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THE FIRST RECORD AND DESCRIPTION OF MALE OF *PARALONGIDORUS REX* (NEMATODA, LONGIDORIDAE) FROM UKRAINE WITH COMMENTS ON FEMALE UTERINE EGGS MORPHOLOGY

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The First Record and Description of Male of *Paralongidorus rex* (Nematoda, Longidoridae) from Ukraine with Comments on Female Uterine Eggs Morphology. Susulovska, S. — This paper presents the first report of male specimen of *Paralongidorus rex* Andrassy, 1986. It was found in the population collected from the rhizosphere of *Acer platanoides* in Lviv, Ukraine. Morphology of male, especially structure of spicules and arrangement of supplements, is described in details and compared with most closely related species. It can be distinguished from all other similar species by longer spicules. Morphometric data on females and male of this population are provided. Morphology of female genital tract is described in details. Uterine eggs are detected in genital tract of females for the first time and their morphometrics are provided. During current research, clearly expressed seasonal reproduction of this parthenogenetic species on the territory of Western Ukraine was revealed. Uterine eggs were observed only in genital tracts of females from the soil samples collected in the first decade of May but no female specimens with eggs were detected in numerous *P. rex* populations collected during summer period (June–September).

Key words: Longidoridae, needle nematodes, morphology, *Paralongidorus rex*, Ukraine.

Introduction

Paralongidorus rex Andrassy, 1986 is a rare parthenogenetic species distributed in Central Europe. It was originally described from Hungary (Andrassy, 1986; Barsi et al., 2007) and later also reported from Poland, Slovakia, and Ukraine (Kornobis et al., 2014). *P. rex* specimens reported from India (Bohra, 2012) were probably misidentified because they differ significantly from all the other populations morphologically and morphometrically. This is the only species of genus *Paralongidorus* reported from Ukraine. The male of this species was not found either in type population or in others reported previously. During further nematological survey in the western part of Ukraine, especially on the territory of Lviv, numerous populations of *P. rex* were detected. In one of these populations, the first male specimen of the species was found. In this contribution the morphology of male spicules and the arrangement of supplements are described in details.

Material and methods

During the survey of the family Longidoridae in Ukraine 1170 soil samples were taken from natural and anthropogenically altered localities on the territory of Opillia and Roztochia in 2013–2018. *P. rex* specimens were detected in 36 samples. Population of *P. rex* described in this article was collected in Lychakiv Park,

Lviv from the rhizosphere of *Acer platanoides* L. Nematodes were extracted from 500 cm³ of soil by modified sieving and decanting method (Brown & Boag, 1988). Extracted specimens were heat killed, fixed in TAF (Cortney et al., 1955), processed to glycerol by a slow evaporation method and mounted on permanent slides. Identification and measurements were made using Olympus BX 51 microscope with Nomarski differential interference contrast, equipped with a digital camera Olympus DP 72 and computer program Quick PHOTO MICRO 2.3. Microphotographs were made using a Leica DM 5000B microscope equipped with Leica DFC 500 digital camera. Spicule terminology follows Peña-Santiago et al. (2014).

Results

Family Longidoridae Thorne, 1935

Genus *Paralongidorus* Siddiqi, Hooper & Khan, 1963

Paralongidorus rex Andrassy, 1986 (fig. 1; table 1)

Material examined. **Ukraine:** Lviv Reg.: Lviv, Lychakiv Park [49°50'08.11"N 24°03'57.09"E], rhizosphere of *Acer platanoides*, 6.06.2018, 16 ♀, 1 ♂ (Susulovska).

Female

Females are very similar to those from previously reported Ukrainian population (Kornobis et al., 2014). They differ by relatively longer tail (mean 41.6 vs 37.3 µm), lower values of index c (213.1 (181.7–240.3) vs 244.1 (192–305)) and slightly more posterior position of guiding ring (41.9 (38–45) vs 38.8 (35–42) µm). Genital branches are equally developed, anterior 973.8 (602–1358) and posterior 971.7 (630–1353) µm long, uteri 449.4 (270–646) and 458.4 (279–631) µm, ovaries 508.3 (163–821) and 489.3 (162–849) µm long respectively.

Table 1. Morphometrics of *Paralongidorus rex* Andrassy, 1986 females and male from Lviv, Ukraine

Character	Female	Male
	(n=16)	(n=1)
L	8.85 ± 0.70 (7.49–9.91)	7.59
a	90.1 ± 4.48 (84.1–100.1)	87.2
b	14.0 ± 0.90 (11.9–15.6)	11.6
c	213.1 ± 17.1 (181.7–240.3)	189.8
c'	0.58 ± 0.02 (0.54–0.60)	0.65
d	1.2 ± 0.07 (1.1–1.4)	1.2
d'	1.4 ± 0.06 (1.3–1.5)	1.4
V/ Spicules length	40.3 ± 1.5 (37.6–43.0)	127
Odontostylet length	168.9 ± 4.4 (160–176)	164
Odontophore length	93.6 ± 6.4 (84–109)	92
Total stylet length	262.5 ± 9.8 (246–282)	256
Anterior end to guide ring	41.9 ± 2.0 (38–45)	41
Pharyngeal bulb length	187.9 ± 12.6 (156–208)	173
Pharyngeal bulb width	34.7 ± 2.7 (30–42)	31
Tail length	41.6 ± 2.9 (37–47)	40
Hyaline part of tail length	15.1 ± 1.3 (12–17)	16
Width at level of:		
lips	34.5 ± 0.8 (33–36)	33
guide ring	49.9 ± 2.3 (45–54)	46
base of pharynx	82.6 ± 3.4 (74–88)	76
vulva or mid-body	98.1 ± 4.9 (88–107)	87
anus	71.8 ± 4.2 (65–83)	62

Note. Abbreviations are defined in Jairajpuri and Ahmad (1992) except for d and d' defined in Brown et al. (1994). All measurements are in µm, except for L in mm, and in the form: mean ± standard deviation (range).

The length of genital branches vary significantly depending on the presence or absence of eggs in uteri and their number. Eggs (n = 17) elongated elliptic, 263–305 × 61–78 µm, 3.5–7.4 times longer than wide and 2.5–3.1 times as maximum body diameter, eggshell smooth, 4.1–6.2 µm thick. Uterine eggs were detected in female genital tract of *P. rex* for the first time. Sperm cells in uteri were not observed.

Male

P. rex male is very similar morphologically and morphometrically to female specimens from this population but has slightly shorter and more slender body, assuming a closed spiral when heat relaxed and more conical tail. In this male specimen, testes and any sperm production were not observed. Spicules robust, 3.2 times longer than tail. Their total length along the arc is 1.3 times that the chord,

5.8 times longer than wide and 2 times longer than body diameter at the cloacal aperture; dorsal side regularly convex and ventral side with slightly expressed hump and hollow, the former located at 40 % of spicule total length from the anterior end; curvature 124°; head 20 μm long, occupying 15.7 % of spicule total length, its dorsal side conspicuously curved at its anterior end; median pieces 10.2 times as long as wide, occupying 50 % of spicule maximum width, posterior end of spicule 17.8 μm broad. Lateral guiding pieces 41.3 μm long, with slightly furcated tip. Adanal pair of supplements located 21 μm from cloacal aperture preceded by a row of 13 almost regularly spaced ventromedian supplements, 7–11 μm apart, two of them lying within the range of spicules with the posteriormost situated 271 μm from the cloacal aperture. Tail is conoid, dorsally convex, with a bluntly rounded terminus, bearing two caudal pores on each side.

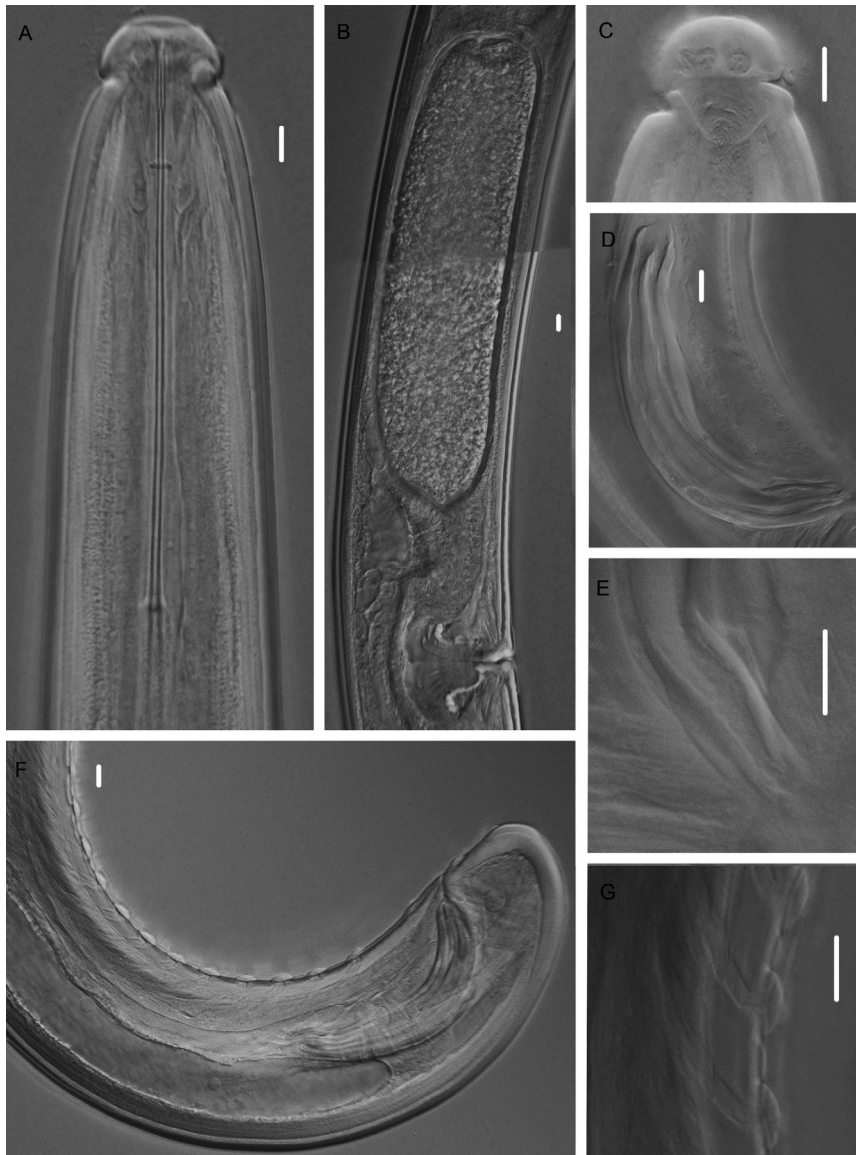


Fig. 1. *Paralongidorus rex* Andr ssy, 1986: A — female anterior region; B — part of female genital branch with egg; C — amphid; D — spicules; E — accessory pieces; F — male posterior region; G — supplements. Scale bar A–G, 10 μm .

Discussion

P. rex morphologically and molecularly is similar to *P. maximus* (Bütschli, 1874) Siddiqi, 1964, *P. paramaximus* Heyns, 1965, *P. litoralis* Palomares-Rius, Subbotin, Landa, Vovlas & Castillo, 2008, *P. iranicus* Pedram, Pourjam, Namjou, Atighi, Cantalapiedra-Navarrete, Liebanas, Palomares-Rius & Castillo, 2012, *P. plesioepimikis* Palomares-Rius, Cantalapiedra-Navarrete, Gutiérrez-Gutiérrez, Liébanas & Castillo, 2013 and *P. francolambertii* Barsi, De Luca, 2017. Most of these species are amphimictic with abundant males (Barsi & De Luca, 2017; Palomares-Rius et al., 2008; Pedram et al., 2013), except for *P. maximus* with only few males reported and *P. plesioepimikis* whose male specimens have not been found yet (Palomares-Rius et al., 2013). Comparative analysis shows some differences in spicule morphology and morphometrics of *P. rex* and closely related species. *P. rex* differs from all of them by longer spicules. Its male shares the most similar spicule structure with *P. iranicus* and *P. maximus*, their length (127 vs 74–85 and 100–106 µm respectively) is the only significant difference between these species. From other species *P. rex* also differs in spicules shape: from *P. paramaximus* and *P. francolambertii* by less expressed hump and hollow of spicules situated closer to their distal end, from *P. litoralis* by more regularly curved ventral contour with moderately expressed hollow.

During 2013–2018 in summer period (June–September) approximately 160 mature female specimens of *P. rex* were detected, however, females with uterine eggs were not observed among them. On the contrary, in samples collected in the first decade of May in 12 or 26.1 % out of 46 females uterine eggs were detected. In this population 15.2 % of females had two eggs — one in each genital branch, and 10.9 % had only one egg in anterior or posterior uterus. This can evidence about clearly expressed seasonal reproduction of *P. rex* on the territory of Western Ukraine.

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