The genus *Peltamigratus* Sher, 1964 with description of two new species (Nematoda : Tylenchida)

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SUMMARY

Five *Peltamigratus* sher, 1964 species, two of which are new, are described. *P. vigiae* sp. n. comes close to *P. brevicaudatus* Doucet, 1984 and *P. longistylus* Doucet, 1980. It can be differentiated from both species by the presence of males and by the shorter tail. *P. banoae* sp. n. closely resembles *P. longistylus* but it is distinguished by the presence of males, by the absence of areolation around scutella and by the c-value. In Brazilian samples were found not only the two new species but also *P. levicaudatus* Bittencourt & Huang, 1986 and *P. nigeriensis* Sher, 1964; in an Argentinian sample was found *P. brevicaudatus*. The genus *Nectopelta* Sidiqi, 1986 is considered a junior synonym of *Peltamigratus*. A table is provided to differentiate the *Peltamigratus* species.

RÉSUMÉ

Le genre Peltamigratus *Sher, 1964 et description de deux nouvelles espèces (Nematoda : Tylenchida)*

Cinq espèces de *Peltamigratus* Sher, 1964, dont deux nouvelles, sont décrites. *P. vigiae* sp. n. est proche de *P. brevicaudatus* Doucet, 1984 et *P. longistylus* Doucet, 1980 dont il diffère par la présence de mâles et une queue plus courte. *P. banoae*, très proche de *P. longistylus*, s'en distingue par la présence de mâles, l'absence d'aréolation autour des scutella et par le coefficient « c ». Dans les prélèvements provenant du Brésil ont été rencontrés, non seulement les deux nouvelles espèces, mais aussi *P. levicaudatus* Bittencourt & Huang, 1986 et *P. nigeriensis* Sher, 1964; *P. brevicaudatus* était présent dans un prélèvement provenant d'Argentine. Le genre *Nectopelta* Siddiqi, 1986 est considéré comme un synonyme mineur de *Peltamigratus*. Une table pour l'identification des espèces de *Peltamigratus* est proposée.

This paper deals with the genus *Peltamigratus* Sher, 1964. The material present in the soil samples from Bahia State, Brazil including two new species permitted a thorough study of the reliability of the morphological characters used to distinguish *Peltamigratus* and *Scutellonema* Andrássy, 1958. Three characters were used in the original diagnosis of *Peltamigratus* to differentiate this genus from *Scutellonema* : position of scutella, lip annulation and shape of male caudal alae. During present study morphological variations are noticed and according to our observations most of the morphological characters attributed to *Scutellonema* also occur in *Peltamigratus*, only one character, the position of scutella is valid between these genera. The differences in position of scutella is a good character for specific identification but its value for taxonomic differentiation of genera is questionable. Taxonomic status of the genus *Peltamigratus* is discussed in relation with the genera *Scutellonema*, *Rotylenchus* Filipjev, 1936 and *Nectopelta* Siddiqi, 1986.

Some morphological characters used at specific level are discussed and a table is provided to differentiate the *Peltamigratus* species. It is, however, difficult to present a key because diagnostic characters are few for the described species.

Material and methods

Soil samples were collected by one of the authors (R.D.S.) around the roots of *Theobroma cacao* L. and *Coffea arabica* L. in Bahia State. The specimens were fixed in hot 5 % formaldehyde, and then processed to pure glycerine by a modified Seinhorst method (De Grisse, 1969) and mounted on aluminium slides for light microscopy study. De Grisse's (1973) modified method for embedding of nematodes in Spurr resin, was used for the preparation of nematodes for SEM observations. The nematodes were observed by JSM-840 (Jeol Scanning microscope).

Peltamigratus vigiae n. sp.
(Figs 1 & 2 A, D)

MEASUREMENTS

Females (Paratypes, n = 7) : L = = 1.02 (0.85-1.12) mm; a = 34.7 (32.3-39.0); b = 7.4 (6.4-8.0); b′ = 5.8 (5.1-6.3); tail = 14.5 (13-17) µm; c = 71.6 (63.81.0); c′ = 0.6 (0.6-0.7); V = 56 (53-59); stylet cone = 17 (15-20) mm; stylet = 34.5 (33-37) µm; anterior phasmid = 74.5 (67-78) %; posterior phasmid = 88.7 (85-92) %.

Males (Paratypes, n = 6) : L = 0.88 (0.78-1.0) mm; a = 34.4 (32.0-37.0); b = 6.4 (5.8-7.0); b′ = 5.2 (4.8-5.9); tail = 17.5 (14.5-20) µm; c = 51.2 (45.2-60.0); c′ = 1.1 (0.9-1.3); T = 35 (32-49); stylet cone = 17 (15-20) µm; stylet = 34.5 (33-37) µm; anterior phasmid = 80 (76-88) %; posterior phasmid = 88.6 (84-93) %.

Holotype (female) : L = 1.03 mm; a = 31.9; b = 7.7; b′ = 6.7; tail = 14 µm; c = 74.0; c′ = 0.6; V = 58; stylet cone = 18.5 µm; stylet = 38 µm; anterior phasmid = 79 %; posterior phasmid = 86 %.

DESCRIPTION

Females

Body assuming spiral-shape when relaxed. Cuticle with two layers, outer distinctly annulated and inner finely striated. Lateral field marked by four incisures, areolated around scutella, extending to the tail end. Lip region slightly offset with fine transverse striation, hardly visible in lateral view; head end-on view of a single female shows oval oral disc and a subdivision of the first head annule into six sectors; one of the small lateral sectors having however, no posterior border line (Fig. 2 A). Stylet strong. Spear knobs rounded with anteriorly directed processes. Orifice of dorsal pharyngeal gland, 8 (6.5-9.5) µm from the base of stylet knobs. Excretory pore varying in position, from opposite isthmus to behind the pharyngo-intestinal junction, 133 (127-142) µm from anterior end. Hemizonid distinct at the level of or within three annules posterior to excretory pore. Nerve ring located at 144 (107-120) µm from head end. Median bulb oval with well sclerotized valves. Pharyngeal glands varying in length, dorsally overlapping the intestine, with three distinct nuclei; dorsal nucleus larger than the two subventral nuclei. Ovaries paired, outstretched. Spermatheca elongate to oval, about 18-20 µm long, filled with refractive sperms. Vulva a transverse slit. Epiptygma double, non-projecting. Tail dorsally convex-conoid, 8 to 11 annules on ventral side, distal annules usually equal in width, sometimes slightly wider than the other annules. Rectum 15-16 µm long.

Males

Body C-shaped when relaxed. Lip region same as in females. Stylet rather short. Excretory pore 127.5 (115-134) µm from head end. Testis single, outstretched. Spicules 32 (31-34) µm long, ventrally arcuate, robust. Gubernaculum 15 (14.5-16.5) µm long, with curved, hook-like proximal end and rounded distal end. Lateral field with four incisures, outer lines fade away at the tail region. In ventral view, caudal alae slightly indented (Fig. 1 H). Tail conical with finely rounded terminus.

TYPE SPECIMENS

Holotype, female, slide 775 in the Collection of the Instituut voor Dierkunde, Gent University, Belgium; paratypes on slides 776-779, same collection. Paratypes have also been deposited in USDA Beltsville, US Nematode Collection (one female, two males); Wageningen, Landbouwhogeschool, the Netherlands (one female); Commonwealth Institute of Parasitology, St. Albans, England (one female); Rothamsted Experimental Station, Harpenden, England (one female).

TYPE HABITAT AND LOCALITY

Light-sandy soil around the roots of *Theobroma cacao* L., cv. Comum, Itamaraju, Faz. Vigia, Bahia St., Brazil.

DIFFERENTIAL DIAGNOSIS

Peltamigratus vigiae n. sp. comes close to *P. brevicaudatus* Doucet, 1984 and *P. longistylus* Doucet, 1980, in having a long stylet and an areolated lateral field around scutella. It is distinguished from both species by the presence of males (absent in both species) and by the shorter tail, both absolutely (13-17 µm *vs* 15-21 µm in *P. brevicaudatus* and 16-21 µm in *P. longistylus*) and relatively (c = 63-81 *vs* 46-59 in *P. brevicaudatus* and 46-61 in *P. longistylus*). *P. vigiae* n. sp. also resembles *P. perscitus* Doucet, 1980 but it has a longer stylet (33.0-38.0 µm in *P. vigiae vs* 31.0-33.5 µm in *P. perscitus*).

This species is named after the farm Vigia, where it was found.

Peltamigratus banoae n. sp.
(Fig. 3)

MEASUREMENTS

Females (paratypes, n = 2) : L = 1.01-1.05 mm; a = 34.4-38.3; b = 8.0-8.2; b′ = 5.7-6.6; tail = 14-15.5 µm; c = 72.5-78.3; c′ = 0.6-0.7; v = 55-60; stylet cone = 17-19 µm; stylet = 34-37 µm; anterior phasmid = 69-70 %; posterior phasmid = 78-84 %.

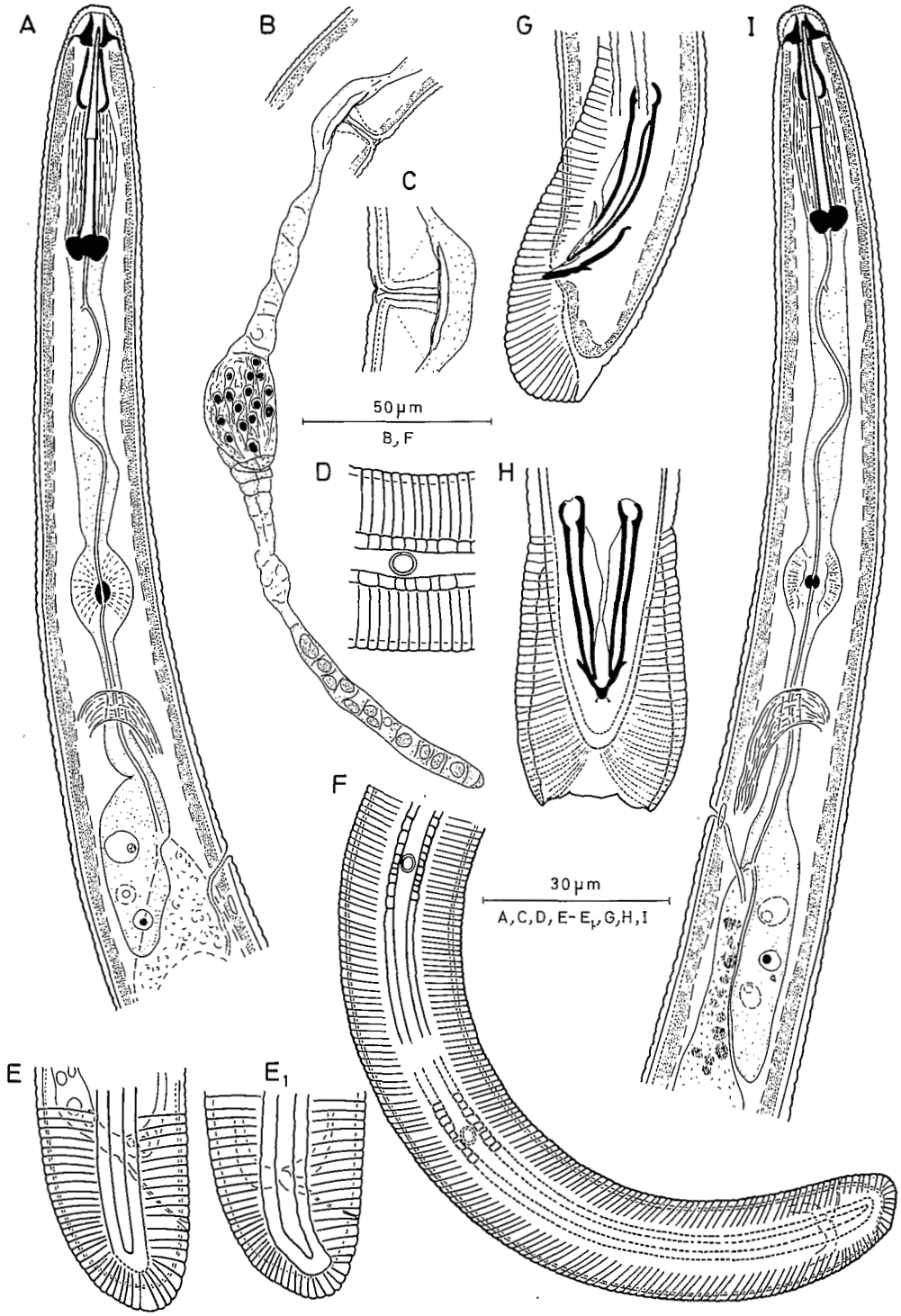

Fig. 1. *Peltamigratus vigiae* n. sp. A : Anterior region female; B : Female reproductive system (posterior branch); C : Vagina and vulva region; D : Lateral field + areolation around scutella; E-E 1 : Female tails; F : Female posterior region; G : Male tail region, lateral; H. : Male tail region, ventral view; I : Anterior region of the male.

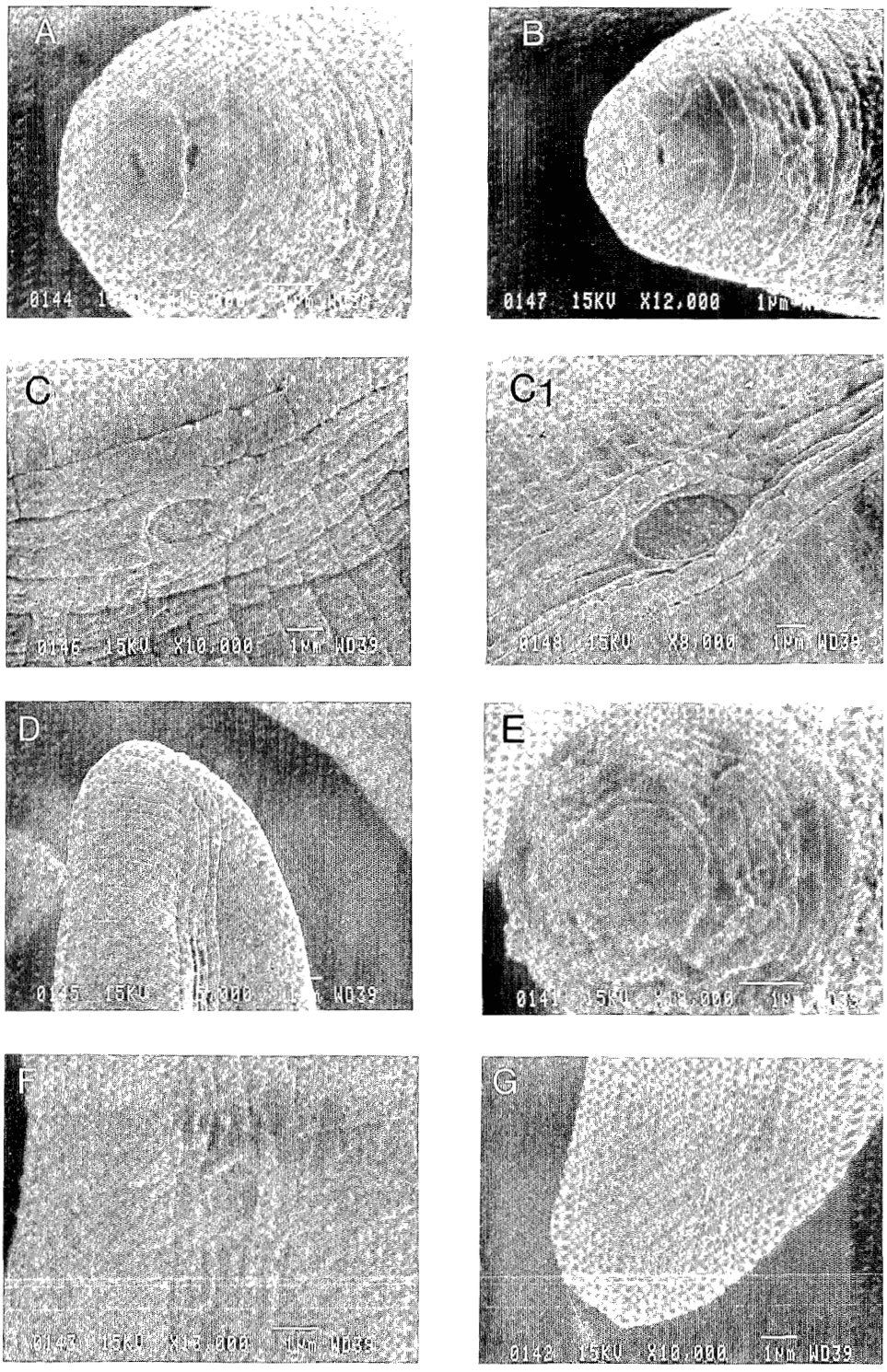

Fig. 2. *Peltamigratus vigiae* n. sp. SEM photographs females : A-B : Two views of females; C-C 1 : Scutella of two females; D : Tail. *Peltamigratus nigeriensis.* E-G : Head, scutella and tail of single female.

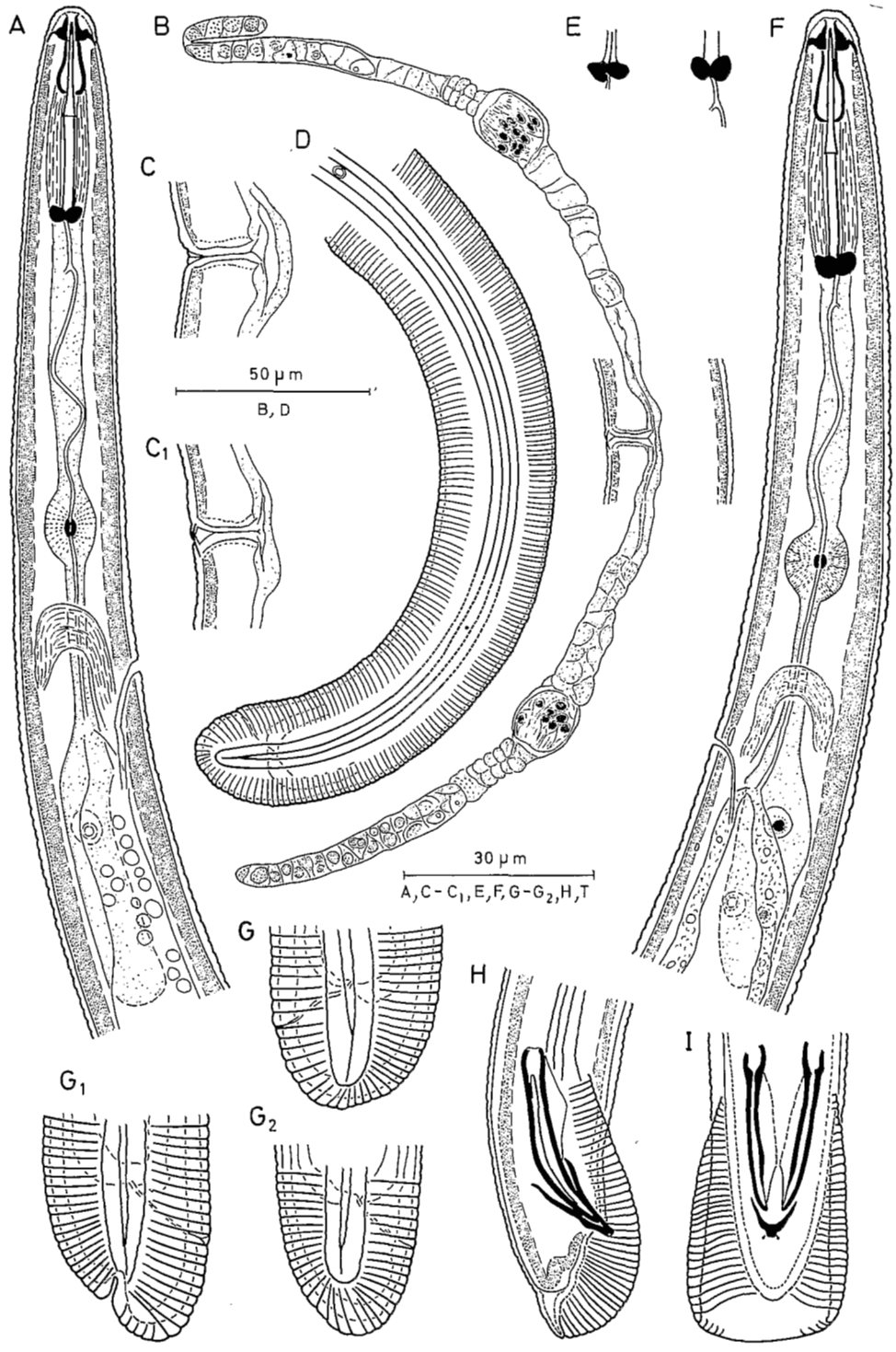

Fig. 3. *Peltamigratus banoae* n. sp. A : Anterior region male; B : Female reproductive system; C-C 1 : Vagina and vulva region; D : Female posterior region; E : Spear knobs; F : Anterior region female; G-G_2 : Variation in female tail region; H : Male tail region, lateral; I : Male tail region, ventral view.

Males (paratypes, n = 9) : L = 0.86 (0.77-0.93) mm; a = 31.0 (26.8-35.5); b = 7.1 (6.3-8.3); b′ = 5.6 (4.8-6.2); tail = 17 (13.5-20) µm; c = 52.5 (43.0-60.2); c′ = 1.0 (0.9-1.2); T = 43.5 (36-53); stylet cone = 17 (15-18) µm; stylet = 33 (31-35) µm; anterior phasmid = 73 (67-81) %; posterior phasmid = 76 (81-91) %.

Holotype (female) : L = 0.89 mm; a = 29.7; b = 7.1; b′ = 5.7; tail = 13 µm; c = 74.3; c′ = 0.5; V = 60; stylet cone = 20 µm; stylet = 38 µm; anterior phasmid = 74 %; posterior phasmid = 88 %.

DESCRIPTION

Females

Body spirally-shaped upon fixation. Cuticle consisting of two layers, outer distinctly annulated and inner finely striated. Lateral field marked by four incisures, slightly crenate, extending almost to the end, inner lines joining at the end (Fig. 3 G, G 2) not areolated around scutella. Lip region hemispherical, anterior margin truncate, very slightly set-off, with 5-6 indistinct annules. Stylet strong, 36 (34-38) µm long; spear knobs rounded with flattened or pointed anterior surface (Fig. 3 E). Dorsal pharyngeal glands' orifice about 4.5 µm behind the stylet knobs. Excretory pore, 120-127 µm from anterior end. Hemizonid distinct, just anterior to excretory pore. Hemizonion distinct in holotype female, about nine annules posterior to excretory pore (Fig. 3 F). Nerve ring around isthmus about 101-106 µm from head end. Median bulb rounded to oval, muscular with well-sclerotized valves. Dorsal pharyngeal glands dorsally overlapping the intestine. Three pharyngeal nuclei distinct; dorsal nucleus larger than the two subventral ones. Ovaries two, outstretched or with anterior branch (Fig. 3 B). Spermatheca rounded, distinct, 19 µm long, with or without elongated sperms. Vulva a transverse slit. Epiptygma double, projecting or not-projecting. Tail short, broadly rounded in holotype female, dorsally convex-conoid in one paratype and indented in other paratypes, with 10-11 annules on ventral surface, terminus annulated.

Males

Body spiral to C-shaped upon fixation. Stylet relatively short, 33 (31-35) µm long. Excretory pore 115.5 (107-124) µm from head end, varying in position. Testis single, outstretched. Spicules ventrally arcuate, 30 (28-32.5) µm long. Gubernaculum 15 (14-16) µm long, proximal end curved and distal end rounded. Bursa not indented in ventral view; two papillae visible (Fig. 3I). Tail conoid, with rounded terminus.

TYPE SPECIMENS

Holotype and paratype (one female) in slide 770 Institut voor Dierkunde, Rijksuniversiteit Gent, Belgium; seven male paratypes in slides 773-774, same collection; paratypes have been deposited in USDA Nematode Collection, Beltsville, USA (one female, one male); in Landbouwhogeschool, Wageningen, the Netherlands (one male).

TYPE HABITAT AND LOCALITY

Light-sandy soil around the roots of *Theobroma cacao* L., cv. Comum and *Coffea arabica* L., Belmonte, Faz. Futurosa, Bahia St. Brazil.

DIFFERENTIAL DIAGNOSIS

The representatives of *P. banoae* n. sp. closely resemble *P. longistylus* Doucet, 1980 in having a similarly long stylet (33.5-37 µm), and also in showing a single middle line on the tail, but our species differs by the presence of males; by the absence of areolation around scutella and by the "*c*" value (c = 72.5-78.3 *vs* 46-61 in *P. longistylus*). *P. banoae* also resembles (*P. striatus* Smit, 1971 and *P. christiei* but differs from both by the longer stylet (*P. striatus* : 24-30 µm; *P. christiei* : 30-34 µm; *P. banoae* : 34-38 µm).

This species is named in honour of the first author's mother.

***Peltamigratus nigeriensis* Sher, 1964**

(Figs 2 E & G; 4)

MEASUREMENTS

Females (n = 16) : L = 0.85 (0.71-0.96) mm; a = 29.5 (26.0-32.2); b = 7.3 (6.2-8.5); b′ = 6.1 (5.0-7.1), tail = 15 (12-18) µm; c = 57.5 (49.2-68.0); c′ = 0.7 (0.6-0.9); V = 56.5 (54-60); stylet cone = 13 (12-15) µm; stylet = 28.5 (27-31) µm; anterior phasmid = 85 (81-87) %; posterior phasmid = 86 (81-91) %.

Males (n = 6) : L = 0.79 (0.65-0.89) mm; a = 33.5 (31.0-36.6); b = 6.8 (6.5-7.3); b′ = 5.3 (4.6-5.8); tail = 14 (13-15.5) µm; c = 57.0 (46.7-66.2); stylet cone = 12.5 (11.5-13.5) µm; stylet = 27 (25.5-29) µm; anterior phasmid = 87 (84-90 %); posterior phasmid = 89 (87-90) %.

DESCRIPTION

Females

Body assuming spiral-shape when relaxed. Cuticle with two layers, outer one distinctly annulated and inner one finely striated. Lateral field with four incisures, outer ones fade away on tail, no areolation around scutella. Lip region hemispheroid with anterior margin truncate, slightly set-off, 5-6 annules, rather indistinct. Under SEM the head-end on view is badly preserved (Fig. 2 E) apparently no subdivisions are present. Stylet strongly developed, robust, with almost equal parts. Spear knobs rounded, slightly sloping anteriorly or

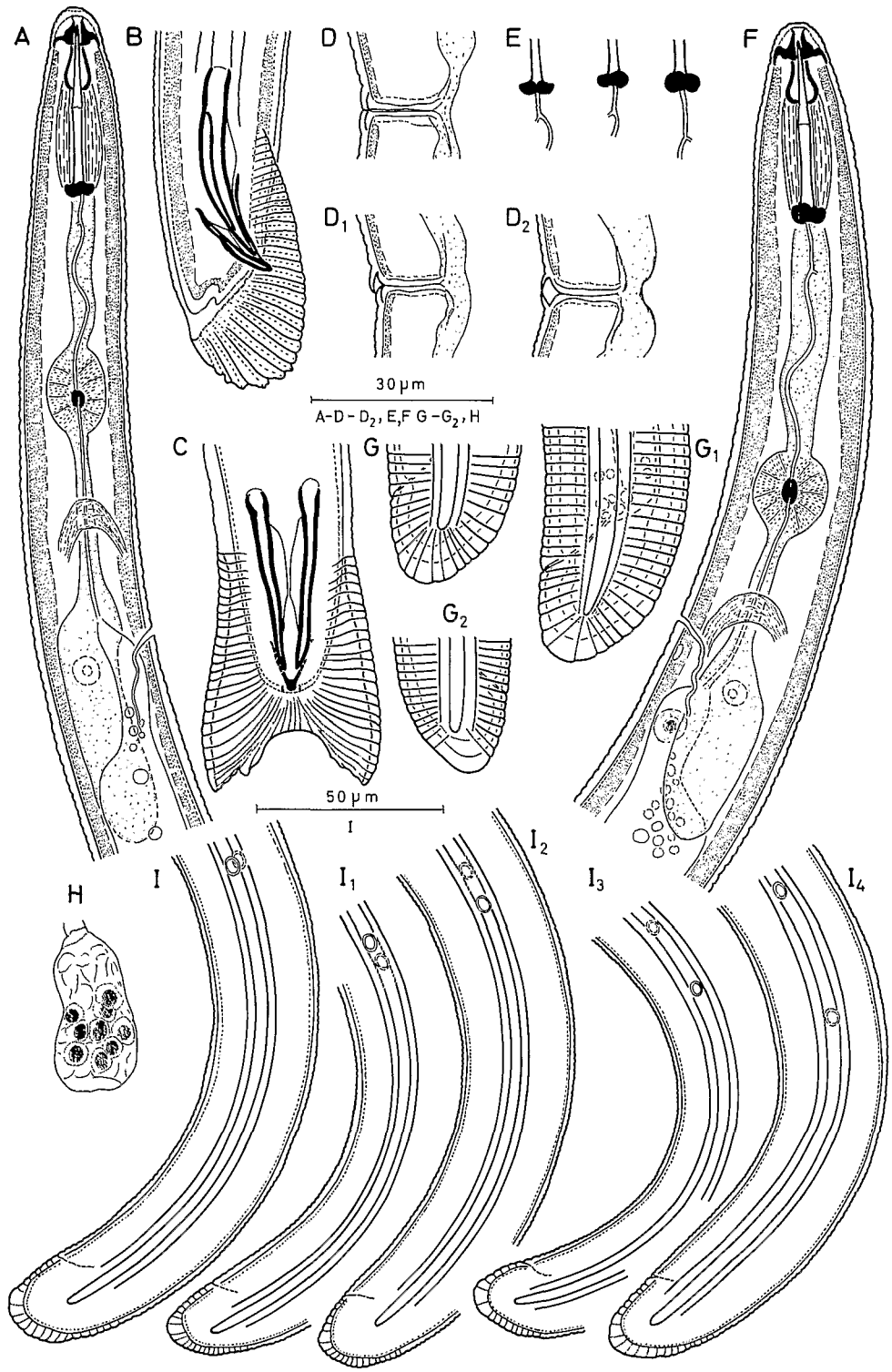

Fig. 4. *Peltamigratus nigeriensis.* A : Anterior region male; B : Male tail region, lateral; C : Male tail region, ventral view; D-D_2 : Vagina and vulva region : E : Spear knobs; F : Anterior region female; G-G_2 : Variation in female tail region; H : Spermatheca; I-I_4 : Female posterior region showing the position of scutella.

flattened. Orifice of dorsal gland 6.5 (4-8.5) µm from base of stylet knobs, distinct. Excretory pore opposite anterior end or middle of pharyngeal gland, 106 (96-118) µm from head end. Hemizonid single, two annules posterior to the excretory pore, in general rather indistinct. Nerve ring around isthmus, 91 (85.5-99.5) µm from anterior extremity. Median bulb rounded to oval with well-sclerorized valve. Dorsal pharyngeal gland dorsally or laterally overlapping intestine, varying in length, 1 1/2 to 2 times body width. Dorsal gland nucleus rather indistinct and subventral nuclei barely visible. Intestine with refracting granules. Ovaries two, outstretched; spermatheca elongate, filled with rounded sperms (Fig. 4 H). Vulva a transverse slit. Epiptygma double, generally projecting (Fig. 4 D 1; D 2). Tail short, hemispheroid to dorsally convex-conoid, 6-10 annules on ventral surface. Distal annule larger than other tail annules. Cuticle thickened at terminus. Scutella varying in position, from opposite one another to 1-32 µm from one another (Fig. 4 I-I 4), distinctly preanal.

Males

Similar to females, except for body shape, C-form when relaxed. Lateral field and scutella position same as in females. Testis single, outstretched. Spicules 31 (26-32.5) µm long, ventrally curved. Gubernaculum 15 (13.5-16) µm long with curved proximal end and rounded distal end. In ventral view, caudal alae deeply indented; two papillae observed (Fig. 4 C). Tail conoid, with rounded, short terminus.

HABITAT AND LOCALITY

Medium soil around the roots of *Theobroma cacao* L. cv. Conum, Gandu, Faz. Asonara Dois, Bahia, Brazil.

DISCUSSION

We identified our population as *P. nigeriensis* Sher, 1964 but some differences were noticed :

— in our population, the scutella are located from opposite each other to 32 µm apart; in the original description, the opposite position was not mentioned;

— in our population, the outer lines of the lateral field continue more posteriorly, till anus level, than in the type population;

— the tail shape in our females is dorsally convex-conoid, with a straight ventral side while, in the type population, the tail is more rounded.

Peltamigratus levicaudatus Bittencourt & Huang, 1986

(Figs 5, 6, 7 & 8, Tab. 1)

MEASUREMENTS

See Table 1.

DESCRIPTION

Female

Body spiral to C-shaped after fixation. Cuticle composed of two layers, outer one distinctly annulated and inner one finely striated. Lateral field with four incisures extending behind the anus, outer two becoming rather indistinct, not areolated around scutella (Figs 6 F & 8 C-D). Lip region hemispheroid, anterior margin truncate, not set off from body contour, with fine transverse striation sometimes hard to observe in lateral view, about 7-8 annules from anterior end to the base of head sclerotization. The end on views of five females showed much more variation than is usually found in *Peltamigratus* and *Scutellonema.* Oral disc rounded to oval, when oval the ventral-dorsal axis being the longest; consecutive head annules more or less subdivided; mid-dorsal and mid-ventral incisures continuing for 2 to 3 head annules while the lateral sectors are confined to the first head annule or continue 2 to 3 annules backwards (Figs 5 & 8). Amphidial aperture as usual, small slit at the lateral border of the oral disc (Figs 7 & 8) no papillae visible; in one female the slit-like oral opening very distinct (Fig. 8 B). Stylet strongly developed. Spear knobs rounded, with flattened to slightly sloping anterior surface. Orifice of dorsal pharyngeal gland, 6 (4-7.5) µm from base of stylet knobs. Excretory pore, 109.5 (94-132) µm from head end, variable in position from opposite isthmus to anterior end of intestine (Fig. 6 A-A_1). Hemizonid distinct, located anterior to posterior of the excretory pore. Nerve ring about 93 (85-99) µm from anterior end, around isthmus. Median bulb rounded to oval, muscular with sclerotized valve plates. Pharyngeal gland varying in length, dorsally overlapping the intestine. Three pharyngeal gland nuclei distinct. Dorsal gland nucleus larger than the two subventral nuclei. Intestine apparently with elongated cells and a lumen of varying width, cells filled with a few granules. Rectum surrounded by tissues in which numerous nuclei usually perceptible (these tissues are probably not intestinal, may belong to the *dilator ani* or are of nervous origin). Ovaries two; outstretched. Spermatheca distinct, small rounded when empty and oval to elongated when filled with sperms, 20 (7.5-28.5) µm long. Oocytes arranged in a single row. Vagina 8.5-10 µm long. Vulva a transverse slit. Epiptygma double or single, well developed, sometimes projecting (Fig. 6 C-C_1). Tail hemispheroid to convex-conoid dorsally, 6-10 annules on ventral surface. Outer cuticle thickened around tail tip; tail terminus generally entirely smooth but sometimes showing some large annules.

Male

Similar in general appearance to female. Testis single, outstretched. Spicules, 27.5 (26-29.5) µm in length along the curvature, ventrally arcuate. Gubernaculum, 14.5 (13.5-16) µm long, proximal end curved hooklike and distally rounded. Caudal alae with shallow inden-

tation, in ventral view (Fig. 5 E). Tail conoid with finely rounded terminus.

HAHITATS AND LOCALITIES

Heavy soil around the roots of *Theobroma cacao* L. cv. Comum, Itapebi, Faz. Lombardia, Bahia State, Brazil and slib, Evergem, Belgium.

DISCUSSION

Our population well corresponds with the type population except for the lateral field (two incisures in the type population and four incisures in our population) and position of hemizonid (only posterior to the excretory pore in the type population but more variable in our population).

An additional population has been studied from Belgium including three females and one male. These specimens are entirely conform with the type population. Sperms were observed in all females.

Peltamigratus brevicaudatus **Doucet, 1984**
(Fig. 9)

MEASUREMENTS

Females (n = 4) : L = 1.02 (0.97-1.07) mm; a = 34.4 (32.6-35.3); b = 7.5 (7.0-9.0); b′ = 6.2 (6.0-6.7); tail = 21.5 (17-26.5) µm; c = 49.3 (36.7-63.3); c′ = 0.8 (0.8-1.0); V = 55 (52-57); stylet cone = 15 (14.5-15.5) µm; stylet = 32 (31-33) µm; anterior phasmid = 69 (66-72) %; posterior phasmid = 85 (82-89).

Table 1

Morphometric data of *Peltamigratus levicaudatus*. Females and Males.

	Type population		*Population (Bahia, Brazil)*		*Evergem population (Belgium)*	
	(n = 20)	*(n = 10)*	*(n = 23)*	*(n = 22)*	*(n = 3)*	*(n = 1)*
L (mm)	0.71-0.87	0.62-0.73	0.82 (0.71-0.94)	0.78 (0.63-0.91)	0.68 (0.63-0.74)	0.68
Excretory pore (µm)	—	—	109.5 (94.0-132.0)	107.0 (86.5-115.0)	100.5 (97.0-103.0)	—
Stylet cone (µm)	—	—	13 (11.5-15.0)	12.5 (9.5-14.5)	14.0 (13.5-15.0)	14.5
Stylet (µm)	29.0-32.5	27.0-29.5	29.5 (27.0-32.5)	28.5 (26.0-31.5)	29.0 (27.5-31.0)	30.5
Tail length (µm)	—	—	14.0 (11.0-18.0)	15.5 (12.5-18.0)	14.5 (13.5-17.0)	13.5
Spicule length (µm)	—	25.0-28.0	—	27.5 (26.0-29.5)	—	28.5
Gubernaculum (µm)	—	10.0-12.5	—	14.5 (13.5-16.0)	—	14.5
Ratios						
a	25.7-34.5	30.5-35.9	32.4 (29.8-35.8)	34.4 (28.2-39.0)	26.3 (24.5-28.3)	29.0
b	6.0-9.5	6.6-8.3	7.4 (6.3-8.0)	6.7 (5.7-7.5)	6.2 (6.0-6.7)	6.3
b′	4.8-6.8	4.7-6.4	6.0 (5.2-6.6)	5.5 (5.0-6.3)	5.1 (4.9-5.6)	4.9
c	38.8-78.0	46.0-66.0	58.8 (47.8-82.6)	50.8 (39.3-62.6)	47.3 (44.0-50.7)	50.7
c′	—	—	0.6 (0.5-0.8)	1.1 (1.0-1.3)	0.7 (0.7-0.8)	1.1
V	52.3-58.8	—	56.0 (52.0-62.0)	—	55.6 (55.0-57.0)	—
T	—	—	—	39.0 (34.0-46.0)	—	45.0
Ant. phasmid (%)	76.6-84.0	77.9-85.3	76.3 (74.0-82.0)	76.6 (73.6-81.0)	75.6 (68.0-84.0)	80.0
Post. phasmid (%)	85.0-89.1	86.9-92.4	90.0 (82.7-92.8)	87.0 (83.0-93.7)	85.3 (81.0-88.0)	89.0

DESCRIPTION

Females

Body spiral to J-shaped after fixation. Cuticle with two layers; outer layer distinctly annulated; inner finely striated. Lateral field with four incisures, areolated around scutella, extending behind the anus.

Lip region hemispheroid, slightly set-off, by a shallow constriction, from body contour, anterior margin truncate. Stylet knobs rounded with flattened or anteriorly sloping surface. Orifice of dorsal pharyngeal gland, 3-6 µm behind the base of stylet knobs. Excretory pore 135 (116.5-147) µm from anterior end, opposite to pharyngo-intestinal junction or posterior to it. Hemizonid just anterior to excretory pore. Nerve ring around isthmus, 103 (95-112) µm from head end. Median bulb oval to rounded, muscular, with well-sclerotized valves. Dorsal pharyngeal gland dorsally overlapping intestine;

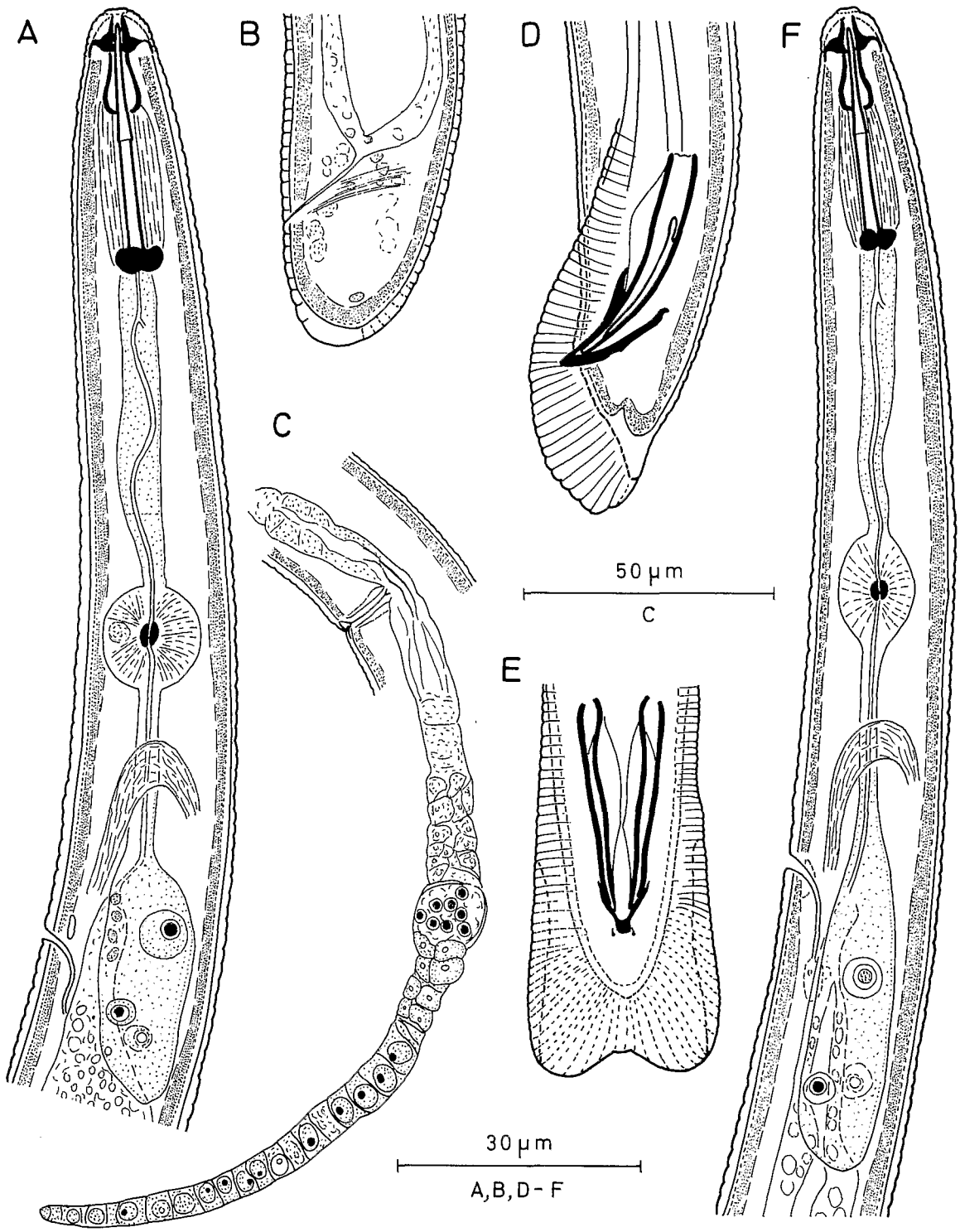

Fig. 5. *Peltamigratus levicaudatus.* A : Anterior region female; B : Tail region female; C : Female reproductive system (posterior branch); D : Male posterior region, lateral; E : Male tail region, ventral view; F : Anterior region male.

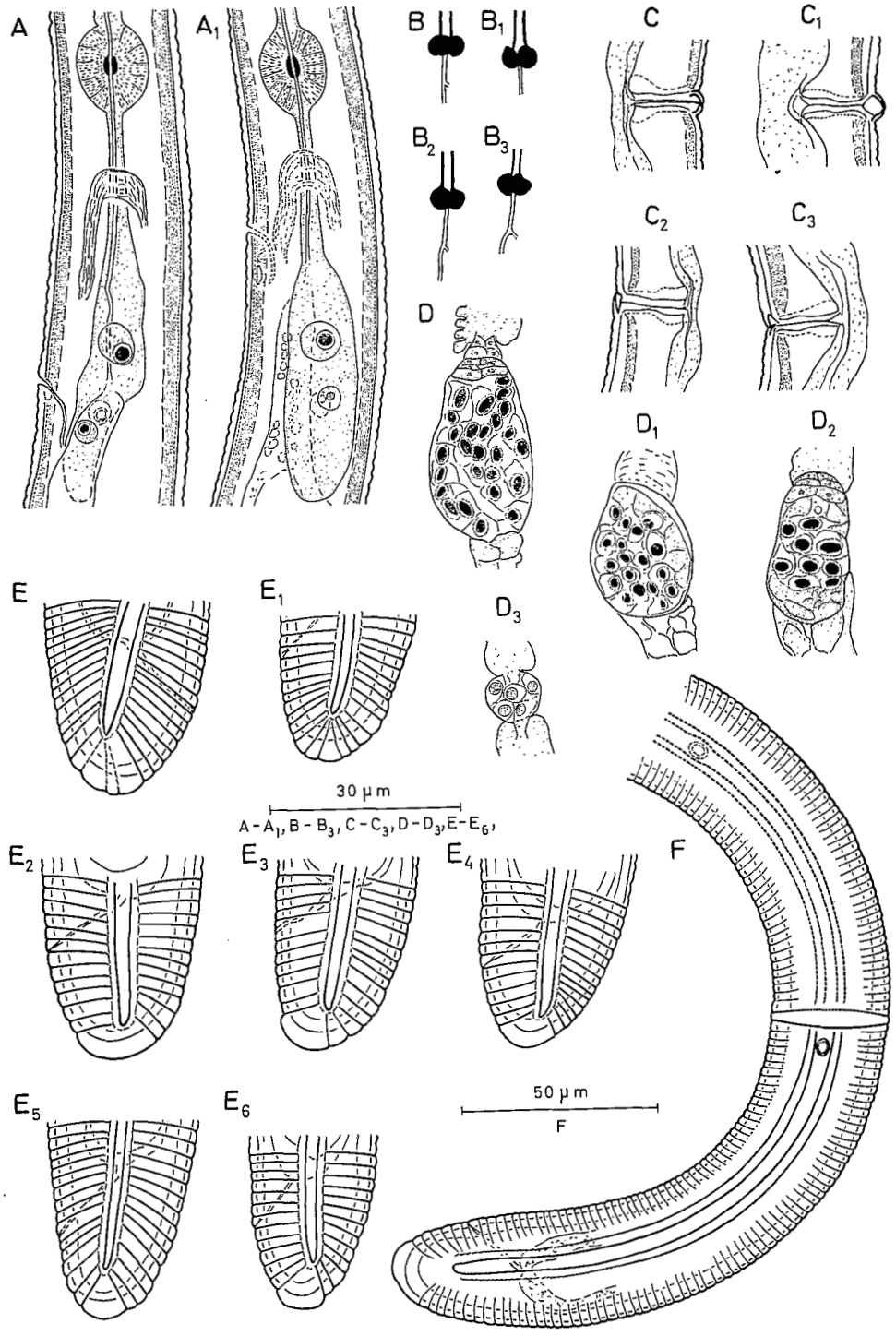

Fig. 6. *Peltamigratus levicaudatus.* A : Pharyngeal region showing the position of excretory pore and hemizonid; B-B_3 : Spear knobs; C-C_3 : Vagina and vulva region; D-D_3 : Variation in shape of spermatheca; E-E_6 : Variation of tail tip in female; F : Female posterior region.

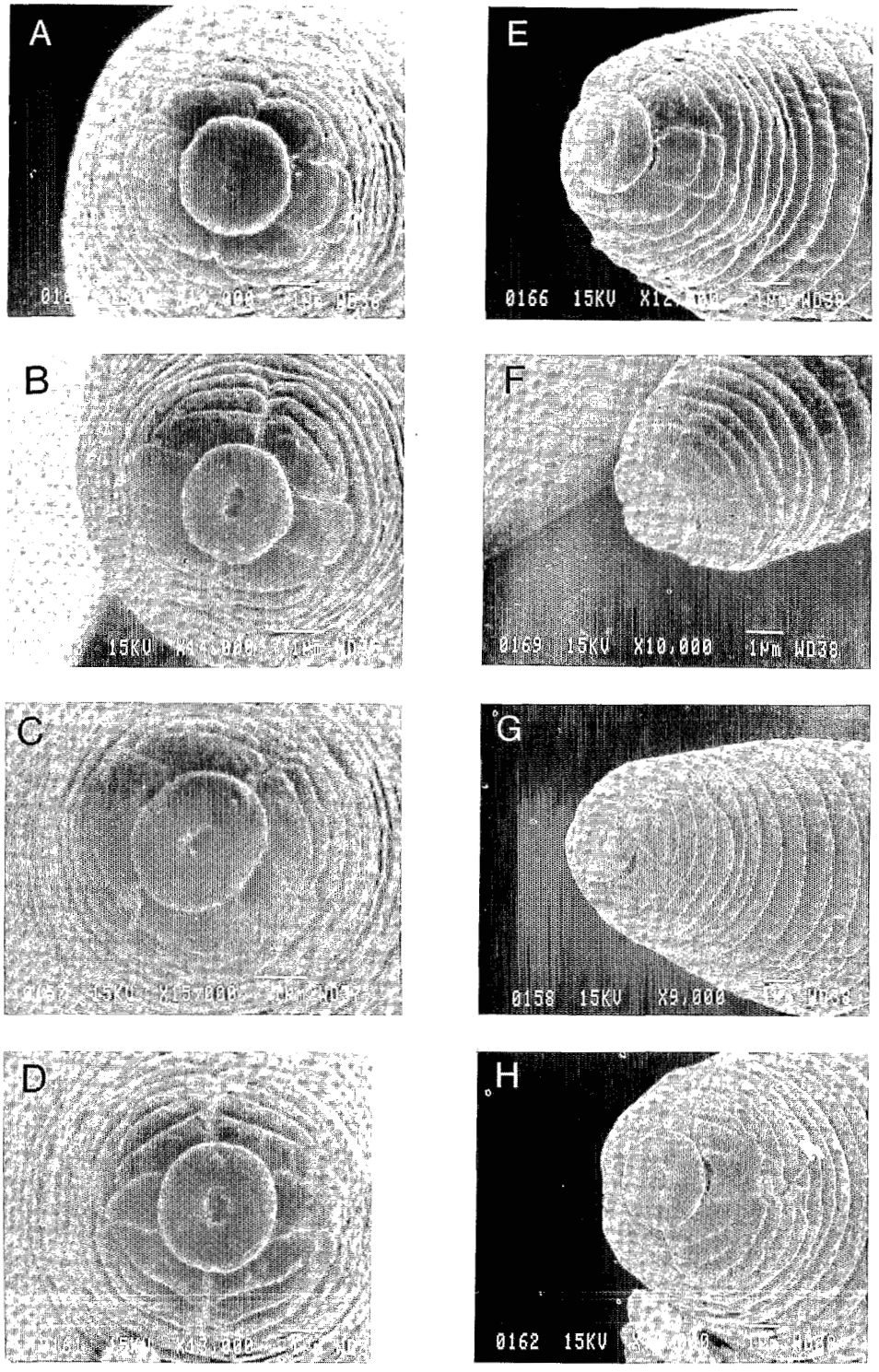

Fig. 7. *Peltamigratus levicaudatus.* SEM photographs : Head views of four females, each one in anterior view (left) and lateral view (right).

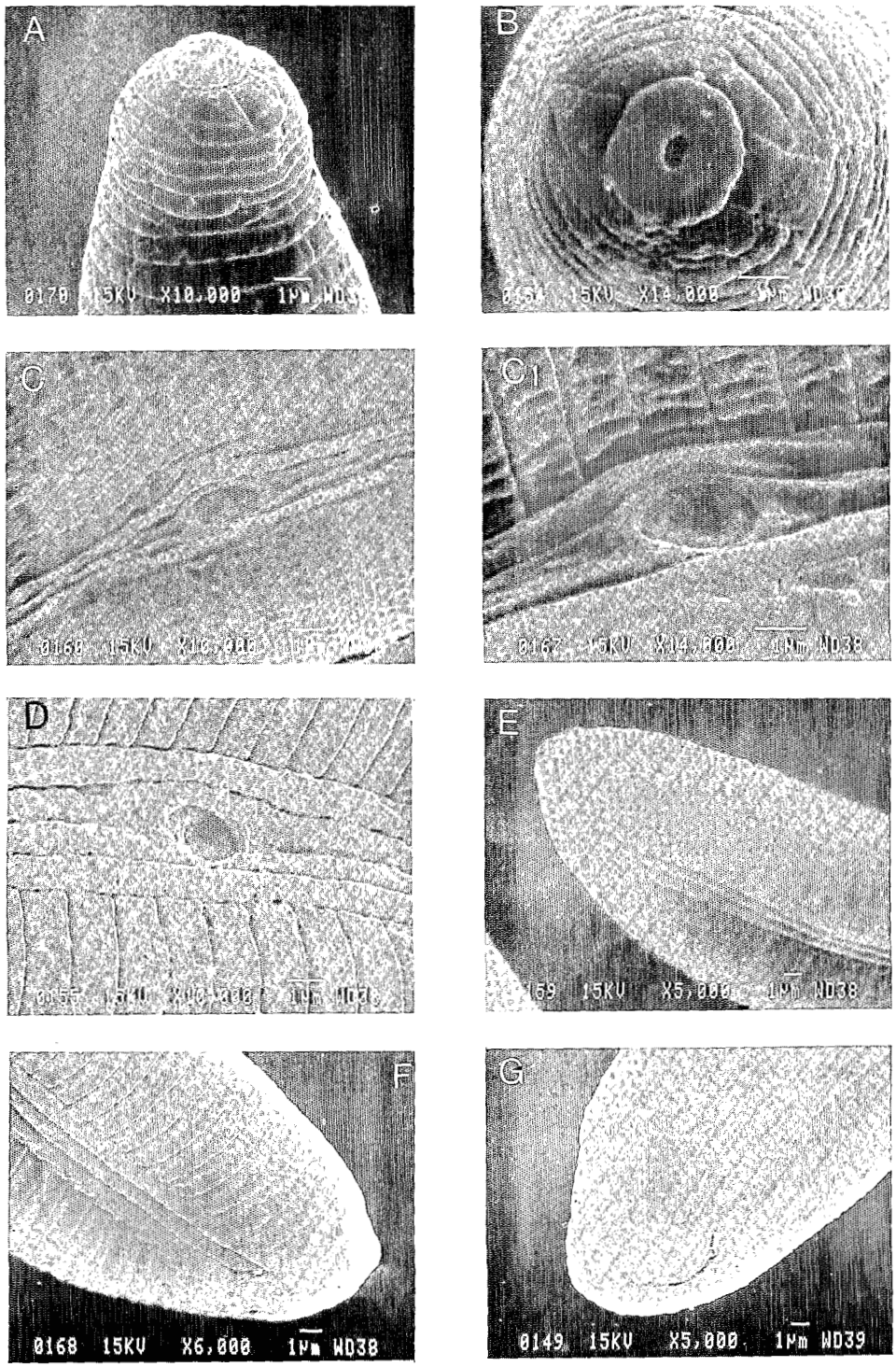

Fig. 8. *Peltamigratus levicaudatus.* SEM photographs (female). A-B : Lateral view (A) of one female; anterior view (B) of another female; C-C 1 : Scutellum of one female; D : Scutella of another female; E-G : Tails.

three pharyngeal gland nuclei distinct. Intestine packed with refractive granules. Ovaries two, outstretched. Spermatheca indistinct, without sperms. Oocytes arranged in a single row. Epiptygma double. Vulva a transverse slit. Tail conoid to broadly rounded, 11-16 annules on ventral side, sometimes distal annule larger than other tail annules. Tail terminus annulated (Fig. 9 D-D 1).

Male

Not found.

HABITAT AND LOCALITY

Uncultivated soil, Tandil, Buenos Aires, Argentina.

DISCUSSION

The females of *P. brevicaudatus* agree well with the original measurements and description given by Doucet (1984). Some variation has been noticed in tail shape, not mentioned for the type population.

General discussion

A. GENERIC DIFFERENTIATION

Sher (1964*b*) excluded the species *Scutellonema christiei* (Golden & Taylor, 1956) Andrássy, 1958, from the genus *Scutellonema* and he proposed a new genus *Peltamigratus*, with the type species *P. christiei* and he added four new species closely related to it.

The original diagnostic characters of *Scutellonema* Andrássy, 1958 and *Peltamigratus* Sher, 1964, are given in Table 2 (Eerens & Loof, 1985).

Phillips (1971) described five new species of *Scutellonema* from Australia. One of these entirely conforms with the diagnosis of *Scutellonema*, while the others show the characters of both genera, so that the demarcation between *Scutellonema* and *Peltamigratus* became less clear.

Recently, Eerens and Loof (1985) studied the type species of both genera and they compared the diagnostic characters; they divided *Peltamigratus* species into two groups and showed that the *Scutellonema* species of Phillips (1971) and the species of *Peltamigratus* group II, greatly resemble each other. No decision was made because the SEM photo's of the head ends of the type species showed some clear differences in the structure of the lip region.

According to Eerens and Loof (1985), the lip region in *S. bradys* (Steiner & Le Hew, 1933) the type species of *Scutellonema*, is strongly annulated, while that of *P. christiei* is more reminiscent of *Helicotylenchus* transverse striae being present but being much weaker than in *S. bradys*, and interrupted laterally by elongate sectors, which is not the case in *S. bradys*, nor in other species of *Scutellonema* which they have examined. Eerens and Loof (1985) indicated either to synonymize *Peltamigratus* and *Scutellonema* or to erect a new generic name to accomodate the *Scutellonema* species of Phillips (1971) and the species of the *Peltamigratus* group II.

Germani *et al.* (1986) transfered the four Phillips' (1971) species, that are not entirely conform to *Scutellonema*, to *Rotylenchus* (together with *S. minutum* Sher, 1964) because of the small scutella. In SEM photographs published by Sauer (1985) we can observe that in *R. minutus* the lateral sectors are slightly elongated, a feature not yet found in *Rotylenchus*.

Siddiqi (1986) excluded six species of the genus *Peltamigratus* and he erected a new genus *Nectopelta*. We consider *Nectopelta* as a synonym of *Peltamigratus*. The characters used (areolation of lateral field and head annulation) are not considered as being of generic level.

During the present study, we found *P. nigeriensis*, *P. levicaudatus* and two new species and we studied one additional population of *P. brevicaudatus* from Argentina. According to our observations and those of Bittencourt and Huang (1986), most of the morphological characters attribued to *Scutellonema* also occur in *Peltamigratus*.

The diagnostic characters mentioned by Sher (1964) are discussed here.

1) *Lip region*

Sher (1964*b*) : no striation in lip region of *Peltamigratus*.

Eerens and Loof (1985) : striation present but much weaker and subdivided by lateral elongate sectors, typical for *Peltamigratus*. In *Scutellonema* the lateral sectors are never elongated (Germani *et al.*, 1986).

Our SEM observations of the head end show some specific variation in the lip region; transverse striation is usually distinct and the lateral sectors are usually elongated (Figs 7, 8 & 2), but sometimes, no lateral elongation occurs, as in *Scutellonema* (Fig. 7 A) and sometimes the lateral sector has indistinct border lines (Fig. 2 A).

2) *Scutella position*

Sher (1964*b*) : enlarged phasmids in the posterior part of the body, anterior to the anal region and not opposite one another.

Eerens and Loof (1985) : distinctly pre-anal, at different levels.

Our population of *P. nigeriensis* shows variation in the position of the scutella, from opposite one another to different levels from each other, always distinctly pre-anal (Fig. 4 I-I 4).

3) *Lateral field areolated around scutella*

Sher (1964*b*) : not areolated.

Eerens and Loof (1985) and Bittencourt and Huang (1986) : areolated in some species, not areolated in others.

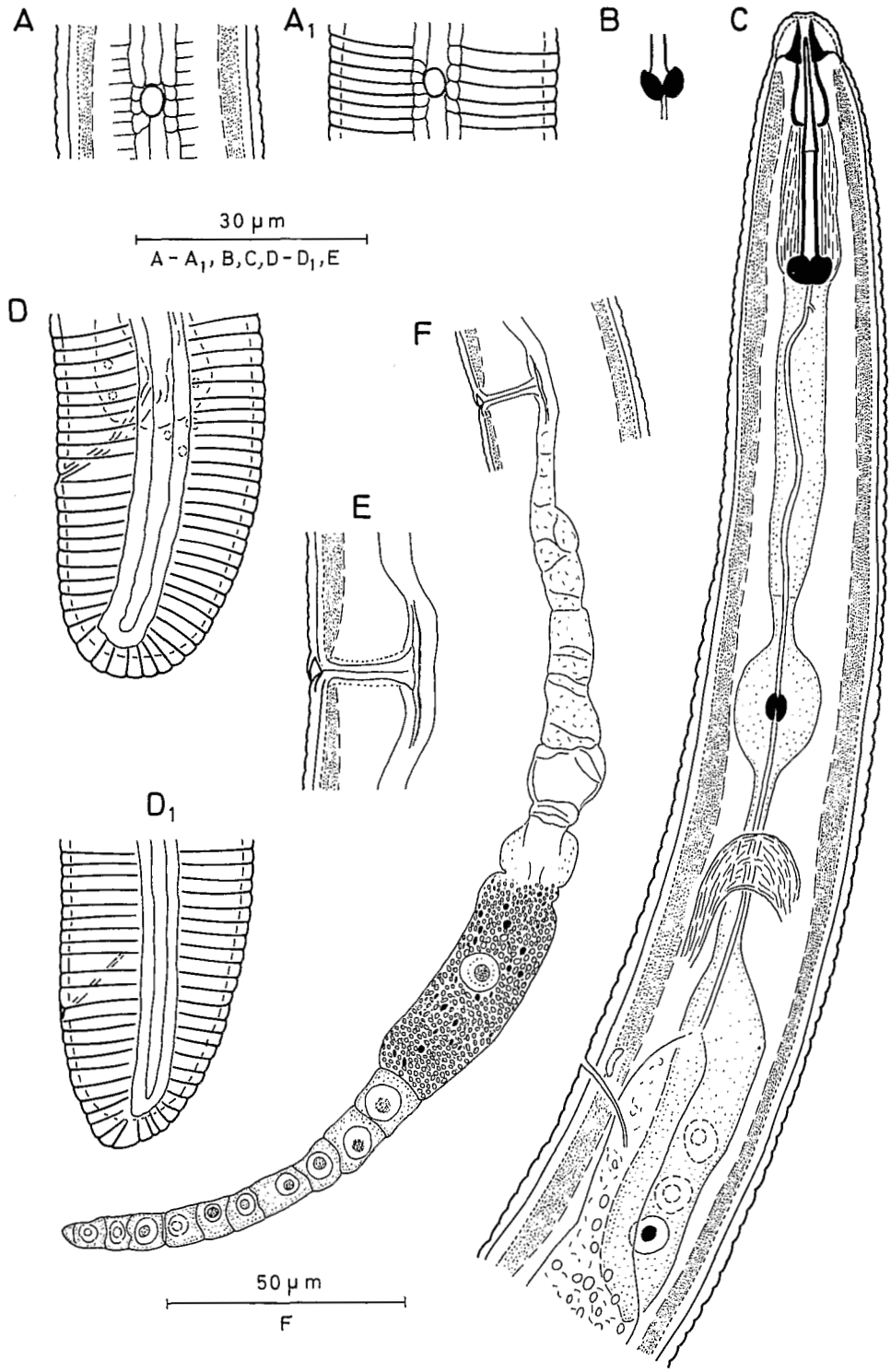

Fig. 9. *Peltamigratus brevicaudatus.* Female. A-A 1 : Lateral field + areolation; B : Spear knobs; C : Anterior region; D-D 1 : Variation of tail region in female; E : Vagina and vulva region; F : Female reproductive system.

Table 2

The present situation of morphological characters of *Scutellonema* and *Peltamigratus*.

	Scutellonema		*Peltamigratus*	
	original	*present situation*	*original*	*present situation*
Lip region with distinct transverse striae	+	+/—	—	+/—
Scutella	on or near tail, opposite one another	on or near tail, opposite one another or at different level	distinctly preanal at different level	distinctly preanal, at different level or opposite another
Lateral field areolated around scutella	+	+/—	—	+/—
Lateral lines	4	4	4 or 2	4 or 2
Caudal alae	not indented	not indented	indented	indented/ not indented

Our species show areolation *(P. vigiae, P. brevicaudatus)* or no areolation *(P. banoae, P. levicaudatus, P. nigeriensis)*.

4) *Caudal alae*

Sher (1964) : caudal alae indented.

Eerens and Loof (1985) : caudal alae indented or unindented.

Our species also shows caudal alae indented *(P. levicaudatus, P. vigiae, P. nigeriensis)* or unindented *(P. banoae)*.

Mulk and Siddiqi (1982) mentioned that the use of the bursa in *Peltamigratus* as a diagnostic character (Sher, 1964) becomes invalid due to the occurrence of both indented and unindented bursa. We agree with their decision.

5) *Conclusion*

In view of the present study, only the position of the scutella can be used to distinguish *Scutellonema* and *Peltamigratus* (cf. Tab. 2).

B. Specific differentiation

Some morphological characters applied at specific level in the genus *Peltamigratus* are difficult to use. It is hard to distinguish the species. A key was provided by Doucet (1984) but some characters used in his key are doubtful.

Remarks to Doucet's (1984) key of *Peltamigratus* :

1) *P. striatus* Smit, 1971 was distinguished from two other species in having simple hemizonid anterior to excretory pore. Hemizonid is usually indistinct, difficult to observe and the position is variable, e.g. in *P. levicaudatus* hemizonid is situated at the level of excretory pore, anterior or posterior to it.
2) *P. triticeus* Doucet, 1984, was differentiated from *P. conicori* Doucet, 1984 by labial disc, width of middle band of lateral field and by simple or double epiptygma. According to our observations, labial disc is usually not prominent; distance between middle lines is irregular and not easy to justify. Generally the middle band is wide at scutella in all species. Epiptygma shows specific variation, appears single or double in some species, e.g. *P. levicaudatus* and *P. striatus* Smit, 1971.
3) *P. thornei* Knobloch, 1969 and *P. indicus* Khan & Husain, 1973, are distinguished only by the difference of distal tail annule. We found this character greatly variable at species level, terminus can be entirely smooth to annulated, distal annule large or equal, e.g. *P. levicaudatus* and *P. nigeriensis*.
4) Doucet (1984) separates *P. christei* and *P. ibiboca* Monteiro & Choudhury, 1978, by tail shape and number of annules on ventral side. Tail shows specific variation in shape and in number of annules. Tail shape can be broadly rounded to ionoid, e.g., *P. brevicaudatus* Doucet, 1984.

It is, however, difficult to arrange a key because diagnostic characters are few for the species described.

In our opinion, the most constant and useful characters are : the stylet length, the number of lateral lines, the areolation around scutella and the presence of males.

A table is provided with some morphological characters (obtained from the literature) of the *Peltamigratus* species (see Tab. 3); it does not always permit species

identification and control of the original description will always be necessary.

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REFERENCES

ANDRÁSSY, I. (1958). *Hoplolaimus tylenchiformis* Daday, 1905 (syn. *H. coronatus* Cobb, 1923) und die Gattungen der Unterfamilie Hoplolaiminae Filipjev, 1936. *Nematologica,* 3 : 44-56.

ANDRÁSSY, I. (1968). Fauna Paraguayensis. 2. Nematoden aus den Galeriewaldern des Acaray-Flusses. *Opusc. zool. bpest,* 8 : 167-315.

BITTENCOURT, C. & HUANG, C. S. (1986). Brazilian *Peltamigratus* Sher, 1964 (Nematoda : Hoplolaimidae) with descriptions of six new species. *Revue Nématol.,* 9 : 3-24.

DE GRISSE, A. (1969). Redescription ou modification de quelques techniques utilisées dans l'étude des nématodes phytoparasitaires. *Meded. Rijksfak. Landbwet. Gent,* 34 : 351-369.

DE GRISSE, A. (1973). A method for preparing nematodes and other soft tissues for scanning electron microscopy. *Meded. Fak. Landwet. Gent,* 38 : 1685-1703.

DOUCET, M. E. (1980). Description of two new *Peltamigratus* species and of a *Hoplolaimus galeatus* population from Cordoba province, Argentina. *Nematologica,* 26 : 34-46.

DOUCET, M. E. (1984). Three new species of the genus *Peltamigratus* Sher, 1964 (Nematoda : Tylenchida) from the province of Cordoba, Argentina. *Revue Nématol.,* 7 : 35-47.

EERENS, J. P. J. & LOOF, P. A. A. (1985). Systematic observations on the genera *Scutellonema* Andrássy, 1958 and *Peltamigratus* Sher, 1964. *Meded. Fak. Landbwet. Gent,* 50/3 a : 857-860.

GERMANI, G., BALDWIN, J. G., BELL, A. H. & WU YUI-YING (1986). Revision of the genus *Scutellonema* Andrássy, 1958 (Nematoda : Tylenchida). *Revue Nématol.,* 8 : 289-320.

Table 3
Some of the characters that can be used to distinguish the species of the genus *Peltamigratus* Sher, 1964.

Species	*Lateral field areolated or not around scutella*	*Males, present or absent*	*Lateral lines*	*Stylet (µm)*	*Lip region*	*Epiptygma*	*Tail shape (and tail annules on ventral side)*
P. areolatus Bittencourt & Huang, 1986	+	+	4	25.0-26.5	hemispheroid slightly set off	—	hemispherical, distal annules separated (6-9)
P. annulatus Mulk & Siddiqi, 1982	+	+	4	25.0-27.0	hemispherical set off	double, projecting or non projecting	hemispherical to conoid round (7-15)
P. perscitus Doucet, 1980	+	+	4	31.0-33.5	hemispheroid not set off	double, projecting	rounded (9-13)
P. vigiae n. sp.	+	+	4	33.0-38.0	hemispheroid slightly set off	double, projecting	rounded dorsally convex-conoid (9-11)
P. conicori Doucet, 1984	+	—	4	28.0-32.0	conoid, not set off	single	conoid (10)
P. triticeus Doucet, 1984	+	—	4	30.0-32.0	truncoid, slightly set off	double non-projecting	conoid (12-15)
P. brevicaudatus Doucet, 1984	+	—	4	31.0-35.0	hemispheroid set off	double, projecting	rounded or conoid (11-16)
P. longistylus Doucet, 1980	+	—	4	33.0-37.0	hemispheroid continuous	double, non projecting	truncated-conical (8-12)
P. striatus Smit, 1971	—	+	4	24.0-30.0	truncoid, not set off	single or double non projecting	rounded (7-10)

Table 3 (cont.)

P. amazonensis Bittencourt & Huang, 1986	—	+	4	25.0-30.0	hemispheroid set off	—	tail conical, distal annule wider (6-9)
P. luci Sher, 1964	—	+	4	26.0-29.0	hemispheroid set off	double	conoid (2)
P. nigeriensis Sher, 1964	—	+	4	26.0-31.0	hemispheroid not set off	double projecting	rounded to conoid, distal annule large
P. browni Khan & Zakiuddin, 1969	—	+	4	27.0-30.0	truncate, not set off	single, non projecting	rounded, distal annule large (7-10)
P. holdemani Sher, 1964	—	+	4	29.0-32.0	truncoid not set off	single, inconspicuous	rounded (10)
P. banoae n. sp.	—	+	4	34.0-38.0	hemispheroid not set off	double, non-projecting	rounded to conoid or indented (9-10)
P. levicaudatus Bittencourt & Huang, 1986	—	+	2/4	27.0-31.0	hemispheroid slightly set off	double or single projecting	rounded to dorsally convex-conoid, terminus usually smooth (6-10)
P. macbethi Sher, 1964	—	+	2	27.0-29.0	hemispheroid slightly set off	double, projecting	broadly rounded distal annule large (10)
P. paraensis Bittencourt & Huang, 1986	—	+	2	27.0-31.0	hemispherical not set off	simple	hemispherical (7-12)
P. raskii Bittencourt & Huang, 1986	—	+	2	29.5-31.5	hemispherical not set off	simple slightly projected	tail conical, distal annule wider (6-9) smooth (6-10)
P. sheri Andrássy, 1968	—	+	2	30.0-32.0	hemispheroid distinctly set off	double, projecting	rounded, dorsally convex-conoid (8)
P. christiei (Golden & Taylor 1956) Sher, 1964	—	+	2	30.0-34.0	hemispheroid slightly or not set off	double	rounded (6-10)
P. cerradoensis Bittencourt & Huang, 1986	—	+	2	30.5-33.0	hemispherical slightly separated	double projecting	tail conical, distal annule wider (4-9)
P. ibiboca Monteiro & Choudhury, 1978	—	+	2	31.0-33.0	hemispheroid slightly set off	double, projecting	rounded (10-14)
P. pachyurus Loof, 1964	—	—	4	30.0-31.0	hemispheroid slightly set off	double, non projecting	broadly rounded terminus entirely smooth (8-10)
P. thornei Knobloch, 1969	—	—	4	32.0-33.0	hemispheroid smooth, not set off	double, projecting	broadly rounded terminus annulated (12-14)
P. indicus Khan & Husain, 1973	—	—	4	32.5-33.5	hemispheroid slightly set off	single, non projecting	rounded, distal annule large (9)

KHAN, F. A. & HUSAIN, S. I. (1973). A new species of the genus *Peltamigratus* Sher, 1963 (Nematoda : Hoplolaiminae) from India. *Zool. Anz.*, 191 (1/2) : 136-138.

KHAN, S. H. & ZAKIUDDIN, (1969). A new species of the genus *Peltamigratus* Sher, 1963 (Nematoda : Hoplolaiminae) from Trinidad, West-Indies. *Annls Zool. Ecol. anim.*, 1 : 495-498.

KNOBLOCH, N. A. (1969). *Peltamigratus thornei* n. sp. (Nematoda : Hoplolaimidae) from soil in Central America. *Proc. helminth. Soc. Wash.*, 36 : 208-210.

LOOF, P. A. A. (1964). Free living and plant parasitic nematodes from Venezuela. *Nematologica*, 10 : 201-300.

MONTEIRO, A. R. & CHOWDHURY, M. M. (1978). *Peltamigratus ibiboca* n. sp. from Brazil Nemata : Hoplolaimidae). *Rev. Agric. Piracicaba, Brazil*, 53 : 189-192.

MULK, M. M. & SIDDIQI, M. R. (1982). Three new species of Hoplomaimid nematodes from South America. *Ind. J. Nematol.*, 12 : 124-131.

Accepté pour publication le 27 juin 1986.

PHILLIPS, S. P. (1971). Studies of Plant and Soil Nematodes. 16. Eight new species of spiral nematodes (Nematoda : Tylenchoidea) from Queensland. *Queensl. J. agric. anim. Sci.*, 28 : 227-242.

SAUER, M. R. (1985). *A scanning electron microscope study of plant and soil nematodes.* Commonwealth Scientific and Industrial Research Organisation. Australia.

SHER, S.A. (1964*a*). Revision of the Hoplolaiminae (Nematoda). III. *Scutellonema* Andrássy, 1958. *Nematologica*, 9 : 421-443.

SHER, S. A. (1964*b*). Revision of the Hoplolaiminae (Nematoda). IV. *Peltamigratus* n. gen. *Nematologica*, 9 : 455-467.

SIDDIQI, M. R. (1986). *Tylenchida Parasites of Plants and Insects.* Commonwealth Institute of Parasitology, 645 p.

SMIT, J. J. (1971). Deux nouvelles espèces africaines d'Hoplolaiminae (Nematoda : Tylenchtidea) : *Peltamigratus striatus* n. sp. et *Scutellonema africanum* n. sp. *Nematologica*, 17 : 113-126.