Nematol. medit. (1995), 23: 283-298

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SOME SPECIES OF TYLENCHIDA (NEMATODA) FROM PAPUA NEW GUINEA

by
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Summary. Eight species of Tylenchida are recorded from Papua New Guinea. A detailed study of *Sakia indica* supported the inclusion of the genus *Sakia* in the family Tylenchidae, subfamily Tylenchinae: SEM showed a wedge-shaped labial area not found in any other tylench but reminiscent of what has been found in *Filenchus*. SEM of *Filenchus discrepans* was similar to that already reported. Morpho-anatomical observations on six other species of Tylenchida frequently detected in Papua are provided.

Soil samples sere collected from natural habitats and the rhizosphere of cultivated and natural vegetation during an expedition in Papua New Guinea, undertaken in June, 1982 by P. Grootaert (Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussel). Specimens belonging to fifteen genera of the order Tylenchida Thorne, 1949 were found in seven localities, as shown in Table I.

Additional morphometric and morphological data, with some notes on internal variability, are given for a *Sakia* species, two species of *Filenchus* and five species belonging to the genera *Aphelenchoides* Fisher, 1894, *Coslenchus* Siddiqi, 1978, *Malenchus* Andrássy, 1968, *Helicotylenchus* Steiner, 1945 and *Tylenchorhynchus* Cobb, 1913.

Materials and methods

All material available for this study was mounted in pure glycerine (by a modified Seinhorst method) between two coverslips on aluminium slides, after fixation in hot 8% formaldehyde.

Results

SAKIA INDICA (Husain *et* Khan, 1965) Khan *et al.*, 1968

(Fig. 1: A-I; Fig. 2: A-E; Table II)

Description

Female: body slender, generally straight after killing, sometimes assuming sinuous habitus. Cuticle finely striated, annuli 0.7-1.5 (1.2) µm wide at mid-body. Lateral field indistinct, probably only two lines. Scanning of a flattened specimen showed a very poor expression of the transverse annuli and the two lateral lines. Cephalic region hemispherical, continuous with body contour, 4-5 µm wide and 2.5-3.5 µm high. Labial sclerotization delicate. SEM shows a wedge-shaped labial area, about 3 µm long along the lateral axis and about 1 µm wide at the mouth opening. This area is clearly demarcated by a groove and contains the oral disc and the amphidial apertures; the oval oral disc

TABLE I - *List of Tylenchida species found in Papua New Guinea.*

Species	Locality	Habitat
Aphelenchoides fragrariae	Warawaranga	along bank of brooklet, in scrapings of a sagu tree
	Bunapas	secondary rainforest; clay under leaves
	Sepen	puddle with duck-weed; bottom composed of coral fragment, with mud
	Boroi (bush)	dry scrapings of sagu tree
Aphelenchus sp.	Bunapas	secondary rainforest, upper 10 cm of a heavy, moist soil and clay
	Boroi (bush)	dry swamp between palm trees and weeds
Basiria sp.	Hansa Point	along the bank of a small creek from the rhizosphere of weeds
	Warawaranga	along water edge of pond, very moist soil
	Bunapas	secondary rainforest; clay under leaves
	Boroi (bush)	dry swamp between palm trees and weeds
Coslenchus costatus	Hansa Point	shallow pond in the shadow; benthos from mid-pond
	Awar Point	coconut plantation, dry soil, among grasses; under cocoa tree
	Bunapas	along bank of a dead arm of Ramu river
Filenchus discrepans	Hansa Point	shallow pond in the shadow; benthos from mid-pond; along the bank of a small creek from the rhizosphere of weeds
	Awar Point	border of mangroves under pandanus tree; coconut plantation, dry soil, among grasses;
Filenchus misellus	Hansa Point	shallow pond in the shadow; benthos from mid-pond; along the bank of a small creek from the rhizosphere of weeds
	Awar Point	border of mangroves under pandanus tree; coconut plantation, dry soil, among grasses;
Gracilacus sp.	Awar Point	secondary rainforest, moist heavy soil
Helicotylenchus multicinctus	Awar Point	secondary rainforest, moist heavy soil; dried-up pond, with weeds, top 10 cm
	Laing Island	among trees, in humus; compostheap, light dry soil
	Warawaranga	along bank of pond, moist soil
	Bunapas	secondary rainforest; clay under leaves
Lelenchus sp.	Boroi (bush)	along bank of swamp and weeds
Malenchus nanellus	Hansa Point	benthos from stagnant brooklet, mud
	Awar Point	border of mangroves under pandanus tree; edge of mangroves under sagu tree; coconut plantation, dry soil, among grasses;

Species	Locality	Habitat
	Warawaranga	along bank of brooklet, in scrapings of a sagu tree
	Bunapas	secondary rainforest, clay under leaves; cowpat
	Sepen	puddle with duck-weed; bottom composed of coral fragment,with mud
	Boroi (bush)	along bank of swamp
Meloidogyne sp.	Hansa Point	along the bank of a small creek from the rhizosphere of weeds; shallow pond in the shadow; benthos from mid-pond; benthos from stagnant brooklet, mud
	Awar Point	border of mangroves under pandanus tree; edge of mangroves under sagu tree; coconut plantation, dry soil, among grasses; under cocoa tree; secondary rainforest
	Laing Island	among trees, in humus;
	Warawaranga	along bank of brooklet, in scrapings of a sagu tree; along bank of pond, moist
	Bunapas	cowpat
Paratylenchus sp.	Awar Point	secondary rainforest, moist heavy soil
	Bunapas	secondary rainforest; upper 10 cm of a heavy, moist soil and clay under leaves
Rotylenchulus reniformis	Awar Point	border of mangroves under pandanus tree;
	Sepen	puddle with duck-weed; bottom composed of coral fragment, with mud
Sakia indica	Hansa Point	along the bank of a small creek from the rhizosphere of weeds
	Awar Point	edge of mangroves under sagu tree; coconut plantation, dry soil, among grasses;
Sakia sp.	Bunapas	secondary rainforest; clay under leaves
Tylenchorhynchus leviterminalis	Awar Point	edge of mangroves under sagu tree;
	Bunapas	secondary rainforest, upper 10 cm of a heavy, moist soil
	Boroi (bush)	along bank of swamp with weeds; dry swamp between palm trees and weeds

shows four very small indents at the border representing sensilla; the amphidial apertures start close to the oral disc and have the shape of slightly sinuous longitudinal slits – they end at the edge of the wedge. The rest of the head shows no special structures, also no annuli. Cephalids two pairs, at 2 and 3.5 µm from anterior end respectively. Stylet delicate, with small rounded knobs directed obliquely, often indistinct. Dorsal oesophageal gland opening at 0.5-2 µm from the base of knobs. Oesophagus 69-90 (80.4) µm long, with a poorly developed median bulb, short and slender isthmus and elongate cylindrical basal bulb. Cardial cells small,

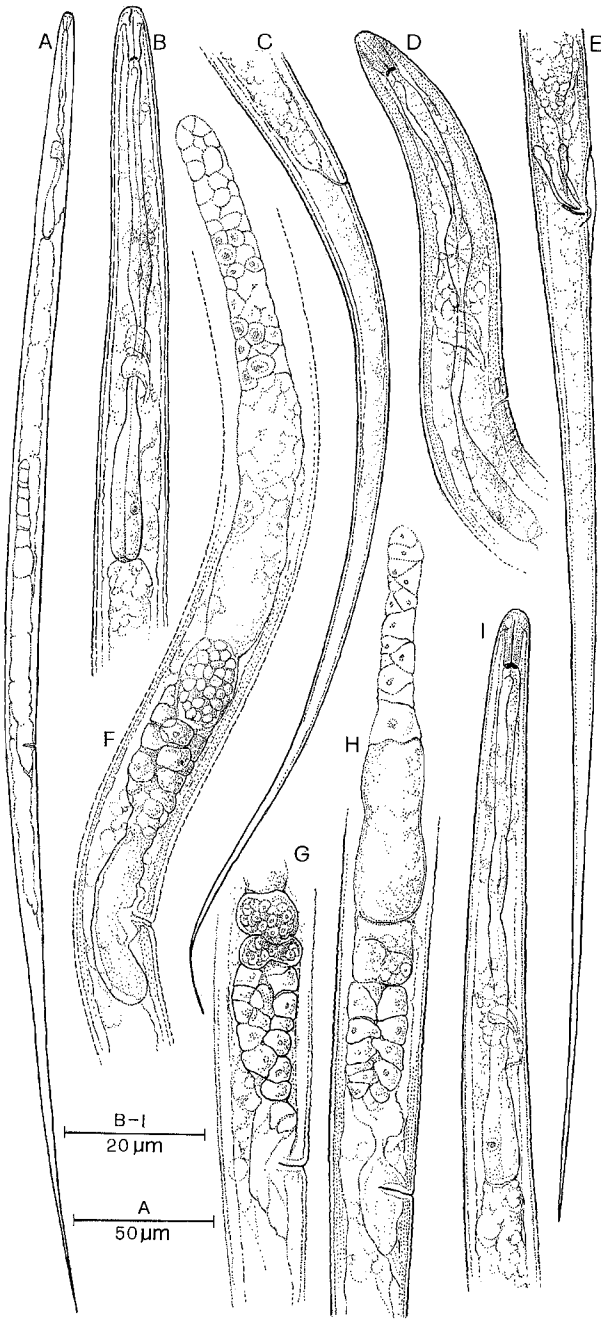

Fig. 1 - *Sakia indica*: A, entire female; B, D, female anterior region; C, female tail; E, male tail; F-H, female reproductive systems; I, male oesophageal region.

sometimes indistinct. The nerve ring across the isthmus, about in the middle of it. The wide excretory pore situated at 57-66 (62) µm from anterior end (Fig. 2 E); hemizonid immediately anterior to it. Phasmids not seen. Female gonad 94-131 (113) µm long, occupying 27-32% of body length; oocytes in single row. In two females they were arranged in more rows. Spermatheca axial, oval to bilobate and full with round sperms. Uterus quadricolumellar, vagina about half the body width long, slightly forward directed; vulva a transverse slit of about 3 µm wide (Fig. 2 B). Post-uterine sac 10.5-15.5 (12.9) µm long; Tail filiform, 111-142 (132) µm long, tapering gradually to the finely rounded terminus (Fig. 2 C).

Male: anterior body region morphologically similar to female. Tail filiform, straight, 110-148 (119) µm long. Testis 111-164 (135) µm long occupying 29-34.5 (31%) of body length. Bursa adanal, about twice spicule length. Spicules arcuate and gubernaculum simple.

Habitats and localities. *Sakia indica* was collected from the rhizosphere of coconut (*Cocos nucifera* L.) and unidentified grasses at Awar Point (sample 1364), and also along the bank of a small creek in the rhizosphere of weeds at Hansa Point (sample 1146), along the bank of a dead arm of the Ramu-river (sample 1172) and in the upper 10 cm of a heavy moist soil, in secondary rainforest (sample 1177) at Bunapas.

Discussion

The genus *Sakia* contains six species, all described from India and rarely reported after the original descriptions; Zeidan *et* Geraert (1991) found *S. alii* Suryawanshi, 1971 in Sudan.

Siddiqi (1986) put *Sakia* in the subfamily Tylenchinae, Maggenti *et al.* (1988) put *Sakia* and *Basiliophora* as genera dubia in the Boleodorinae. The SEM view of the head shows more similarities with *Filenchus* than with *Basiria-Boleodorus* so we agree with Siddiqi (1986).

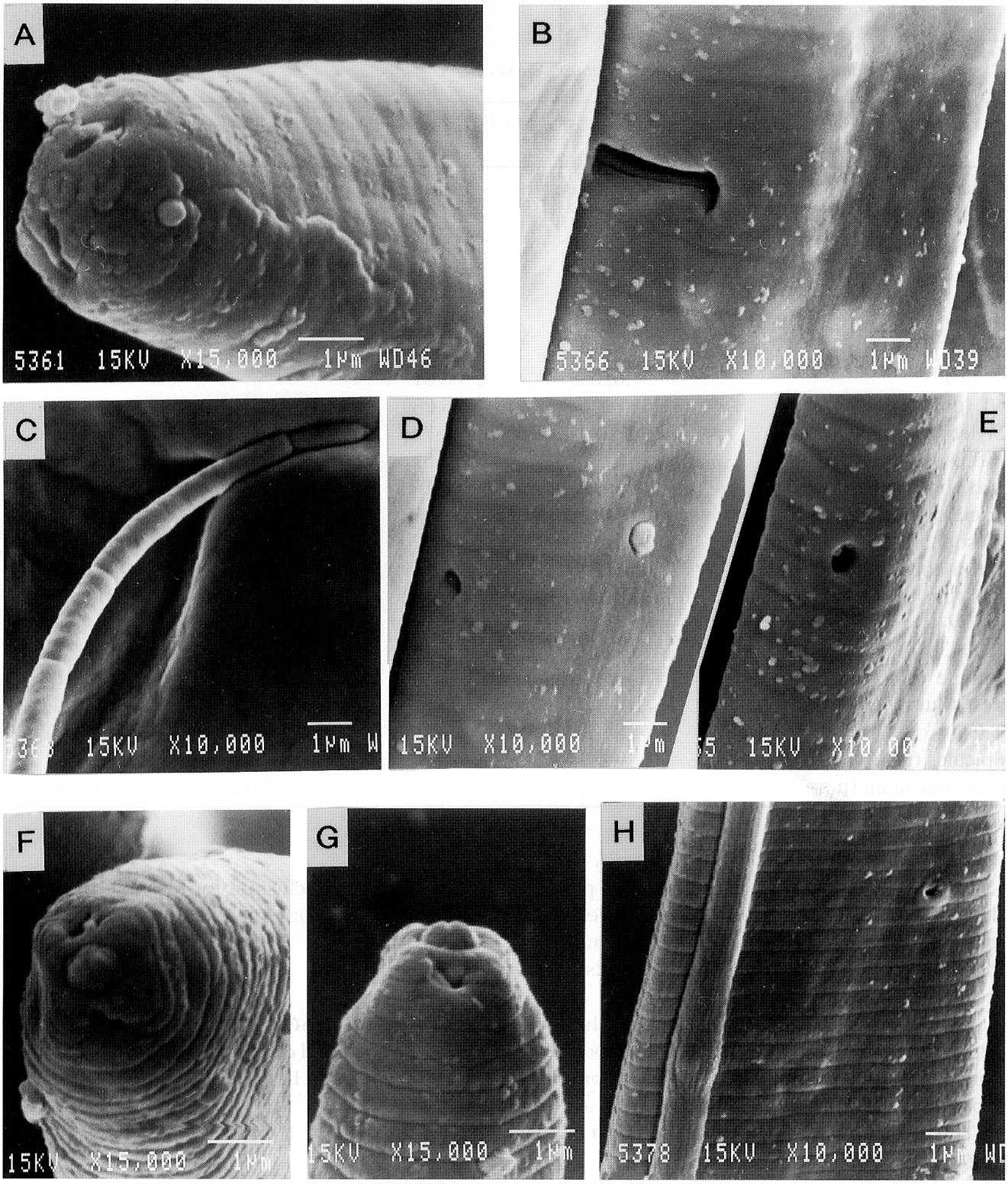

Fig. 2 - SEM of *Sakia indica* (A-E) and *Filenchus discrepans* (F-H): A, head, ventral view; B, vulva in latero-ventral view, notice the absence of distinct lateral lines; C, tail end; D, latero-ventral view of anus; E, latero-ventral view of the very wide excretory pore (compare with H); F, head, en face view; G, head, lateral view; H, lateral field with deirid at level of the excretory pore.

TABLE II - *Morphometrics of* Sakia indica *from Papua New Guinea.*

	females (n=10)		females (n=9)	
	X±SD	range	X±SD	range
L (µm)	452±27.4	401-497	428±28.7	388-477
L' (µm)	330±27.2	304-390	311±22.6	277-330
a	36.2±4.2	30.8-42.2	39.2±3.3	35.2-45.4
b	5.6±0.2	5.4-6.1	5.6±0.3	5.2-6.2
c	3.4±0.1	3.2-3.6	3.7±0.8	3.2-4.0
c'	16.7±2.1	13-19	13.6±2.9	11.1-20.0
V (%)	57.0±1.9	55-61	–	–
V' (%)	77.6±6.2	60-81	–	–
VL (µm)	255.8±16.8	235-289	–	–
Stylet (µm)	6.5±0.4	6.0-7.5	6.7±0.3	6.0-7.0
MB (%)	–	47-51	48.0±3.3	44.0-53.0
Max. body width (µm)	12.6±1.4	10.5-15.5	11.2±1.2	9.3-12.6
Excretory pore (µm)	61.7±3.3	57-66	59.0±5.3	53.0-65.0
Oesophagus (µm)	80.4±5.7	69-90	77.0±5.3	70.0-82.0
Vulva-anus (µm)	64.6±5.4	54.6-73	–	–
Tail (µm)	131.8±10.3	111-142	117.0±12.9	108.0-148.0
Tail/V-a	2.0±0.2	1.8-2.4	–	–
P.U.S. (µm)	12.9±1.7	10.5-15.5	–	–
Annule width (µm)	1.3±0.1	1.1-1.5	1.1±0.2	0.8-1.4
Testis (µm)	–	–	135.0±15.7	111.0-164.0
T (%)	–	–	31.0±1.7	29.0-34.0
Spicules (µm)	–	–	12.7±0.6	11.5-13.8
Gubernaculum (µm)	–	–	3.8±0.2	3.4-4.3

All species show a delicate stylet, a poorly developed median bulb and a well developed excretory pore and excretory canal. Because of the delicacy of the stylet, measurements of it are not very reliable.

All species have long tails but some have a distinctly thicker tail than the Papuan population: *S. alii*, *S. propora* and *S. castori*. *S. jonesi* is reported to have four lateral lines.

This leaves us with *S. indica*, *S. typica* being a *species inquirenda* (Siddiqi, 1986). The original description mentions a stylet of 9.5-10.5 µm, in Suryawanshi's (1971) redescription 6.5-7.8 µm are mentioned. Siddiqi's (1986) drawing of a *Sakia* n. sp. is very similar in appearance to our material. Conclusion: for the time being we consider the Papuan material as representing *S. indica*.

FILENCHUS DISCREPANS (Andrássy, 1954) Raski *et* Geraert, 1986

(Fig. 2: F-H; Fig. 3: J-N; Table III)

Description

Female: body of dead specimens assuming sinuous habitus. Annulation fine but distinct, with annuli 0.7-1.2 (0.8) µm wide at mid-body. Lateral fields faint, bordered by two incisures

(Fig. 2 H). Cephalic region anteriorly flattened, 4-5 µm wide and 2.5-3 µm high, slightly narrower than adjacent body and with a light sclerotization. Amphidial openings longitudinal slits, extending for three-four annules (Fig. 2 F, G). Stylet delicate, conus about 1/3 of its total length; knobs small, rounded, 1.5-2.5 µm width. Oesophagus 69-80 (74) µm long. Procorpus wider and shorter than the isthmus. Metacorpus round, muscular, with a poor valvular apparatus located 40-47 µm form the anterior end. Basal bulb short, saccate; cardia small. Nerve ring nearly in the middle of isthmus or just anterior to it. Excretory pore (Fig. 2 H) and hemizonid at about the same level, 51-61 (56) µm from the anterior end. Phasmids not seen. Anterior part of the reproductive system 52-136 (89) µm long, occupying 16-34 (24) % of body length, with a short (6.5-13 µm) post-vulval uterine sac. Vulva as a slightly open transverse slit; uterus short; spermatheca oblong, full of sperms. Anus distant 49-74 (58.3) µm from the vulva. Tail fairly straight, conoid, tapering in a needle-like to filiform terminus.

Male: anterior body region similar to female. Tail regularly tapering to terminus which is sharply pointed, but not filiform (Fig. 2, M). Testis 105-138 (125) µm long, occupying about 30% of body length. Caudal alae (bursa) adanal, about 20 µm long. Spicules and gubernaculum ventrally arcuate.

Habitats and localities. A populaiton of eight females and two males was collected from the rhizosphere of weeds along the bank of a small creek at Hansa Point (sample 1146); four females were collected in a secondary rainforest, two of which in the upper 10 cm of a heavy, moist soil (sample 1177) and the other two in clay under leaves (sample 1178) at Bunapas; six females and a male were found along the bank of brooklet, in scrapings of a sagu tree at Warawaranga (sample 1264); two males, at the border of mangroves under pandanus trees at Awar Point (sample 1361) and, finally, twentytwo females and three males in a dry soil of a coconut plantation, among grasses, in the same locality (sample 1364).

Remarks. Filenchus discrepans was originally described, from two females and two males, as *Tylenchus* (*Lelenchus*) *discrepans* by Andrássy (1954). Another population was reported from Bulgaria by the same author in 1958. It was transferred to the genus *Filenchus* by Raski and Geraert (1986). The morphometrics of our populations largely agree with both descriptions.

FILENCHUS MISELLUS (Andrássy, 1958) Raski *et* Geraert, 1987

(Fig. 3: A-I; Table III)

Habitats and localities. Specimens of *F. misellus* occurred in natural habitats of the followings localities from Papua New Guinea: Hansa Point (samples 1172, 1177); Warawaranga (sample 1264); Awar Point (samples 1361, 1364). In all cases a low number of specimens was found and always mixed with the other *Filenchus* species reported above.

Remarks. Originally described by Andrássy (1958) from one female and one juvenile as *Ditylenchus misellus*, the species now recognized as *Filenchus misellus* (Raski *et* Geraert, 1987), was recently found in Central Sudan by Zeidan and Geraert (1991), in the rhizosphere of ornamental and fruit trees and has been extensively redescribed. Morphometrically our populations from Papua fit Andrássy's original description and they are also morphologically similar to the populations from Sudan. However, some slight differences from both were observed concerning the following characters:

– body width is larger in our population (a = 17.4-31.5, compared with a = 32.5 of the type population and a = 31-33 of the Sudan population);

– shape of the tail, thicker in most specimens of our populations, ending in a truncate conical terminus (Fig. 2, E). In one female (Fig. 2, G) a

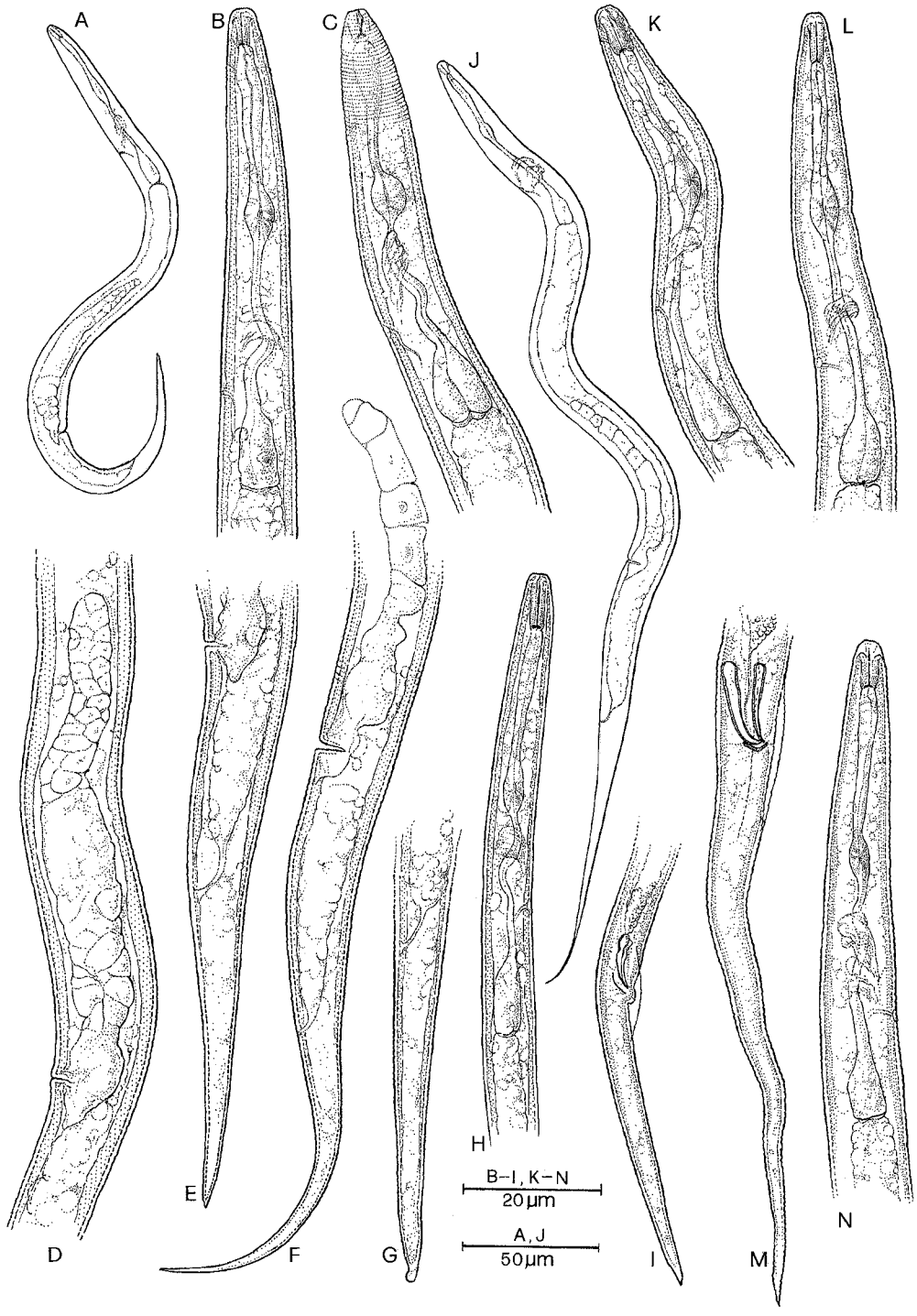

Fig. 3 - *Filenchus discrepans* (A-I): A, entire female; B, C, female oesophageal region; D, female genital system; E, G, female tails; F, female posterior body region; H, male oesophageal region; I, male tail. *Filenchus misellus* (J-N): J, entire female; K, L, female anterior regions; M, male tail; N, male oesophageal region.

TABLE III - *Morphometrics of two species of* Filenchus *from Papua New Guinea.*

	Filenchus discrepans females (n=11)		*Filenchus discrepans* males (n=4)		*Filenchus misellus* females (n=8)	
	X±SD	range	X±SD	range	X±SD	range
L (µm)	369.0±26.8	333.0-404.0	397.8±33.8	367.0-429.0	299.3±32.7	265.0-350.0
L' (µm)	280.4±25.0	247.0-324.0	317.0±35.9	284.0-350.0	251.3±31.2	209.3-300.3
a	31.3±2.5	27.6-38.0	34.6±4.5	29.8-40.5	24.6±4.6	17.4-31.5
b	5.0±0.3	4.6-5.7	5.7±0.7	5.1-6.5	4.4±0.5	3.7-5.3
c	4.2±0.4	3.8-5.1	4.9±0.6	4.3-5.4	6.3±1.0	4.7-7.9
c'	13.0±1.9	9.9-16.3	9.8±1.5	8.2-11.6	7.3±0.9	5.7-8.5
V (%)	60.0±2.0	58.0-63.0	–	–	68.0±1.0	67.0-69.0
V' (%)	79.0±1.0	77.0-81.0	–	–	82.0±2.0	79.0-87.0
VL (µm)	222.1±17.3	198.0-250.0	–	–	205.5±24.0	177.4-242.3
Stylet (µm)	7.0±0.8	5.6-8.4	6.6±0.8	5.9-7.4	6.4±0.7	5.9-7.4
MB (%)	43.0±2.3	40.0-47.0	45.5±0.7	45.0-46.0	44.8±1.0	43.0-46.0
Max. body width (µm)	11.9±1.2	10.0-14.3	11.6±1.3	10.5-13.0	12.5±2.1	9.3-15.2
Excretory pore (µm)	56.5±3.4	51.0-61.0	54.0±2.6	51.0-57.0	50.5±4.0	46.0-56.0
Oesophagus (µm)	74.4±3.2	69.0-80.0	70.3±3.6	65.0-73.0	68.4±7.1	55.0-78.0
Vulva-anus (µm)	58.3±8.0	49.0-74.0	–	–	45.8±9.5	28.0-58.0
Tail (µm)	88.4±7.3	80.0-99.0	80.8±3.5	79.0-86.0	48.0±7.2	37.0-58.0
Tail/V-a	1.5±0.2	1.1-1.8	–	–	1.1±0.4	0.7-2.0
P.U.S. (µm)	9.6±2.1	6.5-13.0	–	–	9.6±2.2	6.2-12.7
Annule width (µm)	0.9±0.2	0.7-1.2	0.7±0.1	0.6-0.7	0.8±0.1	0.7-0.9
Testis (µm)	–	–	124.8±14.4	105.0-138.0	–	–
T (%)	–	–	31.0±2.2	28.0-33.0	–	–
Spicules (µm)	–	–	13.8±0.6	13.0-14.3	–	–
Gubernaculum (µm)	–	–	4.2±0.3	3.7-4.3	–	–

small rounded structure at the end of a sub-cylindrical tail was observed;

– the tail of the Papuan populations, 48 (37-58) µm long, is more similar to that of the type population (about 55 µm, calculated from drawings) compared to that of specimens from Sudan (60-71).

COSLENCHUS COSTATUS (de Man, 1921) Siddiqi, 1978

(Fig. 4: A-G; Table IV)

Description

Female: body medium sized, assuming slightly arcuate or sinuous position when dead; annules at mid-body 1.7-2.2 µm wide. Cuticle marked by 14 (7+7) longitudinal ridges excluding lateral fields which have 4 incisures. Cephalic region truncate, distinctly narrower than adjacent body region (5.5 wide, 3.0 high), with three faint annules. Stylet 9.5-11 (10.4) µm long, with a slender conus, about 40% of total length, and rounded basal knobs. Oesophagus 63-86 (79) µm long, with anterior part slightly shorter (46%) than the entire length. Median bulb rounded, with evident cuticular thickenings. Isthmus slender which ends in an elongate-pyriform bulb. Excretory pore at 58-68 (63) µm, 36-41 annules from anterior end; hemizonid just anterior to it. Deirids at level, or one annule behind the excretory pore. Gonad 89-141 (116)

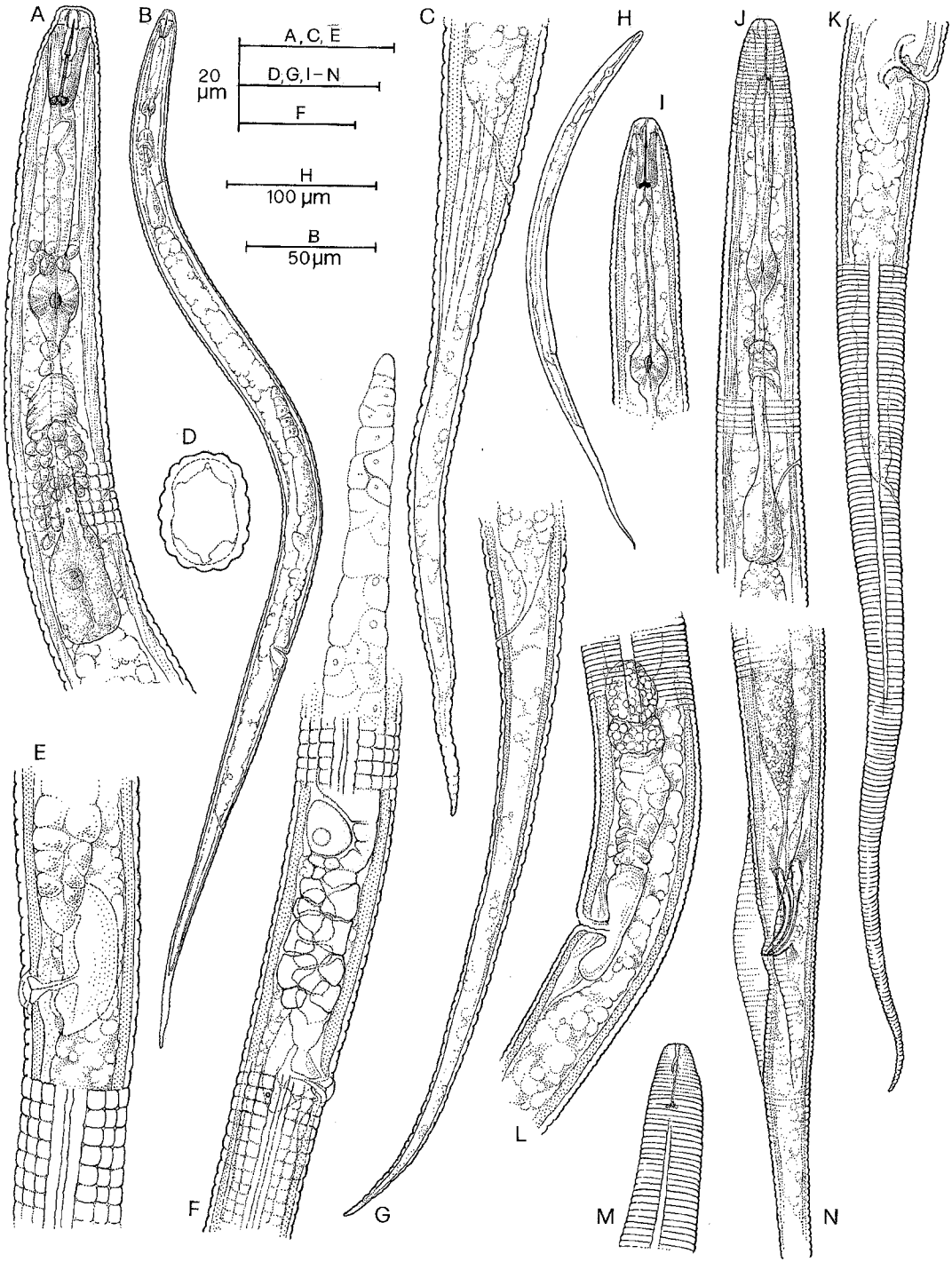

Fig. 4 - *Coslenchus costatus* (A-G): A, female oesophageal region; B, entire female; C, G, female tails; D, cross section at mid-body; E, female vulval region with lateral fields; F, female reproductive system. *Malenchus nanellus* (H-N): H, entire female; I, J, female anterior end; K, female tail; L, female genital system; M, male lip region; N, male cloacal region.

µm long, 27% of total body length. Ovary single with oocytes arranged in double row, except for a short zone in the proximal part. Vulva slightly sunken in body, at 131-156 (145) annules from anterior end; vulval flaps one and a half to two annules long. Vagina oblique, directed anteriorly. Spermatheca empty or, as seen in one specimen, with a single large granular body. Postvulval uterine sac short, about half vulval body width. Vulva-anus distance 61-72 (67) µm or 31-36 annules long. Phasmids at the level of second to third annule posterior to vulva, one to three annules anterior to it in some specimens. Tail 75-92.5 (86) µm long, conoid in shape, with a thick terminus, sometimes showing an irregular contour (Fig. 3 C) annulated up to the rounded tip, never flagelliform.

Male: unknown.

Habitats and localities. Awar Point (sample 1364), coconut plantation, in dry soil, among grasses; Bunapas (sample 1172), along the bank of a dead arm of the Ramu river.

Remarks. The detailed studies by many authors on the morphometrics and intraspecific variability of this cosmopolitan species have greatly extended variability limits of various body parameters. Measurements of the Papuan population are within ranges recently summarized by Brzeski (1987) which includes the data of the neotype (Siddiqi, 1981) and of the rede-

TABLE IV - *Morphometrics of* Coslenchus costatus *from Papua New Guinea.*

	females (n=13)	
	X±SD	range
L (µm)	423.5±18.7	395.0-449.0
L' (µm)	337.8±16.7	313.0-361.0
a	17.5±2.7	21.4-31.5
b	5.4±0.3	5.0-6.3
c	4.9±0.3	4.6-5.5
c'	9.4±0.7	8.3-10.5
V (%)	63.5±1.6	60.0-66.0
V' (%)	80.3±0.7	79.3-81.7
VL (µm)	271.4±14.3	250.0-295.0
Stylet (µm)	10.4±0.5	9.5-11
MB (%)	46.5±2.2	45.0-51.0
Max. body width (µm)	15.5±1.3	14.0-18.0
Excretory pore (µm)	63.0±3.5	58.0-68.0
Oesophagus (µm)	79.2±5.5	63.0-86.0
Vulva-anus (µm)	67.0±3.2	61.4-72.0
Tail (µm)	86.0±5.2	75.0-92.5
Tail/V-a	1.3±0.1	1.2-1.4
Annule width (µm)	2.0±0.1	1.7-2.2
Roes	50±2.6	34-53
RV	145±7.0	131-156
Ra	180±5.9	172-189
RVan	34±1.8	31-36

scription given by Andrássy (1982). However, some differences were noticed, and they essentially concern the shape of the tail and the length of the post uterine sac. The Papuan specimens are characterized by having a rather thick conical tail (Fig. 3 C), with a pointed to finely rounded terminus, never flagelliform. *C. costatus sensu* Andrássy (1982) is known to have a very fine, flagellate terminus although Siddiqi (1981) described and illustrated a neotype with a rather thick, pointed tail; further studies (Brzeski, 1987) ascertained that the filiform condition is the rule, but some variations and irregularities may also occur. Thus, the thick tail of our nematodes is interpreted in terms of intraspecific variability, considering the unreliability of the "tail terminus" character, as pointed out by several authors (Mizukubo and Minagawa, 1984; Brzeski, 1987; Geraert and Raski, 1988). The post uterine sac is also a variable character, and the wider one noticed for the Papuan specimens, compared with that of other populations, is considered to be within the variability limits for this character.

MALENCHUS NANELLUS Siddiqi, 1979

(Fig. 4: H-N; Table V)

Description

Female: habitus ventrally arcuate. Annules fine, 0.8-1.1 µm wide at mid-body. Lateral fields starting at level of knobs or immediately above

TABLE V - *Morphometrics of* Malenchus manellus *from Papua New Guinea.*

	females (n=11)		males (n=8)	
	X±SD	range	X±SD	range
L (µm)	380.4±22.8	347.0-422.0	390.0±9.8	378.0-408.0
L' (µm)	293.3±21.8	261.5-333.0	289.0±5.5	282.5-300.0
a	24.4±1.9	21.8-27.7	29.3±1.1	27.8-30.7
b	5.1±0.4	4.5-5.9	5.4±0.2	5.0-5.7
c	4.3±0.3	4.0-4.7	3.8±0.1	3.8-4.0
c'	11.5±0.7	10.3-12.3	12.1±0.9	10.6-13.5
V (%)	61.5±1.9	58.4-64.9	–	–
V' (%)	80.0±1.4	77.8-82.2	–	–
VL (µm)	234.8±19.8	213.7-273.7	–	–
Stylet (µm)	8.5±0.5	6.9-9.3	7.9±0.7	6.9-9.1
Max. body width (µm)	15.6±0.6	14.1-16.2	13.2±0.3	13.0-13.6
Excretory pore (µm)	63.4±5.6	57.0-77.3	62.1±3.0	57.0-66.0
Oesophagus (µm)	74.7±3.7	69.7-82.8	73.7±3.9	68.0-81.0
Vulva-anus (µm)	58.4±4.2	53.8-67.6	–	–
Tail (µm)	87.2±4.1	77.5-92.0	101.1±4.8	95.5-108.0
Tail/V-a	1.5±0.1	1.3-1.6	–	–
Annule width (µm)	0.9±0.1	0.8-1.1	0.8±0.1	0.7-0.9
Testis (µm)	–	–	133.4±12.5	116.0-151.0
T (%)	–	–	34.7±3.2	29.0-38.0
Spicules (µm)	–	–	14.4±1.1	13.0-15.8
Gubernaculus (µm)	–	–	4.2±0.7	2.8-4.9

(2-5 annules) and ending just before the middle of tail. Head sligthly narrower than body, weakly annulated. Amphidial openings S-shaped. Stylet delicate, with small, obliquely directed knobs. Oesophagus 70-83 µm long. Median bulb oval to rounded; isthmus slender, ending in a rectangular, saccate basal bulb. Excretory pore at 57-77 µm from anterior end. Deirids at level, or three annules behind excretory pore.

Vulva slightly indented into body; vagina directed foreward. Gonad 85-118 µm long, 22-31% of body length. Spermatheca bilobed, full of sperms. Post uterine sac about half body vulval diameter. Vulva-anus distance 58 (54-67) µm in length. Tail 87.2 (77.5-92) µm long, tapering gradually to terminus.

Male: similar to the female, but with a longer tail (95.5-108 µm); bursa adanal, about twice spicule length; spicules and gubernaculum ventrally arcuate.

Habitats and localities. Our populations of *M. nanellus* were found in large numbers at Awar Point (samples: 1361, 1362, 1363, 1364) along the border of mangroves under pandanus and sagu trees, and occurred occasionally along a stagnant brooklet and other natural habitats at Hansa Point (sample 1147, two females), Bunapas (sample 1176, two females, one male, one juvenile), Sepen (sample 1180, three males) and Warawaranga (sample 1264, one male).

Remarks. Our populations of *M. nanellus* correspond well with the previous descriptions (Siddiqi, 1979; Andrássy, 1982; Geraert *et* Raski, 1986), but differ from all of them in the beginning of the lateral fields, which is anteriad in Papuan populations. Some minor differences were noticed compared to the type population (Siddiqi, 1979), in the body length, shorter in the type population, and the tail shape which in the Papuan specimens was slightly thicker, whereas is described as filiform in Siddiqi's specimens.

This is the first record of *M. nanellus* in New Guinea.

TYLENCHORHYNCHUS LEVITERMINALIS Siddiqi, Mukherjee *et* Dasgupta, 1982

(Fig. 5)

Measurements

Females (n=8): L = 633±49.3 (567-727) µm; a = 28.1±1.3 (26.7-30); b = 4.8±0.2 (4.5-5.2); c = 14.1±1.1 (12.7-16.2); c' = 3.4±0.5 (2.8-4.1); V = 55±0.7 (54-56); MB = 49±1.7 (47-50); stylet = 22.1±0.7 (21-23) µm; tail = 45.1±5.1 (39-53) µm.

Males (n=4): L = 619.4±33.4 (572-662) µm; a = 30.1±2.8 (27.6-34.2); b = 4.9±0.5 (4.4-5.6); c = 13.3±0.9 (12.3-14.2); c' = 3.0±0.2 (2.7-3.3); T% = 57±3.5 (53-60); stylet = 21±0.7 (19.8-21.4) µm; spicules = 23.2±1.1 (21.4-24.2) µm; gubernaculum = 12.5±0.6 (11.8-13.4) µm; MB = 47±1.7 (45-49); tail = 46.4±1.9 (44.6-49.6) µm.

Habitats and localities. Fourteen females, four males and thirty juveniles were found at Boroi (bush), (samples 1334 and 1335), along swamp and between palm trees and weeds; six females, three males, fifteen juveniles were collected at Awar Point (sample 1362), at the edge of mangroves under sagu tree and one female, one male and two juveniles at Bunapas (sample 1177), on heavy, moist soil of secondary rainforest.

Remarks. Tylenchorhyncus crassicaudatus leviterminalis Siddiqi, Mukherjee *et* Dasgupta was described in 1982 from an Indian population found in soil around the roots of tropical fruit trees. In 1984 Bridge and Page reported it from Papua New Guinea associated with cardamom at East New Britain. Since its ranking at the specific level (Siddiqi, 1986), this species has been reported from China, in the rhizosphere of strawberry, and exhaustively illustrated and redescribed by Vovlas and Cheng (1988).

A paratype, kindly supplied by Dr. N. Vovlas[1], was studied and compared with Papuan specimens of *T. leviterminalis* (measurements: L = 633 µm; a = 27.5; b = 5.1; c = 12.4; c' = 3.7; V = 55;

[1] Istituto di Nematologia Agraria, C.N.R., Bari.

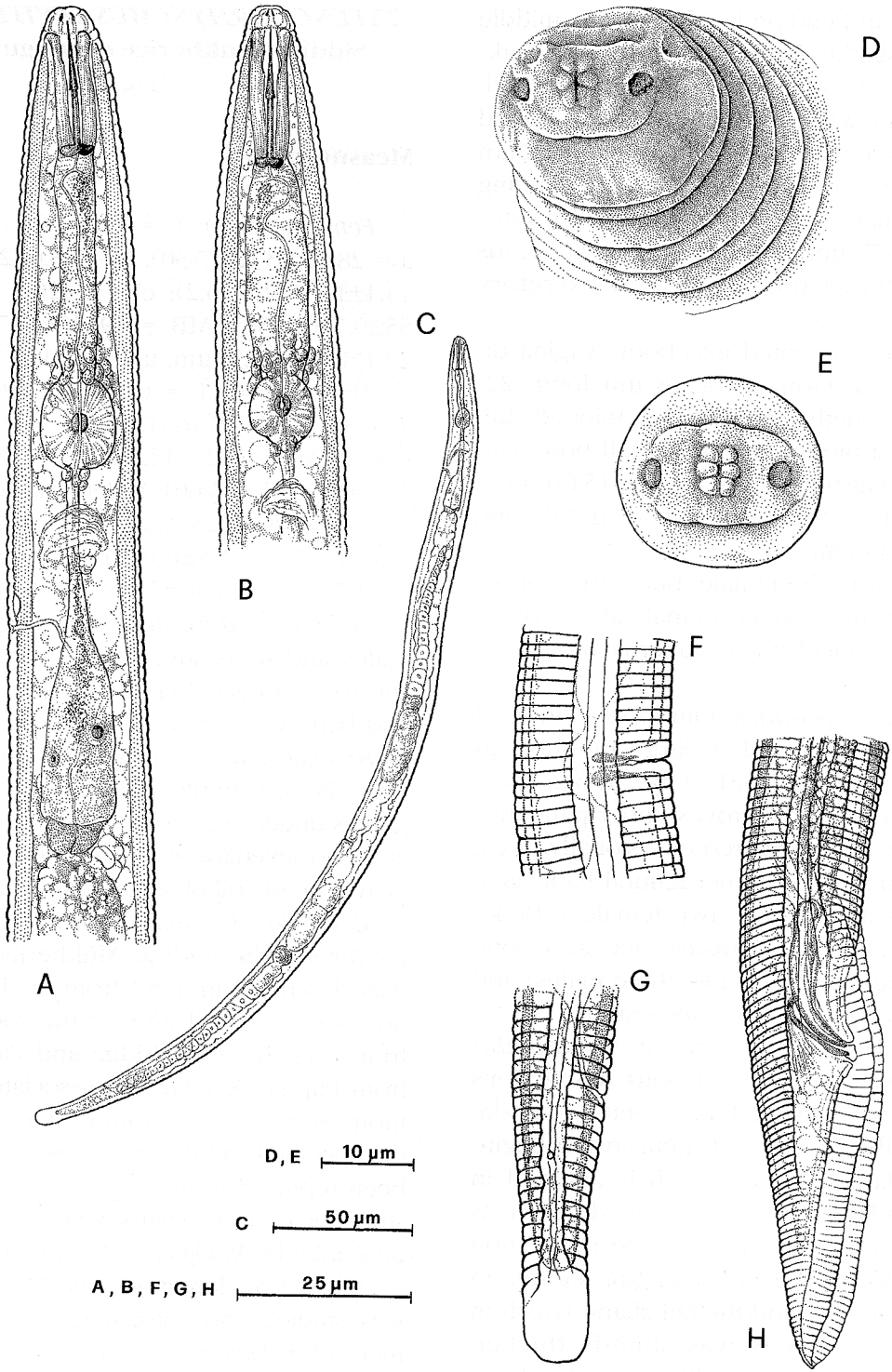

Fig. 5 - *Tylenchorhynchus leviterminalis*: A, female oesophageal region; B, male anterior end; C, entire female; D, E, female cephalic region and lip pattern; F, lateral fields at vulva level; G, female tail; H, male tail.

MB = 58; stylet = 21 µm; tail = 51 µm). No differences were noticed between the two populations, with the exception of a slightly shorter stylet (18-22 µm *vs.* 21-23 µm) and a slightly smaller hyaline tail portion in the Chinese population.

HELICOTYLENCHUS MULTICINCTUS (Cobb, 1893) Golden, 1956

Measurements

Females (n=7): L = 500±37.6 (430-545) µm; a = 26.6±2.4 (22.6-29.8); b = 5.6±0.6 (4.6-6.0); b' = 4.5±0.5 (4.0-5.4); c = 38±3.7 (33-42); c' = 1.2±0.1 (1.0-1.4); V = 66±3.5 (63-73); MB = 58.6±4.6 (52-63); stylet = 24±0.6 (23-25) µm; tail = 13.2±1.3 (11.7-15.2) µm.

Males: not found.

Remarks. This known and widespread species was one of the most represented among plant nematodes of Papua New Guinea. It occurred with 63 females, 10 males and 24 juveniles at Awar Point (sample 1156) from moist heavy soil of secondary rainforest and, with a larger number of specimens (211 females, 15 males and 46 juveniles) at Laing Island (sample 1158 and 1159) from the rhizosphere of trees, in humus. Eight females and three juveniles were also collected along water edge of pond at Warawaranga (sample 1165).

H. multicinctus has previously been reported from Papua New Guinea (Bridge and Page, 1984) as one of the most serious pests of banana. This is the first record for *H. multicinctus* in Papua from the rhizosphere of plants other than banana.

APHELENCHOIDES FRAGRARIAE (Ritzema Bos, 1891) Christie, 1932

Measurements

Females (n=8): L = 477±78.4 (346-598) µm; a = 38.3±7.7 (28-50); b' = 4.6±0.7 (3.6-5.8); c = 12.9±1.9 (10-16.3); c' = 5.1±0.2 (4.9-5.3); V = 66.5±1.6 (65-70); stylet = 9.8±0.7 (9-11) µm; tail = 36.7±1.8 (34.5-39.5) µm.

Morphology and measurements of Papuan specimens are close to those reported by Siddiqi (1975) except for the shorter body. This species is reported for the first time from Papua New Guinea. The largest population (24 females, 10 males and 7 juveniles) was found at Boroi bush (sample 1331) in dry scraping of sagu tree; 4 females, 2 males, 4 juveniles and 4 females and 1 juvenile were collected respectively at Warawaranga and Bunapas, in natural habitats.

Some other genera of Tylenchida were found, as shown in Table I; unfortunately, it was not possible to ascertain their identity at the specific level, due to the paucity of adult specimens available or to their poor preservation.

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Accepted for publication on 31 July 1995.