ERRATA.

Page 12, lines 16 and 17, for *one* hundred read *three* hundred and for *one thousand* read *six hundred.*

Page 17, line 2, dele first letter in the line.

Page 168, line 12, page 177, lines 13 and 14, and page 271, line 10, for *Lemna trisulca* read *Spirodela polyrhiza.*

Page 209, line 2 of foot-note, after *but* insert *represents.*

Page 256, line 7, and page 266, line 19: *snowi* n. s. has been shown to be *hieroglyphica*, ♂.

Page 257, insert as line 8 as follows: -ken to the office produced young in ten days. The

Page 272, line 13, for *P. biguttatus* read *Pompilus biguttatus.*

Page 278, Plate V., 16, after *view* insert as follows: *a*, mentum; *b*, labial rudiment; *c*, maxillary palpi; *d*, maxilla; *e*, labrum; *f*, antenna; *g*, eye; *h*, mandible.

Page 286, line 11, drop initial *the* one line.

Page 386, line 1, for *Comstocki* read *Comstock.*

Page 399, line 17, for *specimens* read *specimen.*

Page 411, line 10, for *Michaelson* read *Michaelsen.*

Page 441, line 3 from bottom, for *66* read *68.*

Page 445, line 10 from bottom, for *57* read *58.*

Page 466, line 1 from bottom, for *Cypria* read *Cypris.*

ARTICLE V.—*A Preliminary Account of two New Oligochæta from Illinois.* By FRANK SMITH.

Several species of Oligochæta were collected by the writer during the past summer at the Biological Station upon the Illinois River, at Havana, founded early in the present year by the University of Illinois, with Prof. S. A. Forbes as Director. Since it will be several months before a full report on the Oligochæta can be prepared, it seems best to publish this preliminary account of the larger forms collected.

In the vicinity of the Station, the Illinois River flows for the greater part of its course between low banks, which are overflowed during the higher stages of water that usually occur in the spring or early summer months. They are covered with the usual bottom-land forests and other vegetation of the region. In those portions of the banks that are above water during the greater part of the year, were found many earthworms of a species closely allied to *Diplocardia communis* Garman which was described from Illinois in 1888* and is abundant in the soil of the prairies of the State. Reproductive activity was greatest throughout the month of May, when cocoons were abundant in their burrows.

Diplocardia riparia nov. sp.

This earthworm is quite similar to *D. communis* in general form, in relative length of somites in different parts of the body, and in the plication and encircling lines of the somites. The number of somites is similar, the average of ten specimens being 150, the minimum and maximum numbers respectively 136 and 157.

The ordinary length of well-extended specimens is 22 to 25 cm., with a diameter of about .3 cm.

*"On the Anatomy and Histology of a New Earthworm (*Diplocardia communis*, gen. et sp. nov.)." (Bull. Ill. State Lab. Nat. Hist., Vol. III., Art. IV., p. 47.)

The color is somewhat darker than that of *D. communis*, which is flesh-colored. The difference is very pronounced on the dorsal surface of the region anterior to the clitellum, where the surface becomes dark brown, this color being usually retained in alcoholic specimens. Posterior to the clitellum the brown dorsal vessel and its lateral branches are very conspicuous through the body wall of the living animal.

The clitellum is of a dull copper-color, and extends over somites XIII to XVIII, inclusive. As in *D. communis*, it is absent or but slightly developed upon a narrow median ventral area of those somites. The setæ have the same arrangement and distribution as in *D. communis*. The first dorsal pore is near the groove between X and XI. The number and position of the gizzards, in somites V and VI, the character of the typhlosole, and other main features of the alimentary tract, are the same in the two species. The nephridiopores are in the vicinity of the outermost setæ.

The generative systems of the two species are alike in main characters, but present specific differences. Two pairs of ciliated rosettes are present in each of the species, occupying the usual position in somites X and XI.

An anomalous position for the testes was ascribed by Garman to *D. communis*. After having sectioned specimens of that species, I find that some of the reproductive organs were misinterpreted by him. Two pairs of digitate testes are present in each of the species. These have the usual position, being attached to the anterior septum of each of somites X and XI.

In number and position of sperm-sacs the two species agree. There is a pair of pre-septal lobulated sperm-sacs in somite IX, and a pair of post-septal lobulated sperm-sacs in somite XII. The latter, in *D. communis*, were described by Garman as testes.

Somites X and XI are filled with developing spermatozoa during the reproductive season, though no definite sacs have been observed. The situation of the sperm-duct in *D. riparia* is like that in *D. communis*. The

male pore is also upon somite XIX, in a longitudinal groove, but is near the anterior margin of that somite.

Two pairs of prostate glands are present in each species, having their external openings on somites XVIII and XX. The species also agree in having two ventral crescentic longitudinal grooves (their convexities inward), which extend from the middle of somite XVIII to the middle of somite XX, and have modified setæ and the external opening of a prostate gland at each of their extremities. In each species somite XIX is without ventral setæ.

On the ventral side of alcoholic specimens of *D. riparia*, an area extending from the middle of somite XVII to the anterior portion of somite XXI and bounded upon the sides by the two longitudinal grooves, is depressed to a depth of about one fifth the diameter of the worm. In alcoholic specimens of *D. communis* no such depression is noticeable.

Two pairs of spermathecæ are present in *D. riparia*, one pair in each of somites VIII and IX, with the external openings at the anterior margins of those somites and in line with the inner rows of setæ. *D. communis* has in addition one pair in somite VII. Although Garman makes the possession of three pairs of spermathecæ a character of the genus, I feel justified in including the new species in the same genus, especially as other genera of earthworms include species which differ in the number of spermathecæ.

The ovaries and female pores are in the usual position, the former in somite XIII, and the latter upon somite XIV.

The vascular system of *D. riparia* is much like that of *D. communis*, except that in no case has any trace been seen of the double dorsal vessel, which is so constant in the latter species. The presence of a double dorsal vessel is included by Garman among the generic characters of Diplocardia, but I think without sufficient reason, since in other instances species differing in this respect are assigned to one genus.

The new species, then, possesses all the characters of *D. communis* which are regarded by Garman as generic except two; viz., three pairs of spermathecæ and a double dorsal vessel. Not regarding these characters as of generic importance, for the reasons given above, I include the new species in the genus Diplocardia.

The more obvious external characters by which this species may be distinguished from *D. communis* are smaller size, darker color,—especially of the anterior portion,— the presence of but two pairs of spermathecal pores, and the single dorsal vessel, which in the living animal is plainly visible through the body wall.

For convenience of comparison the following table has been prepared:

	Diplocardia communis.	*Diplocardia riparia.*
Setæ	Four couples. All ventral.	Four couples. All ventral.
Prostomium	Partially dovetailed into peristomium.	Partially dovetailed into peristomium.
Male pore	XIX.	Anterior part of XIX.
Testes and funnels	X and XI.	X and XI.
Sperm-sacs	Sacculated in IX and XII. X and XI filled with spermatozoa without special sac.	Sacculated in IX and XII. X and XI filled with spermatozoa without special sac.
Prostates	Two pairs, with external openings in XVIII and XX.	Two pairs, with external openings in XVIII and XX.
Copulatory fossæ or longitudinal grooves.	One pair, extending from middle of XVIII to middle of XX, with copulatory setæ and prostate pore at the extremities of each groove.	One pair, extending from middle of XVIII to middle of XX, with copulatory setæ and prostate pore at the extremities of each groove.
Ovaries	One pair in XIII.	One pair in XIII.
Female pore	XIV.	XIV.
Gizzards	Two; in V and VI.	Two; in V and VI.
Typhlosole	Slight dorsal fold.	Slight dorsal fold.
Subneural vessel	Absent.	Absent.
Nephridia	Meganephric.	Meganephric.
Nephridiopore in line with	Fourth seta.	Fourth seta.
Clitellum	XIII—XVIII. Incomplete.	XIII—XVIII. Incomplete, or but slightly developed upon narrow median ventral area.

	Diplocardia communis.	*Diplocardia riparia.*
First dorsal pore.....	Between X and XI.	Between X and XI.
Spermathecæ.....	Three pairs; in VII, VIII, IX.	Two pairs; in VIII and IX.
Dorsal vessel.....	Double.	Single.
Length, well extended.	30 cm.	22–25 cm.
Color anterior region.	Flesh-color.	Brown.
Color clitellum.....	Dull yellow or flesh-color.	Dull copper.

Geodrilus singularis Ude, described from Illinois in 1893,* has several characters in which it resembles Diplocardia, but the position of the prostates and of the male pore is different, and no mention of the longitudinal grooves is made nor is there any indication of them in the figures. Unfortunately Ude was unable to describe the generative organs fully because of the condition of his specimens.

Sparganophilus eiseni nov. sp.

The second species to be described is very abundant in the mud of the Illinois River and of the bottom-land lakes connected with it. Dredging shows it to be distributed over the entire bottom of these bodies of water, although somewhat more abundant near the margins. Specimens have been taken at all times at which collections were made, from April to December inclusive. Their cocoons were most abundant during the month of June, while the clitellum was well developed two weeks earlier.

These worms agree with *Sparganophilus tamesis* Benham† in all the characters given by him as generic, and in a number of others as well. The table at the end of this article will be sufficient reference to many of these resemblances, while others deserve more special mention.

**Beiträge zur Kenntnis ausländischer Regenwürmer.* (Zeit. f. Wiss. Zool., LVII. Bd., p. 69.)

†"A New English Genus of Aquatic Oligochæta (Sparganophilus) belonging to the Family Rhinodrilidæ." (Quart. Jour. Micr. Sci. Vol. XXXIV., p. 155; Plates XIX and XX.)

A few points of difference seem to sharply distinguish the two forms. The worms from Illinois are the larger, and have a length, when moderately extended, of 18 to 20 cm. I have alcoholic specimens fixed after being anæsthetized, which, without being unnaturally extended, are over 20 cm. in length, and average .26 cm. in diameter.

The arrangement of setæ in the two forms differs chiefly in the position of the outer couples, which are in the dorsal half in the new form, instead of in the ventral half as in *S. tamesis*.* Sections have a quadrangular outline, with a couple of setæ at each angle, the arrangement being similar to that in Criodrilus. The distance between the outer or dorsal couples is one and a fourth times that between the inner or ventral couples in the region posterior to the clitellum, and about one and a half times as great in the region anterior to the clitellum. The distance between the outer couple and the inner couple of the same side is slightly greater than that between the two inner couples. The setæ of a couple are quite closely approximated. As in *S. tamesis*, the outer setæ are missing in the region where the clitellum is fully developed. Specimens taken late in the season have setæ in this region.

The spermathecal pores are in line with the setæ of the outer couple, as in *S. tamesis*, but in consequence of the dorsal position of that couple in the new form, the pores are upon the dorsal half of the animal.

The form of the region of the clitellum during reproductive activity is different from that at other seasons and from that figured for *S. tamesis*. At that season the ventral part of the clitellar region, including the ventral setæ and the tubercula pubertatis, is slightly concave downward, and forms two very conspicuous ridges or actual folds where it meets the lateral walls. This concave appearance, though intensified by the action of alcohol in hardening, is not produced by it, but is present in the living worm.

*Benham, loc. cit., Pl. XIX., Fig. 8.

The male pores are situated opposite the anterior part of somite XIX and upon the ventral crests of the ridges, being immediately outside of the tubercula pubertatis, as in *S. tamesis.*

The last point of difference to be mentioned is the most remarkable and unexpected. *S. tamesis* belongs to Benham's family Rhinodrilidæ, in which, according to him, prostate glands are absent.* There is no mention of any such glands in his paper upon Sparganophilus, yet glands that I consider to be homologous with them are present in the form under consideration. These glands require a somewhat detailed description, since their number and position, and even their occurrence, is rather remarkable. Each gland is tubular and of two well-marked divisions; the true glandular part and the duct. The former is more or less convoluted in an irregular manner, and if straightened out would vary from .5 mm. to 1 mm. in length. Its diameter is fairly uniform, and usually about .13 to .15 mm. In a cross section of the gland the lumen is nearly circular and about .015 mm. in diameter. It is surrounded by an epithelial layer .006 to .01 mm. thick, and outside of this is the layer of glandular cells, which is about .05 to .06 mm. thick. Many of the cells of this layer are club-shaped, and extend from the epithelial layer to the exterior, while others extend only part way through the layer. This part of the gland is surrounded by a plexus of blood vessels from which many minute branches penetrate the gland. The duct has a nearly straight course through the body wall, being but little longer than the thickness of that wall, or about .32 mm., with a diameter of about .06 mm. The inner two thirds has a lumen much smaller than that of the gland and often nearly obliterated. It is surrounded by an epithelial layer as in the glandular region, but this is surrounded by a layer of circular muscular tissue about .02 mm. thick, which replaces the glandular layer of that region. The outer

*"An attempt to classify Earthworms." (Quart. Jour. Micr. Sci., Vol. XXXI., 1891, p. 221.)

third of the duct has a lumen somewhat flattened and .004 to .008 mm. in diameter, which is lined with a cuticular layer continuous with the cuticula of the body wall. Its epithelial layer is also continuous with the epithelium of the body wall, the cells becoming longer in the outer portion of the duct, and partaking of the characters of the columnar epithelium of that part of the body surface which is immediately adjacent to the prostate pores. The muscular layer diminishes in thickness and disappears in the outermost portion of the duct.

Usually four pairs of these glands are present in somites XXIII-XXVI, a pair in the posterior part of each of these somites opening just outside of the outer setæ of the ventral couple. The pore and the two setæ are nearly in line, and the distance between the pore and outer seta is about one half as great as that between the two setæ. In one example two glands were found in one side of a somite and none in the other, the opening of the second gland being between the setæ of the ventral couple, but much nearer the outer one. In another example but three pairs were present—in XXIII XXV.

If these are prostate glands,—and I can see no reason to think that they are not,—they are very far removed from the male pore, and are of an unusual number.

Benham has called attention to several features in the structure of *S. tamesis* as being quite remarkable. In these particulars the resemblance of the new form to that species is striking. (1) The sperm duct has the same superficial position and inconspicuous opening, the only difference being that it does not leave its position at the base of the clitellar layer to pass outward until it reaches the septum between XVIII and XIX, where, curving quite abruptly, it opens at the male pore upon the ridge already mentioned and opposite the anterior part of somite XIX. (2) In each species a pair of ovisacs occurs in somite XIV, in which were found ova showing karyokinesis. (3) Longitudinal tegumentary vessels passing forward from somite XIV are present in both,

being readily seen through the body wall of living specimens of the Illinois species. The dorsal one is considerably larger than the other. (4) A perienteric sinus occurs in each species.

From the similarity of the characters just mentioned and of others referred to in the appended table, it is evident that the two forms are very closely allied. Were it not for the presence of the prostate glands in the one here described there could be no question about their belonging to the same genus, and, as it is, I do not feel justified in creating a new one, but prefer, for the present at least, to associate the new species with Benham's by naming it *Sparganophilus eiseni.*

The chief characters by which it may be distinguished from *S. tamesis* are, as already mentioned, its greater size, the dorsal position of the outer setæ and spermathecal pores, the latero-ventral ridges of the clitellar region during the reproductive period, and the presence of prostate glands in some or all of somites XXIII–XXVI.

Necessary figures and additional details will appear in the more complete report to be published later.

	Sparganophilus tamesis.	*Sparganophilus eiseni.*
Clitellum	Somites XVI—XXIV, with part of XV and XXV.	XVI—XXV with part of XV. Diminishing on XXIV and XXV.
Prostomium	Not marked off from the peristomium by a groove.	Not marked off from the peristomium.
Male pore	Inconspicuous. Between XVIII and XIX, without accessory organs.	Inconspicuous. Upon anterior part of XIX.
Sperm-sacs	Two pairs; in XI and XII.	Two pairs; in XI and XII.
Spermathecæ	Simple. Three pairs.	Simple. Three pairs.
Gizzard and œsophageal diverticula	Absent.	Absent.
Typhlosole	Absent.	Absent.
Vascular system	Perienteric blood sinus. Two long tegumentary vessels on each side traverse the anterior somites without communicating with the alimentary tract. No subneural vessel; the only commissural vessels situated anteriorly.	Perienteric blood sinus. Two long tegumentary vessels on each side traverse the anterior somites without communicating with the alimentary tract. No subneural vessel; the only commissural vessels situated anteriorly.

	Sparganophilus tamesis.	*Sparganophilus eiseni.*
Clitellum on ventral surface	Continuous but thinner.	Continuous but thinner.
Lateral setæ	Absent in fully developed clitellum.	Absent in fully developed clitellum.
Alimentary tract	Abruptly widens in IX.	Abruptly widens in IX.
Nephridia	Large. First in XIII.	Large. First in XIII.
Nephridiopore	In front of seta 1.	In front of seta 1.
Testes and funnels	Two pairs; in X and XI.	Two pairs; in X and XI.
Sperm-duct	Subepidermic.	Subepidermic.
Ovaries and female pore.	In usual position.	In usual position.
Ovisacs with ova showing karyokinesis	XIV.	XIV.
Spermathecal pores	In line with lateral setæ, which are ventral.	In line with lateral setæ, which are dorsal.
Dorsal vessel	Dilated in IX—XI.	Dilated in IX—XII.
Lateral hearts	In VII—XI; large and moniliform.	In VII—XI; large and moniliform. Course more tortuous than figured for *S. tamesis*.
Tegumentary vessels	In XIV and backward, one pair from each of dorsal and ventral vessels.	In XIV and backward, one pair from each of dorsal and ventral vessels.
Cocoons	Sausage-shaped, with one end frayed.	Sausage-shaped, with one end frayed.
Length	3 to 4 inches (7.5—10 cm.).	18 to 20 cm.
Outer pair of setæ	In ventral half.	In dorsal half.
Prostates	Absent.	Usually four pairs; in XXIII—XXVI.

CHAMPAIGN, Dec. 10, 1894.

Since this paper went to press, Michaelsen's description of new earthworms from Florida and Georgia* has been received. One species, described under the name *Geodrilus eiseni*, is very closely related to *Diplocardia riparia* described above, but differs in several minor

*Die Regenwurm-Fauna von Florida und Georgia (Zool. Jahrb. Abth. f. System. VIII. Bd. 2 Hft. pp. 177—194.)

characters and seems to be a distinct species. Michaelsen states that Garman's paper upon *Diplocardia communis* was not accessible to him. If it had been, I can see no sufficient reason why he should not have included the new species in the genus Diplocardia. If I am right in not regarding the presence of a double dorsal vessel and of a fixed number of spermathecæ as necessarily of generic importance, and hence in including *D. riparia* in the same genus with *D. communis*, then I think the new species ascribed by Michaelsen to the genus Geodrilus really belongs to the genus Diplocardia, since it has all the other characters of that genus, as far as can be determined from his quite full description, and has no characters that in my judgment are to be considered generically different. I think, therefore, that the new form should be known as *Diplocardia eiseni.*

If Michaelsen be correct in his assumption that Ude's description of *Geodrilus singularis* was erroneous in certain particulars, and, further, in placing his species in the same genus with that of Ude, then it would seem that *G. singularis* must also be regarded as a Diplocardia. I do not, however, believe that this point can be actually settled until *G. singularis* can be more fully described.

The following are some of the differences which distinguish *D. riparia* from *D. eiseni:* (1) The spermathecal pores are in the posterior part of the somite in the latter species, while in the former they are near the anterior margin; (2) the ventral setæ of somites VIII and IX are modified in *D. eiseni* and not in *D. riparia;* (3) a glandular thickening of the ventral surface of somites VIII and IX is present in *D. eiseni* and not in *D. riparia;* (4) setæ 2, or "b," are present in somite XIX in *D. eiseni* and not in *D. riparia;* (5) the first pair of nephridia in *D. eiseni* is found in somite III, while in *D. riparia* a pair is present in somite II; and (6) the first dorsal pore seen in *D. eiseni* is in the first clitellar somite, while in *D. riparia* it occurs in the anterior part of somite XI.