TWO NEW SPECIES OF NEMATODES FROM INDIAN HOSTS.

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(*From the Hookworm Research Laboratory, School of Tropical Medicine and Hygiene, Calcutta. Financed by the Indian Jute Mills Association*).

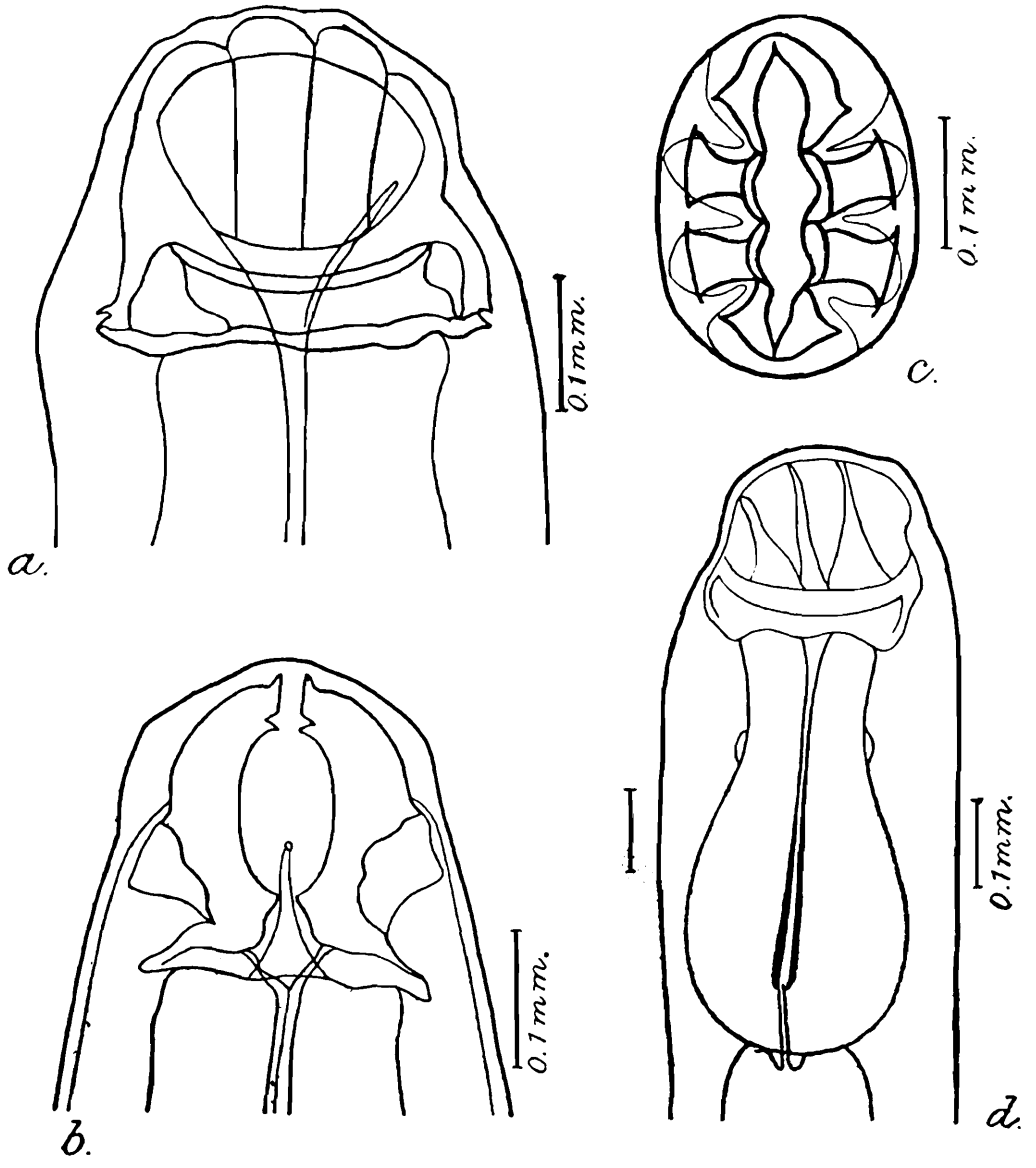
Kalicephalus bengalensis, n. sp.

Host.—Zamenis mucosus (Rat-Snake).

Locality.—India.

Site.—Intestine.

Material available for study. Three males and ten females.



TEXT-FIG. 1.—*Kalicephalus bengalensis,* n. sp.

a. Head, lateral view. Deep focus to show grooves in the capsule wall.

b. Head, dorso-ventral view.

c. Head, end on view. Deep focus to show structure of buccal capsule. (Papillae superimposed).

d. Head, lateral view. Superficial focus to show papillae.

These worms were obtained from two specimens of the rat-snake which died in the Calcutta Zoological Gardens.

The body tapers gradually from before backwards, the head being relatively broad in the dorso-ventral diameter. The mouth is in the form of a dorso-ventral slit looking straight forwards and it is bounded by two broadly-rounded lateral lips (figs. 1*a*, *c*, *d*). Each lip bears three papillae (fig. 1*d*). The papillae of each lip overlie three deep longitudinal grooves in the buccal capsule, which extend almost through its whole thickness (fig. 1*c*). Dorso-ventrally, in optical section, the cavity of the capsule is oval, and there is a groove on its inner surface towards the anterior, where the lateral walls come together (fig. 1*b*). The duct of the dorsal oesophageal gland opens about half way up the depth of the capsule. At its junction with the oesophagus the buccal capsule is reinforced by triangular plates and transverse bars of chitin (figs. 1*a*, *b*).

The oesophagus is short, thick, and flask-shaped, and the maximum diameter of its bulb is equal to about half its length, its lumen is lined by chitin for the greater part of its length, and this lining becomes gradually thicker from before backwards. The nerve-ring surrounds the oesophagus at its narrowest part, which is at about the junction of the anterior and middle thirds (fig. 1*d*).

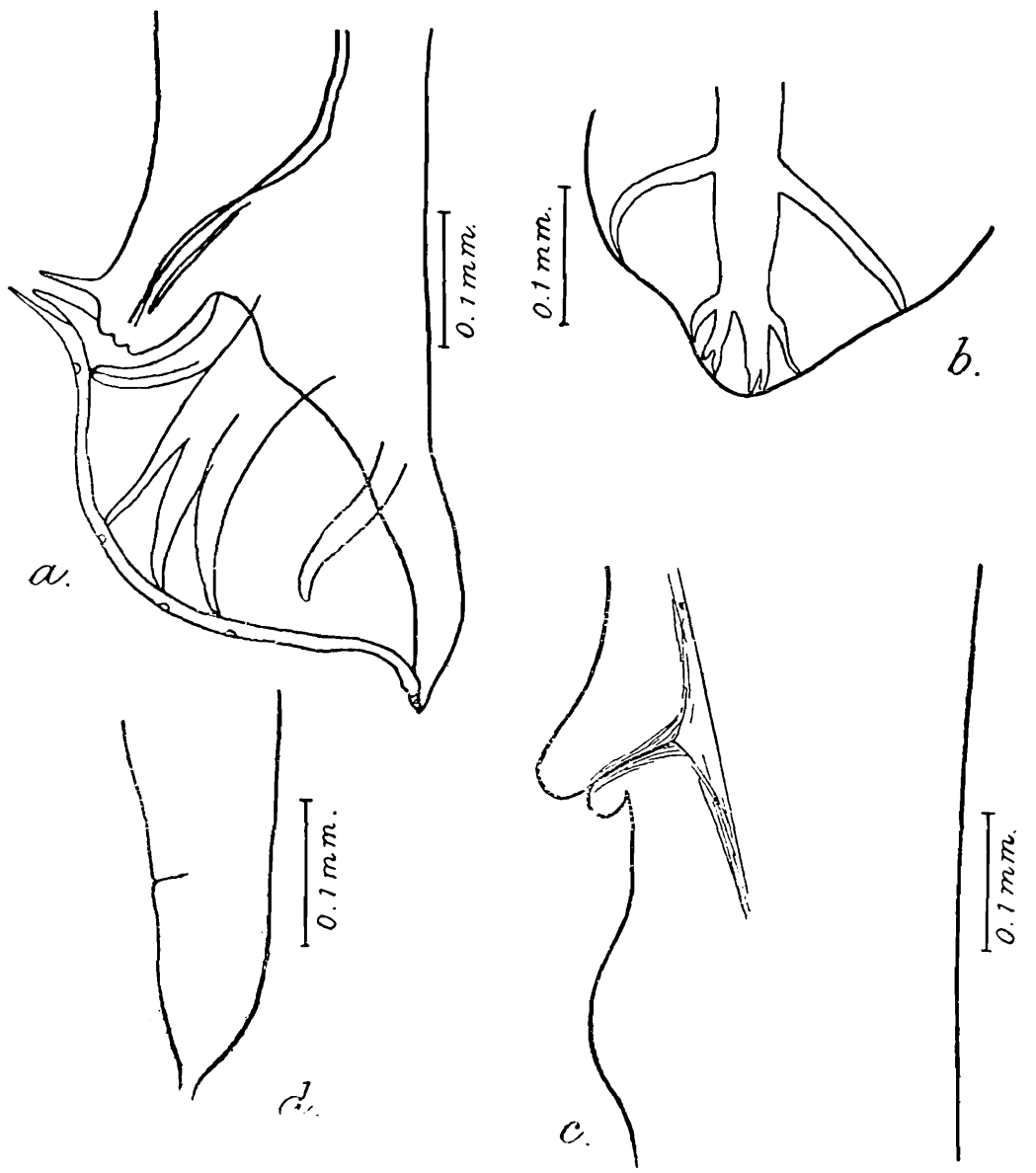
Male.—The rays of the male bursa are very similar to those of other members of the genus, the only special characters noted being that the bursa ends in two sharp points ventrally, and that from each side of the genital cone a relatively long, pointed pre-bursal papilla arises (figs. 2*a*, *b*). The spicules are long, equal and thin, they are only slightly thicker at their bases than at their faintly alate tips. About the middle of their length they take a broad curve towards the ventral surface of the worm. A gubernaculum is present, it is in the form of a long delicate rod of chitin (fig. 2*a*).

Female.—The vulva opens on a prominent cone consisting of two lips, and just behind this cone there is a distinct bulbar enlargement (fig. 2*c*). Immediately posterior to this the worm becomes distinctly narrower, and from this point it gradually tapers to the tail, which is in the form of a sharp cuticular spike (fig. 2*d*). The short vagina runs directly inwards and ends in two ovijectors, which run straight backwards and forwards respectively. About halfway between the vulva and anus the posterior ovijector turns forwards into the uterus which runs forwards parallel to the uterine branch arising from the anterior ovijector.

Measurements.

Male, length	6—7 mm.
,, maximum breadth	0·26 mm.
Female, length	7—9 mm.
,, maximum breadth	0·36 mm.
Oesophagus	0·34 mm.
Nerve-ring from ant. end of oesophagus	0·15 mm.
Spicules, length	0 35 mm.
Gubernaculum	0·12 mm.
Vulva from tip of tail	2·08 mm.
Divides worm approximately	1·4.
Anus from tip of tail (female)	0·16 mm.
Eggs	0·066 0·070 × 0·040 mm.

In size this worm is almost identical with *Kalicephalus indicus* Ortlepp[1] (1923), which was found in the same host ; but there are several points of difference in the anatomy which, in the writer's opinion, justify the creation of a new species. In the male the sharp points in which the bursa ends ventrally, and the pre-bursal papillae are absent in *K. indicus*. In the female the vulva opens between prominent lips and there is a post-vulvar enlargement in *K. bengalensis*, whereas these structures are absent in *K. indicus* ; the diminution in diameter posterior to the vulva is not nearly so marked in the former as it is in the latter species ; the



TEXT-FIG. 2.—*Kalicephalus bengalensis*, n. sp.

a. Male bursa, lateral view.
b. Male bursa, dorsal lobe.
c. Female, region of vulva.
d. Female tail.

ovijectors definitely diverge for a considerable distance and the eggs are larger in the former species than they are in *K. indicus*.

[1] Ortlepp, R. J. (1923). Observations on the Nematode Genera *Kalicephalus*, *Diaphanocephalus*, and *Occipitodontus* g. n., and on the larval development of *Kalicephalus philodryadus* sp. n. *Journ. of Helminthology*, Vol. I, p. 165.

According to the descriptions given by Ortlepp (1923) this worm differs markedly from all other species of the genus.

Type-specimens have been placed in the Indian Museum, Calcutta.

Habronema indica, n. sp.

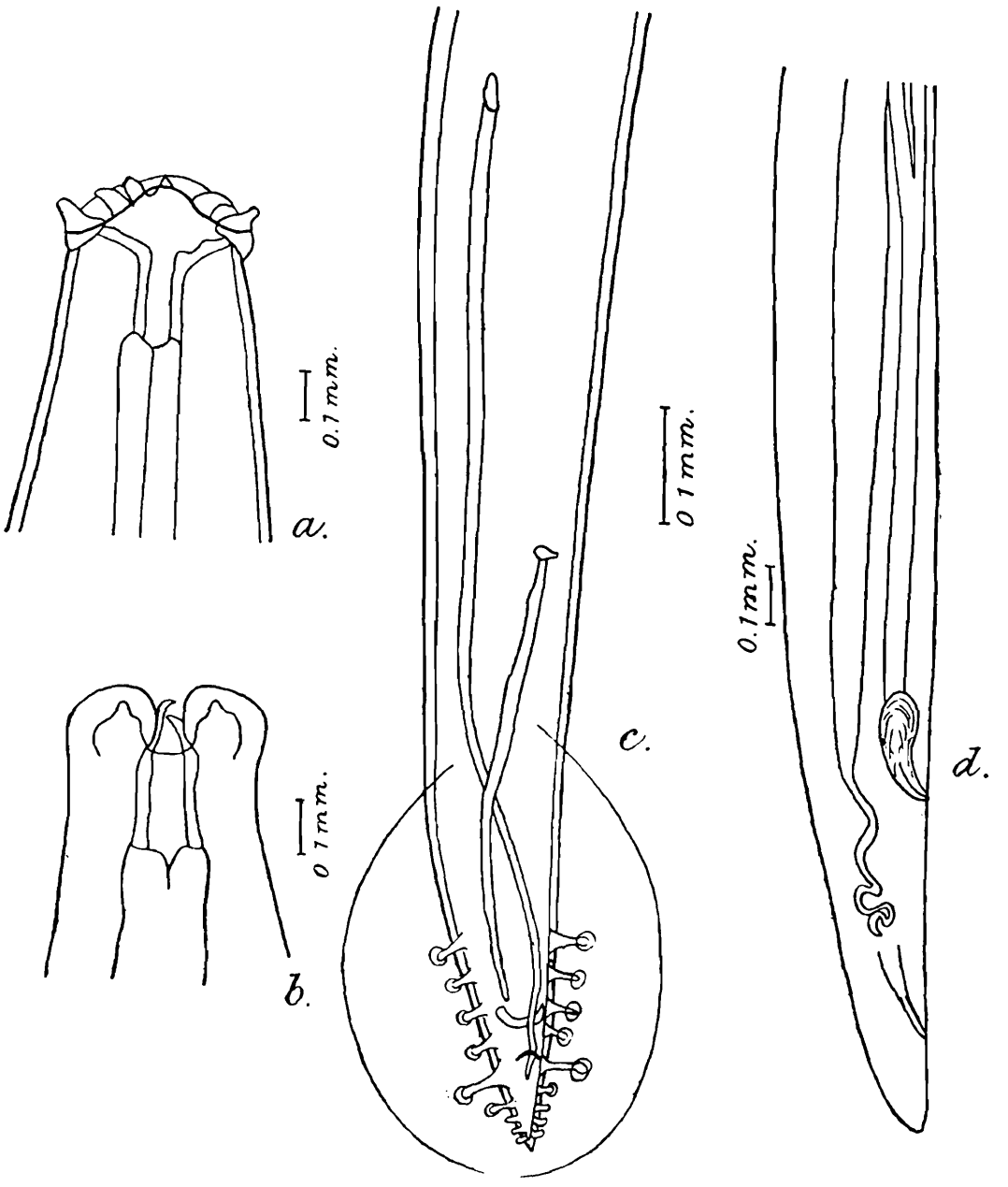
Host.—*Coracias indica* (Indian Roller).

Locality.—India.

Site.—Gizzard.

Material available for study. One male and three females.

These worms were obtained from a bird that died in the Calcutta Zoological Gardens.



TEXT-FIG. 3.—*Habronema indica*, n. sp.

a. Head, lateral view.
b. Head, dorso-ventral view.
c. Posterior extremity, male, ventral view.
d. Posterior extremity, female, lateral view.

The head is fairly small, being only about one-third of the maximum diameter of the body. The cuticle has two sets of transverse striations;

a set of fine striations about 3μ apart and a set of coarser striations about 18μ apart. The mouth is in the form of a dorso-ventral slit, and it is bounded by two thick lateral lips each of which bears a large pointed sub-dorsal and sub-ventral papilla. On the inner surface of each lip there are four chitinous teeth which lightly interlock with those of the opposite side (fig. 3*a*, *b*). The vestibule is strongly chitinised and in the anterior portion it rapidly expands dorsally and ventrally (fig. 3*a*). It is produced anteriorly as a thin chitinous plate, the serrated border of which forms the teeth. The oesophagus is long and thin and it is divided into a short anterior muscular portion and a longer posterior glandular portion.

Male.—The tail is straight and it bears broad caudal alae, which unite behind the tip of the tail ; the alae are slightly asymmetrical, that on the left side extending a little further forward than that on the right side, and their ventral surfaces are marked by transverse striations. There are nine pairs of pedunculated papillae supporting the caudal alae ; four pairs of these are in front of the cloaca, one longer pair is opposite the cloaca, and four pairs, which diminish in length from before backwards lie behind the cloaca. The spicules are long, thin, and unequal ; the right spicule is about twice as long as the left, and in the single male available they cross about the middle of the shorter spicule. There is a boat-shaped gubernaculum (fig. 3*c*).

Female.—The tail ends in a bluntly rounded tip. The vulva opens a little in front of the anus into a flask-shaped muscular ovijector, a long unpaired tube passes forwards from this structure eventually dividing into two uterine branches (fig. 3*d*). Both uterine branches run forwards to about the middle of the worm, at this point one branch bends backwards and ends in a coiled tubular ovary about halfway between the vulva and anus ; the other uterine branch continues an anterior course and ends in an ovary about 0·8 mm. from the anterior end of the worm. Both branches of the uterus are filled with eggs containing embryos.

Measurements.

Male—	
Length	7·1 mm.
Maximum breadth	0·2 mm.
Head, diameter	0·084 mm.
Depth of buccal capsule	0·08 mm.
Oesophagus, muscular	0·3 mm.
,, glandular	1·1 mm.
Spicule, right	0·694 mm.
,, left	0·357 mm.
Female—	
Length	10·75 mm.
Maximum breadth	0·35 mm.
Diameter of head	0·19 mm.
Anus to tip of tail	0·16 mm.
Vulva to tip of tail	0·59 mm.
Ovijector, length	0·175 mm.
Unpaired trunk	0·89 mm.
Eggs	0·040–0·042 × 0.020–0 022 mm.

Comparison of this worm with the descriptions of the complete list of *Habronema* of birds given by Cram[1] (1927) shows that it is quite distinct from all the known species. The most striking character is the extreme posterior position of the vulva, for in the majority of the species the vulva is situated in front of or near the middle of the body ; in only three of the species *viz. H. longestriata*, *H. seurati*, and *H. unilateralis* is it found in a definitely posterior position, and in none of these is it apparently as far back as in the present instance.

Type-specimens are in the Calcutta School of Tropical Medicine.

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[1] Cram, E. B. (1927). Bird Parasites of the Nematode Suborders Strongylata, Ascaridata, and Spirurata. *U. S. Nat. Mus. Bull.*, No. 140.