

Istituto di Nematologia Agraria, C.N.R. - 70126 Bari, Italy

TWO NEW SPECIES OF *XIPHINEMA* (NEMATODA, DORYLAIMIDA) FROM THAILAND

by

F. LAMBERTI, A. TROCCOLI and A. AGOSTINELLI

Summary. Two new species of *Xiphinema* from Thailand are described. *Xiphinema siamense* sp. n., a monodelphic species, resembles *X. radiculicola* Goodey, from which it differs by having a shorter body, continuous with the rest of the body lip region, oblique vagina and shorter tail. *Xiphinema savaryi* sp. n. a didelphic species with reduced anterior ovary, resembles *X. insigne* Loos, from which it differs by having a longer body, continuous with the rest of the body lip region, longer tail and anterior vulva. The male was not found for either species.

Two populations of *Xiphinema* from Thailand represent, in our opinion, two unknown species described here as *Xiphinema siamense* sp. n., sent in 1968 to the senior author by the late Dr. S. A. Sher, University of California at Riverside, and *Xiphinema savaryi* sp. n., found in the collection of the Federal Agricultural Research Station of Changins, Nyon, Switzerland (courtesy of Dr. J. Derron).

Nematodes were fixed either in 5% hot formalin or 4% FA and mounted in dehydrated glycerin. Specimens were measured with the aid of a camera lucida.

***XIPHINEMA SIAMENSE* sp. n.**

(Figs 1 and 2)

Holotype female: L = 1.6 mm; a = 45.6; b = 4.6; c = 31; c' = 2.2; V% = 29; odontostyle = 101.7 µm; odontophore = 60.4 µm; oral aperture to basal guide ring = 96.0 µm; tail length = 52.0 µm; hyaline portion of tail (J) = 24 µm; body diameter at lip region = 10.0 µm; body diameter at basal guide ring = 27.2 µm; body diameter at base of oesophagus = 33.3 µm; body diameter at

vulva = 35.3 µm; body diameter at anus = 24.0 µm; body diameter at beginning of J = 8.7 µm.

Paratype females (n = 15): L = 1.7±0.10 (1.6-1.9) mm; a = 42.8±4.06 (36.2-49.6); b = 5.1±0.44 (4.5-6.1); c = 35.0±3.08 (30.8-40); c' = 2.1±0.10 (1.9-2.2); V% = 27.5±1.96 (25-31); odontostyle = 104.0±4.60 (98.9-111.4) µm; odontophore = 58.0±1.83 (54.3-61.7) µm; oral aperture to basal guide ring = 92.4±2.43 (88.6-97.7) µm; tail length = 49.0±3.15 (45-56.6) µm; J = 21.0±1.44 (19.4-24) µm; body diameter at lip region = 10.0±0.38 (9.1-10.3) µm; body diameter at basal guide ring = 30.1±2.35 (26.3-34.3) µm; body diameter at base of oesophagus = 37.9±3.86 (31.4-43.4) µm; body diameter at vulva = 39.7±3.72 (33.0-44.6) µm; body diameter at anus = 23.5±0.94 (22.3-25.7) µm; body diameter at beginning of J = 8.4±0.72 (7.5-9.7) µm.

Description: female *habitus* curved in an open C. Body short and wide, tapering gradually towards anterior. Cuticle smooth, 2.0±0.1 (1.9-2.1) µm thick at mid-body. Lip region frontally rounded, continuous with the rest of the body. Amphidial pouches large, stirrup shaped. Odontostyle and odontophore robust, the latter

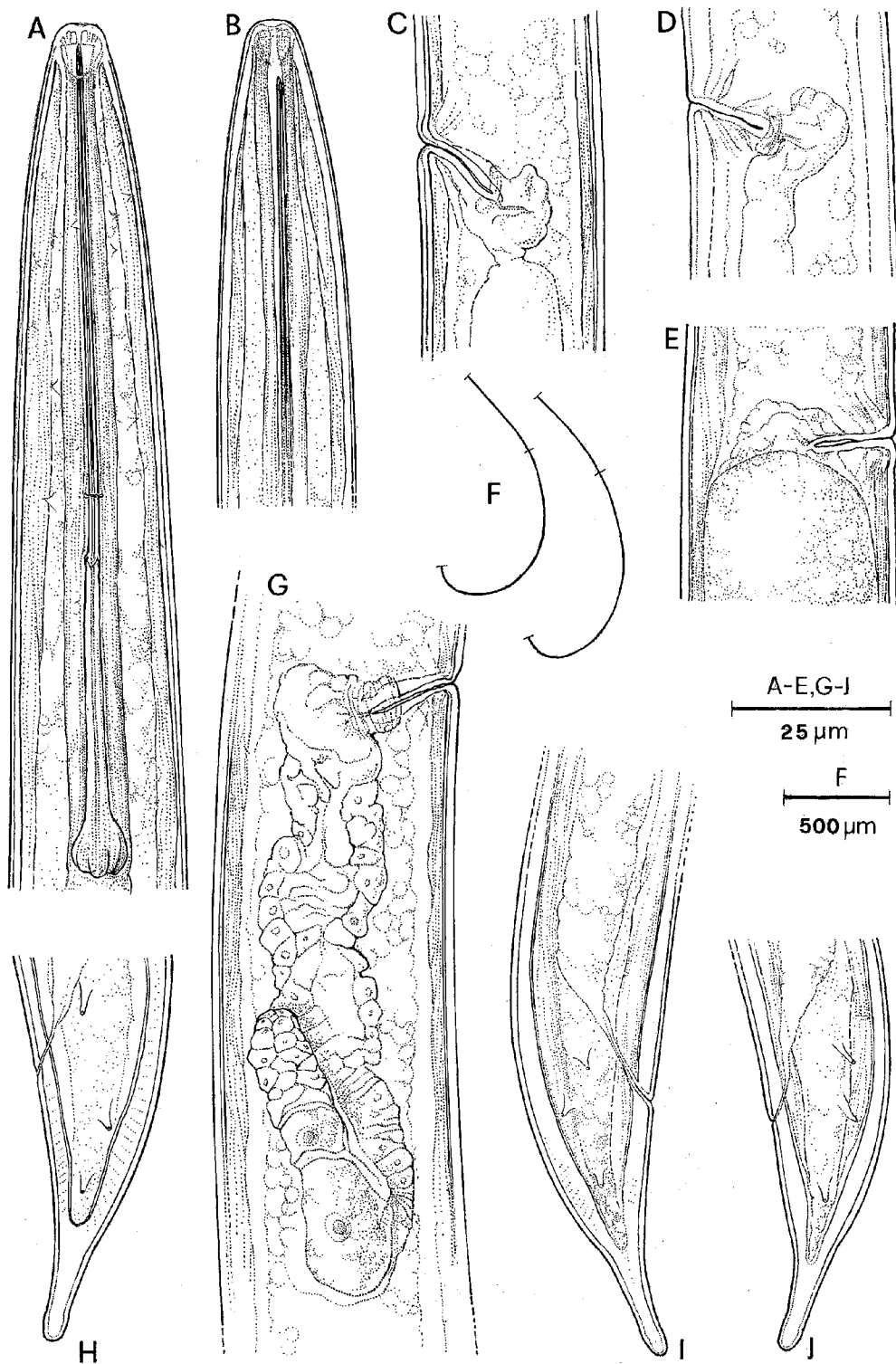


Fig. 1 - *Xiphinema siamense* sp. n.: A, female anterior region; B, female lip region; C-E, female vulval region; F, female habitus; G, female reproductive system; H-J, female posterior region.

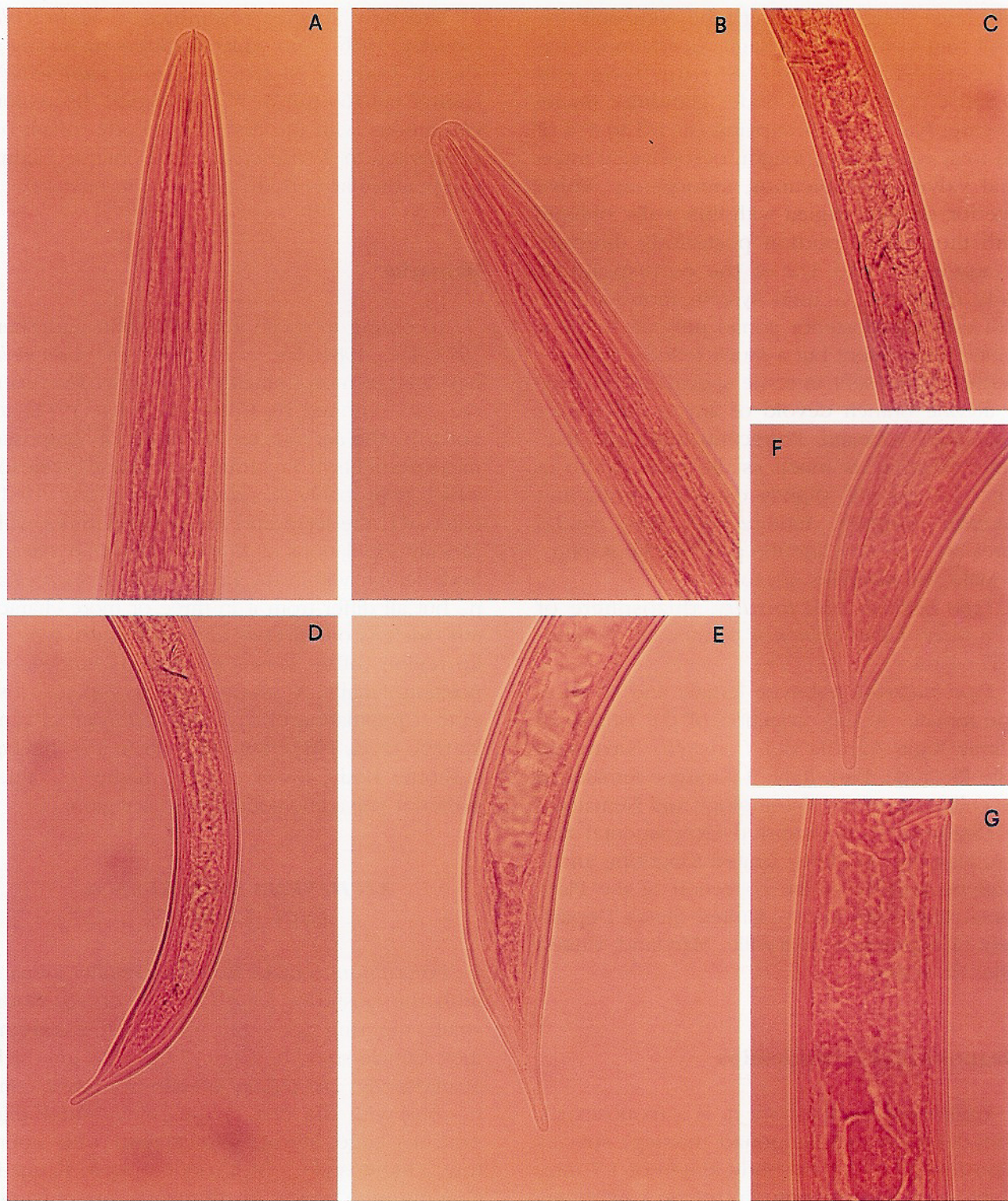


Fig. 2 - Photomicrographs of *X. siamense* sp. n.: A, B, female anterior region; C, G, female reproductive system; D-F, female posterior region.

with large flanges. Guiding tube with only the basal ring visible. Oesophagus dorylaimoid; basal bulb 81.6 ± 2.0 (78.7-85) μm long and 20.5 ± 2.1 (18-23.5) μm wide; glandular nuclei obscure; basal bulb occupying ca. 1/3 to 1/4 of the total oesophagus length; oesophageal intestinal valve inconspicuous, amorphous. Vulva anterior, slit-like; vagina with thin walls, oblique with the uterine portion posteriorly directed, occupying 1/3 to 1/2 of the corresponding body diameter. Genital system monodelphic with only the posterior gonad present. Anterior genital tract absent but a much reduced anterior uterine sac present in some specimens. Posterior uterine branch devoid of any Z differentiation; ovary reflexed. Prerectum indistinct. Rectum extending as much as the body width at anus. Tail conoid, slightly convex dorsally and concave ventrally, digitate with three caudal pores on each side and the peg 18-25 μm long.

Male and juveniles not found.

Type habitat and locality: rhizosphere of litchi trees, *Litchi chinensis* Sonner, at Thomburi, Thailand.

Type material: holotype female and 10 paratype females in the collection of the Istituto di Nematologia Agraria del Consiglio Nazionale delle Ricerche, Bari, Italy; 3 paratype females in the collection of the Entomology and Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, United Kingdom; and 2 paratype females in the collection of the Plant Nematology Laboratory, United States Department of Agriculture, Beltsville, Maryland, United States of America.

Diagnosis and relationships

Xiphinema siamense sp. n. is a monosexual, monodelphic (anterior gonad missing) species characterized by a total body length of 1.7 mm, odontostyle 104 μm long, lip region continuous with the rest of the body, anterior vulva (V% = 27.5) and conoid, digitate tail.

The new species resembles *X. radiculicola* Goodey, 1936, from which it differs by having a shorter body (2.20-2.45 mm in *X. radiculicola*), shorter tail (60 μm in *X. radiculicola*), lip region continuous with the rest of the body (offset by depression in *X. radiculicola*) and oblique vagina (perpendicular to body axis in *X. radiculicola*).

Remarks

According to some authors (Cohn and Sher, 1972; Luc, 1981; Luc *et al.*, 1986), *X. radiculicola* has a large morphometric variability. However, the data reported by Cohn and Sher (1972), as noted by the authors, are the result of composite measurements from three populations, one of which is probably *X. siamense* sp. n. Luc (1981) compared the lecto and the paralectotypes with African populations of *X. radiculicola*. They have a body length within the range of *X. siamense* sp. n., but all differ from it in three or more characters, such as odontostyle and tail lengths, type of lip region (offset versus continuous) and vulva position. Finally, *X. siamense* sp. n. appears closer to a population of *X. radiculicola* from Sri Lanka (Luc *et al.*, 1986), but differs from it by having a shorter body, lower c value, higher c' value, posterior vulva and continuous lip region.

XIPHINEMA SAVARYI sp. n.

(Table I; Figs 3-5)

Description: female *habitus* ventrally arcuate with the posterior fourth more curved. Body small, tapering gradually towards the extremities. Cuticle smooth, 2.2 ± 0.27 (1.7-2.6) μm thick at mid-body. Lip region laterally rounded, continuous with the rest of the body. Amphidial pouches large, stirrup shaped with wide aperture. Odontostyle robust, odontophore flanged. Guiding tube typical of the genus. Oesophagus dorylaimoid; basal bulb measuring 100 ± 5.91 (89-110) μm long and 17.5 ± 1.30 (15-19.7) μm

TABLE I - *Morphometrics of Xiphinema savaryi sp. n. from Thailand.*

	Holotype ♀	Paratypes ♀♀	J ₂	J ₃	J ₄
n		15	3	15	12
L (mm)	2.4	2.6±0.10 (2.4-2.7)	1.0±0.09 (1.1-1.2)	1.5±0.06 (1.4-1.6)	2.0±0.09 (1.9-2.1)
a	54.3	54.7±4.57 (48.6-61.8)	47.5±5.33 (41.8-52.5)	51.0±1.53 (48.5-53.6)	55.9±2.35 (52.5-59.3)
b	6.7	7.3±0.58 (6.5-8.3)	4.4±0.06 (4.4-4.5)	5.2±0.37 (4.6-5.8)	5.8±0.42 (5.1-6.3)
c	17.1	18.8±0.96 (17.0-20.1)	10.9±0.92 (10.4-12)	13.4±0.69 (12.4-14.9)	15.7±0.73 (14.5-16.8)
c'	5.9	5.8±0.28 (5.3-6.4)	7.3±0.23 (7.0-7.4)	6.6±0.41 (5.9-7.3)	6.3±0.40 (5.6-6.8)
V%	35.4	35±0.84 (33-36)	—	—	—
Odontostyle µm	102.7	102.2±1.64 (98.7-104)	57.0±1.67 (56-58.9)	71.5±1.44 (69.7-73.7)	85.3±1.95 (81.5-87.4)
Odontophore µm	66.0	66.0±1.50 (64.0-68.7)	40.5±0.58 (40-41)	48.2±1.84 (42.3-50.3)	55.4±1.69 (51.4-58.5)
Replacement odontostyle µm	—	—	70.7±3.16 (68.6-74.3)	87.4±3.26 (83.4-92.6)	103.3±3.22 (97.7-107.5)
Oral aperture to basal guide ring µm	95.4	93.2±2.83 (88.0-97.2)	51.2±3.29 (47.4-53.1)	61.0±3.32 (56-68.7)	71.4±2.98 (65-76)
Tail µm	142.7	135.8±5.58 (126.7-143.4)	103.8±3.29 (100-105.7)	115.2±4.54 (107.4-125)	127.5±6.03 (120-137)
J (hyaline portion of tail) µm	17.7	18.8±2.23 (15.0-22.3)	9.2±0.98 (8.6-10.3)	10.4±0.85 (9.0-12.6)	13.2±1.11 (11.4-14.9)
Body diam. at lip region µm	10.3	10.2±0.51 (9.3-11.4)	7.4	7.9±0.25 (7.4-8.0)	8.8±0.35 (8.6-9.7)
Body diam at basal guide ring µm	31.3	32.5±0.99 (31.0-34.3)	19.6±0.64 (18.9-20)	23±0.86 (21.7-24.6)	26.5±1.02 (24-28)
Body diam. at base of oesophagus µm	39.7	40.5±3.75 (35.0-46.7)	22.0±1.23 (21-23.4)	28.7±1.45 (26.3-32)	33.5±2.32 (30.3-38.3)
Body diam. at mid-body or vulva µm	45.0	47.2±4.36 (40.2-54.4)	24±1.96 (22.9-26.3)	30.2±1.25 (28-33)	35.7±2.31 (32-40)
Body diam. at anus µm	24.0	23.4±0.98 (22.0-25.3)	14.3	17.5±0.75 (16-18.3)	20.6±0.73 (20-22)
Body diam. at beginning of J µm	5.3	5.2±0.23 (4.8-6.0)	3.6±0.35 (3.5-4.0)	4.1±0.21 (4.0-4.6)	4.5±0.21 (4.0-4.6)

wide, occupying ca. 1/3 of the total oesophagus length and containing three glandular nuclei; oesophageal intestinal valve small, conoid. Vulva anterior, slit-like; vagina perpendicular to the body axis, thin walled, occupying 1/3 of the corresponding body diameter. Genital system amphidelphic with the anterior branch longer, 297±56.2 (204-389) µm, excluding the reflexed ovary, than the posterior, 274±48.5 (207-339)

µm, excluding the reflexed ovary; however, the posterior ovary is often larger and more developed and differentiated than the anterior one. Gonads devoid of any Z differentiation. Prerectum indistinct. Rectum extending as much as 1.5 of the body width at anus. Tail very long, tapering gradually towards the pointed extremity, ventrally curved; three caudal pores present on each side.

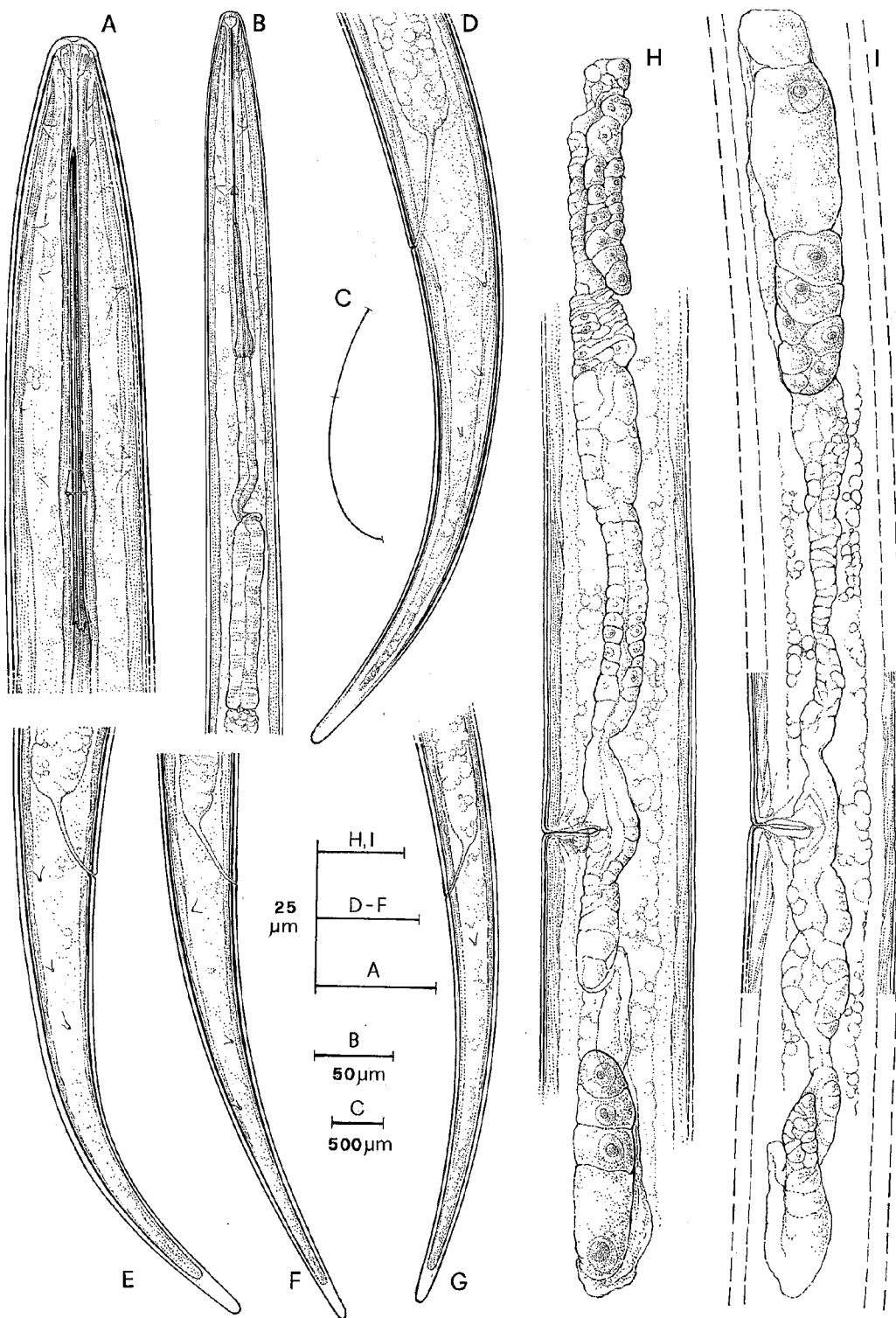


Fig. 3 - *Xipbinema savaryi* sp. n.: A, female anterior region; B, female oesophageal region; C, female habitus; D, female posterior region; E-G, posterior region of 4th, 3rd and 2nd juvenile stages, respectively; H, I, female reproductive system.

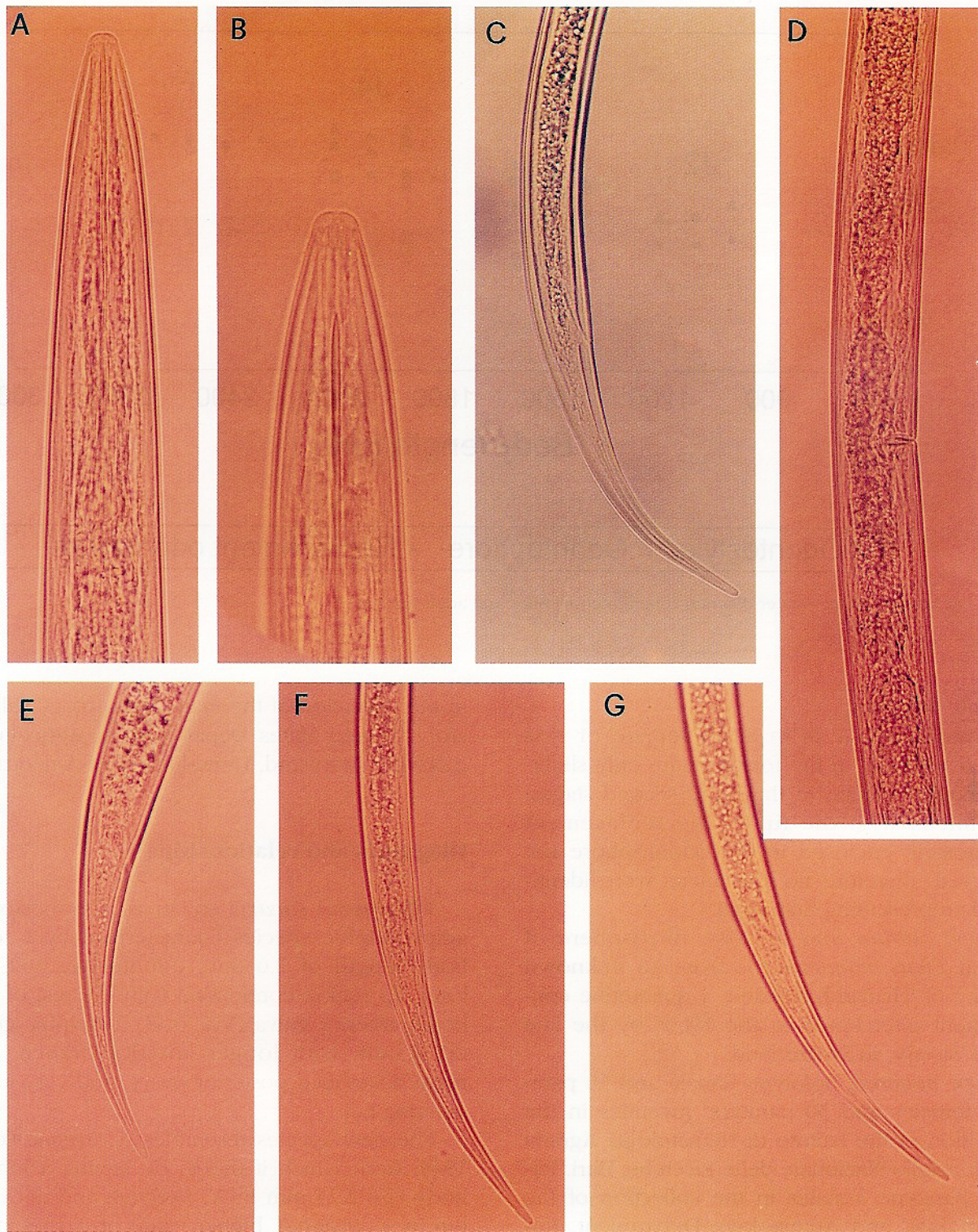


Fig. 4 - Photomicrographs of *X. sawaryi* sp. n.: A, B, female anterior region; C, female posterior region; D, female reproductive system; E-G, posterior region of 4th, 3rd and 2nd juvenile stages, respectively.

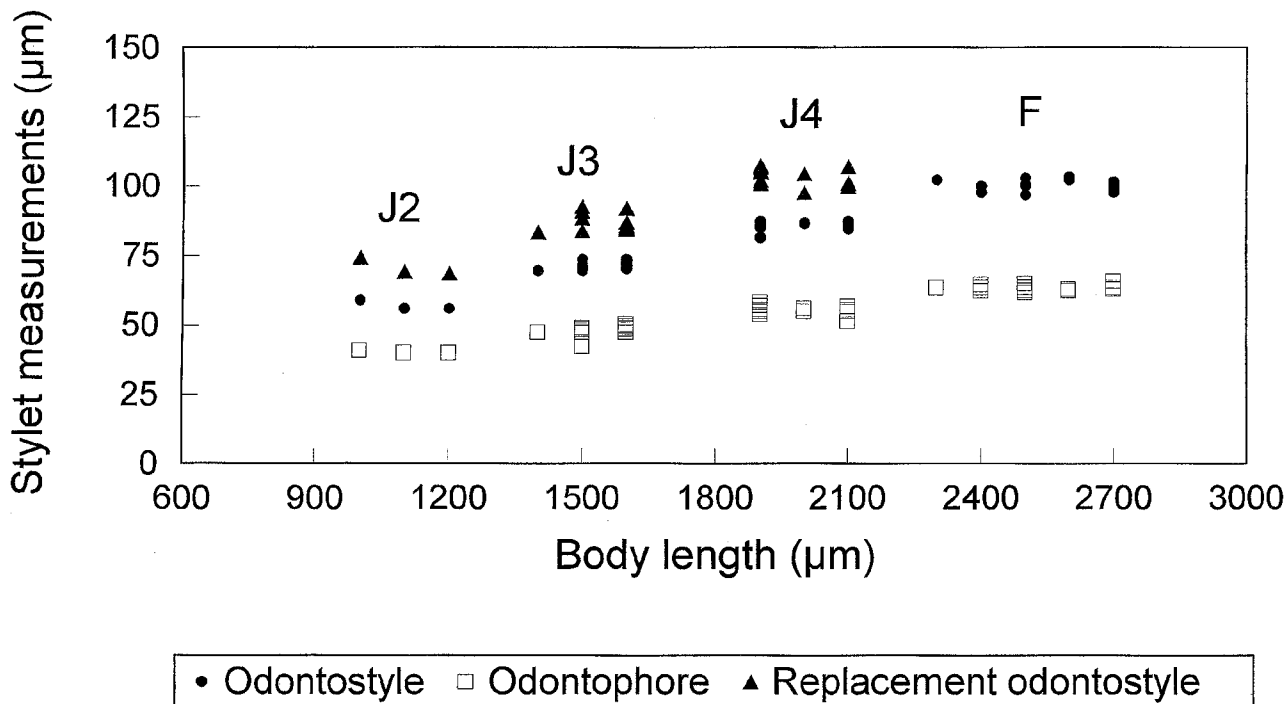


Fig. 5 - *X. savaryi* sp. n.: scatter diagram separating juveniles and adult females.

Male not found.

Juveniles tails as in adult female or less curved ventrally in the fourth stage; only slightly ventrally arcuate in third and second stages; specimens with the tip of the replacement odontostyle enclosed in the odontophore not observed, therefore no specimens were identified as representing first stage.

Type habitat and locality: rhizosphere of bonsai *Ficus benjamina* L. from an unknown locality of Thailand, possibly a quarantine consignment intercepted in the 1960s by the late Dr. A. Savary, in Switzerland.

Type material: holotype female and 10 paratype females and 30 paratype juveniles in the collection of the Istituto di Nematologia Agraria del Consiglio Nazionale delle Ricerche, Bari, Italy; 3 paratype females in the collection of the Entomology and Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, United Kingdom; and 2 paratype females

in the collection of the Plant Nematology Laboratory, United States Department of Agriculture, Beltsville, Maryland, United States of America.

Diagnosis and relationships

Xiphinema savaryi sp. n. is a monosexual amphidelphic species characterized by a total body length of 2.6 mm, odontostyle 102 µm long, lip region continuous with the rest of the body, anterior vulva ($V\% = 35$), didelphic genital system with longer anterior branch, but more developed posterior ovary, and very long, tapering tail.

The new species resembles *X. insigne* Loos, 1949, from which it differs by having a longer body (2.0-2.24 mm in *X. insigne*), and tail (100 µm in *X. insigne*), higher value of c' (4.8 in *X. insigne*), anterior vulva ($V = 30\%$ in *X. insigne*), lip region continuous with the rest of the body

(offset by slight depression in *X. insigne*) and a longer anterior female gonad (equally developed or less developed than the posterior gonad in *X. insigne*).

Remarks

Xiphinema insigne is considered to comprise several morphological forms (Bajaj and Jairajpuri, 1977; Luc and Southey, 1980). Apparently, one of the most variable characters is the structure of the female genital system which was illustrated with the two branches being equally developed in the original description (Loos, 1949), but with the posterior branch slightly longer than the anterior in the redescription of the species by Tarjan and Luc (1963), and with the full range of variations referred to for the ovaries. Also, Bajaj and Jairajpuri, (1977) reported that the anterior ovary was more or less developed than the posterior ovary in the *X. indicum*-form (Siddiqi, 1959).

Xiphinema savaryi sp. n. has several similarities with most of the populations of *X. insigne*-*X. indicum* described. However, it differs consistently from each of these populations in three or more characters which are considered sufficient to separate it as a distinct species.

Jairajpuri and Bajaj (1978) reported that *X. insigne*, probably the *X. indicum*-form, had four juvenile stages. Also, Luc and Southey (1980) reported that for some populations four juvenile stages were readily distinguishable by their odontostyle lengths. It is thought that *X.*

savaryi sp. n. also has four juvenile stages with the first stage probably missed during the extraction procedures because of its small size.

The authors are grateful to Mr. F. Zacheo for preparing the nematodes on slides.

Literature cited

- BAJAJ H. K. and JAIRAJPURI M. S., 1977. Variability within *Xiphinema insigne* populations from India. *Nematologica*, 23: 33-46.
- COHN E. and SHER S. A., 1972. A contribution to the taxonomy of the genus *Xiphinema* Cobb, 1913. *J. Nematol.*, 4: 36-65.
- JAIRAJPURI M. S. and BAJAJ H. K., 1978. Observations on the biology of *Xiphinema basiri* and *Xiphinema insigne*. *Revue Nématol.*, 1: 227-239.
- LOOS C. A., 1949. Notes on free living and plant parasitic nematodes from Ceylon. N° 5. *J. Zool. Soc. India*, 1: 23-29.
- LUC M., 1981. Observations on some *Xiphinema* species with the female anterior genital branch reduced or absent (Nematoda: Longidoridae). *Revue Nématol.*, 4: 157-167.
- LUC M., LOOF P. A. A. and COOMANS A., 1986. Description of *Xiphinema thorneanum* n. sp. and observations on some species of the genus (Nematoda: Longidoridae). *Revue Nématol.*, 9: 337-346.
- LUC M. and SOUTHEY J. F., 1980. Study of biometrical variability in *Xiphinema insigne* Loos, 1949, and *X. elongatum* Schuurmans Stekhoven & Tennissen, 1938; description of *X. savanicola* n. sp. (Nematoda: Longidoridae) and comments on thelytokous species. *Revue Nématol.*, 3: 243-269.
- SIDDIQI M. R., 1959. Studies on *Xiphinema* spp. (Nematoda: Dorylaimoidea) from Aligarh (North India) with comments on the genus *Longidorus* Micoletzky, 1922. *Proc. helmith. Soc. Wash.*, 26: 151-163.
- TARJAN A. C. and LUC M., 1963. Observations on *Xiphinema insigne* Loos, 1949 and *X. elongatum* Schuurmans Stekhoven & Tennissen, 1938 (Nematoda: Dorylaimidae). *Nematologica*, 9: 163-172.