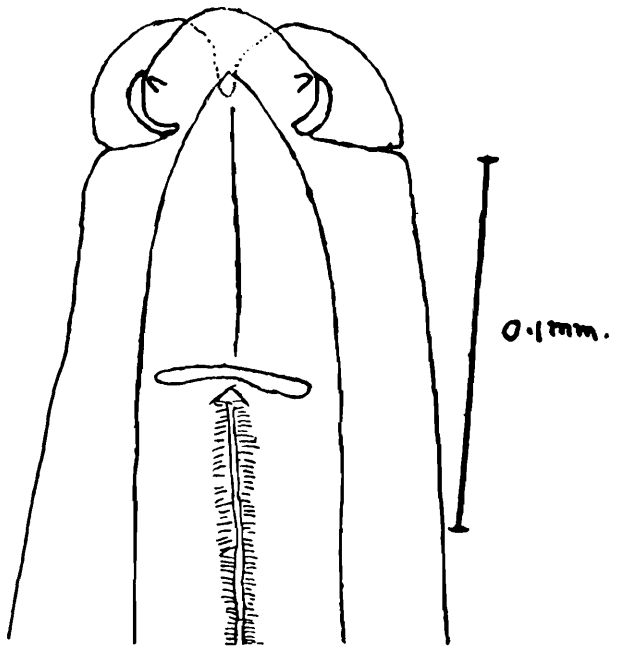
Part 7. Oxyuroidea.

Heterakis longespiculum, n. sp.

Specimens of this worm were obtained from the intestine of a Red-crested Wood-quail (*Rollulus roulroul*).

The head is furnished with three lips separated from the body by a deep groove. The dorsal lip is triangular with rounded angles and it bears two papillae. The ventral notch separating the sub-ventral lips is relatively deep and narrow (fig. 82). The anterior part of the oeso-



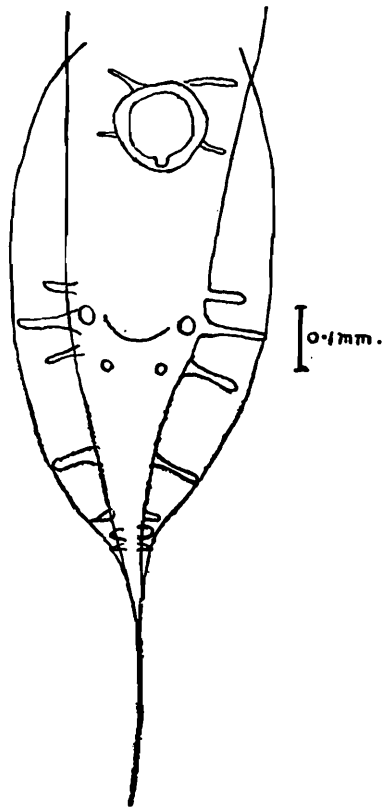
Text-fig. 82.—*Heterakis longespiculum,* n. sp. Anterior end, dorsal view.

phagus is of different structure from the rest of this organ which exhibits transverse striations, and the two parts are separated from each other by a chitinous plate. The oesophagus terminates in the usual bottle-shaped enlargement typical of the genus. There are no lateral flanges.

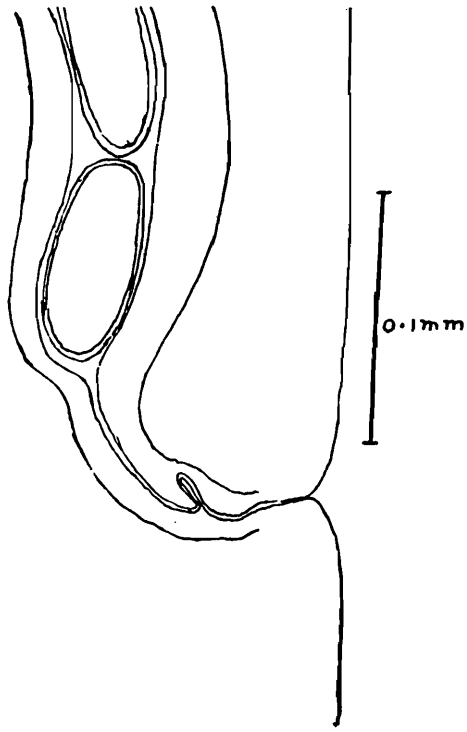
Male.—The males are 8·6 mm. in length and 0·4 mm. in diameter. The anterior portion of the oesophagus is 0·09 mm. in length, and its total length is 1·2 mm. The caudal alae are symmetrical semilunar structures, and the tail ends in a long fine point (fig. 83). The sucker is 0·068 mm. in diameter and it has a notch on its posterior border. The posterior border is 0·18 mm. anterior to the cloaca, and the distance from the cloaca to the tip of the tail is 0·455 mm. There are eleven pairs of caudal papillae whose arrangement can be seen in fig. 83. The spicules are very long, unequal and dissimilar. The long spicule is 4·1 mm. in length and is thin and straight. The short spicule is 2·08 mm. in length ; it is relatively thick and it ends in a sharp point ; it has relatively broad alae on each side for the whole of its length.

Female.—The female is 8·79 mm. in length and 0·4 mm. in diameter. The anterior portion of the oesophagus is 0·096 mm. in length, and its total length is 1·5 mm. The vulva opens 4 mm. from the tip of the tail. There is a short vagina curving inwards and forwards, which opens into a long ovejector (fig. 84). On account of the large number of eggs present

in all the specimens its division into the two uteri could not be made out. There is a cuticular rectum 0·218 mm. in length, and its junction with



TEXT-FIG. 83.—*Heterakis longespiculum*, n. sp. Posterior end, male, ventral view.



TEXT-FIG. 84.—*Heterakis longespiculum*, n. sp. Vulval region.

the intestine is clearly marked. The tail ends in a long straight tip, and the distance from the anus to the tip of the tail is 1·5 mm. The eggs are oval with parallel sides and bluntly rounded ends, they are 0·072 × 0·036 mm.

The great length of the spicules clearly differentiates this species from all other members of the genus *Heterakis*, and another uncommon character which it posseses is the groove separating the lips from the rest of the body. It is accordingly proposed to name this worm *Heterakis longespiculum*, n. sp.

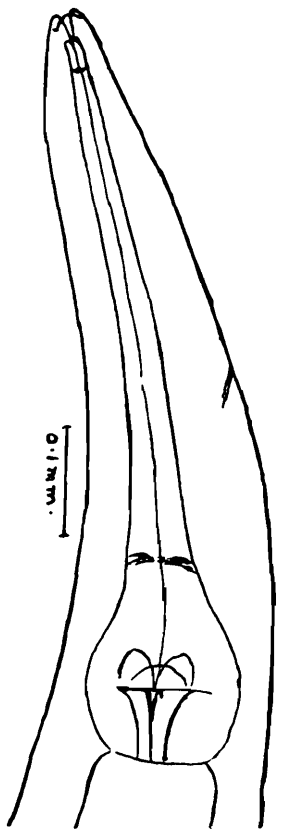
Host.—Rollulus roulroul.

Type-specimens are in the Indian Museum, Calcutta.

Heterakis parva, n. sp.

These worms were obtained from a Silver pheasant (*Euplocamus nycthemerus*) along with some specimens of *Heterakis longicaudata*.

The mouth is surrounded by three broad semicircular lips all of the same size and shape, and each bearing a papilla. The lips are not divided from the body by a groove. There are no lateral flanges (figs. 85 and 86).

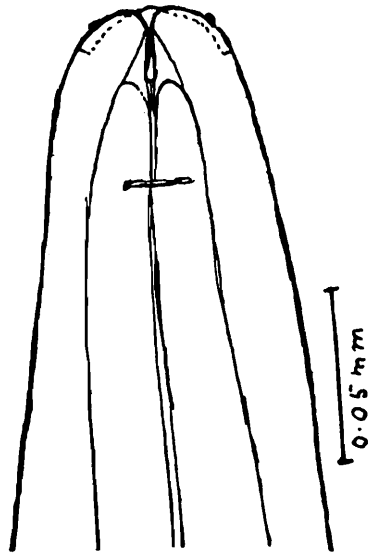


Text-fig. 85.—*Heterakis parva*, n. sp. Anterior end, lateral view.

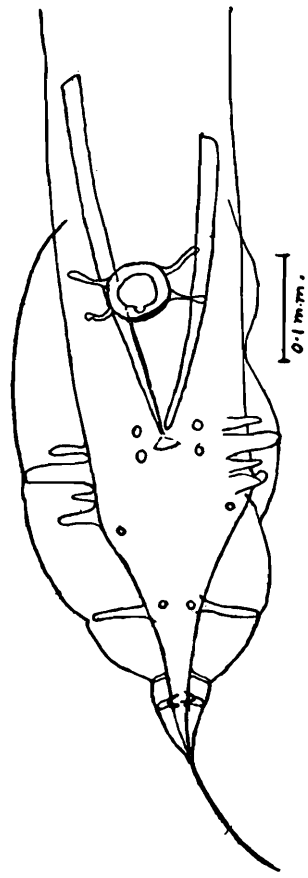
Male.—The male is 4·68 mm. in length and 0·247 mm. in maximum diameter. The oesophagus including the bulb is 0·634 mm. in length, and the short anterior portion is 0·044 mm. in length. The sucker is circular with a notch on its posterior border, which is 0·118 mm. anterior to the cloaca; it is 0·062 mm. in diameter. The tail is 0·356 mm. in length. There are broad caudal alae, and fourteen pairs of papillae, whose size and arrangement can be seen in fig. 87. The spicules are similar in shape but unequal, one being 0·317 and the other 0·277 mm. in length.

Female.—The female is 6·03 mm. in length and 0·376 mm. in maximum diameter. The oesophagus is 0·673 mm. in length including the

bulb. The vulva opens with slightly prominent lips 2·65 mm. from the tip of the tail. A stout vagina runs directly inwards from the vulva for a distance of 0·090 mm., where it divides into divergent uteri. The distance from the anus to tip of tail is 0·594 mm. The eggs measure 0·060-0·062 × 0·032-0·034 mm.



TEXT-FIG. 86.—*Heterakis parva*, n. sp. Anterior end, ventral view.



TEXT-FIG. 87.—*Heterakis parva*, n. sp. Posterior end, male, ventral view.

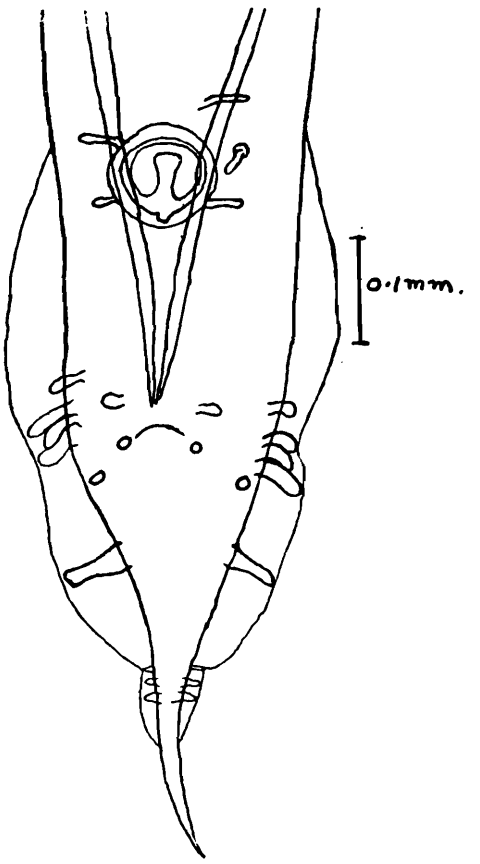
This worm differs from all the other species of *Heterakis* so it is proposed to name it *Heterakis parva*, n. sp.

Host.—*Euplocamus nychtemerus.*

Type-specimens are in the Indian Museum, Calcutta.

Heterakis variabilis Chandler, 1926.

Chandler (1926) described this species from the Peacock pheasant (*Polyplectrum bicalcaratum*) which died in the Calcutta Zoological Gardens. I have recently obtained some specimens from the same host and the same locality, which agree in all essential particulars with Chandler's description. He describes and figures a rather unusual arrangement of the paracloacal papillae. The anterior pair of this group are said to be placed further forward than is usual and they are asymmetrical; a further peculiarity is that the left papilla of this pair is split in two. Chandler does not say how many males he examined, so it is not clear if this arrangement was constant in several specimens, or was only present in a single example.



TEXT-FIG. 88.—*Heterakis variabilis*. Posterior end, male, ventral view.

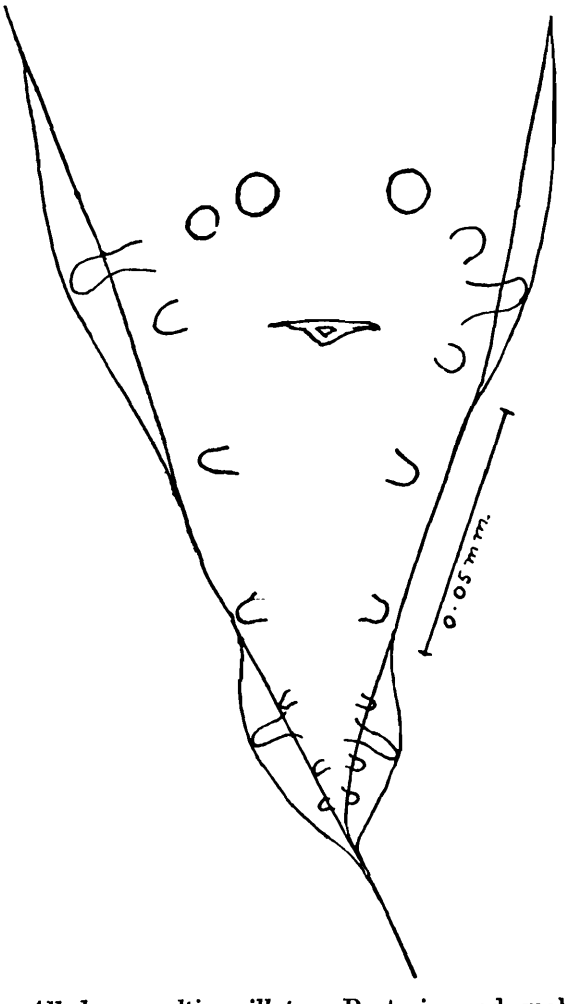
My collection obtained from several birds of the same species contains a number of males, and in most of them the anterior pair of paracloacal papillae are situated close in front of the remaining papillae of this group, and neither of them are bifurcated. In the specimen from which fig. 88 has been drawn it will be noted that there is an accessory papilla on the left side anterior to the sucker. This is clearly an abnormality for it is only present in two of my specimens, and I have a single specimen in a large collection of males of "*Ganguleterakis*" *spumosa*, which exhibits a similar accessory papilla. In some of my specimens there is a third pair of sessile papillae slightly behind and external to the two pairs of sessile paracloacal papillae normally present. It might be thought that these differences in papillae indicate a new species, but this is not considered to be the case, for none of the differences noted appeared constant in any single collection of worms, and they are identical with the

type in all other characters and dimensions, therefore it seems that Chandler has described as the type, what is really only an abnormality, and that the papillae of this species are subject to considerable individual variation.

Allodapa multipapillata Chandler, 1926.

Specimens of this worm have on several occasions been obtained from the Red-crested Wood-quail (*Rollulus roulroul*), the host from which Chandler (1926) originally described it.

My material agrees in all points with Chandler's description, but as he apparently did not obtain a ventral view of the tail of the male he failed to notice the presence of two pairs of narrow caudal alae, and in consequence did not fully appreciate the arrangement of the caudal papillae. One pair of alae is opposite the cloaca and each one is supported by a single pedunculate papilla. In ventral view these papillae are seen to be just anterior to the cloaca, but in the curved lateral view figured by Chandler they seem to be behind the cloaca The second pair of alae is situated near the tip of the tail and they are also each supported by a single pedunculate papilla (fig. 89). It is obvious that



TEXT-FIG. 89.—*Allodapa multipapillata.* Posterior end, male, ventral view.

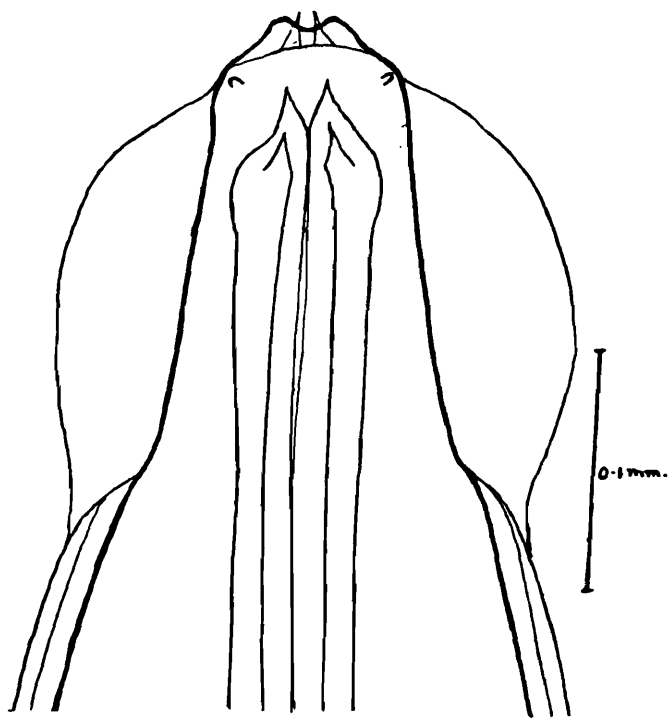
these four pedunculate papillae supporting the four alae are the ones described by Chandler as follows. " One pair of lateral papillae is situated at the level of the anus while the other is at the level of the fourth

ventral postanal." The row of preanal papillae agree in my material with Chandler's description and drawing.

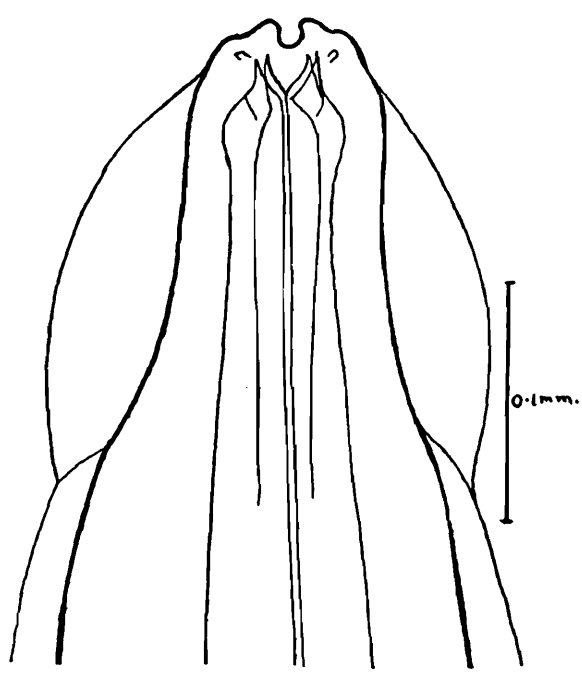
Syphaciella indica, n. sp.

These worms were obtained from the intestine of a Sand grouse (*Pterocleres exustus*).

These small worms have a distinct cuticular inflation and lateral flanges. The body of the worm becomes suddenly wider opposite the termination of the cuticular inflation. The mouth is bounded by three bilobed lips. The dorsal lip bears two finely pointed structures on its inner surface, and they project beyond the lip anteriorly. On the external surface of the dorsal lip there are two papillae (fig. 90). The sub-ventral lips each bear a single papilla (fig. 91). The anterior end of

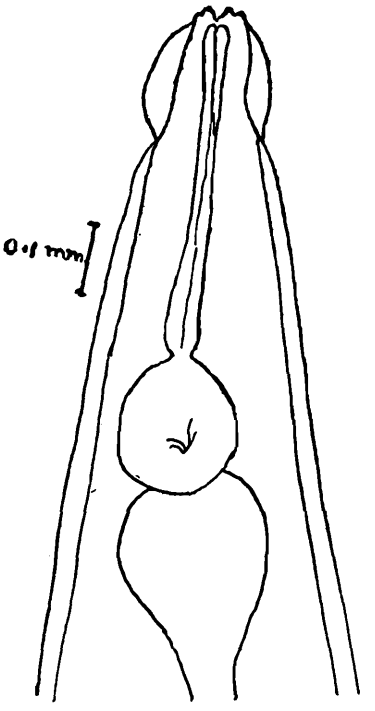


Text-fig. 90.—*Syphaciella indica,* n. sp. Anterior end, dorsal view.

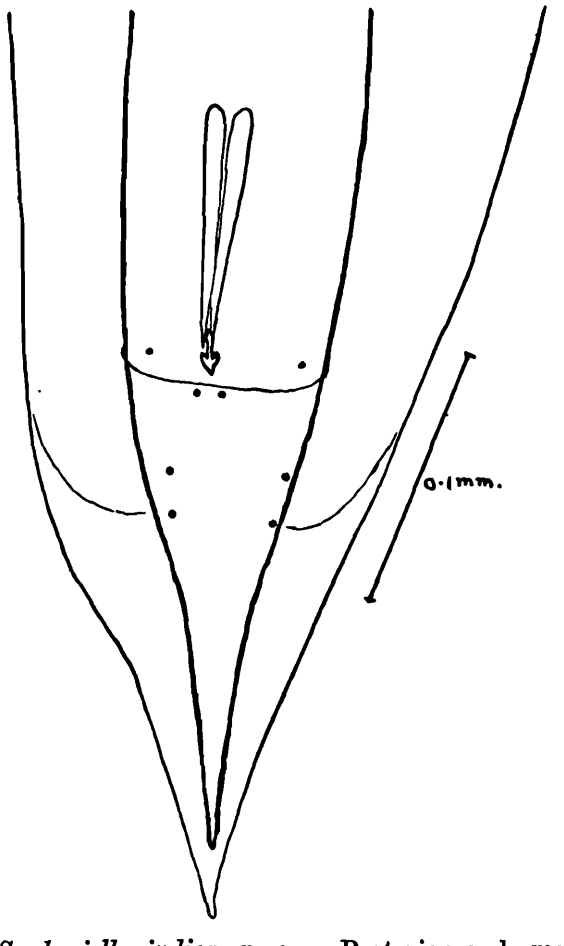


Text-fig. 91.—*Syphaciella indica,* n. sp. Anterior end, ventral view.

the oesophagus is slightly expanded, and it is armed with a pair of pointed teeth on each side of its anterior end. The posterior end of the oesophagus is slightly expanded and this expansion is separated from a glo-



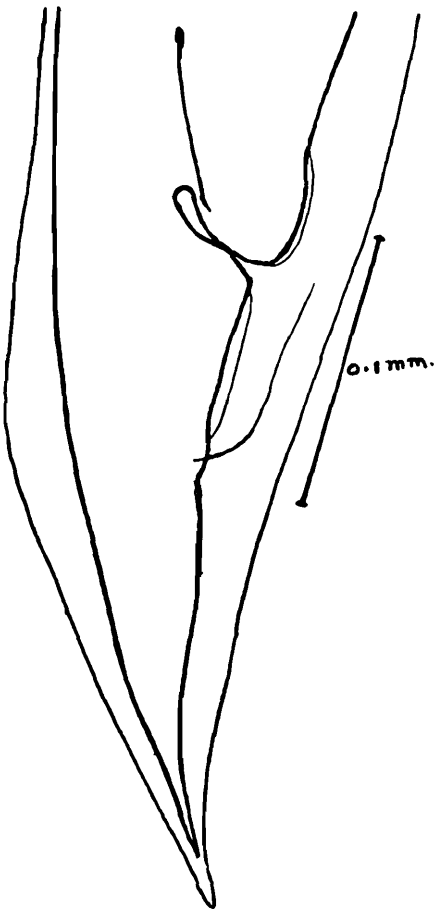
TEXT-FIG. 92.—*Syphaciella indica*, n. sp. Anterior end, low power to show oesophagus.



TEXT-FIG. 93.—*Syphaciella indica*, n. sp. Posterior end, male, ventral view.

bular bulb by a constriction. The intestine has an inverted bottle-shaped expansion at its junction with the oesophagus (fig. 92).

Male.—The males are 3·4 mm. in length with a diameter of about 0·29 mm. The total length of the oesophagus is 0·49-0·51 mm. The tail is straight and pointed and it has on each side relatively broad lateral alae, which are in direct continuation with the lateral flanges. The caudal alae, becoming narrower towards the tail, meet in a sharp point posterior to its tip (fig. 93). There are four pairs of very small papillae on the ventral surface whose position can be seen in fig. 93. The spicules are delicate and straight, their proximal ends are rounded, from which they taper to end in fine points. The gubernaculum is more heavily chitinized, and in lateral view it is seen to be a slightly curved structure, which tapers from base to tip in a similar manner to the spicules (fig. 94). The spicules are 0·084 mm. in length and the gubernaculum is 0·037 mm. in length.

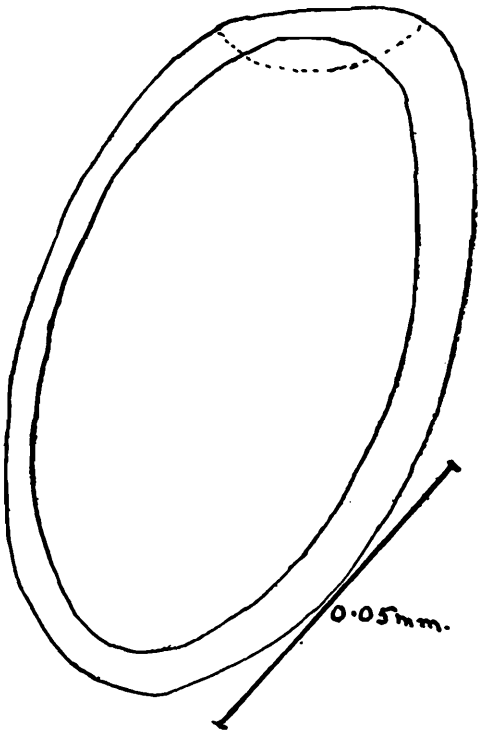


TEXT-FIG. 94.—*Syphaciella indica*, n. sp. Posterior end, male, lateral view.

Female.—The females are 5·5 to 6·6 mm. in length and 0·38 to 0·4 mm. in diameter. The cephalic inflation is 0·168 to 0·184 mm. in length, and the oesophagus is about 0·67 mm. in length. The tail ends in a long fine point and the distance from the anus to the tip is about 1 mm. The vulva is situated about 1·4 mm. from the anterior end. The eggs are oval and thick-shelled, appearing slightly thicker on one side than on the other. The shell is very finely striated and at one pole, where there is an operculum, it is slightly flattened (fig. 95).

This worm is very similar in size and in many of its other characters to *S. capensis* Monnig, 1924, which is the only other species of the genus

hitherto described, but it differs in the possession of a cephalic vesicle, and in the arrangement of the papillae on the tail of the male. It is therefore proposed to name it *Syphaciella indica*, n. sp.



TEXT-FIG. 95.—*Syphaciella indica*, n. sp. Egg.

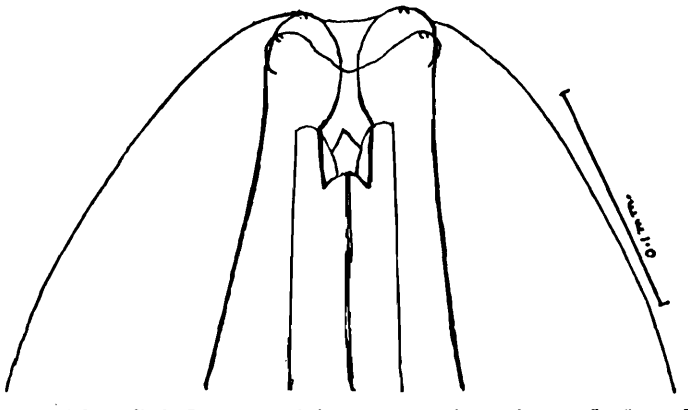
Host.—*Pterocleres exustus.*

Type-specimens are in the Indian Museum, Calcutta.

Subulura turnicis, n. sp.

These worms were found in the intestine of a Little Quail (*Turnix dussumieri*).

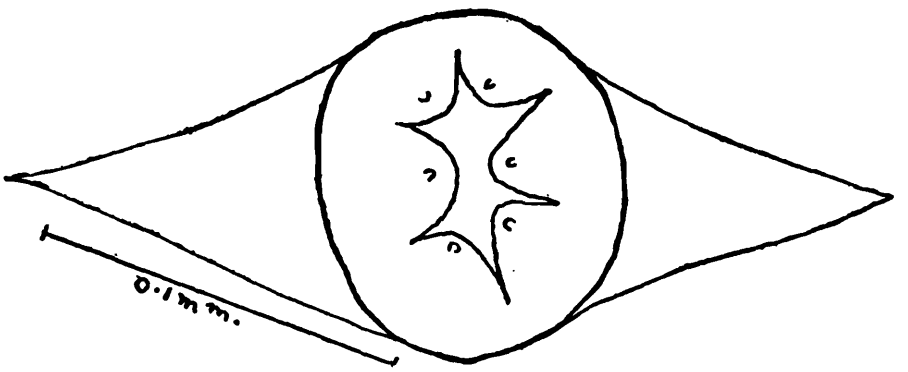
The mouth is surrounded by six broad lips each of which bears a papilla, or two lateral tri-lobed lips (figs. 96 and 97). There are broad



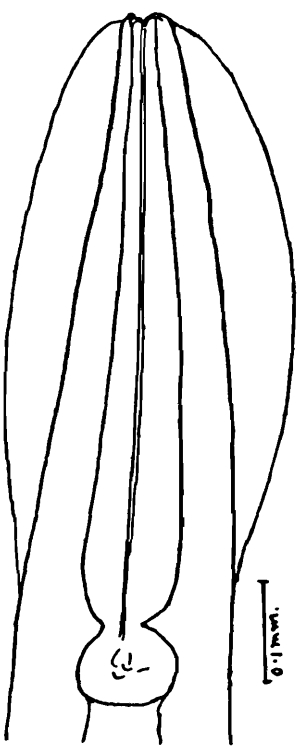
TEXT-FIG. 96.—*Subulura turnicis*, n. sp. Anterior end, dorsal view.

cervical alae on each side of the head; they arise from the bases of the lips and extend posteriorly to about opposite the junction of the anterior part of the oesophagus with its bulb (fig. 98). The oesophagus consists of a relatively long anterior portion separated from a terminal bulb by

a constriction. The mouth leads into a thinly-chitinized vestibule the posterior part of which is within the anterior end of the oesophagus, it is 0·056 mm. in depth and 0·032 mm. in diameter, and three broad teeth arise from its base (fig. 96).



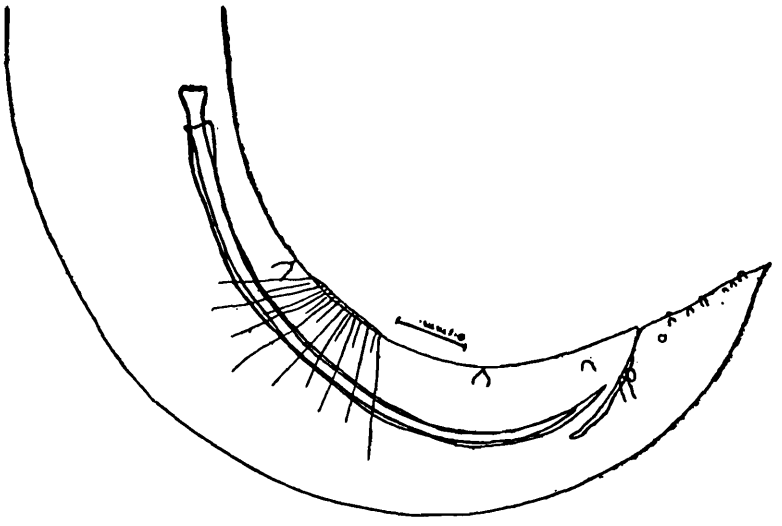
TEXT-FIG. 97.—*Subulura turnicis*, n. sp. Anterior end, end-on view.



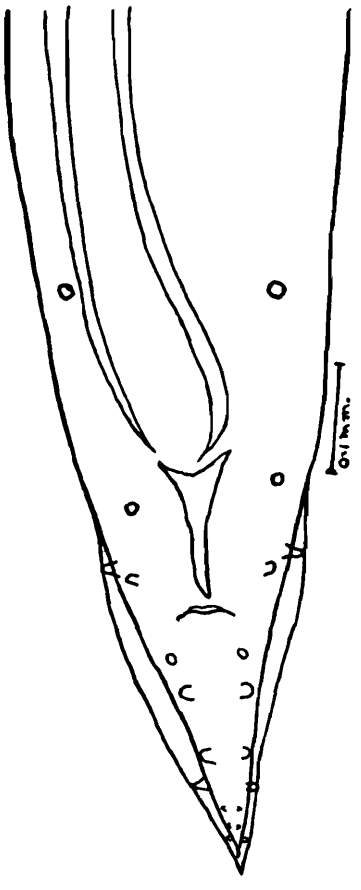
TEXT-FIG. 98.—*Subulura turnicis*, n. sp. Anterior end, low power to show oesophagus.

Male.—The males are 13 mm. in length and 0·42 mm. in maximum diameter. The cervical alae are about 0·8 mm. in length. The total length of the oesophagus is about 1 mm., the bulb being 0·17 mm. in diameter. The posterior end of the worm is curved ventrally (fig. 99). There is an ill-defined oval sucker about 0·120 mm. in length with its posterior border about 0·36 mm. in front of the cloaca. The cloaca is 0·22 mm. from the tip of the tail. There is a pair of narrow caudal alae which extend from a little in front of the cloaca to meet in a point beyond the tip of the tail (fig. 100). There are twelve pairs of caudal papillae, which may be conveniently described in three groups. The first group consists of three large precloacal papillae in a row, the most anterior being just in front of the sucker. The second group consists of three pairs of pedunculate papillae supporting the caudal alae, one of these is just anterior to the cloaca and the other two pairs are near the tip of the

tail. The third group consists of six pairs of sessile papillae more centrally placed on the sub-ventral surface, one pair of this group is precloacal the remainder lying in a row behind it (fig. 108). The spicules are equal and curved ending in sharp points, they are 0·84 mm. in length (fig. 99). The gubernaculum is triangular in ventral view and it is 0·14 mm. in length (fig. 100).



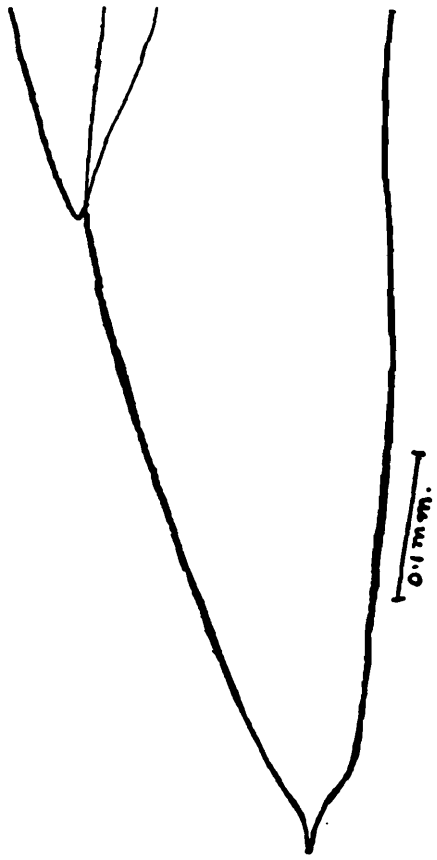
TEXT-FIG. 99.—*Subulura turnicis*, n. sp. Posterior end, male. lateral view.



TEXT-FIG. 100.—*Subulura turnicis*, n. sp. Posterior end, male, ventral view.

Female.—The females are 17·5 mm. in length and 0·42 mm. in maximum diameter. The cervical alae are about 1 mm. in length, and the oesophagus is 1·2 mm. in total length, the bulb being about 0·18 mm. in

diameter. The vulva opens about 7·8 mm. from the anterior end. The tail is straight and ends in a fine cuticular point, becoming suddenly narrower near its tip (fig. 101). The anus is 0·5 mm. from the tip of the tail and the sensory papillae are about 0·13 mm. anterior to the latter. The eggs are thin-shelled and measure 0·068-0·074 × 0·056 mm.



TEXT-FIG. 101.—*Subulura turnicis*, n. sp. Posterior end, female, lateral view.

This worm shows a superficial resemblance to *S. galloperdicis* Baylis and Daubney, 1922, as many of the dimensions are very close. These authors did not describe the vestibule in detail, but examination of the material of this species in the Indian Museum shows that its vestibule is divided into two parts, a character which, according to some authors, distinguishes between the genera *Allodapa* and *Subulura*, although Baylis and Daubney (1926) and Cram (1927) follow Barreto (1919) in regarding this only as a specific character. At all events this point clearly serves to distinguish between the present material and *S. galloperdicis*. My material is possibly identical with two damaged females obtained from a *Turnix* sp. in the Calcutta Zoological Gardens, and impefrectly described by Baylis and Daubney (1922). They were unable to classify the worms further than to say they belonged to a *Subulura* species, but, as many of the measurements given agree with mine, it seems probable the worms are identical. My specimens differ from other members of the genus *Subulura* by the possession of broad cervical alae and twelve pairs of caudal papillae in the male, most species of this genus having eleven pairs. It is therefore proposed to name this worm *Subulura turnicis*, n. sp.

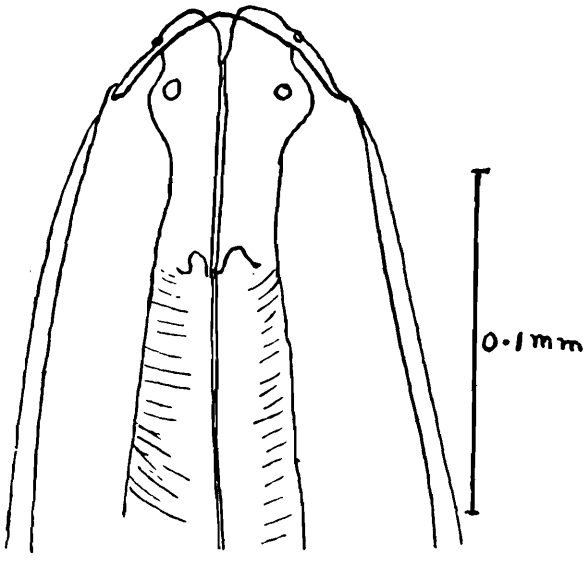
Host.—Turnix dussumieri.

Type-specimens are in the Indian Museum, Calcutta.

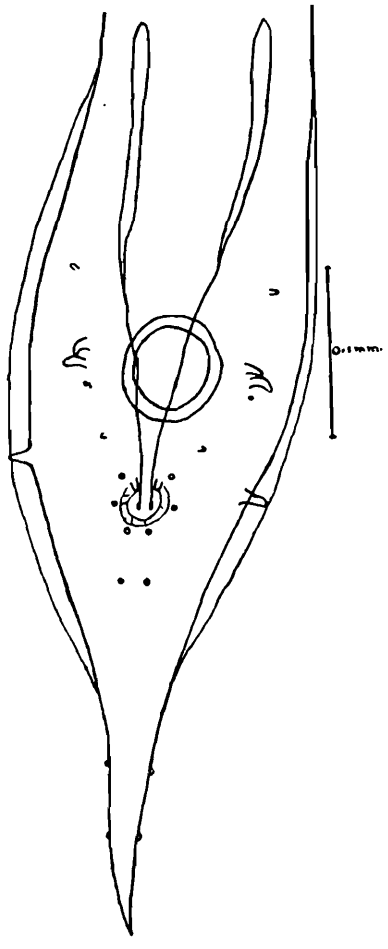
Africana varani, n. sp.

These worms were obtained from the intestine of a Bengal monitor (*Varanus bengalensis*).

The worms are slightly attenuate anteriorly and there are narrow lateral flanges. The mouth is bounded by three lips. The dorsal lip is broad and conical and it bears two papillae, the sub-ventral lips are narrower and each bear a single papilla (fig. 102). The oesophagus is



TEXT-FIG. 102.—*Africana varani*, n. sp. Anterior end, dorsal view.

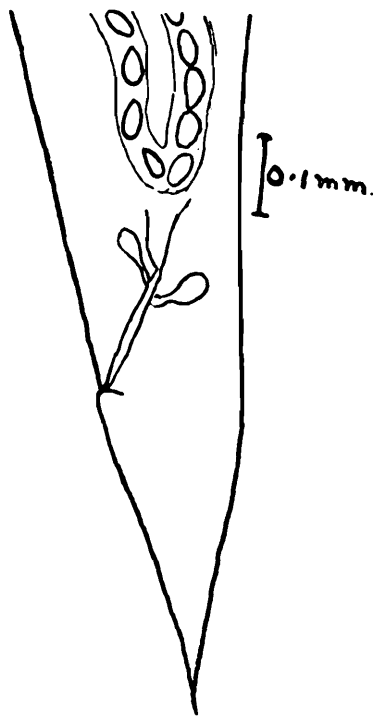


TEXT-FIG. 103.—*Africana varani*, n. sp. Posterior end, male, ventral view.

divided into two portions, a short anterior part without striations and a long posterior part distinctly striated. The oesophagus terminates in a rounded bulb containing a valvular apparatus.

Male.—The males are about 4 mm. in length and 0·192 mm. in diameter, and the lateral flanges are about 0·016 mm. in breadth. The excretory pore is about 0·49 mm. from the anterior end and the total length of the oesophagus is 0·83 mm. The posterior portion of the worm exhibits a fusiform swelling the greatest diameter of which is opposite the sucker (fig. 103). From this point it narrows rapidly and ends in a sharp pointed tail which is strongly curved towards the ventral surface. There are thirteen pairs of papillae some of which are large and pedunculated, and some of which are small and sessile, and in addition there is a small unpaired papilla anterior to the sucker. The size and arrangement of the papillae can be seen in fig. 103. There are a pair of long narrow caudal alae supported by a single large papilla on each side. There is a large circular sucker in front of the cloaca, and the latter opening is surrounded by a circular sphincter muscle in which radial striations are visible. The spicules are equal and about 0·34 mm. in length. The proximal half of the spicules is relatively stout and the distal half is thin and whip-like. There is no gubernaculum (fig. 103).

Female.—The females are about 6 mm. in length and 0·35 mm. in diameter. The cervical papillae are 0·43 mm. from the anterior end and the length of the oesophagus including the bulb is 1·01 mm. The tail is straight and pointed and the anus is situated 0·376 mm. from its tip (fig. 104). The vulva opens 2·7 mm. from the anterior end of the worm



TEXT-FIG. 104.—*Africana varani*, n. sp. Posterior end, female, lateral view.

and the vagina runs posteriorly from it. Owing to the large number of eggs present the division of the vagina into the two uteri could not be made out. The eggs are oval and measure 0·668-0·072 × 0·036-0·041 mm.

Taylor (1924) gives a table of differences of the known species of this genus, and the present species differs from all of them in several

particulars, therefore it is proposed to name the worm *Africana varani*, n. sp.

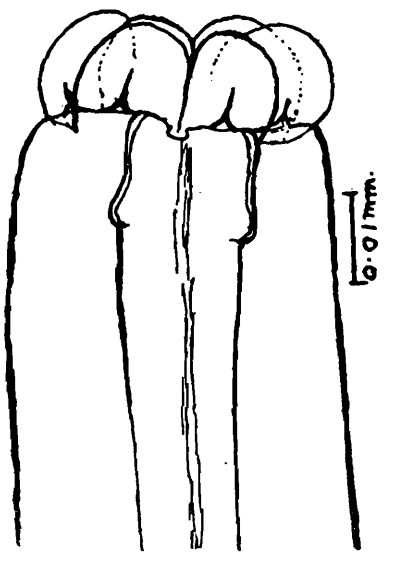
Host.—Varanus bengalensis.

Type-specimens are in the Indian Museum, Calcutta.

Probstmayria simiae, n. sp.

This worm was found in enormous numbers in the mucus scraped from the upper part of the small intestine of a Hoolock (*Hylobates hoolock*).

The cuticle is transversely striated and there are six large semi-globular lips (or three bilobed lips), and into each lobe a central pointed core runs (fig. 105). No external papillae are visible on the lips, which

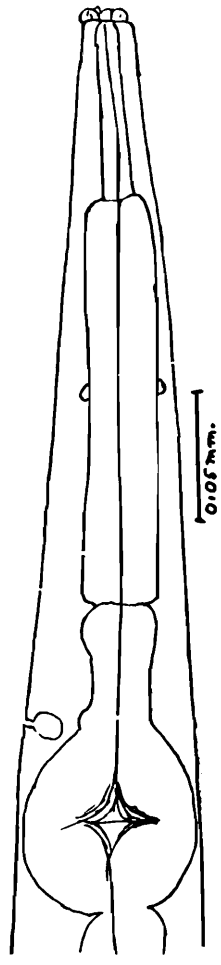


TEXT-FIG 105.—*Probstmayria simiae*, n. sp. Anterior end, dorsal view.

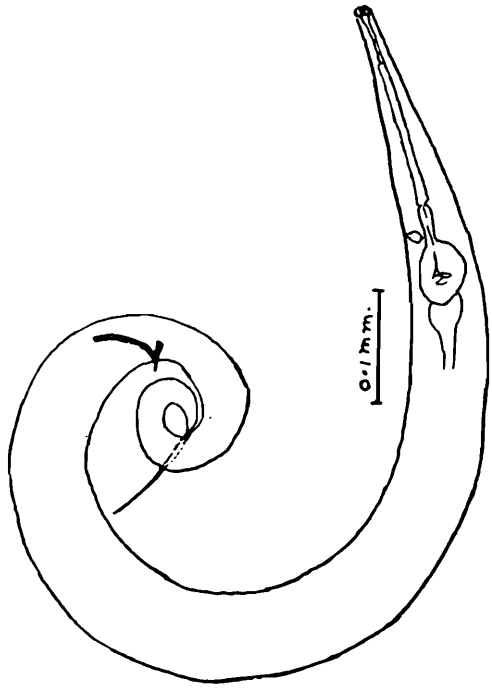
are about 0·010-0·012 mm. in length. There is a chitinous vestibule or pharynx, 0·060-0·065 mm. in length and 0·015 mm. in diameter, under the high power it is seen to be finely striated. The anterior portion of the pharynx for a distance of 0·012 mm. is of slightly greater diameter than the remainder and it is lined with cuticle (fig. 105). The oesophagus consists of two parts, the anterior part is cylindrical, about 0·17 mm. in length and 0·015 mm. in diameter, the posterior part is flask-shaped, being 0·11 mm. in length and terminating in a spherical bulb 0·060 mm. in diameter. The bulb is furnished with a powerful valvular apparatus. Under the oil immersion the cusps of this valve are seen to be covered with fine concentric ridges so it appears possible that it may have a grinding function, like a gizzard (fig. 106). The nerve ring is 0·148 mm from the anterior end, and the excretory pore opens just in front of the oesophageal bulb (fig. 106). It is exceptionally distinct as it leads into a relatively large globular vesicle.

Male.—The males are curved ventrally in their posterior half (figs. 107 and 108). They are 1·5—1·6 mm. in length, and 0·076 mm. in diameter. The tail ends in a fine tapering point about 0·036 mm. posterior to the cloaca. There are four pairs of papillae posterior to the cloaca and no precloacal papillae (fig. 108). The spicules are unequal and

dissimilar. One is short, straight and relatively thick, it is 0·04 mm. in length, the other is more delicate and curved like a sabre blade, it is 0·08 mm. in length. There is no gubernaculum.

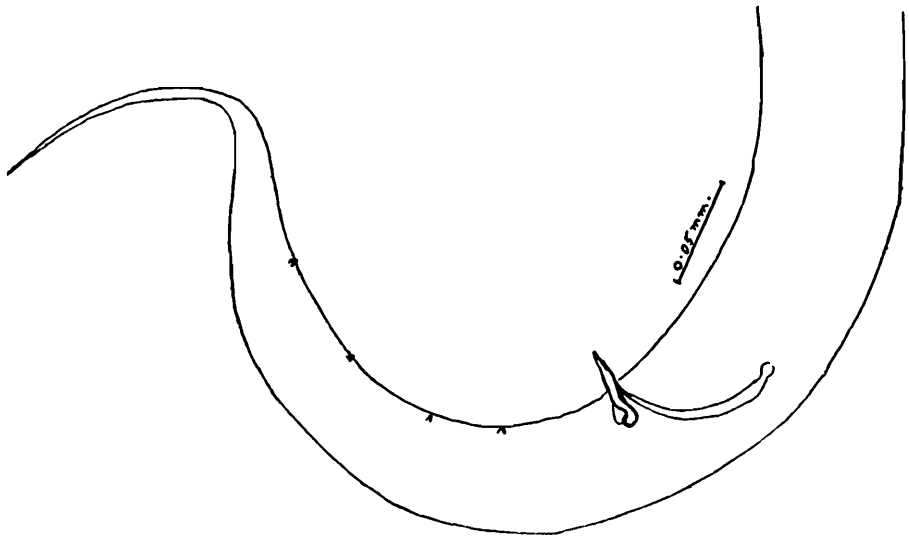


TEXT-FIG. 106.—*Probstmayria simiae*, n. sp. Anterior end, low power to show oesophagus

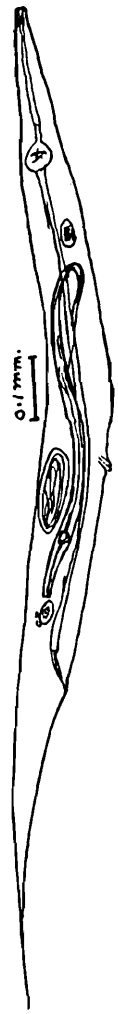


TEXT-FIG. 107.—*Probstmayria simiae*, n. sp. Male, whole worm.

Female.—The females are straight and fusiform, as they taper from the centre towards both ends (fig. 109). Mature worms, judged to be so by the presence within them of large coiled embryos, are 1·6—1·8 mm. in length, and 0·12—0·13 mm. in diameter. The vulva has prominent lips, and it is situated just anterior to the middle of the body. The

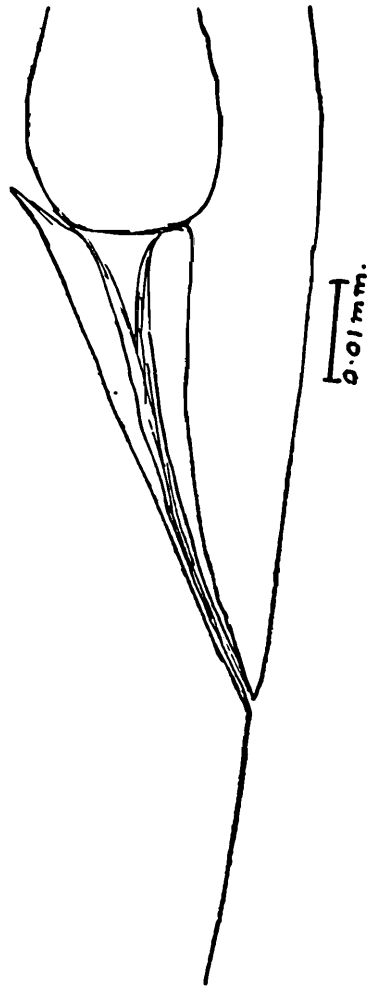


TEXT-FIG. 108.—*Probstmayria simiae*, n. sp. Posterior end, male, lateral view.



TEXT-FIG. 109.—*Probstmayria simiae*, n. sp. Female, whole worm.

tail is long and straight, and it ends in a fine point (fig. 109). The distance from the anus to the tip of the tail is 0·45—0·5 mm. The rectum is lined with a thick funnel-shaped portion of cuticle (fig. 110). The uterus



Text-fig. 110.—*Probstmayria simiae*, n. sp. Anal region, female.

is composed of two divergent branches, and in mature specimens the central portion is occupied by one or perhaps two well-developed embryos, with perhaps a partly developed embryo coiled within its sheath or " egg shell", there is also a partly developed egg at each end of the uterus with two or three minute buds of immature eggs near them (fig. 109). In one specimen, with the embryo partly emerged from the parent worm, the former measured 0·93 mm. in length and 0·041 mm. in diameter. The embryos contain a well-developed oesophagus of the adult type, and they apparently reach maturity without any change in morphology, because all stages from embryos just escaped from the uterus and with no trace of genitalia up to fully mature specimens were encountered, and the only difference in the various stages was in their size.

This worm, with its exceptional method of reproduction and morphology, is very similar to *Probstmayria vivipara* the only known species of the genus, but it differs from this worm in several anatomical details, so it is without doubt a different species. It is therefore proposed to name it *Probstmayria simiae*, n. sp.

Host.—Hylobates hoolock.

Type-specimens are in the Indian Museum, Calcutta.

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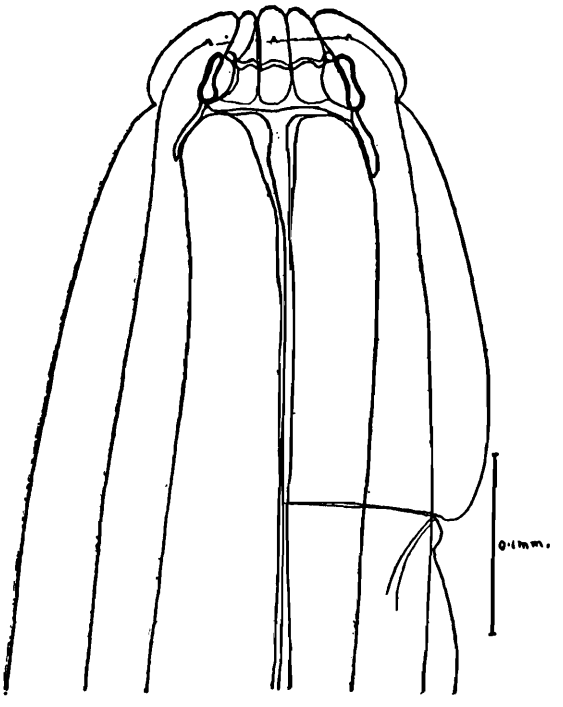
Part 8. OESOPHAGOSTOMINAE AND NECATORINAE.

Oesophagostomum indicum, n. sp.

These worms were found in the large intestine of a Hog deer (*Cervus axis*).

They are similar to *O. dentatum* in general appearance, as the cephalic vesicle is the same shape. There is a distinct mouth collar with three papillae on each side, the lateral pair being larger than the subdorsal and subventral papillae. The cervical papillae are just posterior to the oesophagus (figs. 111 & 112). The buccal capsule is circular and there is



TEXT-FIG. 111.—*Oesophagostomum indicum*, n. sp. Anterior end, lateral view.