

APPENDIX A.

DESCRIPTION of SYLON CHALLENGERI, n. sp., a Parasitic Cirriped. By Dr. P. P. C. HOEK, Member of the Royal Academy of Sciences of the Netherlands.

IN May 1886 Mr. C. Spence Bate sent me a specimen that looked like a *Sacculina*, the only one that he ever saw of the kind attached to a Macrurous Crustacean.

The Macruran to which it was attached was a specimen of *Spirontocaris spinus* (Sowerby), var ϵ . It was taken during the voyage of the Challenger at Station 49, off Halifax. It is figured on Pl. CVI. fig. 5 ϵ , of Mr. Spence Bate's Report, being shown *in situ*; in fig. 10 of the same plate it is shown isolated. In the explanation of this plate it is referred to as a saccular parasite.

At the suggestion of Mr. Spence Bate, Mr. John Murray, Director of the Challenger Commission, asked me to describe the specimen in order to have a description of it embodied in Mr. Spence Bate's Report, a request which I gladly accepted.

The reason Mr. Bate proposed to send the parasite in question to me, was that he believed it to be a parasitical Cirriped. After careful examination, I am able to confirm Mr. Spence Bate's provisional determination; for I found that it belonged to a genus of the Rhizocephala, or parasitical Cirripedia, *Sylon*, a genus well known to the Norwegian zoologists, but no specimens of it had been previously taken in the Atlantic south of lat. 60° N.

Before proceeding to describe the specimen, it will be well to say something concerning the literature of the genus.

In 1855 H. Krøyer¹ published a short note on a very insufficiently known group of Crustaceans, *Pachybdella* and its congeners. This note is remarkable from a historical point of view, since for the first time a third genus of these lower Crustaceans, which afterwards were shown to form the group of the Rhizocephala, was spoken of. The two previously known genera are *Pachybdella*, Diesing (*Sacculina*, Thompson), and *Peltogaster*, Rathke. Of *Pachybdella*, the species of which inhabit Crabs, Krøyer mentions two species, and of *Peltogaster*, which occurs on the abdomen of *Pagurus*, five different

¹ H. Krøyer, Bemaerkninger om en meget ufuldstaendigt bekjendt Gruppe af Krebsdyr *Pachybdella* o.a.v., *Overrigt o. d. K. D. Vid. Selk. Forhandl. Kjøbenhavn*, pp. 127-131, 1855.

species were known to him. Of the third genus, *Sylon*, Krøyer proposed only one species, though the different specimens show considerable variation in shape and size. It seems to occur on the genus *Hippolyte* only. No description of the genus *Sylon* is given in this note; and Krøyer's death in 1870 occurred before the paper, in which he intended to give a full description of the different species and genera, was published. With regard to *Sylon* the only things we learn from his note of 1855 are that its metamorphosis is much like that of *Pachybdella* and *Peltogaster*, and that he believes it to be the only genus of the group in which a kind of vascular system occurs.

In 1870 G. O. Sars published¹ the second part of his father's *Bidrag til Kundskab om Christianiafjordens Fauna*, with the aid of the manuscript left by his father, Dr. Michael Sars, who died in 1869. The same memoir was also published separately.²

In this paper a description is for the first time given (pp. 41-48) of the genus *Sylon*, Krøyer, and of two species belonging to it. The one is *Sylon hippolytes* (Krøyer), most probably the same species that Krøyer observed; it was found on the under side of the abdomen of *Hippolyte securifrons*, Norman, which was taken at a depth of 40 to 60 fathoms in Storemedet, and at a depth of 100 to 120 fathoms in the Rødtangdybet. M. Sars points out that the same species occurs attached to a specimen of *Hippolyte polaris*, Sabine, which Daniellsen obtained in Hardangarfjorden at a depth of 250 fathoms. The other species described is *Sylon pandali*, M. Sars, a parasite of *Pandalus brevirostris*, which lives at a depth of 25 to 60 fathoms "in freto Drøbachiensi." Both species are figured and a fairly full description is given, the only one hitherto published.

The diagnosis which M. Sars proposes for the genus *Sylon* is as follows:—

"Corpus sacciforme, ovatum, subteres, cute (pallio) pellucida sed firma vestitum. Os vel apertura suctoria in organo adfigendi acetabuliformi, annulo corneo cincto, in latere inferiore corporis situm, ubi in posteriore parte aperturae (genitales) binæ parvæ circulares beantes, symetrice positæ, cavitatem intrapallialem aperientes, adsunt. Genitalia bisexualia: ovarium ramosum, in sacco magno maximam partem cavitatis interpallialis explente inclusum; testiculus parvus ovatus, in posteriore parte ventrali hujus cavitatis situs."

At the end of his description of the two species, Sars points out the differences existing between *Sylon* and the other known members of the family Peltogastridæ, established by Lilljeborg. *Sylon* differs from *Peltogaster* in not having an aperture at the anterior extremity of the body, and also in having only a single testis; from *Apeltes* it differs both by the absence of the anterior aperture and of the short tube at the hindermost extremity of the body, and by the presence of a well-developed organ for its attachment to the host, with a mouth in the centre. *Sylon* also differs from both by the shorter form of the body, in which respect it rather resembles *Clistosaccus* of

¹ *Nyt Mag. f. Naturvid.*, vol. xv.

² Christiania, Johan Dahl, 1870.

the Sacculinidæ, and especially by the presence of two symmetrically situated apertures (genital pores) at the ventral side, in the hindermost part of the body.

In consequence perhaps of its being in the Norwegian language, this paper of M. Sars has not become known so widely as it merited. Neither Kossmann¹ nor Delage,² both of whom give an extensive bibliography in their papers on the Rhizocephala, mentions the above paper of M. Sars.

In his second paper on the fauna of the Arctic fjords published in 1884, J. Sparre Schneider of Tromsø³ gave an enumeration of the Crustaceans and Pycnogonids he collected in 1881 in the Kvænangsfjord. In this fjord *Hippolyte pusiola* is common at a depth of 5 to 10 fathoms, at the place where it communicates with the Sørfjord. Schneider says⁴ that this species is to a considerable degree infested with parasites, viz., a species of *Sylon* peculiar to *Hippolyte pusiola*, a couple of them being often observed on the same individual.

In the same year Max Weber⁵ published the results of his researches on the Isopods collected during the cruises of the "Willem Barents." Speaking of *Phryxus abdominalis* (Krøyer), Weber says⁶ that along with the Isopoda of the Barents collection, a specimen of *Hippolyte incerta*, Buchholz, was handed to him, which was infested on the ventral surface by a parasite, that on superficial investigation might be taken for a Bopyrid. On closer examination this idea was given up, and on comparing the parasite in question with specimens of *Sylon* attached to *Hippolyte pusiola*, which he collected himself near Tromsø, he saw at once that the parasite of *Hippolyte incerta*, Buchholz, also belonged to the genus *Sylon*. Through the kindness of Professor Max Weber of Amsterdam University, I was enabled to investigate two specimens of this species of *Sylon*, attached to *Hippolyte pusiola*, Krøyer, and to compare them with the Challenger specimen obtained off Halifax. This comparison brought out the great resemblance between them. They may be different species, but they clearly both belong to the genus *Sylon*. Whether in every case two specimens of *Sylon* living on different hosts should be regarded as different species, I do not venture to decide. From the analogy of similar cases of parasitical Isopoda, great prudence is certainly necessary in coming to a conclusion.

¹ Kossmann (Beiträge zur Anatomie der schmarotzenden Rankenfüssler, p. 5, 1874), says with regard to *Sylon*:—"Der Genusname *Sylon*, welchen zu characterisiren Krøyer durch den Tod gehindert wurde, kann füglich aus unserer Literatur wieder verschwinden, zumal K. seine Exemplare, wie er selbst angibt, sämmtlich verarbeitet hat."

² Delage (Evolution de la Sacculine, *Archives d. Zool. expér.* (2), tom. ii. p. 424, 1884), in regard to *Sylon* is also very decided:—"La même année (1855) Krøyer ajoute aux deux genres déjà connus le genre *Sylon*. Mais il omet de le caractériser et de conserver un exemplaire. Personne depuis n'a pu retrouver le *Sylon*, en sorte que c'est là un genre, que sauf Krøyer, personne n'a vu, et dont personne ne connaît les caractères. Le retrouvera-t-on?"

³ J. Sparre Schneider, *Undersøgelser af dyrelivet i de Arktiske fjorde*, II. Crustacea og Pycnogonida indsamlede i Kvænangsfjorden, 1881, *Tromsø Museums Aarshefter*, vii., 1884.

⁴ *Loc. cit.*, p. 52.

⁵ Max Weber, Die Isopoden gesammelt während der Fahrten des "Willem Barents" in das Nördliche Eismeer in den Jahren 1880 und 1881, *Bijdragen tot de Dierkunde*, 1884.

⁶ *Loc. cit.*, p. 34.

The following list gives the different cases in which species of *Sylon* have hitherto been observed :—

PARASITE.	NAME OF HOST.	OBSERVER.
<i>Sylon hippolytes</i> (Kröyer),	<i>Hippolyte securifrons</i> , Norman, .	M. Sars.
„ „	„ <i>polaris</i> , Sabine, .	„
„ <i>pandali</i> , . . .	<i>Pandalus brevirostris</i> , Rathke, .	„
„ <i>schneideri</i> , n. sp., .	<i>Hippolyte pusiola</i> , Kröyer, .	Sparro Schneider, Max Weber, Hoek.
„ sp., . . .	„ <i>incerta</i> , Buchholz, .	Max Weber.
„ <i>challengeri</i> , n. sp., .	<i>Spirontocaris spinus</i> (Sowerby), .	Hoek.

The specimen of *Spirontocaris spinus* on which the parasite was found had a length of 37 mm. It was attached to the third segment of the abdomen. According to M. Sars, *Sylon hippolytes* is also attached to the third, and *Sylon pandali* to the first abdominal segment of its host. According to my own observations, *Hippolyte pusiola* likewise bears its *Sylon* on the third segment of the abdomen.

In the case of *Spirontocaris spinus*, as shown in Pl. CXLIX. fig. 1, the parasite is attached by a considerable part of its surface, the attached part being circular and having a diameter about half as long as the longest axis of the parasite. The body-wall of the shrimp and of the *Sylon* almost imperceptibly pass into one another; when separating the parasite its chitinous covering was found to have a yellow-coloured thickening, of the shape of a ring, round the place of attachment.

The shape of the parasite is oval,¹ its long axis running nearly but not quite parallel with that of the Shrimp. If we apply the term poles to the extremities of the longest axis, then the anterior pole is situated at a somewhat greater distance from the ring of attachment than the posterior pole. In the species of *Sylon* found upon *Hippolyte pusiola*, and which I will call *Sylon schneideri*, not only is the greater part of the body of the parasite situated in front of the base of attachment, but the anterior pole is at a considerably greater distance from the surface of the host than the posterior pole. The greatest diameter of *Sylon challengeri* measured about 4 mm., and the two other axes only measured 3·16 and 2·6 mm. Taking the plane of the two other axes as perpendicular to the direction of the longest axis, the one second in length (3·16 mm.) is perpendicular, or nearly so, to the surface of the Shrimp; the shortest of the three is the one that runs from the right to the left side of the body of the parasite.

¹ The figures of the parasite on Pl. CVI. figs. 5, 10, represent it as spherical; but this is not quite exact. Fig. 10 also shows the parasite as being attached by means of a short but distinct peduncle, but this is not the case.

Sylon hippolytes, M. Sars, is 10 mm. in length and 7 in breadth; *Sylon schneideri* had a very different size in the specimens I was able to investigate; in one the dimensions were about 3.1 by 2.1 mm., in another the length and the greatest breadth measured 6 and 4.1 mm. respectively. I have also seen a specimen of *Hippolyte pusiola* with two small specimens of *Sylon schneideri* attached to it; the one about 1.5, and the other 2 mm. in length.

The specimen of *Sylon challengeri* which was sent me was not quite uninjured. As is shown in figs. 1 and 3, Pl. CXLIX., the outer wall of the body was torn open in front, and this damage, caused perhaps by the desire of the artist to see as much as possible of the animal without detaching it from the *Spirontocaris*, at first caused some difficulty in the determination of the animal. In *Sylon* the outer surface of the body is quite smooth and bears no appendages or trace of segmentation; the large and very distinct opening found in the other *Rhizocephala*, which Delage calls the cloaca, is wanting in this genus. For the communication of the mantle-cavity with the exterior two rather small round holes alone are present, which were accurately observed and figured by M. Sars. From analogy I am of opinion that they were situated just within the limits of the damaged part of the body of *Sylon challengeri*; and a comparison with the figure of *Sylon schneideri* attached to *Hippolyte pusiola* (Pl. CXLIX. figs. 4, 5) will readily convince any one of the probability of this supposition. In fig. 5 a lateral view is given, and in fig. 4 a front view; in both figures the circular openings exist at *a*, and they are about 0.3 mm. in diameter. In young specimens these openings seem to be closed; at all events I observed them in this condition in a small specimen of *Sylon schneideri*, a transverse section of which is represented on Pl. CL. fig. 2. Like other *Rhizocephala*, *Sylon* carries its developing ova within the mantle-cavity; Kröyer's observations on the larvæ of this genus, and his comparison of these larvæ with those of *Sacculina*, admitting, I think, of no doubt on this point. Most probably the Nauplii, when ripe, leave the cavity by means of the above-mentioned openings. Running from between the two openings towards the place of attachment, a narrow stripe is visible through the transparent outer wall on both sides, limited by a distinct clear line (Pl. CXLIX. fig. 4). Here the body of the *Sylon* seems to be attached to the interior of the mantle, and probably this stripe is comparable to the "mésentère" of Delage.

When I commenced my investigations I did not know the nature of the parasite, and I therefore decided upon studying it by means of transverse sections. I was obliged to detach it from its rather bulky host, taking away along with the parasite an annular part of the body of the Shrimp. Fig. 2, Pl. CXLIX. was made after the animal had been thus loosened, and represents it from below. The round smooth part (*e*) afterwards proved to be the very dense mass of ovarian tubes. The outer covering was so loosely connected with the interior, that I was obliged before embedding it in paraffin to take it quite away; and in so doing I neglected to investigate microscopically the mode in which

the parasite was attached to its host. In the case of *Sylon schneideri*, however, I observed that the connection takes place in much the same way as Delage has described it in *Sacculina*. From a well-developed and rather voluminous basis (the "membrane basilaire" of Delage) numerous roots pass into the interior of the host, and in order to investigate this attachment it is necessary to make transverse sections of the host with the parasite attached to it. A part of the abdomen (the dorsal half having been removed) of a small specimen of *Hippolyte pusiola* with the *Sylon* attached, was embedded in paraffin in the usual way, and sections cut with the aid of the microtome.

Some of the sections so made are shown in Pl. CL. figs. 4-6. As it is not my intention to publish here an elaborate anatomical and histological description of *Sylon*—since both in regard to quantity and quality the material at my disposal was not sufficient—but only to give a preliminary orientation with regard to these little-known animals, a few words must suffice to describe this basilar membrane. It forms a circular disc equal in area to about one-fifth of the whole surface of the *Sylon*, and is not very thick, in the preparation shown in Pl. CL. fig. 4 measuring only about 0.2 mm.; it is composed of connective tissue, the nuclei being very small and numerous. The roots are not very abundant, but rather elongate and much ramified. In one respect there seems to exist an interesting difference between *Sylon* and *Sacculina*—in the latter genus the roots penetrate within the body of the Crab until they reach the wall of the intestine, but in *Sylon*, on the contrary, they as a rule do not reach so far. In *Carcinus mænas*, at the place where *Sacculina* is attached, the distance between the basilar membrane and the wall of the intestine is inconsiderable; in *Sylon* the same membrane is separated from the wall of the intestine by a dense mass of muscles (Pl. CL. fig. 4, *m*). Most of the roots (Pl. CL. figs. 4, 5, *r*) terminate on the ventral aspect of this mass of muscles, and only one root could be followed running close to the lateral surface of the abdomen of *Hippolyte* and directed to the dorsal part of the body. Most probably therefore *Sylon* lives, at least partly, on the blood of its host, and only to a limited extent draws its nourishment from the intestinal contents. Branches of these roots surround the central nervous system, passing through the abdomen in a very curious way (Pl. CL. figs. 4, 5, *n*).

According to Delage the basilar membrane and the roots belong to the internal part of the Rhizocephalid, the external part consisting of the visceral mass and of the mantle. The name "visceral mass" is perhaps not quite exact, as there is no trace of viscera, in the ordinary sense of the word (*intestine, &c.*), the contents being made up almost exclusively of one organ, namely, the very bulky ovary. After soaking in absolute alcohol, the ovary forms a very compact and hard body, which cannot easily be stained, is very brittle, and causes great trouble when cutting sections. It consists of extremely numerous more or less unripe eggs; in the specimens I investigated almost nothing could be observed of the true ovarian tubes, the ova being closely packed together in almost every direction. The latter are all nearly in the same condition of ripeness; each con-

tains a granular plasma and numerous clear vesicles scattered through its substance. As a rule a small nucleus is visible close to the wall of the ovum, which is distinctly coloured by alum carmine. The size of the eggs is much the same throughout the whole ovary; in *Sylon challengerii* (Pl. CL. fig. 1) they are nearly spherical, with a diameter of 0.06 mm., in *Sylon schneideri* (fig. 7) they are oval and slightly larger, the dimensions being 0.08 by 0.06 mm. Here and there between the ovarian eggs, especially in *Sylon challengerii*, stripes of connective tissue with rather large oval nuclei are visible.

The visceral mass is inclosed by an epithelium which is truly chitinogenous, and has a chitinous outer wall at its surface. This chitinous membrane—at all events when the animal carries no eggs in the mantle cavity—is pressed against a similar membrane, which forms the inner surface of the mantle. The latter organ consists of two layers of epithelial cells, separated from one another by connective tissue and muscular fibres; at the outer surface a rather thick and very resistant chitinous membrane is secreted by the epithelial cells, whereas the inner coating of chitin is thin and in not quite full-grown specimens is fused with the exterior chitinous membrane of the visceral mass. At the places where later on the openings of the mantle are formed, a thick, lenticular, chitinous disc (Pl. CL. fig. 2) is observed. The chitinous membrane at the surface of the mantle in the same preparation is distinctly double, but when the process of exuviation takes place the outer layer probably carries away the lentiform disc also, and so opens the genital pores. Between the two chitinous membranes of mantle and visceral mass the mantle cavity is formed by a simple parting of the two membranes.

In the series of preparations of *Sylon challengerii*, the gland, whose secretion serves probably for gluing the eggs together, is seen to be distinctly developed; but I observed only one gland, and not two as is the case in *Sacculina*. One of the sections of the gland is shown on Pl. CL. fig. 1, which fairly well corresponds to the description of it given by Delage in the case of *Sacculina*. He calls it the cement-gland, a name, which, as Giard pointed out,¹ is inexact, for it has quite the function of an "Eikittdrüse," or "glande collétérique." It is a tubular gland, much ramified, and very irregularly convoluted, and a kind of chitinous membrane is seen everywhere within the interior of the different parts. The gland as a whole, with the connective tissue between its convolutions, forms a lentiform mass. In *Sylon challengerii* the opening of the female genital apparatus does not take place, as is the case with *Sacculina*, by means of a vestibule (the atrium of Delage) situated in the centre of the mass of the gland; for I did not find a trace of such an atrium in any one of an uninterrupted series of preparations, all the sections being perpendicular to the surface of the lentiform glandular mass. At one side of the gland, however, the epithelium of the surface of the visceral mass forms a distinct invagination (Pl. CL. fig. 1, *d*), and perhaps the opening of

¹ A. Giard, Sur l'orientation de *Sacculina carcini*, *Comptes rendus*, March 10, 1886.

the female genital apparatus is to be sought here; in that case the tubular gland ought to have its opening in the neighbourhood of this invagination also.

Only in one of the specimens of *Sylon schneideri* did I observe anything that could be considered to be a testis, and this structure formed an oval compact gland, in connection at one extremity with the wall of the visceral mass, the other extremity lying free between the ovarian cæca. The organ which M. Sars observed and regarded as a testis is probably the same. In one respect, however, I do not agree with him, for he believes that he observed a small pore at the surface of the mantle, and considers it to be the male genital pore, while I, on the contrary, believe that the testis communicates by means of an opening with the mantle cavity. In Pl. CL. figs. 5, 6, sections of the testis are represented, figs. 4, 5, and 6 being from the same series; the preparations follow one another in sequence, from behind forwards, but numerous sections between them are not figured. Continuing the series of preparations in the same direction, soon after the one figured in fig. 6, one follows in which the openings of the mantle cavity are visible.

The nervous system was observed in *Sylon schneideri*. The only part of it which I found was an almost spherical body, composed of small cells with distinct and well-stained nuclei, and situated at the surface of the visceral mass, enclosed in a mass of connective tissue (Pl. CL. fig. 2, *n*). Its diameter is about 0.08 mm. In all the sections passing through it there is represented a clear central mass, probably consisting of granular substance, which is characteristic of the nerve-centres of the Arthropoda. In fig. 3 a part of another section, not far in front of that shown in fig. 2, and belonging to the same series, is represented. Here the connective tissue surrounding the nerve centre in fig. 2 is seen to be still more distinctly developed, and encloses a mass of granular substance, which in fig. 2 is just beginning to appear (figs. 2, 3, *l*). I do not know its nature; probably it is blood-serum.

The structure of the Rhizocephalida, so far as regards *Sacculina*, is now well known. Of *Peltogaster* our knowledge is rather insufficient; of *Clistosaccus* and *Sylon* almost nothing was known hitherto, and though for the latter genus at least some information is given in this note, much more data are wanted before it will be possible to discuss the affinities, not only of *Sacculina* and *Peltogaster*, but of all the members of the interesting family Rhizocephalida.

PLATE CXLIX.

- Fig. 1. *Sylon challengeri*, attached to *Spirontocaris spinus*, a part of the right side of the Shrimp having been taken away; *x*, the injured part at the surface of the sac; I., II., III., IV., and V., the first to the fifth pleopods of the left side of the Shrimp; *Va*, the fifth pleopod of the right side. Magnified 13 diameters.
- „ 2. *Sylon challengeri*, seen from below, with a part of the wall of the host attached; *e*, the ovary of the parasite. Magnified 12 diameters.
- „ 3. *Sylon challengeri*, front view; *x*, the injured part at the surface. Magnified 12 diameters.
- „ 4. *Sylon schneideri*, front view; *a*, openings leading into the mantle-cavity; B, transverse section of *Hippolyte pusiola*. Magnified 12 diameters.
- „ 5. *Sylon schneideri*, seen from the side, the lateral parts of the exoskeleton of the second and third abdominal segment of the *Hippolyte* being taken away; *a* and B as in fig. 4; II.-IV., second to fourth pleopod. Magnified 12 diameters.

PLATE CL.

- Fig. 1. *Sylon challengeri*, part of a transverse section, passing through the ovary, *e*, and the "Eikittdruse," A; *a*, connective tissue of the mantle; *b*, epithelium surrounding the visceral mass; *c*, ramified tubes of the gland; *d*, female genital pore. Magnified 136 diameters.
- „ 2. Part of the mantle and visceral mass of *Sylon schneideri*; *a*, connective tissue of the mantle; *b*, epithelium surrounding the visceral mass; *e*, ovary; *f*, chitinous outer wall of the mantle; *g*, thickening of the chitinous outer wall at the place where later on the openings of the mantle-cavity occur; *h*, epithelium of the outer side of the mantle; *i*, epithelium at the inner side of the mantle; *l*, blood-plasma (?); *n*, nervous system. Magnified 136 diameters.
- „ 3. Part of the visceral mass of *Sylon schneideri*; *b* and *e* as in fig. 2; *c*, connective tissue; *l*, blood-plasma (?). Magnified 136 diameters.
- „ 4. Section through a part of *Hippolyte pusiola*, with *Sylon schneideri* attached to it; *e*, ovary of the parasite; *n*, nervous system of the *Hippolyte*; B, basilar membrane; *r*, roots of the *Sylon*; *m*, abdominal flexor muscles of the host. Magnified 30 diameters.
- „ 5. Section in front of the attachment of *Sylon schneideri* to *Hippolyte pusiola*; *e*, *m*, *n*, and *r* as in fig. 4; *t*, testis. Magnified 30 diameters.
- „ 6. Section of the same *Sylon* as in the two foregoing figures; *e*, *t*, as in fig. 5; *t'*, communication of the interior of the testis with the mantle-cavity. Magnified 41 diameters.

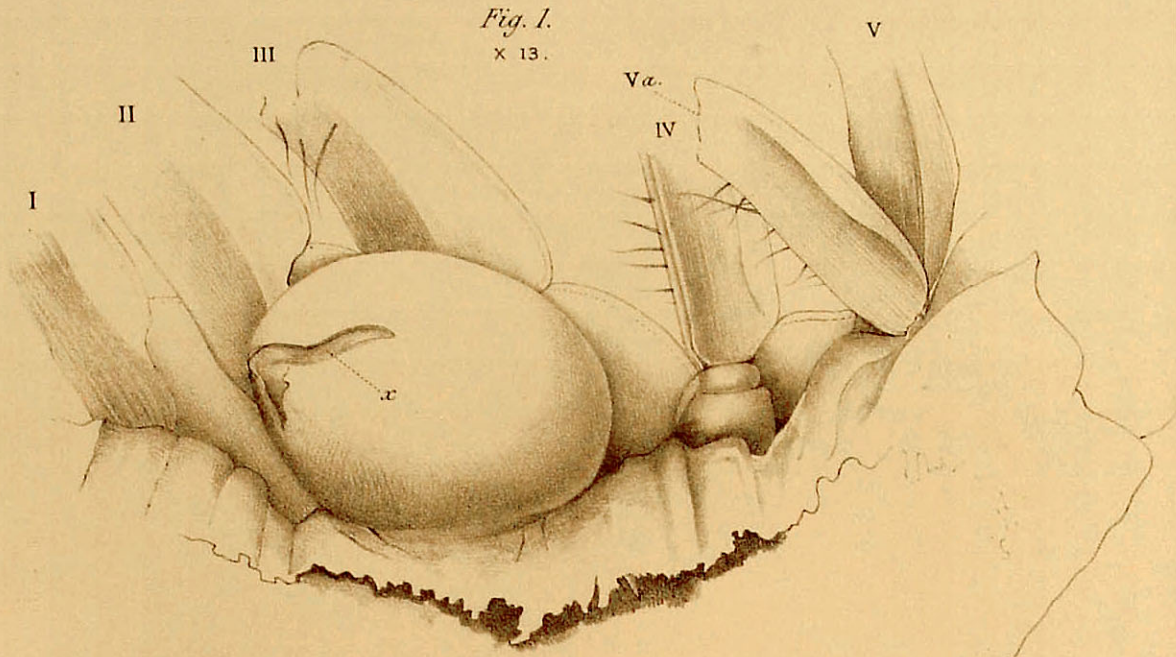


Fig. 2.
x 12.

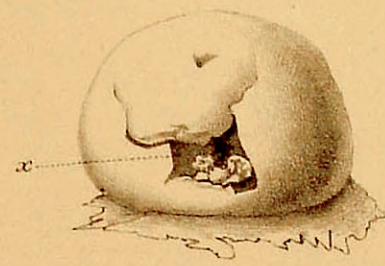
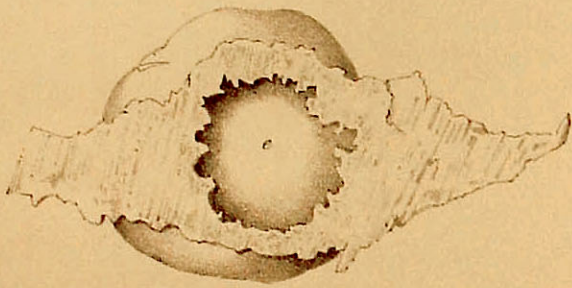


Fig. 3.
x 12.

Fig. 4.
x 12.

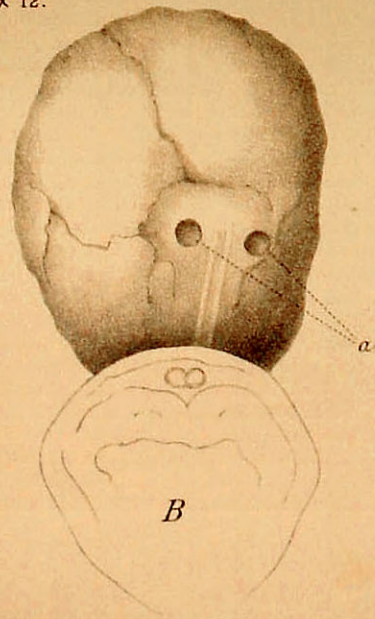
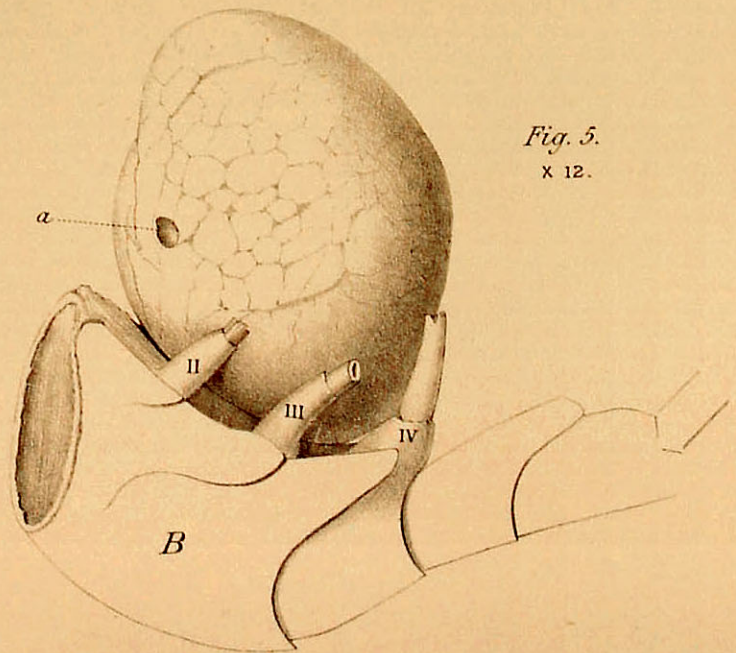


Fig. 5.
x 12.



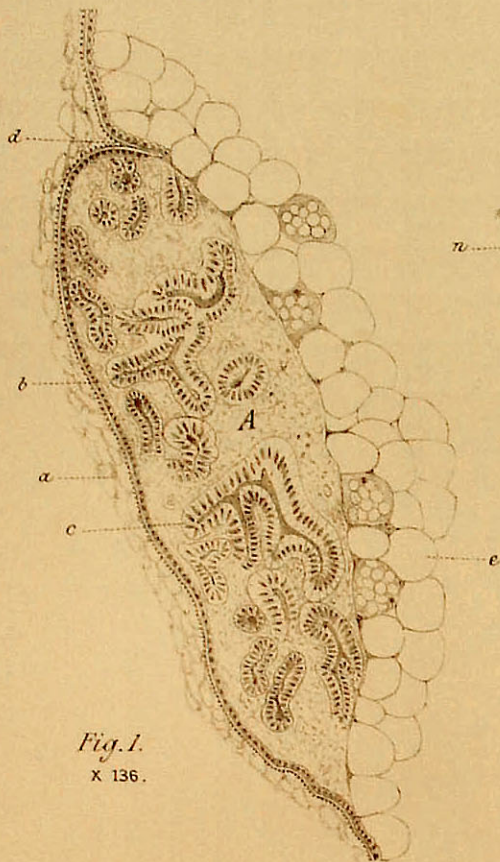


Fig. 1.
X 136.

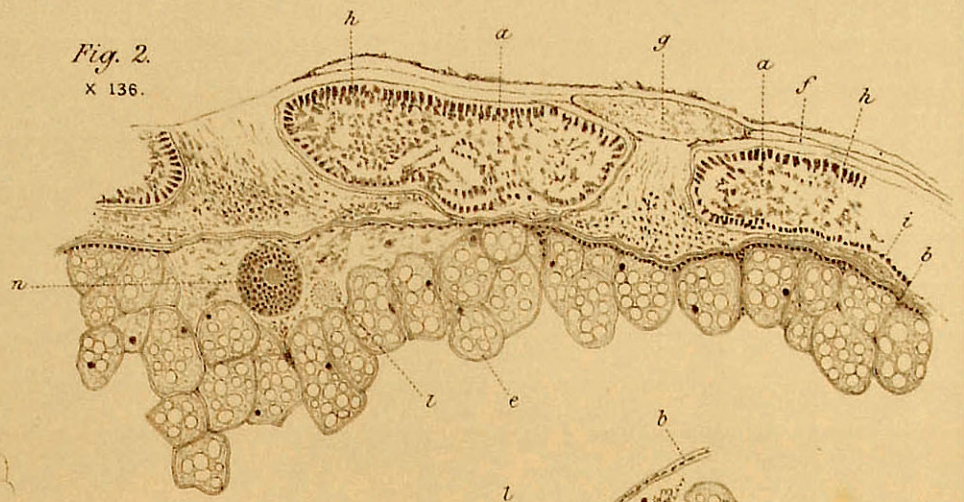


Fig. 2.
X 136.

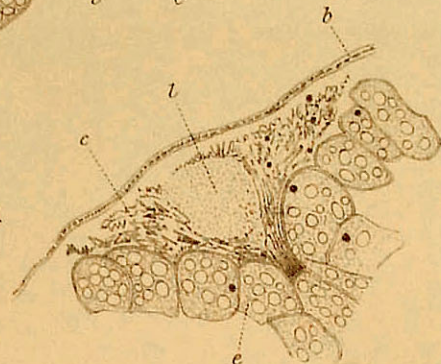


Fig. 3.
X 136.

Fig. 6.
X 41.

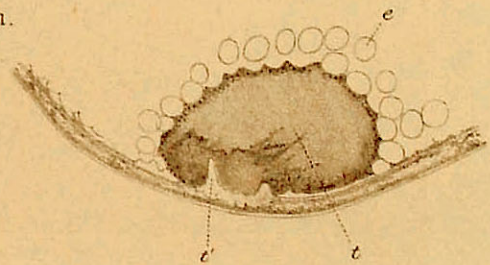


Fig. 4.
X 30.

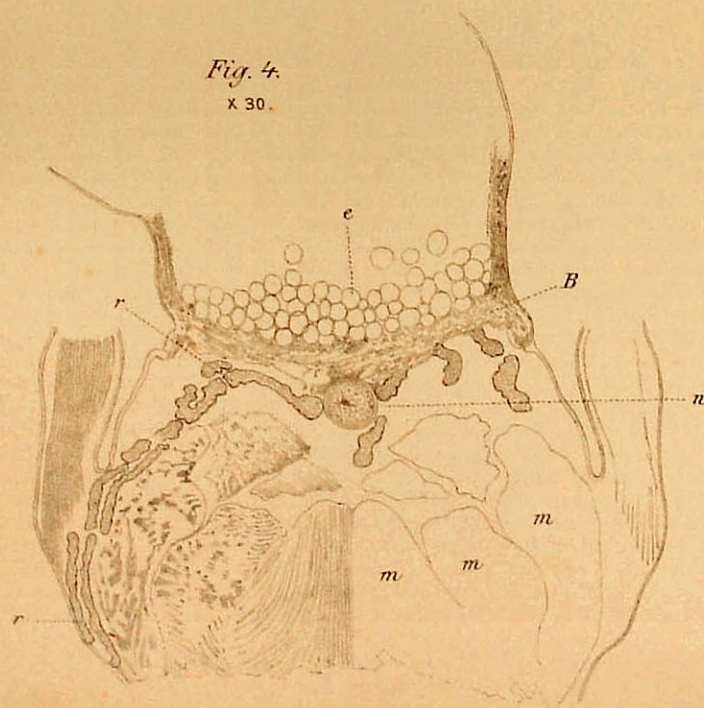
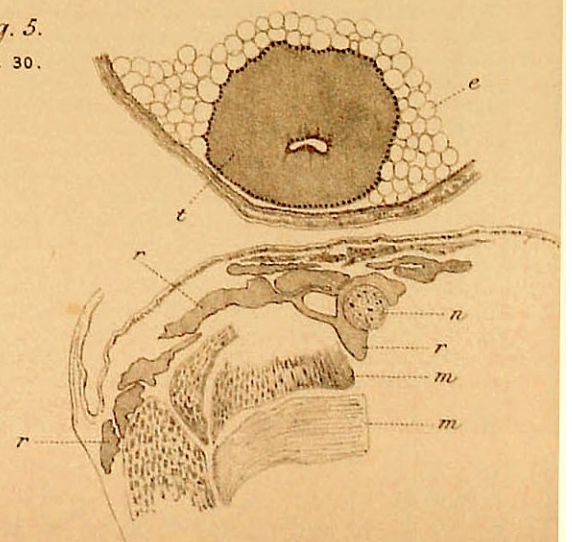


Fig. 5.
X 30.



P.P.C. Hook del.

1. SYLON CHALLENGERI.

2-6. SYLON SCHNEIDERI.

P. Ruth, Lithr.