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REDESCRIPTION OF *TYLENCHORHYNCHUS (BITYLENCHUS) PARVUS* ALLEN, 1955 WITH SEM OBSERVATIONS

by
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Summary. *Tylenchorhynchus (Bitylenchus) parvus* is redescribed and illustrated with comparative details and measurements of females and males from Gulmarg, Srinagar, India; USA; Canada and Japan. This species is characterized in having a slightly setoff lip region with 6-8 annules, lateral fields each with four incisures, outer bands areolated; stylet relatively thin with rounded basal knobs sloping backwards; cylindrical tail with annulated tip; postanal intestinal sac filling most of the tail portion with intestinal granules and fasciculi. The relationship of *T. parvus* to closely related species is discussed.

Nematodes collected from Gulmarg, Srinagar, India by the senior author were studied and compared with specimens identified as *Tylenchorhynchus (Bitylenchus) parvus* Allen, 1955 in the Nematode Collection at Rothamsted Experimental Station, Harpenden, England. The original description of *T. parvus* by Allen, 1955 is however, based on a few specimens with insufficient information on morphological characters and only a few illustrations. Hence a redescription of *T. parvus* with morphological details supplemented with SEM micrographs and intraspecific variability is presented here.

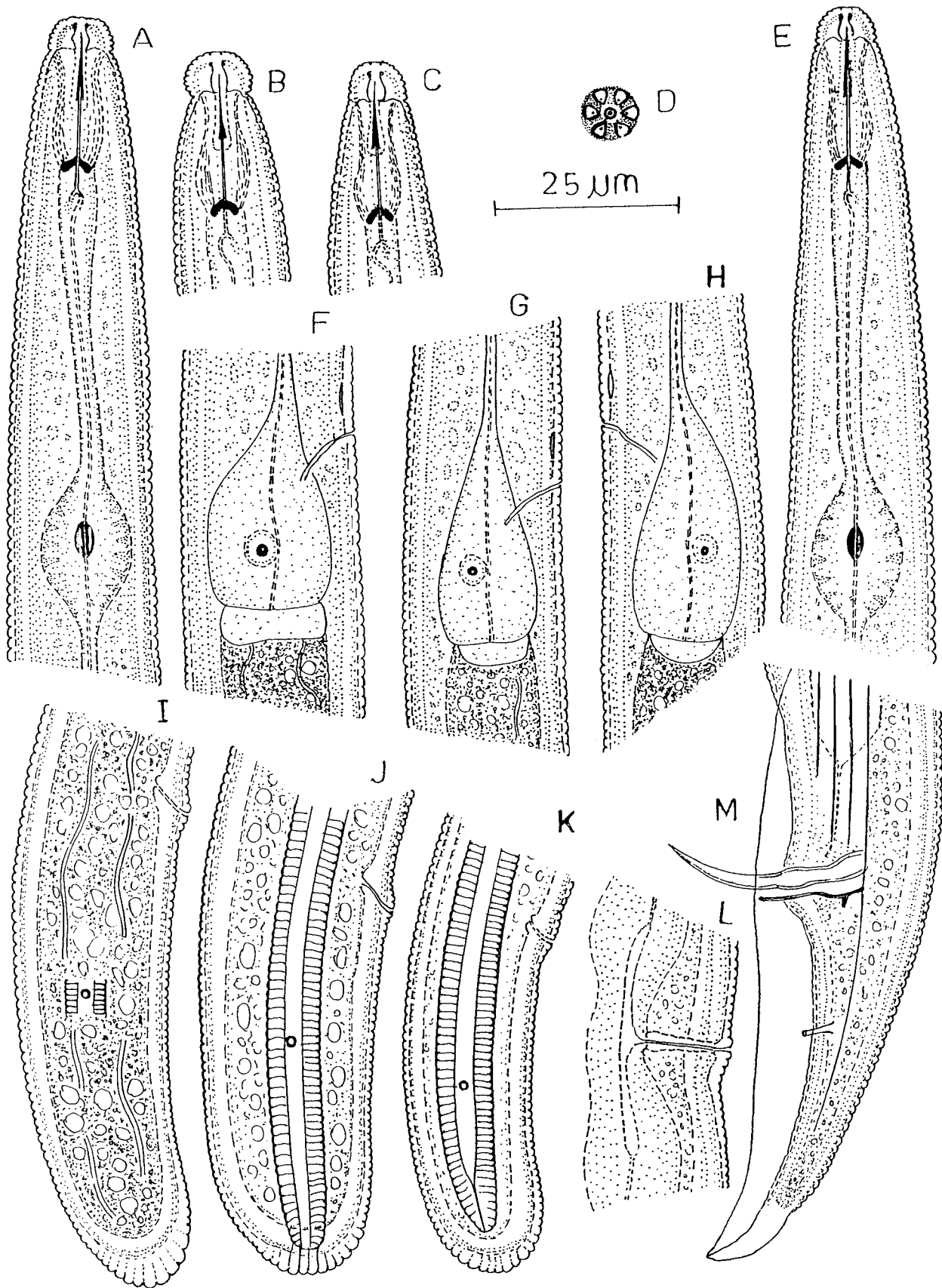
Specimens collected in India were killed by gentle heat, fixed in 4% formalin and processed to anhydrous glycerin; specimens from Canada and Japan mounted in glycerin were made available in Dr. David Hooper's laboratory. For scanning electron micrographs, specimens killed and fixed in 4% formalin were dehydrated in a graded series of ethanol, critical point dried from liquid CO₂, sputter-coated with a 20-30 µm layer of gold palladium and examined with Hitachi microscope at Rothamsted Experimental Station, Harpenden.

***TYLENCHORHYNCHUS PARVUS* Allen, 1955**
Syn. *Bitylenchus parvus* (Allen, 1955) Siddiqi, 1986
(Figs. 1 and 2; Tables I and II)

Female body cylindrical, assuming various postures from almost straight to closed C-shape when relaxed by gentle heat. Transverse striae distinct, 1.2-1.3 µm apart in various body regions. Lateral fields originating in precorpus region, each bearing two incisures, becoming four in

isthmus region and terminating at posterior end of body, about 1/3 of body diameter in width, outer bands areolated. Cephalic region hemispherical, set off by a slight constriction of the body, bearing 6-8 annules. Scanning electron micrographs (Fig. 2) show a minute rounded oral opening surrounded by six oval shaped raised areas (papillae) on a four lobed oral disk, amphid apertures rounded at the depressed lateral sides of oral disk, and lip annules form six ridges of raised areas around the oral disk. Stylet attenuated, 16.5-19.5 (18) µm long, with tubular conus tip and rounded basal knobs sloping backwards. Orifice of dorsal oesophageal gland 2.5-3.5 (3) µm posterior to base of stylet. Median bulb well developed, not offset from precorpus by constriction. Isthmus long and narrow, encircled by the nerve ring at 62-108 µm from anterior end of body. Escretory pore is located 82-120 µm from anterior end of body, between the nerve ring and anterior margin of basal oesophageal bulb. Basal bulb small, pyriform. Oesophago-intestinal valve large. Post-anal intestinal sac large, filling more than half of tail cavity with intestinal granules and fasciculi. Vulva a trasverse slit, sometimes raised, located middle of body, lips not modified. Ovaries outstretched, oocytes in a single row, numbering 10-15. Spermatheca round, axial, filled with sperms. Vagina straight, about a third of corresponding body width long. Tail cylindrical, 43.5-63.4 µm long, tail tip annulated, annules range 42-58 in different geographical populations, cuticle thickened at the terminus. Phasmids prominent, opening anterior to middle of tail.

Male similar to female in general body structure. Testis single, outstretched. Tail completely enveloped by bursa. Spicules distally flanged, gubernaculum large.



Habitat: *Tylenchorhynchus parvus* has been mainly found associated with herbaceous plants and grasses at high altitudes in temperate regions. It is known to occur in USA (Salem, Oregon; San Francisco and Berkeley, California; Salt Lake City, Utah); Gulmarg hills, India; Pakistan; Japan; Canada and United Kingdom. This is the first report of its occurrence in India.

Diagnosis and relationships

Tylenchorhynchus (Bitylenchus) parvus is characterized by its slightly demarcated lip region, bearing 6-8 transverse striae; lateral fields each with four incisures, outer bands areolated; stylet relatively thin (attenuated) with basal knobs sloping backwards; a long post-anal intestinal sac filling most of the tail with intestinal granules and fasciculi; female tail cylindrical with 43-58 annules, tail tip annulated and males commonly present. *T. parvus* is most

closely related to *T. maximus* Allen, 1955; *T. dubius* (Butschli, 1873) Filipjev, 1936 and *T. natalensis* Kleynhans, 1984 on the basis of lip annulation; stylet knobs sloping posteriorly; lateral incisures with four incisures; female tail cylindrical with hemispherical/rounded annulated tip; and presence of post-anal intestinal sac. It differs from *T. maximus* in having a shorter body; shorter stylet; lower c value and larger number of tail annules (*T. maximus*: L = 0.98-1.4 mm; stylet = 21.3-24 μ m; c = 16-20; tail annules = 38-41). From *T. dubius* it differs in lip region, areolation of lateral fields, shape of female tail and size of the post-anal intestinal sac (*T. dubius*: lip region is clearly set off from body contour; lateral fields incompletely areolated; tail subcylindrical, terminus bluntly pointed; post-anal intestinal sac 1/2-2/3 of tail portion). It differs from *T. natalensis* in the lesser body length, a and T/ABW ratios; in tail shape and fewer tail annules (*T. natalensis*: L = 0.787-0.964 mm; a = 36.3-52.4; T/ABW = 3-4.1; tail cylindrical or clavate, with 52-66 annules, terminus hemispherical or truncate).

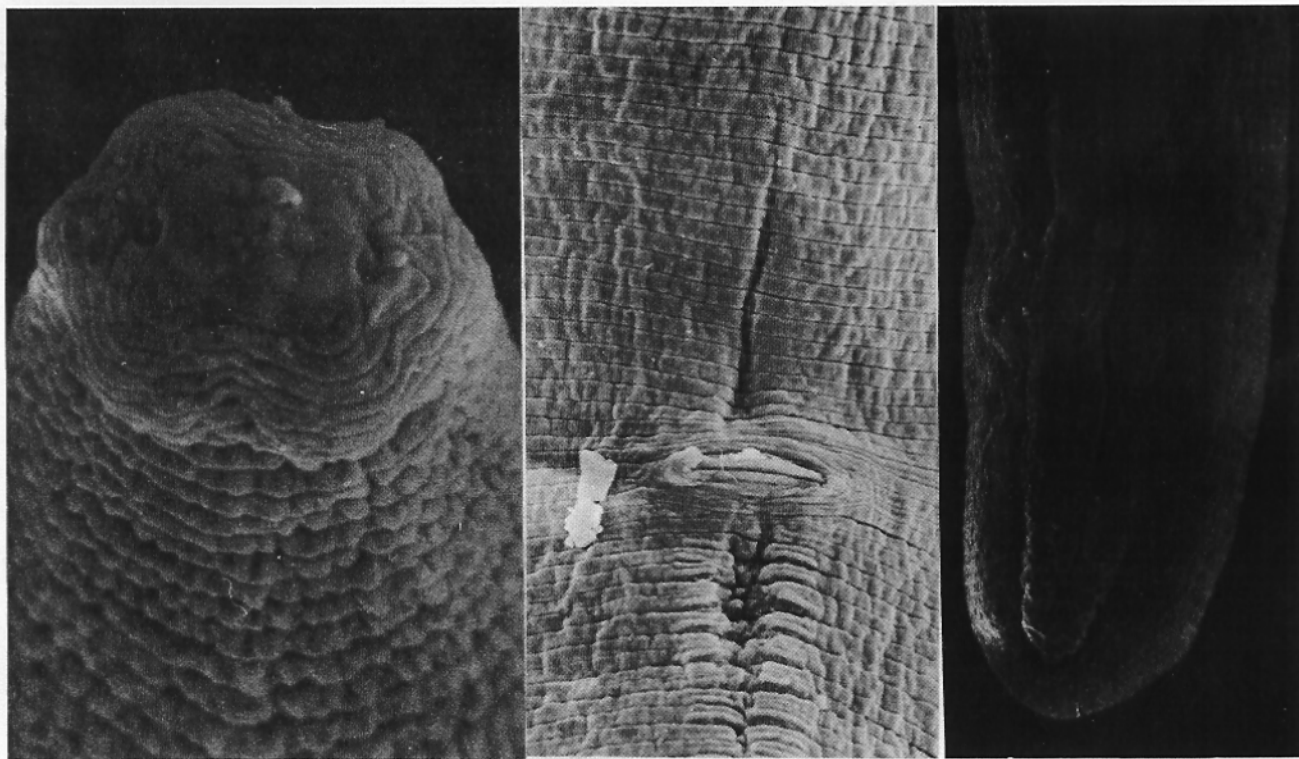


Fig. 2 - Scanning Electron Micrographs of females of *Tylenchorhynchus parvus* from India: from left to right, anterior (2000 X); vulval (2000 X) and posterior (1500 X).

Fig. 1 (Front page) (A-M): *Tylenchorhynchus parvus*, A, B, C = Female, anterior body regions; D = female, en face view; E = male, anterior body region; F, G = female, oesophageal basal bulb; H = male, basal bulb; I, J, K = female, tail variations; L = vulval region; M = spicular region.

TABLE I - Measurements (μm) of females of *Tylenchorhynchus* (*Bitylenchus*) *parvus* (Range, Mean, Standard Deviation)

Body measurements (μm)	Allen, 1955 Utah, USA (N = 6)	Authors measurements		
		Gulmarg India (N = 10)	Canada (N = 10)	Japan (N = 8)
Total body length	650 – 720 —	655 – 914 796 \pm 68.21	705 – 825 810 \pm 48.52	660 – 715 685 \pm 42.64
De Man ratio a	25 – 30 —	24.9 – 31 28 \pm 1.84	25.6 – 30.8 28.2 \pm 1.76	25.3 – 30.4 27.5 \pm 1.81
» » » b	4.8 – 5.6 —	4.9 – 6.3 5.61 \pm 0.41	5.2 – 6.4 5.8 \pm 0.39	4.8 – 5.6 5.3 \pm 0.35
» » » c	13 – 16 —	12.8 – 17.1 14.6 \pm 1.38	13.5 – 16.4 14.3 \pm 1.28	11.8 – 14.5 13.2 \pm 1.27
» » » c'	*	2.3 – 3.0 2.5 \pm 0.32	2.6 – 3.3 2.8 \pm 0.21	2.6 – 3.0 2.8 \pm 0.18
» » » V	52 – 57 —	50.5 – 57 53.8 \pm 1.62	54.2 – 56.5 54.5 \pm 1.01	52.5 – 54 53.6 \pm 1.12
Stylet length	17 – 18.3 —	17 – 19.7 18 \pm 0.77	16.5 – 17.5 17.2 \pm 0.56	16.5 – 17.8 17 \pm 0.63
Base of stylet to dorsal oesophageal gland duct	*	2.3 – 3.4 2.8 \pm 0.43	2.5 – 3.4 2.8 \pm 0.38	2.4 – 3.2 2.6 \pm 0.34
Head tip to median bulb valve	*	63.4 – 75 68 \pm 2.78	65 – 72.5 69.8 \pm 2.65	64 – 68.5 66.2 \pm 2.12
Head tip to base of oesophageal gland	*	128 – 148 139 \pm 5.98	135 – 142 139 \pm 5.72	125 – 144 138 \pm 6.25
Body width	*	23.5 – 33 28.5 \pm 2.6	25.2 – 30.6 27.8 \pm 2.71	24.5 – 30 28 \pm 2.48
Tail length	*	43.7 – 63.4 54.6 \pm 6.21	43.5 – 54.5 48.5 \pm 5.62	53 – 56 54.6 \pm 4.92

* Values not given in the original description.

Specimens deposited: specimens collected from Gulmarg, India are deposited as follows: five females and three males at Nematode Collection, CABI Institute of Parasitology, St Albans, UK; five females and five males at National Nematode Collection, Division of Nematology, IARI, New Delhi and remaining specimens in Nematology Unit, NBPGR, New Delhi, India.

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TABLE II - Measurements (μm) of males of *Tylenchorhynchus* (*Bitylenchus*) *parvus* (Range, Mean, Standard Deviation)

Body measurements (μm)	Allen, 1955 Utah, USA (N = 6)	Authors measurements	
		Gulmarg India (N = 10)	Japan (N = 4)
Total body length	580 – 630 —	718 – 850 796 \pm 29.81	685 – 726 707
De Man ratio a	28 – 33 —	29 – 38 33.6 \pm 2.49	28 – 35 33.5
» » » b	4.4 – 5 —	5.4 – 6.3 5.6 \pm 0.31	5.2 – 6 5.6
» » » c	12 – 16 —	14.6 – 16.4 15.1 \pm 1.21	13.6 – 15.8 14.7
» » » T	60 – 77 —	48 – 74 62 \pm 9.4	55 – 60 58.4
Stylet length	*	17 – 18.8 18 \pm 0.64	16.5 – 17 16.8
Base of stylet to dorsal oesophageal gland duct	*	2.4 – 3.2 2.8 \pm 0.32	2.4 – 3.2 2.71
Head tip to median bulb valve	*	58 – 64 62.4 \pm 2.45	56 – 62 61
Head tip to base of oesophageal gland	*	127 – 147 140 \pm 6.5	116 – 138 134
Body width	*	21 – 26 23.5 \pm 1.36	22 – 25 23.5
Tail length	*	48 – 56 51.9 \pm 2.73	50 – 54 52
Spicules length	*	28 – 28.6 28.2 \pm 0.24	28.5 – 31 29.5
Gubernaculum length	*	12.98 – 13.4 13 \pm 0.32	13 – 13.5 13.2

* Measurements not given in the original description.

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