III

NEMATODA PARASITICA

BY

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During the last cruise of the « *Mercator* » of 1935-1936 Dr. W. Adam collected inter alia a number of parasitic nematoda from fish, reptiles, birds an mammals, which although small, proved to be of some importance. No less than 8 species in total were found, all Ascaroids.

Three of the Ascaroids were taken from the stomach of *Caiman niger*, which is of interest since the parasites of the related *Caiman sclerops* were studied recently by Travassos. So the present study brings welcome additional information to former studies made by Baylis and Travassos.

All species were studied in some detail especially in respect with the distribution of the head sense organs.

Order ASCAROIDEA

Family HETEROCHEILLIDAE

Subfamily ANISAKINAE

Genus MULTICAECUM Baylis 1923

Travassos when describing *Multicaecum baylisi* Travassos has changed Baylis definition of the genus in this respect that he places a querrymark after the passage in Baylis diagnose where it is stated that the species of *Multicaecum* posses lips with dentigerous ridges like for instance the genotype : *Multicaecum agile* Wedl. Travassos *Multicaecum baylisi*, answers however in so far to the

definition of the genus that it presents the characteristical oesophageal and intestinal caeca, which are considered to be the chief characteristics of the Genus. In the latter species as well as in the new species of *Multicaecum* to be described below, no dentigerous ridges could be detected even after continued research.

The closely related Genus *Dujardinia* differs from *Multicaecum*, when the exterior of the species said to belong to it is studied, according to Baylis, Yorke and Maplestone by the absence of dentigerous ridges.

After what is said above in respect with presence of absence of dentigerous ridges in the Genus *Multicaecum*, it is clear that mistrust is warranted about the true nature of the known species of *Dujardinia*. Here the small spherical oesophageal bulb and the absence of an oesophageal coecum should be decisive.

Now Baylis apparently has given no attention to the structure of the intestinal tract in his species *Dujardinia vandenbrandeni* and *australensis*. As far ar the first species is concerned it struck me that the spicules of *Dujardinia vandenbrandeni* strongly ressemble those of the species described below as *Multicaecum helicina* (Molin) and this again brings me to the question if not *Dujardinia vandenbrandeni* Baylis should belong to the Genus *Multicaecum*.

Among the large number of parasitic nematodes taken from the stomach of *Caiman niger* 2 species of *Multicaecum* were identified of which one is described as new; whereas the 2nd. was identified with Molin's *Ascaris helicina* Molin, which from now on has to be named *Multicaecum helicina* (Molin). I have made a special study of the head ends as these are seen on top and in lateral and dorsal views, the more since the head end affords good distinctives for the purpose of generic and specific classification.

Multicaecum acuticauda nov. sp.

(Fig. 1-11.)

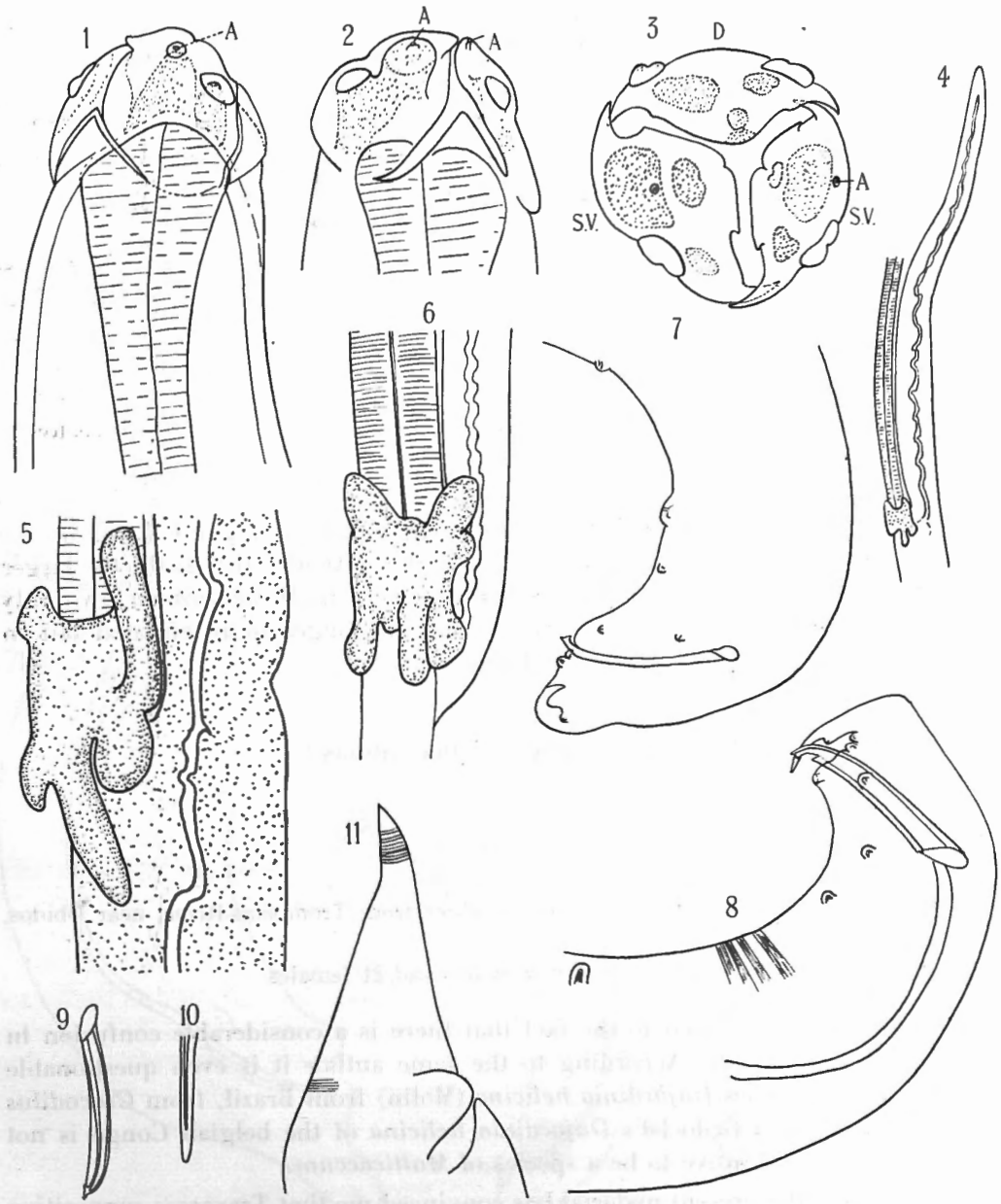
3♀♀, 3 ♂♂, 2 juv from the stomach of *Caiman niger* Trombetas-River, near Obidos, Brazil, 15-I-1936, in the company of numerous *Angusticaecum braziliensi* n. sp. and *Multicaecum helicina* Molin.

One of the females measured 13,5 × 0,6 mm., 2 of the males 9 × 0,4 mm. and 9 × 0,350 mm.

Therefore my specimens were slightly smaller than those of Travassos' *M. baylisi*.

The cuticula is faintly striated with narrow annuli, much less distinct than in the second form, found in the same host species.

The head is conical, the lips broad at their bases alternate with comparatively low interlabia. Seen on top the lips are rounded triangular, their upper portion only faintly demarcated against the remainder and bearing a shallow incision on both subventral lips, in the middle of the its upper border. Lower



Multicaecum acuticauda nov. sp.

FIG. 1, 2. Two head ends of females; in A : the amphids. — FIG. 3. Head of male seen on top. S.V. = subventral lips; D. = dorsal lip. — FIG. 4. Structure of intestine and oesophagus, with intestinal coecum and oesophageal diverticula. — FIG. 5, 6. Two views of oesophageal diverticula. — FIG. 7, 8. Male tails. — FIG. 9. Gubernaculum. — FIG. 10. Distal end of spiculum. — FIG. 11. Female tail.

borders of the lips at either side sharply pointed, the margins of the neighbouring lips overlapping. Subventral lips with a single papilla and an indistinct amphid, situated on the top of a papillalike elevation, whereas the dorsal lip presents the usual 2 papillae. Pulpa divided in unequal portions. When the lips close up, a very small central opening is left. Dentigerous ridges absent. Oesophageal caeca 5-locular with distinct lumen; intestinal caecum long.

Vulva at 61,6 % of bodylength. Tail 240 μ long. Male tail in the possession of a sharply pointed, recurved apex. The gubernaculum is capitate, like in the other species of the genus, broadly barbed at its tip. Spicula very long, 51,1 % of body length. The male possesses 3 pairs of postcloacal papillae, of which 2 pairs are contiguous, just in front of the recurved end of the tail, whereas the third pair is situated on the mentioned point. 4 pairs of precloacal papillae.

From *Multicaecum baylisi* to which it shows strong ressemblance the present species distinctly differs by the much longer and pointed tail in the female sex, by the less distinct striation of the cuticula, the distinctly larger number of praeanal papillae, 4 pairs being present in *M. acuticauda*, two only in *baylisi*, the larger barbed gubernaculum, the longer more effilated tail in the present species and other distinctives.

Multicaecum helicina (Molin)

(Fig. 12-23.)

Syn. *Dujardinia helicina* (Molin) nec Gedoelst.
Ascaris helicina Molin.

970 specimens from the stomach of *Caiman niger* from Trombetas-River, near Obidos, Brazil, 15-I-1936.

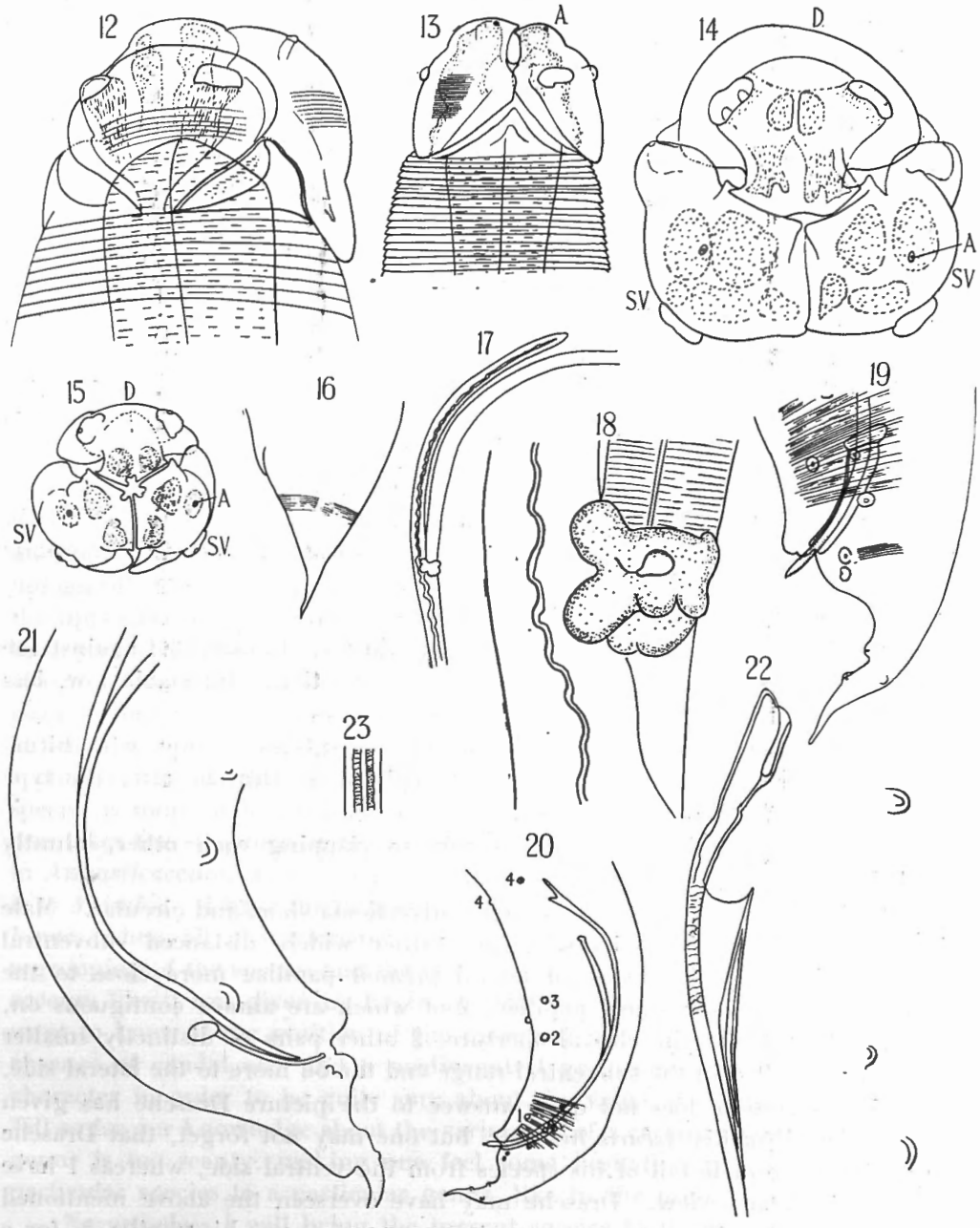
Among 57 specimens of these I counted 36 males and 21 females.

Travassos has pointed to the fact that there is a considerable confusion in the Genus *Dujardinia*. According to the same author it is even questionable if not the type species *Dujardinia helicina* (Molin) from Brazil, from *Crocodilus acutus*, with which Gedoelst's *Dujardinia helicina* of the belgian Congo is not conspecific, should prove to be a species of *Multicaecum*.

A study of the present material has convinced me that Travassos supposition is correct.

Multicaecum helicina may be distinguished from *M. acuticaudatum* in the female sex by the shape of its tail, which quickly tapers and shows an effilated apex. Moreover it reaches a considerably larger size than the former species.

Two of the females measured 31 and 32 mm respectively by 1 mm in width.



Multicaecum helicina (MOLIN)

FIG. 12, 13. Two head ends of females, 12 from dorsal side, 13 from subventral side. — FIG. 14, 15. Two head ends on top, 14 from male, 15 from female. — FIG. 16. Female tail. — FIG. 17. Structure of intestine and oesophagus, with intestinal coecum and oesophageal diverticula. — FIG. 18. Oesophageal diverticula, greatly enlarged. — FIG. 19, 20. Male tails. — FIG. 21. Male tail, to show gubernaculum and tip of spiculum. — FIG. 22. Proximal end of spiculum. — FIG. 23. Portion of spiculum. Lettering as in *Multicaecum acuticauda*.

The cuticule presents a far more obvious striation than in *acuticauda*, the lips are more fleshy and the oesophageal diverticula are much less pronounced than in the mentioned species.

The male of *M. helicina* is in the possession of shorter spicula, the gubernaculum of the same is distinctly more slender than in *M. acuticauda*, its tip is bluntly pointed, just like in the Figure 8.

Drasche has given of Molin's species (Compare my figures with those of Drasche 1882, Tafel IX, fig. 8).

Drasche has only depicted the distal end of the spicula of his male. The proximal end of the spicula is shaped like in *Dujardinia vandenbrandeni* Baylis !

I have already point to the fact, that Baylis does not mention anything about the oesophageal structure of his species *vandenbrandeni*.

Since there is a striking similarity of the spicula of the latter species with those of the present species the suggestion il allowed that Baylis *Dujardinia vandenbrandeni* might likewise belong to the Genus *Multicaecum*.

In my female long 31 mm, the vulva was situated on a distance of 14 mm from the anterior end, which is in accordance with the description of Molin and Drasche who state : « Apertura vulvae in anteriori et fere medio corporis parte ».

One of the valves measured 29 mm.

Lips high and fleshy without dentigerous ridges. Demarcated against the remainder of the body a sharp and definite constriction. Interlabia low, less high than in *acuticauda*.

Labial papillae distributed like in the former species. Pulpa with bifurcate projections similar in shape to those depicted by Drasche after the type specimens of Molin's *Ascaris helicina*.

Caudal ends of the fleshy lips barely overlapping each other, bluntly rounded.

Intestinal caecum long. Oesophageal diverticula short and circular. Male tail sharply pointed. 4 pairs of large, rather widely distanced subventral preanal papillae, 3 other pairs of lateral preanal papillae more close to the cloaca and 5 pairs of postanal papillae, 2 of which are almost contiguous on, a short distance from the cloacal aperture, 2 other pairs of distinctly smaller papillae are situated in the subventral range and the 5d more to the lateral side.

This description does not quite answee to the picture Drasche has given of the male tail of his *Ascaris helicina*, but one may not forget, that Drasche has depicted the male tail of his species from the ventral side, whereas I have figured it in lateral view. Drasche may have overseen the above mentioned lateral praeanal papillae, or may have taken one of these, his papilla 5, for a subventral papilla. In this case Drasche's papilla 3 and 4 are identical with the adjacent postanal papillae of my specimens, whereas the author has overseen the praeapical lateral papillae, depicted in my figures.

Genus ANGUSTICAECUM BAYLIS 1920

Angusticaecum braziliense nov. sp.

(Fig. 24-33.)

972 specimens from the stomach of *Caiman niger*, Trombetas-River, near Obidos, Brazil, 15-I-1936.
Sex ratio ♂ : ♀ = 69 : 74.

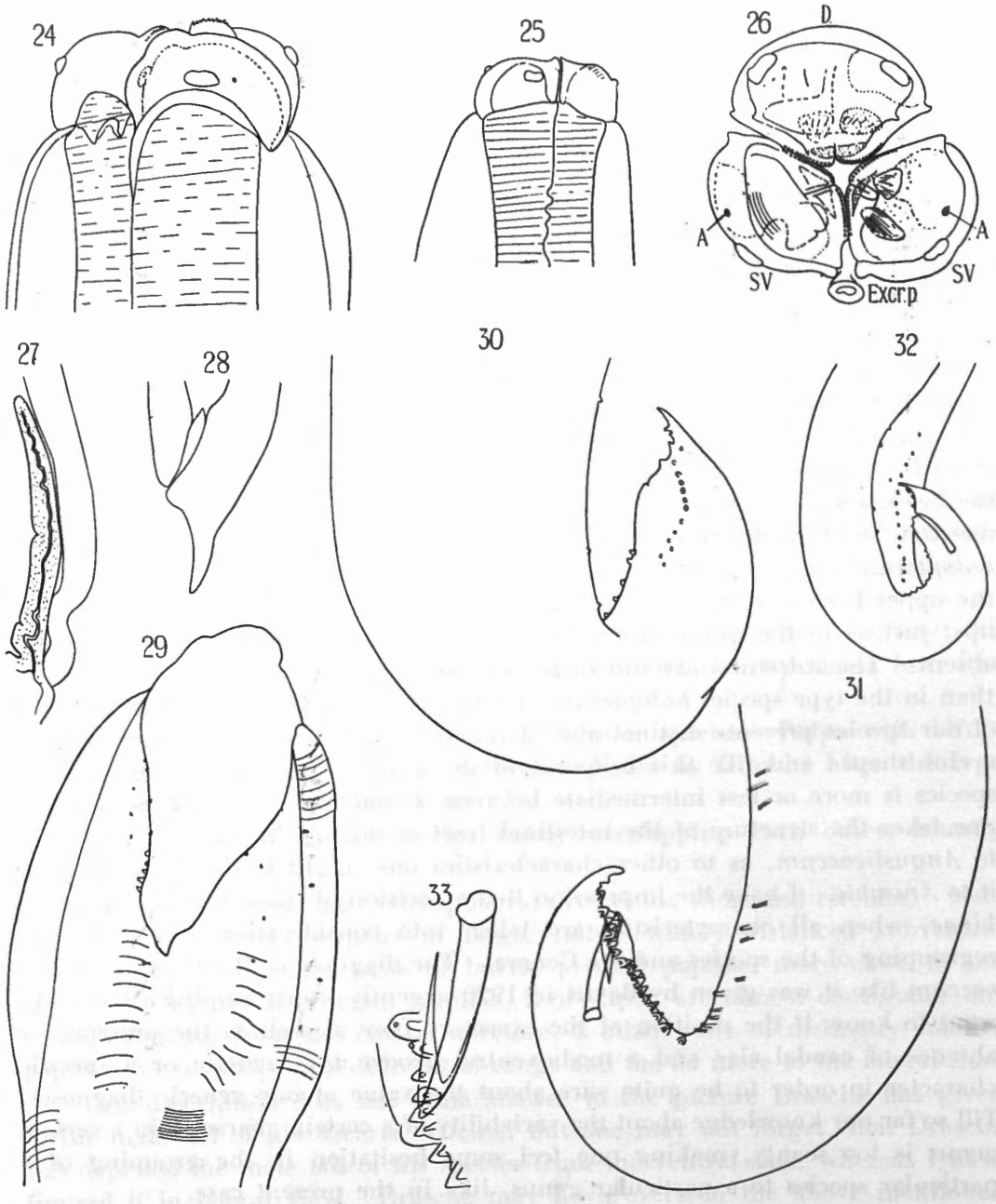
The identification of the present species caused me some trouble. The classification of the *Anisakinae* is built upon the structure of the intestinal tract, on the presence or absence as well as on the structure of oesophageal diverticula and intestinal caeca. Following Baylis scheme and consulting Yorke and Maplestone's figure 187 on page 272 of their wellknown book I had to choose between the Genera *Amplicaecum* and *Angusticaecum*.

The absence of small interlabia decided for the Genus *Angusticaecum*.

Closer observation however and a comparison of the present species with the bestknown species of this Genus *Angusticaecum holopterum* (Rud.) gives me some doubt about the correctness of this identification. In *Angusticaecum holopterum* the excretory pore is found almost halfways between the head and the upper border of the intestinal caecum; here it is situated at the base of the lips, just as in the Genus *Anisakis*, in which Genus the intestinal caecum is absent. The intestinal caecum in the present species is distinctly more broad than in the type species *holopterum* and moreover the tail end in the male sex of our species presents distinct alae, a rather deep ventral median groove and a club-shaped end like this is found in the Genus *Anisakis*. So the present species is more or less intermediate between *Anisakis* and *Angusticaecum*. If one takes the structure of the intestinal tract as decisive it should be brought to *Angusticaecum*, as to other characteristics one might be inclined to bring it to *Anisakis*. I have the impression that a revision of the subfamily of *Anisakinae*, when all characteristics are taken into consideration will lead to a regrouping of the species and the Genera. The diagnose of the Genus *Angusticaecum* like it was given by Baylis in 1920 urgently wants amplification. We want to know if the position of the excretory pore as well as the presence or absence of caudal alae and a medioventral groove is a generic or a specific character in order to be quite sure about the value of our generic diagnoses. Till so far our knowledge about the variability of a certain character in a certain genus is too scanty, making one feel some hesitation in the grouping of a particular species to a particular genus, like in the present case.

Nevertheless I will bring the present species to the Genus *Angusticaecum* which till so far found in tortoises and frogs is recorded now for the first time from crocodiles, which again might be a matter of dispute.

One of the females measured 26 mm in length, width 1 mm. Vulva 12 mm from the anterior or 46,1 % of the total bodylength.



Angusticaecum braziliense nov. sp.

FIG. 24, 25. Head ends of 2 males. — FIG. 26. Head end of a male, top view. Excr.p. = excretory pore, lettering as in former species. — FIG. 27. Structure of oesophagus and intestine with intestinal caecum. — FIG. 28. Female tail. — FIG. 29-32. Male tails, 29 seen from ventral side; 30-32 from lateral side. — FIG. 33. Spiculum of the same.

Length of a male 20 mm, width of the same 0,8 mm.

Seen on top the head presents the usual three lips, of which the dorsal presents two double papillae and each subventral lip 1 papilla only, which is subventral in position, whereas a minute amphid occupies a more dorsal position and is situated on a distinctly higher level as the double papilla. Each lip presents at its anterior border a shallow incision. Denticular ridges present, denticles minute, blunt, giving the whole the impression of a border of pearls. Auricles indicated Pulpa of the lips bilobed. Excretory pore situated between the subventral lips. No interlabia. Seen from the sides the lips are low and broad, much broader than high.

The female tail quickly tapers to the pointed tip, which is slightly prolonged. Intestinal caecum elongate. Male tail allways curved back, clubshaped, pointed at its tip. Spicula short and broad, proximal end broad, distal end bluntly pointed. Gubernaculum in the form of a more or less triangular sheath. The short bluntly pointed tail presents 3 or 4 pairs of postanal papillae, 15 contiguous pointed preaeanal large papillae and some 24 small stalked papillae, separated by variable distances. Caudal alae present, like also a medioventral groove.

Genus ACANTHOCHEILUS MOLIN 1858

Acanthocheilus bicuspis (WEDL)

(Fig. 34-40.)

3 ♂♂ and 3 ♀♀ from the stomach of *Mustelus mustelus* (L), South of Garnet Head (Rio de Oro) (24°41'N.-14°51'W.), 30-X-1935.
Length of a male, 37 mm.; width, 1,5 mm.
Length of a female, 43 mm.; width of the same, 2 mm.

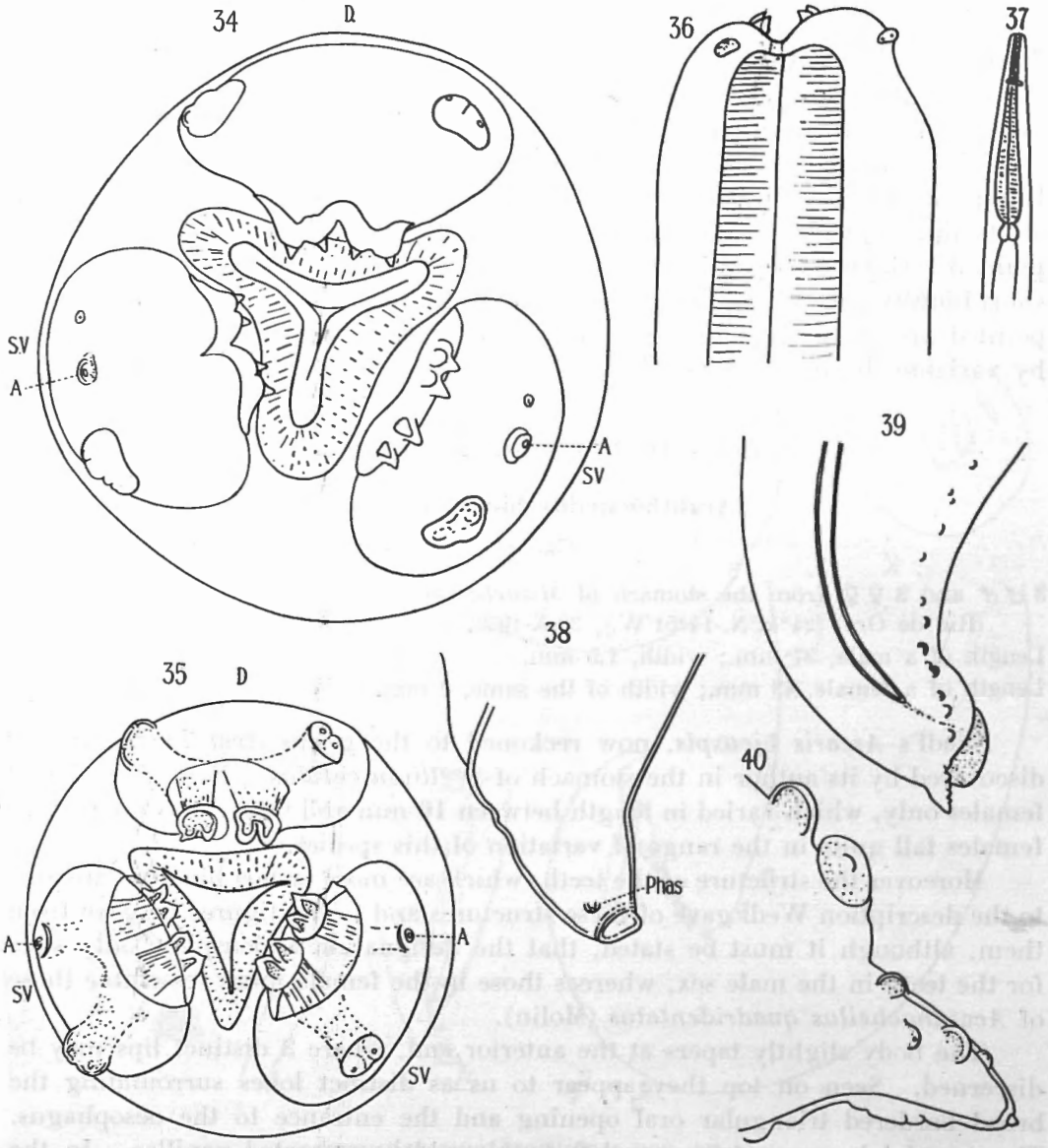
Wedl's *Ascaris bicuspis*, now reckoned to the genus *Acanthocheilus* was discovered by its author in the stomach of *Scyllium catulus*. Here Wedl found females only, which varied in length between 16 mm and 6 cm. So the present females fall quite in the range of variation of this species.

Moreover the structure of the teeth, which are more or less bicuspid answers to the description Wedl gave of these structures and to the figures he gave from them, although it must be stated, that the designation « bicuspid » only suits for the teeth in the male sex, whereas those in the female more ressemble those of *Acanthocheilus quadridentatus* (Molin).

The body slightly tapers at the anterior end, where 3 distinct lips may be discerned. Seen on top they appear to us as distinct lobes surrounding the broad bordered triangular oral opening and the entrance to the oesophagus. The dorsal lobe presents as usual 2 double widely separated papillae. In the male each tooth is bicuspid, each cusp being strongly planted, rounded at the at the tip or with an acute point rising from a more or less rounded base.

They ressemble somewhat the teeth of a carnivorous mammal. In the

female the bicuspid teeth are situated on cuticular bands of stronger structure than in the male. On the dorsal lip just like in the male both teeth are separated by a wider distance than on the subventral lips where they seem to be more contiguous. Subventral lip crowned with a double papilla, a papillalike amphid and a small papilla situated on the dorsal side of the lip.



Acanthocheilus bicuspis WEDL

FIG. 34, 35. Head ends of resp. ♀ and ♂ on top. — FIG. 36. Head end of ♂, in lateral view. — FIG. 37. Anterior portion of body. — FIG. 38. Female tail with phasmids (Phas.). — FIG. 39. Male tail with copulatory mark. — FIG. 40. Male tail, distal end.

Seen from the side the biscupid teeth are also distinctly visible.

Oesophagus club-shaped. Oesophagus and intestine separated by a short circular cardiac portion.

Male tail short, cone-shaped, the latter bearling a blunt point and at its tip a minute micron, moreover 4 postanal pairs of papillae. The exact spot of the anal opening could not be located with absolute exactness. I am not quite certain if it is situated at the base of the terminal point, or on the tip of the more or less circular preterminal dome.

In all my males glue sticked to the cloacal aperture, as a copulation mark making it difficult to discern the cloacal opening. I counted 27 pairs of preanal papillae, of which the anterior ones are separated by wider distances than those nearer to the cloacal opening. Moreover the preanal rows of papillae are slightly irregular.

Female tapering gradually to the blunt apex. Phasmids distinctly visible.

Genus CONTRACAECUM RAILET and HENRY 1912

Contracaecum crenulatum n. sp.

(Fig. 41-45.)

3♀ ♀ from *Cancroma cochlearia* Lin. Leibeshöhle, Trombetas (affuent of Amazone river, near Obidos), Brazil, 14-I-1930.

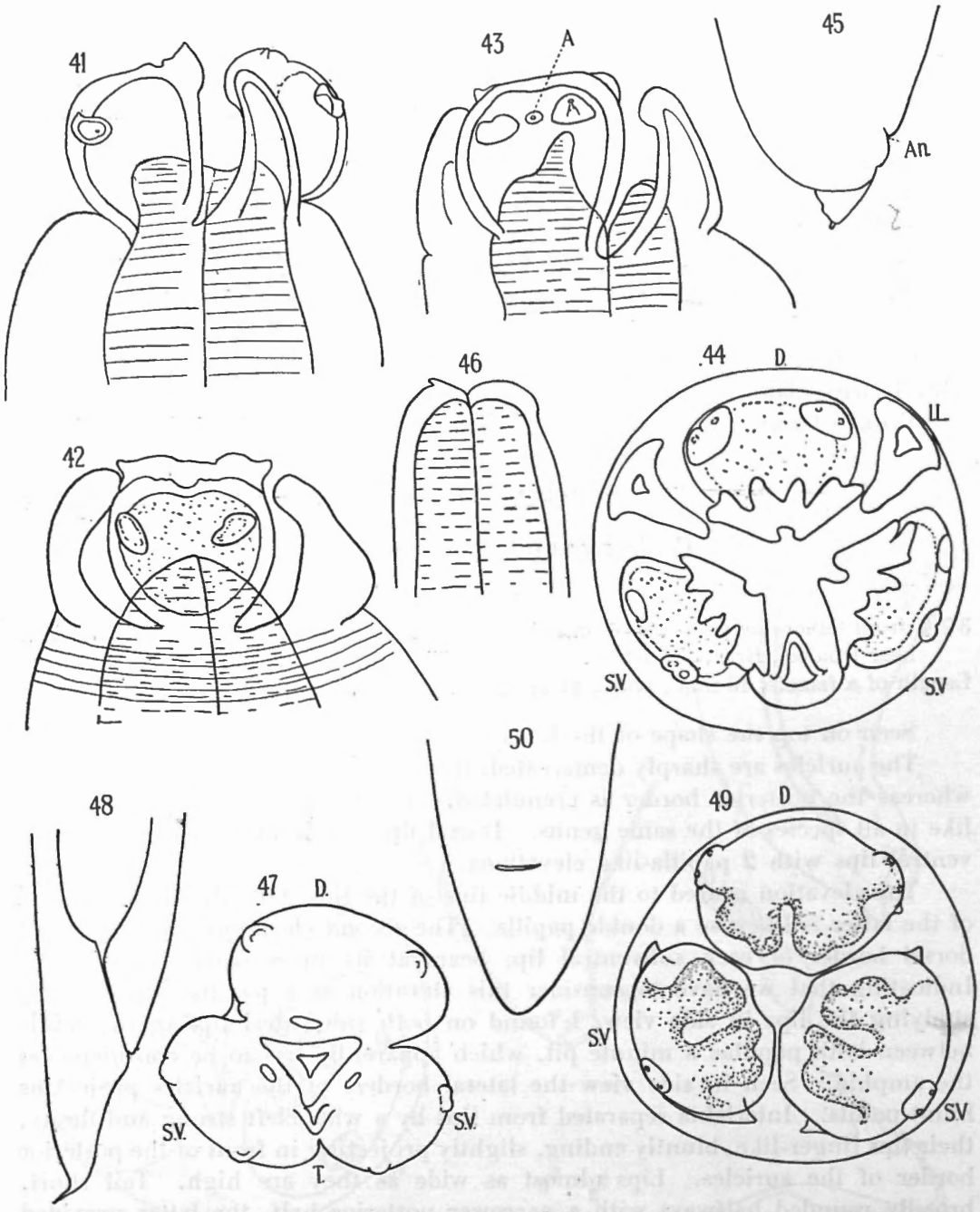
Length of a female, 16 mm.; width of the same, 0,8 mm.

Seen on top the shape of the labia and the interlabia may best be studied.

The auricles are sharply demarcated, they are distinctly incised at the apex, whereas the posterior border is crenulated. The lips are comparatively small like in all species of the same genus. Dorsal lip with 2 double papillae. Subventral lips with 2 papilla-like elevations.

The elevation neared to the middle line of the lips, but slightly subventral of the latter is likewise a double papilla. The second elevation, situated to the dorsal border of each subventral lip, bears at its tip a small single knob. Indicating that we have to consider this elevation as a papilla, whereas, by studying the lips in side view, I found on both subventral lips in the midle between both papillae a minute pit, which apparently has to be considered as the amphid. Seen in side view the lateral borders of the auricles project as blunt points. Interlabia separated from lips by a wide cleft strong and flesny, their tips finger-like, bluntly ending, slightly projecting in front of the posterior border of the auricles. Lips almost as wide as they are high. Tail short, broadly rounded halfways with a narrower posterior half, the latter provided at its tip with a mucron.

Contracaecum crenulatum shows ressemblance to *C. amoyensis* Hsue as for the shape of its lips. The relative size of lips and interlabia is as in *C. spiculigerum* (Rud.). With *C. engonium* Baylis from the black stork, *Ciconia nigra*



Contracaecum crenulatum n. sp.

FIG. 41-43. Three head ends. — FIG. 42. Dorsal view. — FIG. 43. Subventral view with amphids. — FIG. 44. Head end in top view. — FIG. 45. Female tail with anal opening (An.).

Contracaecum sp. Larva.

FIG. 46. Head end, subventral view. — FIG. 47. Idem, top view. — FIG. 48. Tail.

Ascaris lumbricoides L.

FIG. 49. Head end, top view. — FIG. 50. Tail.

it has in sommon the shape of lips and interlabia, the structure of the pulp and the range of size. From this species it differs how ever in that the incisions which lips and interlabia separated is deeper than there.

Contracaecum sp.?

(Fig. 46-48.)

Baylis (1929) says that « it is noticeable that the *Porrocaecum* larvae are much longer and whiter than the *Contracaecum* larvae and are usually coiled up like watch-springs in disc-shaped or lenticular capsules, whereas the *Contracaecum* larvae, though enclosed in sheath consisting partly of old cuticles and partly of pigmented peritoneal tissue from the host, are not usually coiled ».

If this distinctive holds true for all species of *Contracaecum* and *Porrocaecum* than the present larvae should be considered to belong to the Genus *Contracaecum*.

2 larval forms from the body cavity of a flat-fish, caught at Cay Sal Bank, south of Florida, 19-III-1936, depth 5-7 fathoms. Length 5,5 mm.

Head rounded anteriorly, provided with the well-known larval tooth, situated in the cleft between both subventral lips. Each subventral lip with 2 papillae, dorsal lip with likewise 2 papillae.

Tip of tail gradually tapering to the apex, which is finely pointed.

Family **ASCARIDAE**

Subfamily **ASCARINAE**

Genus ASCARIS L. 1758

Ascaris lumbricoides L.

(Fig. 49-50.)

1 ♀ from Cuxiri (*Pithacia satanas*), Zoölogical Garden at Para (Brazil), 6-XII-1935.

Length of the female 15 cm, width 4 mm. The tail of this female is short and bluntly rounded. The head seen on top presents the usual 3 lips which enclose a triangular space, bordered by curved lines. Pulpa of the lips bearing 2 lobular projections, separated by a deep incision, each projection being faintly bifurcated at its tip. Subventral lips with lateral projections near the base. Dorsal lip with 2 double papillae each subventral lip bearing a single double papilla only. Amphids not seen.

Family HETERAKIDAE

Subfamily HETERAKINAE

Genus STRONGYLURIS Müller 1894

Strongyluris brevicaudata Muller

(Fig. 51-59.)

2 ♂♂, 1 ♀ from intestine of *Agama boulengeri* Lataste, Kassa (Iles de Laos, French-Guinea), Africa, 24-XI-1935.

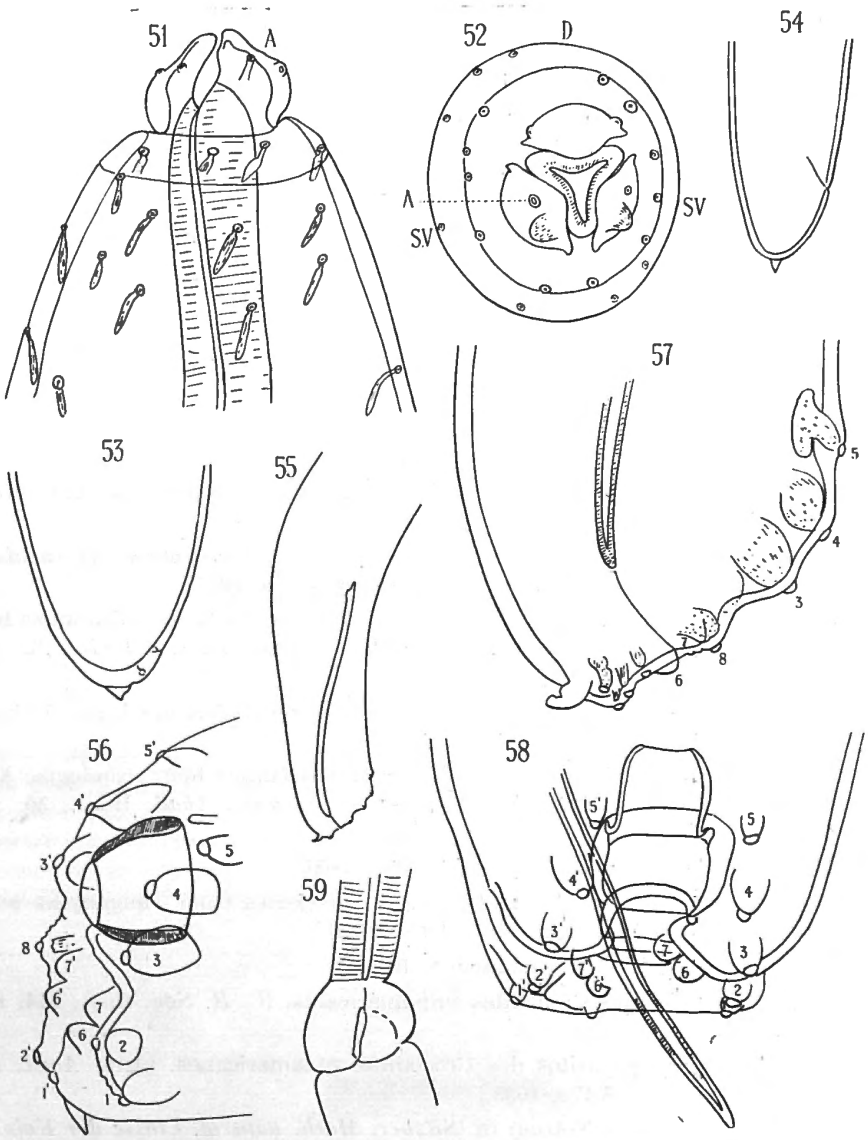
Length of female, 11 mm.; width, 1 mm.; Length of male, 8,5 mm.

Body tapering anteriorly, barely narrowed posteriorly. Head broadly conical sharply demarcated against the remainder of the body. 3 distinct lips, broadly separated. Seen on top each lip presents the shape of a kind of broad-bordered hat. Dorsal lip with 2 papillae, subventral lips with a conical elevated papilla and a distinct amphid each. Opening of the oesophagus triangular, wide, surrounded by a fleshy border. Oral cone surrounded by a neck-like ring with a crown of papillae, other papillae are found arranged more of less in longitudinal rows on the anterior part of the body. Oesophagus at its proximal end with the indication of a bulbus, the latter however without valvulae. Female tail short, dome-shaped with a short point.

Male tail ending broad, truncate, its tip curved backwards to the dorsal side. Spicula bluntly pointed at the tip, slightly more than 3 times as long as the body diameter near the cloaca. In the ventromedian line there is a praecloacal sucker, followed to the apex of the tail by 2 pairs of circular papillae, the tip itself is surrounded at each side by 4 closely approximate papillae. Seen from the side there appear to be 4 pairs of praecloacal papillae. Two of these are situated in front of the opening of the ventromedian sucker, 2 others more lateroventral.

The *Heterakidae* were classed to the *Oxyuroidea* by Yorke and Maplestone, whereas Baylis and Daubney, who I follow in this respect have brought this family to the *Ascaroidea* which I think is justified, since apart from the indication of an oesophageal bulbus, which may also be present in those Ascarids, where there is a separate cardiac portion like for instance in the Genus *Acanthocheilus*, nothing necessitates the separation of this family from the *Ascaroidea*.

Baylis found the same species in *Agama stellio* (*Stellio vulgaris*) at Alexandria, in *Chamaeleo fischeri multituberculatum* (= *werneri*) at Mlalo, near Ambangula, Western Usambera mountains, XII-1923 and in *Chamaeleo fischeri matschleri* at Amani, Usambera mountains, XI-1926, Sandground found it in *Chamaeleo fischeri multituberculatum* and in *Chamaeleo dilepis dilepis*.



Strongyluris brevicaudata MÜLLER

FIG. 51. Head end, side view. — FIG. 52. Top view. — FIG. 53, 54. Female tail ends. — FIG. 55. Male tail, total view. — FIG. 56-58. Male tail ends; 56 and 57, in lateral view; 58, in ventral view. — FIG. 59. Proximal end of oesophagus.

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