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A NEW AND A KNOWN SPECIES OF TELOTYLENCHINAE (TYLENCHIDA: BELONOLAIMIDAE) FROM WEST BENGAL, INDIA

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INTRODUCTION

A few specimens of *Trophurus clavicaudatus* sp. n. and *Tylenchorhynchus mashhoodi* Siddiqi and Basir, 1959 were collected from soil around the roots of litchi (*Litchi chinensis* Sonn.) at South 24-Parganas district, West Bengal, India. Among 14 valid species of *Trophurus* Loof, 1956, as listed by Siddiqi (2000), only 4 species have been described and reported from India and other 10 species have been reported from Europe, Africa, North and South America. The different species of the genus were described from Maharastra (Suryawanshi, 1971), Mysore (Khan and Nanjappa, 1971), Punjab (Saha *et al.*, 1973) and from Madhya Pradesh (Ganguly and Khan, 1983) from the soil around the roots of cotton (*Gossypium herbaceum* L.), coconut plam (*Cocos mucifera* L.), apricot (*Prunus armeniaca* L.) and betel vine (*Piper betel* L.) respectively in India. Kleynhans and Cadet (1994) provided a dichotomous key to the species of *Trophurus* Loof, 1956. This is the first report of the genus from West Bengal, India. *Tylenchorhynchus mashhoodi* was described by Siddiqi and Basir (1959) from soil around the roots of sugarcane (*Saccharum officinarum* L.) from Southern India and this was the first record of the genus *Tylenchorhynchus* Cobb, 1913 in India. Baqri and Jairajpuri (1970) reported *T. mashhoodi* from cotton and other plants and from sugarcane from Uttar Pradesh and Andhra Pradesh respectively with a study of intra specific variation. Singh and Khera (1978) reported the species from Narendrapur, Baruipur block, South 24-Parganas and from Howrah district, West Bengal. Chaturvedi and Khera (1979) recorded it as a parasite of jute plant from different district of West Bengal. Ahmad and Baqri (1987), Baqri (1991) reported the species from soil around the roots of paddy (*Oryza sativa)* at Burdwan district, West Bengal and from citrus (*Citrus reticulate)* in Skkim respectively. These prove the wide distribution of the species in West Bengal as well as in India.

MATERIALS AND METHODS

The collected soil samples were processed by Cobb's sieving and decantation technique (Cobb, 1918) followed by modified Baermann funnel technique (Christie and Perry, 1951) for extraction of nematodes. The nematode specimens were fixed and preserved in their characteristic body posture in warm FA (formalin-acetic acid 4:1) solution and were mounted in anhydrous glycerin, sealed by paraffin wax. Specimens were observed under an Olympus BX-41 trinocular microscope and were measured and photographed. Figures were drawn with the aid of a drawing tube attached to the microscope.

SYSTEMATIC ACCOUNT

Order	TYLENCHIDA Thorne, 1949
Suborder	TYLENCHINA Thorne, 1949
Super family	TYLENCHOIDEA örley, 1880
Family	BELONOLAIMIDAE Whitehead, 1960
Subfamily	TELOTYLENCHINAE Siddiqi, 1960

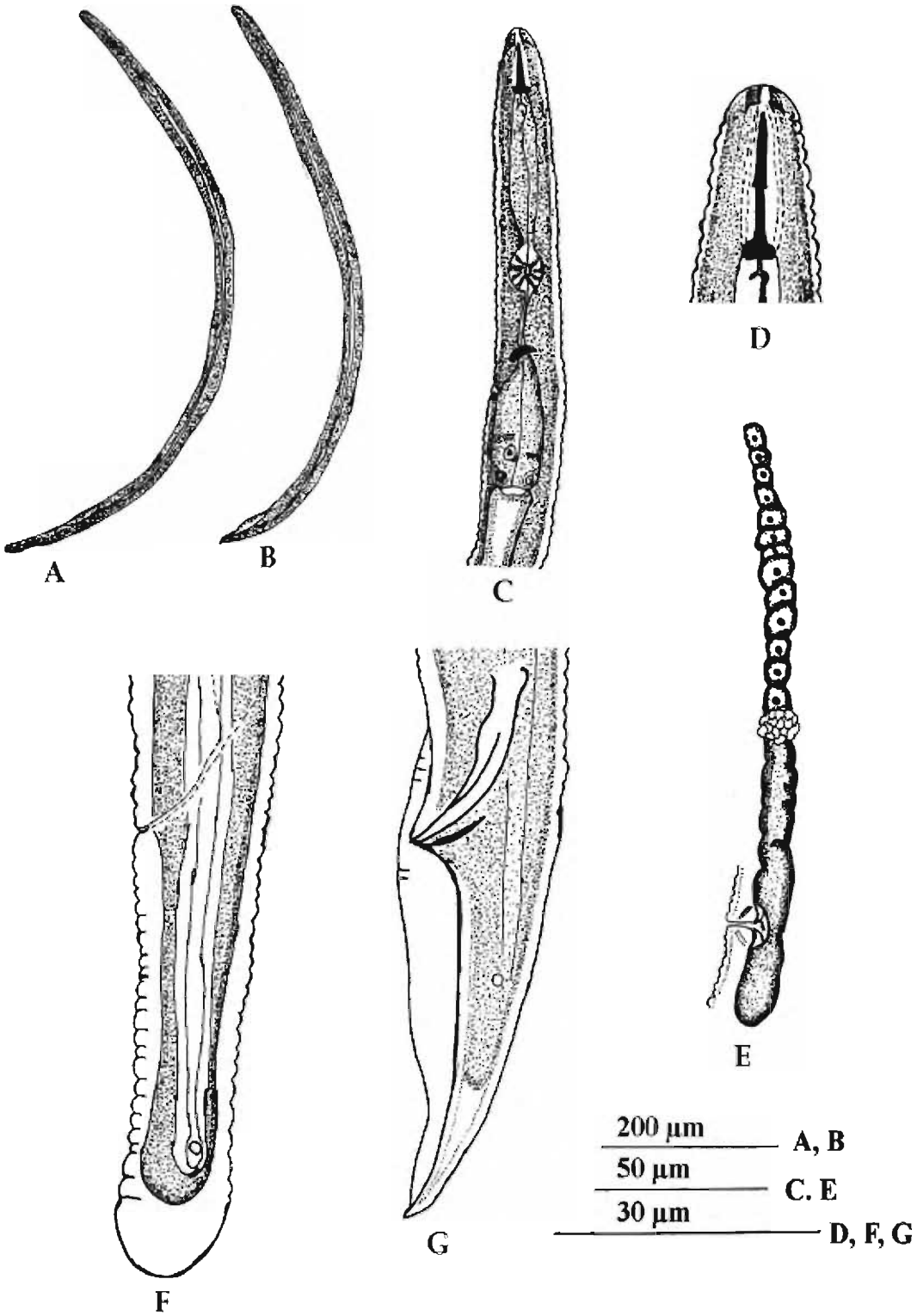

Figure 1. *Trophurus clavicaudatus* **sp. n. Female :** A. Entire body, C. Anterior portion of body, D. Stomatostylet & cephalic region, E. Mono-prodelphic reproductive system with posterior uterine sac, F. Tail. Male: B. Entire body, G. Posterior end shwing spicule, gubernaculum & bursa.

Genus *Trophurus* Loof, 1956

1. ***Trophurus clavicaudatus*** sp. n.

Genus *Tylenchorhynchus* Cobb, 1913

2. ***Tylenchorhynchus mashhoodi*** Siddiqi and Basir, 1959

DESCRIPTION

1. *Trophurus clavicaudatus* sp. n.
(Figures 1 and 2)

Measurements : Shown in Table 1. The measurements given hereafter are based on holotype. Minimum-maximum ranges of measurements of paratypes are given in parenthesis.

Females : Body ventrally curved upon fixation. Cuticle finely striated. Lateral fields with four incisures, occupying about one-fourth of body width at mid body. Cephalic region continuous with body, rounded, measuring 3.0µm (2.5 - 3.0µm) high and 8.0µm (7.0 - 8.0µm) wide, smooth, lip annules not prominent, labial disc indistinct. Cephalic framework weakly sclerotized. Stomatostylet 2.1 (2.1–2.6) lip region-widths long, stylet knobs rounded, measuring 5.0µm across. Opening of dorsal pharyngeal gland 2.0µm behind the stylet base. Median bulb oval with a conspicuous vulvular apparatus, situated slightly posterior to middle of the pharynx. Basal bulb elongate, pyriform. cardia small, broadly rounded. Excretory pore 103.0µm (103.0–110.0µm) from anterior end, 12 annules (10–12 annules) anterior from the base of basal bulb. Nerve ring 96.0µm (91.0–96.0µm) from anterior end, 3 annules anterior to excretory pore. Hemizonid indistinct. Vulva post-equatorial in position. Vagina extending inward half of the body diameter. Reproductive system mono-prodelphic, anterior branch of gonad functional, anterior ovary outstretched, spermatheca rounded. Posterior gonad in the form of a small post-uterine sac, 1.1 (1.1–1.2) vulval body-widths long. Phasmids situated at the posterior half of tail, 19 annules (19–22 annules) posterior to anal opening. Tail sub-clavate with terminal swelling, number of tail annules 24 (24–25), 3.0 (3.0–3.9) anal body-diameters long. Cuticle on tail terminus abruptly thick, 8.5µm (7.5–8.5µm) with a prominent hyaline portion. Tail terminus smooth, broadly rounded and clavate.

Males : Similar to females in general morphology except the following. Tail gradually tapering to a pointed terminus in lateral view, 2.4–2.9 anal body-diameters long. Phasmids slightly anterior to the middle of tail. Testes outstretched. Spicules 1.3–1.6 anal body-diameters long. Gubernaculum developed, 1/2.3–1/2.8 of spicule length. Bursa 3.4–3.8 anal body-widths long, completely enveloping tail

Type habitat and locality : Collected from soil around the roots of litchi at South Kalyanpur, Baruipur block, South 24-parganas on 13. 12. 2004.

Type specimens : Holotype registration No. WN 1051 with one female and two male paratypes on same slide. Paratype registration No. WN 1052 (2 ♂). Deposited in National Zoological Collection, Zoological Survey of India, Kolkata, India.

Etymology : The new species has been named after its characteristic tail shape.

Diagnosis and Relationship: Trophurus clavicaudatus sp. n. is characterized by its club-shaped tail. It comes close to *T. similis* Khan and Nanjappa, 1971, *T. lomus* Saha, Chawla & Khan, 1973 and *T. impar* Ganguly and Khan, 1983. The new species differs from its all closely resembling species in having a clavate tail. From *T. similis*, the present new species differs in having lesser *'a'* and *'c'* values, longer spear and tail, more anteriorly located vulva and longer post-uterine sac. The males also differ in having longer spicules (in *T. similis*, *a* = 40.0–58.0; *c* = 18.0–25.0; spear = 9.0–11.0µm; tail = 36.0m; V = 53.0–64.0%; post-uterine sac = 1/2 vulval body width in females; spicules = 16.0–21.0µm in males). From *T. lomus* it differs in having longer tail evident from lesser *'c'* value, greater *'c'* value, anteriorly located vulva and longer post-uterine sac. The males differs in having slightly longer spicules (in *T. lomus*, *c* = 20.0–30.0; *c'* = 1.2–1.8; V = 53.0–60.0%; post-uterine sac = 1/2 vulval body width long; spicules = 20.0–22.0µm). *T. clavicaudatus* sp. n. differs from *T. impar* in having a shorter body, much lesser value of *'a'* and *'c'* ', longer tail evident from *'c'* value, longer spear and cardia without bifurcation (In *T. impar*, L = 0.80–0.93mm; a = 52.0–58.0; *c'* = 1.8–2.2; c = 30.0–40.0; spear = 12.0–14.0µm and cardia with bifurcate base).

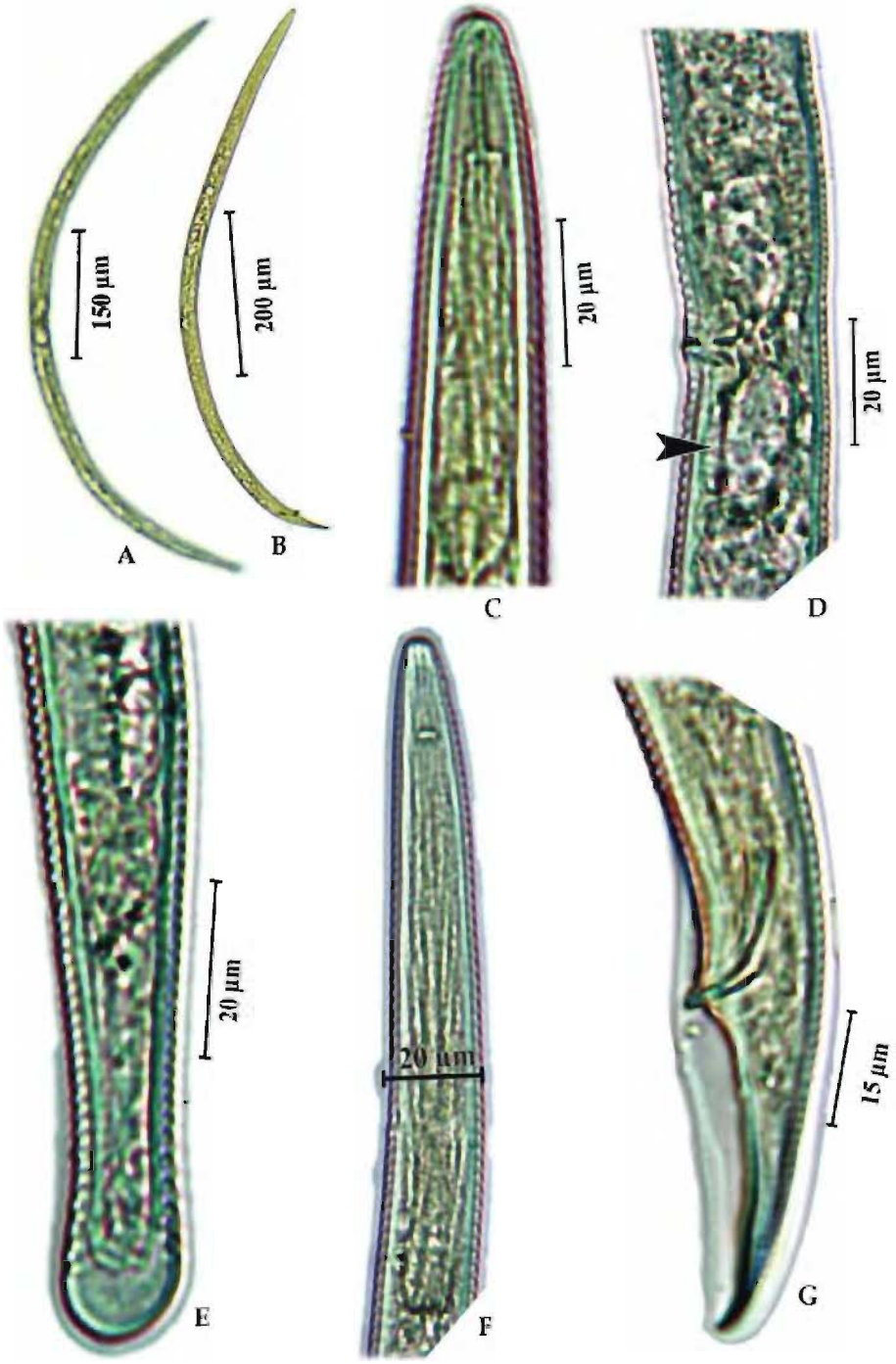

Figure 2. Photomicrographs of *Trophurus clavicaudatus* sp. n. Female: A. Entire body, C. Anterior end, D. Vulva & posterior uterine sac, E. Posterior body end showing tail. **Male: B.** Entire body, F. Anterior end, G. Posterior end showing spicules & bursa.

Table 1. Morphometric data on ***Trophurus clavicaudatus*** sp. n. (All measurements are in µm except L and body ratios, L in mm. As only one paratype female was available, minimum-maximum range, mean, SD & SE calculated on the basis of male paratypes. Number of paratypes examined given in the parenthesis)

Characters	Holotype female	Female Paratype(1)	Male paratypes (4)				
			Min	Max	Mean	± SD	SE
L	0.79	0.74	0.66	0.72	0.7	0.02	0.01
a	32.6	33.6	27.3	32.9	30.4	2.85	1.42
b	5.9	5.5	5.2	5.7	5.5	0.19	0.09
c	15.5	12.5	14.4	16.7	15.5	1.15	0.57
c'	3.0	3.9	2.5	2.9	2.7	0.2	0.1
V % ♀ / T% ♂	51.5	55.3	31.4	36.3	33.5	2.04	1.02
G1%	20.5	20.5	--	--	--	--	--
G2 %	3.0	3.6	--	--	--	--	--
Lip region height	3.0	3.0	2.0	4.0	3.0	0.93	0.47
Lip region width	7.5	6.5	5.5	6.0	5.7	0	0
Length of stomatostylet	17.0	17.5	14.5	15.5	15.0	0.49	0.24
Stylet knobs (across)	5.0	5.0	3.0	4.0	3.5	0.49	0.24
Length of conus	8.0	8.5	6.5	7.0	6.7	0.2	0.1
m %	47.0	50.0	46.6	47.6	47.0	0.49	0.24
Stylet base to opening of dorsal gland	2.0	2.0	--	--	--	--	--
O %	11.7	11.3	--	--	--	--	--
Maximum body width	24.5	22.0	22.0	24.5	23.0	1.44	0.72
Body width at vulva	22.0	22.0	--	--	--	--	--
Length of vagina	11.5	11.0	--	--	--	--	--
Pharyngeal length	135.0	135.0	117.5	137.0	128.0	8.71	4.36
Anterior end to nerve ring	96.0	91.0	71.5	90.0	82.0	9.6	5.54
Anterior end to excretory pore	103.0	110.0	98.0	100.5	99.6	1.44	0.83
Length of anterior gonad	164.0	149.5	--	--	--	--	--
Length of posterior uterine sac	24.5	27.0	--	--	--	--	--
Anterior end to vulva	412.0	409.0	--	--	--	--	--
Tail length	51.5	59.0	42.0	49.0	45.0	3.03	1.51
Anal body width	17.0	15.0	15.0	17.0	16.5	1	0.5
Length of hyaline portion on tail	8.5	7.0	--	--	--	--	--
Number of tail annules	24	25	--	--	--	--	--
Testis length	--	--	220.5	255.0	235.9	15.67	7.83
Length of Spicules	--	--	22.5	24.5	23.5	0.82	0.4
Length of bursa	--	--	58.0	65.5	61.0	3.57	1.78
Length of gubernaculum	--	--	7.5	10	8.8	0.8	0.4

Apart from these, *T. clavicaudatus* sp. n. shows remarkable resemblance with *T. minnesotensis* (Caveness, 1958) Caveness, 1958 in different body measurements and ratios. Even of those similarities, the new species differs from *T. minnesotensis* in having significantly lesser '*c*' value in both female and male, clavate tail in female, anteriorly placed vulva, longer post-uterine sac and spear (in *T. minnesotensis*, *c* = 18 in female and 35 in male; tail broadly rounded in female; V = 58%; post-uterine sac 2 or 3 rudimentary terminal cells and spear = 14.0µm).

2. ***Tylenchorhynchus mashhoodi*** Siddiqi and Basir, 1959
(Figure 3)

Measurements:

Females (n = 3): L = 0.55 - 0.56mm; *a* = 28.1 - 28.5; *b* = 4.6–4.7; *c* = 12.8–13.0; *c'* = 3.9; V = 57.1 - 57.7%; G_1 = 15.0–23.5%; G_2 = 13–21%; stylet length = 19.5–20.5µm; m = 52.0–55.0%; O = 14.0–22.5%; anterior end to centre of median bulb = 60.5–61.5µm, MB = 50.8–52.0%; maximum body width = 19.5µm, length of pharynx = 118.5–119.5µm; body width at vulva = 15.5–17.5µm; distance of vulva from anterior end = 315.5–323.5µm; length of vagina = 6.5–8.0µm; length of anterior branch of gonad = 83.0–132.0µm; length of posterior branch of gonad = 71.5–116.5µm; tail length = 43.0µm; anal body diameter = 10.5µm.

Males (n = 2): L = 0.58–0.66mm; *a* = 28.0–29.6; *b* = 4.6–4.9; *c* = 15.7–17.4; *c'* = 2.3; T = 25.5–55.4%; stylet length = 19.5–18.5µm; m = 50.0–52.6%; O = 15.7–17.5%; anterior end to centre of median bulb = 64.5–76.5µm; MB = 51.0–56.5%; maximum body width = 21.0–22.5µm, length of pharynx = 127.0–135.0µm; tail length = 37.0–38.0µm; anal body diameter = 15.5–16.5µm.; length of testis = 309.0–369.5µm; spicule length = 20.5–23.5µm; gubernaculum = 9.5–10.5µm; length of bursa = 57.0–64.0µm.

DESCRIPTION

Females : Body ventrally curved on fixation. Body striae coarse, cuticle marked with distinct transverse striations, 1.0–2.5µm apart. Lateral field one-third of body width, with four incisures.

Lip region continuous with body, rounded, bearing 3–4 fine and distinct annules, measuring 3.0–4.0µm high and 5.5–6.5µm wide. Cephalic frame work lightly sclerotized. Stomatostylet 2.8–3.4 lip region widths long, stylet knobs small, closely packed together, rounded or directed downward slightly, measuring 3.0µm across. Opening of dorsal pharyngeal gland 3.0–4.5µm behind the stylet base. Median oesophageal bulb muscular, set off from precorpus with vulvular apparatus, round to oval in shape. Centre of median bulb 60.5–62.0µm from anterior end. Basal oesophageal bulb pyriform, 23.5–24.5µm long, with basal portion slightly overlapping the anterior most end of intestine. Cardia small, rounded. Nerve ring at 70.5–84.0µm from anterior end. Excretory pore slightly posterior to nerve ring, 80.0–97.0µm from anterior end or 6–13 annules from the end of median bulb. Hemizonid indistinct. Vulva a transverse slit, post equatorial in position. Length of vagina about one-third of the vulval body-diameter. Reproductive system amphidelphic, ovaries out stretched, oocytes arranged in a single row. Tail cylindrical, slightly ventrally arcuate, regularly tapering, marked with 16–21 annules ventrally, 3.9 anal body-diameters long. Tail terminus rounded and smooth. Phasmids in the anterior half of tail, 5–7 annules apart from anal opening or at 22.5–34.0% of tail from anus.

Males : Similar to females in general morphology except the following. Tail conoid with acute terminus in lateral view, 2.2–2.3 anal body-diameters long. Testis single, outstretched. Spicules cephalated, 1.3–1.4 anal body-widths long. Gubernaculum short, about half of the spicule length. Copulatory bursa large with crenate margins, completely enveloping tail.

Remarks : The present specimens conform well to the type specimens and all other reported specimens of *Tylenchorhynchus mashhoodi* Siddiqi and Basir, 1959 from different parts of India.

Habitat and locality : Collected from soil around the roots of litchi at South Kalyanpur of Baruipur block, South 24-parganas on 13. 12. 2004.

SUMMARY

A few specimens of *Trophurus clavicaudatus* sp. n. and *Tylenchorhynchus mashhoodi* Siddiqi and Basir, 1959 were collected from soil around the roots of litchi at South 24-Parganas district, West Bengal, India. The new species has been characterized by its club-shaped tail and can be differentiated from other species of the genus. It comes closer to *T. similis* Khan and Nanjappa, 1971,

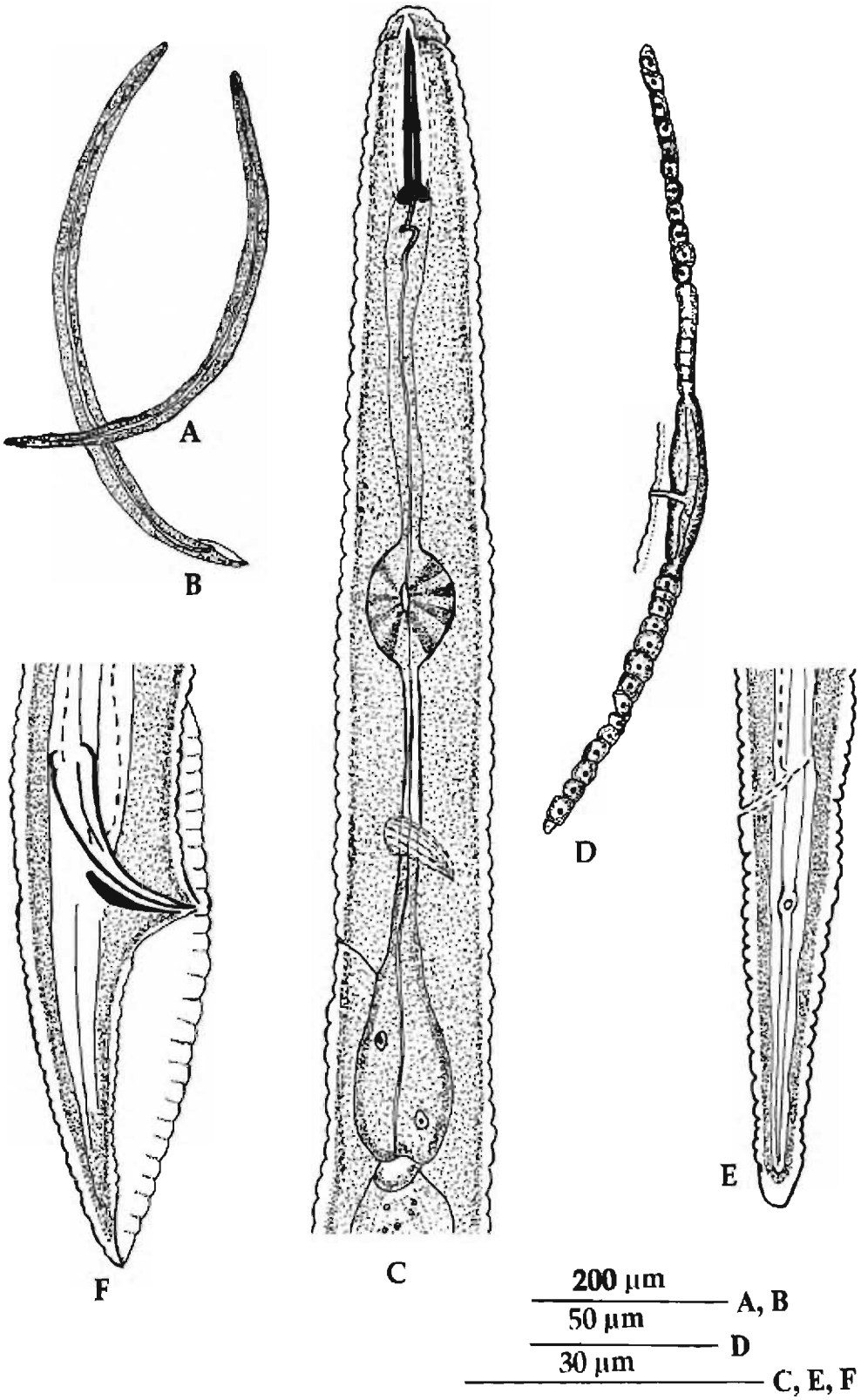

Figure 3. ***Tylenchorhynchus mashhoodi.*** **Female: A.** Entire body, C. Anterior portion of body, D. Reproductive system, E. Posterior end showing phasmid & tail. **Male: B.** Entire body, F. Posterior end showing spicule, bursa, gubernaculum & tail.

T. lomus Saha, Chawla & Khan, 1973 and *T. impar* Ganguly and Khan, 1983 among the species described from India. Apart from these, *T. clavicaudatus* sp. n. also shows remarkable resemblance with *T. minnesotensis* (Caveness, 1958) Caveness, 1958 described from outside India having clear differences in body ratios and measurements. This is the first report of the genus *Trophurus* from the West Bengal, India. The present specimens of *Tylenchorhynchus mashhoodi* conform well to the earlier reports. *T. mashhoodi* is widely distributed in West Bengal as well as in India.

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