ANNELID HUNTING IN NOTTS.

SECOND PAPER.

BY

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Since my former paper(1)* was published in these Transactions considerable progress has been made in our knowledge of the Annelid fauna of this County. My researches could not have been carried out but for the stimulus and help afforded me by Prof. Carr, M.A., and the Royal Society, through whose courtesy the Grant for these investigations from the Government has been generously renewed. I have, in this matter, also to recognize the kindness of Prof. Gamble, F.R.S. of Birmingham University.

The number of Oligochaets already recorded is fifty. Where new records have been made during the interval the old numbers will be employed, so that our new list will begin with number 51. It will prove instructive, perhaps, if I give in the first place some details of the places visited, and the dates which have been set apart for my field work; since it is desirable that we should discover whether any particular kind of annelid is more in evidence at one period of the year than at another. It has not been possible for me to go into details respecting the geology of the districts visited; but as most of my collections are made in humid places or cultivated land, the geological formation may be for the present ignored. The lesser worms, known as Enchytraeids, are usually found in humus, the red-blooded forms (Marionina and Pachydrilus) being somewhat more aquatic, while the Naiads and Tubificids are found among algae, waterweeds, or the mud of ditches and streams. In addition to my own collecting I have to report on some specimens forwarded to me by Prof. Carr. The order is chronological.

April 11th, 1912. Prof. Carr collected from rotten wood at Car Colston, 11 specimens, including four *Lumbricus castaneus* Savigny, four *Dendrobaena arborea* Eisen, two *Fridericia striata*, Levinsen, and probably one *F. callosa*.

April 15th, 1912. During a visit to the City of Nottingham, the banks of the canal were examined, with the result that an interesting addition was made to the fauna. Hitherto not a single specimen of Naididae had ever been recorded for Notts. It was a pleasure therefore to find *Nais elinguis* among the algae which grow on the stones by the overflow from the canal. This

* The figures in brackets refer to the Bibliography.

group of worms is little in evidence, as a rule, save in spring, when they abound in lakes and ponds among algae, weeds, and floating vegetable matter. They are exceeding small, often practically invisible to the naked eye, but form very beautiful objects for the microscope. At the same time I found five different species of Enchytraeid, belonging to three different genera. *Lumbricillus lineatus* was with *Nais* among the algae, *Henlea rhaetica* flourished under the moss and hepaticae near by, while *Enchytraeus minimus*, *nigrinus*, and *albidus* were abundant in the fine black soil against the walls of buildings, bridges and embankments.

In the wide ditch by the canal, I also find in the mud the common Tubifex, and what I take to be a species of Ilyodrilus. This group is still so perplexing on account of the imperfect descriptions which have been printed, and the confusion which different authors have introduced, that I am obliged to reserve my judgment until these researches are further advanced. In addition to a third species belonging to the family, *Limnodrilus hoffmeisteri* and *L. aurantiacus* were also discovered.

May 7-8th, 1912. Mansfield was visited. Several of the common Lumbricidae were found, including *Allolobophora longa*, *Aporrectodea chlorotica*, some specimens of which were an intense green; *Eisenia rosea* (=*mucosa*), *Lumbricus castaneus* and *Dendrobaena subrubicunda*. In the water, specimens of Lumbriculus were plentiful among algae and waterweeds, but no trace of Stylaria or any of the Naids could be found. One Tubificid was taken, and an amazing variety of Enchytraeids. *Fridericia*, as ever, was most richly represented by such species as *polychaeta*, *perrieri*, *bulbosa*, *connata*, *michaelseni*, *glandifera*, and others. *Henlea lampas* or a near ally was frequent, together with *H. rhaetica;* also *Enchytraeus albidus* and *minimus*, *Achaeta incisa*, *Lumbricillus verrucosus*, and other more or less rare forms. Many of these were found in quite sandy soil, and their presence in such surroundings was suggestive. We need a fuller knowledge of the habitats of these creatures, since there can be little doubt about their utility in agriculture.

September 10th, 1912 found me again in Nottingham, and the occasion was utilized for a visit to the ditch and canal, in order, if possible, to obtain light on some of the problems suggested by earlier visits. The algae, which in April abounded in Nais, now had not a trace of annelids of any kind, though larvæ resembling certain forms of oligochaets were profuse. Allurus was plentiful under damp earth and hepaticae, where *Henlea nasuta* and *Henlea lampas* or near allies existed in great numbers, but usually immature. *Henlea attenuata* and a fourth species which was doubtful on account of its immaturity, were found in

the dark soil of walls. *Enchytraeus albidus* and *minimus* were again found, as well as *Achaeta bohemica*. Among the various species of Fridericia were *F. perrieri, connata* and *bulbosa;* while *Tubifex tubifex, Limnodrilus hoffmeisteri, L. udekemianus, L. papillosus,* and another somewhat doubtful species distantly resembling Southern's *Tubifex templetoni*, a Pachydrilid and an Ilyodrilid, were also obtained.

December 16th, 1912 found me at Beeston. Just below the station a ditch was found, into which vegetable debris, cabbage stalks and garden refuse had been cast. This was found to be full of *Enchytraeus albidus*, a white worm which, with its allies *E. pellucidus* and *E. buchholzi*, is of frequent occurrence among decaying vegetable matter, and seems to be exceedingly useful. I doubt whether it has ever been proved to be injurious to living plants. In the soil beneath the debris were found *Allolobophora longa, Eisenia rosea, Dendrobaena subrubicunda, Aporrectodea chlorotica,* and one or two other earth worms. In the ditch a little further on, where flowing water was found, *Lumbriculus variegatus* occurred among the floating weeds. In the soil my most interesting discovery was made when *Helodrilus oculatus* turned up in great numbers, though immature. There has not yet been time to work out all the material collected here, as I had other places to visit.

Passing on to Nottingham a dash was made, while waiting for a train, to the old hunting ground by the side of the canal. No Naids could be found, but two or three Pachydrilids were flourishing in the algae or under moss. Unfortunately this alga seems to kill the annelids if kept in a bottle for a few hours, and the only way to be sure about the fauna would be to take fresh material direct to the laboratory. Under the microscope I found setae of Naids and other tiny annelids in the stomachs or exuvia of larvae, showing that some good work might be done here. The discovery of several old species and one or two new oligochaets resulted from my investigations, among which mention may be made of *Allolobophora longa* and *Lumbricus rubellus* among the earthworms, *Allurus tetraedrus* a semi-aquatic, with *Henlea dicksoni, H. rhaetica,* and *H. attenuata, Enchytraeus albidus, nigrinus, pellucidus,* and *minimus, Marionina georgiana,* and *Fridericia densa* among the Enchytraeids. With *Henlea dicksoni* occurred a variety with many setae which may be named *multispinus. Fridericia bulbosa* which occurred here was of the typical form.

My next move was to Burton Joyce. Near the village *Allurus* was found in a ditch, and I hoped here to find some examples of Tubificids or Enchytraeids, but in this matter disappointment attended me. The heaps of road scrapings, dead leaves and mould by the roadsides were also blank, owing to their

not having had time to ferment or decay. After a few months these rubbish heaps usually yield many interesting Enchytraeids and Lumbricidae, especially *Dendrobaena mammalis* and numerous Fridericias.

Midway between Burton and Lowdham I filled a small two-oz. box with earth and decaying leaves from the sides of a little brook where the cattle came to water, and had the good fortune to bring away a variety of exquisite forms of oligochaets. The sample, though small, has not yet been exhausted, but the following may be mentioned. *Fridericia lobifera* abundant and beautifully developed, *F. polychaeta* and *F bulbosa* both typical, *Enchytraeus minimus* in fine form, as well as a species of *Marionina*. Two Henleas seem to be new to science, and an already familiar form *(H. rhaetica)* accompanied them. Here also was found a most interesting annelid which has not yet been described, but will appear in the subjoined list as *Allurus mollis*. I found it first at Hastings, in July, 1912, but as it was so delicate, my examination of the living worm was brief and imperfect. It is hoped that an opportunity may soon occur for obtaining a fuller supply of living material.

During the night of December 16th—17th, there was a severe fall in the temperature. This prevented me working Lambley as I had intended doing. My regret is the greater because this old world village was full of spots which would have yielded rich stores of material under more favourable conditions. Under the circumstances one had to be content to seek material elsewhere. Fortune favoured me in my work, since Mr. Richardson, head gardener to C. H. Hill, Esq., of Woodboro' Hall, kindly took me under his charge, and found me a couple of suitable spots for research. We first turned over the rich earth recently taken from an exhausted bed. *Lumbricus terrestris, L. rubellus,* and *L. castaneus* were here with the Brandling and Gilt tail, and a species of Octolasium. Elsewhere we found Allurus and the Green worm. The Octolasium was new to the County.

Enchytraeus albidus was fairly abundant, together with a Pachydrilid, which I did not expect to find in such a habitat. In a heap of rubbish under a wall, with specimens of some of the foregoing, we found some Fridericias, of which *F. michaelseni* was already known to the County. One other proves to be new to science, and the material yet awaits a fuller examination.

With this brief survey, we pass on to a systematic list of the species which have been studied during the year, with the localities in which they have been found.

SYSTEMATIC LIST.

As in my former paper, so now I follow the order adopted by Michaelsen (5), Southern (4), and myself (2), and give in the first place the new habitats for species already recorded.

TUBIFICIDÆ.

1. **Limnodrilus udekemianus** Clap. In mud by the wide ditch adjoining the canal under the shadow of Nottingham Castle, April 15th, 1912: confirmed September 10th, 1912.
2. **Limnodrilus hoffmeisteri** Clap. In the same locality as No. 1, and at the same date. Confirmed, September 10th, 1912.
3. **Limnodrilus papillosus** Friend. With the two foregoing on each occasion.
4. **Tubifex campanulatus** Eisen;
5. **Tubifex bonneti** Clap.;
6. **Tubifex tubifex** O.F.M.;
7. **Ilyodrilus glandulosus** Friend, all found near the canal. These species of Limnodrilus and Tubifex are being carefully worked out as occasion serves. I have notes of one or two other species, but as their identification is at present somewhat doubtful, the record must be reserved for a later occasion. They do not affect the present list.

LUMBRICULIDÆ.

8. **Lumbriculus variegatus** O.F.M. Was not recorded as actually taken in Notts. in my former paper, though I believed it had been found at Clumber. In May 1912, it was plentiful in the pond-weeds at Mansfield. On December 16th, 1912, I found it again in a ditch at Beeston. None of its congeners (Stylodrilus or Trichodrilus) have yet been found in Notts. The

ENCHYTRÆIDÆ

still hold the premier place. The number of known species is increasing rapidly, and it is gratifying to know that this County is yielding its quota of new species.

9. **Achaeta bohemica** Vejd. was found again by the canal at Nottingham, September 10th, 1912; this species is not at present widely known.
10. **Henlea dicksoni** Eisen. During the year I have been able to decide the question of identity which was somewhat doubtful when my former report was drawn up. The type was found December 16th, 1912, under moss and hepaticae on the brickwork by the canal sluice, Nottingham. The species is very variable, and when one compares the forms found inland with those obtained by the seaside, the difficulty of deciding between them is often very great.

I think myself justified in adding 10a. **H. dicksoni** Eisen, var. **multispinus** var. nov. found with the type. Length about 12 mm., fairly stout, with 40-45 segments. Salivary glands seem to be present, but as the first nephridia occur in segments 4/5 it is just possible that the nephridia-ducts and the salivary glands have been confused with each other. This forward position of the first pair of nephridia is noteworthy. The brain is typical, but the setae are very numerous, 10-12 per bundle being the usual quantity in many segments.

12. **Henlea attenuata** Friend, found September 10th, 1912, in black mould by Nottingham canal, was confirmed December 10th, 1912.
13. **Enchytraeus albidus** Henle. Nottingham, April 15th, 1912. Mansfield, May 7th, 1912. Beeston, among decaying cabbage stalks, December 16th; Nottingham canal, same date: Woodboro' Hall Gardens, December 17th, 1912. This is a very variable creature, and is nearly always to be found in well rotted manure in farmyards, gardens and fields, and wherever somewhat rich vegetable material is in process of fermentation and decay. On April 24th, 1912, Prof. Carr sent me, from Sherwood Rise, decaying roots of Hollyhock full of them.
14. **Enchytraeus pellucidus** Friend may possibly be identical with the foregoing: but there are such extreme forms of each that any one seeing these side by side without the intermediate links would conclude that they were different species. By the canal, Nottingham, December 16th, 1912.
15. **Enchytraeus minimus** Bretscher. May 8th, 1912, at Mansfield. The Nottingham record was confirmed on April 15th, and again on September 10th, and December 16th, 1912. Fine typical forms were found in decaying leaves between Burton Joyce and Lowdham at the same time.
16. **Enchytraeus nigrinus** Bret. Former records confirmed during the year, especially on April 15th, and December 16th, 1912. Mansfield, May 8th, 1912.
18. **Lumbricillus verrucosus** Clap. Under moss and among algæ by canal, Nottingham, April 15th and December 16th, 1912, also at Mansfield, May 8th, 1912. Other species will be noted later.
21. **Fridericia bulbosa** Rosa, has frequently been found during the year, notably at Mansfield in May, at Nottingham in September and December, and at Burton Joyce on December 16th, 1912.

22. **Fridericia glandifera** Friend (3) was found with the foregoing at Mansfield, on May 8th, 1912.

24. **Fridericia connata** Bret. Mansfield, May 7th, 1912, exactly corresponding with figures and descriptions of Southern (4). Nottingham record confirmed September 10th, 1912.

27. **Fridericia michaelseni** Bret. is not a rare worm in Notts. Found at Mansfield, May 7th, 1912, with the typical large gland at the opening of the spermathecae. Woodboro' Hall Gardens, December 17th, 1912.

30. **Fridericia lobifera** Vejd. has been found at Mansfield, May 8th, and Burton Joyce in considerable numbers, December 16th, 1912. Along with the type at Mansfield, occurred a form which I enter as

30a. **Fridericia lobifera** Vej. var. **minor.** The details will appear in my Studies in British Enchytraeidae (3).

31. **Fridericia perrieri** Vejd. Found at Mansfield with the foregoing on May 8th, 1912, and by the canal, at Nottingham, September 10th, 1912.

32. **Fridericia polychaeta** Bret. has occurred at Mansfield, May 8th, 1912, and in very fine form at Burton Joyce, December 16th, 1912.

34. **Fridericia striata** Lev. Collected by Prof. Carr, M.A., in rotten wood at Car Colston, April 11th, 1912.

LUMBRICIDÆ.

36. **Allurus tetraedrus** Sav. At Mansfield, Beeston, Nottingham, Burton Joyce, Woodboro' and elsewhere: one of our commonest species, found wherever there is water.

37. **Eisenia rosea** Sav. At Mansfield, Beeston, and Woodboro', in May and December.

38. **Eisenia foetida** Sav. At Woodboro' Hall Gardens, December 17th, 1912.

40. **Allolobophora longa** Ude. Mansfield, Beeston, Nottingham, Burton Joyce, and Woodboro'. Universally distributed in this County.

41. **Aporrectodea chlorotica** Sav. Varies much in colour and other particulars. Forms of an intense green at Mansfield, May 7th, 1912: Beeston, Nottingham, and Woodboro', December 16th, 1912.

42. **Dendrobaena subrubicunda** Eisen. At Mansfield, May 8th, as well as at Beeston, December 16th, and Woodboro' Hall Gardens, December 17th, 1912.

43. **Dendrobaena arborea** Eisen. From rotten wood at Car Colston, collected by Prof. Carr, April 11th, 1912.

48. **Lumbricus rubellus** Hoffm. At Mansfield, Nottingham, Beeston, Burton Joyce, and Woodboro' Hall.

49. **Lumbricus castaneus** Sav. Mansfield, May 8th, 1912; in rotten wood at Car Colston, April 11th, and in the Gardens at Woodboro' Hall, December 17th, 1912.

50. **Lumbricus terrestris** L. Found in each of the places visited, but especially fine at Woodboro'.

It will be seen that nearly all the records of the previous year have been confirmed, and the known distribution extended. We now proceed to a more interesting theme, viz.: the discussion of species, new to the County or to science, which have been found during the year.

NEW ADDITIONS.

It is gratifying in the first place to add a new Family to the list, even though as yet only one member of that family has been found in Nottingham.

NAIDIDÆ.

The members of this family (as well as those of the unrepresented Æolosomatidae) are remarkable for their asexual method of reproduction. My colleague, Mr. C. S. Todd, of Tottenham, has also discovered during the year that some of the species at least are carnivorous, and feed on water-fleas and allied creatures. There are some twenty genera known to science, and a very large number of species. They are, as a rule, very tiny, and flourish among the algae and plants of our ponds and lakes. As about a dozen genera exist in Great Britain it is to be hoped that our list may another year be greatly extended. It is necessary to collect material in the spring and summer months; and it would be doing a great favour if naturalists would send floating matter found on the surface of the water for examination, Nais, Paranais, Dero, Stylaria and other genera should abound at Clumber, Welbeck and elsewhere.

51. **Nais elinguis** Müll. A tiny fresh-water worm, with two black or ruddy eyespots, which are sometimes attended by a secondary and smaller pair. The setæ are of different kinds, those of the dorsal bundles beginning in the sixth segment. Though reproduction is usually by gemmation and division, the sexual organs have been observed in this species. Spermathecae and testes occur in segment 5, and ovaries in segment 6. It is widely distributed,

being found in many parts of England, as well as in Bohemia, Germany, Denmark, Belgium, Switzerland, Italy, and elsewhere.

Collected on April 15th, 1912, among algae growing on the sluice or overflow from the canal, under the shadow of Nottingham Castle.

TUBIFICIDÆ.

52. **Limnodrilus aurantiacus** Friend (3). In mud by the wide ditch adjoining the canal, Nottingham, April 15th, 1912. This spot proved very rich in Tubificidæ. I have already indicated that half a dozen other species, already recorded for the County were found here. There are one or two other species yet to be recorded when the material has been carefully worked out. One species resembles the typical Tubifex, but lacks the long sperm duct and campanulate penis-sheath, as well as the pectinate setae; it seems to be a true Ilyodrilus. Also at Mansfield I found a small Tubifex, which may prove to be new to the County. Owing, however, to the uncertainty which still prevails respecting this family, I can do no more at present than indicate the possible results of future research.

ENCHYTRÆIDÆ.

It has already been intimated that the curious little worm Achaeta, which is destitute of setae, is found in the County. It now falls to my lot to record a species which is apparently new to science.

53. **Achaeta incisa** sp. nov. It has not yet been described in the Scientific Journals, so I give a few of the main characters. Length at rest about 5 mm., extending to 7 or 8 when stretching eagerly, when it is very slender. Segments about 35 in number, destitute of setae, but possessing the setae glands dorsally. Owing to the large opaque coelomic corpuscles and chloragogen cells it looks in the microscope like *Enchytraeus nigrinus*. Very long spermducts to the small ampullae which are about 2 or $2\frac{1}{2}$ times as long as broad. Three pairs of septal glands, but no salivary glands to be seen. The dorsal vessel arises as in some Henleas in segment 7 and pulses in front, especially in the sixth segment. The nephridia in front of the girdle have a very large postseptal, and occur in segments 6/7, 7/8. Behind the girdle, the nephridia shew the postseptal narrowing behind to form a short duct. The spermathecae are bottle-shaped,

the neck opening into the intestine. The name *incisa* was given on account of the shape of the brain, which in the type was about 2—3 times longer than broad, and incised behind. I retain the name, though it transpired in later examinations that the brain was sometimes destitute of the incision. Found at Mansfield, in sandy soil, May 8th, 1912, and now described for the first time. The number of species known to science is still under a dozen.

I have already (1) reported three species of *Henlea*, and noted a variety *(multispinus)*. There are some interesting additions to be made to our list.

54. **Henlea rhaetica** Bret. was found at Mansfield, May 8th, 1912, and again at Nottingham and Burton Joyce, December 16th, 1912. At the latter place a many-spined variety occurred along with the variety *multispinus* of *Henlea dicksoni* referred to above. My impression is that when these worms develop in rich soil, or specially suitable surroundings, they take on such characters as these. Hence the need of a wide survey To distinguish this variety, it may for the present be called *multisetosus*.

55. **Henlea lampas** Eisen, is a somewhat doubtful worm, so far as the original is concerned, but I have frequently found a species in England which comes near to Eisen's description, and have therefore adopted his name for it. But in time we may have to separate the material and form a new genus. Found first at Mansfield, May 8th, 1912, then by the canal at Nottingham, September 10th, and December 16th, 1912.

56. **Henlea nasuta** Eisen, is a well-known British species, and is found by the canal side, Nottingham. First record, September 10th, 1912. These species seem to be very fond of the damp mossy soil where the water splashes over the sluice. At Burton Joyce, in the small sample of decaying leaves and earth from the side of the brooklet I found two species of Henlea which are new to Britain, and as far as I can learn, new also to science.

57. **Henlea mariona** sp. nov. is so named because when first discovered it seemed so exactly like a species of Marionina (formerly called Mariona), that I headed my notes accordingly. It was only after I had worked out the species that I was compelled to recognise it as a Henlea and not a Marionina. The name is therefore intended to suggest their apparent relationship.

Length about 10 mm., stout, with some 50 segments, brownish looking, but with colourless blood. Setae about

8 per bundle, somewhat fewer posteriorly, those in front arranged Fridericia-wise, with shortest in middle of each bundle. Remarkable for the possession of only two pairs of septals, the front pair very large: and spermathecae, which, instead of entering the intestine, combine and form a kind of central ampulla quite unlike anything ever described before. Large glands and pores at the male aperture on segment 12, like the Pachydrilus described by Claparède. Intestine with bulb-like enlargement in the 9th or 10th segment, with dorsal vessel arising in the next posterior segment, pulsing forwards. Nephridia in 4/5 and following segments; duct not a continuation of the post-septal. Fine, irregularly coiled sperm-duct with small funnel not more than $1\frac{1}{2}$ to 2 times longer than broad. Burton Joyce to Lowdham, December 16th, 1912.

58. **Henlea parva** sp. nov. was found with the foregoing, but differs from it in many particulars. A very small worm, reaching only 3—4 mm. in length, with 28 segments, brown like the last, with colourless blood. The brown colour apparently due to the oxydised vegetable matter, beech and oak leaves, undergoing decomposition in the intestine. Setae ranging from 3 to 6; usually 3—5 behind, long and stout, six in the middle region of the body, and 4 laterally, 6 ventrally in front. Intestine enlarges in segment 8, with dorsal vessel in 9. Both these species are destitute of oesophageal glands. The spermathecae of *H. parva* are slender ducts opening into the intestine, with small glands at the 4/5 aperture. Three pairs of septals, and nephridia with tiny duct at posterior end.

Another tiny Henlea was found on September 10th, 1912, near the overflow from the canal, Nottingham, which differs from all the foregoing. Further study on fresh material is necessary, however, before arriving at a final decision. The fact is mentioned rather to shew what possibilities are yet before us.

59. **Enchytraeus buchholzi** Vejd. is not at present widely known in Great Britain. It was on this account all the more gratifying to find it on May 7th, 1912, with **E. albidus** at Mansfield in earth at the end of a drain from a farmhouse.

60. **Lumbricillus lineatus** O.F.M. was collected at Nottingham, by the canal, on April 15th, 1912, in company with *Nais elinguis* and *Henlea rhaetica*. I have had occasion to notice elsewhere that there are two distinct worms confused under this title in the usual text books. These have now been isolated and defined.

61. **Marionina crassa** Clap. Possibly a variety, as it differs in certain details from the description of the type, which is fairly well known in Great Britain. No fewer than three different species of parasite were found internally in one specimen. Taken in decayed hot-house bed, Woodboro' Hall Gardens, December 17th, 1912. The situation is unusual, and may account for the variation.

62. **Marionina** sp. Length 10-12 mm. Segments about 50; with red blood. Setae 4-5. Brain straight behind. Spermathecae in the shape of a slender duct without ampulla or glands. Nephridia with duct from the middle of the post septal. Found in leaf matter between Burton Joyce and Lowdham, December 16th, 1912, with *Henlea parva* and *H. mariona*, the latter of which it closely resembles at first sight.

63. **Marionina georgiana** Mich. By canal side, Nottingham, December 16th, 1912. Previously recorded by me for Middlesborough, February, 1912.

64. **Fridericia bisetosa** Levinsen. In sandy soil at Mansfield, May 8th, 1912, with *Henlea rhaetica*, *Achaeta incisa* *F. lobifera*, *F. michaelseni*, and other Enchytraeids.

65. **Fridericia obtusa** Friend (3). Not as yet found anywhere else in England. With the foregoing at Mansfield, May 8th, 1912, also a couple of forms or varieties which must be considered more fully another time, when the matter has been confirmed.

66. **Fridericia densa** sp. nov. A species which recalls *F. striata* and *F. diachaeta*. But whereas in the latter there are only 2 setae in each bundle throughout, in *F. densa* there are four in the mid region, and 6 in front of unequal lengths. The spermathecae have a long, rather stout duct, destitute of 4/5 glands, and with ampulla and diverticula which it was impossible to define in the living worm owing to the density of the epidermis. Hence the specific name. Length 15-20 mm. Segments 60. The dorsal vessel arises about 18/19. Brain of the typical Fridericia form. Found in earth between the canal and wide ditch under the shadow of the Castle, December 16th, 1912.* The Tubificidae already referred to were found in the mud at this same point.

*Later study leads me to think it may be only a dense variety of *F. michaelseni*. H.F.

67. **Fridericia callosa** Eisen is little known in England, but a specimen which cannot at present be referred to any other species, was obtained by Prof. Carr in decaying wood at Car Colston, April 11th, 1912.

68. **Fridericia rotunda** sp. nov. Recalls in various particulars, while it differs in others from *F. udei*, *F. galba* and *F. michaelseni*. Length 20 mm. Segments about 55; of a dirty, yellowish white, opaque, packed with coelomic corpuscles which greatly obscure the nephridia and other organs. Spermathecae with very short stout ducts, at the external opening of which are two glands, resembling those of *F. striata*. In the latter worm, however, there are no diverticula, whereas several sessile diverticula (about 5 or 6) are found on the ampulla of *F. rotunda*. Girdle extending over half of segment 11, and the whole of segments 12 and 13 when fully developed. Spermduct slender, not half as stout as the short duct of the spermathecae. Large atrial glands and pores on segment 12 in connection with the sperm-duct. Setae 3-4 behind, very stout: 6 dorsal, and 8 ventral as a rule in front. Dorsal vessel arises near 17/18. Brain small, almost round, whence the specific name. Found December 17th, 1912, by wall in Woodboro' Hall Gardens.

LUMBRICIDÆ.

In my former paper, when reporting the occurrence of *Octolasium lacteum*, I stated that it closely resembles *O. cyaneum*, which ought also to occur. We can now add this to our list.

69. **Octolasium cyaneum** Sav. (=*A studiosa* Rosa) differs from the foregoing in the position of the girdle. The usual formulæ are:

O. cyaneum.	O. lacteum.
29—34	30—35
30—33	31—34

The Notts. examples, however, differ from the type, in as much as the tubercula extend along the whole length of the girdle ventrally, so that the formula would be $\frac{29—34}{29—34}$. The worm is large, about 6 inches long, steel blue with yellow tail. This genus may be regarded as a link between the more variable Allolobophoras and the more settled Lumbrici. Woodboro' Hall Gardens, December 17th, 1912.

70 **Helodrilus oculatus** Hoff. may be regarded as in many ways the most valuable addition to our fauna. First discovered by Hoffmeister in 1845, it was for nearly half a century lost to sight. In 1890 Michaelsen re-discovered it and called it *Allolobophora Hermanni*, assuming it to be new to science. In 1900 it was known to occur in very moist loamy soil in Germany, Switzerland, and Italy. Later it was found near Edinburgh by Mr. William Evans, and when visiting the Botanical Gardens in Cambridge, I found it in the adult stage and reported it as *A. hermanni* Mich. Five years ago it turned up at Malvern, but though regularly observed by me for a couple of years not a single adult could be found. More recently I have found it at Hastings, near Pevensey, in the Thames at Kew, by the Severn at Worcester, in Derbyshire and elsewhere. It is abundant in a ditch below the Station at Burton Joyce (December 16th, 1912), but no adult was found. This is the slenderest of all our Lumbricidae, and might easily be regarded as a member of another group. When it is adult, however, the male pores are very prominent, and the girdle is well developed between segments 22 and 32 or thereabouts. At first there were doubts about its indigenous character, but its distribution is now found to be so extensive and varied that it may be unhesitatingly classed as a true native.

71. **Allurus** (?) **mollis** sp. nov. Finally I have to record the occurrence of another very interesting addition. In July, 1912, I was collecting by Ecclesbourne Glen, near Hastings, and found among the fresh water algae an immature worm which was new to me. It was in considerable numbers, but so delicate that all the specimens died the day after collection. As I was unable, through family bereavement, to study the material in a living condition I made a second journey to the glen, and obtained a few more specimens for immediate preservation. These have since been examined and referred provisionally to the genus Allurus, though it is quite possible that a new genus will have to be created for it. Among the material collected at Burton Joyce, I had the joy to discover a single specimen of my new annelid. The following notes were made during the brief time that it remained alive. The length varies from 8 to 12 or 15 mm. according to tension. Segments 90: the living worm having much the appearance of a tender Pachydrilid. Setae paired throughout, sigmoid as in Lumbricidae. Pharynx in segments 3-4, and gizzard about the 17th. Brain formed of two lobes, intermediate

between that of the Lumbricidae and the Enchytraeidae, situated in segment 2 or 2-3. The nephridia commence in 5/6, and are of the Lumbricid as opposed to the Enchytraeid type. The intestine enlarges greatly in segment 14, and hearts were seen in 9, 10, 11, with glands in 6, 7, 8, 9. No spermathecae, sperm-ducts, gonads or girdle developed.

In consequence of the un-adult condition of the specimens it is impossible to do more at present towards an exact determination of genus and species, and the name must therefore be regarded as tentative.

The material on which the foregoing report is based has not yet been exhaustively examined, so that one may hope that the coming year will enable us to add still further to the list. Naturalists who can aid in these researches are earnestly requested to send material for examination to the author.

SWADLINCOTE,

BURTON-ON-TRENT. *December 28th, 1912.*

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THE PALMISTRY OF THE ROCKS.

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Comparatively few people have a close acquaintance with the animal life of the sea. Their knowledge and interest centres more naturally around the life on the land, in the past as well as in the present. Unfortunately the odds in favour of preservation as fossils are nearly all on the side of marine forms, for their remains are liable to early burial under the frequently recurring showers of mud and sand.

The carcase of a land animal on the contrary lies exposed, its flesh decays, its bones are disintegrated by rain frost and sunshine, and are turned to dust. Only under exceptional circumstances are they preserved, as for example when the creature is mired in a bog, overwhelmed by a shower of volcanic dust, or swept by a swollen river into a lake or estuary. Occasionally the bones may be buried in a plain under silt from a flood, or dust borne by the wind.

It is from such deposits as these in North America and North Africa that the greatest collections of remains of land faunas of the past have been obtained, revealing an age when mammalian life was more exuberant even than it is to-day. So complete are some portions of these collections that it has become possible to trace the main lines in the evolution of the horse, camel, deer and elephant. The appearance of their progenitors is so strange that had it not been for the series of transitional forms no one would have suspected their affinity with their present day descendants.

But the time required for the transmutation of these strange types into their modern representatives is short compared with that which has elapsed since the rocks which immediately surround Nottingham were formed. Needless to say, therefore, the animals which lived then must have differed from those of to-day to a yet greater extent. These triassic rocks, though laid down upon the land, differ greatly from any of the terrestrial deposits mentioned above. They shew features which indicate that they accumulated under conditions somewhat similar to those which prevail now in Central Asia. That region, which is practically rainless, is