

Description of *Trithornus aquatica* gen. n. sp. n. (Nemtoda:Cephalobina) from aquatic habitat, India

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A new cephalobid nematode, *Trithornus aquatica* gen. n. sp. n. has been described and illustrated. The new genus can be distinguished by the unique shape of its labial probolae, consisting of swollen labial shaft and a trifurcated apical section. The cephalic probolae is triangular in shape. Cuticle is transversely annulated, lateral field with five incisors, outer ones being undulate. The stoma comprises of cheilostom with granular rhabdia, gymnostom narrower than cheilostom and stegostom. Stegostome can be differentiated into three parts meta, meso and telo. A tooth is present on mesostegostome. Females have cephaloboid type of reproductive system. Tail is elongate conoid with a pointed tip. Males were not found. The newly described genus closely resembles *Acrobeles* Linstow, 1877, *Chiloplacus* Thorne, 1937 and *Cervidellus* Thorne, 1937 in having similar stoma, furcated labial probolae, simple cuticle and cephaloboid type of female gonad with a post uterine sac. But, it is clearly distinguishable from the related genera on the basis of the shape of labial probolae and the presence of outer undulated lateral lines. A dichotomous key to the identification of the genus has also been provided.

Key words: Aquatic; Cephalobidae; Cephalobina; *Trithornus*; Taxonomy; India

INTRODUCTION

During the course of study, a number of sediments samples were collected from different water bodies across the India. An interesting population of *Trithornus* gen. n. was discovered from the sediment sample of a pond receiving domestic wastes. Although, the population closely resembles *Acrobeles* Linstow, 1877, *Chiloplacus* Thorne, 1937 and *Cervidellus* Thorne, 1937. However, detailed study leads to an inference that this species cannot be accommodated in any of the known genera of the family Acrobelinae. Therefore, *Trithornus* gen. n. was proposed to assign this species.

MATERIAL AND METHODS

Nematodes were extracted from moist sediments samples by the sieving and decantation and modified Baermann's funnel techniques (Flegg, 1967). Extracted nematodes were fixed in FA (4:1) for 24h and then transferred to glycerin-alcohol (5 parts: 95 parts 30% alcohol) for slow dehydration in a desiccator. Dehydrated specimens were mounted in anhydrous glycerin on glass slides using the wax ring method (de Maeseneer & d' Herde, 1963). All observations, drawing and photographs were made on an Olympus BX 50 DIC microscope.

Cultures were maintained by placing specimens of *Trithornus* gen. n. sp. n. on 1.5% agar medium. Nematodes were fed on bacteria which were grown by spreading milk powder on the agar surface which encouraged the bacterial multiplication.

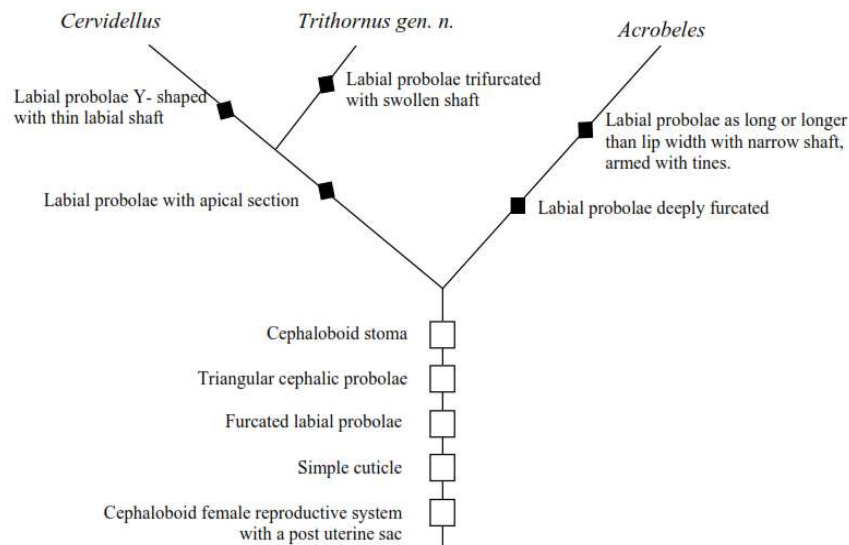


FIGURE 1. Cladogram showing the phylogenetic relationship of the three genera, *Cervidellus*, *Trithornus* gen. n., *Acrobeles*. *Apomorphies* are designated by black squares and *plesiomorphies* by white squares.

RESULTS

Trithornus gen. n.

Diagnosis: Body ranges from 0.41-.061mm. Cuticle transversely annulated. Lateral fields with five incisures, outer ones been undulated. The labial probolae consists of swollen labial shaft and a trifurcated apical section. Cephalic probolae six triangular well separated. Stoma comprising of cheilostom with granular rhabdia; gymnostom narrower than cheilostom and stegostom. Stegostom can be differentiated into three parts meta, meso and telo. Meta stegostom bears a tooth. Pharynx cylindrical, corpus 3.6-5 times of isthmus. Female reproductive system cephaloboid type. Post uterine sac present. Spermatheca weak. Phasmids at 0.8-1.5 anal body diam. from anus. Tail conoid with pointed tip.

Type species: *Trithornus aquatica* gen. n., sp. n.

Relationship: The new genus is related to *Acrobeles*, *Chiloplacus* and *Cervidellus* by cephaloboid stoma, simple cuticle, furcated labial probolae and cephaloboid female reproductive system with a post uterine sac. However, the new genus can be clearly distinguished by the shape of its labial probolae comprising of a swollen labial shaft with a trifurcated apical section and five lateral lines the outer ones been undulated (swollen labial shaft with a trifurcated apical section and outer incisures being undulated is absent in *Acrobeles*, *Chiloplacus* and *Cervidellus*).

Trithornus aquatica gen. n., sp. n.

Description

Trithornus aquatica gen. n., sp. n.

(Fig. 2 &3)

Measurements: In Table 1.

Females: Body ventrally curved to straight upon fixation, gradually tapering at both the ends. Cuticle with prominent transverse annulations, 2.0-2.5 μm wide at neck, 2 μm at midbody. Lateral field with five incisures, outer ones been undulated, occupying 1/5th of corresponding body diameter at mid-body. Lips separated. The labial probolae consists of swollen labial shaft and a trifurcated

apical section. Cephalic probolae six, conoid, triangular well separated. Cheilostom with granular rhabdia; gymnostom narrower than cheilostom, stegostom can be differentiated into three parts meta, meso and telo. Mesostegostom bearing a tooth. Both gymnostom and stegostom cuticularised. Pharynx cylindrical, corpus 3.6-5.0 times of isthmus, basal bulb pyriform with well-developed grinders. Nerve ring encircling isthmus at 67-77 % of pharyngeal length. Excretory pore opposite nerve ring at 68-82% of pharyngeal length. Intestine with distinct wide lumen. Cardia conoid, enveloped by intestinal tissue.

Reproductive system mono-prodelphic. Ovary reversed on right side of intestine with flexure. Oocytes arranged in double row in germinal zone and single in maturation zone. Spermatheca weakly developed smaller than corresponding body diameter. Uterus well developed, uniform, without any differentiation in glandular and muscular parts. Vagina thick walled. Vulva transverse, slit-like. Post-uterine sac 0.5-1.0 vulval body diam. long. Rectum 1-1.2 anal body diam. long. Phasmids at 0.8-1.5 anal body diam. from anus. Tail elongate-conoid, 2-3 anal body diam. long, gradually tapering to pointed tip without annules.

Males: Not found.

Type habitat & locality: Sediment sample collected from sides of a pond, Atruali, Uttar Pradesh.

Type specimens: Holotype female on slide *Trithornus aquaticus* gen. n., sp. n./1; nine paratype females on slides *Trithornus aquaticus* gen. n., sp. n./2-6; deposited in the nematode collection, Department of Zoology, Aligarh Muslim University, Aligarh, India.

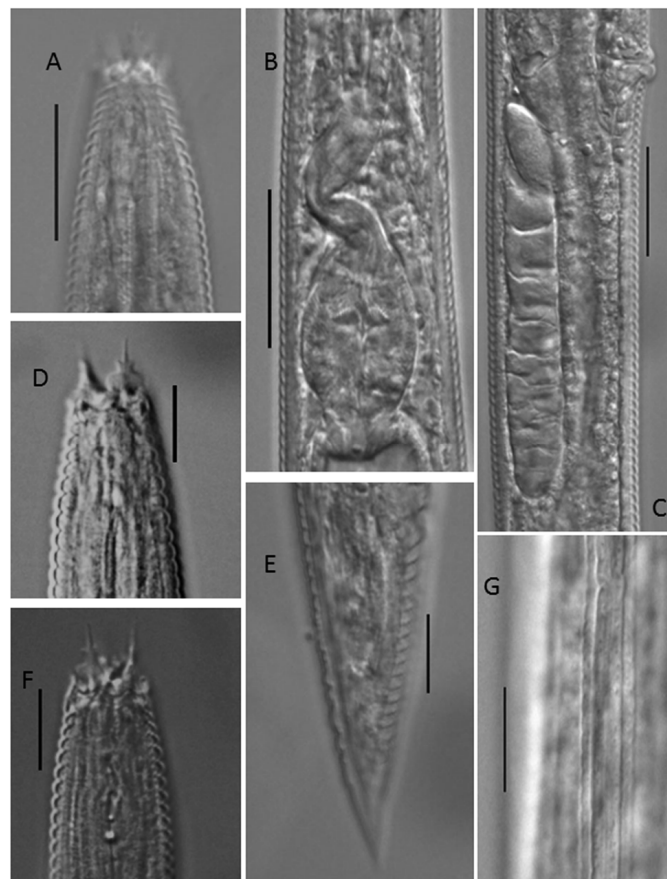


FIGURE 2. *Trithornus aquaticus* gen. n., sp. n. A. Cuticle striations; B. Pharyngeal region showing nerve ring, basal bulb and excretory pore; C. Female reproductive system showing ovary; D. Anterior region showing labial probolae and stoma; E. Tail tip; F. Anterior region showing cephalic probolae; G. Lateral lines. Scale bar= 20µm. (A-C & G) and Scale bar= 10µm (D-F).

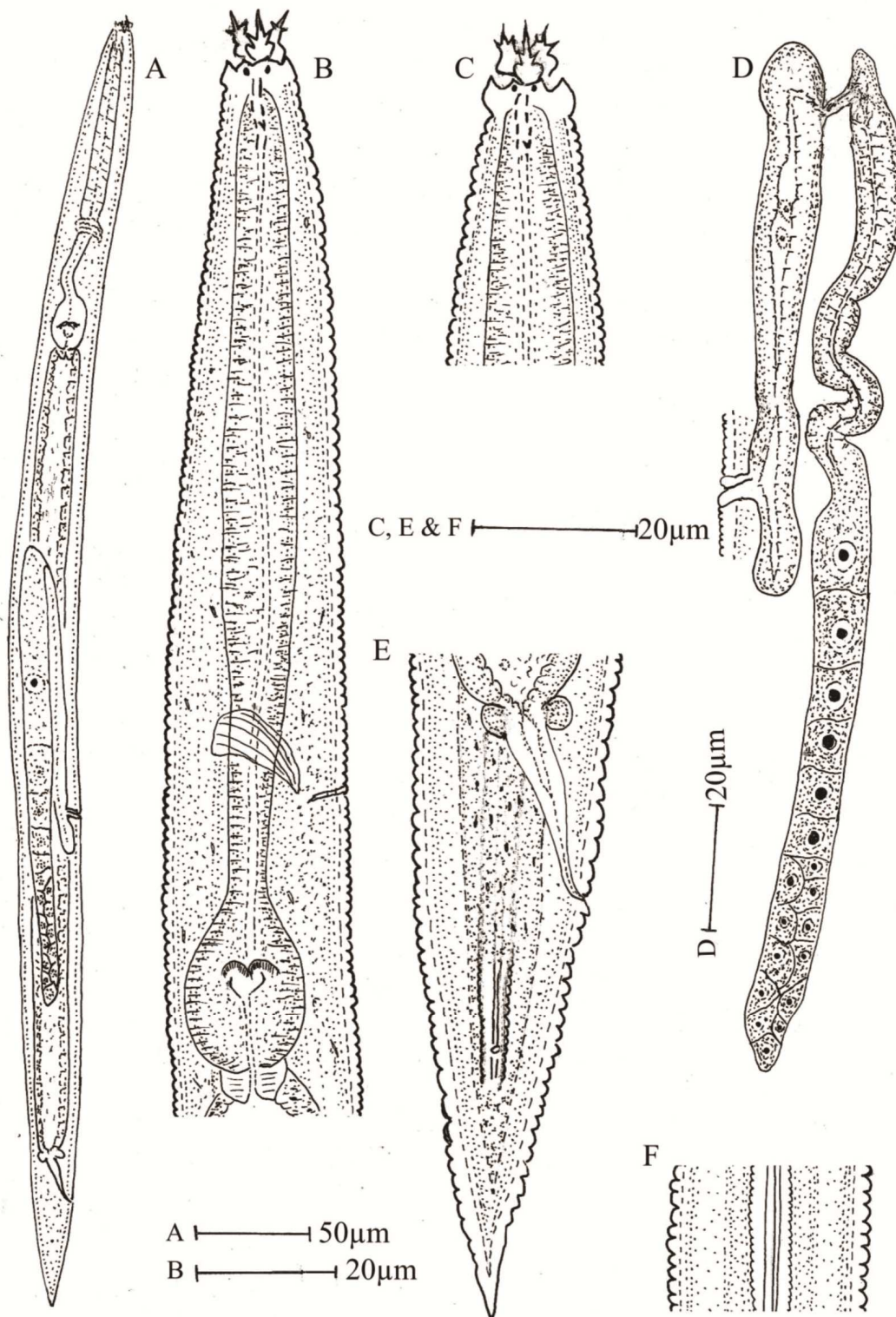


FIGURE 3. *Tritbornus aquatica* gen. n., sp. n. A. Entire female; B. Pharyngeal region; C. Anterior region; D. Female reproductive system; E. Female posterior region; F. Lateral field

TABLE 1. Measurements (in μm) of *Trithornus aquatica* gen. n. sp. n. Mean and S.D. given in parenthesis

Characters	Holotype	Females (n = 9)
L	532	417–613 (538.3 \pm 57.1)
a	18.4	17–20 (18.2 \pm 1.3)
b	3.9	3–5 (4 \pm 0.5)
c	12.8	10–13(14.4 \pm 6.3)
c'	3	2–3 (2.89 \pm 0.3)
V	65	57–67 (62.5 \pm 3.5)
Maximum body width	30	28–35 (31.5 \pm 2.0)
Lip width	11	10–12 (10.5 \pm 0.5)
Length of stoma	11	12–15 (13.5 \pm 1.0)
Pharynx	140	133–150 (142.5 \pm 5.5)
Excretory pore from anterior end	76	66–82 (75.5 \pm 5.0)
Basal bulb width	17	11–20 (16.0 \pm 2.5)
Nerve ring from anterior end	71	60–73 (67.5 \pm 3.5)
Pharynx base to gonad		80–115 (91.0 \pm 11.5)
Anterior gonad	230	120–225 (172.0 \pm 32.5)
Post uterine branch	21	15–26 (18.5 \pm 4.0)
VBD	30	28–34 (30.5 \pm 2.0)
Vulva	470	278–475 (402.5 \pm 57.0)
Vulva – anus distance	175	150–185 (167 \pm 10)
Rectum	20	19–25 (21.5 \pm 2.0)
Tail	43	41–50 (45.5 \pm 2.0)
ABD	13	16–24 (18.5 \pm 4.0)
Phasmids from anus	21	20–25(22.5 \pm 2.0)
Corpus	95	90–100 (97.0 \pm 4.0)
Isthmus	25	20–25 (23.0 \pm 1.5)
Basal bulb length	22	20–25 (23.0 \pm 1.5)

Remarks

Trithornus aquatica gen. n.sp. n. is clearly demarcated from closely related genera by the shape of its labial probolae (swollen labial shaft with a trifurcated apical section). In addition, triangular cephalic probolae; transversely annulated cuticle; five lateral lines outer ones been undualted; cephaloboid stoma; cephaboid-type of female reproductive system and elongate-conoid tail with pointed tip also

characterized the new genus. Related genus *Acrobeles* is clearly distinguished from the new genus by the shape of labial probolae shape (trifurcated *vs* deeply furcated) and tines (absent *vs* present on both cephalic and labial probolae). However, from *Cervidellus* new genus be differentiated on the basis of shape of labial probolae (trifurcated *vs* Y-shaped labial probolae) and cephalic probolae (simple *vs* serrated). The presence of five incisors is also an important characteristics of some species of *Cervidellus*, but outer ones been undulated is unique to *Trithornus aquatic* gen. n. Further, *Chiloplacus* can be differentiated from the new genus by the shape of apical section of labial probolae (trifurcated *vs* bifurcated), shape of cephalic probolae (present *vs* absent) and tail shape (conoid pointed *vs* cylindroid rounded).

We believe that genera like *Trithornus* gen.n., *Acrobeles* and *Cervidellus* of family Acrobelinae are closely related and that the stem species of the clade had cephaloboid stoma, triangular cephalic probolae, furcated labial probolae, simple cuticle and cephaloboid type of female gonad with a post uterine sac. On the evolutionary tree, *Acrobeles* with long and deeply furcated labial probolae is placed on one hand while the genera with small and apically insicured labial probolae are placed on the other hand (*Cervidellus* & *Trithornus* gen.n). From, the evolutionary point of view it is difficult to conclude which of these forms is plesiomorphic state as there no known genera with such type of labial probolae. *Chiloplacus* is not grouped with these genera as it lacks triangular cephalic probolae.

However, it is interesting to observe that the new genus also shows resemblance to other genera of Acrobelinae. Certain characters like cephaloboid stoma, cephaloboid female gonad and conoid pointed tail present are also present in several species and genera belonging to the family Acrobelinae. Apical insicured labial probolae is also the characteristic of few genera like *Chiloplacoides* Heyns, 1994; *Stegelletta* Thorne, 1938; *Stegellitina* Andrassy, 1984 and *Nothacrobeles* Allen & Noffsinger, 1971 but trifurcated apical section of labial probolae of *Trithornus* gen. n. keeps it apart from all the above mentioned genera.

The possible reproductive state of *Trithornus aquatica* gen. n. is hermaphrodite due the complete absence of males in cultures. Further, the presence of sperms in the spermatheca in almost all female supports the probability of been hermaphrodite. However, the details of its biology should be elaborated to put more convincing information in the support of reproductive state.

Trithornus aquatica gen. n. was extracted from sediment sample of a pond receiving domestic wastes. The newly describe genus belongs to an aquatic habitat compare to its closely related genera which occupy terrestrial habitats. This is the first report of any genus of the Acrobelinae from an aquatic ecosystem.

The present work was done with the aim to strengthen the data base of aquatic nematodes. As work done on taxonomy and ecology of these nematodes is just preliminary. It should also be note that aquatic nematodes play a vital role in energy flow of benthic ecosystem (Ali *et al.*, 1983). Pollutions in aquatic environment may bring about change in their population dynamics, genetics and adaptations of these nematodes. Therefore, a great extent of work can be done on this group of nematodes in order to discover them and to understand their functional role in aquatic ecosystem.

*Key to generic identification of Acrobelinae

1. Labial probolae bifurcated, with a narrow shaft and two distal diverging or tuning fork.....2
 Labial probolae simple, rounded or pointed, if apically insicured then “shaft” wide.....9
2. Labial probolae with numerous tines.....3
 Labial probolae smooth or with setose projection, membranous tines if present less than ten..... 4
3. Labial probolae & cephalic probolae both shorter.....*Nothacrobeles* Allen &Noffsinger 1971
 Labial probolae as long as lip region, cephalic probolae fairly large, triangular*Acrobeles* Linstow, 1876

4. Cuticle tessellated on entire body or provided with numerous longitudinal ridges.....5
Cuticle simply annulated, or only on neck region tessellated.....7
5. Ridges 10 on mid-body, but reducing to 8 towards body ends. Only the ridges tessellated.....*Pentijatinema* Heyns & Swart, 1998
Longitudinal ridges or incisures much more numerous; the entire surface of cuticle tessellated.....6
6. Labial probolae arched, tuning-fork shaped, cephalic probolae minute, rounded female tail rounded.....*Stegellata* Thorne, 1938
Labial probolae T or Y-shaped, cephalic probolae well developed, triangular*Stegelletina* Andrassy, 1984
7. Branches of labial probolae much longer than shaft, oesophagus corpus swollen with usually wider lumen.....*Paracrobeles* Heyns, 1968
Branches of labial probolae not longer than shaft, oesophagus corpus not swollen.....8
8. Cephalic probolae with six long seta like process nearly equal in length with labial process, labial probolae distally forked with narrow shaft.....*Chiloplacoides* Heyns, 1994
Cephalic probolae without long seta like process labial probolae Y-shaped with very narrow (thin) shaft.....*Cervidellus* Thorne, 1937
9. Cuticle with simple annules.....10
Cuticle at least on neck tessellated.....13
10. Labial probolae terminally furcate.....11
Labial probolae simple, hemispherical or prismatic14
11. Post uterine sac absent, labial probolae low.....*Zeldia* Thorne, 1937
Post uterine sac present, labial probolae relatively high.....12
12. Labial probolae swollen, apically bifurcated.....*Chiloplacus* Thorne, 1937
Labial probolae swollen, apically trifurcated.....*Trithornus gen.n*
13. Cephalic probolae triangular, ending in long setae.....*Scotinema* Timm, 1971
Cephalic probolae low, rounded.....*Placodira* Thorne, 1937
14. Labial probolae as long as lip region width, sagittiform, sharp.....
.....*Acroukrainicus* Holovachov, Boström & Susulovsky, 2001
Labial probolae much shorter than lip region width, never sharp..... *Acrobeloides* Cobb, 1924

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