

**Parorchis acanthus, the Type of a new Genus
of Trematodes.**

By

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With Plate 21.

THE form with which I am about to deal is one possessing several distinctive features of importance, and for that reason I have thought it worthy of special consideration. The following account is by no means exhaustive, but it is sufficient to place the species beyond any doubt of recognition, and to establish its claim to be regarded as the type of the genus to which it belongs.

Parorchis acanthus, mihi.

1906. *Zeugorchis acanthus*, gen. and sp. n. Nicoll, Ann. and Mag. Nat. Hist. (7), xvii, p. 519—522, pl. xii, figs. 4, 5; xiii, figs. 6, 7.

1907. *Parorchis acanthus*, Nicoll. Ibid (7), xix, p. 128.

The original description of this form as *Zeugorchis acanthus* was made from two preserved specimens found in the bursa Fabricii of a Herring-gull (*Larus argentatus*). It is incomplete and erroneous in parts. I have since

obtained numerous examples from the same situation, and in the only common gull (*Larus canus*) which I have had an opportunity of examining an adult individual occurred in the rectum. The habitat is invariably the bursa Fabricii and the rectum, never the coeca or the intestine proper. The infection is not very numerous, there being seldom more than a dozen parasites in one host. In several instances, especially in young birds, examples of all sizes were found ranging from small immature forms measuring .45 mm. to fully developed adults over 4 mm. long. When removed from the host the parasite displays considerable vitality, several having been kept alive in distilled water over twenty-four hours, and doubtless if a proper temperature were maintained they would survive much longer.

The general outline of the body is roughly oval, narrower in front and rounded behind. In the extended state the breadth is comparatively uniform, but on contraction a characteristic shape is assumed, like that depicted in my original representation of the species. Three well-marked regions are then differentiated, a small head, a stout neck, and a broad flat posterior part. The head is always distinct, and possesses a raised ridge surrounding the oval sucker. The ridge forms a shoulder-like prominence on each side of the sucker, and its ends, which do not meet ventrally, are tucked up towards the mouth. On the edge of the ridge is a single row of regularly-arranged spines, about sixty in number, and having a fairly uniform length of .037 mm. The ant-acetabular region or neck is thick and muscular. Its ventral surface is flattened and beset with numerous strong spines; the dorsal surface is more convex and devoid of spines, except for one or two near the extreme edge of the body. On the ventral surface there is a sort of ridge between the genital papilla and the ventral sucker, which extends a short distance round the sucker on each side. The post-acetabular region is flatter and more delicate in structure. It is not nearly so muscular nor capable of so much contraction as the ant-acetabular region. Its ventral surface

has a few spines near the ventral sucker, but the dorsal surface has none.

The usual length of adult individuals is 3—5 mm. Sexual maturity is seldom attained below a length of 3 mm. The various measurements which will follow have reference to an individual of about 4 mm. length. The breadth of the head is fairly constant, .82—.87 mm. In the extended state the breadth of the rest of the body is 1.2—1.4 mm., but on contraction the posterior acetabular region may be as much as 3 mm. broad. The average breadth is about one third of the length of the body. In young examples the cephalic breadth is proportionately greater than in adults. The thickness of the body varies from .4 mm. in the neck to .8 mm. at the ventral sucker. The post-acetabular region has an average thickness of .5 mm.

The suckers are globular in shape and extremely muscular. The apertures are circular. The oral sucker may attain a diameter of .5 mm., while the ventral sucker is usually rather more than twice as great. In young specimens the proportion between the diameters of the two suckers more nearly approximates 2 : 3, the oral sucker being proportionately larger.

The cuticle is well developed and has an average thickness of .005—.007 mm., although in contracted parts it may be twice as thick. The spines, where they occur, are imbedded deeply in it. The anterior spines have a length of .019 mm. Passing backwards they increase in size, and may be found as long as .031 mm. with a base measurement of .012 mm.

The alimentary system is very well developed. There is a short thin-walled pre-pharynx, .11 mm. long (Plate 21, fig. 2, *p.ph.*). The pharynx is muscular, and measures .24 by .17 mm. On contraction of the animal the pharynx is thrust up inside the pre-pharynx, and the walls of the latter instead of contracting are bent down round the pharynx. The oesophagus is about three times as long as the pharynx. Its walls are crinkled so that numerous small dilatations are formed. In section its dorso-ventral diameter is much greater than its transverse diameter. The epithelium of its lumen is well

developed, usually in one layer, sometimes in two or three. The bifurcation takes place a short distance in front of the ventral sucker, almost on the same level as the genital aperture. The diverticula pass round on either side of the sucker; behind it they are directed in towards the middle line of the body, pursuing a more or less zigzag course. Further back they again bend out to pass round the outer border of the testes, and their terminal part, which is usually somewhat dilated, again approximates the middle line. Like the oesophagus the diverticula are wider dorso-ventrally than from side to side. The characteristic features of the alimentary system are thus its shape, the slightly sacculated condition of its walls, and the lateral flattening.

The excretory system is one of the most peculiar features of this Trematode, and differs very much from the types usually found. The vesical proper (Plate 21, fig. 1, *Ev.*) is not of large size, but is remarkable for its shape. The outline is very irregular, there being on each side about four short unsymmetrical branches, which may be bifurcated at their ends. It is situated at the posterior end of the body; the aperture is not terminal, but is a little forward on the dorsal surface. The excretory system comprises, in addition, two median and two lateral trunks, which communicate posteriorly with the vesicle. The median trunks are wide, compressed dorso-ventrally, and occupy a dorsal position. The lateral trunks are more irregular, and fill up the side-areas of the body. Their lumen is traversed by numerous septa, which divide it, as it were, into a system of anastomosing vessels. Viewed from externally the appearance produced is that of a mosaic of irregular patches, amongst which the excretory fluid circulates. The lumen of the median trunks is not so much divided. Behind the ventral sucker they begin to branch, and communications between the two trunks of one side, as well as between the two median trunks, are not infrequent. At the level of the ventral sucker the median trunks each send out a branch, which forms anastomosing connections almost completely surround-

ing the sucker. In sections the sucker has thus the appearance of being separated from the rest of the body by a cavity (Plate 21, fig. 2). In front of the ventral sucker the four trunks are no longer distinguishable, but are represented by a number of smaller vessels, which still retain their dorsal or lateral position. A few of these small vessels extend as far forward as the head.

The system which has just been described probably corresponds to the usual simple Y-shaped or V-shaped excretory vesicle. The remainder of the excretory apparatus does not differ from that commonly met with. On each side of the body there is a long narrow unbranched collecting tubule, having a ventral situation not far to the outer side of the intestinal diverticula. They are circular in section, and are lined with flagella throughout the greater part of their course. Their walls are distinctly marked, and differ in this respect from those of the excretory trunks, which have the appearance of being mere sinuses in the connective tissue. The fluid in the vesicle and trunks is limpid, and contains comparatively few granules. In the living animal it can be seen to be driven to and fro by the movements of the body.

I am not aware of any Distomid which possesses an excretory system exactly corresponding to this type. Cases in which the limbs of the excretory vesicle are put into communication with each other by means of anastomosing vessels are not uncommon, but they are not of the same nature as the present instance. A condition displaying more resemblance is found in *Mesometra* (*Monostomum*) *orbicularis* (Rud.),¹ in which there is on both dorsal and ventral surfaces a system of anastomosing canals, mapping out little polygonal masses of parenchyma. The form of the vesicle, however, in this species differs entirely from that of *Parorchis*.

The musculature is not essentially different from that of other forms already described. Beneath the cuticle there is a single layer of circular muscles. This is continued round

¹ Cf. 'Bronn's Thierreich,' IV, Vermes I i, p. 650, pl. xxxi, fig. 3.

the outside of the oral sucker, but is apparently absent from the ventral sucker. Within this is a much thicker layer of muscles having mainly a longitudinal direction. Numerous transverse fibres stretch across the body, especially in the anterior region.

The genital organs exhibit many features of peculiar interest. The testes are two comparatively large bodies measuring .55—60 mm. in diameter, situated not very far from the posterior end of the animal. They are placed side by side, almost, in some cases quite, touching each other, and practically on the same level. The obliquity, if any, is very slight, the left testis being possibly a little in advance of the right. They are compressed dorso-ventrally; the outline is roughly circular or polygonal, there being from six to eight distinct, though not very deep, lobes on each. The ovary lies a short distance in front of the testes, almost median or very slightly to the left of the middle line. Its outline is a regular oval, the long axis being transverse; its section is also oval, the long axis again being transverse. It is smaller than the testes, from which it is separated by part of the uterus, and measures .33 by .25 mm. The yolk glands are not of very great extent. They consist of a series of unequal-sized follicles on each side of the body, extending from the ventral sucker to the testes. Anteriorly they are situated close to the outer side of the intestinal diverticula. They retain this position throughout the greater part of their extent, but posteriorly they cross the diverticula ventrally, and a few follicles are to be found on the inner side near the testes. From this point the yolk-ducts run obliquely towards the middle line in a narrow strip of connective tissue lying between the testes and the median trunks of the excretory system. The shell gland is of large size, lying close to the ovary, dorsal and behind it. There is a small globular receptaculum seminis situated between the testes. Laurer's canal is present.

The vasa deferentia occupy a somewhat dorsal position in the body. They are not symmetrically situated, one being

nearer the middle line and more dorsal than the other. They unite in a fairly small, pear-shaped vesicula seminalis. This is a simple structure, not included in the cirrus pouch, and lying dorsal to the posterior half of the ventral sucker, behind which it extends a short distance. It is near the middle line of the body. The ductus ejaculatorius runs dorsal to the ventral sucker; its terminal third is surrounded by numerous prostatic glands. The penis, in its retracted state, is represented by a short dilated sinus, the wall of which is beset with numerous comparatively large spines. The penis and prostate are enclosed in a thin membrane forming the cirrus pouch. The genital aperture is situated a short distance in front of the ventral sucker on a conspicuous oval papilla in the middle line of the body.

The uterus has its beginning in the triangular area bounded by the ovary and testes. After executing several windings between these organs it proceeds to form convolutions running transversely from one side of the body to the other. These convolutions extend some distance to the outer side of the intestinal diverticula. They overlap the testes to a slight extent, but do not pass behind them. Anteriorly they are bounded by the ventral sucker. The vagina is well developed, situated to the left of the ductus ejaculatorius and dorsal to the ventral sucker. It opens on the left of the male duct at the genital aperture.

The ova are large and numerous, arranged in single file in the uterus. They are elliptical in shape, and the shell is of a light yellow colour. Near the ovary the ova are darker, and present the appearance of being in the process of segmentation. They measure $\cdot 081$ — $\cdot 095$ mm. by $\cdot 040$ — $\cdot 044$ mm. Development takes place rapidly, however, so that towards the middle of the uterus the almost fully formed larva can be observed within the egg-capsule. The latter has by this time increased in size to about $\cdot 106$ — $\cdot 113$ mm. by $\cdot 056$ — $\cdot 062$ mm. Shortly after the extrusion of the ova, which process I observed on one occasion,¹ the capsule is

¹ The previously-noted occurrence of ova in the ventral sucker was, I
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burst open at the blunt pole and the larva is set free. This is a small actively-moving Miracidium (Plate 21, fig. 6), not differing much from the usual type. It measures .18 by .05 mm., and the body is differentiated into two distinct parts, a head and a posterior part. The surface is completely covered with long cilia. Near the centre of the head is situated a large, dark, usually five-lobed pigment-spot (fig. 6 *e.s.*).

I shall now proceed to define the genus of which this species is to be regarded as the type.

Genus *PARORCHIS*, mihi, 1907 (= *ZYGORCHIS*, mihi, 1906). Body of moderate size and roughly oval outline, in the contracted state differentiated into three regions, head, neck, and hinder part, varying considerably in breadth. Anterior part of ventral surface beset with strong spines and oral sucker surrounded by an incomplete row of spines (or spines entirely absent?). Anterior part of body muscular, posterior part more delicate. Suckers well developed; ventral sucker much larger than oral sucker. Intestine with short pre-pharynx, powerful pharynx, cesophagus of considerable length with irregularly sinuate walls, and diverticula which pass round the outer side of the ventral sucker, then bend in towards the middle of the body, and, after bending out again, extend nearly to the hinder end; usually somewhat dilated at their termination. Excretory system consisting of a small median, irregularly-shaped vesicle posteriorly, into which open two median and two lateral excretory vessels; the latter are divided by septa into numerous lacunæ, and as they pass forward branch into numerous smaller vessels. Genital aperture median in front of ventral sucker. Cirrus-pouch includes only the penis and the pars prostatica. Penis beset with spines. Vesicula seminalis at some distance to the rear, small, oval, extending a short way behind the ventral sucker. Vagina well developed. Testes distinctly lobed; situated side by side, on approximately the same level near the hinder end of the body. Ovary transversely believe, purely accidental. I have not observed them in that situation again.

oval, pretty close in front of the testes, almost median. Shell gland well developed. Receptaculum seminis small, between the testes. Laurer's canal present. Yolk-glands not extensively developed, composed of unequal follicles; situated for the most part close to the outer side of the intestinal diverticula, and extending between the ventral sucker and the testes. Uterus also confined between the latter limits; convolutions fairly numerous, and having a transverse direction from side to side of the body. Eggs of large size, with light yellow shell, containing even at some distance from the genital aperture a fully developed Miracidium larva.

Habitat.—The terminal portion of the intestine of birds.

Type.—*Parorchis acanthus*, mihi.

In my previous description of the type I made mention of the remarkable similarity which it bears to *Distomum pittacium*, Braun, apart from the fact that the latter form entirely lacks spines. Further investigation of *Parorchis acanthus* has convinced me that the two species are very closely related, and, indeed, differ only in minor details. The outstanding feature of distinction is the absence of spines in *Distomum pittacium*. I am inclined to believe, however, that this difference does not actually exist, and that the spines have been removed as a result of the method of preservation, and their traces unnoticed by Braun. As far as I can gather, his description is based on a single specimen from the Vienna Museum collection, and he has had no opportunity of examining the living animal.

Immersion in a weak acid solution for even a comparatively short time causes the spines to disappear wholly or in great part, and something of this nature has possibly occurred to Braun's specimen. The circum-oral collar, of which one would have expected at least a trace to remain, is not represented in his figure, but, in the absence of spines, it might be apt to be passed over. As sufficient ground for venturing the foregoing supposition I would adduce the remarkable similarity in the internal structure of the two forms. It is

needless to recapitulate the features of resemblance; I shall rather point out the particulars in which they differ. Braun's specimen measured 3.5 mm., so that it is about the same size as an average example of *Parorchis acanthus*. In the former the oral sucker is much smaller than the ventral sucker, the diameters having a ratio of 1 : 3; in the latter the ratio is nearly 1 : 2. In *P. acanthus* the pharynx is slightly larger than that of *D. pittacium*, and in the latter the testes are much smaller. As a consequence the yolk ducts pass in front of the testes. The yolk glands do not quite reach the ventral sucker anteriorly, but the uterus has several convolutions on either side of the sucker as far forward as the middle of it, and, in addition, it extends very far back, passing even beyond the testes. The convolutions extend to the extreme edge of the body, and thus the whole organ is more extensive than that of *Parorchis acanthus*. Braun doubts the existence of a true cirrus-pouch, but marks it in his figure. Owing to what is, no doubt, an oversight, he represents an aperture in the centre of the cirrus pouch (*c.b.*), while on the right side of it the male duct appears to open separately. No mention is made of the excretory system.

From the foregoing considerations there can be little hesitation in including *Distomum pittacium*, Brn., in the genus *Parorchis*, which, therefore, comprises *P. acanthus* as type and *P. pittacius* (Brn.).

With regard to the systematic position of the genus I have previously made some remarks. It displays much affinity with the genus *Pygorchis*, Looss, a member of the sub-family *Philophthalminæ*. It might, though with some difficulty, be included under this sub-family, and is, in any case, very near it. It agrees in the size and muscular nature of the body, the relative sizes and development of the suckers, the well-developed alimentary system, the position of the genital aperture and genital glands, the situation and small extent of the yolk glands, and the condition of the uterus and ova. The differences consist in the spines, the cephalic ridge, the long œsophagus, the weakly-developed cirrus

pouch, and the symmetrical-lobed testes. Looss does not describe the form of the excretory system in the sub-family. The genus is thus brought into close relation with a sub-family, from which it differs externally, and affords a good illustration of the point which Looss¹ insists upon, namely, that external character is often a fallacious guide to the systematic position of a form.

EXPLANATION OF PLATE 21,

Illustrating Mr. William Nicoll's paper on "Parorchis acanthus, the Type of a new Genus of Trematodes."

The following letters apply to all the figures. *Bs.* Ventral sucker. *D.St.* Yolk glands. *Ex.* Excretory system. *J.* Intestinal diverticula. *K.St.* Ovary. *K.G.* Oviduct. *L.C.* Laurer's canal. *M.S.* Oral sucker. *Oe.* Œsophagus. *P.* Penis. *P.G.* Genital aperture. *Ph.* Pharynx. *P.Ph.* Pre-pharynx. *Pr.* Prostate glands. *T.* Testis. *Rs.* Receptaculum seminis. *S.D.* Shell gland. *Ut.* Uterus. *Vg.* Vagina. *V.S.* Vesicula seminalis.

FIG. 1.—*Parorchis acanthus*, extended, slightly compressed. Ventral aspect. *Pa.* Pre-acetabular ridge. *Ex'*. Lateral excretory trunk.

FIG. 2.—Sagittal section through anterior part of body, a little to one side of the middle line. *Pa.* Pre-acetabular ridge.

FIG. 3.—Transverse section through genital aperture.

FIG. 4.—Sagittal section through ovary and shell gland; almost median.

FIG. 5.—Transverse section through receptaculum seminis and testes; somewhat oblique. *S.R.* Collecting tubule.

FIG. 6.—Miracidium larva. *es.* Pigment spot.

¹ 'Zool. Jahrb.,' Syst. xii, p. 596.

