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Whipworms from South African Ruminants.

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UNTIL quite recently it had been taken for granted that the common whipworms of South African Ruminants belonged to the species *Trichuris ovis* (Abildgaard, 1795). Baylis (1932), however, found that *T. globulosa* (v. Linstow, 1906) was quite common among South African cattle, sheep and goats and thought that it would be found to be widely distributed in East and South Africa. This appears to be quite correct, for materials, from various localities in South Africa, in the collection of this institute, which had been identified as *T. ovis*, have on re-examination proved to belong practically all to the species *T. globulosa*; most striking, however, is that among this material there is not a single example of *T. ovis* as redescribed by Baylis (1932) and by Chandler (1930). This re-examination also showed that the whipworms from the Springbok and Blesbok belong to a hitherto undescribed species and that some specimens obtained from a goat and mixed with other goat material and used for class demonstrations, also belonged to a hitherto undescribed species. In the ensuing pages some remarks are passed on the morphology of *T. globulosa*, and the new species mentioned above are described in addition to a new species recently collected on a single occasion from an ox from the Barberton district of Transvaal.

TRICHURIS GLOBULOSA (v. Linstow, 1901).

This species appears to be the commonest species in South African Ruminants, and the materials in the collection of this institute were obtained from cattle, sheep, goats, sable antelope and a camel; an imported Nylghiae (*Boselaphus tragocamelus*), killed soon after its arrival from India, also harboured this parasite. All this material agrees in all essentials with the descriptions recently given by Baylis (1932), Gebauer (1932) and Sprehn (1927). The last two authors definitely state that a distinguishing feature of this parasite from *T. ovis* (Abild. 1795) is that the spicular sheath terminates in a rounded swelling in *T. globulosa* whereas in *T. ovis* it is melon-shaped. In the writer's material there are specimens showing no swelling, i.e. the sheath is only partially everted; a rounded swelling in which the tip of the sheath is not everted; and specimens with fully everted sheaths in which

the swelling is rounded or melon-shaped and is terminated by a smooth "mouth piece" fitting closely to the spicule. The writer is quite satisfied that all these specimens are the same; the nature of the spicule is similar in all, being robust with large "flares" at their proximal ends and showing a slight thickening towards their distal ends and then thinning to end in a sharp point; the distal end of the spicule thus has a sabre-like appearance (Fig. 1); also the spines on the sheath are large towards its distal end and

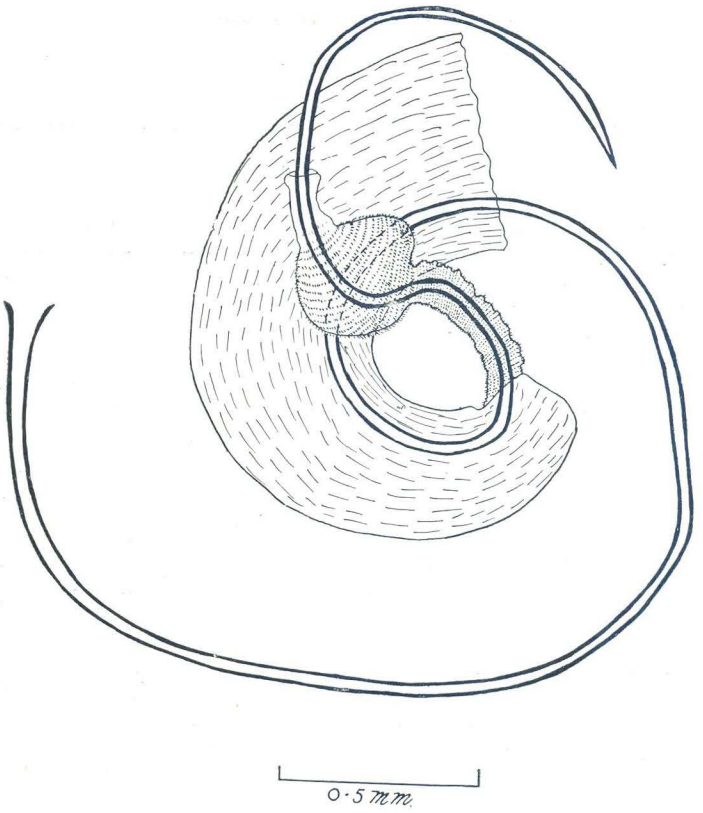

Fig. 1. *Trichuris globulosa*; posterior extremity of male.

become smaller towards its proximal end. In addition all the females examined showed the characteristic structure of the vagina described and figured by Baylis. The variations in the lengths of the spicules observed by the writer agree with those of the above mentioned authors: They were from 3·8 to 5·7 mm. long by 0·035 to 0·043 mm. broad; the breadth also agrees with Baylis' findings but is slightly thicker than Gebauer's, and about half the thickness given by Sprehn (0·08–0·09 mm.).

The spines on the sheath were found to vary from 0·0175 to 0·019 mm. for the large spines on its distal end and from 0·006 to 0·007 mm. for the small spines at its proximal end.

With regard to the internal male genitalia, the cloaca was found to vary from 2·2 to 2·5 mm. in length and the spicular diverticulum joined it from 1·2 to 1·8 mm. from its external opening; the ejaculatory dust was from 5·9 to 7·8 mm. long and the vas deferens from 4·9 to 6·2 mm. long; a slight constriction joined these two parts. The testes, which terminated at about the level of the proximal end of the cloaca, was straight in the region of the ejaculatory duct, but was thrown into conspicuous dorso-ventral folds for its whole length opposite the vas deferens.

Trichuris barbertonensis sp n.

This species, of which 4 males and 5 female specimens were available, were collected from an ox from the Barberton district of the Transvaal. These were the only whipworms collected from this animal.

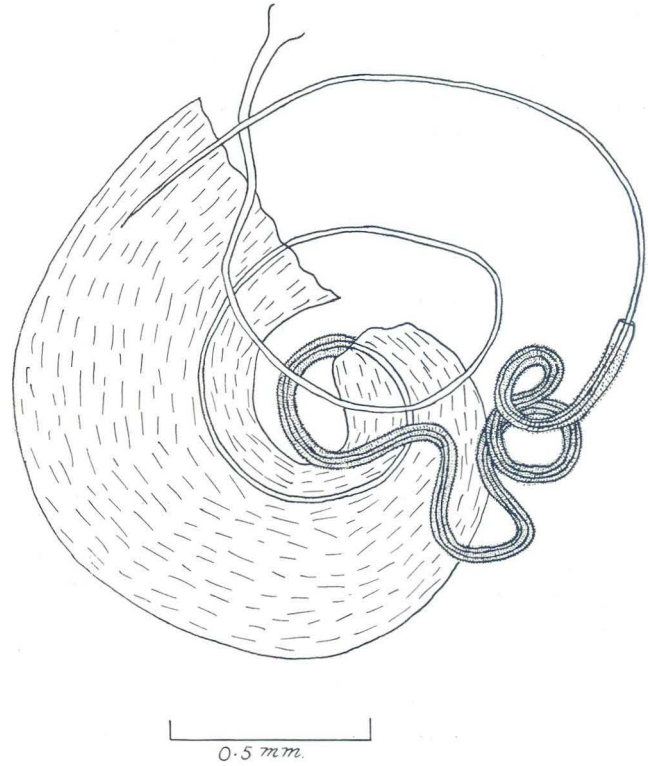

Fig. 2. *Trichuris barbertonensis* sp. n.; posterior extremity of male.

Superficially it is very similar to *T. globulosa*, the thick portion of the body being 11 to 13 mm. long in the male and 14 to 16 mm. long in the female by about 0·5 mm. thick in the latter.

The spicule is long and slender and in the four males measured 6·83, 6·92, 7·12 and 7·3 mm. with a maximum thickness of 0·014 to 0·016 mm. in its middle (Fig. 2);at their proximal ends, just

behind the head, they were from 0·025 to 0·03 mm. thick; they decrease uniformly towards their distal ends to end in sharp tips. The sabre-like swelling seen in *T. globulosa*, and also described for *T. ovis* by Baylis, is absent. The sheath when fully extended has a uniform diameter and does not terminate in a bulb. It is very long and may attain a length of 2·7 mm. It is densely covered by minute spines which are, however, absent on its distal end or "mouth piece", they are largest at its proximal end, reaching a length of 0·01 mm., and smallest at its distal end, where they are only 0·005 mm. long.

The cloaca is relatively long being up to 3·8 mm. long and it is joined by the spicular diverticulum at the junction of its 1st and 2nd proximal quarters. The ejaculatory duct is from 7·7 to 8·7 mm. long and a slight constriction joins it to the vas deferens which is 3·7 to 3·9 mm. long. The testes is convoluted opposite the vas deferens and straight opposite the ejaculatory duct and terminates at about the level of the proximal end of the cloaca.

The vagina is much convoluted and has a more or less even diameter throughout (Fig. 3); its distal end is everted through the vulva and is devoid of spines; instead the cells forming its lining are dome-shaped thus giving this portion a tuberculate appearance.

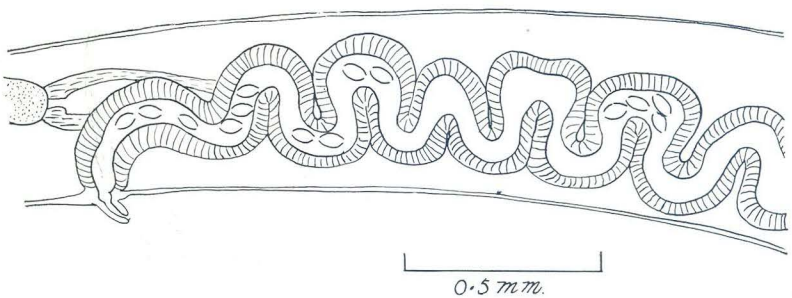

Fig. 3. *Trichuris barbertonensis* sp. n.; vagina.

The eggs are of the usual shape and vary in size from 0·046 to 0·052 mm. long by 0·022 to 0·024 mm. broad including the plugs.

Host: Ox.

Habitat: Caecum.

Locality: Barberton, Transvaal.

Types in the Helminthological Collection, Onderstepoort.

Specific diagnosis.

Trichuridae resembling *T. globulosa* but having a spicule up to 7·3 mm. long and evenly tapering towards its tip; spicule sheath long and slender and not terminating in a bulb. Cloaca up to 3·8 mm. long; vas deferens about half the length of the ejaculatory duct; and vagina simple, convoluted and not spined.

Caecum, Ox, Transvaal.

Discussion.

This species may be easily distinguished from both *T ovis* and *T. globulosa* by the slender spicule devoid of a distal swelling; the long and slender spicular sheath not terminating in a bulb; the simple and convoluted vagina without internal spines; the very much longer cloaca and in that the vas deferens is only about half the length of the ejaculatory duct.

The material from a Uganda Bull, identified by Baylis (1932) as *T. ovis* and having a spicule 7·2 mm. long by 0·0175 mm. thick probably belongs to the above described species.

Trichuris antidorchi sp. n.

This species is represented in the collection by 10 males and 18 females from the caecum of the Springbok and one male and one female from the caecum of a Blesbok. Mönnig (1932) had identified the material from the Blesbok as *T. ovis* and that from the Springbok (1933) as *T. globulosa*. In size and general appearance they are indistinguishable from *T. globulosa*; differences are only evident when the internal organs are examined.

The spicule is remarkable for its robustness and by its weak cuticularization (Fig. 4). It varies in length from 5·43 to 6·5 mm. with an average middle thickness of 0·053 mm. It maintains a fairly even thickness throughout its length and just before its distal termination it suddenly narrows down to end in a fine point. When cleared in lacto-phenol or creosote the spicule can hardly be traced in the body and does not stand out as is the case in *T. globulosa*. The spicular sheath, when fully everted, terminates in a large globular swelling covered by numerous very minute spines from 0·003 to 0·004 mm. long; this swelling is drawn out into a smooth "mouth piece" which closely invests the spicule; the remaining portion of the sheath is tubular and is covered by backwardly directed spines which increase in size towards its proximal end; here the largest spines in the different males are from 0·01 to 0·014 mm. long. The cloaca, as in the preceding species, is also relatively long, being from 3·5 to 3·75 mm. long; the spicular diverticulum, however, joins it more posteriorly, 1·9 to 2·3 mm. from its external opening. The ejaculatory duct is relatively short being from 4·5 to 6 mm. long and the vas deferens, in proportion to it, is relatively long, 3·7 to 4·5 mm. long. A slight constriction joins these two parts. The testis is convoluted opposite the vas deferens and more or less straight opposite the ejaculatory duct, and it terminates just posterior of the anterior limit of the cloaca.

The vagina shows a very characteristic structure in that its distal half is telescoped into itself from two to five times, the usual number of telescopings being three (Fig. 5). This characteristic appears to be a constant feature as it was present in all the females; no such characteristic has so far been recorded in the literature dealing with whipworms. The internal surface of the vagina up to the vulva, and also that portion following the telescopings, is lined

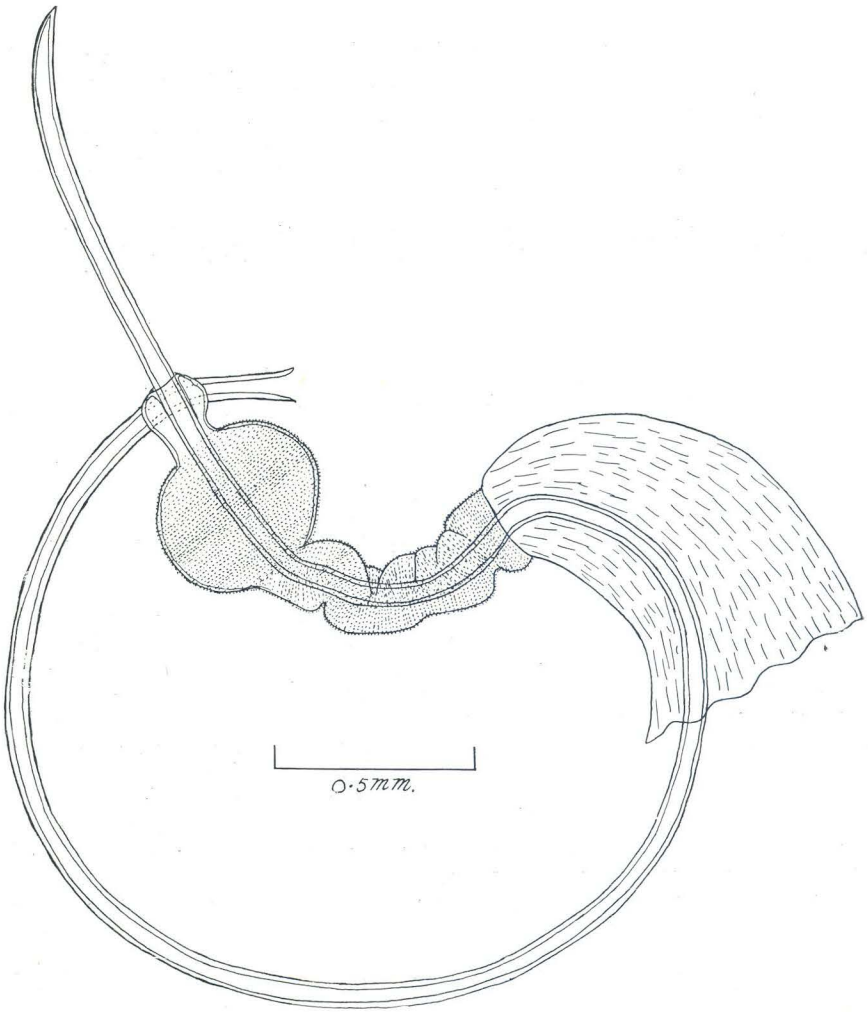

Fig. 4. *Trichuris antidorchi* sp. n.; posterior extremity of male.

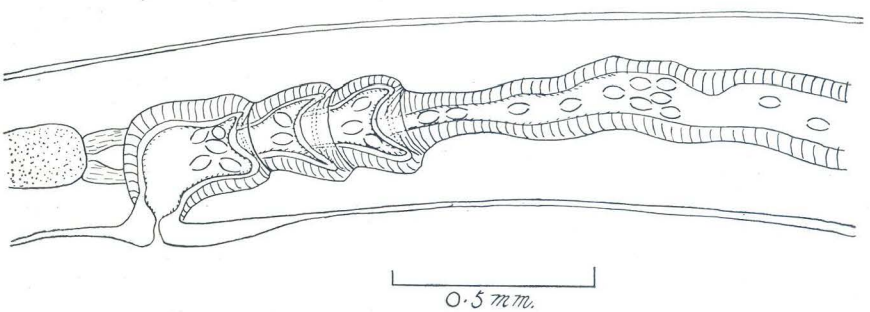

Fig. 5. *Trichuris antidorchi* sp. n.; Vagina.

of the bursa. The lateral rays originate from a thick stem which divides about half-way down the length of the lateral lobe. The externo-lateral ray diverges widely in a ventral direction from the other two; the medio- and postero-laterals are directed somewhat dorsad, run close together, and reach the margin of the bursa. The right externo-dorsal ray comes off very high from the dorsal stem, it is thin and runs a sinuous course into the right lateral lobe. The left externo-dorsal ray is given off just anteriorly to the bifurcation of the dorsal ray and passes into the left lateral lobe. The two branches of the dorsal ray have tridigitate tips which differ in the two rays. The specimen showed one spicule which is alate and twisted irregularly.

(For other measurements see Table 7.)

Habitat: ?.

Host: African elephant.

Bunostomum hamatum Mönnig, 1932.

(Figs. 188, 189.)

The description is also based on a single male specimen. It is smaller than *B. brevispiculum*. Its mouth capsule is similar to that of *B. brevispiculum*, with a slightly longer dorsal tooth (0·055 mm.). The cervical papillae are placed on a level between the nerve ring and excretory pore.

The male bursa has the same appearance as in *B. brevispiculum*, but differs from it in the case of the ventral rays, whose common stem is shorter than the two branches. There are two equal alate spicules, with their distal ends sharply bent dorsalwards and the extreme tips curved back in the form of small hooks.

(For other measurements see Table 7.)

Habitat: ?.

Host: African elephant.

TABLE 7.

Bunostomum.

	B. foliatum.		*B. brevispiculum.*	*B. hamatum.*
	♂	♀	♂	♂
Total length.....	·13	15·2	12·1	8·7
Maximum diameter.....	—		0·073	0·086
Cuticular striations.....	—		0·003	0·003
Vent. length of capsule....	—		0·157	0·161
Dorso-ventral diameter of capsule.....	—		0·118	0·118
Length of oesophagus.....	—		1·02	1·08
Nerve ring from ant. end..	—		0·52	0·50
Excretory pore from ant. end.....	—		—	0·55
Length of spicules.....	1·46		0·224	0·67

On either side of the cloaca there is a prominent conical papilla similar to that found in *T. gazellae* Gebauer, 1933. The cloaca is short being from 1 to 1·01 mm. long and it is joined by the spicular diverticulum 0·48 to 0·56 mm. from its external opening. The ejaculatory duct is relatively very long being from 8 to 8·2 mm. long and the vas deferens is 4·8 to 5 mm. long; these two parts are joined to each other by a narrow constriction, 0·01 mm. long. Opposite the vas deferens the testes is thrown into closely packed dorso-ventral loops; it terminates just posterior of the anterior limit of the cloaca.

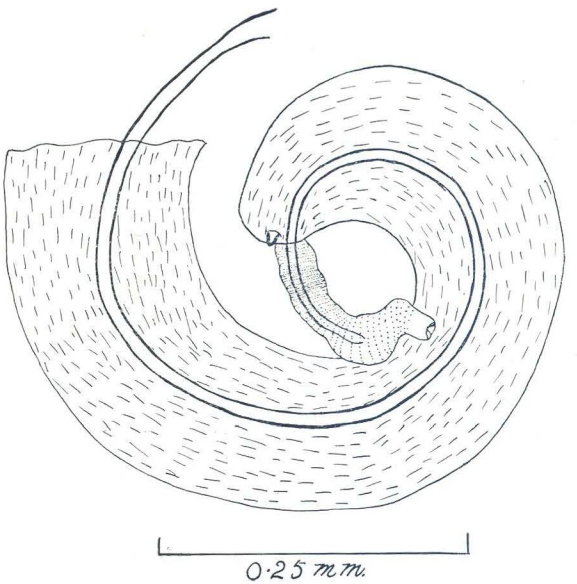

Fig. 6. *Trichuris parvispiculum* sp. n: ; posterior extremity of male.

In the females the distal end of the vagina is in nearly all cases slightly everted through the vulva, and its lumen is lined by very minute spines. Its distal half may pass straight down the body, but a few slight curves are generally present (Fig. 7); the middle portion of the vagina is slightly thickened giving it a slight club-shaped appearance; behind this thickening it is more wavy until it joins the uterus.

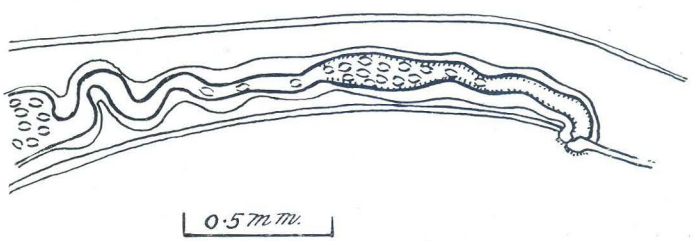

Fig. 7. *Trichuris parvispiculum* sp. n.; Vagina.

The eggs, including the plugs, are 0·044 to 0·046 mm. long by 0·023 to 0·025 mm. broad.

Host: *Capra hircus.*

Habitat: Caecum.

Locality: South Africa.

Types in the Helminthological Collection at Onderstepoort.

Specific diagnosis.

Trichuridae resembling *T. globulosa* externally but having a small spicule up to 1·07 mm. long, but generally less than 1 mm. long, ending in a bluntly rounded tip; a pair of caudal papillae at sides of cloacal aperture; Cloaca about 1 mm. long; ejaculatory duct 8 mm. long and over; vagina simple, more or less straight and provided with minute spines.

Caecum, Goat, South Africa.

Discussion.

Of the whipworms from ruminants this species, because of its short spicule, appears to be closely related to *T. discolor* (v. Linstow, 1906), and *T. spiricollis* Solomon, 1932 and to a lesser extent to *T. gazellae* Gebauer, 1933. It agrees with v. Linstow's species in that the tip of the spicule is bluntly rounded, but the spicule is nearly twice as long as in the writer's species and there are no caudal papillae. Gebauer's species has a spicule up to 4·15 mm. long but it also ends bluntly, and in addition two prominent caudal papillae are present. Solomon's species has a spicule the same length as the writer's species, but differs in that the tip is spatulate; also the body carries anterior cuticular " plagues ", the cloaca is only from 0·2 to 0·3 mm. long as against about 1 mm. in the writer's species, and caudal papillae are absent.

Summary.

The occurrence and morphology of *Trichuris globulosa* are discussed and three new species are described, namely *T. barbertonensis* from cattle, *T. antidorchi* from springbok and blesbok and *T. parvispiculum* from goats.

REFERENCES.

BAYLIS, H. A. (1932). A new species of the nematode genus Trichuris from Queensland. *Ann. Mag. Nat. Hist.*, Ser. No. 10, Vol. 9, pp. 31-32. London.

BAYLIS, H. A. (1932). Three notes on parasitic nematodes. *Ann. Mag. Nat. Hist.*, Ser. No. 10, Vol. 10, pp. 497-502. London.

BAYLIS, H. A. (1935). Four new species of nematodes. *Ann. Mag. Nat. Hist.*, Ser. No. 10, Vol. 16, pp. 370-382. London.

CHANDLER, A. C. (1930). Specific characters in the genus Trichuris, with a description of a new species, *Trichuris tenuis*, from a camel. *Jl. Parasit.*, Vol. 16, pp. 198-206. Urbana.

GEBAUER, O. (1932). Zur Kenntnis der Parasitenfauna der Gemse. *Zeitsch. f. Parasitenk.*, Vol. 4, pp. 147-219. Berlin.

GEBAUER, O. (1933). Ein neuer Wiederkäuer--Peitschenwurm—*Trichuris gazellae* n. sp. aus der Damagazelle. *Zeitsch. f. Parasitenk.*, Vol. 6, pp. 321-325. Berlin.

LINSTOW, O. von (1906). Helminths from the Collection of the Colombo Museum. *Spolia Zeylanica*, Vol. 3, pp. 163-188.

MÖNNIG, H. O. (1932). Wild Antelopes as Carriers of Nematode Parasites of Domestic Ruminants.—Part II. *18th Rept. Dir. Vet. Ser. & Anim. Ind. Union of S. Af.*, pp. 153-'72. Pretoria.

MÖNNIG, H. O. (1933). Wild Antelopes as Carriers of Nematode Parasites of Domestic Ruminants.—Part III. *Ond. Jl. Vet. Sc. Anim. Ind.*, Vol. 1, pp. 77-92. Pretoria.

POLOGENTSEV, P. A. (1935). On the nematode fauna of the Shrew-Mouse *Sorex araneus* L. *Jl. Parasit.*, Vol. 21, p. 96. Urbana.

SCHWARTZ, B. (1926). Specific Identity of the Whipworms of Swine. *Jl. Agr. Res.*, Vol. 33, p. 311. Washington.

SOLOMON, S. G. (1932). On a collection of parasitic Worms from East Africa. *Jl. Helm.*, Vol. 10, pp. 209-230. London.

SPREHN, C. (1927). Einige Bemerkungen über die Trichocephalen der Wiederkäuer. *Zool. Anz.*, Vol. 70, pp. 83-93. Leipsig.