

# Two new species of the genus *Hemicycliophora* De Man, 1921 (Nematoda : Tylenchida)

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## SUMMARY

Two new species of the genus *Hemicycliophora* De Man, 1921 are described and figured. Females of *H. vitiensis* n. sp. from the rhizosphere of cocoa, *Theobroma cacao* L., in Fiji are characterized by a pair of laterally sited labial lobes projecting from the first annule, a structure unique in the genus. Females of *H. signata* n. sp. from the rhizosphere of cotton, *Gossypium hirsutum* L., in Malawi are characterized by a rounded tail with a thickened sheath cuticle, four longitudinal lines in the lateral field, longitudinal scratches on the annules and a low annule number.

## RÉSUMÉ

*Deux nouvelles espèces du genre Hemicycliophora De Man, 1921 (Nematoda : Tylenchida)*

Deux nouvelles espèces du genre *Hemicycliophora* De Man, 1921 sont décrites et figurées. Les femelles de *H. vitiensis* n. sp., provenant de la rhizosphère de cacaoyers (*Theobroma cacao* L.) des Iles Fidji, comportent une paire de lobes labiaux projetés latéralement à partir du premier anneau céphalique ; cette structure, unique pour le genre, suffit à caractériser cette espèce. Les femelles de *H. signata* n. sp., provenant de la rhizosphère de cotonniers, *Gossypium hirsutum* L., du Malawi, se caractérisent par une queue arrondie dont le feuillet cuticulaire externe est épaissi, un champ latéral à quatre incisures et la présence de lignes longitudinales ornant les anneaux, ces derniers étant en nombre réduit.

The species described here were collected in the course of two extensive nematode surveys of crops : one in Malawi (1975) by Dr. J. Bridge, the other in island groups of the South Pacific (1976-1977) by the author.

## Materials and methods

Specimens were heat killed, fixed in F. A. 4 : 10 (*H. vitiensis* n. sp.) or 4% Formaldehyde solution (*H. signata* n. sp.) and subsequently processed to glycerine containing traces of picric acid by a modified Baker method. Annule counts were made on the inner cuticular layer (body cuticle) and measurements along the

body were taken along its central line. Male tail was measured from a point at the base of the anal sheath just above gubernaculum level, to the terminus. *H. vitiensis* n. sp. has been named from "Viti", the Fijian word for Fiji ; *H. signata* n. sp. from the Latin for marked or signed.

## Types

The holotype females of both species and the male allotype of *H. vitiensis* n. sp. have been deposited at the Commonwealth Institute of Helminthology, St. Albans, Herts, England. Paratypes are distributed in the following collections :

- 1) Commonwealth Institute of Helminthology, St. Albans, Herts, England.
- 2) Rothamsted Experimental Station, Harpenden, Herts, England.
- 3) Laboratoire de Zoologie (Vers), Muséum national d'Histoire naturelle, Paris, France.
- 4) Department of Nematology, Landbouwhogeschool, Wageningen, The Netherlands.
- 5) University of California, Nematology Survey Collection, Davis, California, U.S.A.
- 6) Department of Scientific and Industrial Research, Auckland, New Zealand.

in the following manner :

*H. vitiensis* n. sp. 1) Nineteen females, five males.  
2), 3), 4), 5) and 6) Two females and one male each.

*H. signata* n. sp. 1) Eleven females.  
2), 3), 4) and 5) One female each.

#### *Hemicycliophora vitiensis* n. sp.

#### MEASUREMENTS

*Females* (n=30) : L=0.720-1.054 mm (0.918); a=25.7-31.9 (29.4); b=5.0-6.0 (5.5); c=9.8-12.8 (10.6); V=84.1-87.1 (85.4); stylet=86-106  $\mu$ m (97); annules=259-287 (273).

*Aberrant females* (n=2) : L=0.975-1.085 mm; a=29.3-29.5; b=5.5-5.8; c=10.5; V=85.3-85.9; stylet=102-108  $\mu$ m; annules=281-284.

*Males* (n=11) : L=0.652-0.792 mm (0.732); a=37.0-44.0 (39.9); b=?; c=5.5-6.1 (5.7); spicules=42-48  $\mu$ m (46); gubernaculum=9-13  $\mu$ m (11).

*Holotype* (female) : L=0.855 mm; a=28.0; b=5.2; c=10.2; V=85.8; stylet=91.5  $\mu$ m; annules=267.

*Allotype* (male) : L=0.770 mm; a=38.5; b=?; c=5.6; spicules=48  $\mu$ m; gubernaculum=11  $\mu$ m.

#### DESCRIPTION

*Females*: Body slender, slightly curved on heat death, sometimes with post-vulval region angled ventrally to body line. Sheath cuticle

fitting closely on anterior part of body, well separated on tail. Annulation distinct on both cuticular layers; annules 3.0-4.8  $\mu$ m wide at mid body of inner. Lateral field marked by breaks or slight disruptions in the transverse striae with occasional anastomoses, sometimes by a fine central line over short distances. No markings seen outside lateral field. Cephalic region composed of two annules visible on both cuticular layers, a larger domed anterior annule and a smaller posterior annule. The anterior annule bears a pair of laterally sited labial lobes which project forward from the head beyond the level of the lip region and enclose it. With the light microscope in lateral view (Fig. 1, B-E) one of these labial lobes lies over the other giving the head a broadly projecting "snout". In dorso-ventral view (Fig. 1, F) these structures appear as two convex projections at the anterior end. The structure of the cephalic region is more clearly seen in stereoscan photographs (Fig. 4, A-D). These show that the head is roughly four sided, the first annule particularly being four-lobed with median dorsal, ventral and lateral depressions. The labial lobes appear as outgrowths at the lateral edge of the labial disc. The outside posterior edge of each labial lobe is arched, the amphid aperture lying in the centre of this arch at the top of the median lateral depression of the first head annule (Fig. 4, A). In optical section the lip region is well elevated from the first annule.

Stylet extending through 26-33 annules; conical part 73-92.5  $\mu$ m; basal part distorted in some specimens. Stylet knobs squarish, prominently directed outwards and posteriorly to line of shaft. Isthmus widening regularly to well-developed posterior bulb. Oesophageal-intestinal junction 49-60 annules (140-190  $\mu$ m) from anterior. Excretory pore 53-60 annules (140-196  $\mu$ m) from anterior, five annules in front of oesophageal-intestinal junction to five annules behind. Hemizonid distinct, about two annules long, situated 48-58 annules from anterior, on the same annule, or up to four annules anterior to excretory pore. Body cuticle not bulging at hemizonid. Gonad single, outstretched, oocytes in a double row anteriorly, a single row posteriorly. Spermatheca oval, filled with rounded sperm.

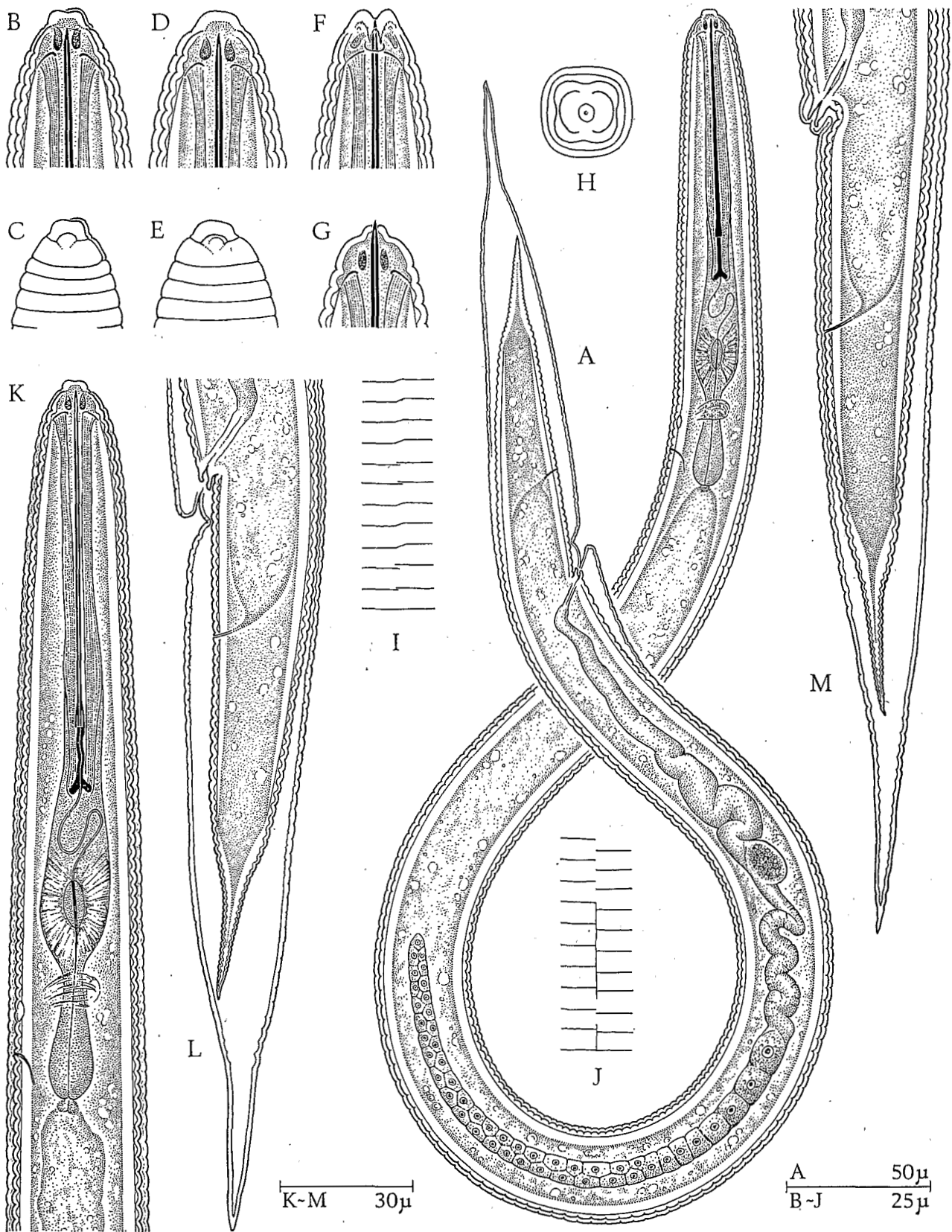


Fig. 1. *Hemicycliophora viliensis* n. sp. Female. A : Entire ; B-E : Anterior end, lateral (C & E : Surface views of B & D) ; F : Anterior end, dorso-ventral ; G : Anterior end of aberrant female ; H : En face ; I, J : Lateral field ; K : Oesophageal region ; L, M : Posterior end.

Vulva a conspicuous discontinuity in the ventral body wall, located 52-66 annules (106-160  $\mu\text{m}$ ) from terminus. Vulval lips modified, elongate. Short vulval sleeve usually present extending about one third of the way round body, but sheath cuticle sometimes fitting tightly round vulval lips (Fig. 1, M). Post-vulval region of body measuring 4.1-5.4 vulval body widths; 5.7-7.4 anal body widths. Body narrowing posterior to vulva. Vulva and anus separated by 13-20 clear annules, a distance of 34-58  $\mu\text{m}$ . Anus 37-49 annules (65-104  $\mu\text{m}$ ) from terminus. Tail measuring 3.5-4.8 anal body widths, at first subcylindroid becoming conoid then distally spiculate. Annulation on spike becoming progressively finer, last few annules often difficult to see. Body cuticle thinner on spike than elsewhere, sheath cuticle not thinning. Cytoplasm extending to terminus. Terminus pointed.

*Aberrant females:* The population contained two adult females which did not have sheath cuticles. In one individual the lateral labial lobes were also missing showing the elevated form of the lip region (Fig. 1, G). Both specimens had sperm in the spermathecae and resembled normal females in tail shape and other details. However, the body length (1.085 mm) and stylet length (108  $\mu\text{m}$ ) of one female were the longest measured of any in the population and increase the known range for the species as a whole.

*Males:* Body straight or slightly curved. Annulation distinct, 1.1-1.7  $\mu\text{m}$  mid-body. Lateral field commencing close behind cephalic region and extending to level of bursa, marked by three incisures, the outer pair crenate. Cephalic region not set off, fairly high, with four longitudinal submedian ridges separated by what appear to be dorsal, ventral and lateral concavities. Posterior limit of oesophagus unclear. Excretory pore 110-128  $\mu\text{m}$  from anterior. Hemizonid distinct, two to four annules long, situated one to seven annules anterior to excretory pore in a bulge in the cuticle.

Testis single, outstretched. Spicules semi-circular, gubernaculum slightly curved, thickened proximally. Anal sheath long (12-16  $\mu\text{m}$ ), the outer side of its lip bearing a fine pointed process 1.5-2.0  $\mu\text{m}$  in length. Prominent

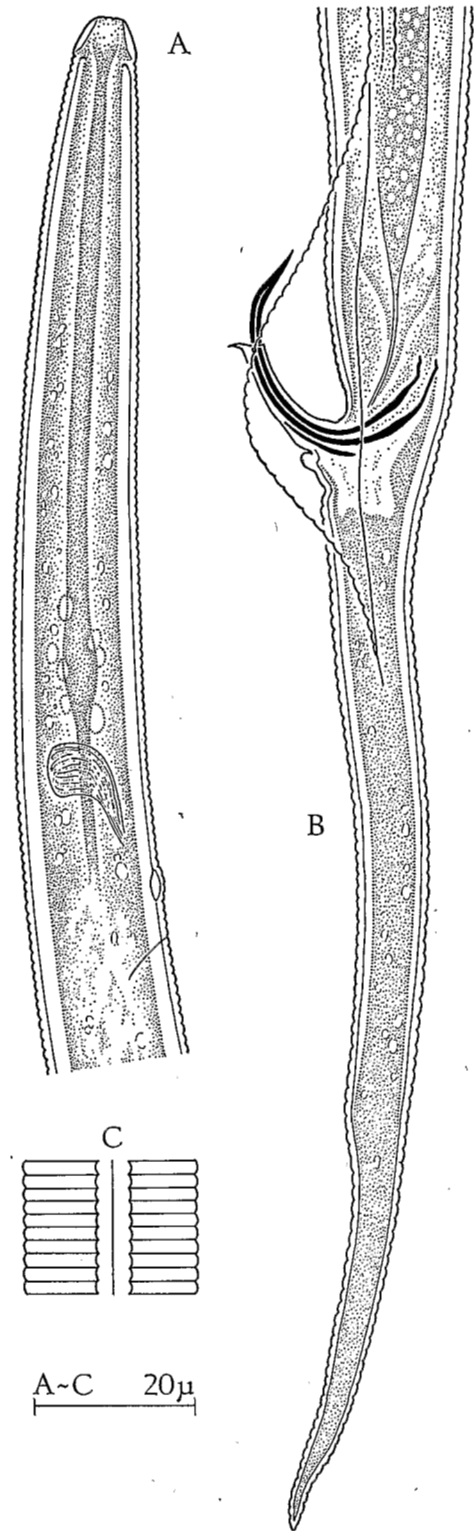


Fig. 2. *Hemicycliophora viliensis* n. sp. Male. A: Oesophageal region; B: Posterior end; C: Lateral field.

cuticular tubercle present at junction of anal sheath and body. Bursa well developed, striated with a crenate edge. Tail 110-142  $\mu\text{m}$  long, elongate-conical; annulation mid tail 1.3-1.8  $\mu\text{m}$  becoming finer distally. Terminus pointed (Fig. 2).

*Juveniles*: Similar to adults but with smaller less prominent lateral labial lobes.

*Type host and locality*: Soil around the roots of cocoa, *Theobroma cacao* L., in a small plantation beside the Labasa-Nasawana Rd. near Nasolo village, Wainunu District, Vanua Levu, Fiji. Collected by author, 20/7/1976.

*Other host*: Soil around the roots of ylang-ylang, *Cananga odorata* (Lam.) Hook. f. & Thoms., at type locality, data as above.

#### DIAGNOSIS

Females of *H. vitiensis* n. sp. are characterized by the possession of paired lateral labial lobes. These distinguish the species from all previously described species.

#### DISCUSSION

*H. vitiensis* n. sp. is unique among species in the subfamily Hemicycliophorinae in possessing lobes on the head. Lobes are commonly present in the related subfamily Criconematinae and since the work of De Grisse and Loof (1965) have been recognised as an important character in the taxonomy of the group. However, when present these lobes are always submedian in position and although they are sometimes linked as in *Criconemoides* Taylor, 1936 (*sensu stricto*), they are linked in pairs dorsally and ventrally, not laterally. The large lateral outgrowths of the labial region of *H. vitiensis* n. sp. (which have been called labial lobes) are not an instantly recognisable homologue of any structure in the Criconematinae and their taxonomic significance is open to question. Scanning electron microscope studies of the cephalic regions of other Hemicycliophorinae are underway hopefully to clarify this. For the time being *H. vitiensis* n. sp. has been left in the genus *Hemicycliophora* of which it is in other respects a typical species.

### *Hemicycliophora signata* n. sp.

#### MEASUREMENTS

*Females* (n=16): L=0.538-0.710 mm (0.608); a=15.8-20.3 (18.3); b=4.6-5.5 (5.1); c=12.3-21.8 (15.8); V=86.9-91.1 (88.5); stylet=55-63  $\mu\text{m}$  (58.5); annules=148-176 (163).

*Holotype* (female): L=0.552 mm; a=16.5; b=4.7; c=15.8; V=87.3; stylet=58  $\mu\text{m}$ ; annules=161.

#### DESCRIPTION

*Females*: Body stout, straight or slightly curved on heat death; sheath cuticle fitting closely except on ventral post-vulval region and tail terminus. Annulation distinct on both cuticular layers, annules 3.2-4.4  $\mu\text{m}$  wide at mid body of inner. Lateral field with four longitudinal lines, the outer pair generally more clearly defined than the inner pair. These lines mark the boundaries of two rows of elevated cuticular blocks which are separated by a lower central area (Fig. 4, E, F). The width of this central area varies between individuals; at its widest it nearly equals the width of the adjacent blocks, at its narrowest it all but disappears and the two inner lines almost merge. In most specimens the situation is intermediate. Transverse striae unbroken or with breaks and anastomoses. Outside the lateral field each annule is ornamented with numerous minute somewhat irregular but basically longitudinal swellings separated by furrows which appear as faint lines running across each annule. These lines may branch or exhibit other irregularities but do not join up with those of adjacent annules to form longitudinal striations down the body.

Cephalic region composed of two annules (three in two specimens), visible on both cuticular layers and of about equal thickness. Head contour truncate-rounded to rounded; lip region not elevated above contour. Stylet extending through 14-18 annules; conical part 44.5-49.5  $\mu\text{m}$  in length. Stylet knobs rounded, compact, close to line of shaft. Isthmus of oesophagus cylindrical and parallel sided before widening to terminal bulb. Oesophageal-intes-

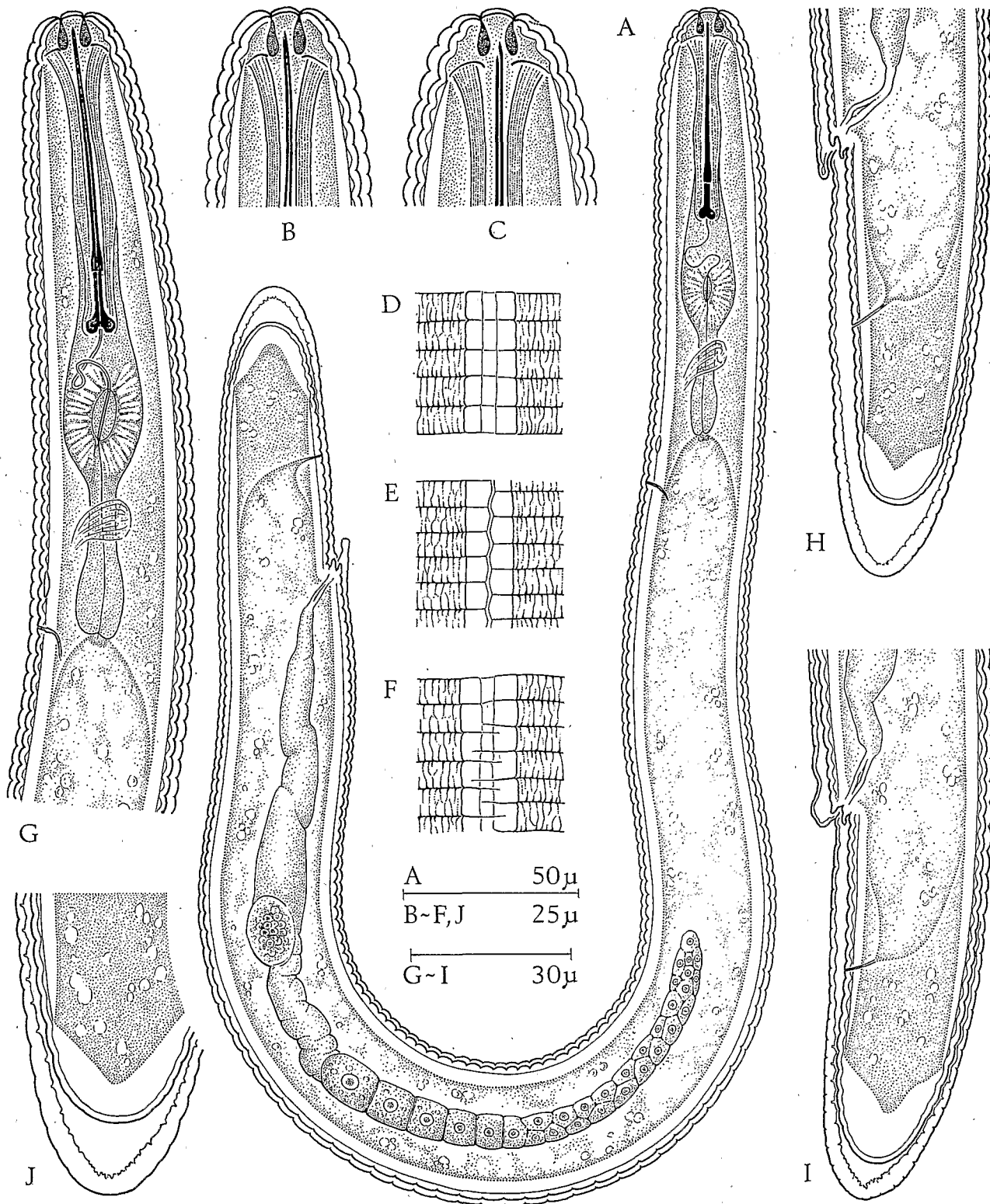


Fig. 3. *Hemicycliophora signata* n. sp. Female. A : Entire ; B, C : Anterior end, lateral ; D-F : Lateral field ; G : Oesophageal region ; H, I : Posterior end ; J : Tail terminus.

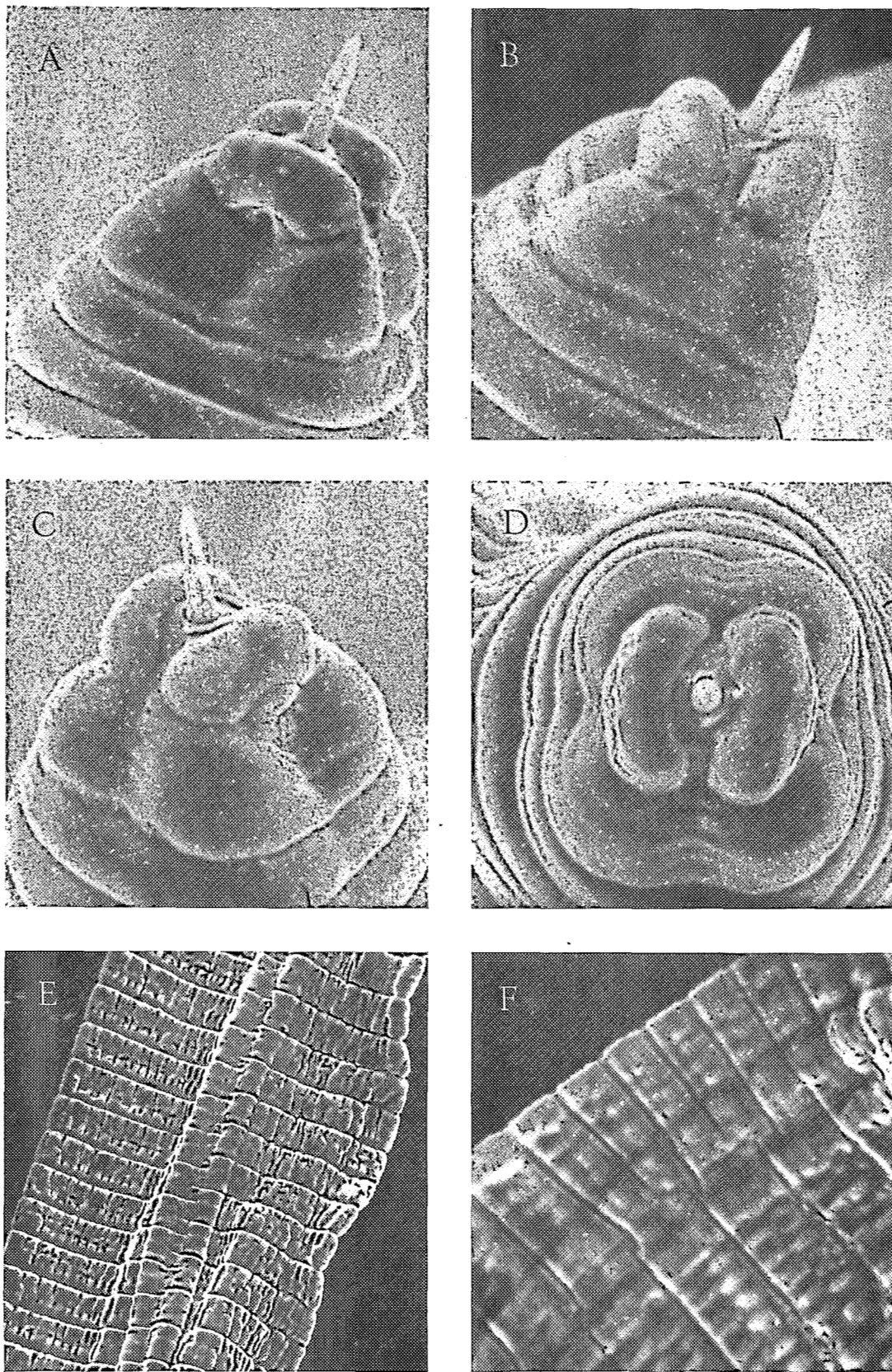


Fig. 4. *Hemicycliophora vitiensis* n. sp. Female. A-D : Cephalic region ; A : Lateral ; B : Dorso-ventral ; C : Dorso-lateral ; D : En face. — *Hemicycliophora signata* n. sp. E, F : Lateral field and cuticular ornamentation.

tinal junction 29-34 annules (108-132  $\mu\text{m}$ ) from anterior. Excretory pore 33-40 annules (117-155  $\mu\text{m}$ ) from anterior; occupying the same annule as the oesophageal-intestinal junction to seven annules behind this. Hemizonid distinct in nine paratypes (probably not seen in the remainder due to orientation of the specimen); about 1.5-2 annules in length and situated 30-37 annules from anterior, one to four annules before excretory pore. Body cuticle not bulging at hemizonid.

Gonad single, outstretched (except in one specimen, with a single flexure); oocytes in a double row at the anterior end, a single row posteriorly. Spermatheca oval, filled with rounded sperm. Vulva a conspicuous discontinuity in the ventral body wall, located 20-28 annules (55-80  $\mu\text{m}$ ) from terminus. Vulval lips modified, elongate but short. Short vulval sleeve usually present extending about one third of the way round body. Post-vulval region of body measuring 1.8-2.7 vulval body widths, 2.3-3.5 anal body widths. Body narrowing posterior to vulva. Vulva and anus separated by 6-12 clear annules, a distance of 19-38  $\mu\text{m}$ . Anus 10-18 annules (27-47  $\mu\text{m}$ ) from terminus. Tail measuring 1.2-2.2 anal body widths with broadly rounded to hemi-

spherical terminus. Tail annulation becoming only slightly finer distally, last few annules sometimes difficult to see. Body cuticle of tail the same thickness as or only marginally thicker than that of the rest of the body; sheath cuticle thickening appreciably towards posterior part of tail, with inside surface irregular around terminus.

*Males*: Not found, although the presence of sperm in the spermathecae of all females examined indicates their existence. This situation has been reported in a number of *Hemicycliophora* species, for example *H. epicharoides* Loof, 1968 and *H. robusta* Loof, 1968.

*Juveniles*: Similar to adults in lateral field and cuticular ornamentation. Tail of earlier stages with a broadly rounded terminal swelling.

*Type host and locality*: Soil around the roots of cotton, *Gossypium hirsutum* L., under cultivation at Changoima, Chikwawa District, Lower Shire Valley, Malawi. Collected by S. Page, 5/3/1975.

*Other host*: Soil around the roots of sugarcane, *Saccharum officinarum* L., Malawi. Data from a sample received at CIH for identification in 1973.

Table 1  
Some characters differentiating *Hemicycliophora signata* n. sp. and related species

	Stylet ( $\mu\text{m}$ )	Annules	Lines in lateral field	Lines outside field	Other major characters
<i>H. biloculata</i> Colbran, 1969	81.2-96.1	214-237	4	absent	
<i>H. brevicauda</i> Sauer, 1958	103(*)	150	1	absent	
<i>H. nigriensis</i> Germani & Luc, 1973	82-90	213-232	many around entire body		Tail pointed or rounded
<i>H. straturata</i> Germani & Luc, 1973	66-71	205-220	28-30 around entire body		
<i>H. tessellata</i> Sauer, 1958	92(*)	150	20 around entire body		
<i>H. truncata</i> Colbran, 1956	84-103	c. 200(*)	3	absent	Form of head and post-vulval region distinct
<i>H. signata</i> n. sp.	55-63	148-176	4	many	

(\*) Data from Brzeski, 1974; all other data from original descriptions.



## DIAGNOSIS

Females of *H. signata* n. sp. are characterized by the low number of body annules, the hemispherical tail terminus surrounded by a thickened sheath cuticle and more particularly by the form of the lateral field and cuticular ornamentation. These characters suffice to separate the new species from all previously described *Hemicycliophora* species. The species closest to *H. signata* n. sp. are those with rounded tails and longitudinal lines in either the lateral field or on the cuticle. These are : *H. biloculata* Colbran, 1969 ; *H. brevicauda* Sauer, 1958 ; *H. nigeriensis* Germani & Luc, 1973 ; *H. straturata* Germani & Luc, 1973 ; *H. tessellata* Sauer, 1958 and *H. truncata* Colbran, 1956.

The major differences between these species and the new one are given in Table 1.

## ACKNOWLEDGEMENTS

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