

First Report of Feline Thelaziosis in Bulgaria and Morphometric Data of *Thelazia callipaeda* Railliet et Henry, 1910 in Present Materials

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Thelazioses are ocular parasitic diseases in a number of mammals, including humans. The genus *Thelazia* includes 14 species, among which is *Thelazia callipaeda* Railliet et Henry, 1910, which is known to parasitize in domestic dogs, raccoon dogs, domestic cats, red foxes, European rabbits, monkeys, and humans. In 2019 one domestic cat from Sofia region, Bulgaria, was referred to veterinary practitioner with symptoms of conjunctivitis. Thirty-five nematodes of *T. callipaeda* species were collected from both eyes of the cat. They were examined by light microscopy, and the most important morphometric features of the species were described. The obtained results were compared with existing ones in the literature. This is the first reported case of thelaziosis in a domestic cat from Bulgaria.

Key words: eyeworm; domestic cat; *Thelazia callipaeda*; morphometric data; Bulgaria

Introduction

Thelazioses are infections caused by parasitic worms of the family Thelaziidae (Nematoda; Spirurida). The adults of these parasites inhabit the eyes and associated tissues (such as eyelids, lacrimal ducts, etc.) of definitive hosts – various mammals and birds, including humans. Intermediate hosts of *Thelazia* are non-biting diptera which feed on animal lachrymal secretions and become infected [16].

A number of species belong to the genus *Thelazia*: *T. rhodesi*, parasitizing in cattle, buffaloes, zebu, bison, horses, sheep and goats; *T. brevispiculata*, parasitizing in cattle; *T. californiensis* – in domestic dogs, domestic cats, coyotes, sheep, Mule deer, American black bears, and humans; *T. callipaeda* – in domestic dogs, raccoon dogs, domestic cats, red foxes, European rabbits, monkeys, and humans; *T. erschowi* – in pigs; *T. ferulata* – in cattle; *T. gulosa* – in cattle and yaks; *T. hsüi* – in cattle; *T. iheringi* – in agouties; *T. kansuensis* – in cattle; *T. lacrymalis* – in horses and donkeys; *T. leesei* – in camels; *T. petrowi* – in cattle; *T. skrjabini* – in cattle and yaks [19].

The helminths of the genus *Thelazia* are known for the Bulgarian fauna. The species *T. gulosa* and *T. rhodesii* have been reported as parasites on cattle and buffaloes

60 years ago [21], and *T. callipaeda* has been found in domestic dogs recently [4,10]. In the present work, we provide brief data on a case of parasitic conjunctivitis in a domestic cat caused by *T. callipaeda* and a morphometric description of the species in the collected materials.

Materials and Methods

In the summer of 2019, a male cat referred to a veterinary practitioner with conjunctivitis was found on clinical examination to have adult nematodes in the conjunctival sac. The cat was of a mixed breed and lived freely in the yard of its owners in a village near Sofia (42° 46' 7.79" N, 23° 24' 23.21" E). After removal of the worms by flushing with saline solution, the cat was treated topically with Advocate® for cats as per label recommendations.

The collected parasites were stored in 70% ethanol. Aiming to differentiate their species 10 male and 10 female specimens were studied after enlightening in lactophenol. The imaging and measurement of the parasitic structures was performed using a "Motic Images Plus 3.0" camera connected to an "Amplival" microscope and the accompanying software. The identification of the helminths was carried out on the basis of their host species, localization and morphological characteristics [19]. The obtained specimens were deposited in the collection of the Institute of Experimental Morphology, Pathology and Anthropology with Museum, Bulgarian Academy of Sciences, Sofia, Bulgaria.

Results and Discussion

Thirty-five parasitic nematodes were collected from both eyes of the cat – 19 female and 16 male. They were identified as *Thelazia callipaeda*.

At the physical examination the cat was in good general condition, but with conjunctival redness and a serous secretion from both eyes, as well as chemosis of the 3rd eyelids.

According to Otranto and Dutto [17] infestation by *Thelazia* in animal and human hosts may be asymptomatic, though it frequently causes watery eyes, conjunctivitis, corneal opacity, or ulcerative keratitis. According to the literature, conjunctivitis is the most common symptom of *T. callipaeda* infestation, with more reports of unilateral conjunctivitis [3, 6, 11, 14] than those describing involvement of both eyes [5, 8] as in the present case. Complications have been also observed, which are not always related to the number of parasites affecting the eyes. For example, severe ocular changes (conjunctivitis, edema, keratitis, and mucoid secretions) have been observed in a domestic dog infested with 77 specimens of *T. callipaeda* [5] as well as in European rabbits infested with only three specimens each [8]. In the latter gross lesions compatible with haemorrhagic viral disease have been described.

Morphometric data of *T. callipaeda* in present materials

Threadlike, whitish body, with slightly narrowed ends. Well-defined transverse striations of the cuticle (**Fig. 1**). Presence of a vase-shaped buccal capsule with a wide middle part and a narrower bottom. The esophagus starts directly from the buccal capsule and expands slightly in its distal part (**Fig. 2**).

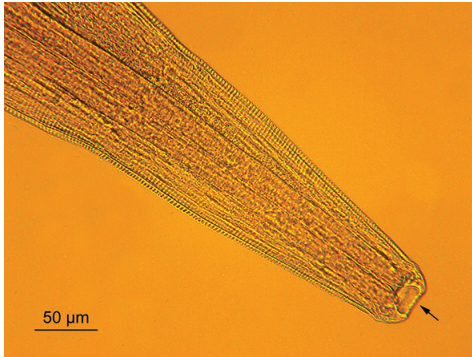


Fig. 1.

Thelazia callipaeda found in a domestic cat from Bulgaria: **Fig. 1.** buccal capsule (arrow); **Fig. 2.** oesophagus (arrow).



Fig. 2.

Male: The posterior end is strongly curved (**Fig. 3**). The spicules are different in shape and size. One is long, thin, with wavy curves, and the other is much shorter, thick with the shape of a gutter. Perianal and postanal genital papillae are observed (**Fig. 4**). Female: The vulva opens at the anterior end of the body, at the level of the last third of the oesophagus (**Fig. 5**). The eggs in the uterus are embryonated. The posterior end is rounded, with 2 small lateral papillae (**Fig. 6**). The metric data on the specimens of the present materials are given in Table. 1. It contains measurements for the species by other authors too.

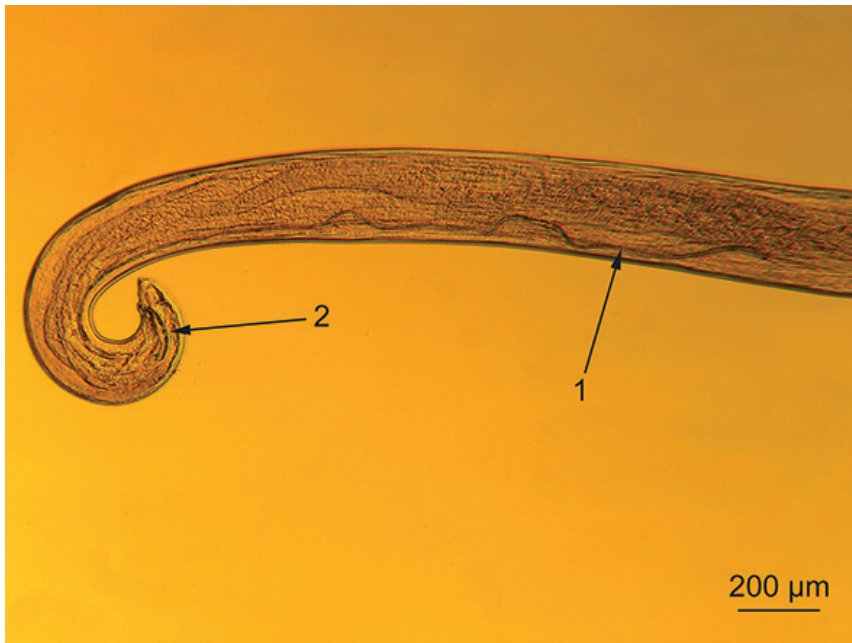


Fig. 3. Posterior end of male *Thelazia callipaeda* found in a domestic cat from Bulgaria: arrow 1 – large spicule, arrow 2 – small spicule.

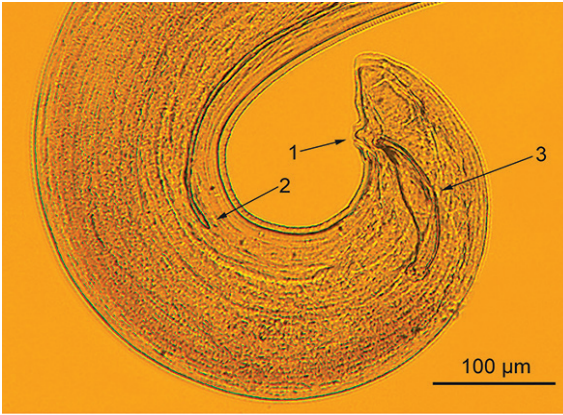


Fig. 4. Posterior end of male *Thelazia callipaeda* found in a domestic cat from Bulgaria: arrow 1 – perianal genital papillae; arrow 2 – distal end of the large spicule; arrow 3 – small spicule; arrow 4 – postanal genital papillae

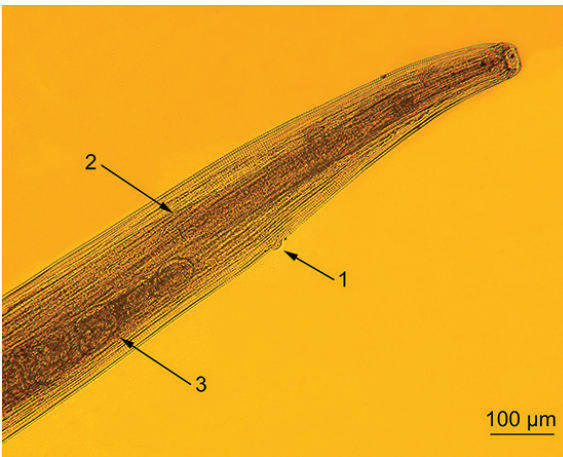
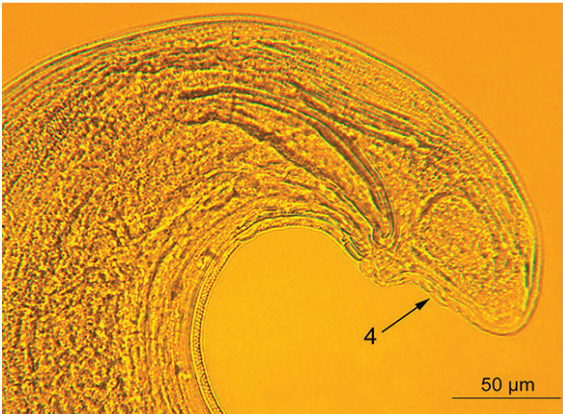


Fig. 5. Anterior end of female *Thelazia callipaeda* found in a domestic cat from Bulgaria: arrow 1 – vulva; arrow 2 – oesophagus end; arrow 3 – uterus with embryonated eggs



Fig. 6. Posterior end of female *Thelazia callipaeda* found in a domestic cat from Bulgaria: lateral papillae (phasmidae) – arrows

When comparing the metric data established for the species in the current materials with those indicated by other sources (**Table 1**), it makes an impression that: 1). The average body length of our specimens falls within the range indicated by most authors [2, 7, 9, 19] but exceeds that indicated by Kanchev et al. [10] and Čabanová et al. [1]. 2). Body width was measured in different sections by different authors. In most studies, data were missing for many structures such as the buccal capsule, oesophagus, the distance between the cloaca and the anus, and the posterior body ends. 3). The length of the large spicule of our specimens exceeds that indicated by other authors. 4). The distance between the vulva and the anterior body end varies, and in most cases it is similar except as indicated by Čabanová et al. [1], but this is logical since the body length of the female specimens in this case is also much smaller.

In general, it can be seen that the size limits of the morphological structures in the species are wide. This may be due to the population peculiarities of the thelazia obtained from different regions and hosts, as well as to the different methods for fixation and processing the parasites. For a more accurate concept, a larger number of future in-depth morphometric studies on materials from various sources are needed.

Thelazia callipaeda has been established in animals and humans in a number of countries in the southern and western parts of the European continent, and autochthonous cases have recently been identified in Central Europe as well [1, 2]. According to Motta et al. [14] in cats thelaziosis is diagnosed sporadically. According to the literature, cases of infestation of domestic cats with *T. callipaeda* have been reported in Italy [15], France [6], Switzerland [12; 14], Portugal [13, 20], Serbia [7], Bosnia and Herzegovina [9] and Greece [18]. This is the first case in which it is found in a domestic cat from Bulgaria.

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Table 1. Metric data of *Thelazia callipaeda* Railliet et Henry, 1910 in different materials

Structure	Our data; Domestic cat, Bulgaria	Authors; Source of the materials					
		Skrjabin et al., 1967	Kanchev et al. 2013; Dom. dogs, Bulgaria	Hodžić et al., 2014; Red foxes, D.dogs, D.cats, Bosnia and Herzegovina, Croatia	Gajić et al. 2014; Dogs, cats, Sarbia	Čabanová et al., 2017 D.dogs, Slovakia	Čabanová et al., 2018; Red foxes, Slovakia
Body length ♂ (mm)	10-12.3 (11.14)	9-13	8.2-10.5	7.5-13	10.46-13.91	8.99 mean	9.3-15.4
Body width ♂ (μm)	119-179 (147.9) *	210-270 *	-	340-430 max	385-438 max	318-455 max	290-657 ^
Buccal capsule length ♂ (μm)	19-22 (20.4)	27-30	-	-	-	-	16.8-23.2
Buccal capsule width ♂ (μm)	30-39 (33.8)	32-36	-	-	-	-	32.3-45.8
Oesophagus length ♂ (μm)	440-592 (526.9)	580-608	-	-	-	-	512.5-634.9
Max. oesophagus width ♂ (μm)	49-63 (51.7)	50-68	-	-	-	-	-
Distance cloaca – tail tip (μm)	70-80 (75.4)	70-90	-	-	74-85	-	-
Big spicule length (mm)	1.497-2.1 (1.823)	1.3-1.7	-	-	1.421-1.800	-	1.782
Small spicule length (μm)	120-145 (131.7)	128-160	-	-	140-159	-	125
Body length ♀ (mm)	11-18 (16.75)	10.45-15	11.5-15.4	12-18.5	14.48-17.95	11.20 mean	15.7-25.4
Body width ♀ (μm)	122-183 (142.4) *	220-260 *	-	370-510 max	420-453 max	336-391 max	265-688 ^
Buccal capsule length ♀ (μm)	22-26 (23.6)	30	-	-	-	-	14.2-33.0
Buccal capsule width ♀ (μm)	35-42 (38.6)	36	-	-	-	-	38.0-48.1
Oesophagus length ♀ (μm)	540-637 (597.4)	560-720	-	-	-	-	317-717
Max. oesophagus width ♀ (μm)	51-57 (54)	90-100	-	-	-	-	-
Distance vulva-anterior body end (μm)	447-556 (501.6)	350-570	-	-	573-640	261 mean	485.0-703.6
Distance anus – posterior body end (μm)	70-81 (74.86)	70-100	-	-	-	-	-

* At the end of the oesophagus; ^ at the middle portion

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