

OBSERVATIONS ON *XIPHINEMA PARITALIAE* LOOF & SHARMA, 1979
(=*X. DOLOSUM* BOS & LOOF, 1985 N. SYN.) WITH A DESCRIPTION OF
THE MALE (NEMATATA: LONGIDORIDAE)

BY

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The study of populations of *Xiphinema paritaliae* Loof & Sharma, 1979 from Martinique and Guiana, as well as of other specimens from Suriname, Peru, and of type specimens of *X. paritaliae* and *X. dolosum* Bos & Loof, 1985, led the authors to synonymize the two species. The description of the female is completed, and a complete description of the male is given for the first time. *X. paritaliae* is remarkable in the exceptional variability of the Z differentiation.

Keywords: morphology, variability, Z-differentiation.

Studying various specimens of *Xiphinema* from samples taken in French Guiana and Martinique by two ORSTOM nematologists, G. Germani and P. Cadet, some of these specimens were at first attributed to *X. dolosum* Bos & Loof, 1985, some others to *X. paritaliae* Loof & Sharma, 1979. A closer reexamination of these specimens and of others, including paratypes of the two species, revealed that taking into account the exceptional variability of the Z differentiation, the two species have to be considered a single one, and consequently *X. dolosum* is a junior synonym of *X. paritaliae*.

A redescription of the females of the species is given below.

A single male was recorded for *X. paritaliae* from Brazil by Ferraz (1980) who gave only the main measurements. No male has been recorded for *X. dolosum* (Bos & Loof, 1985). Males having been found in some of the populations studied, their description is also given below.

X. paritaliae was recorded earlier from various places in Brazil (Loof & Sharma, 1979; Ferraz, 1980; Germani, 1989), in Peru (Lamberti *et al.*, 1987; Alkemade & Loof, 1990) and, as *X. dolosum*, in Nigeria (Bos & Loof, 1985).

The populations studied are from the following localities:

- pop. 1. Soil, fallow, Morne Rouge, place called Savane Petit, Martinique.
- pop. 2. Soil around ferns and Maranthaceae, Cayenne, PK 15 road to Bagne des Annamites, Guiana.

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- pop. 3. Soil around sugar cane, St Laurent-du-Maroni, Plantation des Malgaches, Guiana.

Some specimens of *X. paritaliae* were also found in the following samples: soil around *Alpinia* sp., Morne Rouge, plantation Mackintosh, Martinique; soil around tomato, place called Le Fromager, Martinique; soil around *Anthurium* sp. *i*) Champs Flore, Plantation Yang Ting and *ii*) Gros Morne, Martinique; soil around pineapple, Javouhey, plantation Nmong, Guiana; flooded rice, Mana, Guiana. This species therefore does not seem infrequent in both Martinique and Guiana. Also examined were some specimens from soil around *Prunus* sp., Puno, Peru and from soil collected in Surinam (both courtesy P.A.A. Loof).

The nematodes from Martinique and Guiana were extracted from soil using elutriation (Seinhorst, 1956), killed by gentle heating up to 60° C, fixed with hot neutral formalin (2%), and mounted in anhydrous glycerin following Seinhorst's (1959) rapid method.

Xiphinema paritaliae Loof & Sharma, 1979

= *X. dolosum* Bos & Loof, 1985, *n. syn.*

(Figs 1-6)

Measurements: Female and male, see Table I.

*Description**

Female: When heat-relaxed, body habitus C- or J-shaped, with pronounced ventral curvature of the posterior one-fifth. Cuticle apparently composed of two layers, 2.5-3 µm thick at mid-body, 3.5-4.5 µm in the post-labial region. Lateral chord 8-18 (12) µm wide at mid-body, or 16-33 (24) % of the corresponding diameter. Body pores prominent; in the neck region 14-19 lateral, 3-4 dorsal, 9-14 ventral. Lip region rounded, 13-16 (14.5) µm in diameter, separated from the rest of the body by a weak depression. Amphidial slit straight, large (75-80% of the corresponding diameter), situated at the level of the depression. Stylet typical; basal flanges of odontophore well marked, 11-14 (12.5) µm wide. Stylet guiding apparatus appearing tubular; basal ring at 116-132 (125) µm from anterior end; length of the "tube" variable (11-24 µm), depending on position of the stylet. Pharyngeal bulb well demarcated from anterior tubular part of the pharynx, measuring 75-103×19-25 (89×22.5) µm; pharyngo-intestinal junction a more or less conical valve. Vulva a transverse slit. Posterior to the vulva, the cuticle generally presents a notch or a series of less pronounced ridges (frequency [n=15]: notch=2; ridges=11; plain=2). Vagina straight, perpendicular to the long body axis, surrounded by a globular sphincter. Ovejector symmetrical, with conspicuous circular muscles at junction with uterus. Uterus long, divided into three parts: a proximal** tubular part, a muscular Z differentiation, and a more globulose distal** part, itself divided into a thin walled "spermatheca" generally containing spermatozoa in

* applies to the population 3 (Guiana), as the most abundant.

** Proximal and distal are used in reference to vulva.

TABLE I

Measurements of females and males of *Xiphinema paritaliae* (= *X. dolosum*). (All measurements in μm except *L*, in mm. Spicules measured along median line)

	Females						Males		
	Brazil		Nigeria	Martinique	Guiana		Brazil	Guiana	
	Loof & Sharma (1979) pop. type <i>X. paritaliae</i>	Ferraz (1980)	Germani (1989)	Bos & Loof (1989) pop. type <i>X. dolosum</i>	Original (pop. 1)	Original (pop. 2)	Original (pop. 3)	Ferraz (1980)	Original (pop. 3)
n	3	18	17	34	8	12	25	1	10
L	3.30-3.60	3.20-3.90 (3.60)	2.50-3.60 (2.90)	2.52-3.0	2.51-3.15 (2.9±0.19)	3.05-3.51 (3.27±0.17)	2.65-3.77 (3.17±0.24)	3.80	2.45-3.09 (2.80±0.20)
a	71-73	59-78 (70)	51.7-72.9 (65.5)	53-66	56.9-72.2 (66.5±4.33)	56.7-74.7 (65.7±4.91)	45.7-87.4 (58.3±11.43)	80	50.4-75.4 (61.8±8.95)
b	7.2-8.2	8.5-11 (9.2)	5.4-11 (7.3)	5.9-8.7	6.5-8.2 (7.2±0.78)	7.4-8.8 (8.2±0.49)	6.3-11.6 (9.0±1.65)	10.8	5.9-8.9 (6.9±0.97)
Tail	88-99	78-98	74-92 (82)	66-102	75-83 (79±2.7)	85-96 (89±3.71)	72-102 (91±8.67)	81	70-90 (80±5.91)
c	37-41	37-48 (42)	30.2-48.6 (35.4)	27-39	32.6-40.4 (36.8±2.36)	34.3-41.3 (36.6±2.21)	27.9-52.4 (35.4±5.71)	47	30.5-38.0 (35.1±1.92)
c'	3.1-3.4	2.6-3.3 (2.9)	2.1-3.8 (3.0)	2.3-3.3	2.2-2.6 (2.4±0.17)	2.7-2.9 (2.8±0.07)	2.4-3.1 (2.8±0.21)	2.6	1.8-2.3 (2.2±0.19)
V	39-41	37-44 (41)	37.3-41.8 (39.3)	39-42	31.9-42.2 (40.4±1.07)	41.9-45.3 (43.4±1.31)	41.6-46.2 (43.9±1.39)	-	-
Odontostyle	130-136	106-122 (115)	102-132 (112)	97-109	124-133 (127.5±3.20)	130-146 (139.5±4.48)	120-132 (127.5±2.91)	121	125-132 (128±2.17)
Odontophore	65-76	64-74 (67)	56-84 (62)	66-72	65-70 (68.5±1.87)	67-78 (72.5±3.40)	59-78 (73±4.24)	64	63-72 (67±2.82)
Styilet	196-211	170-192 (182)	160-214 (174)	160-180	190-200 (196±3.73)	204-221 (212±6.50)	179-207 (200.5±6.57)	165	190-201 (195±3.19)
Spicules	-	-	-	-	-	-	-	49	54-62 (59±2.68)
Acc. piece	-	-	-	-	-	-	-	-	12-20 (15±2.30)

contact with the Z differentiation and an apparently glandular part with large cells filling nearly all the space. The Z differentiation is unusually variable, in length as well as in number and size of its apophyses or globules. These latter elements are generally angular, with often a more translucent spherical central part; they can be very reduced both in number and size, and the Z differentiation in such cases is distinguished only by the muscles that are always evident. Sphincter linking uterus and oviduct prominent. Enlarged part of oviduct often containing spermatozoa; thinner distal part of oviduct and ovary without special characters. Tail conical; dorsal and ventral profiles regular; posterior half with pronounced, characteristic, ventral curvature; hyaline terminal part 25-39 (29) μm long or 25.5-38.2 (30.3) % of tail length; blind canal devoid of special features; tail extremity thinned, rounded.

Male: General appearance as in female, but body more strongly curved in its terminal part, and lip region less demarcated from the rest of the body. Otherwise morphology and anatomy similar to that of female, except genital apparatus and somatic structures associated with it. Spicules massive, curved, not cephalated. Double ventral papilla at 12-17 (15 ± 1.28) μm from cloacal opening; 4 to 6 medioventral supplements; frequency of supplements ($n=10$): 4 suppl.=5; 5 suppl.=4; 6 suppl.=1; distance of supplements from cloacal opening: S1=79-106 (90) μm ; S2=102-129 (113) μm ; S3=129-163 (143) μm ; S4=153-191 (169) μm ; S5=175-206 (186) μm ; S6=203 μm . Tail having a general shape similar to that of female but shorter and more regularly ventrally curved.

Variability in the species

Taking into account the previously described populations of both *X. paritaliae* and *X. dolosum*, and the populations studied here, no important variation exists among the main characters and measurements (see Table 1). Body length has the smallest value in the type population of the *X. dolosum* from Nigeria, but it is very close to that of population 1 (Martinique) studied, the largest value being in the population from Brazil recorded by Ferraz (1980). Tail length and shape, and c' coefficient are remarkably constant, as well as the value of V. Stylet is the shortest in *X. dolosum* types and the longest for the populations 2 and 3 (Guiana) studied here, but these values largely overlap when considering all the populations.

The only strongly variable character appears to be the Z differentiation. This has been previously stated by Bos & Loof (1985) who noted, when describing *X. dolosum*, the presence of "well developed Z-organ in the majority of specimens; in others, however, it is weakly developed or even indiscernible". Our observations confirm this statement. In the paratypes of *X. dolosum* examined, the Z differentiation varies from a well defined muscular part containing angular less defined apophyses (Fig. 4K, L), to a weakly muscularized area

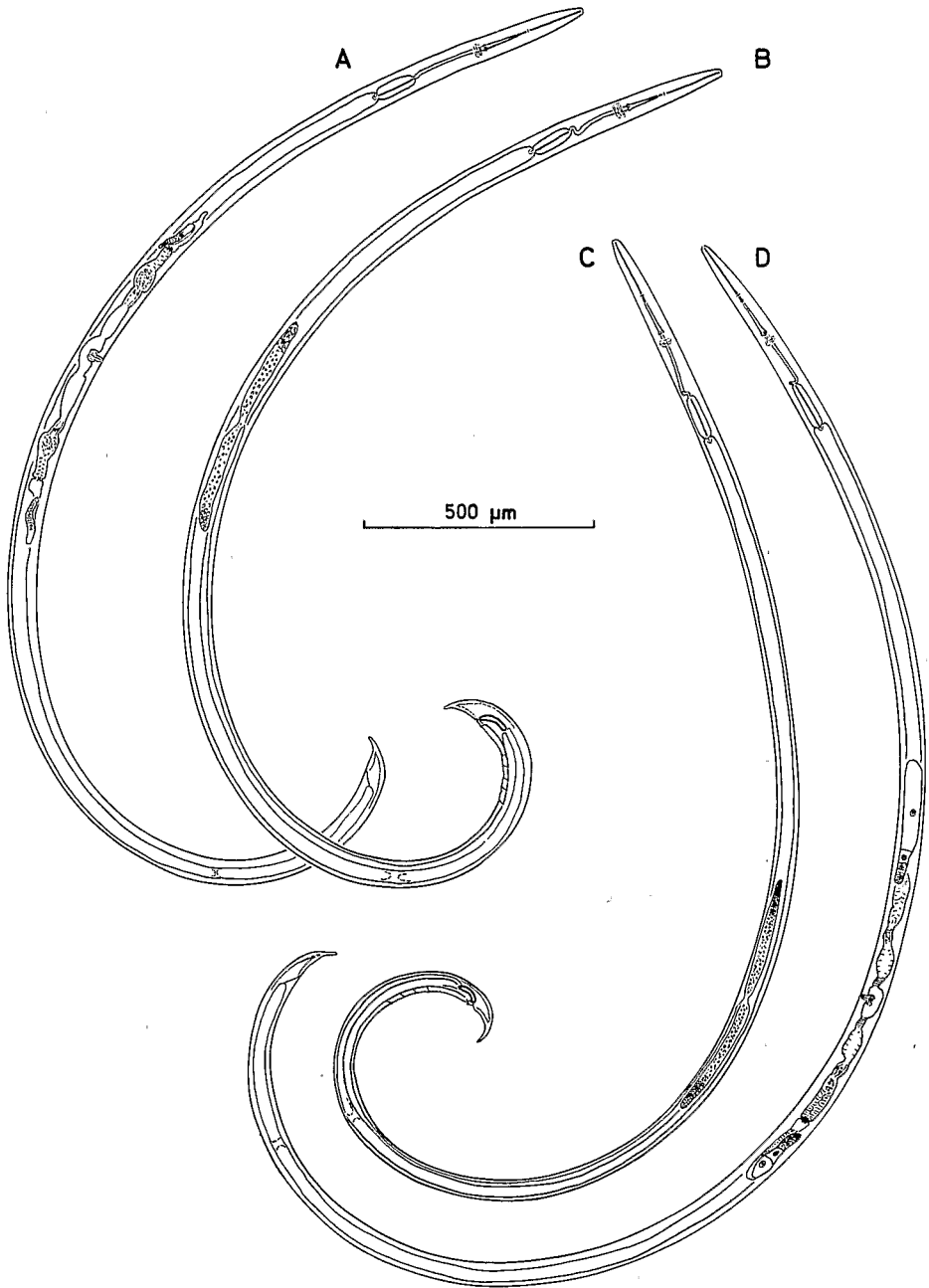


Fig. 1. *Xiphinema paritaliae*. A-B: Female and male, population 1. Martinique. C-D: Male and female, population 3, Guiana.

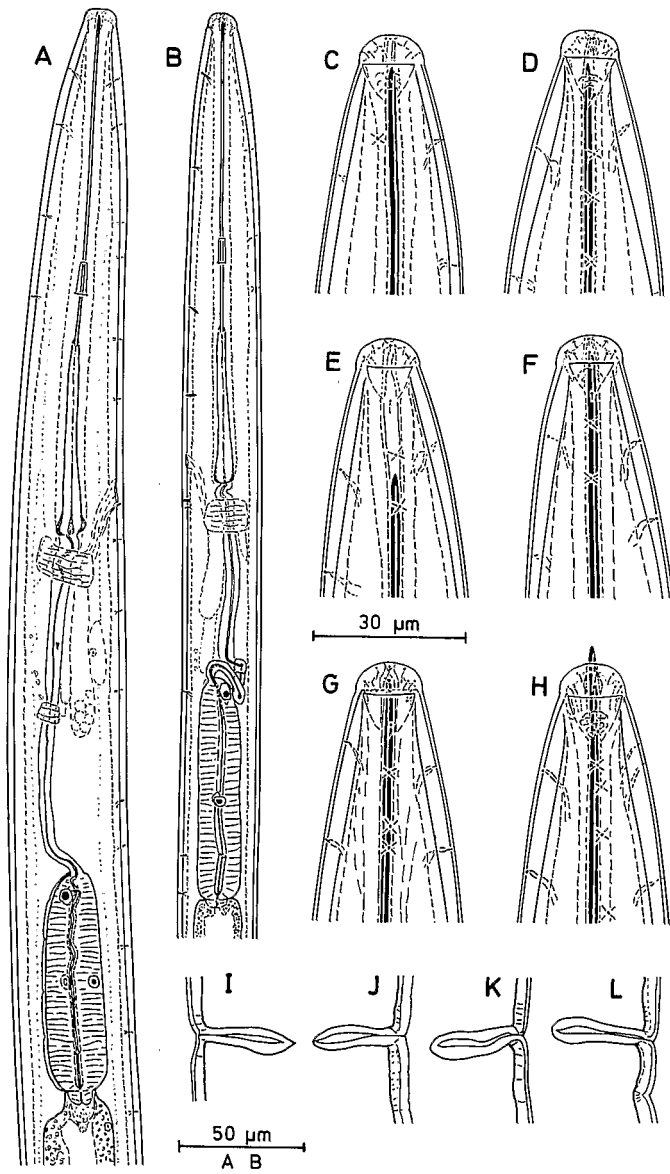


Fig. 2. *Xiphinema paritaliae*. A: Neck region, female pop. 1 Martinique. B: Neck region, female pop. 3, Guiana. C: Head end, paratype female. D: Head end, female from Peru. E-F: Head end, paratype females of *X. dolosum*. G: Head end, female pop. 1, Martinique. H: Head end, female pop. 2, Guiana. I-L: Vulva region. I: Female, pop. 2 Guiana. J-L: Females pop. 1, Martinique.

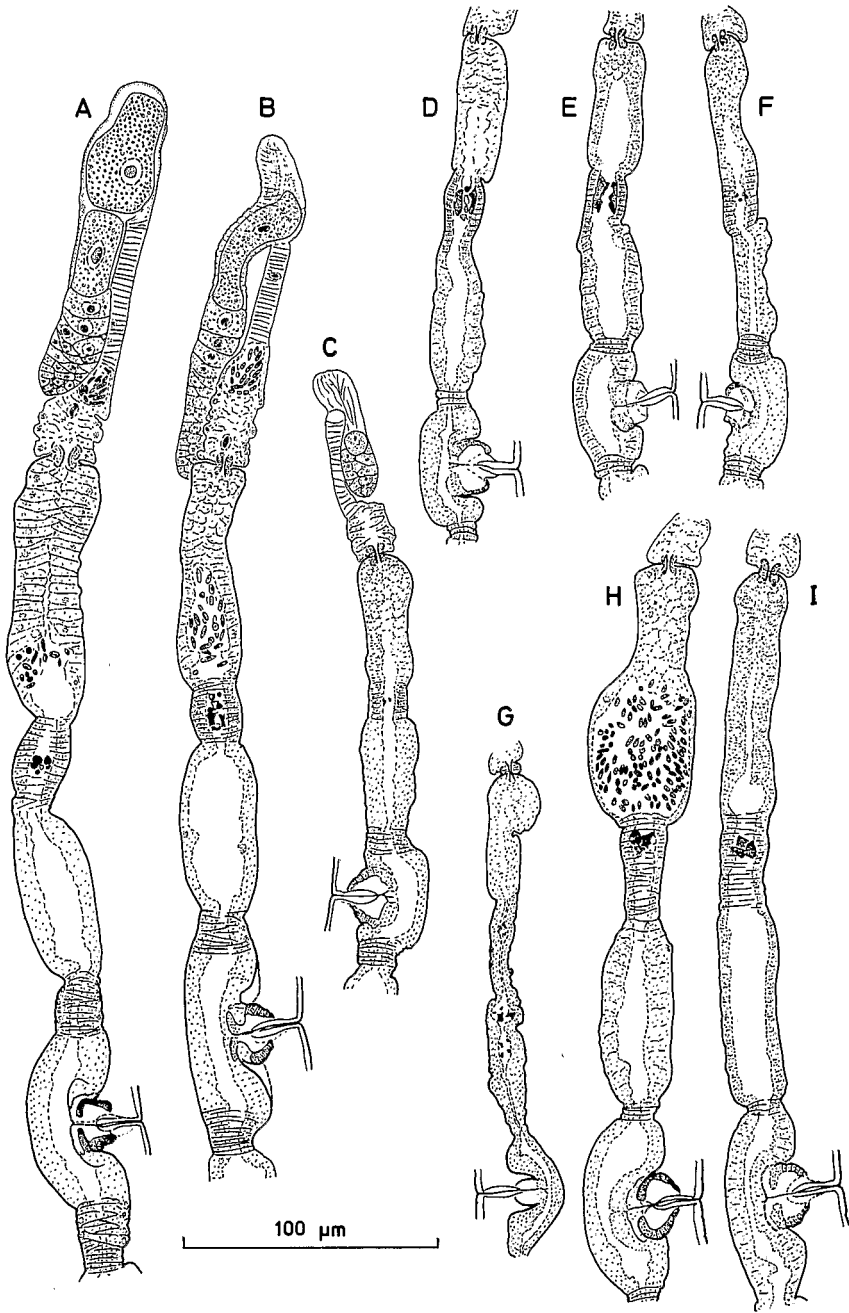


Fig. 3. *Xiphinema paritaliae* female reproductive system. To facilitate comparison all drawings are illustrated with the vulva downward even if they represent the posterior branch. A: Entire G_2 , female pop. 3, Guiana. B: Entire G_1 , female pop. 3 Guiana. C-F: Paratypes of *X. dolosum*. C, D, F: G_1 , entire (C) or uterus. E: G_1 , uterus. G: G_2 , uterus of paratype of *X. paritaliae*. H-I: G_1 , uterus of females pop. 1, Martinique.

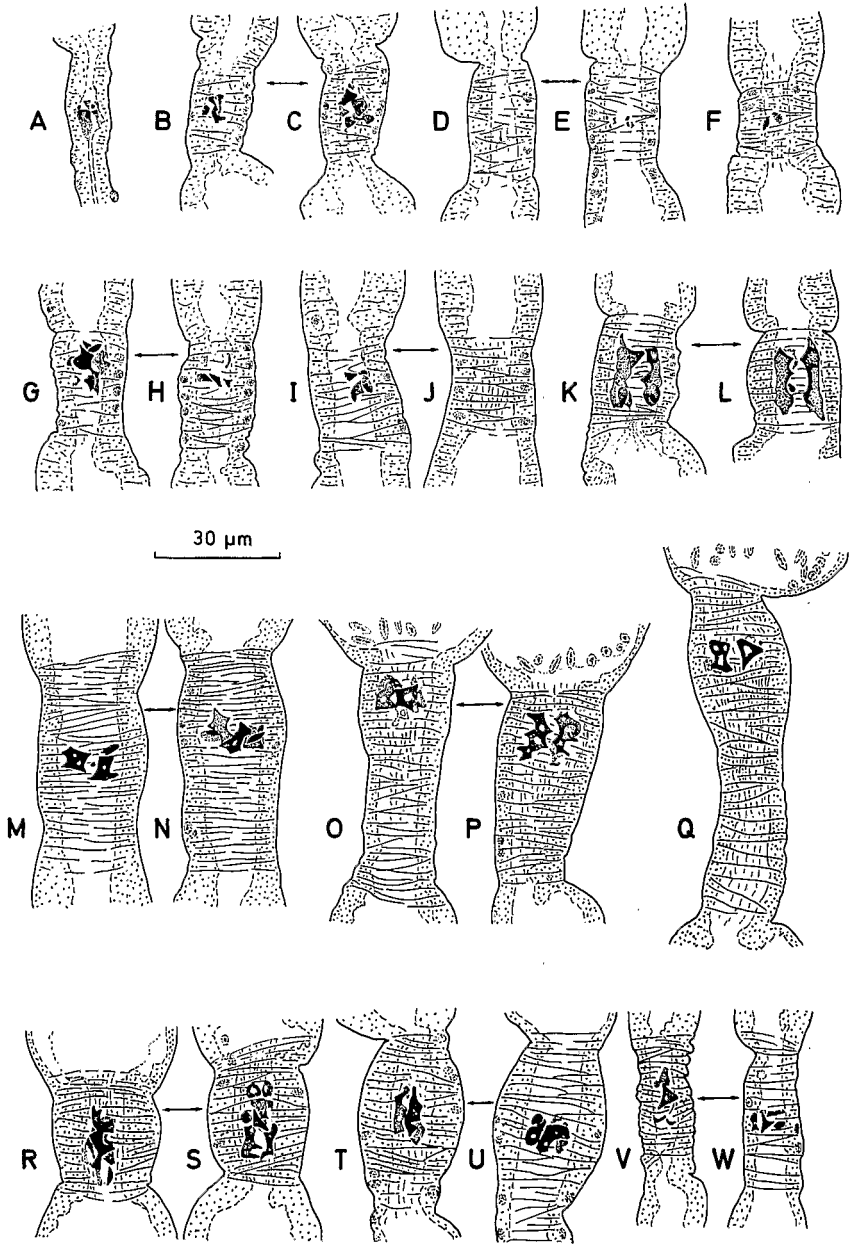


Fig. 4. *Xiphinema paritaliae* Z differentiation. To facilitate comparison all drawings are shown with the downward part pointing toward the vulva. Those drawings with double pointed arrows in between are from the same female (Z differentiation from G_1 , to the left, that from G_2 to the right). A: Paratype. B-C: Specimen from Peru. D-L: Paratypes of *X. dolosum*. M-Q: Specimens pop. 1 Martinique. R-W: Specimens pop. 3, Guiana.

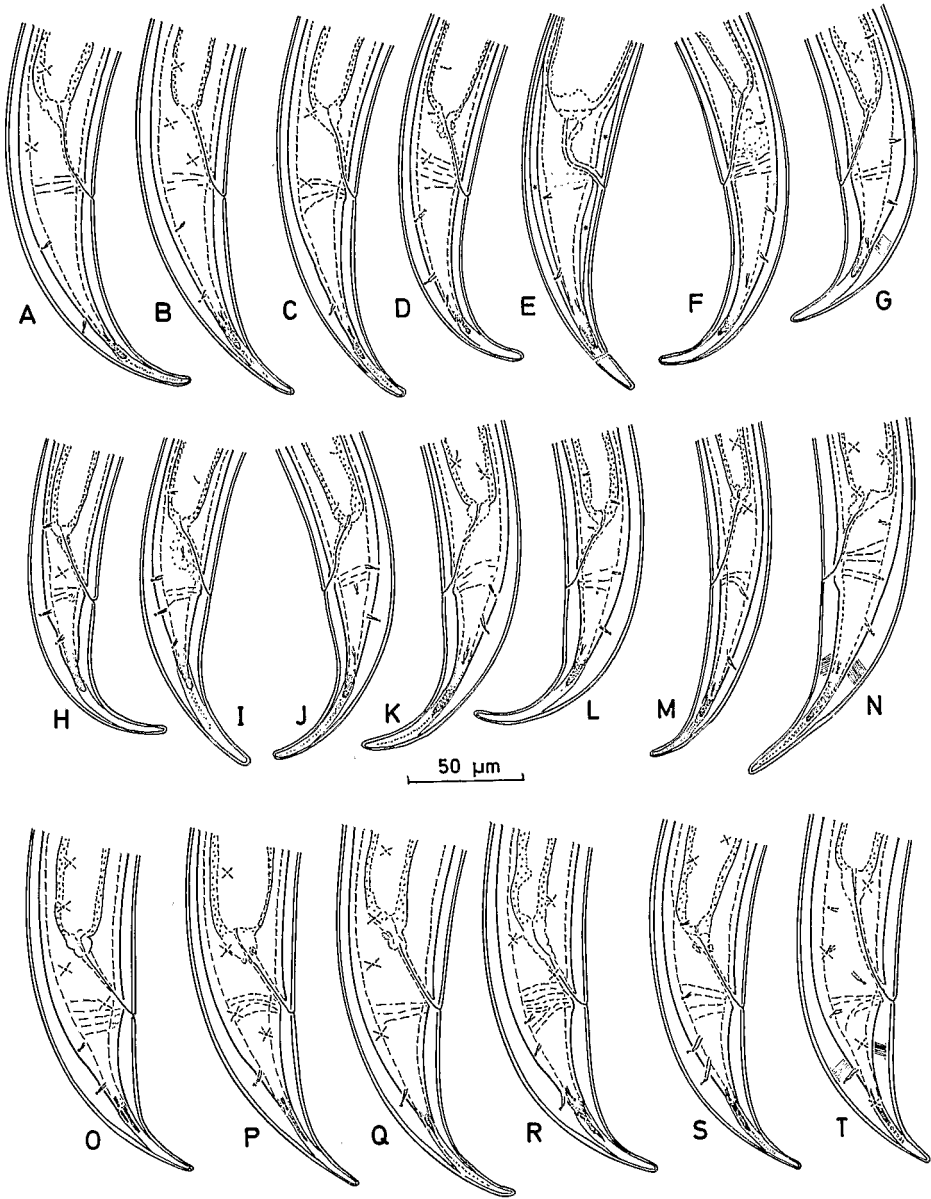


Fig. 5. *Xiphinema paritaliae* female tails. A-C: Specimens from Peru. D: Paratype. E: Holotype (tail tip broken; *=lacunae due to separation of cuticle from underlying tissues). F: Paratype. G: Specimen from Surinam. H-L: Paratypes of *X. dolosum*. M-N: Specimens pop. 3, Guiana. O-T: Specimens pop. 1, Martinique.

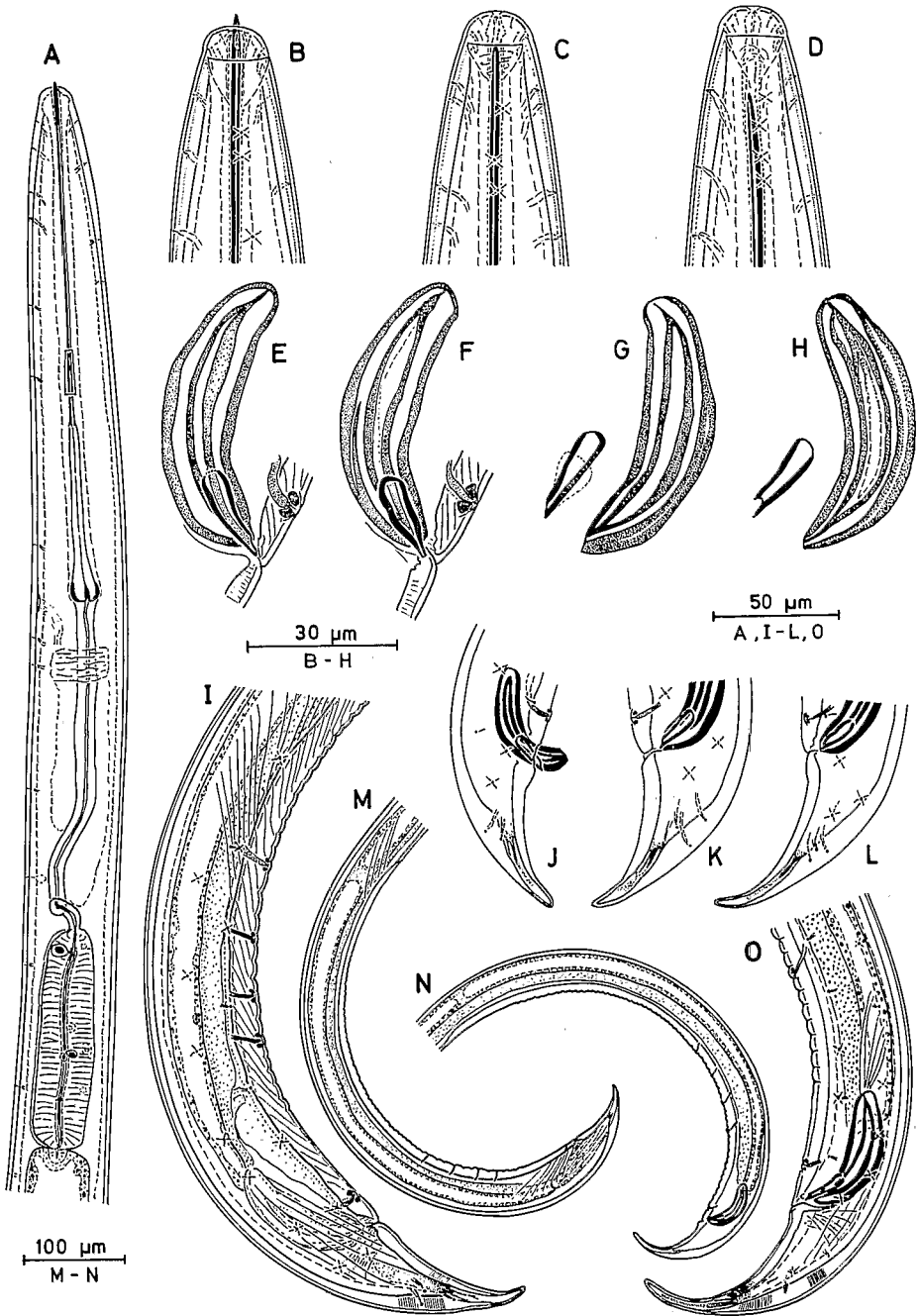


Fig. 6. *Xiphinema paritaliae* male. A: Neck region. B-D: Head ends. B: Specimen pop. 2 Guiana. C-D: Specimens pop. 1, Martinique. E-H: Spicula and lateral guiding pieces. E-G: Specimens pop. 1, Martinique. H: Specimen pop. 3 Guiana. I: Posterior body region, specimen pop. 1, Martinique. J-L: Tails of specimens pop. 1, Martinique. M: Prerectum region, specimen pop. 1, Martinique. N: *Idem*, specimen pop. 3, Guiana. O: Tail region, specimen pop. 2, Guiana. (Copulatory muscles and some other muscles have been completely or partly omitted for clarity.)

containing rare and small granules (Fig. 4 E, F, H) or even no or indiscernible granules (Fig. 4D, J); sometimes one branch has a Z differentiation with sclerotizations and the other one has a Z differentiation without any inclusion (Fig. 4I, J). The only examined paratype of *X. paritaliae* and one specimen from Peru, also show a weakly developed Z differentiation with very small granules (Fig. 4A, B respectively). Compared to these populations, the populations from Guiana show a more evident Z differentiation by the stronger muscularization and the greater number and size of the angular internal elements (Fig. 4 R-W); the population from Martinique has the most developed Z differentiation: the muscular part is longer and stronger, and the internal angular elements are more developed (Fig. 4 M-Q). The better development of the Z differentiation in the populations from Guiana and Martinique has perhaps to be linked to the presence of numerous males in these populations, whereas no male has been recorded for both the type populations of *X. paritaliae* and *X. dolosum*, nor in populations from Peru. It has been observed (Luc, 1973; Grimaldi de Zio *et al.*, 1979) that a Z differentiation is more frequent in amphimictic species than in parthenogenetic ones; this could perhaps be valid for populations of the same species having males or not.

However, no clear cut conclusion concerning structure and development of the Z differentiation can be drawn between all populations observed. Consequently, it is considered that all these populations pertain to the same species and that *X. dolosum* Bos & Loof, 1985 has to be considered a junior synonym of *X. paritaliae* Loof & Sharma, 1979.

In the polytomous key to species of *Xiphinema* published by Loof & Luc (1990), *X. dolosum* was attributed to Group 4, as having both female genital branches equally developed and with a Z-organ, whereas *X. paritaliae* was attributed to Group 5 as having both female genital branches equally developed and with a pseudo-Z-organ. Due to the great variability of the Z differentiation observed, it is difficult to attribute *X. paritaliae* to Group 4 or 5. Such variability appears very exceptional, but it is a kind of rule that a character, stable and constant in the near totality of the species, appears variable in some species. Thus, for the practical purpose of determination, the best solution would appear to be to place *X. paritaliae* in both Groups 4 and 5, with the following citation compared with the earlier citations of *X. paritaliae* and *X. dolosum* in Loof & Luc (1990):

	A	B	C	D	E	F	G	H	I	J	K	L
<i>X. paritaliae</i> (this article)	4	1/2	2/3	3/4	3/4	3/4	2/3	2	3	2	1	1/2
<i>X. paritaliae</i> (Loof & Luc, 1990)	4	2	2	3	3/4	3/4	2/3	2	3	2	-	1
<i>X. dolosum</i> (Loof & Luc, 1990)	4	1	2/3	3/4	3/4	3	2	2	3	2	1	1

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RÉSUMÉ

Observations concernant Xiphinema paritaliae Loof & Sharma, 1979 (=X. dolosum Bos & Loof, 1985 n. syn.) et description du mâle (Nemata: Longidoridae)

L'étude de populations de *Xiphinema paritaliae* Loof & Sharma, 1979 provenant de la Martinique et de la Guyane ainsi que celle de spécimens du Suriname et du Pérou, et de spécimens types de *X. paritaliae* et *X. dolosum* Bos & Loof, 1985, a conduit les auteurs à synonymiser ces deux espèces. Des compléments à la description de la femelle sont donnés, de même que la première description du mâle. *X. paritaliae* est remarquable par la variabilité exceptionnelle de sa différenciation Z.

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