

## Description of *Xiphinema abeokutae* n. sp. and redescription of *X. paulistanum* Carvalho, 1965, two rare species (Nemata : Longidoridae)

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**Summary** – *Xiphinema abeokutae* n. sp. from cocoa soil in Nigeria is described and illustrated. Only few specimens were found; the new species is characterized by having a lip area continuous with the rest of the body, a pseudo-Z-organ, a tail regularly conical, curved ventrad in both sexes, and the absence of medioventral supplements in the male. *X. paulistanum* Carvalho, 1965, found once in São Paulo, Brazil is redescribed on the holotype female and the allotype male (only one additional female was originally reported). Observations confirmed the original description, but permitted to clear the structure of the female genital system in detail: the anterior genital branch is composed of an uterus similar to that of the posterior branch, but the oviduct is reduced to an unorganized mass and the ovary is absent. This species is close to *X. krugi* Lordello, 1955 and *X. llanosum* Siddiqi & Lenné, 1990.

**Résumé** – *Description de Xiphinema abeokutae* n. sp. et redescription de *X. paulistanum* Carvalho, 1965, deux espèces rares (Nemata : Longidoridae) – *Xiphinema abeokutae* n. sp. est décrit et illustré sur quelques exemplaires seulement provenant de sol de cacaoyère du Nigéria. Cette nouvelle espèce est caractérisée par une région labiale continue avec le reste du corps, la présence d'un pseudo-organe Z, une queue régulièrement conique et courbée ventralement chez les deux sexes et l'absence de suppléments médioventraux chez le mâle. *X. paulistanum* Carvalho, 1965, rencontré une seule fois à São Paulo, Brésil, est redécrit sur l'holotype femelle et l'allotype mâle (seule une autre femelle avait été originellement signalée). Les observations faites confirmer la description originale; elles ont permis toutefois de préciser la structure du système génital femelle: la branche antérieure est composée d'un utérus identique à celui de la branche postérieure, mais l'oviducte est réduit à une masse cellulaire inorganisée et l'ovaire est absent. Cette espèce est proche de *X. krugi* Lordello, 1955 et de *X. llanosum* Siddiqi & Lenné, 1990.

**Key-words** : Nematodes, *Xiphinema*.

The present article deals with two *Xiphinema* species. The few specimens of the first one – sent from Nigeria by Dr. F. E. Caveness – were deposited in the collections successively curated by the senior author since nearly thirty years. They represented at evidence a new species but it was expected that further samplings in West Africa could permit to obtain more material. This was not the case. Consequently, notwithstanding the low number of specimens, the authors decided to describe the species under the name *X. abeokutae* n. sp.

The second species, *Xiphinema paulistanum* Carvalho, 1965, was described on two females and one male sampled in an orchard soil, São Paulo, Brazil. In spite of further samplings no further specimens could be found, and no other record exists. However, the original description and illustration appeared clear and detailed

enough to characterize the species; so its validity was admitted by the specialists in the field.

Through courtesy of Dr. L. C. C. B. Ferraz, the authors had the opportunity to examine the holotype (female) and allotype (male) of this species. These specimens were in good condition. However, a slight contraction of the body – but not perceptible at anterior, tail and vulval areas prevented the calculation of ratio "a". Such a contraction could also explain why body length as observed now for both female and male is slightly below the original values.

Although the present observations confirm the great majority of Carvalho's (1965) data, the structure of the female genital tractus appears different from the original brief description. Consequently, a detailed redescription of the type specimens of *X. paulistanum* is given below.

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***Xiphinema abeokutae* n. sp.**

(Figs 1, 2)

MEASUREMENTS

*Female* (n = 4, including holotype) : L = 2.99 (2.82-3.20) mm; a = 62.2 (57.5-70.9); b = 8.1 (7.5-8.6); tail length = 58 (48.5-64)  $\mu$ m; c = 52.1 (45.1-59.2); c' = 2.05 (1.7-2.3); V = 53.7 (50.9-57.1); odontostyle = 110 (108.5-111)  $\mu$ m; odontophore = 61.5 (60.5-63)  $\mu$ m; stylet = 171.5 (168-173)  $\mu$ m.

*Male* (n = 3) : L = 3.08 (2.94-3.30) mm; a = 64.6 (55.0-68.3); b = 8.2 (7.9-9.6); tail length = 61.5 (58-64)  $\mu$ m; c = 50.1 (45.7-56.8); c' = 1.9 (1.6-2.3); odontostyle = 106 (100.5-107.5)  $\mu$ m; odontophore = 59 (57.5-62)  $\mu$ m; stylet = 165 (158-171)  $\mu$ m.

*Holotype* (female) : L = 2.82 mm; a = 57.5; b = 7.5; tail length = 62  $\mu$ m; c = 45.1; c' = 2.3; V = 52.2; odontostyle = 111  $\mu$ m; odontophore = 61  $\mu$ m; stylet = 172  $\mu$ m.

DESCRIPTION

*Female* : When heat-relaxed, body nearly straight in its anterior two thirds, curved ventrad in the posterior part. Body regularly tapered in the anterior part, less and more abruptly in the posterior one. Cuticle finely transversely striated, apparently composed of two optical layers, 2.5  $\mu$ m thick at midbody, 3.5  $\mu$ m in the sublabial area, and 6-6.5  $\mu$ m at the dorsal side of the tail. Lateral chord variable, 20 to 30 % of the corresponding body diameter. Cervical pores (n = 2) : 3-4 dorsal, 10 ventral, 15-17 lateral. Labial area rounded, narrow (10-11  $\mu$ m wide and 5-6  $\mu$ m high), continuous with the rest of the body, with prominent papillae. Amphidial slit 7.5  $\mu$ m wide, i.e. 70 % of corresponding diameter, at 5-6  $\mu$ m from the anterior end. Stylet conform to the genus; stylet flanges 11.5-12.5  $\mu$ m wide, with weak reinforcement. "Tubular" guide long (34-45  $\mu$ m) as all specimens with strongly protruded stylet; basal ring of the guide at 82-98  $\mu$ m from the anterior end. Hemizonid flat, 7  $\mu$ m wide, at 175-183  $\mu$ m from the anterior end; hemizonion lenticular, 2.5  $\mu$ m wide, at 217-243  $\mu$ m from anterior end. Pharyngeal bulb elongated (94-101  $\times$  17-21  $\mu$ m), markedly separated from the tubular anterior part; DO = 9.9; DN = 11.9; DO-DN = 2.0, SN = 47.7, SO = 69.3; cardia small and flattened. Vulva situated at mid-body or more posteriorly. Vagina reaching half the body diameter, surrounded by a well developed sphincter; ovejector strongly muscularized. Both genital branches identical, having about the same length (ant. br. = 333-525  $\mu$ m; post. br. = 438-501  $\mu$ m). Uterus proximally tubular, then forming a rather clearly defined pseudo-Z-organ with muscularized wall; inner folded lining appearing as longitudinal striations; two large angular and some smaller refractive inclusions; *pars dilatata ueri* prominent, divided in two parts; the

proximal one ("spermatheca"), thin walled, containing numerous spermatozoa; the distal one formed by large glandular cells. Sphincter joining uterus and oviduct prominent. *Pars dilatata oviductus* well developed, but smaller than the *pars dilatata ueri*; distal thin part of the oviduct and ovary without special features. Tail regularly conical, curved ventrad in the distal part, extremity rounded to subacute; hyaline terminal portion ("canal") long (19-24  $\mu$ m or 35-39 % of tail length), without special features; two caudal pores and one adanal pore on each side.

*Male* : Body shape as female, but strongly curved ventral at posterior part. Morpho-anatomy similar to that of female except for genital apparatus and the structures linked to it. Amphidial slit 9.5  $\mu$ m long or 80 % of the corresponding diameter. Cervical pores (n = 1) : 5 dorsal, 12 ventral, 15 lateral. Spicules 53-55  $\mu$ m long, slightly curved, not cephalated. Accessory pieces of the gubernaculum appearing tubular, 11.5-14.5  $\mu$ m long. Double papilla at 9-10  $\mu$ m in front of the cloacal aperture. No medioventral supplements. Posterior ventral cuticle only slightly thickened in the precloacal area (4-4.5  $\mu$ m) at level of spicules. Tail conical, curved ventrad, extremity rounded; hyaline terminal part 15-20  $\mu$ m long or 26-42 % of the tail length; three caudal pores and one adanal pore on each side.

TYPE LOCALITY

Sandy soil, vicinity of roots of cocoa-tree (*Theobroma cacao* L.), Owode village, Abeokuta Province, W. Nigeria (rec. et leg. F. E. Caveness).

TYPE SPECIMENS

Holotype (female), two female and two male paratypes deposited in the Collection Nationale des Nématodes du Sol et des Plantes, Muséum, Paris. One male and one female paratype deposited in the collection of the Instituut voor Dierkunde, Universiteit Gent, Belgium.

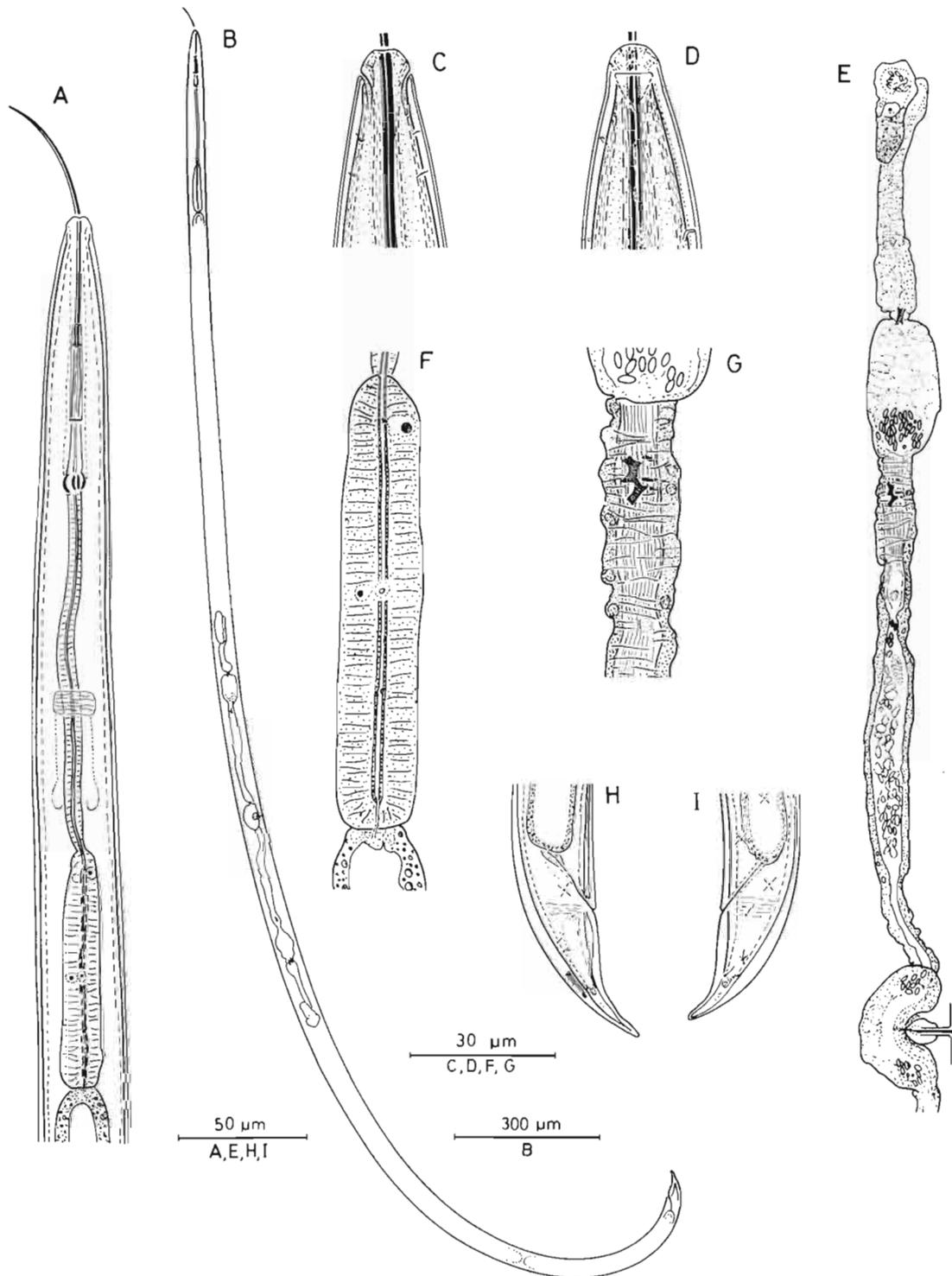
DIAGNOSIS AND RELATIONSHIPS

*X. abeokutae* n. sp. is characterized by the following combination of characters : *i*) lip region narrow and continuous with the rest of the body; *ii*) vulva at mid-body or posterior to it; *iii*) presence of a pseudo Z-organ; *iv*) tail short (c' under 2.5), regularly conical and curved ventrad with plain terminal canal. An additional important character - very rare in the genus - is the absence of ventromedian supplements in the male.

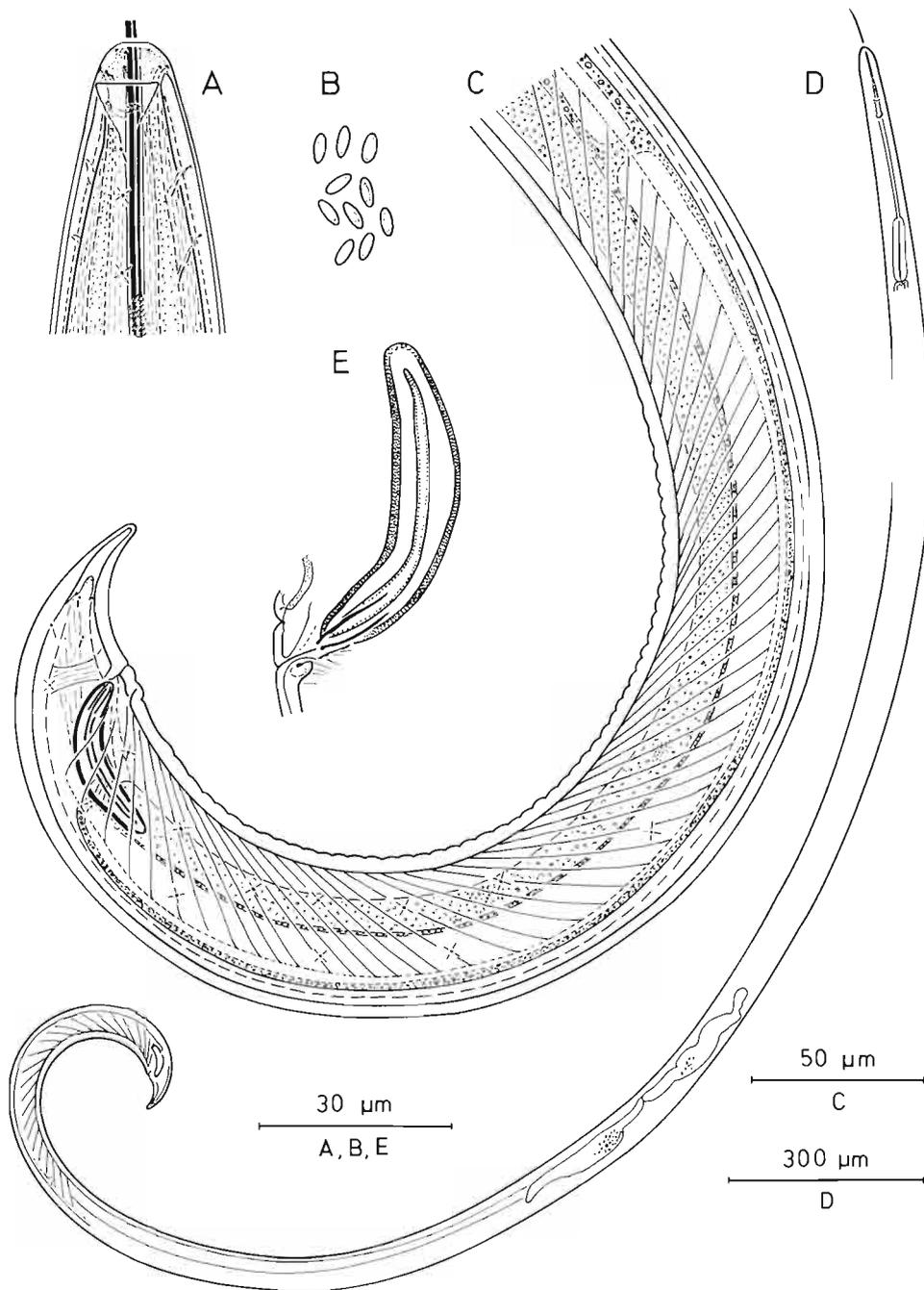
In the polytomous key for *Xiphinema* species (Loof & Luc, 1990, 1993) *X. abeokutae* n. sp. has to be coded as follows :

A 4, B 2, C 3, D 4, E 6, F 3, G 2, H 1, I 3, J?, K?, L 2.

*X. abeokutae* n. sp. belongs to the "group 5" of Loof and Luc (1990), i.e. the species having a pseudo-Z-



**Fig. 1.** *Xiphinema abeokutae* n. sp. Female. A : Neck region; B : Entire; C : Head end (dorsal view); D : Head end (lateral view); E : Anterior genital branch; F : Pharyngeal bulb; G : Pseudo-Z-organ; H, I : Tail.



**Fig. 2.** *Xiphinema abeokutae* n. sp. Male. A : Head end (lateral view); B : Sperm; C : Posterior region; D : Entire; E : Spicule and lateral guiding piece of the gubernaculum.

organ. The lip region continuous with the rest of the body separates it from all the species of group 5 except *X. heynsi* Siddiqi, 1979, *X. natalense* Heyns & Vermeulen, 1982 and *X. zulu* Heyns, 1965. However the tail of these three species has a very different shape.

### *Xiphinema paulistanum* Carvalho, 1965

(Fig. 3)

#### MEASUREMENTS

*Female* (holotype): L = 1.76 mm; a = ?; b = 4.3; tail = 28  $\mu$ m; c = 62.8; c' = 1.1; V = 41.5; odontostyle = 122  $\mu$ m; odontophore = 60  $\mu$ m; stylet = 182  $\mu$ m.

*Male* (allotype). L = 1.86  $\mu$ m; a = ?; b = 5.0; tail = 30  $\mu$ m; c = 62.0; c' = 1.1; odontostyle = 117  $\mu$ m; odontophore = 53  $\mu$ m; stylet = 170  $\mu$ m; spicules = 50  $\mu$ m.

#### DESCRIPTION

*Female*: When heat relaxed, body curved ventrad in open C; curvature slightly more pronounced in the posterior part. Body of moderate size, thin, regularly and weakly tapered at the anterior part, more abruptly at the posterior one. Cuticle thin (2-2.5  $\mu$ m at mid-body), not conspicuously thickened in the sublabial area (3  $\mu$ m). Labial area 13  $\mu$ m wide, flattened anteriorly with rounded edge, nearly continuous with the rest of the body, the demarcation marked by a very weak depression. Amphidial slit about 70 % of the corresponding diameter, at the level of the depression. Hemizonid flat, 7  $\mu$ m long, at 164  $\mu$ m from anterior end; hemizonion lenticular 2  $\mu$ m wide, at 205  $\mu$ m from anterior end. Stylet conform to the genus; basal flanges well developed, 13  $\mu$ m wide. Pharyngeal bulb attenuated at its anterior end, 80  $\times$  22  $\mu$ m. Vulva anterior to mid-body; vagina and ovejector without special features. Posterior genital branch complete; uterus muscularized at its proximal part and *pars dilatata uterus* not well marked (but female apparently young); sphincter prominent; oviduct and ovary normal. Anterior genital branch reduced; uterus of same length as the posterior one, but without recognizable muscularized part; sphincter conspicuous; oviduct reduced to an unorganized, short mass; no ovary. Tail conical rounded; ventral profile continuing that of the preanal part of the body; dorsal profile curved; terminal bulge short, thick and rounded at its extremity; tail cuticle very thick, especially on the dorsal side (5.5  $\mu$ m) and at the terminal part where a granular area appears to separate the two visible layers; two caudal pores on each side of the tail.

*Male*: General appearance and internal structure similar to those of the female, except for genital apparatus and structures related to it. Body more strongly curved at the posterior part, hook-shaped. Spicules thick, massive, slightly curved, 50  $\mu$ m long and 12.5  $\mu$ m wide at the

middle, not cephalated, with a small but conspicuous protuberance on the ventral side, close to the distal end. Accessory pieces of the gubernaculum roughly cylindrical, very small (6  $\mu$ m long). Double papilla 9.5  $\mu$ m in front of the cloacal aperture two medioventral supplements at 164  $\mu$ m and 186  $\mu$ m in front of the cloacal aperture. Tail having roughly the same shape and structure as in the female, but bulge better demarcated, narrower and longer (7  $\mu$ m); two caudal pores and one adanal pore at right side, one caudal and two adanal, pores at left side of tail.

#### TYPE SPECIMENS

The type slide (holotype and allotype) is now deposited in the Collection Nationale des Nématodes du Sol et des Plantes, Muséum, Paris.

#### TYPE LOCALITY

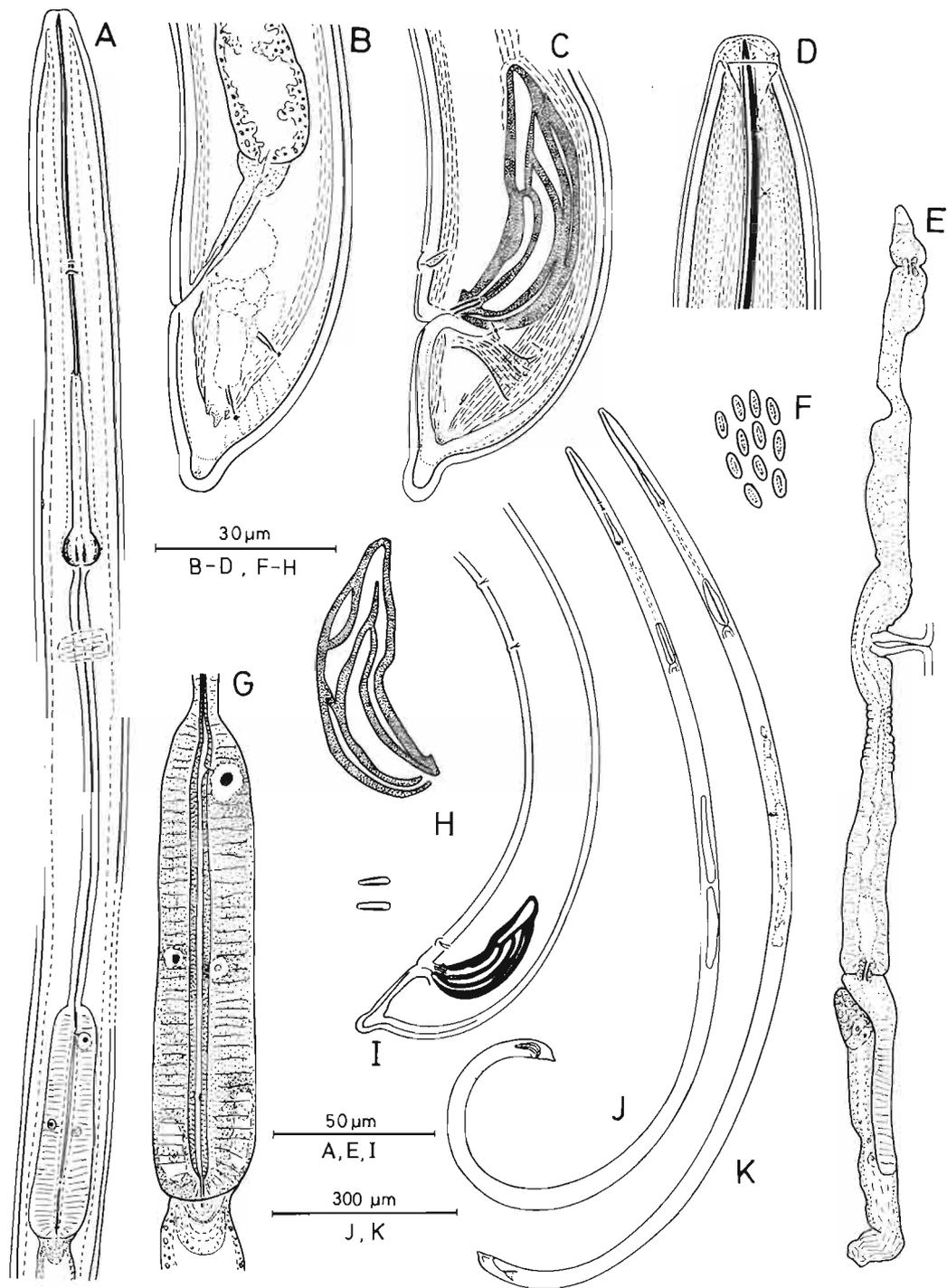
Soil, vicinity of roots of *Myrciaria* sp., orchard, São Paulo, Brazil (*rec.* J. C. Carvalho).

#### DIAGNOSIS AND RELATIONSHIPS

*X. paulistanum* is characterized by *i*) the anterior female genital branch with oviduct reduced and ovary absent; *ii*) a tail short, roughly conical-rounded with a terminal bulge, devoid of a blind canal; *iii*) a V value slightly over 40. Concerning the male, the shape of the spicule and the very short accessory pieces of the gubernaculum appear also very characteristic.

On the basis of the original description, *X. paulistanum* was attributed by Loof and Luc (1990) in their polytomous key of *Xiphinema* species to their "group 7" (= both female genital branches equal, without uterine differentiation; tail elongate to conical). The structure of the genital tractus observed necessitates to attribute the species to "group 2" (= female anterior genital branch devoid of ovary) and *X. paulistanum* must be quoted now as follows: A 2, B 4, C 4, D 5, E 4, F 2, G 2, H (1) 2, I 3, J?, K?, L 2.

*X. paulistanum* is close to *X. krugi* Lordello, 1955 but in this latter species (see Luc & Hunt, 1978) the anterior female genital branch is more reduced (uterus short and degenerated, sphincter weak, often inconspicuous) and the vulva is more anterior (extreme individual values of V, in fifteen populations: 28.6-36.0). Also differences in female and male tail, and in spicule shape are to be noted. *X. paulistanum* is also close to *X. llanosum* Siddiqi & Lenné, 1990, namely in the structure of the female anterior genital branch. But this latter species is different by the tail shape (more rounded and devoid of bulge), the greater body length (2.3-2.7  $\mu$ m), the shorter stylet (144-160  $\mu$ m); also the spicules are thinner, without ventral protuberance, and the accessory pieces of the gubernaculum are longer (10-12  $\mu$ m).



**Fig. 3.** *Xiphinema paulistanum* Carvalho, 1965. A: Female neck region; B: Female tail; C: Male tail; D: Head end, female; E: Female reproductive system; F: Sperm; G: Pharyngeal bulb, female; H: Right spicule and lateral guiding pieces of the gubernaculum (left one above, right one below); I: Posterior end of male; J: Male, entire; K: Female, entire.

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