

## Description of two new species of *Myctolaimus* Cobb, 1920 (Nematoda: Cylandrocorporidae) from northern India

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**Summary.**-This paper deals with description of two new species of *Myctolaimus* Cobb, 1920 obtained from ditch samples from Kishtwar, Jammu and Kashmir, India. *M. neolongistoma* sp. n. is characterized by its medium-sized body (L= 0.60-0.67; a= 21.7-26.1; b= 4.8-5.1; c= 4.8-5.3, c'= 6.9-7.0; V= 48.2-51.3) with fine longitudinal striations, petalloid cheilorhabdions, isthmus equal or slightly smaller than basal bulb, and males with 20-24  $\mu$ m long spicules and ten pairs of genital papillae. The other species, *M. kishtwarensis* sp. n., is characterized by its large body (L= 0.86-1.14; a= 25.1-30.9; b= 5.5-6.8; c= 4.4-5.9; c'= 7.2-10.2; V= 43.1-47.8), six radiating cheilorhabdial arms, isthmus larger than basal bulb and males with 24-28  $\mu$ m long spicules, and nine pairs of genital papillae.

**Keywords:** Description, India, *Myctolaimus*, new species, taxonomy.

**Resumen.**- En este trabajo se describen dos nuevas especies del género *Myctolaimus* Cobb, 1920, recolectadas en muestras de acequias de Kishtwar, Jammu and Kashmir, India. *M. neolongistoma* sp. n. se distingue por tener un tamaño corporal medio (L=0.60-0.67; a= 21.7-26.1; b= 4.8-5.1; c=4.8-5.3; c'=6.9-7.0; V=48.2-51.3), fina estriación longitudinal, queilorabdiones petaloideos, istmo faríngeo igual o poco más pequeño que el bulbo basal, y machos con espículas de 20-24  $\mu$ m de longitud y diez pares de papilas genitales. La otra especie, *M. kishtwarensis* sp. n., se caracteriza por su tamaño corporal grande (L=0.86-1.14; a=25.1-30.9; b=5.5-6.8; c= 4.4-5.9; c'=7.2-10.2; V=43.1-47.8), seis brazos queilorabdiales radiales, istmo mayor que el bulbo basal, y machos con espículas de 24-28  $\mu$ m de longitud y nueve pares de papilas genitales.

**Palabras clave:** Descripción, India, *Myctolaimus*, nuevas especies, taxonomía.

During a survey of nematodes from the state Jammu and Kashmir, two new species of the genus *Myctolaimus* Cobb, 1920 were collected from samples of ditches. The new species are, hereby, described with LM and SEM details.

### MATERIALS AND METHODS

The nematodes were isolated from the slurry samples of ditch using sieving and decantation and

modified Baermann's funnel techniques. For light microscopy (LM), nematodes were fixed in formaldehyde, processed to anhydrous glycerine, and mounted on slides. They were later measured and drawn by using ocular micrometer and drawing tube attachment, respectively. For SEM study nematodes were fixed in glutaraldehyde, post-fixed in osmium tetroxide, dehydrated in acetone series, critical point dried using CO<sub>2</sub> and finally mounted on stubs; the mounted nematodes were coated with gold to be observed under Scanning Electron Microscope (SEM) at 12 kV.

## DESCRIPTIONS

*Myctolaimus neolongistoma* sp. n.  
(Figs 1 & 2C-F)

*Measurements:* See Table I.

*Female:* Body medium-sized, 0.60-0.67 mm long, tapering at extremities, more towards the posterior end. Cuticle transversely striated with very fine longitudinal lines. Lip region 6-9  $\mu\text{m}$  wide and 3  $\mu\text{m}$  high, slightly demarcated from the main body contour. Lips six, laterals slightly larger, labial sensillae in two circlets of 6+6. Cephalic sensillae not discernible. Amphid fovea with elliptical aperture, born at the base of lateral lips, about 1  $\mu\text{m}$  across in SEM. Stoma tubular, divided into cheilostom, gymnostom and stegostom. SEM micrographs show cheilostom with four opposable arms, two wider bifid petaloid arms directed towards lateral sides while two petaloid but non-bifid and narrower arms directed towards the dorsal and ventral sides. In fully extended oral aperture, the borders of cheilostom appear smooth and rounded. Gymnostom representing flexible walls. Stegostom isotopic, anisomorphic, surrounded by 4-5  $\mu\text{m}$  long pharyngeal tissue with a bulge on dorsal side. Pharynx 120-140  $\mu\text{m}$  long, with a cylindroid muscular bulb (corpus), middle isthmus and a small slightly expanded non-valvate pyriform basal bulb. Corpus (55-70  $\mu\text{m}$  long) represented fused procorpus and metacorpus, 3.0-3.5 times longer than wide. Isthmus 25-30  $\mu\text{m}$  long encircled by nerve ring. Basal bulb 21-25 x 16-20  $\mu\text{m}$  in dimension. Excretory pore about 85-88% of the pharyngeal length, immediately anterior to hemizonid, at the middle or posterior level of basal bulb. Nerve ring anterior to excretory pore. Cardia conoid, 3-5  $\mu\text{m}$  long. Gonad didelphic with dorsally reflexed ovaries. Anterior branch left and posterior on the right side of intestine. Ova  $42.33 \pm 4.04 \times 19.66 \pm 0.57$  in dimension showing intra-uterine development. Vulva transverse opening with prominent lips, equatorial in position. Vagina thick-walled, without sclerotization. Intestine with wide lumen, intestinal cells large with defined boundaries. Tail conoid, narrowing down to a whip like terminus. Phasmids at two third of the conoid portion of tail.

*Male:* Body smaller than females, 0.43-0.46  $\mu\text{m}$ . Cuticle, lip region and neck characteristics similar to

females. Stoma surrounded by 4-5  $\mu\text{m}$  long pharyngeal tissue in the region of stegostom. Pharynx with cylindroid muscular corpus of 50-60  $\mu\text{m}$  length. Testis single, dorsally reflexed on the left side of intestine. Spicules paired, slender, 20-24  $\mu\text{m}$  long, ventrally arcuate with capitate proximal ends. Gubernaculum 11-12  $\mu\text{m}$ , simple plate-like. Tail long conoid with whip-like terminus. Caudal papillae 10 pairs: one lateral and three sub ventral pre-cloacal pairs and six post-cloacal pairs. Of the post-cloacal pairs, one lateral, four sub ventral and one sub dorsal pairs. A prominent median precloacal papilla present about 5  $\mu\text{m}$  anterior to cloaca. Bursa rudimentary sticking to the lateral body walls.

*Diagnosis and relationships:* *M. neolongistoma* sp. n. is characterized by having a medium sized body, short conical and slightly amalgamated lips, petaloid cheilorhabdions, isthmus equal or smaller than basal bulb, one unpaired and ten paired genital papillae in males, and a conoid tail tapering sharply into a whip-like terminus.

The new species resembles *M. rifflei* (Massey and Hind, 1970) Andr ssy, 1984 in most morphometric details but differs in having fine longitudinal lines, smaller 'c' and greater 'c'' values as well as in greater number of genital papillae in males, and in absence of a tail spine (*vs* longitudinal lines absent,  $c = 12-14$ ,  $c' = 1.5-2.0$ , and eight pairs of cloacal papillae and tail spine present in *M. rifflei*). The new species also resembles *M. curzii* (Goodey, 1935) Andr ssy, 1984 in morphometric characteristics but differs in having faint longitudinal lines, posteriorly located excretory pore, smaller 'c' value in males, greater number of cloacal papillae and a relatively weak bursa (*vs* longitudinal lines absent, excretory pore anterior to the basal bulb,  $c = 25-32$ , three pre-cloacal and six post-cloacal pairs of papillae and stronger bursa, in *M. curzii*). *M. neolongistoma* sp. n. further resembles *M. macrolaimus* (Schneider, 1866) Andr ssy, 1984 (= *M. longistoma* (Stefanski, 1922) Andr ssy, 1984) in having longitudinal lines, the length of spicules and gubernaculum but differs in having smaller 'a' and 'b' values, greater 'c' and 'V' values and the number of genital papillae (*vs*  $L = 1.00-1.34$  mm,  $a = 29-33$ ,  $b = 6.0-6.4$ ,  $c = 4.0-4.2$ ,  $V = 45-47\%$  and nine cloacal papillae in *M. macrolaimus*).

*Type habitat and locality:* Samples from a ditch, Srinagar, Jammu and Kashmir, India.

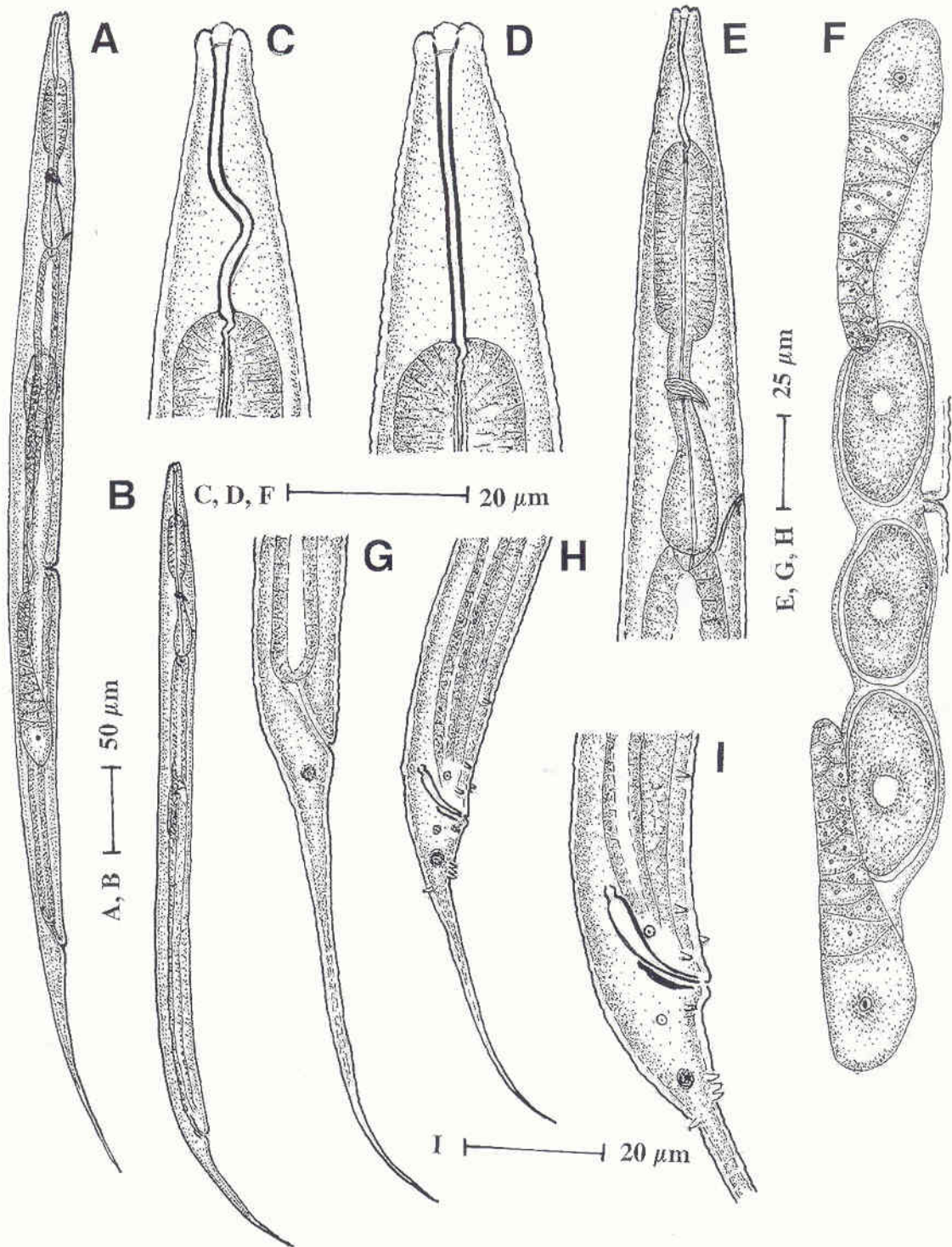


FIGURE 1. *Myctolaimus neolongistoma* sp. n. A: Entire female. B: Entire male. C: Anterior region (male). D: Anterior region (female). E: Pharyngeal region (male). F: Female reproductive system. G: Female tail. H: Male tail. I: Male cloacal region.

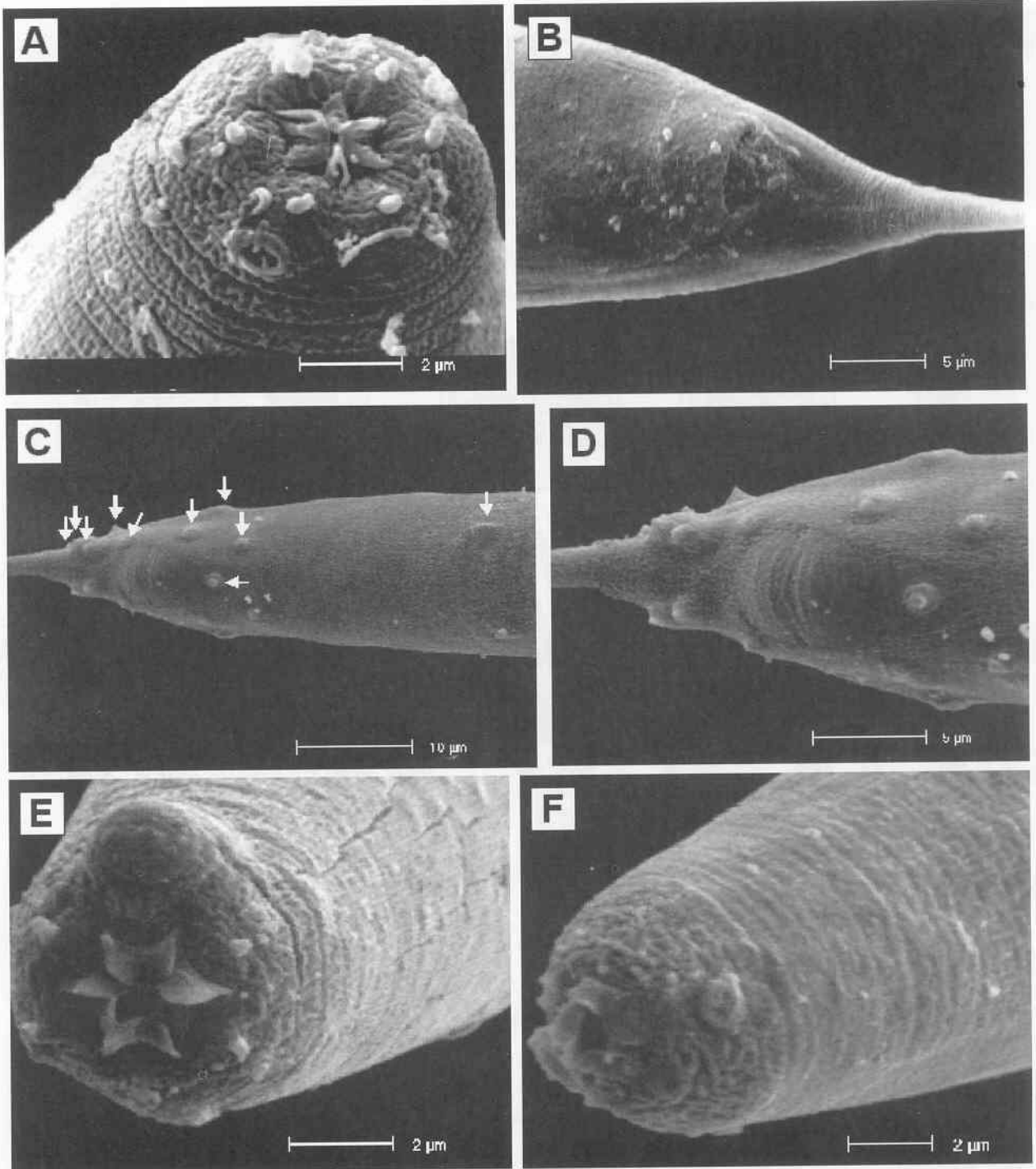


FIGURE 2. A-D: *Myctolaimus kishtwarensis* sp. n. A: En face view. B: Female posterior region. C-F: *Myctolaimus neolongistoma* sp. n. C: Male posterior region. D: Male cloacal region. E: En face view. F: Anterior end.

TABLE I. Morphometric characteristics of *Myctolaimus neolongistoma* sp. n. and *M. kishtwarensis* sp. n. (all measurements in  $\mu\text{m}$ ).

Species	<i>M. neolongistoma</i> sp. n.			<i>M. kishtwarensis</i> sp. n.			
	Characters	n	Holotype ♀	Paratypes 5 ♀♀	Paratypes 3 ♂♂	Holotype ♀	Paratypes 5 ♀♀
Body length	648		643.6± 26.7 (609-674)	447± 19.7 (433-461)	1118	1017.6± 106.5 (861-1145)	826.5± 54.0 (751-902)
Body width	27		27.2± 3.2 (23-31)	20.3± 1.3 (19-21)	41	35.6± 6.5 (29-42)	25.1± 2.8 (22-34)
Stoma length	41		43.5± 2.9 (40-47)	37± 1.3 (36-38)	48	47.8± 4.6 (45-53)	46.0± 1.2 (44-48)
Stoma width	1.5		2.0± 0.6 (1.5-3)	1.7± 0.3 (1.5-2.5)	2	2.0± 0.5 (1.5-3)	2.0± 0.2 (1.5-2.5)
Pharyngeal length	121		129.9± 3.1 (120-140)	109.6± 2.8 (106-112)	165	179.4± 36.0 (161-216)	168.5± 7.5 (152-179)
Nerve ring	98		105.8± 7.8 (98-110)	89.2± 2.9 (87-91)	125	125.2± 8.7 (116-136)	104.6± 2.9 (101-107)
Anal body width	17		17.5± 0.9 (16-18)	15.0± 0.6 (14-16)	26	22.7± 2.3 (21-27)	22.3± 1.43 (18-24)
Tail length	121		125.6± 4.5 (121-130)	86.5± 14.8 (76-92)	189	202.5± 18.2 (185-218)	135.4± 20.7 (115-167)
a	23.8		23.8± 1.8 (21.7-26.16)	21.9± 0.5 (21-22.3)	27.2	27.8± 3.0 (25.1-30.8)	30.7± 5.3 (24.0-37.5)
b	5.0		4.9± 0.1 (4.8-5.1)	4.1± 0.2 (3.9-4.3)	6.7	6.0± 0.7 (5.5-6.7)	4.9± 0.6 (4.1-5.4)
c	5.0		5.1± 0.2 (4.8-5.3)	5.3± 0.9 (4.7-6.0)	5.9	5.0± 0.8 (4.4-5.9)	7.1± 1.8 (5.5-8.7)
c'	6.9		6.9± 0.3 (6.9-7.0)	5.5± 0.4 (5.2-5.9)	7.2	8.9± 1.4 (7.2-10.2)	5.8± 1.1 (4.3-6.8)
V	51.3		49.8± 1.5 (48.1-51.3)	-	46.4	45.5± 3.6 (43.1-47.8)	-
T	-		-	46.5± 2.8 (44.4-49.7)	-	-	42.5± 4.9 (37.9-46.3)
G <sub>1</sub>	22.0		21.7± 1.5 (21.1-23.1)	-	12.7	15.3± 3.7 (12.2-17.9)	-
G <sub>2</sub>	25.0		23.8± 1.4 (22.2-25.0)	-	13.5	15.0± 2.9 (13.2-18.0)	-

*Type material:* Holotype female on slide "*Myctolaimus neolongistoma* sp. n. / 1" deposited at the Museum nationale d'Histoire naturelle, Paris. Paratype females on slide "*Myctolaimus neolongistoma* sp. n. / 2-4" deposited to Nematode Collection of the Department of Zoology, Aligarh Muslim University, Aligarh, India.

*Remarks:* The SEM observations of the anterior end showed the structure of the cheilostom, which seemed difficult to be resolved under light microscopy. Furthermore, the presence of fourth precloacal papillae was found to be unusual when compared with other species having ten pairs of papillae. Another pre-cloacal median papilla, quite

conspicuous in SEM, has been seldom reported in descriptions.

*Myctolaimus kishtwarensis* sp. n.  
(Figs 2A, B & 3)

*Measurements:* See Table I.

*Female:* Body medium sized, 0.86-1.14 mm long, tapering at extremities, more towards the posterior end. Cuticle transversely striated. Lip region 7-9  $\mu\text{m}$  wide and 3  $\mu\text{m}$  high, slightly demarcated from the main body contour. Lips six, equal-sized; labial

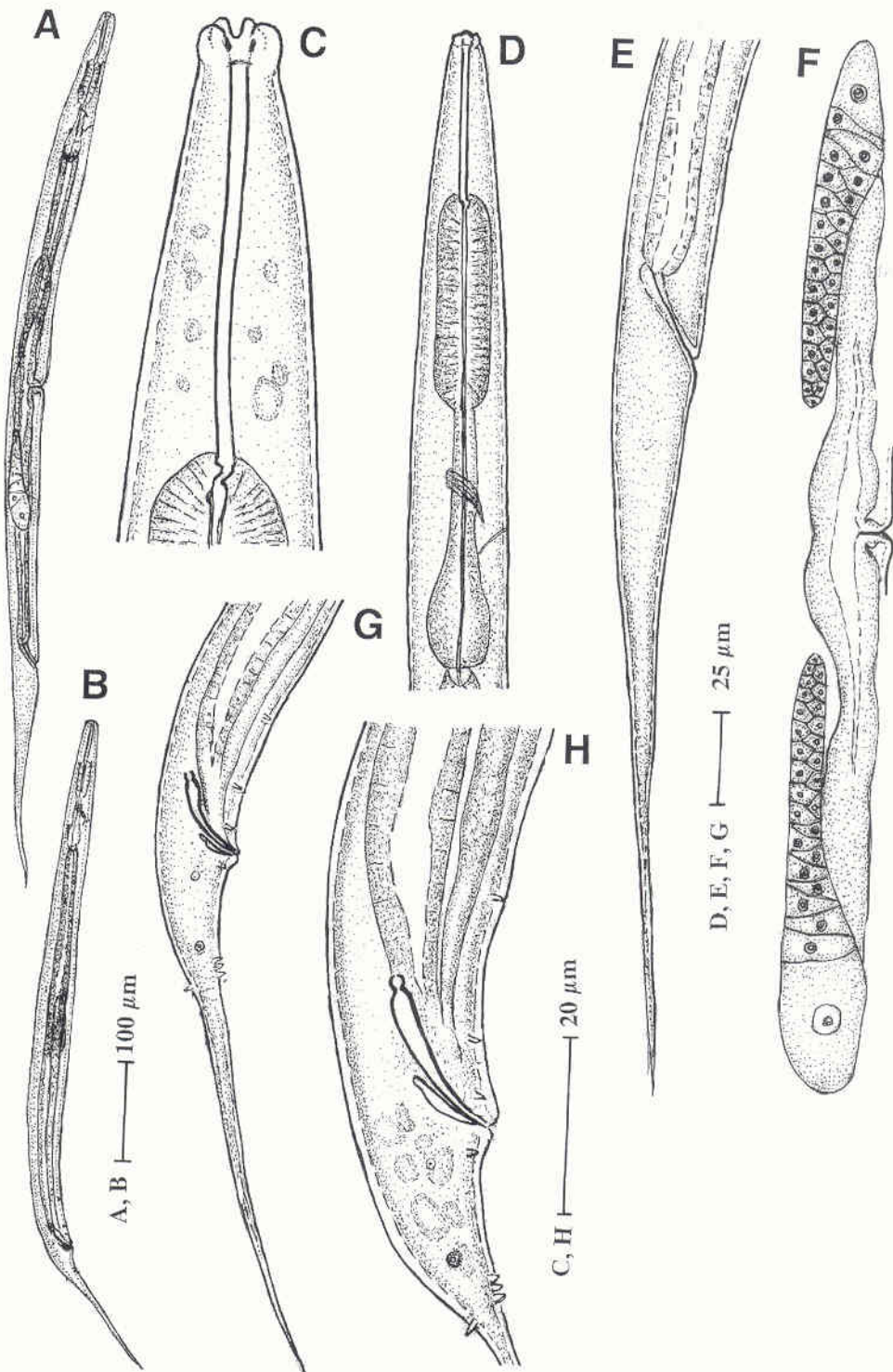


FIGURE 3. *Myctolaimus kishtwarensis* sp. n. A: Entire female. B: Entire male. C: Anterior region. D: Pharyngeal region (female). E: Female tail. F: Female reproductive system. G: Male tail. H: Male cloacal region.

papillae in two circlets of 6+6; cephalic papillae not discernible in LM. Amphid fovea with elliptical aperture, born at the base of lateral lips, about 1  $\mu\text{m}$  across in SEM. Stoma tubular divided into cheilostom, gymnostom and stegostom. In SEM micrograph cheilostom with six ad-radial cuticularised arms each located at the junction of two consecutive lips, forming an alternate arrangement of forked and unforked arms. Gymnostom representing much flexible part. Stegostom isotopic, anisomorphic surrounded by 5-6  $\mu\text{m}$  long pharyngeal tissue. Pharynx with a cylindroid muscular bulb (corpus), middle isthmus and a small slightly expanded non-valvate pyriform basal bulb. Corpus (55-65  $\mu\text{m}$  long) represented fused procorpus and metacorpus, more than three times longer than wide. Isthmus 44-50  $\mu\text{m}$  long, encircled by nerve ring. Basal bulb 26-32 x 18-20  $\mu\text{m}$  in dimension. Excretory pore about 63-73% of the pharyngeal length, in the region of isthmus in front of the basal bulb. Gonad didelphic with reflexed ovaries. Ova 53-55 x 24-26  $\mu\text{m}$  in dimension, segmentation not observed. Vulva a transverse slit with protruded lips, pre-equatorial in position. Vagina thick walled with sclerotized pieces. Cardia conoid, 4-6  $\mu\text{m}$  long. Intestine with wide lumen, intestinal cells large with defined boundaries. Tail long conoid with fine hair-like terminus.

*Male:* Body 0.75-0.90  $\mu\text{m}$  long. Cuticle, lip region and neck characteristics similar to females. Stoma 45-48  $\mu\text{m}$  long surrounded by 5-6  $\mu\text{m}$  long pharyngeal collar in the region of stegostom. Cylindroid muscular corpus of Pharynx 50-57  $\mu\text{m}$  long. Testis single, dorsally reflexed on the left side of intestine. Spicules paired, slender, 24-28  $\mu\text{m}$  long, ventrally arcuate with capitate proximal ends. Gubernaculum, 12-14  $\mu\text{m}$ , simple plate like. Tail 115-167  $\mu\text{m}$  long, conical with whip like tip. Caudal papillae nine pairs: three sub-ventral pre-cloacal pairs, and six post-cloacal pairs. Of the post-cloacal pairs, one lateral, four sub ventral and one sub dorsal pair. One median pre-cloacal papilla present. Cloacal opening crescent-shaped. Bursa rudimentary sticking to the sub lateral body walls.

*Diagnosis and relationships:* *M. kishtwarensis* sp. n. is characterized by a medium to large sized body, equal sized lips, six radiating cheilorhabdial arms, isthmus larger than basal bulb, nine paired and one unpaired papillae in males and a long tail with fine hair like terminus.

The new species resembles *M. macrolaimus* (Schneider, 1866) Andr ssy, 1984 (= *M. longistoma* (Stefanski, 1922) Andr ssy, 1984) in most morphometric details but differs in absence of longitudinal lines, in the structure of cheilostom, in having greater 'b' and 'c' values (*vs* longitudinal lines present, cheilorhabdions rod-shaped, b= 4.0-5.5 and c= 5.4-6.5). The new species also resembles *M. rifflei* (Massey and Hind, 1970) Andr ssy, 1984 in 'a', 'b' and 'c' values and the length of spicules, but differs in having a relatively anterior vulva, smaller 'c' and 'c'' values in males as well as greater number of genital papillae and in absence of a short tail spine (*vs* c= 12-14, c' = 1.5-2, eight pairs of cloacal papillae and a short tail spine present in males of *M. rifflei*). *M. kishtwarensis* sp. n. resembles *M. neolongistoma* sp. n. in most morphometric characteristics but differs in having larger body, no longitudinal lines, greater 'a' and 'b' values, smaller 'V' value, anteriorly located excretory pore, relatively larger spicules and lesser number of genital papillae in males (*vs* L= 0.60-0.67, longitudinal lines present, a= 21-26, b= 4.8-5.1, V= 48-51%, excretory pore at the middle or posterior level of basal bulb, spicules 24-28  $\mu\text{m}$  long, and ten pairs of genital papillae in males of *M. neolongistoma* sp. n.). Furthermore, there is considerable difference in the structure of the cheilostom as observed under SEM.

*Type habitat and locality:* Samples from a ditch, Kishtwar, Jammu and Kashmir, India.

*Type material:* Holotype female on slide "*Myctolaimus kishtwarensis* sp. n. / 1" deposited at the Museum Nationale d'Histoire Naturelle, Paris. Paratype females on slide "*Myctolaimus kishtwarensis* sp. n. / 2-4" deposited to Nematode Collection of the Department of Zoology, Aligarh Muslim University, Aligarh, India.

*Etymology:* The name of the species is based on the city Kishtwar from where it was collected.

*Remarks:* The demarcation of the genus *Cylindrocorpus* and *Myctolaimus* on the basis of bursa as discussed by Poinar *et al.* (2003) has been accepted here. However, it should be further added that the bursa in case of *Myctolaimus* is absent (not discernible) or rudimentary, i.e. sticking to the lateral body walls (as observed in SEM of the above specimens). In

contrast the bursa in *Cylindrocorpus* is fairly discernible but leptoderan.

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