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LONGIDORID NEMATODES FROM NORTHERN EGYPT

by
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Summary. *Longidorus africanus, L. laevicapitatus, L. latocephalus, Paralongidorus erriae, Xiphinema elongatum, X. hygrophilum, X. incognitum, X. italiae, X. santos* and *X. simillimum* are reported from Egypt. Brief descriptions are complemented with morphometrics and illustrations. The scatter diagram separating juvenile stages is given, when sufficient juveniles were available. *L. latocephalus, P. erriae* and all the *Xiphinema* species, except *X. elongatum*, constitute new records for the Country. The male of *X. simillimum* is described for the first time. It is proposed that African reports of *L. pisi* Edward *et al.* are regarded as *L. latocephalus*.

Records of Longidoridae from Egypt are scanty and in most cases need confirmation since no descriptions or measurements are provided by authors.

In 1969 Lamberti reported the occurrence of *Longidorus africanus*, supplementing the description with measurements and illustrations. Its presence was later confirmed and the range of morphometric characters extended (Aboul-Eid, 1970). It was listed with *L. taniwha* as a possible pest of banana (Aboul-Eid and Ameen, 1991). Other longidorid species reported from Egypt are: *L. laevicapitatus* and *L. pisi* (Salem *et al.*, 1994), *L. taniwha* and *Paralongidorus georgensis* (Aboul-Eid, 1970), *Xiphinema elongatum*, pathogenic on olive (Diab and El-Eraki, 1968), *X. index* in vineyards (Lamberti, 1981) and *X. pachtaicum* (referred to as *X. mediterraneum* Martelli *et* Lamberti or *X. americanum sensu lato* by Tarjan in 1969). Records of *L. elongatus* (Tarjan, 1964 and Oteifa and Tarjan, 1965), should actually be regarded as *L. africanus* (Lamberti, 1970).

In the years 1984, 1995 and 1996 soil samples were collected in various localities of northern Egypt. Several specimens of Longidoridae were frequently recovered; measurements and illustrations of the identified species are provided to extend knowledge of their morphometric variability; when available in sufficient number, measurements of juvenile stages are also reported.

Materials and methods

Samples were collected from the rhizosphere of cultivated plants, mainly grapevine and fruit trees. Nematodes were extracted by means of Cobb's wet sieving technique, killed and fixed in hot 5% formalin and processed to anhydrous glycerol. Measurements were made with the aid of a camera lucida.

Results

Three species of *Longidorus*, one species of *Paralongidorus* and six species of *Xiphinema* were identified; they are: *L. africanus* Merny, *L.*

TABLE I - *Morphometric characters* of Longidorus africanus *from Egypt.*

Locality	Beni Seuf						Nubaria
Host	Grapevine					Banana	Grapevine
n	10♀♀	8 J1	8 J2	8 J3	6 J4	1♂	11♀♀
L (mm)	4.0±0.28 (3.6-4.5)	1.2±0.04 (1.2-1.3)	1.8±0.12 (1.7-2.0)	2.2±0.18 (2.0-2.5)	2.9±0.23 (2.6-3.1)	3.5	4.3±0.28 (4.1-4.9)
a	104±5.38 (98.5-113)	58±1.92 (55-60)	70±3.85 (66-76)	79±5.95 (73-91)	90.5±5.33 (83-99)	109	111±7.95 (96-122.5)
b	10.3±0.85 (8.8-11.6)	5.6±0.78 (4.8-7.0)	7.0±0.66 (5.7-7.8)	7.2±0.77 (6.6-8.9)	8.9±0.85 (7.7-9.9)	9.9	11.8±1.10 (9.8-13)
c	102±8.68 (82-111)	30±1.51 (28-32)	42±2.64 (38-46)	52±6.07 (43-60)	67±9.31 (57-84)	77	104±7.86 (95-119)
c'	1.5±0.07 (1.4-1.6)	3.1±0.12 (3.0-3.3)	2.6±0.20 (2.2-2.8)	2.3±0.17 (2.1-2.6)	2.0±0.22 (1.7-2.3)	1.6	1.6±0.08 (1.5-1.7)
V	48±1.76 (46-50)	–	–	–	–	–	48±1.62 (46-50)
Odontostyle µm	91±1.69 (88-94)	58±1.60 (55-60)	65±2.10 (62-69)	70±5.60 (65-77)	78±1.51 (77-80)	90	87±3.37 (83-95)
Odontophore µm	48±1.51 (46-50)	31±3.83 (26-37)	40±1.89 (37-43)	43±2.96 (40-48)	44±3.76 (40-50)	49	49±2.29 (46-53)
Replacement odontostyle µm	–	65.5±1.20 (64-67)	77±1.75 (74-80)	83±3.66 (77-87)	94±1.55 (93-97)	–	–
Oral aperture to guide ring µm	29±1.35 (27-30)	17.5±0.76 (16-18)	22±1.07 (20-23)	23±1.81 (21-26)	26±0.55 (25-26)	29	31±1.22 (29-33)
Tail µm	40±2.07 (37-43)	40±1.85 (37-43)	44±1.58 (41-46)	45±2.14 (42-49)	43±3.58 (38-47)	46	42±2.83 (37-46)
J (hyalin portion of tail) µm	8±0.88 (7-9)	5±0.99 (4-7)	5±0.52 (5-6)	6±0.83 (5-7)	6.5±1.05 (5-8)	8.5	8±1.30 (6-10)
Body diam. at lip region µm	10±0.42 (10-11)	7±0.35 (6-7)	8±0.35 (8-9)	9±0.74 (7-9)	9±0.52 (9-10)	11	10.5±0.53 (10-11)
Body diam. at guide ring µm	18±1.07 (17-20)	11.5±0.76 (11-13)	14±0.71 (13-15)	15±0.46 (14-15)	17±0.41 (16-17)	18	19±0.93 (18-21)
Body diam. at base of oesophagus µm	32.5±2.12 (30-37)	18±0.83 (17-19)	23±0.71 (22-24)	25±0.92 (24-27)	28±1.21 (26-29)	30	34±1.72 (32-38)
Body diam. at mid-body or vulva µm	39±3.81 (35-46)	21±0.83 (20-22)	26±1.30 (25-29)	29±1.41 (27-31)	31±1.37 (30-34)	32	39±3.46 (36-47)
Body diam. at anus µm	26±1.37 (24-29)	13±0.64 (12-14)	17±1.25 (15-18)	19±1.06 (18-21)	22±1.33 (20-23)	29	26±1.50 (25-29)
Body diam. at beginning of J µm	13±0.88 (12-14)	5±0.00 (5-5)	6±0.53 (5-7)	7.5±1.20 (6-9)	9±1.03 (8-11)	12	13±0.88 (11-14)
Spicules µm	–	–	–	–	–	49	–
Guiding piece µm	–	–	–	–	–	12	–

laevicapitatus Williams, *L. latocephalus* Lamberti, Choleva *et* Agostinelli, *P. erriae* Heyns, *X. elongatum* Schuurmans Stekhoven *et* Teunissen, *X. hygrophilum* Southey *et* Luc, *X. incognitum* Lamberti *et* Bleve-Zacheo, *X. italiae* Meyl, *X. santos* Lamberti, Lemos, Agostinelli *et* D'Addabbo and *X. simillimum* Loof *et* Yassin.

Descriptions

LONGIDORUS AFRICANUS Merny, 1966
(Table I; Figs 1-3)

Longidorus africanus occurred in two localities: Beni Suef (El Fayoum Governorate), in the rhizosphere of grapevine (*Vitis* sp.) and banana (*Musa* sp.) and Nubaria (El Behera Governorate), in the rhizosphere of grapevine (*V. vinifera* L.).

The female has a slender, cylindrical body, tapering gradually towards the extremities; assuming a closed C to single spiral posture when killed. Lip region hemi-elliptical, frontally rounded and separated from the rest of the body by a constriction. Amphids pouch-like, more or less bilobed at the base. Odontostyle robust, odontophore and guide ring typical of the genus. Vulva slightly anterior to mid-body, vagina occupying 1/2 of the corresponding body diameter, genital system amphidelphic, with two equally developed branches and reflexed ovaries. Tail broadly conoid, dorsally curved and ventrally flat, with rounded terminus.

A male was found in the population from Beni Suef. Its posterior region is more coiled than in females to which it is similar in all other characters. Spicules robust ventrally bent, testis very long, functional, filled with sperms. The adanal pair of supplements is preceded by a ventromedian row of 12.

Juveniles, which are similar to females, clearly separate into four groups (stages) (Fig. 3).

These Egyptian populations of *L. africanus* fall morphometrically within the range reported for the species (Merny, 1966 from Zimbabwe; Cohn and Mordechai, 1968 from Israel; Lamberti, 1969 from Somalia, Egypt and California; Aboul-Eid, 1970 from Egypt; Vadivelu and Muthukrishnan, 1987 from India; Jacobs and Heyns, 1987 from South Africa; Zeidan and Coomans, 1989 from Sudan; Bravo and Roca, 1995 from Portugal).

LONGIDORUS LAEVICAPITATUS Williams, 1959
(Table II; Fig. 4)

Longidorus laevicapitatus was found at Beni Suef, in the the rhizosphere of banana (only a female in the rhizosphere of grapevine).

The female has a stout body, tapering abruptly in the neck region, with a single spiral habitus when killed. Lip region frontally rounded, continuous with the rest of the body. Amphids pouch-like, bilobed posteriorly. Odontostyle, odontophore and guide ring typical of the genus. Vulva anterior to mid-body, vagina occupying ca. 1/3 of the corresponding body diameter, genital system amphidelphic, with two equally developed branches and reflexed ovaries. Tail broadly conoid, dorsally curved and ventrally flat, with rounded terminus.

Males and juveniles were not found.

L. laevicapitatus from Egypt is morphometrically similar to other African populations of the species including the type population (Williams, 1959 from Mauritius; Merny, 1966 from Congo-Brazzaville; Jacobs and Heyns, 1982 from South Africa; Hooper, 1985; Sakwe and Coomans, 1993 from Cameroon; Lamberti *et al.*, 1995a from Sâo Tomé) with the exception of the vulva position, which is slightly anterior in the Egyptian specimens, and the odontostyle length which is slightly longer in the Egyptian specimens, as in the populations from Sâo Tomé (Lamberti *et al.*, 1995a) or slightly shorter compared to populations from Cameroon (Sakwe and Coomans, 1993).

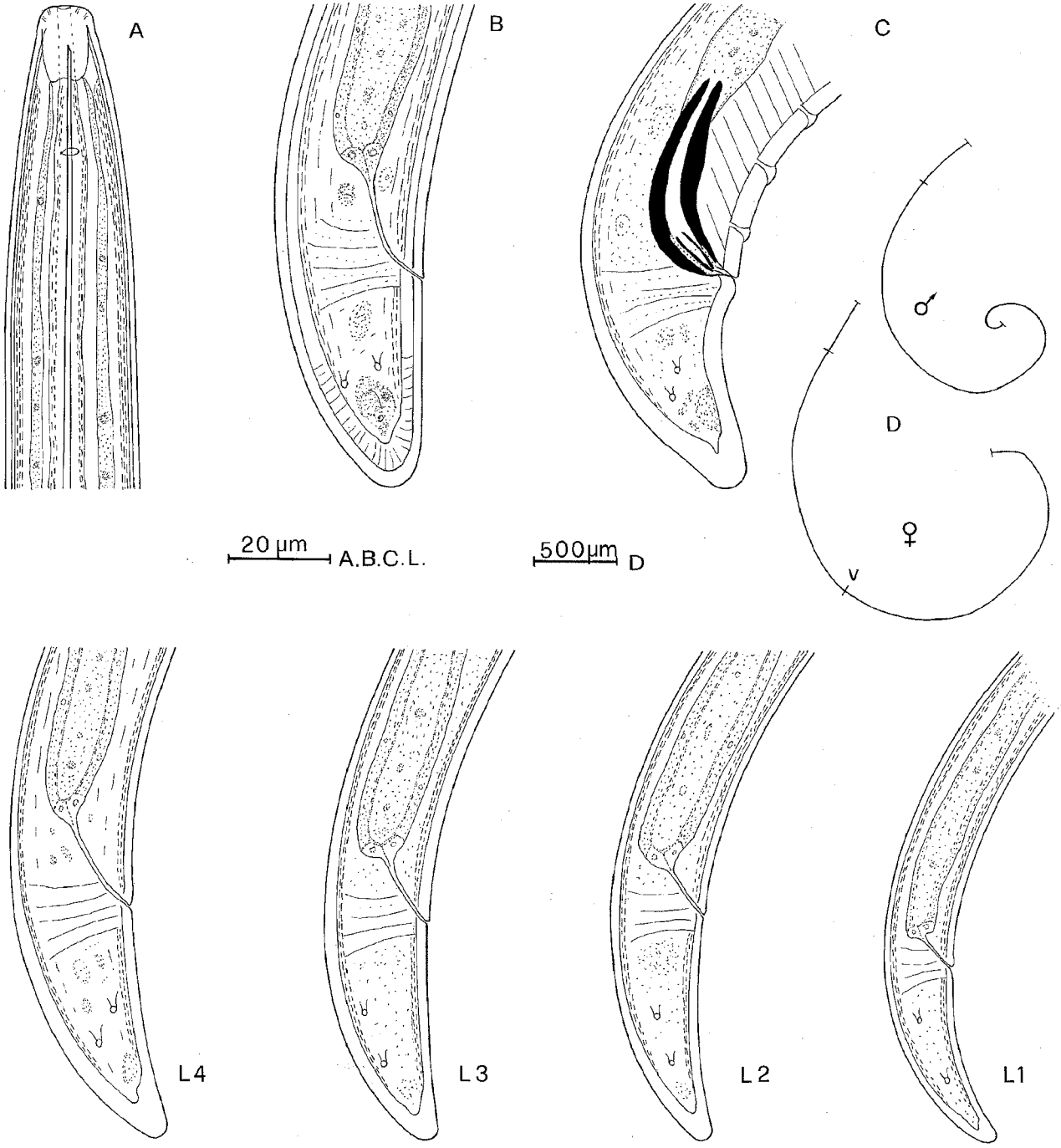

Fig. 1 - *Longidorus africanus* from Egypt: A, female anterior region; B, female posterior region; C, male posterior region; D, habitus; L4-L1, posterior region of 4th, 3rd, 2nd and 1st juvenile stages, respectively.

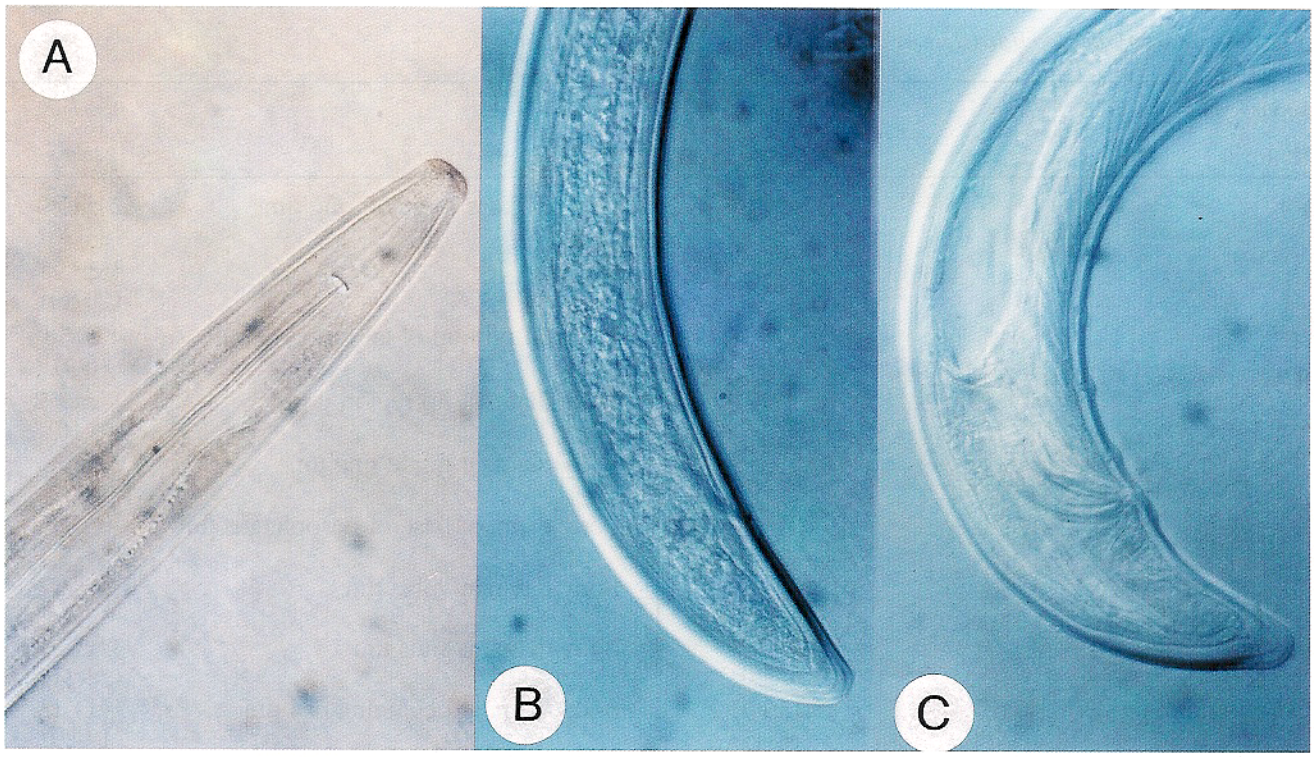

Fig. 2 - Photomicrographs of *L. africanus* from Egypt: A, female anterior region; B, female posterior region; C, male posterior region.

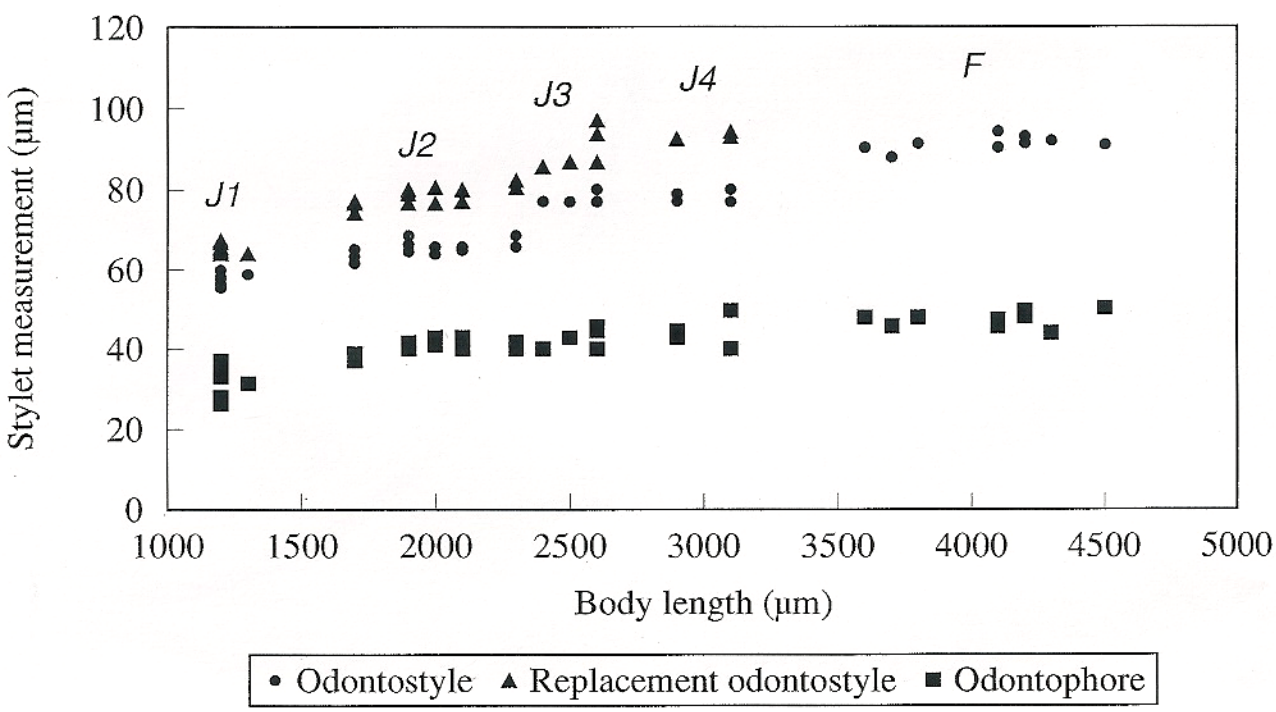

Fig. 3 - Scatter diagram separating juveniles and adult females of *L. africanus* from Egypt.

TABLE II - *Morphometric characters* of Longidorus laevicapitatus *from Egypt.*

Locality	Beni Suef	Locality	Beni Suef
Host	Banana	Host	Banana
n	12♀♀	Oral aperture to guide ring µm	24±1.30 (23-26)
L (mm)	2.8±0.23 (2.2-3.1)	Tail µm	35±3.11 (29-40)
a	58±2.60 (53-62)	J (hyalin portion of tail) µm	8±0.98 (6-9)
b	9.3±0.85 (8.4-11.3)	Body diam. at lip region µm	9.5±0.52 (9-10)
c	79±4.36 (72.5-87)	Body diam. at guide ring µm	20±1.36 (18-22)
c'	1.1±0.07 (1.0-1.2)	Body diam. at base of oesophagus µm	40±2.39 (35-44)
V	45±1.95 (43-50)	Body diam. at vulva µm	47.5±3.73 (38-54)
Odontostyle µm	66±2.25 (63-70)	Body diam. at anus µm	32±1.91 (28-34)
Odontophore µm	41±2.47 (38-45)	Body diam. at beginning of J µm	19±1.13 (17-20)

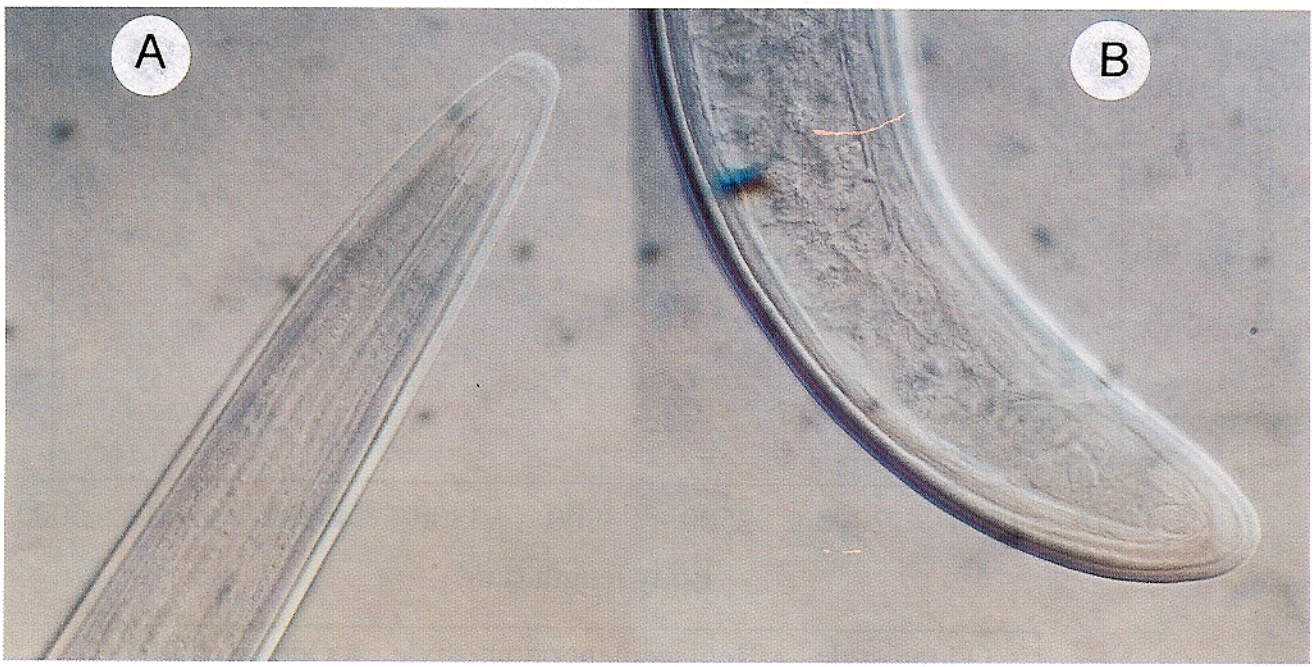

Fig. 4 - Photomicrographs of *L. laevicapitatus* from Egypt: A, female anterior region; B, female posterior region.

LONGIDORUS LATOCEPHALUS Lamberti, Choleva *et* Agostinelli, 1983
(Table III; Figs 5-8)

Longidorus latocephalus occurred at Nubaria in the rhizosphere of grapevine (*V. vinifera*).

Female with slender body, tapering gradually towards the extremities, assuming an open C posture when killed. Lip region hemi-elliptical, knob-like, expanded with respect to the rest of the body. Amphids pouch-like, slightly bilobed posteriorly. Odontostyle thin, odontophore typical of the genus, guide ring posteriorly situated, compared to most *Longidorus* species. Vulva almost at mid-body, vagina occupying 1/2 of the corresponding body diameter, genital system amphidelphic, with two equally developed branches and reflexed ovaries. No sperms were visible in the uteri. Tail elongate, conoid, dorsally curved and ventrally flat, with rounded terminus. Large globules with granular appearence are present laterally in the prerectum region. Spores of *Pasteuria* sp. were present in some specimens.

Three males were found in the population. They are similar to the female, but with the posterior region more coiled. Two of them have a functional testis with sperms in the middle region. Spicules are robust and bow-shaped. The ventromedian row of supplements preceding the adanal pair is constituted by 7, 8 and 9 papillae, respectively.

Three juvenile stages were found (Fig. 7).

In 1991 Choleva *et al.*, proposed *L. latocephalus* as a junior synonym of *L. pisi* Edward, Misra *et* Singh, 1964, but such synonymy was rejected by Navas *et al.* (1993).

Comparison of the morphometrics of the Egyptian population of *L. latocephalus* with those of the original description of *L. pisi* (Edward *et al.*, 1964) further supports the opinion that they are different species. Conversely the Egyptian *L. latocephalus* has more similarities with African populations identified as *L. pisi*. In fact, all characters overlap with South African specimens (Jacobs and Heyns, 1982; mean values are not given) but differs from populations from Malawi (Brown *et al.*, 1982), Sudan (Zeidan and Coomans, 1989) and Cameroon (Sakwe and Coomans, 1993) mainly because of its longer body.

In the original description of *L. latocephalus* (Lamberti *et al.*, 1983) a male is included wich obviously belongs to a different species. A topotype male found in our collection has the following measurements: L = 3.4; a = 132; b = 12.6; c = 108; c' = 1.4; odontostyle = 78 µm; odontophore = 45 µm; oral aperture to guide ring = 41 µm; tail = 31 µm; J (hyalin portion of tail) = 4 µm; body diameter at lip region = 11 µm; body diameter at guide ring = 15.5 µm; body diameter at base of oesophagus = 21.5 µm; body diameter at middle body = 25.5 µm; body diameter at anus = 22.5; body diameter at beginning of J = 8.5 µm; spicules = 34 µm.

The body is thin with an open C posture, more coiled at the posterior extremity. Spicules robust arquate ventrally, testis functional with sperms and four ventromedian papillae preceding the adanal pair.

Thus there are four ventromedian supplements preceding the adanal pair in the Bulgarian topotype, as in the males from Malawi (Brown *et al.*, 1982) and South Africa (Jacobs and Heyns, 1982). The male from Sudan (Zeidan and Coomans, 1989) has six, compared to the three males from Egypt which have respectively seven, eight and nine, and other males from Bulgaria in which the number varies from 6 to 10 (Choleva *et al.*, 1991). Moreover, the spicule length of the Bulgarian topotype is 34 µm; identical to males from Malawi (34 µm) and South Africa (35 µm) but longer than in other Bulgarian (30-31 µm) and Sudanese (28 µm) specimens and shorter compared to the Egyptian males (38-43 µm).

The Bulgarian paratype (Fig. 8) and the Egyptian populations contained only three juvenile stages, as suggested by Robbins *et al.* (1995) for Malawi and Greece populations,

TABLE III - *Morphometric characters* of Longidorus latocephalus *from Egypt.*

Locality	Nubaria				
Host	Grapevine				
n	10♀♀	3♂♂	4 J1	9 J2	15 J3
L (mm)	4.1±0.29 (3.8-4.7)	3.5±0.06 (3.4-3.5)	1.1±0.00 (1.1-1.1)	1.7±0.13 (1.6-1.9)	2.7±0.18 (2.3-2.9)
a	134±7.54 (119-145)	129±2.31 (126-130)	60±4.50 (55-64)	77.5±3.02 (72-82.5)	101±7.42 (87-113)
b	13.6±1.46 (12.2-16.7)	10.9±0.50 (10.4-11.4)	5.6±0.17 (5.5-5.8)	7.3±1.18 (5.1-8.6)	9.7±0.94 (7.9-11.3)
c	113±7.61 (100-121)	105±10.97 (99-118)	32±2.00 (29-33)	47±4.09 (41-52)	69±4.23 (63-79)
c'	1.8±0.13 (1.6-2.0)	1.4±0.12 (1.3-1.5)	3.1±0.22 (2.9-3.4)	2.6±0.17 (2.3-2.8)	2.3±0.12 (2-2.5)
V	51±1.32 (49-54)	–	–	–	–
Odontostyle µm	73±1.62 (71-75)	74±1.15 (73-75)	46±0.50 (45-46)	52±3.12 (49-59)	63±2.47 (57-66)
Odontophore µm	45±1.42 (42-47)	46±3.51 (43-50)	31±1.71 (29-33)	36±2.55 (34-40)	41±1.51 (39-43)
Replacement odontostyle µm	–	–	51±1.50 (50-53)	63±3.54 (60-71)	74±2.70 (69-77)
Oral aperture to guide ring µm	39±1.55 (37-41)	41±0.58 (40-41)	24±1.50 (22-25)	30±1.36 (29-33)	34±1.36 (32-37)
Tail µm	37±3.58 (32-43)	35±5.13 (29-39)	34±2.5 (33-38)	37±1.64 (34-39)	38±2.60 (34-43)
J (hyalin portion of tail) µm	4±1.07 (3-6)	3±0.00 (3-3)	2±0.50 (2-3)	3±0.44 (2-3)	3±0.46 (2-3)
Body diam. at lip region µm	10±0.42 (10-11)	10±0.00 (10-10)	7±0.00 (7-7)	8±0.53 (8-9)	9±0.35 (9-10)
Body diam. at guide ring µm	16±0.74 (15-17)	17±0.58 (16-17)	11±0.00 (11-11)	13±0.33 (12-13)	14±0.49 (14-15)
Body diam. at base of oesophagus µm	26±1.36 (24-29)	23±0.58 (23-24)	15±0.00 (15-15)	20±1.64 (18-23)	23±1.06 (21-24)
Body diam. at mid-body or vulva µm	31±3.20 (27-39)	27±0.00 (27-27)	18±1.50 (17-20)	23±1.86 (21-26)	26±1.40 (25-29)
Body diam. at anus µm	20±1.16 (19-22)	23±0.58 (22-23)	11±0.50 (10-11)	14.5±1.24 (13-17)	17±1.03 (16-19)
Body diam. at beginning of J µm	7.5±1.08 (6-9)	7±1.15 (6-8)	3±0.50 (3-4)	5±0.83 (4-6)	6±0.59 (5-7)
Spicules µm	–	41±2.89 (38-43)	–	–	–
Guiding piece µm	–	12±0.58 (11-13)	–	–	–

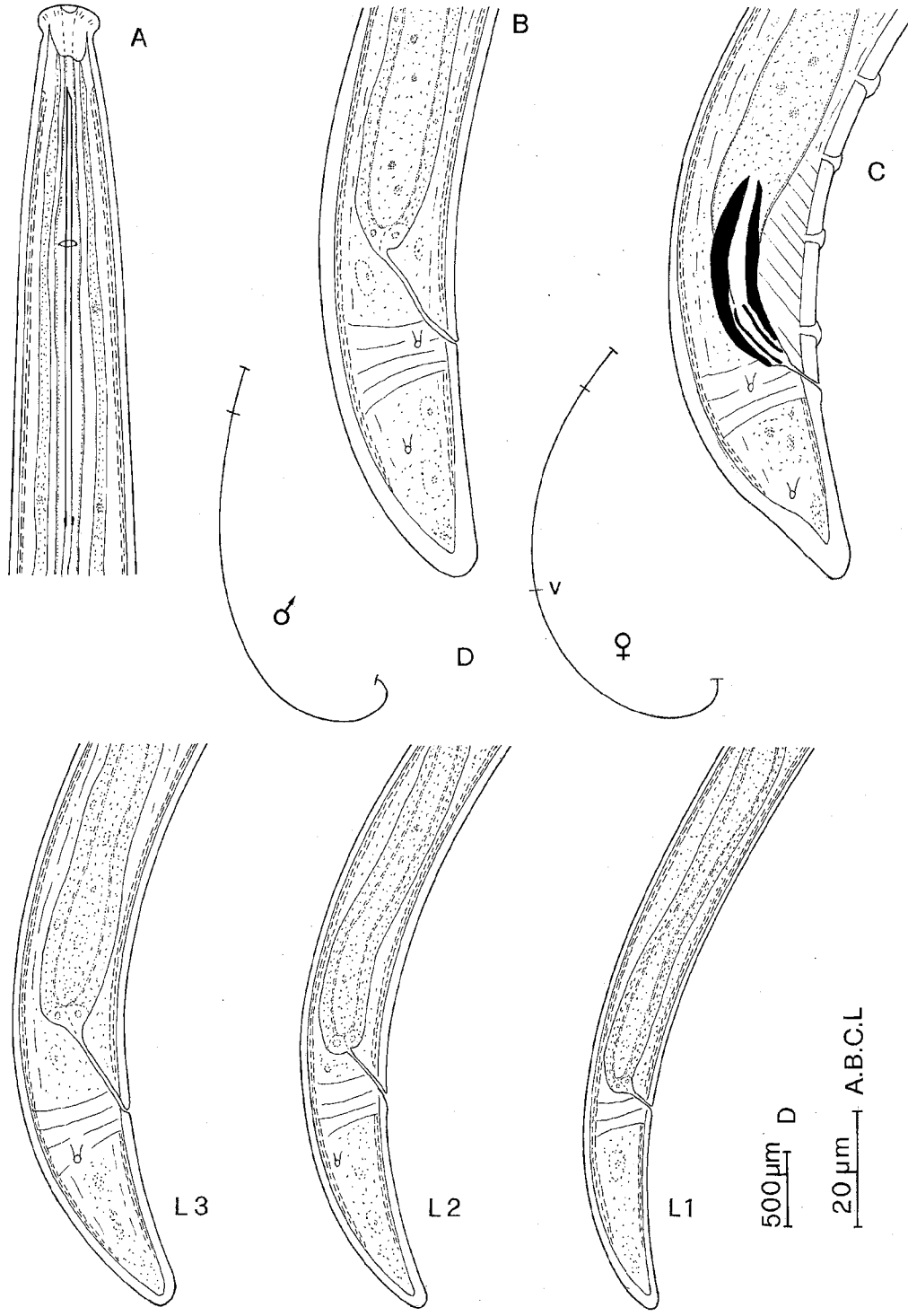

Fig. 5 - *L. latocephalus* from Egypt: A, female anterior region; B, female posterior region; C, male posterior region; D, habitus; L3-L1, posterior region of 3rd, 2nd and 1st juvenile stages, respectively.

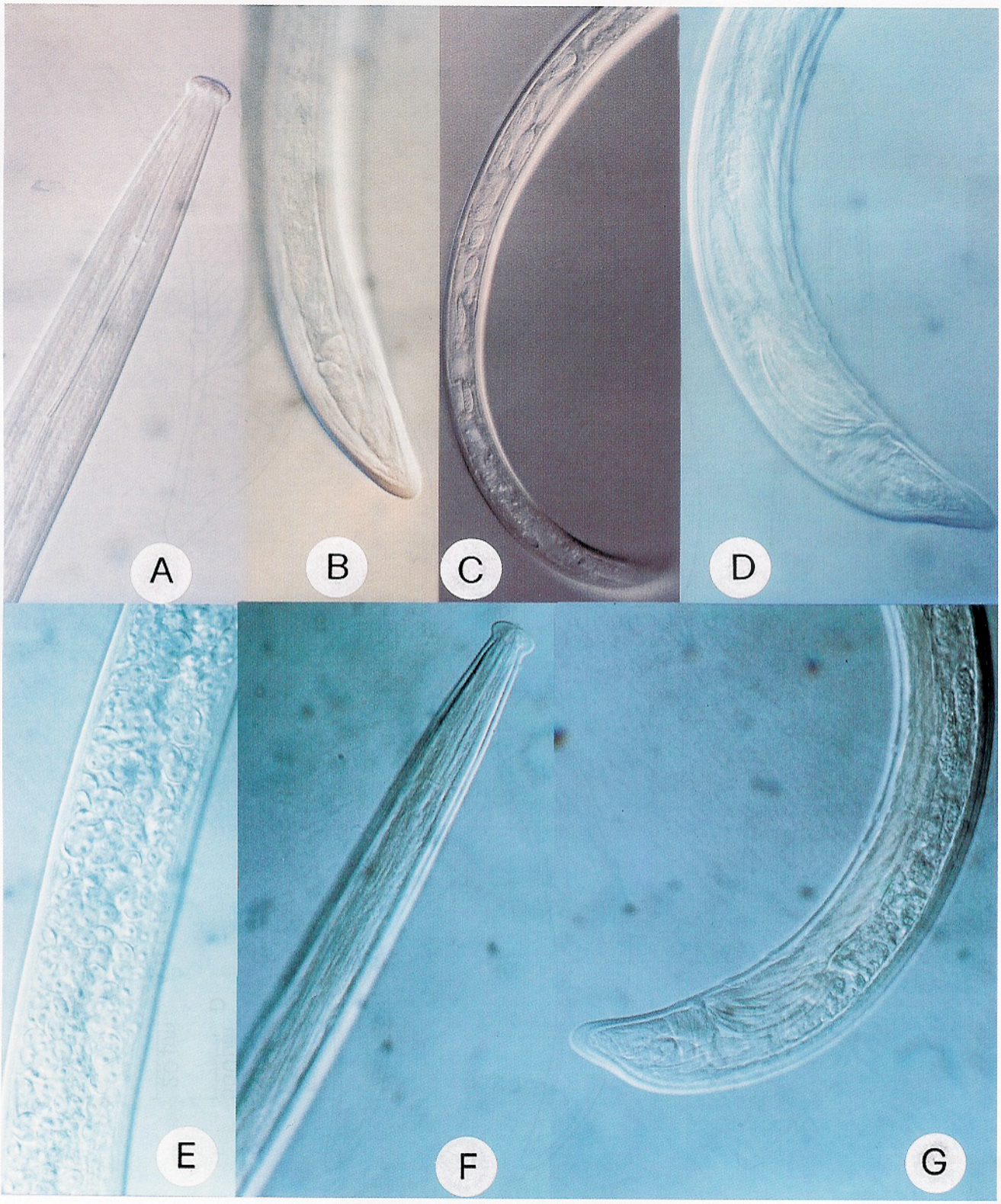

Fig. 6 - Photomicrographs of *L. latocephalus* from Egypt (A-E) and Bulgaria (F, G): A, female anterior region; B, female posterior region; C, globules in the prerectum region; D, male posterior region; E, female body invaded by *Pasteuria* sp.; F, anterior region of a topotype male; G, posterior region of a topotype male.

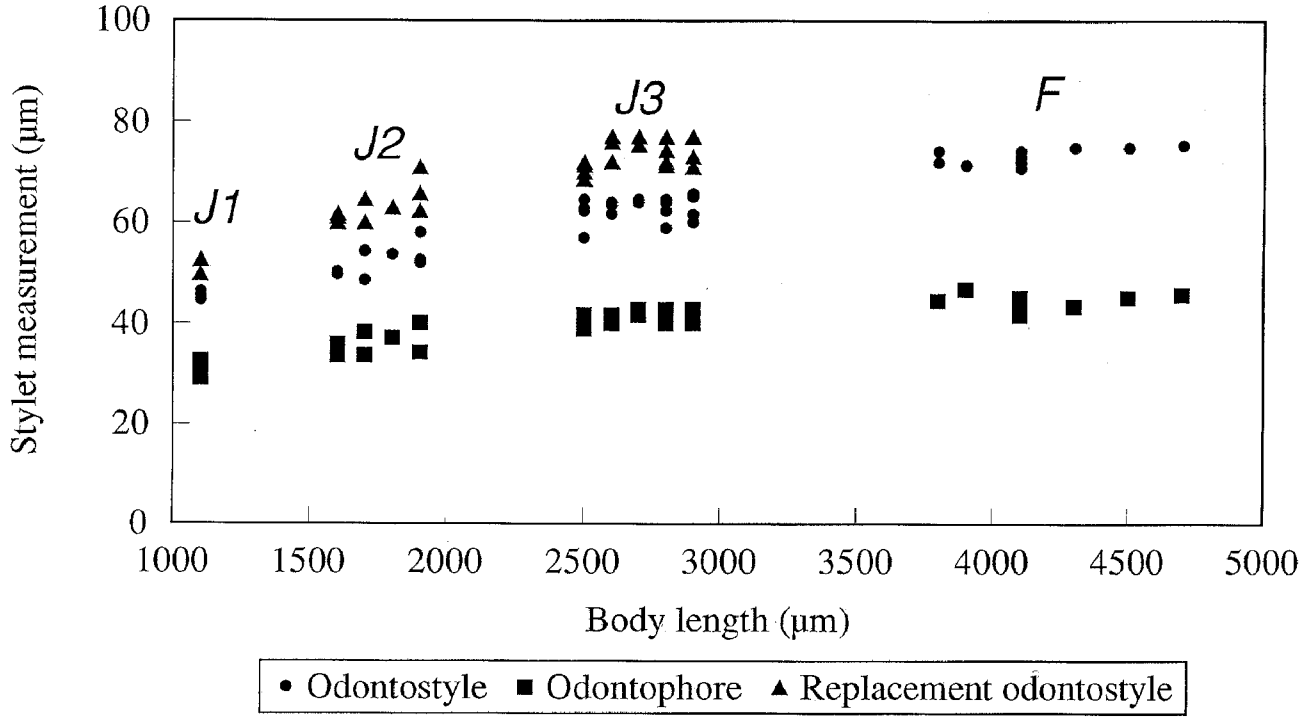

Fig. 7 - Scatter diagram separating juveniles and adult females of *L. latocephalus* from Egypt.

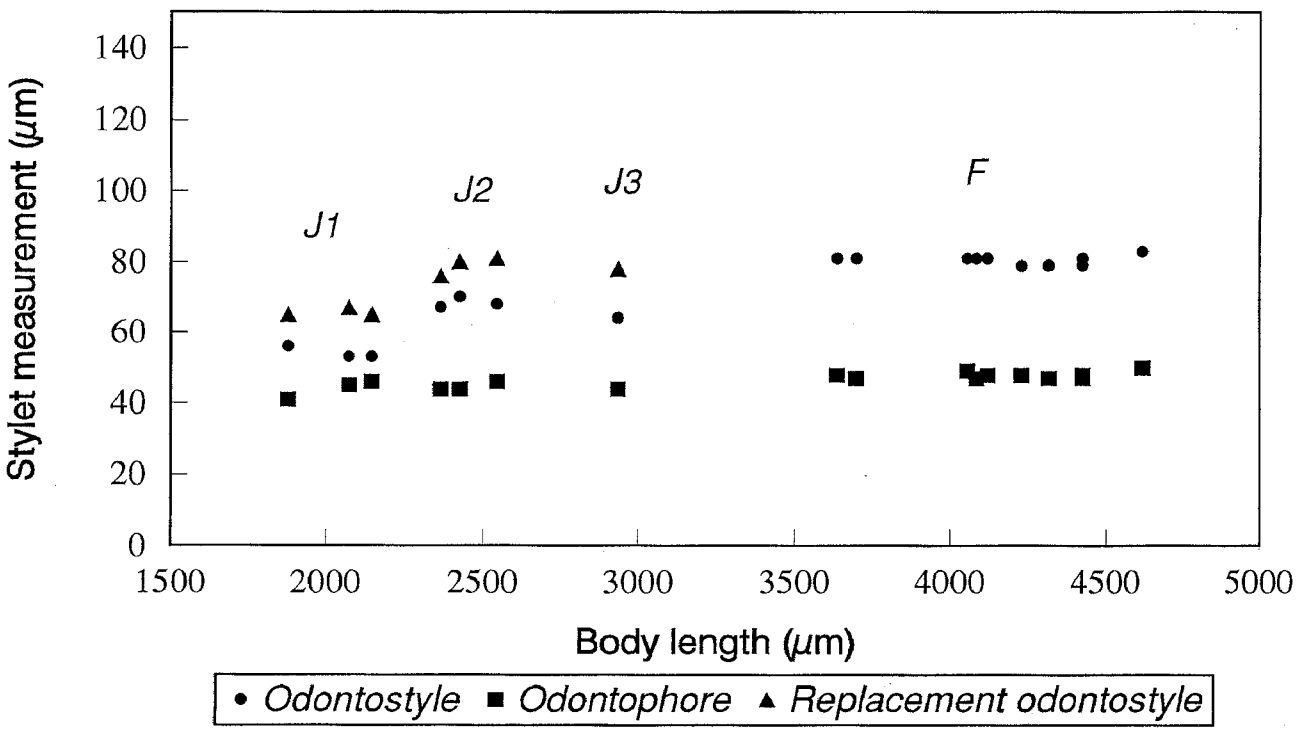

Fig. 8 - Scatter diagram separating juveniles and adult females of *L. latocephalus* from Bulgaria (paratypes and topotypes).

while for *L. pisi* four are reported (Edward *et al.*, 1964).

These considerations, together with the fact that the spear guide ring of the type and the African populations is posteriorly situated (more than 35 µm from the oral aperture) compared to most populations of *Longidorus* species (generally around 30 µm or less) and including paratypes of *L. pisi* (in which it is 32 µm according to Brown *et al.*, 1982), suggest that all the African populations previously identified as *L. pisi* are indeed *L. latocephalus.*

PARALONGIDORUS ERRIAE Heyns, 1965
(Table IV; Fig. 9)

Three females and one male *Paralongidorus erriae* were found in the rhizosphere of grapevine (*V. vinifera*) at Nubaria.

The females have a slender body, tapering gradually towards the anterior extremity and assume a very open C posture when killed. Lip region hemi-elliptical, separated by constriction from the rest of the body. Amphids pouch-like slightly bilobed posteriorly, with wide aperture. Odontostyle, odontophore and guide ring typical of the genus. Vulva at mid-body, vagina occupying 2/3 of the corresponding body diameter, genital system amphidelphic with two equally developed branches and reflexed ovaries. No sperms were visible in the uteri. Tail broadly conoid, dorsally curved and ventrally flat, with rounded terminus.

Male similar to females with robust spicules, slightly bent ventrally. Testis not functional, degenerate. The adanal pair of supplements preceded by a single row of eight papillae.

The Egyptian specimens of *P. erriae* are very similar to those from South Africa (Liebenberg

TABLE IV - *Morphometric characters* of Paralongidorus erriae *from Egypt.*

Locality	Nubaria		Locality	Nubaria	
Host	Grapevine		Host	Grapevine	
n	3 ♀♀	1 ♂	Tail µm	33±1.63 (31-35)	34
L (mm)	4.4±0.37 (3.9-4.8)	4.7	J (hyalin portion of tail) µm	7±0.33 (6-7)	6
a	130±7.59 (120-138)	127	Body diam. at lip region µm	11±0.00 (11-11)	11
b	12.5±0.76 (11.8-13.5)	11.3	Body diam. at guide ring µm	19±1.25 (18-21)	19
c	133±6.18 (124-138)	137	Body diam. at base of oesophagus µm	30±0.47 (30-31)	33
c'	1.4±0.05 (1.3-1.4)	1.3	Body diam. at vulva µm	34±1.41 (33-36)	37
V	49.5±0.47 (49-50)	–	Body diam. at anus µm	25±1.25 (23-26)	27
Odontostyle µm	63±1.63 (61-65)	62	Body diam. at beginning of J µm	13±1.25 (11-14)	10
Odontophore µm	44±2.94 (41-48)	43	Spicules µm	–	49
Oral aperture to guide ring µm	26.5±0.47 (26-27)	27			

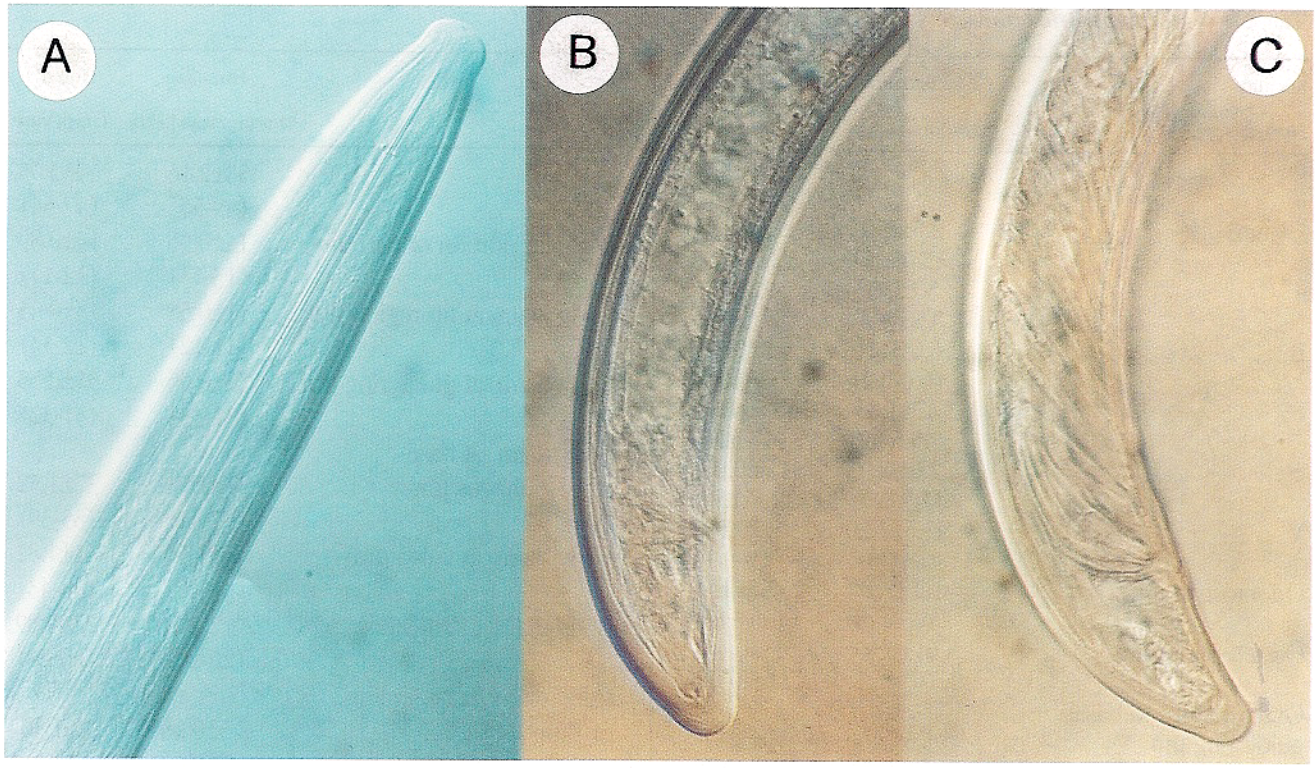

Fig. 9 - Photomicrographs of *Paralongidorus erriae* from Egypt: A, female anterior region; B, female posterior region; C, male posterior region.

et al., 1993), but differ in having higher a and c' values and a longer odontophore. Moreover, the amphids which are drawn as stirrup shaped in the descriptions from South Africa, seem to be pouch-like with bilobed base in the Egyptian specimens.

XIPHINEMA ELONGATUM Schuurmans Stekhoven *et* Teunissen, 1938
(Table V; Fig. 10)

Specimens of *Xiphinema elongatum* were found at Ismailia (El-Smalia Governorate) in the rhizosphere of onion (*Allium cepa* L.) and strawberry (x *Fragaria vesca* L.) and at Nubaria in the rhizosphere of grapevine (*V. vinifera* L.).

Females have a stout body, tapering towards the extremities and assuming an open C posture when killed. Lip region hemi-elliptical, separated from the rest of the body by a constriction. Amphids stirrup shaped with wide slit-like aperture. Odontostyle robust, odontophore well flanged, guiding sheath typical of the genus. Vulva anterior to mid-body, vagina with well cuticularized walls occupying 1/2 of the corresponding body diameter. Genital system amphidelphic with both branches functional, but the posterior one slightly more developed than the anterior; no sperms visible in the uteri; ovaries reflexed. Tail elongate, conical, dorsally curved and ventrally flat, with pointed, subdigitate terminus.

No males were found.

Compared to the holotype (Tarjan and Luc, 1963), the Egyptian specimens of *X. elongatum* are larger in size, have longer odontostyle and posterior vulva (V = 40 in holotype), but com-

TABLE V - *Morphometric characters* of Xiphinema elongatum *from Egypt.*

Locality	Ismailia	Nubaria
Host	Onion, Strawberry	Grapevine
n	4♀♀	5♀♀
L (mm)	2.5±0.08 (2.4-2.6)	2.4±0.11 (2.3-2.5)
a	56±0.00 (56-56)	59±1.66 (57.5-61)
b	6.0±0.10 (6.0-6.2)	6.2±0.42 (5.7-6.8)
c	47±1.65 (45.5-49)	48.5±1.86 (47-52)
c'	2.0±0.10 (1.9-2.1)	1.8±0.05 (1.8-1.9)
V	45.5±1.00 (44-46)	44±0.55 (43-44)
Odontostyle µm	109±3.86 (105-114)	107.5±1.79 (106-110)
Odontophore µm	61±0.50 (61-62)	63±0.45 (63-64)
Oral aperture to basal guide ring µm	95.5±5.60 (91-102)	99±2.17 (97-104)
Tail µm	53±2.16 (49-55)	49±2.95 (47-54)
J (hyalin portion of tail) µm	14±0.96 (13-15)	13±0.89 (12-14)
Body diam. at lip region µm	11±0.58 (11-12)	13±0.45 (12-13)
Body diam. at guide ring µm	32±0.96 (31-33)	31±0.55 (31-32)
Body diam. at base of oesophagus µm	39±1.71 (37-41)	37±1.52 (35-39)
Body diam. at vulva µm	44±1.50 (43-46)	41±1.82 (38-43)
Body diam. at anus µm	26.5±0.58 (26-27)	27±0.89 (26-28)
Body diam. at beginning of J µm	8.5±0.96 (8-10)	8±1.30 (7-10)

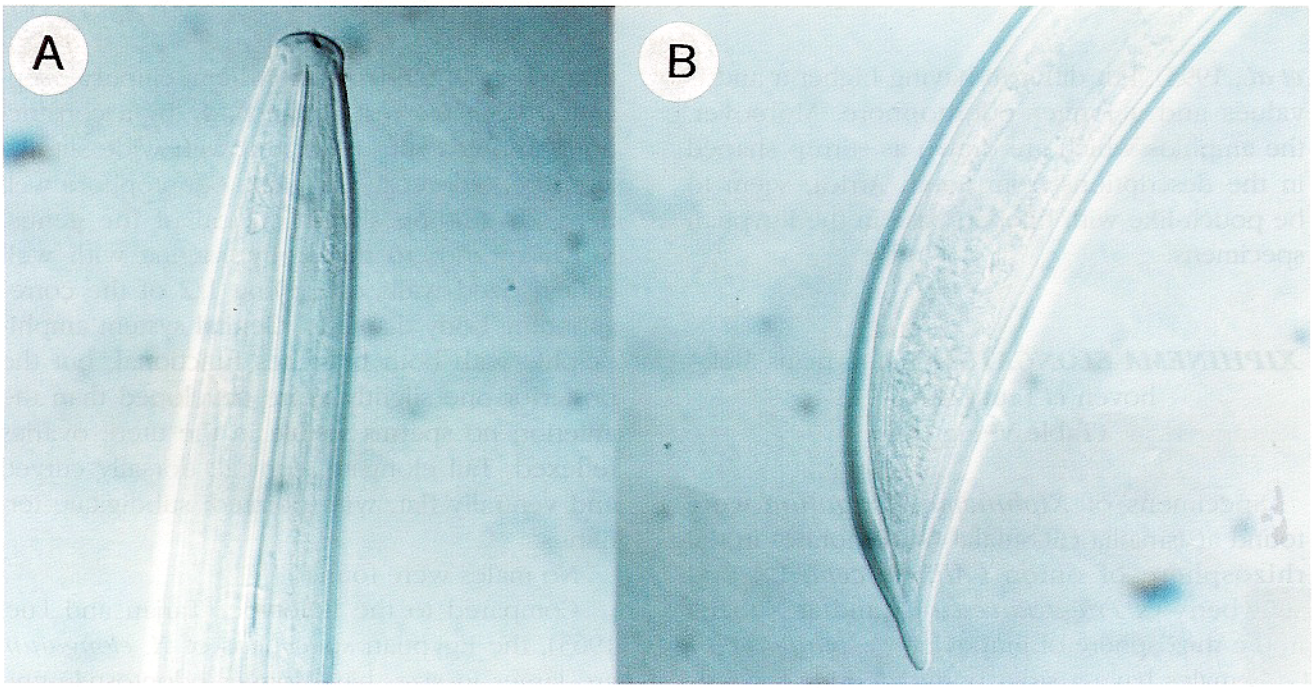

Fig. 10 - Photomicrographs of *Xiphinema elongatum* from Egypt: A, female anterior region; B, female posterior region.

pared to South African populations (Heyns, 1974) they have higher values of a and c, lower value of c', posterior vulva, longer odontostyle and posteriorly situated basal guide ring. Luc and Southey (1980) studied the variability of morphometric characters of 22 populations of *X. elongatum*, 17 of which were from various African regions. All of them, except those from Zimbabwe and one population from Mauritius, had a shorter body; all of them, except populations from Nigeria, Zimbabwe, Madagascar and Mauritius had a longer tail; all of them, except populations from Nigeria, two populations from Zimbabwe, one from Zambia, one from Madagascar and two from Mauritius, had an anteriorly situated vulva; all of them, except populations from Nigeria, Zimbabwe, Madagascar and two from Mauritius had a shorter odontostyle. The small body size (more or less 2 mm) is also reported for a population from Sudan (Zeidan and Coomans, 1989), whereas populations from Cameroon had a longer body but shorter odontostyle (Sakwe and Coomans, 1993). Compared to specimens from Indian Ocean Islands (Heyns and Coomans, 1992), *X. elongatum* from Egypt has a longer body, odontostyle and odontophore, shorter tail and posterior vulva.

XIPHINEMA HYGROPHILUM

Southey *et* Luc, 1973
(Table VI; Fig. 11)

Specimens of *X. hygrophilum* were found in the rhizosphere of mango trees (*Mangifera indica* L.) at Ain Kozin (El Smailia Governorate).

Female body very stout, tapering gradually towards the anterior extremity and assuming a J posture when killed. Lip region continuous with the body, amphids large, stirrup-shaped, with a very wide aperture. Odontostyle robust, odontophore well flanged, guiding sheath typical of the genus. Vulva anterior, vagina occupying from 1/2 to 2/3 of the corresponding body diameter, genital system pseudo-didelphic, with the anterior branch reduced in size and the

TABLE VI - *Morphometric characters* of Xiphinema hygrophilum *from Egypt*

Locality Host	Ain Kozin Mango	Locality Host	Ain Kozin Mango
n	4 ♀♀	Oral aperture to basal guide ring µm	141.5±2.65 (139-145)
L (mm)	2.1±0.13 (1.9-2.2)	Tail µm	21±0.50 (20-21)
a	36±2.06 (34-39)	J (hyalin portion of tail) µm	9±0.50 (9-10)
b	4.6±0.34 (4.1-4.9)	Body diam. at lip region µm	16±1.15 (15-17)
c	99.5±3.67 (95-104)	Body diam. at guide ring µm	47±2.16 (45-50)
c'	0.6±0.06 (0.5-0.6)	Body diam. at base of oesophagus µm	53±3.20 (50-56)
V	35±2.06 (33-37)	Body diam. at vulva µm	57±4.35 (53-61)
Odontostyle µm	160±9.54 (150-173)	Body diam. at anus µm	40±3.77 (36-43)
Odontophore µm	77±1.89 (74-78)	Body diam. at beginning of J µm	31±3.59 (26-34)

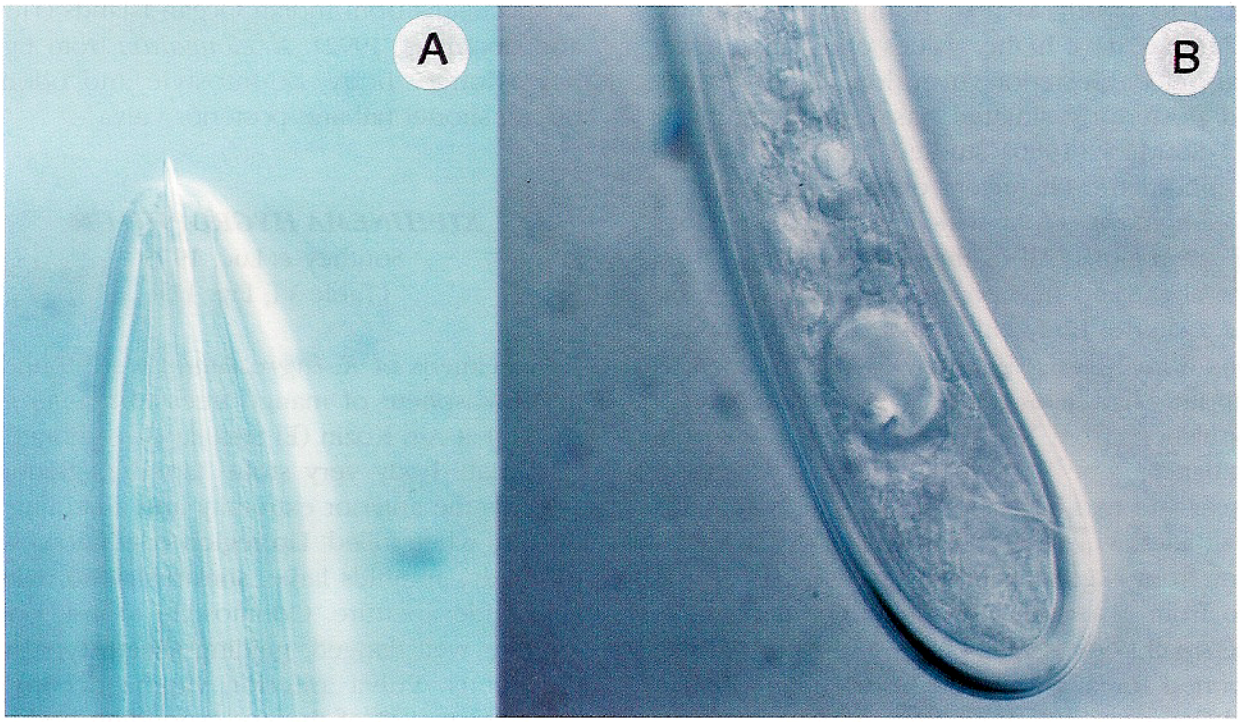

Fig. 11 - Photomicrographs of *X. hygrophilum* from Egypt: A, female anterior region; B, female posterior region.

ovary less developed (sometimes rudimentary) than the posterior one; ovaries reflexed. Tail hemispherical.

Males were not found.

Compared to the type population (Southey and Luc, 1973) the Egyptian specimens of *X. hygrophilum* generally have a larger body, with anterior vulva and longer odontostyle and compared to a population from Israel (Cohn and Sher, 1972, according to Southey and Luc, 1973) have a longer body and odontostyle, but almost equal V value.

XIPHINEMA INCOGNITUM

Lamberti *et* Bleve-Zacheo, 1979
(Table VII; Figs 12-15)

Xiphinema incognitum occurred at Nubaria in the rhizosphere of fig trees (*Ficus carica* L.).

Female body stout, tapering gradually towards the anterior extremity, and assuming a more or less open C posture when killed. Lip region laterally rounded, separated from the rest of the body by a constriction. Amphids stirrup shaped with slit-like aperture. Odontostyle robust, odontophore well flanged, guiding sheath typical of the genus. Vulva slightly posterior to mid-body, vagina occupying 1/2 of the corresponding body diameter, genital system amphidelphic with two equally developed branches; very large ovaries, reflexed. Tail conoid, dorsally curved and ventrally flat with rounded terminus.

Juvenile stages probably separate into four stages (Fig. 14). Actually, juvenile stages form a continuous line to adult female, with none clear cut except for the first stage, while in a South African population (Fig. 15) from Bergendal, Western Cape Province (Lamberti *et al.*, 1995b),

TABLE VII - *Morphometric characters* of Xiphinema incognitum *from Egypt.*

Locality	Nubaria				
Host		Fig			
n	15♀♀	7 J1	7 J2	10 J3	15 J4
L (mm)	1.9±0.11 (1.7-2.1)	0.7±0.00 (0.7-0.7)	0.9±0.05 (0.9-1.0)	1.2±0.07 (1.1-1.3)	1.5±0.08 (1.4-1.6)
a	48±2.30 (43-50)	34±1.11 (32-35)	37±1.51 (35-39)	38.5±3.03 (34-44)	44±1.56 (41.5-47)
b	5.9±0.42 (5.5-6.7)	3.8±0.25 (3.5-4.2)	4.2±0.30 (4.0-4.7)	4.7±0.31 (4.2-5.2)	5.1±0.33 (4.7-6.1)
c	68±5.15 (59-78)	20±0.73 (19-21.5)	27±1.73 (25-30)	35±2.22 (32-39)	45±4.86 (36.5-54)
c'	1.0±0.05 (1.0-1.1)	2.6±0.11 (2.4-2.7)	2.1±0.15 (2.0-2.4)	1.8±0.17 (1.6-2.1)	1.5±0.15 (1.3-1.8)
V	52±1.23 (50-53)	–	–	–	–
Odontostyle µm	89±2.28 (85-93)	43±3.02 (40-48)	49±2.19 (47-53)	62±5.25 (50-69)	73±2.91 (70-80)
Odontophore µm	52±1.70 (50-55)	30±1.00 (29-32)	34±0.76 (33-36)	38±2.00 (35-41)	44±2.73 (41-50)
Replacement odontostyle µm	–	50±2.34 (47-53)	64±1.35 (63-66)	74±2.92 (71-80)	88.5±2.77 (83-93)
Oral aperture to basal guide ring µm	79±3.02 (75-87)	34±1.15 (33-36)	42±1.75 (40-45)	52±3.48 (45-57)	62±3.76 (55-69)
Tail µm	28±1.42 (25-30)	35±1.62 (33-38)	34±1.68 (32-37)	33±1.81 (31-37)	32±2.15 (30-37)
J (hyalin portion of tail) µm	7.0±0.68 (6-9)	5±0.79 (4-6)	6±0.90 (5-7)	6±0.33 (6-7)	7±1.00 (6-9)
Body diam. at lip region µl	13±0.35 (12-13)	8±0.38 (7-8)	9±0.38 (9-10)	10±0.50 (9-11)	11±0.58 (10-12)
Body diam. at guide ring µm	29.5±1.30 (26-32)	16±0.95 (15-17)	19±0.38 (19-20)	22±1.76 (19-25)	25±1.46 (22-26)
Body diam. at base of oesophagus µm	35±1.73 (32-38)	19±0.90 (18-20)	23±1.13 (22-25)	27±1.94 (24-30)	30±1.83 (27-33)
Body diam. at mid-body or vulva µm	39.5±2.45 (35-44)	21±0.69 (20-22)	25±1.11 (23-27)	29±2.60 (26-34)	33±2.08 (30-36)
Body diam. at anus µm	27±1.85 (24-30)	13±0.49 (13-14)	16±0.95 (15-17)	19±1.87 (16-22)	23±2.71 (20-31)
Body diam. at beginning of J µm	13±1.42 (11-17)	5±0.69 (4-6)	6±0.76 (5-7)	7±0.50 (6-7)	9±1.29 (7-11)

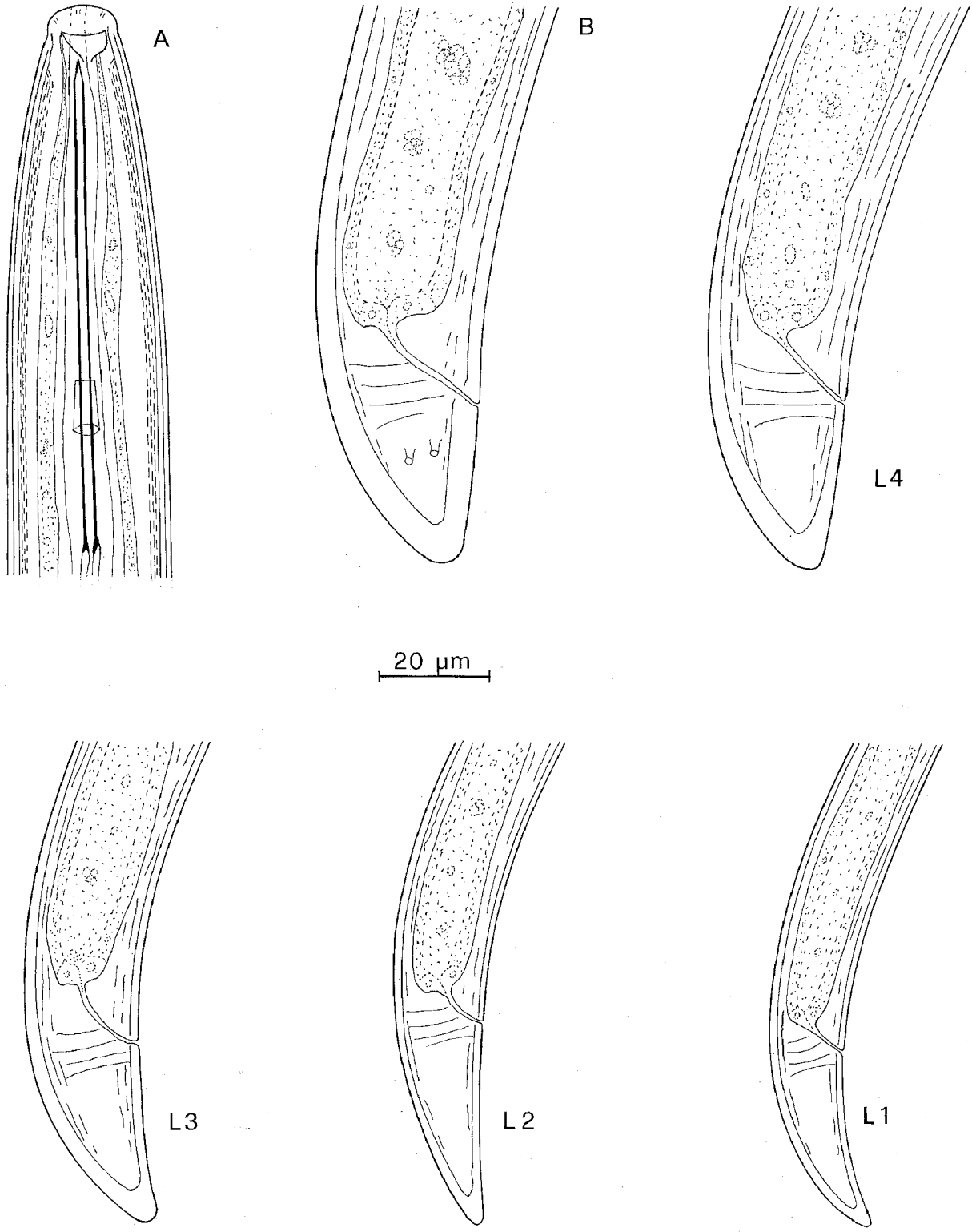

Fig. 12 - *X. incognitum* from Egypt: A, female anterior region; B, female posterior region; L4-L1, posterior region of 4th, 3rd, 2nd and 1st juvenile stages, respectively.

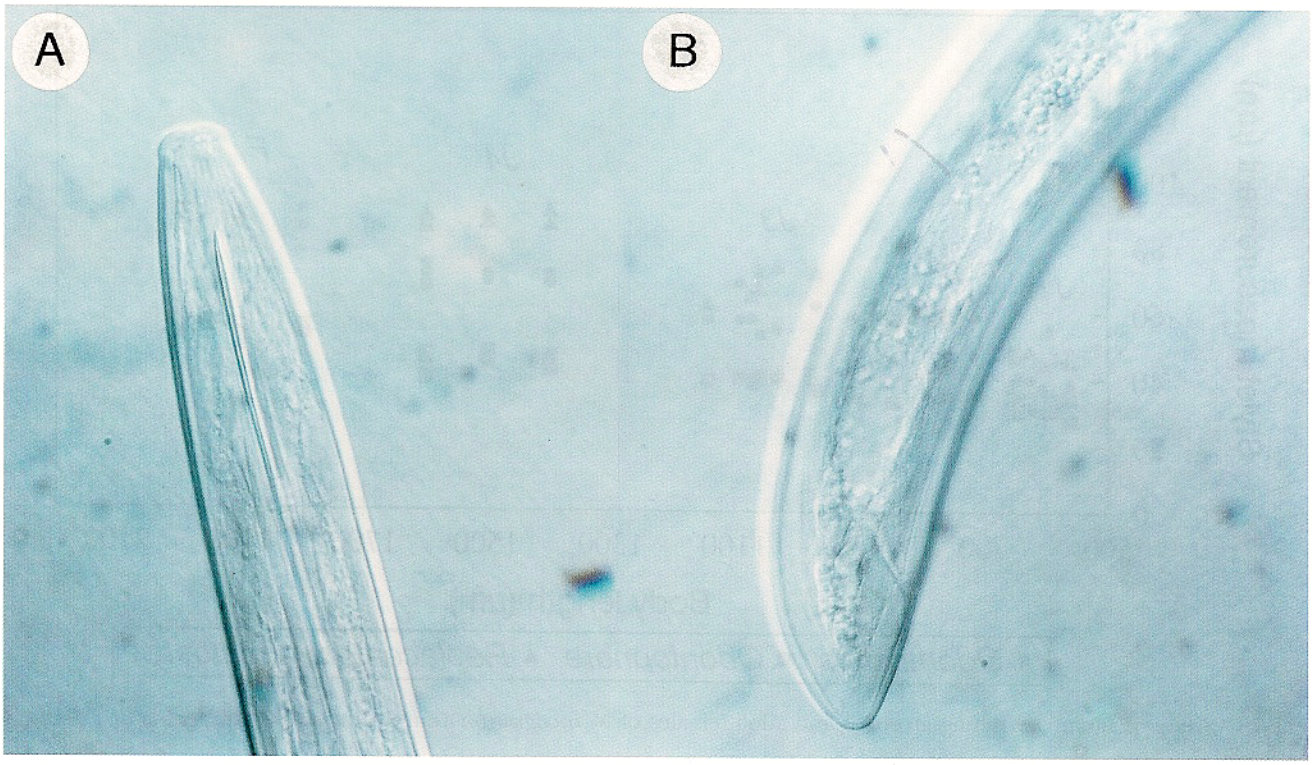

Fig. 13 - Photomicrographs of *X. incognitum* from Egypt: A, female anterior region; B, female posterior region.

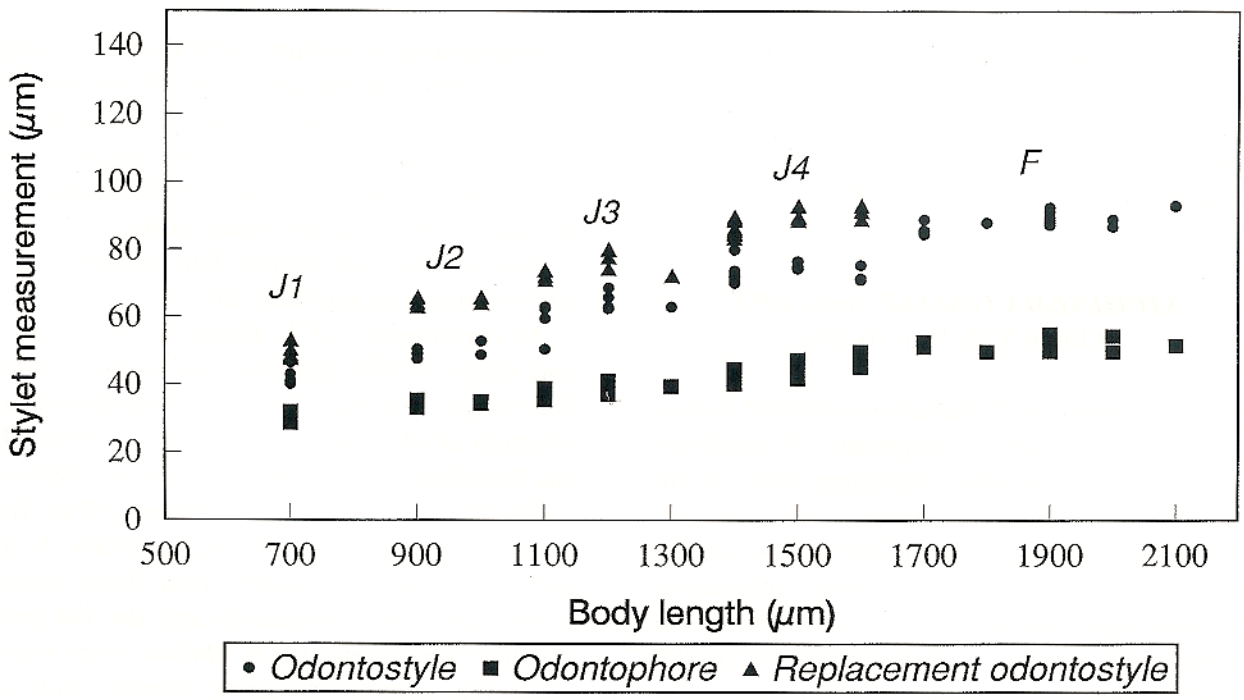

Fig. 14 - Scatter diagram separating juveniles and adult females of *X. incognitum* from Egypt.

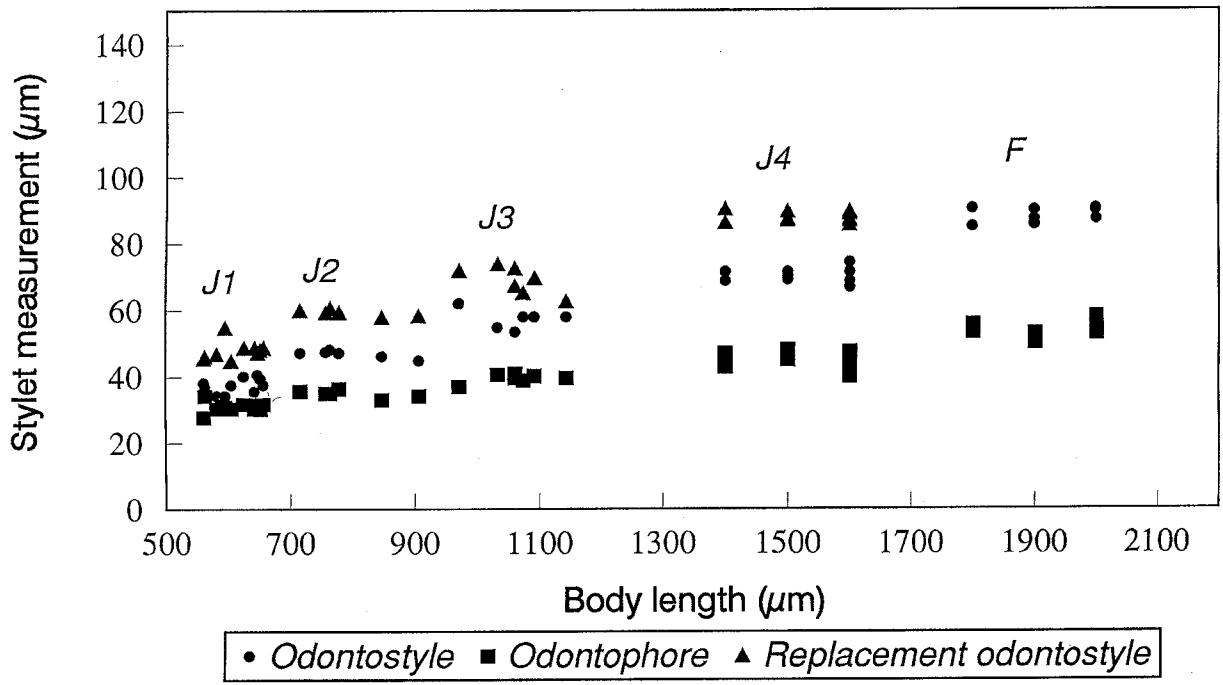

Fig. 15 - Scatter diagram separating juveniles and adult females of *X. incognitum* from South Africa (Lamberti *et al.* 1995b).

the most isolated and the least variable seems to be the fourth stage.

The Egyptian population of *X. incognitum* is almost morphometrically identical to the type (Lamberti and Bleve-Zacheo, 1979).

XIPHINEMA ITALIAE Meyl, 1953
(Table VIII; Figs 16-18)

A population of *X. italiae* occurred at Nubaria, in the rhizosphere of grapevine (*V. vinifera*).

Female body slender, tapering towards the extremities, assuming an open C to J posture when killed. Lip region hemi-elliptical, separated from the rest of the body by a deep constriction. Amphids large, stirrup shaped, with wide slit-like aperture. Odontostyle, odontophore and guiding sheath typical of the genus. Vulva anterior to mid-body, vagina occupying 1/2 of the body corresponding diameter, genital system amphidelphic with equally developed branches, ovaries reflexed. Tail conoid elongate, dorsally convex and ventrally concave, with pointed terminus. Granular structures are visible in the hypodermal cords along the whole body.

Males were not found. The juveniles separate into three stages (Fig. 18).

Morphometrics of *X. italiae* are very variable and those of the Egyptian population fall into the range reported for other Mediterranean (Martelli *et al.*, 1966; Lamberti *et al.*, 1996), Italian (Lamberti *et al.*, 1985; Roca *et al.*, 1991) and South African populations (Heyns, 1974). However, according to Martelli *et al.*, (1966), *X. italiae* has four juvenile stages (only three detected in the Egyptian population) and the tail profile of most specimens of *X. italiae* from regions other than Egypt are more slender and taper more gradually.

TABLE VIII - *Morphometric characters* of Xiphinema italiae *from Egypt.*

Locality	Nubaria			
Host	Grapevine			
n	15♀♀	1 J1	9 J2	12 J3
L (mm)	3.0±0.15 (2.8-3.2)	1.3	1.7±0.12 (1.5-1.8)	2.1±0.11 (2.0-2.3)
a	86.5±2.78 (82-91)	51	61±1.87 (57-62)	70.5±3.03 (66-74)
b	8.0±0.27 (7.5-8.6)	5.1	5.9±0.64 (5.0-6.9)	6.1±0.33 (5.7-6.6)
c	45±2.75 (40-50)	23	25±1.45 (23-28)	32±2.96 (27.5-39)
c'	3.1±0.16 (2.7-3.3)	4.1	3.9±0.27 (3.4-4.3)	3.4±0.16 (3.2-3.7)
V	42±1.23 (41-45)	–	–	–
Odontostyle µm	95±1.82 (91-98)	53	64±0.83 (63-65)	77±1.95 (75-81)
Odontophore µm	58±1.46 (53-59	36	43±1.59 (40-45)	51±1.45 (49-54)
Replacement odontostyle µm	–	66	78±1.66 (75-80)	96±1.98 (94-99)
Oral aperture to basal guide ring µm	84±2.26 (80-87)	45	57±1.80 (54-60)	70±2.19 (66-73)
Tail µm	67±4.39 (57-73)		67±2.85 (61-71)	68±4.34 (60-74)
J (hyalin portion of tail) µm	15±1.44 (13-17)	7	10±1.12 (7-11)	11±0.51 (10-11)
Body diam. at lip region µm	11±0.00 (11-11)	9	9±0.33 (9-10)	10±0.29 (9-10)
Body diam. at guide ring µm	27±1.05 (26-30)	17	21±1.13 (19-23)	23±0.60 (22-24)
Body diam. at base of oesophagus µm	31±1.94 (25-33)	23	25±2.03 (22-28)	28±1.15 (26-30)
Body diam. at mid-body or vulva µm	35±2.08 (30-38)	26	27±2.07 (25-31)	30±0.62 (29-31)
Body diam. at anus µm	21±0.91 (19-23)	15	17±1.83 (15-20)	20±0.87 (19-21)
Body diam. at beginning of J µm	9±0.49 (8-9)	5	6±0.44 (5-6)	6±0.45 (6-7)

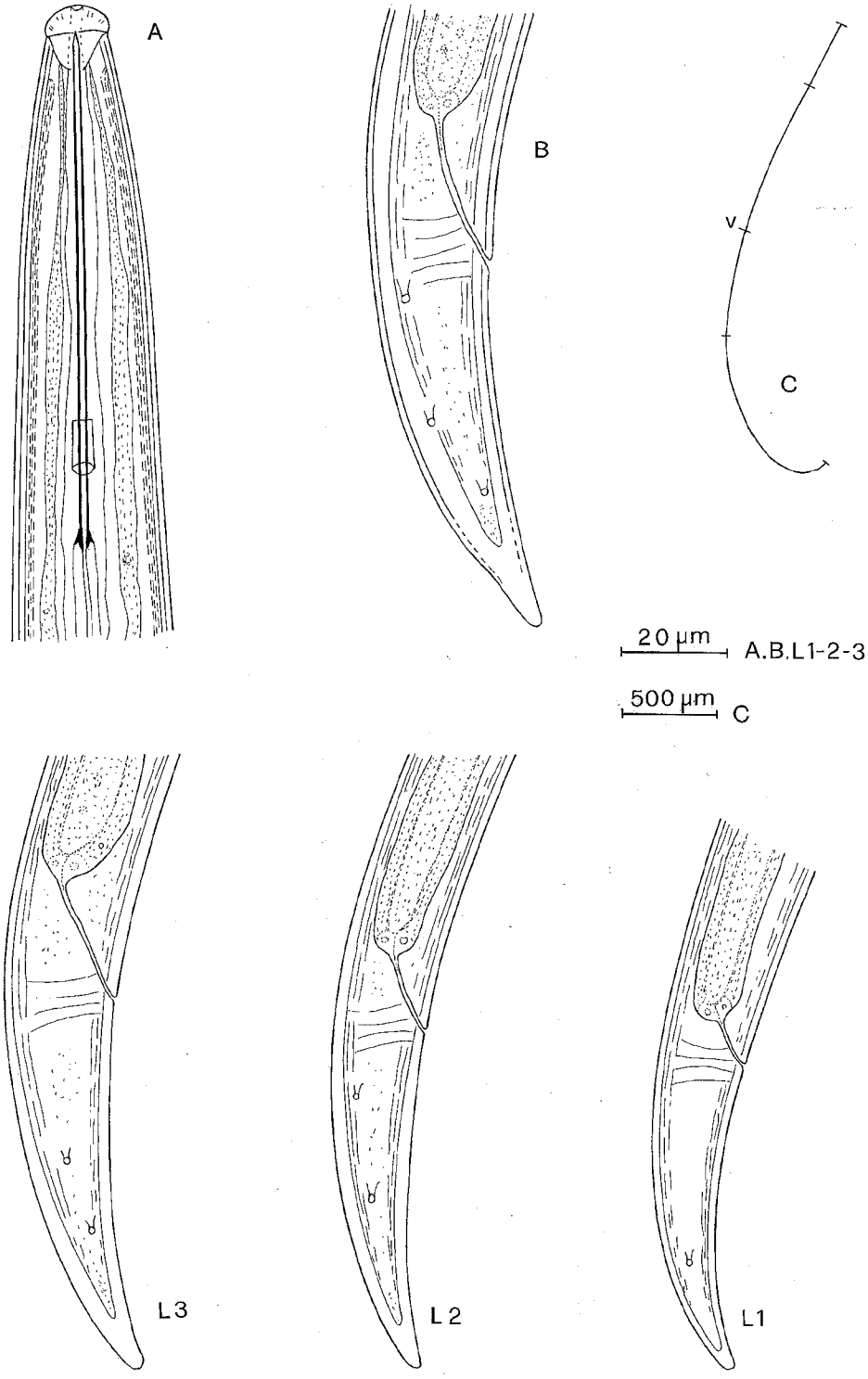

Fig. 16 - *X. italiae* from Egypt: A, female anterior region; B, female posterior region; C, female habitus; L3-L1, posterior region of 3rd, 2nd and 1st juvenile stages, respectively.

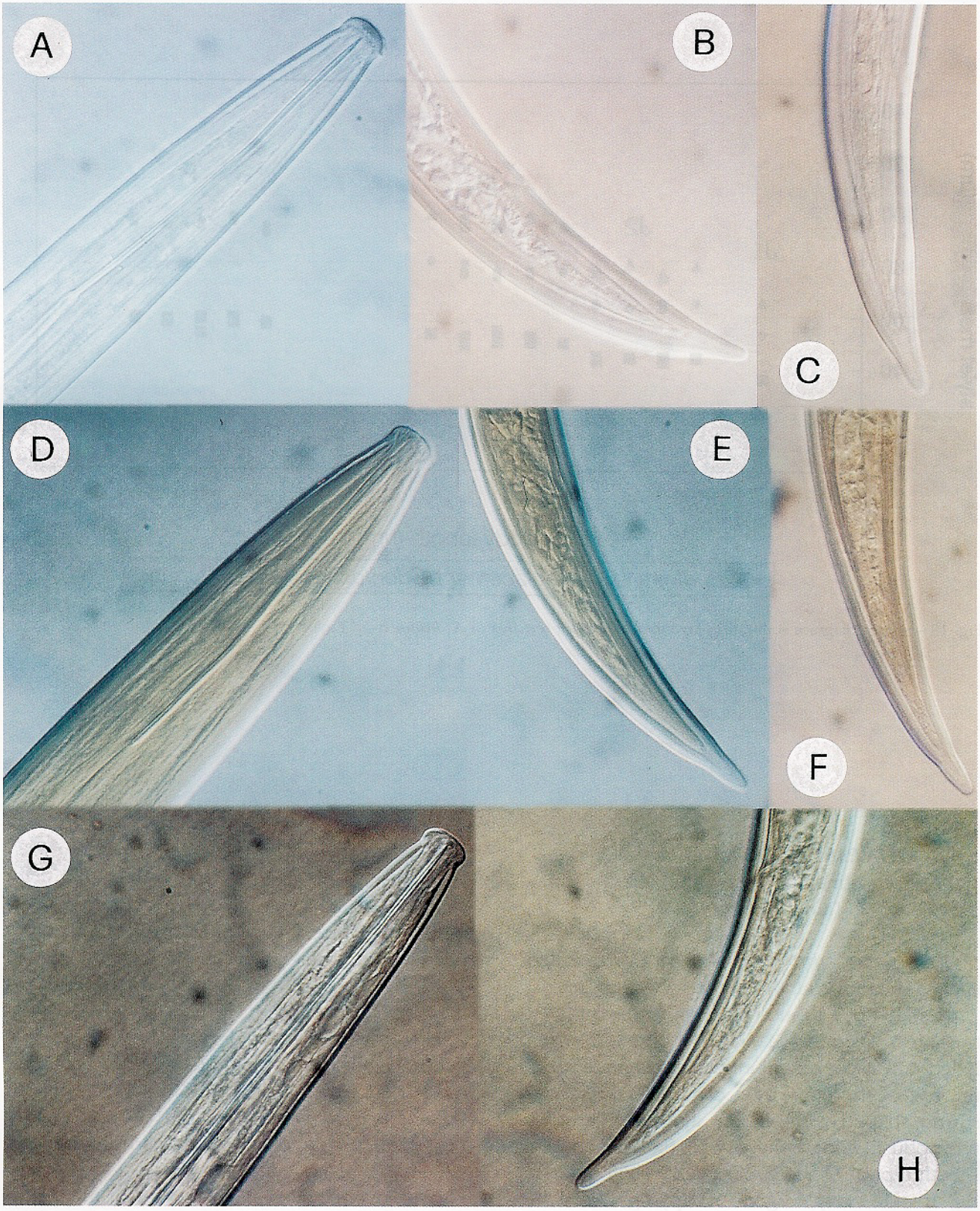

Fig. 17 - Photomicrographs of anterior and posterior regions of *X. italiae* females; A-C, Egyptian population; D-F, Italian population; G, H, Greek population (Crete).

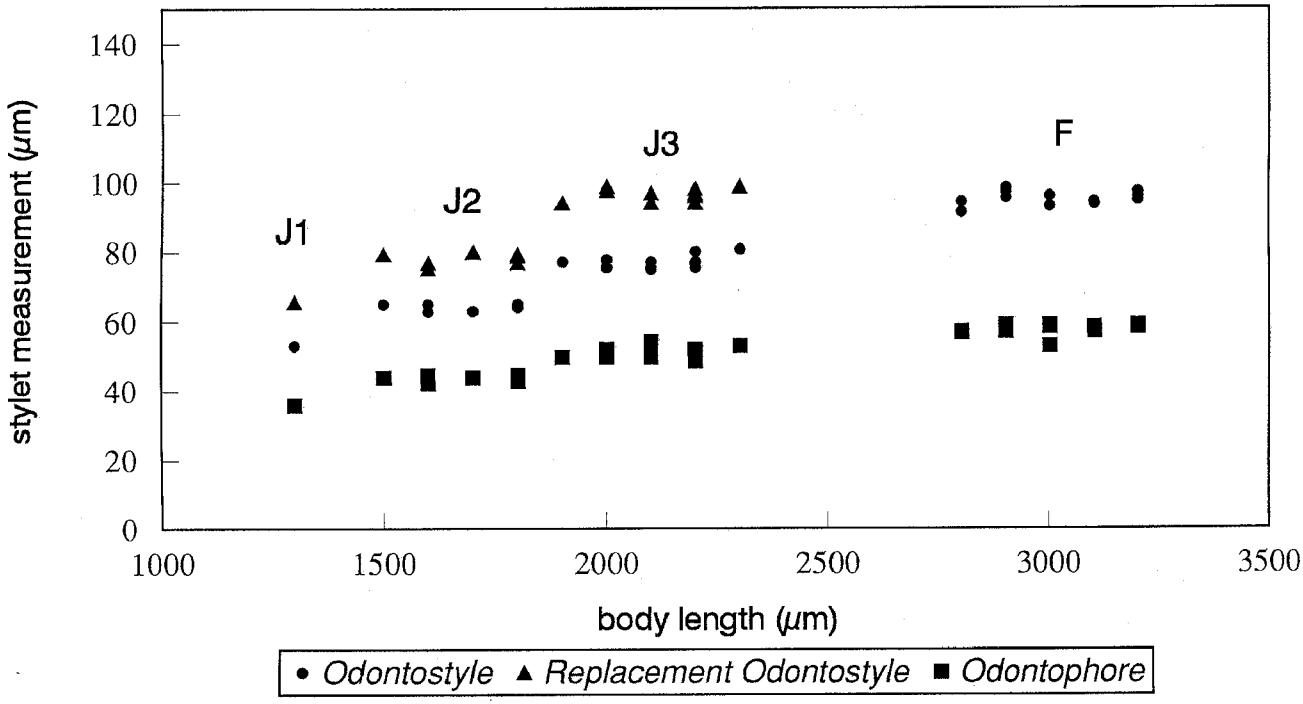

Fig. 18 - Scatter diagram separating juveniles and adult females of *X. italiae* from Egypt.

XIPHINEMA SANTOS Lamberti, Lemos, Agostinelli *et* D'Addabbo, 1995
(Table IX; Figs 19-22)

Xiphinema santos was found in the rhizosphere of grapevine (*V. vinifera*) at Nubaria.

Female body robust, tapering towards the extremities, assuming a closed C posture when killed. Lip region hemi-elliptical, separated from the rest of the body by a constriction. Amphids stirrup shaped with slit-like aperture. Odontostyle robust, odontophore well flanged, guiding sheath typical of the genus. Vulva slightly posterior to mid-body, vagina occupying 1/3 of the corresponding body diameter. Genital system amphidelphic, with equally developed branches and reflexed ovaries. Tail conoid, broadly convex dorsally and slightly concave ventrally, with pointed terminus. Along body, in the hypodermal cords, there are globules with granular appearence; they also occur in the type population from Portugal, although were not reported in the original description (Lamberti *et al.*, 1993).

Males were not found.

The Egyptian population of *X. santos* is almost identical to that from Goubeira, Portugal (Lamberti *et al.*, 1993), but the vulva is slightly posterior compared to specimens from Madeira and Azores (Lamberti et al., 1994).

The juvenile stages, as it seems in the Portuguese population (Fig. 21), separate into four groups (Fig. 22).

TABLE IX - *Morphometric characters* of Xiphinema santos *from Egypt.*

Locality	Nubaria				
Host	Grapevine				
n	22 ♀♀	10 J1	10 J2	10 J3	5 J4
L (mm)	1.9±0.10 (1.7-2.0)	0.7±0.34 (0.7-0.8)	0.95±0.39 (0.9-1.0)	1.25±0.65 (1.1-1.35)	1.6±0.04 (1.5-1.6)
a	51±2.25 (47-54)	35±3.1 (32-40)	38±1.5 (37-41.5)	43±1.9 (40-46)	46±1.52 (44-48)
b	6.5±0.38 (5.7-7.1)	4.3±0.6 (3.6-5.5)	4.8±0.5 (4.2-5.5)	5.2±0.2 (4.9-5.5)	5.4±0.36 (5.0-5.8)
c	53±2.72 (48-57)	23±2.7 (18-27)	28±1.8 (27-32)	35±2.4 (31-39)	44±1.00 (43-45)
c'	1.6±0.09 (1.5-1.8)	2.6±0.2 (2.3-2.8)	2.2±0.2 (1.9-2.5)	2.1±0.2 (1.9-2.3)	1.7±0.05 (1.7-1.8)
V	52±1.32 (49-53)	–	–	–	–
Odontostyle µm	82±1.78 (77-85)	43±1.0 (42-44)	50±1.5 (47.5-52)	62±1.8 (59-65)	70±0.45 (69-70)
Odontophore µm	47±1.35 (44-49)	30.5±0.7 (29.5-31)	35±2.1 (32-38)	40±1.6 (37-42)	41±1.48 (39-43)
Replacement odontostyle µm	–	52±2.7 (48-57)	66±2.1 (64-69)	78±2.1 (75-80)	85±4.32 (78-88)
Oral aperture to basal guide ring µm	68±1.79 (63-71)	41±3.9 (34-45)	42.5±0.8 (41-44)	54±4.1 (48-63)	58±0.84 (57-59)
Tail µm	35±1.21 (33-38)	33±3.5 (28-39)	34±2.4 (30-38)	35.5±2.8 (32-41)	36±1.34 (34-37)
J (hyalin portion of tail) µm	9±0.72 (8-11)	6±1.3 (3-8)	6±1.6 (4-9)	7±0.7 (6-8)	7±0.84 (6-8)
Body diam. at lip region µm	11±0.49 (10-11)	8±0.5 (7-9)	8±0.5 (7-9)	9±0.7 (8-10)	10±0.00 (10-10)
Body diam. at guide ring µm	26±0.59 (25-27)	16±0.7 (15.5-18)	18±0.5 (17.5-19)	21±0.6 (20-22)	24±0.89 (23-25)
Body diam. at base of oesophagus µm	33±1.02 (31-35)	20±1.3 (18-22)	23.5±1.0 (22-25)	27±1.4 (25-29)	31±1.64 (29-33)
Body diam. at mid-body or vulva µm	37±1.62 (35-40)	21±2.3 (18-24)	25±1.4 (23-26)	29±1.7 (27-32)	34±1.30 (33-36)
Body diam. at anus µm	22±0.99 (20-24)	13±1.4 (12-16)	15±0.5 (14.5-16)	17.5±1.9 (15-20.5)	21±0.71 (20-22)
Body diam. at beginning of J µm	9.5±0.51 (9-10)	6±0.7 (5-7)	6±0.7 (5-7)	7±0.6 (6-7)	8±0.55 (7-8)

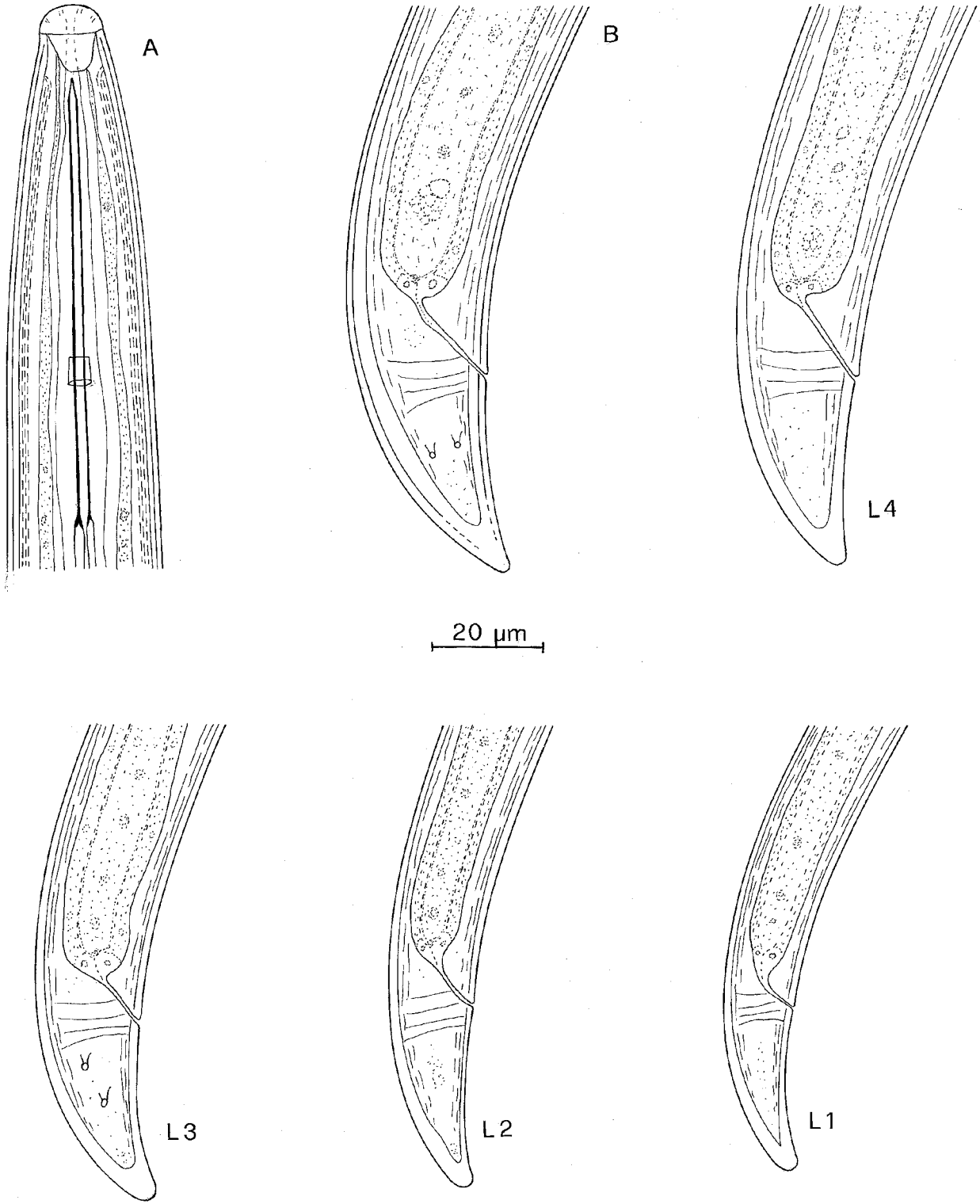

Fig. 19 - *X. santos* from Egypt: A, female anterior region; B, female posterior region; L4-L1, posterior region of 4th, 3rd, 2nd and 1st juvenile stages, respectively.

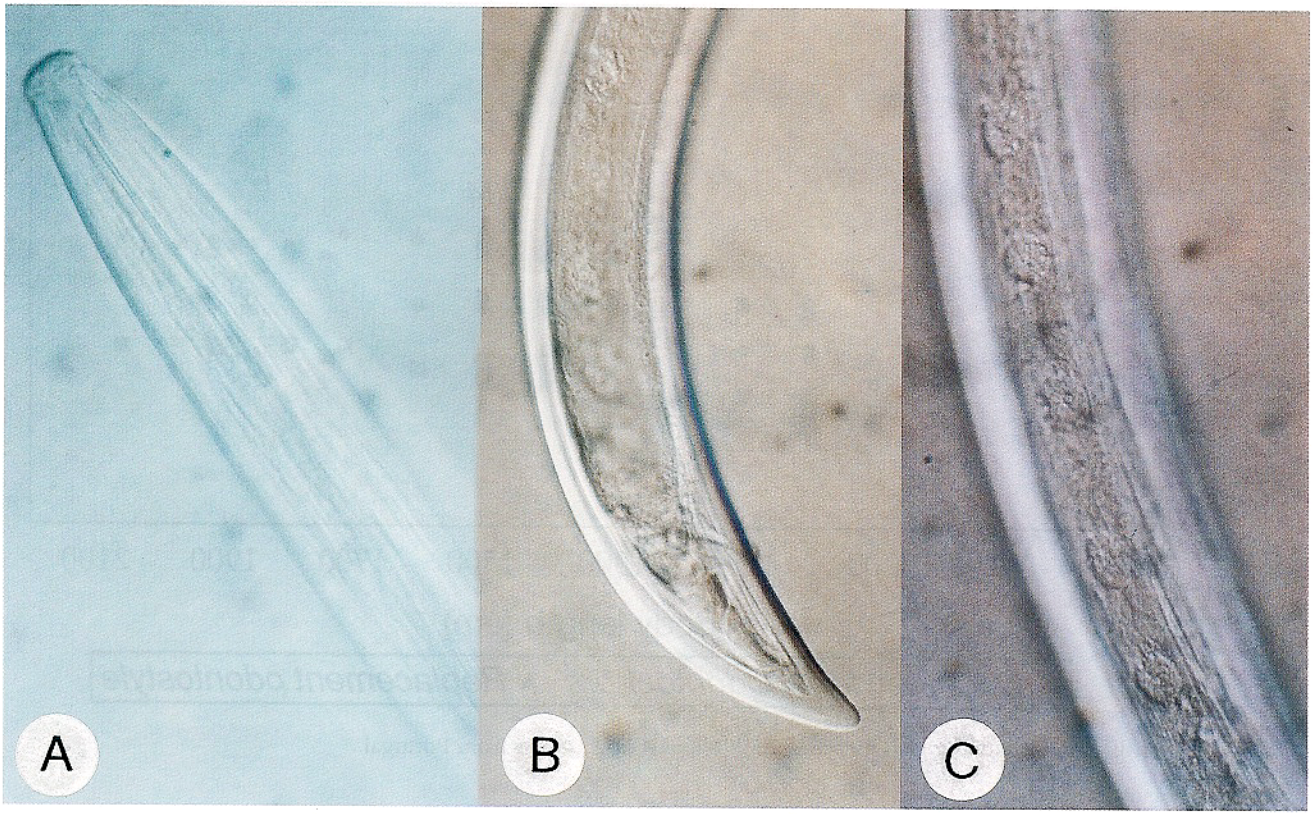

Fig. 20 - Photomicrographs of *X. santos* from Egypt: A, female anterior region; B, female posterior region; C, globular bodies in the hypodermal cord.

XIPHINEMA SIMILLIMUM

Loof *et* Yassin, 1971
(Table X; Figs 23-25)

A population of *X. simillimum* was found in the rhizosphere of a fig tree (*F. carica*) at Nubaria, but single females also occurred at Beni Suef, in the rhizosphere of mango (*M. indica* L.), tomato (*Lycopersicon esculentum*, Milb.) and barley (*Hordeum vulgare* L.) and at Nubaria, in the rhizosphere of grapevine (*V. vinifera*).

Female body robust, tapering towards the extremities, assuming a J habitus when killed. Lip region hemi-elliptical, separated from the rest of the body by a depression. Amphids stirrup shaped with slit-like aperture. Odontostyle, odontophore and guiding sheath typical of the genus. Vulva anteriorly situated, vagina occupying 1/2 to 2/3 of the corresponding body diameter. Genital system amphidelphic, both branches complete, but, the anterior one shorter and with the ovary less developed than the posterior. It seems that eggs are produced only by the posterior branch. Ovaries reflexed. Tail elongate, ventrally bent, dorsally convex and ventrally concave with thin terminus.

The two males (male is described for the first time) found in the population are similar to females, with the posterior region more coiled. Both have functional testis with sperms. Spicules are very robust, ventrally arcuate. The adanal pair of supplements is preceded by a row of five or six papillae. The tail has a thin terminus ending in an attenuated spine. Juveniles seem to separate into four stages with no clear cut between the first and second (Fig. 25).

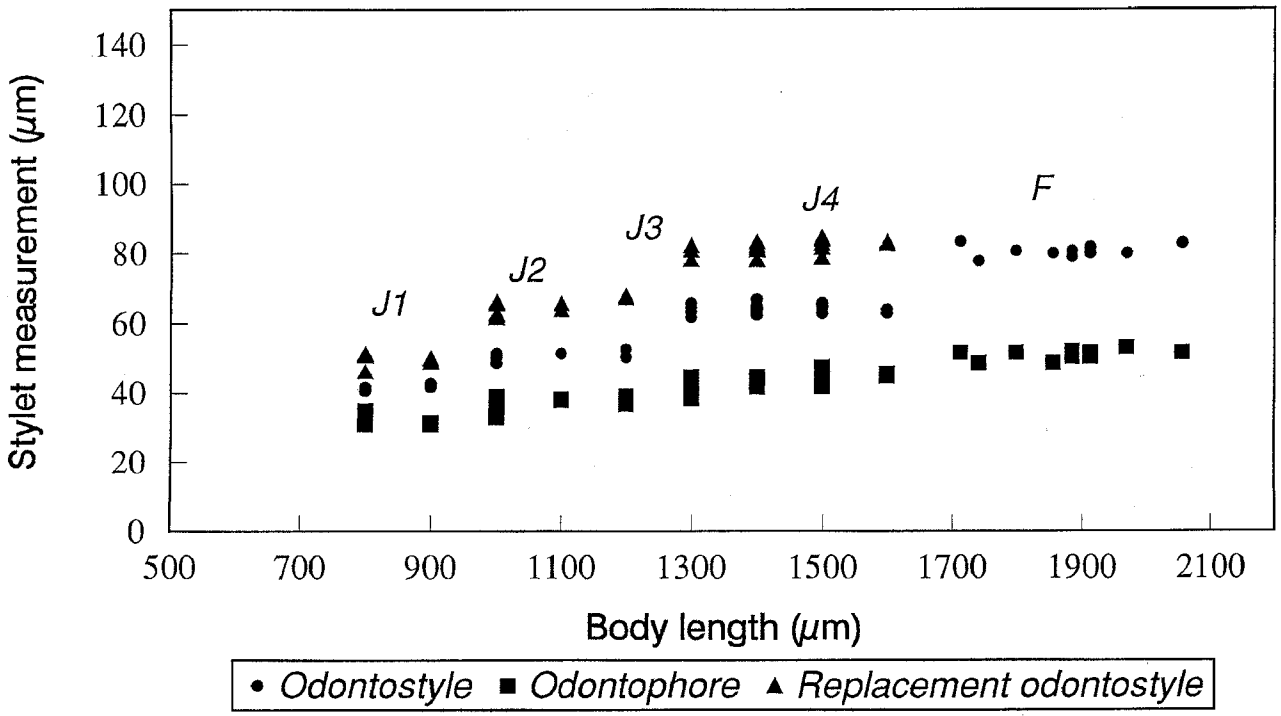

Fig. 21 - Scatter diagram separating juveniles and adult females of *X. santos* from Portugal.

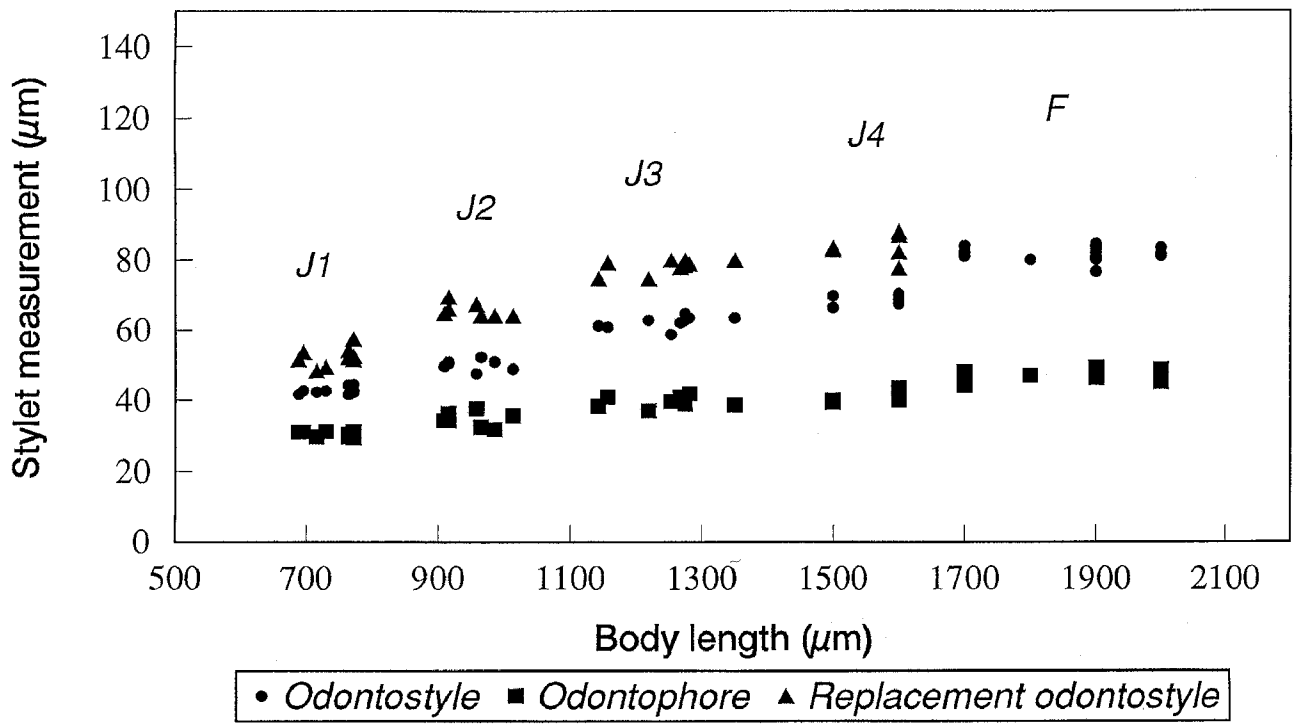

Fig. 22 - Scatter diagram separating juveniles and adult females of *X. santos* from Egypt.

TABLE X - *Morphometric characters* of Xiphinema simillimum *from Egypt.*

Locality			Nubaria			
Host			Fig			
n	15♀♀	2 ♂♂	7 J1	8 J2	5 J3	15 J4
L (mm)	2.3±0.13 (2.1-2.5)	2.3-2.5	0.8±0.08 (0.7-0.9)	1.1±0.06 (1.0-1.2)	1.5±0.00 (1.5-1.5)	1.8±0.20 (1.6-2.1)
a	62.5±4.14 (55-68)	64-68	39±3.27 (35-43)	46±1.81 (45-50)	52±2.60 (50.5-55)	58±3.30 (54-65)
b	6.0±0.52 (4.6-6.6)	5.4-6.9	3.9±0.32 (3.5-4.3)	4.5±0.37 (4.0-4.9)	4.9±0.10 (4.8-5.0)	5.2±0.50 (4.3-6.0)
c	25±1.31 (23-26.5)	36-46	13±1.22 (12-15)	15±1.57 (13-18)	17±1.53 (15-18)	20±2.16 (17-23)
c'	4.0±0.37 (3.5-4.5)	2.2-1.9	5.4±0.11 (5.3-5.5)	4.8±0.35 (4.3-5.2)	4.7±0.23 (4.4-4.8)	4.5±0.36 (3.9-5.2)
V	30±1.99 (26-33)	–	–	–	–	–
Odontostyle µm	105±2.20 (101-109)	106-105	41±0.89 (40-42)	55±1.60 (54-58)	71±0.00 (71-71)	88±3.02 (81-92)
Odontophore µm	62±1.27 (60-63)	63-63	33±1.34 (31-34)	40±1.20 (38-42)	46±0.58 (46-47)	54±1.38 (53-58)
Replacement odontostyle µm	–	–	56±1.14 (54-57)	72.5±1.93 (70-76)	88±1.73 (87-90)	104±3.22 (98-110)
Oral aperture to basal guide ring µm	98.5±2.79 (94-102)	99-101	35±1.22 (33-36)	50±0.83 (49-51)	63±2.00 (61-65)	79±3.55 (74-85)
Tail µm	92.5±4.20 (86-103)	65-55	61±1.34 (60-63)	71±5.53 (61-77)	90±7.02 (83-97)	91±6.61 (77-100)
J (hyalin portion of tail) µm	13.6±2.10 (10-16)	21-18	3.5±0.55 (3-4)	4±0.99 (3-5)	7±0.58 (7-8)	9±1.46 (7-11)
Body diam. at lip region µm	10±0.36 (10-11)	10-10	7±0.00 (7-7)	8±0.74 (7-9)	8±0.58 (8-9)	9±0.53 (8-10)
Body diam. at guide ring µm	29±0.91 (27-31)	30-29	14±0.45 (14-15)	18±0.46 (18-19)	21±0.58 (21-22)	25±0.78 (23-26)
Body diam. at base of oesophagus µm	35±2.21 (31-39)	33-34	18±0.45 (18-19)	22±1.46 (19-23)	27±1.00 (26-28)	29±1.86 (26-32)
Body diam. at mid-body or vulva µm	38±3.13 (33-42)	36-37	20±0.71 (19-21)	24±1.77 (21-26)	29±1.73 (27-30)	31±2.28 (27-34)
Body diam. at anus µm	23±1.14 (21-25)	30-29	11±0.00 (11-11)	15±1.04 (14-17)	19±1.00 (18-20)	21±2.03 (17-25)
Body diam. at beginning of J µm	6±0.53 (5-7)	7-6	3±0.45 (3-4)	3±0.52 (3-4)	5±0.58 (4-5)	5±0.47 (5-6)
Spicules µm	–	54-54	–	–	–	–

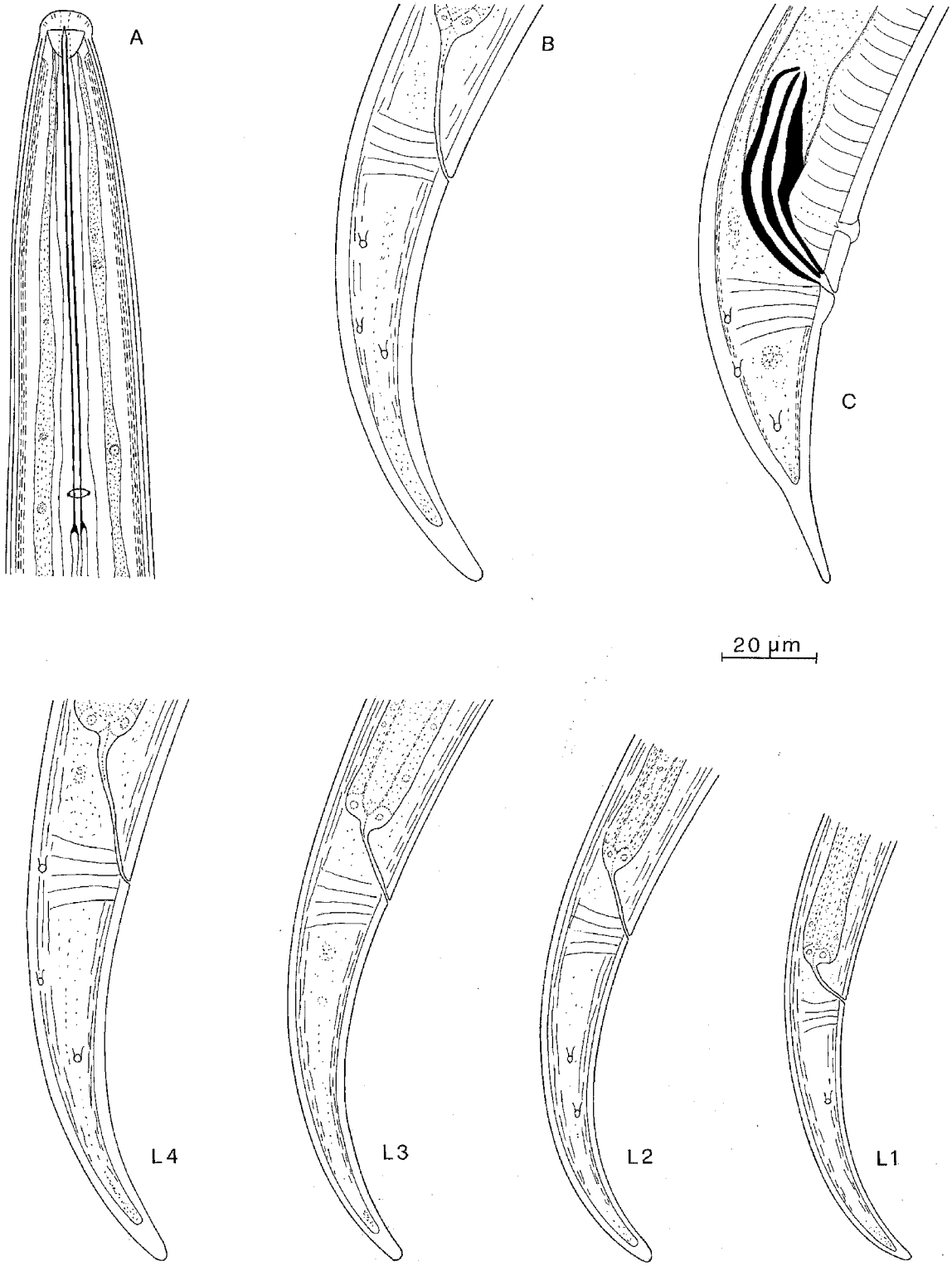

Fig. 23 - *X. simillimum* from Egypt: A, female anterior region; B, female posterior region; C, male posterior region; L4-L1, posterior region of 4th, 3rd, 2nd and 1st juvenile stages, respectively.

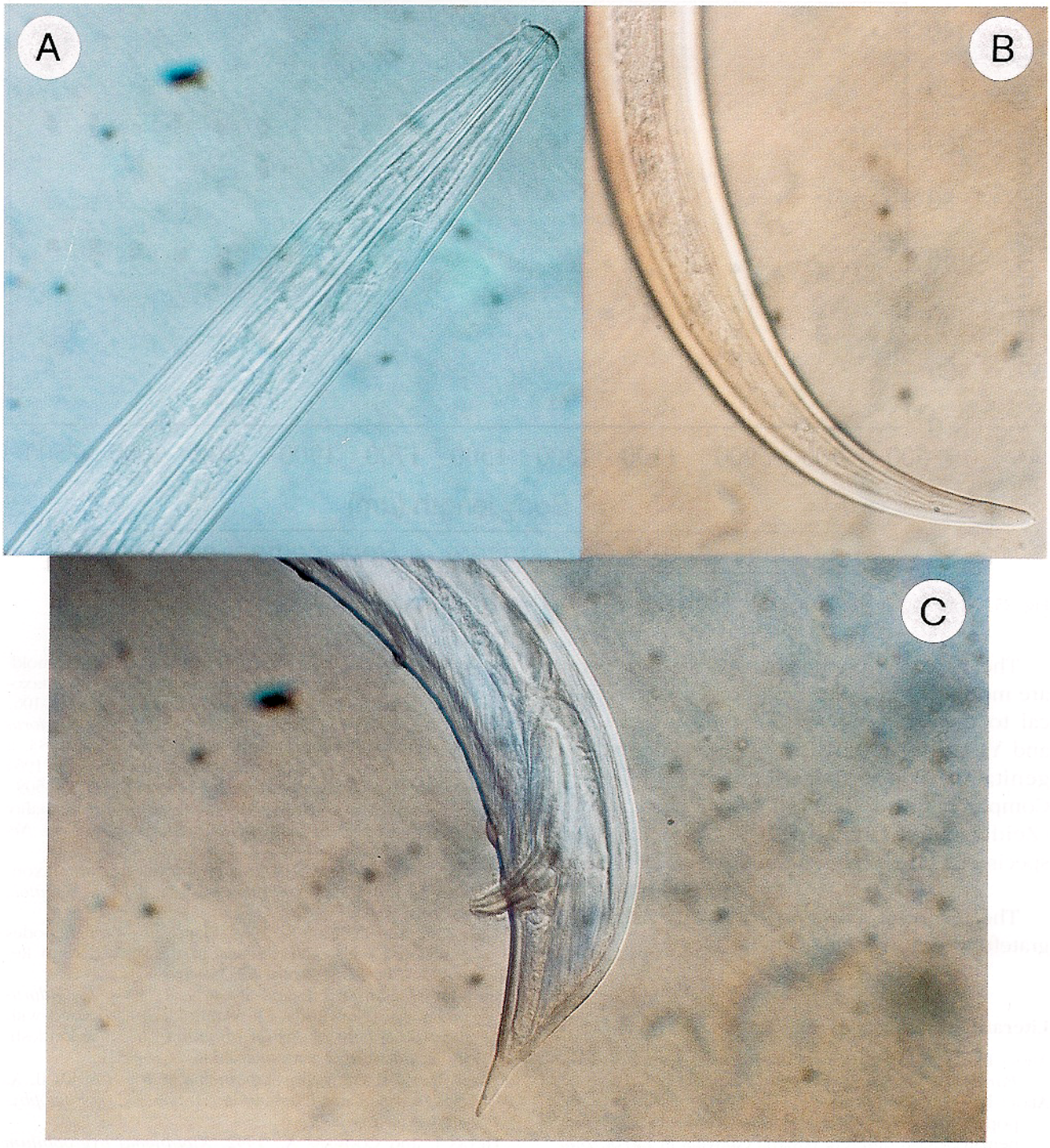

Fig. 24 - Photomicrographs of *X. simillimum* from Egypt: A, female anterior region; B, female posterior region; C, male posterior region.

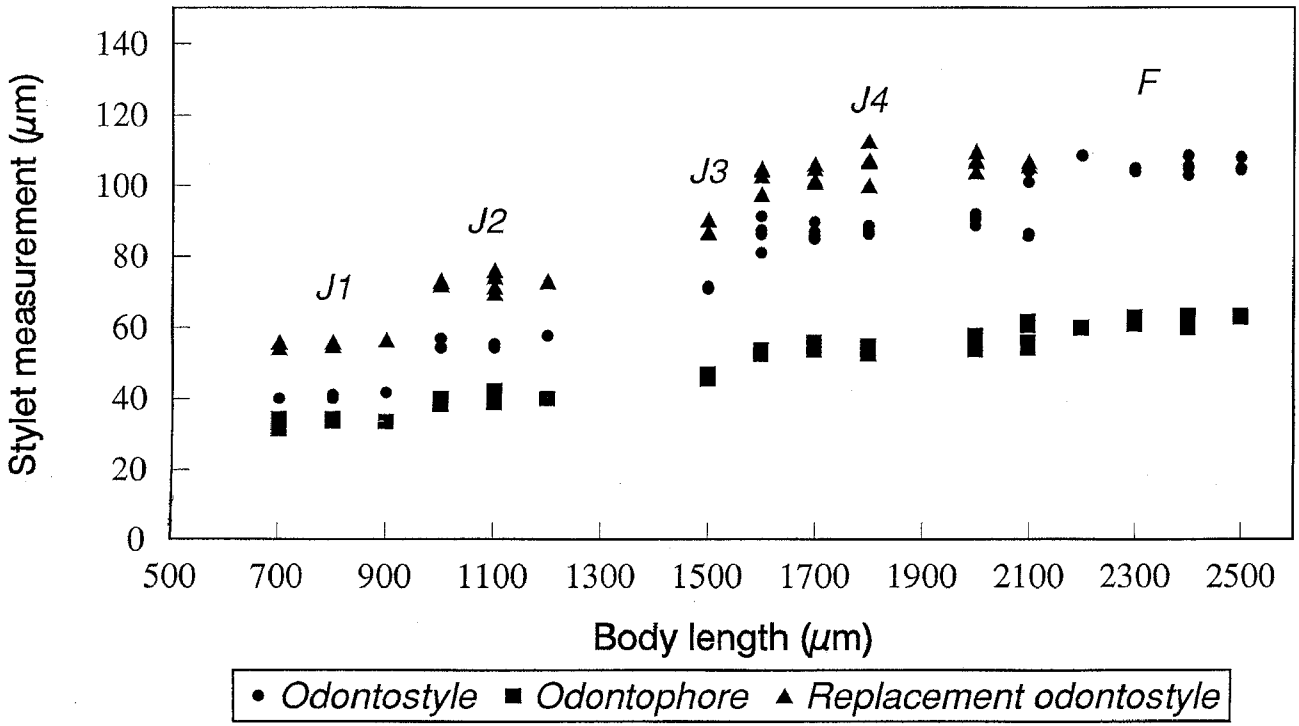

Fig. 25 - Scatter diagram separating juveniles and adult females of *X. simillimum* from Egypt.

The Egyptian populations of *X. simillimum* are morhologically and morphometrically identical to the type population from Sudan (Loof and Yassin, 1970), including the female anterior genital branch as described by Luc (1981). Compared to another population from Sudan (Zeidan and Coomans, 1989), the Egyptian specimens have higher a and lower c' value.

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