

NOTES ON INDIANA EARTHWORMS.

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The great group of animals known commonly as earthworms, comprises four families of the order Oligochaeta: the Moniligastridae, the Megascolecidae, the Glossoscolecidae and the Lumbricidae. Three of these families are represented in our fauna.

At the present time there are more than a thousand well recognized species of earthworms known. By far the larger number of these species have been described during the last twenty years. Most of the work on this group has been done by Europeans, chief among whom is Michaelsen of Hamburg, whose publications make up the bulk of the recent literature on the group. Professor Frank Smith of the University of Illinois has worked on the group in this country and Eisen, a Swede who lived for several years in San Francisco, has worked on West and Central American species.¹ Very little is known of the earthworm fauna of the Central States. Only about fifty species are known to occur in the United States, this scarcity of forms being due in part to lack of study and partly to the actual scarcity of species.²

It has been pointed out by Beddard³ and Michaelson⁴ that the earthworms are an important group for the Zoögeographer. Arldt,⁵ in a recent paper, shows the value of the group for the paleo-geographer and gives many of the facts of distribution now known as well as indicating the value of the group in theoretical considerations within the fields of geography and geology.

The Moniligastridae is a small family limited to Borneo, Ceylon, Southern India and neighboring islands. This family is regarded as the most ancient of the group.

¹Eisen; American Oligochaetes with special reference to those of the Pacific Coast and Adjacent Islands. Proceedings Calif. Acad. Science Vol. II, No. 2, 1900.

²Frank Smith; Earthworms From Illinois. Trans. Ills. Acad. Science. 1912.

³Beddard; A Textbook of Zoögeography. Cambridge, 1895.

⁴Michaelsen; Die geographische Verbreitung der Oligochaeten. Berlin, 1903.

⁵Ardt; Die Ausbreitung der terricolen Oligochaeten in Laufe der erdgeschichtlichen Entwicklung des Erdreliefs. Zool. Jahrb. Abt. f Syst. Geog. u Biol. Bd. 26, pp. 285-318. 1908.

The Megascolecidae are supposed to have arisen from the same root as the Moniligastridae but at a later period, and dates back at least to the Triassic. This is the largest of the earthworm families and contains more than half the known species. The family is widely distributed, chiefly in tropical regions and the southern hemisphere. But one genus, *Diplocardia*, is represented in our fauna. According to Michaelsen, this genus probably appeared in Mexico or Central America during the Jurassic. Derivatives from this genus have spread into Africa, but the genus itself spread northward and is known from Mexico, Lower California, Texas, Florida, Nebraska and Illinois.

The Glossoscolecidae seem to have developed as early as the Jurassic in the northern continental area. The genus *Sparganophilus* of this family is found in Mexico and various parts of the United States. Related forms are known from Central and South America, where many species are recognized.

The Lumbricidae is recognized as the most recent family of the group and is derived from the Glossoscolecidae, probably in southwest Asia. The family is thought to have invaded Europe in the Eocene and North America in the Oligocene. But few endemic species are known from the United States.

In the glaciated regions of the world, it is probable that the endemic species have been destroyed during the Ice Age. These regions have been repopulated by species which have migrated from the south and the earthworm fauna in such places is largely composed of forms carried in by man. In the southern part of Europe are found many endemic species while northern Europe is occupied almost wholly by forms also found further south. The line separating the northern territory with peregrine forms from the southern territory with endemic forms, corresponds very closely to the line of the most southern extension of the glacial ice sheet. It would be interesting to know if a similar condition exists in America.

Last year, under the direction of Professor Frank Smith of the University of Illinois, I began a study of the earthworms of Illinois and Indiana. I received, last fall, some material from Mr. C. E. Allen, of Wabash College, and some from my brother at Kewanee. During the past summer I made some collections in several counties of the State but was unable to make as extensive collections as are desirable. The materials I have contain some forms that may have to be described as new species and I believe that careful collecting in the State will disclose

several species new to science. It is my intention to make several collecting trips through the State during June and July, 1915, but the task of making a complete collection for the State is not to be completed in a few weeks by one man.

Earthworms are easy to collect and no great difficulty is experienced in caring for the collections. The most interesting forms are to be expected in uncultivated areas such as woodlands, stream banks, and the margins of swamps and lakes. Many interesting forms may be taken under logs and under the bark of old logs. The worms are especially easy to collect in the spring when driven from their burrows by the heavy rains. At such times they may be picked up in large numbers from roads and sidewalks. I wish to gain a more extended knowledge of the distribution of *Diplocardia* in the State and to know what forms are found in the unglaciated areas of the State. If any members of the Academy will aid in securing materials, I shall be very glad to have the material and to return named specimens in exchange. I shall be glad to correspond with any one who may be interested in such work.

Following is a list of species I have taken in Indiana together with some notes as to the habitats in which the worms were found. The space of this paper is not sufficient for descriptions of the species. The monograph by Michaelsen is the most authentic single work on the group.¹ The nomenclature used in this list is that of Michaelsen's monograph, except where the nomenclature has been modified in his later papers.²

Family MEGASCOLECIDÆ.

Genus *Diplocardia* (Garman).

1. *Diplocardia communis* var. *typica* Garman.

This form is quite common about Urbana and in other parts of Illinois. I have not found it in Indiana.

D. communis var. *singularis* Ude.

Collected under logs in recently cleared land near Culver, Marshall County. I have other specimens collected in Putnam and Vigo counties, which are very similar to *singularis* but very much larger and differing in minor points.

¹Michaelsen; Oligochæta. Vol. 10 in Schulze's Thierreich. Berlin, 1900.

²See particularly.

Michaelsen; Zur Kenntnis der Lumbriciden und ihrer Verbreitung. Ann. Zool. Mus. Imp. Acad. Sciences, St. Petersburg. 1910.

2. *Diplocardia riparia* F. Smith.

Collected at Terre Haute in a wooded pasture land.

3. *Diplocardia udei* Eisen.

Collected at Terre Haute together with *riparia*. The specimens are somewhat larger than Eisen's species and differ in details of setal modifications. If not *udei* this form is probably to be regarded as a variety of *udei*. The species was described from North Carolina and has not been reported outside that State.

I have other specimens of *Diplocardia* from Indiana, of which the classification is still uncertain.

Family GLOSSOSCOLECIDÆ.

4. *Sparganophilus eiseni* F. Smith.

This species is amphibious, and is found in very wet mud or among the roots of aquatic plants. Collected at Culver, on roots of Eel grass and in mud at margin of Lake Maxinkuckee. Very abundant in mud of small stream near Kewanna, Fulton County.

Family LUMBRICIDÆ.

5. *Helodrilus tetraedrus* var. *typicus* Sav.

Collected at Culver, in vegetable drift at edge of lake. An amphibious species found usually in wet soil along margins of streams or among vegetable detritus in very moist places.

6. *Helodrilus roseus* Sav.

Collected at Culver, Greencastle, Terre Haute. This species is probably to be found in all parts of the State. It is very commonly found in lawns and cultivated fields. My specimens were collected in woods and along stream banks.

7. *Helodrilus constrictus* Rosa.

Collected at Kewanna, under logs at handle factory; Culver under logs in woods.

8. *Helodrilus subrubicundus* Eisen.

Collected at Culver and Kewanna, under logs. The identification of this species is not absolutely certain as no sections have been made. However, this form is fairly well determined from external characters.

9. *Helodrilus chloroticus* Sav.

Collected at Culver, Lake Maxinkuckee, in moist soil at edge of lake. Greencastle, in moist clay soil in abandoned quarry hole. Crawfordsville, in moist clay soil, banks of small stream.

10. *Helodrilus foetidus* Sav.

Collected at Kewanna and Culver. This is the common evil smelling, barnyard or manure worm. Collected at Culver in decaying straw near ice houses. At Kewanna this worm was found in large numbers, in moist soil along a stream just below the outlet of a sewer. The whole locality was quite offensive because of the sewage.

11. *Helodrilus caliginosus* Sav.

Collected in Fulton, Marshall, Putnam, Madison and Vigo counties. This is perhaps our most cosmopolitan species. It is a European species that has spread wherever Europeans have settled. Perhaps 90% of any random collection in the State would consist of this species.

12. *Helodrilus longus* Ude.

Collected at Greencastle, in woods.

13. *Helodrilus zeteki* Smith and Gittins. (Mss.)

Collected at Kewanna, Culver, Summitville. All of my specimens were collected in loose sandy loam under logs, and under the bark of logs. In June I took about thirty-five specimens of adult worms in a woods near Kewanna. At this time I obtained many cocoons of the species, the worms being in the height of sexual maturity. This species was described by one of Professor Smith's students from specimens collected in a woods near Urbana, Ill. The description of the species is not yet in press.

14. *Octolasion lacteum* Oerley.

Collected at Crawfordsville, Culver, Greencastle, Summitville, Kewanna. My Crawfordsville specimens were sent me by C. E. Allen, and were collected in the banks of Sugar Creek. This species is very common under logs and in moist soil everywhere I have collected. It is very widely distributed throughout the world. I have never found it in cultivated fields.

