

STUDIES ON SOME
DIGENETIC TREMATODES
FROM
TASMANIAN FISHES

by

PETER W. CROWCROFT
(University of Tasmania)

With 39 figures.

THE SUBJECT MATTER EMBODIED IN THIS THESIS HAS BEEN PUBLISHED
IN THE FOLLOWING PAPERS :

New Trematodes from Tasmanian Fishes.

Pap. Proc. Roy. Soc. Tasm. 1944 (1945), 61-69, pls. 8,9.

A Description of *Sterrhurus macrorchis* n.sp., with Notes
on the Taxonomy of the Genus *Sterrhurus* Looss.

Pap. Proc. Roy. Soc. Tasm. 1945 (1946), 39-47, pls. 2,3.

The Anatomy of Two New Digenetic Trematodes from
Tasmanian Food Fishes.

Proc. Linn. Soc. N.S.W. 1946, 108-118, 8 figs.

Some Digenetic Trematodes from Fishes of Shallow
Tasmanian Waters.

Pap. Proc. Roy. Soc. Tasm. 1946 (1947), 6-25, 15 figs. (in press)

Note on *Anthobothrium hickmani*, a New Cestode from the
Tasmanian Electric Ray, (*Narcine tasmaniensis* Richardson)

Pap. Proc. Roy. Soc. Tasm. 1946 (1947), 1-5, 5 figs. (in press)

CONTENTS.

Family BUCEPHALIDAE.

Sub-family PROSORYNCHINAE.

Telorrhynchus arripidis n.gen. n.sp. 1.

Discussion of the sub-family Prosor'ynchinae 6.

Family ALLOCREADIIDAE.

Sub-family Opecoelidae.

Coitocaecum parvum n.sp. 11.

Opecoelus tasmanicus n.sp. 18.

Sub-family Allocreadiinae.

Gnathomyzon insolens n.gen. n.sp. 21.

Helicometra neosebastodis n.sp. 26.

Helicometra bassensis Woolcock. 33.

Helicometra fasciata (Rud.) 34.

Family HEMIURIDAE.

Sub-family Derogenetinae.

Derogenes crassus Manter. 35.

Hemiperina manteri n.sp. 37.

Discussion of the genus Hemiperina Manter 40.

Sub-family Sterrhurinae.

Sterrhurus macrorchis n.sp. 45.

Discussion of the genus Sterrhurus and the genus

Iecithochirium..... 50.

Parahemius lovettiae n.sp. 58.

Discussion of the genus Parahemius Vaz. et Pereira..... 61.

Parahemius australis Woolcock 63.

Family BIVESICULIDAE.

Bivesicula australis n.sp. 64.

List of Illustrations 68.

APPENDIX

Note on Anthobothrium hickmani, a new Cestode from the

Tasmanian Electric Ray (Narcine tasmaniensis Richardson).

2 Plates.

FAMILY BUCEPHALIDAE.

Sub-family: Prosorhynchinae Ohdner.

Telor hynchus arripidis n.gen. n.sp.

(Figs. 1 - 5).

<u>Host:</u>	<u>Arripis trutta</u> Bloch and Schn. (Colonial salmon).
<u>Location in Host:</u>	Intestine.
<u>Locality:</u>	Host obtained from Hobart fish market.
<u>Frequency:</u>	Many specimens in two of three host fish examined.

External Features: The worms are slender, elongate, and somewhat flattened dorsoventrally. The dimensions of fifteen "in toto" mounts are 1.55-2.36 mm. long and 0.26-0.24 mm. broad, but living specimens are narrower and one and a half times as long as fixed specimens. The body is broadest at its middle length and tapers towards the extremities (Fig.1). It is narrowest immediately behind the crown of the rhynchus. The latter is hemispherical and bears two papillae anteriorly (Fig.2). (These papillae do not represent contracted tentacles as is the case in some members of the Bucephalidae, as they are seen only when the animal is extended and are not noticeable in fixed specimens). The rhynchus is notable in that it is armed with a single circle of spindle-shaped spines, which are eighteen in number and measure 0.44 mm. long and 0.012 mm. in diameter. The circle is interrupted in the mid-ventral line (Figs. 1-2). The body is covered by a thick cuticle with minute spinules 0.012 mm. long closely arranged in transverse rows. The rhynchus is free from these spinules except within the ventral break in the circle of spines. The mouth is situated on the ventral surface, at about the middle length of the body when contracted, but at the junction of the second and last thirds of the body when extended. The genital aperture is in the mid-ventral line a short distance in front of the posterior extremity. The excretory pore is a median transverse slit at the posterior end of the body.

Digestive System: There is no oral sucker, the mouth opening directly into the muscular pharynx. The rynch is directed dorso-ventrally, and

- 2 -

measures 0.06 mm. in length and 0.05 mm. in diameter. The inner circular muscles of the pharynx are very strongly developed but the radial muscles are very weak. The pharynx is generally displaced to the left of the mid-line by the anterior testis. Its position varies from immediately in front of the anterior testis to the level of the middle of that organ. The pharynx is surrounded by numerous large gland cells which are arranged laterally, closely appressed to the ventral body wall. The intestine is a simple elongate sac extending directly forwards from the pharynx a distance of approximately 0.33 mm., in about the mid-line. Its proximal end is narrow and may be termed as oesophagus. This region is surrounded by densely-staining cells which open into it and which, like those surrounding the mouth, probably secrete a digestive fluid. The wall of the intestine contains thin outer longitudinal, and inner circular muscles, and, with the exception of the oesophagus, is lined by an epithelium of tall cells which contain basal nucle and distal vacuoles.

Excretory System: The excretory pore leads into a simple sac-like excretory vesicle. This extends forwards along the ventral side of the cirrus-sac and passes the pharynx on the right side. It may then expand somewhat before terminating at about the middle of the length of the intestine. The wall of the vesicle is very thin and extensible. Spherical droplets, due to an excretory product, are often present in the vesicle.

Genital System - Male: The testes are two entire, ovoid bodies lying directly or slightly obliquely in tandem within the posterior half of the body. They are always separated from one another as well as displaced on the right side, by the uterus, the anterior testis being usually nearer the right border of the body than is the posterior testis. The testes are approximately equal in size, the anterior one being occasionally larger than the posterior. Under slight cover-glass pressure they measure 0.163 x 0.163-0.21 x 0.24 mm. and 0.15 x 0.18-0.18 x 0.24 respectively. The vasa deferentia arise from the anterior borders of the testes. They immediately turn and run backwards along

the left side of the testes to the base of the cirrus-sac. As the testes are arranged in tandem the vasa deferentia are very unequal in length. They enter the base of the cirrus-sac and expand into a large tubular seminal vesicle. No external portion of the seminal vesicle is present. The cirrus-sac is approximately cylindrical, measuring about 0.13 mm. in length and 0.1 mm. together in diameter. It lies longitudinally or slightly obliquely in the mid-line immediately behind the posterior testis, its anterior end being often displaced to the left side and slightly in front of the posterior border of that organ. The cirrus-sac possesses a very thick muscular wall almost 0.01 mm. in thickness, composed of an inner layer of thin circular fibres and an outer layer of very stout longitudinal fibres. Towards the ends of the sac, the muscular wall is somewhat thinner. The seminal vesicle extends directly backwards for a distance not more than half the length of the cirrus-sac and usually considerably less. It then turns upon itself and passes into pars prostatica through a very narrow aperture surrounded by a sphincter. The pars prostatica forms a single anterior loop lying beside or ventral to the seminal vesicle. Its wall is membranous and is lined by an epithelium of relatively large thin walled cells which appear empty and almost fill the cavity of the pars prostatic leaving only a narrow lumen. The posterior limb of the pars prostatica expands into a large prostate vesicle occupying most of the posterior half of the cirrus-sac. The wall of the vesicle is somewhat thicker than that of the pars prostatica and the epithelial lining of the latter is continued only as a narrow strip along one side of the vesicle. In the specimens sectioned the prostate vesicle was filled with fluid. The remaining space within the cirrus-sac is occupied by the prostate gland, which consists of a matrix containing numerous nuclei. Individual cells of the gland cannot be distinguished. A little in front of the posterior end of the cirrus-sac the pars prostatica passes into a short narrow ejaculatory duct. This leads into the genital atrium through a projecting genital tongue. The latter is a ventrally-directed prolongation of the posterior end of the cirrus-sac. It seems probable that the genital tongue functions as a copulatory organ.

The genital sinus completely encloses the genital tongue and extends a short distance posterior to it before communicating with the genital pore. The sinus measures approximately 0.06 mm. in diameter.

Numerous small gland cells are arranged radially about the genital sinus near the genital tongue. A large number of specimens taken from one of the fishes bore a single spherical spermatophore attached by a tapering stalk which passed within the genital pore into the sinus. (Fig. 4). The spermatophore measures approximately 0.07 mm. in diameter when slightly flattened and has a yellowish wall apparently chitinous in nature. A similar structure has been described as occurring in other species. As Ohdner (1905) points out, the gland cells surrounding the genital sinus closely resemble the shell gland cells of the female reproductive system. It appears certain that the spermatophores are produced within the genital sinus in the same manner as the eggs as formed within the ootype. The presence of the spermatophores throws doubt upon the suggestion that the genital tongue functions as a copulatory organ. Ohdner regards it as a rudimentary copulatory structure which probably assists in the formation of the spermatophores.

Genital System - Female: The ovary is a smooth spherical or ovoid body, which measures approximately 0.12 mm. in diameter. In some specimens it lies directly in front of the anterior testis, but in others obliquely to the left side of that organ. The ovary is never more posterior in position than the middle of the anterior testis and always lies towards the dorsal surface. Directly and obliquely backwards the ovary tapers into the oviduct. The largest ova are found in this tapered region. They measure as much as 0.01 mm. in diameter. The oviduct measures 0.008 mm. in diameter. It possesses a thin ciliated wall. A short distance from the ovary, Laurer's canal connects the oviduct with a pore on the dorsal surface to the left of the mid-line. Laurer's canal measures 0.006 mm. in diameter and only 0.04 mm. in length. It is surrounded by a glandular region containing numerous nuclei. The oviduct turns towards the ventral surface, narrows, and receives the central yolk duct from the yolk reservoir.

The female duct proceeds a further short distance and expands into the ootype. This receives the fine ducts of the numerous surrounding cells which constitute the shell gland. The uterus retains the diameter of the ootype and continues as a convoluted tube towards the posterior end of the body. The proximal loops of the uterus contain darkly staining masses of spermatozoa and therefore function as a receptaculum seminis. At about the level of the anterior end of the cirrus-sac the uterus turns and passes forwards on the left side of the body. It fills the body within the arc formed by the vitellaria, but does not extend into the neck region beyond. The uterus still lying towards the left side of the body, then returns to the anterior end of the cirrus-sac. It crosses the body in front of the cirrus-sac and then passes backwards along the right side of that organ. After forming a single loop behind the genital sinus, the uterus opens into the sinus through a short and very narrow metraterm, the female aperture being ventral to the male opening. The eggs are dark brown in colour. They are ovoid, measuring 0.04×0.023 mm. A large number of eggs are present in mature specimens, often to a great extent obscuring the internal organ.

The vitelline glands are irregular ovoid bodies arranged in a single series in the form of an inverted U within the anterior half of the body. The extremities of the arc extend backwards beyond the ovary on either side to about the level of the front border or the anterior testis. The vitellaria vary in number from 17 to 22, often appearing fewer due to their close appression to one another and to overlapping. The yolk cells are connected by two main ducts which run across from the free ends of the arc to a small reservoir situated behind the ovary. A short narrow central yolk duct, 0.012 mm. long, connects the reservoir with the female duct. (Fig. 3).

Muscular System: The body is peculiar in that it is divisible into cortical and medullary regions. The internal organs lie in a central spongy region, the spaces between the organs being traversed by attenuated membranous strands. The body-wall musculature is continuous with a dense

glandular cortical region, which fills the entire body anterior to the bitellaria. The body-wall contains the usual three layers, circular, longitudinal, and then oblique fibres. The fore-body is traversed by scattered, weak, dorso-ventral fibres. The external hemispherical portion of the rhynchus, bearing the single circlet of spines, is highly muscular having densely packed radial fibres. The long tapered internal portion of the rhynchus possesses a thin muscular wall, and contains four principal internal tracts of dorso-ventral fibres.

The muscular tracts are arranged in a characteristic oblique fashion there being two on either side of the sagittal plane (Fig. 5). Between the dorso-ventral muscle layers the rhynchus is filled with large gland cells.

Nervous System: A central nervous mass, consisting of two ganglia connected by a short thick commissure, lies immediately dorsal to the rhynchus and near its posterior end. Anteriorly, the ganglia are continuous with two stout nerves, which run forwards on either side of the rhynchus for a short distance before breaking up into fine nerves. Posteriorly the ganglia are continuous with two stout nerves which diverge and pass downwards to the ventral surface, in which position they continue backwards.

Discussion: The sub-family Proserhynchinae was set up by Ohdner (1905), to include P. squamatus Ohdner, P. crucibulum (Rud.) and P. aculeatus Ohdner. The essential features of Ohdner's diagnosis are the presence of a rostellum and the configuration of the yolk follicles in the form of an anterior arc, or convex bow, in the fore-body. Many species have been admitted to the sub-family which possesses an attachment organ in the form of a rostellum or rhynchus, but which have the vitellaria arranged in two lateral groups not fusing anteriorly. The presence of an attachment organ in the form of a muscular rhynchus has remained the distinguishing feature of the sub-family. Within the group there is much confusion and disagreement between workers as to the validity of various species and genera. As Manter (1940) remarks, such confusion "invariably accompanies the

early taxonomic history of a group which is being rapidly expanded".

The species most closely related to the form described above are found within the genera Prosorhynchus Ohdner, and Skrjabiniella Issaitschikow (the latter not accepted as a valid genus by some workers). The genus Skrjabiniella was set up for Prosorhynchus aculeatus on the basis of the testes being on either side of the body, the mouth being situated in the posterior half of the body, and the uterus not extending anteriorly to the vitellaria. Manter (1934) does not consider these characters to be of generic importance and regards Skrjabiniella as a synonym of Prosorhynchus. Jones (1943), however, would show the validity of Skrjabiniella by arranging eleven species of Prosorhynchus into two groups upon five characters which he regards as of generic importance, viz. the shape of the body (whether elongate or oval), the arrangement of the testes (in tandem or symmetrically on either side of the body), the shape of the rhynchus (conical or oval), the position of the mouth relative to the anterior testis (anterior or posterior) and the arrangement of the vitellaria (in two separated lateral groups or in an anterior convex arc). Jones shows that the eleven species, with two exceptions, fall into two groups upon all five characters. P. aculeatus Ohdner, P. squamatus Ohdner, P. uniporus Ozaki and P. grandis lebour are placed within the genus Skrjabiniella, while the remaining species dealt with, viz. P. facilis (Ozaki), P. cortai Trav., Art., and per., P. platycephali (Yamaguti), P. manteri Sriv. and P. arabiana Sriv. are placed within the genus Prosorhynchus s. str. This scheme breaks down when further species are considered, e.g. P. rotundus Manter 1940 falls into the genus Skrjabiniella upon body shape, but in Prosorhynchus s. str. upon the remaining four criteria adopted by Jones; P. gonoderus Manter 1940 resembles Prosorhynchus s. str. in its elongate form and conical rhynchus, but has the testes arranged in the manner characteristic of Skrjabiniella species. It appears, therefore, that a separation of the two genera based upon five characters is unsatisfactory, especially as such characters as the form of the body and the positions of the testes relative to one another and to the position of the mouth are sometimes

difficult to determine in highly extensible forms.

It must be remembered that if the nature of the configuration of the yolk follicles is to be used as a means of dividing Prosorhynchus Ohdner into two genera, those species which conform with Ohdner's generic diagnosis, viz. P. aculeatus, P. squamatus, P. uniporus and P. grandis, should remain in the genus Prosorhynchus.

The use of the configuration of the yolk follicles as a feature of diagnostic importance has received much attention in the Bucephalidae, Issaitschikow (1928) attempts to divide the family into two sub-families upon this character. Pigulewsky (1931) regards the configuration of the yolk follicles as a means of dividing the sub-family Prosorhynchinae Ohdner into two tribes, Prosorhynchia and Gotionia. The validity of Gotionius Ozaki has not been accepted by subsequent writers with the exception of Yamaguti, who described Gotionius platycephali.

The form of the attachment organ remains an important diagnostic character within the Bucephalidae. As two distinct types of rhynchus occur in different Prosorhynchus species, it seems possible that any natural cleavage within the genus will emerge upon consideration of the nature of the rhynchus and the configuration of the yolk follicles. In the following table the known species of Prosorhynchus are listed and the form of the rhynchus and the configuration of the yolk follicles stated in each case:

G R O U P 1.

<u>P. aculeatus</u> Ohdner	Yolk follicles in an anterior arc	Rhynchus oval
<u>P. squamatus</u> Ohdner	"	"
<u>P. uniporus</u> Ozaki	"	"
<u>P. grandis</u> Lebour	"	"

G R O U P 11.

<u>P. facilis</u> Ozaki	Yolk follicles in two lateral groups	Rhynchus tapered internally.
<u>P. cortai</u> Trav., Art. & Per.	"	"

GROUP 11 (Contd.).

<u>P. platycephali</u> (Yamaguti)	Yolk follicles in two lateral groups	Rhynchus tapered internally.
<u>P. manteri</u> Sriv.	"	"
<u>P. arabiana</u> Sriv.	"	"
<u>P. ozakii</u> Manter	"	"
<u>P. rotundus</u> Manter	"	"
<u>P. gonoderus</u> Manter	"	"
<u>P. pacificus</u> Manter	"	"
<u>P. atlanticus</u> Manter	"	"
<u>P. promicropsi</u> Manter	"	"

The natural cleavage into two groups is probably sufficient evidence for assuming the presence of two genera. As indicated above, the proposal to regard the species listed in Group 1 as members of a genus other than Prosorhynchus is not permissible. If any species are to be removed from the genus Prosorhynchus Ohdner they should be the members of Group 11. The writer, therefore, does not regard Skrjabiniella as a valid genus.

The genus Gotonius Ozaki is the most suitable genus to receive the members of Group 11 above. Srivastava (1938) attempts to show that Prosorhynchus and Gotonius are synonymous. However, this conclusion is based upon comparisons of body shape and relative positions of the gonads, neither of which characters can be regarded as a sound basis for comparison in this group.

As Telorhynchus arripidis, n. gen., n. sp., possesses a conical rhynchus and yolk follicles in the form of an anterior arc, it is regarded as a linking form. It differs from the species listed above in that the rhynchus is armed with a single circlet of spines, interrupted in the mid-ventral line.

Two members of the Prosorhynchinae possessing rhynchal spines have been described, viz. Dollfustrema vaneyi (Shen) and Dollfustrema gravidum Manter, which have a triple row of spines. The writer

considers Manter (1940) mistaken in assuming that the spines of Dollfustruma correspond to the cuticular folds upon the rhynchus of Mordvilkovia Pigulewsky. The outicular folds shown in Pigulewsky's illustration do suggest irregularly arranged spines but this resemblance seems insufficient reason to assume the synonymy of the two genera. Mordvilkovia is regarded as a valid genus.

Genus Telorhynchus, n. gen.

Diagnosis: Prosorhynchinae of elongate form. Rhynchus tapered internally and armed with a single circlet of spines, interrupted in the mid-ventral line. Body covered with minute spines. Testes directly, or slightly obliquely, one behind the other in posterior half of body. Ovary pretesticular. Vitellaria in a convex bow in the forebody. Uterus not extending anterior to the vitellaria. Laurer's canal present. True seminal vesicle absent. Mouth situated near middle of the body-length. Intestine simple, saccular, directed forwards from the mouth.

FAMILY ALLOCREADIIDAE.

Sub-family OPECOELINAE Manter.
Genus COITOCAECUM Nicoll.

COITOCAECUM PARVUM n. sp.

(Figs. 6-8).

- Hosts: Galazias attenuatus Jenyns.
Pseudaphritis urvillii (Cuv. and Val).
- Location in
Hosts: Intestine generally, rarely gall bladder.
- Locality: Near Bower Monument at East Risdon near Hobart.
- Frequency: Usually 1-6 in the first host, rare in the second host, few when present.

External Features:

Trematodes of small but variable size, the average dimensions being 0.86 mm. long and 0.34 mm. wide, under slight cover glass pressure. The length of individual specimens varies from 0.57 - 1.8 mm. The worms are of long oval shape with a tapered anterior end, and are broadest in the vicinity of the acetabulum or just behind that organ. In section the body is slightly flattened dorso-ventrally. The acetabulum is relatively large and strongly muscular. It is situated in the posterior of the anterior half of the body, and measures approximately 0.19 x 9.14 mm. The inner surface of the gape may be papillate. The oral sucker is sub-terminal and measures about 0.09 mm. in diameter.

The living trematodes are of a white translucent appearance, and of a yellowish colour in the regions of the vitellaria. The principal organs, vitellaria, testes, ovary, and alimentary system can readily be seen when the animal is viewed by transmitted light. A change in the proportions of the body takes place as the young adults mature. Very young specimens are broadest in the region of the testes, and the acetabulum is situated about the middle of the body. Older specimens show elongation of the body behind the acetabulum accompanied by relative enlargement of the testes.

The oral sucker leads by a very short prepharynx into the globular muscular pharynx, which measures 0.48 - 0.72 mm. long and 0.44 - 0.76 mm. in diameter. This is followed by the oesophagus, the length of which varies greatly according to the general state of contraction of the specimen. The average length of the oesophagus is about 0.04 mm.

It has a fairly stout muscular wall composed of inner circular and outer longitudinal muscles. The hind portion of the pharynx and the whole length of the oesophagus are surrounded by gland cells. The oesophagus joins the intestine, the two rami of which are simple and tubular and run backwards laterally, to unite below the excretory vesicle forming a continuous arc. The posterior intestinal arc lies along the posterior edge of the hind testis. There is no connection between the intestine and the excretory vesicle.

The common genital pore opens on the ventral surface to the left and just anterior to the intestinal fork. The testes are two large lobed bodies lying in tandem or oblique fashion, within the posterior intestinal arch. The hind testis is frequently larger than the anterior. They measure approximately 0.16 x 0.09 mm. and 0.17 x 0.1 mm. respectively. The vasa deferentia are given off anteriorly and run forward to the base of the seminal vesicle, where they unite. The seminal vesicle lies within the anterior intestinal arch, dorsal to the acetabulum, and to the left of the mid-line. It crosses the left ramus of the intestine just below the fork. The vesicle is sac-like and may extend backwards to the posterior edge of the acetabulum, but is frequently shorter. It measures about 0.16 mm. long. Anteriorly the vesicle tapers and enters the cirrus sac, where it passes over into the ejaculatory duct. The seminal vesicle thus lies entirely outside the cirrus pouch, with the exception of the short tubular portion leading to the ejaculatory duct. The ejaculatory duct is coiled once before leading into the common

genital atrium. The terminal portion is thickened to form a small unarmed cirrus. The cirrus sac is pear-shaped, being narrow where it joins the seminal vesicle, and expanded to contain the anterior coiled portion of the ejaculatory duct. The sac measures 0.064 mm. long and 0.032 mm. broad at the broad anterior region. Its wall is thin but muscular, being composed of inner circular and outer longitudinal muscles. Scattered darkly staining cells forming the prostate are present in the anterior of the sac. There appears to be no distinct pars prostatica.

The ovary is ovoid and lies on the right side of the body directly in front of, or obliquely to, the anterior testis. It measures approximately 0.09 x 0.06 mm. Anteriorly and dorsally the ovary tapers into the oviduct. The oviduct passes dorsally and divides, one branch leading into the ootype, the other running across the body as Laurer's canal. The canal forms a ventrally directed loop, and opens on the dorsal surface by a pore situated to the left of the mid-line, at the level of the yolk reservoir.

The ootype is situated about in the mid-line of the body and passes into the uterus, which describes a few inter-caecal turns before turning forward over the left side of the acetabulum. When the proximal portion of the uterus is not distended with eggs a slightly expanded receptaculum seminis uterinum containing sperms can be seen a short distance from the ootype. Anteriorly, the uterus, together with the seminal vesicle, passes under the left ramus of the gut and ends in a well-developed matraterm. This lies above the cirrus sac and opens into the common genital atrium, just in front of the male aperture. The eggs are ellipsoid, light brown in colour, and measure 0.06 - 0.076 x 0.032 - 0.04 mm. The number of eggs present in the uterus is usually few, only five, six or seven being found in small specimens, but in larger individuals the uterus may contain twenty or more eggs. In small

specimens the eggs appear relatively enormous. They have an operculum, 0.016 mm. diameter, at one end. No filament is present.

The yolk follicles are numerous, and extend laterally from the level of the pharynx to the posterior region of the body, where they fill the body behind the testes. Laterally the follicles lie above, below, and external to the gut rami, occasionally surrounding them completely. Their shape varies, but is generally ovoid, measuring 0.036 - 0.048 mm. in greatest diameter. Anterior and posterior collecting ducts, on each side, fuse in a transverse duct. In the mid-line, or slightly to the right of the mid-line, the transverse ducts enter the spindle-shaped yolk reservoir. The median yolk duct leaves the reservoir antero-dorsally, runs directly dorsally and then turns and enters the ootype laterally (fig. 7). A group of shell-glands surrounds the yolk duct where it joins the ootype.

The excretory vesicle is large and club-shaped. It opens at the excretory aperture situated in the mid-line of the posterior border of the body, and extends forward as far as the yolk reservoir. Near the anterior extremity of the vesicle two main collecting ducts arise. These ducts run forward beneath the rami of the gut into the neck region.

Hosts: Pseudaphritis urvillii (Cuv. and Val.).
Galaxias attenuatus Jenyns.

Locality: Creek, near Bowen Monument, Risdon
(April, 1944).

Type: It is proposed to deposit the type specimen
in the Sydney Museum.

A F F I N I T I E S.

The general characters of the trematode place it at once in the genus Coitocaecum Nicoll. It seems to be most closely related to C. anaspidis Hickman. The present writer agrees with Stunkard, Harshey and Manter that the absence of an

annus and the minor differences from Opecoelus are not sufficient reasons for removing Coitocaecum from the Opecoelidae. Further, that the family Opecoelidae should be abandoned and the genera in that family included with Coitocaecum in the subfamily Opecoelinae Manter (1934) of the Allocreadiidae.

Opecoelus tasmanicus n.sp.

(Figs. 9-11).

Hosts: Latridopsis forsteri Castelnau

Location in
Host: Rectum.

Locality: Host obtained from Hobart Fish Market.

Frequency: Eight specimens from one of two hosts examined.
(March 1946).

Principle Dimensions.

	Length	Breadth	Forebody	Oral Sucker	Ventral Sucker	Eggs
1.	2.74	0.86	0.73	0.24	0.39	---
2.	2.99	0.77	0.83	0.24	0.39	52 x 32
3.	3.34	0.86	1.06	0.27	0.24 x 0.39	60 x 32

External Features: The elongate body is broadest at the level of the testes. It tapers sharply towards the anterior end and is bluntly roundly tapered posteriorly. In section the worms are quite flat. The oral sucker is sub-terminal and is not preceded by a lip. The ventral sucker is situated at the junction of the first and middle thirds of the body length. It is slightly elongated transversely and opens by a transverse aperture, the lips of which are produced into five or six blunt papillae. The ventral sucker is not pedunculate. In this respect it differs from most species of Opecoelus. The common genital aperture is situated to the left of the oesophagus midway between the pharynx and the intestinal fork. The excretory pore is at the posterior tip of the body. A further aperture, the anus, occurs on the ventral surface just anterior to the excretory pore. The cuticle is smooth and spineless.

Alimentary System: The oral sucker is separated from the pharynx by a short thin-walled prepharynx. The pharynx measures 0.14 mm. long by 0.09 mm. in diameter, and is followed by a

muscular oesophagus leading to the intestinal fork. The cuticle does not appear to extend into the gut beyond the pharynx. The two rami diverge and run backwards on either side of the body some little distance from the lateral margins. Posteriorly they unite into a continuous arc which runs parallel with the posterior border of the body. A blunt caecum from the middle of the posterior arc passes backwards to meet an invagination of the body wall forming a connecting tube between the intestine and the anus. The gut wall lacks conspicuous muscle fibres and is lined throughout by a flattened epithelium containing numerous ovoid nuclei.

Excretory System: There is a median excretory bladder which extends forwards as far as the ovary, lying dorsal to the testes. Anteriorly the vessel gives off a pair of slender vessels which diverge and run forward below the gut rami into the neck region.

Reproductive System: i. Male:- The two testes are irregularly rounded lobed bodies lying one behind the other, between the rami, in the third quarter of the body length. They are elongated transversely and measure from 0.27 x 0.21 mm. to 0.52 x 0.39 mm. The anterior testis lies immediately behind the ovary and is separated from the second by a short space which may be occupied to a more or less degree by yolk follicles. The vasa deferentia arise on the anterior borders of the testes and run forward above the ovary into the uterine region. They pass over the ventral sucker side by side and enter the base of the seminal vesicle. In the "in toto" mounts the vesicle lies obliquely in front of the ventral sucker, but in the contracted uncompressed specimens sectioned, the vesicle is seen to lie in the mid-line, and to extend backwards for a considerable distance above the ventral sucker. The vesicle has the form of an elongated sac which tapers anteriorly as it crosses the left ramus of the gut and enters the cirrus sac. The size of the seminal vesicle varies greatly in different individuals. Very prominent gland cells which are highly

vacuolate, are clustered about its thin wall. The cirrus sac measures about 0.14 mm. long and 0.06 mm. in diameter. It is quite muscular, possessing stout outer longitudinal and inner circular fibres. The tubular extension of the seminal vesicle lying within the sac leads into the pars prostatica. This portion of the male duct is short and is lined by the typical tall empty-looking cells. It receives the fine protoplasmic threads from the surrounding prostate gland which consists of comparatively few darkly staining nuclei within the cirrus sac and numerous free cells clustered about the narrow duct leading from the seminal vesicle. The pars prostatica is followed by the terminal portion of the male duct approximately 0.05 mm. long which is slightly thickened and constitutes an unarmed cirrus. This leads into a short common genital atrium leading to the ventral surface.

ii. Female:- The ovary is a compact kidney-shaped body lying directly in front of the anterior testis, with its long axis directed transversely. In four "in toto" mounts the ovary measures approximately 0.30 x 0.15 mm. The oviduct leaves the ovary at the middle of its antero-dorsal surface, runs backwards and gives off Laurer's canal. This winds a sinuous course forwards and upwards and opens through the cuticle in the mid-line above the ovary. The canal contains masses of sperms in one specimen sectioned. After giving off Laurer's canal the oviduct expands into the ootype. This receives innumerable protoplasmic threads from the cells of the shell gland. The gland is well developed and diffuse, extending right across the intercaecal space in front of the ovary. The gland cells are large and well defined, each containing a prominent nucleus and darkly-staining vacuolate cytoplasm. The female duct receives a short yolk duct from the yolk reservoir and passes into the thin-walled uterus. Sperms may be present throughout the entire length of the uterus but the proximal loops consistently contain spermatic fluid and

function as a receptaculum seminis. The convoluted uterus fills the intercaecal space between the ventral sucker and the ovary. It passes over the ventral sucker near the mid-line, and forwards along the left side of the seminal vesicle. The terminal portion of the uterus is muscular and may be distinguished as a metraterm. This opens into the common genital atrium in front of the male opening. The eggs are relatively large and thin-walled, possessing a circular operculum 12 in diameter. They are roundly ovoid in form and yellow in colour.

The vitellaria are small ovoid and irregularly formed follicles occupying the space between the lateral body margins and the gut rami. They are continued around the posterior arch of the gut and the intercaecal spaces in the vicinity of the ovary and the testes are largely filled by them. The yolk cells are collected by lateral yolk ducts which lie below the gut rami. Just in front of the ovary transverse ducts unite to form the central yolk reservoir. This tapers into a short duct which opens into the female duct. The vitellaria do not extend forwards beyond the posterior border of the ventral sucker.

Discussion: Opecoelus tasmanicus n.sp. seems most closely related to O. mexicanus Manter, from which it differs in its larger size and in the nature of the papillae of the ventral sucker. The seminal vesicle does not extend posterior to the ventral sucker in whole amounts and extended specimens. In this respect O. tasmanicus resembles those species placed in the genus Opegaster. However the vitellaria are entirely post-acetabular, and the glands present in the forebody do not appear to be concerned with the production of yolk. As Manter (1940) points out, the genera Opecoelus and Opegaster are very similar. It seems evident that the extent of the seminal vesicle and the vitellaria are unsatisfactory reasons for separating the genera. The tendency to raise minor differences to the rank of important diagnostic characters has long been exhibited by

some writers on this group. The preferable course would seem to be the grouping of such similar species into one genus until such time as sufficiently clear sub-groups appear to warrent the setting up of several genera.

Sub-family ALLOCREADINAE.

Gnathomyzon, gen.n.

Diagnosis: Small pyriform worms with a flattened elliptical cross-section. Integument spinous. Oral sucker sub-terminal. Acetabulum large, possessing a pair of lateral muscular gripping jaws. Intestinal limbs simple, tubular, reaching almost to the posterior edge of the body. Testes, one behind the other in the posterior third of the body. Ovary directly in front of anterior testis. A large receptaculum seminis present, lying transversely, the dorsal to the ovary. Laurer's canal long. External seminal vesicle large and tubular. Cirrus sac highly muscular, containing a large internal seminal vesicle. Diffuse prostate gland present. Definite pars prostatica absent. No true cirrus present. Coils of uterus few, intercaecal, and between acetabulum and ovary. Short metraterm present. Genital aperture to the left of the mid-line, slightly in front of the intestinal fork. Excretory vesicle tubular, bifurcating anteriorly.

Gnathomyzon insolens, sp.n.

(Figs. 12-13).

Small pyriform trematodes. Specimens fixed under slight cover-glass pressure measured 1.40 - 2.00 mm. long, and 0.61 - 0.94 mm. wide at their broadest region, this being in the posterior third of the body. The oral sucker is sub-terminal and measures 0.14 - 0.19 mm. in diameter. The acetabulum measures 0.32 mm. diameter and is remarkable in that it possesses a pair of differentiated lateral thickenings or gripping jaws, which are present and identical in every specimen examined.

The living animal has a white translucent appearance, the principal organs, testes, receptaculum seminis, ovary, vitellaria and cirrus pouch being visible in transmitted light. The cuticle is covered with minute spines, and the active mobile neck region of the body is leech-like in appearance.

The oral sucker is followed by a short prepharynx 0.1 mm. long, which leads into the strongly muscular pharynx which measures 0.08 mm. in diameter. The oesophagus is 0.08 mm. long. It has a fairly muscular wall and leads to the bifurcation of the gut, whence the two rami of the gut run backwards as simple unbranched tubes almost to the posterior end of the body. The bifurcation is mid-way between the pharynx and the anterior edge of the acetabulum. There is no connection between the gut and the excretory vesicle.

The two testes are transversely elongated and lies one behind the other in the posterior third of the body. Under slight cover-glass pressure they measure 0.44 x 0.13 mm. and are slightly lobed in outline. The very slender vas deferentia lead past the left side of the ovary, and meet at the posterior extremity of the seminal vesicle, which extends forward from just behind the acetabulum. Posteriorly it is large and sac-like, but narrows and passes over the acetabulum as a thin walled tube. At the anterior margin of the acetabulum the vesicle narrows and passes into the posterior end of the cirrus sac. Within the cirrus sac it expands into a large internal seminal vesicle, which in the turgid condition completely fills the cirrus sac except at the anterior end, where the vesicle narrows into a short ejaculatory duct leading into the genital atrium. The terminal portion of the ejaculatory duct is not thickened or armed to form a distinct cirrus, but from the appearance of the musculature at the anterior end of the cirrus sac, it seems to be protrusible. The ejaculatory duct and the tapered anterior end of the internal seminal vesicle are surrounded by numerous small gland cells whose long thin ducts can be seen leading through the muscular wall. There is no distinct pars prostatica. The cirrus sac extends from the level of the anterior edge of the acetabulum to the genital atrium, which is situated slightly to the left of the mid-line at the level of the posterior edge of the pharynx. The sac

thus passes under the left branch of the gut near the bifurcation. It measures up to 0.13 mm. in diameter and 0.24 mm. long, and has a strongly muscular wall composed of a thick outer layer of longitudinal muscles and an inner layer of thick circular muscles.

The ovary is a transversely elongated ovoid body, slightly indented in outline, and lying against the anterior testis. It may be median or slightly displaced toward the right side of the animal. It measures 0.21-0.31 x 0.08-0.13 mm. Dorsally the ovary tapers into the oviduct, the proximal portion of which is expanded into a fertilization chamber. The oviduct then passes transversely and dorsally towards the left side, meeting a transverse passage, which expands on the right side into a large receptaculum seminis. On the left side, the transverse passage gives off the uterus ventrally and continues across the body as Laurer's canal. The latter forms a ventrally directed loop and returns to the dorsal surface to open at a pore situated to the left of the mid-line, at the level of the yolk reservoir. The uterus passes ventrally, receives the median yolk duct from the vitelline reservoir, and expands slightly to form the ootype, into which open a group of shell-glands having short wide ducts. The convolutions of the uterus are intercaecal and few in number. They lie between the acetabulum and the anterior testis, ovary and receptaculum seminis. The uterus passes forward over the acetabulum slightly to the left of the mid-line, and lying above the cirrus sac, extends to the level of the genital pore. A short muscular metraterm passes ventrally to open into the common genital atrium in front of the male aperture. The circular muscles of the metraterm are continuous with those of the ejaculatory duct. The eggs are ellipsoid in form and the shell is dark brown in colour. They measure 0.056 x 0.032 mm. and possess an operculum 0.008 mm. in diameter at one end.

No filaments are present.

The yolk form a densely aggregated mass above, below, and external to the intestinal rami. They extend from the posterior of the body to about the level of the middle of the acetabulum, and also occupy the posterior region of the body behind the posterior testis. The follicles are somewhat angular in shape and vary in size from 0.048 mm. in diameter to 0.10 x 0.036 mm. The yolk is collected by tubules which unite main right and left longitudinal ducts. The main longitudinal ducts of each side unite into the right and left transverse ducts, which pass dorsally and meet in the spindle-shaped reservoir situated to the left of the mid-line and slightly behind the ovary. From the left of the reservoir a short duct runs forward to the uterus.

The excretory pore is situated on a sunken papilla in the middle of the posterior margin of the body. The excretory vesicle is simple and tubular, and extends from the pore to the posterior testis, above which it may extend forward for a short distance. The vesicle measures 0.3 mm. long, and 0.03 mm. diameter, and is lined with a glandular epithelium. At its anterior end it bifurcates into two main collecting tubes, which pass forward on either side of the hind testis within the dorso-ventral muscles. These main tubes run towards the dorsal surface for a short distance, pass downwards within the dorso-ventral muscles and come to lie below the rami of the gut. Fine collecting tubules open into the main tubes throughout their length.

Host	<u>Pseudolabrus tetricus</u> Rich
Locality	Derwent Estuary, Tasmania (March 1944)
Type	It is proposed to deposit the type specimen in the Sydney Museum.

A F F I N I T I E S.

A F F I N I T I E S.

The general characters of the trematode place it in the sub-family Allocreadiinea of the Allocreadiidae, although it differs in that a prominent cirrus is not developed. The genus is distinguished by its peculiar ventral sucker. Manter (1934) described Myzoxenus vitellus, from Calamus calamus (Cuv. and Val.) and Decodon puellaris (Poey), which possesses apparently similar gripping structures. Manter also mentions that a rather similar modification of the ventral sucker occurs in Dolichosaccus amplicava Travassos.

GENUS HELICOMETRA OHDNER.

Helicometra Neosebastodis, n. sp.
(Figs. 14 - 16)

External Features: The body is elongate, being broadest at about the middle length, and tapering towards the extremities. The body is flattened dorsoventrally, especially in the posterior region, which is leaf-like, possessing frilled or convoluted lateral margins. Both anterior and posterior regions of the animal are highly extensible. Specimens fixed under slight cover-glass pressure measure 3.02-5.9 mm. long and 0.7-1.0 mm. broad.

The oral sucker is subterminal, and is relatively large for the genus, measuring 0.31-0.49 mm. in diameter. It tapers towards the prepharynx and has a longitudinally-elongated aperture. The acetabulum is situated at the junction of the first and second quarters of the body length and measures 0.29-0.46 mm. in diameter. In each of the ten "in toto" mounts, the acetabulum was slightly smaller than the oral sucker. The common genital aperture is situated on the ventral surface in the mid-line, midway between the suckers. There is a transversely-elongated aperture the entrance to a deep pit, equidistant between the genital aperture and the anterior edge of the acetabulum. The excretory pore is situated in a depressed groove on the dorsal surface, near the posterior extremity. The cuticle is smooth and spineless. As in Helicometra tenuifolia Woolcock there are numerous short finger-like sub-cuticular canals opening on the surface by minute pores. These canals are especially prominent along the lateral margins of the body and about the border of the oral sucker. As suggested by Woolcock (1937) they are probably excretory in function.

Digestive System: The cavity of the oral sucker leads through a short thin-walled prepharynx into the muscular pharynx.

This measures 0.16-0.19 mm. long and is of the same measurement in width anteriorly, but tapers posteriorly. The pharynx is connected to the gut rami by a muscular oesophagus of the same length as the pharynx. The wall of the oesophagus contains stout outer longitudinal muscles and weaker inner circular muscles. The gut rami diverge from the posterior end of the oesophagus and run backwards on either side of the cirrus-sac as sinuous tubes, somewhat irregular in transverse section. The walls of the rami are fairly muscular, possessing muscles similar to those of the oesophagus. The rami are lined by an epithelium of flattened cells containing large ovoid nuclei. Posterior to the acetabulum, and rami are situated a considerable distance from the lateral margins of the body, and extend in this position almost to the posterior extremity. The gut is not connected with the excretory vesicle.

Excretory System: The excretory vesicle is a long slender tube which extends from the excretory pore to the uterine region and in position is dorsal to the tests and ovary. Anteriorly the vesicle does not terminate blindly, but breaks up and diffuses into the regular spongy parenchyma which fills the body between the coils of the uterus. The vesicle does not extend further forward than the middle of the uterine region. At the level of the receptaculum seminis, a lateral duct is given off on either side, and runs obliquely forwards and outwards coming to lie on the inner side of the gut. The lateral ducts extend into the neck region as far as the pharynx, where each terminates in a slightly expanded chamber containing a large multi-ciliated flame.

Genital System - Male: The two testes are in tandem and situated in the intercaecal space within the third quarter of the body. They are roundly indented and variable in outline. In the largest mounted specimen, which is 5.9 mm.

in length, the testes measure 0.39 x 0.26 mm. and 0.33 x 0.3 mm. respectively. The slender vasa deferentia leave the mid-dorsal surfaces of the testes and run forwards together dorsal to the ovary. They then diverge and pass on either side of the helical uterus, just within the intestinal tami. The vas deferens from the anterior testis lies on the left side, that of the posterior testis on the right. Immediately posterior to the acetabulum the vasa deferentia converge and pass together to the rear end of the cirrus-sac. They enter the cirrus-sac through its ventral surface a little in front of its posterior end, and immediately open into the large longitudinally-coiled seminal vesicle which occupies its posterior half. The cirrus-sac is large and well developed, measuring as much as 0.14 mm. in diameter and extending from the genital pore to the level of the middle of the acetabulum. It is banana-shaped, being curved and tapered towards either end; it lies generally in the mid-line, but is displaced to the left side in mounted or flattened specimens. The sac wall is highly muscular, consisting of thin inner circular and stout outer longitudinal muscles. Near its anterior end the cirrus-sac is connected with the ventral body wall by stout lateral oblique muscles which probably aid the protusion of the cirrus by drawing the cirrus-sac towards the ventral surface.

The internal seminal vesicle has a thin membranous wall, which contains widely separated nuclei. Anteriorly the vesicle is constricted and leads through a sphincter into the well-developed pars prostatica. This section of the male duct possesses a thin membranous wall lined by large columnar vacuolate cells in which no nuclei are visible. Anteriorly the pars prostatica narrows and passes into the short broad muscular cirrus, which extends to the anterior limit of the cirrus-sac. The male duct now meets the metraterm, the muscular wall of the two ducts being continuous, and forms a

short narrow common genital atrium leading to the exterior.

Genital System - Female: The ovary is situated in the mid-line, immediately in front of the anterior testis and sometimes contiguous with it. The ovary is characteristically four-lobed, in the form of a transversely elongated four-leafed clover and measures 0.08-0.19 mm. broad. The ripe ova within the anterior lobe of the ovary measure up to 0.008 mm. in diameter. The oviduct arises at the anterior border of the ovary and runs upwards a distance of 0.08 mm to enter the ventral surface of the receptaculum seminis. The proximal portion of the oviduct is very narrow. This expands into a broader ciliated division leading to the receptaculum seminis. The latter is spherical or pear-shaped, depending on the degree of distension, and measures in two sectioned specimens approximately 0.13 mm. in diameter. The wall of the receptaculum is membranous and contains large flattened nuclei. The receptaculum is usually situated to the left of the mid-line directly in front of the ovary, but it is occasionally median and directly dorsal to that organ. Anteriorly it is drawn out into Laurer's canal, which passes forwards and upwards as a thick-walled convoluted tube approximately 0.008 mm. in diameter, and opens on the dorsal surface to the left of the mid-line.

A broad duct leaves the receptaculum seminis immediately in front of the entrance of the oviduct and passes towards the ventral surface for a short distance. It then turns upon itself and expands into the ootype. The thick wall of the ootype is surrounded by innumerable radiating threads derived from the cells of the shell gland. The shell gland is exceptionally large and diffuse, surrounding the female complex and filling most of the intercaecal space in front of the ovary. The gland cells are most profuse laterally. They are large with uniformly staining contents and possess large vacuolate nuclei. After receiving

a slender duct from the yolk reservoir the uterus forms a helix of eight or nine loops containing several hundred eggs between the shell gland and the acetabulum. The uterine coils enclose a core of spongy parenchyma. Immediately behind the acetabulum the membranous wall of the uterus, containing widely separated flattened nuclei, abruptly changes into the thin muscular wall of the metraterm composed of weakly-developed inner circular and outer longitudinal muscles. The metraterm passes over the acetabulum on the left side and then forwards closely appressed to the cirrus-sac. It then passes from a lateral position on the left side of the cirrus-sac to a dorsal position at its anterior end. The metraterm may extend beyond the level of the genital pore before turning downwards to open into the common genital atrium directly in front of the male aperture.

The eggs are light orange-brown, and measure 0.06-0.068 mm. long, and 0.02-0.028 mm. broad. At one end the shell is drawn out into a long, hollow, tapering filament which measures six or seven times the length of the egg. At the opposite end of the egg there is an operculum. As the eggs are arranged in close succession, with their filaments tapering behind, a section through the uterus at any point shows a number of the filaments cut through at different levels. The egg-shell is a double structure consisting of a thin outer dense layer and a thick inner light-coloured layer. The viteline follicles are small and variable in shape and size, varying from ovoid follicles measuring approximately 0.08 x 0.04 mm. to spherical forms 0.028 mm. in diameter. The follicles are very numerous and extend from the posterior extremity to the level of the first two or three uterine loops. They lie above, below and outside the gut rami and fill the post-testicular intercaecal space. Fine tubules connect them on either side with anterior and posterior lateral yolk

ducts which lie outside the rami. The lateral ducts fuse on either side into transverse ducts which run directly across the body immediately in front of the ovary. The two transverse ducts expand and fuse to form the yolk reservoir to the right of the mid-line. A slender duct runs forward from the reservoir to the ootype.

Muscular System: The musculature of the reproductive organs has been described above. The entire body wall is strongly muscular, containing well-developed circular, longitudinal and oblique muscles, which are especially developed in the neck region. Dorso-ventral fibres are very numerous throughout the body. The suckers present no unusual features, containing the usual equatorial, meridional and radial fibres. The oral sucker possesses no distinct retractor muscles, but in connection with the acetabulum there are well-developed anterior and posterior oblique muscle bands running to the dorsal body wall in front of the preacetabular pit.

Nervous System: The pair of ganglia composing the brain lie towards the dorsal surface of the anterior end of the pharynx. They are composed entirely of nerve fibres possessing nuclei only around their periphery. The ganglia are connected above and below the pharynx by slender commissures. Stout nerves run directly to the dorsal and ventral body surfaces on either side. The ganglia are continued posteriorly into paired nerve chords immediately within the excretory canals. These nerves were not traced backwards beyond the oesophagus.

Host: Neosebastes thetidis Waite.

Location of Parasite in Host: Gut
immediately behind stomach.

Degree of Infection: One to three parasites in
each of seven fish examined.

Hosts obtained from Hobart fish market, December, 1944.

Discussion: The species described above is most closely related to Helicometra tenuifolia Woolstock, from which it differs in the possession of lobed testes which are much smaller than the acetabulum, and in the size and relative proportions of the body. The locality and the host are also distinct.

HELICOMETRA BASSENSIS Woolcock.

(Fig. 17)

Host: Platycephalus bassensis *Cuv. et Val.*

Location in Host: Intestine

Locality: Derwent Estuary

Frequency: Four specimens in one fish examines. (Feb. 1945)

Principle Dimensions.

	Length	Breadth	Forebody	Oral sucker	Ventral sucker	Eggs
1.	2.17	0.36	0.72	0.19	0.28	60x28
2.	2.25	0.51	0.47	0.21	0.34	56x28
3.	2.59	0.49	0.68	0.23	0.33	60x28
4.	3.31	0.56	0.83	0.24	0.37	60-70x28

There is no doubt that these trematodes represent Helicometra bassensis, but the specimens are worthy of note as the body is more slender and the testes are proportionately smaller than in Woolcock's specimens. The host is the same as that in which this species occurs in Victorian waters.

HELICOMETRA FASCIATA. (Rud.).

(Fig. 18)

Hosts: Neosebastes thetidis Waite.

Location in host: Intestine, immediately beyond stomach.

Locality: Host obtained from Hobart fish market.

Frequency: Six specimens in one of six host fish examined. (March 1945).

Principle Dimensions.

	Length	Breadth	Forebody	Oral Sucker	Ventral Sucker	Eggs
1.	2.04	0.85	0.93	0.16	0.29	64 x 28
2.	2.49	1.09	0.99	0.19	0.36	88 x 28
3.	2.56	1.06	0.83	0.18	0.37	62-72 x 24
4.	2.79	1.08	1.11	0.19	0.36	72-88 x 24-28
5.	2.79	1.12	1.16	0.19	0.39	72-80 x 28-36
6.	3.63	1.45	1.58	0.28	0.46	88 x 28

Minor differences occur between these specimens and descriptions of forms taken from different fishes in other regions, but there seems every reason to include them in H. fasciata. This species is one of the most widely distributed of digenetic trematodes having been previously reported from the Atlantic and Mediterranean Oceans; Tortugas, Florida; and Mexico. This is the first record of its occurrence in Southern waters. Its presence here is of interest as its occurrence is now known to be from distant Northern to Southern waters, in cold and in tropical seas over a wide range of longitude.

FAMILY HEMIURIDAE.

Sub-family Derogeninae.

Derogenes crassus Manter 1934.

(Fig. 19-20)

Hosts: Physiculus barbarta Günther.
Location in Hosts: Gall bladder.
Locality: Hosts obtained from Hobart Fish Market.
Frequency: Seven specimens in one host (July 1945).
Absent from many hosts examined previously and since that date.

Principle Dimensions.

	Length	Breadth	Forebody	Oral Sucker	Ventral Sucker	Eggs
1.	3.44	1.12	1.50	0.37	0.81 x 0.75	64 x 28-32
2.	3.21	1.03	1.29	0.34	0.75 x 0.75	58-64x 30-32.
3.	2.85	0.93	1.17	0.34	0.67 x 0.67	60-64 x 28-32

The principle dimensions of three mounted specimens are given in the above table. The four remaining specimens were embedded and sectioned. Unfortunately the hard thick shells of the innumerable eggs which occupy most of the body prevented the preparation of successful serial sections.

Manter (1934) describes Derogenes crassus from a single mounted trematode which he regards as presenting sufficient differences from known species to warrant the formation of a new one. The present specimens are slightly larger than Manter's specimens but resemble it closely in proportion, the disposition of the internal organs and in the size of the eggs. There appears to be a difference in the form of the vitellaria, those of my specimens being roundly lobed, while those of Manter's specimen are described as compact and unlobed.

It is possible that a more detailed examination of the deep-water form from Tortugas, and of the Tasmanian form may reveal specific differences, but in view of the inadequate material

material available it seems quite advisable to include my specimens in Derogenes crassus. Slight displacement of the organs often occurs in the mounting of stout trematodes. This accounts for the variation in the relative positions of the ovary and vitellaria shown by the three mounted specimens (Fig. 19, 20). The occurrence of the ovary on the left side in one specimen may not be due to displacement, but may represent a variation within the species.

HEMITEPTRINA MANTTARI n.sp

(Fig. 21-22)

Hosts: 1. Latridopsis forsteri Castelnau (Bastard trumpeter)

2. Cheilodactylus spectabilis (Garp)

Location in Host: Stomach

Locality: Hosts obtained from Hobart fish market.

Frequency of infection: The body is elongate, and almost round in section being only slightly flattened ventrally, The thick cuticle is unspined and smooth. The body is broadest at the level of the ventral sucker which is situated at the junction of the second and last third of the body length. In front of the ventral sucker the body tapers gradually to the bluntly rounded anterior end. Posteriorly the body tapers strongly. The oral sucker is surmounted by a fleshy pre-oral lip. The principle dimensions of nine mounted specimens are given in the following table. Specimens 5 and 6 are those taken from the second host mentioned above.

	Length	Breadth	Forebody	Oral Sucker	Ventral Sucker	Eggs
1.	2.07	0.68	0.93	0.24	0.50	32 x 12
2.	2.10	0.79	1.03	0.24	0.45	32 x 12
3.	2.23	0.64	1.08	0.26	0.46	36 x 12
4.	2.44	0.81	1.11	0.29	0.62	36 x 12
5.	2.51	0.81	1.16	0.27	0.52	32 x 12
6.	2.62	0.81	1.45	0.29	0.55	32 x 12
7.	2.62	0.83	1.24	0.29	0.60	36 x 12
8.	2.67	0.78	1.35	0.31	0.59	32 x 12
9.	3.01	0.70	1.47	0.28	0.55	40 x 8-12

The common genital aperture is situated at the end of a protrusible genital cone, which is median in position, a short distance behind the oral sucker. The excretory aperture is a simple pore at the posterior extremity.

Digestive System:- The oral sucker is applied to the pharynx postero dorsally a prepharynx being absent. The pharynx is slightly longer than its diameter, measuring 0.114 mm. x 0.08 mm. Posteriorly it opens into a

short oesophagus whose wall is thinly muscular consisting of inner circular and outer longitudinal fibres. At its junction with the pharynx, the oesophagus is narrow but it rapidly expands into the oesophageal pouch frequently seen in this family. The oral sucker, pharynx and oesophagus are lined by an internal extension of the cuticle. The gut rami arise from the dorsal wall of the oesophageal pouch. A proximal portion of each ramus is smooth and unlined and runs directly outwards from its origin. The rami then turn backwards and pass through the long forebody. They be some distance from the body margins and enclose the uterus. They pass over the ventral sucker lying closely together, diverge behind that organ to encompass the shell gland and continue backwards side by side almost to the posterior end of the body. Throughout their length the rami are lined by large columnar cells containing prominent nuclei. These cells are somewhat separated from one another and impart a speckled appearance to the rami of the stained "in toto" mounts. The actual wall of the gut is membranous and apparently lacks distinct muscle fibres.

Excretory System:- The posterior, single median portion of the excretory vesicle is quite short bifurcating behind the level of the vitellaria. The two arms run forward side by side to about the level of the ovary. They then diverge and come to lie beneath the gut rami. In this position the paired canals run forward throughout the forebody. Anteriorly they pass towards the dorsal surface and are seen to be continuous with one another above the pharynx.

Reproductive System:- 1. Male. There are two round, triangular testes lying almost side by side in the posterior fifth of the body. In specimens 5 and 6 of the above table the testes measured 0.26×0.21 and 0.13×0.24 and 0.23×0.24 and 0.19×0.29 respectively, but they were either lacking or partially disintegrated in the specimens taken from Latridopsis forsteri. The testes lie immediately behind the vitellaria, and when fully developed their posterior border is but a short distance in front of the termination of the gut rami. The fine vasa deferentia were not completely traced forwards but were seen to unite at the base of the seminal vesicle midway between the sucker. The seminal vesicle takes the form of a sinuous tube 0.05 mm. in diameter which runs forward almost to the

bifurcation of the gut. Its wall is membranous and contains widely scattered flattened nuclei. At its anterior end the vesicle narrows abruptly into a duct which runs forwards and downwards and opens through a sphincter into the pars prostatica. This measures 0.018 mm. in diameter. The lumen is very narrow due to the lining of tall empty-looking cells. The pars prostatica and the narrow portion of the seminal vesicle leading to it are surrounded by the numerous cells which constitute the well-developed diffuse prostate gland. Fine protoplasmic threads radiate backwards and outwards from the wall of the pars prostatica to the vacuolate prostate cells. The pars narrow and passes through the some-what diffuse meridional muscles which must be regarded as constituting a sinus-sac. The typical prostatic lining is lost and when the male duct penetrates as far as the centre of the sinus-sac, it receives the metraterm posteriorly, forming the genital sinus or hermaphrodite duct. The sinus-sac measures 0.068 mm. in diameter and appears to be responsible for the eversion of the genital cone through which the hermaphrodite duct passes to the genital aperture situated at its extremity.

2. Female:- The ovary is situated a short distance in front of the testes in a median position. It is globular and in specimens mounted under cover-glass pressure appears transversely elongated measuring 0.098 - 0.19 x 0.16 - 0.29 mm. The nuclei in the ovary measure 0.008 mm. in diameter. Dorsally the ovary passes into a narrow oviduct which runs directly dorsal for a short distance. It then turns abruptly and receives Laurer's canal. This runs forward sinuously for a short distance and opens on the dorsal surface, in the mid-line. The canal is slightly dilated a short distance from its origin and may function as a receptaculum seminis. Laurer's canal measures 0.015 mm. in diameter but is lined by a thick non-staining layer which leaves only a narrow lumen. A very short distance from its junction with Laurer's canal the oviduct receives a short narrow yolk duct from the central yolk reservoir, and enters the compact shell gland. The latter is globular and measures 0.09 mm. in diameter. The numerous cells of the gland display abundant contents and prominent nuclei. Within the shell gland the female duct runs backwards describes a complete turn and runs antero-ventrally as the ootype.

The vitelline glands are two entire ovoid bodies lying on either side of the ovary and extending slightly beyond that organ posteriorly. They are approximately equal in size measuring about 0.16 x 0.11 mm. and vary only slightly in form in the mounted specimens. The glands are bounded by thin membranous walls and are loosely packed with yolk cells. The cells contain yolk particles and large spherical nuclei each with a single prominent nucleolus. A yolk duct leaves each gland on its innermost surface and runs obliquely dorsally between the ovary and the gut. They unite into a fairly large yolk reservoir dorsal to the ovary and immediately behind the origin of the oviduct.

After leaving the shell gland the female duct expands slightly into the uterus. This describes many loops and forms a compact mass below and in front of the ovary, and which extends forward to the ventral sucker. The uterus then passes over the ventral sucker between the gut rami and describes a helical spiralled course to the level of the prostate gland. Here it narrows into a muscular metraterm 0.028 mm. diameter which runs forwards and downwards and penetrates the sinus-sac. It opens through a stout sphincter into the common genital sinus which measures 0.024 mm. in diameter and 0.06 mm. long when the genital cone is retracted. The first loops of the uterus contain numerous sperms and function as a uterine seminal receptacle.

The innumerable eggs are light brown in colour. They are elongate bearing a bluntly rounded operculum in front and at the other end tapering into a very long slender filament which is many times longer than the body of the egg.

Discussion:- The genus Hemiperina was set up by Manter (1934) for a single species. Hemiperina nicolli. Manter did not include this species in the genus Hemipera Nicoll "because of the evident lack of a citrus sac, absence of a seminal receptacle. better prostate gland and much smaller eggs." The species described above is identical in size with Hemiperina nicolli and closely resembles it in structure. The chief differences are in the form of the seminal vesicle and the presence in Hemiperina manteri of a weakly developed sinus-sac. The genus Hemipera Nicoll contains two species H. ovocaudata Nicoll and H. sharpei Jones.

The four allied species are compared in the following table:-

<u>Hemipera</u> <u>Ovocaudata.</u>	<u>H. Sharpei.</u>	<u>Hemiperina nicolli</u>	<u>H. manteri.</u>
<u>Host:</u> <u>Lepadogaster gouanii</u>	<u>Cepola rubescens</u>	<u>Chaunas nuttingi</u> <u>Diplacanthopoma</u> <u>brachysoma</u> <u>Dibranchus</u> <u>Atlanticus</u>	<u>Matridopsis</u> <u>Forsteri</u> <u>Cheilodactylus</u> <u>spectabilis</u>
<u>Location in</u> <u>Host:-</u> Stomach	Under Gill-cover	Stomach	Stomach
<u>Length:-</u> 1.54 x 0.56 mm.	4.77 x 0.85 mm.	2.07-3.13 x 0.72 - 0.87	2.07 - 3.01 x 0.68 - 0.83
<u>Oral Sucker:-</u> 0.22 mm.	0.37 mm.	ratio 2 : 3 or 3 : 4	0.24 - 0.31 mm.
<u>Ventral Sucker:-</u> 0.4 mm.	0.74 mm.		0.46 - 0.62 mm.
<u>Termination of</u> <u>male duct:-</u> Cirrus-sac present containing prostate gland. Vesicula seminalis externa present.	Cirrus-sac present, probably contains prostate gland, and seminal vesicle.	Cirrus-sac absent. Well developed free prostate gland and seminal ves. present. Vesicle sac-shaped and muscular.	Sinus-sac weakly developed. Well developed free prostate gland and seminal ves. present. Ves tubular, thin walled.
<u>Female</u> <u>Complex:-</u> No distinct Receptaculum sem. Laurer's canal apparently absent.	Prominent receptac. sem. present. Laurer's canal present	Receptac. sem. uterum present. Laurer's canal not described.	Receptac. sem. uterinum present Laurer's canal present.
<u>Eggs:-</u> 100 x 27 with short filaments.	100 x 38 with filaments about 11 times egg length.	44-52 x 16-20 with filaments at least 20 times egg length	30-40 x 8-12 with filaments at least 20 times egg length

Although a weakly developed sinus-sac is present in Hemiperina manteri this structure does not correspond to the cirrus-sac of Hemipera but is parallel rather with the sinus-sac of Theletrum. The generic diagnosis of Hemiperina must therefore be amended to include forms in which a sinus-sac is in evidence.

Sub-family Sterrhurinae.

STERRHURUS MACRORCHIS new Species.

(Figs. 23-27)

External features. - Stout, spindle-shaped trematodes, little or not at all, flattened dorso-ventrally. The type-specimen measures 2.9 mm. long and 1.09 mm wide under slight cover-glass pressure, and has the 'tail' or 'ecsoma' completely withdrawn (fig.). The 'tail' is capable of eversion to a length of approximately 0.5 mm., being poorly developed in comparison with that of most other members of the genus Sterrhurus.

The oral sucker is sub-terminal and directed ventrally. It measures 0.36 mm. in diameter and is bounded anteriorly by a narrow lip. The acetabulum is situated at about the posterior limit of the front half of the body. It is circular in outline and measures 0.57 mm. in diameter. The ratio in diameter between the acetabulum and the oral sucker in the type and paratypes varies from 1.5 to 1.6. Immediately in front of the acetabulum there is a deep transverse groove, the pre-acetabular pit. The common genital aperture is situated in the mid-line, half-way between the anterior extremity and anterior border of the acetabulum. The excretory aperture is at the extreme tip of the 'tail'. The cuticle is quite smooth and spineless. The extensive uterus, filled with orange-brown eggs, imparts a brownish appearance to the posterior half of the body, which elsewhere appears light-yellow.

Digestive System. - The cavity of the oral sucker opens directly into the pharynx, a prepharynx being absent. The musculature of the pharynx is quite independent of that of the oral sucker. The pharynx measures 0.16 mm. in diameter and is of approximately the same measurement in length. The pharynx opens through a strong sphincter into a short

irregular chamber, the oesophagus, the wall of which is strongly muscular, possessing inner circular and outer longitudinal muscles. There is also a strong sphincter at the posterior end of the oesophagus separating it from the gut. From the oesophagus the gut rami run directly outward as smooth tubes for a distance of about 0.1 mm. This region and the oesophagus, pharynx and the oral sucker are lined by a thin layer of the cuticle. In each ramus a weakly developed sphincter separates the proximal smooth region from a short expanded chamber, lined by an epithelium which almost fill the lumen. This is the gland-stomach. The strands in other species have been described as protoplasmic threads, strands of mucus, and as cilia. The left and right gland-stomachs narrow and then expand into smooth sinuous tubes which extend backwards, near the dorsal surface, almost to the posterior extremity, occasionally entering the 'tail' for a short distance. Posterior to the gland-stomachs the rami are lined by columnar epithelial cells with basal nuclei. They possess a thin muscular wall consisting of inner circular and outer longitudinal fibres. The entire length of the gut is surrounded by a dense absorptive layer containing numerous nucleim which is most developed in the vicinity of the oesophagus.

Excretory System - The excretory vesicle extends from the excretory aperture to the level of the middle of the acetabulum as a thin-walled sinuous tube, which passes through the uterine coils, to the left of the ovary. At the anterior end, the ventral wall of the vesicle becomes raised in the mid-line, and further forward fuses with the dorsal wall, dividing the cavity into two approximately equal tubes. These paired vesicles diverge and come to lie near the lateral margins of the body. In this position they pass forwards to the level of the oral sucker, turn sharply inwards and fuse to form a continuous arc dorsal to the oral sucker.

When the 'tail' is withdrawn the posterior vesicle lies contorted in the uterine region and the excretory aperture opens into a chamber lined by the invaginated body wall. The excretory products escape through a posterior narrow ridged channel.

The surface of the entire excretory system is covered by a minute spherical droplets, arranged singly, in short chains or in small aggregates. They are also present on the surface of the posterior chamber formed when the 'tail' is withdrawn and are apparently due to some excretory product.

Genital System - (1) Male - The testes are two relatively large ovoid or roundly triangular bodies lying symmetrically near the lateral margins, slightly towards the dorsal surface, at about the middle length of the body. Their anterior border is at the level of the middle of the acetabulum. They measure 0.4 mm. broad and 0.47 - 0.59 mm. long. The vasa deferentia leave the anterior borders of the testes and run forward obliquely to open together into the base of the large seminal vesicle. The vesicle is S-shaped and is divided into two regions, namely, (a) a large thin-walled posterior portion which is folded upon itself, and (b) a smaller anterior portion which has a thicker muscular wall composed of inner longitudinal and outer circular fibres, and which is connected to the posterior portion by a narrow neck. The anterior division connects with the pars-prostatica by a constructed muscular tube which terminates in a well-developed sphincter. The pars-prostatica has a muscular wall with a glandular lining of cubical empty-looking cells. It is tapered anteriorly and measures 0.16 mm. long, and near the posterior end 0.06 mm. in diameter. For the greater part of its length it is enclosed within the dorsal musculature of a large muscular sac, the so-called 'sinus-sac'. Anteriorly

the pars-prostatica opens through the antero-dorsal wall of the sinus sac and surrounds the pars-prostatica. The cells of the prostate gland are very large and vacuolate with prominent nuclei. The large sinus sac is ovoid in shape, having its long axis directed dorso-ventrally and measuring approximately 0.39 mm. x 0.21 mm.

The large dorsal cavity has its own wall. This is membranous and closely applied to the wall of the sinus sac dorsally. Ventrally and laterally there is a space between it and the sac wall filled by vacuolate spongy tissue. The wall of the expanded chamber is continuous with the ejaculatory duct and the musculature of the sac around the base of the small 'collar'. In the ventral floor of the expanded chamber there are two distinct muscle fibres. A narrow pore leads through a muscular thickening of the floor into the cavity of the hermaphrodite duct is wide and highly muscular, having stout longitudinal muscles running from the body wall to the floor of the expanded chamber and inner circular muscles which project into the cavity. As the hermaphrodite duct is directed dorso-ventrally it does not extend posteriorly to the level of the common genital aperture as is the case in many other species of Sterrhurus (fig. 25)

(2) Female - The ovary is a large, smooth, oval body lying immediately behind the right testis, slightly towards the dorsal surface. It measures 0.31 mm. x 0.42 mm. and has its long axis directed transversely. The largest ova in the ovary measure 0.008 mm. in diameter. The oviduct, the thin wall of which contains large flattened nuclei, leaves the ovary ventrally. On the right side it meets a duct which leads backwards into the receptaculum seminis. The oviduct passes ventrally a further 0.02 mm. and meets the short yolk duct. It then passes backwards as the ootype into the compact shell gland, turns upon itself, and passes

directly forward to emerge anterior to the level of the origin of the oviduct. The tube expands slightly into the relatively narrow proximal portion of the uterus. This circumvents the shell gland and receptaculum seminis posteriorly and fills the body on the right side between the vitellaria. The uterus then passes backwards to fill the body posterior to them. The first loops of the uterus contain abundant sperma, indicating their function as a receptaculum seminis uterinum.

The shell gland and the receptaculum seminis are closely approximated into a compact organ between the ovary and vitellaria, the shell gland being anteroventral and the receptaculum postero-dorsal. The shell gland contains dense gland cells arranged radially around the U-shaped ootype (fig.27). The receptaculum seminis has an extensive cavity incompletely divided by thin partitions into four or five compartments. In the four specimens sectioned the receptaculum was devoid of contents. The single pair of vitellaris lie near the three blunt expanded lobes. The yolk ducts arise near the inner borders of the vitellaria, converge sharply and unite to form a very short common yolk duct. The yolk cells measure as much as 0.012 mm. in diameter. The extensive coils of the uterus occupy the body space behind the to the left of the vitellaria and passing forwards fill the space between the testes. In extended specimens the posterior uterine coils may enter the base of the 'tail'. The innumerable uterine eggs are long-oval in shape, measuring 0.02-0.024 mm. long and 0.008-0.1 mm. broad and are orange-brown in colour. At the level of the hind edge of the acetabulum the wall of the uterus, which is membranous and contains flattened nuclei, abruptly narrows and becomes muscular, possessing outer longitudinal and inner circular fibres. This narrow muscular portion measuring approx-

imately 0.01 mm. in length expands into a thin-walled tube of the same length, which abruptly narrows and passes into the metraterm. The metraterm is highly muscular and, in addition to the outer longitudinal and inner circular muscle, has a lining of cuticle. Anteriorly it penetrates the wall of the muscular sac and passes forward immediately below the thin-walled dorsal chamber. Directly below the male aperture in the floor of this chamber it passes into the short broad hermaphrodite duct.

The metraterm is divided into two portions by a constriction at the level of the middle of the acetabulum. In the contracted state the distal muscular and thin-walled portions of the uterus and the proximal portion of the metraterm are coiled into a compressed helix.

Muscular System - The oral sucker and the acetabulum present no unusual features. They possess the normal equatorial meridional and radial muscles. The body-wall is composed of the usual circular, longitudinal, and oblique muscles. It is highly muscular in the 'neck' region, but behind the acetabulum the musculature is weak. Throughout the body-length, the ventral body-wall is the more muscular. In addition to the posterior oblique retractor muscles of the oral sucker there are a few very large hollow fibres, derived from the longitudinal muscles of the dorsal body wall, which curve forwards and downwards and are inserted in the antero-dorsal wall of the sucker. Weak oblique muscles run forwards and downwards from the dorsal body wall to the pre-acetabular pit.

Nervous System - The nerve ganglia are situated on either side of the anterior portion of the pharynx. Ganglion cells are numerous near their dorsal periphery. The dorsal nerve commissure bends slightly forwards and lies above the oral

sucker, while the ventral commissure bends backwards and lies beneath the oesophagus, giving off nerves to the anterior regions of the gut. Ventrally the ganglia give off two slender nerves which diverge and pass downwards to lie near the ventral surface. These lateral nerves were traced as far as the level of the genital aperture.

HOST. - PHYSICULUS BARBARTUS Günther.

LOCATION IN HOST - Pharynx and stomach.

FREQUENCY - Present in one of ten hosts examined.

Hosts obtained from Hobart Fish Market,
October, 1944.

THE STRUCTURE OF THE TERMINAL GENITAL DUCTS
IN THE GENUS STERRHURUS LOOSS.

(Figs. 28-33)

Looss (1907a) in his diagnosis of the genus Sterrhurus remarks of the terminal genital ducts, 'Der den Cirrusbeutel ersetzende Muskelsack hat birnformige Gestalt, und umschliesst ausser dem Ductus ejaculatorius, auch den Anfangsteil des Metraterms und den kurzen Ductus ejaculatorius, dessen Endabschnitt zu einem kugelformigen Hohlraum erweitert ist. In diesen tritt von hinten her die ausserhalb des Beutels gelegene Pars prostatica wobei ihr innerer Belag lippenartig in den Hohlraum der Blase vorspringt. Oft setzen sich die Secretmassen auch mehr oder minder weit auf die Wand der Blase fort.' Looss includes in the genus the following species, S. musculus, S. imocavus, S. grandiporus (Rud.) and S. fusiformis (Lühe). In an extended account of the type species (S. musculus) Looss (1907b) states his conviction that the cavity or bladder within the cirrus sac represents an expanded portion of the ejaculatory duct. He says 'Der männliche Leitungsweg, der nach seinem Austritt aus dem Ductus hermaphroditicus als Äquivalent eines Ductus ejaculatorius betrachtet werden kann, erweitert sich nach kurzem Verlauf unvermittelt zu der mehrfach erwähnten Blase, deren Vorhandensein anscheinend die birnförmige Gestalt des Cirrussacks bedingt. Ihr innere Auskleidung ist ohne Zweifel eine stark verdünnte, aber direkte Fortsetzung der Auskleidung des Ductus ejaculatorius, denn man sieht beide kontinuierlich ineinander Übergehen; eine äussere Muskelauflagerung scheint der Blase zu fehlen'. Looss also states that the pars-prostatica projects into the expanded bladder like the opening of the womb, and that of the wall of the expanded portion of the ejaculatory duct is covered with droplets of prostatic secretion in most of his specimens, but in some is free from these, and the bladder filled with groups of spermatozoa.

Linton (1910), briefly describes S. monticelli and records some specimens of S. fusiformis (Lühe). The detailed

structure of the terminal genital ducts is not given, but an illustration of a longitudinal section through the fore-body of S. monticelli shows a large 'cirrus' projecting into the common genital duct. Linton's figure of longitudinal section through the fore-body of the S. fusiformis shows the expanded bladder within the dorsal end of the cirrus sac lined by tall cells and labelled 'duct of prostate'.

Nicoll (1915) describes S. brevicirrus and states that a 'Prostate vesicle' is present at the base of the cirrus sac. A detailed account of the species is not given, but Nicoll remarks that his species displays all the typical features of the of the genus Sterrhurus Looss.

Manter (1934) describes S. laevis, S. floridensis, S. robustus, S. profundus, and S. praeclarus. In S. laevis the cirrus-sac or sinus sac is described as short and very broad and mostly occupied by the 'prostate vesicle' which is itself almost filled by the tall cells which line its wall. In this species the seminal vesicle is conspicuously divided into two parts, one of which is anterior and the other usually posterior to the ventral sucker. In S. floridensis there is a spherical 'prostate vesicle' within the base of a clavate cirrus sac. The vesicle is shown to be lined by tall cells similar to those usually lining the pars prostatica, and the metraterm meets the male duct immediately in front of the vesicle, forming a long sinous ductus hermaphroditicus. S. praeclarus differs from perviously described species in that the cirrus sac is much reduced and the metraterm meets the male duct at the anterior end of the pars prostatica which is near the genital pore. In S. robustus the cirrus sac or sinus sac is totally lacking, the ejaculatory duct and ducts hermaphroditicus being simply tubular in form. Manter describes the prostate gland as lying free around the prostate vesicle and shows the seminal vesicle lying mainly behind the acetabulum and conspicuously constricted into two parts. He remarks that S. profundus presents so many peculiarities that it might

warrant the formation of a new genus; and in his specific diagnosis states "Genital atrium very short; ejaculatory duct long, narrow, straight or slightly sinuous, widening opposite the pharynx to form a thick-walled prostate vesicle'.

S. profundus differs from all previously described species in that the seminal vesicle is undivided, the genital pore far anterior, etc. Manter states that as it is difficult to arrive at a logical generic limitation, at the time he prefers to place this species in the genus Sterrhurus. In none of the species of Sterrhurus described by Manter is there present any structure projecting into the cavity of the prostate vesicle as described by Looss.

Yamaguti (1934) describes S. inimici, and puts forward a new interpretation of the terminal portions of the genital ducts. He regards the expanded bladder at the base of the 'sinus sac' as a greatly expanded ductus hermaphroditicus. Since Yamaguti (1938) rescinds this interpretation after further examination of the specimens, it need not be elaborated further. Stunkard and Nigrelli (1934) describe S. branchialis. The copulatory organs and 'sinus sac' of this species agree with those of S. musculus Looss, except that the ductus hermaphroditicus is somewhat longer. These authors express the view that S. praeclarus, S. robustus, and S. profundus of Manter should not be included in the genus Sterrhurus Looss, but do not attempt to re-classify these species. Stunkard and Nigrelli express the view that the Ductus hermaphroditicus is undoubtedly formed 'by fusion of the distal parts of the metraterm and ejaculatory duct.'

Park (1936) states that Looss refers to the vesicle at the base of the 'sinus sac' as 'merely the vesicular expansion between the pars prostatica and the ductus hermaphroditicus'. However as shown above, Looss expresses the definite opinion that this vesicle represents an expanded portion of the ejaculatory duct. In S. magnatestis Park the prostatica projects into the 'prostate vesicle' within the 'sinus sac' (or cirrus sac) in the

same manner as in S. musculus Looss, but it bears at its innermost extremity a nozzle or collar which, according to Park, is covered with minute spinules. Park regards this nozzle as representing a copulatory organ or true cirrus and designates the expanded portion of the male duct into which it projects a 'cirrus vesicle'. In view of the muscular nature of the 'sinus-sac' and cirrus vesicle' Park predicts that the 'Cirrus' may be protusible at the time of copulation. The aperture connecting the 'cirrus vesicle' with the hermaphrodite duct is regarded as representing a very short ejaculatory duct. Park remarks 'However this is not a true one in origin, although it may be functioning as such in those species lacking a cirrus. It is probable that the duct is derived from a modification of the anterior part of the cirrus sac'. Park considers that in his species the true ejaculatory duct is lacking or has become a part of the 'cirrus' and that on this account Stunkard and Nigrelli's statement that the hermaphrodite duct is formed by the fusion of the distal parts of metraterm and ejaculatory duct might need modification. Park considers that the hermaphrodite duct or genital sinus might rather be formed by invagination and elongation of the genital atrium in development since the structure of the muscular vesicle shows 'a possible modification of the cirrus sac which contains a cirrus. Under this assumption the muscular vesicle is homologous with the cirrus sac or part of it. Therefore the name cirrus vesicle is preferable to prostate vesicle from the evolutionary point of view'.

Yamaguti (1938) describes S. musigarei and S. magnus. In S. musigarei two-thirds of the pars-prostatica projects through the wall of the 'sinus sac' into the cavity within the dorsal end of the sac. As this chamber is regarded as an expansion of the ejaculatory duct and discharges sperms into the hermaphrodite duct upon the contraction of the 'sinus sac', Yamaguti prefers the term 'ejaculatory vesicle' to 'prostate vesicle'.

The pars-prostatica bears at its extremity a thin nozzle similar to the 'cirrus' of Park. The ejaculatory vesicle opens anteriorly into a short, wide hermaphrodite duct. In S. magnus the genital end-organs are of similar construction. Yamaguti points out that S. robustus Manter should be transferred to Dinosoma. A year later Yamaguti (1939) describes a further species, S. pagrosomi, in which the pars prostatica is enclosed anteriorly in the dorsal wall of the 'ejaculatory vesicle'. The metraterm is described as running forwards along the ventral wall of the 'ejaculatory vesicle' and opening at its anterior end into the ductus hermaphroditicus. Jones (1943) re-describes Sterrhurus fusiformis (Lühe) in detail. The prostate vesicle at the base of the 'sinus sac' is lined by large vacuolate cells similar to those lining the pars-prostatica. The prostate vesicle and the pars-prostatica are directly continuous, there being no inwardly projecting portion of the latter into the cavity.

In S. macrorchis, described above, the terminal genital organs correspond essentially to Yamaguti's description of S. pagtosomi, but resemble those of S. magnatestis in the possession of the collar, nozzle, or 'cirrus' of Park, which does not appear to be present in S. Pagrosomi.

The above accounts of the terminal genital ducts of Sterrhurus species indicate that the expanded vesicle within the muscular pouch has arisen in two different ways. The organs of some species are adequately described by Looss=¹ original diagnosis of the genus. These species possess a vesicular expansion of the ejaculatory duct, into which the terminal portion of the pars-prostatica may project, and which connects with the hermaphrodite duct by an unexpanded portion of the ejaculatory duct which may be more or less abbreviated. In view of the origin and function of the expanded vesicle in these species the term 'ejaculatory vesicle' proposed by Yamaguti should be applied to it. A gradual encroachment of the pars

prostatica into the cavity of the ejaculatory vesicle is seen to have taken place. In S. macrorchis the anterior portion of the pars prostatica, while enclosed within the musculature of the 'sinus Sac', yet does not project into the cavity of the ejaculatory vesicle '(fig.25.). In S. musculus Looss, S. branchialis Stunk. et Nig. (fig.30) S. magnatesis Park (fig.28), and S. inimici Yamaguti, the pars projects a short distance into the vesicle. A further stage has been reached in S. Musigarei Yamaguti and S. magnus Yamaguti in which as much as two-thirds of the entire length of the pars may project into the ejaculatory vesicle (fig.29). The 'cirrus' of Park appears to be constantly present in some species and in S. macrorchis, at least, is not the copulatory organ. It is possible that the terminal genital organs have arisen in different ways in Sterrhurus species, but as this seems unlikely, Park's term 'cirrus vesicle' is not suitable,

In S. fusiformis (Luhe) (fig.31), S. floridensis Manter (fig.32), and S. laevis Manter, the expanded vesicle within the muscular pouch appears to have arisen by expansion of a portion of the pars prostatica. The vesicle is lined by a continuation of the lining of the pars prostatica, and the free part of the pars is directly continuous with the vesicle, there being no projection into the vesicle. The question arises as to whether these species should be included in the genus Sterrhurus. An indication of their true systematic position follows from a consideration of the structure of the terminal genital organs in the genus Lecithochirium (Luhe).

THE TERMINAL GENITAL ORGANS OF LECITHOCHIRIUM.

Looss (1907b) re-defines the genus and includes two species, L. rufoviride (Rudolphi) and L. gravidum which has previously not been separated from the former. These two species are very similar, differing only in size, proportion, and size of suckers, etc. Looss states that the structure of the

terminal ducts in the genus is essentially similar to that found in the genus Sterrhurus. The genus Lecithochirium is distinguished from Sterrhurus principally because of morphological differences in the fore-body. L. rufoviride (Lühe) and L. gravidum Looss possess a pair of prominent muscular thickenings in the ventral wall of the oral sucker, which is preceded by a well-developed pre-oral lip or lappet, only weakly developed in the Sterrhurus species recognised by Looss. Lecithochirium is also distinguished by the presence of a pre-acetubular pit or groove.

Further species have been assigned to the genus, which have the pre-oral lip developed to a more or less degree, and none of which possess the muscular thickenings of the oral sucker. The genital ducts of those species added to the genus since 1907 and which have been described in detail, have been essentially similar to those of S. floridensis, S. laevis, and S. fusiformis (according to Jones' re-description). Workers on the group have applied various terms to these structures. Chandler (1935), in his description of L. microstomum, states that the prostatic portion of the vas deferens was sac-like and constricted into two parts where it penetrates the sinus-sac (fig. 9). Yamaguti (1938) takes the view that the pars-prostatica is divisible into two parts. He proposes the use of the term 'Prostatic vesicle' for the expanded portion within the sinus sac. Manter (1940) adopts the term 'prostate vesicle' for the prostatic portion of the male duct, whether enclosed within the sinus-sac or free from it. Thus in species of Lecithochirium Manter refers to 'internal' and 'external' prostate vesicles. I concur with Yamaguti's proposal.

As Jones (1943) points out the present separation of the genera Sterrhurus and Lecithochirium is unsatisfactory as the genus Sterrhurus is defined upon negative features which for the most part are really only differences of degree. It can be seen

that two fundamentally different types of terminal genital organs are present in the two genera. In all the adequately described species of Lecithochirium the bladder within the muscular pouch or sinus-sac is a portion of the pars prostatica. All those species in which the bladder is derived from a portion of the ejaculatory duct are included in the genus Sterrhurus but several species in which the bladder represents a portion of the pars prostatica have been included in this genus, namely, S. fusiformis, S. floridensis, and S. laevis. If the difference in structure of the terminal genital ducts is adopted as a means of distinguishing the genera, many anomalies pointed out by Jones disappear. S. fusiformis (Lühe), S. floridensis Manter, and S. laevis Manter are accordingly, transferred to the genus Lecithochirium (Lühe). Until adequate detailed descriptions of S. brevicirrus and S. Monticelli appear their position is uncertain. However, from the descriptions available, the former appears to be correctly assigned, but the latter should be transferred to Lecithochirium. S. robustus Manter has been transferred to the genus Dinosoma Manter by Yamaguti (1938). S. praeclarus Manter and S. profundus Manter differ so markedly from the members of either genus that new genera should be set up to accommodate them.

Sub-family:- Hemuirinae.

Parahemivirus lovettiae new species
(Figs. 34-35)

Host:- Lovettia sealii Johnston (White Bait)

Location in Host:- Intestine

Locality:- Huon Estuary

Degree of infection:- One to three specimens in four out of twelve hosts examined.

Principle Dimensions.

	<u>Length.</u>	<u>Breadth.</u>	<u>Forebody.</u>	<u>Oral Sucker.</u>	<u>Acetabulum</u>	<u>Testes</u>	<u>Ovary</u>	<u>Eggs.</u>
1.	1.21 x 0.25	0.29	0.18	0.08	0.15	0.13 x 0.098	0.13 x 0.08	20 x 8
2.	1.19 x 0.23	0.36	0.28	0.08	0.15	0.13 x 0.098	0.15 x 0.08	20 x 8
3.	1.27	0.39	0.16	0.08	0.15	0.098	0.114 x 0.065	20 x 8
4.	0.85 x 0.34	0.285	0.17	0.089	0.15	0.08	0.098 x 0.065	20 x 8
5.	0.91 x 0.23	0.28	0.10	0.08	0.15	0.114	0.13 x 0.08	21 x 9

External Features: The body is slender and cylindrical, tapering towards the anterior end. Posteriorly the body is produced into a tapered "tail" or ecsoma, which is capable of complete withdrawal into the body. The ecsoma makes up approximately a quarter of the animal's total length. The oral sucker is terminal, its aperture being only slightly directed towards the ventral surface. The ventral sucker is situated approximately at the junction of the first and second fifths of the body length. The ratio between the suckers is 1:1.875. The excretory pore is at the tip of the exsoma. The cuticle is produced into the prominent rings or plications, characteristic of the group. They extend laterally and ventrally for the full length of the soma, becoming gradually more separated towards the posterior end. They do not extend to the ecsoma. Dorsally the plications extend completely across the body beyond the level of the ventral sucker but appear to be lacking beyond the level of the anterior testis.

Alimentary System: The oral sucker opens directly into the pharynx. This is spherical and measures 0.05 mm in diameter. The pharynx leads into a globular muscular oesophagus or oesophageal pouch. Posteriorly the wall of the oesophagus is thickened to form a sphincter through which the oesophagus communicates with the two gut rami. The proximal portions of the rami are unlined and run directly transversely. The rami then turn sharply backwards and expand into thin-walled sinuous tubes, which are lined by an epithelium of closely packed tall cells with basal nuclei. The cuticle does not appear to extend into the gut beyond the pharynx. The rami continue backwards lying dorsal to the ovary and vitellaria and enter the ecsoma, in some cases extending almost to the tip of the tail. The gut wall is very weakly muscular.

Excretory System: This species presents no variation from the typical system of the family. A single tubular vesicle penetrates the ecsoma and bifurcates approximately at the level of the testes.

The branches diverge and pass forwards and towards the dorsal surface, fusing to form a continuous loop above the pharynx.

Reproductive System: i. Male:- The two testes are ovoid unlobed bodies lying directly or slightly obliquely in tandem in the middle region of the body. In all specimens examined the testes are in contact, never separated by loops of the uterus. The relative size of the testes varies somewhat in different individuals but they are always smaller than the ventral sucker and in most specimens, smaller than the ovary. The vasa deferentia are very short as they pass directly to the base of the seminal vesicle which may be to the right of the testes or directly dorsal to them. The vesicle is a large spindle-shaped muscular sac which extends obliquely forwards from the vicinity of the posterior testis to a point mid-way between the anterior testis and the ventral sucker, or almost to the posterior border of the latter. The seminal vesicle measures 0.2 - 0.3 mm. in length and 0.05 - 0.08 mm. in diameter at its middle length. The wall is extremely thick, the lumen measuring 0.032 mm. in diameter in the transverse section of a vesicle 0.08 mm in diameter. As is the case in the other species placed in this genus the lumen is undivided. At its anterior extremity the vesicle tapers into a slender muscular duct which turns backwards and expands slightly forming a long pars prostatica 0.022 mm. in diameter. The prostate gland consists of numerous individual small vacuolate cells which have prominent nuclei, clustered uniformly around the pars prostatica throughout its length. The prostate cells are not enclosed by any limiting membrane, and they become sparser posteriorly finally petering out. The male duct then meets and fuses with the narrow terminal portion of the female duct, forming the long narrow hermaphrodite duct which passes directly forwards over the ventral sucker, through the neck region to the genital pore. Throughout its entire length the duct is enclosed by a strongly muscular sinus sac which is separated from the duct by a narrow

space. It seems certain that the terminal portion of the hermaphrodite duct functions as the copulatory organ, as Woolcock (1935) observes in the case of P.australis.

ii. Female:- The ovary is a smooth ovoid body situated towards the left side of the animal mid-way between the ventral sucker and the posterior end of the soma. In most specimens it is in contact with the posterior testis but it may be separated from that organ by loops of the extensive uterus. The ripe egg-cells measure 0.008 mm. in diameter. The vitellaria are two adjacent lobed bodies lying immediately behind the ovary. In form they may be roundly bilobed or somewhat more divided (Fig.35). The material is not favourable for the detailed examination of the course of the oviduct and vitelline ducts. However, the ootype lies immediately behind the ovary in a position dorsal to the vitellaria, and is surrounded by small cells with densely staining contents, which constitute the shell gland. A small receptaculum seminis is present beside the shell gland. The uterus runs back into the ecsoma and then turns forward and fills most of the body spaces behind the ventral sucker. It is voluminous and contains very numerous elongate-ovoid eggs, which are light brown in colour. The uterus narrows abruptly before fusing with the male duct to form the hermaphrodite duct or genital sinus.

Discussion: Since the genus Parahemiurus was erected by Vaz & Pereira (1930), with P.parahemiurus as the tupe, ten species have been added. Of these Manter (1940) recognizes only six, regarding P.parahemiurus, P.platichthyi, P.atherinae, and P.harengulae as synonyms of P.merus (Linton), and retaining P.merus, P.australis, P.anchoviae, P.sardinae, P.seriolae, and P.ecuadori. The species described above closely resembles P.australis in form and proportions of the body, in the shape of the seminal vesicle, which in this species at least, does not appear to be variable, and in the size of the eggs.

However, the body and all organs are markedly smaller and it differs from P.australis in the greater extent of the

plications of the cuticle. The diagnostic value of the latter character is generally accepted, but it is sometimes difficult to ascertain the extent with certainty and published descriptions are not always clear on this point. Until workers are agreed on the relative diagnostic importance of morphological characters in the Trematoda, and until the extent of the effects of different hosts and conditions upon a species is understood, the recognition of individual species of Parahemiurus will remain controversial. However, there is a sufficiently clear group of related species with sufficiently marked individual differences to ensure the survival of this genus.

Parahemius australis Woolcock.

(Fig. 36)

In a previous paper the writer pointed out the presence of a Hemiurid which appeared to be Parahemius australis, in the stomach of the "Rock Cod", Physiculus barbata Gunther. The principle dimensions of the specimens are given here for purposes of comparison with those of the preceding species. An illustration of a whole mount is given for the convenience of local students.

Principle Dimensions.

	<u>Length.</u>	<u>Breadth:</u>	<u>Forebody</u>	<u>Oral Sucker</u>	<u>Acetabulum</u>	<u>Testes.</u>	<u>Ovary.</u>	<u>Eggs.</u>
1.	1.83 x 0.44	0.51	0.29	0.15	0.28	0.23 x 0.15	0.28 x 0.13	20 x 8
2.	68 x 0.52	0.72	0.34	0.18	0.32	0.18 x 0.11	0.26 x 0.15	24 x 8
3.	1.66 x 0.41	0.52	0.39	0.18	0.29	0.19 x 0.11	0.26 x 0.13	20 x 8
4.	1.55 x 0.42	0.46	0.29	0.13	0.24	0.13	0.20 x 0.12	22 x 6
2.	1.38 x 0.52	0.54	0.27	0.16	0.25	0.23 x 0.16	0.24 x 0.13	22 x 8

FAMILY BIVESICULIDAE.

Bivescula australis n. sp.

(Fig 37-39.)

Host: Neosebastes thetidis Waite

Location in Host: Intestine, near stomach.

Locality: Hosts obtained from Hobart Fish market.

Frequency: One in each of three hosts, Two in one host, absent from four others examined (December 1944, March 1945).

Principle Dimensions

<u>Length</u>	<u>Breadth</u>	<u>Oral sucker</u>	<u>Ovary</u>	<u>Testis</u>	<u>Eggs</u>
1. 1.59	0.62	0.18	0.15	0.24 x 0.29	84 x 48
2. 2.51	1.04	0.31	0.13 x 0.16	0.41	60 x 44
3. 2.54	1.17	0.26	0.19	0.39 x 0.41	72 x 48

External Features:- The small highly contractile trematodes, appear fusiform in the extended state, but when contracted they are tapering from before backwards. The oral sucker is funnel shaped, and isterminal in position. It may be completely withdrawn into the body and in this position communicates with the exterior through a ventral invagination of the body wall. No acetabulum is present. The cuticle is thick and towards the front end of the animal is armed with extremely minute spinules. Numerous blindly terminating tubules occur around the border of the oral sucker and for some distance posterior to that organ. These tubules are quite similar to those described by Woolcock (1936) from Helicometra tenuifolia. As in that species the tubules are probably excretory in function. The genital pore is situated on the ventral surface in the mid-line, at the junction of the middle and last thirds of the body. The excretory pore is at the posterior extremity. The worms are "ocular", an area containing pigment granules occuring on either side of the oesophagus.

Alimentary System:- The oral sucker opens directly into the oesophagus, a distant pharynx being absent. The oesophagus is narrow and its length varies greatly according to the state of contraction of the specimen. When contracted its wall is strongly muscular possessing stout inner circular and outer longitudinal fibres. Posteriorly the oesophagus opens into the gut rami, which diverge sharply and come to lie close to the body margins. The rami extend backwards al

most to the posterior extremity of the body, as smooth sinuous tubes, uniformly round or oval in section and tapering considerably towards their extremities. The walls of the rami are membranous and lined by a flattened epithelium containing very numerous ovoid nuclei.

Excretory System:- Paired excretory vesicles fuse immediately in front of the excretory pore. They extend forwards from this point as greatly distendable tubes which pass forwards on either of the testis, lying below the gut. Anterior to the testis they narrow and pass between the gut rami and the cirrus sac. In the front of the cirrus sac they pass between the converging gut rami and occupy the bulk of the lateral regions of the body. In contracted specimens the vesicles appear to terminate in front of the posterior border of the oral sucker, but when the animal is normally extended they do not reach the level of that organ. The walls of the excretory vesicles are membranous, containing widely separated nuclei.

Reproductive System:- Male:- The single large testis is median, lying in the intercaecal space in the posterior third of the body. It is circular or roundly oval in outline and flattened dorso-ventrally. The testis is bounded by a membranous wall containing flattened nuclei. Two vasa deferentia arise from the anterior border of the testis, and run forwards along the right and sides of the cirrus sac. The cirrus sac is a relatively large cylindrical structure which measures 0.33 mm in diameter, and 0.55 mm long in the largest specimen. It occupies the middle third of the body length and lies in the mid-line entirely in front of the genital pore. Its wall is strongly muscular, consisting of stout inner circular and outer longitudinal fibres. The vasa deferentia expand and fuse into a small "external" seminal vesicle which lies at the anterior end of the cirrus sac. This vesicle communicates with an "internal" seminal vesicle within the cirrus sac, by means of a fine duct. The "internal" seminal vesicle possesses a weakly muscular wall and is almost spherical in form. It therefore narrows abruptly into a short muscular duct surrounded by a sphincter. This duct leads into the

pars prostatica, which occupies most of the volume of the cirrus sac. The wall of the pars is thick, being composed of stout outer longitudinal and inner circular fibres. It is lined by the typical empty-looking cells, which are relatively tall. The musculature and the epithelium are more strongly developed along one side producing a prominent ridge which projects into the lumen. Anteriorly the pars is produced into two lateral pouches, one of which extends forwards on either side of the internal seminal vesicle. The remaining space within the cirrus sac is occupied by the well developed prostate gland. This consists of a matrix in which numerous ovoid nuclei are embedded. The nuclei are densely arranged in outer zone near the sac wall, leaving an inner clear zone surrounding the pars prostatica which consists of radiating protoplasmic strands. A short distance in front of the posterior end of the cirrus sac the pars prostatica passes through the ventral wall of the sac and opens into the common genital atrium.

ii. Female:- The ovary is a smooth spherical or ovoid body lying on the right side of the body at the level of the genital aperture or slightly in front of that level. Topographically it lies between the right ramus of the gut and the hind end of the cirrus sac, and towards the dorsal surface. The ripe egg-cells measure 12 in diameter. Postero-ventrally the ovary tapers into a wide muscular oviduct. This runs backwards and expands, directly behind the ovary, into the ootype. Laurer's canal is given off approximately at the middle length of the oviduct. The canal, which is very narrow, winds a sinuous course to minute pore in the cuticle in the mid-line at the level of the anterior border of the testis. The ootype is surrounded by a large compact shell gland which consists of a vacuolate matrix through which numerous nuclei are uniformly distributed. Individual cell boundaries are not distinguishable.

The yolk follicles are numerous small irregular bodies filling the body from the level of the genital atrium to the level of the middle of the oesophagus. In a small mounted specimen (Fig.14

the follicles are more uniform and display a greater degree of independence than in the larger specimens. The follicles of the latter have a tendency to fusion. (Fig.13). The yolk is collected into a transversely elongated reservoir which lies on the left side of the shell gland. A duct from the reservoir opens into the oviduct as it enters the gland.

The uterus passes directly backwards on the right side lying near the dorsal surface, and fills the body behind the testis. The proximal descending portion of the uterus functions as a receptaculum seminis uterinum. After describing two or three loops behind the testis the uterus passes forwards beside its proximal portion and crosses the body in front of the testis. It describes a loop to the left side of the cirrus sac before narrowing abruptly into a muscular metraterm which leads to the genital atrium. The few eggs are light yellow in colour and variable in size. In one specimen (2, in the above table), the eggs bear at one end, a blunt hollow appendage measuring 16 long and 5 thick. (Fig 16) In the remaining specimens this appendage is entirely lacking. The presence of this unipolar process upon the eggs of the one specimen does not appear sufficient grounds for placing it in a separate species.

Discussion: The genus Bivesicula was erected by Yamaguti (1934) for a single species, B. claviformis. He considered that form sufficiently differentiated from the rest of the Monorchiidae to warrant the formation of a new sub-family. Later Yamaguti (1938), described two further species, B. synodi, and B. epinephali. A further allied species which differed from the above three species in that the intestine and vitellaria extended backwards beyond the testis, and in that the uterus was limited to a region in front of that organ, was placed in a new genus Bivesiculoides. The same author (1940), raised the sub-family to family rank.

Bivesicula australis n.sp. resembles the three known species of the genus in the extent of the vitellaria and the uterus but it is similar to Bivesiculoides in that the gut rami extend almost to the posterior end of the body, and in the possession of the lateral pouches of the pars prostatica.

It thus provides a link between the two genera. The length of the gut can no longer be regarded as a distinction the two genera, and accordingly the generic diagnosis of Bivesicula must be amended to include species in which the gut rami may extend posterior to the testis.

REFERENCES.

- CHANDLER, A. C., 1935. - Parasites of Fishes in Galveston Bay
Proc. U.S. Nat. Mus. Washington. 83, pp. 127-128, pl. 6.
- JONES, D. O., 1943. - The Anatomy of Three Digenetic Trematodes
Skrjabiniella aculeatus (Ohdner), *Lecithochirium*
rufoviride (Rud.) and *Sterrhurus fusiformis* (Luhe),
from Conger conger (Linn.). Parasitology Cambridge, 35, 1
pp. 47-57.
- FUHRMAN, O., 1928. - Trematoda in Krumbach and Kuhkenthal's
"handbuch der Zoologie," 2 Lief. 3 Berlin; de Gruyter.
- HARSHEY, K. R., 1937.- "On some new Trematodes with anus." Proc
Ind. Acad. Sc. V5. No.2. Sec. B, 64-75.
- HICKMAN, V. V., 1934.- On *Coitocaecum anaspidis*, sp. nov., a Trem
atode exhibiting progenesis in the fresh water crust-
acean *Anaspides tasmaniae* Thompson. Parasitology, 26
121-126.
- ISSAITSCHIKOW, J. M., 1928.- Zur Kenntniss der parasitischen Wur-
mer einiger Gruppen von Wirbeltieren der Russischer
Arktis. Ber. Wiss. Meeresinst., 3: S2.
- JONES, D. O., 1943.- The Anatomy of Three Digenetic Trematodes,
Skrjabiniella aculeatus (Ohdner), *Lecithochirium ru-*
foviride (Rud.). and *Sterrhurus fusiformis* (Luhe),
from Conger conger (Linn). Parasitology, 35: 45-47.
- LINTON, E., 1910.- Helminth Fauna of the Dry Tortugas, 2, Trem-
atodes. Carnegie Inst. Wash. Publ. No.133, pp. 61-63
pl. 17-18.
- LOOSS, A., 1907a.- Zur Kenntniss der Distomenfamilie Hemiuridae.
Zool. Anz. Leipzig. 31, p. 600.
- 1907b. - Beitrage zur Systematik der Distomen. Zool.
Jahrb., Abt. System., 26. pp. 139-141, Taf. 12-13.
- MANTER, H. W., 1934.- Some Digenetic Trematodes from Deep-water
Fishes of Tortugas, Florida. Carnegie Inst. Wash.
Publ. No.435, pp. 305-312, pl. 11-13.
- 1940.- Digenetic Trematodes from the Galapagos Islands
and the Neighboring Pacific. Report Alan Hancock
Exped. 1940 pp. 426-429, pl. 47.

- MACFARLANE, W. V., 1939.-Life cycle of *Coitocaecum anaspidis* MacFarlane, a New Zealand digenetic trematode. *Parasitology*. 31, 172-184.
- MANter, H. W., 1934,-Some digenetic trematodes from Deep water Fish of Tortugas, Florida. *Carnegie Inst. Wash.* No. 432, p. 299.
-
- 1940,- Digenetic Trematodes from the Galapagos Islands and the neighbouring Pacific. *Rep. Alan Hancock Exped.*, 2. 14, 371-373.
- NICOLL, W. 1915.- The trematode parasites of North Queensland, *Parasites of Fishes. i. Parasitology*. 8, 22-40.
- OHdNER, T., 1905. - Die Trematoden des arktischen Gebietes. *Fauna Arctica*, 4 (2) : 297.
- OZAKI, Y., 1929.-Note on *Coitocaecidae*, a new Trematode family. *Ann. Zool. Jap.*, 12, 75-90.
- PARK, J. T., 1936.- Two New Trematodes, *Sterrhurus magnatesis* and *Tubulovesicula californica* (Hemiuridae) from Littoral Fishes of Dillon's Beach, California. *Trans Amer. Micros. Soc.* 55. pp. 477-481, pl. LX.
- PIGULEVSKY, S.W. 1931.- Fishparasiten des Dnjeprbassins. *Annu. Mus. Zool. Acad. Leningrad*, 32, 439-443. (German summary, 451-452.)
- SRIVASTAVA, H. D., 1928.- Studies on the Gasterostomatous Parasites of Indian Food Fishes. *Ind. J. Vet. Sci.* 8 : 317-340.
- STUNKARD, H. W. 1931.-Further observations on the occurrence of anal openings in digenetic Trematodes. *Z. Parasitenk* 3 (4) 713-715.
- STUNKARD, H. W. AND NIGRELLI, R. F. 1934.-Observations on the Genus *Sterrhurus* Looss, with a Description of *Sterrhurus branchialis* sp. nov. (Trematoda-Hemiuridae). *Biol. Bull.* 68 (3), pp. 535-543.
- VAZ, Z. and PEREIRA, C. 1930.- "Nouvel Hemiuride parasite de *Sardinella aurita* Cuv. et Val., *Parahemiur* n. g.
- WISNIEWSKY, L. W., 1933.- Ueber zwei neue progenetische

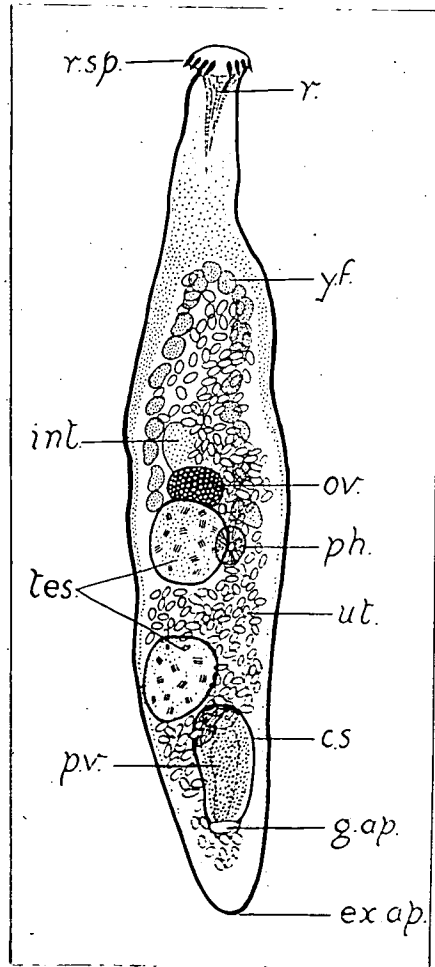
- ~~Trematoden aus den Balkanischen Gammariden.~~ Bull.
Acad. Polon., Cracovie, Ser. B, 1932 (1933), 260-268.
-
- 1934.- Beitrag zur Systematic der Coitocaecidae (Trematoda), Nicolla, gr.n., Math. Nat. B, 1934, 27-42.
- WOOLCOCK, V. 1935.- Digenetic Trematodes from some Australian Fishes. Parasitology, 27: 310-314.
- WU, K., 1937.- Two encysted trematodes of fresh water shrimps around Shanghai region. Peking Nat. Hist. Bull., 11 199-201.
- YAMGUTI, S., 1934.- Studies on the Helminth Fauna of Japan 2.
Trematodes of Fishes I. Jap. Journ. Zool. 5 (3), pp. 444-445.
-
- 1938.- Studies on the Helminth Fauna of Japan 21.
Trematodes of fishes IV. (Revised) Pub. by the Author, (Maruzen. Tok.) pp. 120-130.
-
- 1939.- Studies on the Helminth Fauna of Japan 26.
Trematodes of Fishes VI. Jap. Journ. Zool. 8, pp. 226-227, pl. 29.
-
- 1940.- Studies on the Helminth fauna of Japan, Trematodes of Fishes, vii. Japan. J. Zool., Tokyo, 9, No. 1, 77-79.

List of Illustrations

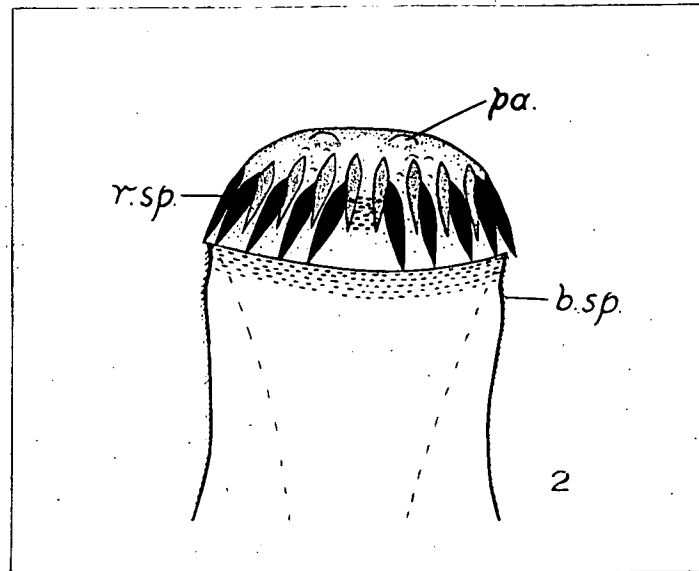
(For references see text)

1. Telorhynchus arripidis n.gen. n. sp. Whole animal from the ventral aspect.
2. T. arripidis Ventral view of the rhynchus of an extended specimen.
3. T. arripidis Diagram of female complex drawn from transverse sections.
4. T. arripidis Spermatophore projecting from genital pore.
5. T. arripidis Transverse section of the internal tapered portion of the rhynchus.
6. Coitocaecum parvum n.sp. Whole animal from the dorsal aspect.
7. C. parvum Female genital complex from the dorsal aspect.
8. C. parvum Terminal genital organs as seen in longitudinal sections.
9. Onecoelus tasmanicus n.sp. Whole animal from the ventral aspect.
10. O. tasmanicus Terminal genital organs.
11. O. tasmanicus Female complex drawn from transverse sections.
12. Snathomyzon insolens n.gen. n.sp. Whole animal from the ventral aspect.
13. G. insolens Female complex from the posterior aspect.
14. Helicometra neosebastodis n.sp. Whole animal from the ventral aspect.
15. H. neosebastodis Portion of sagittal section showing cirrus-sac and male duct.
16. H. neosebastodis Female complex drawn from transverse sections. (Shell gland omitted for clarity.)
17. Helicometra bassensis Woolcock. Whole animal from the dorsal aspect.
18. Helicometra fasciata (Rud.) Whole animal from ventral aspect.
19. Derogenes crassus Manter Whole animal from the ventral aspect.
20. a and b. Positions of the sex glands in two other individuals.
21. Hemiperina manteri n.sp. Whole animal from the dorsal aspect.
22. H. manteri The junction of the genital ducts within the sinus sac. Transverse section from the anterior aspect.
23. Sterrhurus macrorchis n.sp. Whole animal from the ventral aspect.
24. S. macrorchis Transverse section passing through the testes.
25. S. macrorchis Diagram of terminal genital organs drawn from longitudinal sections.
26. S. macrorchis Photomicrograph of a portion of the ejaculatory vesicle showing the 'collar' (the 'cirrus' of Park).
27. S. macrorchis Female complex drawn from transverse sections.

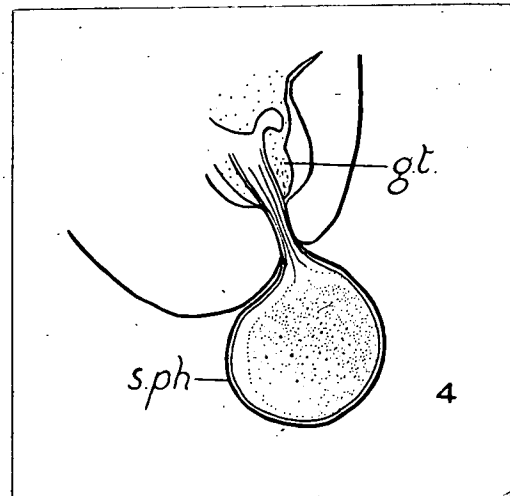
28. Sterrhurus magnatestis Park Terminal genital organs, after Park.
29. Sterrhurus musigarei Yamaguti Terminal genital organs after Yamaguti
30. Sterrhurus branchialis Stunk. and Nig. Terminal genital organs, after
Stunkard and Nigrelli.
31. Lecithochirium fusiforme Luhe (Sterrhurus fusiforme) Terminal genital
organs, after Jones.
32. Lecithochirium floridense n.comb. (Sterrhurus floridense Manter) Terminal
genital organs, after Manter.
33. Lecithochirium microstomum Chandler Terminal genital organs, after Chandler
34. Parahemiurus lovetiae n.sp. Whole animal from the dorsal aspect.
35. P. lovetiae The vitellaria of two further individuals.
36. Parahemiurus australis Woolcock. Whole animal from the dorsal aspect.
37. Bivesicula australis n.sp. Whole animal from the ventral aspect.
38. B. australis Whole animal (oral sucker withdrawn) from the dorsal aspect.
39. B. australis (a) Eggs with polar process.
(b) Normal eggs.



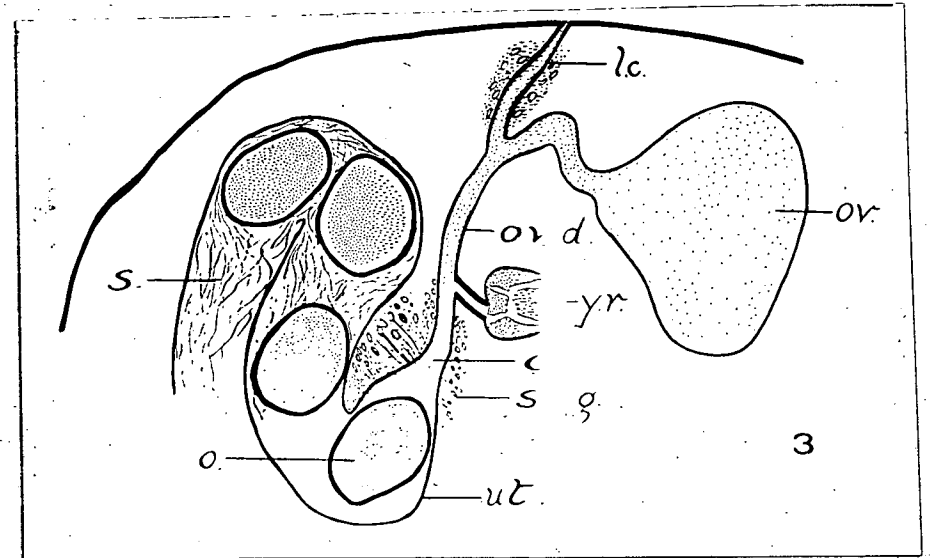
1



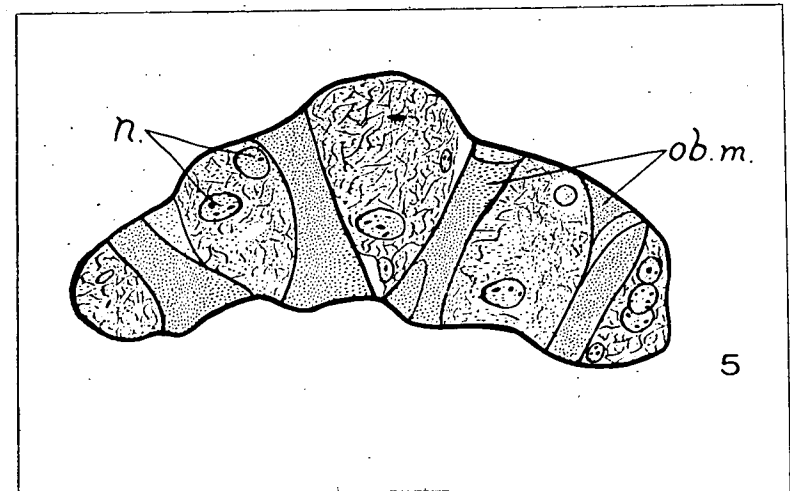
2



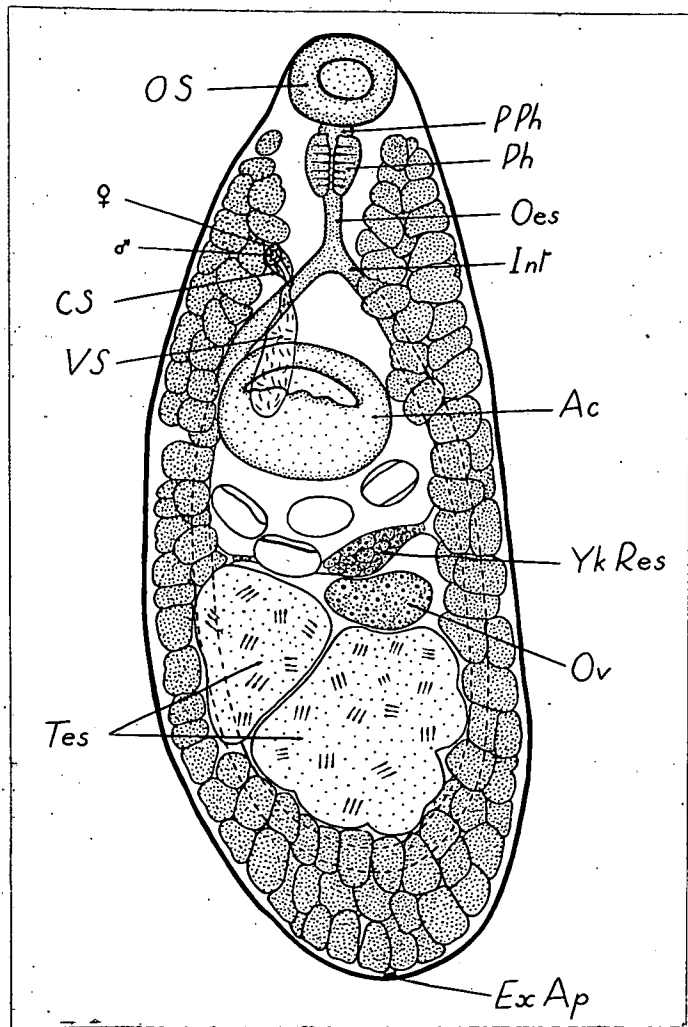
4



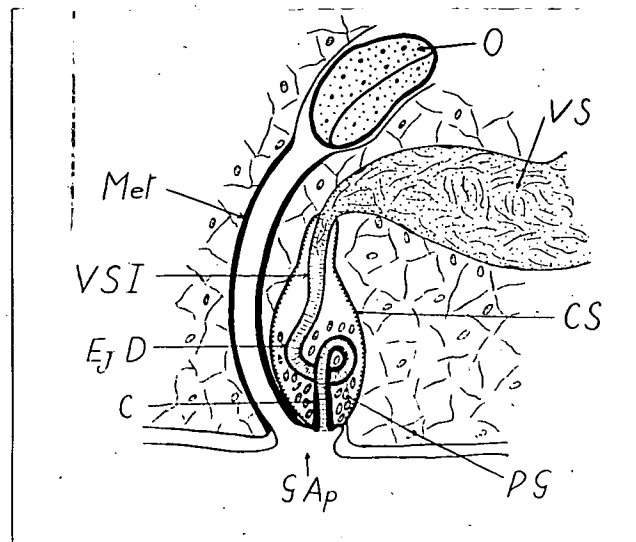
3



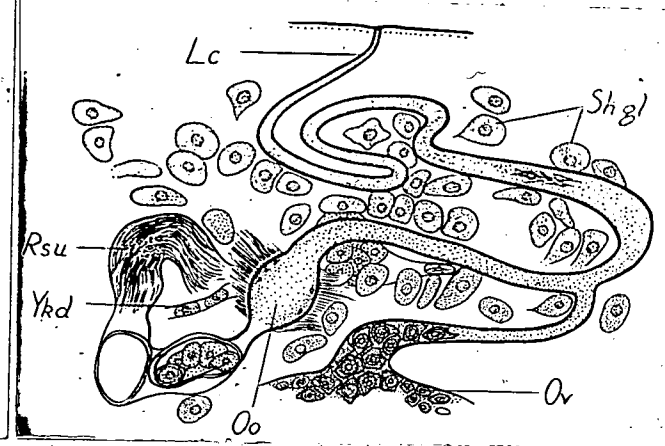
5



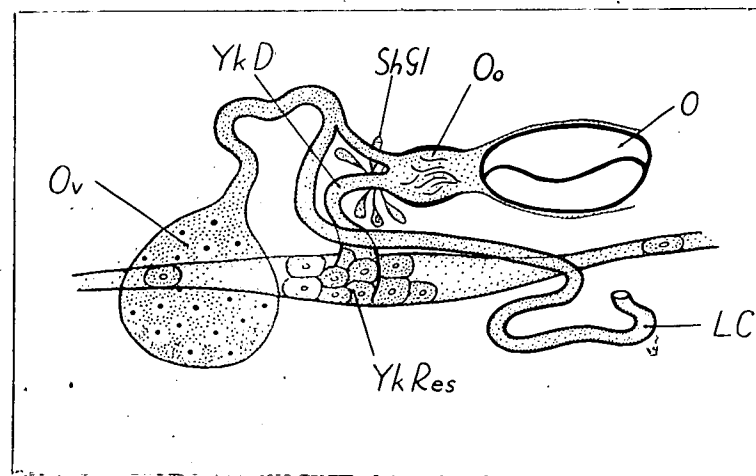
6



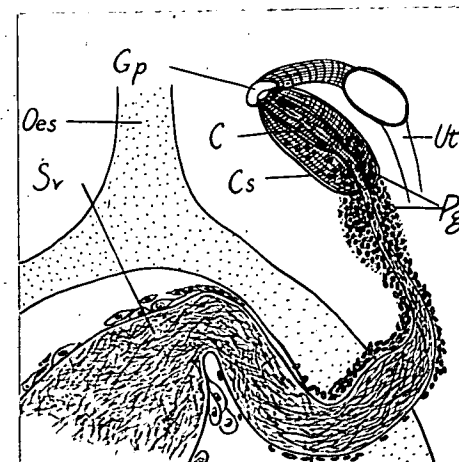
8



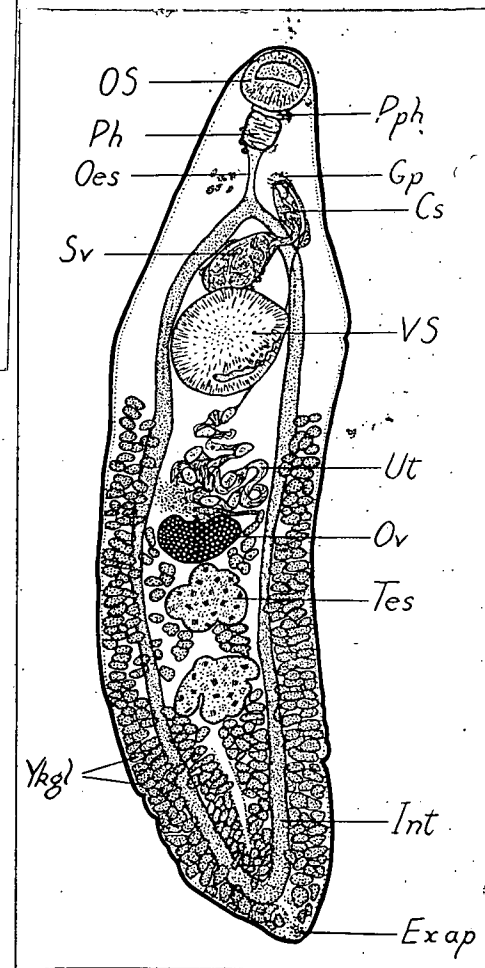
11



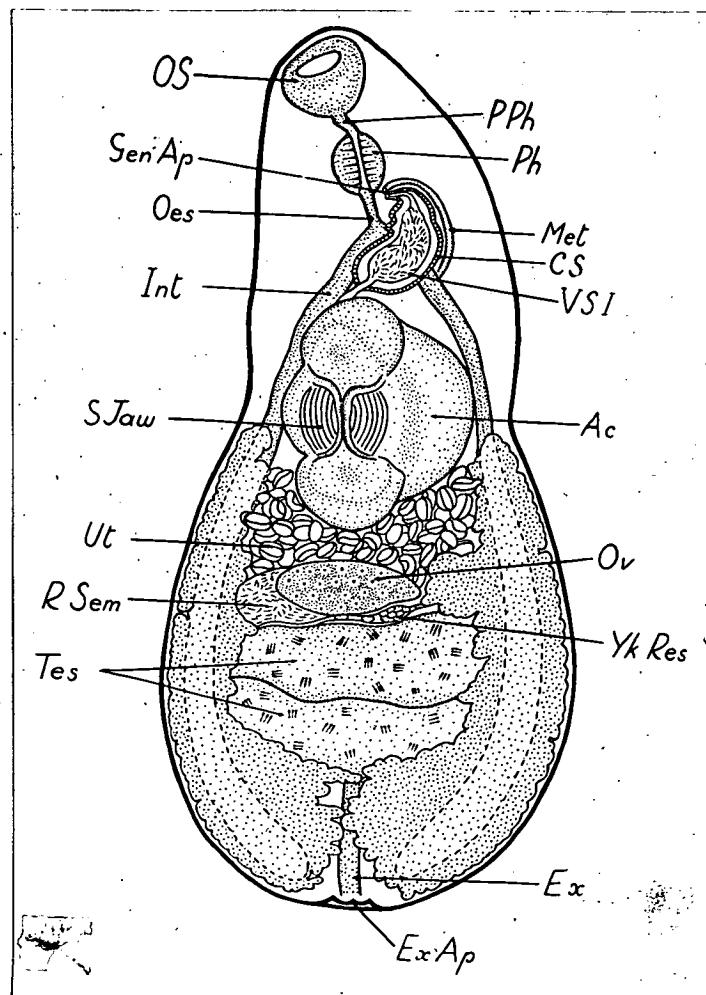
7



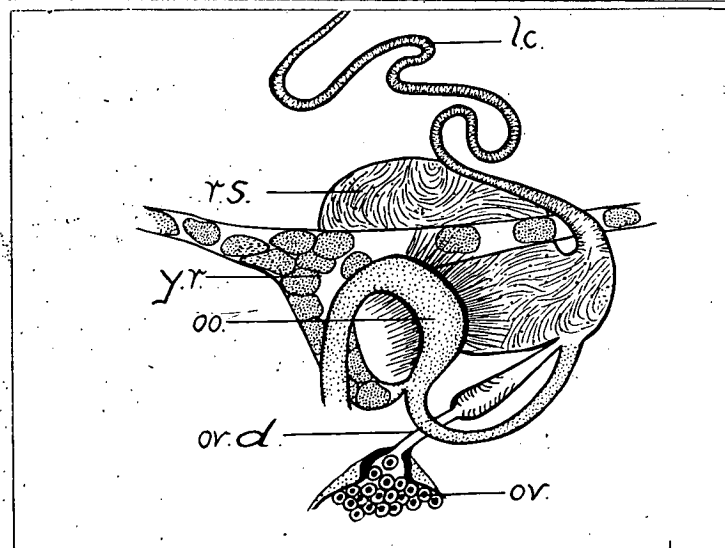
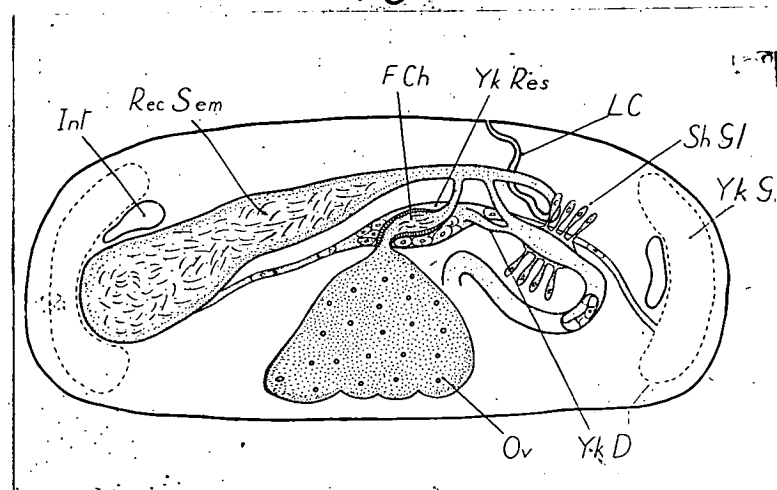
10



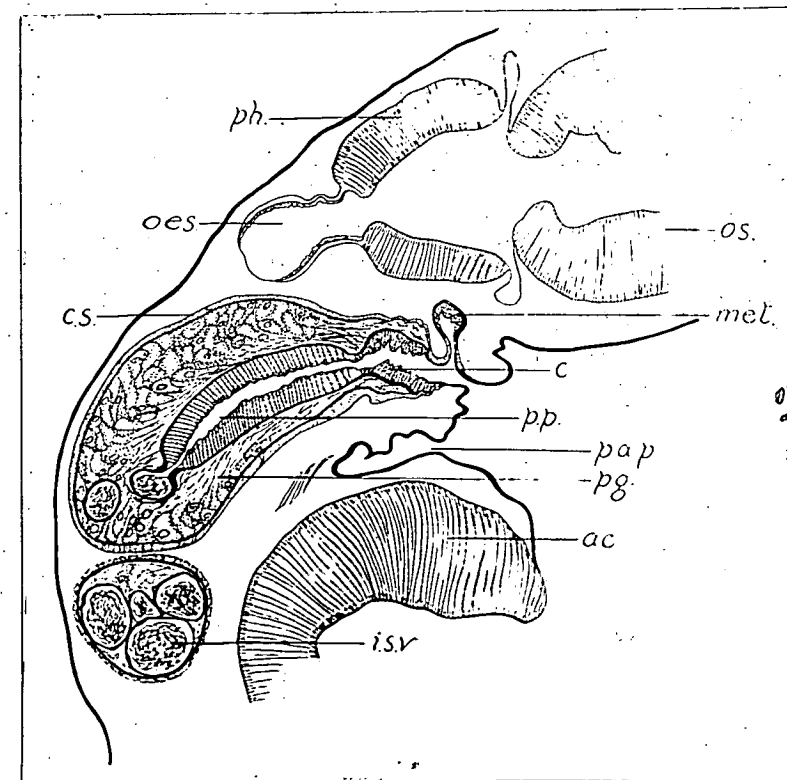
9



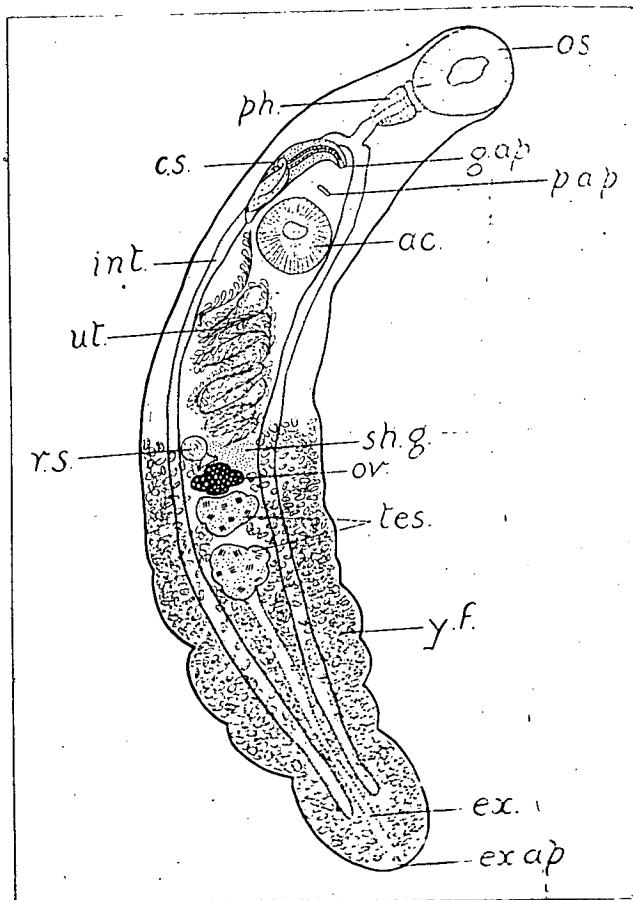
12



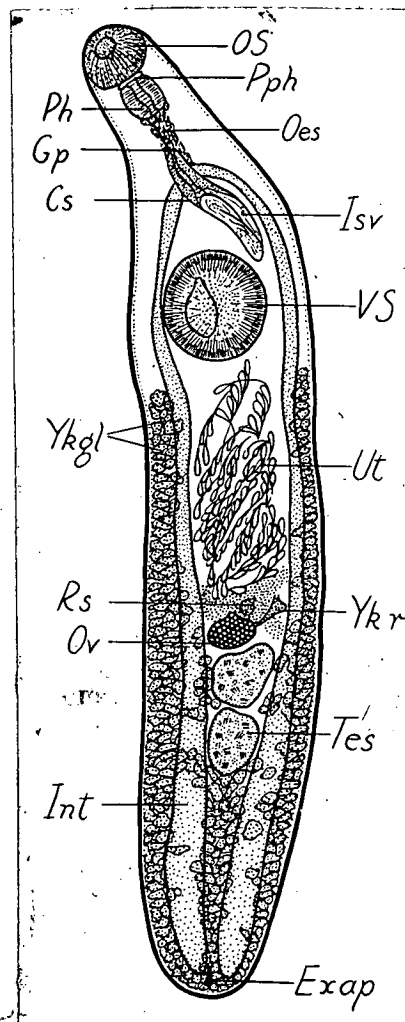
16



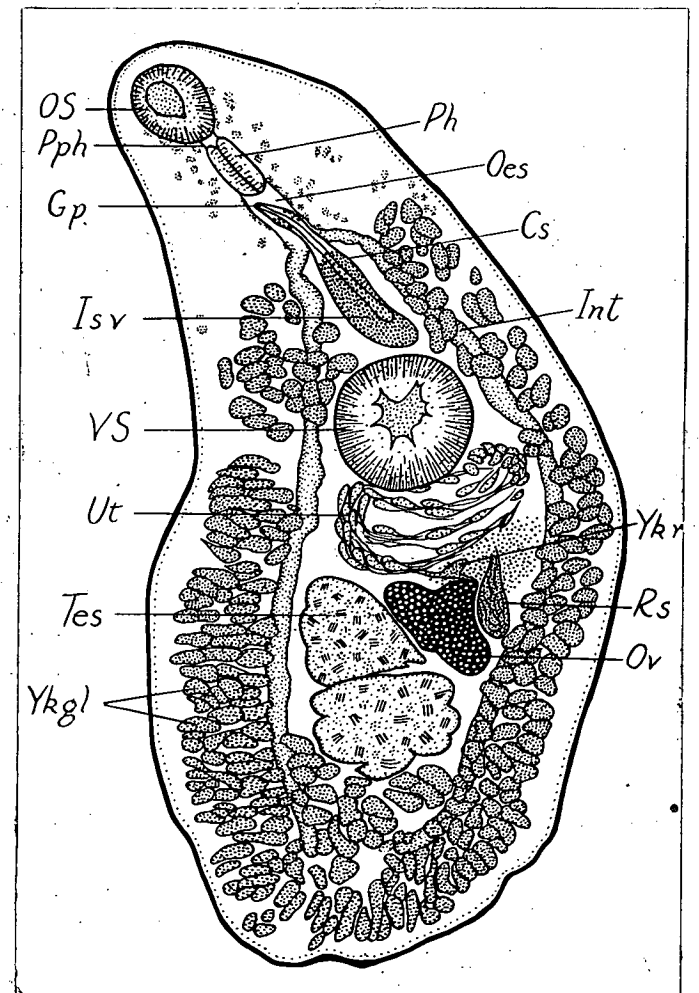
15



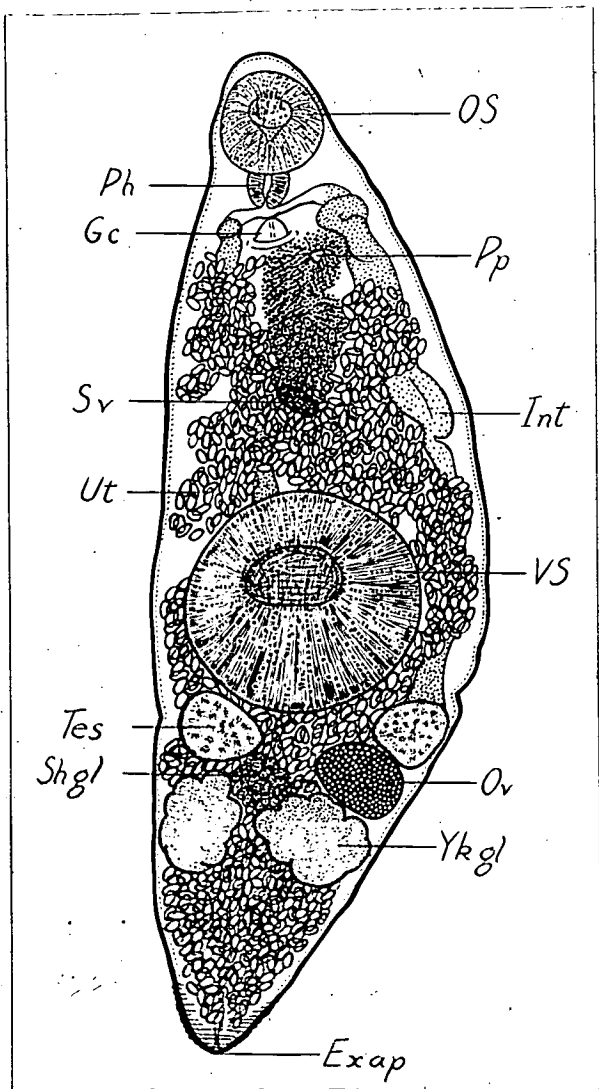
14



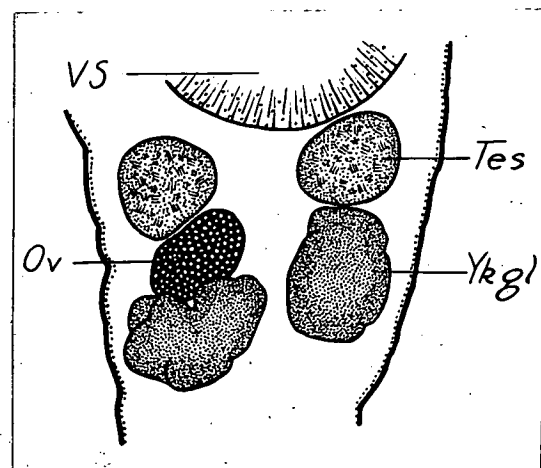
17



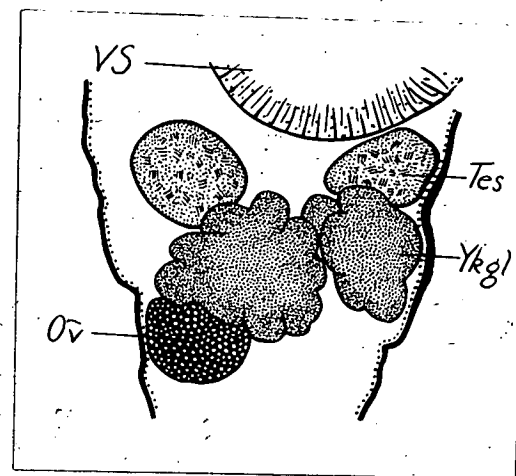
18



19

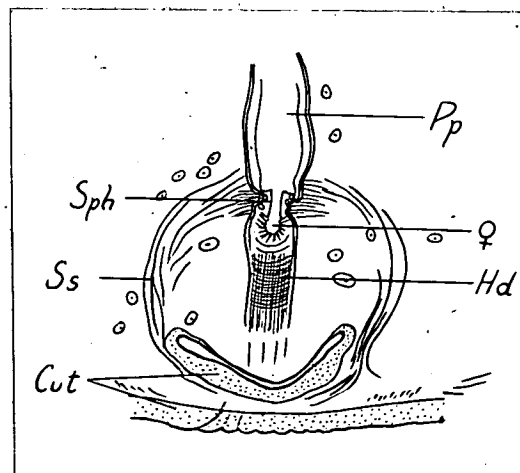


a

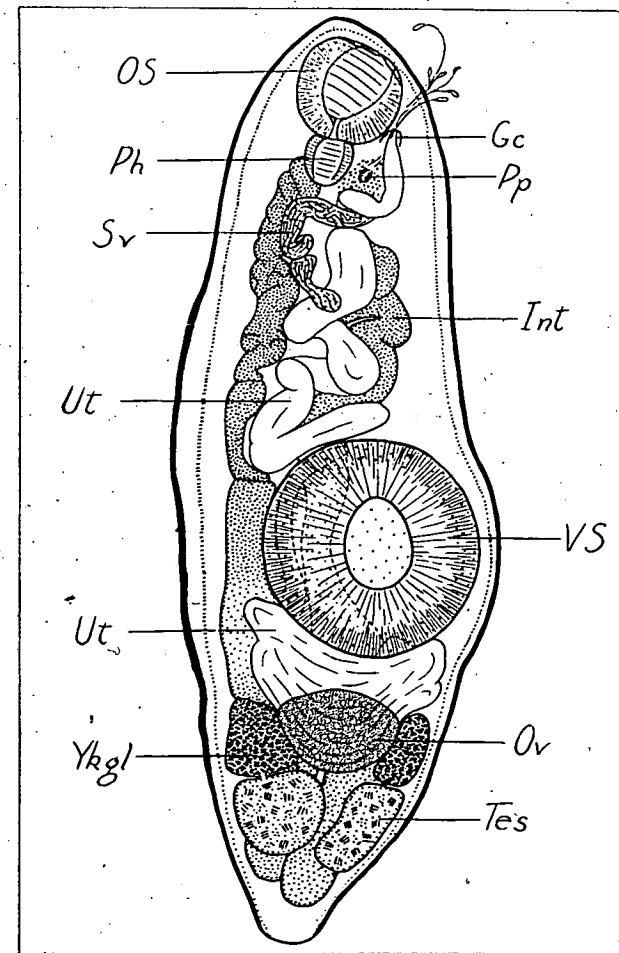


b

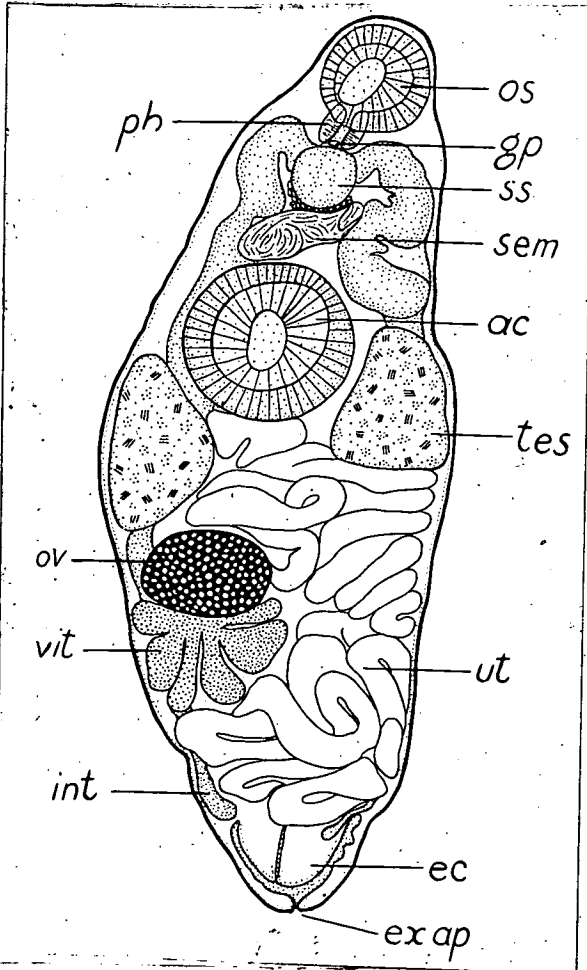
20



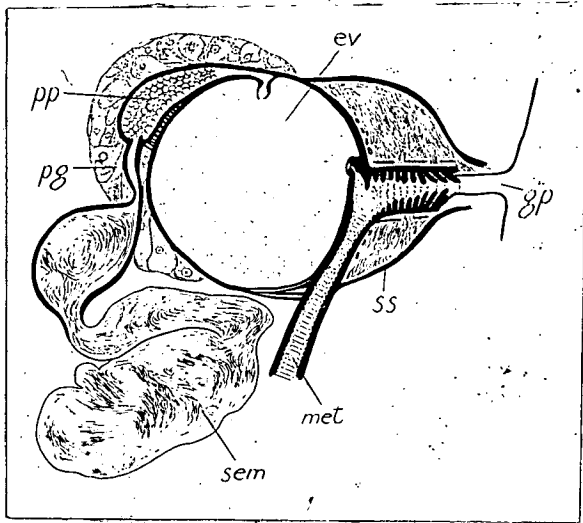
22



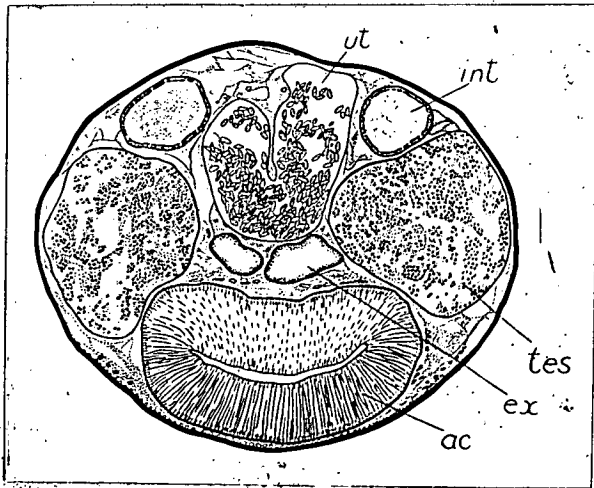
21



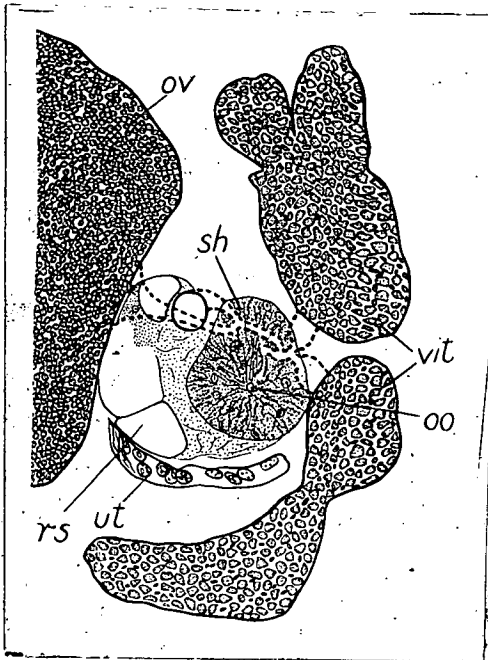
23



25



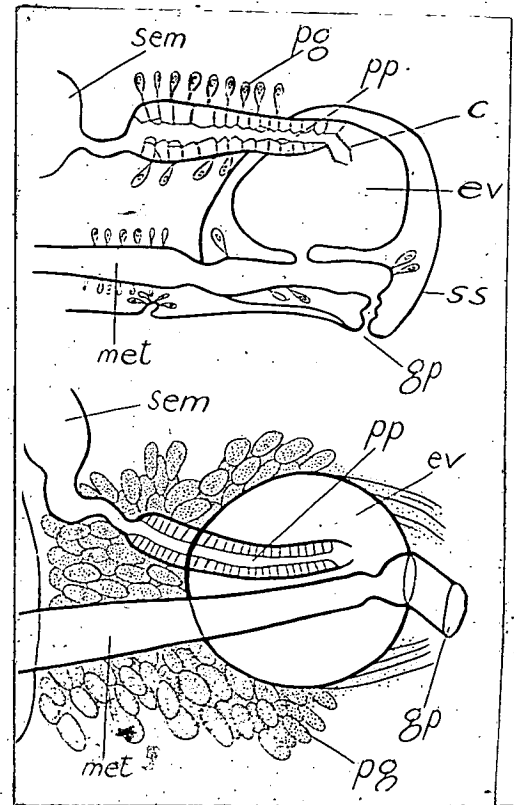
24



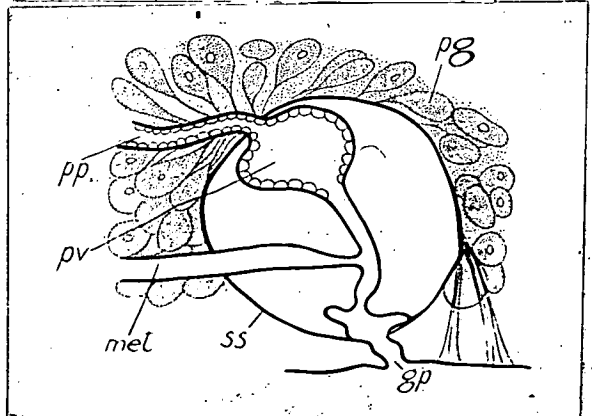
27



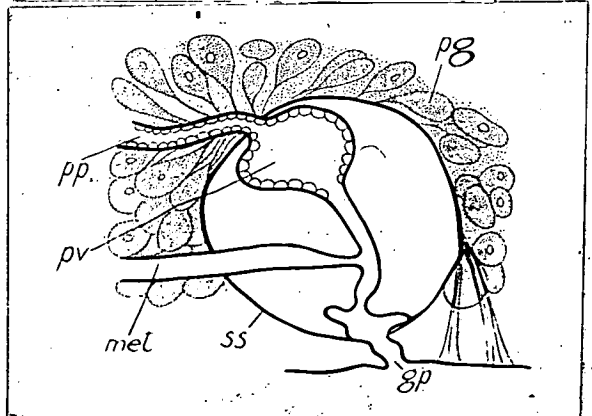
26



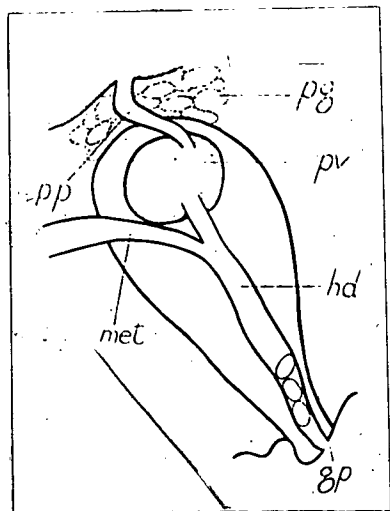
28



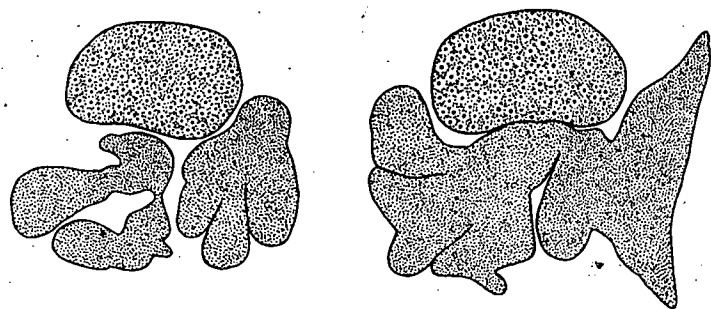
29



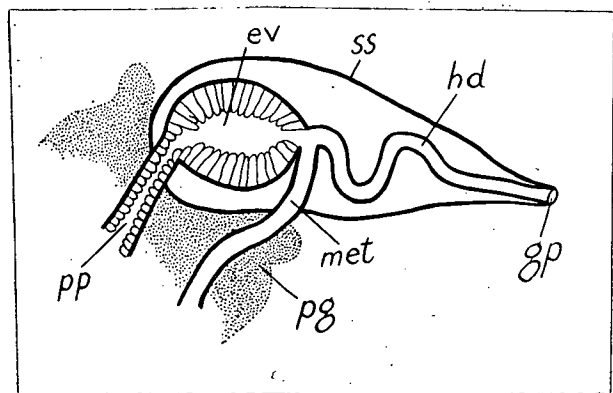
31



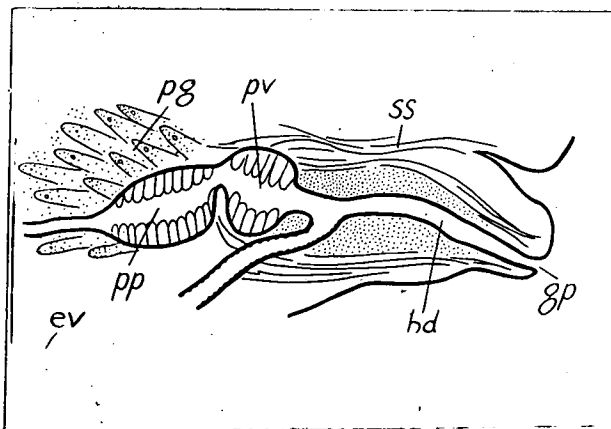
30



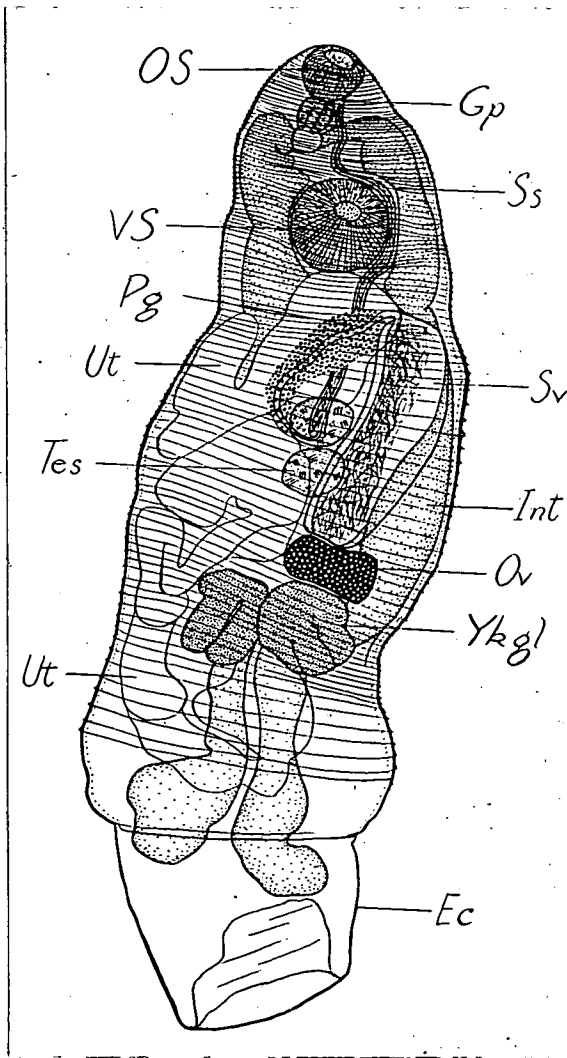
35



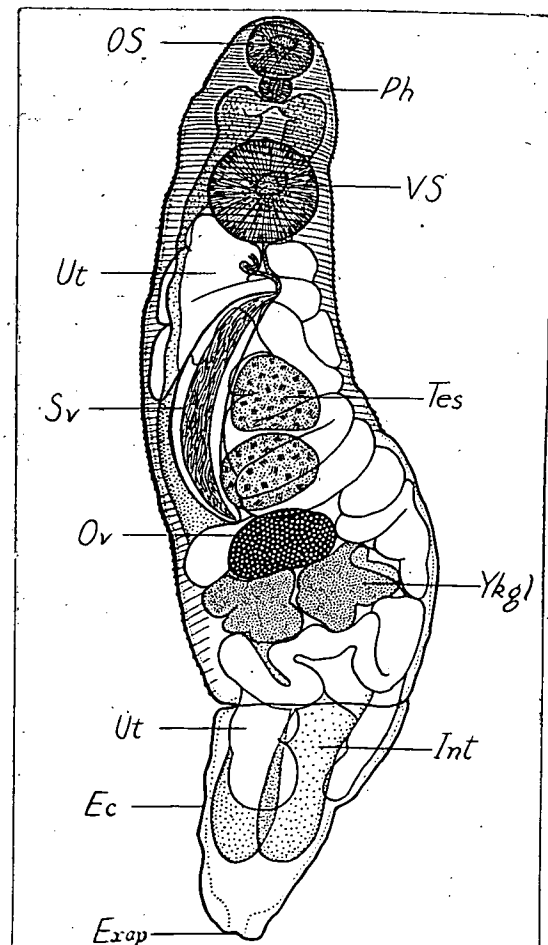
32



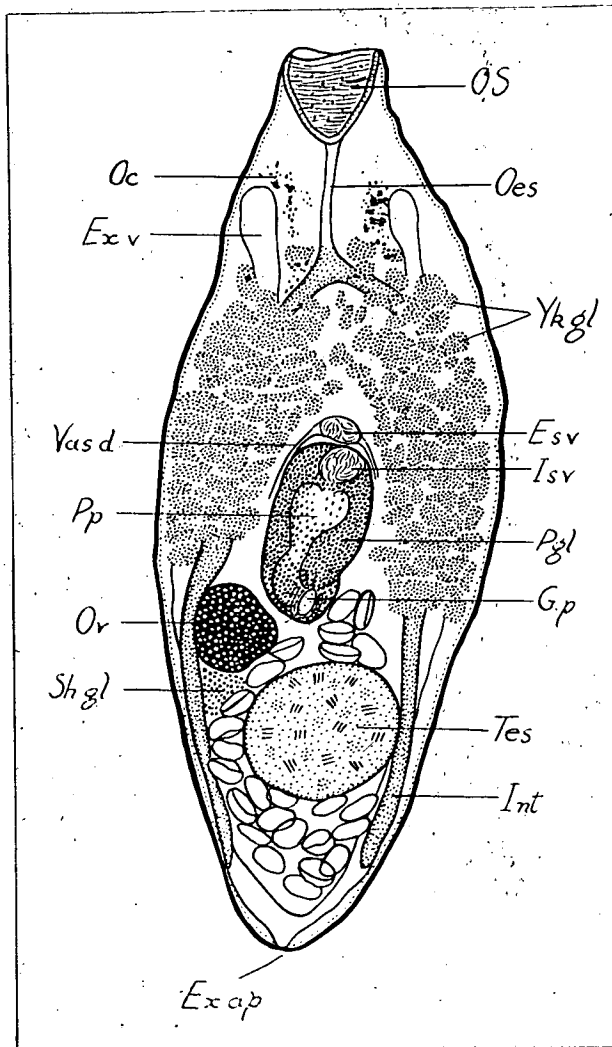
33



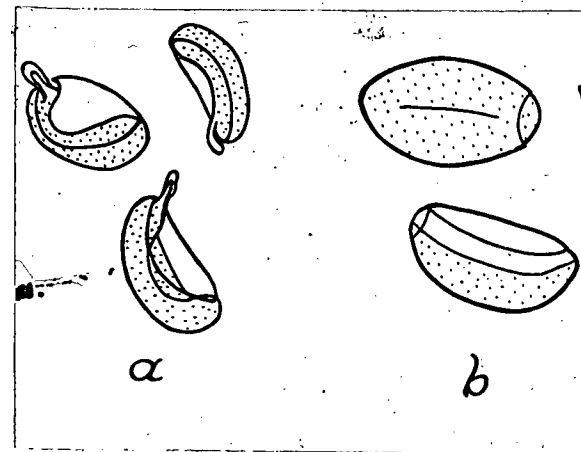
34



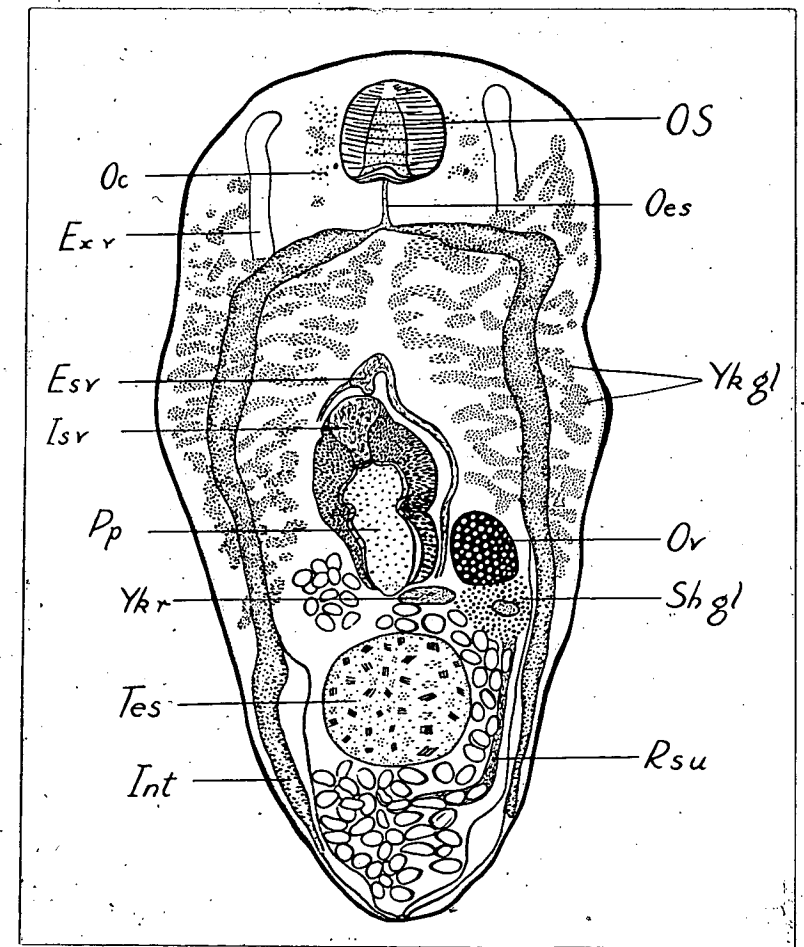
36



37



39



38

A P P E N D I X .

NOTE ON ANTHOBOTHRIMUM HICKMANI, A NEW CESTODE FROM THE
TASMANIAN ELECTRIC RAY (NARCINE TASMANIENSIS RICHARDSON)

The presence of a Tetraphyllid cestode in the spiral valve of Narcine tasmaniensis was pointed out to me by Professor V.V. Hickman, who kindly made available a mount of a scolex and a number of proglottides collected by him some years ago. In April 1945 two rays were examined for parasites. One contained one worm and the other two worms. The first specimen also yielded a single mobile free proglottid. No gravid proglottides were found. Three small specimens of the same ray examined in June 1945 appeared free from the cestode.

The tape worm proves to be a hitherto undescribed species of the genus Anthobothrium van Ben., 1850. There does not appear to be any previous record of a species of this genus in Australian waters.

External Features: Scolex. (Figs. 1 - 3)

The scolex bears four simple pedunculate bothridia, two of which are dorsal and two ventral in position. Each bothridium has the form of a shallow cup, the outer edge of which is formed into a single row of shallow loculi. The form and proportions of the scolex vary with its age and with the degree of contraction of the bothridia. A mature expanded scolex is reminiscent in form of a four-leafed clover. The loculi are more readily seen in the living condition than in mounted material. They may extend completely around the margin of the bothridium or may be lacking from the proximal margin. In the youngest scolex collected loculi are not in evidence (Fig. 3). At the apex of the scolex there is a blunt elevated myzorhynchus, which contains a well developed sucker. (In the young specimens whose bothridia do not possess well developed loculi,) this is quite similar

to a typical Trematode acetabulum, but the mature scolex possesses a less distinctive structure. This would seem to indicate that a degeneration of the sucker accompanies the expansion and development of the bothridia.

The Strobila: (Fig. 4)

The scolex is followed by a short neck region in which no strobilation is visible. The length of the neck varies with the age and degree of contraction. The proximal proglottides are extremely short (Fig. 2), but they become progressively more elongate until at the posterior end they measure 1.2 mm long and 0.5 mm wide. The longest worm collected comprised 105 distinguishable proglottides. The strobila is slightly flattened in transverse section and each proglottid is slightly constricted at the level of the genital pore, which is approximately $1/5$ of its length in front of the posterior end. The genital pores are marginal and alternate irregularly. The proglottides may become free before fertilisation.

Genital System, Male: There are approximately 60 testes arranged in two single or double rows, lying on either side of the mid-line in the anterior two thirds of the proglottid. They are somewhat compressed in the mounted specimens measuring approximately 0.06 mm in diameter. The vas deferens describes several coils before entering the base of the cirrus sac. Within the sac it expands immediately into an unarmed muscular cirrus which runs directly through the sac to the genital atrium. The cirrus is composed of outer longitudinal and inner circular fibres. The sac is ovoid and measures 0.1 mm long and 0.06 mm in diameter. In sections of apparently fully developed proglottides the wall of the sac is membranous and contains no distinct muscle fibres. The space within the sac not occupied by the cirrus is filled by the prostate gland. No distinct cells are visible the gland consisting of a matrix containing numerous small spherical nuclei. The genital atrium is a deep tubular depression

0.76 mm long and 0.36 mm in diameter which extends directly inwards from the genital pore to the outer end of the cirrus sac.

Female: (Fig. 5) The ovary is a U-shaped body which occupies the proglottid posterior to the genital pore. In transverse section the lateral arms of the U, which are directed forwards, are seen to be expanded dorsally and ventrally and constricted medially. Mid-way along their length the two lateral arms taper and come together into oviducts which fuse in the mid-line and pass into a fertilisation chamber. A transverse section through this region shows the dorsal and ventral lobes of the arms arranged in the form of an X. The female duct runs directly ventrally from the fertilisation chamber as a wide ciliated tube. It fuses with the vagina, loses its ciliated lining, and runs dorsally to the level of its origin. Here it fuses with the central yolk duct and enters the shell gland. This is a compact ovoid mass containing numerous small nuclei arranged radially about the ootype. Beyond the shell gland the female duct passes into the uterus, which runs forward between the two rows of testes as a wide tube, which extends almost to the anterior end of the proglottid. The vitellaria are very numerous small follicles closely packed into two lateral rows which extend from the anterior end of the proglottid to just in front of the genital pore. The yolk collecting ducts from each side unite into a transverse reservoir below the central female complex. The central yolk duct runs directly dorsally from the reservoir to join the female duct. The terminal portion of the vagina lies beside the cirrus sac. It describes a convoluted path backwards between the ovary lobes and descends to enter the oviduct. Throughout its length it is surrounded by very numerous nuclei.

As no gravid specimens were obtained the eggs are not described. The gravid proglottides in the mount supplied by Professor Hickman exhibit the usual shrinkage and distortion

of the eggs. These specimens exhibit break down of the organs of reproduction and expansion of the uterus into a large irregularly lobed sac occupying the whole of the proglottid in front of the genital pore.

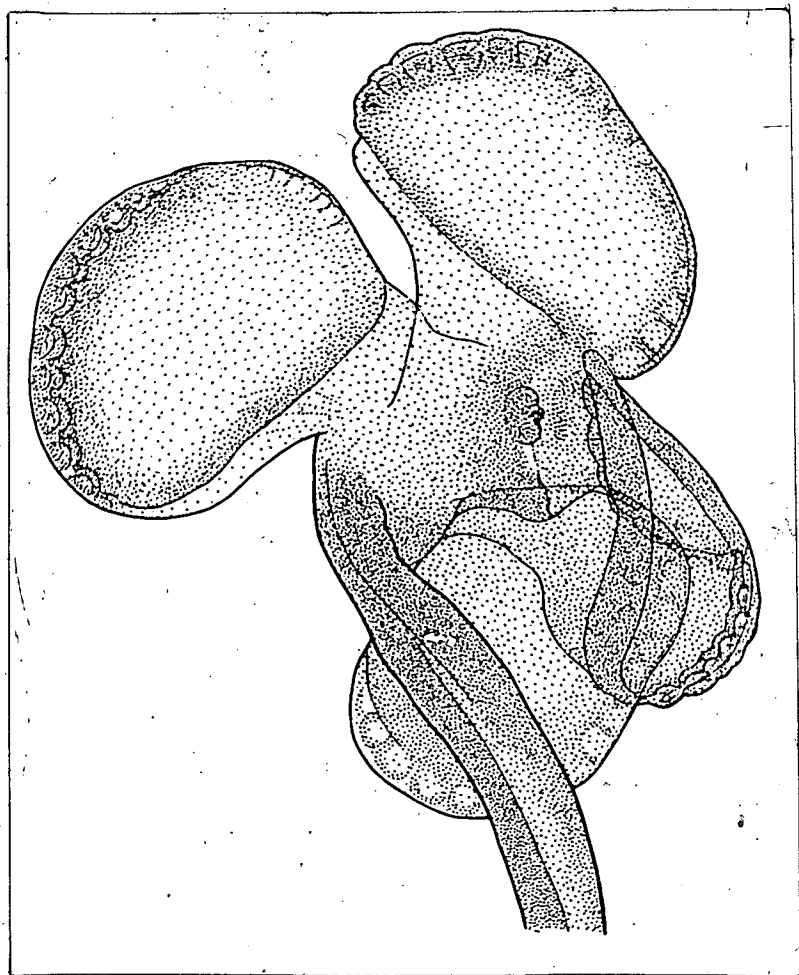
Affinities: Anthobothrium hickmani differs from most species of the genus in the relatively simple form of the scolex. It seems most related to Anthobothrium (Echeinobothrium) simplex Shipley and Hornell from which it differs in the possession of a distinct myzorhynchus.

References:-

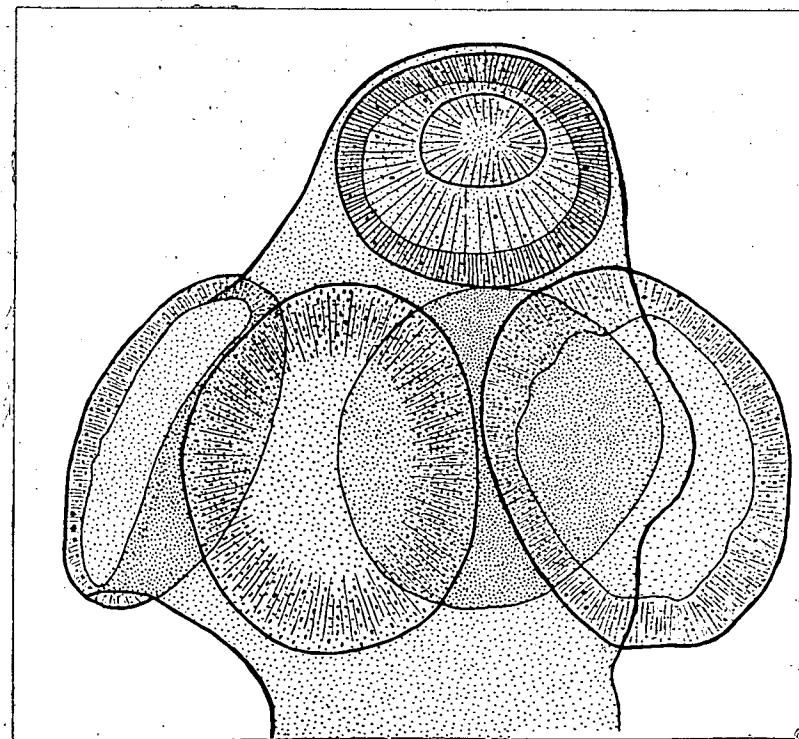
Southwell T. (1925) A monograph on the Tetraphylidea
Liverpool School Trop. Med. Mem. N.S. No.2. 1925.

Abbreviations used in Text figures:-

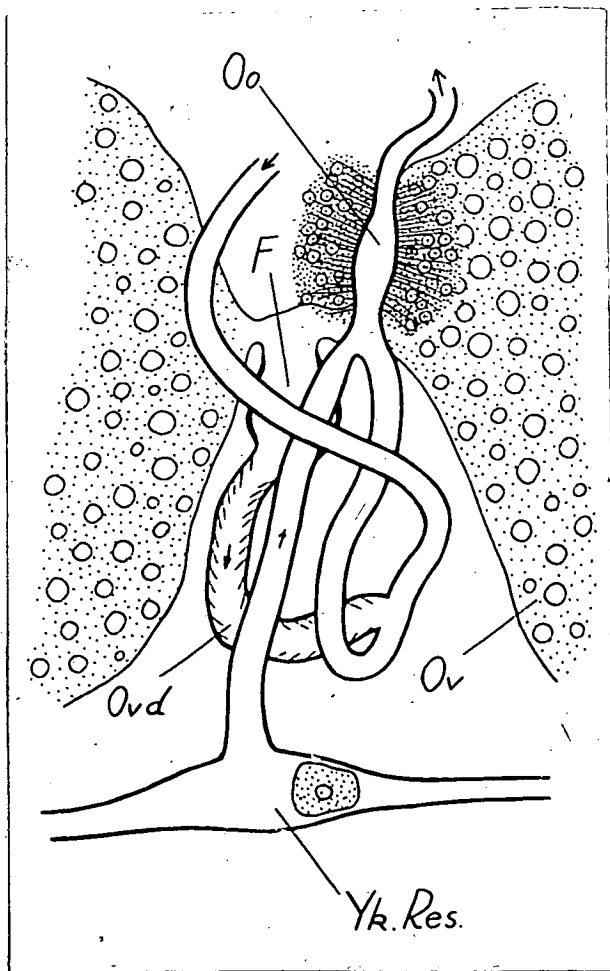
F, fertilisation chamber. Oo, ootype. Ov, ovary.
Ovd, oviduct. Shg, shell gland. Tes, testes. Ut, uterus.
Yk gl, yolk glands. Yk Res, yolk reservoir.



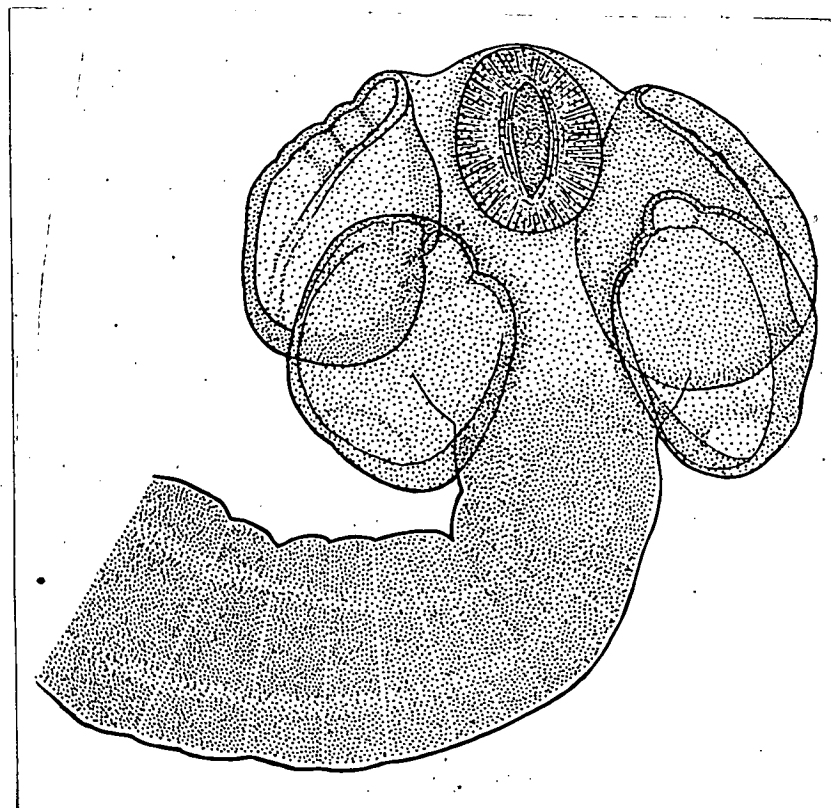
1



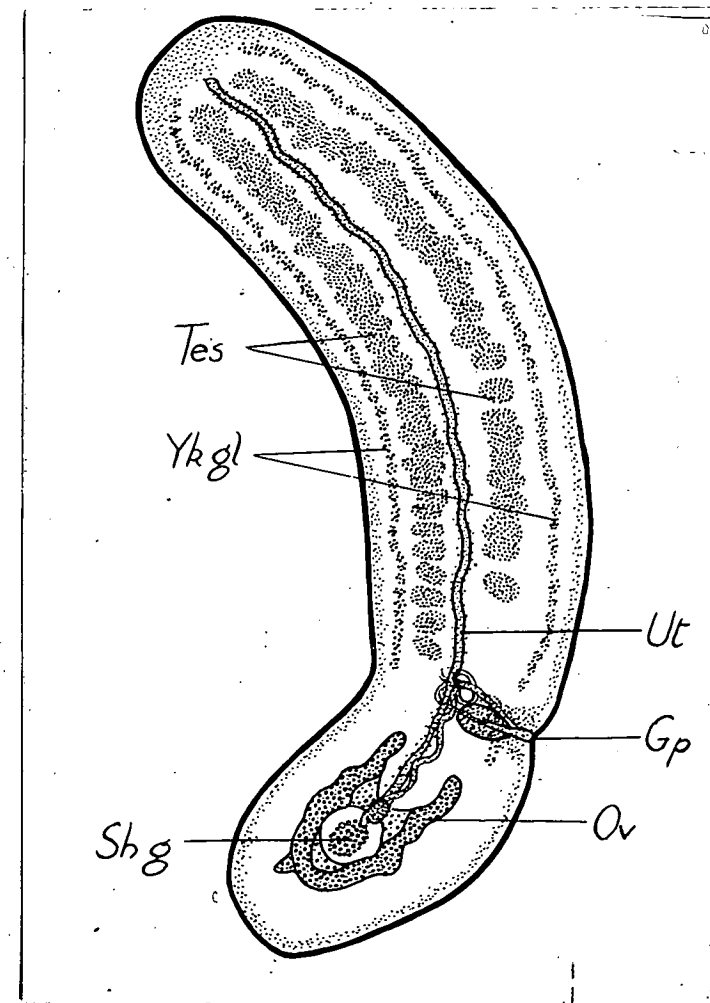
3



5



2



4