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v.11 1896-97: https://www.biodiversitylibrary.org/item/129322

Page(s): Title Page, Table of Contents, Page 4, Page 160, Page 161, Page 162, Page 163, Page 164, Page 165, Page 166, Page 167, Page 168, Page 169, Page 170, Page 171, Page 172, Page 173, Page 174, Page 175, Page 176, Page 177, Page 178, Text, Illustration, Text, Text, Illustration, Text, Text

PROCEEDINGS

AND

TRANSACTIONS

OF THE

LIVERPOOL BIOLOGICAL SOCIETY.

VOL. XI.

SESSION 1896-97.

LIVERPOOL:
PRINTED BY T. DOBB & CO., 229, BROWNLOW HILL.
—
1897.

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[WORK FROM THE PORT ERIN BIOLOGICAL STATION.]

ADDITIONAL NOTES on the TURBELLARIA of the L.M.B.C. DISTRICT.

By H. LYSTER JAMESON, B.A.

With Plates V. and VI.

[Read May 14th, 1897.]

IN this list, which is intended to supplement Mr. F. W. Gamble's Report (Trans. L'pool Biol. Soc., Vol. VII., 1893), I propose to record the Turbellaria which I found in the neighbourhood of Port Erin, during a couple of weeks I spent at the Laboratory of the Liverpool Marine Biology Committee in April, 1897.

During my stay at Port Erin I confined my attention to the marine species, the only fresh-water form that I am able to record being *Polycelis nigra*, a number of specimens of this Triclad having been found by Mr. A. R. Jackson, B.Sc., Science Student at University College, Liverpool, who kindly handed them over to me for identification.

Of the Marine species *Graffilla buccinicola* is new to science, seven Rhabdocoeles and one Polyclad are not recorded in Mr. Gamble's list; while two Polyclads and eighteen Rhabdocoeles, already recorded in his report, were also found by me.

I regret that the shortness of my stay at Port Erin allowed me but few opportunities of exploring new collecting grounds on the Manx coast; but Port Erin Bay and Port St. Mary supplied me with such a quantity of material, that I devoted all my time to these two places.

I must here express my gratitude to Mr. Gamble for his valuable advice as to the best localities for finding a

rich supply of material, and for many useful hints as to collecting and identifying my specimens.

As to the occurrence of the species: the commonest Rhabdocoele by far was *Macrorhynchus croceus; Monotus lineatus* and *M. fuscus* coming next in number of individuals. The two latter, taken together, hardly outnumbered the former, while to these three species belonged about half of the Turbellarians I examined. Of the remaining types the commonest were *Pseudorhynchus bifidus, Byrsophlebs intermedia, Promesostoma agile, Provortex balticus,* and *Macrorhynchus heligolandicus.*

My experience of the Parasitic Rhabdocoeles is limited to the new *Graffilla*, which occurred in numbers in the kidney of almost every *Buccinum undatum* and *Fusus antiquus* that I examined. The "Cocoons" of *Fecampia erythrocephala* were not uncommon between tide-marks, but I searched in vain for the worm itself.

TURBELLARIA.

I. TRICLADIDA.

Polycelis nigra, O. F. Müller.

New to Isle of Man fauna.

Nine examples of this very common species were found by Mr. A. R. Jackson in a small stream near Port Erin. They measured from 6 to 14 mm. in length and were of a particularly deep black, showing none of the variations so common in this species, which is frequently coloured brown or grey, and presents all gradations from these colours to black.

II. RHABDOCOELIDA.

A. Acoela.

Aphanostoma diversicolor, Oersted.

Two examples, among seaweeds collected at low tide near Port Erin Breakwater.

Three specimens of an acoelous type, probably an *Aphanostoma*, in which no trace of gonads or genitalia was visible were taken by tow-netting in Port Erin Bay.

Convoluta paradoxa, Oersted.

One example only was found, in some seaweeds gathered at low-water opposite the Biological Station. This individual measured 2 mm. in length, and presented no trace of the transverse bars which sometimes occur.

B. Rhabdocoela.

Family Mesostomidæ.

Promesostoma marmoratum (Schultze).

Two specimens taken in tidal pools near the biological station had the usual dark reticular pigment between the eyes. Five others found among seaweeds between tide-marks near the Breakwater were without reticular pigment, but provided with copious yellowish-red colouring matter in the epidermis, resembling the variety that v. Graff records from Naples (Monographie, p. 270).

Promesostoma solea (O. Schmidt).

Although Gamble does not record this species in his paper (4), he gives Port Erin as a locality in the list of British species which he has appended to his article on the Turbellaria in the Cambridge Natural History (vol. ii., p. 49). I procured two specimens at low water, among seaweeds, in front of the biological station.

This species can at once be distinguished from *P. ovoideum* (O. Schm.), by the presence of a curious process of the pigment-cup, which extends outwards over the lens of the eye.

My two specimens differed considerably in the density of their body pigment, in one it was as dense as in v.

Graff's figure of *P. ovoideum* (Monogr. Tab. vii., fig. 11), but not extending right to the anterior and posterior ends of the body, and thinning off between the eyes; in the other specimen it was altogether more diffuse. Length of both specimens ·6 mm.

Promesostoma agile (Levinsen).

New to L.M.B.C. District.

I obtained seventeen specimens of this worm among seaweeds collected at low tide on Port Erin Breakwater. They varied from ·35 to ·6 mm. in length. Colour, light red. The penis was in most of my specimens more strongly curved at the apex than it is in Gamble's figure (3, pl. xl., fig. 14), in some few it is even more so than in Levinsen's sketch (10, Tab. iii., fig. 5), but it is evident that this feature is one that varies.

I have in vain tried to make out the relations of the "receptaculum" in this species, the organ is visible behind the atrium in all specimens, and has a club-shaped appearance, but I can find no connexion between this structure and the other genitalia, nor am I quite clear as to the normal position of the genital atrium itself. These points can only be cleared up by the study of sections.

Very typical of this species are several very large granular salivary (?) glands, with ducts which converge just behind the pharynx, they do not seem to have been observed before.

Byrsophlebs intermedia, v. Graff.

Common on *Cladophora* collected in tide-pools near the biological station.

Proxenetes flabellifer, Jensen.

One specimen among *Cladophora*, in a rock-pool near the station.

Mesostoma neapolitanum, v. Graff (Pl. V., fig. 1).

New to L.M.B.C. District.

Under this name I introduce a single specimen, found among seaweeds collected between tide-marks at Port St. Mary, which conforms in all essential details with the descriptions of v. Graff and Gamble.

Length ·6 mm., white, gut slightly discoloured by yellowish food-stuff. Pharynx central (not in front of centre as described by v. Graff and Gamble, but this difference is perhaps due to unequal contraction in my specimen). Rhabdites very densely distributed in anterior end, forming two very well marked lines between the eyes. The eyes are small and reniform, provided with lenses, body pointed in front, rounded behind, genital pore close to posterior end of body. Testes lateral, elongated; seminal vesicle kidney shaped, the penis being attached to the concave side (fig. 1). Penis consists of a proximal muscular portion and a distal chitinous tube which is slightly more curved than in v. Graff's figure. The atrium is extremely large and conspicuous, copiously supplied with glands.

The female reproductive organs were not developed in my specimen. It is strange that in all the recorded occurrences (as far as I am aware) of this species, viz., von Graff's (Monographie, p. 310), Gamble (3), p. 26, and the present note, only single specimens have been found. I have preserved this specimen as a microscopic preparation, by Dr. M. Braun's method. ("Die Rhabdocoeliden Turbellarien Livlands"; Archiv. f. d. Naturkunde Livlands, &c., Bd. X., 1885.)

Family PROBOSCIDÆ.

Pseudorhynchus bifidus (M'Intosh).

Common between tide-marks at Port Erin and Port St. Mary. Some of those found on the Breakwater measured as much as 2·2 mm. in length, although v. Graff gives

1·7 mm. and Gamble 1—1·3 mm. as usual size. The number of turns in the spiral on the chitinous penis varied between six and seventeen. The spiral was right-handed in all the examples that I examined. The bursa, which has a delicate chitinous lining, was very obvious in some of the specimens I examined; it has been accurately figured by Jensen (7, Tab. iv., fig. 12).

When disturbed this worm retreats rapidly backwards in a very characteristic manner, attaching itself by its adhesive tail and drawing the body up, the movement being repeated in a leech-like manner.

Acrorhynchus caledonicus (Claparède).

Port Erin Breakwater, two specimens; Port St. Mary, between tide-marks, three specimens.

Macrorhynchus nägelii (Kölliker).

Among seaweeds at low-water opposite the biological station, six examples.

Macrorhynchus croceus (Fabricius).

New to L.M.B.C. District.

This species was the commonest Turbellarian during my stay at Port Erin; numerous specimens, from fully grown individuals with a ripe egg capsule in uterus, to young ones in which the gonads were only appearing, being found in every piece of seaweed examined, both from Port Erin and from Port St. Mary. I have been unable, although I had exceptional opportunities, to make out from pressure preparations the relations of the female gonads to the atrium, but I hope to be able to throw some light upon this question by the examination of sections of some specimens which I preserved for this purpose.

Macrorhynchus heligolandicus, Metschnikoff.

Occurred at Port St. Mary and at Port Erin among seaweeds, and in tide-pools.

Family VORTICIDÆ.

Provortex balticus (Schultze).

Common in tide-pools at Port Erin. A large proportion of those examined had ripe eggs in their uteri. A variety without the usual brown pigment was found along with normally coloured individuals among Cladophora.

Provortex affinis (Jensen).

New to L.M.B.C. District.

One example, among *Cladophora* in a tide-pool near the station. This species is easily distinguishable from *P. balticus* by the form of its penis, the distal part of the chitinous tube bending at an angle to the proximal part and bearing a leaf-like triangular plate.

Fecampia erythrocephala, Giard.

Gamble gives Port Erin as a locality for this parasitic form in the Cambridge Natural History, vol. ii., p. 50, although at the time of his publishing his paper in these "Transactions" he had not met with it.

I found numerous "cocoons" of this species under stones between tide-marks, but I failed to find the worm itself in any of the *Carcini* that I examined.

Graffilla buccinicola, n. sp. (Pl. V., figs. 3 to 6; Pl. VI., figs. 7 to 13).

The above name I propose to give to a parasite from the kidney of *Buccinum undatum* and *Fusus antiquus*, which I found infesting these two molluscs in considerable numbers. The genus *Graffilla*, von Jhering (8), was established to receive a species found in the kidney of *Murex*, which v. Jhering called *Graffilla muricicola*. To the same genus a parasite discovered by Lang (9) was referred by v. Graff (Monographie, p. 375) who called it *G. tethydicola*. V. Graff also refers the *Anoplodium mytili* of Levinsen (10) to this genus. Finally a fourth species was described by Dr. Ferdinand Schmidt (Archiv. fur

Naturgesch. v. lii., pt. 1, p. 305, 1886), from the liver of *Teredo*, under the name of *Graffilla braunii*. A valuable account of the anatomy of the first two species is given by Böhmig; (2). The genus *Graffilla* has not hitherto been found in British waters.

DESCRIPTION:—Length 1—2·5 mm. Breadth ·5—1 mm. Colour greyish yellow to reddish yellow, very opaque, in favourable pressure preparations groups of olive brown pigment granules (fig. 5) are visible evenly distributed over the body. Sections prove that they are situated in the parenchyma. Form, cylindrical in section; outline of body varies according to condition of genital glands; in small, 1—1·8 mm. long individuals, in which male organs alone are visible, it is elongate with the greatest breadth behind middle of body, and posterior third tapered off into a tail; in larger specimens with ovaries and yolk glands highly developed the general outline is stouter, and the "tail" usually cannot be recognised (fig. 6).

Mouth on ventral aspect of anterior end of body, being in fact an excellent example of a terminal mouth. It leads into a pharyngeal sack, quite obvious in all sections of well preserved specimens, in which lies the small doliiform (v. Graff) pharynx, which can be protruded by the living animal to a certain extent. The pharynx measures $\frac{1}{12}$—$\frac{1}{15}$ of total length of body.

Nothing comparable to the "Haftapparat" of Böhmig is present in this species. The interior of the pharyngeal sack is not ciliated. Eyes, two; small, reniform, provided each with three or four small lens cells, they are completely buried in the substance of the brain as will be seen in fig. 7. The body is uniformly ciliated, the cilia are short and comparatively thick, the cuticular layer of the epidermis is also thicker than is usual among the Turbellaria. Around the mouth I observed a few cilia longer than

the others and non-motile, they are presumably tactile. No rhabdites were to be observed in the skin although in living specimens pressed on the slide a considerable amount of viscid mucous matter was extruded from the epidermis. I have found no trace of the epidermal glands so characteristic of *Graffilla tethydicola*.

There is an outer circular and an inner longitudinal muscle layer. The pharynx passes off into a well marked œsophagus (fig. 8). The œsophagus soon widens out into the very extensive gut, which has histologically the characters described by Böhmig. The extent of the lumen of gut depends upon the amount of food recently absorbed by the cells, and may be said to vary inversely as the amount of granules and vacuoles in the gut cells themselves. The gut occupies the whole volume of the animal's body posteriorly to the germ glands or testes, excepting the small space left between it and the body wall, in which the great yolk glands ramify.

The genital opening is a very short distance behind the mouth, approximately on a level with the posterior opening of the pharynx, so that in a section it is possible to get the eyes, the genital opening and the posterior end of the pharynx in the same plane, as was actually the case in the specimen from which fig. 7 is copied. The whole relations of the genital organs are so exceedingly variable according to the age of the particular specimen examined that they will require separate descriptions, just as if the worm was of separate sexes.

This *Graffilla* presents one of the most extreme cases of successive hermaphroditism with which I am acquainted among the Turbellaria, specimens which present traces of both male and female organs being very unusual. In specimens measuring 1—1·8 mm. the male organs are generally predominant, the most conspicuous organ is the

large seminal vesicle about twice as long as the pharynx, and lying just posterior to it. It completely conceals the atrium in pressure preparations, but the relations of the various parts have been drawn from a section in fig. 8. Here we see the penis projecting into the atrium; and the diverticulum which will afterwards form the seminal receptaculum lying ventral and posterior to the seminal vesicle. The testes are lateral, they extend forward to the level of the seminal vesicle, with which they communicate by short ducts opening into the posterior end of the vesicle. Posteriorly they do not quite reach back to the middle of the body (fig. 3).

The penis is very difficult to observe, but my examinations of pressure preparations which I have been able to confirm by sections shew it to be a short thick tube, strengthened by several cuticular rings and capable of being retracted so as to appear as a rosette shaped organ on anterior end of seminal vesicle (fig. 10), or of being protruded as shown in figs. 11 and 13. The distal rings appear to be provided with fine serrations. I have not been able to make out the mechanism by which the penis is thus protruded.

In large individuals, in which the female organs are fully developed the testes and seminal vesicle together with the penis have atrophied and cannot be found either in pressure preparations or in sections. In one or two lucky pressure preparations I had the good fortune to find the seminal vesicle persistent, and the testes still visible; in these specimens the germ glands were not mature, and the yolk glands were much less extensive than in the majority of cases.

In the typical "female" condition the receptaculum seminis is large, spherical, and lies dorsal and posterior to the atrium (figs. 4 and 12) which is provided with uni-

cellular shell (?) glands. The germ glands lie entirely in the anterior third of the body, their proximal ends converging forward to open into the posterior part of the atrium in company with the yolk glands. Their distal halves are bent at an acute angle to the proximal halves, the apex pointing forwards and upwards, so that in a pressure preparation the glands present the appearance of two V's, one on either side of the body, occupying much the position that the testes formerly did.

In minute structure they conform to the type which is so distinctive of *Graffilla*, the individual ova being somewhat flattened and suggesting rouleaux of coins. The ducts of the yolk glands lie internally (mesiad) to the germaria and open into the posterior wall of the atrium. A short distance behind the atrium they branch, and by complex branching and anastomosing form a more or less complete sheath around the gut extending from the brain to the tail (fig. 4). Underneath the epidermis is the same extraordinary system of supposed excretory tubes that has been observed in other species of the same genus. They ramify and anastomose all over the dorsal surface in a most complex manner; and, as in the other members of this genus, no flame cells are visible. On either side of the body, running from anterior to posterior end, is a larger tubule, which presents a slight dilatation about the middle of its length.

The chief characters which distinguish this species from the other four members of the genus, are the position of the genital pore, the form of the germ gland and the penis, and the possession of pigment spots in the parenchyma. From *G. muricicola* it differs in the absence of Böhmig's "Haftapparat" or "Bohrapparat," in the form of the body, the position of the genital opening, the form of the germ glands, the fact that the eyes are embedded

in the brain, &c. From *G. tethydicola* it is at once distinguishable by the possession of eyes, and absence of the very striking epidermal glands. *G. braunii* also possesses the "Haftapparat," while the "excretory" tubules are very distinctive, the testes are in front of the atrium, the germ glands also present quite different relations. With regard to *G. mytili*, as since Levinsen (10) published his original description no specimens have been found, its position is doubtful, but Levinsen's description supplies quite enough details to prove that it is distinct from the worm I am describing. "Ovaria longa, sacciforma intra margines laterales sita" is sufficient in itself to distinguish *G. mytili* from *G. buccinicola*, to say nothing of the further statement in the Danish text, where he describes it as extending itself along the side of the body from the eyes far backwards, as a pair of broad sinuous sacks. His sketch and description of the seminal vesicle and penis have also no resemblance to the same structures in my species.

HABITAT :—In the kidney and renal duct of *Buccinum undatum* and *Fusus antiquus*. The greater number of specimens of both these molluscs were infected, the number of parasites in one host varied between four and several dozen. A few worms were generally present in the mantle cavity as well, into which they had probably escaped through the renal aperture. The movements of this species are sluggish, like the other members of the genus it frequently lies on its side with the body dorso-ventrally flexed and swims round in a circle. From my observations upon living examples, kept in sea-water, I find that it is extremely sensitive to light, hiding under any object that is put into the vessel with it.

As the specimens of *Buccinum* which I examined were procured from the fishermen (who use them as bait), and

had been out of the water for a couple of days before I received them, I cannot say whether the host suffers serious consequences from the attacks of the parasites; the kidney, in many cases, was distended, and contained a large quantity of mucus, and its walls seemed to be locally attenuated, being almost transparent in places.

LOCALITY:—Port Erin, Isle of Man.

C. ALLOIOCŒLA.

Family PLAGIOSTOMIDÆ.

Plagiostoma koreni, Jensen.

New to L.M.B.C. District.

Four specimens occurred among seaweeds collected in tide-pools near the biological station.

Body oval, pointed behind, rounded in front, broadest about the middle. Colour, under a low power or pocket lens, greyish white with a broad dark band across the body about the middle. The colour is due to two kinds of pigment, a dark brown reticular pigment in the parenchyma, which corresponds to the dark zone; and a lighter brown granular pigment in the epidermis, which, although denser in the middle of the body, extends to the head and tail as well.

The eyes are very variable in form, carmine red, and as far as I can make out have no lens. One of my examples presented a particularly beautiful variation in the form of the eyes. Here they were triangular, carmine red, with a violet spot in the centre which sent processes of the same colour to the three angles. I am inclined to believe that in this species we have an eye of the *Monotus* type, *i.e.*, a simple mass of pigment without lens.

Plagiostoma vittatum (Frey and Leuckart).

One specimen in a pool near the biological station,

colour distribution as in v. Graff, Monographie, Tab. xxii., fig. 6, *f*.

Vorticeros auriculatum (O. F. Müller).

Three specimens among seaweeds, opposite the biological station.

An individual 1·8 mm. long was taken in the tow-net by Mr. A. R. Jackson, at sunset on the 26th April in Port Erin Bay.

Cylindrostoma quadrioculatum (Leuckart).

A few specimens among *Cladophora*, collected in shallow rock pools near high-water mark, beside the biological station. This species seems particularly sensitive to light, and only appeared at the surface of the vessels, in which I put the *Cladophora*, after dark.

Family Monotidæ.

Monotus lineatus (O. F. Müller).

Port Erin and Port St. Mary, very common among seaweeds collected between tidemarks.

In the great majority of the specimens that I examined the eye spot had the form of an irregular semilunar patch of pigment, such as is figured by Boeck (7), Pl. F., figs. 2, 6 and 9, or by von Graff (6), Tab. xx., fig. 18. One individual, however, taken at Port St. Mary presented such an extreme reduction of the "eye" that I have figured it (Pl. V., fig. 2). Here it is merely represented by a faint row of granules, forming a semicircle in front of the otolith.

Monotus fuscus (Oersted).

Common in tide-pools, and among tidal refuse, at Port Erin. Also found at Port St. Mary, but nowhere was it quite so numerous as *M. lineatus*.

III. POLYCLADIDA.

A. Acotylea.

Family Planoceridæ.

Stylochoplana maculata, Quatrefages.

New to L.M.B.C. District.

Two specimens, under stones, at low-water, in front of the biological station.

Length of my two specimens 11 and 13 mm. respectively, body elongated; broad and leaf-like in front, tapering behind. Tentacles in the first fifth of body, the base of each is surrounded by a circle, which in examination of the living animal suggests a thickening of the epidermis, and gives one the idea of a depression into which the tentacle can be partly retracted. Five to seven eyes on base of each tentacle; between tentacles, and running toward anterior margin are two groups of eight or nine eyes, besides which, one of my specimens showed several minute black specks intermixed with these intertentacular eyes.

Colour, to naked eye, greyish brown; under microscope the ground colour is yellowish-brown, with darker spots, and a number of large white blotches, very well developed in one specimen, but smaller and less clearly marked in the other. Two genital openings are present.

I kept both specimens under observation for some hours, and noted that they swim with dorso-ventral flexion of the whole body, much as the medicinal leech does; and if disturbed, when creeping on the wall of the vessel, they retreat with a curious wriggling movement, which is produced by the alternate use of the two sides of the anterior end of the body; the left anterior corner being extended, and the body drawn up, when immediately the right side is pushed forwards and the process repeated

alternately by the two sides, the worm literally dragging itself along "hand over hand."

Verrill has suggested the generic name *Heterostylochus* for this species, considering that by the possession of two genital openings it has a right to generic distinction. (Trans. Connecticut Acad., vol. viii., 1892, p. 467.)

Family Leptoplanidæ.

Leptoplana tremellaris (O. F. Müller).

Several specimens, under stones, at Port St. Mary and Port Erin.

B. Cotylea.

Family Euryleptidæ.

Cycloporus papillosus, Lang, var. *lævigatus*, Lang.

Two specimens at Port St. Mary under the same stone one of which measured 13·5 the other 11 mm.

Two found by Prof. Herdman, adhering to a colony of *Botrylloides* outside Port Erin Harbour, length 9 mm. and 6 mm. respectively. I have not had sufficient experience of this species to say whether this marked difference in size between the two individuals which usually consort together is or is not constant; further observations upon this point will be of interest, as it is possible that these couples which are so frequently found together represent stages in which the male and female elements are respectively at the maximum of development.

The relation between *Cycloporus* and the Ascidians with which it is so frequently associated is also a mystery, whether *Cycloporus* eats the Ascidian or merely derives moisture from it during the period it is exposed by the tide remains to be determined.

Postcript :—Since the above was written I have found

a previous record of *Stylychoplana maculata* and of *Fecampia erythrocephala* for the district. Report Brit. Assoc., 1894. Proc. Sect. D, p. 318. *Fecampia* has also been recently observed at Plymouth by Mr. Garstang; (Journal Marine Biol. Assoc., vol. iii., p. 217).

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Explanation of Plates.

Plate V.

Fig. 1. Penis of *Mesostoma neapolitanum*, v. Graff. *v.s.*, seminal vesicle; *ch.*, chitinous tube which projects into the spacious atrium.

Fig. 2. Anterior end of variety of *Monotus lineatus* (O. F. M.), with greatly reduced eye spot. *e.*, eye; *ot.*, otolith; *g.*, gut; *t.c.*, tactile cilia on anterior margin.

Fig. 3. *Graffilla buccincola*, n. sp., from a pressure of preparation, the male organs are developed in this individual. *ep.*, epidermis; *ph.*, pharynx; *e.*, eye; *s.gl.*, salivary (?) glands; *g.*, gut; *te.*, testis; *v.s.*, seminal vesicle; *pe.*, penis.

Fig. 4. Anterior end of an individual in which the female elements are developed. *ger.*, germ gland; *y.*, yolk gland, which is not figured on the right side of the sketch; *at.*, atrium; *r.s.*, receptaculum seminis; other letters as in fig. 3.

Fig. 5. Pigment spots, composed of groups of granules, from the subcutaneous parenchyma of *G. buccinicola*.

Fig. 6. Four sketches, to illustrate the variations in form, of *G. buccinicola*. *a.* and *b.*, examples in the

male stage; *c.* and *d.*, do. in female stage; *ph.*, pharynx; *v.s.*, seminal vesicle; *g.*, gut; *ov.*, germ gland.

PLATE VI.

Fig. 7. Transverse section through region of brain of *Graffilla buccinicola*; *ep.*, ciliated epithelium; *br.*, brain; *ph.*, pharynx (posterior end); *at.*, genital atrium; *g.o.*, genital pore; *e.*, eye.

Fig. 8. Longitudinal section of specimen with male organs developed. *ep.*, epidermis; *r.m.*, circular muscles; *l.m.*, longitudinal muscles; *br.*, brain; *ph.*, pharynx; *oe.*, oesophagus; *ph.s.*, pharyngeal sack; *g.o.*, genital pore; *r.s.*, rudiment of receptaculum seminis; *p.*, penis; *v.s.*, seminal vesicle.

Fig. 9. Transverse section of *G. buccinicola* in the female stage, passing through body near the apex of the loop formed by the germ glands. *g.c.*, cavity of gut; *ger. p.*, proximal limb of germ gland; *ger. d.*, distal do.; *y.*, yolk gland.

Fig. 10. Seminal vesicle with penis retracted.

Fig. 11. Do. penis protruded, from the same specimen under higher pressure.

Fig. 12. Scheme of relationships of the female apparatus constructed from sections. *at.*, atrium; *r.s.*, receptaculum seminis; *sh. gl.*, shell glands; *ger.*, germ glands.

Fig. 13. Penis, strongly magnified, from a pressure preparation.

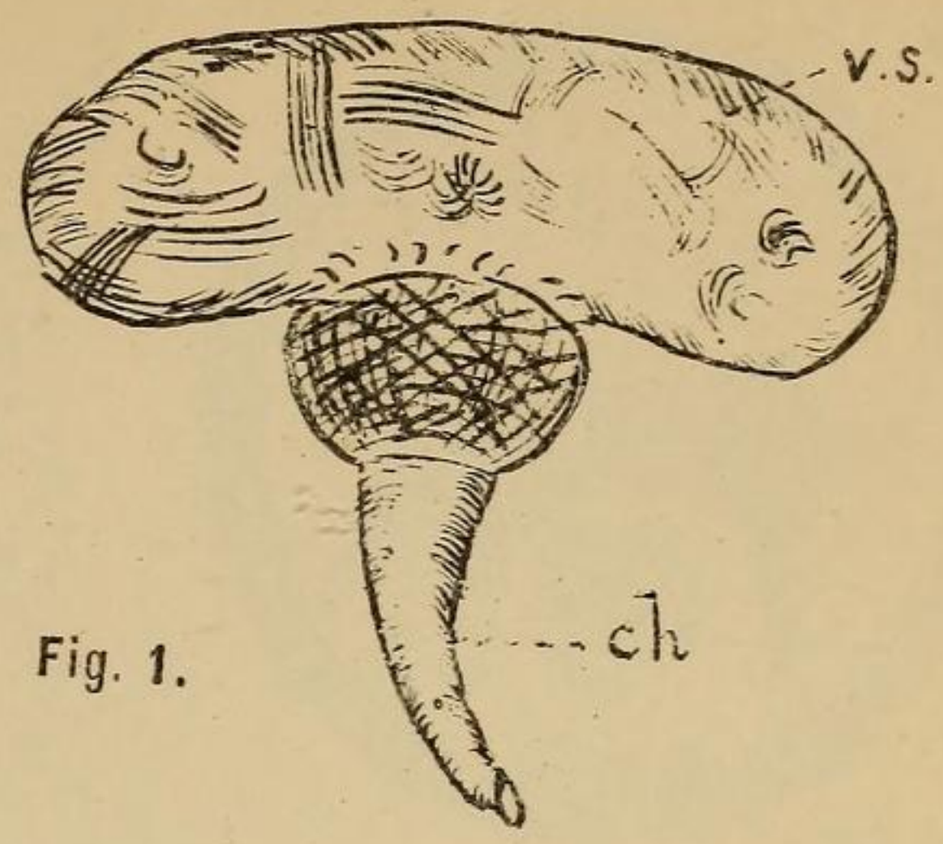

Fig. 1.

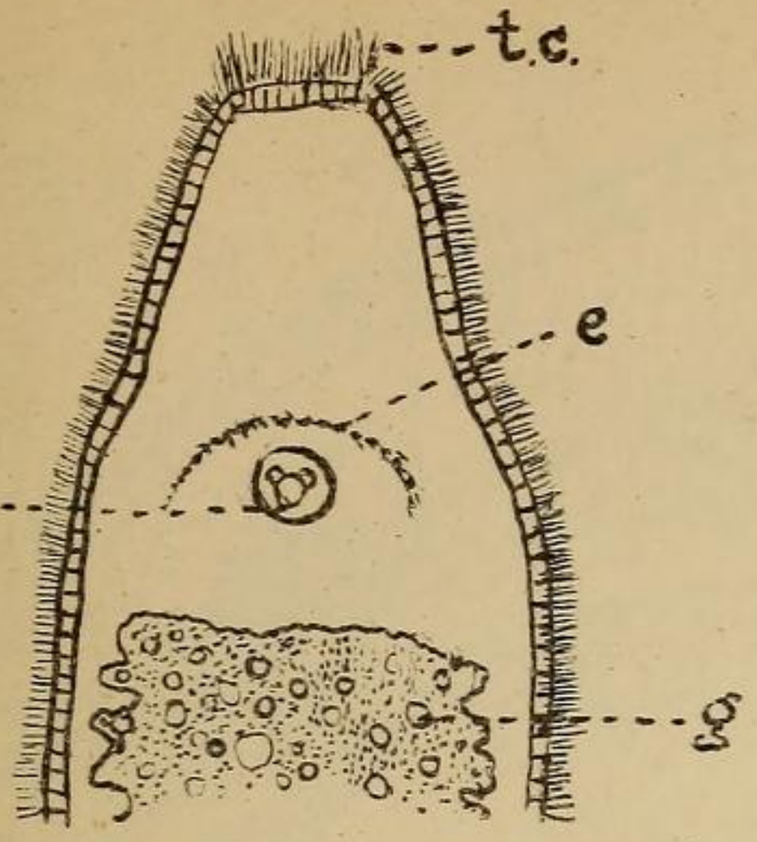

Fig. 2.

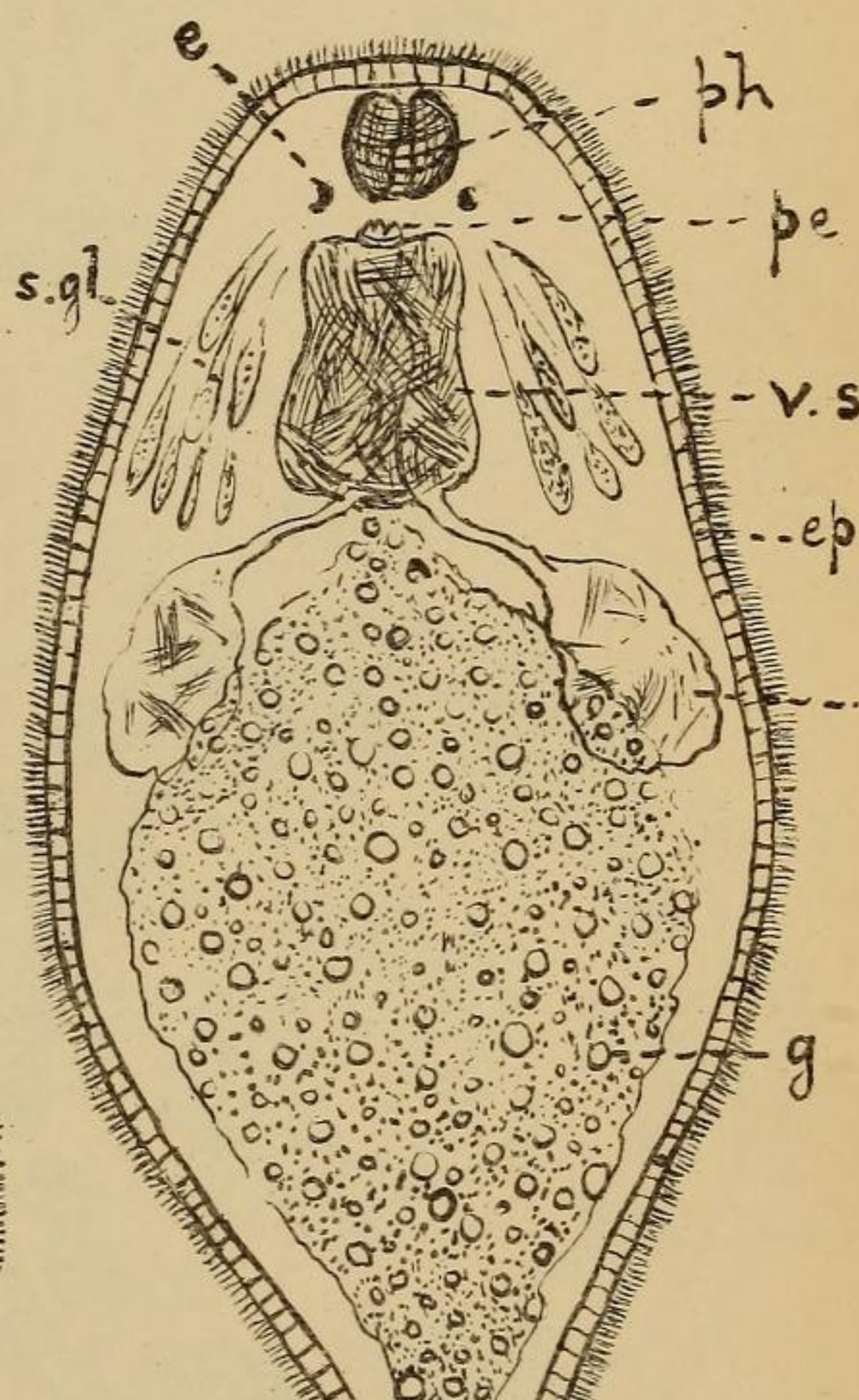

Fig. 3.

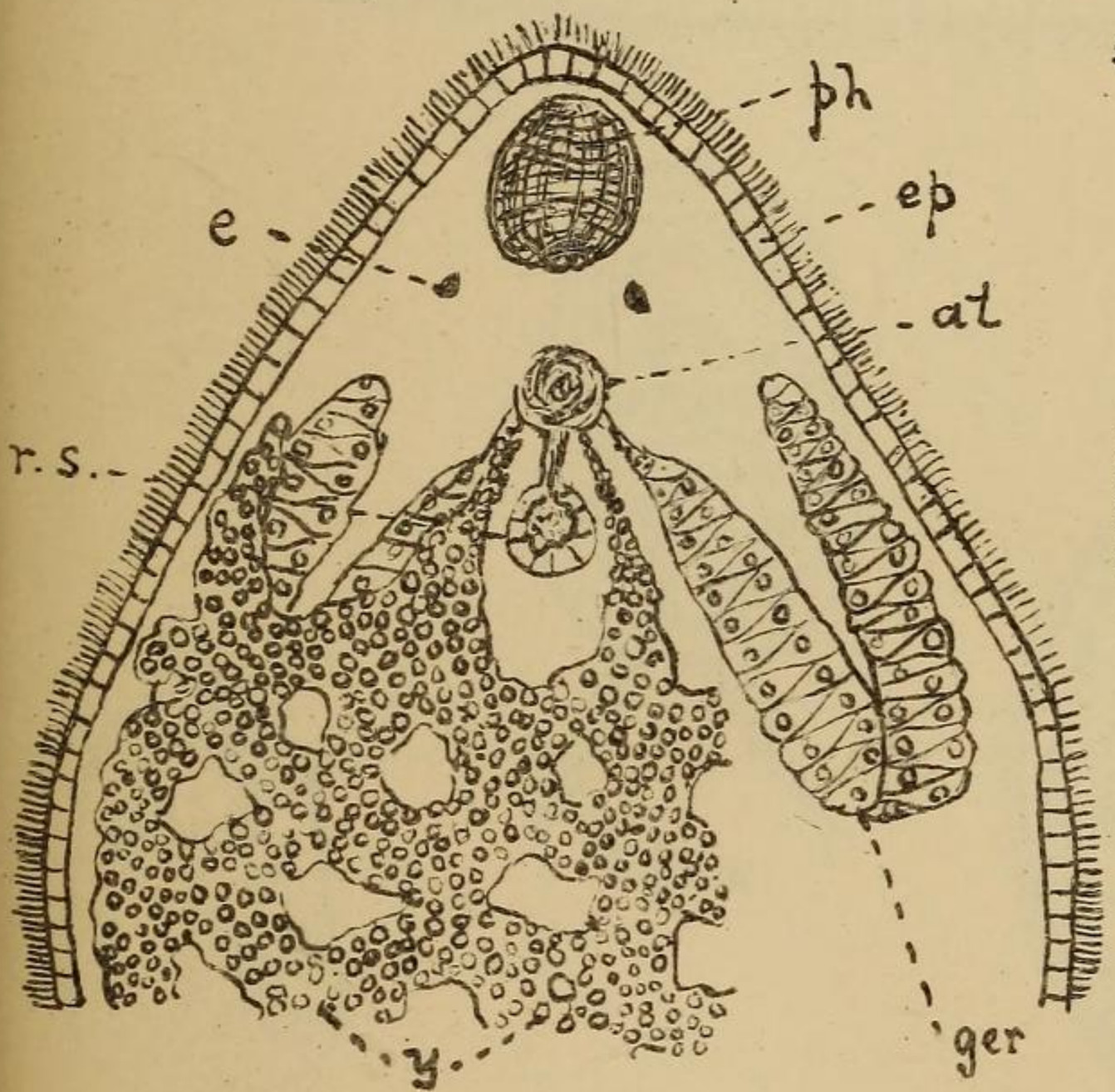

Fig. 4.

Fig. 5.

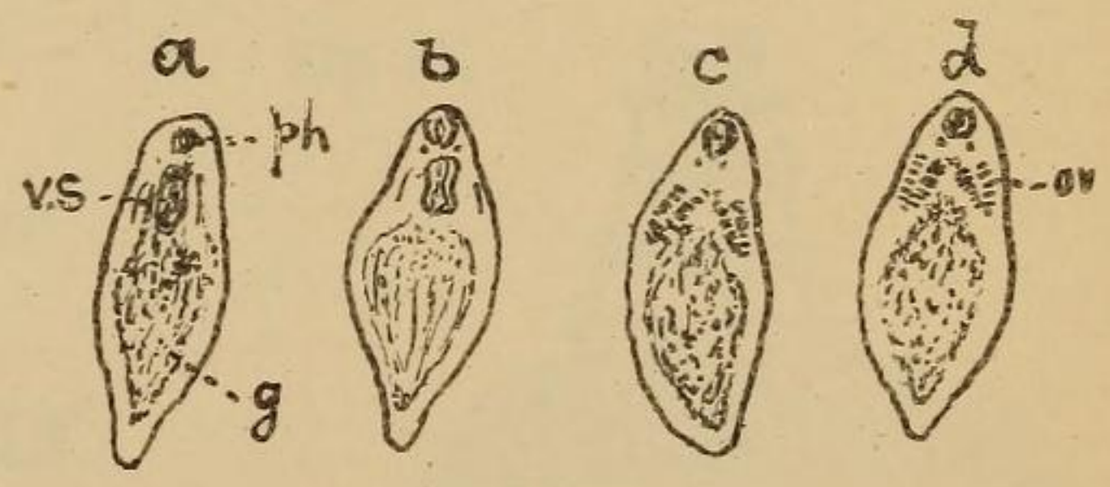

Fig. 6.

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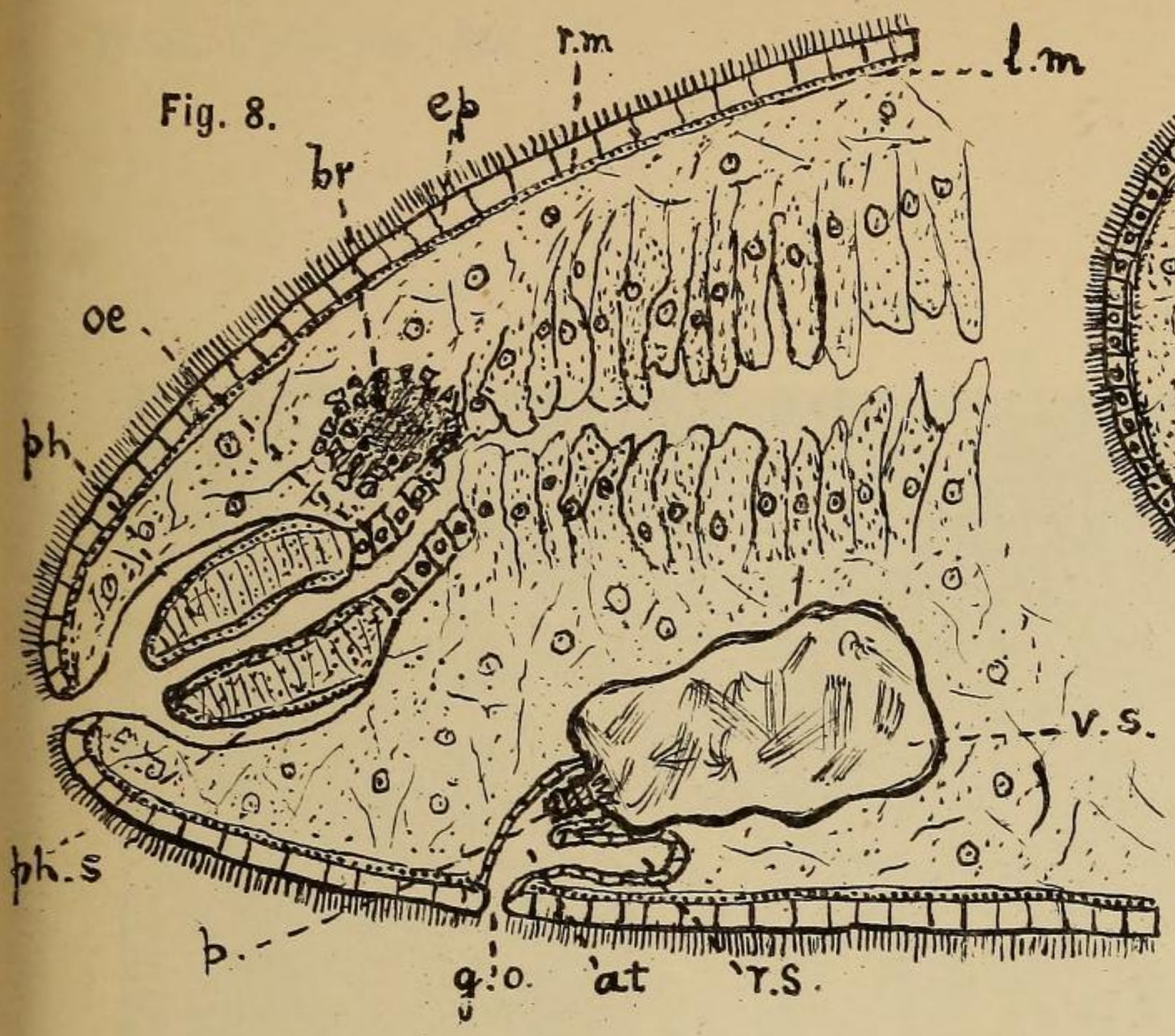
Fig. 8.



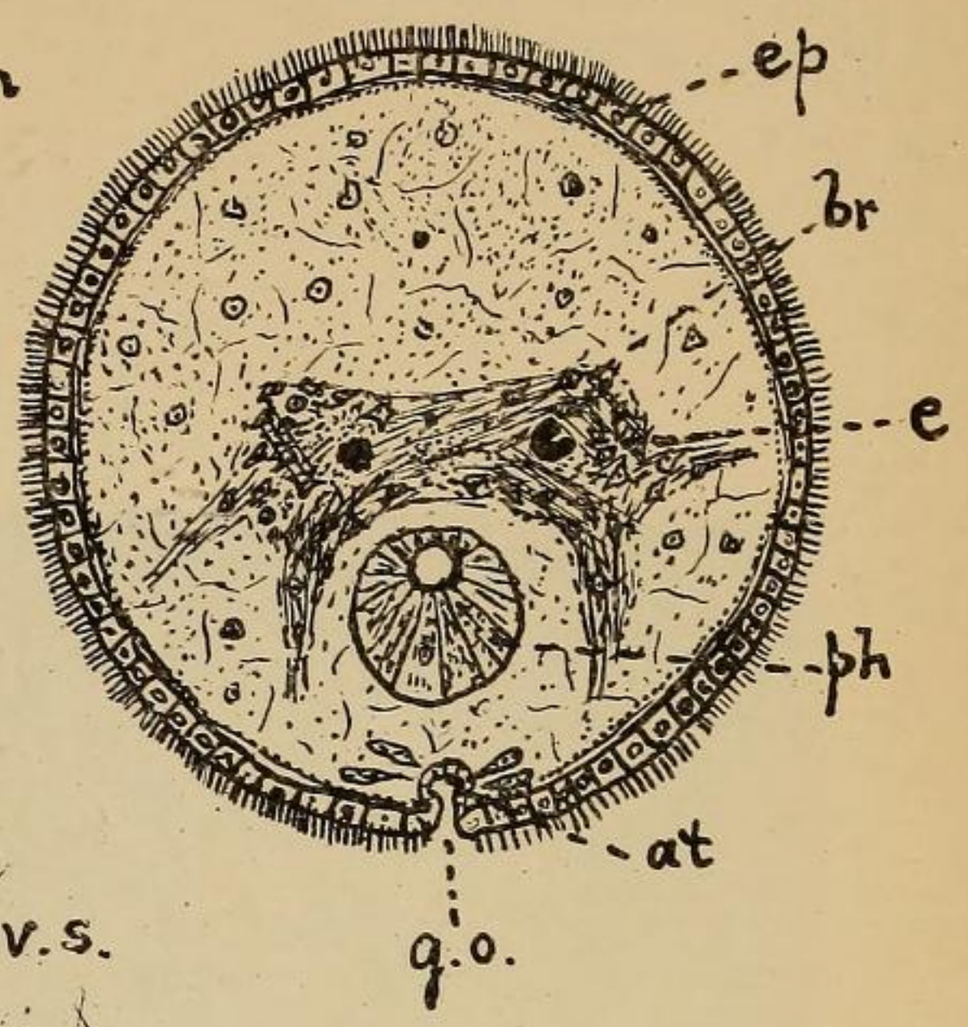


Fig. 7.

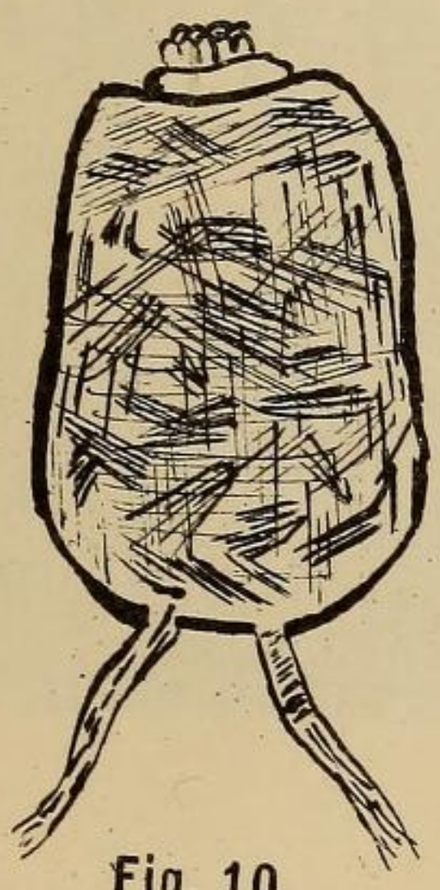


Fig. 10.

Fig. 9.

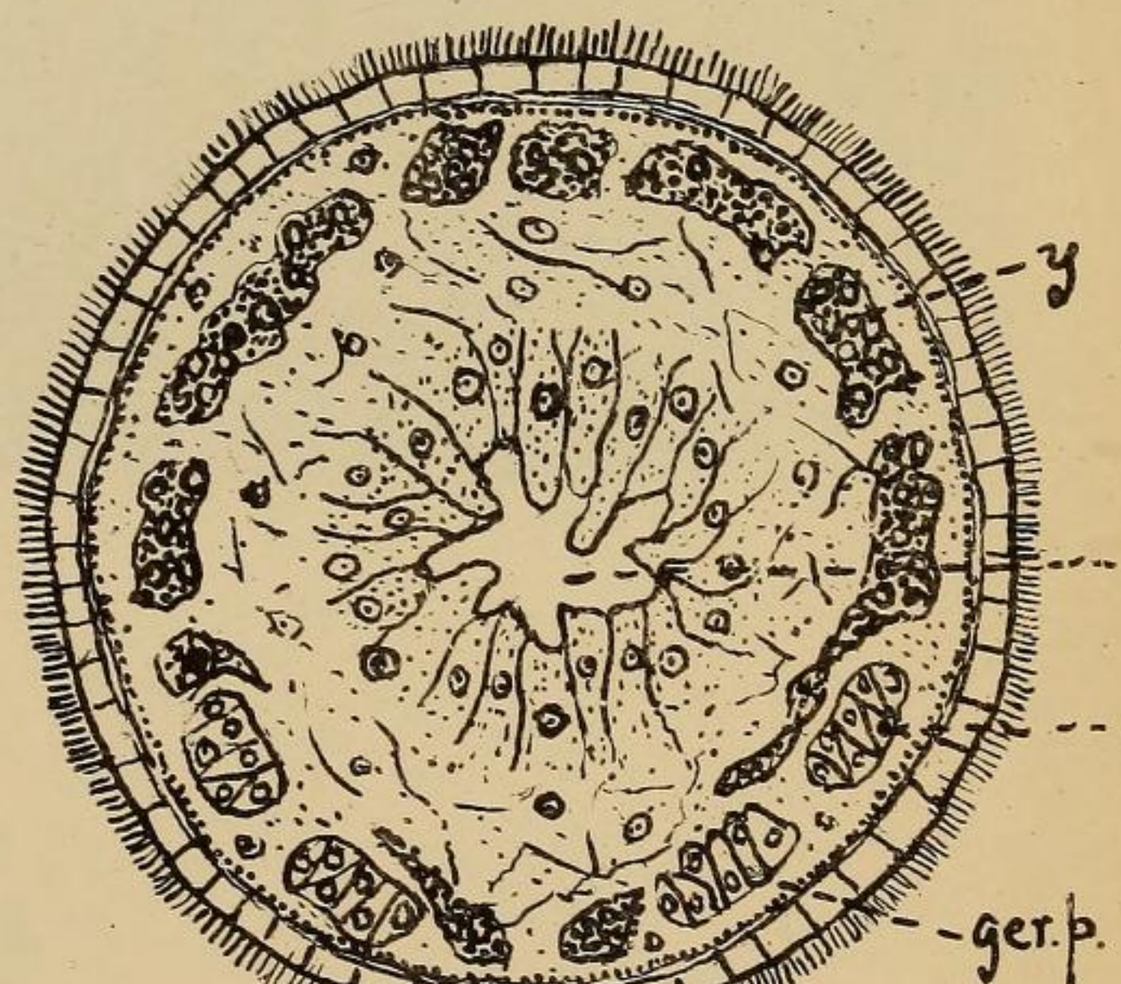


Fig. 11.

Fig. 12

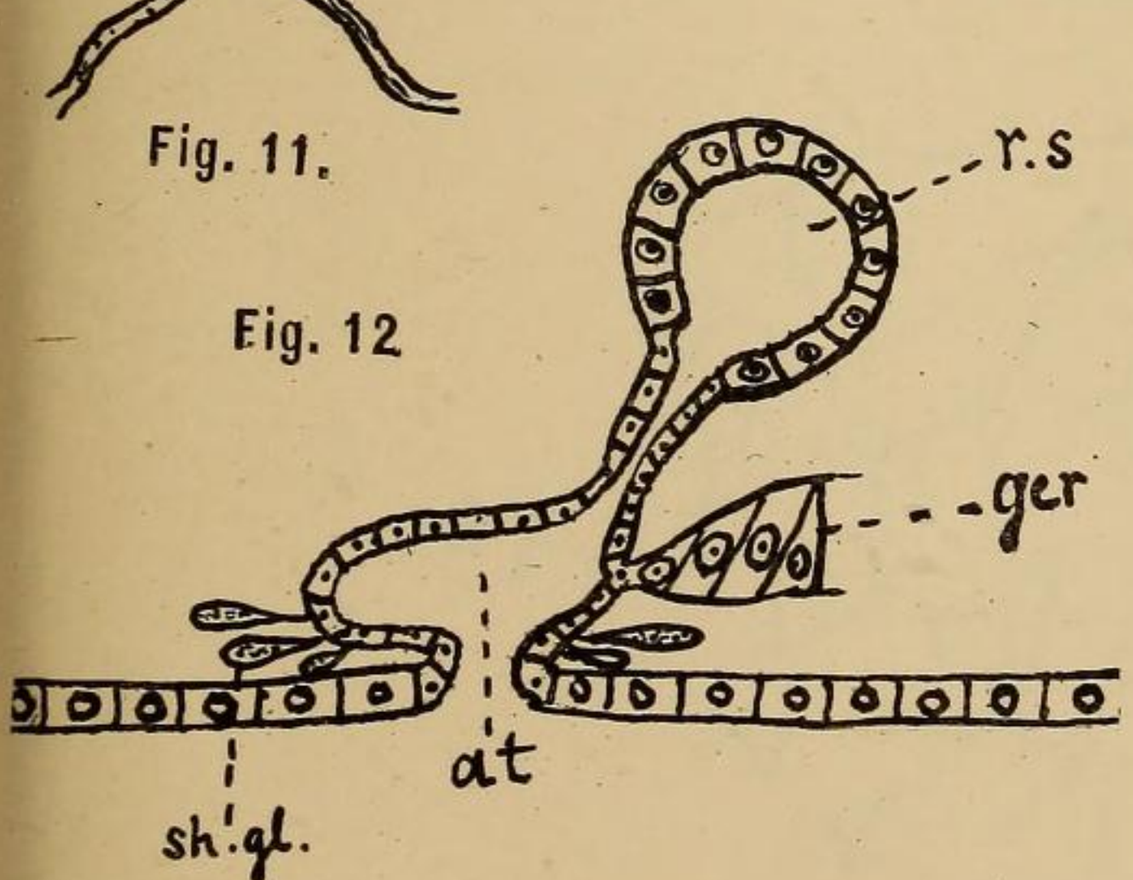
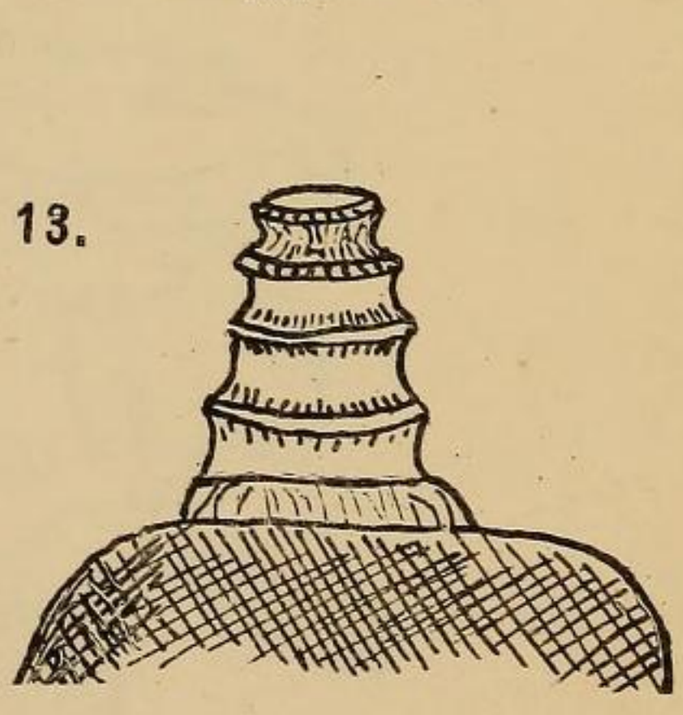


Fig. 13.



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