

Some Earthworms From Southern Oklahoma¹

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INTRODUCTION

It is unfortunate that the taxonomy of a group of animals as common as the earthworms has been neglected for so long. Almost nothing is known of the distribution in the United States, and indeed, little is known of the earthworm fauna of a majority of the states. Approximately thirty states have less than half a dozen reported species. Oklahoma is one of fifteen states with no species recorded in the literature.

Collections of specimens reported in this work are from Marshall, Love, and Bryan counties and were taken during June and July, 1954, by the author.

One might expect the southwestern soils, climate, rainfall, etc. to affect the natural history and physiology of a species. Whether or not these agents have been sufficiently different from the better known areas to cause western speciation or sub-speciation cannot be postulated until more intensive collecting and identifying have been done.

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LITERATURE

Only incidental references to Oklahoma earthworms appear in the literature. Dr. Martha W. Shackleford has written a number of papers (1928, 1929, 1935) on an ecological survey of the invertebrate fauna of a prairie community in central Oklahoma. However, the emphasis was placed on other groups or on relative numbers and the earthworms were not identified to species.

There is in the United States National Museum (as of January, 1954) a single collection of earthworms from Oklahoma. These specimens were sent in by Mrs. J. C. Thompson of Ardmore and were identified by Professor Frank Smith as *Allolobophora caliginosa* (Savigny), 1826.

The literature covering the oligochaeta is large. Beddard (1895) reviews the literature up to 1894 in his "Monograph of the order Oligochaeta." Michaelson's "Oligochaeta" in *Das Tierreich* (1900) is largely taxonomical and Stephenson's (1930) "The Oligochaeta" is more morphological and biological in its approach.

In this country, Professor Frank Smith devoted much of his professional life to this group. His paper on the lumbricids in the U. S. National Museum (1917) is a good summary to that date. Dr. H. W. Olson has published on the earthworms of Ohio (1928), Missouri (1936), and New York (1940). Dr. G. E. Gates' "Genus *Pheretima* in North America" and his "Check List and Bibliography of North American Earthworms" are significant contributions. His many publications on the Asiatic genus *Pheretima* comprise most of the literature on that group. Causey's (1952) "Earthworms of Arkansas" is the latest work on a statewide basis.

MATERIALS AND METHODS

Very little special equipment is required for the study of earthworms. A good supply of specimen bottles up to six inches in length is indispensable. For specimens longer than this, glass tubing cut to required lengths and

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stoppered with cork is good. Dip the corked end in paraffin to insure a sealed surface. A dissecting microscope is necessary in finding characters of taxonomic importance, and a spading fork or shovel and a hook or crow-bar for turning logs are helpful.

Earthworms abound in almost any type of soil if there are sufficient moisture and protection. Sand and sandy soils, however, are not generally good collecting places. Certain species can be found in habitats that are not inhabited by other species. Manure piles, compost heaps, rotten logs, semi-aquatic or marshy places all have their particular fauna. Moist soil will, however, yield the largest number of individuals and species.

Waste alcohol serves as a good anesthetizing and killing agent. When all movement has stopped, remove the worm from the alcohol and place in a straight position in 10% formalin. Leave the specimens over-night in this solution and they will harden with a minimum of twisting or curling. Store in fresh 10% formalin and renew the preservative occasionally (annually) if the specimens are to be kept for long periods of time.

It should be pointed out that labels do not last well in formalin and precaution should be used in selecting the paper for labels or renew them periodically. The latter is not recommended.

DISCUSSION

The scarcity of specimens in spite of frequent and varied collections may be attributed to the scant rainfall in the summer months. Much of the soil in the areas surveyed was very sandy. This generally does not provide good earthworm collecting even when moist.

The rainfall figures given in the following table are the official records of the Marshall County Soil Conservation Service. The figures are expressed in inches.

TABLE I
Official Records of the Marshall County Soil Conservation Service

	1952	1953	1954
June	0.00	1.48	2.76
July	3.55	6.64	0.00
August	0.53	0.89	*

* Data obtained on 20 July 1954

Many of the specimens collected in this work were found rolled into a ball in their burrows. Sometimes two or even three worms were together. Gates (1953) reports that some species have an obligatory diapause. If these individuals were in diapause, it was a facultative diapause. Most of the specimens were *A. caliginosa* and this species has been collected in Louisiana during all seasons of the year without showing any of the symptoms here observed. A heavy mucus covered their bodies and when dug up—usually from 12 inches or deeper—they were very inactive. However they did show a normal amount of activity in reaction to the killing solutions.

LIST OF SPECIES

FAMILY MEGASCOLECIDAE

Sub-family Diplocardiinae

Genus *Diplocardia* Garman 1888

Diplocardia riparia Smith 1895

Madill, Marshall County, at junction of state highways 99 and 199 in the city; June 14, 1954, 3 clitellate specimens, 3 acitellate specimens.

Kingston, Marshall County, in drainage ditch near cotton gin; June 16, 1954, 1 clitellate specimen.

Willis, Marshall County, on edge of field near drainage ditch, June 19, 1954, 2 clitellate specimens, 1 acitellate specimen.

Madill, Marshall County, east city limits on highway 199, in area kept moist for fishing bait, June 28, 1954, 1 clitellate specimen.

Durant, Bryan County, near Blue River east of Durant, June 30, 1954, 9 clitellate specimens.

This species has been collected in Oklahoma by others (Causey and Gates) but has not been reported from the state. The specimens correspond with the description given by Smith with the exception of the somite number. Nearly all Oklahoma specimens had many more somites than the type. This species is rather long and the difficulty in getting an entire specimen is great. Smith (1895) says of the somite number: ". . . the average of 10 specimens being 150, the minimum and maximum numbers respectively 136 and 157." Somite numbers and length in centimeters are given for the preserved specimens here reported: 204, 24 cm.; 188, 12.7 cm.; 151, 13.0 cm.; 195, 12.5 cm.; 106, 14.5 cm.; 230, 20 cm.; 282, 21.5 cm.; 225, 20 cm.; 104, 14.0 cm. The shorter ones are probably amputees.

FAMILY LUMBRICIDAE

Genus *Allolobophora* Eisen 1874

Allolobophora caliginosa (Savigny) 1826

Madill, Marshall County, at junction of state highways 99 and 199 in the city; June 14, 1954, 1 clitellate specimen.

Kingston, Marshall County, yard of cotton gin, June 16, 1954, 3 clitellate specimens.

Kingston, Marshall County, northwest part of town, under rocks in pasture land. June 16, 1954, 6 clitellate and 4 acitellate specimens.

Marshall County, 2 miles west of intersection of state highway 32 and the U.O.B.S. road. June 23, 1954, 2 clitellate specimens, 2 acitellate specimens and 3 juveniles.

Love County, 6 miles east of Marietta on state highway 32, in alfalfa field, June 23, 1954, 5 clitellate and 3 acitellate and 1 juvenile specimen.

Willis, Marshall County, on Briar Creek 5 miles north of Willis, June 26, 1954, 2 clitellate, 3 acitellate, and 1 juvenile specimen.

Willis, Marshall County, in hog pasture 5 miles north of Willis, June 26, 1954, 1 clitellate specimen, 5 juveniles.

Madill, Marshall County, east city limits on highway 199, in area kept moist for fishing bait. June 28, 1954, 16 clitellate specimens.

Bryan County, Blue River east of Durant, June 30, 1954, 3 clitellate specimens.

Durant, Bryan County, Durant Nursery Company, July 28, 1954, 1 clitellate specimen.

Stephenson (1930) considers this the most common species ". . . taking the world into consideration." It has been reported from nearly all states from which there have been reports. The somite number on the local specimens is more conservative than the published range—100 to 250. The count on 31 mature specimens was: 87, 89, 107, 110, 111, 112, 113 (2), 127, 128, 131, 132, 134, 135, 137, 138, 139, 140, 143 (2), 147 (2), 149, 150, 152, 155, 157, 165, 166 (2), 171.

In a majority of the specimens the clitellum covered somites xxvii-xxxiv; however in one individual the clitellum covered nearly all of xxxv. In four additional specimens the clitellum began slightly anterior to xxvii or $\frac{1}{2}$ xxvi. In only one did the clitellum involve part of xxvi and part of xxxv.

All of the clitellate specimens and the acitellate specimens that were mature enough to show the tubercula pubertatis had it on somites xxxi-xxxiii. In one individual the swelling was such as to extend over part of

xxxiv. The number involving either an anterior or posterior somite in the clitellum seems to be about even.

The number of abnormalities in this species was greater than in any other species collected. For the most part the abnormality consisted of the absence of setae. Seta *a* seemed to be the one most often absent. In one individual of 154 total somites, somite 114 was only on the right side. It was complete in setal number and arrangement on that one side. The septa inside converged at the mid-dorsal and mid-ventral lines and the partial somite was just as marked internally as it was externally. One spiral anomaly involving the somites ii-vi occurred in one collection. The intersegmental grooves and septa were both spiral.

Genus *Bimastos* (Moore) 1893

Bimastos gieseleri var. *hempeli* Smith 1915

Willis, Marshall County, Rowland Creek near where it empties into Lake Texoma south west of the Post Office at Willis, June 19, 1954, 1 clitellate specimen.

Kingston, Marshall County, northwest part of town in pasture under rocks. June 16, 1954. 1 clitellate specimen. These two specimens were the only ones collected, but since they came from two widely separated places it can be assumed that the species is more common than these records show. They had 88 and 110 somites.

Genus *Eisenia* Malm 1877

Eisenia foetida (Savigny) 1826

Marshall County, in U.O.B.S. Collection. Collected by W. R. Hood, July 21, 1953, 1 clitellate specimen.

Marshall County, in U.O.B.S. Collection. Collected by P. Davis, July 20, 1953, 1 acitellate specimen.

Marshall County, in U.O.B.S. Collection, Coll. O.A., July 10, 1952, 2 clitellate specimens.

Marshall County, in U.O.B.S. Collection. Coll. Dick Hood, July 21, 1952, 3 acitellate specimens.

Murray County, in U.O.B.S. Collection, Coll. Leon Harney, July 26, 1952, 2 acitellate macerated specimens.

Bryan County, Durant Nursery Company, July 28, 1954, 6 clitellate specimens, 26 acitellate specimens.

Bryan County, Leonard Floral Company, in greenhouse, July 28, 1954. 8 acitellate specimens.

Most of these specimens were in the University of Oklahoma Biological Station collection from previous years. The author was able to collect this species only in greenhouses in Bryan County. Many collections were made in barn yards and other likely places for this species, but everything was too dry to be productive.

Eisenia rosea (Savigny) 1826

Bryan County, Leonard Floral Company greenhouse. July 28, 1954. 2 clitellate specimens and 13 acitellate specimens.

It is interesting to see this species, so common on the East coast, appear in Oklahoma only in greenhouses. The author has collected this species repeatedly in Virginia and Maryland. It is recorded from Missouri (Olson 1936), Arkansas (Causey 1952) and Louisiana (Smith 1917) as well as from several more eastern states.

CONCLUSIONS

Five species of earthworms, representing four genera and two families are here recorded from Oklahoma for the first time. Of these species, only one—*D. riparia*—is native to North America. The others are introduced, but

have become so well established as to be considered "native" by many. Gates (1954) says that peregrine species of the family Lumbricidae have been established in the United States for 150 years or more. *Allolobophora caliginosa trapezoides* is the commonest species in this area, based on the available collections.

Diplocardia riparia is a very common species in the blacklands prairie soil. Some earthworms in Oklahoma enter a facultative state of diapause in the summer months.

The summer months do not have sufficient rainfall for the earthworms to survive at surface levels.

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