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## **XIPHINEMA AEQUUM sp. n. (NEMATODA: DORYLAIMIDA) FROM ITALY, WITH DESCRIPTION OF THE MALE OF LONGIDORUS ERIDANICUS**

by  
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**Summary.** *Xiphinema aequum* sp. n. is described. It was found in the rhizosphere of olive trees (*Olea europaea* L.) at Palagiano (Taranto), south Italy. The new species is similar to *X. diversicaudatum* (Micoletzky, 1923 and 1927) Thorne 1939 and *X. dissimile* Roca, Pereira *et* Lamberti, 1987 from which it differs in the lack of the «Z pseudo-organ». *X. aequum* closely resembles *X. israeliae* Luc, Brown *et* Cohn, 1982, *X. barberchaeckae* Coomans *et* Heyns, 1985 and *X. lacrimaspiniae* Hutsebaut, Heyns *et* Coomans, 1987. The male of *Longidorus eridanicus* is also described.

Samples of soil collected from around the roots of olive trees (*Olea europaea* L.) at Palagiano, near Taranto, south Italy, revealed the presence of a *Xiphinema* species, provisionally identified as *X. diversicaudatum* (Micoletzky, 1923 and 1927) Thorne, 1939. The biometrical characters of this species fell within the range of various populations of *X. diversicaudatum* (Goodey *et al.*, 1960; Roca *et al.*, 1987, 1987a). However, since the specimens collected at Palagiano did not possess a «pseudo Z organ» in the uterus, some doubts arose about its true identity. Additional differences between this population and specimens of *X. diversicaudatum* were observed on new and freshly collected material. Therefore the species is described here as new and named *Xiphinema aequum* sp. n.

*Longidorus eridanicus* Roca, Lamberti *et* Agostinelli, 1984 was described only from females of a population collected at Villastellone (Torino), northern Italy. The male of this species was not found in the type population nor in the populations reported from various localities in the original description (Roca *et al.*, 1984). Recently, a male of *L. eridanicus* was found in a population collected at Carpi (Ferrara), central Italy, from the rhizosphere of grapevine. The biometrical characters of this population and the description of the male of *L. eridanicus* are reported here.

Nematodes were extracted from soil samples by the Cobb wet sieve technique, killed and fixed in 5% hot formalin and mounted in glycerin on nematology slides

by the slow method. Specimens were measured with the aid of a camera lucida.

*XIPHINEMA AEQUUM* sp. n.  
(Fig. 1 - Table I)

Holotype female: L=4.7 mm; a=87; b=10.1; c=101; c'=1.2; V=46.5; odontostyle=143 µm; odontophore=81 µm; oral aperture to guiding ring=139 µm; tail length=46.4 µm; J=13.5 µm; body diameter at lip region=15 µm; body diameter at guiding ring=40.5 µm; body diameter at base of oesophagus=51 µm; body diameter at vulva=54 µm; body diameter at anus=39 µm; body diameter at beginning of J=19 µm; tail peg=9 µm.

Allotype male: L=4.5 mm; a=96; b=10.8; c=87; c'=1.3; odontostyle=149 µm; odontophore=78 µm; oral aperture to guiding ring=128 µm; tail length=52 µm; J=12 µm; body diameter at lip region=16 µm; body diameter at guiding ring=41 µm; body diameter at base of oesophagus=45 µm; body diameter at mid body=47 µm; body diameter at anus=38 µm; body diameter at beginning of J=18 µm; tail peg=12 µm; spicules=70.5 µm; lateral guiding piece=16 µm.

*Description:* female *habitus* slightly ventrally curved as J shape when heat-relaxed; body robust, cylindrical, tapering very gradually towards the anterior extremity, more abruptly posteriorly; cuticle very fine transversely striated, 3-3.5 µm thick along body, more thickened in the neck region where it measures 4.5-5 µm at the base of the lip region, and in the caudal region where it is 6-6.5 µm ventrally and 7.5-8 µm dorsally in the post

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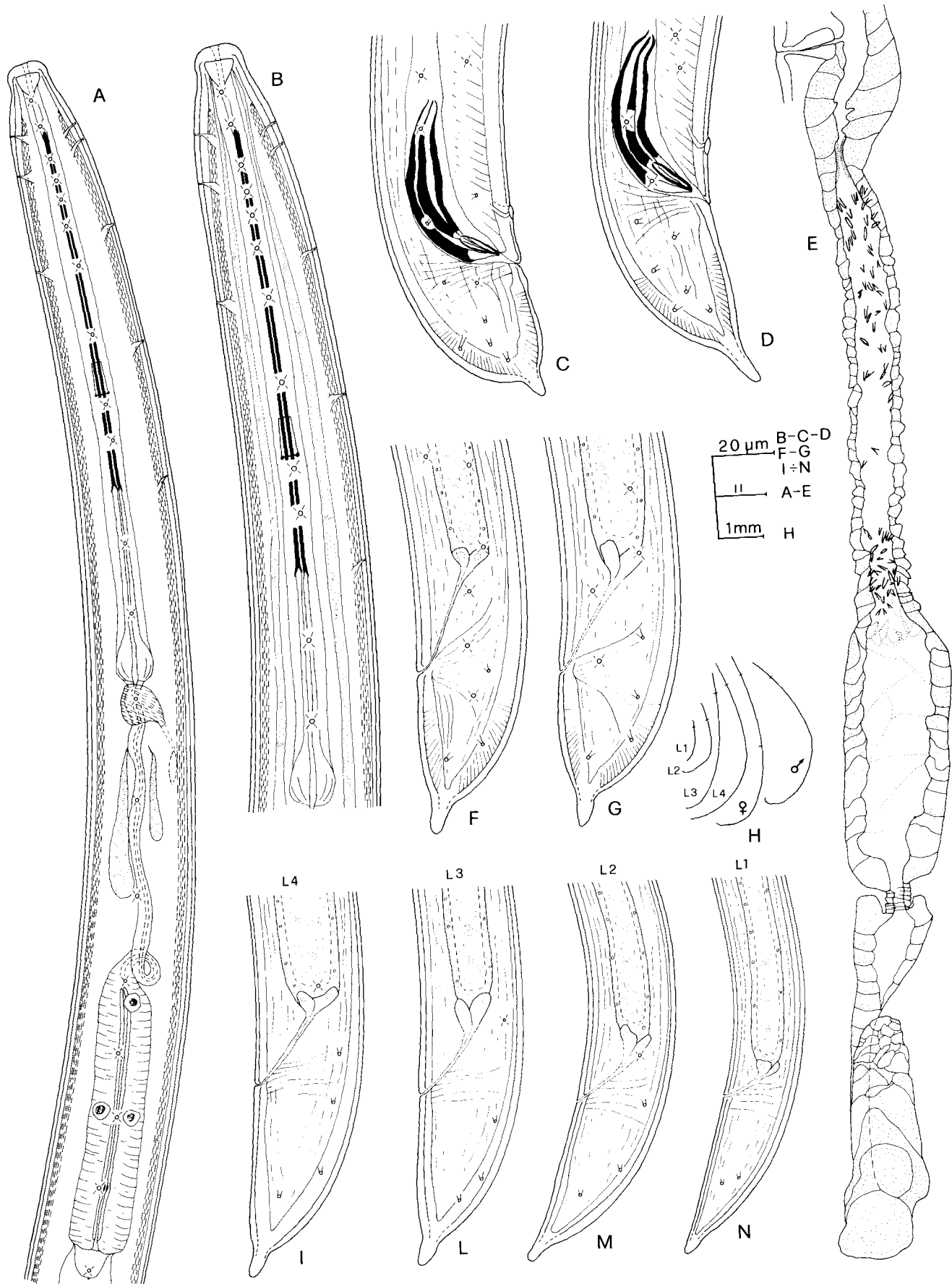


TABLE I - *Morphometrics of Xiphinema aequum* sp. n. (*paratypes*).

STAGES	Range (Means $\pm$ Standard Deviation)					
	L1	L2	L3	L4	♀♀	♂♂
n	3	5	1	4	10	11
L mm	1.3 - 1.5 (1.4 $\pm$ 0.11)	2.0 - 2.3 (2.2 $\pm$ 0.11)	3.0	2.8 - 3.5 (3.2 $\pm$ 0.29)	4.1 - 5.3 (4.6 $\pm$ 0.37)	4.0 - 5.0 (4.5 $\pm$ 0.28)
a	48.0 - 53.1 (51.1 $\pm$ 2.74)	58.2 - 65.5 (62.5 $\pm$ 2.71)	78.5	70.5 - 84.0 (78.7 $\pm$ 5.77)	76.0 - 109.6 (90.6 $\pm$ 10.66)	90.1 - 108.7 (98.5 $\pm$ 6.18)
b	3.9 - 4.5 (4.1 $\pm$ 0.29)	5.1 - 5.6 (5.3 $\pm$ 0.20)	6.2	6.0 - 7.1 (6.6 $\pm$ 0.49)	8.4 - 11.4 (9.7 $\pm$ 1.07)	8.2 - 12.8 (9.8 $\pm$ 1.46)
c	24.9 - 25.3 (25.1 $\pm$ 0.21)	35.5 - 45.0 (39.8 $\pm$ 3.83)	53.2	53.6 - 62.3 (57.8 $\pm$ 4.75)	82.6 - 103.0 (92.2 $\pm$ 7.36)	79.0 - 110.8 (92.6 $\pm$ 8.40)
c'	2.5 - 2.8 (2.6 $\pm$ 0.1)	1.7 - 2.3 (1.9 $\pm$ 0.22)	1.8	1.5 - 2.0 (1.8 $\pm$ 0.25)	1.2 - 1.5 (1.4 $\pm$ 0.08)	1.1 - 1.5 (1.3 $\pm$ 0.12)
V	—	—	—	—	44.7 - 49.8 (47.5 $\pm$ 1.58)	—
Odontostyle $\mu$ m	76.4 - 80.0 (78.8 $\pm$ 2.08)	95.3 - 107.0 (100.8 $\pm$ 4.76)	119.4	119.4 - 130.0 (125.1 $\pm$ 4.67)	139.3 - 150.6 (146.5 $\pm$ 3.70)	141.3 - 151.3 (145.1 $\pm$ 3.39)
Odontophore $\mu$ m	54.1 - 58.8 (57.0 $\pm$ 2.56)	61.1 - 65.8 (63.4 $\pm$ 2.36)	70.5	67.0 - 72.3 (69.8 $\pm$ 2.22)	72.0 - 82.6 (78.6 $\pm$ 3.65)	75.3 - 83.0 (78.9 $\pm$ 2.36)
Replacement odontostyle $\mu$ m	102.9 - 110.0 (106.4 $\pm$ 3.55)	114.1 - 127.0 (122.5 $\pm$ 5.19)	139.4	141.1 - 153.0 (146.6 $\pm$ 5.03)	—	—
Oral aperture to guiding ring $\mu$ m	70.0 - 73.0 (71.7 $\pm$ 1.57)	89.4 - 100.0 (94.8 $\pm$ 4.06)	117.6	111.7 - 123.5 (115.7 $\pm$ 5.30)	110.0 - 146.0 (131.8 $\pm$ 12.77)	104.3 - 139.3 (126.8 $\pm$ 11.77)
Tail length $\mu$ m	52.3 - 60.5 (57.6 $\pm$ 4.60)	47.0 - 60.0 (54.8 $\pm$ 5.30)	56.4	45.8 - 64.7 (56.4 $\pm$ 8.18)	46.6 - 52.0 (49.8 $\pm$ 1.79)	42.6 - 52.6 (48.8 $\pm$ 3.52)
J $\mu$ m	8.8 - 13.0 (11.0 $\pm$ 2.10)	10.5 - 15.3 (13.0 $\pm$ 1.92)	15.8	14.7 - 20.5 (17.0 $\pm$ 2.52)	16.0 - 21.3 (17.9 $\pm$ 1.56)	14.6 - 20.6 (17.9 $\pm$ 1.68)
Body diam. at lip region $\mu$ m	10.5 - 11.1 (10.7 $\pm$ 0.35)	12.3 - 15.3 (13.0 $\pm$ 1.30)	16.4	14.1 - 15.3 (14.7 $\pm$ 0.49)	14.0 - 16.6 (15.7 $\pm$ 0.71)	14.5 - 16.6 (15.4 $\pm$ 0.62)
Body diam. at guiding ring $\mu$ m	24.7 - 26.4 (25.6 $\pm$ 0.86)	30.5 - 32.3 (30.9 $\pm$ 0.78)	35.3	34.1 - 36.4 (35.4 $\pm$ 0.98)	37.3 - 44.0 (40.0 $\pm$ 1.89)	35.3 - 40.6 (38.5 $\pm$ 1.61)
Body diam. at base of oesophagus $\mu$ m	26.4 - 28.8 (27.8 $\pm$ 1.25)	32.3 - 38.2 (34.5 $\pm$ 2.29)	37.0	37.6 - 40.5 (39.5 $\pm$ 1.37)	38.0 - 48.6 (45.1 $\pm$ 3.03)	42.0 - 46.0 (43.7 $\pm$ 1.21)
Body diam. at mid body or vulva $\mu$ m	25.3 - 31.1 (28.4 $\pm$ 2.92)	32.3 - 38.8 (34.8 $\pm$ 2.73)	38.2	38.8 - 43.5 (41.2 $\pm$ 2.14)	47.3 - 56.0 (50.9 $\pm$ 2.68)	43.3 - 49.3 (45.8 $\pm$ 1.80)
Body diam. at anus $\mu$ m	21.1 - 22.3 (21.7 $\pm$ 0.60)	25.8 - 30.0 (27.5 $\pm$ 1.66)	31.1	31.1 - 33.5 (32.0 $\pm$ 1.15)	34.0 - 37.3 (36.0 $\pm$ 1.40)	35.3 - 39.3 (37.5 $\pm$ 1.09)
Body diam. at beginning of J $\mu$ m	7.3 - 8.8 (7.9 $\pm$ 0.79)	8.8 - 10.0 (9.4 $\pm$ 0.42)	12.3	13.5 - 17.0 (15.4 $\pm$ 1.6)	16.6 - 22.6 (19.8 $\pm$ 2.04)	18.6 - 25.3 (20.4 $\pm$ 2.14)
Tail peg $\mu$ m	—	—	—	—	6.6 - 12.0 (10.0 $\pm$ 1.76)	8.6 - 12.0 (10.6 $\pm$ 1.35)
Spicules $\mu$ m	—	—	—	—	—	66.6 - 86.6 (75.4 $\pm$ 6.57)
Lateral guiding pieces $\mu$ m	—	—	—	—	—	13.0 - 15.3 (14.2 $\pm$ 1.23)

Fig. 1 (front page) - *Xiphinema aequum* sp. n.: A and B, female anterior region; C and D, male posterior region; E, posterior branch of the female genital tract; F and G, female posterior region; H, posture of juvenile and adult stages; I - N, posterior regions of juveniles.

anal portion; lateral hypodermal cords readily visible throughout the length of the body, 10.5-11.5  $\mu\text{m}$  wide at mid body or 20-21% of the corresponding body diameter; lateral body pores 9-10 in the range of the odontostyle, arranged in a single row in the neck region, in a double row in the rest of the body from the beginning of the intestine; dorsal and ventral body pores well evident in the neck region, less so in the rest of the body, 4 dorsally and 3 ventrally in the range of the odontostyle; labial region almost hemispherical, slightly flattened frontally, 8-9  $\mu\text{m}$  high, offset from the rest of the body by a wide depression; amphids large, stirrup shaped, with wide aperture as a straight transverse slit; odontostyle robust, 2-2.5  $\mu\text{m}$  in diameter; basal flanges 14-15  $\mu\text{m}$  wide and «tube» well evident, 12-15  $\mu\text{m}$  in length, with guiding ring robust, 5-5.5  $\mu\text{m}$  wide; oesophagus dorylaimoid with the anterior part tubular; basal enlarged portion occupying 1/4 of the total oesophagus length and measuring 112-113  $\mu\text{m}$  long and 21-22  $\mu\text{m}$  wide, containing three large nuclei; oesophagus intestinal valve goblet-shaped; female reproductive system amphidelphic, with equally developed branches; vulva slit-like, situated slightly anterior to mid body; vagina extending more or less 2/3 of the corresponding body diameter; gonads with reflexed ovaries; oviduct consisting of a cylindrical part and a large pouch separated from the uterus by a robust sphincter; uterus composed by a well developed *pars dilatata* followed by a tubular part containing globular inclusions in the proximal portion and spiniform structures distributed over the entire length with distinct concentration at the extremities of the tube-like portion; prerectum 700-750  $\mu\text{m}$  long; rectum extending more than the body width at anus; tail almost conoid or shorter, rounded dorsally and slightly arcuate ventrally; terminal peg with large base; five caudal pores are evident on each side of the tail.

**Male:** general appearance similar to female with posterior part of the body more curved; morphology and anatomy similar to female except in the genital apparatus and the somatic structures associated with it; spicules robust, curved, not cephalated with enlarged central portion; lateral guiding pieces straight, rounded proximally and narrow at distal end; precloacal pair of papillae preceded by four ventro-median single supplements; ventrosublateral body pores arranged in two lines from the beginning of the intestine until the end of the body; tail similar to that of female, almost conoid or shorter, with terminal peg variable in length, bearing 6 caudal pores on each side.

**Juveniles:** morphologically similar to adult females from which they differ by the size; tail of first stage elongated and conoid.

**Type habitat and locality:** rhizosphere of olive trees (*Olea europaea* L.) at Palagiano, Taranto, south Italy.

**Type material:** holotype, allotype, six paratype females, seven paratype males and juveniles in the collection of the Istituto di Nematologia Agraria del Consiglio Nazionale delle Ricerche, Bari, Italy; two paratype females and two paratype males, Nematology Department Rothamsted Experimental Station, Harpenden, Herts, England; two paratype females and two paratype males, Plant Nematology Laboratory Collection, United States Department of Agriculture, Beltsville, Maryland, U.S.A.

**Differential diagnosis:** *Xiphinema aequum* sp. n. resembles *X. diversicaudatum* (Micoletzky, 1923 and 1927) Thorne, 1939 and *X. dissimile* Roca, Pereira et Lamberti, 1987, from both of which it can be distinguished by the absence of a «pseudo Z-organ». The new species closely resembles *X. israeliae* Luc, Brown et Cohn, 1982, *X. barberchaeckae* Coomans et Heyns, 1985 and *X. lacrimaspiniae* Hutsebaut, Heyns et Coomans, 1987. It differs from *X. israeliae* in having larger body length (4.6 vs 3.9 mm), longer odontostyle (146 vs 123  $\mu\text{m}$ ), slightly anterior situated vulva ( $V=47.5$  vs 49) and presence of spines in the uterus (absent in *X. israeliae*); it differs from *X. barberchaeckae* in having larger body length (4.6 vs 3 mm), more slender body («a» value 91 vs 69), longer odontostyle (146 vs 100  $\mu\text{m}$ ), longer odontophore (78 vs 64  $\mu\text{m}$ ), longer distance of oral aperture to guiding ring (132 vs 93  $\mu\text{m}$ ) and presence of the male (not found in *X. barberchaeckae*); it differs from *X. lacrimaspiniae*

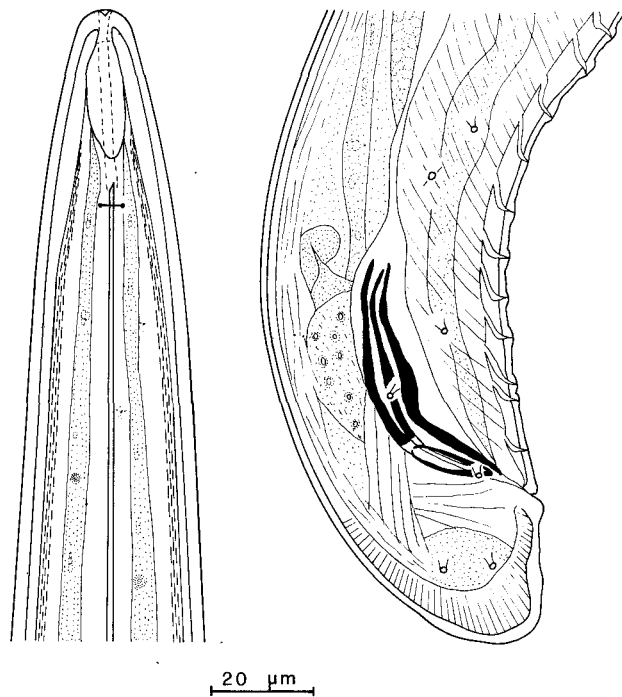


Fig. 2 - *Longidorus eridanicus*: male anterior and posterior regions.

in having larger body length (4.6 vs 3.1 mm), more slender body («a» value 91 vs 67), higher «c» value (92 vs 61), longer odontostyle (146 vs 100  $\mu\text{m}$ ), longer odontophore (78 vs 68  $\mu\text{m}$ ), different tail shape (less rounded in *X. lacrimaspinæ*) and presence of the male. The female reproductive system of *X. æquum* sp. n. is similar to that of *X. barberchæckæ*, with spiniform structures equally distributed over the entire length, and the same distinct concentration just after *pars dilatata* and before the ovjector.

### LONGIDORUS ERIDANICUS

Roca, Lamberti *et* Agostinelli, 1984

(Fig. 2; Tab. II)

The measurements refer to a population collected from the rhizosphere of grapevine at Carpi, province of Ferrara, Italy.

*Male: habitus* when dead slightly ventrally curved, more coiled in the posterior region; body cylindrical, tapering very gradually towards the anterior extremity; cuticle very fine transversely striated, 3.5-4  $\mu\text{m}$  thick along the body, more thickened just behind lip region and in the caudal region; labial region subacute, 5-5.5  $\mu\text{m}$  high, continuous with the rest of the body; amphids extended forward, elliptically shaped, not lobed, with pointed base; odontostyle long and slender; odontophore and guiding ring typical of the genus; oesophagus dorylaimoid with basal bulb occupying about one third of the oesophagus total length, measuring 122  $\mu\text{m}$  long and 22  $\mu\text{m}$  wide; oesophagus-intestinal valve large, bluntly rounded conoid; testis very long and well developed with sperms inside; spicules heavily sclerotized, curved, not cephalated, with enlarged central portion; lateral guiding pieces bifid at distal end; the pair of adanal supplements is preceded by a series of 19 ventromedian ones; tail short, rounded, dorsally convex and ventrally straight, bearing 2 caudal pores on each side.

*Female:* morphologically identical to that of the original description.

Measurements of the Carpi population of *L. eridanicus* are essentially similar to those of the original description, except for the longer body of females than in the type population, and consequently «c» value is higher.

TABLE II - *Morphometrics of a population of Longidorus eridanicus.*

	Means (Range)	
	♀ ♀	♂
n	5	1
L mm	5.7 (5.4-6.2)	5.4
a	91 (80-102)	99
b	10.5 (9.8-11.5)	9.3
c	234 (189-268)	201.5
c'	0.6 (0.5-0.7)	0.7
V	46 (43-49)	—
Odontostyle $\mu\text{m}$	165 (153-170)	167
Odontophore $\mu\text{m}$	76 (67-81)	75
Oral aperture to guiding ring $\mu\text{m}$	42 (41-44)	42
Tail length $\mu\text{m}$	25 (21-31)	27
J $\mu\text{m}$	18 (16-21)	12
Body diam. at lip region $\mu\text{m}$	11 (10.5-11.5)	12
Body diam. at guiding ring $\mu\text{m}$	27 (26-30)	26.5
Body diam. at base of oesophagus $\mu\text{m}$	58 (51-64)	54.5
Body diam. at mid body or vulva $\mu\text{m}$	63.5 (56-73)	54.5
Body diam. at anus $\mu\text{m}$	41 (38-45)	38
Body diam. at beginning of J $\mu\text{m}$	36.5 (33-41)	26.5
Spicules $\mu\text{m}$	—	64.5
Lateral guiding pieces $\mu\text{m}$	—	17.5

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