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II.—*Note on an Alciopid, a Parasite of Cydippe densa, Forskål.* By EDWARD RENÉ CLAPARÈDE, Professor of Comparative Anatomy in the Academy of Geneva, and PAUL PANCERI, Professor of Comparative Anatomy in the Royal University of Naples\*.

[Plate V.]

THE authors, having made in the month of March last observations on the same subject, which agree and are mutually complementary, have determined to publish them in conjunction, and prior to other works, in order to make known sooner the first and perhaps the only observations that have been made on the metamorphosis of the *Alciopæ* †, and to illustrate this case of endoparasitism, singular among the Annelida ‡.

Among the many deep-sea animals which the currents bring into the Gulf of Naples, and which delight as well the resident naturalists as those who resort to these shores from distant countries, one of the numerous and elegant forms of the Beroids is a Pleurobranch, corresponding, as we think, to the *Cydippe densa* of Forskål, better described by Gegenbaur under the more recent name of *C. hormiphora* §. In some individuals of this species, obtained at different periods, there were visible within the gelatinous mass, and also towards the outer surface of the body, some white corpuscles, which at first sight we took for those larvæ of *Distoma*, with the tail armed, which have been described by G. Müller || as *Cercaria setifera*, and subsequently by Graeffe as *C. thaumantiatis* ¶,

\* Translated and kindly communicated by A. H. Haliday, A.M., from the 'Memorie della Società Italiana di Scienze naturali,' tomo iii. No. 4. Milan, 1867.

† An Alciopæ larva seems to have been seen by Leuckart (Arch. f. Naturg. xxi. 1855); but, to judge from the figure, we are inclined to think it may have been a young animal in the act of reproducing the posterior extremity of the body.

‡ As ectoparasitic or sedentary Annelida may be considered (besides a great number of *Hirudinea*) the *Stylaria* and the *Chætogaster* of *Lymnæus* and other Naids, as also the Amphinomid discovered by Fritz Müller in the cavity of the shell of *Lepas anatifera*, and referred to by him in his essay 'Für Darwin,' 1864, pp. 29, 30; to which we have now to add the *Myzostomum* of *Comatula*, according to what Mecznirow has published concerning its development and its position among the Annelida (Zeitschr. f. wissensch. Zoologie, Bd. xvi. 1866).

§ Studien üb. Organisat. u. Systematik der Utenophoren (Arch. f. Naturg. Bd. xxii. 1856). [= *Cydippe plumosa*, Sars, = *Hormiphora plumosa*, Agassiz.—*Note by TR.*]

|| Ueber eine eigenth. Wurmlarve (Arch. f. Anatomie u. Physiologie, 1850, p. 497).

¶ Beobacht. üb. Radiat. u. Würmer in Nizza (Denkschr. der Schweiz. Naturf. Gesellschaft, Bd. xvii. 1858).

For further details about these larvæ, see Claparède, Beobacht. üb.

and which commonly, and sometimes in multitudes, inhabit the external surface of nearly all the *Acalephæ* of the ocean and the Mediterranean; but the coexistence of others of a larger size, and the presence of minute *Annelida* in the stomach, have led us, with the help of direct observations, to the conviction that all these parasites are larvæ of *Annelida*, which the development and pigment of the eyes early indicated to belong to the family of the *Alciopids*.

The smallest of these larvæ, which we will call the first stage, and which scarcely attain the length of 1 millim., have the head not yet distinct from the rest of the body, and without any vestige of appendages. The eyes are not protuberant, but represented by a small crystalline lens, nearly spherical, posterior to which and in the interior is seen a layer of pigment. The body, elongated and with scattered pigmentary spots, has no indication of the division into segments, except in the presence of three pairs of conical feet, having each two short projecting setæ: vibratory cilia were observed in two tracts—from the mouth to the middle of the abdominal surface, and again in the extreme posterior region. The opening of the mouth has the form of a simple fissure, to which succeeds a muscular tube, then a spacious gastric sac, open behind.

In the larvæ which we call the second stage, the head acquires a greater development; the eyes become prominent, and, in addition to the crystalline and the layer of pigment, show a ring which defines their outline. The oral segment has now become apparent, furnished with two rudimentary appendages; and the tube now becomes gradually exsertile from the mouth. The body is more elongated, has lost the cilia, and, besides the three rings furnished with setigerous feet, shows the outlines of the consecutive segments.

The larvæ in the third stage attain the length of 2–3 millims.; and the largest of them have four tubercles, which are the first vestiges of the antennæ. The eye is further increased in volume, and the choroid is gradually acquiring pigment in its posterior segment. The other feet, additional to the three primitive pairs, become furnished with setæ, and are gradually developed, so that sixteen segments or more may now be counted, the anterior ones possessing prominences and pigmentary spots, representing respectively the cirrus and the tubercles of the dorsal region in its more advanced stage.

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Anatomie u. Entwicklung wirbelloser Thiere an der Küste von Normandie, 1863, p. 12, and the investigations on the same subject by Prof. A. Costa (*Rendiconto d. R. Accad. d. Sc. Fische e Matematiche di Napoli*, fasc. 4, Aprile 1864).

The cirri of the feet and the spots become more conspicuous in the next or fourth stage, in which the antennæ are better marked, the eyes enlarged, the number of segments increased to nineteen, and the body attains the length of 4 millims.

But it is in the fifth stage that the structure of the eyes is best seen, as they now appear surrounded by several layers of cells, the nuclei of which are easily rendered visible by means of an ammoniacal solution of carmine, and which are probably of nervous matter, composing as they do that layer external to the choroid which exists, as is known, in the adult *Alciope* as well as in many Mollusca, the Cephalopoda and Heteropoda for instance, in which the gangliary portion of the retina is seen posterior to the choroid. It is in this stage (distinguished further by the appearance of the capillary setæ) that we were enabled to distinguish the dorsal vessel with the perfectly transparent blood.

In the sixth stage, the four antennæ are still more produced, and the choroid appears completely lined with pigment, and composed of grains disposed in perfectly regular series. Besides the nervous layer composed of cells of which we have spoken, another layer is visible, exterior to this, surrounding the entire bulb, which, though composed of cells resembling those of the nervous matter, is analogically to be considered a sclerotic. The crystalline is evidently enlarged, and beyond the nucleus presents the appearance of stratification. The larvæ in this stage measure 5 millims. in length, and have from twenty to thirty segments. The feet of the first three pairs, which evidently correspond to the original feet of the larva in its first stage, appear smaller than the rest, and consist of a stump, deprived of the setæ and sheathing fine acicular darts, and of two cirri, the dorsal one conical, the ventral short and broader in proportion. The other feet have become more developed; they are conical, with a dorsal cirrus in the form of a pedunculated oval plate, and a smaller ventral cirrus, besides a dorsal tubercle with scattered pigment-cells, the ramifications of which are interlaced in an intricate manner. The setæ are of two sorts,—the first numerous, capillary, simple, flexible; the others larger, one of them projecting a little from the foot, with a surface armed with very delicate spinules, while the other, of similar structure, remains concealed in the interior of the foot, like a dart with the point only a little exerted\*.

\* Setæ and a surface beset with very minute spines have been described by one of the authors in a larva of a Dorsibranch, as yet undetermined, which has some points of analogy to the one in question (Claparède, Beobacht. t. vi. p. 77).

The larvæ of the most advanced stage which we have observed are a centimetre long, with about thirty-six segments. The upper antennæ are elongated and somewhat porrected, while the lower ones retain the form of tubercles. The eyes, now more amply developed, have the form which they exhibit in the adult *Alciopæ*, and, in conjunction with the lobes of the head, have the faculty of executing movements which change the direction of their axis. Except the hindmost pairs, which still want them, the feet are furnished with setæ, as has been stated already, and as is shown in the figures.

In all these larvæ, besides the pigmentary spots of the dorsal tubercles, there are also pigment-cells, more or less dark in colour, with fine ramifications, in the tegument of the head and of the dorsal portion of the segments; but these have not, except in the first stage of the larvæ, the regular arrangement usual in the larvæ of other Annelida.

The larvæ from 5 to 10 millims. long we have found in the stomach of the *Cydippe*; and we should have been inclined to consider them to have been accidentally introduced, or as the food of the *Cydippe*, if we had not obtained the others, of smaller size, from the external tissues of the animal. This seems to establish that they are parasites, inhabiting probably the gastrovascular canals. Hence it seems to us a reasonable supposition that the eggs, detached from the dorsal tubercles of the mother, to which they appear constantly to adhere for a certain period in the *Alciopæ*, as is proved to be the case with other Annelida, are then swallowed by the *Cydippe*, and pass, along with the serochyme, by means of the four principal canals which branch off from the bottom of the stomach, into the pleural canals, and from them into the smaller ones, whence, as the growth of the larva goes on, they find their way back into the larger canals and the stomach, out of which they may easily escape or be expelled. Yet another hypothesis may be considered—that the eggs are developed at large in the water, and that the swimming larva penetrates into the *Cydippe*—on which supposition the cilia may be regarded as the instruments of locomotion. But, in either case equally, whether the eggs are hatched in the body of the *Cydippe* or out of this, as the cilia of the hexapod larvæ are few and soon disappear entirely, both these circumstances attest the parasitic habits of the larvæ. The prolonged existence of these organs in swimming larvæ, and their persistence in some parts of a great number of adult Annelida, and even of some adult animals of the same family to which our larvæ belong, corroborate the importance of this character, which is intimately related to the particular mode of life which we have described.

No doubt it will have seemed strange to the readers of the title of this Note that deep-sea Annelida, with eyes so well developed and with natatory organs, should pass through a stage as parasites, which might have been more readily admitted in the case of Annelida shapeless, blind, and degraded; and yet it seems to us very evident that the larvæ we have described, and perhaps those of other Alciopids also, present this condition of temporary endoparasitism for this very end, that the eyes and feet, under such circumstances, may have time and the conditions favourable to their development and growth.

In conclusion, it may be demanded to what form of the Alciopids these larvæ are to be referred. In the most advanced stage to which we have traced them, they cannot be assigned to any known genus: but whether the tentacles of the oral segment continue short or are lengthened in the progress of development, we shall have a new genus, characterized principally by the four antennæ, the two tentacles of the oral segment, and by the difference of structure of the first three pairs of feet from the rest, as well as by other characters of generic value, which may be gathered from the description we have given. The subjects being larvæ, and not adult animals, we cannot at present give a complete and positive character; nevertheless, being convinced that the genus is new, we propose to distinguish our Annelid by the name of *Alciopina parasitica*.

Subsequently to these studies of ours, Herr Buchholtz, of the University of Greifswald, having observed, at Naples also, in the month of May, similar larvæ in the same *Cydippe*, on collating these with ours, has found that they are of the same genus, but differ as to the number of the large setæ, which are four instead of two, and not muricated, accompanied by a dart. These observations, while they confirm our suspicion that there are other kinds of Alciopids which resemble that described by us in the mode of life at first, present a new incitement to further investigations of the subject.

#### EXPLANATION OF PLATE V.

- Fig. 1.* *Cydippe densa*, Forskål, with parasitic larvæ inside. The stomach and principal gastrovascular canals injected.  
*Figs. 2, 3, 4.* Ciliated larvæ, first stage. Natural length 1 millim.  
*Fig. 5.* Larvæ, second stage; the cilia gone.  
*Figs. 6, 7.* Larvæ, third stage, in which the antennæ begin to appear and the feet acquire greater development. Nat. length 2-3 millims.  
*Fig. 8.* Larva, fourth stage, with the development of the antennæ, eyes, and feet more advanced. Nat. length 4 millims.

- Fig. 9.* Larva, fifth stage; the dorsal vessel and the flexible setæ have made their appearance.
- Fig. 10.* Larva, sixth stage: the three original pairs of larval feet have lost the setæ; the others are furnished with two sorts of setæ. Nat. length 5 millims.
- Fig. 11.* Larva, seventh stage, in which the upper pair of antennæ are more developed. Nat. length 10 millims. The tube is represented in the act of emerging.
- Fig. 12.* Eye of larva in sixth stage: *a*, swelling of the cephalic ganglion; *b*, gangliary layer of the retina; *c*, choroid; *d*, crystalline; *e*, sclerotic.
- Fig. 13.* Fragment of the choroid.
- Fig. 14.* Foot of larva in the sixth and seventh stages: *a*, dorsal cirrus; *b*, abdominal cirrus; *c*, foot proper; *d*, dorsal tubercle.
- Fig. 15.* Setæ: *a*, the larger spinulous ones; *b*, the simple flexible ones.

III.—*On a new Volute.* By FREDERICK M'COY, Professor of Natural Science in the University of Melbourne.

[Plate III. figs. 1 & 2.]

*Voluta (Amoria) canaliculata* (M'Coy).

*Sp. Ch.* Elongate-ovate; spire short, of  $4\frac{1}{2}$  whorls, distinctly channelled at the suture; pillar with four strong, subequal, oblique plaits, the most posterior continued into ridge of anterior thickened belt. Colour whitish (faded specimen), with, on body-whorl, five spiral rows of longitudinally elongate-oblong tawny spots, one row at the suture. Total length 1 inch  $8\frac{1}{2}$  lines, proportional length of aperture  $\frac{80}{100}$ , greatest width  $\frac{50}{100}$ .

This *Volute* differs from the *V. (Amoria) maculata*, which it most nearly resembles in shape and colouring, by the spots being more numerous and shorter, by the plaits of the pillar being oblique, by the width being greater and the greatest width being nearer the suture, and by the suture being distinctly canaliculated.

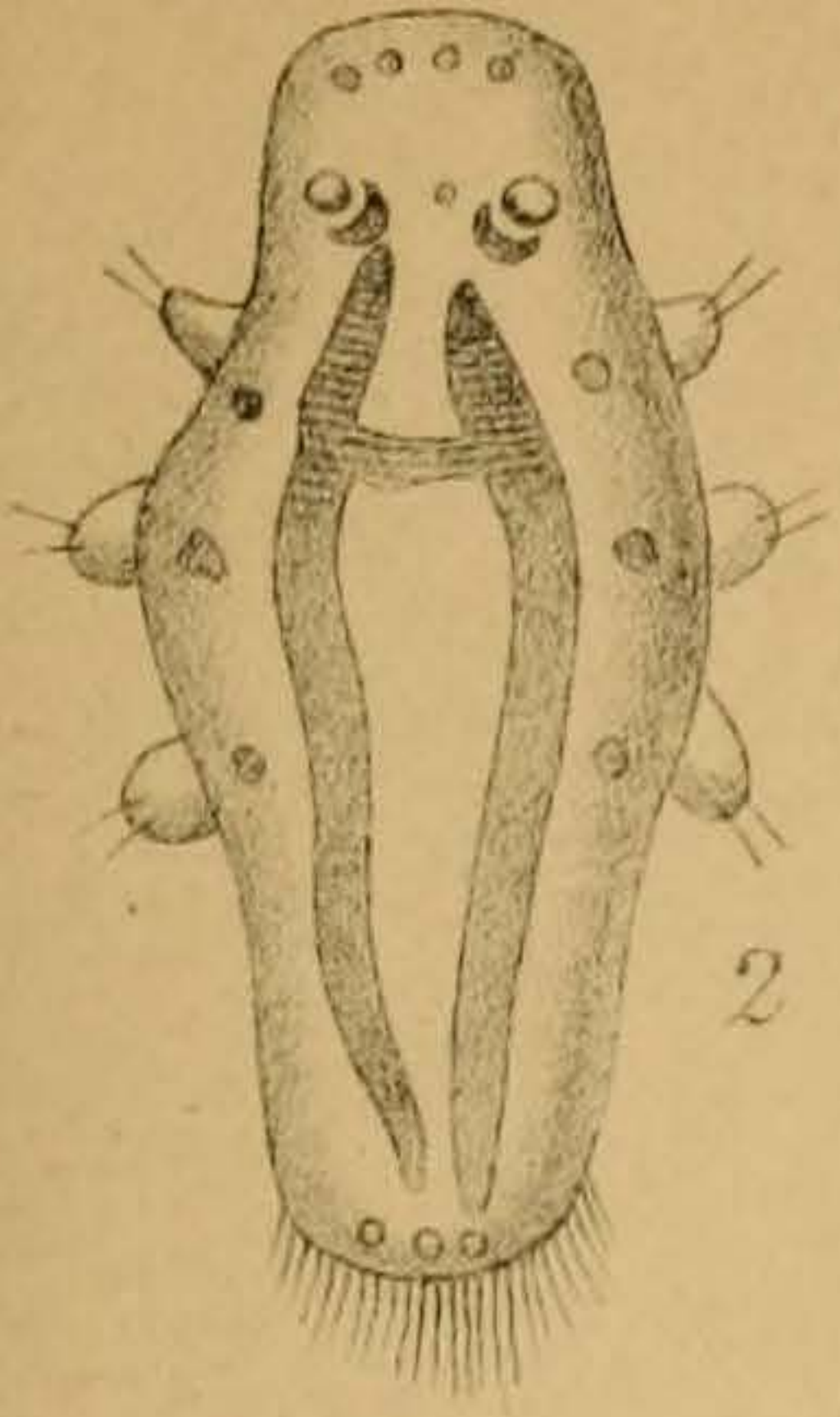
I obtained the only specimen I have seen of this species, for the National Museum at Melbourne, from Mr. R. Thatcher, who had observed the fact of its being specifically distinct from the *V. (A.) maculata*.

*Locality.* Port Denison.

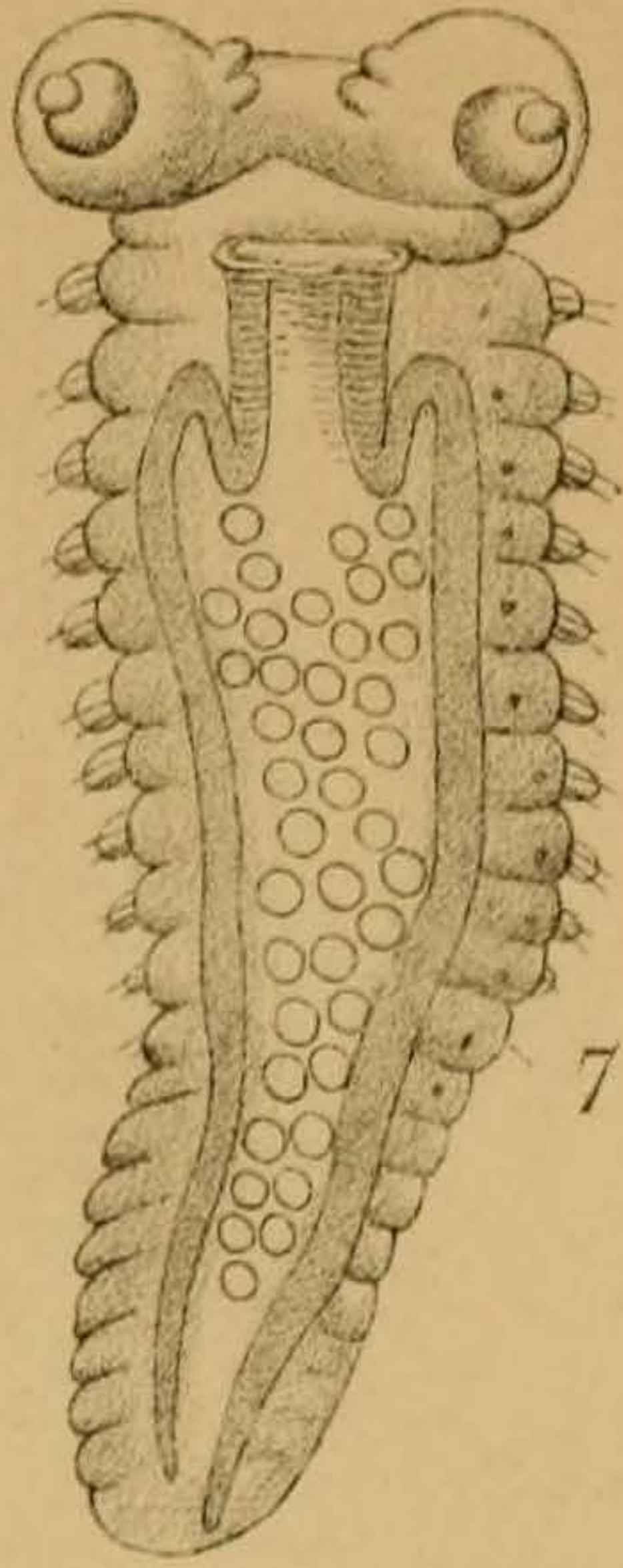
EXPLANATION OF PLATE III.

*Figs. 1 & 2.* *Voluta canaliculata*, back and front views, natural size.

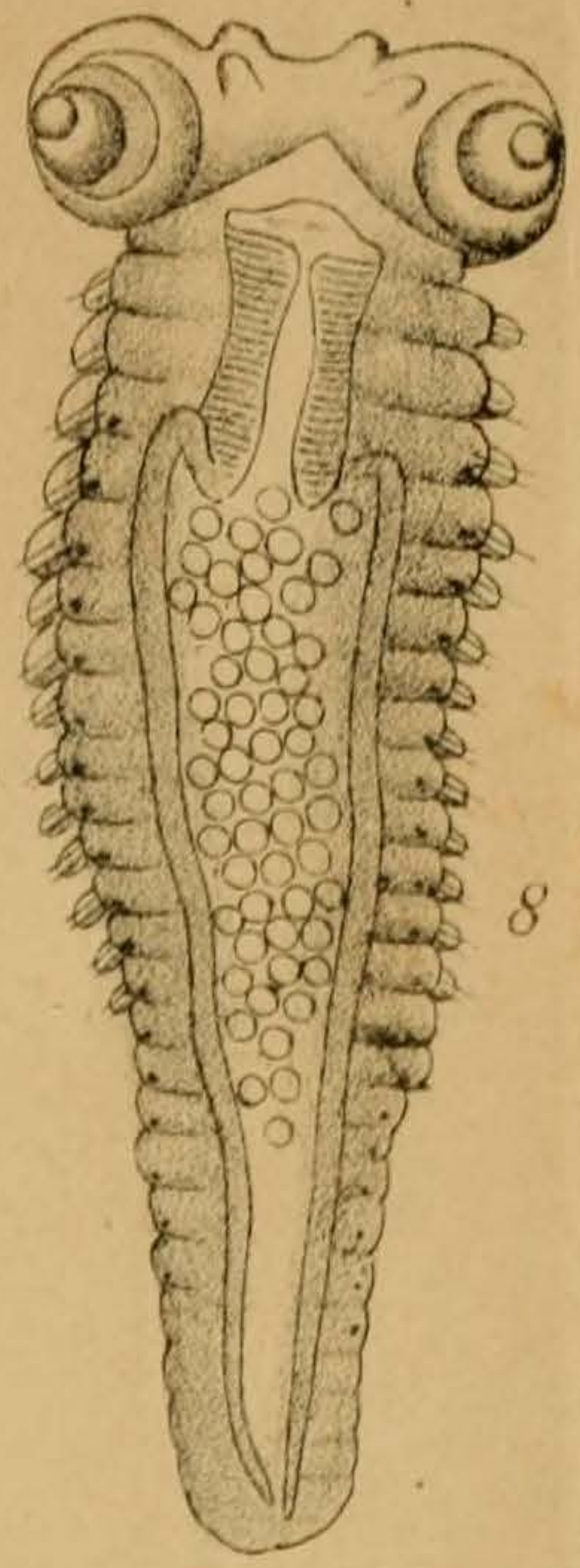




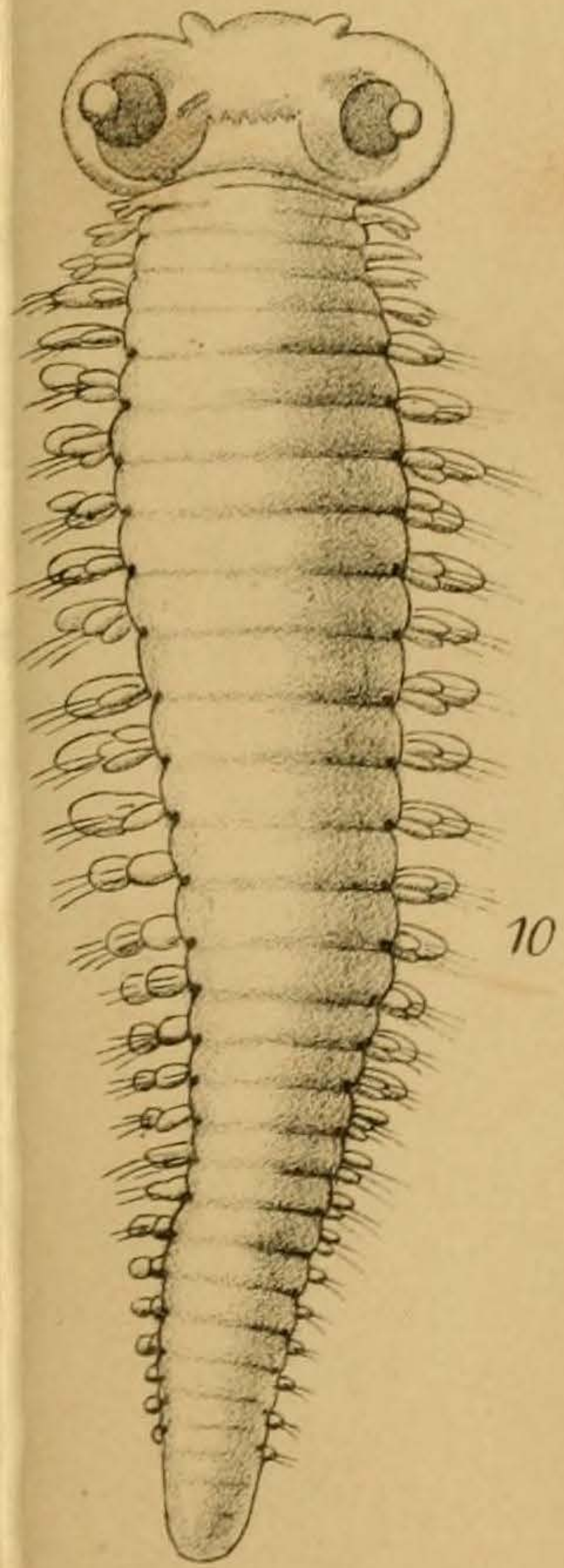
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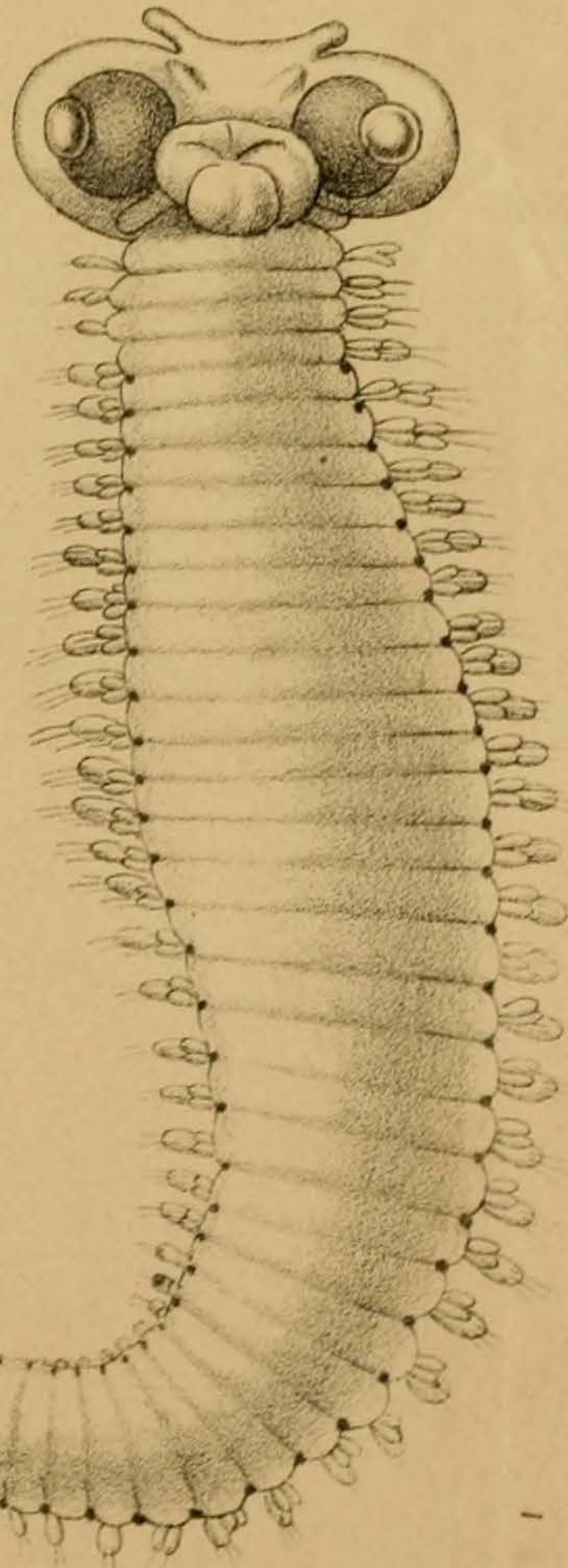


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b



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