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TWO NEW SPECIES WITHIN THE *XIPHINEMA AMERICANUM*-GROUP (NEMATODA, DORYLAIMIDA) FROM GARHWAL HIMALAYAS, INDIA

by

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Summary. Two monosexual didelphic new species within the *Xiphinema americanum*-group are described from India. *Xiphinema minor* sp.n. resembles *X. americanum* Cobb and *X. lambertii* Bajaj et Jairajpuri from which it differs in having the lip region continuous with the rest of the body. *Xiphinema himalayense* sp.n. resembles *X. brevicolle* Lordello et Da Costa, *X. diffusum* Lamberti et Bleve-Zacheo, *X. incognitum* Lamberti et Bleve-Zacheo and *X. taylori* Lamberti, Ciancio, Agostinelli et Coiro. However, it differs from all these species in having the lip region continuous with the rest of the body and the longer body and odontostyle.

A nematode survey carried out in 1995 in five districts of Garhwal Himalayas, India, revealed the presence of two unknown species within the *Xiphinema americanum*-group. They are described here as *Xiphinema minor* sp.n. and *Xiphinema himalayense* sp.n.

Material and methods

Soil samples of approximately 1 kg were collected from the rhizosphere of forest and fruit trees and wild grasses in the districts of Chamoli, Dehradun, Pauri, Tehri and Uttarkashi in Uttar Pradesh at elevations ranging from 550 to 4329 m a.s.l. Nematodes were extracted by Cobb's wet sieving technique and sugar centrifugation, then killed and fixed in hot 5% formalin and processed by the slow method to anhydrous glycerin. Measurements were made with the aid of a camera lucida.

Descriptions

XIPHINEMA MINOR sp.n.

(Table I; Figs 1 and 3)

Female *habitus* ventrally curved in a more or less open C. Body short and wide, tapering abruptly towards the extremities. Cuticle smooth, 2 µm thick at mid-body. Lip region frontally rounded, continuous with the rest of the body. Amphidial pouches stirrup shaped. Odontostyle and odontophore robust, the latter with large flanges. Guiding sheath with only the basal ring readably visible. Oesophagus dorylaimoid, basal bulb measuring 55-65 µm long and 18-20 µm wide, occupying ca. 1/3 of the total oesophagus length; three glandular nuclei are visible; oesophageal intestinal valve inconspicuous, of variable shape.

Vulva at mid-body; vagina with thin walls, occupying ca. 1/3 of the corresponding body

TABLE I - *Morphometrics of Xiphinema minor sp.n. from India.*

	Holotype	Paratypes
n	♀	7 ♀♀
L mm	1.4	1.5±0.10 (1.4-1.6)
a	41.8	48.57±3.78 (41.8-53.5)
b	5.1	5.86±0.37 (5.4-6.5)
c	42.5	49.93±4.4 (44-57)
c'	1.7	1.63±0.11 (1.5-1.8)
V	50	50.86±1.07 (50-53)
Odontostyle µm	67.6	68.51±3.40 (61.8-71.7)
Odontophore µm	45.7	44.41±2.27 (40.5-47.4)
Oral aperture to guide ring µm	56	57.29±3.05 (51.4-61.3)
Tail µm	33	30.13±3.18 (26-34.6)
J (hyalin portion of tail) µm	7.5	9.39±1.12 (9.2-10.4)
Body diam. at lip region µm	8.6	9.89±0.41 (9.2-10.4)
Body diam. at guide ring µm	22.5	23.6±0.95 (21.9-24.9)
Body diam. at base of oesophagus µm	31.2	27.91±1.68 (25.4-30.6)
Body diam. at mid-body or vulva µm	33.5	30.7±2.06 (27.2-33.5)
Body diam. at anus µm	19	18.23±1.46 (16.2-20.2)
Body diam. at beginning of J µm	8	8.83±1.09 (7.5-10.4)

diameter. Genital system amphidelphic, with equally developed branches, devoid of any "Z" differentiation; ovaries reflexed, degenerated because of many microsporidia like bodies. Prerectum 65-80 µm long; rectum extending more or less as much as the body width at anus. Tail elongate, conoid, dorsally curved and ventrally straight, bearing two caudal pores on each side.

Male not found.

Type habitat and locality

Rhizosphere of *Pinus roxburghii* Sargent, 1897 at Khand village, Uttarkashi district, Uttar Pradesh, India; 1250 m a.s.l.

Type material

Holotype and three paratype females in the collection of the Istituto di Nematologia Agraria

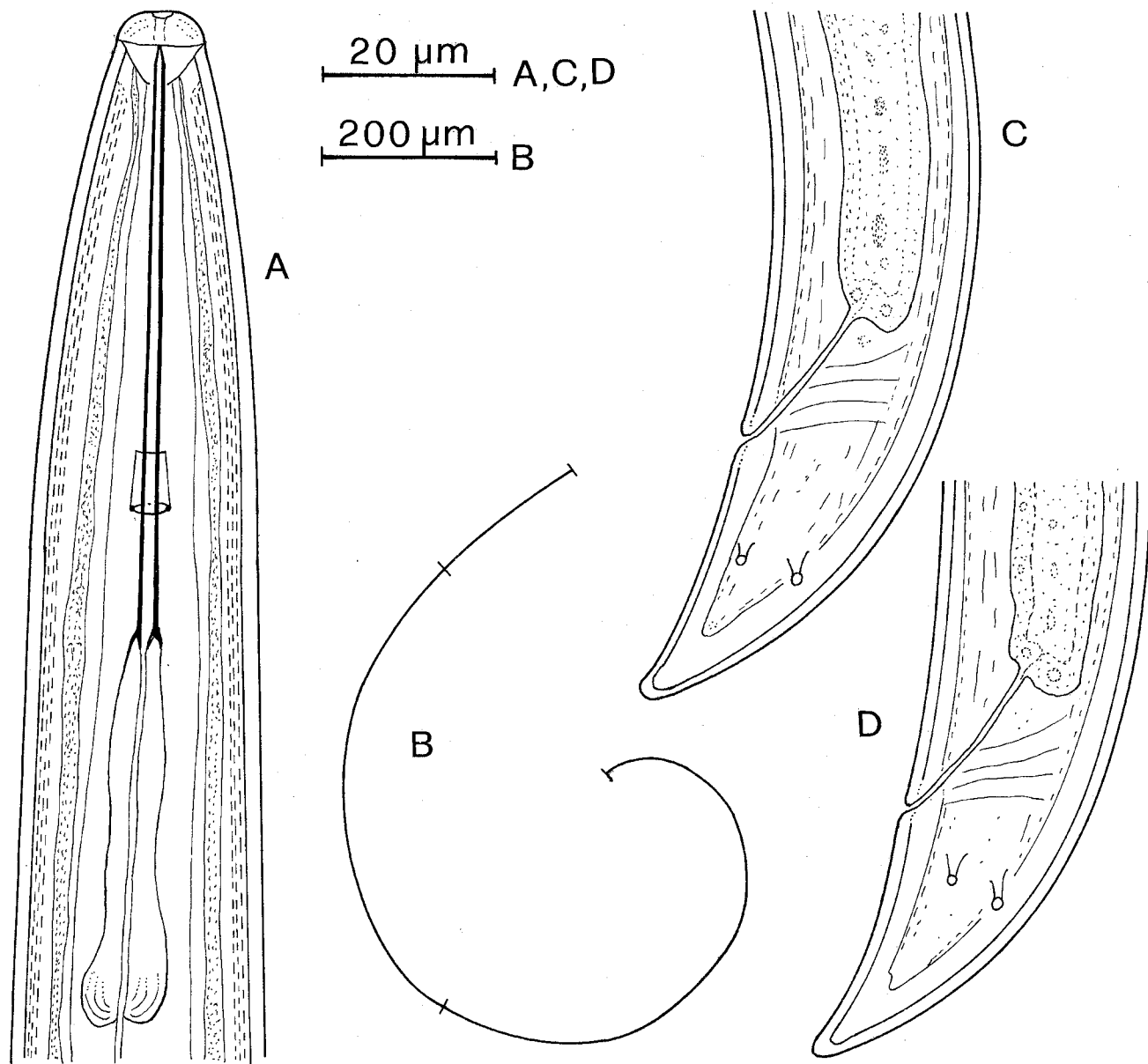


Fig. 1 - *Xiphinema minor* sp.n.: A, anterior region; B, *habitus*; C and D, posterior region of female.

del Consiglio Nazionale delle Ricerche, Bari, Italy; two paratype females in the collection of the Entomology and Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, United Kingdom and two paratype females in the collection of the Nematology Section, Zoology Department, Aligarh Muslim University, India.

Diagnosis and relationships

Xiphinema minor sp.n. is a monosexual didelphic species characterized by a total body length of ca. 1.5 mm, odontostyle 70 µm long, lip region continuous with the rest of the body, mid-body vulva, equally developed genital branches and elongate conoid tail.

It resembles *X. americanum* Cobb, 1913 and *X. lambertii* Bajaj *et* Jairajpuri, 1976. However, *X. minor* sp.n. differs from both these species in having the lip region continuous with the rest of the body (more or less offset in *X. americanum*

and *X. lambertii*). Moreover, *X. minor* differs from *X. americanum* in having a more abruptly tapering tail and from *X. lambertii* in having a longer odontostyle and odontophore (55-64 and 38-40 μm respectively in *X. lambertii*).

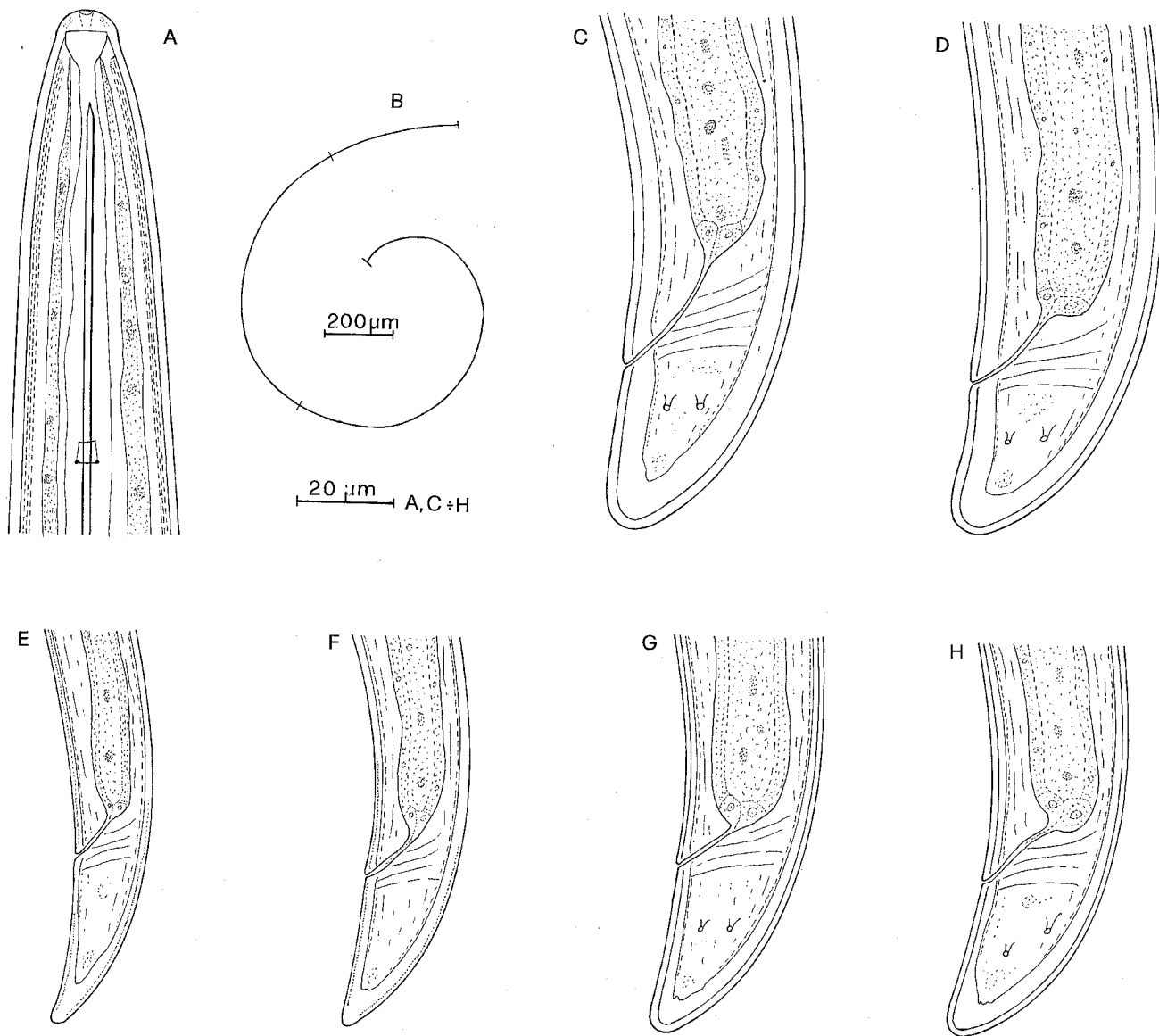


Fig. 2 - *Xiphinema himalayense* sp.n.: A, female anterior region; B, female *habitus*; C and D, female posterior region; E, F, G and H, posterior region of first, second, third and fourth juvenile stages respectively.

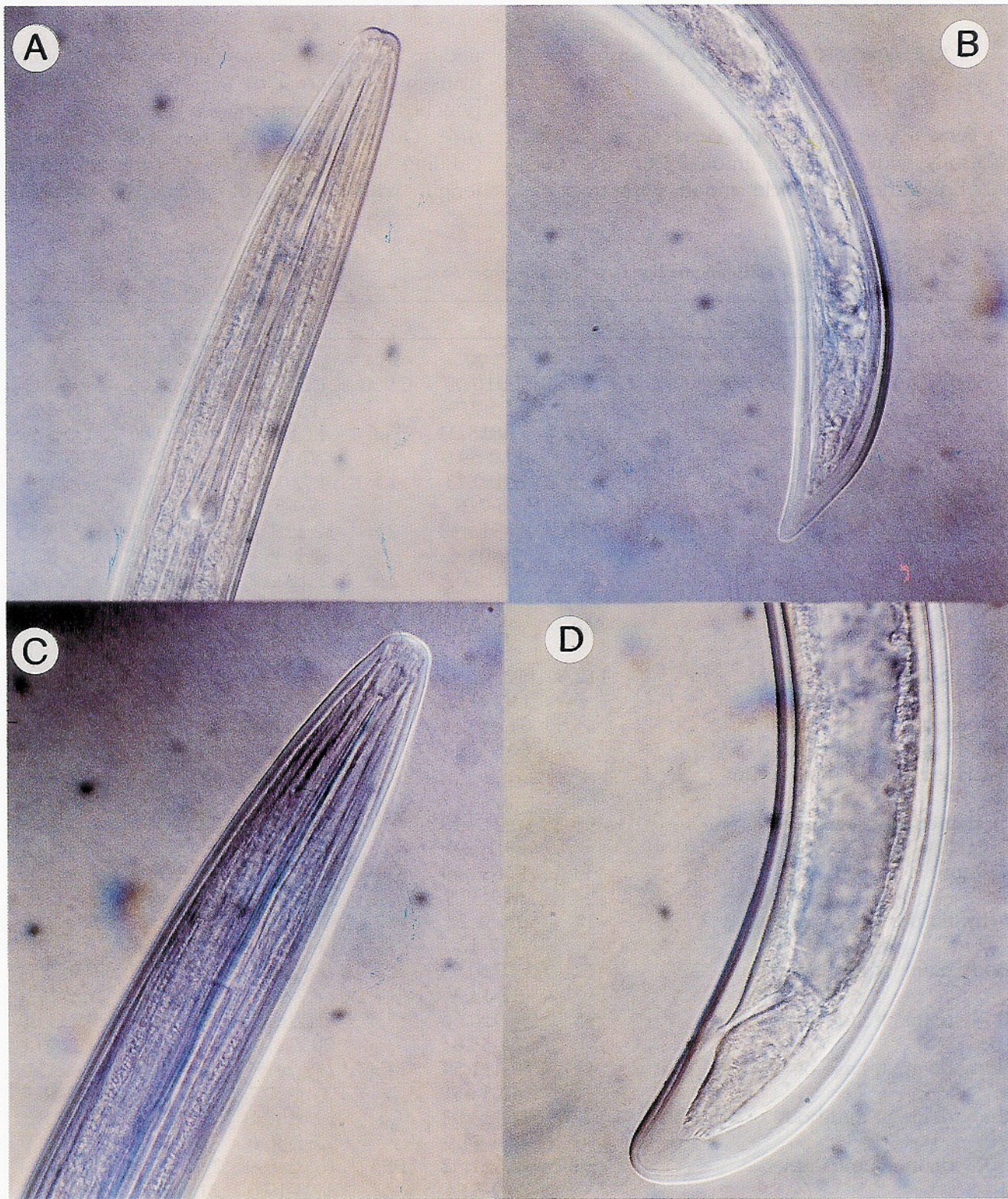


Fig. 3 - Photomicrographs of *X. minor* sp.n.: A, anterior region; B, posterior region and of *X. himalayense* sp.n.: C, anterior region, D, posterior region.

XIPHINEMA HIMALAYENSE sp.n.

(Table II; Figs 2-4)

Female *habitus* ventrally curved as a closed C. Body wide, tapering gradually towards the anterior extremity. Cuticle smooth 2 µm thick at

mid-body. Lip region frontally rounded, continuous with the rest of the body. Amphidial pouches large, stirrup shaped with a wide aperture. Odontostyle and odontophore robust. Guiding sheath readily visible in throughout its length, with a strong basal ring. Oesophagus

TABLE II - *Morphometrics* of *Xiphinema himalayense* sp.n. from India.

	Holotype			Paratypes		
n		7 ♀♀	1 J ₁	4 J ₂	3 J ₃	7 J ₄
L mm	2.7	2.6±0.09 2.5-2.7	0.900	1.2±0.10 1.1-1.3	1.55±0.06 1.5-1.6	2.0±0.11 1.9-2.2
a	52.5	54.8±3.23 49.2-59.9	34.6	4.0±2.24 37-42.4	46.2±2.86 43.4-48.9	51.8±1.99 48.5-54.3
b	6.9	6.8±0.45 6-7.2	4.1	4.7±0.48 4.0-5.1	5.7±0.31 5.2-5.8	5.9±0.65 5.1-6.9
c	77.8	85.5±4.32 79-93.4	25	32.1±2.68 29.2-35.7	46.4±3.11 43.2-48.9	61.5±3.56 58.5-67.1
c'	1.1	1.0±0.07 0.9-1.1	2.6	2.0±0.17 1.8-2.2	1.5±0.06 1.5-1.6	1.4±0.05 1.3-1.4
V	52	52±0.00 52-52	—	—	—	—
Odontostyle µm	112.5	112.5±1.88 110-114.5	54.3	65.5±3.60 60.1-67.6	76.0±3.00 73.4-78.6	92.0±3.38 85.5-96.5
Odontophore µm	65	64.4±2.20 60.7-67.5	37.6	42.1±1.96 39.3-43.9	49.9±1.53 48.5-51.4	53.7±2.59 49.7-57.8
Replacement odontostyle µm	—	—	61.8	77.2±4.28 71.1-80.9	91.6±2.72 88.4-93.6	109±4.50 104-115.6
Oral aperture to guide ring µm	95	94.7±4.48 89-102.9	43.9	54.6±1.91 52-56.6	63.3±0.60 63-64.2	76.9±3.07 73.4-82.1
Tail µm	35	30.6±1.69 28.9-32.9	37.6	36.3±1.29 34.7-37.6	35.5±0.98 34.7-36.4	33.1±2.40 30-37.6
J (hyalin portion of tail) µm	11	9.6±1.22 8.7-12	8.7	7.4±0.90 6.9-8.7	7.8±0.86 6.4-8.1	7.8±1.06 6.5-9.8
Body diam. at lip region µm	12	12.7±0.53 12-13.3	8.1	8.8±0.25 8.7-9.2	9.8±0.35 9.8-10.4	10.9±0.54 10.4-11.6
Body diam. at guide ring µm	35	34.9±0.66 34-35.8	17.3	21±0.57 20.2-21.4	25.7±0.35 25.4-26	28.7±1.29 27.2-30.1
Body diam. at base of oesophagus µm	44	42.4±1.54 40.5-45	24.3	26.6±1.55 24.3-27.7	32.6±1.46 30.6-33.5	35.9±1.91 32.9-38.7
Body diam. at mid-body or vulva µm	51.5	47.9±3.93 43.4-54.9	26	29.4±1.58 27.1-30.6	35.8±1.72 33.5-36.9	39±2.82 35.8-43.9
Body diam. at anus µm	32	30.5±1.32 28.9-32.4	14.5	18.6±0.99 17.3-19.6	23.4±1.46 21.4-24.3	24.8±1.64 23.1-27.7
Body diam. at beginning of J µm	19	18.7±1.52 16.2-21.4	6.9	8.3±0.57 7.5-8.7	11.3±0.91 9.8-11.6	13.0±0.75 12.1-13.9

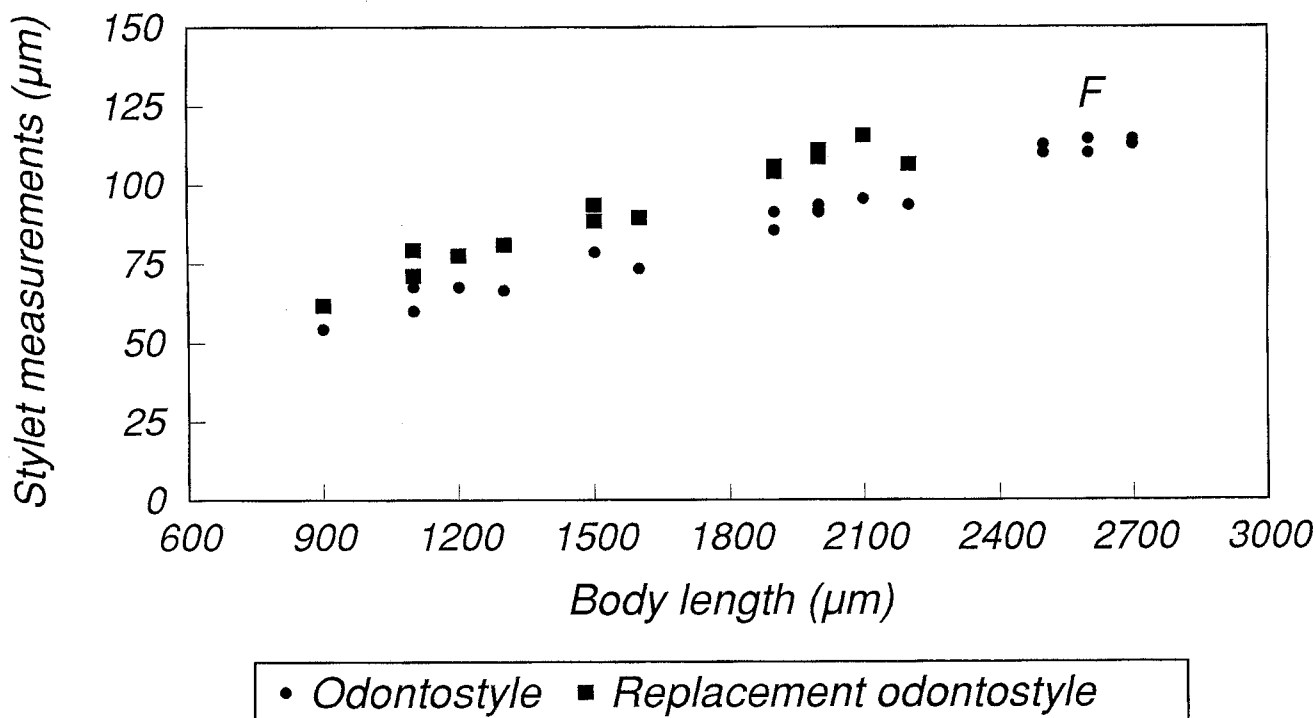


Fig. 4 - *X.himalayense* sp.n.: scatter diagram separating juveniles and adult females (F).

dorylaimoid, basal bulb measuring 88-90 µm long and 22-25 µm wide, occupying ca. 1/3 of the total oesophagus length, containing three glandular nuclei; oesophagus intestinal valve amorphous. Vulva slightly posterior to mid-body, vagina with thick walls, occupying between 1/3 and 1/4 of the corresponding body diameter. Genital system amphidelphic, with equally developed branches, devoid of any "Z" differentiation; ovaries reflexed, filled with microsporidia-like bodies. Prerectum obscure; rectum extending more or less as much as the body width at anus. Tail short, conoid, dorsally curved and ventrally straight or slightly concave, with rounded terminus, bearing a pair of caudal pores on each side.

Male not found.

Juveniles separate into four groups (Fig. 4) with more elongate tails compared to adult female, especially in the first two stages.

Type habitat and locality

Rhizosphere of unidentified wild grasses at Pandukeshwar, Chamoli Garhwal District, Uttar Pradesh, India; 1850 m a.s.l.

Type material

Holotype, three paratypes females and 15 paratypes juveniles in the collection of the Istituto di Nematologia Agraria del Consiglio Nazionale delle Ricerche di Bari, Italy; two paratype females in the collection of the Entomology and Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, United Kingdom and two paratype females in the collection of the Nematology Section, Zoology Department, Aligarh Muslim University, India.

Diagnosis and relationships

Xiphinema himalayense sp.n. is a monosexual didelphic species characterized by a total body length of 2.6 mm, odontostyle ca. 112 μ m long, lip region continuous with the rest of the body, vulva slightly posterior to mid-body, equally developed genital branches and short conoid with rounded terminus tail.

It resembles, *X. brevicolle* Lordello *et* Da Costa, 1961, *X. diffusum* Lamberti *et* Bleve-Zacheo, 1979, *X. incognitum* Lamberti *et* Bleve-Zacheo, 1979 and *X. taylori* Lamberti, Ciancio, Agostinelli *et* Coiro, 1991. However, *X. himalayense* sp.n. differs from all these species in having the lip region continuous with the rest of the body (separated from the rest of the body by a shallow de-

pression in *X. diffusum* and *X. incognitum* or incisure in *X. brevicolle* and *X. taylori*). Moreover, *X. himalayense* differs from all these species in the longer body (1.9-2.1 mm in *X. brevicolle*, 1.7 mm in *X. diffusum*; 1.9 mm in *X. incognitum*; 2.3 mm in *X. taylori*), and odontostyle (90-104 μ m in *X. brevicolle*, 87 μ m in *X. diffusum* and *X. incognitum*; 94 μ m in *X. taylori*). Compared to *X. taylori*, *X. himalayense* also has a slightly posterior vulva ($V = 49-51$ in *X. taylori*).

The first author is thankful to DST, New Delhi, India for granting a major research project (SP/SO/C-10/94).

The valuable help of Mr. V. Radicci in preparing the illustrations is gratefully acknowledged.