

South African Helminths, Part VI.

Some Helminths, chiefly from Rodents.

By R. J. ORTLEPP, Section of Parasitology, Onderstepoort.

PARALIBYOSTRONGYLUS VONDWEI gen. and sp. nov.

Available material: three males and seven females.

Length: males 9.7 to 10 mm.; females 21 to 24 mm.

Breadth: males 0.15 to 0.168 mm.; females 0.2 to 0.22 mm.

Body slender, straight to coiled in fixed material, creamy white in colour; attenuated anteriorly in both sexes and posteriorly in female from level of vulva; cuticle transversely striated by very delicate striae which are not easily seen; numerous longitudinal striations about 0.001 mm. apart just under cuticle and extending through length of body. No longitudinal ridges, lateral alae, cervical papillae or cephalic swelling.

Mouth cavity simple; no buccal capsule; six very small circum-oral papillae. Oesophagus straight and increases in thickness posteriorly; 0.5 to 0.528 mm. long in males and 0.612 to 0.66 mm. long in females. Anterior thickness of oesophagus in males 0.024 mm. and in females 0.027 to 0.03 mm.; maximum thickness at posterior end in males 0.042 to 0.045 mm. and in females 0.069 to 0.078 mm. Diameter head 0.027 to 0.028 mm. in males and 0.033 to 0.035 mm. in females. Nerve ring 0.296 to 0.3 mm. from anterior end in males and 0.28 to 0.32 mm. in females; excretory pore very small 0.372 to 0.42 mm. from anterior end in males 0.336 to 0.43 mm. in females.

Vulva in posterior fifth of body; transverse slit, non protuberant 4.56 to 4.7 mm. from posterior end. Cuticle for distance of about one mm. anterior and posterior of vulva provided with about 20 longitudinal rugose ridges, the two ridges on lateral lines may be enlarged to form alae about 0.05 mm. high. Ovejector and uteri opposed; combined length of ovejectors 0.696 to 0.72 mm. by 0.09 mm. thick. Eggs thin walled, oval and morulated *in utero*; 0.06 to 0.065 mm. long by 0.03 mm. thick. Tail (Fig. 1D) tapers to blunt tip, and may show slight constriction of cuticle about 0.05 mm. from tip; 0.228 to 0.276 mm. long.

Bursa of male trilobed (Fig. 1A), with large lateral and small dorsal lobe; lateral lobes 0.3 to 0.318 mm. long. Small prebursal alae supported by small prebursal papillae and showing coarse granulations along their edges and in area of their papillae. Ventral and lateral rays provided with common stem. Ventro-ventral ray isolated, thin and straight except for its tip which is bent anteriorly; latero-ventral ray closely apposed to antero-lateral ray for about two-thirds of its length; its posterior third curves forwards so that its tip approaches that of the ventro-ventral ray; its proximal two-thirds thick, distal third thin. Antero- and medio-lateral rays

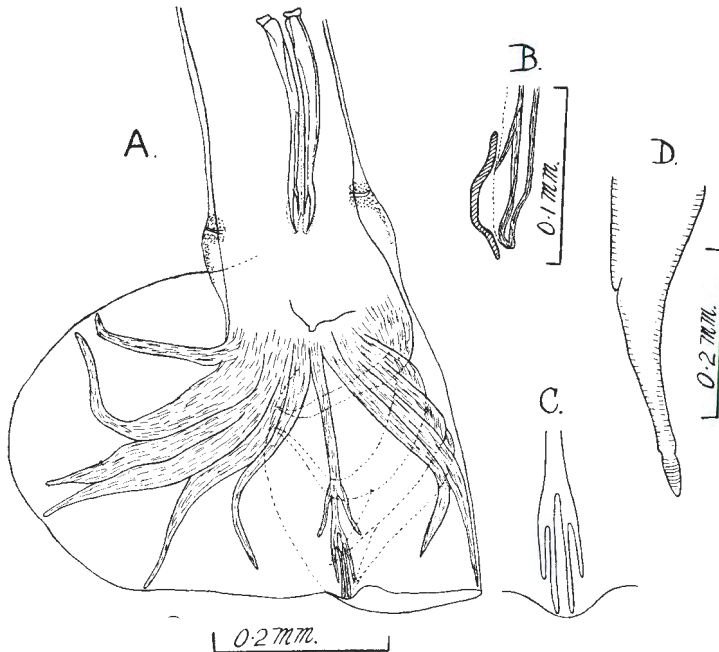


Fig. 1.—*Paralybostrongylus vondwei* g. and sp. nov.

- A. Dorso-lateral view of bursa.
- B. Lateral view of gubernaculum and tip of spicule.
- C. Distal extremity of dorsal ray.
- D. Tail of female.

straight and apposed except for their tips which are slightly divergent; postero-lateral ray as thick as other lateral rays except for its distal half which is thinner; proximally it is apposed to medio-lateral ray, but distally it diverges considerably; its tip reaches margin of bursa. Dorsal ray large and long; has two short branches which curve away from it at about its posterior third; its posterior quarter split (Fig. 1C), and each branch again sub-divides to form two thin and parallel rays, the inner of which almost reaches the margin of the bursa. Externo-dorsal rays arise from base of dorsal ray; have same thickness as dorsal rays, and are curved, their tips some distance away from bursal margin. Spicules dark brown, equal and similar, 0.246 to 0.252 mm. long by 0.018 mm. thick at

their proximal ends; they have a few longitudinal ridges, are alate and bluntly pointed in dorsal view; each has a delicate spike on its inner side about 0.06 from its tip, spike 0.027 mm. long. Genital cone a small flattened cone 0.06 mm. wide at its base and 0.024 mm. long. Gubernaculum (Fig. 1B) represented by an indistinct and strongly arched chitinous structure, concavity directed ventralwards, about 0.07 mm. long.

Affinities.—The species described above shows close affinities to *Libyostrongylus hebreunicutus* Lane, 1923 obtained from the stomach and duodenum of a Gorilla and to *Obelescooides nigeriae* Baylis, 1928, from the intestine of *Crictomys emini* (Rodentia, Murinae). The disposition of the bursal rays, the shape of the bursa, spicules, gubernaculum and female tail appear to be almost the same; the only differences in these structures appears to be that in Lane's and Baylis' species the externo-dorsal rays originate from the dorsal ray at about one-quarter to one-third of its length from its base, whereas in the writer's species they originate from the base of the dorsal ray; also the outer of the final four digitations of the dorsal ray are shorter in Lane's and Baylis' species than in the writer's. In all three species a cephalic swelling and longitudinal ridges are absent. The writer feels that these three species should be placed in a genus by themselves separate from the genus *Libyostrongylus* to which genus Travassos also refers Baylis' species. We admit that these three species show affinities to the genotype of *Libyostrongylus* (*L. douglassi* Cobb, 1882) as shown by the somewhat similar spicules, similar externo-dorsal rays, large dorsal rays terminated by six branchlets; *L. douglassi*, however, differs in that the dorsal ray is split prior to the origin of its branchlets and the medio- and ventro-lateral rays diverge considerably in their distal thirds so that their tips are respectively closer to the postero-lateral and latero-ventral rays than to each other. In the three members of the new genus the tips of these two rays are closer to each other than to the postero-lateral and latero-ventral rays.

To this genus we propose giving the name *Paralibyostrongylus* with the following *generic diagnosis*: Trichostrongylinae. Cuticle with fine transverse striations, no cephalic swelling or longitudinal ridges. Cervical papillae absent. Vulva in posterior fifth of body; ovejectors and uteri divergent. Tail of female bluntly pointed. Bursa with large lateral and small dorsal lobes; ventral rays separate from each other but their tips fairly close together; medio- and ventro-lateral rays apposed except for their tips which are slightly divergent; postero-lateral ray diverges considerably from medio-lateral ray. Externo-dorsal rays large and arises from or near base of dorsal ray; dorsal ray with pair of lateral branches at about one-third of its length from its distal end; distal portion of dorsal ray bifurcates twice to terminate in four digitations. Spicules short and equal; gubernaculum present; prebursal papillae present.

Parasites of Rodents and Primates.

Type: *Paralibyostrongylus vondwei* sp. nov.

Other species *P. hebreunicutus* (Lane, 1923) (Syn. *Libyostrongylus hebreunicutus*, Lane, 1923 and *P. nigeriae* (Baylis, 1928) (Syn. *Obelescooides nigeriae* Baylis, 1928).

Specific Diagnosis: Trichostrongylinae: medium sized worms reaching a length of 10 mm. for the males and 24 mm. for the females. Vulva in posterior body fifth; cuticle for about 1 mm. anterior and posterior of vulva with about 20 longitudinal ridges and lateral alae in this region. Bursa ample; four terminal digitations of dorsal ray relatively long, parallel and slender. Externodorsal rays large and originate from base of dorsal ray. Spicules equal, pointed and ridged, 0.246 to 0.252 mm. long and with internal delicate spike. Gubernaculum delicate and arched.

Host: *Thryonomys swinderianus variegatus* Ptrs. (Thryonomidae.)

Location: Stomach.

Locality: Zululand.

Types in Onderstepoort Helminthological Collection.

Libyostongylus bathyergi sp. nov.

Material available: four males and 27 females, all mature.

Length, males: 7.5 to 8.04 mm.; females: nine to ten mm.

Breadth, males: 0.078 to 0.09 mm.; females: 0.12 to 0.132 mm.

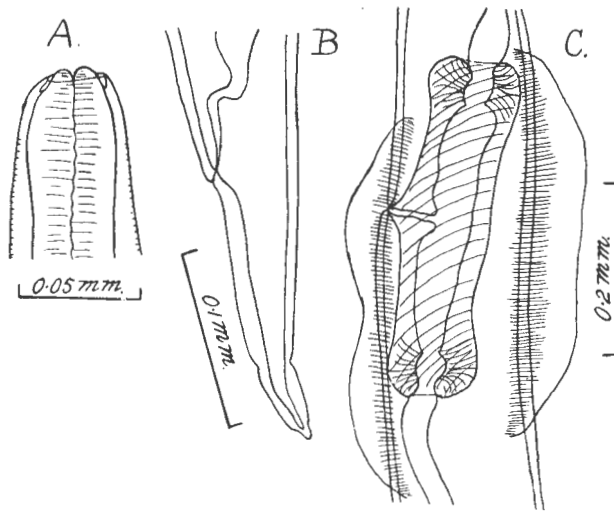


Fig. 2.—*Libyostongylus bathyergi* sp. nov.

A. Anterior extremity.

B. Tail of female.

C. Region of vulva.

Reddish straight worms tapering anteriorly and having a head diameter of 0.036 to 0.04 mm. for the males and 0.036 to 0.042 mm. for the females. Cephalic cuticle not inflated. Longitudinal body ridges and cervical alae present. Cervical papillae apparently absent. Cuticle finely striated transversely. Cuticle at anterior extremity reflexed to form small collar-like sheath round anterior portion of oesophagus which projects forwards as three small hemispherical "lips" (Fig. 2A). Oesophagus increases in thickness

posteriorly, 0.348 to 0.375 mm. long in the males and 0.48 to 0.504 mm. long in the females; its anterior thickness 0.036 mm. in males and 0.033 to 0.039 mm. in females; its posterior diameter 0.048 to 0.054 mm. in males and 0.066 to 0.075 mm. in females. Nerve ring 0.25 mm. from anterior end in males and 0.25 to 0.264 mm. from anterior end in females. Excretory pore towards posterior end of oesophagus, 0.32 to 0.36 mm. from anterior end in males and 0.39 to 0.417 mm. from front in females.

Female.—Vulva in posterior eighth of body, 1.1 to 1.2 mm. anterior of anus; non protuberant. Body cuticle in vulvar region usually raised to form two or three broad alae, 0.4 to 0.5 mm. long and up to 0.07 mm. broad (Fig. 2 C); in some females these alae entirely absent. Vagina short and transverse. Ovejectors muscular and divergent; their combined length 0.384 to 0.48 mm. with a maximum thickness of 0.078 to 0.096 mm. Uteri apposed. Eggs oval, thinwalled, smooth and morulated *in utero*, 0.06 to 0.063 mm. long by 0.033 to 0.036 mm. thick. Tail (Fig. 2 B) tapering, 0.156 to 0.18 mm. long, with slight constriction about 0.045 mm. from its tip.

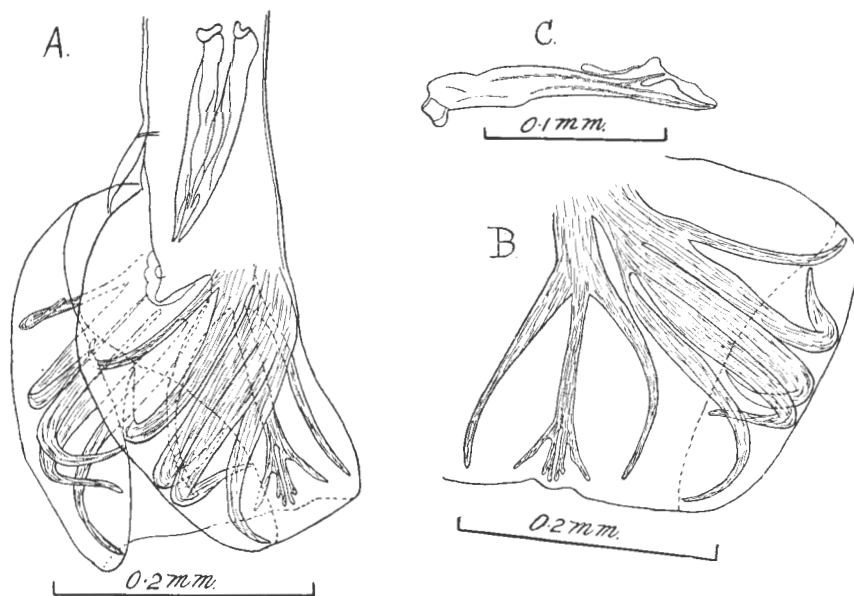


Fig. 3.—*Libyostrongylus bathyergi* sp. nov.

- A. Ventro-lateral view of bursa.
 B. Dorsal and lateral rays of bursa.
 C. Lateral view of left spicule.

Male.—Maximum body thickness about 1.0 anterior of bursa. Bursa large, with large intolled lateral lobes and small dorsal lobe (Fig. 3 A and B). Ventral rays with common stem and divergent for their whole length; their tips almost reach margin of bursa; ventro-lateral ray slender. Lateral rays have common stem and all have same thickness as latero-ventral ray; antero- and medio-lateral

rays adjacent, their posterior quarter only being divergent and their tips almost reach margin of bursa; postero-lateral ray parallel to medio-lateral ray, its posterior half, however, diverging from this ray; its tip reaches margin of bursa. Dorsal ray large, its posterior quarter split and each branch again divides to form a slightly longer outer branchlet and an inner straight branch with bidigitate tips. Externo-dorsal rays large and curved, their tips terminating some distance from the edge of the bursa; they arise at same level from stem of dorsal ray at about a quarter of its length from its base. Small prebursal papillae present. Spicules (Fig. 3 C) equal, similar and ridged, 0.156 to 0.162 mm. long by 0.016 to 0.02 mm. thick at their proximal ends; each provided with a small dorsal spur about 0.02 mm. long at about 0.05 mm. from its tip; its posterior portion for about 0.04 mm. is broadened out and somewhat spear-shaped; its posterior half alate. No definite gubernaculum present but thickening in dorsal wall of spicular canal may represent a very weakly chitinized accessory piece.

Affinities.—The structure of the spicules and of the bursa, especially of the dorsal ray, is very similar to that found in the genotype of the genus *Libyostrongylus* Lane, 1923, except that the four terminal digitations of the two inner branches are much longer in this species than in the writer's; the structure of these digitations approaches more closely that found in the species *Paralibyostrongylus nigeriae* (Baylis, 1928) and *P. hebrenicus* (Lane, 1923); the writer's species differs from these two, however, in that the dorsal ray is split prior to the origin of its lateral branchlets and the tips of the ventral rays do not approach each other. This species appears to occupy an intermediate position between the genotype of the genus *Libyostrongylus* and the members of the genus *Paralibyostrongylus*.

Specific Diagnosis.—Trichostrongylineae; Reddish worms, straight, reaching a length of 8 mm. for the males and 10 mm. for the females. Cephalic extremity not swollen but cuticle reflexed to form a small collar round anterior tips of oesophagus which project forwards in the form of three minute "lips". No longitudinal ridges or alae. Vulva in posterior eighth of body, two or three short cuticular alae often being present in this region. Tail conical, 0.156 to 0.18 mm. long. Bursa ample with large and inrolled lateral lobes and small dorsal lobe. Dorsal ray large and split in its posterior quarter prior to origin of its lateral branchlets; four internal digitations small. Externo-dorsal rays symmetrical in origin from stem of dorsal ray. Ventral rays divergent and their tips do not approach each other. Prebursal papillae present. Spicules similar, equal and ridged, 0.156 to 0.162 mm. long, with small dorsal barb distally, tip somewhat spear-shaped and distal half alate. Gubernaculum absent.

Host: *Bathyerigus suillus suillus* (Schreber). (Bathyerigidae.)

Location: Stomach.

Locality: Strandfontein, Capetown.

Types in the Onderstepoort Helminthological Collection.

Longistrongylus schrenki sp. nov.

Available material: two males and three females.

Length: males: 6.5 and 6.7 mm.; females: 8.3 and 8.5 mm.

Breadth: males 0.09 and 0.092 mm.; females: 0.102 and 0.107 mm.

Body reddish, straight, attenuated anteriorly in both sexes and posteriorly in females; greatest width of males just anterior of bursa and in females about midway between vulva and anus. Cephalic extremity shows very slight anterior swelling (Fig. 4 A.) swelling 0.007 mm. long; diameter of head, including swelling, 0.02 to 0.021 mm. Cuticle with very fine transverse striations and 30 to 50 longitudinal lines, number of longitudinal lines increases posteriorly and each is composed of single row of minute punctate markings. Cervical papillae small and peglike, symmetrically situated 0.264 to 0.312 mm. from anterior end. Cervical alae absent. Mouth small and inconspicuous, no lips discernible. Cephalic papillae represented by minute circumoral refringent dots. Oesophagus straight, increases in diameter posteriorly, 0.594 to 0.6 mm. long in males by 0.012 to 0.015 mm. thick at anterior end and 0.045 to 0.048 mm. thick at posterior end; in females length is 0.6 to 0.62 mm. by 0.015 mm. thick at anterior end and 0.045 to 0.054 mm. thick at posterior end. Nerve ring 0.204 to 0.22 mm. from anterior end and excretory pore small, 0.24 to 0.3 mm. from anterior end.

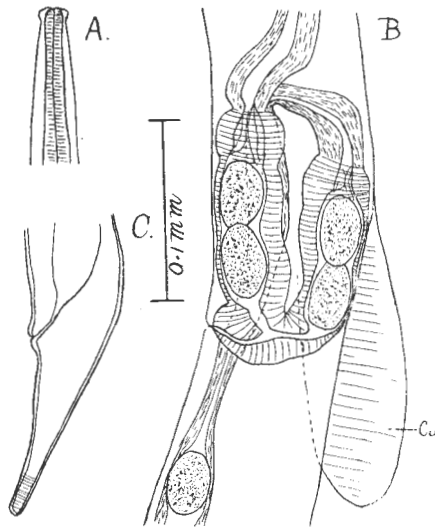


Fig. 4.—*Longistrongylus schrenki* sp. nov.

- A. Cephalic extremity.
 B. Ovejectors (Cu. cuticular flap).
 C. Tail of female.

Vulva a transverse slit, 0.034 to 0.039 mm. wide, in posterior body half, 1.39 to 1.42 mm. anterior of anus; non protuberant. Cuticular flap on right side of body in region of vulva; flap 0.216 to

0.228 mm. long by 0.042 to 0.054 mm. high and shows transverse striations. Ovejectors well developed, their combined lengths 0.324 to 0.33 mm. by 0.048 mm. thick; opposed in two females and parallel in third female (Fig. 4 B). Eggs thinwalled, oval and embryonate *in utero* 0.051 to 0.054 mm. long by 0.027 to 0.03 mm. thick. Tail (Fig. 4 C) short, 0.105 to 0.132 mm. long, tapers to end in bluntly rounded tip 0.01 mm. in diameter.

Bursa symmetrical (Fig. 5 A and B). Lateral lobes ample. Dorsal lobe fan-shaped, separate from lateral lobes and lies ventral of their dorsal portions, about 0.057 mm. broad and 0.06 mm. long. Ventral rays arise from common stem, separate slightly in their distal halves but tips become approximated and terminate fairly close together near margin of bursa; latero-ventral ray stoutest ray of bursa. Lateral rays have common stem; antero-lateral more or less straight or slightly sinuous terminates some distance from edge of bursa; medio- and postero-lateral rays parallel and close together for their whole lengths, tips almost reach edge of bursa. Externodorsals stout and arched, arise from stem of dorsal, their tips almost reach margin of bursa. Dorsal ray stout and bidigitate, dips ventralwards and lies ventral of dorsal margin of lateral lobes. Spicules equal and similar 0.144 to 0.15 mm. long, straight in dorsal or ventral view but strongly elbowed ventralwards in lateral view; posterior third alate and tips slightly hooked. Gubernaculum not seen. Telamon strongly chitinized, ring-shaped with two backwardly directed processes; ring 0.036 mm. broad and 0.021 mm. high and processes 0.015 mm. long. Prebursal papillae small.

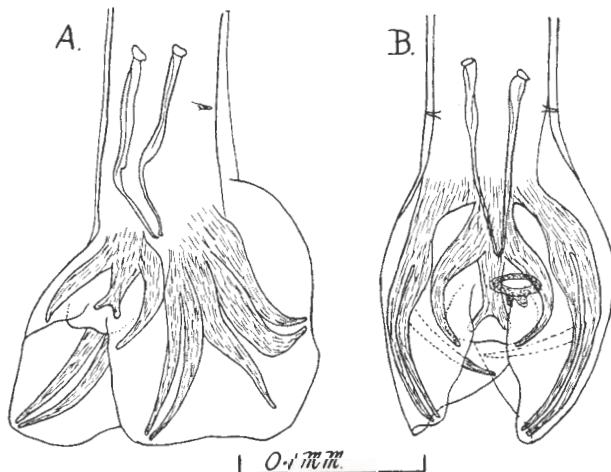


Fig. 5.—*Longistrongylus schrenki* sp. nov.
A. Dorso-lateral view of bursa.
B. Dorsal view of bursa.

Affinities.—The nature of the spicules, dorsal and externo-dorsal rays of the above-described species is very similar to *L. sabie* (Mönnig, 1932); this latter species, however, differs in that it has slightly longer spicules, the distal portions of the postero- and medio-lateral rays are divergent so that the tips of the three lateral rays

are more or less equidistant from one another, the externo-dorsal ray is distinctly elbowed, the dorsal ray does not support a separate dorsal bursal lobe separate from and lying ventral of the dorsal portions of the lateral lobes, and a cuticular flap in the region of the vulva is absent. The nature of the dorsal ray distinguishes this species from the remaining two species of this genus namely *L. meyeri* le Roux, 1931 and *L. albifrons* (Mönnig, 1931) in which species the dorsal ray is split to its root.

Specific Diagnosis.—Trichostrongylinæ reaching a length of seven mm. in the males and nearly nine mm. in the females. Head with very slight cephalic swelling. Dorsal ray stout and bidigitate, supports a separate bursal lobe lying inside lateral lobes. Externodorsal rays large and arched. Postero- and medio-lateral rays parallel, their tips close together. Latero-ventral ray large, slightly arched in its distal half, its tip near to that of ventro-ventral ray. Spicules similar, equal, elbowed ventralwards, 0.144 to 0.15 mm. long, their tips slightly hooked. Telamon ring-shaped with two backwardly directed processes. Vulva in posterior body half about 1.4 mm. anterior of anus. Cuticular flap on right side of body in region of vulva. Tail short and ends in a rounded point. Eggs oval, thinshelled, 0.051 to 0.054 mm. long by 0.027 to 0.03 mm. broad.

Host: *Kobus ellipsiprymnus ellipsiprymnus* (Ogilby). (Bovinae.)

Location: Abomasum.

Locality: Guernsey, district Pilgrims Rest, Eastern Transvaal.

Types in the Onderstepoort Helminthological Collection.

The above species is named in honour of Mr. Schrenk, Manager of the African and European Investment Co. Estates, through whose kindly services the above material was obtained.

Paracooperia raphiceri sp. nov.

Material available: seven males and fifteen females, all mature.

(These were the only helminths collected from scrapings of the duodenal mucosa.)

Length: males: 4.3 to five mm., females: 4.9 to six mm.

Breadth: males: about 0.88 mm., females: 0.09 to 0.11 mm.

Specimens somewhat shrunken and kinked. Colour reddish. Head inflated and shows transverse striations; inflation 0.03 to 0.033 mm. across by 0.033 mm. long in males, and 0.033 to 0.036 mm. across by 0.036 mm. long in females. Transverse striations on body very faint. Ten longitudinal lines extend through length of body, striations more evident on these lines and gives them a pectinate appearance. Cephalic papillae small and consist of the usual two larger lateral papillae and four smaller submedian papillae. Cervical papillae not seen. Lateral alae absent. Mouth small, circular and terminal. Oesophagus straight and increases in diameter posteriorwards; in males 0.32 to 0.33 mm. long by 0.02 to 0.024 mm. thick at its anterior end and 0.04 to 0.042 mm. thick at

its posterior end; in females it is 0.324 to 0.36 mm. long by 0.02 to 0.025 mm. thick at its anterior end and 0.039 to 0.042 mm. thick at its posterior end. Nerve ring about 0.10 mm. from front in both sexes and excretory pore is just slightly posterior to it.

Female.—Body attenuated towards both extremities from about level of vulva where body is thickest. Tail 0.105 to 0.12 mm. long and tapers uniformly to end in a slightly obtuse point. Vulva in posterior body-fifth, 0.76 to 1.03 mm. anterior of anus; consists of transverse slit, about 0.05 mm. across, with thickened lips and only slightly protuberant. Vagina short and transverse. Ovejectors divergent, their combined lengths 0.38 to 0.43 mm. by 0.054 to 0.06 mm. thick. Uteri divergent. Eggs oval and thin-shelled, 0.048 to 0.051 mm. long by 0.03 to 0.033 mm. thick.

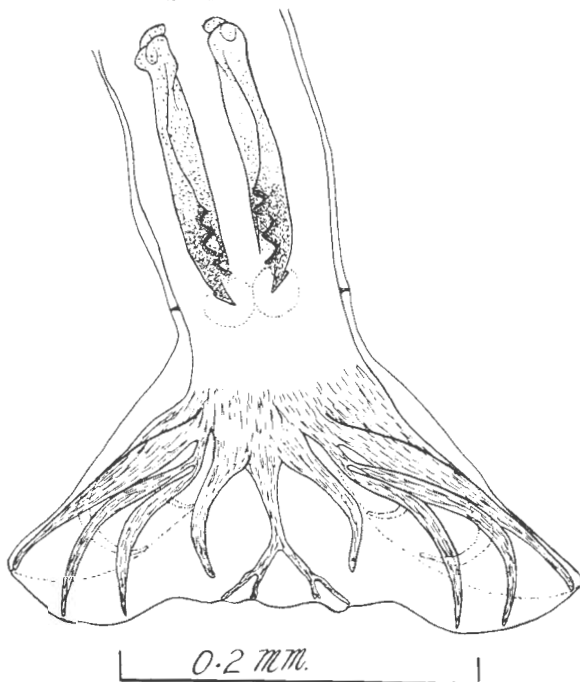


Fig. 6.—*Paracooperia raphiceri* sp. nov.
Dorsal view of bursa.

Males.—Body attenuated anteriorly only. Bursa slightly spread out with rays typical for genus (Fig. 6). Spicules of same type to that found in other members of genus; length (including vesicular alae at their tips) 0.171 to 0.192 mm.; number of serrations on each middorsal branch was four in all the seven males; distal extremity of each spicule somewhat spear-shaped with tip directed obliquely posteriorwards and inwards and not transverse as in genotype. Inner surface of bursa studded with minute tubercles which are largest just dorsal of the small genital cone. Prebursal papillae small. Gubernaculum and telamon absent.

Affinities.—The nature of the bursal rays and spicules easily places this species in the above genus. It differs from the three

known species in that the female is not provided with a linguiform process overlapping the vulva. Its closest relative is the genotype—*P. serrata* (Mönnig, 1931)—from which species it differs however by being much smaller and in having much shorter spicules the tip or “foot” of which is not transverse.

Specific Diagnosis.—Trichostrongylinae reaching a length of five mm. for the males and six mm. for the females. Body reddish. Ten longitudinal lines on body. Vulva 0.76 to 1.0 mm. anterior of anus. Ovejectors and uteri divergent. No linguiform process present. Eggs 0.048 to 0.051 mm. long by 0.03 to 0.033 mm. thick. Bursal rays typical for genus. Spicules short, equal and similar, 0.17 to 0.192 mm. long and dorsal branch of each has four serrations. Terminal or “foot” portion of spicules directed obliquely backwards and inwards.

Host: *Raphicercus* sp. (Bovinae).

Location: Duodenum.

Locality: Guernsey, district Pilgrims Rest, Transvaal.

Types in the Onderstepoort Helminthological Collection.

Longistriata (Longistriata) capensis sp. nov.

Available material: several males and females.

Length: males: 5 to 5.4 mm.; females: 8 to 8.3 mm.

Breadth: males: 0.09 to 0.1 mm.; females: 0.1 to 0.12 mm.

Body red and coiled in a loose spiral, with 12 longitudinal ridges of which the two lateral are larger, forming longitudinal alae 0.033 to 0.035 mm. wide; transverse cuticular striation present, greatly developed on ridges. Cephalic extremity inflated, inflation 0.057 to 0.06 mm. long by 0.045 to 0.048 mm. wide in the males and 0.066 to 0.069 mm. long by 0.051 to 0.057 mm. broad in the females; separated from rest of body by annular constriction. Mouth simple, surrounded by six circumoral very small papillae. Cervical papillae small, symmetrical, sometimes protruding slightly above lateral alae; 0.3 to 0.312 mm. from anterior end in males and 0.315 to 0.36 mm. in females. Oesophagus straight and thicker posteriorly; 0.43 to 0.444 mm. long in the males and 0.47 to 0.51 mm. long in the females; their anterior and posterior diameters are for the males and females respectively 0.027 to 0.03 and 0.051 to 0.054 mm. and 0.032 to 0.034 mm. and 0.051. Nerve ring 0.195 to 0.22 mm. from anterior end in males and 0.10 to 0.204 mm. in the females. Excretory pore at level of cervical papillae or just behind them.

Vulva towards posterior end of body, 0.15 to 0.17 mm. anterior of anus (Fig. 7 B). Ovejector 0.228 to 0.252 mm. long by 0.072 to 0.078 mm. in diameter. Single uterus with large oval and thin-walled eggs measuring 0.084 to 0.09 mm. long by 0.051 to 0.06 mm. thick. Tail short 0.048 to 0.051 mm. long, conical and its tip has several very small rugosities of which the posteriormost is slightly bifid.

Bursa of male inrolled, and appears to be symmetrical; deeply indented between branches of dorsal ray (Fig. 7 A). Ventral rays arise from common stem, which originates from common stem of lateral rays. Ventral rays fairly closely apposed and some distance from lateral rays, their tips divergent; latero-ventral thicker than ventro-ventral and reaches edge of bursa. Antero-lateral and medio-lateral rays closely apposed for their greater length, their tips divergent; antero-lateral bent ventralwards and thicker than other rays; postero-lateral ray arises from medio-lateral ray about two-thirds of its distance from its base; it is curved dorsalwards; tips of all the lateral rays do not reach margin of bursa. Dorsal ray large, split for about one-third of its length and each branch terminates in two smaller and diverging branches, the inner being smaller and reaching edge of bursa, the outer longer and its tip slightly recurved

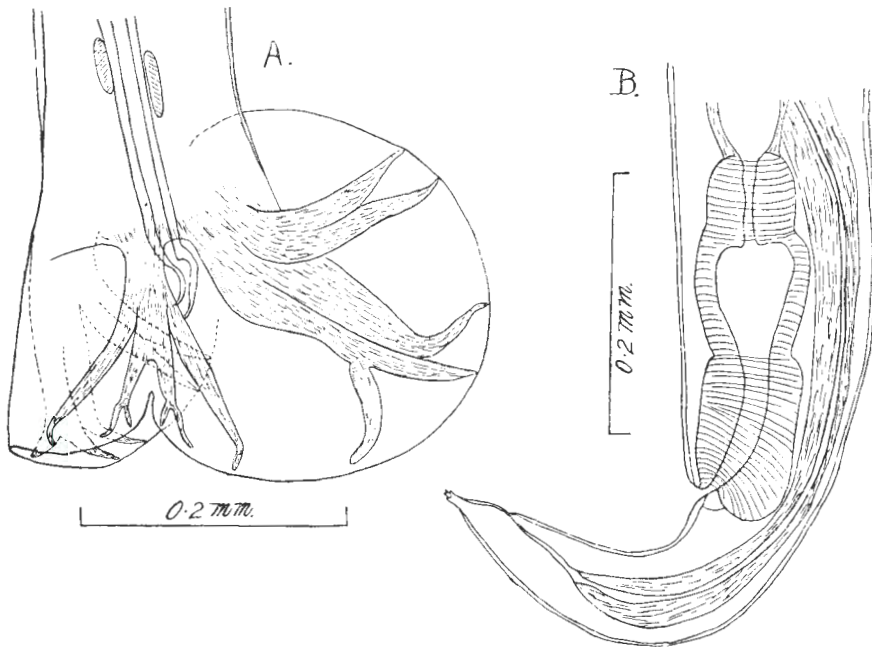


Fig. 7. *Longistriata (L.) capensis* sp. nov.

A. Dorso-lateral view of bursa.

B. Lateral view of posterior extremity of female.

and not reaching edge of bursa. Externo-dorsals arise at same level from stem of dorsal ray at about one-quarter of its distance from its base, are more or less straight except for their tips which are bent dorsalwards and do not reach edge of bursa. Lateral bursal lobe 0.28 mm. long by 0.25 mm. broad. Prebursal papillae absent. Spicules equal or very slightly sub-equal, straight, except for their tips, and dark brown in colour, 0.336 to 0.36 mm. long by 0.012 mm. thick at their proximal ends; they are alate except for their anterior quarter; tip of left spicule bent, that of right spicule sickle-shaped. Gubernaculum present, dark brown and tubular, 0.042 mm. long. Genital cone small and inconspicuous.

Affinities.—The nature of the spicular tips and the disposition of the bursal rays together differentiate this species from all the known members of this genus. The spicular tips show some resemblance to those of *L. travassosi* Lent and de Freitas, 1937 and *L. norvegica* Dikmans, 1935, but in these species both the spicules have somewhat sickle-shaped tips, besides the disposition of the bursal rays of these two species also differ from that of the writer's species.

Specific Diagnosis.—Viannaiinae. Small red worms coiled in a loose spiral. Twelve longitudinal ridges of which the two lateral are enlarged to form lateral alae up to 0.035 mm. wide. Vulva near anus; tail of female short and conical and its tip carries small tubercles. Bursa apparently symmetrical; ventral rays have common stem and close together, their tips divergent; lateral rays apposed for their greater portion, antero-lateral the thickest; postero-lateral arises from medio-lateral and is bent dorsalwards. Dorsal ray large, bifurcate, branches with diverging bidigitate tips. Externo-dorsals larger, straight except for their tips and arise at some level from stem of dorsal ray. Spicules alate, apparently equal, 0.336 to 0.36 mm. long, tip of left spicule bent, that of right sickle-shaped; Gubernaculum present.

Host: *Rhabdomys pumilio vittatus* (Wagn.). (Murinae.)

Location: Small intestine (Ileum).

Locality: Jonkershoek, Stellenbosch.

Types in the Onderstepoort Helminthological Collection.

Longistriata (Longistriata) bathyergi sp. nov.

Material available: five males and three females, all mature.

Length: males: 4.6 to 5.5 mm.; females: 6.0 to 6.96 mm.

Breadth: males 0.12 to 0.14 mm.; females: 0.132 to 0.144 mm.

Body red and irregularly coiled, attenuated anteriorly; maximum thickness of males slightly anterior of bursa, in females at level of vulva. Cuticle of cephalic extremity inflated (Fig. 8 A), showing transverse annulations in its posterior half; inflation 0.081 mm. long in males by 0.039 to 0.044 wide; in females length 0.087 to 0.09 mm. by 0.042 mm. wide. Body cuticle not inflated and raised into 12 faint longitudinal ridges; transverse striation on body very faint. Cervical alae absent. Cervical papillae not seen, apparently absent. Mouth small, circular and terminal, leads into minute buccal capsule with cuticular wall, wall converging anteriorly. Oesophagus straight, increases slightly in thickness posteriorly, 0.306 to 0.318 mm. long in males by 0.022 to 0.024 mm. thick at anterior end and 0.03 mm. thick at posterior end; in females these measurements are respectively 0.318 to 0.324 mm. long by 0.021 to 0.024 and 0.036 to 0.039 mm. thick at its anterior and posterior ends. Excretory pore minute, situated 0.06 to 0.075 mm. posterior of oesophagus. Nerve ring not definitely located.

Female.—Vulva situated near posterior end, 0.1 to 0.12 mm. anterior of anus; non-protuberant. Vagina short and transverse. Ovejector large and directed anteriorly, 0.24 to 0.27 mm. long by

0·078 to 0·09 mm. thick. Uterus directed anteriorly. Eggs oval, thin-shelled, smooth and morulated *in utero*, 0·096 to 0·102 mm. long by 0·056 to 0·06 mm. thick. Tail (Fig. 8 B) short and conical, 0·0039 to 0·0045 mm. long, with somewhat truncated tip bearing dorsally a short spike about 0·004 mm. long.

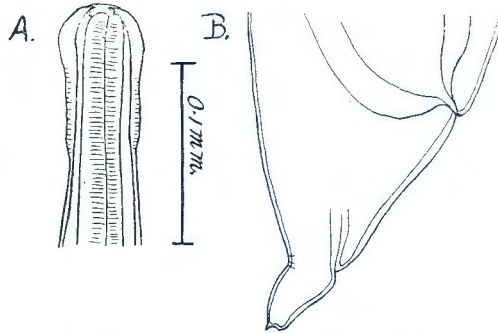


Fig. 8.—*Longistriata (L.) bathyergi* sp. nov.
A. Cephalic extremity.
B. Tail of female.

Male.—Bursa ample with large and slightly inrolled lateral lobes; dorsal lobe small and notched (Fig. 9 A and B). Ventral rays arise from common stem, greatly divergent, tips almost reach margin of bursa; ventro-ventral ray slender. Lateral rays have common

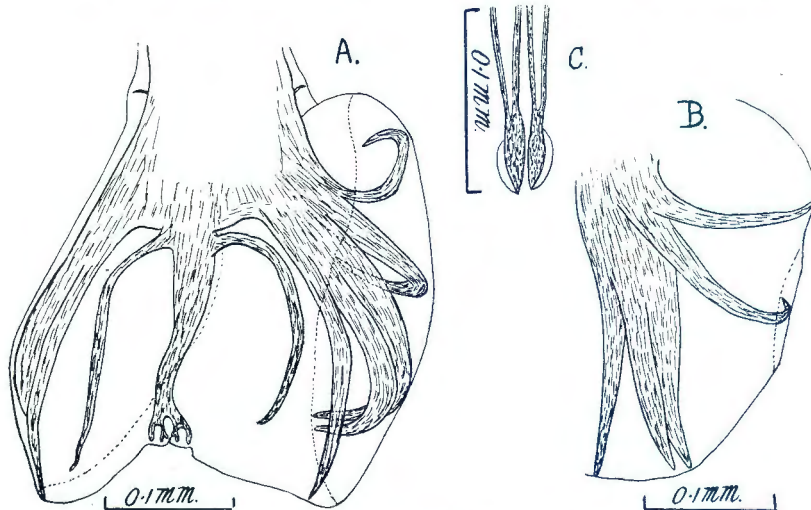


Fig. 9.—*Longistriata (L.) bathyergi* sp. nov.
A. Dorsal view of bursa.
B. Lateral lobe and rays.
C. Tips of spicules.

stem; antero- and medio-yateral rays stouter than other rays, parallel and almost reach margin of bursa, their tips slightly divergent; postero-lateral ray diverges from medio-lateral ray, its tip reaches margin of bursa. Dorsal ray large, its terminal portion divides

twice to give rise to four small branches, the inner two of which are bidigitate; these terminal digitations support the small dorsal lobe. Externo-dorsal rays slender, arched with slightly asymmetrical origin from near base of dorsal ray; their tips terminate some distance from edge of bursa. Prebursal papillae small. Spicules equal and similar, 0.696 to 0.702 mm. long by 0.015 mm. thick at their base; their tips (Fig. 9 C) slightly enlarged and alate; thin alae, about 0.012 mm. broad, extend along inner edge of each spicule for practically its whole length. A slight dorsal thickening of cuticle of spicular canal may represent an indefinite gubernaculum.

Affinities.—Because of the length of the spicules, being more than three times the body breadth, the above species falls into the sub-species *Longistriata* Schulz, 1926. Four species of this sub-species have spicules more or less 0.7 mm. long, namely *L. nematodiriformis* (Trav., 1918) (Spicules 0.78 mm. long), *L. travassosi* Lent and de Freitas, 1938 (Spicules 0.67 to 0.62 mm. long), *L. didelphis* Trav., 1911 (Spicules 0.64 to 0.8 mm. long) and *L. securati* Trav. and Darr., 1929 (Spicules 0.675 mm. long). The species *L. leporis* Schulz, 1931, *L. moennigi* (Baylis, 1928) and *L. zetta* Trav., 1937 have spicules longer than 0.8 mm. Of the first-named four species only *L. nematodiriformis* has the dorsal ray terminating in six points, but in this species the bursal rays are different to those found in the writer's species. The distribution of the bursal rays in the species described above appears to be very similar to that found in *L. securati*, but differs from it in the termination of the dorsal ray and the post-oesophageal position of its excretory pore.

Specific Diagnosis.—Viannaiinae. Small red worms, irregularly coiled, reaching a length of 5.5 mm. for the males and 7 mm. for the females. Cephalic extremity inflated. Body with 12 small longitudinal ridges. No alae. Excretory pore post-oesophageal. Vulva close to anus. Ovejector large. Tail of female a short truncated cone with minute dorsal spike. Bursa with very small dorsal lobe and large inrolled lateral lobes. Ventral rays greatly divergent. Antero- and medio-lateral rays parallel, their tips only diverging. Postero-lateral ray diverges from medio-lateral ray. Dorsal ray large, its posterior sixth split and terminating in six points. Externo-dorsal rays rise slightly asymmetrically from posterior sixth of dorsal ray. Spicules similar, equal, simple and alate, their tips enlarged and alate; 0.696 to 0.702 mm. long. Gubernaculum indefinite.

Host: *Bathyerigus suillus suillus* (Schreber). (Bathyerigidae.)

Location: Duodenum.

Locality: Strandfontein, Capetown.

Types in Onderstepoort Helminthological Collection.

Heligmonella spira MÖNNIG, 1927.

Travassos (1937), in his monograph of the Trichostrongylidae, places the species of the genus *Longistriata* in several sub-genera; one of these—*Heligmonella*—is characterised chiefly by relatively short spicules (their lengths about twice the width of the body) and

has as type *Longistriata spira* (Mönnig, 1927). The other species of this sub-genus are *L. dubia* (Travassos, 1921), *L. brevispicula* Lent and de Freitas, 1936 and *L. argentina* de Freitas, Lent and Almeida, 1937. Mönnig gives the length of the spicules of his species as 0.41 mm. (about four times the body width), but Travassos, basing his observations on Mönnig's figures, doubts whether this measurement is correct and concludes that the spicule length is only about twice the width of the body, i.e., about 0.2 mm. The writer has re-examined Mönnig's types and finds that Mönnig's figure is correct; their apparent shortness in the figure being due to the fact that they are not straight but wavy in one plane so that they appear to be somewhat straight and shorter when viewed at the angle from which they are drawn. It follows, therefore, that Mönnig's species cannot be associated in the same sub-genus with the three species mentioned above, but must be transferred to the sub-genus *Longistriata*. As the sub-genus now loses its type the name also lapses and it is necessary to create a new sub-genus having a different type for the remaining three species; for this sub-genus the writer proposes the name *Brevispiculoides* with type *Longistriata (Brevispiculoides) brevispicula* Lent and de Freitas, 1936 from *Agouti paca* (L) characterized by having relatively short spicules whose length is only about twice the body width. The other two species are *L. (B.) dubia* (Travassos, 1921) and *L. (B.) argentina* de Freitas, Lent and Almeida, 1937.

Heligmonoides stellenboschius sp. nov.

Available material: two males and one female.

Length: males: 5.2 and 5.3 mm.; female: 6.9 mm.

Breadth (including alae): males: 0.11 and 0.12 mm.; female: 0.12 mm.

Body red and coiled in a loose spiral; has transversely striated cuticle and 12 to 15 longitudinal ridges on which the striations are strongly developed; ridge of left side enormously developed to form a broad alae (Fig. 10) reaching a breadth of 0.36 mm. Cephalic extremity has inflated cuticle 0.06 to 0.066 mm. long by 0.045 mm. wide, inflation separated from rest of body by annular constriction. Mouth simple and surrounded by six minute papillae. Oesophagus straight and increases in diameter posteriorly: 0.336 and 0.348 mm. long in the males by 0.021 and 0.024 mm. thick at its anterior end and 0.036 and 0.034 mm. thick at its posterior end respectively. In female oesophagus is kinked, but is about 0.35 mm. long, by 0.024 mm. and 0.033 mm. thick at its anterior and posterior ends. Nerve ring 0.06 mm. from anterior end in males, not seen in female. Cervical papillae absent. Excretory pore opposite base of oesophagus. Diameter of head, excluding inflation is 0.027 and 0.028 in the males and 0.028 mm. in the female.

Vulva towards posterior end of body, 0.336 mm. from anus (Fig. 11); eyejector 0.168 mm. long by 0.063 mm. thick, directed anteriorly; single uterus passes straight up body and is filled with oval thin-walled eggs measuring 0.07 to 0.072 mm. long by 0.042

to 0.045 mm. broad. Tail short and conical ending in a bluntly rounded tip; its length 0.048 mm. Cuticle at posterior extremity may be much inflated dorsally.

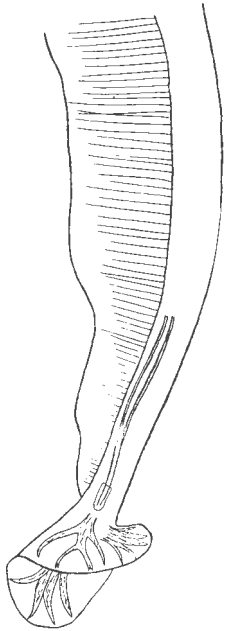


Fig. 10.

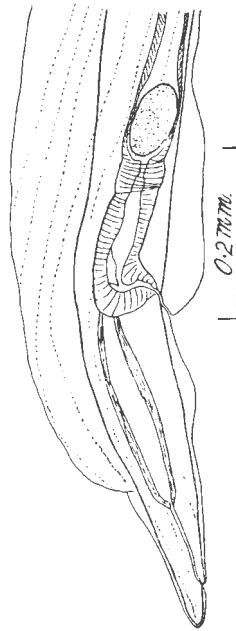


Fig. 11.

Fig. 10.—*Heligmonoides stellenboschius* sp. nov.
Posterior extremity of male showing enlarged lateral alae.

Fig. 11.—*Heligmonoides stellenboschius* sp. nov.
Posterior extremity of female.

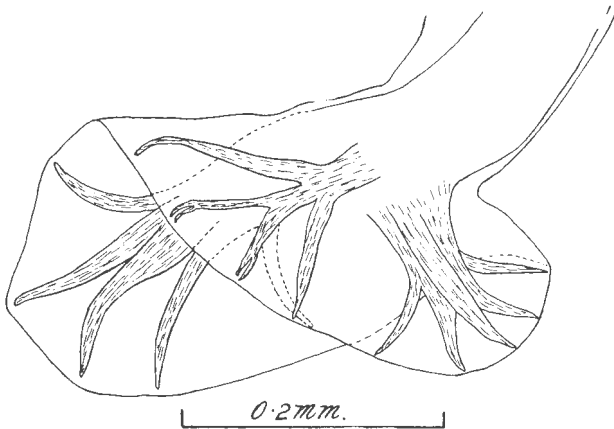


Fig. 12.—*Heligmonoides stellenboschius* sp. nov.
Dorsal-lateral view of bursa.

Bursa of male very asymmetrical (Fig. 12), left lobe very much larger than right; dorsal lobe not separated off from lateral lobes. Rays of left lobe larger than those of right lobe, otherwise they are

occur in the specific phase will react with their own type sera, while those that happen to be in the non-specific phase will agglutinate with a group serum. When a reaction occurs a characteristic flocculation is seen which is readily distinguished from non-specific salt agglutination of Rough variants. Moreover, in a positive test flocculation will occur only in the one drop and not in the other, whereas in the case of salt agglutination clumping will be observed in both. A good hand lens and a dissecting microscope are very useful during the fishing for colonies as well as for the study of the reaction. Colonies that have given a positive reaction are picked, subcultured and studied further.

“ Pure ” type-specific sera can be prepared by inoculating rabbits with 6 to 8-hours old broth cultures of the organism in the specific phase. But as these sera always contain a certain amount of group agglutinin, preliminary absorption of the latter with another *Salmonella* containing the same group phase, but another type phase, is recommended. If *typhi-murium* serum, for example is absorbed with a mixture of *paratyphi-B* and *cholera-suis*, the group agglutinins will be removed leaving a “ pure ” type serum-dilution. If the organisms used for the absorption contain the same somatic antigen (e.g. *paratyphi-B* and *typhi-murium*) the “ O ” agglutinins will also be removed; thus preventing them from interfering with the reaction. The “ pure ” type serum will contain only type agglutinins, but neither “ O ” nor group agglutinins. For routine diagnosis a set of representative type-specific sera should be available, e.g. *paratyphi-B*, *typhi-murium*, *cholera-suis*, *newport*, *thompson*, *potsdam*, *bovis-morbificans*, *typhi*, *enteritidis* and *L2* sera. If a suspected colony gives a characteristic reaction with only one of these sera, a preliminary diagnosis is made and the culture obtained from it is studied further by means of agglutination absorption tests. If group serum is used, colonies occurring in the group phase will be detected. Occasionally more than one type *Salmonella* is present in the culture (mixed infection), but the second organism is not likely to be missed as long as a reasonable number of colonies is examined.

Sometimes, when diphasic *Salmonellas* are studied, there may be some difficulty in demonstrating the existence of specific-phase colonies, if colonies in the group phase predominate. On repeated sub-cultivation of the latter, however, an occasional colony occurring in the specific phase may be detected. But in cases like European *choleraesuis*, where the organism occurs permanently (?) in the group phase, phase dissociation will not readily take place.

For the acceleration of phase dissociation Scott (1934) recommends the use of broth containing approximately 15 per cent. group serum. Group colonies cultured in this medium yield a culture with a clear supernatant fluid and a dense deposit after 18 hours' incubation. On repeated sub-cultivation in group serum-broth, a turbid supernatant fluid may ultimately be obtained. If this turbid culture is now plated, most of the colonies resulting will be in the specific phase. Sometimes as many as 10 or 12 passages may be necessary before the phase dissociation becomes apparent.

With regard to *Heligmonina magna* Baylis, 1928, we do not agree with Travassos (1937) that it should be placed in the genus *Heligmonoides* Baylis. It appears to occupy a position intermediate between these two genera; the mode of origin of the externo-dorsal rays is similar to that found in *Heligmonina praomyos* Baylis, 1928, but the symmetrical dorsal ray allies it to the species of the genus *Heligmonoides*. In consequence we propose creating a separate sub-genus—*Paraheligmonina*—of the genus *Heligmonina*, for its reception with the following *subgeneric diagnosis*: Similar to *Heligmonina* (*Heligmonina*) as redefined by Travassos, 1937, except that the dorsal ray is symmetrical.

Type: *Heligmonina* (*Paraheligmonina*) *magna* (Baylis, 1928).

Syn. *Heligmonina magna* Baylis, 1928.

Heligmonoides magna (Baylis, 1928). Trav. 1937.

Heligmospiroides spira n.g. n.sp.

Available material: about two dozen males and females.

Length: males: about 6 mm.; females: about 7 mm.

Breadth: males: above bursa 0·096 to 0·102 mm.; females: 0·09 tot 0·126 mm.

The lengths are only approximate as the writer was not able to unroll and straighten any of the specimens without breaking them. The breadths are exclusive of the breadth of the alae.

Body red and tightly rolled in a corkscrew-like spiral, with about 12 longitudinal ridges; ridges of lateral lines form alae, that of the left enormously enlarged, up to 0·06 mm. wide in the males and up to 0·09 mm. wide in the females and extend through length of body; right alae may reach a width of 0·024 mm. Transverse cuticular striations present and indistinct, except on longitudinal ridges, where they are very conspicuous. Transverse markings conspicuous on alae. Cuticle of cephalic extremity inflated, inflation 0·06 to 0·066 mm. long by 0·036 to 0·38 mm. broad in males and 0·06 to 0·072 mm. long by 0·04 to 0·042 mm. broad in females; separated from rest of body by annular constriction. Mouth simple and surrounded by six minute circumoral papillae. Cervical papillae appear to be absent. Oesophagus straight and thickens gradually posteriorly; 0·018 to 0·021 mm. thick at anterior end and 0·036 to 0·039 mm. thick at posterior end in males and 0·021 to 0·025 mm. thick at anterior end and 0·042 to 0·051 mm. thick at posterior end in females; total length 0·3 to 0·336 mm. in males and 0·354 to 0·402 mm. in females. Nerve ring situated about 0·17 mm. from anterior end. Excretory pore towards posterior end of oesophagus, just anterior, at level, or just posterior of hind end of oesophagus.

Vulva a transverse slit towards posterior end of body 0·162 to 0·252 mm. anterior of anus. Single ovejector 0·195 to 0·21 mm. long by 0·054 to 0·06 mm. broad; directed anteriorly. Single uterus directed anteriorly with relatively few large eggs, which are thin-walled and oval. Eggs measure 0·078 to 0·084 mm. long by 0·042

to 0.048 mm. broad. Tail short and bluntly conical 0.047 to 0.058 mm. long. Cuticle round posterior end may be much inflated dorsally.

Bursa (Fig. 13) of male inrolled and closed anteriorly; asymmetrical, consisting of large left lateral lobe, smaller right lateral lobe and very small dorsal lobe. Ventral rays have common stem but are widely divergent; ventro-ventral ray thin and curved inwards and ventralwards, sinuous towards its tip which does not reach margin of bursa; latero-ventral ray thicker, gently curved ventralwards and reaches edge of bursa. Lateral rays have common stem and those of left side different from those of right side; on right side antero- and medio-lateral rays thick, apposed for their proximal half and divergent for their distal half; postero-lateral arises from base of medio-lateral, is thinner and gently curves dorsalwards; distance between tips of these two rays about twice that between the medio- and antero-lateral rays. On left side ventro- and medio-lateral rays straight, apposed for practically their whole length, their tips only being slightly divergent; former ray being the stoutest ray of bursa; postero-lateral ray arises from base of medio-lateral ray, is fairly stout and curves dorsalwards. Externodorsal rays asymmetrical in origin from dorsal ray, that of left side arising near base of dorsal ray and that of right arising about half way up stem of dorsal ray. Dorsal ray split in its posterior quarter and its branches are bidigitate. Prebursal papillae absent.

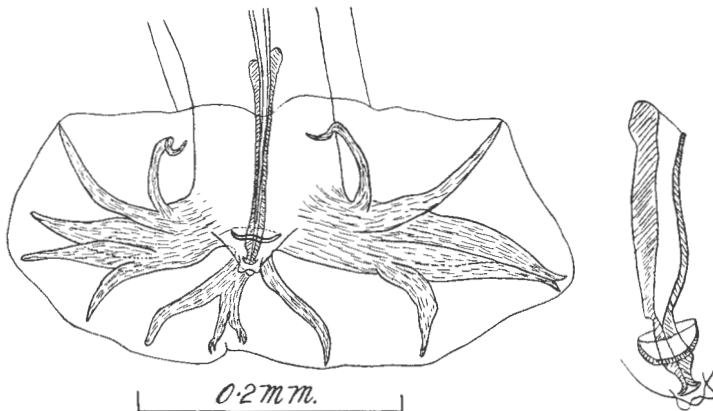


Fig. 13.—*Heligmospiroides spira* g. and sp. nov.
Ventral view of spread out bursa.

Fig. 14.—*Heligmospiroides spira* g. and sp. nov.
Ventral view of gubernaculum.

Spicules relatively long, equal, similar and simple, ending in fine points, 0.59 to 0.61 mm. long and 0.009 mm. thick at their base. Gubernaculum (Fig. 14) well developed 0.114 to 0.138 mm. long, of complex structure and extending to posterior end of genital cone, which is small.

Affinities.—The enlarged left lateral alae, the asymmetrical bursa with an enlarged left lobe and asymmetrical dorsal ray places the above species near those of the genera *Heligmonina* Baylis, 1928,

and *Trichobaylisia* Travassos, 1937; it also agrees with the latter species in the asymmetrical origin of the externo-dorsal rays. It differs, however, from both these genera in that the lateral rays are not similar on both sides and the gubernaculum is more complicated. In consequence, a new genus *Helignospiroides* is created for its reception with the following *generic diagnosis*: Viannaiinae with red and tightly coiled body, having inflated cephalic extremity, longitudinal ridges and enlarged left alae. Vulva towards posterior end of body; bursa asymmetrical, left lobe larger with antero- and medio-lateral rays straight and adjacent on left lobe, and divergent on right lobe. Spicules relatively long, equal, similar and thin. Gubernaculum complicated. *Type*: *H. spira* sp. nov.

Specific Diagnosis.—Small worms, males about 6 mm. long and females about 7 mm. long. About 12 longitudinal ridges; left alae much broader than right. Spicules 0.59 to 0.61 mm. long. Otherwise as for generic diagnosis.

Host: *Rhodomys pumilio vittatus* (Wagn.). (Murinae.)

Location: Duodenum.

Locality: Jonkershoek, Stellenbosch.

Types in Onderstepoort Helminthological Collection.

Theileriana breviesophagus sp. nov.

Material available: Three males and 13 females.

Length: Males: 11.2, 12.2 and 12.5 mm.; females: 12.4 to 16 mm.

Breadth: Males: 0.42, 0.5 and 0.48 mm.; females: 0.52 to 0.6 mm.

Body straight, except for posterior end which is bent ventrally in both sexes, attenuated anteriorly only. Cuticle transversely striated by very coarse striations, 0.02 to 0.037 mm. apart. Mouth collar constricted off from rest of body, collar 0.084 to 0.09 mm. wide by 0.024 mm. high in males, about 0.09 mm. wide and 0.025 mm. high in females. Four submedian cephalic papillae project beyond cuticle and curve inwards; each has small inner branch not piercing cuticle. Lateral cephalic papillae not piercing cuticle. Cervical papillae post-oesophageal, 0.61 to 0.624 mm. from anterior end in males and 0.66 to 0.73 mm. from anterior end in females. Excretory pore post-oesophageal, 0.06 to 0.1 mm. anterior of cervical papillae.

Buccal capsule circular; walls about 0.007 mm. thick; external diameter of capsule 0.04 to 0.048 mm. by 0.012 to 0.014 mm. deep in males and 0.045 to 0.048 mm. wide by 0.02 mm. deep in females. Elements of leaf crown about 30, do not project beyond anterior level of mouth collar (28 elements counted in end-on view of decapitated female individual); tips appear to be simple. Oesophagus (Fig. 15 A and B) constricted in anterior half and hour-glass shaped, relatively short and similar in both sexes; 0.264 to 0.276 mm. long in males with maximum thickness of 0.098 to 0.124 mm.; in females length varies from 0.266 to 0.284 mm. with maximum

thickness of 0·13 to 0·132 mm.; constriction divides oesophagus roughly into ratio of 9:13 in males and 9:14 in females. Anterior face of oesophagus provided with small denticles, not very distinct in females. Dorsal gutter well developed in females, not seen in males. Nerve ring situated in oesophageal constriction.

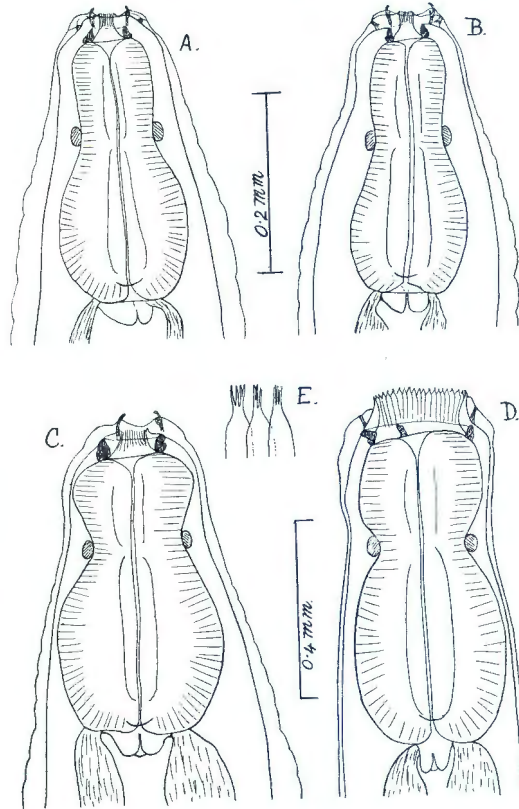


Fig. 15 A and B.—*Theileriana breviesophagus* sp. nov.

- A. Anterior extremity of male.
- B. Anterior extremity of female.

Fig. 15 C, D and E.—*Theileriana brachylaima* (V. Linst.).

- C. Anterior extremity of male.
 - D. Anterior extremity of female.
 - E. Elements of leaf crown.
- (A B and C drawn to same scale.)

Vulva approximated to posterior end of body, 0·09 to 0·168 mm. anterior of anus (Fig. 16); protuberant and leads into long vagina about 10 mm. long; ovejectors divergent, their combined length about 1·25 mm. by 0·15 mm. thick; posterior uterus recurves immediately and passes forwards more or less parallel to anterior uterus. Eggs large, oval, thin-walled and embryonated *in utero*; 0·172 to 0·18 mm. long by 0·09 to 0·096 mm. thick. Tail short and conical, 0·12 to 0·15 mm. long, has terminal pointed portion or spike. Terminal portion of body bent ventralwards. No cuticular collar-like fold at posterior extremity of any of the females.

Bursa (Fig. 17) trilobed with distinct and somewhat hemispherical dorsal lobe. Bursal rays as for *T. brachylaima* (v. Linst.). Genital cone large, about 0.29 mm. long. Spicules long, thin and simple, terminate in fine points, 0.29 to 0.312 mm. long. Gubernaculum saddle-shaped, well cuticularized, about 0.12 mm. long. Small prebursal papillae present. Terminal portion of body strongly hooked ventralwards.

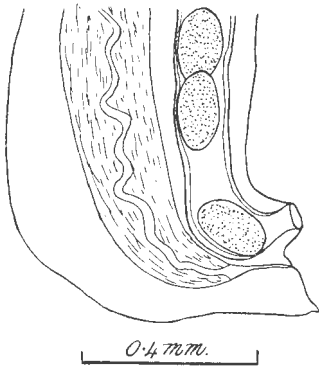


Fig. 16.

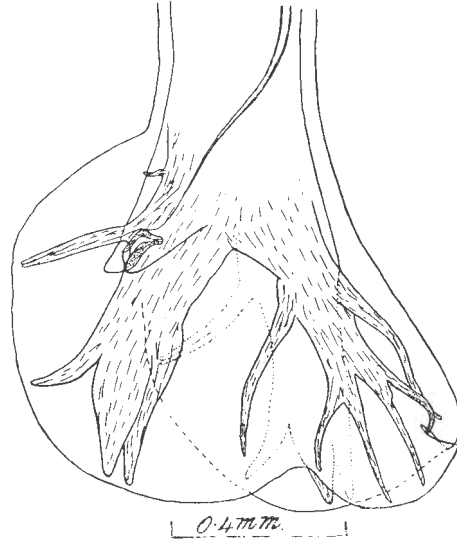


Fig. 17.

Fig. 16.—*Theileriana breviesophagus* sp. nov.
Posterior extremity of female.

Fig. 17.—*Theileriana breviesophagus* sp. nov.
Dorso-lateral view of bursa.

Affinities.—The above-described species forms the third to be assigned to this genus. The genotype *T. brachylaima* (v. Linst., 1901) differs from the above in that it is much larger; in that the oesophagus in both sexes is relatively much larger and robuster and its constriction is more anterior in position; and in that the difference in size of the oesophagus in the two sexes is very marked, being about twice as long in the females as in the males. The second species *T. denticulata* Baylis, 1936, differs in being smaller in size; in having the oesophagus of the females smaller than that of the males; and in that the spicules are much shorter, only reaching a length of 0.17 mm. The eggs in the writer's species are also much larger than in the two previously described species.

Specific Diagnosis.—Trichoneminae reaching a length of 12.5 mm. in the males and 16 mm. in the females. Single leaf crown of about 30 elements with apparently simple points (frayed in genotype, Fig. 15 E). Buccal capsule circular. Oesophagus in two sexes of approximately same size and shape, its constriction more posterior than in genotype; 0.264 to 0.276 mm. long in males and 0.266 to 0.284 mm. long in females. Vulva near anus. Ovejectors divergent. Uteri parallel. Eggs large, 0.172 to 0.18 mm. long by 0.09

to 0.096 thick. Tail short with terminal spike. No cuticular collar at posterior end of female. Bursa trilobed with distinct hemispherical dorsal lobe. Bursal rays as for genotype. Spicules slender, equal and similar, 0.29 to 0.312 mm. long. Gubernaculum saddle-shaped.

Host: *Procapra capensis* subsp. (Hyracoidea.)

Location: Colon.

Locality: Jonkershoek, Stellenbosch.

Types in the Onderstepoort Helminthological Collection.

Heterakis macrospiculum sp. nov.

Material available: two males and six females, all mature.

Length: Males: 18.6 and 19.8 mm.; females: 25 to 33 mm.

Breadth: Males: 0.84 and 0.82 mm.; females: 0.93 to 1.1 mm.

Body creamy yellow in colour, attenuated towards both extremities; anterior extremity generally bent ventralwards. Lateral alae extend along whole length of body originating about 0.4 to 0.5 mm. from anterior end and about 0.03 mm. broad. Cuticle transversely striated. Three equal lips each 0.03 mm. high and each with small dome-like papilla. Mouth simple; no teeth. Oesophagus of usual shape and structure, 1.30 and 1.37 mm. long in males and 1.4 to 1.6 mm. long in females; its bulb 0.31 mm. wide and 0.25 mm. long in males and 0.37 mm. wide and 0.26 mm. long in females. Excretory pore 0.68 mm. from anterior end in males and 0.7 to 0.72 mm. from anterior end in females. Nerve ring 0.46 and 0.48 from front in males and 0.5 to 0.53 mm. from front in females. No cervical papillae seen.

Female.—Vulva in anterior portion of body at junction of first and second body thirds; slightly protuberant. Vagina long; it reaches a length of 8.5 mm. by 0.2 mm. wide at its junction with the vulva and 0.36 mm. wide at its junction with uteri; it passes backwards and its posterior half has thinner walls and is filled with eggs thus acting as an egg reservoir. Eggs oval, thick-walled, smooth and morulated *in utero*; 0.08 to 0.099 mm. long by 0.063 to 0.066 mm. thick. Tail (Fig. 18) elongate, 1.5 to 1.8 mm. long, tapers uniformly to terminate in bluntly rounded tip with small terminal wart-like knob 0.006 mm. long.

Male.—Caudal extremity of male alate, alae best developed anterior of cloaca. Sucker prominent and circular; its external diameter 0.262 and 0.272 mm., internal diameter 0.138 and 0.136 mm., height 0.096 and 0.102 mm. in two males respectively. Distance between sucker and cloaca 0.162 and 0.138 mm. Tail 0.744 and 0.89 mm. long and terminated by small spike 0.02 and 0.024 mm. long. Caudal papillae show slight irregularities anterior of sucker, not being the same in the two males; 12 pairs appear to be typical number consisting of six large pre-cloacal pairs and six small post-cloacal pairs; pre-cloacal papillae arranged as follows: one pair anterior of sucker, three pairs lateral of sucker and two pairs between sucker and cloaca; post-cloacal papillae consist of three pairs close to cloaca of which

one pair is very lateral, and three pairs on posterior third of tail, one pair being lateral. This is the arrangement in one of the males (Fig. 19); in the other male the arrangement is very similar except that the papillae lateral of the sucker are smaller and there are two and three small papillae anterior of the sucker on the right and left side respectively making a total of 13 and 14 papillae for each of the two sides. Caudal pores small and situated immediately posterior to the second to last caudal papillae. Spicules equal, similar, massive and arched, 1.8 mm. long with maximum thickness of 0.14 and 0.15 mm. in their middle in each male. Gubernaculum absent.

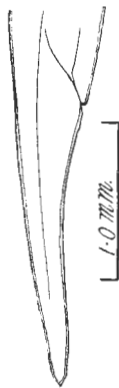


Fig. 18.

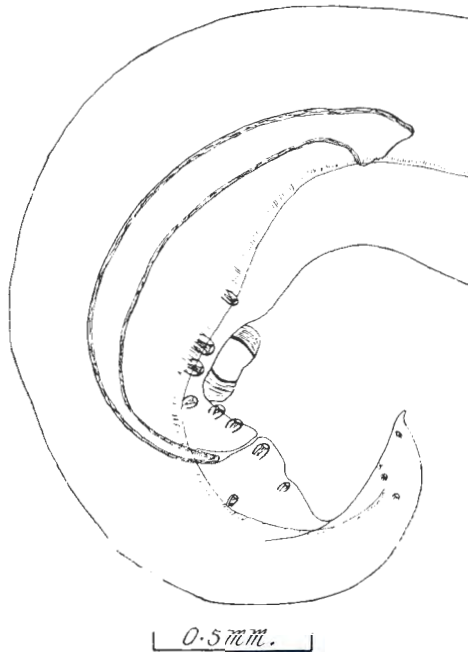


Fig. 19.

Fig. 18.—*Heterakis macrospiculum* sp. nov.
Tail of female.

Fig. 19.—*Heterakis macrospiculum* sp. nov.
Posterior extremity of male.

Affinities.—Four species of this genus have been recorded from Rodents, namely *H. spumosa* Schneider, 1866, *H. dahomensis* Gendre, 1911, *H. gangula* (Lane, 1914) and *H. girardi* (Lane, 1917). Hall (1916) considers the first three to be co-specific and they differ from the writer's species in being much smaller, having only 10 pairs of caudal papillae in the male and the spicules do not reach 0.5 mm. in length. The last-named species differs from the writer's in having 15 pairs of caudal papillae in the male, the spicules, although being of comparable length, have a different structure and the tail of the female terminates in a sharp point.

Specific Diagnosis.—Heterakidae reaching a length of 20 mm. for the males and 33 mm. for the females. General anatomical characters typical for the genus. Vulva at junction of first and second body thirds. Vagina very long, reaching a length of 8.5 mm. Tail elongate, tapers gradually to terminate in bluntly rounded point with wart-like terminal knob. Male tail with 12 or more pairs of papillae of which six pairs are typically pre-cloacal and six pairs post-cloacal and smaller. Spicules robust, equal, similar, non-alate and arched, 1.8 mm. long and 0.15 mm. thick. Gubernaculum absent.

Host: *Batherygus suillus suillus* (Schreber). (Batherygidae.)

Location: Large intestine.

Locality: Strandfontein, Capetown.

Types in the Onderstepoort Helminthological Collection.

RESUMÉ.

In the foregoing pages 10 new species of helminths are described; namely, seven from Rodents, two from Antelopes and one from the Rock Rabbit. These species are placed in nine genera of which two are new, namely *Paralibyostrogylus* for the helminths from the Cane Rat, and *Heligmospiroides* for one of the helminths from Mice. The 10 species are *Paralibyostrogylus vonduvei* gen. and sp. nov., from the Cane Rat; *Longistrogylus schrenki* sp. nov., from the Waterbuck; *Paracooperia raphiceri* sp. nov., from the Steenbuck; *Longistriata* (L.) *capensis* sp. nov., *Heligmonoides stellenboschius* sp. nov., and *Heligmospiroides spira* gen. and sp. nov., from Mice; *Libyostrogylus bathyergi* sp. nov., *Longistriata* (L.) *bathyergi* sp. nov., and *Heterakis macrospiculum* sp. nov., from the Dune Mole; and *Theileriana breviesophagus* sp. nov., from the Rock Rabbit.

It is further shown that the basis on which Travassos (1938) made the species *Heligmonella spira* Mönnig, 1927, the type of his sub-genus *Longistriata* (*Heligmonella*) is incorrect, and that the length of the spicules of this species, as given by Mönnig, is correct. In consequence, Mönnig's species is transferred to the sub-genus *Longistriata* (*Longistriata*). The sub-genus *Longistriata* (*Heligmonella*) lapses as it loses its type, and in its place the sub-genus *Longistriata* (*Brevispiculoides*) is created with *Longistriata* (*Brevispiculoides*) *brevispicula* Lent and de Freitas, 1936, new comb. as type.

Also the species *Heligmonina magna* Baylis, 1928, from *Protoxerus stangeri nigeriae*, is made the type of a new sub-genus—*Paraheligmonina*—of the genus *Heligmonina* Baylis, 1938.

REFERENCES.

- BAYLIS, H. A. (1928). "On a Collection of Nematodes from Nigerian Mammals (chiefly Rodents)." *Parasit.*, Vol. 20, pp. 280-304. Cambridge.
- BAYLIS, H. A. (1936). "Some Parasitic Worms from the British Cameroons." *Ann. Mag. Nat. Hist.*, Ser. 10, Vol. 17, pp. 257-272. London.

- DIKMANS, G. (1935). "New Nematodes of the genus *Longistriata* in Rodents." *Jl. Wash. Ac. Sc.*, Vol. 35, pp. 72-81. Washington.
- DE FREITAS, J. F., LÉNT, H., AND ALMEIDA, J. L. (1937). "Pequena contribuição ao estudo da fauna helminthologica da Argentina (Nematoda)." *Mem. Inst. Osw. Cruz.*, Vol. 32, pp. 195-209. Rio de Janeiro.
- HALL, M. C. (1916). "Nematode Parasities of Mammals of the orders Rodentia, Lagomorpha and Hyracoidea." *Proc. U.S. Nat. Mus.*, Vol. 50, pp. 1-258. Washington.
- KHALIL, M. BEY (1932). "Parasites from Liberia and French Guinea. First Part: Nematoda." *Zeitsch. Parasitk.*, Vol. 4, pp. 431-458. Berlin.
- LANE, C. (1914). "Suckered Round-Worms from India and Ceylon." *Ind. Jl. Med. Res.*, Vol. 2, pp. 655-669. Calcutta.
- LANE, C. (1917). "*Gireterakis girardi* (n.g., n.sp.) and other Suckered Nematodes." *Ind. Jl. Med. Res.*, Vol. 4, pp. 754-765. Calcutta.
- LANE, C. (1923). "Some Strongylata." *Parasit.*, Vol. 15, pp. 348-364. Cambridge.
- LÉNT, H., AND DE FREITAS, J. F. (1936). "Novo parasito de *Agouti paca* (L) (Nematoda, Strongyloidea)." *Mem. Inst. Osw. Cruz.*, Vol. 31, pp. 357-359. Rio de Janeiro.
- MÖNNIG, H. O. (1923). "South African Parasitic Nematodes." *9th and 10th Repts. Dir. Vet. Ed. and Res.*, pp. 435-478. Pretoria.
- MÖNNIG, H. O. (1926). "On a new Physaloptera from an Eagle and a Trichostrongyle from the Cane Rat, with Notes on *Polydelphis quadricornis* and the genus *Spirostrongylus*." *Trans. Roy. Soc. S. Afr.*, Vol. 14, pp. 261-265. Capetown.
- MÖNNIG, H. O. (1931). "Wild Antelopes as Carriers of Nematode Parasites of Domestic Ruminants. Part I." *17th Rept. Dir. Vet. Serv. and Anim. Ind.*, pp. 233-254. Pretoria.
- NAGATY, H. F. (1938). "The Genera *Asymmetricostrongylus* Nagaty, 1932, and *Libyostrongylus* Lane, 1923, and their Relation to the Genus *Trichostrongylus* Looss, 1905." *Liv. Jub. Travassos*, pp. 341-352. Rio de Janeiro.
- TRAVASSOS, L. (1921). "Contribuições para o conhecimento da fauna helminthologica brasileira. XIII Ensaio monografico da familia Trichostrongylidae Leiper, 1909." *Mem. Inst. Osw. Cruz.*, Vol. 13, pp. 5-135. Rio de Janeiro.
- TRAVASSOS, L. (1937). "Revisão da familia Trichostrongylidae Leiper, 1912." *Monogr. Inst. Osw. Cruz.*, No. 1, pp. 1-512. Rio de Janeiro.
- TURNER, M. (1922). "On some Helminth Parasites of an East African Rock Rabbit (*Procapra* sp.)." *Trans. Roy. Soc. Trop. Med. and Hyg.*, Vol. 15, pp. 182-189. London.