

# A NEW MEGASCOLECID EARTHWORM FROM MICHIGAN WITH NOTES ON ITS BIOLOGY

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Re-examination of specimens assigned by the writer (1956) to the species *Diplocardia singularis* (Ude) has shown that the Michigan form should be considered a distinct species. This oligochaete was collected from: (1) Section 8, Waterloo Township, Jackson County; (2) Section 12, Dexter Township, Washtenaw County; and (3) Section 20, Putnam Township (E. S. George Reserve), Livingston County. The Washtenaw County specimens were used in describing this species, named in honor of Professor H. R. Eggleston, Marietta, Ohio.

## *Diplocardia egglestoni* n. sp.

Color, flesh to brown due to blood and internal pigmentation; integument colorless. Size, 70–90 by 1.2–2.0 mm. Somites, 75–110, average 106. Clitellum, XIII–XVII, cingulum type. Setal formula,  $aa:ab:bc:cd = 16:6:13:8$ ,  $dd = \frac{1}{2}c$ . Genital field with paired seminal grooves on XIX in setal line *a*, often extended slightly on XVIII and XX. Spermiducal pores paired, on XIX. Prostate pores missing. Genital setae, setae *ab* of XVIII and XX nearly contiguous, sinuately curved, about two and one-half to three times longer than normal setae, without sculpturing, distal portion often twisted. Glandular areas, distinct and paired in 17/18 and 20/21 at setal line *ab*, occasionally in 18/19 and 19/20; setae of *ab* on XVIII and XX surrounded by rounded, glandular papillae. Oviducal pores, paired, on slightly depressed, oval, glandular area of XIV, anteromedian to *a*. Spermathecal pores on anterior margin of VII, VIII, and IX, slightly above setal line *a*; spermathecal setae not differentiated. Nephropores are intersegmental, regular, at setal line *d*. First dorsal pore, 8/9. Prostomium, epilobic, two-thirds.

Septa 8/9 and 9/10 considerably thickened; 7/8, 10/11, and 11/12 somewhat thickened. Testes and funnels, two pairs in X and XI; ovaries and funnels, one pair in XIII. Ovisacs absent. Seminal vesicles, two pairs, small; those of IX arising from ventro-lateral portion of 9/10, those of XII from ventro-medial aspect of 11/12. Seminal receptacles, three pairs in VII, VIII, and IX; duct and ampulla of equal length; diverticulum finger-like, on anterior surface of duct at the base of the ampulla; diverticulum about one-fifth as long as the entire seminal receptacle. Dorsal vessel single, last hearts in 12, no subneural trunk. Gizzards two, in V and VI. Esophagus, IX–XIV with distinct looping of the lumen wall; ciliated, longitudinal ridges beginning in XV; intestine expanding abruptly in XVII. Typhosole beginning in XVII. Meganephridial. Syntypes—in collection of United States National Museum (USNM Cat. No. 28714). Paratypes—in collection of author.

*Diplocardia egglestoni* stands very close to *D. singularis* (Ude), differing from the latter, and all other described species of the genus, in complete absence of prostate glands. Observed variations in shape and form of the spermathecal diverticulum cast doubt on the value of this structure for specific determination. Eisen (1899) described the diverticulum in *singularis* as "oblong"; Macnab and McKey-Fender (1955) used the expression "short stalk with a smoothly-rounded knob-like apex." In *egglestoni*, the diverticulum (fig. 1C) is short, fingerlike, and appressed to the stalk of the spermatheca; folding of the epithelium is not evident externally, but does appear in histological sections.

On the basis of the description by Eisen (1899), penial setae of *Diplocardia egglestoni* and *D. singularis* are similar; Macnab and McKey-Fender (1955), however, characterize the penial setae of *singularis* as "sinuately curved, but so slightly that the total effect is of a nearly straight seta." These setae, in *egglestoni*, are distinctly curved (fig. 1B), and from two and one half to three times longer

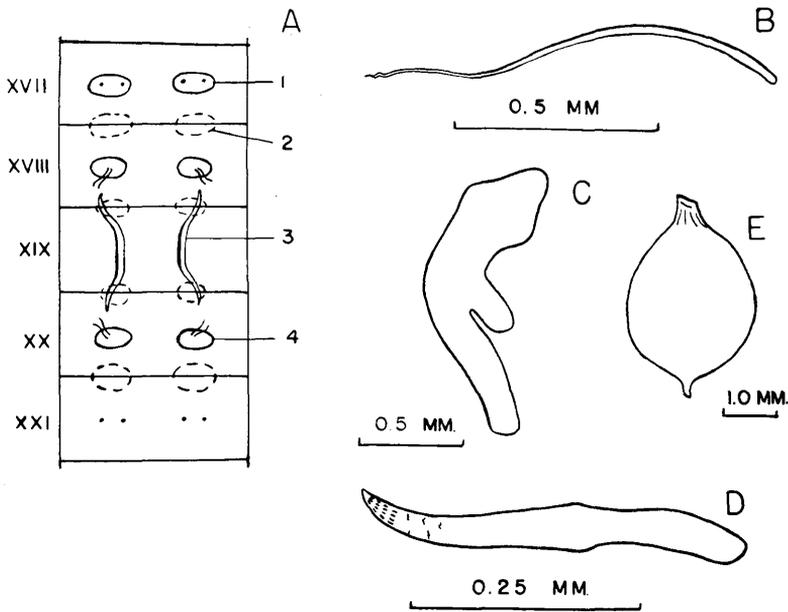


FIGURE 1

A. Genital field of *Diplocardia egglestoni*

- (1) Glandular papilla
- (2) Intersegmental papilla
- (3) Seminal groove
- (4) Papilla surrounding genital setae *ab*.

B. Genital seta *a* of XVIII.

C. Spermatheca of VIII.

D. Seta of spermathecal segment IX.

E. Oötheca of *D. egglestoni*.

than ordinary setae. No markings of any nature could be observed on the genital setae, whereas ordinary setae often show faint striae near the tip (fig. 1D). In young worms, glandular areas appear at 18/19 and 19/20 (fig. 1A); the identity of these areas is difficult to establish in older individuals as the entire genital field is then somewhat swollen.

#### *Biology of Diplocardia egglestoni*

All collections of *Diplocardia egglestoni* were made in upland forest soils (largely oak-hickory), or open grassy fields. None were ever encountered in wet, poorly-drained soil. *D. egglestoni* is a true soil species, forming irregular burrows throughout the upper soil; in open woods or fields, worms are usually found among grass roots near the surface. When disturbed, individuals assume a semirigid attitude and make no escape movements.

A population of *Diplocardia egglestoni* in Dexter Township, Washtenaw County, was studied for the period May 1, 1952, through May 30, 1953, in order to determine population density and variation in seasonal activity. At the peak of earthworm activity during May, 1953, ten soil samples, each measuring 50 X 50 X 50 centimeters, yielded an average of 14.7 *egglestoni* per plot. Similar samples, collected at biweekly intervals throughout the year, demonstrated the considerable control exercised by moisture and temperature on the biology of *Diplocardia egglestoni* insofar as seasonal periodicity was concerned.

The number of worms in the upper 50 centimeters of soil declined in June and, through July and August, they were virtually absent from the upper soil. The population increased in mid-September and remained fairly stable until December when a second major depression in population numbers occurred. The "normal" condition was resumed in late March.

This apparent cyclic behavior, as evidenced by changes in population density, was caused by migration of worms to the lower levels during periods of drought or soil freezing. The depth of such penetration can only be guessed, but a few individuals were recovered at 70 centimeters during July, 1952. *Diplocardia egglestoni* can enter a quiescent condition (*diapause* of some authors) similar to that found in the Lumbricidae. This state is induced by drought or cold and appears completely facultative.

In the dry summer period, it was the larger individuals which migrated downward beyond the sampling depth of 50 cm; smaller worms entered a quiescent condition, usually from 20 to 40 cm. The winter migration, probably because the soil was quite moist to all depths, involved departure of both large and small individuals from the upper soil layers. It should be pointed out that this responsiveness of *egglestoni* to moisture and temperature extremes is likely to vary somewhat under different conditions of drainage and soil texture; thus, precise thresholds and limits cannot be given.

Fully clitellate worms occurred only during May and June; it is probable however, that suitable soil moisture condition would have extended the reproductive period into the summer months. The only oötheca (cocoon) encountered in the entire period was collected on May 27, 1953, at a depth of four inches, among grass roots. It was subspherical in shape, opaque, and pale green in color; measuring 3.5 mm in length, and 2.5 mm in diameter (fig. 1E). The young worm was well developed at the time of collection, and emerged on the 18th of June; upon emergence it measured 15 mm in length.

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