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First record of *Longidorus danuvii* Barsi, Lamberti and De Luca, 2007 (Nematoda: Longidoridae) from Poland with description of pathologies of the lip region and reproductive system

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Summary

Up to date, fourteen species of the genus *Longidorus* have been recorded from Poland. During a recent survey, *L. danuvii* Barsi, Lamberti and De Luca, 2007 was found for the first time. It is also the first record outside Serbia, from where it was described. Among normal females two pathological specimens were found: one bivulval with abnormal structure of the genital tract and one with deformated lip region. Description of both normal and pathological females is provided. Normal females are similar to populations from Serbia, the main difference is shorter tail in population from Poland (41.6 vs 46.4 and 46.5) and lower c' value (1.60 vs 1.70 and 1.85).

Keywords: *Longidorus danuvii*; Poland; bivulval female

Introduction

Up to date, fourteen species of the genus *Longidorus* have been recorded from Poland (complete list in Kornobis & Peneva (2011)). During a recent survey of the longidorids occurance in Poland, previously unrecorded *Longidorus danuvii* Barsi, Lamberti and De Luca, 2007 was found. Among normal females of this species, two pathological specimens were found: one bivulval with abnormal structure of the genital tract and one with deformated lip region. Description of morphology and morphometrics of normal and pathological females is presented here.

Matherials and methods

Soil samples were taken from the rhisosphere of *Salix alba* L. growing on the bank of Strwiąż river, close to village Krościenko in southern-east Poland (geographical coordinates: 49.47721N, 22.68660E). Specimens were extracted from soli by the sieving and decanting method, heat killed, preserved in TAF and subsequently transferred to glycerine by the Seinhorst method (Seinhorst, 1959). In order to ensure correct morphological identification, specimens from Poland were compared with paratypes kindly provided by Dr. László Barsi from Faculty of Sciences, Department of Biology and Ecology, Novi Sad, Serbia.

Results

Descriptions

Female (Table 1, Fig. 1 A – C). Body assuming C shape, more strongly curved in posterior 1/3 – 1/4 of total length. Lip region moderately expanded, anteriorly flattened, latterally rounded, set off by shallow depression. Cuticule usually smooth, in some specimens very fine transverse striation present along whole body with striae more visible on tail. Cuticule 1.5 – 2µm thick behind lip region, 2 – 3µm along body, 4 – 5µm at dorsal and ventral half of the tail length. Hypodermal chord 5 – 7µm and 10 – 15µm thick at base of pharynx and mid-body region, respectively. Amphidial fovea pouch like, distinctly and symmetrically bilobed at posterior end (according to the terminology proposed by Decraemer and Commans (2007)). Nerve ring slightly posterior to the base of odontophore, 169.8 ± 4.35(160 – 174) µm (n = 11) from the anterior end. Muscular pharyngeal bulb 4 – 5 times longer than wide, nuclei of the dorsal gland situated at 32.6 (29 – 36) % (n = 4) of its length, nuclei of ventrosublateral glands at 53.4 (50 – 56) and 55.6 (52 – 58) % (n = 8). Vagina extending to 55.0 ± 5.6 (47.6 – 65.8) % of the corresponding body width. *Pars distalis vaginae* and *pars proximalis vaginae* 8 – 14 and 10 – 13µm long, respectively. Anterior and posterior uteri 139.8 ± 10.9 (122 – 158) and 133.0 ± 15.3 (114 – 162) µm (n = 11) long, respectively. Tail conoid with rounded terminus, elongated, dorsally convex, ventrally slightly to clearly concave. Pair of caudal pores on each side.

Anomalies. Bivulval female (Fig. 1 D – E). Morphometrics: L = 4.82 mm; a = 126.8; b = 14.4; c = 109.5; c' =

1.69; d = 2.3; d' = 1.5; V1 = 50.4; V2 = 58.5; odontostyle = 92 µm; odontophore = 59µm; anterior end to guiding ring = 27 µm; tail = 44 µm; hyaline tip = 10µm; body width at: lip region = 12 µm, guiding ring = 18 µ, base of pharynx = 31 µm; vulva1 = 38, vulva 2 = 38, anus = 26 µm; distance from vulva1 to vulva 2 = 372 µm. *Pars distalis vaginae* 10 µm long in both vaginae, *pars proximalis vaginae* of anterior and posterior vaginae 16 and 11µm, respectively. Reproductive system associated with the anterior vulva developed anormally: anterior branch turns back at the level of uteri resulting in three branches of genital tract (two of anterior and one of posterior vagina) present in relatively small (372 µm long) space between two vulvae. More detailed observation of this part of the genital tracts not possible due to the overlap of the elements of all three branches, however both reproductive systems appear unconnected. Poorly developed ovary present at the level of second vagina (Fig. 1E). Posterior branch of reproductive system of the second vagina developed similarly to normal females. Remaining morphology similar to normal females from the same population.

Table 1. Morphometrics of females and juveniles of *Longidorus danuvii* from Poland. Measurements in µm (except for L) and in the form: mean ± standard deviation (range). Letter n below measurements indicates number of specimens measured if different than indicated in first line. If number of measurements is lower than five, standard deviation is not given

Character	Females	J1	J2	J3	J4
n	14	5	3	4	7
L (mm)	4.52 ± 0.26	1.03 ± 0.07	1.51	2.09	3.12 ± 0.15
	(3.99 – 4.93)	9.36 – 1.14	(1.37 – 1.64)	(1.68 – 2.67)	(2.94 – 3.33)
a	114.6 ± 8.32	65.7 ± 6.79	65.5	79.7 ± 9.92	101.7 ± 7.13
	(95.1 – 130.0)	58.4 – 73.5	(63.0 – 68.2)	(64.6 – 90.8)	(86.6 – 107.5)
b	12.6 ± 1.00	4.5 ± 0.40	5.7	6.9	9.0 ± 0.33
	(11.0 – 15.1)	4.1 – 5.0	(5.1 – 7.3)	(5.9 – 8.8)	(8.7 – 9.6)
c	109.2 ± 8.47	29.2 ± 2.95	38.8	46.9	71.6 ± 2.29
	(90.8 – 120.2)	24.6 – 32.6	(31.9 – 44.3)	(44.2 – 48.9)	(68.5 – 74.2)
c'	1.60 ± 0.12	3.18 ± 0.33	2.59	2.2	1.91 ± 0.08
	(1.44 – 1.84)	2.91 – 3.61	(2.3 – 2.9)	(1.9 – 2.5)	(1.78 – 2.04)
d	2.2 ± 0.12	2.0 ± 0.14	2.0	2.2	2.3 ± 0.12
	(2.1 – 2.5)	1.8 – 2.1	(1.9 – 2.1)	(2.0 – 2.6)	(2.1 – 2.5)
d'	1.5 ± 0.06	1.5 ± 0.07	1.5	1.5	1.6 ± 0.06
	(1.4 – 1.6)	1.4 – 1.6	(1.4 – 1.6)	(1.5 – 1.6)	(1.5 – 1.7)
V/ replacement odontostyle	49.3 ± 1.96 (46.5 – 52.5)	64.8 ± 2.49 (63 – 68)	74.3 (71 – 78)	86 (85 – 88)	92.0 ± 1.41 (90 – 94)
Odontostyle	90.8 ± 2.08	57.6 ± 2.3	62.7	73.8	82.6 ± 2.44
	(88 – 95)	(55 – 60)	(60 – 68)	(69 – 76)	(80 – 86)
Odontophore	56.6 ± 1.71	-	-	-	-
	(53 – 60)				
Total stylet	147.6 ± 1.76	-	-	-	-
	(146 – 151)				
Pharyngeal bulb length	81.8 ± 3.57 (78 – 87)	-	-	-	-
Pharyngeal bulb width	17.2 ± 1.25 (15 – 19)	-	-	-	-
Anterior end to guiding ring	26.5 ± 0.76 (25 – 28)	16.4 ± 0.55 16 – 17	18.3 (17 – 19)	21.8 (20 – 26)	23.9 ± 1.07 (23 – 25)
Genital primordorium length	-	15 n = 1	23.0 (21 – 24)	-	53.6 ± 4.7 (48 – 63)
Tail	41.6 ± 2.98	35.4 ± 1.82	39.7	41.5	43.6 ± 1.81
	(38 – 47)	(33 – 38)	(37 – 43)	(38 – 44)	(41 – 46)
Hyaline tip	9.5 ± 0.66	4.6 ± 0.55	5	6.5	8.5 ± 1.05
	(8 – 10)	(4 – 5)	(5 – 5)	(5 – 7)	(7 – 10)
Body width at: lip	12.1 ± 0.47	8.2 ± 0.45	9.0	9.8	10.4 ± 0.53
region	(11 – 13)	(8 – 9)	(9 – 9)	(9 – 10)	(10 – 11)
guiding ring	18.1 ± 0.27	12.4 ± 0.55	13.7	15.3	16.6 ± 0.53
	(18 – 19)	(12 – 13)	(13 – 14)	(15 – 16)	(16 – 17)
base of pharynx	34.4 ± 1.16	16.4 ± 0.55	21.3	24.5	28.9 ± 1.21
	(32 – 37)	(16 – 17)	(20 – 23)	(23 – 26)	(27 – 31)
vulva or mid-body	39.6 ± 2.79	15.8 ± 2.05	23.0	25.8	30.7 ± 1.60
	(36 – 47)	(14 – 19)	(21 – 24)	(23 – 28)	(29 – 34)
Anus	26.0 ± 1.30	11.2 ± 0.84	15.3	19.0	22.7 ± 0.76
	(24 – 28)	(10 – 12)	(15 – 16)	(17 – 20)	(22 – 24)

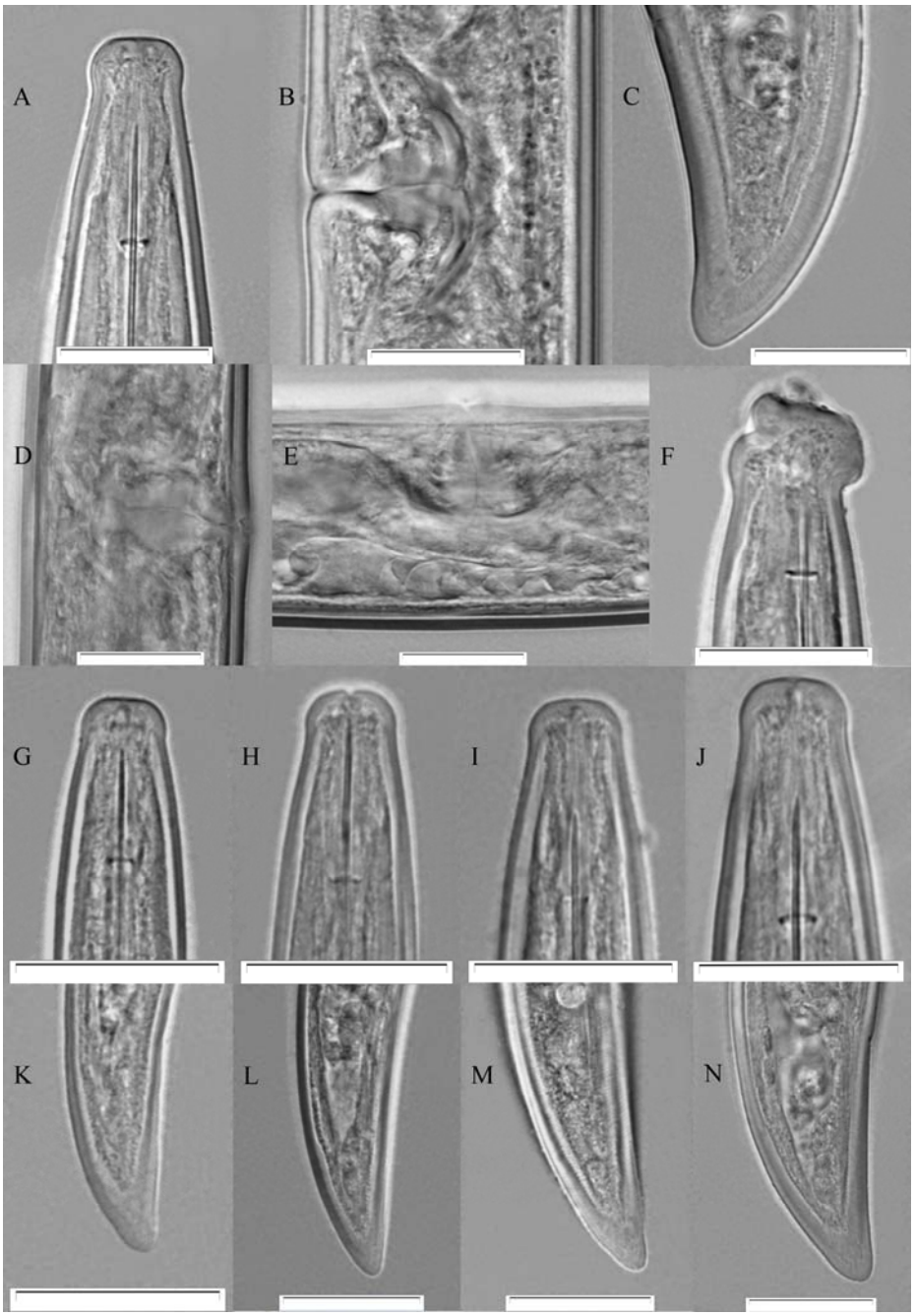

Fig. 1. A. female, anterior end; B. female, vulva; C. female, tail; D. bivulval female, anterior vulva; E. bivulval female, ovary at the level of second vulva; F. female, deformated lip region; G – J. juveniles, J1 – J4 anterior end, respectively; K – N. juveniles, J1-J4 tail, respectively. Scale bar under each photograph represents 20μm.

Female with deformated lip region. One female was found with greatly enlarged and asymetrical lip region (Fig. 1F). Lip region width 16 μm, remining morphology and morphometrics within range of normal females. This specimen was not included into morphometrics presented in Table 1.

Males. Not found

Juveniles (Table 1, Figs. 1 G – N, 2). Four juvenile stages present. With except of the reproductive system, morphologically similar to adults.

Remarks

Specimens of *L. danuvii* from Poland are morphologically and morphometrically rather similar to populations from Serbia (Barsi *et al.* 2007). The main difference in females is shorter tail in population from Poland (41.6 vs 46.4 in type population and 46.5 in additional population associated with *Populus sp.*) and lower c' value (1.60 vs 1.70 and 1.85).

Data on the morphological and anatomical abnormalities in species of the genus *Longidorus* are rather scarce, however pathologies of the genital tract similar to those described here were recorded in other species (e.g. in *L. euonymus*

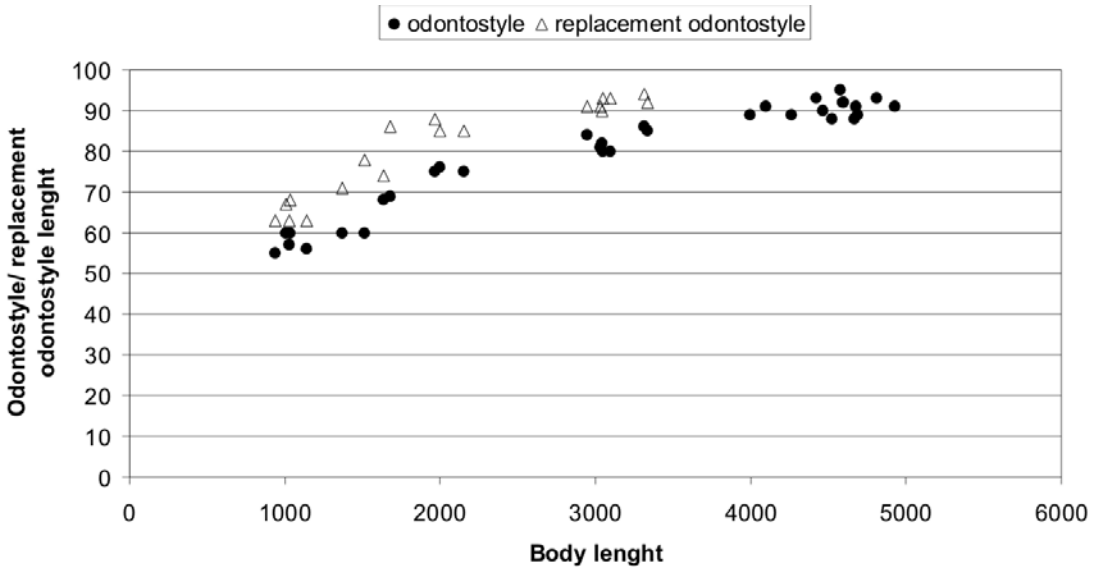

Fig. 2. Scatter plot of the functional and replacement odontostyle in relation to juvenile and females body length in a Longidorus danuvii population from Poland

(Barsi 1994), *L. juvenilis* (Širca et. al. 2007) and *L. poessneckensis* (Kornobis & Peneva 2011)).

To the best of my knowledge, *L. danuvii* was reported only from two Serbian populations, associated with *Amporpha fruticosa* L. and *Populus sp.* (Barsi *et al.* 2007). The current finding extends geographical and host- associations range known for this species.

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