

FIVE NEW NEMATODE SPECIES ASSOCIATED WITH COCONUT IN KERALA, INDIA

BY

E. KHAN and A. R. SESHADRI

Division of Nematology, Indian Agricultural Research Institute, New Delhi-12, India

B. WEISCHER

Biologische Bundesanstalt, Münster (Westf.), Deutschland

and

K. MATHEN

Central Coconut Research Station, Kayangulam, Oachira, Kerala, India

Five new species, *Dolichodorus pulvinus*, *Macroposthonia oachirai*, *Discocriconemella recensi*, *Longidorus saginus* and *Paralongidorus flexus* collected from sandy loam soil around the rhizosphere of coconut at Kayangulam (Kerala) are described and differentiated from the related species.

The present investigation is a follow-up of an earlier project undertaken by B. Weischer, in collaboration with the Coconut Research Station, Kayangulam on the possible role of plant parasitic nematodes in the wilt disease of coconut in Kerala under an EPTA/UN programme in 1965 (Weischer, 1967). Five new species of nematodes collected around the rhizosphere of coconut at Kayangulam are described below. The soil in this area is a sandy loam, with a pH of 5-6.

DOLICHODORUS PULVINUS SP. N.

(Fig. 1, A-G)

16 ♀♀ (paratypes): L = 2.1-2.7 mm; a = 64-83; b = 8.6-10.0; c = 32-49; V = 51-54; T/ABW = 1.6-2.0; spear = 105-129 μ .

14 ♂♂: L = 1.9-2.2 mm; a = 58-76; b = 7.6-10.0; c = 39-48; spear = 106-130 μ ; spicule = 58-65 μ ; gubernaculum = 25-30 μ ; T = 50-60.

Female (Holotype): L = 2.0 mm; a = 74; b = 10; c = 34; V = 53.5¹⁵; T/ABW = 2.0; spear = 116 μ .

Fig. 1, A-G. *Dolichodorus pulvinus* sp. n. A—Entire female; B—Female tail, lateral view; C—Female, vulval region lateral view; D—Male tail, ventral view; E—Male tail, lateral view; F—En face view; G—Female, oesophagus.

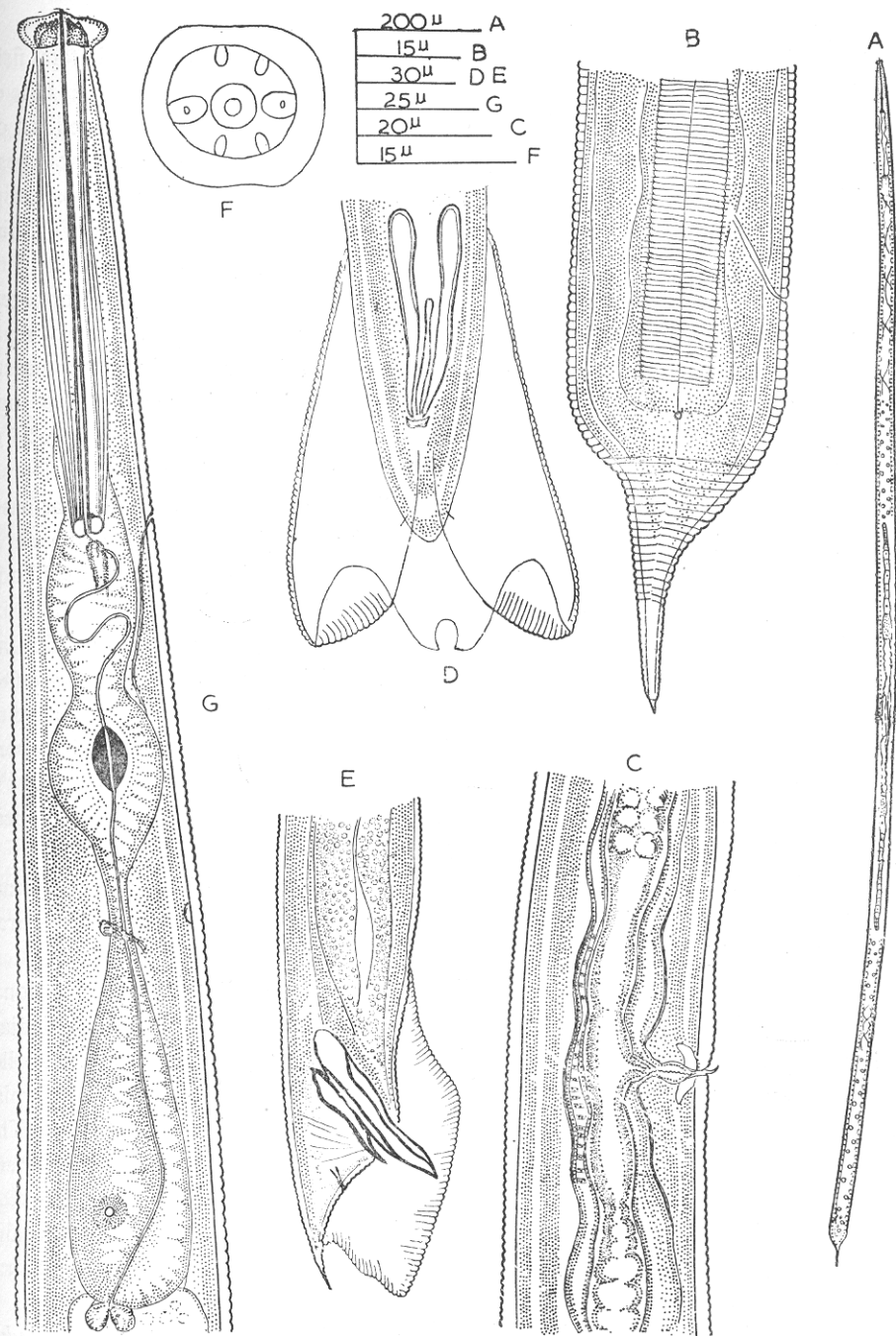


Fig. 1

Body straight when killed. Striae 1.8μ apart at mid-body. Lateral field approximately $\frac{1}{3}$ of body width at mid-body, marked by 3 lines arising at base of metacarpus and continuing up to half of tail length. Head cushion-shaped, set off by deep groove, measuring 22μ across by 11μ high ($18-23 \times 9-11 \mu$ in paratypes), marked by 6 striations (6-9 in paratypes). *En face* view showing 6 lips, with the oblique amphidial apertures located in the two larger sublaterals; labial disc circular encircling the mouth; cephalic sclerotization massive. Guiding ring absent. Spear with rounded basal knobs. Opening of the dorsal oesophageal gland located 6μ ($6-7 \mu$ in paratypes) posterior to spear knobs. Procorpus separated from the metacarpus by distinct constriction, the latter oval in shape measuring $37 \times 25 \mu$ ($37-42 \times 20-26 \mu$ in paratypes). Isthmus $\frac{1}{2}$ ($\frac{1}{2}-1$ in paratypes) as long as the corresponding body-width. Terminal bulb cylindrical measuring $77 \times 25 \mu$, overlaps intestine slightly. Oesophago-intestinal valve conoid rounded. Dorsal oesophageal gland nucleus large and distinct. Excretory pore opposite spear base. Nerve ring located at 203μ from anterior end; hemizonid located opposite nerve ring, extending up to 4 body annules. Vulval slit measuring half the vulval body width. Ovaries outstretched, vagina extending $\frac{1}{3}$ rd into body supported by cuticularized pieces (Fig. 1 C); spermatheca elongate oval, longer than wide and filled with sperms. Epiptygma single. Tail cylindrical measuring 58μ ($48-68 \mu$ in paratypes) long, abruptly narrowing into a sub-acute terminus bearing a fine terminal mucro. Tail striated till the end, bearing 40 annules. Phasmid located in the anterior third of tail, i. e., half the anal-body-diameter posterior to anus.

Male: Resembling female in general body morphology. Bursa trilobed, enveloping entire tail. Minute titillae present.

Holotype: Female on Type Slide No. 118, deposited with the National Nematode Collection, Division of Nematology, Indian Agricultural Research Institute, New Delhi-12.

Paratypes: 16 ♀♀, 14 ♂♂ distributed as follows: 12 ♀♀, 10 ♂♂, National Nematode Collection, Division of Nematology, I. A. R. I., New Delhi-12, India; 1 ♀, 1 ♂, U. S. D. A. Nematode Collection, Nematology Investigations, Beltsville, Maryland, U. S. A.; 1 ♀, 1 ♂, Department of Nematology, University of California, Davis-California, U.S.A.; 1 ♀, 1 ♂, Plantenziektenkundige Dienst, Wageningen, The Netherlands and 1 ♀, 1 ♂ Nematology Department, Rothamsted Experiment Station, Harpenden, England.

Type habitat and locality: From soil around the roots of coconut palm (*Cocos nucifera*) at the Central Coconut Research Station, Kayangulam, Oachira, Kerala, India.

Diagnosis and relationships: *D. pulvinus* sp. n. comes close to *D. profundus* Luc, 1960, *D. silvestris* Gillespie & Adams, 1962 and *D. nigertiensis* Luc & Caveness,

1963. From *D. profundus* the present species differs by the absence of guiding ring and minute rectangular plates on the fore part of body. It can also be separated from *D. silvestris* by smaller body and spear ($L = 2.6-3.6$ mm and spear = $132-162\mu$ in *D. silvestris*) and shape of lip region while from *D. nigeriensis* by longer body, shorter tail and longer spear ($L = 1.8-1.95$ mm, $c = 21.4-27.1$ and spear = $89-95\mu$ in *D. nigeriensis*).

MACROPOSTHONIA OACHIRAI SP. N.

(Fig. 2, A-G)

10 ♀♀ (*paratypes*) : $L = 0.31-0.45$ mm ; $a = 7-10$; $b = 3-4$; $c = 30-37 ?$; $V = 92-95$; spear = $54-60\mu$; $R = 46-50$; $R_v = 2-3$; $R_{an} = 1-2$.

Male : Unknown

Female (Holotype) : $L = 0.33$ mm ; $a = 9$; $b = 3$; $c = 33 ?$; $V = 93$; spear = 59μ .

Body straight when killed. Head with single large non-retrorse anteriorly-directed annule, measuring 22μ across, set off by a distance of 7μ from the second annule which measures 26μ across. Succeeding body annules coarse and retrorse, 45 in number. *En face* view showing 6 lips, the 2 sub-laterals being larger. Submedian lobes absent. Oral aperture 'I' shaped ; amphidial apertures slit-like located in the sub-lateral lips. Nerve ring located at 117μ from anterior end ; excretory pore opposite terminal bulb, 142μ from anterior end. Vulva on 3rd annule from tail terminus with overhanging lip-like structures. Spermatheca offset, with sperms. Anus on the terminal annule. Tail rounded with a button-like structure at the terminus.

Juvenile : Resemble the females in general body morphology except the gonad. Margin of body annules serrated.

Holotype : Female on Type Slide No. 332, deposited with the National Nematode Collection, Division of Nematology, Indian Agricultural Research Institute, New Delhi-12.

Paratypes : 10 ♀♀, 9 juveniles, distributed as follows : 6 ♀♀, 9 juveniles, National Nematode Collection, I. A. R. I., New Delhi-12, India ; 1 ♀, U.S.D.A. 1 ♀, Nematode Collection, Nematology Investigations, Beltsville, Maryland, U.S.A. ; Department of Nematology, University of California, Davis-California, U.S.A. ; 1 ♀, Plantenziektenkundige Dienst, Wageningen, The Netherlands and 1 ♀, Nematology Department, Rothamsted Experiment Station, Harpenden, England.

Type habitat and locality : Same as for previous species.

Diagnosis and relationship : *Macroposthonia oachirai* sp. n. comes close to *M. axestus* (Fassuliotis & Williamson, 1959) De Grisse & Loof, 1965, *M. ferniae*

(Luc, 1959) De Grisse & Loof, 1965 and *M. teres* (Raski, 1952) De Grisse & Loof, 1965. From *M. axestus* the new species differs by having a single head annule, by the absence of submedian lobes (head annules 3, sub-median lobes present in *M. axestus*), shape of female tail (female tail conoid in *M. axestus*), more posteriorly located vulva (vulva on 4-5th annule from tail terminus in *M. axestus*) and the posterior margin of annules in juvenile without fine beads. From *M. ferniae* the new species is distinctive by having lesser number of body annules (93-95 in *M. ferniae*), and lesser number of annules from vulva to tail terminus (vulva at 8th annule from terminus in *M. ferniae*), while from *M. teres* by lesser number of body annules and shorter spear (body annules = 106-113 and spear = 75-76 μ in *M. teres*).

DISCOCRICONEMELLA RECENSI SP. N.

(Fig. 2, H-I)

4 ♀♀ (*paratypes*): L = 0.24-0.32 mm; a = 9-10; b = 3-4; c = 17-21?; V = 88-93; spear = 50-58 μ ; R = 100-110; Rv = 13-14; Ran = 4-5.

Male: Unknown

Female (Holotype): L = 0.24 mm; a = 10; b = 3; c = 17?; V = 89; spear = 56 μ .

Body short and plumpy, strongly arcuate. Head set off with a single non-retrorse saucer-shaped annule measuring 12 x 4 μ , succeeding annules retrorse with smooth margins, numbering 109. Occasional anastomosis of annules present. Nerve ring located at 66 μ from anterior end. Excretory pore located 5 annules posterior to terminal bulb. Vulva located on 14th annule from tail terminus. Spermatheca absent. Tail bluntly conical.

Holotype: Female on Type Slide No. 333 deposited with the National Nematode Collection, Division of Nematology, Indian Agricultural Research Institute, New Delhi-12.

Paratypes: 4 ♀♀ on Type Slide Nos. 334-337, other data same as for holotype.

Type habitat and locality: Same as for the previous species.

Diagnosis and relationship: *D. recensi* sp. n. comes close to *D. macramphid* De Grisse, 1967, and *D. glabrannulata* De Grisse, 1967. From *D. macramphid*

Fig. 2, A-G. *Macroposthonia oachirai* sp. n. A—Female, head end; B—En face view; C—Female, entire; D—Female, neck; E—Juvenile, anterior end; F—Female, posterior end; G—Juvenile, posterior end. H-I. *Discocriconemella recensi* sp. n. H—Female, neck; I—Female, entire.

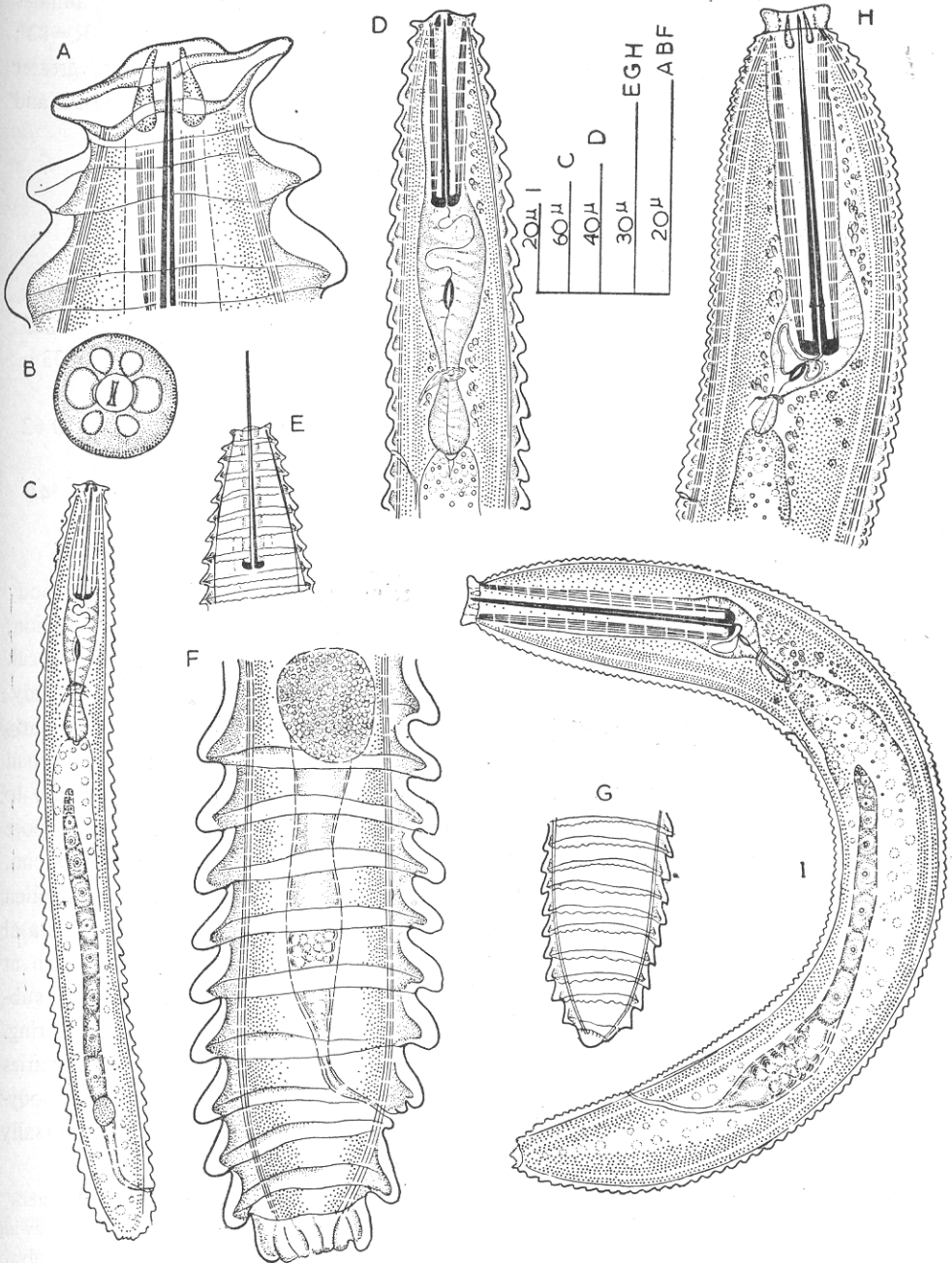


Fig 2

the present species differs by shorter spear, greater number of body annules and the number of annules from tail terminus to vulva (spear=65 μ ; R=82; Rv=12 in *D. macramphid*) while from *D. glabrannulata* by longer spear, greater number of body annules and the value of Rv (spear=37.44 μ ; R=83.92 and Rv=8.9 in *D. glabrannulata*).

LONGIDORUS SAGINUS SP. N.

(Fig. 3, A-J)

18 ♀♀ (paratypes): L=4.8-6.4 mm; a=83-130; b=8-17; c=190-265; V=40-45; spear=135-155 μ ; spear extension=55-75 μ ; tail length = 21-33 μ ; T/ABW=0.6-0.8.

2 ♂♂: L=4.6-5.4 mm; a=83-108; b=14-15; c=185-215; T=60-62; spear=135-148 μ ; spear extension=50-68 μ ; Tail length=25-26 μ .

Female (Holotype): L=5.9 mm; a=91; b=9; c=196; V=64.4; spear=154 μ ; spear extension=70 μ .

Body arc-shaped when killed, tapering at both ends. Lateral body pores beginning 15 μ from anterior end, arranged serially in the neck region, but irregularly thereafter. Lateral hypodermal chord arising as a thin streak in region of spear extension, occupying $\frac{1}{3}$ rd of body width in mid-body. Lateral hypodermal glands weakly developed. Lip region continuous, slightly expanded and measuring 25 x 6 μ (20-26 x 5-7 μ in paratypes). Amphids broad and short, distinctly bilobed, reaching half the distance from anterior end to guiding ring. *En face* view showing 6 lips. Amphidial aperture indistinct, pore like. Guiding ring located at 34 μ (27-35 μ in paratypes) from anterior end, i.e., 1.5 times the lip width (1.2-1.6 in paratypes). Spear extension swollen slightly at the base. Nerve ring located at 250 μ from anterior end. Basal oesophageal bulb measures 85 x 20 μ , i.e., twice as long as the body width at base of oesophagus and half as wide. A small mucro located in left sub-ventral sector of anterior tubular part of oesophagus in region of nerve ring. Vulva a transverse slit, $\frac{1}{4}$ of vulval body diameter. Gonad paired, ovaries reflexed at the oviduct. 'Z' organ present. Prerectum 14 times the anal body-width in length. Rectum half as long as the anal-body width. Tail dorsally

Fig. 3, A-J. *Longidorus saginus* sp. n. A—Female, head lateral view; B—Female, neck; C—Male tail; D—*En face* view; E—Female tail, ventral view; F—Male tail showing supplements; G—Female, ventral view of head; H—Female, ventral view of vulval region; I—Female tail, lateral view; J—Female gonads.

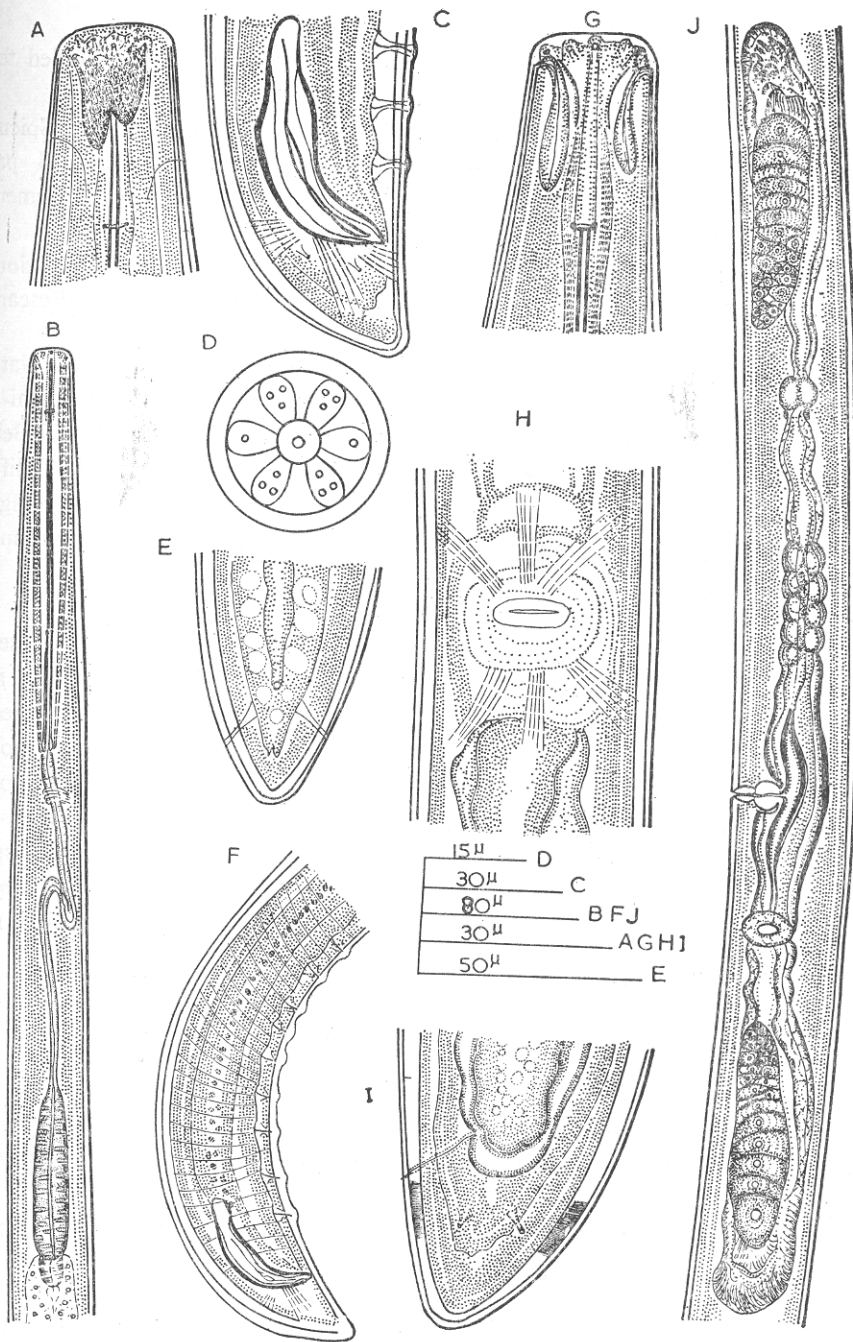


Fig. 3

convex conoid, $4/5$ the anal body width in length, with obtusely rounded terminus. Two pairs of caudal pores present.

Male: General body morphology similar to that of female. Spicula $60-61 \mu$ long; lateral guiding piece $41-47 \mu$ in length. Besides the adanal pair of supplements a series of 8 equally spaced ventro sub-medial supplements observed. Tail similar to that of female.

Holotype: Female on Type Slide No. 101, deposited with the National Nematode Collection, Division of Nematology, Indian Agricultural Research Institute, New Delhi-12.

Paratypes: 18 ♀♀, 2 ♂♂, distributed as follows: 14 ♀♀ and 2 ♂♂, National Nematode Collection, Division of Nematology, I.A.R.I., New Delhi-12, India; 1 ♀, U.S.D.A. Nematode Collection, Nematology Investigations, Beltsville, Maryland, U.S.A.; 1 ♀, Department of Nematology, University of California, Davis-California, U.S.A.; 1 ♀, Plantenziektenkundige Dienst, Wageningen, The Netherlands, and 1 ♀, Nematology Department, Rothamsted Experiment Station, Harpenden, England.

Type habitat and locality: Same as for the previous species.

Diagnosis and relationship: *Longidorus saginus* sp. n. comes close to *L. attenuatus* Hooper, 1961, *L. vineacola* Sturhan & Weischer, 1964, *L. profundorum* Hooper, 1965 and *L. moniloides* Heyns, 1966. The present species differs from *L. attenuatus* by having more robust body, longer spear and shorter tail ($a=201$, $spear=75 \mu$, $c=107$ in *L. attenuatus*); from *L. vineacola* by shorter body, longer spear and anterior location of vulva ($L=7.6_2^1$ mm, $spear=100 \mu$ and $V=53$ in *L. vineacola*); from *L. profundorum* by shorter body, longer spear and anteriorly located vulva ($L=6.8$ mm, $spear=102 \mu$ and $V=55$ in *L. profundorum*) while from *L. moniloides* by longer body and spear ($L=3.25-4.14$ mm, $spear=56-63 \mu$ in *L. moniloides*).

PARALONGIDORUS FLEXUS SP. N.

(Fig 4, A-F)

4 ♀♀ (*paratypes*): $L=4.8-5.3$ mm; $a=88-120$; $b=14-19$; $c=61-77$; $V=48-50$; $spear=105-115 \mu$; $spear\ extension=41-48 \mu$; $tail\ length=65-74 \mu$; $T/ABW=2.5-2.7$.

5 ♂♂: $L=4.6-5.5$ mm; $a=103-131$; $b=12-17$; $c=51-74$; $T=47-68$; $spear=105-121 \mu$; $spear\ extension=48-55 \mu$.

Fig. 4, A-F. *Paralongidorus flexus* sp. n. A—Female, ventral view of head; B—Female, lateral view of head; C—Male, entire; D—Male tail, lateral view showing supplements; E—Female tail; F—Female, neck region.

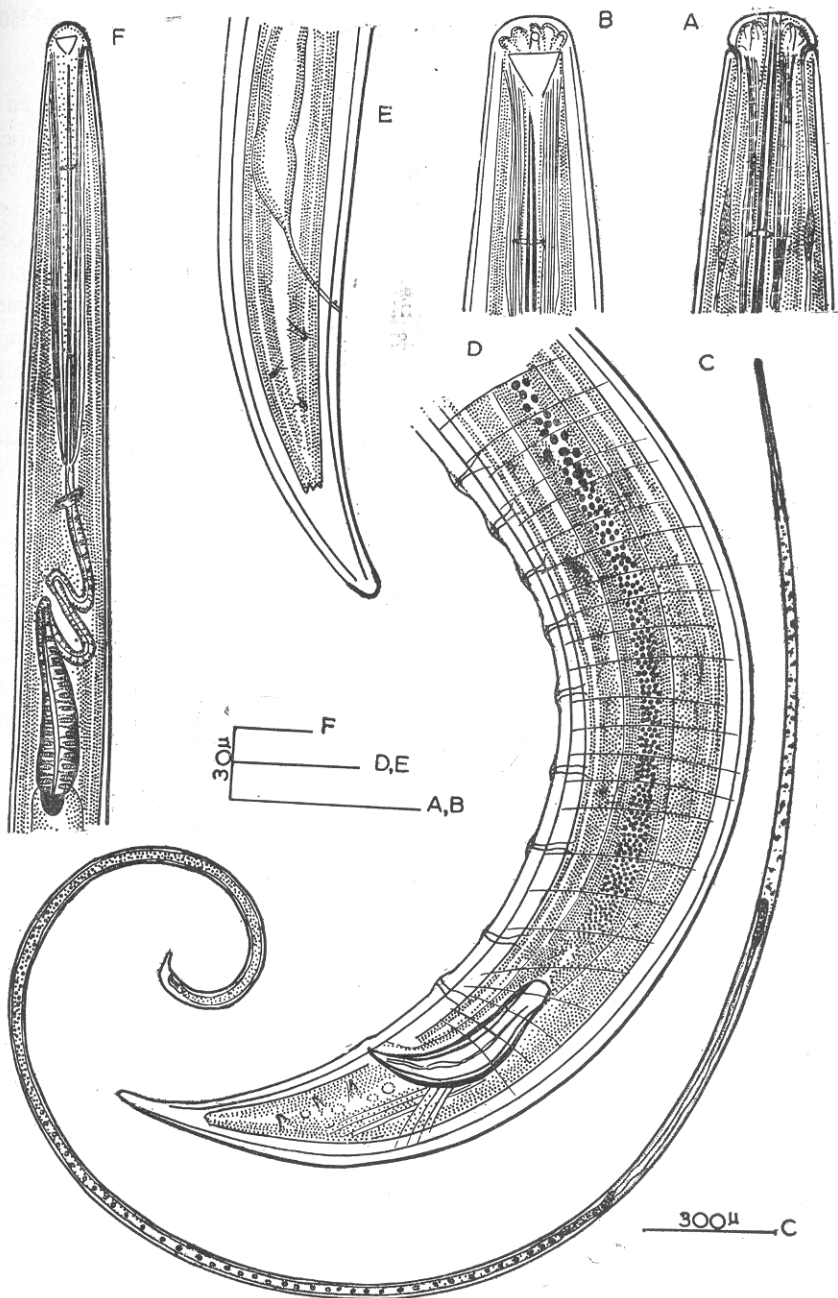


Fig. 4

Female (Holotype) : L=4.8 mm ; a=88 ; b=15 ; c=70 ; V= $5 \cdot 150^{4 \cdot 3}$; spear=105 μ ; spear extension=48 μ .

When killed body curves ventrally assuming the shape of an open '6'. Body tapering anteriorly to a slightly set off lip region measuring $\frac{1}{3}$ rd as wide as body width at base of oesophagus. Lip contour rounded measuring 13 x 6 μ (13-15 x 6-7 μ in paratypes). Lateral hypodermal chords occupying a quarter to third of the body width, gradually narrowing anteriorly to a thin line in the oesophageal region. Lateral body pores serially arranged in neck region while irregularly so in rest of the body. Dorsal and ventral pores not observed. Amphidial openings slit-like occupying 70 per cent (70-80 in paratypes) of lip-width. Amphids stirrup-shaped. Each amphid connects via a tube to a sensillar sac located in level with spear guiding ring. Stoma a cylindrical tube slightly over 3 head widths in length, unsclerotized ending in a single thick guiding ring located at 36 μ (34-37 μ in paratypes) from anterior end. Anterior tubular part of oesophagus 150 μ in length encircled by nerve ring located at 177 μ from anterior end; posterior oesophageal bulb twice as long and half as wide as the body-width at base of oesophagus. Dorsal oesophageal gland nucleus at 25 per cent while the two paired sub-ventral gland nuclei at 42 and 54 per cent of the basal oesophageal bulb from anterior end. Vulva a transverse slit. Gonad paired, opposed ; ovaries reflexed at the oviducts. Spermatheca elongate oval, $3\frac{1}{2}$ times as long and $\frac{3}{4}$ as broad as the corresponding body-width, packed with sickle-shaped sperms. Pre-rectum $7\frac{1}{2}$ times and rectum one anal-body-diameter in length. Tail dorsally convex conoid, 73 μ long (65-75 μ in paratypes), the clear digitate terminus measuring one anal-body-width in length. Three pairs of caudal pores on tail.

Male : General body morphology as that of female. Spicula paired, arcuate, 53-55 μ long ; lateral guiding piece 35-40 μ . Besides an adanal pair of supplements, a series of 8 equidistant ventro sub-median supplements present.

Holotype : Female, on Type Slide No. 83, deposited with the National Nematode Collection, Division of Nematology, Indian Agricultural Research Institute, New Delhi-12.

Paratypes : 3 ♀♀ and 4 ♂♂, with the National Nematode Collection, Division of Nematology, I.A.R.I., New Delhi-12, India. 1 ♀, 1 ♂, with U.S.D.A. Nematode Collection, Nematology Investigations, Beltsville, Maryland, U.S.A.

Type habitat and locality : Same as for the previous species.

Diagnosis and relationship : *Paralongidorus flexus* sp. n. comes close to *P. afzali* (Khan, 1964) Siddiqi & Husain, 1965 from which it differs by a longer body, short spear and shape of amphid (L=3.31-4.1 mm ; spear=113-120 μ and amphid broad pouch-like in *L. afzali*).

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