

New Record of *Leidynema appendiculata* (Leidy, 1850) Chitwood, 1932. (Oxyuroidea: Thelastomatidae) from the Cockroaches *Blatta orientalis* (Dictyopetra: Blattidae) from Kashmir

Rehana R, Bhagat RC, Fayaz A Rukhsana and Tanveer A Sofi*

Department of Zoology, University of Kashmir, Srinagar, Jammu and Kashmir, India

Abstract

During the present study, for the first time Nematode parasites were from the colon region of the intestine of *Blatta orientalis* from Srinagar. On close examination, they were found to resemble to those of *Leidynema appendiculata* in all their morphological and biological features. Both male and female specimens were recovered but male specimens were lesser in comparison to females. Measurements and camera lucida drawings are also given.

Keywords: Cockroach; Nematode; Measurements; Srinagar

Introduction

Insect parasitic nematodes are small and round worms that complete part of their life-cycle in insects. Several species of these nematodes can kill insects in this process and are of considerable interest because of their potential being developed and marketed as biological control agents of pest insects. Parasitic nematodes of Kashmir valley offer an ideal environment for the survival of various kinds of insect's species to unique geographical position of temperate climate [1,2]. It is home for representative of almost all phyla situated in the subtropical north temperate region of Asia.

Thousands of species of insect parasitic nematodes not only attack the general insects form, belonging to different orders but also the insect pests of agricultural, veterinary, medical and forestry importance. Potential for use of entomophilic nematodes as self perpetuating biological control agents lies in areas where chemical pesticides are too expensive, not practical or most noxious to human and environment [3].

Materials and Methods

The cockroaches for the present study were collected at night with the help of forceps from toilet, main holes bathroom from different localities of Srinagar, and were then dissected with the help of scissors, forceps and needles and the alimentary tract was drawn out intact by grasping the head and thorax and gently pulling apart. The intestine was then slit lengthwise with fine needles and placed flat on a slide. Although the nematode parasites were best studied alive, distilled water and normal salt solution were found to be the best media to observe live nematode Parasites. Nematodes were picked out of this suspension under the low magnification of a Stereoscopic microscope. Slivers of bamboo and fine tipped brushes were used in the present study for handling and picking of nematodes for its easy availability and handling.

After thorough washing of the parasites in normal saline were fixed in either AFA or in Sizzling hot 70% alcohol. Subsequently they were cleared in glycerin or in lactophenol. Their temporary mounts were made in glycerin. Nematodes were arranged in the centre of a drop of mounting fluid separated from each other and rested on the glass slide i.e., not floating in the mountant [4]. All diagrams were made with the help of camera lucida and measurements were taken with the aid of oculometer in mm.

Key to the Families of Superfamily Oxyuroidea

1. Corpus of oesophagus not extremely short; male with one or zero spicules - Corpus of oesophagus extremely short and thick; male with two or zero spicules - **Atractidae**.
2. External circle of 4-double cephalic papillae - External circle of 8-cephalic papillae - **Thelastomatidae**.
3. Adults usually in hindgut of vertebrates chiefly amphibians, reptiles and mammala - **Oxyuridae**.

Adults found in gut of millipedes - **Rhingtonematidae**

Diagnostic Characters of the Family Thelastomatidae

The thalastomatid, parasites of insects and myriapods, throughout the literature and descriptions of between 60 and 70 species have been provided but usually not much other information is available. However, studies by Dobrovolny and Ackert [5] and other indicate that most of these species probably have the same type of the life-cycle which is comparatively simple. Eggs pass out of the host with feces. Eggs do not hatch in the intestine to re-infect the same host but must first undergo some development on the outside to reach an infective stage. The various arthropod hosts acquire their parasites by swallowing these infective eggs.

Mouth of female surrounded by eight sub median papillae or labiopapillae. Amphids represented externally by circular or oval openings; esophagus consisting of an anterior corpus, which may or may not be modified; a more or less distinct isthmus and a posterior valvular bulb. Females with one or more ovaries. Male with single testis, a single spicule or none, and one to five pairs of caudal papillae [6,7].

***Corresponding author:** Tanveer A Sofi, Department of Zoology, University of Kashmir, Srinagar-190 006, Jammu and Kashmir, India, Tel: +919797127214; E-mail: stanveer96@gmail.com

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Key to the Genera of Family Thelastomatidae

1. Vulva posterior to base of esophagus - Vulva anterior to base of esophagus - 7
2. Esophagus with a pseudo bulb - 3 - Esophagus without a pseudo bulb - *Blattellicola*
3. Vulva in anterior part of body - *Hammerschmidtella* - Vulva about middle or posterior to middle of body
4. Anterior and posterior parts of corpus not distinctly set off, the whole corpus forming a pear-shaped pseudo bulb - *Aorurus* - Anterior and posterior parts of corpus distinctly set off
5. Corpus distinctly enlarged in form of a sub spherical swelling at base of buccal cavity - *Blatophila*
6. Corpus not distinctly enlarged in form of a sub spherical swelling at the base of buccal cavity
7. Corpus terminated by sub-cylindrical swelling - *Leidynema*
8. Corpus terminated by sub-spherical swelling - *Leidynemella*
9. Tail of female short and conical
10. Tail of female long and filiform - *Linstowiella*
11. Female esophagus long and narrow, forming about $\frac{1}{4}$ of body length - *Protrelloides*
12. Female esophagus not as long as narrow - *Protrellus*.

Diagnostic Characters of the Genus *Leidynema*

Mouth surrounded by very large sub median labiopapillae, amphids or lateral organs appearing externally as small circular openings. Esophagus of female consisting of an anterior part which is subdivided into cylindrical parts of which the posterior is somewhat larger in diameter than the anterior, a distinct isthmus, and a valvular bulb. Excretory pore posterior to base of esophagus. Intestine may or may not be enlarged anteriorly to form a cardia; a posteriorly directed caecum may or may not be present; the intestine may have a loop in the posterior part of the body. Vulva near middle of body; amphidelphic [8-10]. Eggs ellipsoidal. Esophagus of male without distinct posterior swelling in anterior part of esophagus. Tail of female attenuated or filiform. Tail of male short, rounded, filiform. One pair of large preanal caudal papillae, two pairs of postanal papillae. One spicule.

Leidynema appendiculata (Leidy, 1850) Chitwood, 1932

Host: *Blatta orientalis* Linn.

Site of infection: Large intestine

Location: Srinagar

Twenty-eight female and two male nematode parasites from ten Cockroaches (*Blatta orientalis*) from Srinagar, were recovered. It favored more anterior position and was more restricted in its distribution in the colon and was found to be a lumen dweller. A brief description of the parasite is given as under.

Description

Female

2.14 mm long by 0.27 mm (270 μ) wide. Cuticle closely annulated throughout the length of body. Lateral alae

prominent, each ala terminating posteriorly in a spine-like projection. Buccal capsule is 0.02 mm long and 0.01 mm wide. Esophagus 0.43 mm (430 μ) long consisting of an anterior corpus 0.32 mm (320 μ) long, subdivided into an anterior part 0.17 mm (170 μ) long by 0.035 mm (35 μ) wide and a posterior pseudo bulb 0.14 mm (140 μ) long by 0.06 mm (60 μ) wide, an isthmus 0.03 mm (30 μ) long by 0.04 mm (40 μ) wide, set off distinctly from the anterior cylindrical pseudo bulb, and a posterior valvular bulb 0.09 mm (90 μ) long by 0.12 mm (120 μ) wide. Nerve ring 0.16 mm (160 μ) from the anterior end of body; Anterior part of intestine greatly enlarged, provided with a posteriorly directed intestinal caecum or diverticulum (Figures 1-3; Pmgs 1-4; Table 1) posterior part of intestine forming a loop in mature specimens. Anus 0.36 mm from the tip of the tail. Tail filiform. Vulva slightly posterior to middle of body, 1.12 mm from anterior end of the body. Ovaries two; amphidelphic. Eggs oval, elongate and flattened slightly on one side, 94 μ long by 40 μ Wide.

Male

0.088 mm 880 μ long by 0.055 mm (55 μ) wide; cuticle striated, striations prominent near the anterior end, 0.003 mm (3.33 μ) apart. Buccal capsule 0.003 mm (3.33 μ) by 0.001 mm (1.66 μ). Esophagus 0.14 mm (140 μ) long; anterior part 0.105 mm (105 μ) long by 0.01 mm (10 μ) wide; isthmus 10.001 mm (17.5 μ) long by 0.01 mm (10 μ) wide, not distinctly set off; bulb 0.025 mm (25 μ) long by 0.02 (20 μ) wide. Nerve ring 0.09 mm (90 μ) from anterior end of body. Intestine simple without a diverticulum or a loop, anus 0.01 mm (10 μ) from posterior end of body. Tail much attenuated and very small, provided with one pair of large sub-ventral preanal papillae, one pair of sub-ventral post anal papillar, and one pair of small, sub-dorsal papillae. One spicule 0.026 mm (26.666 μ) long (Figures 4-6; Pmgs 5-12; Table 2) [11].

Remarks

The genus *Leidynema* was proposed by Schwenk in Travassos, 1929 to accommodate *Oxyuris blattae orientalis*

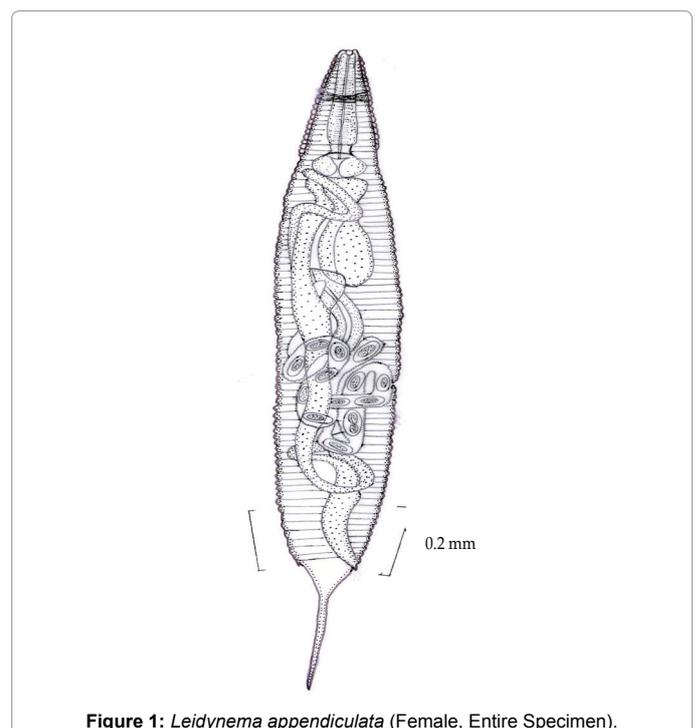


Figure 1: *Leidynema appendiculata* (Female, Entire Specimen).

Measurements (a)		(Leidy and Chitwood) [3,8]	Dobrovoly and Ackert [5]	Present specimens
Length		1.9-4.025 mm	2.27-4.025 mm	2.14 mm
Width		140-350 μ	0.238-0.35 mm	0.27 mm (270 μ)
Buccal capsule	Length	-	-	0.02 mm
	Width	-	-	0.01 mm
Nerve ring From anterior end of body		120-195 μ	0.135- 0.195 mm	0.16 mm (160 μ)
Esophagus		396-497 μ	0.435-0.497 mm	0.43 mm (430 μ)
Anterior corpus length		290-330 μ	-	0.32 mm (320 μ)
Anterior part	Length	144-180 μ	-	0.17 mm (170 μ)
	Width	30-36 μ	0.045-0.085 mm	0.035 mm (35 μ)
Posterior Pseudo bulb	Length	140-148 μ	-	0.14mm (140 μ)
	Width	30-36 μ	-	0.06mm (60 μ)
Isthmus	Length	16-45 μ	0.021-0.045 mm	0.03 mm (30 μ)
	Width	35-40 μ	0.035-0.04 mm	0.04 mm (40 μ)
Valvular Bulb	Length	90-106 μ	0.09-0.106 mm	0.09 mm (90 μ)
	Width	100-148 μ	0.1-0.148 mm	0.12 mm (120 μ)
Anus from tip of tail		420-825 μ	0.42-0.825 mm	0.44 mm (440 μ)
Vulva from ant. end		1.05-1.985 mm	1.05-1.985 mm	1.12 mm
Cuticular Striations	At ant. end.	-	-	0.02 mm
	at post. end	-	-	0.04 mm
Eggs	Length	100-112 μ	0.106-0.112 mm	94 μ
	Width	45-53 μ	0.045-0.048 mm	40 μ

Table 1: Measurements of *Leidynema appendiculata* (Female).

Measurements		(Leidy and Chitwood) [3,8]	Dobrovoly and Ackert [5]	Present specimen
Length		0.525-0.850 mm (525-850 μ)	0.525-0.850 mm	0.88 mm (880 μ)
Width		0.045-0.087 mm (45-87 μ)	0.045-0.087 mm	0.045 mm (45 μ)
Buccal capsule	Length	-	-	0.0033 mm (3.33 μ)
	Width	-	-	0.0016 mm (1.66 μ)
Nerve ring from ant end of body esophagus		0.075-0.155 mm (75-155 μ) 0.133-0.185 mm (133-216 μ)	0.075-0.105 mm 0.133-0.185 mm	0.09 mm (90 μ) 0.17 mm (170 μ)
Anterior part	Length	80-166 μ	0.08-0.125 mm	0.105 mm (105 μ)
	Width	8-20 μ	0.015-0.02 mm	0.01 mm (10 μ)
Isthmus	Length	17-20 μ	0.017-0.02 mm	0.00175 mm (17.5 μ)
	Width	0.009-0.12 mm (9-12 μ)	0.009-0.12 mm	0.01 mm (10 μ)
Bulb	Length	0.034-0.04 mm (34-40 μ)	0.034-0.04 mm	0.025 mm (25 μ)
	Width	0.020-0.036 mm (20-36 μ)	0.027-0.036 mm	0.02 mm (20 μ)
Anus from post end		0.01-0.20 mm (10-20 μ)	0.01-0.15 mm	0.01 mm (10 μ)
Cuticular striations (length at anterior end)		0.003 mm (3 μ)	0.003 mm	0.0033 mm (3.33 μ)
Spicule		0.026-0.035 mm (26-35 μ)	0.026-0.035 mm	0.0266666 mm (26.6666 μ)

Table 2: Measurements of *Leidynema appendiculata* (Male).



Pmg 1: *Leidynema appendiculata* (Female, Entire Specimen) 40X.



Pmg 2: Anterior end showing Esophagus 100X.

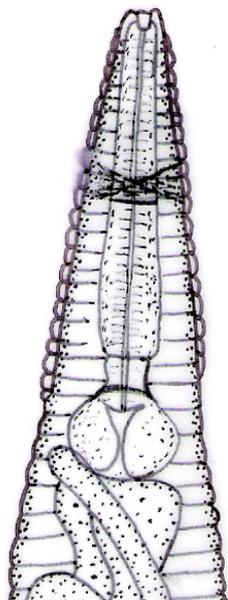


Figure 2: Anterior end (Enlarged view).

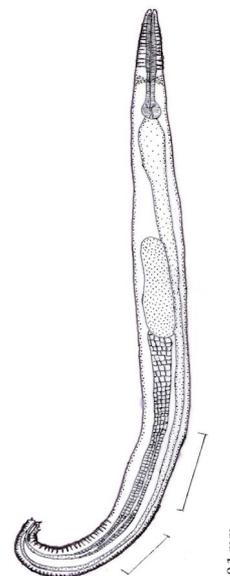


Figure 4: *Leidynema appendiculata* (Male, Entire Specimen).

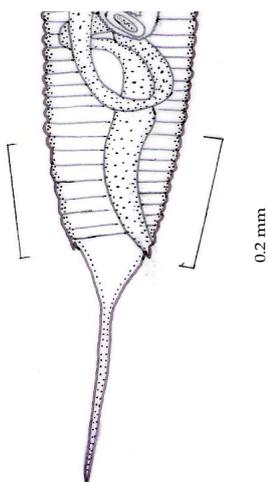
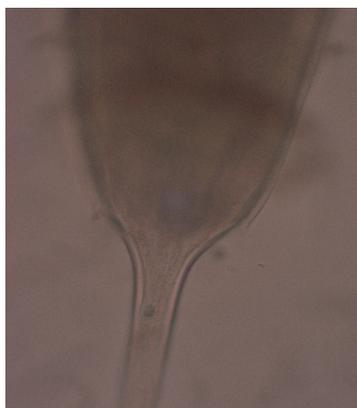


Figure 3: Posterior end (Enlarged view).



Figure 5: Anterior end (Enlarged view).



Pmg 3: Posterior end with spine like projections 100X.

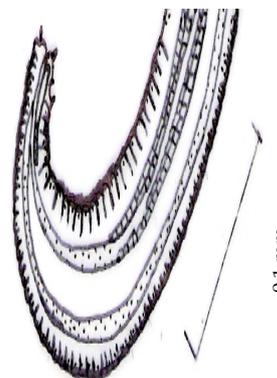


Figure 6: Posterior end (Enlarged view).

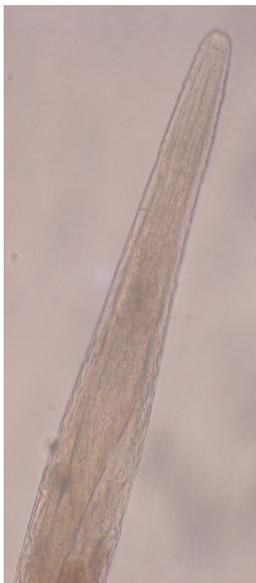
Ham., 1847. From Hammer Schmidt's original description and figures of this worm it becomes apparent that he had only re described and redrawn his previously described *O. diesingi*, and the latter has been placed in the genus *Aorurus* by Travassos 1929. Apparently, Schwenk agrees with Leidy (1851) who cites *O. blattae orientalis* as being the same species as his *Thelastomum appendiculatum*. Butschli (1871), Galeb (1878) and Magalhaes (1900) have followed Leidy in this matter. *O. blattae orientalis* now being regarded as a synonym of *Hammer Schmidtella diesingi* (*O. diesingi*), the type species of the



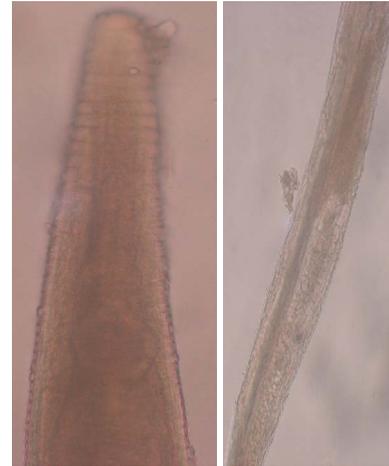
Pmg 4: Tail region showing Anus 100X.



Pmg 5 and 6: *Leidynema appendiculata* (Male, Entire Specimen) 100X.

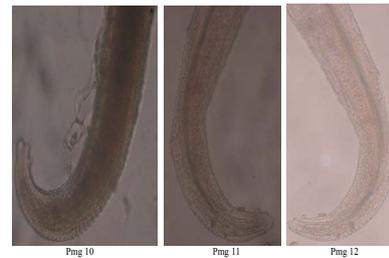


Pmg 7: Anterior esophageal region.



Pmg 8: Anterior end with cuticular striations **Pmg 9:** Testis and Gland cells

Pmg 8 and 9: *Leidynema appendiculata* (Male) 100X.



Pmgs 10-12: *Leidynema appendiculata* [Male] with tail region showing Anal Papillae and Spicule 100X.

genus *Leidynema* will have the name of *L. appendiculatum*, this being the original name of the species and meant for the type species of this genus by Schwenk. Chitwood (1932) added two species, *L. cranifera* and *L. delatorrei* to this genus and Chitwood and Chitwood, 1933 added a fourth, *L. nocalum*. Serrano Sanchez 1947 divided the type species, *L. appendiculatum*, into three varieties, *L. appendiculata* var. *americana*, *L. appendiculata* var. *indiana* and *L. appendiculata* var. *hispana*.

On comparing the present specimens with the *Leidynema appendiculata* (Leidy, 1850) Chitwood, 1932 type species of the genus *Leidynema* Schwenk and by Dobrovolony and Ackert [5] the present specimen is very close to it in all its measurements except for some size differences. The morphological features, like the presence of pseudo and valvular bulb [12] in anterior corpus of females and presence isthmus, presence of filiform tail and oval eggs and presence of one spicule in males confirms its resemblance to *L. appendiculata*.

From the above discussion, it becomes clear that the present specimens possess all the diagnostic features of the species *Leidynema appendiculata* (Leidy, 1850) Chitwood, 1932 except for some size variations and locality hence the present specimens are assigned to it. While Kashmir Valley is the new locality record for this species.

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