

ions that at that time flocks were derived from native exotic rams. At the present time the sheep in the almost completely exotic and little upbreeding of takes place. Consequently there is little contact between and the Highland flocks and so less opportunity for

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A New Species of *Stephanofilaria* in Skin Lesions from the Black Rhinoceros (*Diceros bicornis* L.) in Kenya

By M. C. ROUND*

Veterinary Research Laboratory, Kabete, Kenya

Schulz and Kluge (1960) recorded the presence of filarioid worms in cutaneous lesions from the black rhinoceros in South Africa but adult worms were not recovered. The pathology of similar lesions from the same host in Kenya has been described by Tremlett (1964). Examination of the worms obtained from fresh material from the same sites indicated them to be a hitherto unknown species of the genus *Stephanofilaria* Ihle and Ihle-Landenberg, 1933. The species is described here and named *Stephanofilaria dinniki* sp. nov. in honour of Dr. J. A. Dinnik.

MATERIAL AND METHODS

The outer 3 mm. of fresh lesion material was cut off and placed in a digestive medium composed of 1% pepsin in 1% hydrochloric acid. Partial digestion had taken place in twenty-four hours, when some worms were recovered from the digestive fluid. After a further twenty-four hours digestion was completed and all the worms were removed. In all about forty specimens were obtained, all were dead and most were damaged to a greater or lesser extent. They were preserved in 70% alcohol / 5% glycerin and examined in glycerin. For the detailed examination of the anterior end, the head was cut off and mounted in glycerin jelly.

DESCRIPTION OF THE SPECIES

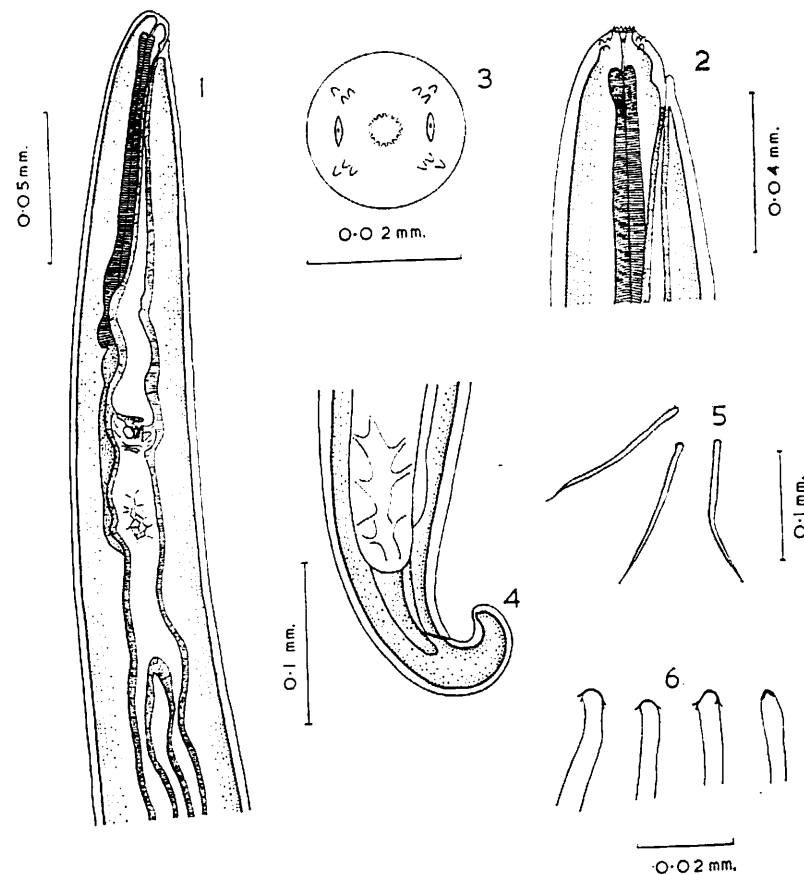
The worms are small and hairlike, the females being thicker than and about twice the length of the males. In both the males and the females, the body is of even thickness except for the anterior and posterior ends which are gradually tapered. Twelve males and ten females were measured; the former are 2.6-3.1 mm. in length and 0.072-0.086 mm. in maximum thickness, the latter 4.6-5.7 mm. and 0.087-0.119 mm. respectively. The cuticle throughout the length of the body of both the males and females is finely striated transversely.

*Present address: Animal Health Trust, Equine Research Station, Newmarket.

There are no spines or cuticular frills posterior to the striae. Lateral alae are lacking in both sexes. The head is somewhat truncated with a terminal peri-buccal ring of 11 or 12 cuticular spines. Behind this ring is a circle of eight cephalic spines, arranged in pairs, two pairs dorsal and two ventral to the large amphids. Radially situated from these cephalic spines are sub-median papillae, one to each pair of spines. The mouth opens into a small vestibule which leads into the slender oesophagus which is 0.136–0.144 mm. long in the male and 0.144–0.173 mm. in the female. Due to the damage which occurred in the digestive process, the position of the nerve ring was not easy to determine. It appears to encircle the oesophagus at its posterior end and is located 0.097–0.108 mm. from the anterior end in the male and 0.115–0.144 mm. in the female. The intestine is only slightly swollen at its junction with the oesophagus.

Male

The posterior end of the male is strongly curved ventrally. A cuticular expansion of the posterior region is present on the ventral surface. It is not prominent when viewed from the ventral aspect but is very noticeable laterally. The tail is short and rounded measuring 0.018–0.029 mm. in length. The papillae are small and difficult to resolve with accuracy but may be conveniently divided into (1) Laterals, (2) Subventrals, (3) Median post-anal and (4) Post-anal. With the exception of the caudal papillae, which are sessile, they are pedunculate and rather digitiform. The subventral papillae are generally longer than the laterals. In the twelve specimens examined, the number and arrangement of the lateral and subventral papillae are variable in each specimen from the right and left lateral aspects. There are no median precloacal papillae. The lateral and subventral papillae of each side cannot be grouped into pairs as in other species of the genus. It is therefore easier to describe the pre-anal papillae as 6–9 subventral and 2–5 lateral on each side. Post-anally there are 2–4 lateral and 0–1 subventral papillae on each side. In the median post-cloacal position there are, in eleven specimens, three pairs of papillae which are constant in position. In one specimen, only five such papillae could be seen. In the specimens in which six papillae are present, they form two equilateral triangles, the papillae at the apices being median in position. At the tip of the tail there are usually two pairs of caudal papillae but in some specimens an extra pair is found. The number and arrangement of the papillae is given in Table I. The spicules, as in the previously described species are unequal in length. The left spicule is long and slender, measuring 0.53–0.75 mm. in length. The right spicule is shorter, thicker and slightly bent and is 0.062–0.115 mm. long.



Stephanofilaria dinniki n.sp.

Fig. 1.—Female, lateral view anterior. Fig. 2.—Enlargement of Fig. 1. Fig. 3.—Female, *en face* view of head. Fig. 4.—Female, lateral view posterior end. Fig. 5.—Larvae, removed from vagina. Fig. 6.—Larvae, anterior end.

An accessory piece, 10.8–14.4 microns long is present. The testis extends into the anterior quarter of the body. The range of measurements of the twelve specimens and detailed measurements of six of these are given in Table II.

TABLE I
The number and arrangement of the papillae of the tail of males of
Stephanofilaria dinniki sp. nov.

	Preanal		Postanal			
	Lateral	Subventral	Lateral	Subventral	Median	Caudal
Left Side	2–5 mainly 3	6–9	2–4 mainly 3	0–1 mainly 0	3	2–3 mainly 2
Right Side	2–3 mainly 3	7–8	2–3 mainly 3	0–1 mainly 0	2–3 mainly 3	2–3 mainly 2

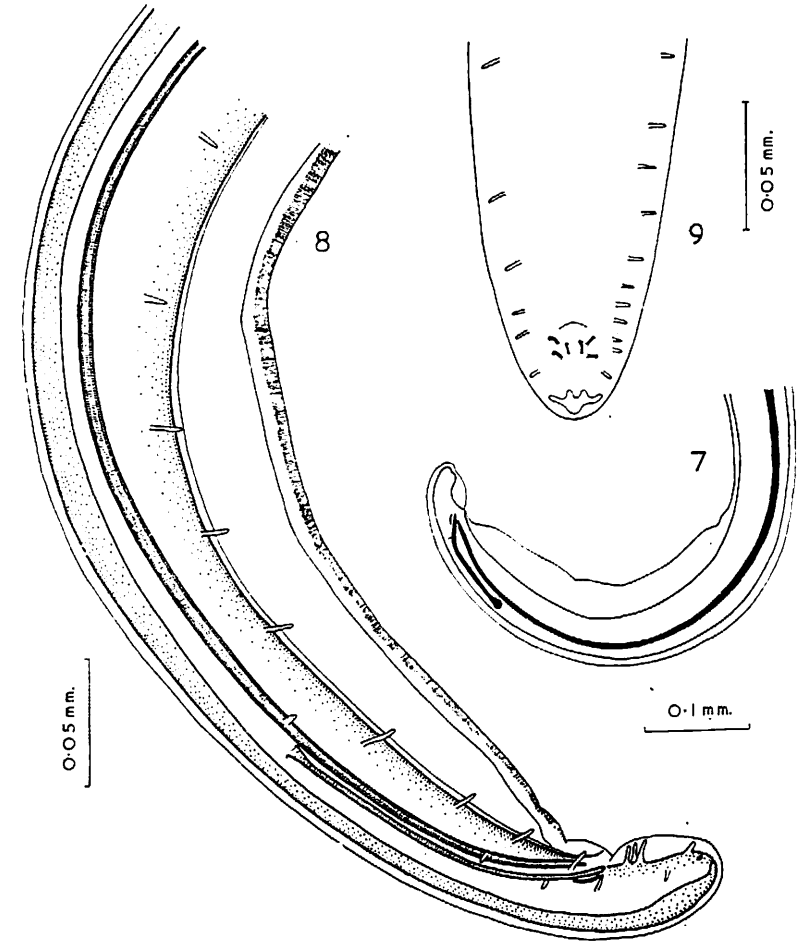
TABLE II
Measurements of males (in mm.)

	1	2	3	4	5	6	Range (12 specimens)
Length	2.7	2.8	2.6	3.1	2.7	2.8	2.6–3.1
Width	0.077	0.079	0.086	0.086	0.079	0.079	0.072–0.086
Length:							
Left spic.	0.58	0.66	0.75	0.70	0.66	0.53	0.53–0.75
Right spic.	0.062	0.083	0.065	0.070	0.10	0.08	0.062–0.115
Gubernaculum	10.8	13.2	12.6	12.6	10.8	14.4	10.8–14.4
Anus/tail	25.2	25.2	22.3	21.6	25.2	28.8	18.0–28.8

Measurements of gubernaculum and anus/tail in microns.

Female

The posterior end is bent ventrally. The tail is bluntly rounded and is 0.045–0.057 mm. long. A distinct anus can be seen under high magnification. The vulva is situated close to the anterior end, just behind the mouth opening at a distance of 9.0–14.4 microns. No special modification of the vagina in the region of the vulva could be seen. The vagina is 0.18–0.224 mm. long. At about 0.14 mm. from the posterior end of the vagina, the common uterus divides into two, each branch running posteriorly to the region of the rectum and both being loosely coiled around each other. The ovarian tubules lie



Stephanofilaria dinniki n.sp.

Fig. 7.—Malc, lateral view posterior end. Fig. 8.—Enlargement of Fig. 7 to show papillae. Fig. 9.—Malc, ventral view posterior end.

coiled in the posterior end of the body, extending into the caudal extremity. The range of measurements of the ten specimens examined and the detailed measurements of six of these are given in Table III.

TABLE III
Measurements of females (in mm.).

	1	2	3	4	5	6	Range (10 specimens)
Length	5.3	5.2	4.7	5.7	5.1	4.6	4.6-5.7
Width	0.087	0.094	0.119	0.101	0.108	0.101	0.087-0.119
Vagina to anterior	10.8	9.0	12.0	10.8	10.8	10.8	9.0-14.4
Vagina length	0.216	0.212	0.216	0.216	0.19	0.205	0.18-0.224
Oesophagus length	0.144	0.173	0.173	0.158	0.151	0.144	0.144-0.173
Anus to tail	0.048	0.045	0.050	0.055	0.045	0.053	0.045-0.057

(Measurements of vagina to anterior in microns).

Larvae

Larvae were removed from the vagina, mounted in glycerin and examined under phase contrast. They measure 0.12-0.15 mm. in length. The body is cylindrical in shape, the head blunt and the tail tapers to a point. The head bears a cuticular cap which usually has three posteriorly directed spine-like structures. Singh (1958) mentions that some of the larvae of *S. zaheeri* had "faint indications of lateral cuticular ridges" on the anterior end. It is very possible that these are the same structures as found in the larvae of *S. dinniki*. The whole of the body has a dense granular appearance. No striations as observed by Singh (1958) in the larvae of *S. zaheeri* were seen in the new species.

DISCUSSION

Five species of the genus *Stephanofilaria* Ihle and Ihle-Landenberg, 1933 have been previously described, all associated with dermatitic lesions. These are: *S. dedoesi* Ihle and Ihle-Landenberg, 1933, *S. stilesi* Chitwood, 1934, *S. assamensis* Pande, 1936, *S. kaeli* Buckley, 1937, and *S. zaheeri* Singh, 1958. All these species were described from bovine hosts. The new species is the first of the genus to be recorded from a host other than a ruminant and, it is believed, the

TABLE IV
Comparison of the species of *Stephanofilaria* (measurement in mm.).

	<i>S. dedoesi</i> Ihle & Ihle- Landenberg, 1933	<i>S. stilesi</i> (Chitwood, 1934)	<i>S. assamensis</i> (Gnedina, 1950)	<i>S. kaeli</i> (Buckley, 1937)	<i>S. assamensis</i> (Pande, 1936)	<i>S. dinniki</i> (Singh, 1958)	<i>S. dinniki</i> (Present data)
<i>Male</i> :							
Length	2.3-3.2	3.0-3.5	2.69-3.28	2.6-3.65	3.0-4.5	3.0-4.3	2.6-3.1
Breadth	0.07-0.09	0.04-0.05	0.04-0.05	0.08-0.1	0.108-0.126	0.1-0.123	0.072-0.086
Left spicule	0.226-0.230	0.276	0.28-0.32	0.19-0.23	0.15-0.18	0.16-0.22	0.53-0.75
Tail length	0.022-0.032	—	—	0.025-0.035	0.025-0.03	0.026-0.03	0.018-0.028
Post anal ventral papillae	2 pairs	2-3 pairs	2 pairs 1 pair	3 pairs	2 pairs	3 pairs	4-8 on left side 4-7 on right side 5 or 6 median
Pre anal ventral papillae	—	6 pairs	6 pairs	13-15 pairs	—	8 pairs	8-14 on left side 9-11 on right side
<i>Female</i> :							
Length	6.1-8.5	5.64-5.8	4.74-5.10	6.9-9.4	7.0-9.5	10.1-13.6	4.6-5.7
Breadth	0.156-0.172	0.10-0.117	0.09	0.15-0.16	0.19-0.208	0.15-0.205	0.087-0.119
Valva anterior to end	0.049-0.057	0.078-0.09	0.08-0.09	0.062-0.098	0.075-0.09	0.095-0.12	0.009-0.014
Anus	Indistinct	Present	Present	Present	Indistinct	Present	Present

first record of the genus from Africa. Schulz and Kluge (1960) found on histological examination of the lesions from the black rhinoceros in South Africa, sections of microfilariae and adult filarioids although determination of the genus could not be made from these fragments.

Comparison of the Species of the Genus

The principal measurements and anatomical features of the six species are given in Table IV. It will be seen that the new species possesses several features, each of which serves to differentiate it from the other members of the genus.

The new species cannot be differentiated on a size basis. The males fall into the range of length of the other males of the genus and the females, although somewhat smaller than those of the other species, form a continuous series through to *S. zaheeri*, the females of which are the largest of the known species. Both males and females of *S. dinniki* lack spines on the transverse striations. Buckley (1937), in his description of *S. kaeli*, drew attention to the cuticular frills or spines surrounding the body at each striation. He thought it probable that this feature was characteristic of the genus. Since neither *S. stilesi* nor the new species possess this feature, it is apparently not a characteristic. *S. stilesi* and *S. dinniki* possess the least number of cephalic spines. The two species differ in that these cephalic spines are arranged asymmetrically in the former species and symmetrically in the latter. The tails of both the males and females of *S. dinniki* are prominently curved ventrally while in the other species this is not so evident. The new species may be grouped with *S. stilesi*, *S. kaeli* and *S. zaheeri* in the possession of a distinct anus in the female and with *S. kaeli*, *S. zaheeri* and *S. dedoesi* in the absence of lateral alae. Apparently only *S. zaheeri* and *S. dinniki* have submedian papillae. In the former species there are eight while in the latter, only four.

The characteristic which readily differentiates the males of *S. dinniki* from the other males of the genus is the length of the left spicule. This is approximately twice or more the length of that of *S. stilesi* which possesses the longest left spicule of the hitherto known species. With the exception of *S. kaeli*, the males of the new species have more pre-anal papillae than the other males. In *S. kaeli* there are 13-15 pairs of pre-anal papillae which are arranged symmetrically, whereas in *S. dinniki* the number is fewer and the papillae are not regularly arranged in pairs. Of the three previously described species having pre-anal papillae, *S. kaeli* and *S. zaheeri* have with certainty, papillae in the median pre-cloacal position. Chitwood (1934), in his description of *S. stilesi*, though featuring what appears

to be a median pre-cloacal papilla, does not mention it in the text. The new species does not possess such papillae. Post-anally, *S. dinniki* possesses more papillae than do the other species. Median post-cloacal papillae are present and have a characteristic arrangement. They are also closer in position to the cloaca than in the other species of the genus. *S. dinniki* appears to be the only representative of the genus in which the male has a ventral cuticular inflation at the posterior end of the body. In the female, the distance of the vulva from the anterior end is by far the shortest of any of the other species. There is no modification of the vagina in the region of the vulva.

The above comparison has been made from the original descriptions of the species of the genus. Ivashkin *et al.* (1961) have given a description of *S. stilesi* recovered from bovines in the U.S.S.R. The detailed measurements of these authors are included in Table IV and also those of Gnedina (1950) as quoted by them. Chitwood (1934) found 4-5 asymmetrically arranged spines in the right dorsal region posterior to the circumoral elevation. Ivashkin *et al.* (1961) found 4-6, sometimes even 8 such spines in their specimens and report them as being latero-ventral in position. Whereas Chitwood (1934) found a distinct anus in the female, the Russian workers did not find one. In the male, Ivashkin *et al.* (1961) record a gubernaculum, this structure not being mentioned by Chitwood and whereas the latter author records 2 or 3 pairs of post-anal papillae, Ivashkin *et al.* found 7 pairs, of which 3 pairs are situated post-cloacally and arranged in a similar way to the post-cloacal papillae in *S. dinniki*. As mentioned earlier, Chitwood featured a median pre-cloacal papilla in his illustration but did not mention it in the text. Ivashkin *et al.* found two pairs of papillae, pre-cloacal in position, one pair being median and one pair more laterally and a single papilla immediately above the cloaca. The rest of the pre-anal papillae as illustrated by the Russian workers are obviously not symmetrically arranged in pairs, a feature noted in the species from the rhinoceros. Chitwood (1934) gives the measurements of the larvae of *S. stilesi* as 0.68 mm., and Ivashkin *et al.* (1961) as 0.018 mm. (0.18 mm.?) in length.

Type specimens deposited in the Department of Parasitology, London School of Hygiene and Tropical Medicine.

SUMMARY

Stephanofilaria dinniki sp. nov. is described from cutaneous lesions of the black rhinoceros, *Diceros bicornis* L. The species differs from the others of the genus mainly in the length of the left spicule in the male; the short distance of the vulva from the anterior end in the female; and the curved tails in both sexes.

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On a New Trematode, *Tremajoannes buckleyi* et sp. nov. (Lecithodendriidae) from Central American Bats with some notes on *Phaneropsorbicularis* (Diesing, 1850) Braun, 1901

By M. F. A. SAOUD*

From the Department of Parasitology
London School of Hygiene and Tropical Medicine

The material of this study consists of two lots. Two specimens of an interesting trematode, collected respectively from the small intestine of *Pteronotus davyi fulvus* and *Mormoops megalophylla* at Columbia, Central America by Dr. H. Marinkelle, form the first lot. These were forwarded to Dr. L. S. Yeh, who kindly entrusted their study to the writer with them. The second lot consists of three mature specimens of *Phaneropsolus* sp. collected from *Saimiri sciureus*, originating from Guiana, which died at the London Zoo. These specimens were deposited in the helminthological collection of the Department of Parasitology, London School of Hygiene and Tropical Medicine.

An examination of the first two specimens revealed that they were identical, and are a new species belonging to a hitherto unknown genus which is described here as *Tremajoannes buckleyi* gen. et sp. nov. This trematode is named in the honour of Professor J. J. C. Buckley.

The other three specimens, were identified as *Phaneropsorbicularis* (Diesing, 1850) Braun, 1901 and are redescribed here.

TREMAJOANNES BUCKLEYI n.g., n.sp.

Description:

The body is small, fusiform attenuated at both ends measuring 1.081-1.387 mm. in length with a maximum breadth of 0.414-0.444 mm. The body is not covered with spines. The oral sucker is relatively large, subterminal, lying at the anterior end of the body measuring 0.190-0.198 mm. × 0.189-0.203 mm. The acetabulum lies in the anterior part of the middle third of the body. It is smaller than the oral sucker measuring 0.144-0.144 mm. × 0.150-0.151 mm.

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