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been unnecessary. It is probable that the point will never be decided, and, as Schmarda's worm no longer forms an exception to the zoo-geographical problem, its decision is now of little importance.

EXPLANATION OF PLATE XI.

The illustrations of the anatomy of the earthworms described in this article are purely diagrammatic, indicating only the segmental position of the various organs, the worm being supposed to be slit up along the dorsal line and the body-wall pinned aside.

A group of three diagrams refers to each worm herein described. The left-hand diagram in each of the groups referring to a species represents the external features. The location of the various genital pores is represented as round black dots (if on a papilla this is left white), the clitellum is obliquely shaded, the tubercula pubertatis are vertically shaded.

In addition, the arrangement of the chætæ—labelled *a*, *b*, *c*, *d*—is indicated in segments 5 to 23 on one side; they are omitted on the other side for clearness' sake. The true relative spacing of the chætæ is shown.

The position of the nephridiopores is indicated by the small circles on one side of the figure.

The middle figure represents the alimentary canal and so much of the vascular system as is diagnostic. The latter is black. The gizzard is indicated by vertical shading, the œsophageal glands by more or less horizontal lines. The intestine is not represented as being constricted, which is, however, the case in most worms.

The right-hand figure shows the reproductive system. The gonads are in black. The sperm-sacs are dotted. The sac with penial chætæ when present is indicated, and the muscular duct of the spermiducal gland is transversely striped. The transverse muscles in the 18th segment are shown.

No attempt is made to give the relative sizes of the worms or of the various organs.

ART. XIX.—*On the Oligochæta from the Southern Islands of the New Zealand Region.*

By W. B. BENHAM, D.Sc., M.A. F.Z.S., Corr. M. R. Soc. Tasm., Professor of Biology, University of Otago.

[*Read before the Otago Institute, 13th September*, 1904.]

Plates XII. and XIII.

IN the winter of last year (July, 1903) Dr. L. Cockayne paid a visit to the southern islands on the Government steamer "Hinemoa," and while collecting plants was good enough to collect earthworms, which he kindly handed over to me. The following is the list of worms described in the present paper, all but the last being collected during this expedition :—

Fam. MEGASCOLECIDÆ.

Subfam. ACANTHODRILINÆ.

(1.) *Notiodrilus aucklandicus*, Benham.
(2.) *Notiodrilus campbellianus*, n. sp.
(3.) *Rhododrilus cockayni*, n. sp.
(4.) *Rhododrilus leptomerus*, n. sp.

Fam. ENCHYTRÆIDÆ.

(5.) *Marionina antipodum*, n. sp.
(6.) *Enchytræus albidus*, Henle.
(7.) *Lumbricillus macquariensis*, n. sp.

We already know two species of *Notiodrilus* from these southern islands—viz., *N. macquariensis*, Beddard, originally described some years ago, and more recently studied and illustrated by myself,* and *N. aucklandicus*, described by myself in 1902. Hitherto these two worms have been the only Oligochæta recorded from this region, and the other islands have been unexplored for this branch of their fauna. The present contribution thus adds a third species of *Notiodrilus*,† as well as two new species of *Rhododrilus*, which is endemic in New Zealand, and, unlike some of our other genera, is represented alike in the North and South Islands, as well as in the Chathams. The presence, too, of Enchytræids in these southern islands is of interest, as species of both *Marionina* and *Lumbricillus* have been recorded from South Georgia and Tierra del Fuego, while the same species of *Enchytræus* has been met with all over the globe.

The Oligochætal fauna, so far as are known, may here be summarised :—

Antipodes Island :—
Notiodrilus aucklandicus.
Marionina antipodum.

Lord Auckland Isles :—
Notiodrilus aucklandicus.
Rhododrilus cockayni.
Rhododrilus leptomerus.

Campbell Islands :—
Notiodrilus aucklandicus.
N. campbellianus.
Rhododrilus cockayni.
Enchytræus albidus.

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* Trans. N.Z. Inst., 1900 and 1902.

† It may be that these three forms are local varieties of one and the same species.

Macquarie Islands :—
Notiodrilus macquariensis.
Enchytræus albidus.
Lumbricillus macquariensis.

In the present paper I confine myself to detailing the characters of the new species, and will postpone a consideration of the bearing that the facts of geographical distribution have in regard to the previous extension of the New Zealand land surface. I have so much new material waiting investigation that it is desirable to gather together these facts in a general paper at a later date.

Dr. Michaelsen has recently* pointed out that *Notiodrilus kerguelarum* is to be found not only on dry land but also on the sea-shore within reach of the sea-spray, in company with typically littoral Oligochæta such as *Enchytræus albidus*—or, to use his term, it is " euryhaline." It is worthy of note, therefore, that in the collection made by Dr. Cockayne there is further evidence in support of this statement, for in the bottle containing *N. campbellianus* there are *Enchytræus albidus*, a few Polychæta, and a Nemertine. After reading Michaelsen's remarks I wrote to Dr. Cockayne for further details as to the " stations " at which these worms had been obtained, and he writes me that " all the Campbell Island worms were collected near one another on the stony shore of Perseverance Harbour, just above high-water mark. I collected no other worms on Campbell Island. It is possible that sea-spray may reach any place at which the Adam Island worms were collected, but the soil cannot be termed brackish in any degree. As for Ewing Island worms, these were collected on or near the shore. On the other hand, the 'peat bog' in which the worms from Antipodes Island were collected is quite out of the influence of the sea-spray."

Notiodrilus aucklandicus.

The single specimen from the Antipodes Island is, curiously enough, truncated anteriorly, and has lost four anterior segments; this injury, however, is entirely healed up, but no new prostomium has yet been formed, nor have the anterior segments been regenerated, for the porophores, instead of being on segments 17 and 19, occur on the 13th and 15th. Granting this loss of four segments, the organs occupy the normal position.

The colour differs somewhat from the type in being yellowish instead of grey posterior to the clitellum. This is not due to the preservative, for formaline was used in both cases, but is due to colour of intestinal contents.

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* Die Geograph. Verbreit. d. Oligochæten, 1903.

The specimen is smaller than the type, being only 55 mm. × 2 mm.

It was collected in "bog land, in peat of *Pleurophyllum*." This "*Pleurophyllum* meadow" is described in detail by Dr. Cockayne in his interesting article "A Botanical Excursion during Midwinter to the Southern Islands of New Zealand"*: "Then the leaves of the past year lie rotting upon the surface of the soil, while their bases form great decayed masses many centimeters in thickness round the leaf-bases of the young leaves of *Pleurophyllum criniferum* or *P. hookeri*. In these sheaths of decaying leaves considerable numbers of earthworms were found, and they appear also to be fairly numerous in the peat itself."

Those from the Campbell Islands were obtained from the "roots of plants" in some number, mature and immature. Their colour is pinkish-brown anteriorly, instead of sienna-brown as in the type. The only noticeable difference anatomically from the type is the absence of definite œsophageal glands, though the gut-wall is thicker and dilated in segments 13, 14, and 15. Also the diverticula of the spermathecæ arise from the duct free from the body-wall.

From Adam Island (one of the Lord Auckland Group) I received nine specimens, of which three are immature. These show no sensible variation in colour.

Notiodrilus campbellianus, n. sp.

Three specimens were obtained, of which two are immature; all are ill-preserved.

Colour (in formaline).—Dark chocolate-brown, with paler clitellum.

Length, 50 mm., approaching *N. macquariensis*.

Prostomium is epilobic, one-third, with a transverse groove.

The *chætæ* are isolated, the interspaces nearly equal, though the gap *bc* (= *aa*) is greater than *ab* or *cd*, and *dd* is considerably greater than *aa*. This chætal formula agrees with that of *N. macquariensis*.

The *clitellum* is complete, extending over segments 13 to 16 in the only mature specimen in my possession.

Genital Pores, &c.—The porophores are white, in line with *b*. There are also paired copulatory tubercles, quite pale in colour, near the anterior margins of segments 17, 19, and 20, in line with *a*; while behind the spermathecal pores in segments 8 and 9 similar tubercles occur in the same line. This, in general, agrees with what I have recorded for *N. aucklandicus*, for in *N. macquariensis* no mention has been made of such tubercles.

Internal Anatomy.—The dorsal vessel is single, and the last

* Trans. N.Z. Inst., 1903, p. 257.

heart is in the 12th segment, as in *N. aucklandicus*. There are no distinct œsophageal glands.

Reproductive System.—The long undulating prostates extend through six and four segments respectively, terminating in segment 22. The duct is thick and muscular, and rather swollen at its entrance to the body-wall.

The penial chæta is rather strongly curved below the tip, as in the allied species, but is more delicate than in either of these. The tip is blunt, as in *N. aucklandicus*, and the ornamentation is in the form of pectinated ridges, as in that species, but are not so close together as in the type, nor do they extend so far towards the tip.

The spermatheca resembles that of *N. macquariensis* in its globular form and two divergent diverticula.

Remarks.—This species is evidently very closely allied to *N. aucklandicus*, yet it differs in several respects from it, and approaches *N. macquariensis* in these points—viz., in its small size, in the spacing of the chætæ, absence of distinct œsophageal glands, form of the spermatheca.

Although I have given a new specific name to this worm, it may become desirable to consider these three forms as varieties of one species.

Hab. Campbell Island. In the bottle containing these specimens were also some *Enchytræus albidus*, Polychæta, and Nemertine. They were all collected near one another close to the sea.

Rhododrilus cockayni, n. sp.

Seven individuals were collected, of which the majority are sexually mature.

Colour.—The general colour is a greyish-purple, darker anteriorly, with brown clitellum. The posterior region is very pale, with a purplish-grey line along the dorsum. The body-wall is thin.

Dimensions.—The specimens have a length of from 100 to 150 mm., with a diameter of 3·5–4 mm. immediately behind the clitellum. The segments number 72 in the shorter and 110 in the larger individuals.

The *prostomium* is epilobic, about one-quarter, without a transverse furrow.

The *chætæ : a* and *b* are nearer together than are *c* and *d*, and the formula here is $aa = bc$; $dd = 2cd = 3ab$; or $ab < cd < bc < dd$; while towards the tail *ab* widens out so that the four chætæ on each side are nearly equidistant.

The *clitellum* is saddle-shaped, extending as far downwards as chæta *b*, and covers segments 13–17.

Genital Pores, &c.—The single pair of porophores on the 17th

segment are in line with *ab*, but the male pore is in line with *b*. Copulatory tubercles are variously developed, but in all the mature specimens there are paired oval post-chætal glands on segments 10 and 11 in line with *ab*. Some individuals have others on segment 9 and even on the 8th as well. In a single case, similarly paired papillæ occur on segments 19 and 20 as well as on the two anterior segments, and all are in the same relative position on the segment, and have the same form—viz., transversely oval, with a slight depression—giving the impression of a sucker.

Spermathecal pores : Three pairs, at the anterior margin of segments 7, 8, and 9, in line with *b*. Nephridiopores also in line with *b*.

Internal Anatomy.—The six septa behind segments 8–13 are stout. The dorsal vessel is single ; last heart in segment 12. The worm is meganephric.

Alimentary Tract.—A very small gizzard occupies the 5th segment. A large lobulated and highly vascular salivary gland lies on each side of the pharynx. The œsophagus is distinctly dilated in the 13th segment to form a spherical sac, the lining of which has the general villous structure of a gland, though the lateral region is not constricted from the axial œsophagus.

In segments 14–17 the gut is narrow, with a yellowish wall ; in the 18th it suddenly dilates to form the thin-walled intestine.

Reproductive System. — Three pairs of sperm-sacs occupy segments 9, 11, and 12. The spermiducal (prostate) glands are long, tubular, and undulating: each extends through the five segments 17 to 21 inclusive. The short muscular duct is confined to segment 17. The sacs of penial chætæ are also long. On the removal of the arcuate muscles from segments 16, 17, and 18, the two sperm-ducts on each side are readily seen on the body-wall, and can be traced backwards outside the prostate duct, where they bend mesially behind it and the penial sac to open to the exterior.

The penial chæta (Plate XIV., fig. 6) is long, delicate, and curved rather abruptly near the tip, which is slightly recurved.

The only " ornamentation " is in the form of a few scattered minute serrated markings some little distance below the tip.

The three pairs of spermathecæ are in segments 7, 8, and 9 (and in one specimen from Adam Island there are three on the left side but four on the right). These increase in size backwards, and the diverticulum becomes relatively longer. Each spermatheca (Plate XIV., fig. 2) consists of a large somewhat ovoid sac with a short wide duct, into which opens a curved cylindrical diverticulum. This, in mature forms, is longer than

the "ampulla," though in the young form and in the anterior sacs it is shorter.

Hab. Campbell Island; Ewing and Adam Islands of the Lord Auckland Group.

Rhododrilus leptomerus, n. sp.

This peculiar species is represented by two mature individuals collected "on moss (? Auckland Islands)."

Colour.—Pale-yellowish, with a white clitellum.

Dimensions.—Length, 75 mm.; breadth, 3 mm; with 82 segments.

Prostomium epilobic, one-half, with a posterior transverse groove.

Chætæ in couples, the individuals of the ventral couple being rather near, the other spaces wide: $aa = bc = cd = 2ab$; $dd = 1\frac{3}{4}aa$.

The *clitellum* is saddle-shaped, and covers segments 13 to 16; it has well-defined margins anteriorly and posteriorly, and appears to be fully developed, as the intersegmental furrows are obliterated except on the ventral surface.

Genital Pores, &c.—A single pair of porophores occurs on the 16th segment in line with chæta *b*: it is only feebly prominent, and on it are three pores, as in other species of the genus—viz., one common to the sperm and prostate ducts, the other two for the two penial chætæ. There are no copulatory tubercles. There is a single pair of spermathecal pores between segments 7 and 8. Nephridiopores in line with chæta *c*.

Internal Anatomy.—There are no thickened septa. The only notes on the vascular system are from longitudinal sections, which show two pairs of hearts, in segments 10 and 11 respectively, of which those in the former segment are especially large. But owing to the hard-coagulated blood in the wall of the gut and blood-vessels the sections were somewhat torn, and I was unable to trace the matter further.

The Alimentary Tract.—There is a short thick-walled gizzard in segment 6, concealed by the muscles of the pharynx. The œsophagus is dilated in segments 12 and 13, but no definite glands are formed. The intestine commences in the 15th segment, where the thick wall of the œsophagus is replaced by a thin wall. The typhlosole is a very low ridge.

Reproductive Organs.—There are two pairs of testes in segments 9 and 10. The three pairs of sperm-sacs are in segments 8, 10, and 11. The first is small and attached to the hinder septum; the others larger and attached to the anterior septa of their segments. All are "botryoidal" and contain developing spermatozoa. The spermiducal gland on each side is very long,

undulating, and bent in a U-shaped fashion. It occupies five segments, 16 to 20 inclusive. The free end of the gland lies in the former segment, and the closely undulating or zigzag portion extends into the 20th, against the hind wall of which it bends sharply on itself, and the rather wider recurved limb passes forwards into the 19th, at the anterior end of which the muscular duct commences. This is narrow and long, passing through three segments to open to the exterior at the 16th segment. The penial sac is also long, occupying the four segments 16 to 19 inclusive.

The penial chæta (Plate XIV., fig. 7) is long, curved, with a spoon-shaped pointed tip, and is without ornamentation. The total length of a penial chæta is 4 mm.

The ovaries are plainly visible in the dissected worm in the 12th segment.

The single pair of spermathecæ lie in the 8th segment. Each (Plate XIV., fig. 3) is a subglobular sac with a short thick duct, which receives a relatively large cylindrical diverticulum which is bent upon itself.

Remarks.—The most remarkable feature about this species is the apparent shifting forwards of the genital organs by one segment—*i.e.*, the genital pore, instead of being on the 17th, is on the 16th segment, and each of the internal genital organs—ovaries, testes, and sperm-sacs—similarly occupy the segment preceding the one normal for the genus. As to the spermatheca in the 8th segment, it is uncertain whether this has been affected, for in *R. edulis* the single spermatheca is in this segment, though in other species with a single pair it is in the 9th.

The position of the male and female gonads is so constant throughout the whole group of earthworms, with the exception of the *Moniligastridæ*, that this forward movement is very puzzling.

Both individuals present this same dislocation. Naturally, this led me to re-examine very carefully the external and internal segmentation, both with a lens of high power and, after bisection and clearing, with the compound microscope, and, further, I cut one individual into a series of longitudinal sections. It at once occurred to me that the prostomium and peristomium might be invaginated, or that an injury had been received at this end; but the latter suggestion was negatived by the occurrence of two individuals presenting precisely the same phenomenon; and, moreover, there is no sign of injury at this anterior end. The prostomium is perfectly well defined; it has the usual relations to the peristomium—it is, indeed, "dovetailed" into the latter segment.

The 1st segment has no chætæ—*i.e.*, it agrees with the usual

character of the peristomium. The chætæ commence in the 2nd segment. This and the following segments are perfectly normal: there is no indication of a double set of chætæ in any of them. There is no furrow in the 1st or 2nd or any subsequent segment to suggest a fusion of two segments; in fact, the segments are not annulated, as is sometimes the case. The worms are fairly soft, not contracted at all, so that the limits of the segments are quite distinct and definite. There seems no possibility of error in the enumeration of the segments such as does occur in a strongly annulated worm (*e.g.*, *Octochætus*). There seems to be no means of explaining the peculiarity from an external examination. Internally, too, the septa, though thin, are quite distinct. There is none of that shifting of septa that occurs in many large worms; and, as the soft condition permitted it to be fully extended, there is no crowding of the septa. Repeated countings, both externally and internally, gave the same result—viz., the ovaries (fortunately large and readily seen) in segment 12, and other organs one segment forward. There is no "spiral segment" such as has been observed by Morgan and others. Longitudinal sections show that the cerebral ganglia occupy the normal position at the hinder part of the 3rd segment; the circumpharyngeal commissure lies in this segment, and the first ventral ganglion occupies the anterior half of the 4th segment, and a single ganglion corresponds to each of the subsequent segments.

The condition of preservation is not sufficiently good to enable me, with certainty, to study the detailed distribution of the ganglion-cells in the first ventral ganglion; but, from a consideration of the facts, the only way to explain the shifting of the organs is to imagine an "excalation" of a segment in front of the testes: if the spermatheca has been unaffected, then the original 9th segment has disappeared; or if the spermatheca has been moved forwards, then one segment lying between the 2nd and 8th has disappeared; but as the gizzard is in the 6th segment the former suggestion is the more probable. If we had had only a single individual this peculiar forward shift would have been remarkable enough, and might have been explained by supposing that the anterior extremity had been cut off, and that an imperfect regeneration of segments had followed — a regeneration in which one segment short of the full number had been formed; but when two individuals exhibit exactly the same phenomenon it does not seem possible to refer it to regeneration. Nevertheless, I do not consider it necessary to form a new genus for the reception of the worm—as we should have done a few years back—for in all essential structural points it agrees so closely with species of *Rhododrilus* that it must be looked upon

as an extremely abnormal species of that genus: though it is true that in no other species is the spermiducal gland provided with such a long muscular duct.

Marionina antipodum, n. sp.

Four small Enchytræids appear to belong to this new species. The longest is 11 mm. in length and 0·75 mm. broad, with 35 segments.

The chætæ are very feebly sigmoid, the points being slightly curved: there are nearly constantly four in each bundle throughout the body, only in a few anterior segments are there five in each bundle.

The clitellum is girdle-like, completely covering segments 12 and 13.

The usual head-pore was noted.

The œsophagus passes gradually into the intestine, being, however, rather dilated in segments 8, 9, and 10.

There are four pairs of septal glands, lying in segments 4, 5, 6, and 7.

The dorsal blood-vessel commences at the hinder end of the 13th segment, and immediately in front of its origin it becomes a good deal dilated, but no "cardiac body" is present. The blood was in life apparently colourless, as the blood-vessels, instead of being filled with a red-stained or yellowish coagulum, are empty. In an entire specimen (stained) I was unable to detect the vessels; but in transverse sections the dorsal vessel appears as a small empty tube with a single nucleus on either side; while even anteriorly the ventral vessel appears to be closely adherent to the œsophageal wall.

The segments 10 and 11 are filled with spermatozoa, and the septum 11/12 is pushed back to the end of the 13th segment.

The testes are quite small and relatively loose in structure, though there are no definite lobes, the edge being slightly frayed.

The sperm-funnel is a good deal curved in the entire specimen, but appears to be about four times as long as its breadth. The penial apparatus (Plate XIV., fig. 9) is comparatively small, as it scarcely exceeds the thickness of the longitudinal muscles of the body-wall. Opening into it, however, is a conspicuous prostate gland.

The spermatheca (Plate XIV., fig. 10) is a long pyriform organ, in which the muscular duct is not distinctly marked off from the sac, which, moreover, is empty in all the individuals examined. The duct is without glands, but at the pore is a couple of groups of gland-cells—one anterior and one posterior.

It should be noted that the longitudinal muscles, instead of

consisting of a single row of fibres, present several layers, as Ude has noted in *Lumbricillus verrucosus*.

Loc. Antipodes Island.

Remarks.—I cannot fit this worm to any of the species diagnosed in Michaelsen's monograph.* It does not agree with any of the South American forms described by Ude ;† for, amongst other differences, I do not find any "subneural glands" in the present worm, although the specimens sectioned are sexually mature.

Enchytræus albidus, Henle.

Specimens indistinguishable from this widely distributed species were collected on Campbell Island, close to the sea ; and I have specimens from Macquarie Island, which were collected some years ago. I may add that a re-examination of the worm collected and named *E. simulans* by me‡ convinces me that this name must be eliminated : they are *E. albidus*, as I at first imagined them to be.

Lumbricillus macquariensis, n. sp.

Several specimens of this Enchytræid were collected some years ago by Mr. Hamilton on Macquarie Island, and are entered in the Museum register by the late Professor Parker as "small Oligochæta from brackish pools, with *Siphonaria*, planarians, &c." I take this opportunity of giving an account of this species.

Length, 23 mm. ; breadth, 1·25 mm. ; with 60 segments.

Chætæ very feebly sigmoid and relatively small, in the usual four bundles of 4–7 per bundle. Anteriorly there are in several segments six dorsal and four ventral, while in the 2nd segment six dorsal and seven ventral. Posteriorly the usual numbers are four or five dorsal and six or seven ventral. There are no ventrals in segment 12, and the dorsals are few in the 12th and 13th segments.

The clitellum covers segment 12 and part of the 13th, ceasing at the level of the chætæ. The male pore, in 12, is in some cases prominent owing to the protrusion of the terminal organ.

The usual head-pore is present between the prostomium and the 1st segment. The œsophagus passes very gradually into the intestine, which commences in the 15th segment. There are three pairs of septal glands, as usual.

The dorsal blood-vessel arises either at the hinder end of the

* Michaelsen, "Das Tierreich: Oligochæten," 1900.

† Ude, "Enchytraeiden," in Hamb. Magalhaen, Sammelr., 1896.

‡ P.Z.S., 1903, vol. ii., p. 219.

13th or at the commencement of the 14th segment. The blood appears to have been reddish in life.

In segments 10 and 11 there are great lobulated masses attached to the body-wall at the insertion of the septum 10/11, some lobes passing forwards and even reaching into the 9th segment, others backwards. This is the "multiple testis" (of Claparede); but, as Michaelsen has shown, it is only "testis" at its base—towards the extremities of the lobes the sperm mother cells are found dividing up, and various stages in sperm-formation occur.

The tub-shaped sperm-funnel (Plate XIV., fig. 13) in the 11th segment has a length equal to about twice its breadth. The narrow sperm-duct coils considerably immediately after passing through the septum 11/12, then takes a straight course to the "penis." This consists of a spherical mass of gland-cells enclosed in a thin muscular coat, consisting of circular and longitudinal muscles. Some of the gland-cells open directly to the exterior, others into the sperm-duct as it passes through the apparatus. The sperm-duct arrives at the outer side of the "penis," which it perforates obliquely to open externally at its centre. The area of the body-wall over which the gland-cells open is, in the specimen sectionised, retracted, so that a deep narrow pit results.

The ovary, like the testis, is "multiple"—*i.e.*, lobulated—each lobe being moniliform, consisting of strings of ova, while a few large ova lie free in segment 13.

The oviducal pore is visible on the mounted specimen at the junction of segments 12/13.

The spermatheca has the usual position, opening, that is to say, between segments 4/5. It (Plate XIV., figs. 11, 12) is a cylindrical tub-shaped sac, with a sharply constricted, very short duct which is surrounded by a circle of gland-cells. At the opposite end of the sac a narrow tube puts it into communication with the œsophagus.

The nephridia have a small pre-septal portion, and a large post-septal region whence the duct passes from the hinder end to the body-wall, usually bending forward below the rest of the organ.

There are three subneural (? copulatory) glands—two large ones in segments 14 and 15, and a smaller one in the 16th segment.

In transverse section it is seen that the gland (Plate XIV., fig. 8) rises up the sides of the nerve-cord and leaves the greater part of its upper surface uncovered. Each lobe is of considerable size—at least four or five times the diameter of the nerve-cord—and extends laterally as far as the ventral chætæ. The ducts—*i.e.*, necks—of the gland-cells pass through the circular mus-

cular coat of the body-wall, and spread out fan-wise below the epidermis.

Remarks.—This species appears to be nearly allied to *L. maritimus*, Ude,* from which, however, it differs in the following points: It is more than twice the length, and contains nearly twice as many segments; the excess of chætæ in the dorsal bundle of some of the anterior segments, and the fewer chætæ in the bundle of the hinder segments; the less extent of the clitellum; the relatively smaller size of the sperm-funnel, which in *L. maritimus* is three or four times longer than broad (the form of the spermatheca appears to differ, for Ude makes no mention of the narrow œsophageal duct, saying that the "beutelformige" sac communicates by its narrow end with the gut); the relatively great size of the subneural glands in the present species; and the presence of a third small one in the 16th segment.

EXPLANATION OF PLATE XIV.

Fig. 1. A spermatheca of *Rhododrilus kermadecensis.*

Fig. 2. A spermatheca of *Rh. cockayni.*

Fig. 3. A spermatheca of *Rh. leptomerus.*

Fig. 4. Penial chæta of *Rh. kermadecensis*, seen from above (×350).

Fig. 5. The same, side view, showing spoon-like tip (×350).

Fig. 6. Penial chæta of *Rh. cockayni* (×350).

Fig. 7. Penial chæta of *Rh. leptomerus* (×350).

Fig. 8. *Lumbricillus macquariensis.* A transverse section of a subneural gland (camera×175). *a*, nerve-cord; *c*, circular muscular coat; *e*, epidermis; *l*, longitudinal muscular coat.

Fig. 9. *Marionina antipodum.* The aperture of the sperm-duct, from a transverse section (×175, camera). *d*, sperm-duct; *gl*, spermiducal gland, opening into terminal apparatus; *p*, pore; *l*, longitudinal coat of muscles consisting of several fibres in depth.

Fig. 10. *Marionina antipodum.* The spermatheca. *gl*, gland at its exit; *a*, œsophageal opening; *p*, external pore.

Fig. 11. *Lumbricillus macquariensis.* A spermatheca, with rosette of glands at the pore. *o*, œsophageal opening.

Fig. 12. The same. Base of spermatheca (from a transverse section), showing very short muscular duct, and the glands around the pore.

Fig. 13. The same. The male apparatus for an entire individual. *d*, duct; *f*, funnel; *p*, pore; *s*, septum.

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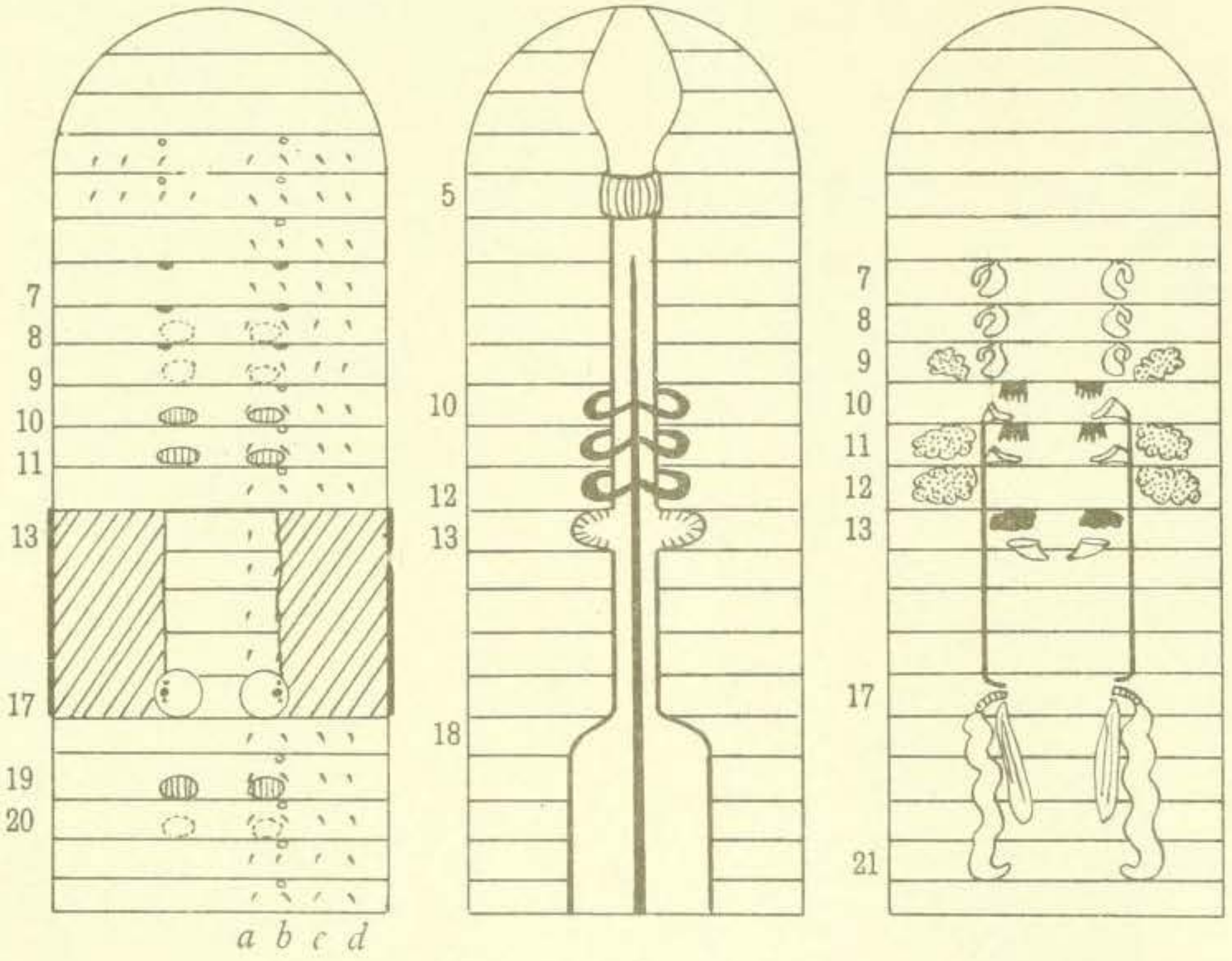
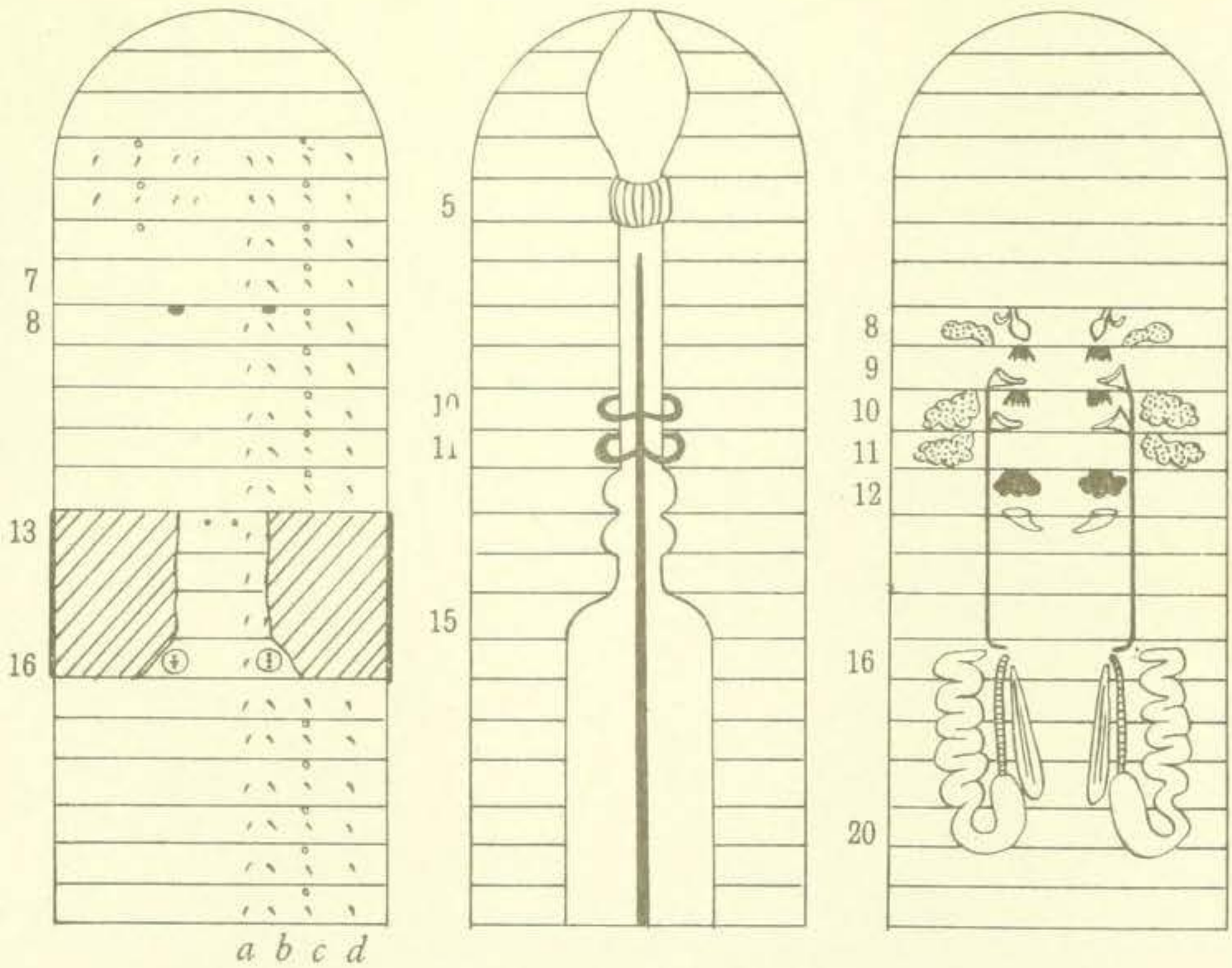
* Ude, "Enchytraeiden," Hamb. Magalhaen, Sammelr., 1896, p. 6.

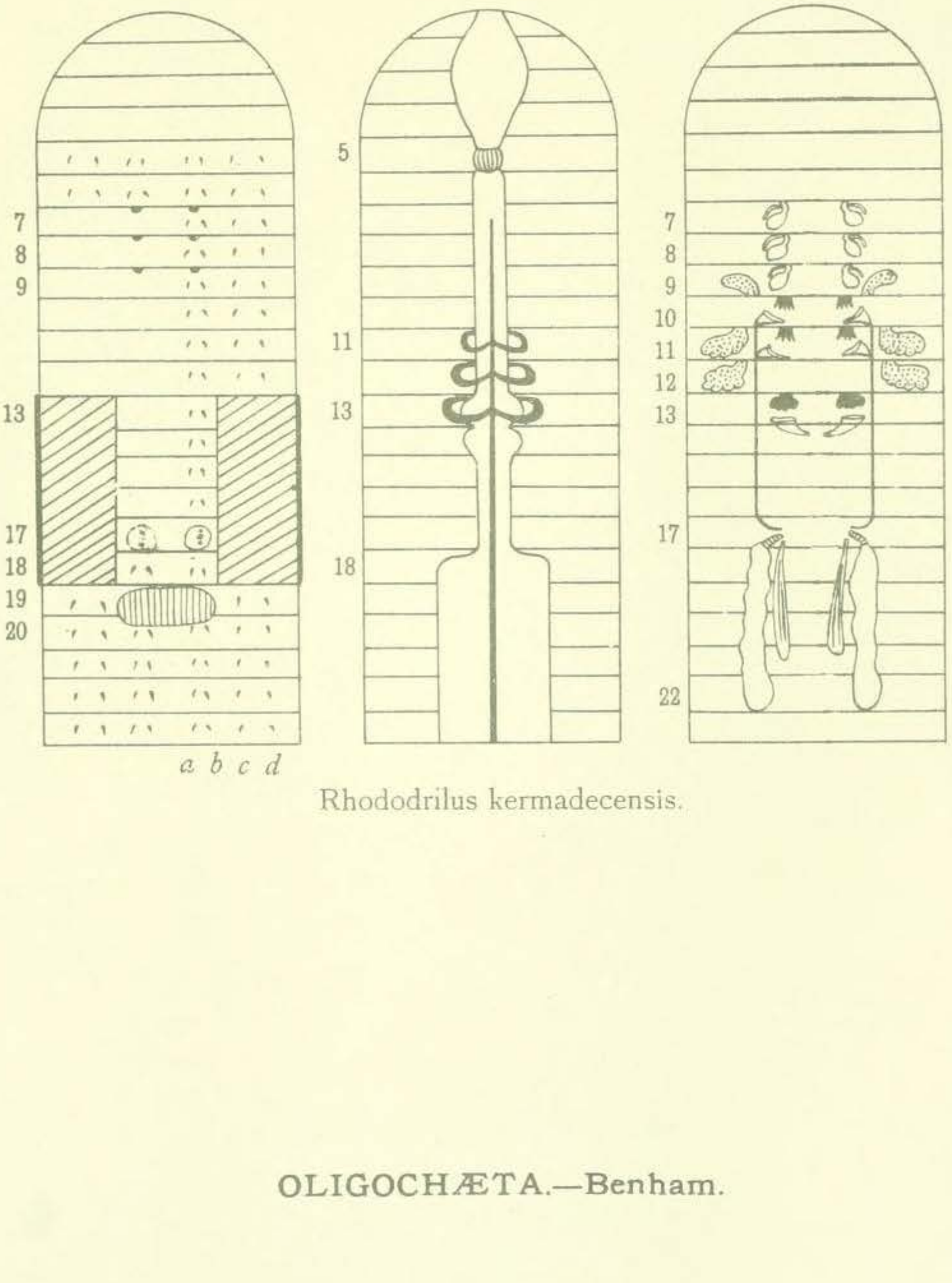


Rhododrilus cockayni.



Rhododrilus leptomerus.

OLIGOCHÆTA.—Benham.



Rhododrilus kermadecensis.