Some Tylenchids from coffee-fields of Ivory Coast, with the description of *Hemicriconemoides snoecki* n. sp. (Nematoda : Tylenchida) [1]

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Summary

Ten species of tylenchs from coffee cultures in Bingerville (Ivory Coast) are reported and discussed. *Hemicriconemoides snoecki* n. sp. is described and characterized by a non-differentiated first cephalic annule, a rather short stylet, a relatively high number of body annules, a poorly developed spermatheca, the presence of a postrectal intestinal sac, the absence of males and the presence of six scales in the juveniles. Two *Tylenchus (Filenchus)* species were found : one similar to *T. clarki* Egunjobi, 1968 and one similar to *T. discrepans* Andrássy, 1954 (except for the much wider body annules). *Meloidogyne incognita* showed some unexpected variation. The other species, on which some additional data are reported, are : *Malenchus* sp. (?) *cognatus*, Andrássy, 1981 ; *Scutellonema bradys* (Steiner & Le Hew, 1933) Andrássy, 1958 : *Rotylenchulus reniformis* Linford & Oliveira, 1940 ; *Criconemella onoensis* (Luc, 1959) Luc & Raski, 1981 ; *Aphelenchus avenae* Bastian, 1865 and *Aphelenchoides bicaudatus* (Imamura, 1931) Filipjev & Schuurmans Stekhoven, 1941.

Résumé

Sur quelques Tylenchides associés au caféier en Côte d'Ivoire, avec description de Hemicriconemoides snoecki *n. sp. (Nematoda : Tylenchida)*

Dix espèces de Tylenchides associées à des caféiers, à Bingerville (Côte d'Ivoire) sont signalées et commentées. *Hemicriconemoides snoecki* n. sp. est décrit et figuré ; cette nouvelle espèce est caractérisée par un premier anneau céphalique non différencié, un stylet relativement court, un nombre assez élevé d'anneaux, une spermathèque peu développée, la présence d'un sac intestinal postrectal, l'absence de mâles et la présence de six écailles sur les anneaux des juvéniles. Deux espèces de *Tylenchus (Filenchus)* ont été trouvées, l'une fort proche de *T. clarki* Egunjobi, 1968, l'autre très semblable à *T. discrepans* Andrássy, 1954, mais ayant des anneaux beaucoup plus larges. Des variations morphologiques assez prononcées sont décrites chez *Meloidogyne incognita.* Les autres espèces signalées, avec quelques données nouvelles, sont : *Aphelenchoides bicaudatus* (Imamura, 1931) Filipjev & Schuurmans Stekhoven, 1941 ; *Aphelenchus avenae* Bastian, 1865 ; *Criconemella onoensis* (Luc, 1959) Luc & Raski, 1981 ; *Malenchus* sp. (?) *cognatus* Andrássy, 1981 ; *Rotylenchulus reniformis* Linford & Oliveira, 1940 et *Scutellonema bradys* (Steiner & Le Hew, 1933) Andrássy, 1958.

During the month July and August 1979 one of us (L.S.) collected in Ivory Coast several soil samples around the roots of various plants, but predominantly coffee. This report deals with Tylenchs of some of the samples of coffee fields. In these samples only a few species in small numbers were found, probably due to the dry condition in the sampling period. Most tylenchs were known species on which a few additional data will be given ; one species is new for science and is described in detail.

Material and Methods

In Bingerville, at the I.F.C.C. (Institut Français du Café et du Cacao), the following plants were sampled : *Coffea canephora* Pierre *ex*

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Frochner, *C. arabica* L., *C.* × *arabusta* (*C. canephora* × *C. arabica*) (Capot, 1973) and *Flemingia* sp., a grass cultivated between the rows of young coffee plants and cut off at regular times to be used as soil covering.

DATA ABOUT THE SAMPLES :

LS204 : *C. canephora*. Sandy soil covered by a thick layer of coffee-pods.

LS205 : *C. arabica*. Sandy soil with a thick layer of coffee-pods.

LS206 : *C. canephora*. Sandy soil, little covering. Hybrid 1975 (block B_2).

LS207 : *Flemingia*. Sandy soil, little covering, in alternating rows with LS206.

LS208 : *C. canephora*. Sandy soil without covering. Collection '66-74'. Variety with red leaves and pink flowers (row 2 and 3).

LS209 : *C. arabica*. Sandy soil. Closely joined plantation. Old collection — 1967 (row 43 in alternation with *Flemingia*).

LS210 : *C.* × *arabusta*. Sandy soil. Young plantation — 2.5 years old (row C_9).

The samples were immediately treated with hot 4% formaldehyde ; the nematode extraction was done later on in the laboratory by a centrifugation-flotation method (similar to that of Coolen and D'Herde, 1977) with Ludox HS (Du Pont). They were then processed to pure glycerin by a modified Seinhorst method (De Grisse, 1969) and mounted between cover slips on aluminium slides.

The perineal patterns of *Meloidogyne incognita* (Kofoid and White, 1919) Chitwood, 1949 were prepared with the method of Taylor and Netscher (1974).

For the abbreviations used see Southey (1970).

Aphelenchoides bicaudatus (Imamura, 1931) Filipjev & Schuurmans Stekhoven, 1941
[sample LS210]
(Fig. 4, K-O)

MEASUREMENTS

Females (n = 4) : L = 0.39 mm (0.36-0.43) ; a = 28.4 (26-30) ; b = 4.7 (4.1-5.5) (n = 3) ; b' = 3.8 (3.6-4.1) (n = 3) ; c = 11.1 (10.8-11.4) ; c' = 5.2 (5-5.6) ; V = 67.5 (66.5-70) ; stylet = 10.5 µm (10-11) ; rectum = 1.7-2.4 anal body widths.

DISCUSSION

These specimens show no differences with the description by Siddiqui and Taylor (1967), except for the much longer oesophagus (b = 4.7 against 8.2) and the rectum with a sigmoid curving (instead of straight). Concerning the lateral field we tend to assume that there are three longitudina lines, instead of two, as mentioned in Siddiqui and Taylor (1967) as we can not see any difference between the two outer incisures and the inner one or 'narrow refracted band' as stated by the previous authors.

Aphelenchus avenae Bastian, 1865
[samples LS206, LS210]

Our two specimens agree very well with previous descriptions of this species, except for a somewhat smaller total body length.

Hemicriconemoides snoecki n. sp.
(Fig. 1)

FEMALES

Measurements

Holotype : L = 0.45 mm ; a = 15.3 ; b = 5.1 ; c = 13 ; c' = 1.6 ; V = 91.5 ; R = 107 ; R Oes = 20 ; R ex = 29 ; RV = 13 ; R an = 12 ; R Van = 1 ; VL/VB = 1.7 ; stylet = 52 µm ; O = 0.85.

Paratypes (n = 12) : L = 0.45 mm (0.41-0.49) ; a = 15.3 (14.4-18) ; b = 4.8 (4.1-5.3) ; c = 12.9 (11.6-13.8) (n = 11) ; c' = 1.7 (1.4-1.8) (n = 11) ; V = 91.5 (90-93) ; R = 105 (100-110) ; R Oes = 21 (19-24) ; R ex = 29 (28-30) ; RV = 13 (11-13) ; R an = 11 (10-12) (n = 11) ; R Van = 1 (0-2) (n = 11) ; VL/VB = 1.7 (1.5-1.9) ; stylet = 53 μm (49-54) ; O = 6-11.

Description

Body slightly curved ventrally, with a rounded anterior end and a conical posterior end. Outer cuticular layer closely adpressed to inner cuticular layer. Cuticular annules not retrorse ; only a few anastomoses occur on the body ; at mid-body the annules are about 3 μm (2.5-3.5) wide and rounded. Labial region relatively low (6 μm high, 15 μm wide) and rounded, almost continuous with body contour, consisting of two cephalic annules apart from the slightly elevated oral disc. First annule narrower and smaller than the second one, no amphidial plate present. The oral disc (Fig. 1 D) is rounded and shows fourteen lobes on its outer margin. An octogonal thickening, corresponding with the attachment of the inner cuticular layer, surrounds the oral opening. Close to the oral opening six raised areas, as described by Sher and Bell (1975), can be seen. Amphids open just below the oral disc, more or less kidney shaped foveae, visible just below the oral disc, at level 2 (Fig. 1 E) ; fusus visible at level 3 (Fig. 1 F). First head annule somewhat hexagonal in circumference, second head annule rounded. Cephalic sclerotization well developed, hexaradial. Stylet relatively long, with massive, anchor-shaped stylet knobs ; conical part four times as long as cylindrical part of stylet. Oesophagus typical for the genus ; median bulb 3/5 of the corresponding body-width wide, terminal bulb 1/2 of the body-width. Nerve ring encircling the oesophagus at middle of the isthmus, ganglion cells mostly concentrated in front of the nerve ring. Dorsal gland orifice at 4.5 μm (3-6) from stylet base. Cardia small, rounded. Intestine bulges somewhat posterior to the rectum, resulting in an intestinal sac. Rectum difficult to distinguish, about 1/3 of anal body-width long. Anus, somewhat obscure, in most of the specimens on the annule just behind the vulva. Female reproductive system relatively short. Vulva conspicuous, open, with a well developed vulvar sheath. Vagina directed obliquely forward. On the ventral side of the uterus, at the junction with the oviduct, the spermatheca is discernable as a small sac, although no spermatozoa are present. Oviduct short, formed by eight cells. Ovary clearly separated in a germinative zone and a differentiation zone. The former four times as long as the latter, in the specimens studied. Oocytes in one row in the first proximal third and in two rows in the distal two thirds of the germinative zone. Tail conical with rounded tip, about 35 μm long, narrowing more or less abruptly at halfway its length, especially at the dorsal side.

MALES

Not found.

THIRD STAGE JUVENILES

Measurements (n = 4) : L = 0.25 mm (0.20-0.29) ; a = 10 (8.9-11.3) ; b = 3.6 (3-4.5) ; c = 13.3-13.8 (n = 2) ; c′ = 1.2-1.4 (n = 2) ; R = 103 (91-110) ; R Oes = 28 (23-31) ; R ex = 31-32 (n = 2) ; R an = 10 (n = 2) ; stylet = 40 μm (38-41).

Description

Body curved ventrally. Annules with triangular scales, directed backwards, arranged in six rows at mid-body, bearing on their outer margin, at the fore-part of body mostly three dentations and at mid-body only one or two. Rows of scales alternating in position, except on the lateral side in the oesophageal and posterior region and sometimes also at mid-body for a very short distance (only six annules). Labial region offset by a small constriction and relatively low with two annules and the oral disc. Both annules with smooth margins. First head annule, in lateral view, sub-angular in shape, slightly directed forward. In 'en face' view the oral disc can be split up in two small subdorsal, two subventral lobes and two larger lateral ones ; first head annule with similar outline (Fig. 1 A) ; second head annule (Fig. 1 B) somewhat irregular, but a hexaradial symmetry is discernable with six small lobes opposite each arm of the cephalic framework and a bigger lobe between the small ones. First body annule without scales (but fine striae are present) and

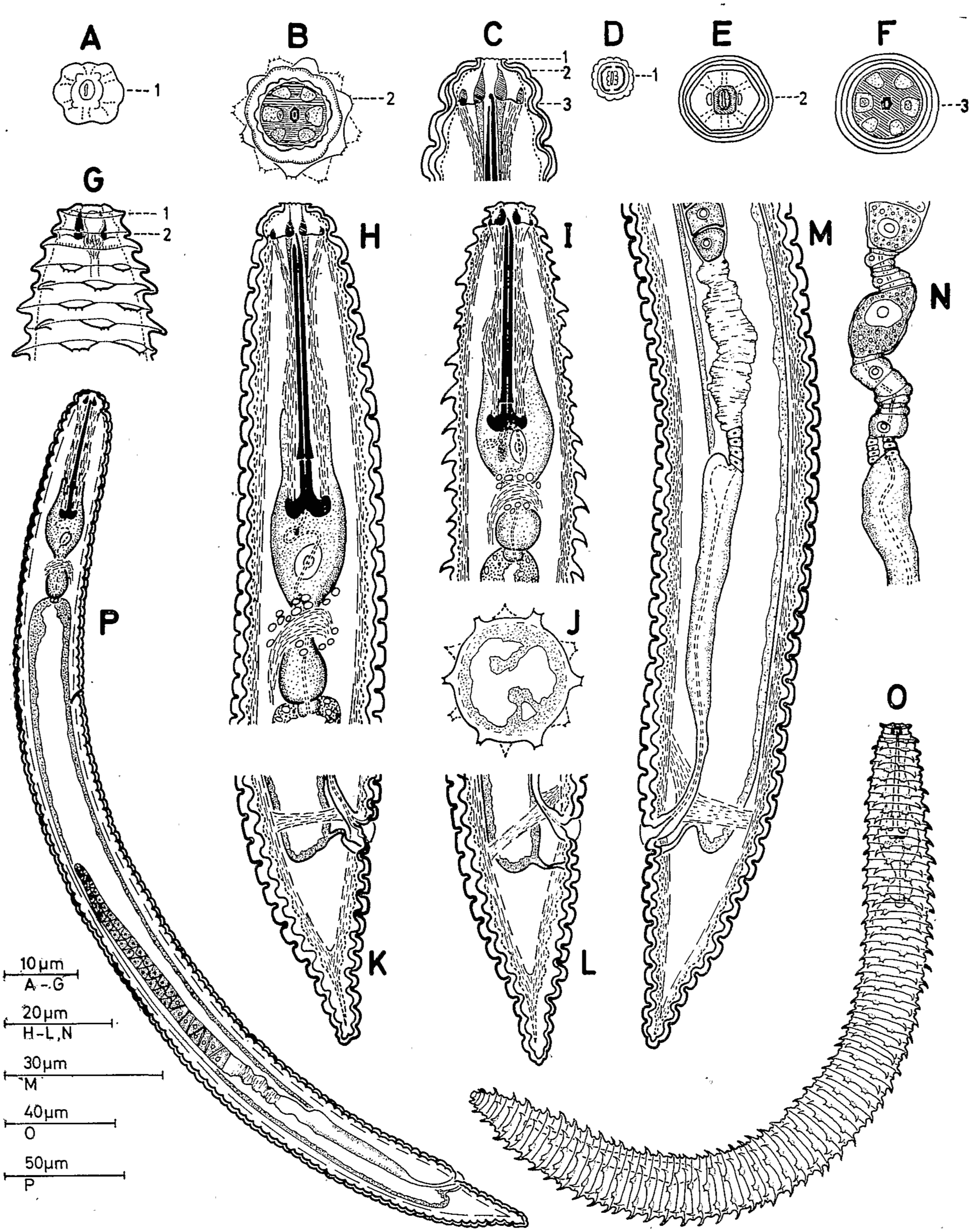

Fig. 1. *Hemicriconemoides snoecki* n. sp. A-B : 'En face' view of juvenile head at different levels ; C : Lateral view head of female ; D-F : 'En face' view head of female at different levels ; G : Lateral view head of juvenile ; H : Oesophageal region in female ; I : Oesophageal region in juvenile ; J : Cross-section at mid-body of juvenile ; K-L : Tail region of female ; M : Posterior part of female reproductive system ; N : Differentiation zone of ovary and oviduct ; O : Juvenile ; P : Female.

divided into six lobes, slightly shifted against the lobes of the second head annule. Second body annule with six scales (with dentations) alternating with the lobes of the first body annule. Amphid apertures not visible, situated just below the oral disc, slit-like. Cephalic sclerotisation well developed, hexaradial. Genital primordium 41-67 µm long.

DIAGNOSIS

Hemicriconemoides snoecki n. sp. belongs to the species of *Hemicriconemoides* Chitwood & Birchfield, 1957 in which the first head annule is not differentiated, nor separated from the other ones, with a relatively short stylet (< 60 µm) and a rather high number of body annules (R > 76). *Hemicriconemoides snoecki* n. sp. is distinguished from all the species except *H. affinis* Germani & Luc, 1970, by the poorly developed spermatheca. It differs from *H. obtusus* Colbran, 1962 ; *H. brachyurus* (Loos, 1949) Chitwood & Birchfield, 1957 ; *H. communis* Edward & Mistra, 1963 ; *H. intermedius* Dasgupta, Raski & Van Gundy, 1969 and *H. pseudobrachyurum* De Grisse, 1964 by its conical tail.

It is closest related to *H. cocophilus* (Loos, (1949) Chitwood & Birchfield, 1957 ; *H. affinis* and *H. wessoni* Chitwood & Birchfield, 1957 from which it differs by the presence of an intestinal sac passing the rectum and by the more developed vulvar sheath.

From *H, cocophilus* it differs furthermore by its somewhat larger RV-(12 against 9-11 in *H. cocophilus*) and R an-value (11 against 7-10 in *H. cocophilus*), the absence of males and spermatozoa, the absence of an amphidial plate, the rounded lip region (truncated in *H. cocophilus*) and by the small number of scales in the juveniles (6 against 10 in *H. cocophilus*) as well as their arrangement (mostly alternating against paired in *H. cocophilus*).

From *H. wessoni* it differs by its larger RV (12 against 8-9 in *H. wessoni*) and R an-value (11 against 6-7 in *H. wessoni*), the much larger R-value (105 against 76-91 in *H. wessoni*), the rounded body annules and the shape of the tail (without such abrupt narrowing behind the anus).

From *H. affinis* it differs by the smaller R (105 against 121 in *H. affinis*) and R ex-value (29 against 31-34 in *H. affinis*), the wider body annules, the much smaller oral disc ('anneau labial' in Germani and Luc, 1970), the smaller number of scales in the juveniles (6 against 11-13 in *H. affinis*) and their arrangement (paired or alternating against in spirals in *H. affinis*) and by the two head annules, in the juveniles, being smooth on their outer margin, with a few lobes.

The juveniles are very much alike those of *H. pseudobrachyurum* De Grisse, 1964, especially with regard to the arrangement of the scales on the body, but the head annules lack the very fine indentations.

Remark : We prefer to use 'oral disc' because the term 'labial disc' ('anneau labial' in Germani and Luc, 1970) refers to the whole lip region, which is not the case.

TYPE LOCALITY

Sandy soil, from about the roots of *C. arabica*, I.F.C.C., Bingerville, Ivory Coast (sample LS209).

TYPE MATERIAL

Holotype, slide n. LS209-42 ; Paratypes, slides n. LS209-1, LS209-3, LS209-4, LS209-6, LS209-7, LS209-26, LS209-32, LS209-33, LS209-34, LS209-35, LS209-36 and LS209-37. One female paratype deposited in each of the following centres. Division of Nematology, University of California, Davis, U.S.A. ; Rothamsted Experimental Station, Harpenden, England ; Landbouwhogeschool, Wageningen, The Netherlands ; U.S.D.A. Nematology Collection, Beltsville, Maryland, U.S.A. ; Muséum national d'Histoire naturelle, Laboratoire des Vers, Paris, France. Remaining paratypes deposited at the Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium.

This species was named after Ir. J. Snoeck, who has been of great help during the sampling.

Criconemella onoensis (Luc, 1959) Luc & Raski, 1981 (samples LS206, LS208, LS209, LS210)

MEASUREMENTS

Females (n = 17) : L = 0.39 mm (0.25-0.47) ; a = 11.5 (9.4-13.3) ; b = 4.3 (3.6-5.7) ; c = 17.4 (15.5-21.2) (n = 9) ; c' = 1 (0.9-1.2) (n = 9) ; V = 93 (91-95) ; R = 126 (112-134) ; R Oes = 32 (30-34) ; R ex = 36 (34-37) (n = 8) ; RV = 11 (10-13) ; R an = 10 (9-11) (n = 9) ; R Van = 2 (1-3) ; stylet = 42 µm (38-51) ; O = 10-13.

DISCUSSION

The specimens agree very well with the original description of *Criconemella onoensis* (Luc, 1959) Luc & Raski, 1981 ; more especially with the 'type' population of this species in Luc (1970). We can confirm the existence of a glandular structure, posterior to the excretory pore, which, in one specimen, is indeed connected with the excretory duct, as stated by Luc (1970). Our specimens clearly showed that the uterus is, in the distal part, built up by a quadricolumella, followed by an offset spermatheca, without spermatozoa. The oviduct consists of eight cells, arranged in two rows, not lying in the same plane. This gives the upper row the appearance of a sausage-like outgrowth, starting from the quadricolumella, overgrowing the region of the spermatheca and ending in the differentiation zone of the ovary.

Malenchus sp. (?) **cognatus** Andrássy, 1981 (sample LS205)

MEASUREMENTS

Female (n = 1) : L = 0.39 mm ; a = 21.1 ; b = 5.2 ; c = 5.9 ; c' = 7.7 ; V = 66.5 ; stylet = 8 µm ; R Oes = 68 ; R ex = 63 ; Ex = 70 µm ; R Van = 54.

DISCUSSION

Using Andrássy's (1981) key of *Malenchus* we come to *M. malawiensis* (Siddiqi, 1979) Andrássy, 1981 and *M. ovalis* (Siddiqi, 1979) Andrássy, 1981. However our specimen has a better developed median bulb and a shorter stylet (10-11.5 µm in *M. malawiensis*, 10-11 µm in *M. ovalis*). The body annules are intermediate between those of the two species. The shape of the spermatheca cannot be compared, because in our specimen it is somewhat pressed between an egg in the uterus and a mature oocyte in the oviduct. Sperm not seen.

The character tail length to vulva-anus distance used by Andrássy (1981) in his key cannot be followed (item 9 of his key is in contradiction with item 4). Against the fact that we key out to the two above mentioned species, our specimen is closely related to *M. cognatus* Andrássy, 1981 which has a tail longer than the vulva-anus distance. Similar are the stylet (8 µm) the oesophagus (with well developed median bulb) and cephalic region. There are small differences in dimensions, numbers of annules in the vulvar and tail region (R Van : 54 against 44-46 ; tail length : 68 µm against 75-78 µm ; tail V an = 1.1 against 1.4-1.5 in *M. cognatus*) and in the beginning of the lateral field (near the stylet knobs against midregion of oesophageal corpus in *M. cognatus*). Because the variability of these characters is not known and because we have only one female, we prefer to refer our specimen to the closely related species *M. cognatus*.

Meloidogyne incognita (Kofoid & White, 1919) Chitwood, 1949) [samples LS204, LS207] (Fig. 2 & 3)

MEASUREMENTS *

Juveniles (n = 35) : L = 0.36 mm (0.32-0.40) ; a = 27.1 (22.3-32.3) (n = 33) ; b = 3.1

* abbreviations in Whitehead (1968).

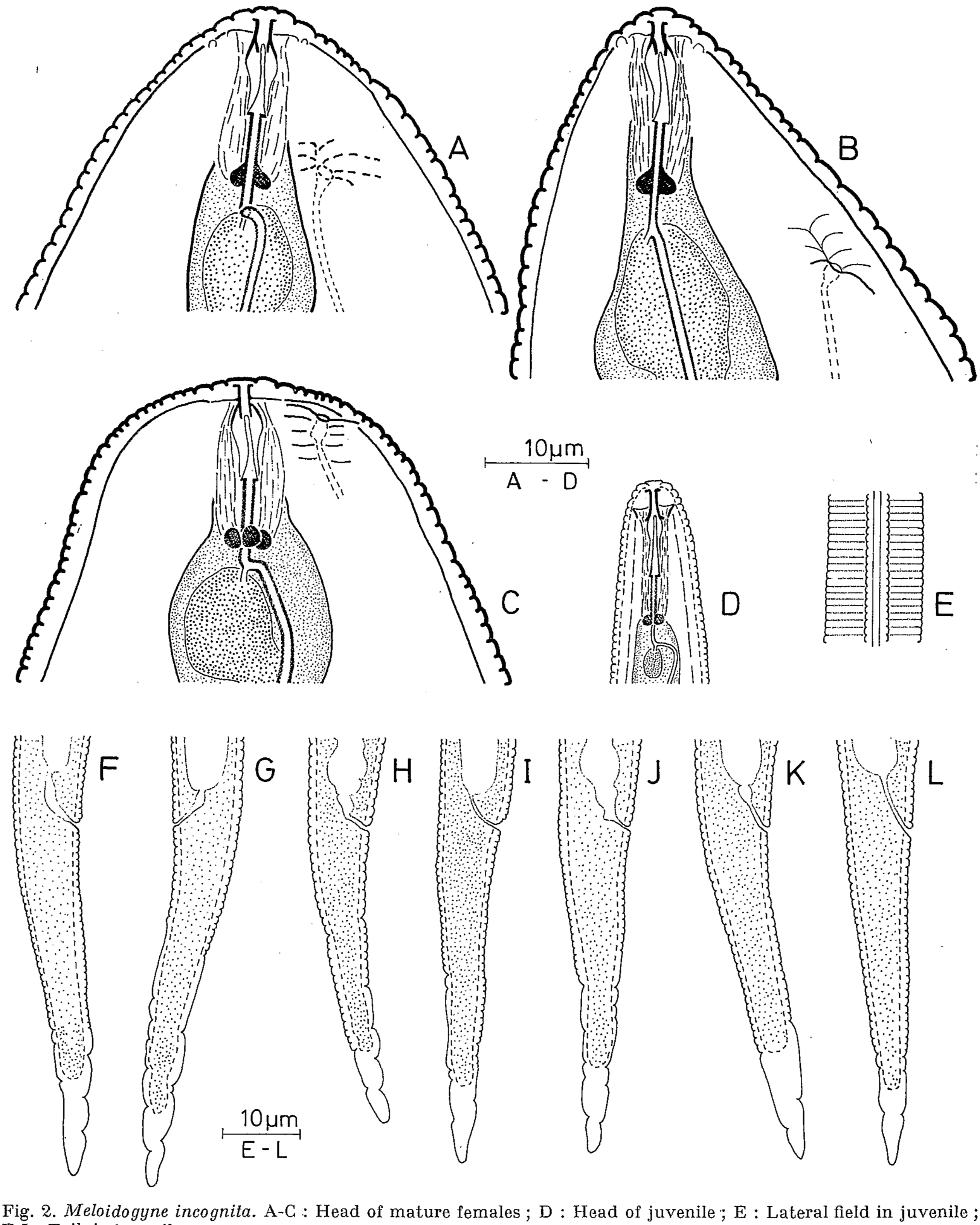

Fig. 2. *Meloidogyne incognita.* A-C : Head of mature females ; D : Head of juvenile ; E : Lateral field in juvenile ; F-L : Tails in juveniles.

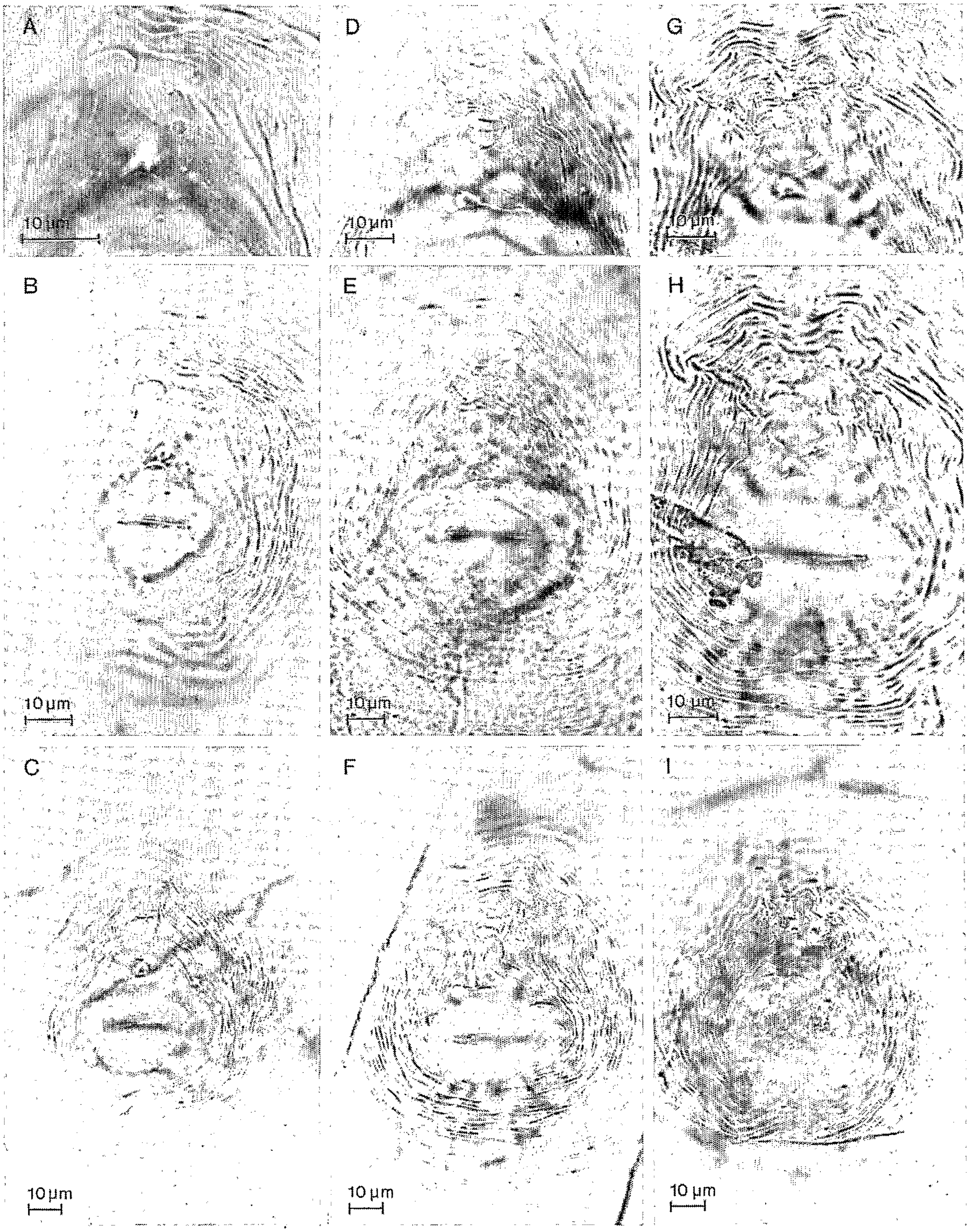

Fig. 3. *Meloidogyne incognita.* Perineal pattern. A-C : Not egglaying females ; A-B : Same female ; A : Detail broken lateral lines ; D-F : Egg-laying females with more regular pattern and high dorsal arch ; D : Detail tail whorl of female in E with transverse lines and forked striae laterally ; G-I : Egg-laying females with wavy pattern ; G : Detail tail whorl of female in H ; H : A somewhat indented dorsal arch and just below forked lateral line.

(2-3.9) (n = 17) ; b_1 = 7.2 (6.5-8.5) (n = 29) ; c = 7.8 (6.9-8.5) (n = 26) ; c' = 5 (4-5.8) (n = 26) ; stylet = 11 µm (10-12.5) (n = 26) ; Ex = 75 µm (62-90) (n = 30) ; tail length = 45 µm (42-52).

Adult females (n = 6) : L = 0.54 mm (0.42-0.66) ; stylet = 14 µm (13-14.5) ; cylindrical part of stylet = 6.5 µm (6-7) ; width of stylet base = 3.5-4 µm ; O = 21.8 (15.4-25.9) ; l. (m.b.) = 39.5 µm (34-45.5) ; b. (m.b.) = 35 µm (31-38) ; l. (m.b.v.)= 14 µm (12.5-16) ; b. (m.b.v.) = 12.5 µm (11-14) ; interphasm. distance = 19.5 µm (16.5-22.5) ; anus to centre vulva = 27 µm (23.5-30) ; width vulva = 19.5 µm (14.5-22.5) ; dorsal oesophageal gland orifice 3.5 µm (2.5-4) from base of stylet.

Discussion

Juveniles

The juveniles show most affinities with *M. incognita* in the shape of the head (relatively high, not offset, three annules behind head cap), the length of the stylet and the tail length. They closely resemble Whitehead's (1968) South-Rhodesian population which has a mean body length of 0.35 mm.

However, the absence of cross-lines in the lateral field is a character more reliable to *M. exigua* Goeldi, 1887. Nevertheless, it should be noticed that even the body annulation, in our specimens, is very faint, so that those cross-lines might be obscure. Another character for separating L_2 juveniles, the rectal gland (or inflation or not of the rectum) cannot be furthermore maintained as a good taxonomic criterion because it was proved by Bird (1979) to be present in species were it was thought to be absent and to vary considerably in size within the same species.

Adult females

The sclerotisation of the stoma (thick proximal part, thinner distal part), the length of the stylet (within the range of the South Rhodesian population), the dorsal curvation of the stylet, the length and the width of the median bulb valves, the typical abrupt thickening of the cuticle opposite the base of the stylet (or slightly anterior to it, depending on the shape of the head), the position of the dorsal gland orifice and the shape of the head (two prominent cephalic annules behind the head cap) are as in Whitehead's (1968) Rhodesian *M. incognita* population. However, in our specimens, the arms of the head skeleton are not as heavily sclerotised and the head is less distinctly offset. The position of the excretory pore varies from almost frontal in two females (Fig. 2 C) to posterior to the base of the stylet (Fig. 2 B), with intermediate position in some specimens (Fig. 2 A). The very anterior position of the excretory pore (Fig. 2 C) cannot be explained by the shape of the head, but on the contrary the more posterior position in Fig. 2 B is due to the pronounced conical shape of the head. We do not believe in the use of the position of the excretory pore to separate subspecies (cf. Golden & Birchfield, 1968), because the position of the excretory pore (in µm or in terms of stylet length) depends to a certain extent on the shape of the fore-end. The perineal patterns show the big variation of *M. incognita.* In some specimens it corresponds to Williams's (1973) Fig. 2 A, showing a somewhat rounded perineal pattern (Fig. 3 I), with strong wavy lines. Other specimens show a more regularly shaped but high dorsal arch, sometimes strongly indented on the lateral side (Fig. 3 D-H), resulting in a pyroid shaped perineal pattern.

On all perineal patterns some transverse striae are present between the anus and the dorsal arch, and a well formed tail whorl can always be identified, although more pronounced in young not egg-laying females (Fig. 3 A-C). In all specimens the smooth to wavy striae are clearly broken and forking at the place of the lateral field, even close to the phasmids (Fig. 3 D). The overall shape in young not egg-laying females (Fig. 3 B-C) is more rounded and regular, with the striae somewhat less marked and wavy.

Rotylenchulus reniformis
Linford & Oliveira, 1940
(samples LS206, LS207, LS208, LS209)

Measurements

Immature females (n = 10) : L = 0.36 mm (0.30-0.39) ; a = 23.4 (22-26) ; b = 3.5 (3-3.9) (n = 8) ; b′ = 2.9 (2.5-3.3) (n = 9) ; c = 13.7 (11.5-15.7) ; c′ = 2.9 (2.4-3.4) ; V = 71.5 (69-74) ; h = 5.5 µm (4-6) (n = 8) ; O = 84 (74-97) ; stylet = 17.5 µm (16-19) ; valves of metacorpus = 5-6.5 µm long ; Ex = 77 µm (72-83) ; tail length = 25 µm (21-28).

Mature females (n = 4) : L = 0.49-0.50 mm ; a = 3.4-4.6 ; V = 63-71.

Males (n = 11) : L = 0.38 mm (0.33-0.44) ; a = 25.9 (23.8-30) ; b = 4.2 (3.4-4.8) (n = 7) ; b′ = 3.7 (3.1-4) ; c = 14.8 (11.8-18.3) ; c′ = 2.4 (2-2.8) ; h = 5.5 µm (4-9) ; O = 81.5 (68-93) (n = 4) ; spicules = 21 µm (19-21.5) ; gubernaculum = 7.5 µm (6-8.5) ; stylet = 14.5 µm (12-19.5).

Discussion

Our specimens correspond very well with the populations of *R. reniformis* from West-Africa (Germani, 1978) and with the redescription of the species done by Dasgupta, Raski and Sher (1968), except for the tail process in the mature females. Two young mature females have a somewhat longer tail of 32-35 µm, probably because the body swelling, resulting in a tail reduction, has not been completed. The tail of two gravid females measures 11-12 µm, against 5-8 µm in Dasgupta, Raski and Sher (1968), which can be regarded as a local variation.

Scutellonema bradys

(Steiner & Le Hew, 1933) Andrássy, 1958
(samples LS209, LS210)

Measurements

Females (n = 6) : L = 0.76 mm (0.72-0.85) ; a = 22.8 (18-25.3) ; b′ = 5.8 (4.8-6.5) (n = 5) ; c = 27.2 (22-33) ; c′ = 1.1 (0.9-1.3) ; V = 57 (56-58) ; stylet = 28 µm (26.5-30.5) ; O = 26.5-36 ; ring width = 1.5 µm.

Males (n = 2) : L = 0.82-0.83 mm ; a = 27-28 ; b′ = 6.5 (n = 1) ; c = 22-23 ; c′ = 1.9-2.1 ; spicules = 32-35.5 µm ; gubernaculum = 14.5 µm ; capitulum = 11 µm ; stylet = 28-29 µm.

Discussion

This population of *S. bradys* shows no differences with the original description, except for the more complex cuticular pattern of the tail region in the females. It resembles very well the Nigerian population (Sher, 1963), from which it differs only by the somewhat longer tail (c = 22-33 against 29-44 in the Nigerian population) and by the more posterior position of the outlet of the dorsal gland (O = 26.5-36 against 17-30 in the Nigerian population).

The male copulatory system is very similar to that described by Coomans (1962 *b* & *c*). The structure which connects the capitulum with the gubernaculum is, in our opinion, membraneous instead of muscular, as drawn by Sher (1963), because it is a part of the sheat-like gubernaculum (Chitwood & Chitwood, 1950).

Tylenchus (Filenchus) sp. (?) clarki

Egunjobi, 1968
(samples LS204, LS206, LS207, LS208, LS210)
(Fig. 4 A-J)

Measurements

Females (n = 7) : L = 0.29 mm (0.27-0.32) ; a = 30.2 (25.2-36.2) ; b = 4.2 (3.9-4.3) ; c = 5 (4.3-5.7) ; c′ = 9.7 (8.7-12.2) ; V = 66.5 (62-71) ; stylet = 5.5 µm (5-6) ; deirids = 55-57 µm from head end = 4-7 µm behind excretory pore ; width of annules = 0.5 µm ; length of median bulb = 7 µm ; width of median bulb = 4 µm ; MB = 41-44 ; nerve ring at 56-60% of oesophagus length ; Ex = 48-53 µm ; vulva-anus distance 62-87% of tail length ; tail length = 48-67 µm.

Male (n = 1) : L = 0.27 mm ; a = 27 ; b = 4.1 ; c = 5.4 ; c′ = 9.9 ; stylet = 6 µm ; spicules = 10 µm ; gubernaculum = 3 µm ; tail length = 50 µm.

Discussion

Our specimens mostly resemble *T. clarki* Egunjobi, 1968 because of the short stylet, the

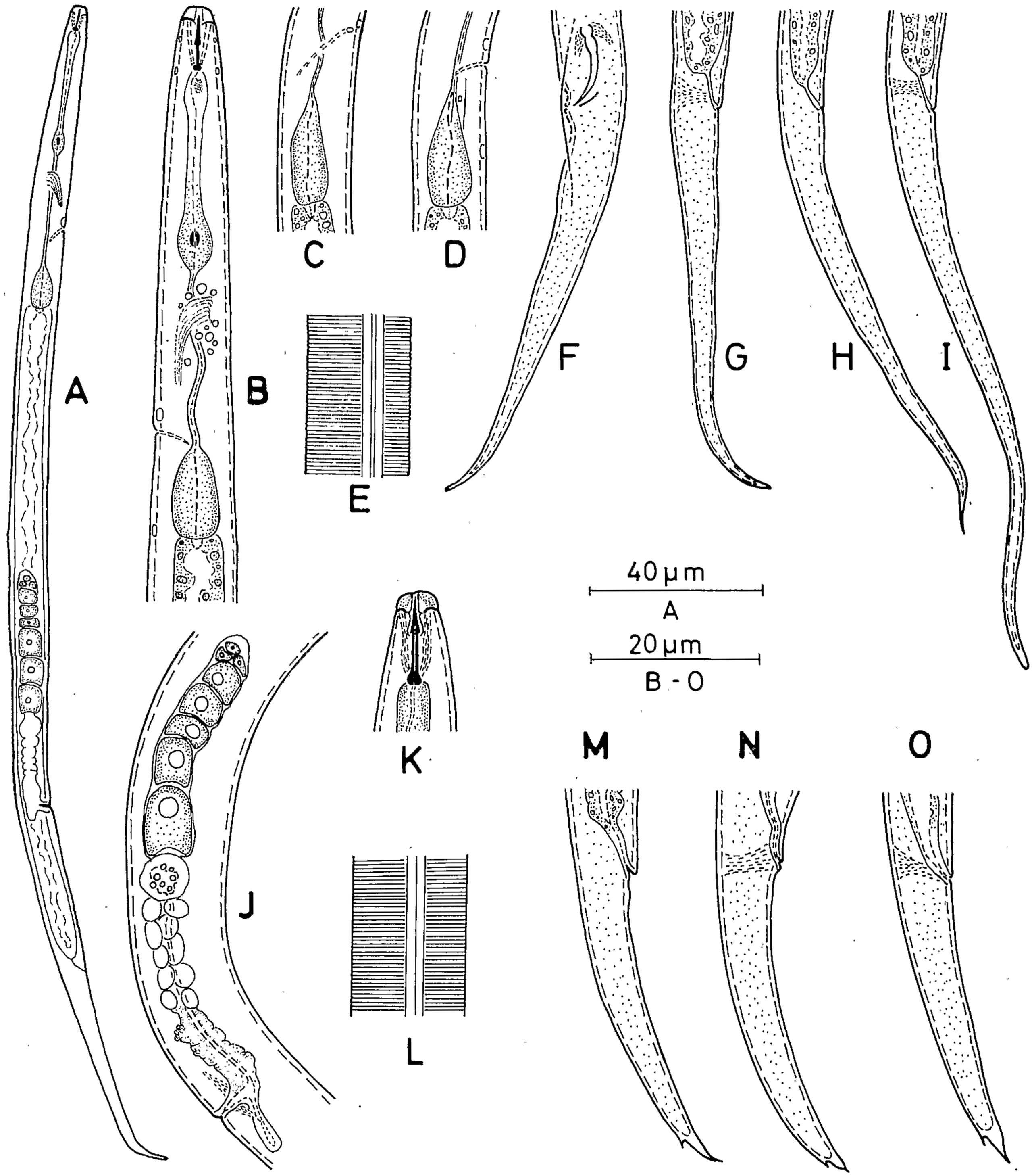

Fig. 4. A-J *Tylenchus* spec. (?) *clarki*. A : Female ; B : Anterior end of female ; C-D : Variation in shape of terminal bulb ; E : Lateral field ; F : Male tail ; G-I : Female tails ; J : Female reproductive system. K-O : *Aphelenchoides bicaudatus*. K : Female head ; L : Lateral field ; M-O : Female tails.

very fine annulation and the shape of the tail. Unfortunately it is not known whether *T. clarki* has a post-vulvar sac or not, nor whether the lateral field has two or four incisures (Bello & Geraert, 1972) ; in our specimens a post-vulvar sac is present and the lateral field has four incisures. Our specimens differ from the redescription of *T. clarki* (Bello & Geraert, 1972) by the position of the deirids (more anteriorly located in our specimens) and the shape of the spermatheca (not offset and rounded in our specimens instead of oblong and offset).

Our specimens also resemble *Ditylenchus misellus* Andrássy, 1958, considered as a representative of the genus *Tylenchus* Bastian, 1865 by Brzeski (1966), Paramonov (1970) and Bello and Geraert (1972), but differ from it in the position of the excretory pore, in the shape of the terminal oesophageal bulb and in the much shorter female reproductive system.

We can conclude that this population is the most resemblant to *T. clarki*, as redescribed by Bello and Geraert (1972), except for the presence of a short post-vulvar sac and a lateral field with four incisures.

Tylenchus (Filenchus) sp. (?) **discrepans** Andrássy, 1954 (samples LS204, LS206)

Measurements

Females (n = 2) : L = 0,38-0,42 mm ; a = 30.5-31.3 ; b = 4.8 ; c = 3.6-3.9 ; c′ = 12.4-13.2 ; V = 60-63 ; stylet = 7 µm ; width of annules = 1.4 µm ; MB = 49 ; Ex = 67 µm ; vulva-anus distance 50% of tail length ; tail length = 110 µm.

Discussion

Our specimens resemble very much *T. discrepans* Andrássy, 1954 in body length, shape of oesophagus (median bulb weakly developed), shape of tail (filiform with pointed tail tip), post-vulvar uterine sac (shorter than body width at vulva), length of stylet and position of the vulva. They differ from this species by the much wider body annules (very fine in *T. discrepans*).

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