Hippopotamenema aliporensis gen. n. sp. n. (Nematoda : Atractidae) from Hippopotamus (Hippopotamus amphibius Linnaeus, 1758) Captivated at the Alipore Zoological Garden, Kolkata, West Bengal, India

Abstract: Nematode specimens collected during a survey from the faecal samples of the Hippopotamus (Hippopotamus amphibius), Captivated at the Alipore Zoological Garden, Kolkata, India. The specimens were carefully studied and identified as a new genus and species Hippopotamenema aliporensis under the superfamily Cosmocercoidea and family Atractidae. The new genus and the species differs from all other valid atractid genera in the presence of the features–oral opening ventrally directed; mouth without lips; cephalic region ornamented with two submedian and two subventral papillae and a pair of lateral amphids; buccal cavity, small, broad, ‘U’-shaped and with a pair of oesophageal teeth; neck region bounded by a collarette, attached anteriorly and with a free bell-shaped hyaline sheath.

Key words: Nematode, Hippopotamenema aliporensis gen. n., sp. n., captive Hippopotamus, Alipore Zoological Garden, Kolkata, West Bengal, India.

In the course of 2 month’s survey (June and July, 2007) on the gastrointestinal parasites of Hippopotamus (Hippopotamus amphibius) captivated at the Alipore Zoological Garden in Kolkata, West Bengal, India, on the basis of faecal samples only 8 female nematode specimens were recovered. The present specimens were identified as members belong to the superfamily Cosmocercoidea1 of the family Atractidae2,3. The characteristics of the specimens are quite different from the valid genera and species of the said family. So these are described and illustrated here as a new species under newly formed genus.

Materials and Methods: The nematodes recovered from the faeces of Hippopotamus (Hippopotamus amphibius) remaining captive in the Zoological Garden, Kolkata, India, were fixed by dipping them in hot FA (formalin : glacial acidic acid, 4 : 1) and subsequently stored in 70% alcohol. The specimens after fixation was dehydrated slowly4,5, mounted in anhydrous glycerin and sealed with paraffin wax. 2 specimens after clearing in glycerin alcohol was hand sectioned using a razor blade and was mounted in glycerin jelly to examine the oral structures. The specimens were studied under different magnifications with Zeiss Trinocular research microscope and photomicrographs were taken with Sanyo Digital Camera attached to the same research microscope. Figures were drawn with the aid of Camera Lucida. Total of 8 specimens (all females) have been collected during the study period. The average measurements of 6 specimens were taken and calculated ± standard deviation. Range is mentioned in parenthesis.

Result: Hippopotamenema gen. n. (Figure 1 and 2) : Diagnosis: Nematoda; Cosmocercoidea; Atractidae. Body stout, tapering anteriorly; cuticle faintly striated (Fig.1F,2E); oral opening ventrally directed, without lips or dentition; buccal cavity, small, broad, ‘U’-shaped and with a pair of oesophageal teeth; neck region bounded by a collarette, attached anteriorly and with a free bell-shaped hyaline sheath; 2 parts – an anterior oesophagus (corpus) is wider but shorter than posterior oesophagus (isthmus), ending into a bulb furnished with a vulvular apparatus and is not followed by a separate bulb; nerve ring surrounding the isthmus; excretory pore present, posterior to the nerve ring. Female is monodelphic (Fig.1D) with vulva very close to the anus (Fig.1E,2B); tail long, tapering and pointed (Fig.1E, 2D). Male not known.

Hippopotamenema aliporensis gen. n., sp. n.

Description: type species : General: The worms are stout, more than 3mm long; body tapering anteriorly (Fig.1F,2E); cuticle faintly striated; oral opening ventrally directed, without lips or dentition; buccal cavity, small ‘U’ shaped and broad with a pair of oesophageal teeth (Fig.1A,2A); behind the neck region a collarette attached anteriorly and with a free bell-shaped posterior margin surrounding the region on the body as a kind of hyaline sheath (Fig.1A,2F); oesophagus divided into 2 parts – an anterior oesophagus (corpus) is wider but shorter than posterior oesophagus (isthmus), ending into a bulb furnished with a vulvular apparatus and is not followed by a separate bulb; oesophago intestinal junction is represented by a prominent cardia; nerve ring surrounding the isthmus and excretory pore, posterior to the nerve ring (Fig.1B,2C). Female vulva close to the anus (Fig.1E,2B), ovary monodelphic, tube-like, not reflexed (Fig.1D). Uterus well
developed tube-like, eggs or larvae not observed (Fig.1D); rectum surrounded by few rectal glands; Tail long, tapering to a point (Fig.1E, 2D). Males unknown.

**Female (Holotype and 5 paratypes)**: Body 3.75 mm ± 3.53 (3.65 – 3.70) mm long and 125.0 ± 7.07 (115.0 – 120.0) µm wide (1F,2E); Head 26.25 ± 0.88 (25.0 – 26.25) µm long and 33.0 ± 0.35 (33.0 – 33.5) µm wide; Buccal cavity measuring 29.7 ± 0.21 (29.7 – 30.0) µm long and 23.1± 1.34 (23.1 – 25.0) µm thick; anterior oesophagus 187.5 ± 0.56 (186.5 – 188.0) µm long and 50 ± 0.27 (50.0 – 50.5) µm wide, posterior oesophagus 262.5 ± 2.83(260.0 – 267.0) µm long and 37.5± 0.35 (37.0 – 38.0) µm wide, bulb 75.0 ± 0.27(75.0 – 75.5) µm long and 51.25 ± 0.20 (51.0-51.5) µm wide. The bell-shaped hyaline sheath 38.75 ± 0.33 (38.00 – 38.75) µm x 87.50 ± 0.27 (87.50-87.70) µm in diameter, and at 62.5 ± 0.61 (61.0-62.5) µm from the anterior end (Fig. 1A,2F); nerve ring at 200.0 ± 3.88 (200 – 205.5) and excretory pore at 350.00 ± 6.01 (350 – 358.5), both from anterior end (Fig. 1B,2C); vulva post equatorial at 219.00 ± 0.05 (219.5 – 220.0) from posterior end and anus at 2812.5 ± 3.53 (2820.0 – 2825.0) from anterior end. Distance from vulva to anus 75.00 ± 1.41 (73.0 – 75.0). Gonad 1612.5 ± 1.76 (1612.5 – 1615.0) µ long. Tail long and pointed, 900.0 ± 3.53 (995.0 – 1000.0) long from posterior end (Fig. 1E,2D).

**Location**: Unknown.

**Habitat and Locality**: Specimen was collected by the first author from the stool samples of the type host Hippopotamus (Hippopotamus amphibius) captivated at Alipore Zoological Garden, Kolkata, West Bengal, India.

**Materials Deposited**: Holotype – one female (in one slide), is deposited to the National Zoological Collections of the Zoological Survey of India, Kolkata, West Bengal, India. Under the Registration No. WN 1357.

**Date of Collection**: 15.06.2007.

**Discussion**: The presence of clearly divided oesophagus – an anterior and a posterior part; the posterior oesophagus terminating into a distal bulb with a vulvulas apparatus, tail pointed.; monodelphic, vulva in the posterior most part of the body; viviparous. So the specimens belong to the family Atractidae\(^2,1\).

Previously, the family Atractidae, was placed in the Superfamily Oxyuroidea; but later Chabaud & Petter\(^6\) considered the family Atractidae under the Superfamily Cosmocercoidea and their classification is now widely accepted. Chabaud\(^7\) accepted 20 genera in the family Atractidae while, Adamson and Baccam\(^8\) listed 14 genera only and charachterized the family in having didelphic and monodelphic ovary. The didelphic ovary group includes the genera *Fitzsimmonsnema*\(^9\)* and *Probstmayria*\(^10\)*, and the monodelphic ovary group includes the genera *Atractis*\(^11\)*; *Cobboldina*\(^12\)*; *Crossocephalus*\(^13\)*; *Cyrtosomum*\(^14\)*; *Grassenema*\(^15\)*; *Labiduris*\(^16\)*; *Leiperenia*\(^17\)*; *Monhysterides*\(^18\)*; *Orientatractis*\(^9\)*; *Proatratc*\(^20\); and *Rondonia*\(^3\). Bursey et al.\(^21\) included the genus *Nouvelnema*\(^15\), in the didelphic atractid genera. In the recent years a number of genera have been added to the monodelphic atractid genera such as: *Pseudocyrtosomum*\(^22\)*; *Buckleyatractis*\(^23\); *Diceronema*\(^24\)*; *Klossinemella*\(^25\)* (since , Moravec and Thatcher\(^26\) synonymized with *Proatratc*\(^20\); *Podocnematractis* Gibbons et al.\(^27\)*; *Paraorientatractis*\(^28\); *Rhinolemmysnema*\(^29\)*; *Pneumoatractis*\(^31\)*, *Rhinoceronema*\(^4\)* and *Indoatratc*\(^30\)*.
The nematode specimen described here show some similarities to the genus *Labiduris* in the position of the mouth (ventrally directed) and presence of buccal cavity. However, it differs from genus *Labiduris* and all the other genera of Atractidae in the presence of a ‘U’-shaped buccal capsule with a pair of teeth and mainly in the presence of a cuticular collar in cervical region.

The absence of lips and specialized anterior cuticular structures and the presence of monodelphic reproductive system brings the present specimen close to *Monhysterides* but differs from the latter in having ‘U’-shaped buccal capsule with a pair of teeth and mainly in the presence of a cuticular collar in cervical region.

Due to the absence of specialized anterior cuticular structures, and the presence of monodelphic reproductive system, the genera which comes closer to the present specimen are *Atractis, Cyrtosomum, Leiperenia, Monhysterides, Paratractis, Rondonia, Pneumoatractis, Pseudocyrtosomum* and *Rhinoceronema*. But the present genus has a cuticular collar in the cervical region and smooth dorsal surface, while *Paratractis, Buckleyatractis, and Podocnematractis* have scale-like cuticular projections along the dorsal surface of the body, and *Paraorientatractis* has semiannules on the dorsal surface of the body, but no cuticular collar formation. The present genus has cuticular collar in the cervical region and has no cuticular formations in the cephalic region, whereas *Cobboldina, Crossocephalus, Grassenema, Klossinemella, and Orientatractis* have specialized cuticular formations around the mouth but no cuticular collar formation around the neck/cervical region.

In *Leiperenia*, the anterior part of the esophagus is one fourth of total length; whereas in the present genus, the anterior part is more than half of total length. *Pneumoatractis* have 3 prominent lips and oesophageal corpus is longer than oesophageal isthmus whereas, in the present genus lips are absent and oesophageal corpus is shorter than oesophageal isthmus. In the present specimen, the excretory pore is situated posterior to the esophageal bulb, but in *Rhinoclemmysnema*, and *Cyrtosomum*, the excretory pore is situated anterior to the esophageal bulb. In *Diceronema*, spines are restricted to the ventral surface of the female tail, while in the present genus smooth ventral surface of the female tail. Moreover, females of the present specimen have separate openings for vulva and anus, whereas, the females of *Rondonia* possess a cloaca.

The genus *Indoatractis* is separated from the present specimen by the position of the oral opening and the presence of lips (oral opening apical in position, mouth with three lips, v/s oral opening ventral in position, mouth without lips in the present specimen).

Lastly, the present specimen can be further separated from *Fitzsimmonsnaema* and *Probstmayria* by the nature of reproductive system (monodelphic reproductive system v/s didelphic reproductive system in the last two species).

**Etymology** : The new genus described here is named after the generic name of the host and the specific name is given from where it was collected.

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*SAGATA MONDAL*  
*BUDDHADEB MANNA***

***Department of Zoology, Parasitology Research Unit, University of Calcutta, 35 Ballygunge Circular Road,*
Kolkata 700 019, India.
E-mail : bmanna59in@yahoo.com

**Department of Zoology, Parasitology Research Unit, University of Calcutta, 35 Ballygunge Circular Road, Kolkata 700 019, India.
E-mail : sagata.mondal@rediffmail.com

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