Terrestrial Annelida.—*By E. Ray Lankester, M.A., F.R.S.*

The Rev. A. E. Eaton, on his return from the Expedition of the Transit observers to Kerguelen's Land, placed in my hands for description two small earthworms obtained by him in the island, and preserved in strong spirit. The specimens were small and immature, not exceeding $1\frac{1}{2}$ inch in length; but by cutting transverse sections of one, and slitting the other up the median dorsal line, staining with carmine, and mounting in Canada balsam, I have succeeded in making out the affinities of the species.

The study of the various species of Earthworms (Lumbricidæ proper) has only recently been attempted with due attention to anatomical detail. Their excessively complicated generative glands, ducts, and pouches present the greatest diversity of arrangement, so as to enable us to establish a series of strongly marked genera, which, while differing in the arrangement of these parts, yet present but slight differences in external form, or in the arrangement of their setæ. Professor Edmond Perrier, availing himself of the very fine collection of exotic Lumbricidæ in the Jardin des Plantes, has been the pioneer in this branch of investigation, and in his memoir "Recherches pour servir a l'histoire des Lombriciens terrestres," published in the "Nouvelles Archives du Muséum d'Histoire Naturelle, 1872," he has established a series of genera on the only possible characters in modern zoology—namely those derived from thorough anatomical examination. M. Perrier has studied earthworms from North and South Africa, from the East Indies, from the West Indies, from North and South America, and a number of scattered islands, and has rendered it evident that he has tapped a rich storehouse of zoological facts of first-rate importance. Presenting, as they do, a considerable number of genera, and occurring as they do almost universally on the earth's surface where there is vegetable soil—being moreover absolutely destitute either of means of transport or of power to resist deleterious agents whilst being passively transported (earthworms and probably their eggs are rapidly killed by sea-water), the *Lumbricidæ* promise to yield, when fully investigated, a mass of information bearing upon the problems of the causes of geographical distribution and the connections of continents and islands in past epochs—more decisive and indisputable in its character than that presented by any similar small group of the animal kingdom. The essential feature of their organisation which gives to the *Lumbricidæ* so interesting and important a position, is the possession of a most sensitive generative apparatus—*sensitive*, that is to say, in the sense of responding by innumerable modifications of its highly-developed male ducts, prostatic glands, seminal reservoirs, penial setæ, copulatory pouches, and other accessory glands, to those slight differences of environment which whilst thus affect-

ing the genitalia so as to create generic distinctions, have yet left the external form and character unaffected.

The two small specimens from Kerguelen's Land are the first Earthworms of special interest which I have received, though for some time, through the kindness of Sir J. Hooker, Earthworms, found in the Wardian cases sent from abroad to the Royal Gardens at Kew, have been forwarded to me for examination. I may take this opportunity of saying that persons who may wish to preserve specimens of exotic earthworms for examination in this country should either send them home alive, which is easy and the most satisfactory to the student, or should kill them with chloroform, by which means they are prevented from shrinking, and then place them first for twenty-four hours in weak spirit, and afterwards in the strongest which can be procured.

The Earthworms brought from Kerguelen by Mr. Eaton are small specimens of a species of *Acanthodrilus*. The genus *Acanthodrilus* is established by Edmond Perrier for the reception of three species, two of which come from New Caledonia (*A. obtusus* and *A. ungulatus*), whilst the third (*A. verticillatus*) is an inhabitant of Madagascar. The addition of Kerguelen's Land to the distribution already indicated by Perrier for *Acanthodrilus*, is a matter of some consequence, though until our collections of *Lumbricidæ* are more exhaustive than at present, it would be very rash to discount the conclusions to which we shall be ultimately led.

I propose now to give the characters of the genus *Acanthodrilus* as indicated by Perrier in his classical work, and then to point out the distinctive characters of the Kerguelen species.

Characters of the genus ACANTHODRILUS, *with notes on the new species.*

The *Lumbricidæ* are divided by Perrier into three sections according as the male generative apertures are in front of, within, or behind the clitellum. The genus *Lumbricus* alone is *Præclitellian*, the genera *Anteus*, *Titanus*, *Rhinodrilus*, *Urochæta*, and *Geogenia* are *Intraclitellian*, whilst *Pontodrilus*, *Eudrilus*, *Moniligaster*, *Acanthodrilus*, *Digaster*, *Perionyx*, and *Perichæta* are *Postclitellian*.*

The genus *Acanthodrilus* is especially characterised amongst the *Postclitellian Lumbricidæ* by the possession of two pairs of male generative orifices which are placed in the 17th and 19th, 18th and 20th, or 19th and 21st segments.† These orifices are so placed as to give exit each to a bundle of greatly elongated and specially modified "penial" or "genital" setæ. The term "penial" proposed by Perrier is more appropriate than that which I had previously used in describing

* It is impossible to determine the true value and position of the genera of Lumbricidæ established by Kinberg, since he has not furnished the necessary anatomical details.

† The cephalic lobe and the buccal ring form the *first* segment.

similarly modified setæ in Chætogaster and Nais (see my paper "On distinct larval and sexual forms in the Oligochæta." Ann. & Mag. Nat. Hist. 1870). The existence of these penial setæ is what has suggested the name of the genus, since they appear to be unique amongst the *Lumbricidæ*, though we find similar setæ in the *Naididæ*, and in *Lumbricus* an enlargement and elongation of the setæ in several of the segments connected with the reproductive organs, though not a well marked specialization of form is noticeable. The setæ which are thus modified in *Acanthodrilus* are those which correspond to the two ventrally placed pairs (one on each side the median line) of a segment of *Lumbricus*, the dorsally placed pairs being unmodified. In the new *Acanthodrilus* the penial setæ are in two bundles of four each, or eight altogether to each male genital pore. They are notched near the anterior extremity as in Perrier's *A. verticillatus* (see fig. 6.)

Perrier gives as a character of the genus that the locomotor setæ are arranged as in *Lumbricus* in four series, each group of bristles containing as in *Lumbricus two* functional setæ. This character must be amended, since in the new *Acanthodrilus* of Kerguelen's Land the setæ are arranged, not in *four* series of bundles or groups, each containing *two* setæ, but in *eight* series, each seta standing alone, and widely separate from its fellows of neighbouring series (fig. 4). Thus on each segment we can distinguish, on each side of the median antero-posterior vertical plane, a medio-ventral seta and a latero-ventral seta, a latero-dorsal seta, and a medio-dorsal seta. It becomes quite clear that the double ventral series in *Lumbricus* and the other species of *Acanthodrilus*, is formed by the approximation of two single series such as we see in the medio-ventral and latero-ventral series of the *Acanthodrilus* of Kerguelen's Land, since in certain segments of this species, namely, the 16th, 17th, 18th, and 19th, the two separate ventral series of single setæ approach one another, and form a double ventral series (see fig. 2), exactly comparable to the arrangement which obtains throughout the series both dorsal and ventral in *Lumbricus* and most other *Lumbricidæ*. *Acanthodrilus* is stated by Edmond Perrier to possess the median dorsal pores leading from the body-cavity to the exterior, which are wanting in some genera.

A full description of the genitalia of *Acanthodrilus* is still a desideratum. The exact position of the testes and ovaries is not known, nor do my very young specimens from Kerguelen enable me to supply the required information. Opening close by the side of the penial bristles, and with its orifice covered by a flap of integument (fig. 7), is a tube (one on each side in each of the two penial segments) which runs horizontally, and expands into a short, undulated, thick walled cæcum. These four cæca have been observed by Perrier in the various species of *Acanthodrilus* studied by him, and appear to be prostatic glands connected each with a distinct vas deferens, which place the four male genital orifices in continuity with the testes situated about the 11th segment. The four cæca (see fig. 7 *pr.*) are

well developed in the specimen from Kerguelen's Land, but I was unable to find the testes or vasa deferentia in these small specimens.

The cingulum noticed by Perrier in his *Acanthodrilus ungulatus* on the 14th, 15th, 16th, 17th segments, was not developed in my specimens.

The copulatory pouches, which in the species described by Perrier are placed to the number of two pairs in the 8th and 9th or 8th and 10th segments, have a similar position in the new species, namely, on the line of the latero-ventral series of setæ between the 7th and 8th and the 8th and 9th segments.

The cephalic protuberance, prostomium, or upper lip (fig. 3 *pr*) is worthy of note from its peculiar setting in the buccal ring; a similar form of prostomium is described by Perrier in the *Acanthrodrilus verticillatus* of Madagascar.

Distinctive features of the ACANTHRODRILUS *of Kerguelen's Land.*

Male orifices and penial setæ placed in the 17th and 19th segments; orifices of the copulatory pouches between the 7th and 8th, and 8th and 9th segments. Setæ arranged, not in four double, but in eight single rows, viz.: right and left medio-ventral, latero-ventral, latero-dorsal, and medio-dorsal. The latero-ventral and medio-ventral rows converge in the 16th, 17th, 18th, and 19th segments. The penial setæ are formed by eight setigerous sacs, a latero-ventral and a medio-ventral to each of the four male genital pores. The prostomial lobe is short, and sunk within the buccal ring.

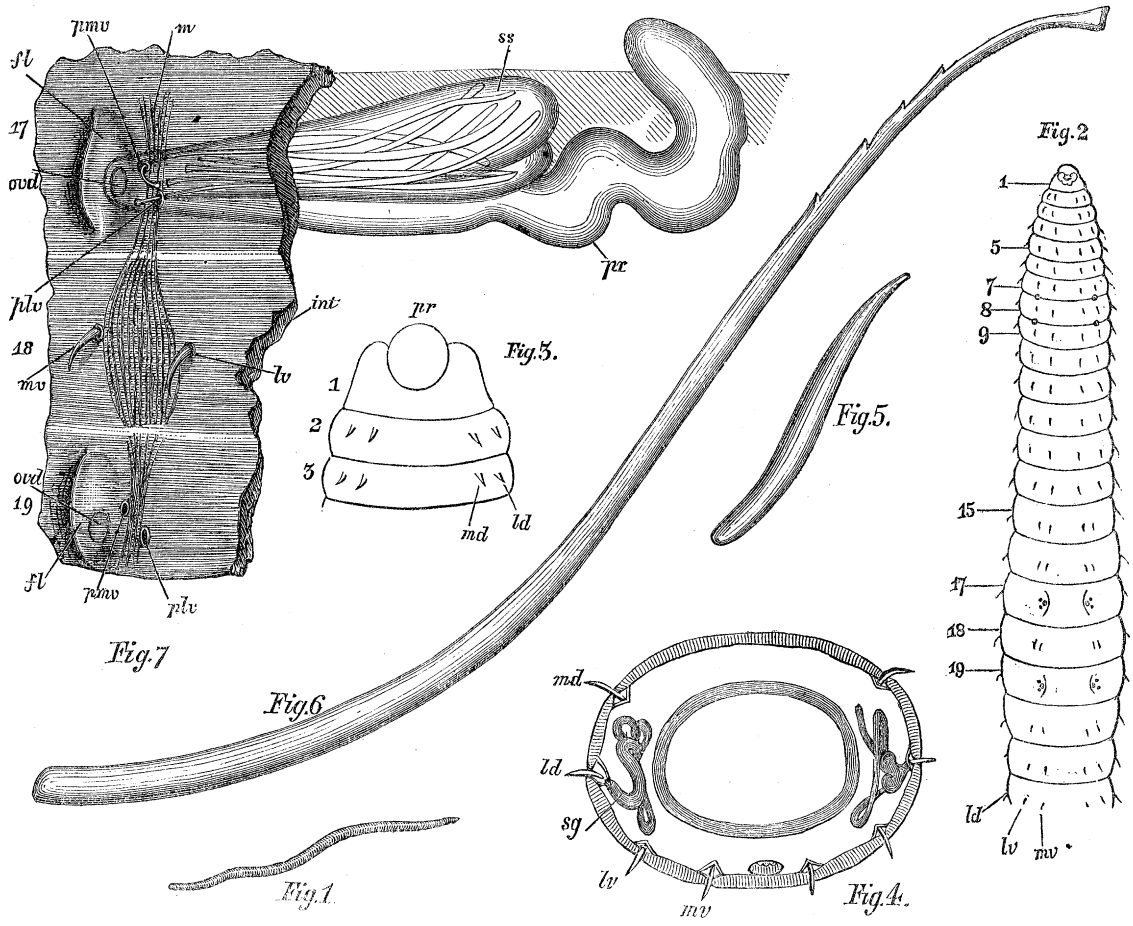
The genus and species are briefly characterised thus :—

Acanthrodrilus, *Edm. Perrier.*

Lumbricidæ post-clitelliani, poris genitalibus masculis quattuor, duobus in seg. 17, 18, vel 19; duobus in seg. 19, 20, vel 21, prope setas ventrales positis. Setæ ventrales, poros genitales juxta, valde elongatæ et numerosæ, *peniales* dicuntur. Bursæ copulatrices utrinque duæ in seg. 7, 8, vel in segmentis vicinalibus.

Acanthodrilus kerguelenensis, sp. n.

A. poris genitalibus masculis in seg. 17 et seg. 19 positis; bursis copulatricibus inter seg. 7 et 8, et inter seg. 8 et 9. Setæ locomotores in lineis 8 ordinatæ, utrinque medio-ventrales, latero-ventrales, latero-dorsales et medio-dorsales. Lobus prostomialis brevis, rotundus, annulo buccali immersus.



Explanation of the Woodcut.

Fig. 1. Young specimen of *Acanthodrilus kerguelenensis*, natural size.

Fig. 2. The anterior twenty-one segments of the same magnified and seen from the ventral aspect, to show the position of the setæ and the genital orifices.

ld, latero-dorsal series of setæ.

lv, latero-ventral series of setæ.

mv, medio-ventral series of setæ.

The medio-dorsal series are not visible.

Between segments 7, 8, and 8, 9, are seen the orifices of the copulatory pouches.

In segment 17, and segment 19 are seen the two pairs of male genital pores, which are provided with the penial setæ.

Fig. 3. Dorsal view of the three anterior segments to show the form of the prostomial lobe *pr*. *md*, medio-dorsal setæ. *ld*, latero-dorsal setæ.

Fig. 4. Diagrammatic section through the thirtieth segment to show the position of the eight series of setæ, and of the openings of the segmental organs.

md, medio-dorsal setæ.

ld, latero-dorsal setæ.

lv, latero-ventral setæ.

mv, medio-ventral setæ.

sg, segmental organs.

Fig. 5. Ordinary locomotor setæ.

Fig. 6. One of the penial setæ ("genital setæ" *mihi* of *Chætogaster* and *Nais*), drawn to the same scale as fig. 5.

Fig. 7. The male genital orifices and setigerous pores of the left side (diagrammatic).

int, cut edge of the integument.

fl, flap of the integument which overlies the male genital orifice *ovd*.

ovd, orifice of the vas deferens.

pmv, penial seta and orifice of the medio-ventral series.

plv, penial seta and orifice of the latero-ventral series.

ss, penial setæ in the setigerous sac.

pr, prostatic cæcum of Perrier.

mv, medio-ventral locomotor setæ.

lv, latero-ventral locomotor setæ.

m longitudinal muscular band separating the orifices of the medio-ventral and latero-ventral setigerous sacs.

The setæ, setigerous sacs, and prostatic cæcum of the 19th segment are not represented. They would be identical with those of the 17th.