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PARASITIC NEMATODES FROM THE BELGIAN CONGO,

by J. H. Schuurmans Stekhoven Jr (Utrecht).

The nematode parasites of vertebrates which Prof. Dr. V. Van Straelen, Director of the « Musée royal d'Histoire naturelle de Belgique » kindly allowed me to study, were collected in the Belgian Congo. These collections were transmitted to the Museum by the « Institut National pour l'Etude agronomique du Congo belge » (Brussels) and by M. Ghesquière (Brussels).

In total 7 species were present, 2 of which belonged to the Strongyloidea, 2 to the Ascaroidea, 2 to the Spiruroidea, whereas only one belonged to the Filarioidea. Three of the concerned species are new to science.

Family *STRONGYLIDAE*.

Genus Amira Lane, 1914.

1. Amira straeleni n. sp.

(Fig. 1 A-G).

— Type ♂ et cotype from Yangambi, 1935, from an elephant. (I. N. E. A. C., coll.) Musée royal d'Histoire naturelle de Belgique.

— 2 ♂♂, from Yangambi, 1935, african elephant, excrements. (I. N. E. A. C., coll.)

M. KHALIL (1922) was the first to give a survey of the parasitic nematodes of the elephant. In 1932, MÖNNIG has described some strongylid parasites of the african elephant. Afterwards VUYLSTEKE (1935) gave further notes on parasitic nematodes of the

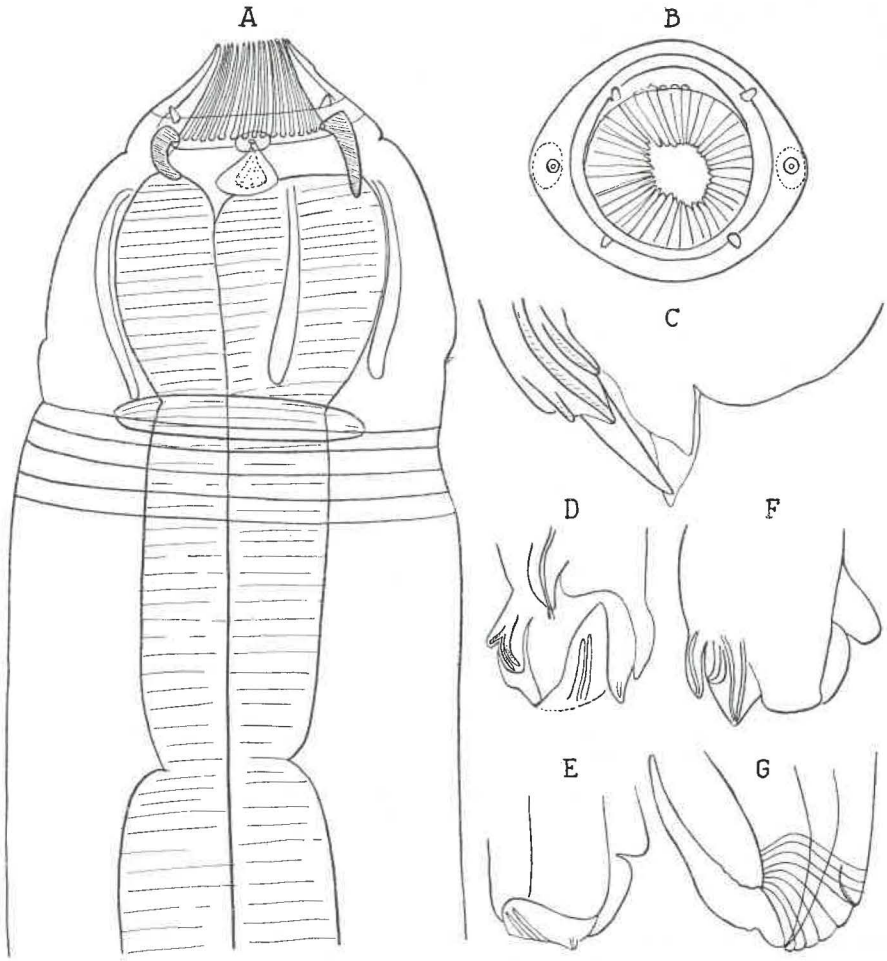

Fig. 1. — *Amira straeleni* n. sp.
A. Head end × 80; B. Head top view × 80; C. Male tail × 80; D-F. Male tails in various views × 22,5; G. Female tail × 22,5.

african elephant, which paper contains the description of an *Amira*-species, made after a female specimen.

VUYLSTEKE has given no specific name to that parasite, because he was in doubt if it was the female of *Amira sameera* KHALIL, the female of which like he thought was not known up to that moment, or the female of a species of *Amira* hitherto not known to science. The female in question was distinctly smaller than the males described by KHALIL.

Moreover the head portion shows some differences with that of *Amira sameera*. The same may be said from the female *Amira* found by MÖNNIG (1932). VUYLSTEKE (1935) apparently has taken no notice of the concerned paper of MÖNNIG (1932), describing as *Amira sameera* a female *Amira* found in the african elephant. Now VAN DER WESTHUYSEN (1938) has published a monograph of the helminth parasites of the elephant, in which paper he combines the descriptions of both the male (after KHALIL 1922) and the female (after MÖNNIG 1932) of *Amira sameera*. Apparently VUYLSTEKE's paper has escaped to his attention.

VAN DER WESTHUYSEN (1938, p. 86) points to the fact, that there exist some differences between the female and male in the composition of the external leaf crown. He copies the figures of both female (after MÖNNIG) and male (after KHALIL) but says nothing about the difference in length of the cephalic papillae, which difference is however very obvious.

Now one would be at first inclined to suppose, that this difference might be due to sex. In that case the male should be in the possession of distinctly longer cephalic papillae than the female. Moreover the mesostoma of the female presents distinctly more curved sides than that of the male.

The males of the present collection may as to my opinion give the clue to this problem.

In the present males the head portion (Fig. 1 A) closely resembles that of VUYLSTEKE's female, since it is in the possession of small cephalic papillae and the same is true for MÖNNIG's female. The shape of the buccal cavity of the present males is conform to that of both VUYLSTEKE's and MÖNNIG's female. Therefore I am inclined to join VUYLSTEKE in bringing his female, as well as my males and probably MÖNNIG's females too to a knew species for which I propose here the name *Amira straeleni* n. sp.

Unfortunately the bursa copulatrix (Fig. 1 D-F) of my males

was in a bad state of preparation, so that it could not be studied in sufficient detail, although so much can be stated, that it differs distinctly from the bursa copulatrix of *Amira sameera* to which it shows some resemblance.

The males in question are even shorter than the female of VUYLSTEKE as may be easily seen from the following measurements.

Dimensions of the concerned males :

Length of the first male 7,5 mm. Width 0,5-0,6 mm.
male 6 mm.
of a female 9 mm.

VUYLSTEKE's female measured 8,6 mm. width 0,620 mm.

MÖNNIG's presumed ♀♀ of *A. sameera* were 11,5-12 mm. long. and had a maximal diameter of 0,65 mm. VUYLSTEKE's ♀ falls in the same range of size with my males, since we may suppose, that the female sex is almost without exception somewhat larger than the male sex.

Such proved to be likewise the case with the females of the same locality.

As to its dimensions MÖNNIG's female shoult fit in the scheme of *A. samcera,* as to its structure and especially in respect of the size of the cephalic papillae it shows striking resemblance with the present males and with the females of VUYLSTEKE.

The anterior body end is (Fig. 1 A) distinctly truncate and set off against the remainder of the body by a shallow constriction. The oral cone is formed by a crown of some 40 leaflets, bordering the prostome at its interior (Fig. 1 B). VUYLSTEKE counted 40 leaflets in the external leaf crown of his female, MÖNNIG says to have observed 42 leaflets of the same leafcrown in his. VUYLSTEKE mentions an internal leafcrown, composed of minute leaflets, MÖNNIG says to have found an internal leafcrown, composed of short blunt leaflets. I have not observed the internal leafcrown in my males. The mesostome is bordered by strongly cuticularized, more or less concave walls (Fig. 1 A). Similar structures were found to be present in VUYLSTEKE's and MÖNNIG's females. Opposite to that portion of the buccal cavity the voluminous amphids are situated.

In MÖNNIG's female one of these is figured as a dark elevation. VUYLSTEKE apparently has seen the amphids likewise, without having understood their signification. At any rate he depicts an amphid. Slightly in front of the amphids the 4 short, conical submedian papillae are found. The anterior por-

tion of the oesophagus is balloon-shaped. This part is accompanied by four cervical sacs. The posterior part of the oesophagus, separated from the first by a constriction which is encircled by the nerve ring, is more or less cylindrical. I have not observed the cephalic apillae. Cuticula distinctly striated transversely.

Bursa colulatrix short (Fig. 1 D-F), in bad condition, the dorsal lobe distinctly longer than the lateral lobes, although shorter than in *Amira pileata* RAILLET, HENRY and BAUCHE. It is apparently slightly longer than in the male of *Amira sameera* KHALIL. On the dorsal lobe two rays may be discerned, just as in *A. pileata*. With the dorsal lobe of *A. sameera* differences are found.

For the texture is very complicate in *sameera,* compare KHALIL's figures, whereas the scheme seems to be rather simple in *A. straeleni,* although we must not forget that, owing to the condition of the animals in question, I was not capable to unfold the bursa in order to get an exact idea of the whole structure. The number of rays, found on the lateral lobes could not be discerned with certainty, but as far as I could conclude from my observations, it must be 3 at least. One of the lateral rays is bifurcated, both branches lying close together, forming so to say a single finger. In the females seen by me the tail is tapering, anal aperture and vulvar slit being adjacent (Compare Fig. 1 G). I come to the conclusion, that the present male, which distinctly differs from the male of *A. sameera* and the females observed by VUYLSTEKE alltogether belong to the same species, which should be named *A. straeleni.* The females described by MÖNNIG as *A. sameera* probably likewise belong to that species.

Genus Murshidia LANE, 1914.

2. Murshidia hadia KHALIL, 1922.

(Fig. 2 A-H).

— 20 ♀♀ and 6 ♂♂ from Yangambi 1935, elephant, excrements. (I. N. E. A. C., coll.) Musée royal d'Histoire naturelle de Belgique.

DIMENSIONS : Length of female 1 21 mm.
» » 2 17,5 mm., width 1 mm., length of tail 2 mm.
» male 17 mm., width 1 mm.

KHALIL (1922) has given a good description of this species. It has been redescribed by VAN DER WESTHUYSEN (1938, p. 63). He denotes as measurements, a length of 18,5 for the male and of 24 mm. for the female. The female tail was 2,5 mm. long in his female.

Mouth collar well developed (Fig. 2 D), sharply set off against the remainder of the body by a deep groove, in front of which the amphids are situated (Fig. 2 A, B, C, E).

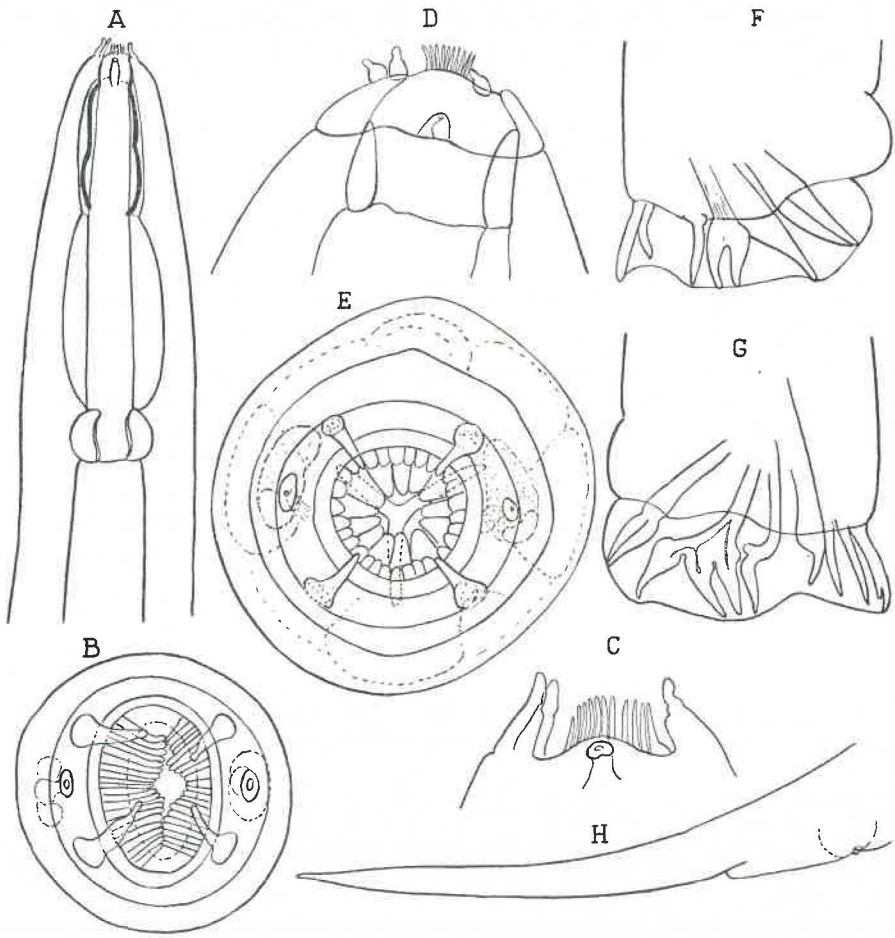

Fig. 2. — *Murshidia hadia* KHALIL, 1922.

A. Male anterior end, × 22,5; B. Male head end, seen on top × 80; C. Male head end, side view; D. Female head end, × 80 E. Female head end, seen on top × 80; F. G. Male tails × 30 H. Female tail × 22,5.

The latter are found at the lateral sides. They appear to be large, especially so when the head is seen on top (Fig. 2, B, 2 E) and are followed by large amphidial pouches and surrounded by large cells. The oral slit is elliptical. The external leaf crown is composed in the male of 40 rays of unequal size, the lateral ones being longer than the ventral and dorsal rays (Compare Fig. 2 B). The four submedian comparatively long-stalked cephalic papillae are surmounted by a small knob.

In the female the head seen on top gives a different picture. The oral opening is more circular, surrounded by two crowns of leaflets, about 30 short and blunt leaflets of the external crown and 13 coarser, longer and broader leaflets of the internal crown (Fig. 2 E). In the female the submedian cephalic papillae are likewise long and slender, although not so knobbed. Amphids smaller than in the female, which might be a secondary sexual character, like so often is the case in freeliving nematodes too. Buccal cavity wide, cylindrical, its mesostome bordered by thick almost straight cuticular linings (Fig. 2 A). Oesophagus vigorous, the anterior part cylindrical and strengthened by cuticular prongs, the posterior portion distinctly swollen. A cardia is present. Female tail long (Fig. 2 H), tapering to a fine point. A short distance in front of the anal aperture the vulva is observed. Length of tail equal to 6 anal diameters. The bursa copulatrix of the male is short (Fig. 2 F, 2 G). the ventral ray bifid, the lateral rays originating from a common origin, whereas the externo-lateral ray is separated from the mediolateral and dorsolateral rays, which lie close together. Dorsal ray giving rise to an externo-dorsal ray, that nears the dorsolateral ray. Any of both branches of the dorsal ray is trifid.

KHALIL (1922) has reported the species of Uganda, whereas VAN DER WESTHUYSEN (1938) has found it in the intestine of elephants in South Africa.

It apparently is a common parasite of elephants.

Family *GNATHOSTOMIDAE*.

Genus Gnathostoma OWEN, 1836.

3. Gnathostoma minutum n. sp.

(Fig. 3 A-C).

— 1 juvenile specimen, from a « Vipère à cornes », *Bitis nasicornis* (SHAW) killed at Lula, Belgian Congo. (I. N. E. A. C., coll.) Type in Musée royal d'Histoire naturelle de Belgique.

— 1 juvenile specimen, from the connective tissue of a serpent at Eala, Belgian Congo. (GHESQUIÈRE, coll.)

The specimens at hand, although near relatives of *Gnathostoma accipitri* SKRJABIN, which CHANDLER (1925 A) is inclined to consider synonymous with *Gn. pelecani* can neither be referred with certainty to this species nor to one of the other species brought to the same genus. The analytical key of BAYLIS and DAUBNEY (1923) gives us no clue as to the identity of the specimens under observation, although we must take into consideration that CHANDLER remarks, that BAYLIS & LANE (1920) erroneously state that there is no mention of spines on the body. The same author discovered that a high percentage of certain species of snakes — *Python reticulatus, Naja bungarus* and over 50 % of the studied specimens of *Naja tripudians* contained

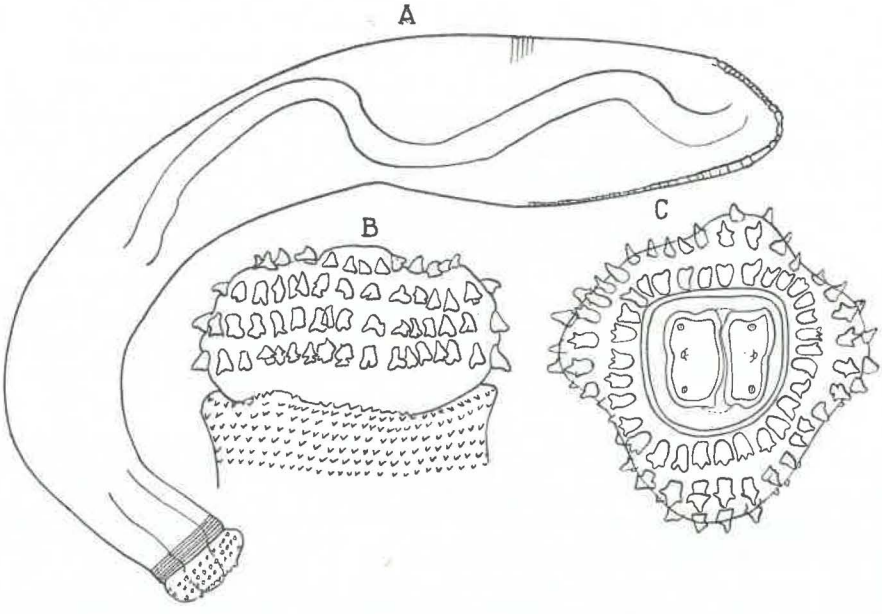

Fig. 3. — *Gnathostoma minutum* n. sp.
A. Total view × 30; B. Head × 18-; C. Head on top × 180.

large numbers of small yellow cysts containing *Gnathostoma* larvae, this author identifies with *Gnathostoma pelecani*. Feeding cats with the cyst material taken from the mentioned snakes CHANDLER observed that in these cats further development had taken place. The majority of the young Gnathostomes in cats

wasp found burrowing in the liver tissue. In Calcutta (CHANDLER, 1925 B) Gnathostomes are fairly common parasites of cats. CHANDLER has never found the adult of this common nematode in a mammal host. This would as to my opinion point to the probability, that a mammal is not the true definite host, but that we have to consider as such a snake-eating bird of prey.

Recently YOSHIDA (1934) brings evidence, that the aquatic snakes become infected with the gnathostome larvae by swallowing infected *Cyclops,* YOSHYDA proved experimentally, that « if hatched embryos are put in a shallow dish containing numerous *Cyclops,* alsmost all of them are found in the alimentary canal of the *Cyclops* on the next day, and two or three days later actively moving larvae can be observed in the body cavity of the host, in which they grow and reach a definite stage of development. The larvae in the control dishes with no *Cyclops* in them, die within a few days. The larvae in the body cavity grow to a fair size, when the characteristic head bulb appears. » So with some probability the life cycle may be traced as follows : Hatching of the eggs in aquatic surroundings, swallowing of larvae by *Cyclops,* penetration of the same into the body cavity of the latter, swallowing of infected *Cyclops* by aquatic and semi-aquatic snakes; swallowing of the snakes by birds of prey.

The present material brings the second record of Gnathostome larvae in snakes, which are therefore undoubtedly a common link in the lifecycle of the species belonging to the said Genus.

From *Gnathostoma accipitri* the present species differs inter alia in that it possesses 3-uncinate spines on the head bulb, in that the number of spines of each crown is distinctly smaller than in *accipitri* and in that the tail is more rounded here, whereas *accipitri* has a distinct acutely tipped tail. This fits for the description of SKRJABIN as well as for that of CHANDLER. The latter author depicts however biuncinate spines for the more grownout specimens of *Gn. pelecani,* taken from cats. Until more material is available I think it wise to bring the specimens at hand provisionally to a new species, for which I propose the name *Gnathostoma minutum.*

Length of the specimens (Fig. 3 A) in question 2 mm., falling in the range of variation of *Gnathostoma hispidum* as described by MORISHITA and FAUST (1925).

No genital aperture visible. Head with the usual bulb (Fig. 3 B). Head bulb with 4 crowns, each composed of 31 1- to 3-uncinate spines. Body with regular rows of minutes spines.

Oral opening slit-like closed in between 2 lips (Fig. 3 C), each lip with two submedian papillae, apparently of double origin, and a lateral amphid, situated on a conical elevation. Mouth collar narrow. Anal aperture close to the apex of the body, the latter rounded.

Genus Tanqua BLANCHARD 1904.

4. Tanqua occlusa n. sp.

(Fig. 4 A-I).

8 ♀♀ and 1 ♂ in the stomach of snake 796 d, together with a half digested fish. (GHESQUIÈRE, coll.)

Males and 2 females together with several larvae in the digestive tract of an aquatic snake 715, [*Gragia smythii* (LEACH)] Eala VIII-1935 (GHESQUIÈRE, coll.). Males and females in the œsophagus of snake N° 796 b, Eala (GHESQUIÈRE, coll.).

In their key BAYLIS and CLAYTON LANE (1920) divide the species of the Genus *Tanqua* after the number of swellings of the head-bulb. *Tanqua tiara,* parasitic in semi-aquatic lizards, Varanidae, is in the possession of 4 swellings, whereas *Tanqua diadema* and *Tanqua anomala* both are in the possession of a head-bulb with 2 swellings. The latter 2 species have an uterus with two branches opposed, whereas the uterus of *Tanqua tiara* possesses 4 branches, 3 anterior and 1 posterior.

The present form does not anwer to either of the described forms. It has an uterus with 2 branches opposed like *T. diadema* and *T. anomala,* but at the same time a head-bulb with 4 swellings, so that its position is intermediate between both groups. This is the reason why I have considered the species as new, for which conclusion the distribution of the genital papillae in the male sex also speaks.

3 females from snake 796 d measured respectively 62, 57, 47 and 45 mm.

In the female large 57 mm., the vulva was situated at 12 mm. from the anterior end, which is at 21 % of the total bodylength.

The lips are quite as high as the headbulb (Fig. 1 A) itself. Their distal borders intercross, closing (Fig. 4 B, C, G, H) the mouth firmly by doing so. The middle one of the three elevations is bifurcated, the lateral ones pointed. I counted 4 submedian double papillae and 2 minute amphids (Fig. 4 B, C). In the male of snake 715 the bifurcation of the middle elevation

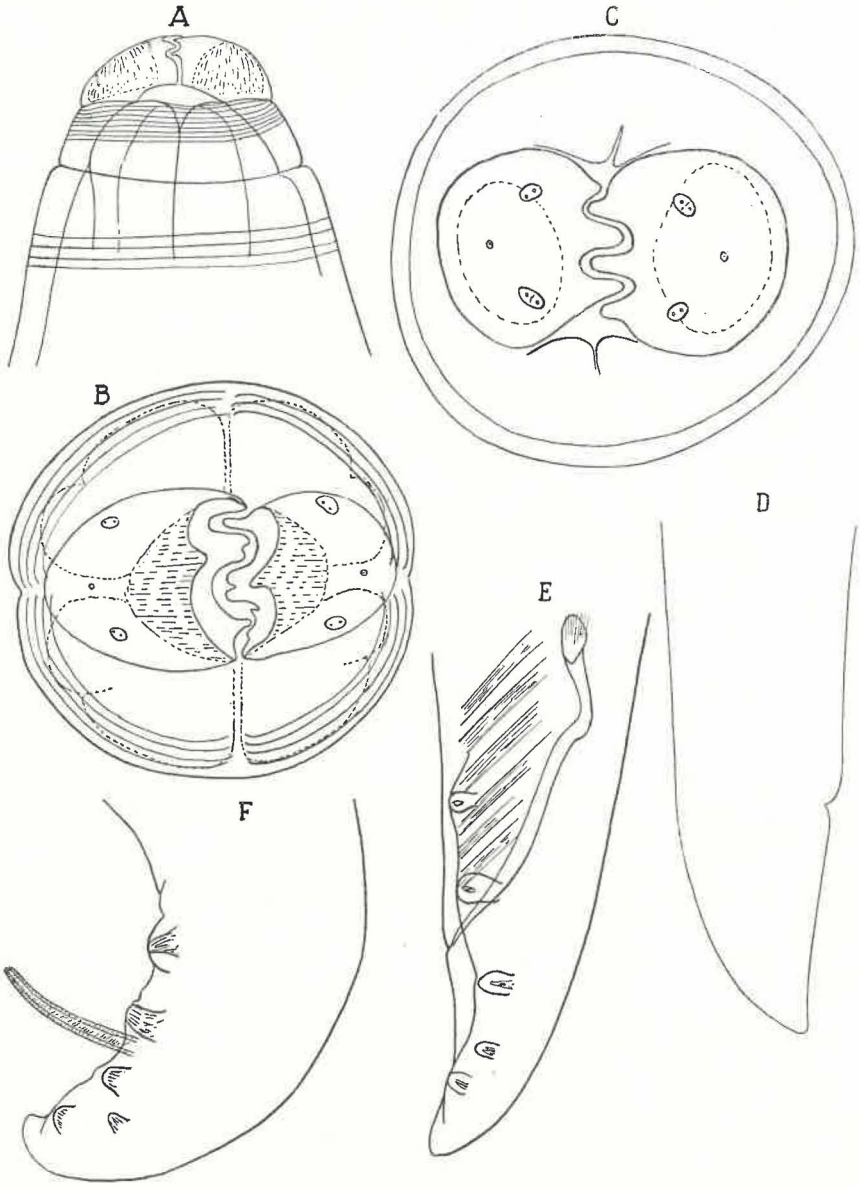

Fig. 4. — *Tanqua occlusa* n. sp.

A. Head end, side view; B. Head end on top of ♀ × 180; C. Head end on top of ♂ × 180; D. Female tail; E. Male tail, both × 30; F. Male tail about × 30.

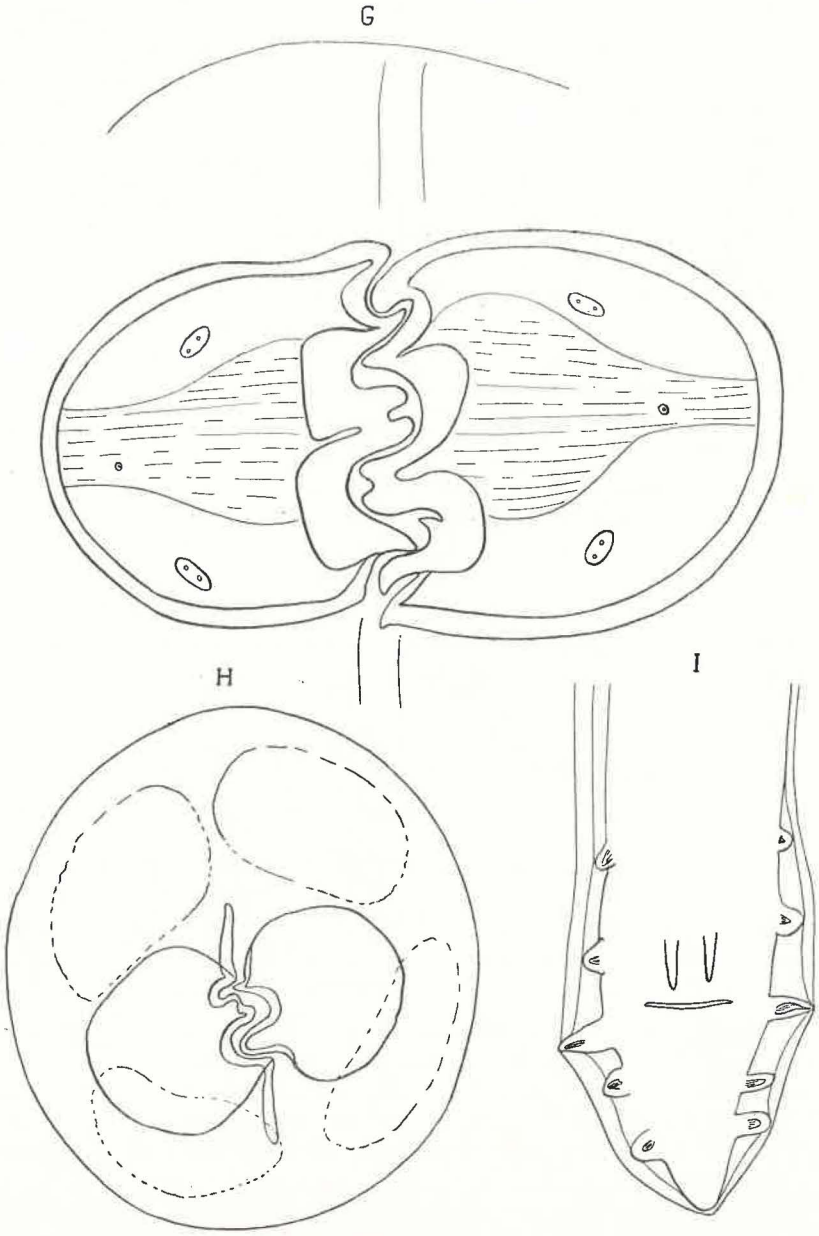

Fig. 4. — *Tanqua occlusa* n. sp.

G. Male head on top × 225; H. Head end with the 4 sacs × 180; I. Male tail × 25. Seen from the ventral side.

of the distal border of the lips was less pronounced, moreover were the lateral elevations less sharply pointed. In the case of snake 796 b, the lips of the *Tanqua*-specimens were undivided. It seems therefore that some variations is possible. Cervical sacs (Fig. 4 H) long. In the female the tail is bluntly conical (Fig. 4 D). The male has a similarly shaped tail (Fig. 4 E, F, J), provided with 3 pairs of postanal papillae, 2 of them subventral, the third lateral. In front of the anal slit I found 2 pairs of papillae, making a total of 5 pairs of papillae, also distinctly less than in *T. anomala* and *T. tiara*. The arrangement of the pre and postanal papillae mostly resembles that in *Tanqua anomala,* like depicted by BAYLIS and LANE (1925), but I have not found the small accessory papillae these authors depict.

The male taken from the aquatic snake N° 715 measured 33 mm.

My specimens distinctly differ from *Tanqua tiara* like depicted by MÖNNIG by the fact that the latter miss the incisions on the median elevations of the lips, and moreover by differences in the distribution of the caudal papillae in the male sex.

All these facts brought me to the conclusion that the specimens at hand might belong to a separate species, for which I propose the name *Tanqua occlusa.*

Family *DICHEILONEMATIDAE.*

Genus Setaria VIBORG, 1795.

5. Setaria southwelli THWAITE, 1927.

(Fig. 5 A-K).

Several males and females in the body cavity of an antelope, Yangambi 1935. (I. N. E. A. C., coll.) Musée royal d'Histoire naturelle de Belgique.

Length of a female 113 mm. of a male 47 mm.

THWAITE (1927) has given an excellent description accompanied by adequate figures, which eneasy the recognition of this ♂ species. I will give therefore some additions only in respect with the structure of the head sense organs.

Head seen on top (Fig. 5 4, C) elliptical in outline. Oral opening circular, œsophageal lumen trifid. Dorsal and ventral border of mouth collar with epaulettelike spines (confer Fig. 5 B, 5 E). Four pairs of submedian papillae, those of the outer

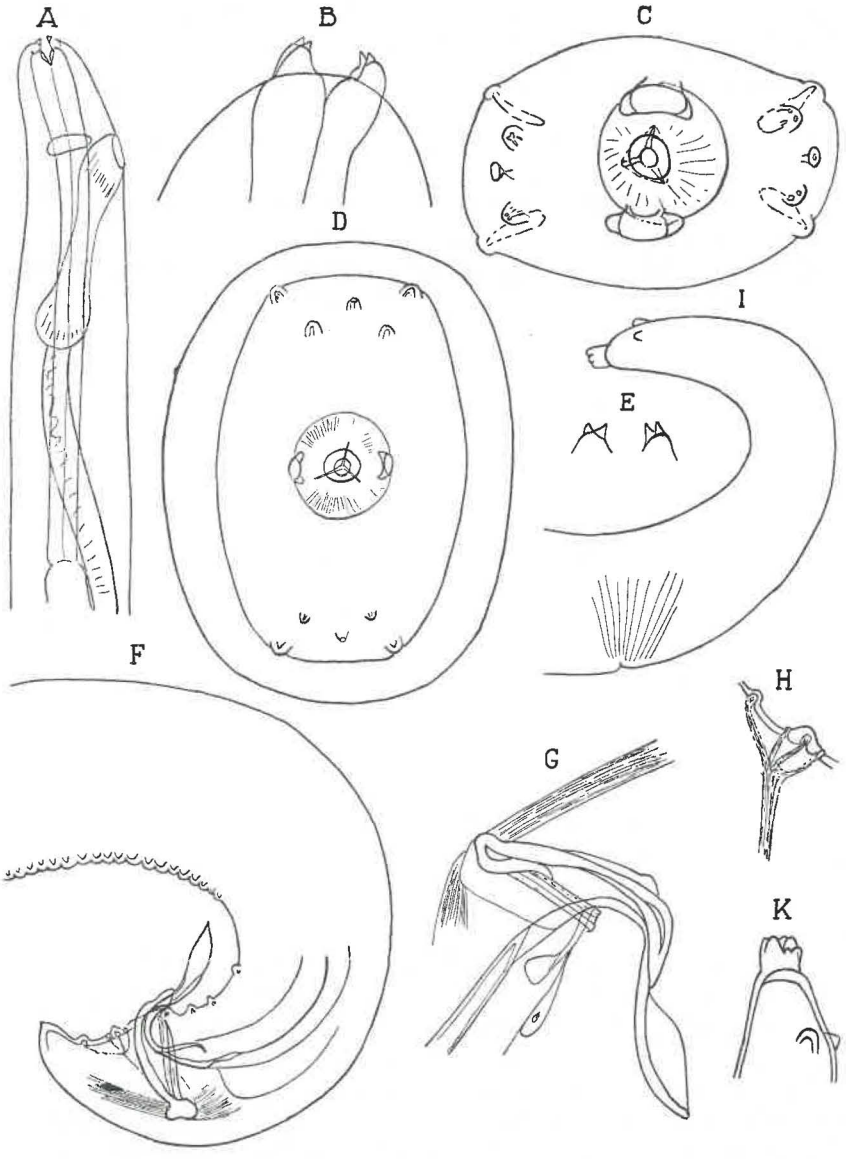

Fig. 5. — *Setaria southwelli* THWAITE, 1927.

A. Anterior body portion; B. Head end, side view × 300; C. Head ♀ seen on top × 300; D. A head seen on top, somewhat schematized × 300; E. The tips of the circumoral teeth × 300; F. Male tail × 80; G. Genital mechanism of the male × 300; H. The postanal papillae × 300; I. Female tail × 80; K. Female tail tip × 300.

circle more diverging than the papillae of the inner circle, which are comparatively close together, approaching the median line of the head. Amphids elliptical, at a level with the papillae of the inner circle. Vulva (Fig. 5 A) just posterior to the nerve ring. Female tail finger-shaped (Fig. 5 J, K), curved dorsally, ending in a club-shaped prolongation, the latter crowned with a number of papillae. Close to the caudal extremity 2 papilla-like lateral appendages are observed.

Male tail (Fig. 5 F) curved ventrally, with 4 pairs of preanal papillae, situated comparatively close together, and 2 pairs of postanal papillae, of which the most apical is accompanied by a couple of minute papilla-like sensory organs (Fig. 5 H). Spicula unequal (Fig. 5 G), the smaller one serving as a gubernaculum for the longer one, which has a twisted appearance and ends into a lancet-shaped flap. Gubernaculum bow-shaped.

Family *HETEROCHEILIDAE*.

Genus Amplicaecum BAYLIS, 1920.

6. Amplicaecum gedoelsti YORKE and MAPPLESTONE, 1926.

(Fig. 6 A-H).

Males and females in the abdominal connective tissues of a viper at Eala IX-1935. (GHESQUIÈRE, coll.) Musée royal d'Histoire naturelle de Belgique.

A male measured 16 mm. a female 24 mm. The species answered quite to the description GEDOELST (1916) has given from his *Ascaris bufonis* GEDOELST as one easily may conform by comparing my figures from the head seen on top with GEDOELST's Fig. 6 (1916, p. 22). The lips with (Fig. 6 A-D) their pronounced median incision (Fig. 6 C), the prominent dental ridges which border the medial border of the latter, the lateral grooves at the upper border of the auricles are alltogether shaped like in the specimens of GEDOELST. I must further point to a peculiarity which seems me to be of some importance, I mean the prong-like elevations of the pulpa, caudal from the medial incision of the upper border of each lip, which I consider to be the rudiment of the papillae of the inner circle. If this would prove to be the case than the present species would be in this

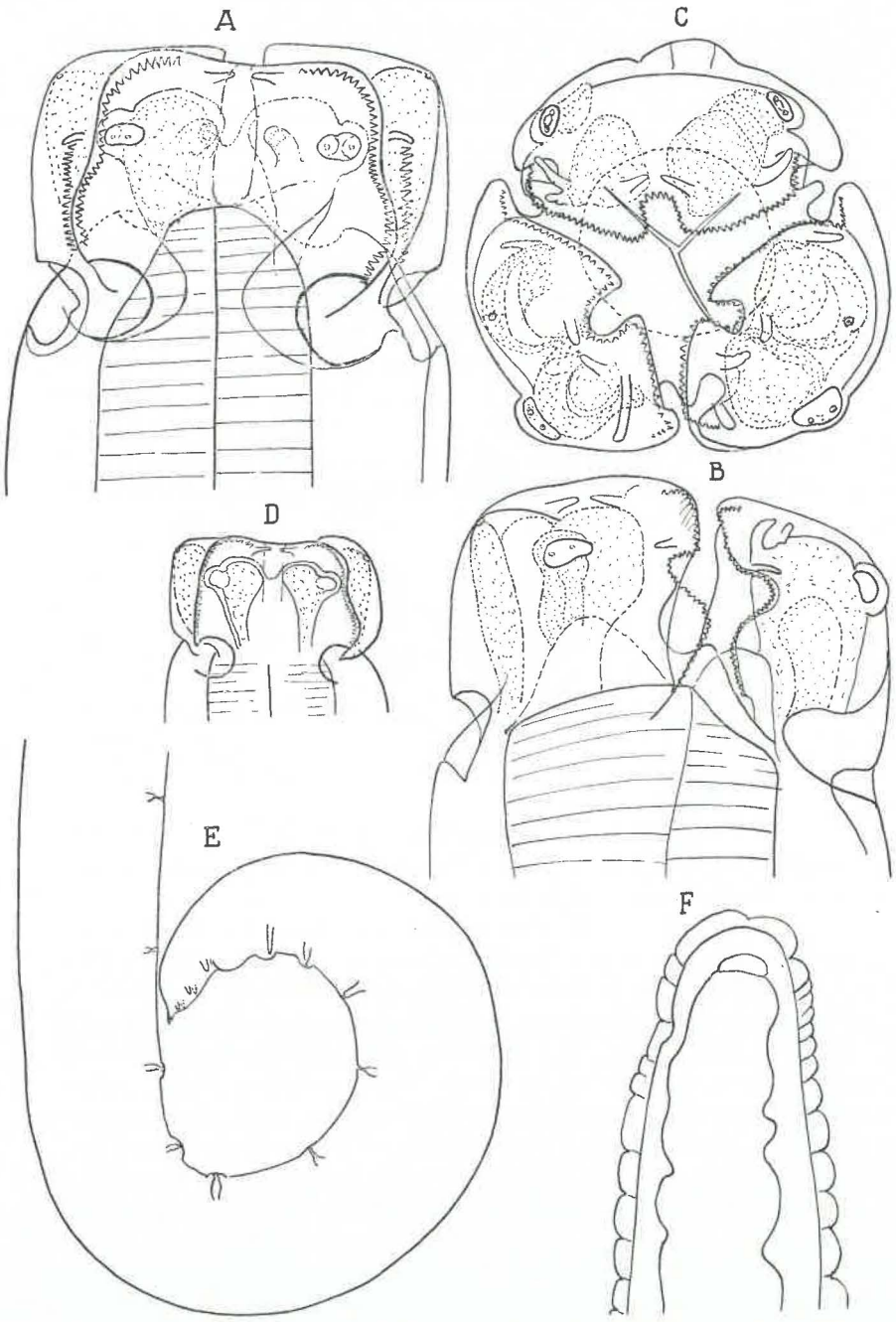

Fig. 6. — *Amplicaecum gedoelsti* YORKE AND MAPPLESTONE, 1926.
A. Head end, female dorsal side × 180; B. Seen on top × 180; C. Seen from the ventral side × 180; D. Male head, dorsal side × 70; E. Male tail × 30; F. Female tail × 30.

respect a primitive form where the inner circle, absent in other ascarids, would have been preserved.

Small interlabia present. Papillae in the usual arrangment. Amphids minute.

Tail in the female with rounded tip (Fig. 6 D). Male tail (Fig. 6 E) conical with a minute point and 3 pairs of postanal as well as 10-11 pairs of preanal papillae the former being distinctly longer than in *Amplicaecum africanum* TAYLOR to which the present species is closely allied. The head end is similarly of a different texture and misses the grooves GEDOELST observed in the specimen taken from a large toad at Dolo.

Family *ASCARIDAE*.

Genus Polydelphis DUJARDIN, 1845.

7. Polydelphis anoura DUJARDIN, 1845.

(Fig. 7 A-H).

1 ♂ and 11 females in a viper « à cornes » *Bitis nasicornis* (SHAW), killed at Lula (I. N. E. A. C., coll.). One of the females measured by me was 68 mm. long and 1,2 mm. wide. Other females measured 60, 70 and 90 mm. respectively. The male in question was not measured. Among the specimens several juvenile specimens were observed.

Seen on top (Fig. 7 C), the three lips are separated by a rather wide cleft in the middle of which the oral opening is seen, in the shape of a triangular slit. Each lip presents a shallow medial incision. Dorsal lips (Fig. 7 A) with the usual 2 large double papillae, both subventral lips (Fig. 7 B, D, E, F) with a subventral double papilla and an amphid, the latter slightly more cephalad as the former, situated on the tip of a papilla-like elevation. Seen from the ventral side the large cleft between the lips is very obvious. Inner border of lips provided with dentigerous ridges composed of minute teeth. Pulp of lips (Fig. 7 D) with finger-shaped elevations, from which fibrous strings arise. These structures are quite identical to the figure given by BAYLIS and DAUBNEY in their paper on the parasitic Nematodes of India (1923) Fig. 3. These expansions are most easily observed from the inner side of the lip.

Female tail short (Fig. 7 G), bluntly rounded, the anal aper-

Fig. 7. — *Polydelphis anoura* DUJARDIN, 1845.

A. Dorsal lip × 220; B. Subventral lip, from the exterior × 80; C. Head seen in top × 80; D. Subventral lip seen from the interior × 220; E-F. Head ends from different sides × 40; G. Female tail × 35; H. Male tail × 80.

ture subterminal. Male tail (Fig. 7 H) just like described by BAYLIS and DAUBNEY with 6 pairs of postanal papillae of which the one near to the anal cleft is double. The median double preanal papilla, depicted by BAYLIS and DAUBNEY in their figure 4. I have not found in my specimen. Preanally two rows of subventral papillae may be observed. The figure given by YORKE and MAPPLESTONE (1926, p. 265) in their handbook is therefore apparently not quite correct. In the juvenile specimens the oral opening is triangular and there is already a narrow cleft between the lips which do not yet show their full development. Papillae and amphids indicated but not so prominent as in the fullgrown specimens.

BAYLIS and DAUBNEY (1923) found the species in question in *Python molurus* in India. Other hosts : *Python sebae, Bitis arietans, Drymobius bifossatus, Coluber corais, Zamenis constrictor.*

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