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Description of five new and four known species of *Dorylaimellus* Cobb, 1913 with perioral disc (Nematoda: Belondiroidea) from the Western Ghats of India

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Abstract. Five new and four known species of the genus *Dorylaimellus* Cobb, 1913 are described and illustrated from the Western Ghats of India. *Dorylaimellus attenuatus* sp. nov. has a 0.73–0.84 mm long body; lip region rounded, offset; odontostyle attenuated with indistinct lumen, odontophore 9–10 µm long; expanded part of pharynx 39–48% of neck length; female genital system amphidelphic and tail long filiform. *Dorylaimellus cylindricaudatus* sp. nov. has a 1.0–1.15 mm long body; lip region rounded, offset; odontostyle 4 µm long, odontophore 11–12 µm long; expanded part of pharynx 47–56% of neck length; female genital system amphidelphic, and tail elongate-cylindrical with rounded terminus. *Dorylaimellus karnatakensis* sp. nov. has a 1.2–1.3 mm long body; lip region rounded, offset; odontostyle 5 µm long, odontophore 12–13 µm long; expanded part of pharynx 45–53% of neck length; female genital system amphidelphic; spicules 22 µm long, ventromedian supplements four, and tail elongate-conoid dorsally convex. *Dorylaimellus kasplateauensis* sp. nov. has a 0.68–0.83 mm long body, lip region with a weak perioral disc; odontostyle 6–7 µm long, odontophore 11–14 µm long; expanded part of pharynx 38–43% of neck length; female genital system amphidelphic, and tail elongate arcuate conoid. *Dorylaimellus tropicus* sp. nov. has a 0.6–0.7 mm long body; lip region rounded, offset; odontostyle 4–5 µm long, odontophore 8–10 µm long; hemizonid present; expanded part of pharynx 43–52% of neck length; female genital system amphidelphic and tail elongate-filiform, sudden tapering, ending with rounded tip. *Dorylaimellus andrassyi*, *D. discocephalus*, *D. belondirelloides*, *D. chakpilus* are redescribed based on the specimens collected from several localities of the Western Ghats.

Keywords. Belondiridae, biodiversity hotspot, description, nematode, taxonomy.

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Introduction

Cobb (1913) proposed the genus *Dorylaimellus* with *D. virginianus* Cobb, 1913 as its type species from Virginia. Thorne (1939) placed *Dorylaimellus* in his newly proposed family Belondiridae Thorne, 1939 with six new species and transferred two species, *Tylencholaimus aequalis* Cobb, 1918 and *Tylencholaimus mirabilis* de Man, 1876 to it. A number of species were added by several authors (Williams 1958; Andrássy 1959, 1968, 2009; Geraert 1962; De Coninck 1962; Heyns 1962, 1963; Clark 1963; Goodey 1963; Thorne 1964; Jairajpuri 1964, 1965; Kruger 1965; Siddiqi 1964, 1966, 1968, 1983; Husain & Khan 1967; Baqri & Jairajpuri 1968; Yeates 1970, 1979; Ali *et al.* 1974) to this genus, making it one of the most heterogeneous groups. A large number of species of the genus *Dorylaimellus* show highly divergent characters such as body size, shape of lip region, length of pharynx, shape of vulva, type of female genital system, shape of spicules, and shape and size of tail. On the basis of these characters, Jairajpuri & Ahmad (1980) subdivided the genus *Dorylaimellus* into nine subgenera (*Dorylaimellus, Prodorylaimellus, Mesodorylaimellus*, *Metadorylaimellus*, *Axodorylaimellus*, *Belondorylaimellus*, *Elongidorylaimellus*, *Filidorylaimellus* and *Clavidorylaimellus*). Siddiqi (1983) raised six of these subgenera to the generic level, and proposed six further new genera (*Capitellus*, *Rashidanema*, *Ibadanus*, *Sindellus*, *Amazonema* and *Jamilius*) under the subfamily Dorylaimellinae Jairajpuri, 1964. Jordaan & Heyns (1984) described two new species under the genus *Dorylaimellus* (*D. aferoides* and *D. meridionalis*) and a new species under *Elongidorylaimellus* (*E. jonsoni*) from South Africa. Yeates & Ferris (1984) described *D. egmonti* from New Zealand, and Baqri (1991) described *D. murtazai* from India. Jairajpuri & Ahmad (1992) did not accept the proposal of Siddiqi (1983), instead they accepted the subgeneric proposal of Jairajpuri & Ahmad (1980). Several species were further added by De Bruin & Heyns 1993, Dhanam & Jairajpuri 1998, Peralta & Peña-Santiago 2000, Ahmad & Sturhan 2000, Mohilal *et al.* 2000, Gagarin & Nguyen 2004, and Bohra & Baqri 2005 to this group. Peña-Santiago (2006) and Jiménez-Guirado *et al.* (2007) did not accept any of the subgenera or genera and regarded *Dorylaimellus* as a single genus. Andrássy (2009) rejected the subgeneric grouping and accepted four genera (*Dorylaimellus* Cobb, 1913; *Axodorylaimellus* Jairajpuri & Ahmad, 1980; *Mesodorylaimellus* Jairajpuri & Ahmad, 1980; and *Ibadanus* Siddiqi, 1983), and synonymized the subgenera *Belondorylaimellus*, *Clavidorylaimellus*, *Elongidorylaimellus*, *Filidorylaimellus*, *Metadorylaimellus*, *Prodorylaimellus*, *Amazonema*, *Capitellus*, *Jamilius*, *Rashidanema*, and *Sindellus* with *Dorylaimellus* and listed the valid species of four aforementioned genera (*Dorylaimellus*, *Axodorylaimellus*, *Mesodorylaimellus*, and *Ibadanus*). However, Ahmad & Naz (2010a, 2010b, 2012) accepted the subgeneric grouping as proposed by Jairajpuri & Ahmad (1980), and described several new species to this group.

The genus *Dorylaimellus* Cobb, 1913, is a much diversified and widely distributed dorylaimid taxon, currently represented by a total of 67 valid species, out of which 27 species have been recorded from India. *Dorylaimellus muthi* Dhanam & Jairajpuri, 1998 is the only species recorded so far from the Western Ghats (Dhanam & Jairajpuri 1998). Although, it is one of the 36 global biodiversity hotspots (Myers *et al.* 2000, Kobayashi *et al.* 2019), which are known for their rich and unique assemblage of flora and fauna. During the course of the present study, soil samples collected from different localities of the Western Ghats yielded several populations belonging to the genus *Dorylaimellus*. On detailed study, these populations were found to represent nine species, four of these are known and five are new to science. All the nine species are described in the following.

Material and methods

Soil samples were collected from several habitats and localities of the Western Ghats of India. Nematodes were extracted from soil samples by using Cobb′s (1918) sieving and decantation technique and by a modified Baermann′s funnel technique. Extracted nematodes were killed and fixed in hot 4% TAF

(Courtney *et al.* 1955), dehydrated by a slow evaporation method, and mounted in anhydrous glycerine on slides. Measurements of the specimens were taken by ocular micrometer fitted in the microscope, line illustrations were made using a drawing tube attached to a OLYMPUS BX 51 Microscope. Photographs were taken with a digital camera attached to a "Nikon Eclipse 80i" Microscope. Raw photographs of the specimens were edited by using Adobe Photoshop 7.0. Spicules morphometrics were taken as per Peña-Santiago *et al.* (2014). Loof & Coomans' (1970) formula was followed for the measurements of the position of pharyngeal glands and their nuclei.

Type material and others specimens are deposited in the nematode collection of the Department of Zoology, Aligarh Muslim University, India (AMU/ZD/NC), as well as in the nematode collection of the Zoological Survey of India, Kolkata, India.

Abbreviations used in the text

n	=	number of specimens.
L	=	total body length.
a	=	body length / greatest body diameter.
b	=	body length / neck length.
c	=	body length / tail length.
c′	=	tail length / body diameter at anus or cloaca.
V	=	distance of vulva from anterior end × 100 / body length.
G1	=	length of anterior genital branch × 100 / body length.
G2	=	length of posterior genital branch × 100 / body length.
DO	=	orifice of dorsal pharyngeal gland nucleus from anterior end × 100 / total neck length.
DN	=	position of dorsal pharyngeal gland nucleus from anterior end × 100 / total neck length.

Results

Phylum Nematoda Cobb, 1932
Class Enoplea Inglis, 1983
Subclass Dorylaimia Inglis, 1983
Order Dorylaimida Pearse, 1942
Suborder Dorylaimina Chitwood, 1933
Superfamily Belondiroidea Thorne, 1939
Family Dorylaimellidae Jairajpuri, 1964
Subfamily Dorylaimelliane Jairajpuri, 1964
Genus *Dorylaimellus* Cobb, 1913

Dorylaimellus andrassyi Heyns, 1963
Fig. 1, Table 1

Dorylaimellus andrassyi Heyns, 1963: 400–402.
Dorylaimellus pastura Yeates, 1979: 435–437.

Dorylaimellus andrassyi — Chaturvedi & Khera 1979: 49–50. — Jordaan & Heyns 1984: 286–288. — De Bruin & Heyns 1993: 22–23.

Material examined

INDIA • 7 ♀♀, 2 ♂♂; Kerala State, Ernakulam district, Thattekad Bird Sanctuary; 10°7′48″ N, 76°40′48″ E; 5–20 cm deep; 28 Oct. 2017; soil samples collected from around the roots of grasses (unidentified); slide reference number AMU/ZD/NC/*Dorylaimellus andrassyi*/1–5.

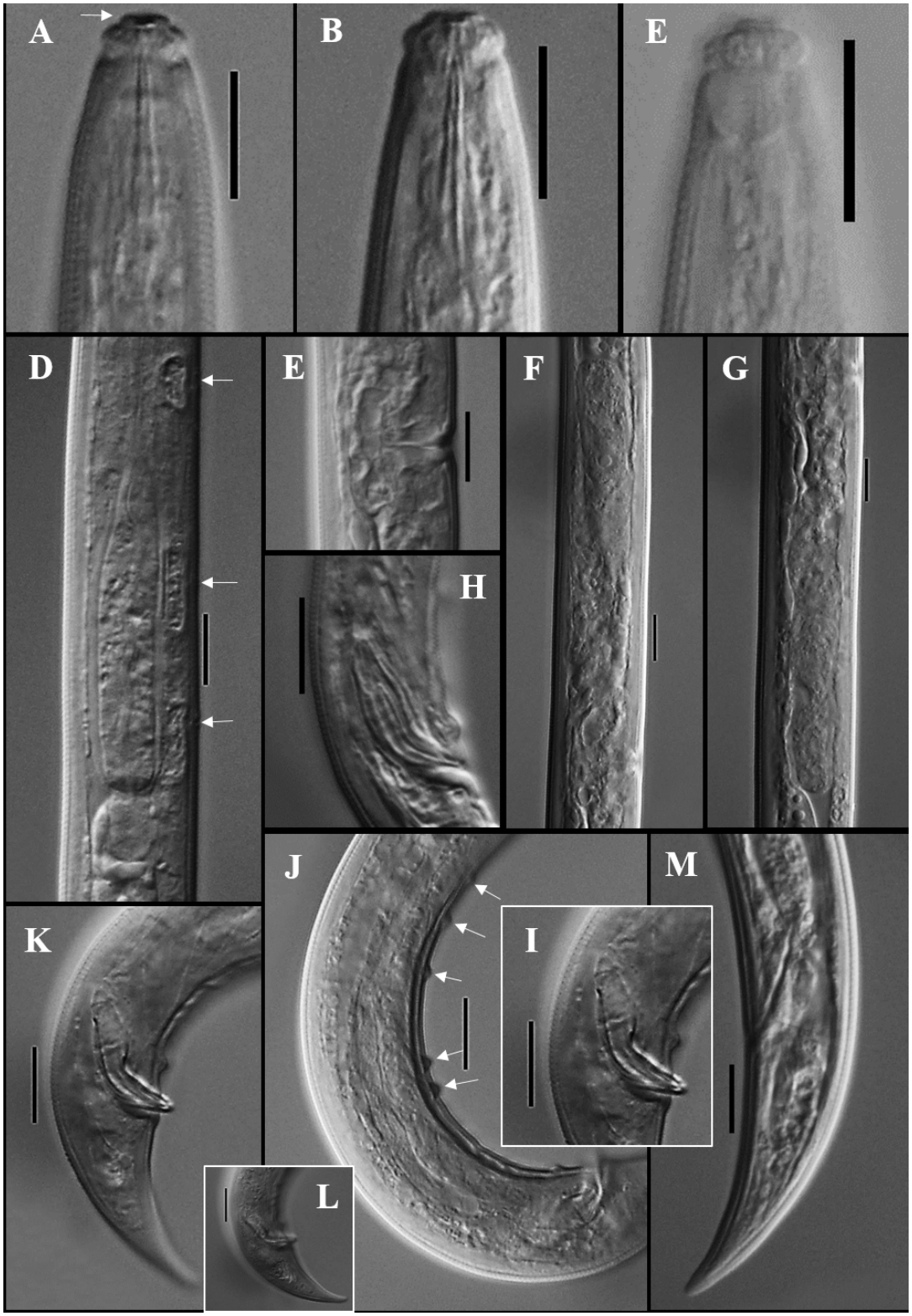

Fig. 1. *Dorylaimellus andrassyi* Heyns, 1963 (LM photographs). **A**–**B**. Anterior region, arrow indicating perioral disc. **C**. Anterior end showing amphid. **D**. Expanded part of pharynx, arrows indicating ventral body pores. **E**. Vulva. **F–G**. Female genital branches. **H**–**I**. Spicules. **J**. Arrows indicating ventromedian supplements. **K–L**. Male posterior end. **M**. Female posterior end. Scale bars: A–M = 10 µm.

Table 1. Morphometrics of *Dorylaimellus andrassyi* Heyns, 1963. All the measurements in µm except L in mm, and in the form: mean ±SD (range) for females.

Characters	Females	Males
n	7	2
L	1.1 ± 0.1 (1.0–1.2)	1.0, 0.9
a	48 ± 3.1 (44–53)	47.5, 47.4
b	7.9 ± 0.7 (6.7–9.0)	7.7, 5.5
c	27.8 ± 3.1 (26–32)	33.7, 33.4
c′	2.6 ± 0.4 (2.2–2.9)	1.7, 1.7
V	51.5 ± 0.9 (50.5–53.4)	–
G1	10.7 ± 1.4 (8.2–12.8)	–
G2	10.13 ± 1.2 (8.2–12.3)	–
Body diam. at pharynx base	19.7 ± 0.7 (18–20)	7, 7
Body diam. at mid–body	22.7 ± 1.6 (21–26)	22, 19
Body diam. at anus/cloaca	15 ± 0.5 (14–16)	18, 16
Lip region diam.	7	7, 7
Lip region height	3	3, 3
Amphid aperture	4.8 ± 0.4 (4–5)	5, 4
Odontostyle length	4.2 ± 0.4 (4–5)	4
Odontophore length	10.9 ± 0.6 (10–12)	12
Guiding ring from ant. end	4	4
Nerve ring from ant. end	64 ± 2.6 (60–67)	61, 69
Neck length	137.4 ± 5.1 (131–146)	135, 164
Expanded part of pharynx	41 ± 5.4 (32–47)	42, 54
Cardia length	7.3 ± 1.1 (5–8)	7
Anterior genital branch	119 ± 17.6 (89–144)	–
Posterior genital branch	111.8 ± 12.4 (88–123)	–
Vaginal depth	11 ± 0.5 (10–12)	–
Vulva from ant. end	559.7 ± 32.6 (508–606)	–
Prerectum length	64 ± 3.6 (61–71)	85, 63
Rectum length	20.1 ± 1.6 (17–22)	22, 23
Tail length	39.6 ± 5.6 (36–43)	31, 27
Spicule length	–	23, 19
Ventromedian supplements	–	5, 5

Description

Female

Body slightly curved ventrad upon fixation, 1.0–1.2 mm long. Cuticle with distinct transverse striations, about 1 µm at anterior and mid-body, 2–3 µm on tail tip. Lateral chords 5–8 µm wide, or one-fourth to two-fifths (23–40%) of the body diameter at mid-body with weakly developed glandular bodies, about 46–49 in number; 4 in neck region, 16–18 from pharyngeal base to vulva, 23–25 from vulva to anal region and 2 in caudal region. Ventral body pores distinct, about 35–38 in number; 5–6 in pharyngeal region, 12–15 from pharyngeal base to vulva, 18–19 from vulva to anal region; dorsal and lateral body pores indistinct. Lip region cap-like, offset by constriction, 2.3 times as wide as high, or about one-third

to two-fifths (33–40%) of body diameter at neck base. Lips rounded, amalgamated, perioral disc distinct. Cheilostome a truncate cone with refractive walls and distinct cuticularized pieces near oral aperture. Amphids fovea stirrup-shaped, their aperture occupying about 0.6–0.7 times lip region diameter, fusus almost at level of odontophore base. Guiding ring distinct, at 0.6 times the lip region diameter from anterior end. Odontostyle short, 4–5 times as long as wide, or about 0.6–0.7 times as long as lip region diameter, its aperture about one-fourth of length. Odontophore with weakly developed basal flanges, 2–3 times as long as odontostyle. Nerve ring encircling anterior slender part of pharynx at 43–50% of neck length from anterior end. Pharyngeal expansion gradual; expanded part 2.9–4.7 times as long as wide, or about 1.6–2.6 times as long as body diameter at neck base, occupying about 25–34% of total neck length, enclosed in thick spiral muscular sheath. Only dorsal pharyngeal gland nucleus and orifice visible: DO = 75–78; DN = 77–79; DO–DN = 1.5–2.1. Cardia elongate rounded, 1.0–1.4 times as long as wide, occupying about one-fourth to two-fifths (25–40%) of corresponding body diameter.

Genital system amphidelphic, both branches almost equally developed. Ovaries reflexed, rarely reaching oviduct-uterus junction, measuring 41–122 µm (anterior) and 45–65 µm (posterior) long, with squamous shaped oocytes arranged in single row except near tip. Oviduct joining ovary subterminally, anterior 41–65 µm or 1.9–2.7 times, and posterior 41–66 µm or 1.9–2.7 times as long as mid-body diameter, consisting of slender part with prismatic cells and slightly wider pars dilatata with distinct lumen; oviduct-uterus junction marked with sphincter. Uterus simple tube, anterior 30–46 µm or 1.3–2.1 times and posterior 32–43 µm or 1.4–1.9 times as long as corresponding body diameter, mostly containing oval-shaped sperm. Vulva longitudinal with small opening. Vagina extending inwards about two-fifths to three-fifths (42–57%) of corresponding body diameter; pars proximalis longer than wide, 7–10 × 4 µm, with somewhat concave walls, pars refringens absent; pars distalis 3 µm with thickened and slightly rounded walls. Prerectum 3.8–4.7 and rectum 1.2–1.4 times as long as anal body diameter. Tail elongate conoid, ventrally arcuate, with rounded terminus. Caudal pores two on each side.

Male

Similar to female in general morphology, except for posterior region being more curved ventrally. Genital system diorchic, with oppositely outstretched testes. Sperm oval-shaped, 4–5 × 1–2 µm. In addition to adcloacal pair, located at 6–7 µm from cloacal aperture, there are five ventromedian supplements, located above range of spicules; first ventromedian supplement at 17–26 µm from adcloacal pair, second at 5–22 µm from first, third at 6–15 µm from second, fourth at 10–20 µm from the third and fifth at 8–12 µm from the fourth ventromedian supplement. Copulatory muscles weak, beginning from level of middle of spicules and continues till level of last supplement. Spicules dorylaimoid, slightly bent ventrally, total length along arc as long as chord, 3.2–5.7 times maximum width or 1.2–1.3 times body diameter at cloacal aperture. Curvature estimated about 137–140°. Dorsal contour regularly convex, ventral contour concave with prominent hump, located at 47–48% of spicules total length from anterior end; head occupying about 31% of spicule length; median pieces simple, 13 times as long as wide and occupying about 17% of spicule maximum width; posterior end about 2 µm wide. Lateral guiding pieces indistinct. Prerectum 3.9–4.7 and rectum 1.2–1.4 times as long as cloacal body diameter. Tail elongate conoid, ventrally arcuate with rounded terminus. Caudal pores two on each side.

Remarks

Heyns (1963) described *D. andrassyi* from Transvaal, South Africa and differentiated it from *D. bambesae* de Coninck, 1962 and *D. imitator* Heyns, 1963, in having a shorter expanded part of the pharynx and a ventrally arcuate tail. Chaturvedi & Khera (1979) redescribed it from the rhizosphere of jute plants (*Corchorus capsularis*) from West Bengal, India. Yeates (1979) described a closely related species, *D. pastura*, from New Zealand and differentiated it from *D. andrassyi*, in the nature of the glandular bodies in the lateral hypodermal chords and absence of male. Later, Jordaan & Heyns (1984) made a detailed study of this species based on the type material, as well as fresh specimens (161 females and 8

males) collected from several localities of South Africa, and recorded variations in body size, number of glandular bodies in the lateral chords, absence of male in some populations, in the shape of spicules and tail. As a results of this, they did not find any conclusive difference between *D. pastura* and *D. andrassyi*, and hence they synonymized *D. pastura* Yeates, 1979 with *D. andrassyi*. Further, it was reported from Botswana by De Bruin & Heyns (1993). The present population of Kerala generally conforms well to the original one, although it differs from this in its slightly wider lip region (one-third to two-fifths vs one-fourth of body diameter at neck base) and slightly longer prerectum (3.9–4.7 vs 2.0–3.5 times as long as anal body diameter). It differs from the West Bengal population, in having a shorter odontostyle (4–5 vs 6 µm long) and a slightly longer odontophore (10–12 vs 9 µm). From the material described by Jordaan & Heyns (op. cit.) from South Africa, it differs in its shorter odontostyle (4–5 vs 5.2–10 µm), lower number of glandular bodies in lateral hypodermal chords (46–49 vs 54–108), and shorter body length in males (0.9–1.0 vs 1.2–1.6 mm). From the material described by De Bruin & Heyns (1993) from Botswana, it differs in its shorter body size (1.0–1.2 vs 1.64 mm), narrower lip region (7 vs 9 µm wide), shorter expanded part of pharynx (25–34% vs 39% of total neck length) and posterior located vulva (V= 50–53 vs 49). The specimens from various localities of South Africa reported by Jordaan & Heyns (op. cit.) display a wide range of morphological variations in body length (0.87–2.3 mm), odontostyle length (5–10 µm) and tail length (36–67 µm). As a results of this, they regarded it as a single highly variable species (cf. Jordaan & Heyns, 1984).

Dorylaimellus discocephalus Siddiqi, 1964

Figs 2–3, Table 2

Dorylaimellus discocephalus Siddiqi, 1964: 5. — *Dorylaimellus cephalus* Jairajpuri, 1964: 182–183.
Dorylaimellus discocephalus Baqri & Jairajpuri 1968: 305–306.

Material examined

INDIA • 2 ♀♀, 1 ♂; Maharashtra State, Sangli district, Chandoli National Park; 17°11′30″ N, 73°46′30″ E; 5–20 cm deep; 14 Apr. 2016; soil samples collected from around the roots of *Ipomoea carnea* plants (morning glory); slide reference number AMU/ZD/NC/*Dorylaimellus discocephalus*/1–3.

Description

Female

Body slightly curved ventrad upon fixation, 1.10–1.11 mm long. Cuticle with distinct transverse striations, about 1 µm at anterior and mid-body, 2 µm on tail tip. Lateral chords 4–5 µm or one-fifth (20%) of body diameter at mid-body with weakly developed glandular bodies, about 50 in number; 10 in pharyngeal region, 21 from pharyngeal base to vulva, 18 from vulva to anal region and only one in caudal region. Ventral body pores distinct, about 46 in number; 8 in pharyngeal region, 14 from pharyngeal base to vulva, and 24 from vulva to anal region; lateral body pores about 37 in number; about 5 in pharyngeal region, 7 from pharyngeal base to vulva, and 22 from vulva to anal region; dorsal body pores indistinct. Lip region cap-like, offset by constriction, 2.3 times as wide as high, or about one-third to two-fifths (30–43%) of body diameter at neck base. Lips rounded, amalgamated, perioral disc present. Cheilostome a truncate cone with refractive walls and distinct cuticularized pieces near oral aperture. Amphids fovea cup-shaped, their aperture occupying about 0.7 times lip region diameter, fusus slightly posterior to level of odontophore base. Guiding ring weakly developed, at 0.6 times the lip region diameter from anterior end. Odontostyle short, weakly developed, about three times as long as wide, or about 0.4 times as long as lip region diameter, its aperture occupying about one-third of its length. Odontophore with weakly developed basal flanges, 2.7 times as long as odontostyle. Nerve ring encircling the anterior slender part of pharynx at about 30% of neck length from anterior end. Pharyngeal expansion gradual; expanded part 6.5–8.6 times as long as wide, or about 3.8–4.5 times body diameter

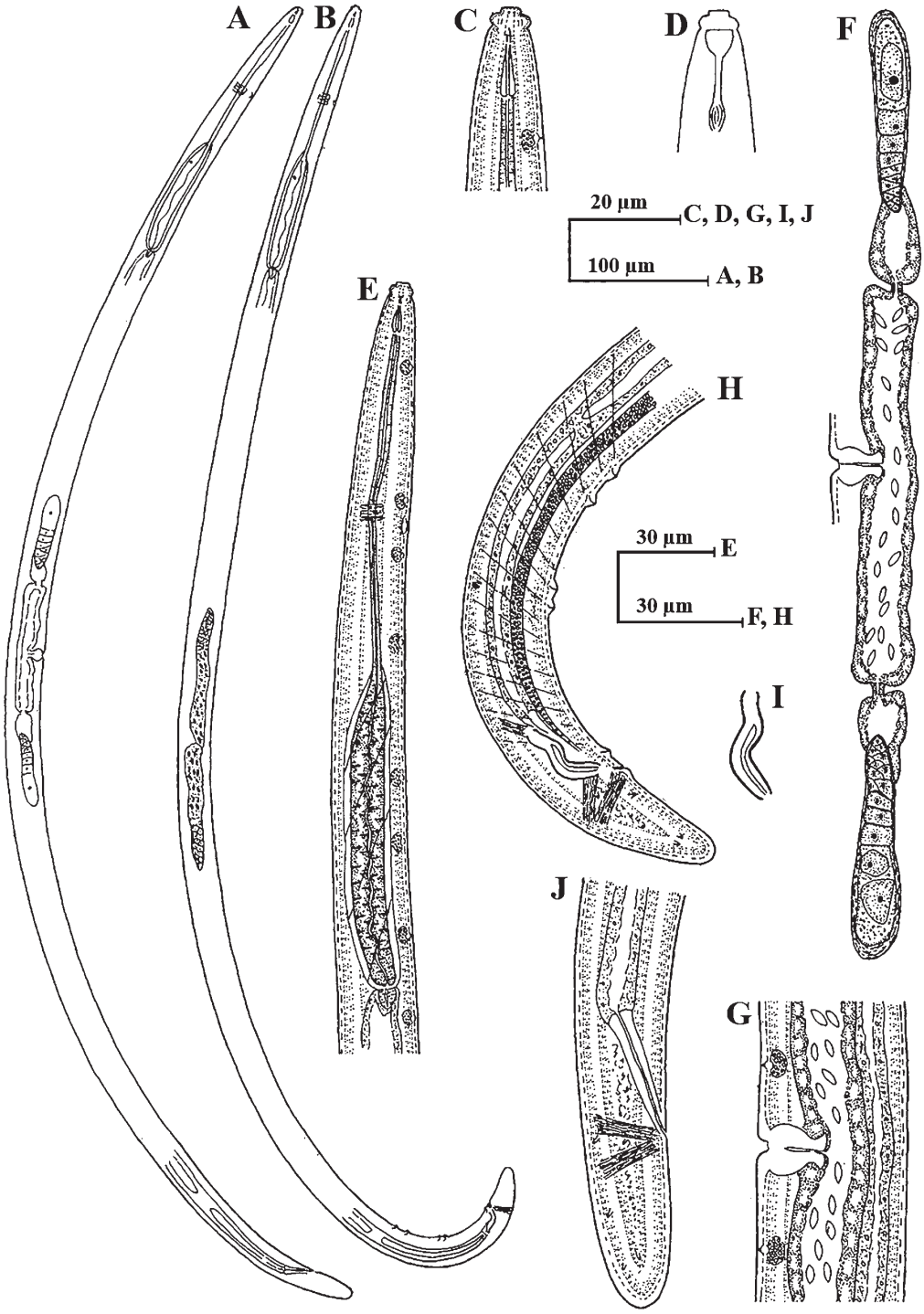

Fig. 2. *Dorylaimellus discocephalus* Siddiqi, 1964. **A**. Entire female. **B**. Entire male. **C**. Anterior region. **D**. Anterior end showing amphid. **E**. Neck region. **F**. Female genital system. **G**. Vulva region. **H**. Male posterior region. **I**. Spicule. **J**. Female posterior end.

Fig. 3. *Dorylaimellus discocephalus* Siddiqi, 1964 (LM photographs). **A**. Anterior region, arrow indicating basal flanges. **B**. Arrow indicating perioral disc. **C**. Anterior end showing amphid. **D**. Expanded part of pharynx. **E**. Vulva. **F**. Arrows indicating ventromedian supplements. **G**. Male posterior end, arrow indicating spicule. **H**. Female posterior end. Scale bars: A–H = 10 µm.

Table 2. Morphometrics of *Dorylaimellus discocephalus* Siddiqi, 1964. All the measurements are in µm except L in mm.

Characters	Females	Male
n	2	1
L	1.11, 1.12	1.11
a	40, 43	42.7
b	5.2, 4.7	5.4
c	34, 33	34.7
c′	2.2, 2.3	1.8
V	48, 51	–
G1	10.9, 9.8	–
G2	9.9, 6.7	–
Body diam. at pharynx base	24, 16	24
Body diam. at mid–body	28, 26	26
Body diam. at anus/cloaca	15	18
Lip region diam.	7	7
Lip region height	3	3
Amphid aperture	5	5
Odontostyle length	3	3
Odontophore length	8	7
Guiding ring from ant. end	4	3
Nerve ring from ant. end	70, 69	70
Neck length	212, 236	205
Expanded part of pharynx	91, 112	85
Cardia length	5, 7	7
Anterior genital branch	121, 110	–
Posterior genital branch	110, 75	–
Vaginal depth	12	–
Vulva from ant. end	535, 564	–
Prerectum length	42, 63	115
Rectum length	21, 20	27
Tail length	33, 34	32
Spicule length	–	19
Ventromedian supplements	–	4

at neck base, occupying about 43–47% of total neck length, enclosed in a thick dextrally spiral muscular sheath. Only dorsal pharyngeal gland and orifice visible: DO = 64.6; DN = 66.5; DO–DN = 1.9. Cardia elongate rounded, 1.2, 1.4 times as long as wide, occupying about one-fourth to two-sevenths (25–28%) of corresponding body diameter.

Genital system amphidelphic, both branches almost equally developed. Ovaries reflexed, not reaching oviduct-uterus junction, measuring 50 µm (anterior) and 56 µm (posterior) long, with squamous shaped oocytes arrange in single row except near tip. Oviduct joining ovary subterminally, anterior 55 µm or 2.0 times and posterior 60 µm or 2.1 times the mid-body diameter, consisting of a slender part made of

prismatic cells and slightly wide pars dilatata with distinct lumen; oviduct-uterus junction marked with a sphincter. Uterus simple tube, anterior 54 µm or 1.9 times and posterior 45 µm or 1.6 times as long as corresponding body diameter; containing oval-shaped sperms. Vulva longitudinal. Vagina extending inwards about two-fifths of corresponding body diameter; pars proximalis vaginae longer than wide, 10 × 5 µm, with somewhat convex walls; pars refringens absent; pars distalis vaginae 2 µm with rounded wall. Prerectum 3.0, 4.2 and rectum 1.4, 1.3 times as long as anal body diameter. Tail cylindroid with broadly rounded terminus. Caudal pores four on each side.

Male

Similar to female in general morphology, except for posterior region being more curve ventrad. Genital system diorchic, with oppositely outstretched testes. Sperms oval-shaped, 3–4 × 2 µm. In addition to adcloacal pair, located at 6 µm from cloacal aperture, four irregularly spaced ventromedian supplements, arranged in two groups, first supplement located at 46 µm from adcloacal pair, second at 4 µm from first, third at 23 µm from second and fourth at 10 µm from the third supplement. Copulatory muscles conspicuous, beginning from level of middle of spicules and continues the level of end of supplements. Spicules broad proximally, and sharply ventrally bent at middle, total length along arc equal to chord, 4.7 times maximum width, about 1.1 times body diameter at cloacal aperture. Dorsal contour irregularly convex, ventral contour concave, bearing distinct hump, located at 36.8% of spicules total length from its anterior end; head slightly bent dorsally, occupying about 26.3% of spicule length; median pieces simple, 14 times as long as wide and occupying about 25% of spicules maximum width; posterior end about 2 µm wide. Lateral guiding pieces indistinct. Prerectum 6.4 and rectum 1.5 times as long as cloacal body diameter. Tail dorsally convex-conoid with rounded terminus. Caudal pores three on each side.

Remarks

Siddiqi (1964) described *Dorylaimellus discocephalus* from the soil around the roots of maize plants (Zea mays) from Aligarh, India and differentiated it from *D. projectus* Heyns, 1962 on the basis of a longer and slender body, a longer odontostyle aperture, a longer expanded part of the pharynx and a longer tail. In the same year, Jairajpuri described a closely related species, *Dorylaimellus cephalus*, from roots of *Saccharum ravennae* in Aligarh and differentiated it from *D. projectus* based on the long and slender body. Siddiqi (1966) failed to find any reliable differentiating character between *D. discocephalus* and *D. cephalus*, therefore, he did not consider *D. cephalus* a valid species. Baqri & Jairajpuri (1968) redescribed *D. discocephalus* from various localities of Uttar Pradesh. Andrássy (2009) synonymized *D. cephalus* with *D. discocephalus* on the basis of priority. The present population of Maharashtra conforms well with the original and subsequent descriptions. Although, it slightly differs from the original population in having a comparatively robust body (a = 40–43 vs 46–53); a shorter and weak odontostyle (3 µm vs 4–5 µm); a shorter and weakly developed odontophore (8 µm vs 11–12 µm long with well-developed basal flanges), in the presence of body pores (vs not reported) and the presence of males (vs absent). The male of this species is being reported here for the first time.

Dorylaimellus belondirelloides Siddiqi, 1968

Fig. 4, Table 3

Dorylaimellus belondirelloides Siddiqi, 1964: 250–253.

Material examined

INDIA • 21 ♀♀; Karnataka State, Shimoga district, village Dummalli; 13°55′53.65″ N, 75°34′4.48″ E; 10–15 cm deep; 26 Oct. 2018; soil samples collected from around the roots of plants (unidentified); slide reference number AMU/ZD/NC/*Dorylaimellus belondirelloides*/1–10.

Description

Female

Body slightly curved ventrad upon fixation, 0.8–0.9 mm long. Cuticle with distinct transverse striations, about 1 µm at anterior and mid-body, 2 µm on tail tip. Lateral chords 4–6 µm or about one-fifth to one-third (20–30%) of body diameter at mid-body, glandular bodies indistinct. Lateral, dorsal and ventral body pores indistinct. Lip region cap-like, offset by constriction, 2.0–2.3 times as wide as high, or about two-sevenths to two-fifths (28–37%) of body diameter at neck base. Lips rounded, amalgamated; perioral disc distinct. Cheilostome a truncate cone with refractive walls and distinct cuticularized pieces near oral aperture. Amphids fovea cup-shaped, their aperture occupying about 0.6–0.7 times lip region diameter, fusus almost at level of odontophore base. Guiding ring single, weakly developed, at 0.7–1.0 times lip region diameter from anterior end. Odontostyle robust, slightly fusiform, 5–6 times as long as wide, or about 0.8–1.0 times as long as lip region diameter, its aperture occupying about one-third of length. Odontophore with weakly developed basal flanges, 1.7–2.2 times as long as odontostyle. Nerve ring encircling anterior slender part of pharynx at about 34–40% of neck length from anterior end. Pharyngeal expansion gradual; expanded part 5.9–8.4 times as long as wide, or about 3.7–4.9 times body diameter at neck base, occupying about 37–47% of total neck length, enclosed in thick sheath of dextrally spiral muscles. Anterior portion of expanded part of pharynx with prominent small globules, rarely indistinct. Only dorsal pharyngeal gland and orifice visible: DO = 57–65; DN = 59–66; DO–DN = 1.0–2.0 (n = 8). Cardia short, elongate-rounded, 1.0–1.6 times as long as wide, occupying about one-fourth to two-fifths (24–42%) of corresponding body diameter.

Genital system amphidelphic, both branches almost equally developed. Ovaries reflexed, not reaching oviduct-uterus junction, measuring 21–45 µm (anterior) and 21–56 µm (posterior) long, with squamous shaped oocytes arranged in single row except near tip. Oviduct joining ovary subterminally, anterior 22–40 µm or 1.1–1.9 times, and posterior 20–37 µm or 1.0–1.8 times as long as mid-body diameter, consisting of a slender part with prismatic cells and wide pars dilatata with distinct lumen; oviduct-uterus junction marked with sphincter. Uterus small tube, anterior 8–12 µm or 0.4–0.6 times, and posterior 7–13 µm or 0.3–0.7 times as long as corresponding body diameter; sperms not observed. Vulva longitudinal. Vagina extending inwards about two-fifths to one-half (40–50%) of corresponding body diameter; pars proximalis vaginae longer than wide, 5–7 × 4.0 µm, with convex walls; pars refringens absent; pars distalis 2–3 µm. Prerectum 7.2–10.6 and rectum 1.4–2.1 times as long as anal body diameter. Tail cylindroid-subclavate with thick cuticle at terminus. Caudal pores two on each side.

Male

Not found.

Remarks

Siddiqi (1968) described *D. belondirelloides* from around the roots of *Lagenaria siceraria* plants (Bottle gourd) from Assam, India, and differentiated it from *D. caffrae* Kruger, 1965 and *D. projectus* Heyns, 1962 in having a comparatively anterior located vulva, a longer prerectum and a longer tail. The present population conforms well with the original description except for having a comparatively longer and slender body (L= 0.8–0.9 vs 0.73–0.76 mm; a = 40.4–47 vs 37–40), a cuticle with distinct transverse striations (vs fine transverse striation and hypodermis coarsely striated), in the nature of the odontostyle (slightly fusiform vs linear), in the presence of small globules in the anterior region of the expanded part of the pharynx (vs absent) and a longer tail (c = 16–19 vs 21–23 or c′ = 4–5 vs 3).

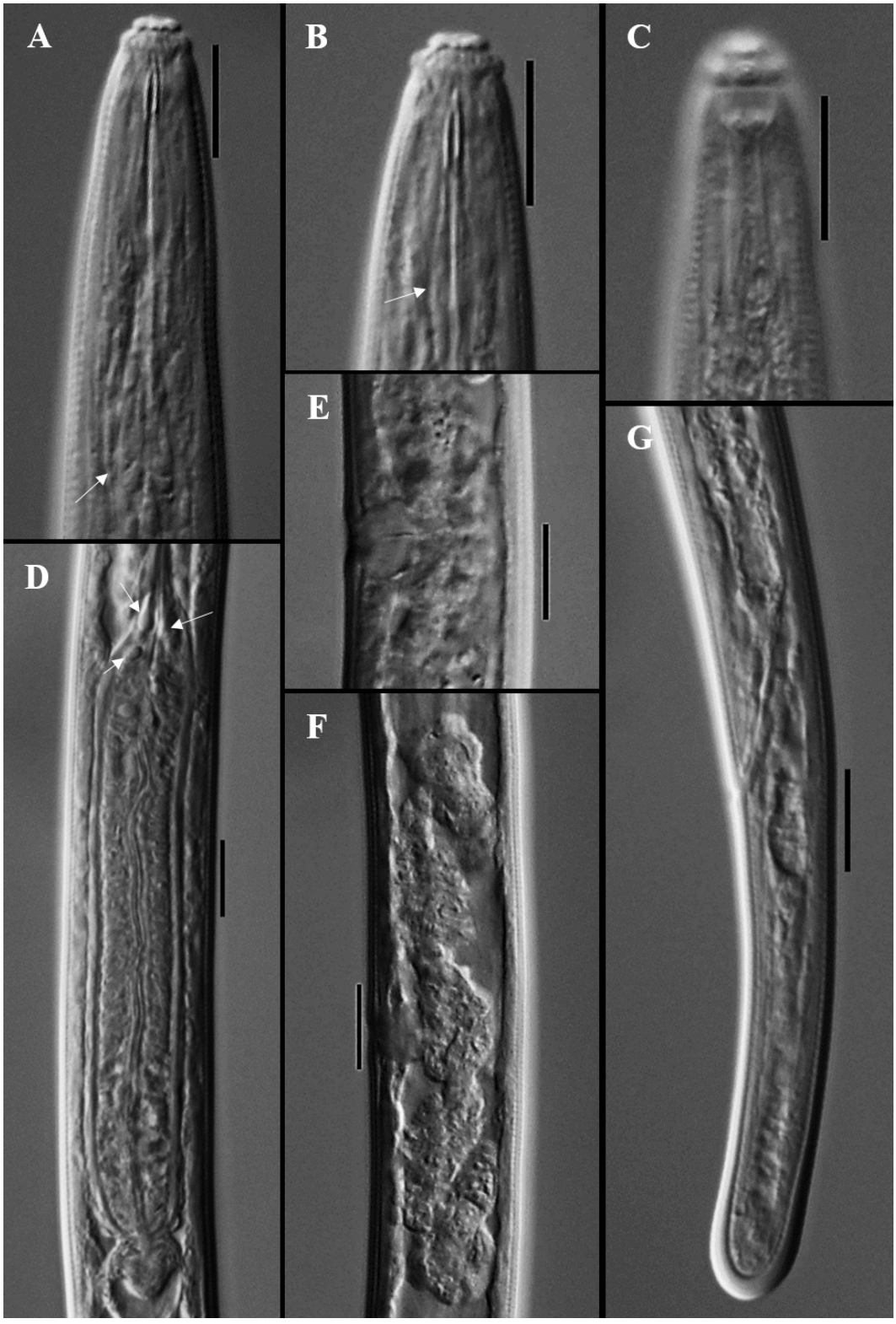

Fig. 4. *Dorylaimellus belondirelloides* Siddiqi, 1968 (LM photographs). **A**. Anterior region, arrow indicating fusiform thickening. **B**. Arrow indicating basal flanges. **C**. Anterior end showing amphid. **D**. Expanded part of pharynx, arrows indicating small globules. **E**. Vulva region. **F**. Female genital system. **G**. Posterior region. Scale bars: A–G = 10 µm.

Table 3. Morphometrics of *Dorylaimellus belondirelloides* Siddiqi, 1968. All the measurements are in µm except L in mm, and in the form: mean ±SD (range).

Characters	Females
n	21
L	0.86 ± 0.1 (0.78–0.91)
a	43.4 ± 1.9 (40.4–47.1)
b	4.3 ± 0.2 (4.0–4.8)
c	17.4 ± 0.9 (16–19)
c′	4.5 ± 0.2 (4.0–4.8)
V	48.4 ± 0.9 (47–50)
G1	5.5 ± 0.8 (3.9–7.0)
G2	5.7 ± 0.8 (4.0–7.4)
Body diam. at pharynx base	20 ± 0.7 (19–21)
Body diam. at mid–body	19.9 ± 0.6 (19–21)
Body diam. at anus/cloaca	11.1 ± 0.4 (10–12)
Lip region diam.	6.2 ± 0.4 (6–7)
Lip region height	3
Amphid aperture	4
Odontostyle length	5.5 ± 0.5 (5–6)
Odontophore length	10.8 ± 0.4 (10–11)
Guiding ring from ant. end	4.8 ± 0.6 (4–6)
Nerve ring from ant. end	72.6 ± 2.4 (67–77)
Neck length	198.3 ± 6.4 (185–210)
Expanded part of pharynx	85.3 ± 6.0 (77–94)
Cardia length	6.6 ± 0.7 (5–6)
Anterior genital branch	49.6 ± 11.2 (33–60)
Posterior genital branch	49.3 ± 6.6 (35–63)
Vaginal depth	8.7 ± 0.8 (8–10)
Vulva from ant. end	417.5 ± 13.8 (390–444)
Prerectum length	104.3 ± 9.5 (87–123)
Rectum length	19.5 ± 1.4 (16–23)
Tail length	49.7 ± 2.1 (44–53)

Dorylaimellus chakpilus Mohilal, Gambhir & Dhanachand, 2000
Fig. 5, Table 4

Dorylaimellus (*Belondorylaimellus*) *chakpilus* Mohilal, Gambhir & Dhanachand, 2000: 55–57.

Material examined

INDIA • 13 ♀♀; Karnataka State, Hassan district, village Yaraganalu; 13°08′03.5″ N, 76°18′31.4″ E; 10–15 cm deep; Oct. 26, 2018; soil samples collected from around the roots of grasses (unidentified); slide reference number AMU/ZD/NC/*Dorylaimellus chakpilus*/1–9.

Description

Female

Body slightly curved ventrad upon fixation, 0.6–0.8 mm long. Cuticle with transverse striations, about 1 µm thick throughout length of body. Lateral chords 5–7 µm or about one-third to two-fifths (30–40%) of the body diameter at mid-body, glandular bodies weakly developed, about 20–34 in number; 4–9 in pharyngeal region, 4–8 from pharyngeal base to vulva, 8–19 from vulva to anal region and 1–2 in caudal region. Ventral body pores distinct, about 22–28 in number; 5–9 in pharyngeal region, 6–8 from pharyngeal base to vulva and 10–13 from vulva to anal region; lateral and dorsal body pores indistinct. Lip region cap-like, distinctly offset, about 2.0–2.3 times as wide as high, or about one-third to two-fifths (33–40%) of body diameter at neck base. Lips rounded, amalgamated; perioral disc distinct. Cheilostome a truncate cone with refractive walls and distinct cuticularized pieces near oral aperture. Amphids fovea cup-shaped, aperture occupying about 0.6–0.7 times lip region diameter, fusus at level of odontophore base. Guiding ring single, weakly developed, at 0.6–0.8 times lip region diameter from anterior end. Odontostyle comparatively slender, slightly fusiform, 4–5 times as long as wide, about 0.7–0.8 times as long as lip region diameter, its aperture occupying about one-third of length. Odontophore with moderately developed basal flanges, 2.0–2.7 times as long as odontostyle. Nerve ring encircling anterior slender part of pharynx at 30–33% of neck length from anterior end. Pharyngeal expansion gradual; expanded part 9.5–13 times as long as wide, or about 5.2–7.3 times as long as body diameter at neck base, occupying about 48–56% of total neck length, enclosed in thick dextrally spiral muscular sheath. Only dorsal pharyngeal gland and orifice visible: DO = 52–57; DN = 54–59; DO–DN = 1.5–3.4. Cardia short, hemispheroid, 1.0–1.8 times as long as wide, occupying about two-sevenths to two-fifths (28–43%) of corresponding body diameter.

Genital system amphidelphic, both branches almost equally developed. Ovaries reflexed, rarely reaching oviduct-uterus junction, measuring 17–91 µm (anterior) and 19–73 µm (posterior) long, with oocytes arranged in single row except near tip. Oviduct joining ovary subterminally, anterior 15–28 µm or 0.8–1.6 times, and posterior 16–31 µm or 0.9–1.8 times as long as mid-body diameter, consisting of a slender part with prismatic cells and a wider pars dilatata with distinct lumen; oviduct-uterus junction marked with sphincter. Uterus a small tube, anterior 5–12 µm or 0.3–0.8 times, and posterior 6–13 µm or 0.4–0.7 times as long as corresponding body diameter; sperms not observed. Vulva longitudinal. Vagina extending inwards about one-third to one-half (33–50%) of corresponding body diameter; pars proximalis vaginae longer than wide, 4–6 × 3.0 µm, with convex walls; pars refringens absent; pars distalis 1–2 µm. Prerectum 5.1–8.1 and rectum 1.3–1.9 times as long as anal body diameter. Tail slightly ventrally curved, subcylindrical, tapering gradually to a broadly rounded terminus.

Male

Not found.

Remarks

Mohilal *et al.* (2000) described *D. chakpilus* from around the roots of *Cynodon dactylon* (dhoob grass) from Manipur, India, and differentiated it from *D. paralongicaudatus* Hussain & Khan, 1967 (now *D. longicaudatus* Jairajpuri, 1964) and *D. parvus* Jairajpuri, 1965. The present specimens from Karnataka conform well with the type population except for having a slightly longer body (L = 0.6–0.8 vs 0.57–0.6 mm), in the presence of weak lateral glandular bodies (vs indistinct),distinct ventral body pores (vs indistinct); wider lip region (6–7 vs 5.2 µm), a shorter odontostyle (4–5 µm vs 5.6–7.2 µm or 0.7–0.8 vs slightly longer than lip region diameter), and a slightly longer odontophore (10–11 vs 8.0–9.6 µm); however, the combined odontostyle-odontophore length is almost the same. In the original description, the shape of the vulva has been mentioned as transverse; however, in the figure (Mohilal *et al.* 2000 fig 2e) it appears longitudinal. The present specimens also have a longitudinal vulva.

Fig. 5. *Dorylaimellus chakpilus* Mohilal, Gambhir & Dhanachand, 2000 (LM photographs). **A–B**. Anterior region, arrow in A indicating basal flanges. **C**. Anterior end showing amphid. **D**. Arrows indicating body pores. **E**. Expanded part of pharynx. **F**. Vulva region. **G**. Female genital system. **H**. Posterior end. Scale bars: A–H = 10 µm.

Table 4. Morphometrics of *Dorylaimellus chakpilus* Mohilal, Gambhir & Dhanachand, 2000. All the measurements are in µm except L in mm, and in the form: mean ±SD (range).

Characters	Females
n	13
L	0.71 ± 0.1 (0.6–0.8)
a	42.3 ± 2.5 (35.1–45.1)
b	3.5 ± 0.3 (2.7–4.0)
c	16.3 ± 1.3 (14–20)
c′	4.4 ± 0.3 (3.8–4.8)
V	51.3 ± 2.7 (46–58)
G1	7.1 ± 2.2 (4.1–12.4)
G2	7.1 ± 1.9 (4.9–11.1)
Body diam. at pharynx base	17.1 ± 0.9 (16–18)
Body diam. at mid–body	16.9 ± 0.9 (15–18)
Body diam. at anus/ cloaca	9.9 ± 0.5 (9–11)
Lip region diam.	6.1 ± 0.4 (6–7)
Lip region height	3
Amphid aperture	4
Odontostyle length	4.9 ± 0.3 (4–5)
Odontophore length	10.4 ± 0.5 (10–11)
Guiding ring from ant. end	4.3 ± 0.5 (4–5)
Nerve ring from ant. end	62.8 ± 1.7 (60–65)
Neck length	201.7 ± 9.2 (183–217)
Expanded part of pharynx	103 ± 6.0(93–118)
Cardia length	5.7 ± 0.7 (5–7)
Anterior genital branch	50.5 ± 16.9 (33–91)
Posterior genital branch	50.4 ± 12.4 (38–80)
Vaginal depth	7.1 ± 0.6 (6–8)
Vulva from ant. end	366.6 ± 14.8 (346–398)
Prerectum length	68.7 ± 6.1 (56–80)
Rectum length	16.1 ± 1.5 (13–19)
Tail length	44 ± 3.0 (38–48)

Dorylaimellus attenuatus sp. nov.

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Figs 6–7, Table 5

Diagnosis

Dorylaimellus attenuatus sp. nov. is characterized by having a 0.73–0.84 mm long body; lip region distinctly offset, cap-like with prominent perioral disc, cuticularized pieces present around oral opening; odontostyle attenuated with indistinct lumen and aperture, 5.0–5.5 µm long; odontophore with weakly developed basal flanges; amphids with stirrup-shaped fovea; expanded part of pharynx occupying about 39–48% of total neck length; female genital system amphidelphic; vulva longitudinal, and tail elongate-filiform.

Etymology

The new species is named *Dorylaimellus attenuatus* sp. nov. because of its attenuated odontostyle.

Material examined

Holotype

INDIA • ♀; Kerala State, Palakkad district, Agali Forest Range; 11°06′4.32″ N, 76°38′50.64″ E; 10–15 cm deep; 25 Oct. 2017; roots of grasses (unidentified); slide reference number AMU/ZD/NC/*Dorylaimellus attenuatus*/1.

Paratypes

INDIA • 13 ♀♀; same collection data as for holotype; slide reference number AMU/ZD/NC/*Dorylaimellus attenuatus*/2–10.

Type habitat and locality

Soil samples collected from around the roots of grasses (unidentified) from Agali Forest Range, Palakkad district, Kerala State, India.

Description

Female

Body slightly curved ventrad upon fixation, 0.73–0.84 mm long. Cuticle with fine transverse striations, about 1 µm thick throughout the length of body. Lateral chords 4–7 µm, or about one-fifth to two-fifths (22–37%) of mid-body diameter; glandular bodies indistinct. Ventral body pores distinct, about 29–35 in number: 8–9 in pharyngeal region, 8–9 from pharyngeal base to vulva and 15–17 from vulva to anal region; lateral and dorsal body pores indistinct. Lip region cap-like, distinctly offset by constriction, 1.5–2.0 times as wide as high, or about one-third to two-fifths (32–38%) of body diameter at neck base. Lips rounded, amalgamated; perioral disc distinct. Cheilostome a truncate cone with refractive walls and distinct cuticularized pieces near oral aperture. Amphids fovea stirrup-shaped, about 0.8 times the lip region diameter, fusus just at level of odontophore base. Guiding ring single and weakly developed, at 0.8 times lip region diameter from anterior end. Odontostyle attenuated with indistinct lumen, 10–11 times as long as wide, or about 0.8–0.9 times lip region diameter, aperture very minute, difficult to measure. Odontophore rod-like with weakly developed basal flanges, 1.6–2.0 times as long as odontostyle. Nerve ring encircling the anterior slender part of pharynx at about 33–37% of neck length from anterior end. Pharyngeal expansion abrupt; expanded part 5.7–8.9 times as long as wide, or about 3.6–5.4 times the body diameter at neck base, occupying about 39–48% of total neck length, enclosed in a thick spiral muscular sheath. Only dorsal pharyngeal gland and orifice visible: DO = 62–64; DN = 64–65; DO–DN = 1.2–2.1. Cardia short, rounded conoid, 1.2–1.8 times as long as wide, occupying about one-fourth to two-fifths (27–40%) of corresponding body diameter.

Genital system amphidelphic; both genital branches almost equally developed. Ovaries reflexed, not reaching oviduct-uterus junction, measuring 21–72 µm (anterior) and 34–96 µm (posterior) long, with oocytes arranged in single row except near tip. Oviduct joining ovary subterminally, anterior 31–41 µm or 1.7–2.4 times, and posterior 35–50 µm or 1.9–2.6 times as long as mid-body diameter, consisting of long slender part of prismatic cells and wider pars dilatata with distinct lumen; oviduct-uterus junction marked with sphincter. Uterus simple tube, anterior 13–21 µm or 0.7–1.1 times, and posterior 13–18 µm or 0.7–1.0 times as long as corresponding body diameter; sperm not observed. Vulva longitudinal. Vagina extending inwards about one-half to three-fifths (47–59%) of corresponding body diameter; pars proximalis vaginae longer than wide, 5–8 × 3 µm, with convex walls; pars refringens absent; pars distalis 2–3 µm with somewhat rounded walls. Prerectum 5.2–9.0 and rectum 1.5–2.1 times as long as anal body diameter. Tail elongate-filiform with a finely rounded terminus. Caudal pores two on each side.

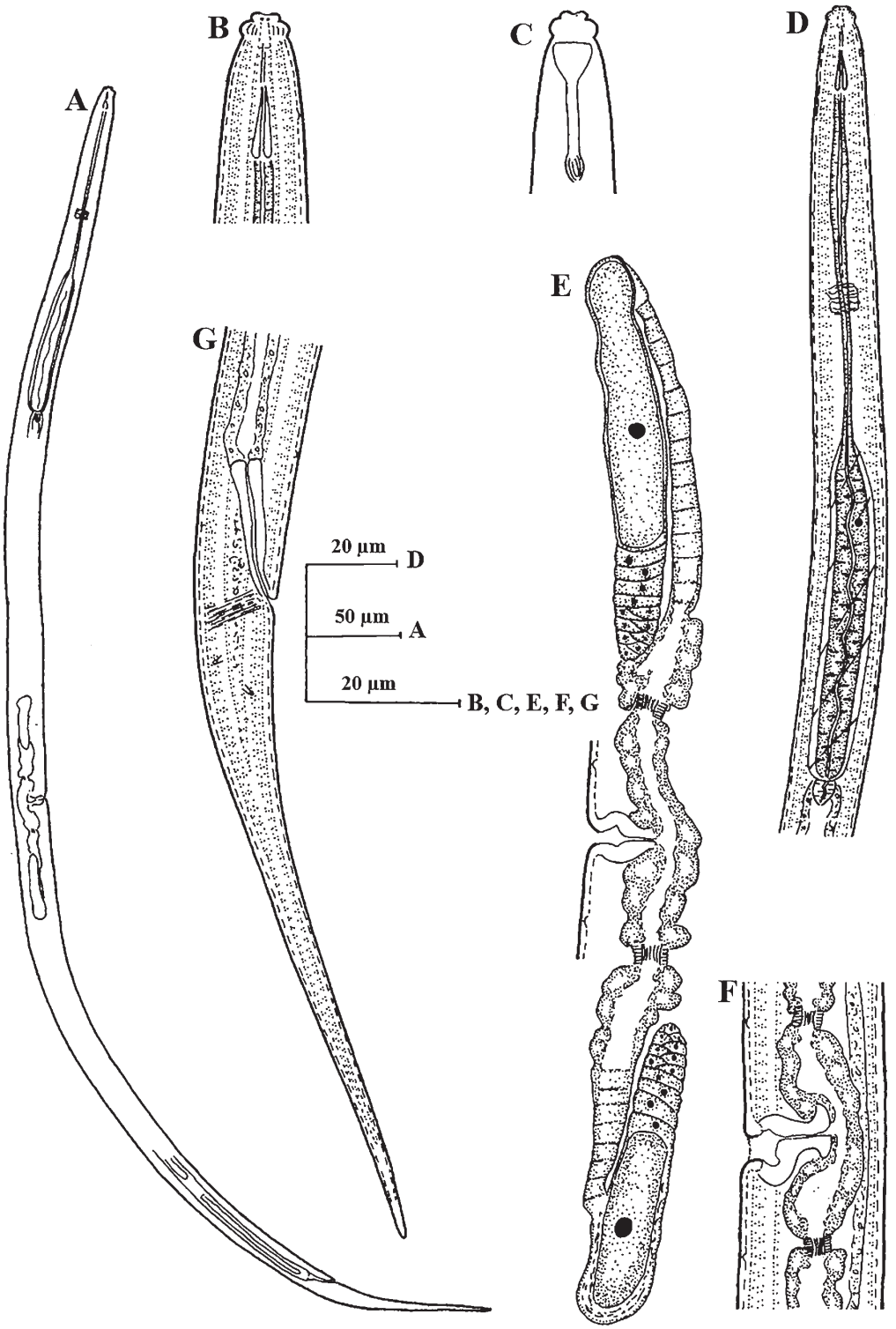

Fig. 6. *Dorylaimellus attenuatus* sp. nov. **A–D, F–G**. Paratype 6, ♀ (Slide 7). **E**. Paratype 11, ♀ (slide 12). **A**. Entire female. **B**. Anterior region. **C**. Anterior end showing amphid. **D**. Neck region. **E**. Female genital system. **F**. Vulva region. **G**. Posterior region.

Fig. 7. *Dorylaimellus attenuatus* sp. nov. (LM photographs). **A–H**. Paratype 6, ♀ (Slide 7). **A**. Anterior region, arrow indicating basal flanges. **B**. Arrow indicating odontostyle. **C**. Anterior end showing amphid. **D**. Expanded part of pharynx. **E**. Vulva. **F**. Female genital system. **G**. Arrows indicating ventral body pores. **H**. Female posterior end. Scale bars: A–H = 10 µm.

Table 5. Morphometrics of *Dorylaimellus attenuatus* sp. nov. All the measurements are in µm except L in mm, and in the form: mean ±SD (range).

Characters	Holotype female	Paratype females
n	1	13
L	0.77	0.8±0.1 (0.73–0.84)
a	43.2	44±1.7 (40.7–47.2)
b	4.8	4.6±0.3 (3.9–5.1)
c	9.3	9.1±0.3 (8.5–9.6)
c′	9.2	8.6±0.5 (7.4–9.2)
V	48.6	47.9±0.7 (47–49)
G1	7.9	7.8±0.6 (7.3–9.3)
G2	8.4	8.7±1.6 (7.2–13.1)
Body diam. at pharynx base	17	17.2±0.9 (16–19)
Body diam. at mid–body	18	18.1±0.9 (17–19)
Body diam. at anus/cloaca	9	10.3±0.5 (10–11)
Lip region diam.	6	6
Lip region height	4	3.7±0.4 (3–4)
Amphid aperture	5	5
Odontostyle length	5	5.1±0.2 (5.0–5.5)
Odontophore length	10	9.5±0.5 (9–10)
Guiding ring from ant. end	–	5
Nerve ring from ant. end	59	62.9±1.7 (61–65)
Neck length	170	175.2±7.8 (159–186)
Expanded part of pharynx	76	75.3±7.4 (61–89)
Cardia length	5	6.0±0.8 (5–7)
Anterior genital branch	61	63.9±7.9 (54–80)
Posterior genital branch	65	70.5±13.3 (57–108)
Vaginal depth	10	9.5±0.9 (8–11)
Vulva from ant. end	376	382.2±10.8 (356–398)
Prerectum length	70	75.2±9.7 (57–90)
Rectum length	19	17.5±1.3 (16–20)
Tail length	83	88±3.4 (82–95)

Male

Not found.

Taxonomic remarks

In having an attenuated odontostyle, an amphidelphic gonad and an elongate filiform tail, *Dorylaimellus attenuatus* sp. nov. comes close to *D. filiformis* Jairajpuri, 1964, *D. salvus* Siddiqi, 1968 and *D. dorylaimoidurus* Siddiqi, 1966, but differs from the former in the shape of the lip region (cap-like with distinct perioral disc vs conoid without perioral disc), in the nature of the odontostyle (attenuated with indistinct lumen and aperture vs slender with distinct lumen and aperture), a longer pharynx (b = 3.9–5.2 vs 5.8); longer expanded part of the pharynx (38–48 vs 33% of total neck length),

a posterior vulva position (V = 47–49 vs 43), a longer prerectum (5.2–9.0 vs 5.0 times length of anal body diameter) and the presence of body pores (vs indistinct).

From *D. salvus*, the new species differs in having a shorter body (L = 0.73–0.83 vs 1.17–1.23 mm), a cuticle with fine transverse striations (vs coarsely striated), in the presence of ventral body pores (vs indistinct); indistinct lateral glandular bodies (vs distinct), in the lip region morphology (lip region with distinctly developed perioral disc vs with pseudo-labial disc), in the nature of the odontostyle (attenuated with indistinct lumen and aperture vs robust with distinct lumen and aperture), a longer pharynx (b = 3.9–5.2 vs 6.5–7.5), a longer expanded part of the pharynx (39–48 vs 33% of total neck length) and in the absence of males (vs present).

From *D. dorylaimoidurus*, it differs in having a slender body (a = 41–47 vs 40), in the presence of body pores (vs indistinct), shape of the lip region (cap-like with a prominent perioral disc vs smoothly rounded without a perioral disc), a shorter odontostyle (5.0–5.5 vs 6.5 µm), a shorter odontophore (9–10 vs 12 µm), a longer pharynx (b = 3.9–5.2 vs 5.6), the anterior vulva position (V = 47–49 vs 42), in the nature of the tail shape (tail not dorsally arcuate vs dorsally arcuate) and in the absence of males (vs present).

Dorylaimellus cylindricaudatus sp. nov.

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Figs 8–9, Table 6

Diagnosis

Dorylaimellus cylindricaudatus sp. nov. is characterized by having a 1.0–1.15 mm long body; lip region offset, cap-like with prominent perioral disc, perioral sclerotization distinct; odontostyle slender 4 µm long; odontophore 11–12 µm long with moderately developed basal flanges; expanded part of pharynx occupying about 47–56% of total neck length; female genital system amphidelphic; vulva longitudinal, post-equatorial, located at 55–60% of total body length; prerectum 4.8–6.4 times as long as anal body diameter; tail arcuate, elongate-cylindrical with rounded terminus.

Etymology

The new species is named *Dorylaimellus cylindricaudatus* sp. nov. because of its cylindrical tail shape.

Material examined

Holotype

INDIA • ♀; Karnataka State, Shimoga district, village Thirtha; 14°07′10.0″ N, 75°03′26.5″ E; 10–15 cm deep; 27 Oct. 2018; roots of grasses (unidentified); slide reference number AMU/ZD/NC/*Dorylaimellus cylindricaudatus*/1.

Paratypes

INDIA • 3 ♀♀; same collection data as for holotype; slide reference number AMU/ZD/NC/ *Dorylaimellus cylindricaudatus*/2–3.

Type habitat and locality

Soil samples collected from around the roots of grasses (unidentified) from village Thirtha, Shimoga district, Karnataka State, India.

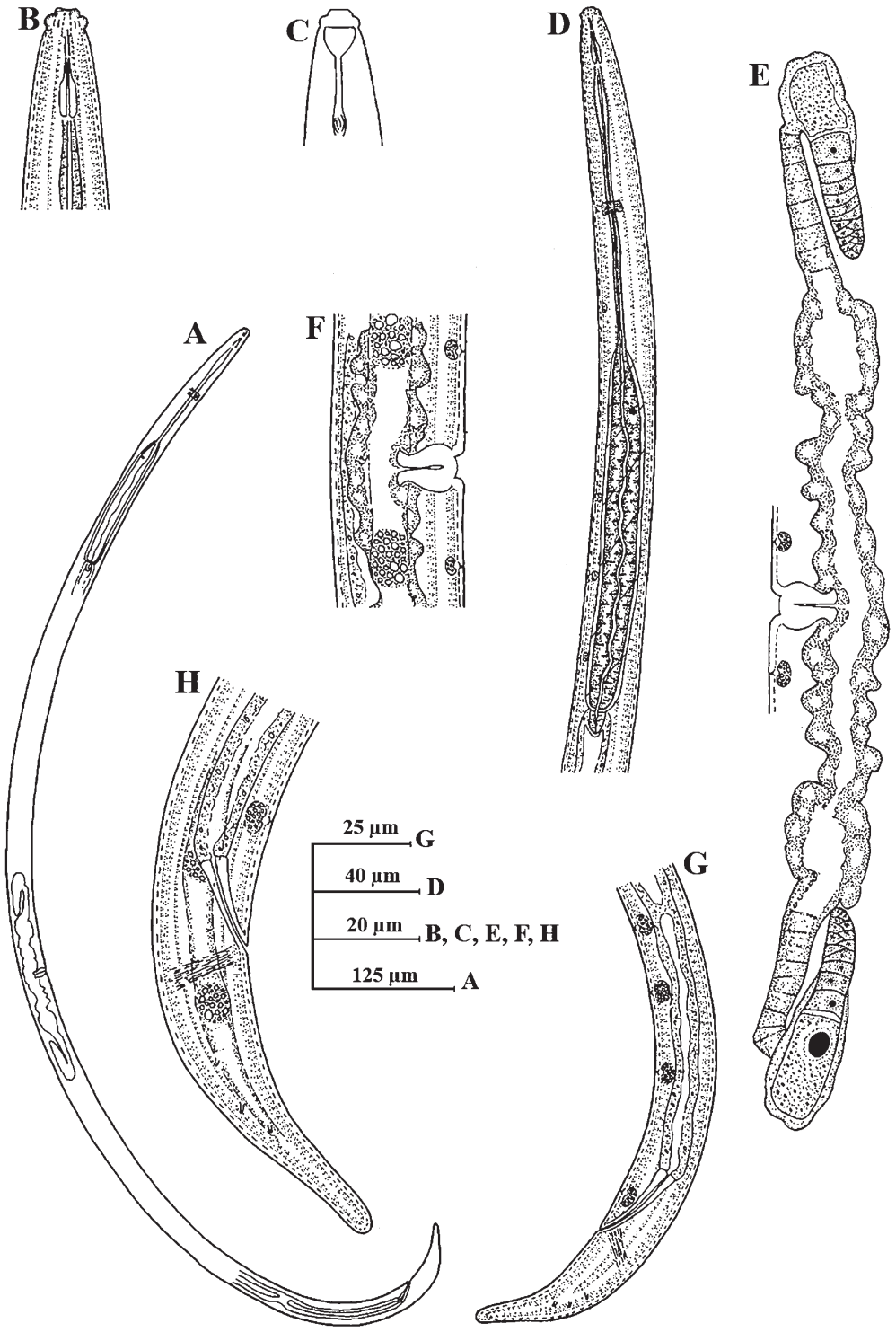

Fig. 8. *Dorylaimellus cylindricaudatus* sp. nov. **A–G**. Paratype 2, ♀ (Slide 3). **H**. Holotype, ♀ (slide 1). **A**. Entire female. **B**. Anterior region. **C**. Anterior end showing amphid. **D**. Neck region. **E**. Female genital system. **F**. Vulva region. **G–H**. Posterior regions showing prerectums and tails.

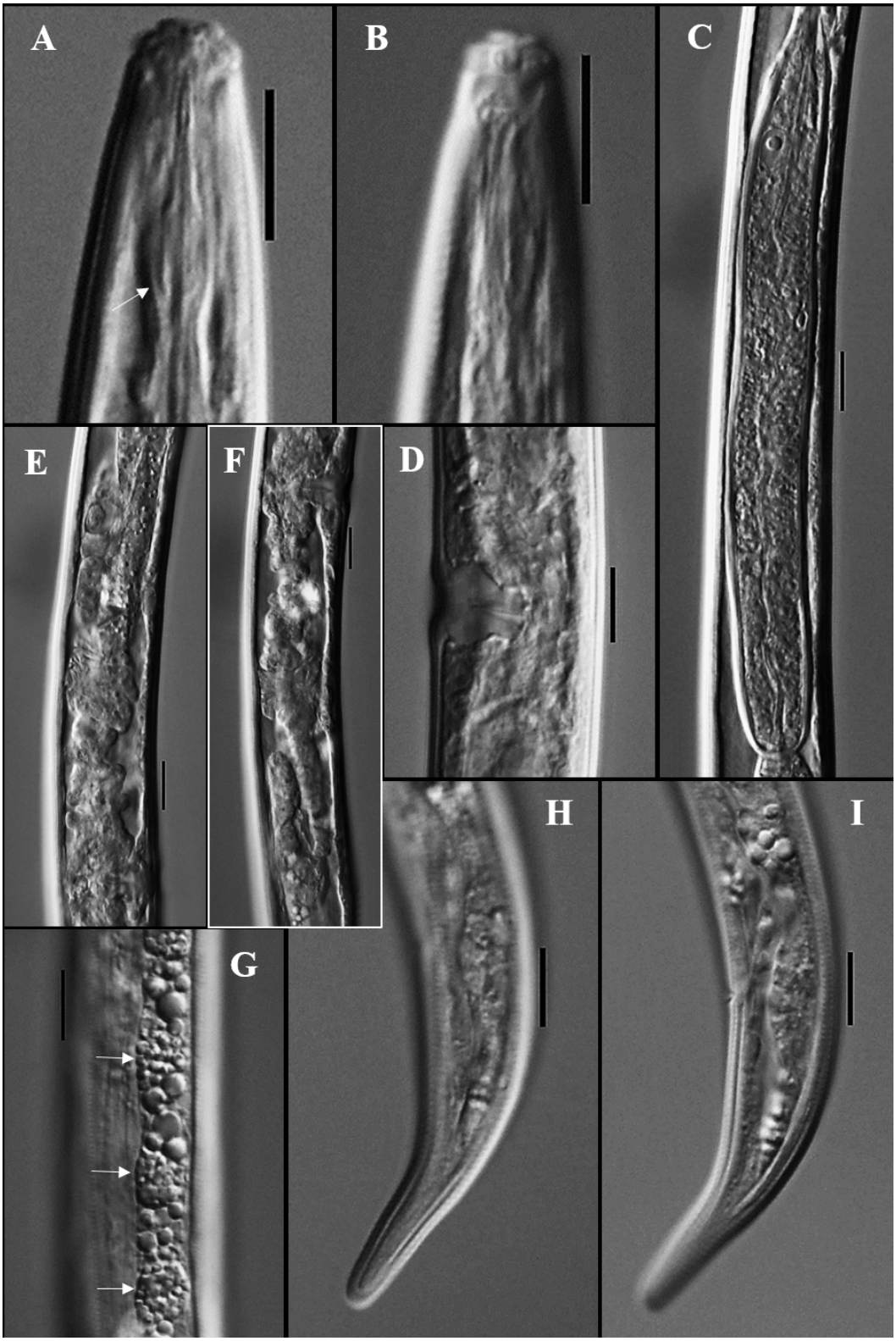

Fig. 9. *Dorylaimellus cylindricaudatus* sp. nov. (LM photographs), paratype 2, ♀ (Slide 3). **A**. Anterior region, arrow indicating basal flanges. **B**. Anterior end showing amphid. **C**. Expanded part of pharynx. **D**. Vulva region. **E**–**F**. Female genital branches. **G**. Lateral glandular bodies. **H**–**I**. Posterior end. Scale bars: 10 µm.

Table 6. Morphometrics of *Dorylaimellus cylindricaudatus* sp. nov. All the measurements are in µm except L in mm, and in the form: mean ± SD (range).

Characters	Holotype female	Paratype females
n	1	3
L	1.15	1.06 ± 0.1 (0.99–1.12)
a	52.5	43.4 ± 4.4 (38.1–48.8)
b	5.0	4.1 ± 0.2 (3.8–4.3)
c	25.7	21.1 ± 3.5 (18.7–26.1)
c′	3.0	3.1 ± 0.3 (2.7–3.4)
V	54.7	58.4 ± 2.0 (55.6–60.4)
G1	9.2	8.6 ± 0.1 (8.5–8.8)
G2	10.1	10 ± 0.8 (9.1–10.8)
Body diam. at pharynx base	21	23.3 ± 1.7 (21–25)
Body diam. at mid–body	22	24.7 ± 1.2 (23–26)
Body diam. at anus/cloaca	15	16.3 ± 0.5 (16–17)
Lip region diam.	7	7
Lip region height	3	3
Amphid aperture	5	5
Odontostyle length	4	4
Odontophore length	11	11.7 ± 0.5 (11–12)
Guiding ring from ant. end	5	5
Nerve ring from ant. end	73	73.7 ± 2.6 (70–76)
Neck length	230	259.7 ± 1.7 (258–262)
Expanded part of pharynx	107	137.3 ± 6.8 (128–144)
Cardia length	7	8.3 ± 1.9 (7–11)
Anterior genital branch	106	95.5 ± 0.5 (95–96)
Posterior genital branch	117	110 ± 11 (99–121)
Vaginal depth	14	13.5 ± 0.5 (13–14)
Vulva from ant. end	632	622 ± 17 (599–641)
Prerectum length	95	94.3 ± 13 (76–104)
Rectum length	23	19.5 ± 2.5 (17–22)
Tail length	45	51.3 ± 6.2 (43–58)

Description

Body curved ventrad upon fixation, 1.0–1.15 mm long, Cuticle with fine transverse striations, more pronounced on tail, about 1 µm at anterior and mid-body, 1–2 µm on tail tip. Lateral chords 5–6 µm wide, one-fifth to one-fourth (21–24%) of mid-body diameter with distinct glandular bodies, about 39–51 in number; 5 in neck region but weakly developed, 16–20 from pharyngeal base to vulva, 22–29 from vulva to anal region and 1–2 in caudal region. Ventral body pores distinct, about 35–42 in number; 7–8 in neck region, 11–15 from pharyngeal base to vulva and 14–19 from vulva to anal region; dorsal and lateral body pores indistinct. Lip region cap-like, distinctly offset by constriction, 2.3 times as wide as high, or about two-sevenths to one-third (28–33%) of body diameter at neck base. Lips rounded, amalgamated; perioral disc distinct. Cheilostome a truncate cone with refractive walls and distinct cuticularized pieces near oral aperture. Amphids fovea cup-shaped, their aperture occupying

about 0.7 times lip region diameter, fusus slightly posterior to odontophore base. Guiding ring weakly developed, at 0.6 times lip region diameter from anterior end. Odontostyle slightly fusiform, slender with distinct lumen, four times as long as wide, or about 0.6 times as long as lip region diameter, its aperture occupying about one-fourth of its length. Odontophore with moderately developed basal flanges, 2.7–3.0 times as long as odontostyle. Nerve ring encircling anterior slender part of pharynx at 29–32% of neck length from anterior end. Pharyngeal expansion gradual; expanded part 8.2–12 times as long as wide, or about 5.1–6.7 times as long as body diameter at neck base, occupying about 47–56% of total neck length, enclosed in a thick spiral muscular sheath. Only dorsal pharyngeal gland and orifice visible: DO = 50.6–56.2; DN = 51.7–7.4; DO–DN = 1.2. Cardia elongate conoid, 1.2–2.0 times as long as wide, occupying about two-sevenths to one-half (28–51%) of corresponding body diameter.

Genital system amphidelphic, both genital branches almost equally developed. Ovaries reflexed, not reaching oviduct-uterus junction, measuring 35–40 µm (anterior), and 35–39 µm (posterior) long, with squamous shaped oocytes arranged in single row except near tip. Oviduct joining ovary subterminally, anterior 45–50 µm or 2.0 times and posterior 62–63 µm or 2.5–2.8 times as long as mid-body diameter, consisting of a slender part made of prismatic cells and wide pars dilatata with distinct lumen; oviduct-uterus junction marked by sphincter. Uterus simple tube, anterior 35–40 µm or 1.4–1.8 times and posterior 38–43 µm or 1.5–2.0 times as long as corresponding body diameter; sperms not observed. Vulva longitudinal. Vagina extending more than one-half (56–64%) as long as corresponding body diameter; pars proximalis vaginae longer than wide, 7–10 × 4–5 µm, with convex walls, pars refringens absent; pars distalis 3 µm with slightly rounded wall. Prerectum 4.8–6.4 and rectum 1.1–1.5 times as long as anal body diameter. Tail arcuate, elongate cylindrical with rounded terminus. Caudal pores three on each side.

Male

Not found.

Taxonomic remarks

In the presence of a perioral disc, elongate cylindrical tail and amphidelphic gonad, *Dorylaimellus cylindricaudatus* sp. nov. comes close to *D. afer* Andrássy, 1969, *D. globatus* Yeates, 1970 and *D. jonsoni* Jordaan & Heyns, 1984, but it differs from the former in having a longer and slender body (L= 1.0–1.15 vs 0.84–0.88 mm; a = 38–52 vs 31–33), a wider and comparatively weakly offset lip region (7.0 vs 5.5 µm wide, offset by deep constriction), a shorter odontostyle with narrower lumen (4 µm vs 5 µm long, with comparatively wider lumen), a shorter pharynx (b = 3.8–5.0 vs 3.3–3.5), a longer expanded part (46–56 vs 45% of total neck length), a posterior vulval position (V = 55–60 vs 52), in the tail shape (elongate cylindrical with broad rounded terminus vs quickly narrow like finger and curve slightly dorsally with finely rounded terminus) and differs in the absence of males (vs present).

From *D. globatus*, the new species differs mainly in the absence of globules in the anterior region of the expanded part of the pharynx (vs large and small sizes globules present in anterior portion of expanded part of pharynx), a shorter body (L = 1.0–1.15 vs 1.2–1.4 mm), a shorter odontostyle (4 µm vs 5–7 µm or 0.6 vs 0.7–0.8 times as long as lip region diameter), a slightly shorter odontophore (11–12 vs 12.5–13.0 µm), a shorter expanded part of the pharynx (46–56 vs 57–69% of total neck length), a shorter tail (43–58 vs 61–75 µm), and a very short hyaline part of the tail (1–2 µm vs 6.5–12 µm long).

From *D. jonsoni*, the new species differs in having a shorter tail (43–58 µm vs 59–84 µm long), a higher c and a lower c′-value (c = 19–26 vs 12–15 and c′ = 2.7–3.5 vs 3.6–5.1), a narrower lip region (about one-third vs one-half of body diameter at neck base), in the presence of well-developed perioral disc (vs weak), a shorter odontostyle (4.0 vs 4.8–7.4 µm or 0.6 times vs 0.8 times the lip region diameter), a larger expanded part of the pharynx (46–56 vs 43% of total neck length), in the tail shape (elongate cylindroid vs conoid with a more or less cylindroid distal portion) and in the absence of males (vs presence).

Dorylaimellus karnatakensis sp. nov.
urn:lsid:zoobank.org:act:32155AE3-FE8E-40FE–B67C-93FB53646399
Figs 10–11, Table 7

Diagnosis

Dorylaimellus karnatakensis sp. nov. is characterized by having a 1.2–1.3 mm long body; lip region rounded, offset with perioral disc, cuticularized pieces distinct; odontostyle slender, 5 µm long, odontophore 12–13 µm long with weakly developed basal flanges; expanded part of pharynx occupying about 45–53% of total neck length; female genital system amphidelphic; vulva at 48–52% of total body length; male with 22 µm long spicules; ventromedian supplements four, arranged in two groups, and tail elongate-conoid, dorsally convex, ending with a rounded terminus similar in both sexes.

Etymology

The new species is named after its type locality.

Material Examined

Holotype
INDIA • ♀; Karnataka State, Uttara Kannada district, Yellapur village; 14°58′12″ N, 74°43′12″ E; 10–15 cm deep; 28 Oct. 2018; roots of grasses (unidentified); slide reference number AMU/ZD/NC/*Dorylaimellus karnatakensis*/1.

Paratypes
INDIA • 2 ♀♀, 1 ♂; same collection data as for holotype; slide reference number AMU/ZD/NC/*Dorylaimellus karnatakensis*/2–4.

Type habitat and locality

Soil samples collected from around the roots of the grasses (unidentified) from village Yellapur, Uttara Kannada district, Karnataka State of India.

Description

Female
Body curved ventrad upon fixation, 1.2–1.3 mm long. Cuticle with distinct transverse striations, about 1 µm at anterior and mid-body, 2 µm on tail tip. Lateral chords 6–7 µm wide, about one-fourth to two-sevenths (25–28%) of body diameter at mid-body with distinct glandular bodies, about 43–46 in number; 4–12 in pharyngeal region weakly developed, 11–16 from pharyngeal base to vulva, 21–25 from vulva to anal region and 2 in caudal region. Body pores observed on ventral and dorsal side of body, about 61–74 on ventral side; 14–18 in pharyngeal region, 19–23 from pharyngeal base to vulva and 28–33 from vulva to anal region; about 59–61 on dorsal side; 16 in pharyngeal region, 17 from pharyngeal base to vulva, 26–61 from vulva to anal region. Lip region rounded, offset by constriction, 1.7–2.3 times as wide as high, or about one-third (30–33%) of body diameter at neck base. Lips amalgamated, inner lips elevated forming perioral disc. Cheilostome a truncate cone with refractive walls and distinct cuticularized pieces near oral aperture. Amphids fovea cup-shaped, their aperture occupying about 0.7 times as long as lip region diameter, fusus slightly posterior to level of odontophore base. Guiding ring weakly developed, at 0.7–0.9 times as long as lip region diameter from anterior end. Odontostyle weak, slender, about five times as long as wide, or about 0.7 times as long as lip region diameter, its aperture occupying about one-third of length. Odontophore with weakly developed basal flanges, 2.4–2.6 times as long as odontostyle. Nerve ring encircling anterior slender part of pharynx at 27–31% of neck length from anterior end. Pharyngeal expansion gradual; expanded part 7.5–12.2 times as long as wide, or

about 4.9–6.7 times longer than body diameter at neck base, occupying about 45–53% of total neck length, enclosed in thick dextrally spiral muscular sheath. Only dorsal pharyngeal gland and orifice visible: DO = 55.8–59.7; DN = 56.6–60.4; DO–DN = 0.8–1.1. Cardia elongate-conoid, 1.2–2.0 times as long as wide, occupying about one-third to one-half (31–54%) of corresponding body diameter.

Genital system amphidelphic, both branches almost equally developed. Ovaries reflexed, not reaching oviduct-uterus junction, measuring 34–61 µm (anterior), and 56–57 µm (posterior) long, with squamous shaped oocytes arranged in single row except near tip. Oviduct joining ovary subterminally, anterior 55–67 µm or 2.3–2.7 times and posterior 65–72 µm or 2.7–3.0 times as long as mid-body diameter, consisting of a slender part with prismatic cells and wide pars dilatata with distinct lumen; oviduct-uterus junction marked with sphincter. Uterus simple tube, anterior 43–45 µm or 1.8–1.9 times and posterior 40–48 µm or 1.7–2.0 times as long as corresponding body diameter; mostly containing oval-shaped sperm. Vulva longitudinal. Vagina extending inwards about one-half (50–54%) of corresponding body diameter; pars proximalis vaginae longer than wide, 8–10 × 4–5 µm, with convex walls surrounded by weakly circular muscles; pars refringens vaginae absent; pars distalis vaginae 2–3 µm with rounded walls. Prerectum 6.9–8.0 and rectum 1.3–1.6 times as long as anal body diameter. Tail elongate-conoid, dorsally convex, ending with bluntly rounded terminus. Caudal pores three on each side.

Male

Similar to female in general morphology, except for posterior region being more curved ventrally. Genital system diorchic, with oppositely outstretched testes. In addition to adcloacal pair, located at 4 µm from cloacal aperture, there are four ventromedian supplements, first supplement located at a distance of 46 µm from adcloacal pair, second at 4 µm from first, third at 23 µm from the second and fourth supplement at 10 µm from third ventromedian supplement; arranged in two groups. Copulatory muscles conspicuous, beginning from level of middle of spicules and continues till level of last supplements. Spicules stout, relatively broad in proximal half and strongly ventrally bent near middle, total length along arc 1.2 times as long as chord, 5.5 times maximum width or 1.3 times body diameter at cloacal aperture. Dorsal contour irregularly convex; ventral contour concave, with prominent hump, located at 32% of spicules total length from anterior end; head short with rounded end, occupying about 20.7% of spicule length; median piece simple, 17 times as long as wide and occupying about 25% of spicule maximum width; posterior end slightly less than 2 µm wide. Lateral guiding pieces absent. Prerectum 5.1 and rectum 1.2 times as long as cloacal body diameter. Tail arcuate-conoid with sharply rounded terminus. Caudal pores two on each side.

Taxonomic remarks

Dorylaimellus karnatakensis sp. nov. comes close to *D. discocephalus* Siddiqi, 1964, *D. vexator* Heyns, 1963, and *D. graminis* Kruger, 1965 in general morphology and measurements, but differs from the former in having a comparatively weak perioral disc (vs prominent), in the nature of the lip region (offset by weak constriction vs deeply constricted), of the odontophore (odontophore with weak flanges vs prominent flanged), longer prerectum (7–8 vs 6 times as long as anal body diameter), a longer tail (c = 28–32 vs 34–39), a differently shaped tail (elongate-conoid, dorsally convex, ending with sharply rounded terminus vs elongate-cylindroid with broadly rounded terminus) and in the presence of males (vs absent).

From *D. vexator* Heyns, 1963, the new species differs in having longer and slender body (L = 1.2–1.3 vs 0.8–0.9; a = 51–54 vs 36–44), a comparatively weak and slender odontostyle (vs well developed and relatively robust), a longer odontophore with weak basal flanges (2.4–2.6 vs 2.0 times odontostyle length with prominent basal flanges), a shorter pharynx (b = 4.5–5.2 vs 2.9–3.6), a longer prerectum (7–8 vs 6 times as long as anal body diameter), a differently shaped tail (vs dorsally convex, ventrally straight with bluntly rounded terminus) and in the presence of males (vs absent).

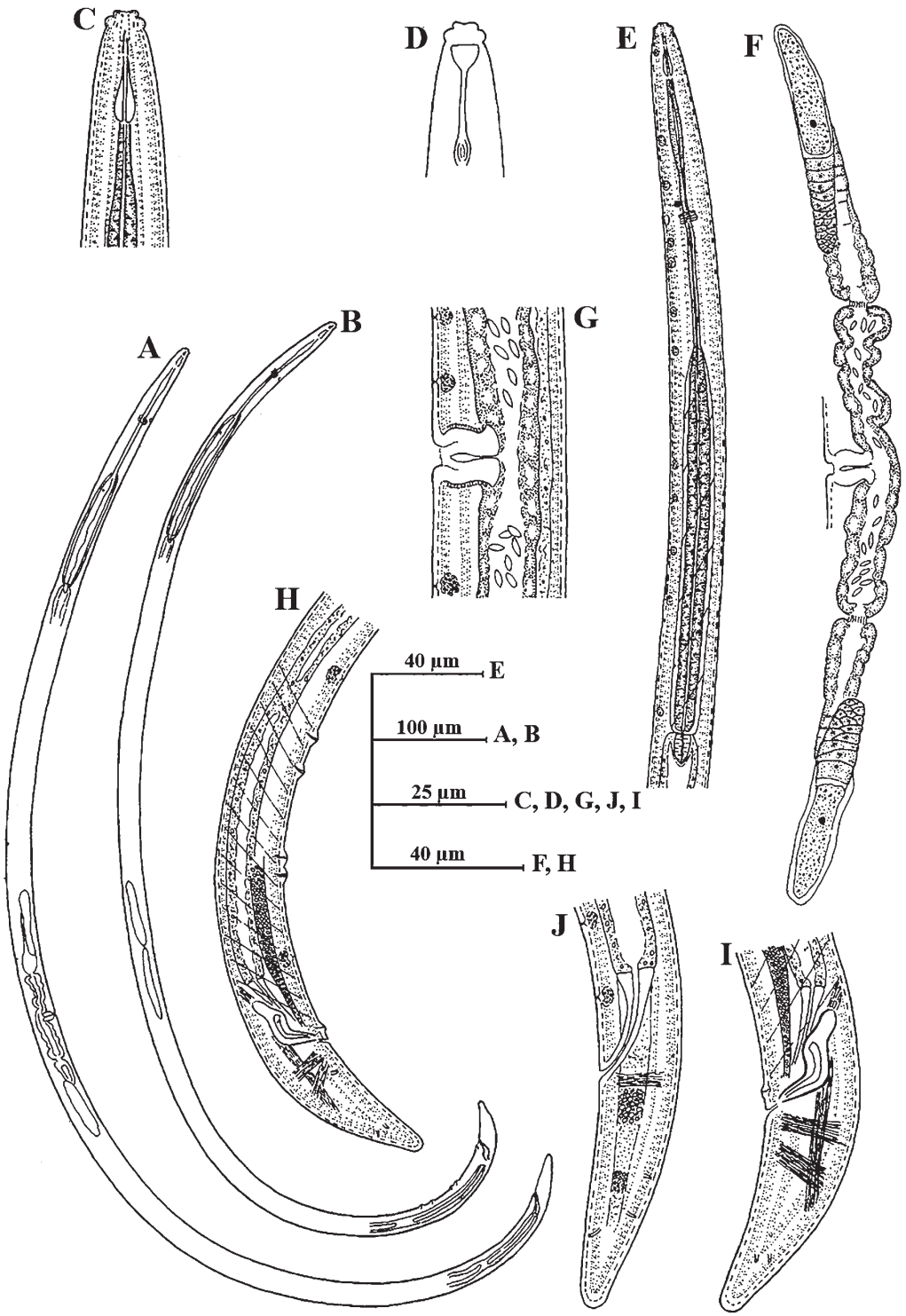

Fig. 10. *Dorylaimellus karnatakensis* sp. nov. **A, C–D**. Paratype 1,♀ (slide 2). E–G, J. Paratype 2, ♀ (slide 3). **B, H–I**. Paratype 4, ♂ (slide 4). **A**. Entire female. **B**. Entire male. **C**. Anterior region. **D**. Anterior end showing amphid. **E**. Neck region. **F**. Female genital system. **G**. Vulva region. **H**. Male posterior region showing ventromedian supplements. **I**. Male posterior end showing spicule. **J**. Female posterior end.

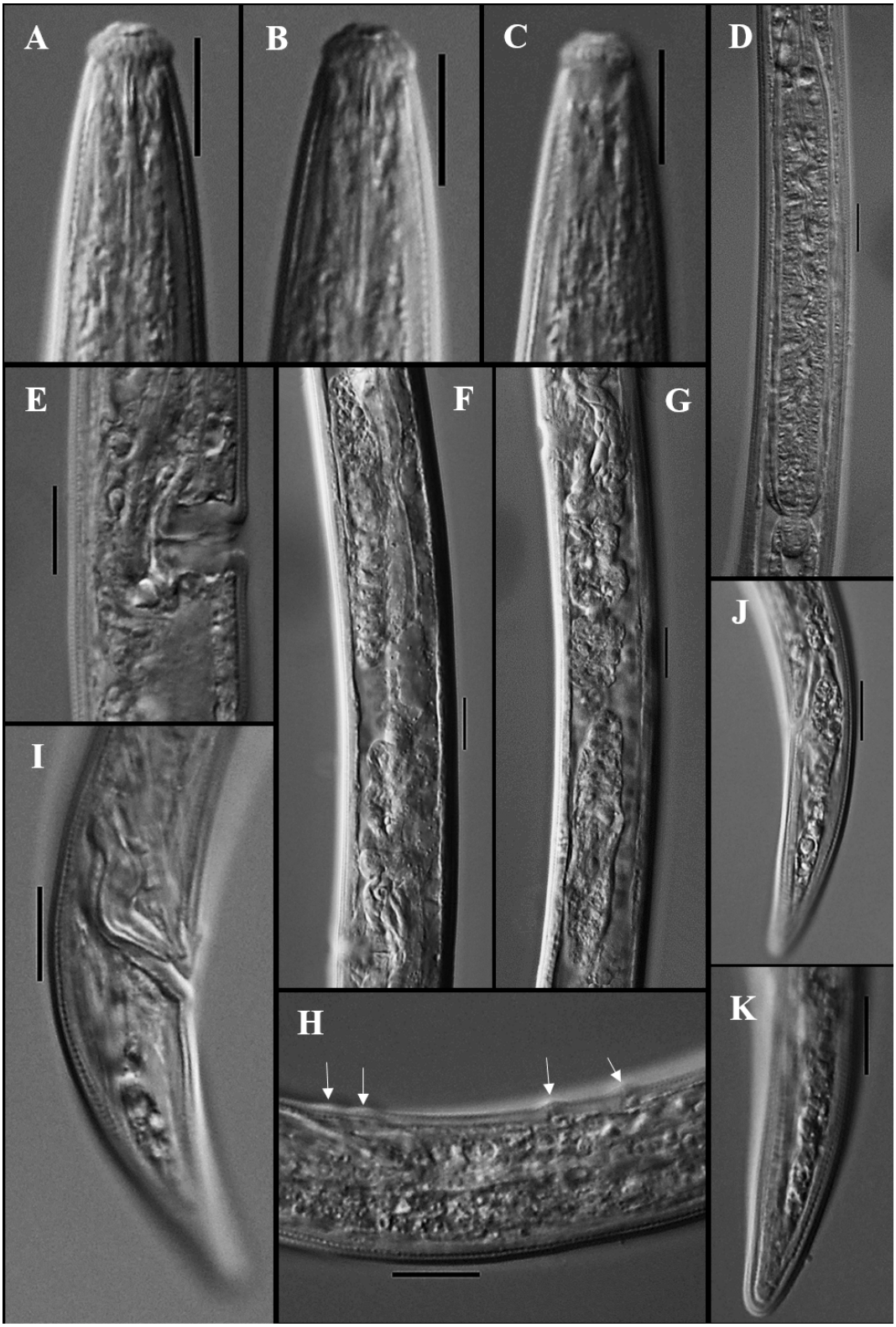

Fig. 11. *Dorylaimellus karnatakensis* sp. nov. (KM photographs). **A–C**. Paratype 1,♀ (slide 2). **D–G, J–K**. Paratype 2, ♀ (slide 3). **H–I**. Paratype 4, ♂ (slide 4). **A–B**. Anterior region. **C**. Amphid. **D**. Expanded part of pharynx. **E**. Vulva. **F–G**. Female genital branches. **H**. Ventromedian supplements. **I**. Male posterior end. **J–K**. Female posterior end. Scale bars: 10 µm.

Table 7. Morphometrics of *Dorylaimellus karnatakensis* sp. nov. All the measurements are in µm except L in mm.

Characters	Holotype female	Paratype females	Paratype male
n	1	2	1
L	1.2	1.26, 1.3	1.17
a	50.6	50.7, 53.9	58.8
b	4.6	4.5, 5.2	4.6
c	28.9	27.5, 32.3	31.8
c′	2.8	3.3, 3.1	2.2
V	48	51.2, 50	–
G1	9.4	10.4, 9.3	–
G2	10.6	9.0	–
Body diam. at pharynx base	22	22, 23	21
Body diam. at mid–body	24	25, 24	20
Body diam. at anus/cloaca	15	14, 13	17
Lip region diam.	7	7	7
Lip region height	4	3, 4	3
Amphid aperture	5	5	5
Odontostyle length	5	5	5
Odontophore length	12	13, 12	12
Guiding ring from ant. end	6	5	–
Nerve ring from ant. end	71	76	74
Neck length	263	283, 248	256
Expanded part of pharynx	140	147, 112	130
Cardia length	8	12, 7	6
Anterior genital branch	115	132, 120	–
Posterior genital branch	129	117	–
Vaginal depth	13	13, 12	–
Vulva from ant. end	585	653, 647	–
Prerectum length	120	110, 90	87
Rectum length	19	18, 21	21
Tail length	42	46, 40	37
Spicule length	–	–	21
Ventromedian supplements	–	–	4

From *D. graminis* Kruger, 1965, it differs in having a longer and slender body (L = 1.2–1.3 vs 0.88–0.9 mm; a = 51–54 vs 36–40), in the presence of body pores (vs not reported) and lateral glandular bodies (vs inconspicuous), a distinct perioral disc (vs indistinct), a shorter and slender odontostyle (5.0 µm vs 6.5 µm or almost equal to the lip region diameter, and robust comparatively thick walled), a slightly shorter pharynx (b = 4.5–5.2 vs 4.0–4.1), an anterior vulva position (V = 48–52 vs 54–56) and in the tail shape (vs dorsally convex, arcuate-conoid ending with sharply rounded terminus).

Dorylaimellus kasplateauensis sp. nov.
urn:lsid:zoobank.org:act:91F04E30–6908–4A27-B3B5-CFB9B6F09A86
Figs 12–13, Table 8

Diagnosis

Dorylaimellus kasplateauensis sp. nov. is characterized by having a 0.68–0.83 mm long body; lip region offset, inner lips elevated forming a perioral disc, sclerotized pieces distinct; odontostyle robust, 6–7 µm long, odontophore 11–14 µm long with weakly developed basal flanges; expanded part of the pharynx occupying about 38–43% of total neck length; female genital system amphidelphic; vulva longitudinal, located at 48–51% of total body length, and tail elongate conoid, ventrally arcuate, with rounded terminus.

Etymology

The new species is named after its type locality.

Material examined

Holotype

INDIA • 1 ♀; Maharashtra State, Satara district, Kas Plateau Reserve Forest; 17°43′12″ N, 73°49′22″ E; 10–15 cm deep; 13 Apr. 2016; roots of grasses (unidentified); slide reference number AMU/ZD/NC/*Dorylaimellus kasplateauensis*/1.

Paratypes

INDIA • 8 ♀♀; same collection data as for holotype; slide reference number AMU/ZD/NC/ *Dorylaimellus kasplateauensis*/2–4.

Type habitat and locality

Soil samples collected from around the roots of the grasses (unidentified) from Kas Plateau Reserve Forest of Satara district, Maharashtra State, India.

Description

Female

Body curved ventrad upon fixation, 0.68–0.83 mm long. Cuticle with fine transverse striations, more pronounced on tail region, about 1 µm at anterior and mid-body and about 2 µm on tail tip. Lateral chords 6–7 µm wide, about one-fourth to one-third (24–32%) of mid-body diameter with distinct glandular bodies, about 41–49 in number; 5–7 in pharyngeal region, 11–16 from pharyngeal base to vulva, 21–26 from vulva to anal region and 1–2 in caudal region. Ventral body pores distinct, 26–32 in number; 4–8 in neck region, 8–12 from pharyngeal base to vulva region and 13–15 in caudal region; lateral and dorsal body pores indistinct. Lip region cap-like, offset by constriction, 1.7–2.7 times as wide as high, or about one-third to two-fifths (31–40%) of body diameter at neck base. Lips rounded, inner lips elevated forming weak pseudo-perioral disc. Cheilostome a truncate cone with refractive walls and distinct cuticularized pieces near oral aperture. Amphids fovea stirrup-shaped, their aperture occupying about 0.6–0.7 times lip region diameter, fusus just opposite or slightly posterior to odontophore base. Guiding ring at 0.6–0.8 times lip region diameter from anterior end. Odontostyle robust, 6–7 times as long as wide, about 0.7–1.0 times as long as lip region diameter, aperture occupying about one-third of its length. Odontophore with weakly developed basal flanges, 1.6–2.3 times as long as odontostyle. Nerve ring encircling anterior slender part of pharynx at 36–42% of neck length from anterior end. Pharyngeal expansion abrupt; expanded part 4.2–6.3 times as long as wide, or about 2.4–3.5 times as long as body diameter at neck base, occupying about 38–43% of total neck length, enclosed in dextrally spiral muscular sheath. Only dorsal pharyngeal

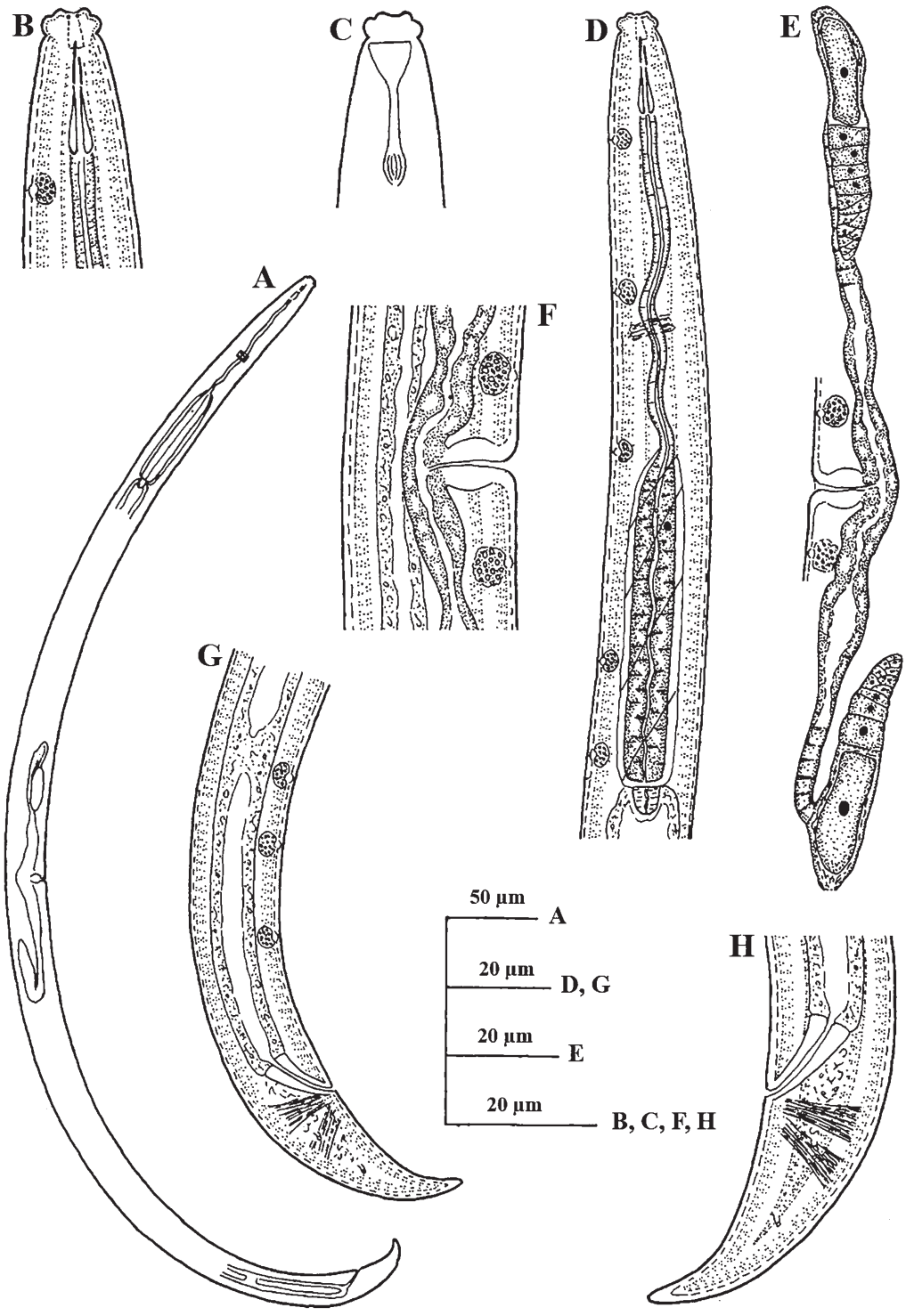

Fig. 12. *Dorylaimellus kasplateauensis* sp. nov. **A–C**. Paratype 1, ♀ (slide 1). **D, F**. Paratype 2, ♀ (slide 1). **E**. Paratype 3, ♀ (slide 2). **G–H**. Paratype 5, ♀ (slide 4). **A**. Entire female. **B**. Anterior region. **C**. Anterior end showing amphid. **D**. Neck region. **E**. Female genital system. **F**. Vulva region. **G–H**. Female posterior region.

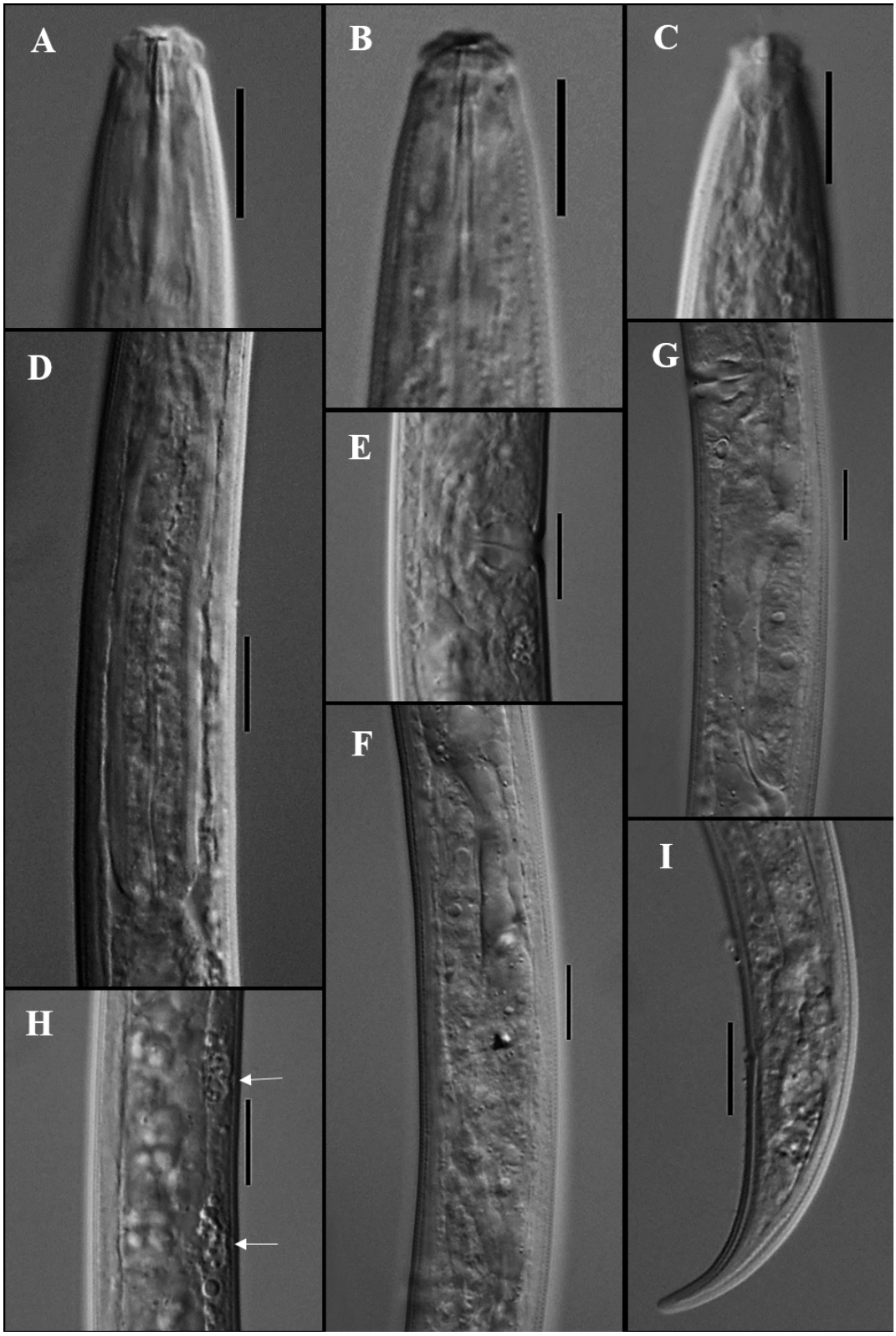

Fig. 13. *Dorylaimellus kasplateauensis* sp. nov. (LM photographs). **A–C**. Paratype 1, ♀ (slide 1). **D–E, H–I**. Paratype 2, ♀ (slide 1). **F–G**. Paratype 4, ♀ (slide 2). **A–B**. Anterior region. **C**. Anterior end showing amphid. **D.** Expanded part of pharynx. **E**. Vulva. **F**. Anterior genital branch. **G**. Posterior genital branch. **H**. Arrows indicating body pores. **I**. Female posterior end. Scale bars: A–I = 10 µm.

Table 8. Morphometrics of *Dorylaimellus kasplateauensis* sp. nov. All the measurements are in µm except L in mm, and in the form: mean ± SD (range).

Characters	Holotype female	Paratype females
n	1	8
L	0.8	0.77 ± 0.1 (0.68–0.83)
a	36.1	33.1 ± 2.2 (29.6–36.1)
b	5.1	5.3 ± 0.3 (4.8–5.8)
c	20.9	21.6 ± 2.0 (17.6–24.3)
c′	2.5	2.5 ± 0.3 (2.3–3.1)
V	48.3	50.3 ± 0.5 (49.2–50.9)
G1	9.4	9.6 ± 1.4 (7.5–11.3)
G2	10.1	9.0 ± 1.1 (8.0–10.6)
Body diam. at pharynx base	20	20.9 ± 0.6 (20–22)
Body diam. at mid–body	22	23.4 ± 1.0 (22–25)
Body diam. at anus/cloaca	15	14.3 ± 0.9 (13–15)
Lip region diam.	7	7.2 ± 0.4 (7–8)
Lip region height	3	3.4 ± 0.5 (3–4)
Amphid aperture	5	5
Odontostyle length	6	6.1 ± 0.3 (6–7)
Odontophore length	13	12 ± 1.0 (11–14)
Guiding ring from ant. end	5	5.2 ± 0.4 (5–6)
Nerve ring from ant. end	64	57.7 ± 2.5 (55–62)
Neck length	155	146.5 ± 10.3 (132–162)
Expanded part of pharynx	67	60.1 ± 5.8 (51–70)
Cardia length	5	5.8 ± 0.7 (5–7)
Anterior genital branch	75	73.7 ± 10.1 (60–85)
Posterior genital branch	80	70 ± 9.9 (56–85)
Vaginal depth	11	11.7 ± 0.4 (11–12)
Vulva from ant. end	384	395.4 ± 12.5 (382–418)
Prerectum length	70	56 ± 12.1 (42–75)
Rectum length	14	12.5 ± 2.2 (10–17)
Tail length	38	36 ± 3.7 (32–44)

gland nucleus and its orifice visible: DO = 62–66.5; DN = 63.5–67.3; DO–DN = 0.6–1.5. Cardia short, rounded conoid, 0.8–1.4 times as long as wide, occupying about one-fourth to one-third (24–35%) of corresponding body diameter.

Genital system amphidelphic, both genital branch almost equally developed. Ovaries reflexed, not reaching oviduct-uterus junction, measuring 31–46 µm (anterior) and 31–48 µm (posterior) long, with oocytes arranged in single row except near tip. Oviduct joining ovary subterminally, anterior 36–45 µm or 1.6–1.9 times and posterior 25–35 µm or 1.1–1.5 times as long as mid-body diameter, consisting of a slender part with prismatic cells and a slightly wider pars dilatata; oviduct-uterus junction marked with a weak sphincter. Uterus simple tube, anterior 21–33 µm or 0.9–1.5 times and posterior 21–23 µm or 0.9–1.0 times as long as corresponding body diameter; sperms not observed. Vulva longitudinal. Vagina extending inwards about one-half (46–55%) of corresponding body diameter; pars proximalis

vaginae longer than wide, 7–9 × 3 µm, with convex walls; pars refringens absent; pars distalis 2–3 µm with somewhat rounded walls. Prerectum 2.8–5.0 and rectum 0.7–1.3 times as long as anal body diameter. Tail elongate conoid, ventrally arcuate, with rounded terminus. Two caudal pores present on each side.

Male

Not found.

Taxonomic remarks

Dorylaimellus kasplateauensis sp. nov. comes close to *D. andrassyi* Heyns, 1963 in general morphology and measurements but differs in having a shorter body (L = 0.68–0.83 vs 0.87–2.3 mm), in the lip region morphology (lip region with weak perioral disc vs prominent perioral disc), in having a longer pharynx (b = 4.8–5.7 vs 5.7–12); and the absence of males (vs male present). It differs from the Kerala population of *D. andrassyi* (in the present paper), in having a shorter and robust body (L = 0.68–0.83 vs 1.0–1.2 mm; a = 30–36 vs 44–53), in the lip region morphology (inner lips elevated forming a weak perioral disc vs prominent perioral disc), the longer and robust odontostyle (6–7 vs 4–5 µm long and slender), the longer pharynx (b = 4.8–5.7 vs 6.7–9.0), the larger expanded part of the pharynx (38–43 vs 24–35% of total neck length), as well as in the longer tail (c = 18–24 vs 26–32) and absence of males (vs present).

In the tail shape, the new species also comes close to *D. basiri* Jairajpuri, 1965 but differs in having a shorter and robust body (L= 0.68–0.83 vs 1.2–1.5 mm; a= 30–36 vs 48–54), in the lip region morphology (inner lips elevated forming a weak perioral disc vs absent), the longer odontostyle (6–7 vs 5 µm), the shorter odontophore with weakly developed basal flanges (1.6–2.3 times vs broadly flanges, about four times as long as odontostyle), the longer pharynx (b = 4.8–5.7 vs 6.0–6.5), the shorter pharyngeal bulb (38–43% vs about one-half of total pharyngeal length), and the shorter prerectum (2.8–5.0 vs 7 times as long as anal body diameter).

Dorylaimellus tropicus sp. nov.

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Figs 14–15, Table 9

Diagnosis

Dorylaimellus tropicus sp. nov. is characterized by having a 0.6–0.7 mm long body; lip region rounded, offset with prominent perioral disc, cuticularized pieces distinct around oral opening; odontostyle 4–5 µm long, odontophore 8–10 µm long; hemizonid present at level of nerve ring; expanded part of pharynx 43–52% of neck length; female genital system amphidelphic; vulva post-equatorial (V = 52–56); prerectum 3.6–6.3 times as long as anal body diameter; tail elongate-filiform, sudden tapering ending with rounded tip.

Etymology

The new species is named *Dorylaimellus tropicus* because of its distribution in tropical rain forests.

Material examined

Holotype

INDIA • 1 ♀; Karnataka State, Shimoga district, Dummalli village; 13°55′53.65″ N, 75°34′4.48″ E; 10–15 cm deep; October 26, 2018; roots of grasses (unidentified); slide reference number AMU/ZD/NC/*Dorylaimellus tropicus*/1.

Paratypes

INDIA • 13 ♀♀; same collection data as for holotype; slide reference number AMU/ZD/NC/*Dorylaimellus tropicus*/2–9.

Type habitat and locality

Soil samples collected from around the roots of the grasses (unidentified) from village Dummalli, district Shimoga, Karnataka, India.

Description

Female

Body straight to slightly curved ventrad upon fixation, 0.6–0.71 mm long. Cuticle with distinct transverse striations, about 1 µm thick throughout length of body. Lateral chords 3–6 µm, about one-sixth to one-third (17–30%) of body diameter at mid-body, glandular bodies distinct in some specimens, about 29–35 in number; 7–9 in pharyngeal region, 7–11 from pharyngeal base to vulva, 13–14 from vulva to anal region and 2 in caudal region. Ventral body pores distinct, about 31–42 in number; 8–13 in pharyngeal region, 9–10 from pharyngeal base to vulva, 13–18 from vulva to anal region and 1–2 in caudal region; lateral and dorsal body pores indistinct. Hemizonid present at level of nerve ring. Lip region cap-like, offset by deep constriction, 1.8–2.0 times as wide as high, or about two-sevenths to two-fifths (28–38%) of body diameter at neck base. Lips amalgamated, perioral disc prominent. Cheilostome a truncate cone with refractive walls and distinct cuticularized pieces near oral aperture. Amphids fovea cup-shaped, their aperture occupying about 0.6–0.7 times lip region diameter, fusus almost at level of odontophore base. Guiding ring weakly developed, at 0.8–1.0 times lip region diameter from anterior end. Odontostyle 4–5 times as long as wide, or about 0.7–0.8 times lip region diameter, its aperture occupying about one-third of its length. Odontophore with weakly developed basal flanges, 1.8–2.5 times as long as odontostyle. Nerve ring encircling anterior slender part of pharynx at 30–37% of neck length from anterior end. Pharyngeal expansion abrupt; expanded part 7–11 times as long as wide, or about 4.1–5.8 times body diameter at neck base, occupying about 43–52% of total neck length, enclosed in a spiral muscular sheath. Only dorsal pharyngeal gland and orifice visible: DO = 53–60; DN = 55–62; DO–DN = 1.7–3.5. Cardia oblong, 1.0–1.5 times as long as wide, occupying about one-fourth to two-fifths (25–40%) of corresponding body diameter.

Genital system amphidelphic, anterior genital branch slightly longer than posterior. Ovaries reflexed, reaching oviduct-uterus junction, measuring 32–75 µm (anterior) and 32–55 µm (posterior) long with oocytes arranged in single row except near tip. Oviduct joining ovary subterminally, anterior 25–40 µm or 1.3–2.1 times and posterior 28–38 µm or 1.4–2.0 times as long as mid-body diameter, consisting of a long slender part with prismatic cells and a slightly wider pars dilatata; oviduct-uterus junction marked with sphincter. Uterus a small tube, anterior 12–25 µm or 0.6–1.2 times and posterior 11–19 µm or 0.6–1.0 times as long as corresponding body diameter; sperm not observed. Vulva longitudinal. Vagina extending inward about two-fifths to one-half (40–53%) of corresponding body diameter; pars proximalis vaginae longer than wide, 4–7 × 3–4 µm, with convex walls, pars refringens absent; pars distalis 2 µm. Prerectum 3.6–6.3 and rectum 1.0–1.5 times as long as anal body diameter. Tail suddenly tapering, elongate-filiform with finely rounded terminus. Caudal pores two on each side.

Male

Not found.

Taxonomic remarks

Dorylaimellus tropicus sp. nov. comes close to *Dorylaimellus vietnamensis* Ahmad & Sturhan, 2000; *D. afer* Andrássy, 1969; and *D. salimi* Siddiqi, 1966 but differs from the former in having a well-

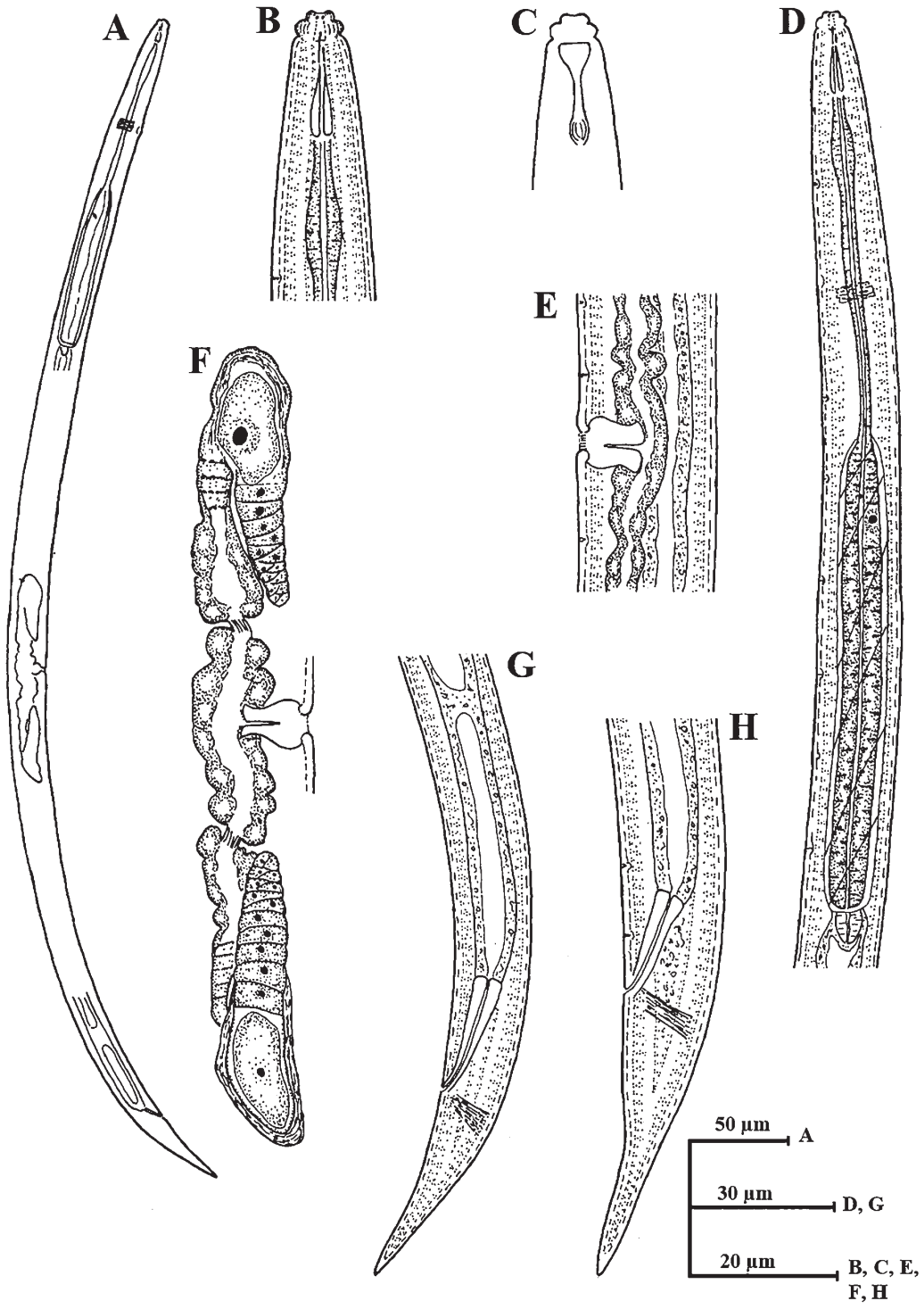

Fig. 14. *Dorylaimellus tropicus* sp. nov. **A–B, F**. Paratype 1, ♀ (slide 2). **C, E, G–H**. Paratype 3, ♀ (slide 4). **D**. Paratype 2, ♀ (slide 2). **A**. Entire. **B**. Anterior region. **C**. Anterior end showing amphid. **D.** Neck region. **E**. Vulva. **F**. Genital system. **G**. Posterior end showing prerectum. **H**. Female posterior end.

Fig. 15. *Dorylaimellus tropicus* sp. nov. (LM photographs). **A, D–E, G, I**. Paratype 1, ♀ (slide 2). **B–C, F, H**. Paratype 3, ♀ (slide 4). **A**. Anterior region, arrow indicating cuticularized pieces. **B**. Arrow indicating odontostyle. **C**. Anterior end showing amphid. **D**. Arrow indicating hemizonid. **E**. Expanded part of pharynx. **F**. Vulva. **G**. Female genital system. **H**. Tail. **I**. Hypodermal glandular bodies. Scale bars: A–I = 10 µm.

Table 9. Morphometrics of *Dorylaimellus tropicus* sp. nov. All the measurements are in µm except L in mm, and in the form: mean ±SD (range).

Characters	Holotype female	Paratype females
n	1	13
L	0.63	0.64 ± 0.1 (0.6–0.71)
a	33	34.2 ± 1.3 (32–36)
b	3.6	3.6 ± 0.2 (3.2–3.9)
c	14.6	15.7 ± 1.0 (13–17)
c′	3.9	3.4 ± 0.3 (3.1–4.3)
V	53	53.9 ± 1.2 (52–56)
G1	9.6	10 ± 2.0 (7.6–13.8)
G2	8.8	8.8 ± 1.0 (6.8–10.2)
Body diam. at pharynx base	18	18 ± 1.0 (16–20)
Body diam. at mid–body	19	19 ± 0.8 (17–20)
Body diam. at anus/cloaca	11	12.1 ± 0.7 (11–13)
Lip region diam.	6	5.9 ± 0.3 (5–6)
Lip region height	3	3
Amphid aperture	4	4
Odontostyle length	5	4.2 ± 0.4 (4–5)
Odontophore length	9	9.5 ± 0.6 (8–10)
Guiding ring from ant. end	5	5.1 ± 0.4 (5–6)
Nerve ring from ant. end	55	58.5 ± 1.9 (55–62)
Neck length	172	180.2 ± 5.0 (173–191)
Expanded part of pharynx	85	87.1 ± 5.3 (78–95)
Cardia length	6	5.4 ± 0.6 (5–7)
Anterior genital branch	60	65.8 ± 13.6 (47–89)
Posterior genital branch	55	56.7 ± 5.4 (48–65)
Vaginal depth	10	8.9 ± 0.6 (8–10)
Vulva from ant. end	329	350 ± 15.6 (315–382)
Prerectum length	47	59.1 ± 10.6 (41–76)
Rectum length	16	16.3 ± 1.7 (13–20)
Tail length	43	41.3 ± 2.4 (37–47)

developed hemizonid almost at the level of the nerve ring (vs hemizonid absent), a ventral body pore present (vs absent), a comparatively robust body (a = 32–36 vs 39–42), a narrower lip region (5–6 vs 7–8 µm), a shorter tail (c = 13–17 vs 10.5–12.2; c′ = 3.1–4.3 vs 4.5–5.3) and in the tail shape (sudden tapering, elongate-filiform ending with rounded tip vs gradual tapering, elongate-filiform ending with finely rounded tip).

From *D. afer* Andrássy, 1969, the new species differs in having a shorter body length (0.6–0.7 vs 0.88 mm); presence of a hemizonid (vs absent), in having a longer tail (c= 13–17 vs 20–22) and also in the tail shape (vs bends slightly ventrally first, then quickly narrows like a finger and curved slightly dorsally, ending with finely rounded terminus).

From *D. salimi* Siddiqi, 1966 the new species differs in having a comparatively shorter and robust body (L = 0.6–0.7 vs 0.7–0.8 mm; a= 32–36 vs 43–53), distinct hypodermal glandular bodies (vs obscured), an odontostyle comparatively robust with distinct lumen and aperture (vs slender with indistinct aperture), a longer odontophore (8–10 vs 7 µm), a longer pharynx (b = 3.2–3.9 vs 4.7), a longer expanded part (43–52 vs 40% of total neck length) and in the tail shape (sudden tapering to a elongate-filiform vs regularly tapering to a finely rounded terminus) and in the absence of male (vs present).

Discussion

The genus *Dorylaimellus* is one of the most heterogeneous group with a distinct variation in body size, shape of the lip region, presence or absence of the perioral disc, pharynx length, expanded part of the pharynx; type of the female gonad, shape of the vulva, tail shape and size. Jairajpuri & Ahmad (1980) divided this genus into nine subgenera (*Dorylaimellus, Prodorylaimellus*, *Mesodorylaimellus*, *Metadorylaimellus*, *Axodorylaimellus*, *Belondorylaimellus*, *Elongidorylaimellus*, *Filidorylaimellus* and *Clavidorylaimellus*), and placed 43 valid species in these subgenera. Siddiqi (1983) raised six of Jairajpuri & Ahmad′s subgenera (*Dorylaimellus*, *Mesodorylaimellus*, *Metadorylaimellus*, *Axodorylaimellus*, *Belondorylaimellus* and *Elongidorylaimellus*) to generic rank, and placed the remaining three subgenera in synonymy, he (loc. cit.) also proposed six further new genera (*Capitellus*, *Rashidanema*, *Ibadanus*, *Sindellus*, *Amazonema* and *Jamilius*) under the subfamily Dorylaimellinae Jairajpuri, 1964. Jordaan & Heyns (1984), although not completely satisfied with the proposal of Jairajpuri & Ahmad (1980) and Siddiqi (1983), still followed the Siddiqi′s plan and described two new species under the genus *Dorylaimellus* (*D. aferoides* and *D. meridionalis*) and a new species under *Elongidorylaimellus* (*E. jonsoni*). Jairajpuri & Ahmad (1992) did not accept the generic proposal of Siddiqi (1983), instead they retained the subgeneric grouping as proposed by Jairajpuri & Ahmad (1980), and also considered all the genera proposed by Siddiqi (1983) as subgenera under *Dorylaimellus*. Andrássy (2009) accepted the generic rank of four taxa (*Dorylaimellus* Cobb, 1913; *Axodorylaimellus* Jairajpuri & Ahmad, 1980; *Mesodorylaimellus* Jairajpuri & Ahmad, 1980; and *Ibadanus* Siddiqi, 1983) which differs in some distinguished morphological characters such as the presence or absence of the perioral disc, the size of the expanded part of the pharynx, the type of the female gonad, the shape of the vulva, (either transverse or longitudinal) and the size and shape the of tail. In other dorylaimid groups, some of these characters have not been considered important at generic level (e.g., gonad and tail shape in *Xiphinema* Cobb, 1913, female genital system and perioral disc in *Basirotyleptus* Jairajpuri, 1964); however in others, the perioral disc has been used as an important taxonomic character such as in *Discomyctus* Thorne, 1939, *Capilonchus* Siddiqi, 1982, etc. The perioral disc has been a very important diagnostic character of the subfamily Dorylaimellinae; however, the presence of this character seems to be uncertain in some species. The present paper on the genus *Dorylaimellus*, deals with those species that possess a perioral disc.

The genus *Dorylaimellus* is one of the most diversified and widespread dorylaimid taxa distributed all over the world and represented by a total of 67 species, out of which 27 have been reported so far from India. Interestingly, only one species (*Dorylaimellus muthi* Dhanam & Jairajpuri, 1998) has so far been recorded from the Western Ghats, a biodiversity hotspot. During the course of the present study, several populations of the genus *Dorylaimellus* were recorded which included nine new records, representing four known (*D. andrassyi*, *D. discocephalus*, *D. belondirelloides* and *D. chakpilus*) and five new species. With the addition of the presently described new species, the total number of valid species of this genus comes to 72. With the addition of the present data, the Indian fauna of the genus *Dorylaimellus* is now represents by 32 species, out of which 10 are represented from the Western Ghats itself.

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