it under the genus *Dorylaimus* Dujardin, 1845 due to its shorter body length and ventro-median supplements not arranged in two distinct groups. Andrassy (1988) also included this species under *Dorylaimus* in his review of the family Dorylaimidae. The proposed new species comes closest to *Dorylaimus geraerti* Baqri et Jana, 1986 and is the second species of the genus *Dorylaimus* reported from the South 24-Parganas district.

### MATERIALS AND METHODS

During a survey in the guava (*Psidium guajava* L.) orchards of South 24-Parganas district of West Bengal, In-

dia, a small population of the proposed new species was collected. To extract nematodes, soil samples were processed using Cobb's sieving and decanting technique (Cobb, 1918) combined with the modified Baermann's funnel technique (Christie and Perry, 1951). The nematode specimens were fixed and preserved in hot (90-100 °C) FA (formalin-acetic acid 4:1) solution, mounted in anhydrous glycerin, and sealed with paraffin wax. They were then observed under a compound microscope (Olympus BX 41), measured and photographed. The formulae, to locate the positions of pharyngeal gland nuclei and the terms to denote them, were used as given by Andrassy (1998). The nematode population contained an abnormal short tailed female and first stage juveniles of which measurements are also given.

### DESCRIPTION

#### *DORYLAIMUS BENGALENSIS* sp. n. (Table I, Figs 1-3)

*Measurements.* See Table I. The measurements given hereafter in the text are based on holotype. Minimum-maximum ranges of measurements of paratypes are given in parenthesis.

*Females.* Body ventrally curved upon fixation, tapering regularly towards extremities. Inner layer of cuticle with fine longitudinal ridges. The thickness of the cuticle is 6.0 (5-7) µm at the level of odontostyle, 4.9 (4-6) µm at mid-body and 9.8 (7-10) µm on the tail. Body pores numerous and distinct. Lip region slightly set off by a depression, narrower than adjoining body, 7 µm

---

\* Corresponding author: Debabrata.zsi@gmail.com

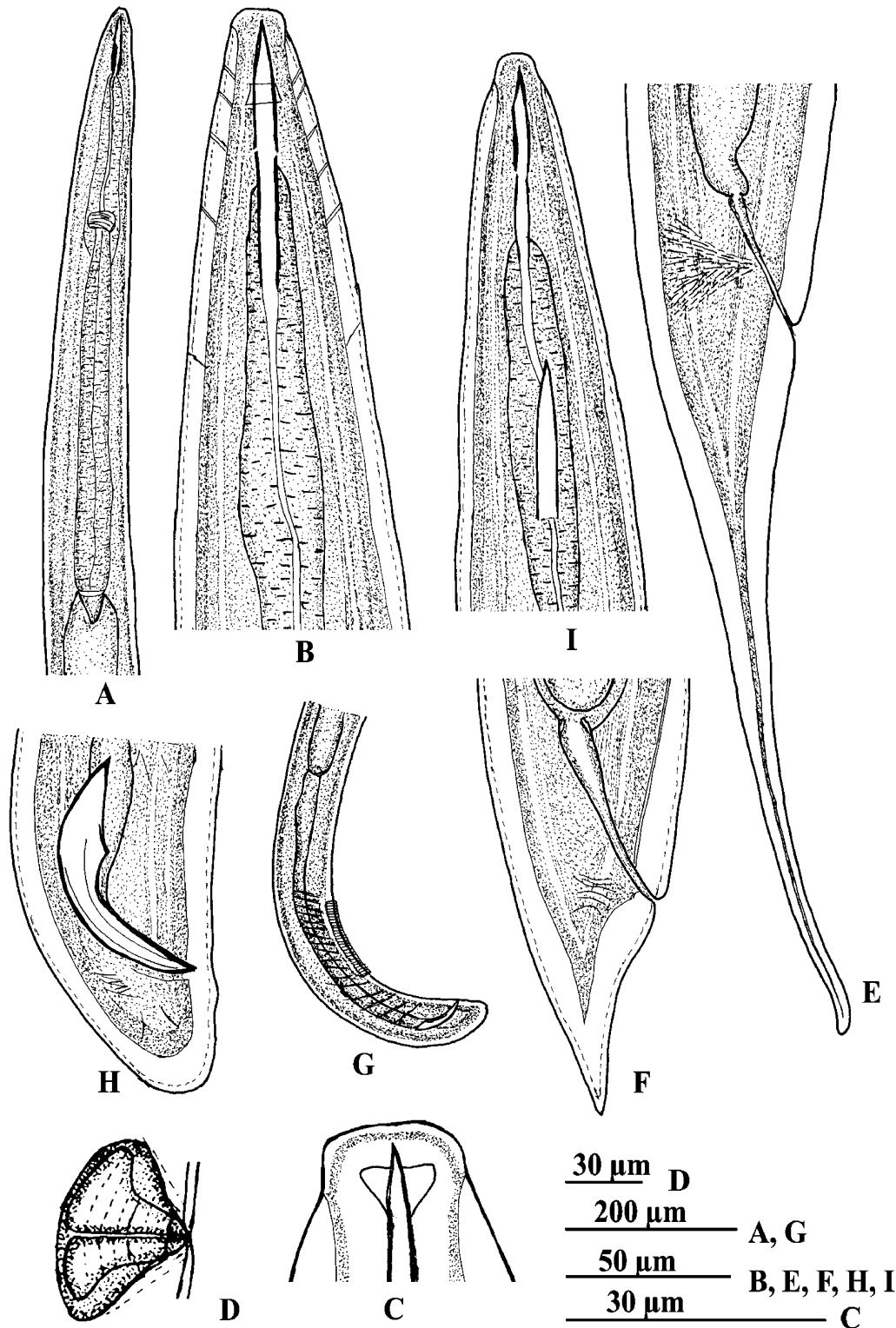
**Table I.** Morphometrics of *Dorylaimus bengalensis* sp. n. All measurements are in  $\mu\text{m}$  except L (mm) and body ratios. Of the short-tailed female, the measurements of L, i. e., total body length and tail length, have not been considered for calculation of minimum-maximum range, mean, and SD of L, a, b, c, c', V, G<sub>1</sub> and G<sub>2</sub> of other paratypes.

Character	Holotype	Paratype females	Paratype males	First stage juveniles	Abnormal female
n:		4	4	5	1
L	3.5	2.9±0.36 (2.6-3.0)	2.8±0.42 (2.4-3.0)	2.25±0.35 (2.0-2.5)	3.0
a	30.1	31.2±2.15 (29.4-33.6)	30.1±0.45 (29.7-30.6)	31.05±2.61 (29.2-32.9)	29.2
b	4.8	4.3±0.24 (4.1-4.6)	4.1±0.35 (3.8-4.5)	4.1±0.28 (3.9-4.3)	4.3
c	15.9	14.1±1.19 (13.3-15.5)	78.1±6.39 (70.7-82.0)	12.9±0.98 (12.2-13.6)	47.0
c'	4.7	4.4±0.24 (4.2-4.7)	0.7±0.03 (0.7-0.7)	4.55±1.06 (3.8-5.3)	1.4
V%/T%	39.6	42.4±1.38 (40.8-43.3)	60.3±2.17 (58.4-62.7)	--	47.8
G <sub>1</sub> %	12.4	11.5±1.33 (10.5-12.4)	--	--	17.0
G <sub>2</sub> %	12.0	11.7±0.52 (11.3-12.1)	--	--	12.2
Odontostyle length	44.0	45.2±1.44 (44.0-46.5)	44.0±2.5 (41.5-46.5)	36.0±2.82 (34.0-38.0)	46.5
Replacement odontostyle	--	--	--	6.7±1.06 (6.0-7.5)	--
Odontophore length	44.0	42.7±1.44 (41.5-44.0)	42.3±3.82 (39.0-46.5)	36.5±0 (36.5-36.5)	41.5
Odontostyle aperture	15.0	15.0±0 (15.0-15.0)	15.0±0 (15.0-15.0)	12.0±0 (12.0-12.0)	15.0
Odontostyle width	4.9	5.5±0.70 (4.9-6.0)	5.7±0.70 (4.9-6.0)	3.6±0 (3.6-3.6)	6.0
Maximum body width	117.5	96.8±14.91 (79.5-114.0)	95.6±15.33 (78.5-108.0)	76.05±10.53 (68.6-83.5)	103.0
Body width below lip region	20.0	21.7±3.5 (20.0-27.0)	28.6±1.38 (27.0-29.5)	20.75±1.76 (19.5-22.0)	27.0
Body width at neck base	110.0	93.6±13.51 (78.5-110.0)	92.3±12.04 (78.0-100.5)	73.4±10.46 (66.0-80.8)	98.0
Body width at vulva	108.0	91.9±16.28 (73.5-108.0)	--	--	103.0
Pharyngeal length	728.0	674.2±44.36 (617.5-723.0)	686.1±53.69 (625.0-725.5)	566.0±3.53 (563.5-568.5)	690.0
Expanded part of pharynx	392.0	372.5±7.59 (363.0-380.0)	346.2±35.01 (306.0-370.0)	271.0±15.55 (260.0-282.0)	377.0
Glandularium	352.8	326.5±25.57 (294.0-354.7)	326.5±25.57 (294.0-354.7)	239.8±10.11 (232.7-247)	--
Length of cardia	34.0	27.5±3.07 (24.5-31.8)	25.3±2.88 (22.0-27.0)	27.0±0 (27.0-27.0)	27.0
Length of anterior gonad	441.0	434.8±112.61 (355.0-514.5)	--	--	514.5
Length of posterior gonad	428.7	374.8±10.39 (367.5-382.0)	--	--	367.5
Anterior end to vulva	1404	1293±135.88 (1151.5-1441)	--	--	1441.0
Tail length	222.0	207.7±9.05 (198.5-216.6)	36.7±2.61 (34.0-39.0)	181.4±3.39 (179.0-183.8)	64.0
Anal body width	46.5	45.7±3.30 (42.0-49.0)	49.0±4.33 (44.0-51.5)	40.4±8.62 (34.0-46.5)	44.0
Length of pre-rectum	237.5	198.3±21.53 (174.0-223.0)	334.8±62.62 (282.0-404.0)	181.5±3.53 (179.0-184.0)	223.0
Length of rectum	50.0	53.0±6.29 (46.5-60.0)	59.6±11.01 (49.0-71.0)	39.5±3.53 (37.0-42.0)	56.5
Testis length	--	--	1741.8±285.9 (1445.5-2016.0)	--	--
Length of spicules	--	--	76.6±5.48 (73.5-83.0)	--	--
No. of V. M. supplements	--	--	33.6±2.08 (32-36)	--	--

high and 18.0 (17-18)  $\mu\text{m}$  wide or 1/1.1 (1/1.1-1/1.4) of adjoining body width. Amphids stirrup-shaped, apertures 9  $\mu\text{m}$  wide and 7-9  $\mu\text{m}$  from anterior end.

Odontostyle 2.4 (2.4-2.7) lip region widths long, 4.9 (5-6)  $\mu\text{m}$  thick, aperture 15.0  $\mu\text{m}$  or 34.1% (34.1-36.1%)

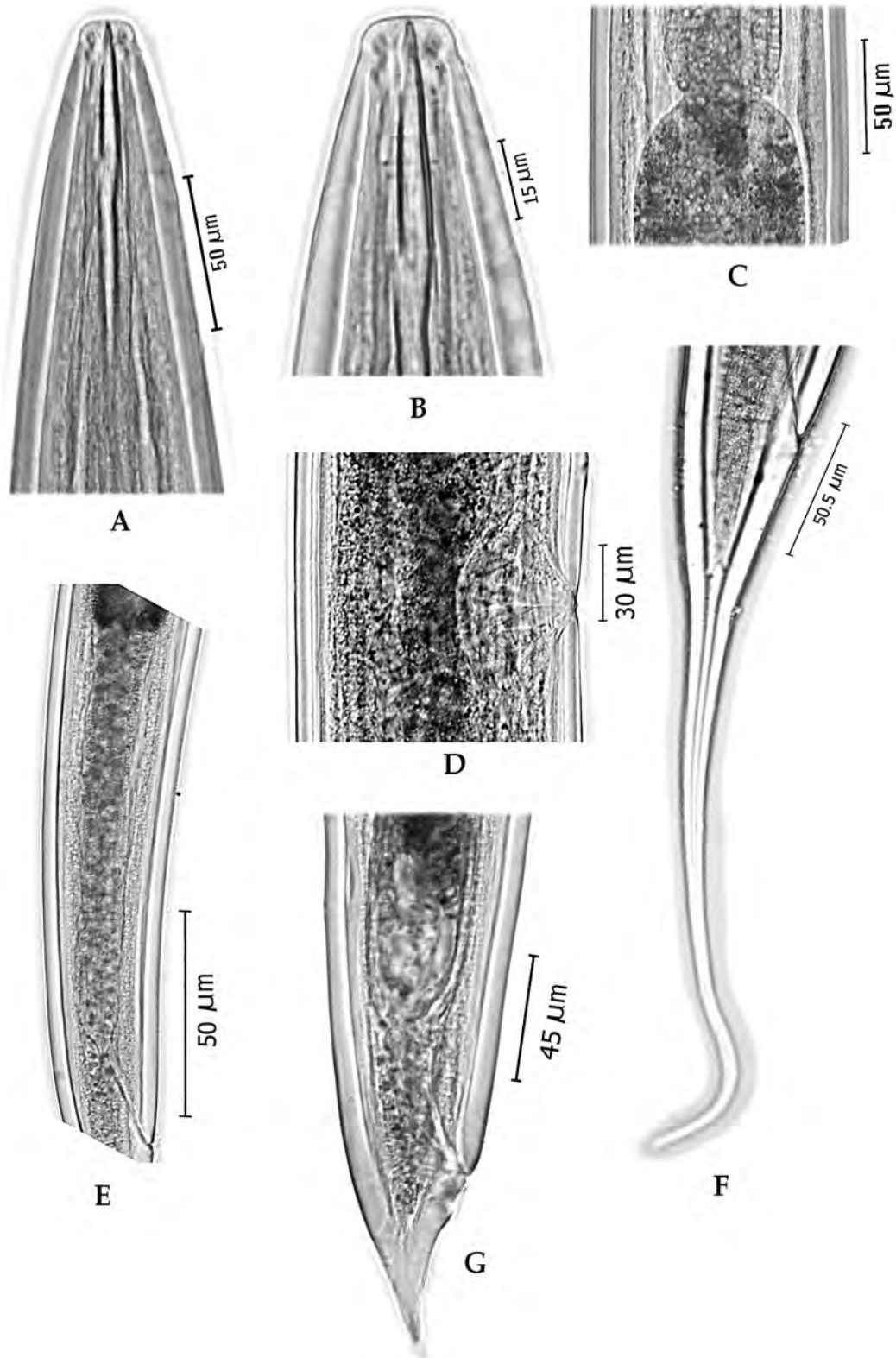
of odontostyle length. Guide ring double, 22.5  $\mu\text{m}$  (22.5-29.0  $\mu\text{m}$ ) or 1.2 (1.2-1.5) lip region widths from anterior end. Odontophore 1.0 (0.8-1.0) time the odontostyle length. Nerve ring at 210  $\mu\text{m}$  (174-210)  $\mu\text{m}$  or at 28.8% (25.7-28.8%) of pharyngeal length from anterior end.



**Fig. 1.** *Dorylaimus bengalensis* sp. n. Female: A, anterior portion of body showing pharynx, pharyngo-intestinal junction and cardia; B, anterior end showing cephalic region and odontostyle; C, amphids; D, vulva and vagina; E, tail; F, abnormal short tail of a female. Male: G, posterior portion showing pre-rectum, ventro-median supplements and tail; H, spicules. First juvenile stage: I, anterior end showing replacement odontostyle.

Expanded portion of pharynx or the cylindrus 3.5 (3.4-4.7) times the neck base width or 53.8% (52.5-59.9%) of the pharyngeal length. Glandularium 90.0 (88.5-94.0)% of the cylindrus. Locations of pharyngeal gland nuclei

are: D = 49.4 (50.5-53.3)%; AS1 = 19.0 (20.4-35)%; AS2 = 20.4 (21.3-39.1)%; PS1 = 51.1 (51.1-60.0)%; PS2 = 54.7 (52.6-61.6)%. Very thin cardiac disc present, cardia elongate conoid, 34  $\mu\text{m}$  (24-34)  $\mu\text{m}$  long.

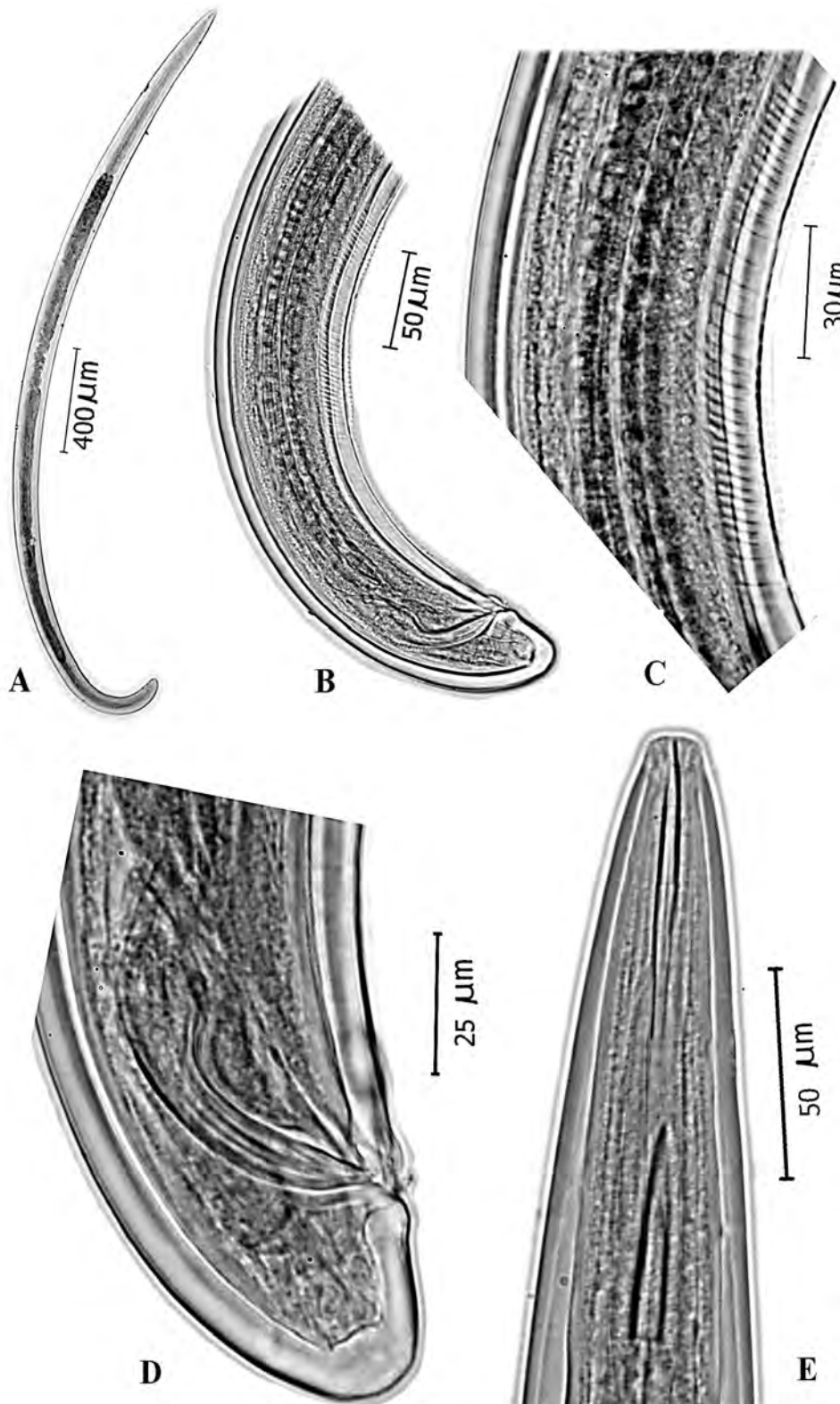


**Fig. 2.** Photomicrographs of *Dorylaimus bengalensis* sp. n. Female: A, anterior end; B, anterior end showing odontostyle in enlarged form; C, pharyngo-intestinal junction and cardia; D, vulva; E, rectum and pre-rectum; F, tail; G, abnormal short tail of a female.

Vulva transverse, pre-equatorial. Vagina 35.5 (28.5-37.7)  $\mu\text{m}$  long or 1/3.1 (1/2.2- 1/3.7) of the corresponding body width, triangular-shaped sclerotization present. Length of *pars proximalis* vagina 29 (19.6-29)  $\mu\text{m}$ , *pars refringens* 5 (4.9-6.5)  $\mu\text{m}$ , combined width of *pars*

*refringens* vagina 10.7 (11.7-14.7)  $\mu\text{m}$  and length of *pars distalis* 1.5 (1.9-2.9)  $\mu\text{m}$ . Reproductive system amphidelphic, ovaries reflexed, anterior ovary 110 (98-135)  $\mu\text{m}$  and posterior ovary 122.5 (86-127)  $\mu\text{m}$  long.

Pre-rectum 5.1 (3.8-5.1) and rectum 1.0 (0.9-1.2)



**Fig. 3.** Photomicrographs of *Dorylaimus bengalensis* sp. n. Male: A, entire body; B, posterior end; C, ventro-median supplements; D, spicules. First stage juvenile: E, anterior end showing replacement odontostyle.

anal body widths long. Tail attenuated and elongate-conoid with finely rounded terminus, 4.7 (4.2-4.7) anal body widths long.

*Female with abnormal short tail.* All the measurements and body ratios are within the range of normal long tailed specimens, unless related to total body length as well as tail length. As the tail is abnormally short, the body length/tail length ratio is very high ( $c = 47.0$ ) in comparison with the other specimens with long tail. The tail is 1.4 anal body widths long, conoid with pointed tip and with slight ventral concavity towards terminus.

*Males.* Similar to females in general morphology except the following: body more ventrally curved towards posterior end; pre-rectum longer than in female, 6.1-7.8 anal body widths long, beginning well before the ventro-median supplements. Testes outstretched, 1445.5-2016.0  $\mu\text{m}$  long. Spicules 73.5  $\mu\text{m}$  or 1.4-1.6 anal body widths long. The supplements consist of a contiguous series of 32-36 ventro-median supplements and an adanal pair. Tail short with bluntly rounded terminus, 0.71-0.77 anal body width long.

*First stage juveniles.* Body shape similar to that of adult females. Cuticle comparatively thinner, 4  $\mu\text{m}$  thick at anterior end, 1-2  $\mu\text{m}$  at mid-body and 5  $\mu\text{m}$  on the tail. Odontostyle 2.3-2.5 lip region widths long, 3.6  $\mu\text{m}$  thick, aperture 31.5-35.3% of odontostyle length. Replacement odontostyle more stout, 6-7  $\mu\text{m}$  thick. Odontophore 0.9-1.0 time the odontostyle length. Guide ring at 20-24.5  $\mu\text{m}$  or 1.1-1.3 lip region widths from anterior end. Nerve ring at 164  $\mu\text{m}$  or at 28.8% of pharyngeal length from anterior end. Expanded portion of pharynx 45.6-50% of the pharyngeal length. Pharyngeal gland nuclei inconspicuous and cannot be located. Pre-rectum 3.9-5.2, rectum 0.9-1.0 anal body widths long. Tail shape similar to that of adult females, 3.8-5.3 anal body widths long.

*Type habitat and locality.* Soil from around the roots of guava at Calcutta University experimental farm, Balarampur, Baruipur, 24-Parganas (S), West Bengal, India.

*Type specimens.* Holotype registration No. WN 1012 with one female and two male paratypes on same slide. Paratype registration Nos. WN 1013 (1 Short tailed female), WN 1014 (5 juveniles) and WN 1015 (3 females and 2 males) on three different slides. Deposited in the National Zoological Collection, Zoological Survey of India, Kolkata, India.

*Etymology.* The new species has been named after the state West Bengal, from where it was collected.

*Differential Diagnosis and Relationship.* *Dorylaimus bengalensis* sp. n. is characterized by its unique body length, which shows similarity only with *D. geraerti* Baqri *et* Jana, 1986 ( $L = 2.8-3.5$  mm). In this genus the maximum body length of females of the longest species ranges between 6.5 and 7.5 mm (*D. gigas* Kleynhans, 1970) and that of females of the shortest species is 2.2 mm (*D. siddiqii* Ahmad *et* Jairajpuri, 1982) or 2.3 mm (*D. carinatus* Thorne *et* Swanger, 1936). The minimum and maximum ranges of female body length of all other species vary between 3.1 and 6.4 mm, except *D. thornei* Andrassy, 1969 (2.7-2.8 mm). The males of *D. bengalensis* sp. n. are characterized by the number and arrangement of ventro-median supplements with an adanal pair.

The proposed new species differs from *D. geraerti* in having smaller value of  $a$ , significantly shorter tail, evident from the greater value of  $c$ , smaller value of  $c'$  and elongate-conoid cardia. Further, the male differs from that of *D. geraerti* in having shorter spicules, lesser number and different arrangement of ventro-median supplements, and longer pre-rectum ( $a = 33-39$ ,  $c = 12-13$ ,  $c' = 6-11$ , tail length = 249-406  $\mu\text{m}$ , cardia conoid in females, spicule = 81-84  $\mu\text{m}$ ; supplements consist of an adanal pair and 35-38 ventro-median supplements, arranged contiguously, except that 4-5 are slightly spaced near the middle of the series, pre-rectum 213-322  $\mu\text{m}$ , in males of *D. geraerti*).

## ACKNOWLEDGEMENTS

The authors are grateful to the Director and to Dr. A. K. Sanyal, Additional Director, Zoological Survey of India, Kolkata. They are also grateful to Prof. Dr. Istvan Andrassy for his gracious support of relevant literatures.

## LITERATURE CITED

- Andrassy I., 1988. The superfamily Dorylaimoidea (Nematoda) – a review of the Family Dorylaimidae. *Opuscula Zoologica, Budapest*, 23: 3-63.
- Andrassy I., 1998. Once more: the oesophageal gland nuclei in the dorylaimoid nematodes. *Opuscula Zoologica Budapest*, XXXI: 165-170.
- Baqri Q.H. and Jana A., 1986. Nematodes from West Bengal (India) IX. Three new species of the superfamily Dorylaimoidea (De Man, 1876) Thorne, 1934. *Indian Journal of Helminthology (n.s.)*, 3(2): 11-20.
- Christie J.R. and Perry V.G., 1951. Removing nematodes from soil. *Proceedings of the Helminthological Society of Washington*, 18: 106-108.
- Cobb N.A., 1918. *Estimating the nema population of the soil.* Agricultural Technology Circular I. Bureau of Plant Industry, United States Department of Agriculture, USA, 48 pp.