

Helminthological Notes.

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I. *FILARIA SETARIOSIA* N.SP.

WHILE studying the internal parasites of the meerkat (*S. suricatta*), a student of Professor H. B. Fantham, of the Witwatersrand University, found three males and three females of a Filariid worm in the fatty tissue surrounding the intestine of the host; Professor Fantham kindly brought these worms to me for identification. They appear to be unknown and are here described as *Filaria setariosa* n.sp. on account of several points of resemblance to the genus *Setaria* Viborg. From the situation where these worms were found one might expect them to belong to the genus *Setaria*, although they were not free in the peritoneal cavity. The worms, however, cannot be classed in that genus, although the male spicules and lateral appendages of the tail are characteristic of *Setaria*.

Morphology.

The worms are pale white in colour, long and thin, tapering posteriorly, but very slightly anteriorly; the hind ends in both sexes are spirally coiled, but much more so in the male than in the female. The cuticle is not striated. The head ends fairly bluntly with a slight protuberance around the mouth; the latter appears to be surrounded by ten papillae, an outer ring of a dorsal, a ventral and four submedian, and an inner ring of four submedian; but they are rather indefinite. The mouth opening is a minute circular pore leading into a short cylindrical buccal cavity (fig. 1), which opens into the oesophagus. Around the beginning of the oesophagus, and at the base of the buccal cavity, there is a flat cuticular ring which might correspond to the circumoral ring of *Setaria*, but has no indentations. The oesophagus is composed of an anterior muscular portion 0.49 mm. long and a posterior, wider, glandular portion 1.8 mm. long. The intestine presents no special features: the rectum narrows posteriorly to form a very thin tube; and the anus is a minute circular pore, 4μ in diameter.

Male.—The male is 40 mm. long by 0.16 mm. thick. The hind end is spirally coiled, resembling a cork-screw with four to five turns. The tail is 0.27 mm. long, ending in three points (fig. 2), or rather a thin point with two slightly smaller lateral appendages; just anteriorly to each appendage there is situated ventro-laterally a small papilliform protuberance, which is also found in the female, and can hence not be counted with the postanal papillae of the male. Of the latter there are three pairs: No. 1 situated in the last quarter of the tail, No. 2 slightly behind the middle, and No. 3 directly behind the level of the anus. There are four pairs of preanal papillae, of which

two pairs are placed close together in front of the anal opening and the other two a little farther apart and more anteriorly. There are two unequal spicules, the left measuring 0.36 mm. in length and the right 0.17 mm.; the left spicule has, towards its middle, a longitudinal slit which is about one-sixth as long as the spicule; the right divides at its middle into two parts which join up again posteriorly and form a thick, transversely corrugated portion, ending in a fine point.

Female.—The female is 81.5 mm. long by 0.23 mm. thick in the region of the vulva. The hind end is only slightly coiled; the tail is 0.5 mm. long and resembles that of the male, except for the postanal papillae of the latter. The vulva is situated ventrally at a distance of 2.5 mm. from the anterior end and is a small, inconspicuous pore; it leads into a short vagina, which is followed by an ovijector of 5 mm. length; the latter runs backwards, makes a forward loop, and then extends backwards again, opening into two uteri which proceed backwards. The uteri are anteriorly filled with larvae, more posteriorly there are eggs with embryos in various stages of development; the eggs are thin-shelled and measure 37μ by 27μ .

Host: *Suricatta suricatta*.

Locality: Rustenburg District, Transvaal.

Situation: Adipose tissue surrounding intestine.

Types placed in Onderstepoort Helminthological Collection No. 2154.

II. NEMATODES FROM THE AFRICAN RHINOCEROS.

The nematode parasites of the rhinoceros have not received much attention until lately, when Neveu-Lemaire published his article "Les Strongylides du Rhinoceros Africain" (Ann. d. Parasit; Tome II, No. 2, 1924), and more recently Thapar reported on the examination of some material of *Kiluluma* (*Journ. Helminthol.*, Vol. II, No. 5, 1924). Thapar finds that *Kiluluma stylosa* (v. Linst.) Skriabin consists of several specifically different worms, and he describes six new species, allowing the specific name *stylosa* to lapse.

Some material in the Onderstepoort helminthological collection, provisionally labelled *Kiluluma stylosa* was accordingly examined, and also six different species were found, viz., five of Thapar's species and a new one:—

Kiluluma rhinocerotis, *K. africana*, *K. pachyderma*, *K. solitaria*, *K. magna*, and
Kiluluma longispiculata n.sp.

The bulk of the material consisted of this species, which can be easily recognized by the extremely long spicules of the male.

Diagnosis: Kiluluma.—The body is fairly thick and tapers towards both extremities. The cuticle is thick and transversely folded, with fine circular striations as in other species, and it is inflated around the head, standing out distinctly as in *K. africana*.

The mouth collar is distinct, but not high, and bears the four submedian papillae. The lateral papillae are blunt and situated in the cephalic groove, where the cephalic glands open on them.

The buccal capsule is broad and shallow, with a strong cuticular lining, very slightly curved out anteriorly. There are six fleshy lobes arising from the buccal capsule: two lateral, two ventro-lateral, and two dorsolateral; their anterior extremities are slightly curved, as

represented in fig. 4, and project well out of the mouth opening. The oesophagus is club-shaped, 0.67 mm. long in the male and 0.74 mm. in the female (fig. 3). The cervical papillae are situated slightly behind the level of the excretory pore and not far behind the oesophagus, although this distance is somewhat variable.

Male.—13 mm. to 18 mm. long by 0.9 mm. thick. Excretory pore 0.75 mm. from anterior end, cervical papillae 0.8 mm. The bursa is well developed and bears the usual number of rays found in *Kiluluma*. The "preventral" and ventral rays present nothing unusual; the lateral rays are separated from one another and the "extra-lateral" arises somewhat higher from the lateral stem. The "externo-dorsal" ray arises very high, so that it seems to come off almost before the beginning of the dorsal ray; it is long and thin and bifid at its end, the ventral branch of the bifurcation being much the thinner of the two; the dorsal ray is long and bifurcates near its end.

The two spicules are equal and very long, measuring 8.5 mm. or more than half as long as the worm; they are wavy, and in some specimens make almost transverse curves in the body. They have each only one ala, which is transversely striated. The gubernaculum is hoof-shaped as in *K. rhinocerotis*. The genital cone is well developed as usual, and the dermal collar is fairly well marked, but not prominent.

Female.—23 mm. by 1.1 mm. Excretory pore 0.88 mm. from anterior end and cervical papillae 0.98 mm. The nerve ring is situated around the thin anterior part of the oesophagus, 0.3 mm. from the anterior end. The tail resembles that of *K. solitaria* and is 0.3 mm. long; the vulva is situated 0.14 mm. in front of the anus and leads into a vagina of 1.1 mm. length, which then divides to form the two horns.

Host: *Rhinaster bicornis*.

Situation: Stomach.

Locality: Zululand, South Africa. Types in Onderstepoort Helminthological Collection No. 2197.

The male bursa of *Kiluluma* is unique amongst that of the strongyles in possessing apparently two rays above the normal number. This seems to be rather strange, as the number of bursal rays is otherwise very constant, excepting for regressive changes as in the *Metastrongylidae*. The origin of these two extra rays wants explanation, and Thapar offers the following opinion: That the "preventral" rays are homologous with the prebursal papillae of other strongyles, and, as regards the "extra-lateral" ray, that it "corresponds to the postero-lateral ray of *Strongylinae* and that the externo-lateral has split up into two parallel branches," so that there is an entirely new development in *Kiluluma*. In the case of the "preventral" ray, the view of Thapar is probably correct, while the other case requires further consideration. I am inclined to regard it as homologous with the externo-dorsal ray of the other strongyles, which has, like the prebursal papillae, entered the lateral lobe of the bursa. It may be conceived that there was the necessity for more power in the lateral lobes, and that this was effected by the entrance into these lobes of the prebursal papillae ventrally and the externo-dorsal ray dorsally. The inclusion of the externo-dorsal ray in the lateral lobe is not at all unique for *Kiluluma*, as an examination of the male bursae of

Strongylus equinus, *S. edentatus*, and *S. vulgaris* will already show: on the other hand, the inclusion of the prebursal papillae is far more uncommon. In *Kiluluma* this questionable ray seems to originate from the lateral stem, but it can be clearly seen in some species, e.g. in *K. longispiculata*, that its muscular core does not join the common lateral stem, but originates from the common muscular stem of the dorsal rays. Moreover, the appearance of the lateral rays is not unusual, and it does not appear as if any division has taken place there, as Thapar also remarks. The dorsal ray, on the other hand, is usually more variable in its branching and general conformation, and even in *Kiluluma* is not very stable, e.g. in specimens of *K. magna* the point of bifurcation of the dorsal ray proper is variable and the "externo-dorsal" is usually split as in *K. longispiculata*; in *K. africana* the "externo-dorsal" is often basal; in *K. rhinocerotis* it is usually bifid. The "extra-lateral" ray of Thapar does, therefore, not appear to be an extra development in *Kiluluma*, but probably is the externo-dorsal ray, and the ray that has been called "externo-dorsal" is a lateral branch of the dorsal, originating above the point of bifurcation of the latter, as is also found, e.g. in *Poteriostomum*, so that the arrangement in *Kiluluma* does not present any new development and conforms to the general plan of the bursal rays in *Strongylidae*.

The nematodes that have up to the present been described from the rhinoceros are all *Strongylidae*. We may, therefore, record here for the first time the presence of *Oxyuris equi* in this host, originating from the same locality as the above material.

III. HISTIOSTRONGYLUS ORNATUS N.SP.

The genus *Histiostrongylus* of the *Trichostrongylidae* so far contains three known species, all from bats, viz.: *H. coronatus* Molin., *H. tipula* (Van Beneden), and *H. paradoxus* Travassos. We may add to these a fourth species, *H. ornatus*, from a South African bat.

The genus *Histiostrongylus* is characterized as follows:—Small, thin *Trichostrongylinae*, with the anterior extremity dilated, bearing a bell-shaped membrane, mouth small, triangular, and terminal. Male with well developed bursa and two equal spicules. Female with vulva posterior, two uteri, the tail ending in a sharp point and with accessory projections around this pointed projection.

Habitat: Intestine of bats.

Type species: *H. coronatus* Molin.

Histiostrongylus ornatus n.sp.

The worms are small and of a light reddish-yellow colour. They taper towards both extremities, but much more anteriorly than posteriorly, so that the anterior part of the body is very thin. The cuticula is thick, 0.014 mm. to 0.016 mm., and very finely striated transversely; these striations appear to be continued through the whole thickness of the cuticula, so that when the latter is seen in optical section at the sides of the worm, it presents the appearance of a very fine comb. The cuticle is slightly raised along the lateral lines, forming two longitudinal ridges. Around the head the cuticle is inflated in the shape of a thimble, and this inflation is marked anteriorly by three transverse constrictions (fig. 7); posteriorly the inflation ends abruptly on a ring-like raised area of the body wall. The mouth is

small, naked, and leads directly into the oesophagus. The latter is fairly long and has no bulb. The excretory pore is ventral and 0.22 mm. from the anterior end.

Male.—3.8 mm. long and 0.094 mm. thick. The inflation around the head is 0.051 mm. long and 0.031 mm. thick; the oesophagus is 0.294 mm. long. The bursa is well developed, consisting of large lateral lobes and a small dorsal one. The bursal rays are very much obscured by a network of fine ridges on the outer cuticula (fig. 10b) and numerous papillae, which cover the inside of the bursa. The ventral rays are separated and the latero-ventral seems to receive a strengthening part from the lateral rays; the lateral rays are also far apart and the medio-lateral curves backward at a fairly sharp angle; the externo-dorsal does not reach the edge of the bursa; the dorsal ray bifurcates just beyond its middle; and each branch ends in a smaller lateral and a larger medial branch. The bursa is 0.012 mm. long. The spicules are equal, 0.255 mm. in length, slightly bent, and split at the ends, with one point blunt and the other sharp and a little longer; the gubernaculum is 0.07 mm. long and lancet-shaped. There is a fairly prominent genital cone of simple type.

Female.—4.8 mm. long by 0.118 mm. thick. The inflation around the anterior end is 0.054 mm. long and 0.033 mm. thick. The oesophagus is 0.322 mm. long, the tail 0.051 mm., and the vulva is situated 1.08 mm. from the tail end. There are two strong ovijectors and the uteri run in opposite directions; the eggs measure 90μ by 47μ and are apparently laid in the one-cell stage. The tail narrows abruptly and has a fine, pointed projection which is 0.019 mm. long; around this projection three triangular processes or appendages are situated, measuring 0.016 mm. in length. The conformation of the rectum gives the hind-end a typical appearance: the rectum is dilated, although empty, and has a roughly quadrangular shape, and it is connected to the anus by a narrow part which lies against the ventral body wall.

Host: *Eptesicus capensis* (Cape house bat).

Situation: Small intestine.

Locality: Onderstepoort, Pretoria.

Types placed in the Onderstepoort Helminthological Collection No. 2139.

IV. EQUINE NEMATODES.

Two mountain zebras (*Hippotigris zebra*) originating from Oudtshoorn, Cape Province, died in the Pretoria Zoological Gardens and were sent to Onderstepoort for post-mortem examination. They harboured the following nematode parasites:—

Ascaris megalocephala.

Strongylus asini—this is the second record of this parasite, the first being by Boulenger (1920) from a donkey in East Africa.

Strongylus vulgaris.

Oxyuris equi.

Triodontophorus serratus, *T. minor*, *T. tenuicollis*.

Cylindropharynx intermedia, *C. brevicauda*, *C. longicauda*.

Craterostomum mucronatum.

Cylicostomum insigne, *C. auriculatum*, *C. triramsum*, *C. tetracanthum*, *C. longibursatum*, *C. minutum*, *C. caricatum*.

V. CLINOSTOMUM HETEROSTOMUM.

Pieces of muscle from a fish, caught in the Vaal River at Parys, Orange Free State, were brought to the laboratory, containing encysted parasites. Three immature specimens of the trematode *Clinostomum heterostomum* were found as well as several immature specimens of a nematode *Contracecum* sp. The former were already so well developed that identification of the species presented no difficulty; the largest specimen measured 16 mm. in length. The worms were all alive and the intestines of the Clinostomes contained a yellow yolk-like material which was evacuated through the mouth when the worms were placed in physiological saline. The adults of this trematode are known from the mouth and pharynx of aquatic birds, especially *Ardeidae*, the intermediate stage from fishes has apparently not yet been described. There are several species of *Ardea* common in South Africa and the adult stage will probably be found in them, as also that of the *Contracecum*.

VI. MULTICEPS MULTICEPS.

The coenurus is, as is well known, found in the brains of herbivora, the only place in the body in which it develops, with a few rare exceptions as so far recorded. A coenurus was recently found at Onderstepoort in the intermuscular connective tissues of the left thigh of a goat; the cyst was well developed, the size of a large hen's egg, and contained a large number of scolices.

EXPLANATION OF FIGURES.

- Fig. 1.—*Filaria setariosa*, n. sp.—Head (papillae not represented).
 Fig. 2.—*Filaria setariosa*, n. sp.—Hind end of male (the spicules have turned so that the right is on the left).
 Fig. 3.—*Kiluluma longispiculata*, n. sp.—Ventral view of anterior end.
 Fig. 4.—*Kiluluma longispiculata*, n. sp.—Ventral view of head.
 Fig. 5.—*Kiluluma longispiculata*, n. sp.—Male bursa, lateral view.
 Fig. 6.—*Kiluluma longispiculata*, n. sp.—Dorsal view of dorsal lobe of male bursa.
 Fig. 7.—*Histiostromylylus ornatus*, n. sp.—Anterior end, lateral view.
 Fig. 8.—*Histiostromylylus ornatus*, n. sp.—Hind end of female, lateral view.
 Fig. 9.—*Histiostromylylus ornatus*, n. sp.—Female genital organs, lateral view.
 Fig. 10a.—*Histiostromylylus ornatus*, n. sp.—Male bursa, lateral view, showing internal papillae.
 Fig. 10b.—*Histiostromylylus ornatus*, n. sp.—Male bursa, dorsal view, showing external ornamentation and internal papillae.
 Fig. 11.—*Histiostromylylus ornatus*, n. sp.—Male spicules and gubernaculum, ventral view, the left spicule twisted.
 Fig. 12.—*Histiostromylylus ornatus*, n. sp.—Male genital cone.

ADDENDUM.

While this article was in press, a second paper by Thapar on species of *Kiluluma* appeared, in which he describes the above *K. longispiculata* as *K. goodeyi*. The name *K. longispiculata* therefore should read *K. goodeyi*.

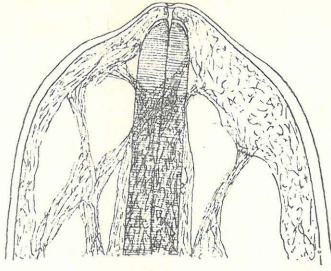


Fig. 1.

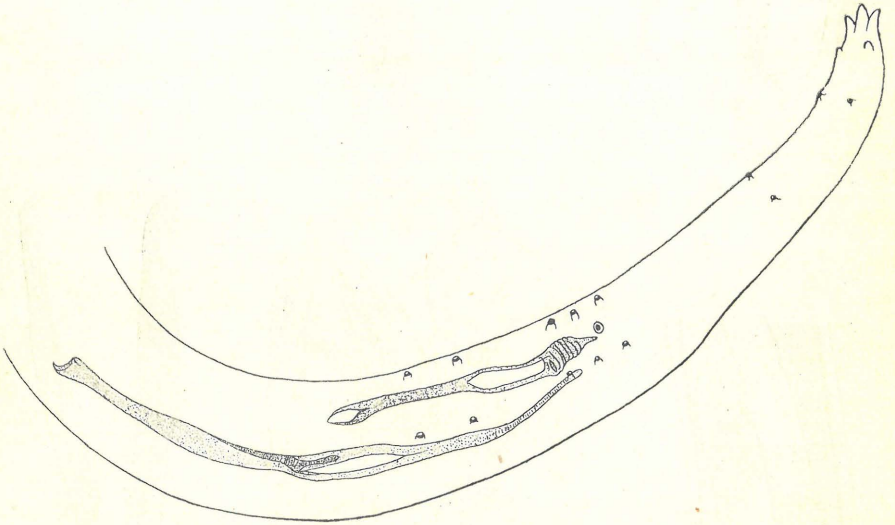


Fig. 2.

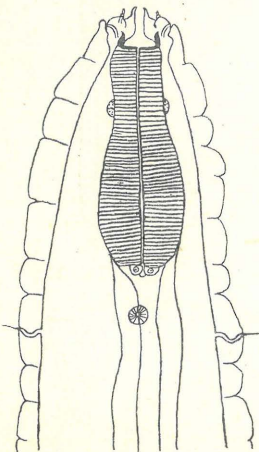


Fig. 3.

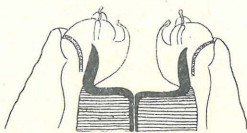


Fig. 4.

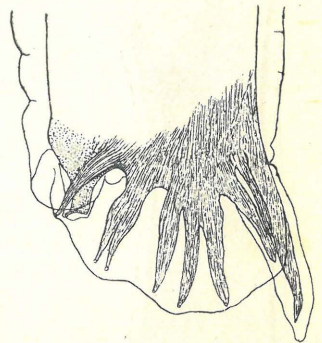


Fig. 5.

Helminthological Notes.

[*H. O. Monniq.*

FIGS. 1 TO 5.

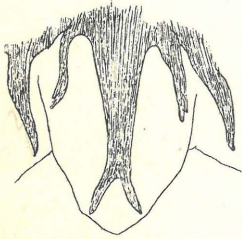


Fig. 6.

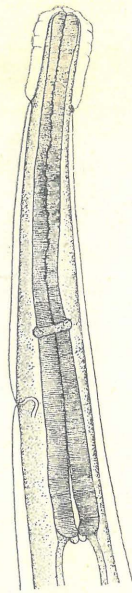


Fig. 7.

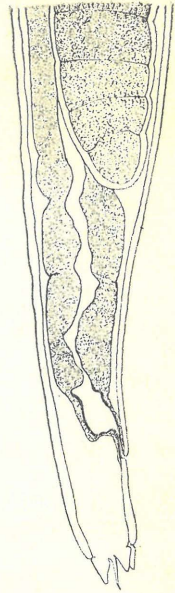


Fig. 8.

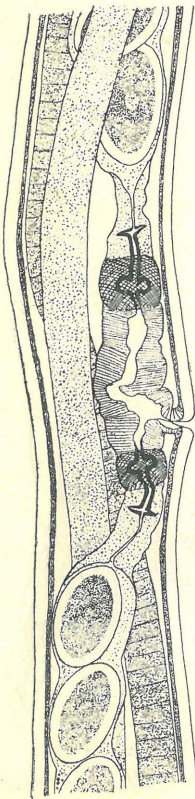


Fig. 9.

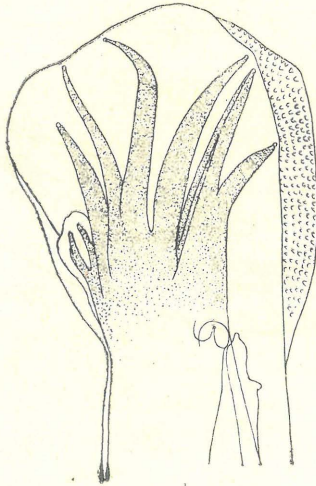


Fig. 10 (a).

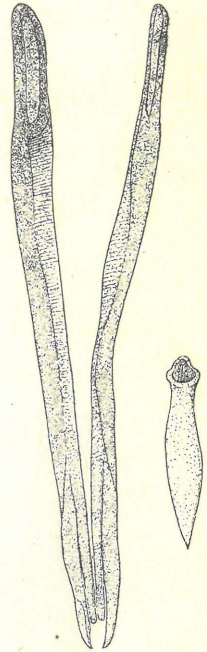


Fig. 11.

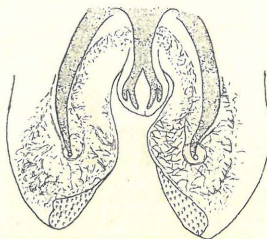


Fig. 10 (b).

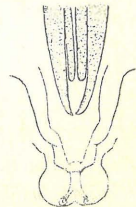


Fig. 12.