

OBSERVATIONS ON *XIPHINEMA INSIGNE* LOOS, 1949 AND
XIPHINEMA ELONGATUM SCHUURMANS STEKHOVEN
& TEUNISSEN, 1938 (NEMATODA: DORYLAIMIDAE) ¹

BY

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Syntypes of *Xiphinema insigne* Loos, 1949 and paratypes of *X. indicum* Siddiqi, 1959 were studied. The latter species was found to be identical to and a synonym of the former. The holotype on which *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938 was based is redescribed. Syntypes of *X. pratense* Loos, 1949 and topotypes of *X. campinense* Lordello, 1951 were found to be identical to *X. elongatum* and are designated as junior synonyms of that species.

The genus *Xiphinema* Cobb, 1913 recently has received much attention, partly because certain species have been shown to be vectors of plant viruses (Harrison, 1960). During the past five years, Luc (1958, 1961b) has erected eleven new species, Siddiqi (1959, 1961) four new species, and Altherr (1958), Heyns (1962), Lordello & Da Costa (1961), and Williams (1961) have each proposed one new species.

Clive Loos kindly lent syntypes of his *Xiphinema insigne* and *X. pratense* for this study. The holotype specimen of *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938 was found preserved in formaldehyde at the Institut des Parcs Nationaux du Congo, Brussels, Belgium. President V. van Straelen, of the Institut, amiably lent this specimen for transference to glycerine and subsequent study.

This paper presents additional data on the above-mentioned species and indicates their relationships to closely related *Xiphinema* species later erected.

XIPHINEMA INSIGNE LOOS, 1949

Syn: *Xiphinema indicum* Siddiqi, 1959

(Figure 1, a-l)

Measurements: 4 ♀♀. L = 2097 μ (1978-2243 μ); a = 54 (50-57); b = 6.3 (5.1-7.1); c = 22 (20-25); V = ⁹⁽⁸⁻¹¹⁾ 30 (30-31) ⁹⁽⁸⁻¹³⁾; stylet = 150 μ (137-161 μ).

Lectotype ♀: L = 2243 μ ; a = 55; b = 7.1; c = 20; V = 830⁸; stylet = 161 μ .

¹) Joint contribution from the Office de la Recherche Scientifique et Technique Outre-Mer and the Florida Citrus Experiment Station; Florida Agricultural Experiment Station Journal Series No. 1618.

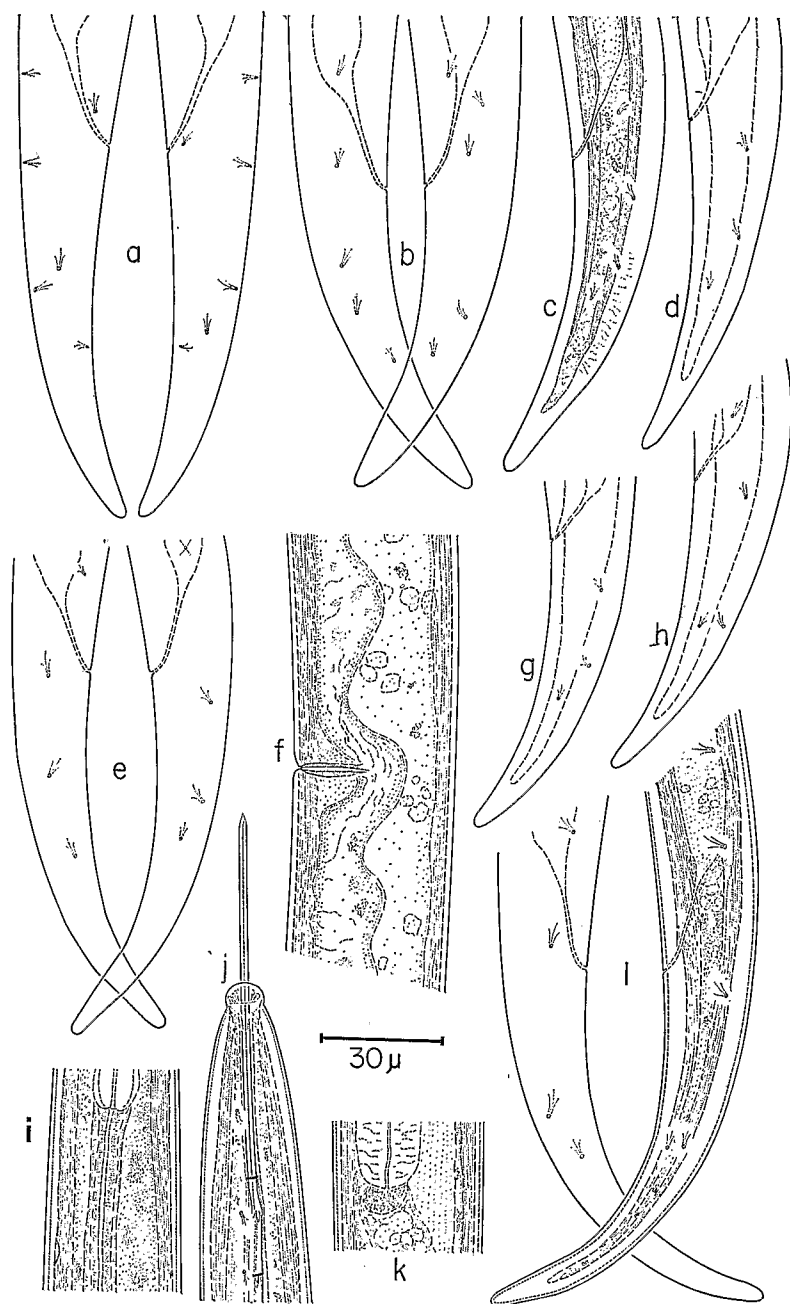


Fig. 1. *Xiphinema insigne* Loos, 1949. Female Paratypes — a, b, e: opposite sides of tails. Female Lectotype — f: portion of body at vulva; i: portion of body below stylet knobs showing "hemizonid-like" structure; j: anterior part of body; k: esophago-intestinal valve; l: opposite sides of tail. *Xiphinema indicum* Siddiqi, 1959 (= *X. insigne*). Female paratypes — c, d, g, h: tails.

Lectotype description:

Body slightly arcuate; anteriorly tapering gradually from base of stylet, then more noticeably from a point four to five lip region widths behind oral opening. Posteriorly, body tapering evenly from anus to tail terminus. Cuticular annulation indiscernible. Lip region hemispherical, 11 μ wide, set off from rest of body by slight constriction. Lips completely amalgamated; labial papillae obscure. Amphid apertures very faint, appearing slightly more than one-half as wide as base of lip region. A single line of lateral pores beginning about three lip region widths behind oral opening (Fig. 1, j) and continuing to area above posterior ovary where the pores become obscure. Posteriorly, caudal pores as shown (Fig. 1, l) with another pore located above junction of rectum and prerectum and two additional pores, about a body width apart, preceding it. Stylet almost straight, composed of anterior portion 102 μ and posterior portion 59 μ long. Flanged portion of stylet 12 μ wide. Stylet "guide" 25 μ long, composed of two rings separated by the junction of the stylet parts. A "hemizonid-like" structure (unlike a rudimentary excretory pore) located on the ventral body wall behind the base of the stylet at 7 per cent of the body length behind the oral opening (Fig. 1, i). Esophageal bulb 88 μ long, terminating in conical esophago-intestinal valve 7 μ long and 12 μ wide (Fig. 1, k). Vulva non-protruding; vagina transverse (Fig. 1, f). Body 22 μ wide at latitude of anus. Tail uniformly elongate-conical, about five anal-body-widths in length or 110 μ long, with a hyaline, non protoplasmic tip 14 μ long.

Diagnosis:

Species distinctive due to position of vulva (30%) and elongate-conical tail. Most similar to *X. radiccicola* Goodey, 1936, an opisthodelphic species with distinctly digitate tail, to *X. longicaudatum* Luc, 1961, a species with atrophied anterior gonad and a more attenuated tail, and to *X. truncatum* Thorne, 1939 and *X. bakeri* Williams, 1961 which have tails that are shorter than and of different shape from that found in *X. insigne*.

Lectotype: Identical female as originally depicted by Loos (1949), mounted in glycerine and in the personal collection of Clive A. Loos, 808 N. Spring Street, Los Angeles 12, California, U.S.A.

Paratypes: Two females in personal collection of Clive A. Loos. One gravid female on Slide 4, Tray 2, Cabinet C-2724, Nematode Collection, Florida Citrus Experiment Station, Lake Alfred, Florida, U.S.A.

Type Host: From soil about roots of soursop (*Anona muricata*), coconut, and grass.

Type Locality: Kurunegala, Ceylon.

Originally published as "*Xiphinema insignis*" (Loos, 1949), the name of this nematode was modified to *X. insigne* by Lordello (1953) in accordance with Rules of Zoological Nomenclature. The nematode has since been found associated with coffee plants in India (Somasekhar, 1958).

Loos' adequate description was based on three females which are in an excellent state of preservation and which were available for the present study along with another female that he did not describe.

The above measurements lie within the ranges prescribed by Loos. In describing the caudal pores (papillae?) he stated, "Tail with seven caudal papillae visible in lateral view"; yet the drawing of the tail, admittedly poorly reproduced, showed three, possibly four, pores. Loos' description apparently was based on examination of the syntype specimen depicted in Fig. 1, l where there are a total of five pores on the whole tail along with two pores situated preanally. The variability in caudal pore location is likewise as apparent in the other three females studied (Fig. 1, a, b, e) and is representative of most *Xiphinema* species. Hence the number of pores observed on one side, or even the whole tail, within members of this genus, cannot be considered of critical diagnostic importance. Opposite sides of female tails show in Fig. 1, b and l, had unequal numbers of caudal pores. For example, one side of the tail shown in Fig. 1, b had only two pores, yet the tail in Fig. 1, a shows four pores.

The specimen designated as lectotype of the species (Fig. 1, f, i-1) is the same animal portrayed in Loos' paper (1949), Fig. 3.

Siddiqi (1959) proposed the name *Xiphinema indicum* for populations of nematodes obtained from around roots of *Grewia asiatica* L. and coffee. In his diagnosis he stated, "*X. indicum* comes closest to *X. insigne* Loos, 1949, but can be distinguished by having a slightly longer spear and only three pairs of caudal pores as compared to seven for the latter." His measurements showed the total length of the stylet to range from 158-167 μ as contrasted to 146-159 μ , the length of stylet reported by Loos for *X. insigne*. These ranges overlap and cannot be accepted as valid, specific differences between the two species, especially in the realization that the same species may exhibit differing measurements depending upon host, environment, and geographical location. It has already been pointed out that Loos inferred that there were seven pores on the entire tail of *X. insigne*, not only on one side as believed by Siddiqi, which equates the number of caudal pores for both species.

Through the kind cooperation of Dr. Siddiqi, four female paratypes of *Xiphinema indicum* were made available for study. Their measurements conformed to those reported by Siddiqi. The length of the stylet was from 155-164 μ , which falls within the range of stylet length reported earlier in this paper for *X. insigne*. Whereas the average stylet length for *X. insigne* was found to be 150 μ , the length of stylet for the lectotype is 161 μ , which compares favorably to the average stylet length of 160 μ found for *X. indicum*. Although the average tail length for *X. indicum* was shorter than for *X. insigne* (80 μ : 97 μ), the values derived by dividing the tail length by the width of the body at the anus were close (3.9 : 4.4).

In the description of *X. indicum*, Siddiqi stated that the ovaries were asymmetrical with the anterior ovary being rudimentary. The nematode formula which he gave for the holotype indicated the anterior gonad to be 149 μ long and the

posterior gonad 223 μ long. Examination of the sexual systems of the specimens available confirmed that the anterior ovary was less developed than the posterior ovary, although the length of the anterior gonad was 164 μ (148-188 μ) and thus compared favorably to the length of the posterior gonad which was 173 μ (139-215 μ). The single specimen of *X. insigne* in the Florida Citrus Experiment Station Nematode Collection likewise shows a well-developed posterior ovary containing an ovum while the anterior ovary is less developed as in the case of *X. indicum*.

The tails of the *X. indicum* specimens studied show three caudal pores arranged in tandem (Fig. 1, c, d, g) although on one specimen the terminal pores were adjacent (Fig. 1, h) as for the holotype of *X. insigne* (Fig. 1, l).

We believe that there are no valid differences between *X. insigne* and *X. indicum* and that these species may be regarded as being conspecific. Hence, *Xiphinema indicum* is synonymized to *X. insigne*, the older established species.

XIPHINEMA ELONGATUM SCHUURMANS STEKHOVEN & TEUNISSEN, 1938

Syn: *Xiphinema pratense* Loos, 1949

Xiphinema campinense Lordello, 1951

(Figure 2, a-i; Figure 3, a-c)

Measurements: Holotype female. L = 2089 μ ; a = 49; b = 6.1; c = 35; V = 8407; stylet = 153 μ .

Amended Holotype Description: Body ventrally arcuate; cuticle without visible annulation. Anterior end tapering gradually from esophageal region and more noticeably from about half-way on the anterior portion of the stylet forward. Cuticle composed of two layers, the outer layer about 0.8 μ wide, and a thicker inner layer that becomes 3.8 μ wide on the dorsal side of the tail. Lip region completely amalgamated, 14 μ wide, set off by a slight constriction (Fig. 2, a). Amphids not observed. Stylet ventrally arcuate. Anterior part of stylet 94 μ , posterior part of stylet 59 μ long. Stylet flange area obscure, about 15 μ wide. Stylet guide appearing as two rings, 14 μ apart. An obscure structure on the ventral hypodermal wall appearing much like a hemizonid situated 166 μ from anterior end. Excretory pore or duct not observed. Nerve ring faint, located one-third the distance between the stylet and the esophageal bulb, 180 μ from anterior end. Esophageal bulb 18 μ wide and 93 μ long, occupying 27 per cent of the length of the esophagus. Esophago-intestinal valve 7 μ long and 12 μ wide. Vulva transverse, non-protruding (Fig. 2, b), with amphidelphic gonads, without eggs. Gonads reflexed, well-defined. Tail uniformly conoid, two and a half times as long as body width at anus, forming sub-digitate terminus (Fig. 2, c). Only one cervical pore detected, situated about two and a half lip region widths behind oral opening. A single series of dorso-sublateral pores extending from tail into posterior quarter of body, then becoming indistinct. Tail 59 μ long, bearing three pairs of pores.

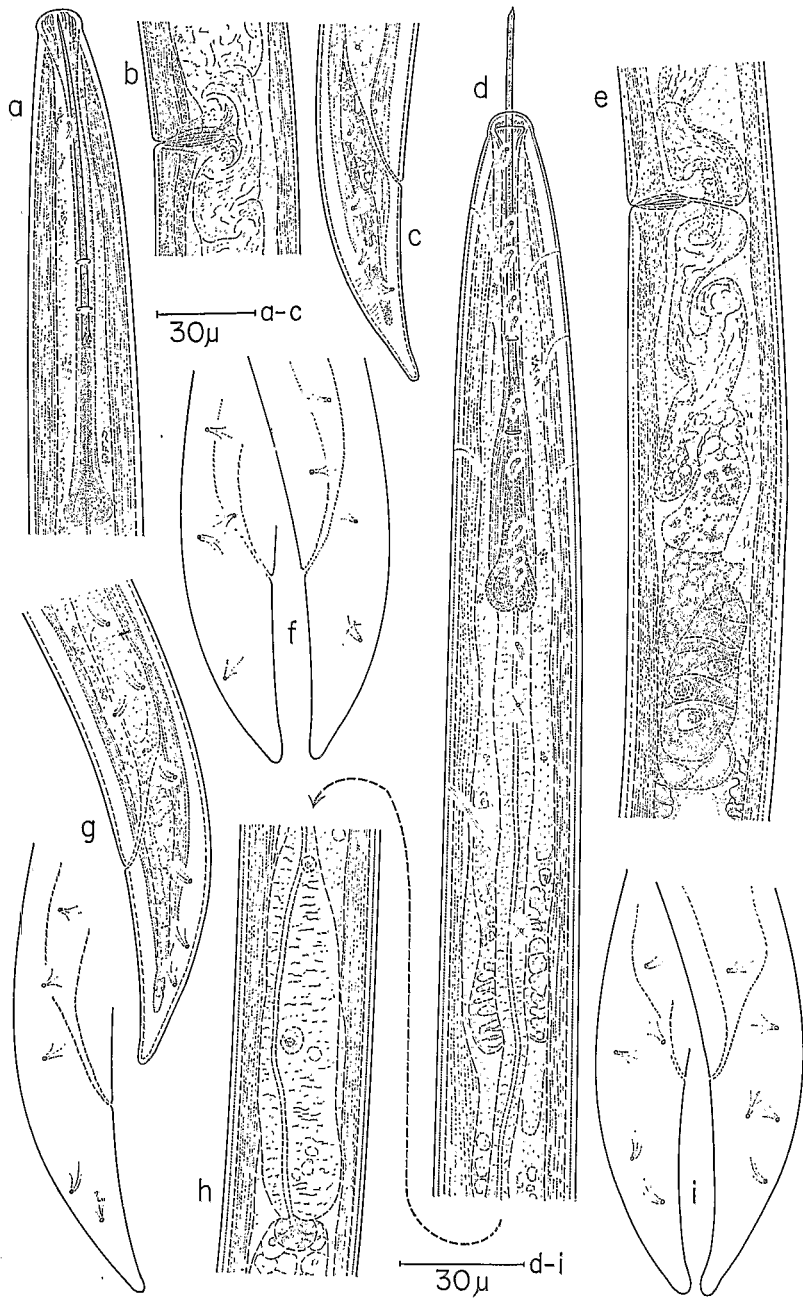


Fig. 2. *Xiphinema elongatum* Schuurmans Stekhoven & Teunissen, 1938. Female Holotype — a: anterior end of body; b: portion of body at vulva; c: tail. *Xiphinema pratense* Loos, 1949 (= *X. elongatum*). Female Syntypes — d, h: anterior end of body; e: vulva and posterior gonad; f, g, i: opposite sides of tails.

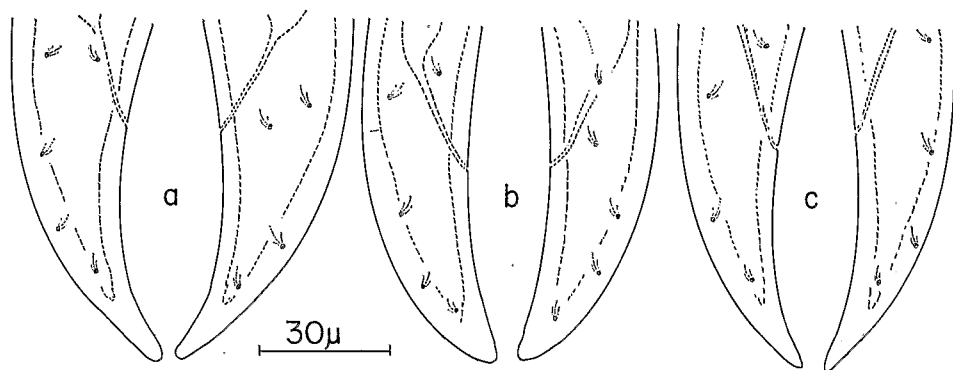


Fig. 3. *Xiphinema campinense* Lordello, 1951. (= *X. elongatum*). Female topotypes from Caraguatatuba, Brazil. a-c: opposite sides of tails.

Diagnosis: Position of vulva on body generally comparable to 12 other nominal *Xiphinema* species, from 10 of which *X. elongatum* is immediately distinct due to tail shape. *Xiphinema attorodorum* Luc, 1961 is quite similar to *X. elongatum* but differs in having a greater body and stylet length.

Holotype: Female described by Schuurmans Stekhoven & Teunissen, 1938, mounted in glycerine and in the collection of the Institut des Parcs Nationaux du Congo, 1 Rue Defacz, Brussels, Belgium.

Type Host: Unknown.

Type Locality: Rutshuru, Republic of the Congo (Léopoldville), Africa at an altitude of 1,285 m.

Schuurmans Stekhoven & Teunissen characterized this species as having a stylet 150 μ long, being amphidelphic, and with a tail 3.28 times as long as the body diameter at the anus. They further stated that the tail exhibited three pairs of sub-lateral and three pairs of subdorsal papillae. Their drawings of the tail, however, lacked clarity, thus obscuring the exact position of these pores (papillae?). Furthermore, this drawing showed the tail to be 2.3 times as long as the anal body diameter and not 3.28 times as long, as they had claimed. This mistake was rectified when Schuurmans Stekhoven (1951) referred to the female above as having a tail length 2.5 times the anal body width. At that time he assigned to the species another female found associated with tulip bulbs also from Rutshuru.

The species characteristic of six pairs of caudal pores, referred to by Schuurmans Stekhoven & Teunissen, was deemed useful by Lordello (1955), Luc (1958), and Hopper & Cairns (1959), who thus separated this species from others in their keys of the genus.

The single specimen on which the species description was based was received in

darkened condition, due to prolonged storage in formaldehyde. This condition was satisfactorily corrected by passage of the specimen into glycerine.

It is unfortunate that when Loos (1949) established *X. pratense* as a new species he discussed only its relationship to *X. americanum* Cobb, 1913. In the following two pages he did refer to *X. elongatum*, but only to compare it to *X. radicola* Goodey, 1936. Yet his failure to suspect the conspecificity of *X. pratense* with *X. elongatum* is wholly understandable considering the meager description and drawings given by Schuurmans Stekhoven & Teunissen (1938). Then, too, *X. elongatum* was originally described as having six pairs of pores while Loos found only two pairs and a solitary posterior pore on the tail of *X. pratense*. Perhaps another factor contributing to the apparent dissimilarity of the two species was Loos' misconception of the stylet of *X. elongatum* (as illustrated by Schuurmans Stekhoven & Teunissen) to be comprised of three parts. Such a stylet, of course, differed radically from the two-part stylet of *X. pratense* and all other species of *Xiphinema*, for that matter.

Xiphinema pratense was accurately drawn and described, which contributed to its solidarity as a valid species for over a decade. Lordello (1953) modified Loos' specific name "*pratensis*" to "*pratense*." Williams (1959) described and figured this species, which he found in sugar cane fields in Mauritius. Young (1960) also found the species associated with sugar cane in Queensland, Australia. Siddiqi (1961) has recently redescribed and refigured *X. pratense* collected in India. His specimens showed no major difference from those originally described by Loos.

In the present study, four of the five specimens of *X. pratense* on which Loos (1949) based his description were examined. The measurements of these four females were: L = 2084 μ (2041-2130 μ); a = 55 (52-56); b = 6.5 (5.9-7.0); c = 42 (39-43); V = ⁹⁽⁶⁻¹⁴⁾ 42 (40-44) ¹⁰⁽⁷⁻¹⁶⁾; stylet = 147 μ (143-150 μ). The single specimen that Loos illustrated in his "Text-Fig. 2" was studied in detail and new drawings of this female are presented in Fig. 2, d-i.

Loos' description of this species was quite adequate. His drawing of the anterior part included only the stylet region, hence the entire esophageal area as well as the cervical pore arrangement is presented in Fig. 2, d, h. There was no sagittate barb (apparently the primordium of a reserve stylet), as has been found in many of the specimens studied of several other *Xiphinema*. Details of the reproductive area, including the posterior gonad are presented in Fig. 2, e. The gonads are symmetrical and of comparatively simple constitution without evidence of rudimentation or presence of structures such as the "Z organ" (Luc, 1961a). Placement of caudal pores on the tail is quite variable (Fig. 2, f, g, i) with three pairs of caudal pores appearing to be the average (Fig. 2, g, i). As already alluded to by Loos, an uneven number of pores on the tail is not uncommon.

The foregoing descriptions and drawings clearly indicate the lack of major differentiating characteristics between *Xiphinema elongatum* and *X. pratense*. These species cannot be separated on the basis of nematode formulae, and body or stylet lengths. The single specimen of *X. elongatum* carries three pairs of caudal pores,

as also demonstrated by two specimens of *X. pratense*. Accordingly, *X. pratense* is synonymized to *X. elongatum*, the older established species.

Xiphinema campinense Lordello, 1951 was established as a valid species, admittedly close to *X. pratense*, but differing in certain dimensions, absence of cuticular transverse striation (Loos (1949) described the cuticle of *X. pratense* as minutely transversely striated), and by differences in number and location of caudal pores. Of these, the number of pores appears to be the most important. Lordello cited the existence of four pores on each side of the tail, but his drawings show only three that are truly caudal, with the fourth being pre-anal, as is the case of *X. elongatum*. Lordello (*in litt.*) had informed the senior author that the syntype material of *X. campinense* was lost.

Through the kind cooperation of J. C. Carvalho, three female specimens of *X. campinense* were submitted for study. These were collected from around the roots of banana near Caraguatatuba, São Paulo, Brazil, about 115 miles from Campinas, the type locality for the species. The measurements of these females were: L = 2111 μ (2044-2222 μ); a = 54 (50-62); b = 6.5 (6.3-6.7); c = 39 (37-41); V = 39 (37-41); stylet = 153 μ (151-155 μ). Carvalho (*in litt.*) has stated that three additional females which he collected from the same location have the following measurements: L = 2208 μ (2174-2229 μ); a = 55 (52-60); b = 6.5 (6.1-7.4); c = 39 (38-40); V = 40. Three conspicuous differences between the above measurements of the specimens from banana and those given by Lordello (1951) are in the length of the body, "a" value, and "c" value. Although Lordello stated the female length to be 2517 μ and the "a" measurement as 60.9, the female in his Fig. 1, A appears to be about 2130 μ long and 39 μ wide, giving an "a" measurement of 55. Whereas the tail in his Fig. 1, A is 67 μ in conformance with the measurements cited in his text, the adult female tail shown in his Fig. 1, C is only 41 μ long, suggesting that tail length can be quite variable, thus resulting in differing "c" values. The tails of the females from banana (Fig. 3, A-C) show variable shapes and pore arrangements but are generally consistent with those of *X. elongatum* and *X. pratense* (= *X. elongatum*). Because of the absence of any demonstrable differences between these species, *X. campinense* is regarded as identical with and a synonym of *X. elongatum*.

RÉSUMÉ

Observations sur Xiphinema insigne Loos, 1949 et Xiphinema elongatum Schuurmans Stekhoven & Teunissen, 1938

L'étude des syntypes de *Xiphinema insigne* Loos, 1949 et des paratypes de *X. indicum* Siddiqi, 1959 a montré aux auteurs que cette dernière espèce était identique à la première et devait être considérée comme un synonyme de celle-ci. L'holotype de *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938, seul individu sur lequel était basée la description originale, est réétudié. Les syntypes de *X. pratense* Loos, 1949 et des topotypes de *X. campinense* Lordello, 1951, ont été trouvés identiques à *X. elongatum*; ces deux espèces sont donc considérées comme synonymes de *X. elongatum*.

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OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE-MER

(O. R. S. T. O. M.)

DEPARTEMENT DE NEMATOLOGIE

PUBLICATION N° 34

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Stekhoven & Teunissen, 1938

(Nematoda : Dorylaimidae)

by

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Extrait de : *NEMATOLOGICA*, 9, 163-177, 1963

(Contribution commune Florida Citrus Experiment Station - O.R.S.T.O.M.)

O.R.S.T.O.M. Fonds Documentaire

N° : 33276, ex 1

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