Some undescribed Trematodes.

By

J. Stafford, B. A., Toronto, Ph. D., Leipzig.

(From the Biological Department, University of Toronto.)

With Plate 26.

1. *Distomum pelagicum n. sp.*

This Trematode I obtained in Passamaquoddy Bay, off St. Andrew's, New Brunswick. It was to be found among the numerous small crustacea, nauplii and other crustacean larvae, insect larvae, small annelids, eggs etc., procured by dragging beside a boat and half immersed in the surface water a system of five small nets placed one inside of another. The mouths of the nets were supported by strong wire rings about six inches across and the nets themselves were so arranged that the one with the largest meshes was on the inside, that with the smallest meshes to the outside. In this way a sorting of the objects caught took place — only the smallest ones making their way to the outer net.

I had seen this animal and had hurriedly examined it, under the microscope, while it was alive, but for want of time paid no further attention to it. I, however, dropped some of the contents of the outer net into a little bottle of formaline which I brought home. Upon looking over this material a few weeks ago, I could find but 2 specimens of the required *Distomum*. One I stained slightly and mounted in toto in Canada balsam. The cut, Fig. 1, is drawn from this preparation. The other, smaller and more shrunken specimen, I laid into a series of transverse sections by the microtome; and although these did not prove altogether satisfactory yet they served to verify and correct my impressions to a considerable extent.

The animal mounted measures 0,92 mm in length (accurately 927 μ), and 0,22 mm in greatest breadth. Sections of the other specimen show a circular outline.

Most conspicuous of the organs are the two suckers. They are equal in size and, in proportion to the mass of the animal, are relatively powerful adhesive organs. The oral sucker, in its natural position, looks downwards and forwards and the ventral sucker lies behind it at a distance of about one quarter of the length of the animal.

The integument is supplied with a cuticle laid out into a succession of rings of which the posterior rim of each appears to project over the one succeeding it. Under high magnification it can be seen that each ring contains a circular row of small spines.

So far as I have yet determined, the body walls and the parenchyma filling the intervals between the several visceral organs agree in structure with other Trematodes.

The intestinal system is composed of a mouth, a pharynx and two blindly ending lateral branches.

A nervous system is present in the shape of a supra-pharyngeal transverse band, and I suppose lateral nerves are present although I have not distinguished them.

The excretory system remains entirely unknown, unless a portion which I shall shortly have to refer to is to be considered the expulsion canals.

This Trematode is, as usual, hermaphrodite — both male and female reproductive organs being present in the same individual. Two testes are situated between the intestinal caeca immediately behind the ventral sucker. They lie right and left, one being partly behind the other; their greatest diameter is in the vertical axis.

Behind these again, about the middle of the body, is the ovary, while laterally from it but slightly more posterior are two yolk glands.

Before the worm was mounted, when, upon making a change of alcohol the diffusion currents caused it to roll over and over, it seemed as if the yolk glands were lobed and connected with one another across the middle of the body. The connective was no doubt the transverse vitelline ducts which contained enough yolk to be made visible. The ducts of the reproductive glands I have not followed but their distal ends meet and open to the exterior just in front of the ventral sucker. One fold of the uterus, containing small nucleated spherical ova, crosses over the pharynx from side to side.

I have now to describe an organ which appears to me to be of

considerable interest both from a morphological point of view — in its large size and characteristic structure, and from a physiological point of view — in the probability of its function. If it is as it appears in my mounted specimen, I think it may well count as new to Trematode Helminthology. The scantiness of my material, however, compels me to accept only with some reservation any view as to the uses of the organ in question.

The posterior end of the animal appears to be invaginated and the cavity thus formed is continuous with the exterior through a narrowed opening. The walls of this relatively large cavity are folded longitudinally and its anterior end is pushed backwards to form a cup which receives the blind ends of the intestine and some undifferentiated meristem parenchyma. I suppose that two lateral excretory tubes open into this cavity behind the intestine and it seems likely that this whole structure is to be considered as an enormously enlarged expulsion canal. The cuticle in some other Trematodes continues through the porus excretorius on to the inner surface of the expulsion canals, but here the thick muscular wall also appears to be continued. In a section falling through the anterior wall of this organ are apparently two openings, but, on account of the folds and creases of its inner walls, I could not be certain that they are the mouths of the excretory tubes. A longitudinal section here would be very instructive.

The whole structure impressed me from the first with the idea that we have to do here with a specialization of the posterior end of the excretory system in adaptation to the requirements of a parasitic animal which has acquired the habit of temporarily quitting one host and leading for a time a pelagic existence by forcibly squirting water from its expulsion canal in a fashion similar to what takes place in the jelly-fishes and squids until perchance it is thrown against a new host. While I observed it living, I saw no such performance although it was very active in squirming, fixing and releasing its suckers etc. and it is possible that the structure in question may have quite a different function.

Should it be found capable of the locomotion I suggest, it will be observed that the animal is pelagic; but it must also be for a time ectoparasitic, for which mode of life its suckers are well suited; and further, as is indicated by the structure of its cuticle, it is an endoparasite, capable of wandering through the softer tissues of the animal it infests.

2. *Monostomum amiuri n. sp.*

The only Distomes I have observed in the cat-fish are 2 species — one in the eye and the other in the liver of the young fishes, about an inch and a quarter long, that we use from which to prepare serial sections. This Trematode occurs in the swim-bladder of the adult cat-fish (*Amiurus nebulosus*). Since it possesses but one sucker — the oral — it falls in the group Monostomidae; and the name *Monostomum amiuri*, by which I have chosen to designate it, can not, so far as I at present see, prove either vague or conflicting.

Monostomum amiuri is a worm about 5 mm long and 2,25 mm broad. It is much flattened and is broadest in its posterior two thirds, the anterior third narrowing towards the mouth-sucker. The dorsal surface of the living worm reminds one, in its pigmented appearance, of some of the free-living fresh-water Planaria. The colour is largely due to the contents of the intestine and to the numerous eggs. It is somewhat dark, not unlike the inner membrane of the air-bladder on which it rests, but with two longitudinal, rusty stripes. The living animals are very soft bodied, inactive creatures.

The integument bears a cuticle and is apparently very thin; the sub-cuticular and glandular parts seem to have a similar structure to the same parts of the Distomes with which I am most acquainted.

The intestinal system begins with the mouth whose thick muscular walls form the oral sucker. This is succeeded by a muscular pharynx after which follows a narrow oesophagus. The latter gives rise to two lateral intestinal caeca, extending as broad tubes to near the posterior end of the body where they end blindly.

The nervous system I have not yet undertaken to follow.

Owing to the unfavourableness of the living worm, only the posterior unpaired part of the excretory system has been made out.

The reproductive system is of the usual complex type for this group of animals. There is no sexual dimorphism, each individual being dioecious. The genital glands of the male sexual organs — the testes — are situated most posterior in the body, between the median expulsion tube of the excretory system and the ends of the intestinal caeca. Vasa deferentia rise out of their anterior ends and proceed, by a direct course, to near the middle of the animal where they meet in the vesicula seminalis. The latter runs forwards and opens by a muscular penis on the ventral surface of the worm, about one third from its anterior end. The structure of this portion of the genital organs I have not satisfactorily made out. The female organs include

an ovary, located a little behind the middle of the animal, a long, folded oviduct — the uterus — filled with eggs, occupying most of the posterior two thirds of the body and opening by a bulbous vagina immediately behind and to the right of the penis. To these organs must be added two lobular yolk glands, lying outside of the forked intestine and extending from the level of the genital openings to the hind end of the animal. A longitudinal yolk duct receives the yolk cells from the numerous follicles on each side and conducts them, by a transverse tube in the region of the ovary, to a yolk reservoir that communicates with the oviduct close by the shell gland.

The egg is 45 μ × 24 μ in size and its blunt broader end is provided with a short hooked filament.

3. *Distomum hospitale n. sp.*

This is a worm 4 mm in length, taken from the mid-intestine of the Newt (*Diemyctilus viridescens*). It is a delicate, flat worm of long-elliptical outline. The feature first to be noted is the shortness of the intestinal caeca, which extend scarcely beyond the enclosed ventral sucker. Between the two is the opening of the genital glands.

The ovary lies to the left, not quite half the length of the animal from its anterior end. The oviduct has a small receptaculum seminis, and, farther back, the uterus lies, in folds and spirals, across the posterior half of the body.

An anterior testis is to be found on the right side, opposite to the ovary; and on the left side, behind the ovary, is the second testis. The vitellarium is paired — right and left — reaching from the pharynx to the genital glands. The expulsion canal is long.

In the cuticle of the anterior portion of the animal are fine spines.

In the posterior half were three small, spherical sacks each containing a small, curved, square-headed, pointed-tailed Nematode. It is due to the presence of these guests that I have selected the above specific designation.

4. *Distomum quietum n. sp.*

This graceful little worm occurs in the intestine of the frog, in the brown region round the opening of the bile duct and posterior to this.

It is somewhat cigar-shaped, compact and symmetrical in form. It measures, when fixed, about 3 mm in length and scarcely 1 mm in breadth. The one from which the drawing, Fig. 4, was made measured

2.75 mm by 0.875 mm, but I have measured living specimens 3.675 mm long and proportionately broad. Measurements of different individuals, unless they are distorted by pressure, are likely to bear pretty accurately the same proportions; for, as indicated in the specific name, this is a very quiet little creature, that may rest inactive for considerable time, and, when it does move, it is with slow and graceful movements that change its dimensions only to a slight extent, chiefly in extending and withdrawing the anterior end and not at all in violently flopping back and forward, wriggling and disfiguring itself as some other frog-trematodes do. The body is cylindrical, as shown by the circular transversal sections, the posterior end blunt or rounded and the anterior tapering. The colour is white, except in the middle region of the posterior half which is brown — due to the eggs. This worm is not at all evidently exposed when the intestine of the frog is slit open. They are easy to overlook even when one directs his attention to a small surface. Often a minute light brown speck is all that can guide one's forceps to the object of his search. It may be that this is the cause of our worm's having escaped the attention of helminthologists so long; or, on the other hand, it may be that it is only local in its occurrence, or that it has been mistaken for *Distomum endolobum* to which I think it bears considerable resemblance.

The integument is furnished with a thick cuticle containing except at the anterior and posterior ends small backwardly slanting spines. These are arranged in longitudinal rows with great regularity. The rows are perhaps 15 μ apart and the spines of every second row are opposite the spaces between those of the first and third rows. Between two spines of the same longitudinal row is a space of 30 μ, but this may vary a little according to the region of the body. The spines themselves appear narrow when looked at on the edge of the body, but more scale like when viewed at right angles to the surface of the body; they seem to be fixed to a circular basal plate and are 15 μ in length.

The fixing organs are an anterior mouth-sucker and a ventral sucker of smaller dimensions. The mouth sucker, in the mounted specimen above described is 0.260 mm broad while the ventral sucker measures 0.175 mm. The ventral sucker is placed 1 mm from the anterior end and 1.75 mm from the posterior end, while between the two suckers is a space of 0.875 mm.

In a living worm 3.675 mm in length the anterior sucker measured 0.350 mm across and the ventral sucker 0.210 mm. From the anterior

end to the middle of the ventral sucker was 1.487 mm while from this point to the posterior end was 2.187 mm and between the middle points of the two suckers intervened a distance of 1.225 mm.

The intestinal system begins with the ventrally directed mouth in the mouth-sucker; this passes into a muscular pharynx and then into a narrow thin walled oesophagus; the latter gives origin to the biramous intestine, the two diverticula not reaching to the posterior end of the animal.

A bunch of glands on each side of the oesophagus sends its ducts forwards to open anterior to the pharynx and other long skin-glands extend forwards and open to the surface at the anterior end.

The nervous system outside of the neckband I have not yet followed.

The excretory system seems to me, so far, to be of a slightly different type from those I have studied. From the first I missed the brightly gleaming capillaries that generally cross ones view. Again I searched faithfully in several animals before I found flame cells. On obtaining young specimens just beginning to fill with eggs, however, I was able to find some of these funnel-organs. The cause of their being more difficult in this than in many other forms is perhaps due to the readiness with which the tissues begin to disintegrate and become dark and mirky when the worms are exposed to water or are compressed by the cover-slip. From whatever cause, I, at any rate, searched harder in this than in any of the other worms of our district including *Distomum cygnoides*, *Distomum variegatum*, *Distomum ovocaudatum*, *Distomum tetracystis*, *Amphistomum subclavatum*, *Polystomum oblongum*, *Sphyranura osleri*, *Planaria polychroa*, *Taenia dispar*.

The number and arrangement of the funnel-organs remain to be determined as does also the arrangement of the larger vessels. These do not bear cilia on their walls as occurs in some forms, e. g. *Aspidogaster*, but their walls appear correlatively more muscular. This I have noticed in the worm under discussion even in the tubes of the second order of size. The large collecting vessel or expulsion canal extends from the testes to the posterior end of the body in the centre of which lies the porus excretorius.

Reproductive organs are represented by male and female genital glands and a yolk gland, together with their efferent ducts. Two spherical testes are situated in the middle of the body, side by side, the left one slightly more posterior than the right. Their vasa deferentia

are delicate tubes running direct to the penis sack the broad posterior end of which lies above the right side of the ventral sucker and contains a vesicula seminalis. The anterior end curves round to the left and opens between the sucker and the fork of the intestine.

The ovary is also a globular body, smaller than the testes, and to the left of the ventral sucker. Near the ovary the oviduct is joined by a receptaculum seminis and from the junction diverges a LAURER's canal which bends upwards to open in the mid-dorsal line, above the ventral sucker. Ootype, shell gland and receptaculum seminis uterinum follow; the latter passes into the uterus, which forms many foldings, right and left, between the branches of the intestine. The space beyond the blind ends of the caeca is also crowded full to the body walls. From here the uterus returns in a similar fashion towards the middle of the body and opens by a vagina, with the penis, into the unpaired genital cloaca.

Vitellaria or yolk glands lie between the prongs of the intestine and the lateral body walls and are composed of a considerable number of follicles, whose narrowed necks open into longitudinal vitelline ducts. These glands occupy the lateral regions of the middle half of the body. I have not followed the ducts in detail but I suppose there are two transverse vitelline ducts, that conduct the yolk cells from the before mentioned longitudinal ones to a vitelline reservoir and that this opens into the oviduct in the region of the shell gland.

It will be seen, as I have already intimated, that there are certain resemblances to *D. endolobum*. But there are also many differences, some of which I shall enumerate.

Small ventral sucker.

Pharyngeal glands.

Ovary left of sucker instead of right (I describe the position of the organs as they appear in the compound microscope).

Testes spherical. Their lateral position, and in the middle of the body. Also left one most posterior.

Vitellaria in middle region.

Long uterus, filling posterior part of body.

Long expulsion canal.

5. *Distomum chelydrae n. sp.*

The Distome thus conveniently designated occurs in the intestine of the Snapping Turtle (*Chelydra serpentina*). — It measures about 6 mm in length, and sections are 0.735 mm broad and 0.420 mm

deep. It often exhibits a constriction at the middle of the body; and at the sides of the mouth-sucker a pair of lateral expansions is often to be seen.

The suckers are nearly equal in size — about 0,275 mm, in sections, although the ventral one appeared to me rather the smaller, in the living animal. It is situated near the middle of the anterior half of the animal.

The integument has a cuticle, and the longitudinal muscle fibres are especially large.

Mouth, pharynx, and lateral intestines are present, as usual; the latter being especially long, reaching to the posterior end of the animal.

The median, unpaired expulsion canal of the excretory system is very long, extending from the posterior porus to the ovary, near the ventral sucker, where it divides into lateral, anteriorly directed branches.

Of the reproductive system, the testes are conspicuous, near the middle of the body, in the broadest part, just behind the constriction. One is situated behind and to the right of the other. Narrow vasa deferentia connect them with the penis, lying to the right of the ventral sucker. A seminal vesicle lies in the base of the penis sack, and is continued, as a ductus ejaculatorius, to the genital sinus, which opens ventrally, immediately behind the forking of the intestine.

A single ovary lies behind and to the right of the ventral sucker. The oviduct soon gives off a Laurer's canal which curves upwards to open in the mid-dorsal line, above the posterior, inner edge of the ovary. At an equal distance beyond this again is the duct of the yolk reservoir, from which latter proceed, sideways, the two transverse vitelline ducts. Following the mouth of the yolk reservoir the oviduct forms an ootyp with its shell gland, a receptaculum seminis uterinum, and then the uterus which lies between the anterior testis and the genital pore into which its distal end opens.

Yolk glands are situated laterally from the intestinal caeca, in the second half of the body [1]).

6. *Distomum angustum n. sp.*

The worm here referred to I found in the intestine of the Painted

1) In outline this animal resembles the one figured and described by A. Leard, in: Quart. Journ. microsc. Sc., (N. S.) V. 2, 1862, pp. 168—170, under the name of *D. constructum*. Habitat and structure are, however, different.

Turtle (*Chrysemys picta*). It is a long, narrow (*angustum*), very thin animal. Its length, when mounted, is 3.150 mm, its breadth 0.455 mm. The anterior sucker measures 0.125 mm; the posterior, ventral sucker 0.095 mm broad, is situated 0.875 mm farther back.

The pharynx, 0.075 mm long, is situated 0.050 mm from the mouth-sucker, and there is another, longer, constricted, piece, the oesophagus, 0.225 mm, between it and the forking of the intestine. The latter is very like the corresponding part in the preceding species-parasitic in the Snapping Turtle.

The unpaired part of the excretory system branches, I think, at the posterior testis.

The testes are found, one behind the other, between the ends of the intestinal caeca, and the duct from the anterior one is turned to the right side. The penis is a long narrow organ (length = 0.5 mm), lying obliquely across the left caecum, with its base to the right of the ventral sucker and its apex opening on the ventral surface, near the left margin, a little posterior to the line traversing the forking of the intestine. There is a penis sack containing a vesicula seminalis and the end of the intromittent organ is, in the mounted specimen I am describing, exserted from the genital pore and bent back under the body. The ovary lies behind the ventral sucker, a little in front of the middle of the body and between two enlarged lateral vessels of the excretory system. Behind it is the yolk reservoir with the transverse vitelline ducts. The anterior end of the oviduct — the vagina — lies on the opposite side of the ventral sucker from the penis sack and opens with the latter at the genital pore. Eggs occupy the body from the sucker to the anterior testis but chiefly behind the ovary and between the intestines. The vitelline glands lie between the intestines and the body walls, extending from the region of the genital pore to near the anterior testis.

Remarks on other Trematodes [1]).

In the frogs of this region are found other Trematodes besides the one already mentioned as a new species. Of these two species have been already reported. These are:

1) I at first intended to publish this paper in Canada. Accordingly, there will be found a few statements that were designed to assist students of the subject in this country to recognize the worms or to find the literature. For others this part of the subject will only be of value from the standpoint of distribution.

1. *Distomum variegatum* Rud.[1]).

2. *Distomum cygnoides* Zeder.

Both of these species are very common here. Of the first — our largest frog-parasite — I have found as many as 17 full-grown, deeply coloured specimens in one lung — the other lung of the same bull-frog also containing 12. In some frogs I have found a greater number than this but I have no record of how many.

I shall not describe these forms here. For *D. variegatum*, besides the reference already given, there is a short description by Leidy [2]); and for a lengthy account, giving also its various synonyms, and an excellent illustration I shall refer to the large work by Looss.

Distomum cygnoides from the urinary bladder of the frog is to be found in still greater numbers. Illustrations are given in the paper by Bensley and in the work of Looss, as well as in many other places.

3. *Distomum ovocaudatum* Vulpian.

This species occurs, frequently two or three individuals together, in the mouth of our largest water-frog (*Rana catesbiana*). I have seen it on the tongue but not yet under the tongue — the only place named by Vulpian, Creutzburg and Looss. I find it occurring more frequently at the entrance of the Eustachian tubes, in a fold along the inner edge of the jaw bone, at the entrance of the posterior nares and round the entrance to the oesophagus. In one frog I lately found 11 specimens of this worm chiefly at the entrance and even deep in the Eustachian tube and at the entrance of the oesophagus. One of these taken from the ear cavity was fully three times as big as I had ever seen before but it would not extend itself to permit of

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1) For *D. variegatum* see R. Ramsay Wright, Contributions to American Helminthology, No. 1, 23 pages and 2 plates, p. 8, in: Proc. Canadian Inst., V. 1, No. 1, 1879. — For *D. cygnoides* see R. R. Bensley, Two Forms of Distomum cygnoides, 6 pages and 1 plate, in: Ctrbl. Bakt., V. 21, No. 8/9, 1897.

2) Leidy, Contrib. to Helminth., in: Proceed. Acad. nat. Sc. Philadelphia, V. 6 (1840—47) 1852, pp. 205—209; 222—227; 239—244; 284—290, where reference may also be found to a couple of other Frog-Trematodes, viz. *D. cygnoides* and *D. retusum* Duj. — *D. atriventre n. sp.* Weinland, in: Proc. Boston Soc., V. 6, 1856, p. 24, referring to a blackish spotted *Distomum* in the lungs of frogs and toads doubtless means the same species. — Looss, Die Distomen unserer Fische und Frösche, in: Biblioth. zool., Heft 16, 1894, 296 pages and 9 large double page plates.

a favourable measurement. It was perhaps of the same size as the largest described by Looss while the normal ones are smaller, of the size given by Sonsino and Creutzburg, about 5 or 6 mm.

An illustration, literature, anatomy etc. are given in the book by Looss.

4. *Distomum tetracystis* Gastaldi.

This form I observed two years ago and in great numbers — apparently hundreds — in the thoracic cavity of small grass frogs. Being occupied with other work at the time, I did not follow up the question. Upon slitting open the ventral wall including the shoulder girdle, these Trematodes could be drawn off in a pipette from the region in front of the heart. They were entirely free in the lymph which flowed into the thoracic cavity and I thought that it was possible that they came from some lymph spage between the muscles. As they were all free I did not suppose that I had the same species as that of Gastaldi.

A week or two ago I directed my attention again to this subject, using the bull-frog (*R. catesbiana*). I find the worm encapsuled, in great numbers, in the region of the throat. By removing the skin, slitting through the mylohyoid muscle and lifting up the cartilaginous anterior end of the sternum, the capsules are exposed, lying imbedded in a gelatinous mass that extends over a considerable space, reaching back to the level of the heart and also spreading outwards and backwards to the attachment of the anterior limbs. It was by cutting through this mass that the worms were freed in such numbers into the thoracacic cavity, upon my first noticing them. Only a few days ago, however, I found a huge gelatinous mass containing abundance of worms lying on the duodenum in the position of the pancreas which appeared to have been destroyed.

The capsules measure about 0.8 mm by 0.7 mm and smaller, and the thickness of their walls is 0.085 mm. The worms are able to free themselves rapidly from their delicate, connective-tissue capsules as shown by the great numbers that speedily become free when disturbed. Gastaldi's[1]) description although brief is remarkably correct.

They are immature worms, about 700 μ long when alive, but possessed of great freedom in lengthening and shortening their bodies.

1) Biagio Gastaldi, Cenni sopra alcuni nuovi elminti della Rana esculenta, Torino 1854.

They can extend to 1000 μ, or contract to a rounded lump about 350 μ across. When killed in glacial acetic acid and dehydrated with ascending strengths of alcohol, stained and mounted they measure 450 μ in length and 210 μ in greatest breadth. The ventral sucker is 186 μ from the anterior end and is 78 μ across. It is situated in the middle of the ventral surface where the body is broadest. The anterior sucker is never so plain as one is accustomed to find in Trematodes. Perhaps this is partly due to the mouth being at the end of the body and, owing to the small size of the worm, is scarcely ever turned towards the observer by pressure of the cover glass.

Following the mouth is a narrow oesophagus in which is situated a pharynx. The intestinal caeca are short and, viewed from the surface, appear to clasp between them the ventral sucker.

Conspicuous objects are the four large glands situated round the forking of the intestine and between this and the ventral sucker. There are two on each side, each finely granular, nucleated and sending off from its centre a duct. The two ducts from each pair soon come together and run forwards side by side, enlarge in the lateral regions of the oral sucker and open on to the anterior end close by the mouth opening. These glands were regarded by LEUCKART [1]) as destined to supply a material by the help of which the worm could form its capsule.

The excretory tubes are also conspicuous objects. Near the posterior pore are two lateral expulsion bulbs which narrow into vessels extending forwards as far as the level of the intestinal caeca. Laterally from these they form a coil which becomes straightened out upon the extension of the animal. As far as I could make out there are two vessels given off from this coil, one proceeds forwards to the mouth sucker, the other turns backwards towards the excretory pore. Each gives origin to lateral branches which are apparently in clusters but whether these bear the funnels or the capillaries I cannot yet decide. The rapid movements of the animal, when allowed sufficient space to move, and the way in which the vessels coil about one another upon contraction of the animal, when its movements are arrested, make it difficult to obtain a satisfactory observation. I have counted eight funnel organs whose capillaries converged apparently to the one spot but I cannot say at present whether there is such a regularity

1) LEUCKART, Die Parasiten des Menschen, 2. Aufl., V. 1, Lief. 4, p. 132.

in number and arrangement as I have shown to occur in *Aspidogaster*[1]). GASTALDI must have seen the cilia of the funnels for he mentions ciliated canals, and, as far as I can make out, there are no cilia on the inner walls of the tubes themselves. The funnels appear to be numerous and are tolerably easily found for such organs.

The cuticle, especially of the anterior part of the animal, contains minute spines and there is also a double row of these round the opening of the ventral sucker.

A bunch of cells, distinct from the parenchyma, lies between the ends of the intestine and the confluence of the expulsion canals. This is doubtless the rudiment of the genital glands.

Where this worm reaches maturity is not known. One can imagine such a bird as a hawk eating the flesh of a frog and with it some of these worms; in its intestine, perhaps, they reach maturity and discharge their eggs, which may be voided with its faeces round ponds; the miracidia may creep into snails or insect larvae or crustaceans that fall prey to the frog.

5. *Amphistomum subclavatum* RUD.

This Trematode I have found, on several occasions, in the rectum of frogs — chiefly of the small grass frogs. It is easily distinguished from the other species on account of its broad ventral sucker, which in this worm is at the posterior end of the body, and its conical form tapering into the small anterior mouth-sucker.

It is illustrated in PAGENSTECHER's "Trematodenlarven und Trematoden", Heidelberg 1857. See also LOOSS, Ueber Amphistomum subclavatum und seine Entwicklung, in: Festschr. LEUCKART, Leipzig 1892.

6. *Distomum medians* OLSSON.

It is only quite lately that two individuals of the species I thus provisionally designate have fallen in my way. Notwithstanding a difference of habitat and numerous minor differences in form and organization yet on the whole the dispositions of the organs are the same as in the *D. medians* figured and described in "Die Distomen unserer Fische und Frösche" by LOOSS.

My specimens I took from the liver of a bull-frog (*Rana catesbiana*). Each was in an elliptically shaped capsule, lying immediately under the surface of the liver and showing through. The capsules were thick walled and composed of a very tough connective-tissue

1) For Aspidogaster see Zool. Jahrb., 1896, V. 9, Anat., pp. 477—542, tab. 1—4, p. 510.

material that I could not tear open with forceps; they must have measured from 3 to 4 mm in length and not quite so much in breadth.

As the animals appeared very sluggish and somewhat non-transparent I was afraid to keep them under observation for any length of time, in a changed medium, for fear they should become more turbid or even die; I accordingly killed them at once in glacial acetic acid, washed in 70% alcohol, stained in alcoholic carmine, dehydrated, cleared and mounted in balsam.

The larger and, judging from the contents of the uterus, the older of the two measures 1.9 mm in length and 1.28 mm in breadth. It is broadest across the ventral sucker and narrows more towards the anterior than the posterior end. The dorsal wall of the oral sucker projects a little, as a blunt cone, at the anterior end and the posterior end of the body has a broad but shallow indentation.

The mouth sucker measures 0.038 mm across, while the ventral sucker is slightly broader, with its anterior rim in the middle of the length of the animal.

The cuticle contains spines.

The expulsion canals diverge from the excretory pore.

The intestine agrees with the figure given by Looss, but the caeca are nearly filled with brown egg-shells like those in its uterus.

Its testes are situated right and left of the ventral sucker, at the ends of the caeca, the right one slightly in advance of the left. The penis lies across the ventral surface of the left caecum and stretches from close to the ventral sucker to a point half way between the caecum and the margin of the body and slightly behind the level of the forking of the intestine. The ovary is placed between the prongs of the intestine but more dorsal and with its outer border overlying the middle of the right caecum, its right border in the median longitudinal axis of the animal. It appears to be a lobed body of irregular outline. Corresponding with the shortness of the post-acetabular portion of the body, the uterus does not fall in two long folds, right and left, with smaller secondary folds in the transverse direction, as shown is the figure by Looss, but the primary folds are transverse and the secondary fall in the direction of the long axis of the worm. If it should turn out, however, that these worms are un-naturally contracted, then that might explain this difference. I can find no indication of a gelatinous coat round the eggs but here again I must obstain from conclusions until I examine the living animal.

Vitellaria lie between the testes and the pharynx and are not

plainly in two halves, neither are they confined to the lateral regions, but lie also across the ventral surface of the intestine and ovary.

I shall here mention a few of the ways in which the worms I have differ from the figure and description by Looss. If his figure is characteristic, and if my examples are normal, then there still remains the question whether the differences are of more than varietal importance.

Length : breadth = 3 : 2 instead of 2 : 1.

Broadest at middle and posterior.

Posterior end broad and indented instead of drawn out and pointed.

Ventral sucker rather larger than oral sucker instead of the reverse.

Oesophagus shorter than would appear in the figure by Looss.

Ovary inside instead of outside the right caecum, and with an irregular lobed shape instead of rounded.

Uterus in folds transversely instead of longitudinally.

Eggs without a gelatinous coat.

Vitellaria extending over a much greater surface and not distinctly separate, instead of being confined to two separate, small districts on each side of the oesophagus.

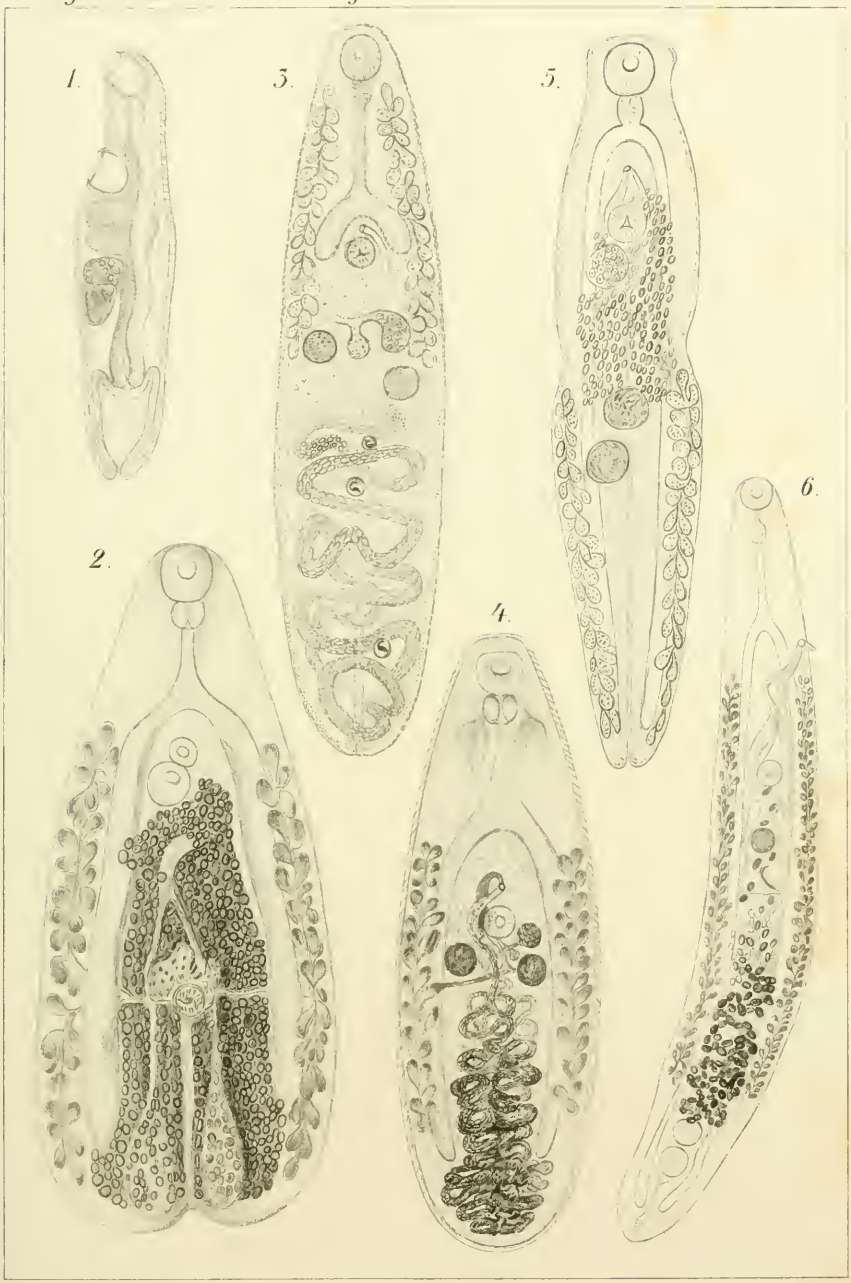
Occur encapsuled in the liver instead of free in the proximal portion of the small intestine.

7. *Polystomum oblongum* Wright.

In the paper by Wright, already referred to, he figures and describes a new species from the urinary bladder of the musk turtle and expresses the opinion that Polystomes would be found in the mouth of the painted turtle and of the snapping turtle. I have found a single specimen on the palate of the first named turtle and I feel tolerably certain that it is the same species as the one described by Wright under the name *Polystomum oblongum*. I sought to learn as much as possible from the single animal and accordingly studied it first alive and afterwards killed and sectioned. As might be expected under such treatment neither method would give its best results.

Explanation of the Plate.

Fig. 1. *Distomum pelagicum.* Surface of the ocean. Real length 0.92 mm.
Fig. 2. *Monostomum amiuri.* Swim-bladder, catfish. Length 5 mm.
Fig. 3. *Distomum hospitale.* Intestine, newt. Length 4 mm.
Fig. 4. *Distomum quietum.* Intestine, frog. Length 2.8 mm.
Fig. 5. *Distomum chelydrae.* Intestine, snapping turtle. Length 6 mm.
Fig. 6. *Distomum angustum.* Intestine, painted turtle. Length 3.15 mm.



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