

RESEARCH ARTICLE

***Probstmayria bengalensis* n.sp. (Cosmocercoidea: Atractidae) in Captive Indian one Horned Rhinoceros (*Rhinoceros unicornis*) from Alipore Zoological Garden, Calcutta, West Bengal, India**

Sagata Mondal*, Buddhadeb Manna

Department of Zoology, University of Calcutta,
35 Ballygunge Circular Road, Calcutta 700 019, India

Published online : Received 20 April 2010 / Revised 18 June 2010 / Accepted 18 June 2010

© The Author(s) 2010. This article is published with open-access at springerlink.com

Abstract

Nematode specimens collected from the faeces of the Indian one horned Rhinoceros (*Rhinoceros unicornis*) in the Alipore Zoological Garden, Calcutta, India are diagnosed as a new species under genus *Probstmayria* and named as *Probstmayria bengalensis* n. sp. The new species is distinguished from the other valid species of the genus in the presence of 3 pairs of postanal papillae and unequal, similar spicules (42.9 - 49.5 µm for left and 26.4 - 29.7 µm for the right spicule), with a spicular ratio of 1:1.62-1.66 and a small gubernaculum (13.2-16.5 µm long), that bents towards dorsal surface.

Keywords

Nematode, *Probstmayria bengalensis* n. sp., *Rhinoceros*, Alipore Zoological Garden.

Introduction

A survey was conducted in the Alipore Zoological Garden in Calcutta, West Bengal, India during April 2007- March 2010, where a new species of nematode *Probstmayria bengalensis*, was recovered from the faeces of one horned Indian Rhinoceros (*Rhinoceros*

unicornis). The nematode described here belongs to the superfamily Cosmocercoidea and family Atractidae. The species under the genus *Probstmayria* were reported in various groups of vertebrates such as horses, ponies, donkeys, swine (south African Wild Swine), Rhesus Macaque, chimpanzees, Gorilla, Rhinoceros (*Diceros bicornis bicornis*, and *Ceratotherium simum*), Chelonia (South African tortoise) in Asia and Africa. In the present report *Probstmayria bengalensis* n sp. is recorded for the first time from the Indian one horned Rhinoceros from Alipore Zoological Garden, Kolkata in captive condition.

Materials and methods

The nematodes collected from the faeces of *Rhinoceros unicornis* were fixed by dipping them in hot 4% FA (formalin : glacial acetic acid, 4 : 1) and subsequently stored in 70% alcohol. Most of the specimens after fixation were dehydrated slowly following Seinhrost, (1966), and were mounted in anhydrous glycerin and sealed with paraffin wax. A male specimen after clearing in glycerin alcohol was hand sectioned using a razor blade and was mounted in glycerine jelly to examine the caudal papillae. Specimens were observed in different magnification under Zeiss trinocular light microscope. Figures were drawn with

*E-mail address : sagata.mondal@rediffmail.com

the aid of Camera Lucida. All measurements are in micrometer, unless otherwise stated.

Genus : *Probstmayria* Ransom, 1907.

Probstmayria bengalensis n. sp. (Fig. 1)

Materials : Total of 82 specimens (59 females, 3 males and 20 larvae) have been collected and studied, but description is based on the measurements of 3 males, 9 females and 5 larvae.

Diagnosis

Worms are small delicate hair-like, cuticle transversely striated; mouth with 6 prominent lips, each bearing a papillae at its extremity; body length varies from 3.75 – 5µm . Pharynx long, narrow, tubular; oesophagus divided into 2 parts – an anterior muscular and wider and a posterior narrower and glandular which ends into a spherical bulb; it is furnished with a vulvular apparatus; Males are with 2 similar but unequal spicules; gubernaculum is small, bent towards dorsal surface. Females are didelphic, viviparous and vulva nearly equatorial in position .Tail filamentous in both sexes.

Male

Body 1.25 – 1.45 mm long ; 50µm in thickness ; pharynx 29.70-36.30µm long and 2.50-4.95µm in width; anterior oesophagus 105.6- 162.5µm long and 9.9 –16.5µm wide, posterior oesophagus 36.3- 37.5µm long and 9.9-13.2µm wide; nerve ring at 137.5-150µm and excretory pore at 187.5 –220µm, both from anterior end; tail filamentous, ventrally curved, 350 – 375µm long; spicules similar, conical, unequal, proximally bent and longer, 42.9 - 49.5µm long and smaller spicule 26.4 - 29.7 µm long; spicular ratio 1: 1.62-1.66; gubernaculum small, bent measuring 13.2 – 1.56µm in length; caudal papillae 3 pairs, post anal, discernible.

Female

Body 1.35- 1.56mm long and 37.5 -62.5µm wide ; pharynx measuring 30.00 -39.60µm long and 2.5- 6.6µm thick ; anterior oesophagus 150-187.5µm long and 16.5-23.1µm wide, posterior oesophagus 37.5 - 50µm long and 13.2µm wide. Nerve ring at 137.5 - 175µm and excretory pore 200 -225µm, both from

anterior end ; vulva almost equatorial at 662.5 -750µm from anterior end . Ovary (362.5-650µm) didelphic, tube-like, uterus filled with one or three well developed larvae and one or two eggs. The larvae within the uterus measuring 625 –750µm in length and 12.5 - 25µm in width; tail filamentous, 437 -500µm long.

Larvae : The larvae measure 1000 -1037.5 µm long and 25 µm wide.

Type specimen : Holotype (♂) in one slide; Allotype (♀) in another slide and Paratype (2♀♀) in two separate slides, deposited at present to the nematode collection of Parasitology research unit, Department of Zoology, University of Calcutta, India. Accession No. 000016N/10.

Type Host : Indian One horned Rhino (*Rhinoceros unicornis*)

Location : Lumen of intestine.

Type Locality : Alipore Zoological Garden, Calcutta, West Bengal, India.

Date of Collection: April 2007 – March 2010

Etymology : Named after the name of the state from where it was collected.

Prevalence : Total 74 faecal samples were collected out of which 64 were positive (86.48%).

Discussion

During 1865, Probstmayr recovered the specimens in equines in Germany and named it as *Oxyuris vivipara*. The same species were also recorded in horses in Italy by Perroncito (1882), Fiorentini (1890) and Jerke (1902) and in donkeys in Egypt by Looss (1902). Later Ransom (1907) found this species from horses of United States and proposed it a new name *Probstmayria vivipara* (Probstmayr, 1865). Subsequently, different workers placed the genus *Probstmayria* under many different oxyurid subfamilies. Skrjabin and Lagodovskaya, (1961) placed *Probstmayria* in the subfamily Probstmayriinae under the family Cosmocercidae. But latter this author

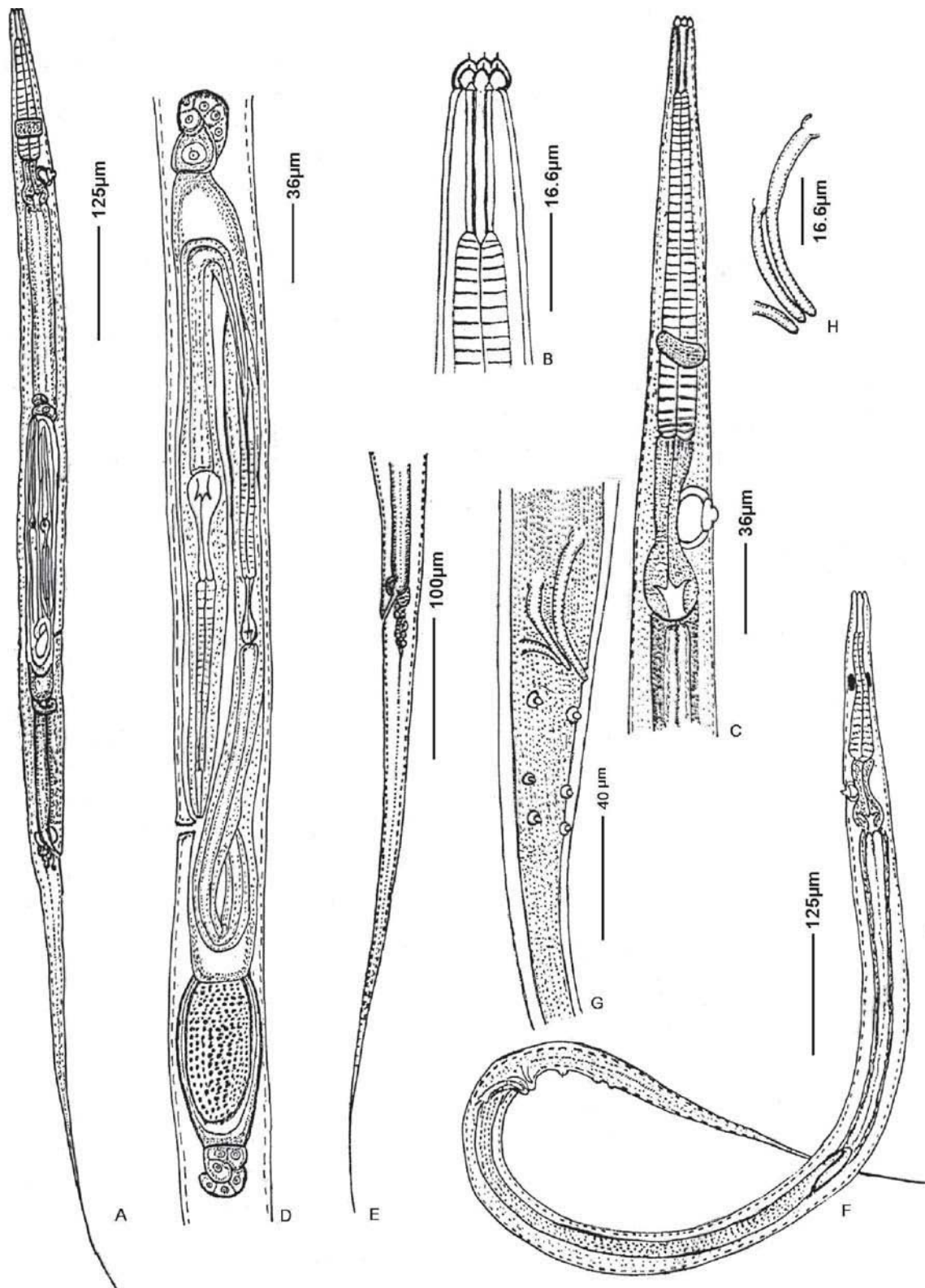


Fig 1. Camera Lucida drawings of *Probstmayria bengalensis* n.sp.

Female: A. Whole body; B. Head; C. Oesophagus; D. Gonad and vulval region; E. Anal and Tail region

Male : F. Whole body; G. Anal region showing positions of Papillae, Spicules and Gubernaculum H. Tail terminus.

accepted the proposal of Chabaud (1957) and Chabaud and Petter (1960) who placed the genus *Probstmayria* under the superfamily Cosmoceroidea of the family Atractidae.

At present, there are 11 previously described valid species under the genus *Probstmayria*, *P. vivipara* (Probstmayr, 1865) Ransom, 1907; *P. simiae* Maplestone, 1931; *P. gorillae* Kreis, 1955; *P. vesiculata* Vuylsteke, 1956; *P. suis* Troncy *et al.*, 1972; *P. gombensis* File, 1976; *P. nainitalensis* Arya, 1981; *P. goodallae* Van Waerebeke *et al.*, 1988; *P. inversa* Van Waerebeke *et al.*, 1988; *P. gabonensis* Van Waerebeke *et al.*, 1988 and *P. tapiri* Van Waerebeke *et al.*, 1988. Of the two other species *P. reptilae* (Fitzsimmons, 1958) was placed in the attractid genus *Fitzsimmons nema* by Petter (1966). *P. phacochoeri* (Kreis, 1973) is synonymized with *P. suis*, since it resembles measurements and structures and even recovered from the same host *Phacochoerus aethiopicus*.

The worms described here has the characteristic head, lips, pharynx, oesophagus, male and female sex organs similar to the genus *Probstmayria* Ransom, 1907. The presence of similar spicules brings the present species closer to *P. gorillae* and *P. tapiri*. The present species differs from *P. gorillae* in having unequal spicules and different spicular ratio. The present form comes closest to *P. tapiri* (Table – 1), but differs in having a spicular ratio 1:1.66, gubernaculum small, 19.8 µm long, bent towards dorsal surface; 3 pairs of post anal papillae; the distance between vulva to anus is 250–312.5 µm long. Thus for all the distinct characters, the specimen discussed here differs from all other species under the genus *Probstmayria* and to accommodate it the authors assigned a new species named *Probstmayria bengalensis* n. sp. in the name of its place of recovery.

Key to the species for the genus *Probstmayria* Ransom, 1907

1. Males without a gubernaculum 2
Males with a gubernaculum 3
2. Males with subequal spicules, with a spicular ratio 1:1.5. Adults of both sexes longer than 2.5 mm.

P. vivipara (Probstmayr, 1865) Ransom, 1907.

Males with subequal spicules, with a spicular ratio 1:2. Adults of both sexes less than 2 mm.

..... *P. simiae* Maplestone, 1931.

3. Males with dissimilar spicules 4

Males with similar spicules 6

4. Tip of shorter spicules bifurcated. Males with preanal papillae

..... *P. suis* Troncy *et al.*, 1972

Tip of shorter spicules non-bifurcated. Males without preanal papillae 5

5. Tip of shorter spicule elongate and nipple-like, spicular ratio 1:2. Post anal papillae 4-pairs.

..... *P. gombensis* File, 1976

Tip of shorter spicule elongate and blunt, spicular ratio 1:1.41–1.50. Post anal papillae 6-pairs.

..... *P. nainitalensis* Arya, 1981

6. Males with subequal spicules, with a spicular ratio 1:1.3.

..... *P. gorillae* Kreis, 1955.

Males with unequal spicules 7

7. Males with spicular ratio 1:1.39–1.59; Gubernaculum large, asymmetrical, 23 µm long with 9 post anal papillae.

..... *P. tapiri* Van Waerebeke *et al.*, 1988.

Males with spicular ratio 1:1.62–1.66; Gubernaculum small bent and directed dorsally and 19.8 µm long; 3 pairs of post anal papillae present.

..... *P. bengalensis* n. sp.

In the key, *Probstmayria vesiculata*, *P. inversa*, *P. goodallae* and *P. gabonensis* are not included, due to the lack of description of the male specimens. *P. vesiculata* (Vuylsteke, 1956) has a cephalic cap or vesicle and thereby can be distinguished from all other members of the genus. *P. inversa* (Van Waerebeke *et al.*, 1988) differs from the other members of the genus in having an aberrant cephalic symmetry (one ventral

Table 1. Comparison of *Probstmayria bengalensis* n.sp, with closer species *Probstmayria tapiri* Van Waerebeke et al., 1988

Morphometrics (In μm else otherwise Stated)	<i>Probstmayria bengalensis</i> sp.n From <i>Rhinoceros unicornis</i>		<i>Probstmayria tapiri</i> Van Waerebeke et al., 1988 From <i>Tapirus terrestris</i>		<i>Probstmayria tapiri</i> Van Waerebeke et al., 1988 From <i>Tapirus bardii</i>	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
All measurements						
Length mm	1.25-1.45	1.35-1.56	1.53-1.64	1.670-1.92	1.74	2.01-2.21
Thickness	50	37.5-62.5	88.4	87.1-94.9	66-84	76-111
Pharynx(L)	29.70-36.30	30 -39.60	37.3	39-41.1	————	————
Pharynx(B)	2.50-4.95	2.5-6.6	————	————	————	————
Oesophagus(L)	174.9-225	212.5-287.5	315	311.1-323	293-306	295-334
Anterior oesophagus (L)	105.6- 162.5	150-187.5	————	————	————	————
Anterior oesophagus (B)	13.2-16.5	16.5-23.1	————	————	————	————
Posterior oesophagus (L)	36.3- 37.5	37.5-50.0	————	————	————	————
Posterior oesophagus (B)	9.9-13.2	13.2	————	————	————	————
Oesophagesl bulb (L)	25-33	25-37.5	————	————	55.2	56.4-58.8
Oesophagesl bulb (B)	23.1-26.4	25-29.7	————	————	42.2	45.2-50
Nerve Ring*	137.5-150.0	137.5-175.0	168	169-177.3	143-155	139-167
Excretory Pore*	187.5 - 220	200-225	272.1	270.2-278.4	235-251	229-291
Tail	350-375	437.5-500	576.2	641.4-670.7	477-542	481-602
Large Spicule	42.9 -49.5	————	————	————	66.2	————
Small Spicule	26.4-29.7	————	————	————	41.5	————
Gubernaculum	13.2-16.5	————	————	————	————	————
Caudal Papillae (post cloacal)	3 – pairs	————	9– pairs	————	9– pairs	————
Spicular ratio	1:1.62-1.66	————	1:1.39-1.59	————	1:1.59	————
Vulva*	————	662.5-750	————	870-928.1	————	————
Distance from vulva to anus	————	250-312.5	————	289.1-312.7	————	————

* = Distance from anterior end.

and 2 dorsolateral lips) ; small pharynx (19 μm) and in structure of head and buccal capsule. *P. goodallae* (Van Waerebeke et al., 1988) also have similar cephalic symmetry as *P. inversa* but it differs from the latter in having longer pharynx and in the presence of delicate points on the buccal capsule. *P. gabonensis* (Van Waerebeke et al., 1988) differs from *P. gorillae* (Kreis, 1955) in the measurements of the head, oesophagus and tail; from *P. gombensis* (File,1976) in the finer head and labia which do not appear convex in the lateral view; from *P. simiae* (Maplestone, 1931) and from *P.*

nainitalensis (Arya, 1981) in the position of the vulva, shape of cephalic labia and tail length; from *P. tapiri* (Van Waerebeke et al., 1988) and *P. bengalensis* n. sp. in the position of vulva and cephalic structures.

Acknowledgments

The authors are grateful to Sri S.R. Dey Sarkar, Senior assistant (Retd.),Nemathelminthes Section , Zoological Survey of India, Calcutta for his valuable help in identification of nematodes and the staff of Alipore Zoological Garden, Calcutta for their help in

collection of the Parasites. The authors are also grateful to the Director and Deputy Director, Alipore Zoological Garden, Calcutta for their kind permission of collecting the parasites and frequent visit to the zoos. The authors are also thankful to the Head, Department of Zoology, University of Calcutta, for his kind permission in conducting the research works.

References

- Arya, S.N. 1981. A new species of the genus *Probstmayria* Ransom, 1907 (Nematoda: Atractidae) from the Rhesus Macaque, *Macaca mulatta*. *Primates*, 22(2): 261-265.
- Chabaud, A. G. 1957. Sur la systématique des nématodes du sous-ordre des Ascaridina parasites des Vertèbres. *Bulletin de la Société zoologique de France*, 82: 243-253.
- Chabaud, A. G. Petter, A. J. 1960. Sur les nématodes Atractides. *Libro Homenaje, E. ED. Caballero*, pp. 465-470.
- File, S. K., 1976. *Probstmayria gombensis* sp. n. (Nematoda: Atractidae) from the chimpanzee. *J. Parasitology*, 62(2): 256-258.
- Fiorentini, A. 1890. Sull'ossiuride vivipara (*Oxyuris vivipara* Probstmayr) cenni descrittivi. *Bulletin Scientific of Pavia*, 12(1): 21-25.
- Fitzsimmons, W.H. 1958. On *Probstmayria reptilae* n. sp. From *Homopus femoralis* and some notes on the genus *Probstmayria*. *J. Helminthology*; 32 : 211-218.
- Jerke, H.W.M. 1902. Eine parasitische Anguillula des Pierdes. *Archiv fur Wissenschaftliche und Praktische Thierheilkunde, Berl.*, 29(1-2): 113-127.
- Kreis, H. A. 1955. Beitrage zur Kenntnis parasitischer Nematoden XVIII. Das genus *Probstmayria* Ransom, 1907. *Schweiz. Arch. Tierheilk*, 97: 422—433.
- Kreis, H. A. 1973. Beitrage zur Kenntnis parasitischer Nematoden XXVIII. Zwei neue Oxyuren aus dem Warzenschwein, *Phacochoerus aethiopicus*. *Schweiz. Arch. Tierheilk*, 115: 175-183.
- Looss, A. 1902. The Sclerostomidae of horses and donkeys in Egypt. *Records of the Egyptian Government. School of Medicine. Cairo* pp. 25-139.
- Maplestone, P. A. 1931. Parasitic nematodes obtained from animals dying in the Calcutta Zoological Gardens. *Records of Indian Museum.*, 33 : 71-171.
- Petter, A. J., 1966. Equilibre des espèces dans les populations de nématodes parasites du colon des Tortues Terrestres. *Mém. Mus. Nat. Hist., Nat. Ser. A., Zool.*, 34(1): 1-252.
- Perroncito, E. 1882. I parassiti dell'uomo e degli animali utili. Delle più comuni malattie da essi prodotte profilassi e cura relativa. *Milano*, 12: 233, 506.
- Probstmayr, W., 1865. *Oxyuris vivipara*. *Wchnschr. f. Thierh. U. Viehzucht, Augsburg*, IX (23) : 178-180. 8. Juni.
- Ransom, B. H. 1907. *Probstmayria vivipara* (Probstmayr, 1865) Ransom, 1907, a nematode of horses heretofore unreported from the United States. *Transactions of the American Microscopical Society*, 27: 33-41.
- Seinhorst, J. W. 1966. Killing nematodes for taxonomic study with hot f. a. 4 : 1. *Nematologica* 12: 175.
- Skrjabin, K. I., Lagodovskaya, E. A. 1961. *Oxyurata of Animals and Man. Essentials of Nematology*, Vol. 5, Part 2. Israel Program for Scientific Translation, Jerusalem, 1974.
- Troncy, P. M., Graber, M., Thal, J. 1972. *Probstmayria suis* n. sp. (Nematoda: Atractidae), parasite de Suidae. *Bulletin, Museum National History, Nat. Series 3, No. 94, Zool.*, 73: 1313-1317.
- Van Waerebeke, D., Chabaud, A.G., Anthony, G. 1988. *Probstmayria tapiri* n. sp, Nematode parasite d'un Tapir du Nouveae Monde. *Bulletin Du Museum National D'Histoire Naturelle, A. (Zoologie, Biologie Et Ecologie Animales)*. 10(1):3-8.
- Van Waerebeke, D., Chabaud, A.G., Collet, J.Y. 1988. New atractid nematode parasites of the chimpanzee and gorilla in Gabon. *Annales de parasitologie humaine et comparée* 63(1):37-47. [in French]
- Vuylsteke, A. 1956. Note sur quelques nématodes parasites avec description de neuf espèces nouvelles. *Revue de zoologie et de botanique africaines*, 53: 441-477.