

Descriptions of Three New *Longidorus* Species from Slovakia (Nemata: Longidoridae)¹

M. LISKOVA,² R. T. ROBBINS,³ AND D. J. F. BROWN⁴

Abstract: Three new *Longidorus* species from Slovakia are described. *Longidorus carpathicus* n. sp. most closely resembles *Longidorus silvae* but differs by having a longer odontostyle, odontophore, and total stylet; smaller a and c ratios; and longer distance to the guide ring. This new species also resembles *L. piceus*, *L. macrosoma*, and *L. major* but differs by having a narrower lip width. It further differs from *L. piceus* by having a longer odontostyle and smaller c ratio, and by lacking males; from *L. macrosoma* by having a longer odontostyle, smaller c ratio, by lacking males, and a more pronounced J1 tail peg; and from *L. major* by having a shorter body length, longer odontostyle, longer odontophore, and longer J1 tail peg. *Longidorus piceicola* n. sp. most closely resembles *L. eridanicus*, from which it differs by having a greater lip width, longer tail, smaller c ratio, larger c' ratio, shorter hyaline tail length, and a conically rounded vs. hemispherical tail. This new species differs from *L. cylindricaudatus* by having a larger lip width, longer odontostyle and odontophore, and a greater distance to the guide ring; from *L. nevesi* by having a shorter body length, longer odontostyle, larger c' ratio, and shorter hyaline tail length. *Longidorus juglandicola* n. sp. most closely resembles *L. athesinus* but differs by its longer body, wider lips, and larger a and c ratios. It closely resembles *L. vineacola* but differs by its shorter body length, smaller c ratio, and an almost parallel lip outline vs. an expanded lip outline; from *L. lusitanicus* by a longer odontophore and tail, and an almost parallel lip outline vs. an expanded lip outline.

Key words: *Longidorus carpathicus* n. sp., *Longidorus juglandicola* n. sp., *Longidorus piceicola* n. sp., morphometrics, nematode, new species, taxonomy.

During a nematological survey to determine the occurrence and distribution of Longidoridae and Trichodoridae in Slovakia (Liskova et al., 1995) specimens representing three undescribed *Longidorus* species were collected. The species, which are described herein, were each found at only one site: *L. carpathicus* n. sp. in a beech forest (*Fagus sylvatica* L.) in the area of Baba (a hill in the Carpathian Mountains of western Slovakia), *L. piceicola* n. sp. from a Norway spruce forest (*Picea abies* (L.) Karst) near the village of Cervena Skala in the Muranska Planina Mountains in central Slovakia, and *L. juglandicola* n. sp. from a walnut grove (*Juglans regia* L.) in the area of Sorozka (a hill in eastern Slovakia).

MATERIALS AND METHODS

Specimens were extracted from the soil with a modified decanting and sieving method (Liskova et al., 1995). Longidorid specimens were hand-picked from the samples, heat-killed, fixed in 2% formalin, processed to anhydrous glycerin by a modification of Seinhorst's rapid method (Seinhorst, 1959), mounted on glass slides, and examined with a high-resolution light microscope with Nomarski differential interference contrast. The ratio J' is the length of the hyaline region of the tail (measured on the longitudinal axis) divided by the hyaline width (measured perpendicular to the longitudinal axis at the beginning of the hyaline region).

SYSTEMATICS

Longidorus carpathicus n. sp. (Fig. 1)

Description

Morphometrics of the holotype female and four paratype females are given in Table 1 and of the paratype juveniles in Table 2.

Female: Body forming J-shape, tapering gradually anteriorly, lip base width 20–23% of mid-body width. Cuticle appearing plain

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² Parasitological Institute, Slovak Academy of Sciences, Hlinkova 3, 040 01 Kosice, Slovak Republic.

³ Department of Plant Pathology, Nematology Laboratory, University of Arkansas, Fayetteville, AR 72701.

⁴ Virology Department, Scottish Crop Research Institute, Dundee, DD2 5DA, Scotland. Research at the Scottish Crop Research Institute was grant-aided by the Scottish Office Agricultural, Environment and Fisheries Department.

E-mail: rrobbin@comp.uark.edu

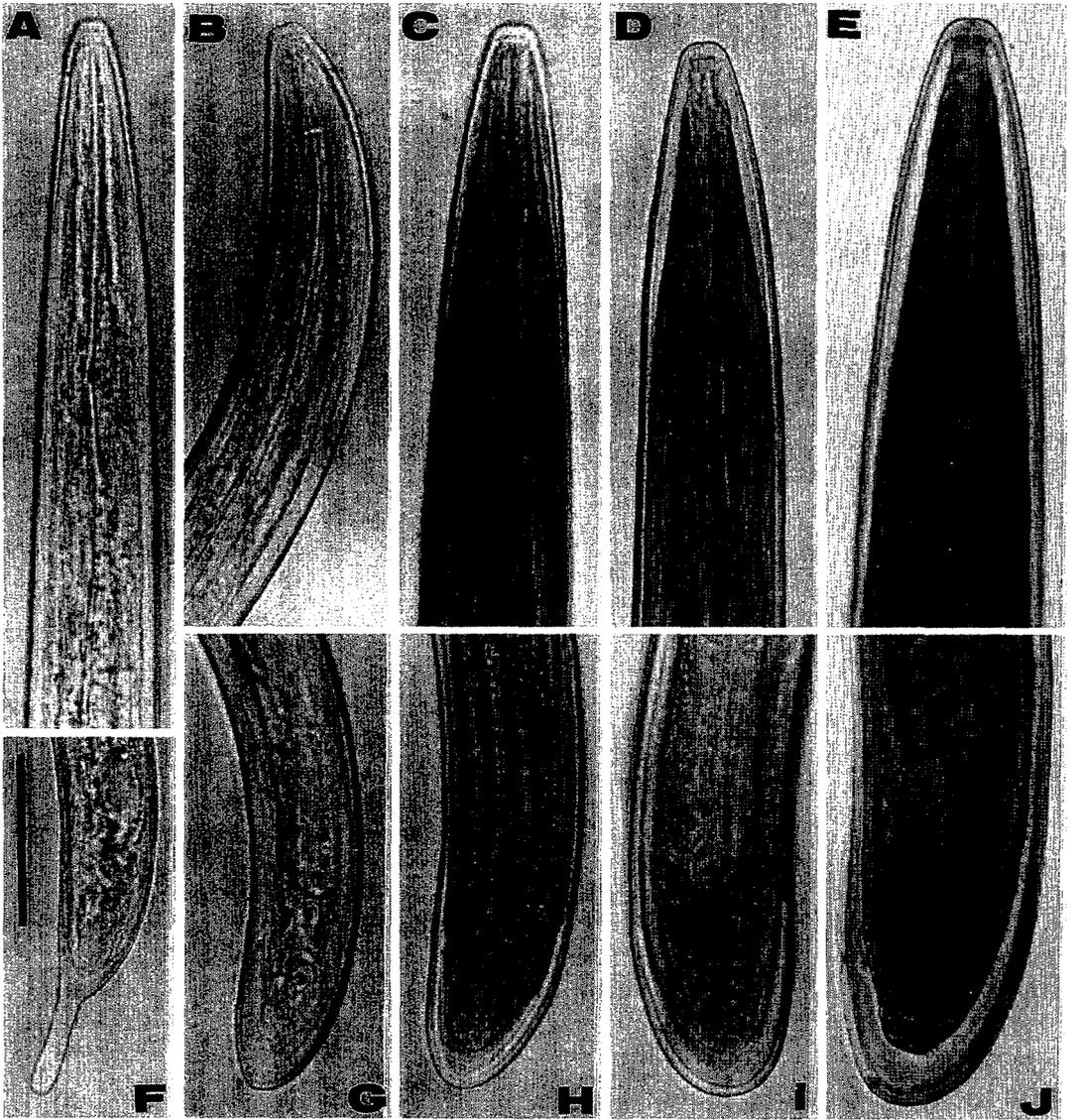


FIG. 1. Photomicrographs of *Longidorus carpathicus* n. sp. A-D) Juvenile anterior regions, J1-J4, respectively. E) Female anterior region. F-I) Juvenile posterior regions, J1-J4, respectively. J) Female posterior region. Scale bar = 50 μ m.

except for inconspicuous pores, with two layers, each about 2 μ m thick, becoming thicker about two anal body widths anterior to anus with a maximum thickness of about 15 μ m at tail tip with inner layer about 10 μ m thick (Fig. 1J). Lip region tapering; arcuate anteriorly with small, obscure labial and cephalic papillae present; no lip constriction or expansion (Fig. 1E). Amphidial pouch appearing bilobed in one specimen, seen obliquely in other specimens, extend-

ing posteriorly to about half of the distance to guide ring. Nerve ring about one body width (at odontophore base) posterior to the odontophore base. Odontostyle long and very slender, 1-1.5 μ m wide at base. Odontophore base slightly swollen and muscular. Esophageal bulb about 4.5 times as long as wide, tapering anteriorly. Esophago-intestinal valve about 30% of body width at base of esophageal bulb, about as long as wide, almost conical posteriorly. Vulva not

TABLE 1. Morphometrics of female *Longidorus carpathicus* n. sp.

	Holotype female	Paratypes 4 females	
		Mean SD	Range
Body length (mm)	6.36	6.34 ± 0.12	(6.21–6.49)
a	90	79 ± 4.1	(74–84)
b	14.4	14 ± 3.4	(10–18)
c	57	153 ± 3.3	(149–156)
c'	0.8	0.8 ± 0.02	(0.76–0.81)
J'	0.3	0.4 ± 0.03	(0.36–0.43)
V%	52.8	49 ± 1.8	(47–51)
Length (µm)			
Odontostyle	154	156 ± 9.2	(142–162)
Odontophore	81	83 ± 5.0	(77–87)
Total stylet	236	239 ± 13.1	(219–248)
Tail	41	41 ± 1.0	(41–43)
Anterior ovary	554	668 ± 140	(524–838)
Posterior ovary	530	649 ± 110	(544–809)
Hyaline tail	12	15 ± 1.8	(13–17)
Widths (µm)			
Lips	16.2	17.5 ± 1.0	(16.2–18.3)
Mid-body	71	81 ± 3.5	(77–85)
Anal	51	53.3 ± 1.0	(53–55)
Head end to guide ring (µm)	44	42 ± 1.8	(41–44)

elevated. Vagina perpendicular to body axis with slightly thickened cuticular lining, encircled by a muscular band at juncture with uterus, cuticle not obviously thickened exterior to the vagina. Uterus and sphincter joining uterus and oviduct prominent; sperm not observed in uterus. Ovaries paired, opposed, reflexed. Prerectum length 8 to 10 anal body widths. Rectum length about 85% of anal body width. Tail dorsally curved with a conical to bluntly rounded tip. Hyaline area of tail 2.3–3.0 times wider than long.

Male: Not found.

Juveniles: Body shape arcuate to J-shaped, smaller than adult females. All juvenile lip shapes similar to adult female (Fig. 1A–D). Replacement odontostyle present in all four stages; anterior tip located within odontophore base in J1 (Fig. 1A), anterior tip in non-molting specimens of J2, J3, and J4 in area of nerve ring. Tail of J1 with a distinct mucronate peg 20–29 µm long (Fig. 1F). Tails of J2–J4 more conical than female (Fig. 1G–I).

Diagnosis

Longidorus carpathicus n. sp. differs from most other species in the genus by having the odontostyle length in excess of 130 µm, anterior end smoothly tapered, tail conically rounded, J1 with distinctly pegged tail, males not found, and four juvenile stages found (Robbins et al., 1995). The code in the polytomous key (Chen et al., 1997) is: A67-B3-C4-D1-E2-F3-G12-H1-I1.

Relationships

Longidorus carpathicus n. sp. most closely resembles *L. silvae* Roca, 1993 (Roca, 1993) but differs by its longer odontostyle (142–162 vs. 114–133 µm), longer odontophore (77–87 vs. 45–70 µm), longer total stylet length (219–248 vs. 165–198 µm), shorter mean body length (6.34 vs. 6.90 mm), smaller mean a ratio (79 vs. 99), smaller mean c ratio (153 vs. 167), and longer mean distance from the anterior end to the guide ring (42 vs. 36 µm). *Longidorus carpathicus* n. sp. differs from *L. picenus* Roca, Lamberti and Agostinelli, 1984 (Roca et al., 1984), *L. macrosoma* Hooper, 1961 (Hooper, 1961), and *L. major* Roca and D'Errico, 1987 (Roca and D'Errico, 1987) by its narrower lip width (16–18 vs. 19–22, 21–23, and 22–27 µm, respectively). It further differs from *L. picenus* by its longer mean odontostyle (154 vs. 137 µm), smaller mean c ratio (153 vs. 179), and the absence of males. *Longidorus carpathicus* differs from *L. macrosoma* by its shorter length (6.21–6.49 vs. 8.40–11.90 mm), longer odontostyle (142–162 vs. 123–140 µm), smaller c ratio (149–156 vs. 205–253), lack of males, and longer J1 tail peg. It differs from *L. major* by its shorter body length (6.21–6.49 vs. 8.50–12.00 mm), longer odontostyle (142–162 vs. 125–137 µm), longer odontophore (77–87 vs. 54–67 µm), and longer J1 tail peg (20–29 vs. 12–15 µm).

Type host and locality

Type specimens collected 28 September 1994 (3 females, 12 juveniles) and 24 April

TABLE 2. Morphometrics of juvenile stages of *Longidorus carpathicus* n. sp.

	J1		J2		J3		J4	
	Mean	SD (Range)	Mean	SD (Range)	Mean	SD (Range)	Mean	SD (Range)
n	14		7		6		6	
Body length (mm)	1.73 ± 0.18 (1.45–2.07)		2.46 ± 0.23 (2.08–2.77)		3.20 ± 0.31 (2.77–3.56)		4.32 ± 0.46 (3.60–4.80)	
a	52 ± 6.0 (43–63)		55 ± 3.0 (51–60)		63 ± 4.0 (56–68)		75 ± 9.8 (66–94)	
b	5.5 ± 0.6 (4.1–6.1)		8.0 ± 1.8 (5.4–9.7)		7.6 ± 0.8 (6.6–8.6)		10.1 ± 2.4 (7.6–13.5)	
c	29 ± 3.1 (26–36)		62 ± 6.7 (51–73)		80 ± 13.4 (57–98)		106 ± 19.5 (71–125)	
c'	2.5 ± 0.3 (1.9–3.1)		1.2 ± 0.1 (1.0–1.3)		1.0 ± 0.1 (0.9–1.3)		0.9 ± 0.2 (0.8–1.3)	
J'	2.2 ± 0.3 (1.8–2.8)		0.3 ± 0.1 (0.2–0.4)		0.3 ± 0.1 (0.2–0.4)		0.4 ± 0.1 (0.3–0.5)	
Length (µm)								
Odontostyle	90.3 ± 2.7 (85–93)		100.0 ± 4.8 (89–104)		113.7 ± 3.6 (110–120)		125.5 ± 7.9 (112–134)	
Odontophore	54.5 ± 3.8 (49–61)		60.0 ± 7.0 (51–67)		69.4 ± 12.9 (55–91)		81.5 ± 6.2 (75–91)	
Total stylet	144.9 ± 4.3 (138–150)		160.1 ± 9.9 (142–168)		183 ± 13.1 (167–207)		207.1 ± 10.6 (189–221)	
Replacement odontostyle	99 ± 2.0 (97–104)		112 ± 7.3 (102–122)		133 ± 3.8 (128–138)		162 ± 7.7 (140–162)	
Tail	60 ± 5.6 (51–67)		40 ± 2.8 (37–45)		41 ± 4.4 (37–49)		42 ± 4.8 (37–51)	
Hyaline tail	31.5 ± 2.8 (28–37)		7.8 ± 0.8 (7–9)		8.8 ± 1.5 (7–11)		10.8 ± 1.0 (10–12)	
Width (µm)								
Lips	9.8 ± 0.06 (9–11)		11.7 ± 0.5 (11–12)		13.7 ± 1.1 (12–15)		15.4 ± 1.0 (14–16)	
Mid-body	34 ± 3.0 (24–39)		45 ± 3.7 (40–49)		51 ± 2.9 (47–56)		59 ± 10.8 (43–71)	
Anal	24 ± 3.0 (19–28)		34 ± 3.1 (30–39)		51 ± 2.9 (47–56)		46 ± 4.7 (41–51)	
Head end to guide ring (µm)	24 ± 1.2 (22–27)		29 ± 1.7 (26–32)		34 ± 2.6 (32–39)		37 ± 2.7 (33–41)	

1996 (holotype female, one paratype female, 22 juveniles) from the rhizosphere of beech (*Fagus sylvatica* L.) in the area of Baba (a hill in the Carpathian Mountains of western Slovakia), M. Liskova, coll.

Type designations

Holotype female, one paratype female, and 33 paratype juveniles (14 J1, seven J2, six J3, six J4) deposited in USDA Nematode Collection, Beltsville, Maryland. Two paratype females deposited in the Museum national d'Histoire naturelle, Laboratoire des Vers, Paris, France, and one paratype female deposited in the Parasitological Institute

nematode collection, Slovak Academy of Sciences, Kosice, Slovak Republic.

Etymology

The species is named after the Carpathian Mountains, where the specimens were collected.

Longidorus piceicola n. sp.
(Figs. 2, 3)

Description

Morphometrics of the holotype female, paratype females, and allotype male are given in Table 3 and of the paratype juveniles in Table 4.

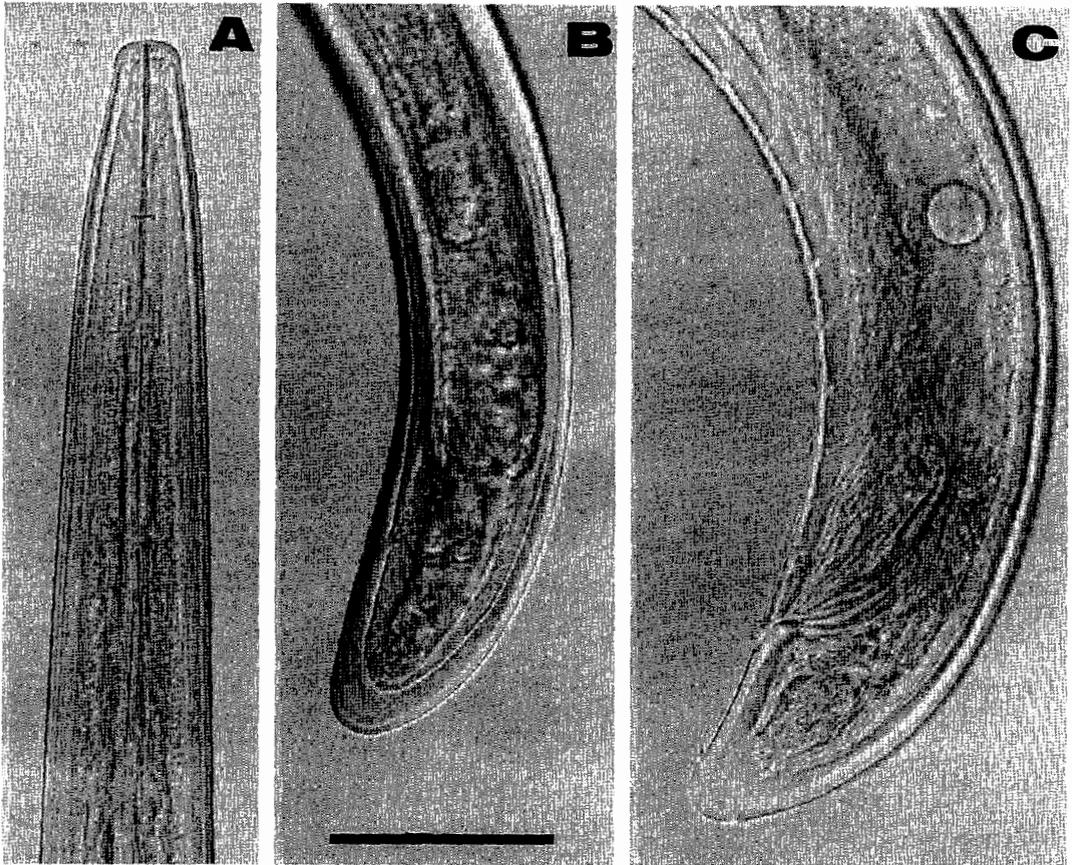


FIG. 2. Photomicrographs of *Longidorus picicola* n. sp. A) Female anterior region. B) Female posterior region. C) Male posterior region. Scale bar = 50 μ m.

Female: Body forming spiral to J-shape, tapering gradually anteriorly, width at lip base 24–33% of midbody width. Cuticle appearing plain except for inconspicuous pores, with two layers about 3–4 μ m thick, with the outer layer about twice as thick as the inner, becoming thicker about two anal body widths anterior to the anus, with a maximum of 8–14 μ m at the tail tip, inner layer about 4 times thicker than the outer. Lip region tapering; arcuate anteriorly with small, obscure labial and cephalic papillae present; no lip constriction or expansion (Fig. 2A). Amphidial pouch not distinct, appearing more or less pocket-shaped. Nerve ring about one body width (at odontophore base) posterior to the odontophore base. Odontostyle long and very slender, approximately 2 μ m wide at base; odontophore base slightly swollen and muscular. Esophageal

bulb about 4–6 times as long as wide, tapering anteriorly. Esophago-intestinal valve about 30% of body width at base of esophageal bulb, about as long as wide, almost conical posteriorly. Vulva not elevated. Vagina perpendicular to body axis with slightly thickened cuticular lining, encircled by a muscular band at juncture with uterus. Uterus about 2 body widths in length, not obviously thickened exterior to the vagina. Uterus and sphincter joining uterus and oviduct prominent; sperm not observed. Ovaries paired, opposed, reflexed. Prerectum length 8–10 anal body widths. Rectum length 75–85% of anal body width. Tail dorsally curved with a conically rounded tip (Fig. 2B). Hyaline tail tip approximately twice as wide as long.

Male: Morphologically similar to females, tail more tightly curled. Spicules thick, mas-

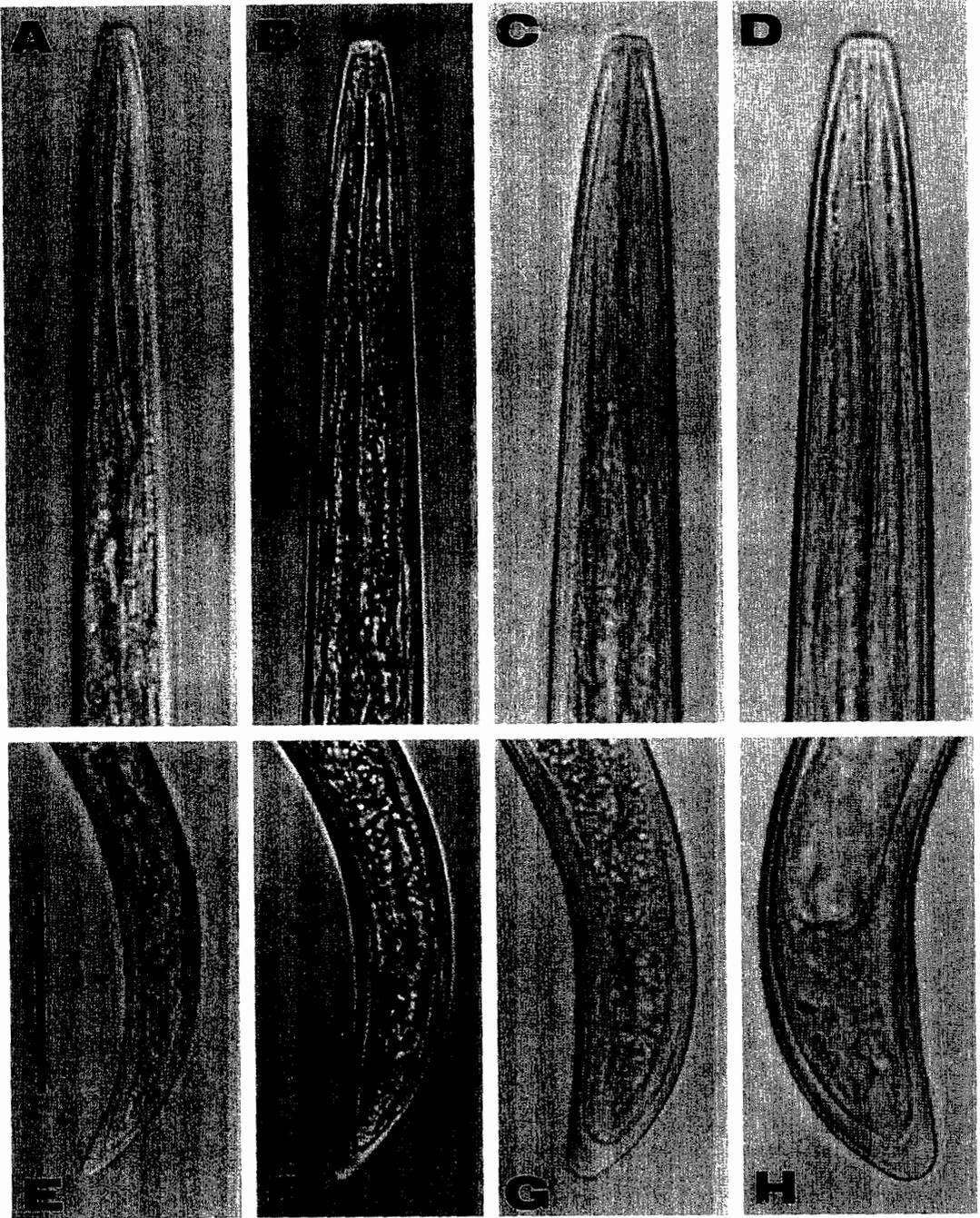


FIG. 3. Photomicrographs of *Longidorus piceicola* n. sp. juveniles. A-D) Anterior regions, J1-J4, respectively. E-H) Posterior regions, J1-J4, respectively. Scale bar = 50 μ m.

sive, lateral accessory pieces inconspicuous. Posteriorly, adanal pair of supplements and 11 ventral supplements (Fig. 2C). Sperm present in male genital tract.

Juveniles: Body shape arcuate to J-shaped,

smaller than adult females. All juvenile lip shapes similar to adult female (Fig. 3A-D). Replacement odontostyle present in all four stages: anterior tip located within odontophore base in J1 (Fig. 3A); anterior tip in

TABLE 3. Morphometrics of female and male *Longidorus piceicola* n. sp.

	Holotype female	Allotype male	Paratypes 24 females		
			Mean	SD	Range
Body length (mm)	5.14	4.92	5.19 ± 1.44		(4.22–5.97)
a	96	78	94 ± 6.5		(73–104)
b	9.2	7.8	9.5 ± 0.9		(8–11)
c	120	113	125 ± 15.8		(94–149)
c'	1.1	1.0	1.1 ± 0.1		(0.9–1.3)
J'	0.5	0.6	0.5 ± 0.1		(0.4–0.6)
V or T (%)	46	40	47 ± 1.5		(44–50)
Length (µm)					
Odontostyle	166	166	160 ± 4.5		(151–169)
Odontophore	79	61	81 ± 4.0		(75–87)
Total stylet	246	227	241 ± 7.3		(226–254)
Tail	43	44	42 ± 3.0		(36–49)
Anterior ovary	351	–	347 ± 56		(262–467)
Posterior ovary	266	–	323 ± 56		(238–459)
Hyaline tail	12	16	12 ± 1.6		(8–14)
Spicules	–	53	–		
Width (µm)					
Lips	16	16	16 ± 0.7		(14–17)
Mid-body	53	44	56 ± 4.5		(48–63)
Anal	39	45	40 ± 2.1		(37–45)
Head end to guide ring (µm)	42	47	42 ± 2.3		(37–45)

non-molting specimens of J2, J3, and J4 in area of nerve ring. Juvenile tails more conical than female tails, with J1 tail being the most conical (Fig. 3E–H).

Diagnosis

Longidorus piceicola n. sp. differs from most other species in the genus by having an odontostyle longer than 150 µm, anterior end smoothly tapered, a conically rounded tail, males occurring rarely, and four juvenile stages. The code in the polytomous key (Chen et al., 1997) is: A67-B23-C34-D2-E(12?)-F23-G12-H12-I2.

Relationships

Longidorus piceicola n. sp. most closely resembles *L. eridanicus* Roca, Lamberti and Agostinelli, 1984 (Roca et al., 1984) from which it differs by its greater lip width (14–17 vs. 10–14 µm), longer tail (36–49 vs. 21–29 µm), smaller c ratio (94–149 vs. 159–242), larger c' ratio (0.9–1.3 vs. 0.5–0.7), shorter hyaline tail length (8–14 vs. 15–19 µm), and conically rounded vs. hemispherical tail. *Longidorus piceicola* n. sp. differs from *L. cylindricaudatus* Kozłowska and Seinhorst,

1979 (Kozłowska and Seinhorst, 1979) by its greater lip width (14–17 vs. 13–14 µm), longer odontostyle (151–168 vs. 128–140 µm), longer odontophore (75–87 vs. 50–70 µm), and greater distance to the guide ring (37–45 vs. 33–38 µm). *Longidorus piceicola* n. sp. differs from *L. nevesi* Macara, 1985 (Macara, 1985) by its shorter body length (4–6 vs. 6–10 mm), longer odontostyle (151–169 vs. 133–152 µm), larger c' ratio (0.9–1.3 vs. 0.6–0.9), and shorter hyaline tail length (8–14 vs. 14–18 µm).

Type host and locality

All type specimens of *Longidorus piceicola* collected 28 September 1994 from the rhizosphere of Norway spruce (*Picea abies* (L.) Karst) growing in a gravelly sandy loam soil in the Muranska Planina Mountains near the village of Cervena Skala, Slovakia, M. Liskova, coll.

Type designations

Holotype female, allotype male, 9 paratype females, and 78 paratype juveniles (22 J1, 16 J2, 16 J3, 20 J4) deposited in USDA Nematode Collection, Beltsville, Maryland.

TABLE 4. Morphometrics of juvenile stages of *Longidorus piceicola* n. sp.

	J1	J2	J3	J4
	Mean SD (Range)	Mean SD (Range)	Mean SD (Range)	Mean SD (Range)
n	22	16	16	20
Body length (mm)	1.50 ± 0.13 (1.32–1.72)	2.36 ± 0.22 (1.93–2.73)	3.00 ± 0.22 (2.60–3.47)	3.75 ± 0.45 (3.07–4.62)
a	61 ± 3.6 (56–74)	67 ± 3.5 (62–73)	74 ± 2.9 (67–79)	80 ± 8.6 (67–103)
b	5.3 ± 1.1 (3.9–7.4)	6.5 ± 1.0 (5.1–7.7)	7.2 ± 0.6 (6.1–8.2)	7.9 ± 0.9 (6.3–9.5)
c	34 ± 3.2 (30–42)	49 ± 6.1 (40–59)	68 ± 7.3 (57–81)	81 ± 13.5 (58–108)
c'	2.6 ± 0.2 (2.2–3.0)	1.9 ± 0.3 (1.5–2.3)	1.5 ± 0.2 (1.3–1.8)	1.3 ± 0.2 (1.1–1.7)
J'	1.1 ± 0.1 (1.0–1.4)	0.9 ± 0.1 (0.8–1.0)	0.6 ± 0.1 (0.4–0.7)	0.6 ± 0.1 (0.4–0.8)
Length (µm):				
Odontostyle	92 ± 0.1 (81–99)	99 ± 3.0 (95–104)	119 ± 5.3 (110–128)	133 ± 8.5 (117–144)
Odontophore	47 ± 2.5 (43–53)	60 ± 3.5 (55–65)	67 ± 4.0 (59–73)	75 ± 4.7 (63–83)
Total stylet	140 ± 6.1 (130–150)	160 ± 3.8 (154–167)	185 ± 7.5 (169–201)	208 ± 10.4 (191–225)
Replacement odontostyle	99 ± 3.2 (91–104)	122 ± 3.0 (118–126)	138 ± 6.3 (128–150)	158 ± 10.0 (144–183)
Tail	44 ± 3.3 (39–51)	48 ± 3.6 (40–53)	45 ± 3.3 (37–49)	47 ± 4.6 (39–54)
Hyaline tail	8 ± 0.8 (7–10)	9 ± 0.8 (8–10)	10 ± 0.9 (8–11)	11 ± 1.5 (8–14)
Width (µm):				
Lips	9 ± 0.3 (8.1–9.1)	11 ± 0.5 (10–12)	12 ± 0.3 (11.6–12.6)	13 ± 0.9 (12–14)
Mid-body	25 ± 2.2 (21–28)	36 ± 3.1 (30–42)	41 ± 2.9 (37–48)	47 ± 3.6 (39–52)
Anal	17 ± 1.2 (15–20)	25 ± 2.5 (21–30)	30 ± 2.1 (26–35)	36 ± 2.7 (30–39)
Head end to guide ring (µm)	22 ± 0.6 (20–23)	28 ± 1.4 (26–32)	32 ± 0.9 (30–34)	36 ± 1.7 (34–40)

Twelve paratype females deposited in the Museum national d'Histoire naturelle, Laboratoire des Vers, Paris, France, and three paratype females deposited in the Parasitological Institute nematode collection, Slovak Academy of Sciences, Kosice, Slovak Republic.

Etymology

The specific epithet was chosen for this nematode's association with spruce (*Picea*) and the Latin *cola* (to dwell).

Longidorus juglandicola n. sp.
(Figs. 4, 5)

Description

Morphometrics of the holotype female, allotype male, paratype females, and paratype males are given in Table 5 and of the paratype juveniles in Table 6.

Female: Body forming J- to spiral shape, about 80% of mid-body width at esophago-intestinal junction, tapering to about 35% of mid-body width at lip base. Cuticle appearing plain except for inconspicuous pores,

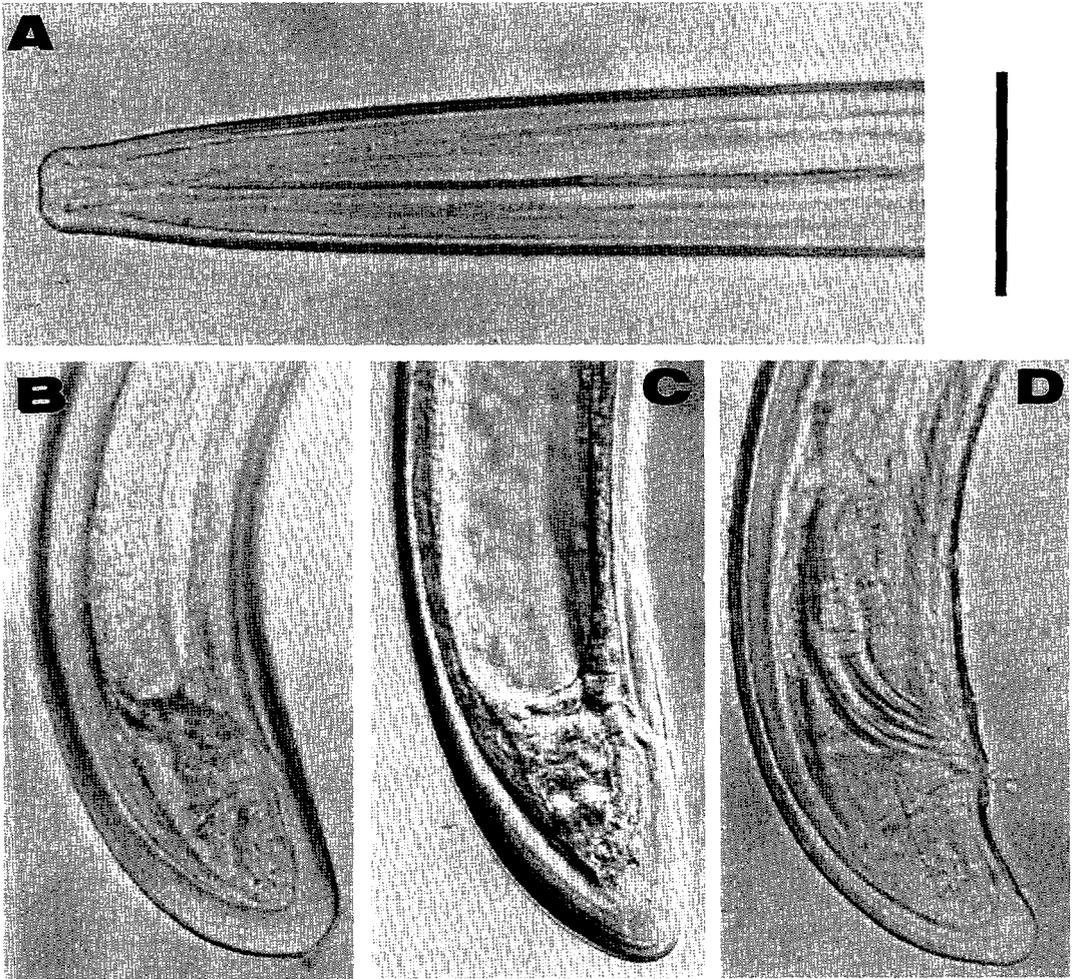


FIG. 4. Photomicrographs of *Longidorus juglandicola* n. sp. A) Female anterior region. B–C) Female posterior regions. D) Male posterior region. Scale bar = 50 μ m.

made up of two layers 3–4 μ m thick with both layers of about equal thickness, becoming thicker two anal body widths anterior to the anus, to a maximum of 10–20 μ m; inner layer nearly three times thicker than the outer layer at the tail tip. Lips parallel to slightly expanded, arcuate to almost truncate (Fig. 4A). Small, obscure labial and cephalic papillae present. Amphidial pouch appearing bilobed in lateral view, extends posteriorly about two-thirds of the distance to the guide ring. Nerve ring about one body width (at odontophore base) posterior to the odontophore base. Odontostyle long and slender, about 1.5 μ m in diameter at base, odontophore base slightly expanded.

Esophageal bulb 4–6 times as long as wide, tapering anteriorly. Esophago-intestinal valve about 40% of body width at base of the esophageal bulb, about as long as wide, almost conical posteriorly. Vulva slightly elevated, vagina perpendicular to body axis, with slightly thickened cuticular lining encircled by a muscular band at juncture with uterus, cuticle not obviously thickened exterior to the vagina. Uterus and sphincter joining uterus and oviduct prominent, uterus length 4.5 to 6 times midbody width, sperm observed in uterus. Ovaries paired, opposed, reflexed. Prerectum length 7 to 9 anal body widths. Rectum length almost 75% of anal body width. Tail with dorsal curve, tip coni-

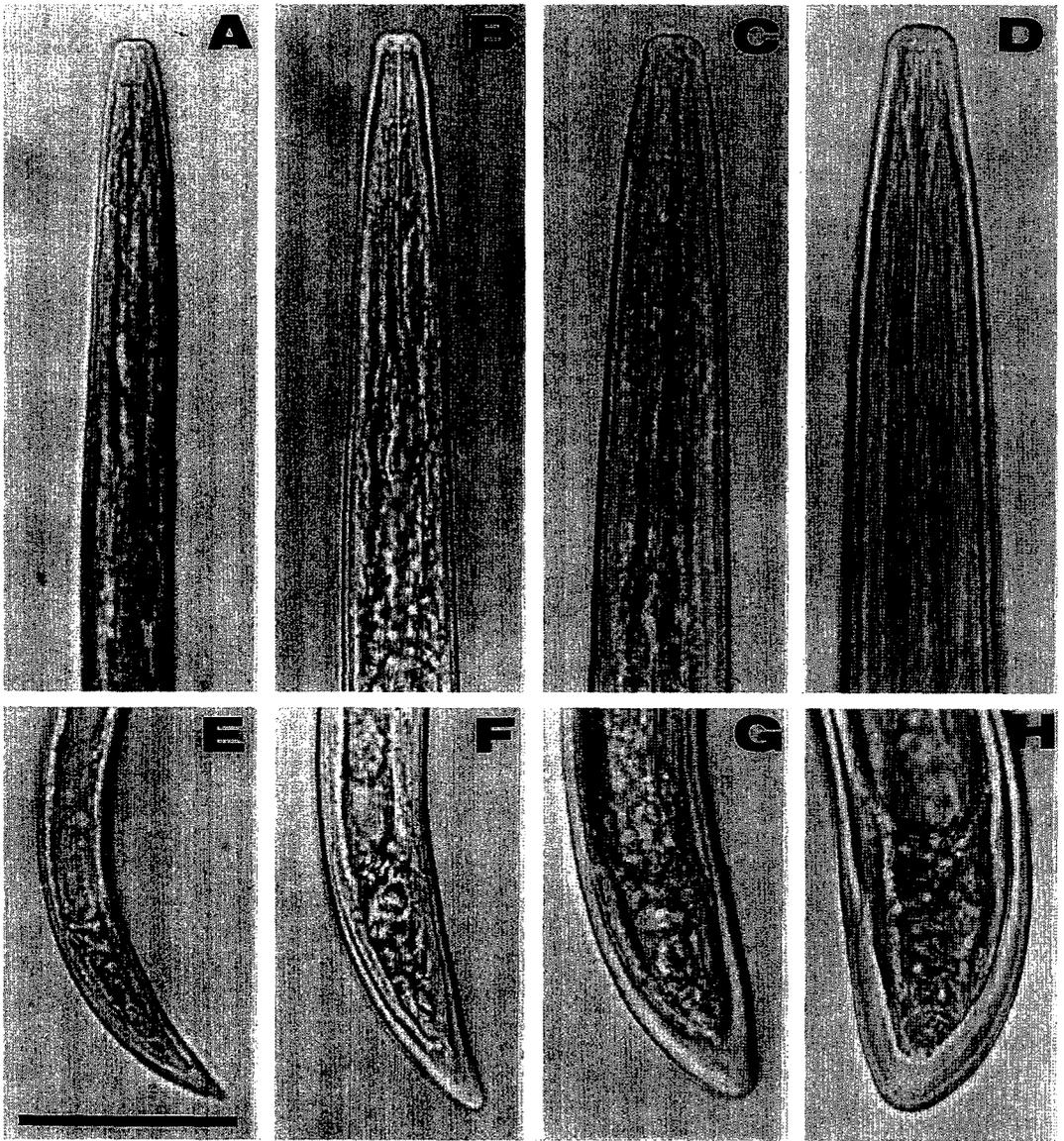


FIG. 5. Photomicrographs of *Longidorus juglandicola* n. sp. juveniles. A–D) Anterior regions, J1–J4, respectively. E–H) Posterior regions, J1–J4, respectively. Scale bar = 50 μ m.

cal to bluntly rounded (Fig. 4B,C). Hyaline area of tail about twice as wide as long.

Male: Body shape similar to female, except posterior region strongly curved ventrally. Morphometrics and anatomy similar to female except for structural differences in genitalia. Spicules thick, massive, lateral accessory pieces inconspicuous. Paired adanal supplements 13–18 μ m anterior to cloacal opening; 10 to 14 medioventral supplements anterior to cloaca. Tail conical, ven-

trally curved, with tip semi-hemispherical to conical (Fig. 4D). Hyaline area about twice as wide (21–28 μ m) as long.

Juveniles: Body shape arcuate to J-shaped, smaller than adult females. All juvenile lip shapes similar to adult female (Fig. 5A–D). Replacement odontostyle present in all four stages: anterior tip located within odontophore base in J1 (Fig. 5E); anterior tip in non-molting specimens of J2, J3, and J4 in area of nerve ring. Juvenile tails more con-

TABLE 5. Morphometrics of female and male *Longidorus juglandicola* n. sp.

	Holotype female	Paratypes 17 females		Allotype male	Paratypes 9 males		
		Mean	SD		Range	Mean	SD
Body length (mm)	6.93	6.40 ± 0.57	(5.61–7.51)	6.53	6.05 ± 0.60	(5.43–7.30)	
a	108	115 ± 7.9	(104–131)	124	113 ± 8.1	(99–128)	
b	15.1	14.2 ± 1.4	(11–17)	13.3	13.8 ± 1.7	(11–17)	
c	148	156 ± 12.7	(136–180)	153	139 ± 17.1	(116–163)	
c'	1.0	0.9 ± 0.1	(0.8–1.1)	0.9	1.0 ± 0.1	(0.9–1.2)	
J'	0.6	0.4 ± 0.1	(0.3–0.6)	0.5	0.6 ± 0.1	(0.4–0.7)	
V or T (%)	55	55 ± 1.8	(52–57)	43	42 ± 4.8	(37–52)	
Length (µm):							
Odontostyle	89	87 ± 4.0	(81–95)	89	87 ± 4.5	(81–93)	
Odontophore	77	76 ± 4.3	(71–83)	83	74 ± 5.2	(65–81)	
Total stylet	166	163 ± 6.6	(152–177)	173	161 ± 4.3	(154–167)	
Tail	47	41 ± 4.6	(36–51)	43	44 ± 4.3	(39–53)	
Anterior ovary	609	641 ± 105	(600–940)	–	–	–	
Posterior ovary	595	600 ± 119	(491–1003)	–	–	–	
Hyaline tail	20	14 ± 3.4	(10–20)	12	14 ± 1.9	(12–16)	
Spicules	–	–	–	65	66 ± 4.4	(57–71)	
Width (µm):							
Lips	19	19 ± 0.9	(198–21)	20	20.4 ± 0.3	(20–21)	
Mid-body	64	56 ± 3.6	(51–64)	53	54 ± 2.5	(51–57)	
Anal	49	45 ± 2.0	(41–49)	46	45 ± 1.3	(43–48)	
Head end to guide ring (µm)	32	34 ± 1.5	(31–37)	35	35 ± 1.4	(33–37)	

cal than female tails, with J1 tail being the most conical (Fig. 5E–H).

Diagnosis

Longidorus juglandicola n. sp. is characterized by body length of 5.6–7.5 mm, odontostyle length of 81–95 µm, parallel to slightly expanded lips, distance to guide ring from anterior end less than 2 lip widths, conically rounded tail, numerous males, and four juvenile stages. The code in the polytomous key (Chen et al., 1997) is: A3-B4-C3-D3-E2-F34-G23-H12-I2.

Relationships

Longidorus juglandicola n. sp. most closely resembles *L. athesinus* Lamberti, Coiro, and Agostinelli, 1991 (Lamberti et al., 1991) but differs by its longer body (5.6–7.5 vs. 3.7–5.8 mm), wider lips (18–21 vs. 14–18 µm), larger a ratio (104–130 vs. 56–88), and larger c ratio (140–180 vs. 99–145). *L. juglandicola* also closely resembles *L. vineacola* Sturhan and Weischer, 1954 (Sturhan and Weischer, 1954) but differs by its shorter length (5.6–7.5 vs. 6.9–9.2 mm), smaller c

ratio (140–180 vs. 186–247), and an almost parallel lip outline vs. an expanded lip outline. *L. juglandicola* also closely resembles *L. lusitanicus* Macara, 1985 (Macara, 1985) but differs by its longer odontophore (71–83 vs. 46–58 µm), longer tail (36–51 vs. 27–36 µm), and an almost parallel lip outline vs. an expanded lip outline.

Type host and locality

Collected 28 September 1994 from the rhizosphere of walnut (*Juglans regia* L.) in sandy loam soil in the area of Sorozka (a hill in eastern Slovakia), M. Liskova, coll.

Type designations

Holotype female, allotype male, 7 paratype females, 4 paratype males, and 79 juvenile paratypes (six J1, 17 J2, 26 J3, 30 J4) deposited in the USDA Nematode Collection, Beltsville, Maryland; 8 paratype females and 4 paratype males deposited in the Museum national d'Histoire naturelle, Laboratoire des Vers, Paris, France, and 2 paratype females and one paratype male deposited in the Parasitological Institute nematode col-

TABLE 6. Morphometrics of juvenile stages of *Longidorus juglandicola* n. sp.

	J1	J2	J3	J4
	Mean SD (Range)	Mean SD (Range)	Mean SD (Range)	Mean SD (Range)
n	6	17	26	30
Body length mm (L)	1.41 ± 0.19 (1.26–1.76)	2.14 ± 0.25 (1.69–2.59)	3.29 ± 0.28 (2.97–4.05)	4.63 ± 0.46 (3.78–5.68)
a	62 ± 3.9 (56–66)	66 ± 4.3 (60–72)	79 ± 4.0 (70–88)	98 ± 6.1 (89–113)
b	5.7 ± 1.0 (4.2–6.5)	7.5 ± 1.0 (5.8–10.0)	9.5 ± 0.9 (8.2–11.5)	11.7 ± 1.7 (9.3–16.6)
c	32 ± 4.2 (28–38)	48 ± 5.9 (39–57)	74 ± 7.8 (62–92)	108 ± 9.1 (92–125)
c'	2.4 ± 0.3 (2.1–2.9)	1.8 ± 0.2 (1.5–2.2)	1.3 ± 0.1 (1.1–1.7)	1.1 ± 0.1 (1.0–1.4)
J'	1.0 ± 0.2 (0.7–1.3)	0.8 ± 0.2 (0.6–1.1)	0.6 ± 0.1 (0.5–0.7)	0.5 ± 0.1 (0.3–0.6)
Length (µm)				
Odontostyle	48 ± 1.5 (47–51)	57 ± 3.1 (51–63)	67 ± 3.6 (59–76)	76 ± 3.6 (67–81)
Odontophore	34 ± 3.1 (30–39)	53 ± 4.4 (47–63)	63 ± 3.8 (55–71)	63 ± 3.4 (55–71)
Total stylet	82 ± 3.7 (79–87)	110 ± 4.8 (106–124)	129 ± 6.0 (120–142)	139 ± 4.6 (126–146)
Replacement odontostyle	59 ± 2.8 (55–62)	73 ± 3.8 (65–77)	81 ± 5.2 (73–95)	89 ± 4.4 (79–97)
Tail	44 ± 4.6 (39–49)	46 ± 3.3 (39–53)	44 ± 3.6 (37–51)	43 ± 4.3 (37–59)
Hyaline tail	10 ± 1.9 (7–12)	11 ± 1.8 (7–14)	12 ± 1.4 (10–14)	12 ± 2.0 (9–17)
Width (µm)				
Lips	10.0 ± 0.4 (9–10)	12 ± 0.9 (10–14)	14 ± 0.4 (13–15)	16 ± 0.5 (15–17)
Mid-body	23 ± 3.8 (19–29)	33 ± 4.6 (24–43)	42 ± 3.1 (36–50)	47 ± 3.8 (41–59)
Anal	18 ± 3.1 (15–23)	26 ± 3.3 (21–30)	34 ± 2.7 (28–41)	40 ± 2.9 (36–47)
Head end to guide ring (µm)	17.9 ± 0.5 (17.3–18.3)	22 ± 1.2 (20–24)	26 ± 1.1 (24–28)	30 ± 1.4 (27–33)

lection, Slovak Academy of Sciences, Kosice, Slovak Republic.

Etymology

The specific epithet was chosen for this nematode's association with walnut (*Juglans*) and the Latin *cola* (to dwell).

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