A NEW DISCODRILID WORM FROM COLORADO.

MAX M. ELLIS,

Instructor in Biology, University of Colorado.

The material on which this account is based was received through the kindness of Prof. T. D. A. Cockerell. It consists of two sets of worms. Forty-five specimens of this Discodrilid were found on two specimens of *Cambarus diogenes* Girard in the University of Colorado museum, labeled "Boulder, Colorado, July 24, 1908." Another lot of about 300 worms came from five specimens of *Cambarus diogenes* Girard collected on the University of Colorado campus, July 9, 1911. One of the crayfish, a medium-sized male, carried quite a number of the stalked eggs of this worm on the underside of its abdomen. The writer is indebted to Miss Margaret Hankins, who discovered this second lot of worms, for information concerning the living animals; to Mr. E. Bethel, of East Denver, for carefully preserving these specimens; and to Prof. J. P. Moore, of the University of Pennsylvania, for the loan of a valuable reprint.

All the figures were made from camera lucida drawings, except fig. 4.

CAMBARINCOLA, new genus.

This genus is easily distinguished from *Bdellodrilus* Moore by the noneversible penis, by the eversible bursa, by the simple spermatheca, by the large accessory tube connected with the male reproductive organs in segment 6, and by the absence of the conspicuous, clear, paired, segmental glands in the first nine post-cephalic segments. It is separated from *Branchiobdella* Odier by the single, median dorsal, pulsatile papilla carrying the single common opening of the anterior nephridia, by the possession of two pairs of testes and vasa deferentia, and by dissimilar dental plates.

Type of the genus.—Cambarincola macrodonta.

CAMBARINCOLA MACRODONTA, new species.

Type-specimen.—4.65 mm. body length; Cat. No. 53794, U.S.N.M.

Cotypes.—Four specimens, 1 to 4.25 mm. body length; Cat. No. 53794, U.S.N.M.

Body rather slender when extended, slightly arched ventrally, circular in cross section in all regions, greatest diameter in the fifth or

sixth segment, shortest diameter in the first segment, sloping gradually from the fifth segment to the first and rather abruptly from the sixth segment to the acetabulum; greatest diameter of the head always less than the greatest diameter of the body; greatest diameter of the

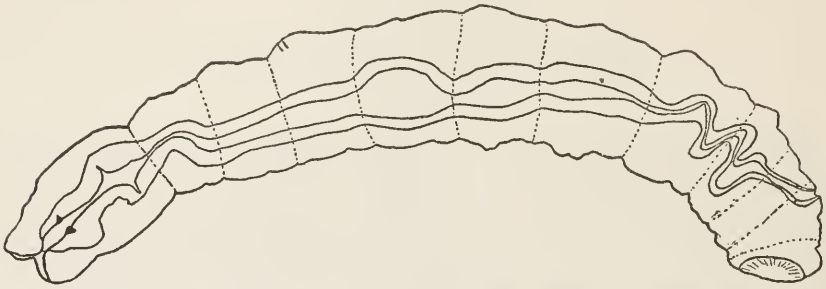

FIG. 1.—CAMBARINCOLA MACRODONTA. OUTLINE SIDE VIEW OF TYPE-SPECIMEN.

body 5 to 8 in the body length; head distinct, elongate in extended specimens; length of the head greater than the greatest diameter of the body in extended specimens (greatest diameter of the body 1.1 to 1.3 in the length of the head), equal to or less than the greatest diameter of the body in contracted individuals (length of the head 1 to 1.3 in the greatest diameter of the body); greatest diameter of the head 1.2 to 1.4 in the greatest diameter of the body.

FIG. 2.—CAMBARINCOLA MACRODONTA. DORSAL DENTAL PLATE, FRONT VIEW. FROM A CLEARED PREPARATION.

Head composed of four annulations; the first or anterior cephalic annulation very prominent, of less diameter than the second annulation, tapering forward, from 2.3 to 3.3 in the total length of the head, depending upon the degree of contraction, composed largely of two fleshy lips—a dorsal and a ventral—of which the dorsal is very slightly the longer; the other three annulations very indistinctly marked, so that the remainder of the head appears to be but a single piece; first seven or eight body segments showing a rather distinct biannulation, the anterior portion of each segment being of the greater diameter; acetabulum terminal, of moderate size, from 1 to 1.25 in the greatest diameter of the head; genital papillæ on segments 5 and 6, quite conspicuous in large specimens.

FIG. 3.—CAMBARINCOLA MACRODONTA. VENTRAL DENTAL PLATE, FRONT VIEW. FROM A CLEARED PREPARATION.

Mouth terminal, or very slightly ventral, its opening rather diamond shaped, with the greatest dimension at right angles to the dorso-ventral line, guarded by two large lips, each of which bears several tiny papillæ on its inner surface and a few minute hairs on its outer edge near the median line; each lip entire with the exception of a single slight emargina-

tion in the median line, which may be entirely wanting; dental plates very dark-brown to black, situated at or just in front of the junction of the first and second cephalic annulations; dorsal plate roughly triangular in outline when seen from the front, middle portion of the base excavated so that the two corners extend beyond the rest of the plate as two horns, anterior face with two rather prominent teeth on each side near the edge of the plate, the tooth nearer the apex on each side being pointed and larger than the basal tooth, apex produced into a single large cylindrical tooth with a conical point; ventral plate with an excavated base like that of the dorsal plate, the anterior face bearing a single small knob-shaped tooth on each side near the base, apex produced into two large cylindrical teeth, each with a conical point.

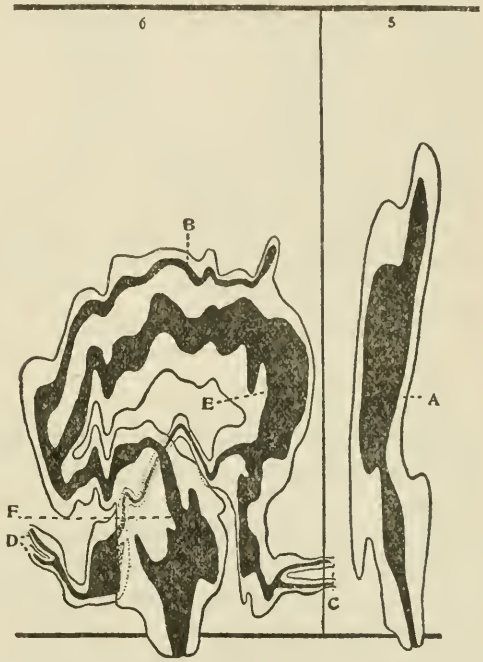

FIG. 4.—CAMBARINCOLA MACRODONTA. RECONSTRUCTION TO SCALE FROM SECTIONS OF THE GENITAL TRACTS OF SEGMENTS 5 AND 6 SEEN FROM THE RIGHT SIDE OF THE ANIMAL. A, SPERMATHECA; B, ACCESSORY SPERM TUBE; C, ANTERIOR PAIR OF VASA DEFERENTIA; D, POSTERIOR PAIR OF VASA DEFERENTIA; E, SPERMATIC VESICLE; F, OPENING OF THE PENIS.

Pharynx narrowing just behind the dental plates, with a distinct dorsal diverticulum near the junction of the second and third cephalic annulations and a ventral diverticulum slightly caudad, the mouths of the two diverticula producing an irregular enlargement of the pharynx in the third annulation; esophagus narrow, occupying the first body segment, near the middle of which it drops to the floor of the body cavity; crop or post-esophageal portion of the alimentary canal extending through segments 2 and 3, rising gradually to the center of the body, increasing steadily in diameter, caudad, and showing little or no constriction at the junction of segments 2 and 3 unless distended with food; stomach large, almost filling segment 4, marked off by definite constrictions; intestine proceeding as a straight tube of slightly less diameter than that of the stomach through the center of segments 5 and 6; in segment 7 becoming somewhat narrowed, swinging dorsally and to the left side of the body in the anterior portion of the segment, and returning much narrower to the right of the

median line in the posterior portion of the segment, leaving segment 7 near the dorsal wall of the body cavity; continuing in the anterior portion of segment 8 much narrower, crossing again to the left side and descending to the center of the segment, enlarging in the posterior portion of the segment, but leaving segment 8 near the center as a small tube; the rectum beginning in segment 9, passing diagonally through this segment to its dorsal wall, opening dorsally in the median line in the anterior portion of segment 10.

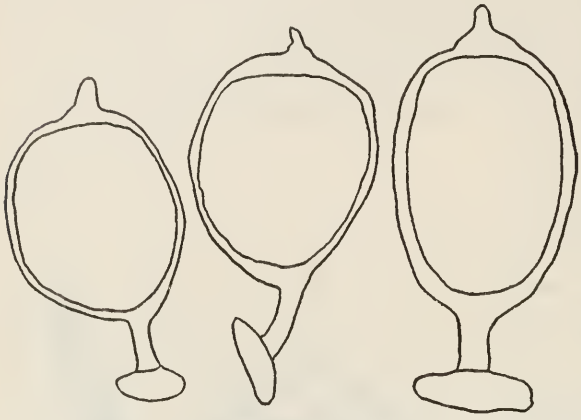

FIG. 5.—CAMBARINCOLA MACRODONTA. THREE COCOONS, SHOWING THE VARIATION AND IRREGULARITIES.

Living animals colorless and quite transparent excepting the alimentary canal (which was a pale green in the specimens observed), and the gonads; body quite contractile.

Cocoons subspherical and borne by a short pedicle; distal portion of the capsule produced into a slender, pointed peak which usually shows a basal enlargement; total length of cocoon and pedicle 0.7 to 0.9 mm.; length of pedicle about 0.14 mm.; length of peak about 0.08 mm.; average width of cocoon 0.3 mm.

Found on almost any part of the exterior of *Cambarus diogenes* Girard, particularly on the ventral surface. No specimens were found in the gill chambers.

This species may be separated from *C. philadelphica* (Leidy), the nearest related species, and its systematic position determined from the following key. Its general anatomy, with the exceptions already made in the description, is practically the same as that of *Bdellodrilus illuminatus* (Moore), which has been elaborately treated by Moore.[1]

KEY TO THE KNOWN DISCODRILIDÆ OF THE UNITED STATES EAST OF THE ROCKY MOUNTAINS.

a^1. Dorsal and ventral dental plates similar; anterior nephridia with separate dorsal openings.....*Branchiobdella* Odier.

b^1. A pair of cup-shaped organs on the latero-ventral surface of both segments 8 and 9; alimentary canal rather straight.....*B. pulcherrima* Moore.

b^2. No cup-shaped organs on segments 8 and 9; alimentary canal much convoluted near its posterior end; posterior half of the body distinctly wider than the anterior half.....*B. instabilia* Moore.

[1] Journ. Morph., vol. 10, 1895, p. 497 et seq.

a^2. Dorsal and ventral dental plates dissimilar; anterior nephridia opening through a common mid-dorsal pore in the center of a small papilla.

c^1. Spermatheca bifid; dental plates colorless; without sensory hairs about the mouth; oral sensory papillæ wanting; nine post-cephalic segments each with a conspicuous pair of large clear glands opening to the exterior dorsally and ventrally; penis eversible. ..... *Bdellodrilus* Moore.
B. illuminatus (Moore).

c^2. Spermatheca not bifid; dental plates colored; sensory hairs about the mouth; oral sensory papillæ present; no large clear glands in the nine post-cephalic segments; penis not eversible, but bursa eversible.. *Cambarincola*, new genus.

d^1. Head as wide, usually wider than the greatest width of the body, campanulate; lip single, circumoral and slightly crenate; intestine rather straight; dorsal dental plate with 3 small teeth on each side, apical tooth conical; ventral dental plate with 4 small teeth on each side; base of both even.
C. philadelphica (Leidy).

d^2. Head elongate, width always less than the greatest width of the body, tapering in the anterior half; lips 2; intestine much convoluted in the last three segments through which it passes; dental plates each with lateral horns; dorsal dental plate with 2 prominent teeth on each side, apical tooth cylindrical and pointed; ventral dental plate with a single pair of knob-shaped teeth, one on each side, the two apical teeth large, cylindrical and pointed; pharynx with a distinct dorsal and a distinct ventral diverticulum.
C. macrodonta, new species.

BIBLIOGRAPHY.

1. Branchiobdella Odier, 1823.

1. *Branchiobdella pulcherrima* Moore.

Branchiobdella pulcherrima Moore, Proc. Acad. Nat. Sci. Phila., vol. 45, 1893, p. 423, pl. 12, fig. 2 *a*, *b*, *c*, *e* (Watauga Co., North Carolina, on *Cambarus bartonii*).

Branchiobdella pulcherrima Smallwood, Biol. Bull., vol. 11, No. 2, 1906, pp. 100 and 106, fig. 2 (Lake Clear, Harriettstown, Franklin Co., New York).

2. *Branchiobdella instabilia* Moore.

Branchiobdella instabilia Moore, Proc. Acad. Nat. Sci. Phila., vol. 45, 1893, p. 425, pl. 12, fig. 3 *a*, *b*, *c*, *e* (Watauga Co., North Carolina; Delaware Co., Penn.).

Branchiobdella instabilia Smallwood, Biol. Bull., vol. 11, No. 2, 1906, pp. 100 and 104, fig. 1, (Lake Clear, Harriettstown, Franklin Co., New York).

3. *Branchiobdella tetrodonta* Pierantoni.

Branchiobdella tetrodonta Pierantoni, Napoli Annuario Mus. Univ., vol. 2, No. 4, 1906, (California on *Astacus*, sp.).

2. Bdellodrilus Moore, 1895.

Moore, Journ. Morph., vol. 10, 1895, p. 497. Type, *Bdellodrilus illuminatus* (Moore)=*Branchiobdella illuminata* Moore.

4. *Bdellodrilus illuminatus* (Moore).

Branchiobdella illuminata Moore, Proc. Acad. Nat. Sci. Phila., vol. 45, 1893, p. 421, pl. 12, fig. 1 *a*, *b*, *e*, (Philadelphia, Pennsylvania; Watauga Co., North Carolina; from *Cambarus bartonii*).

Bdellodrilus illuminatus. Moore, Journ. Morph., vol. 10, 1895, p. 497 et seq., pls. 28–32.

Bdellodrilus illuminatus Smallwood, Biol. Bull., vol. 11, No. 2, 1906, p. 100 (Lake Clear, Harriettstown, Franklin Co., New York).

3. CAMBARINCOLA, new genus.

Type, *Cambarincola macrodonta*, new species.

5. *Cambarincola philadelphica* (Leidy).

Astacobdella philadelphica LEIDY, Proc. Acad. Nat. Sci. Phila., vol. 5, p. 209, and Smiths. Misc. Coll., vol. 46, 1904, No. 177, p. 51 (from *Astacus bartonii*).—VERRILL, Rept. U. S. Com. Fish., 1872–73, p. 688.

Branchiobdella philadelphica MOORE, Proc. Acad. Nat. Sci. Phila., vol. 45, 1893, p. 427, pl. 12, fig. 4 *a*, *b*, *c*, *d*, *e* (Watauga Co., North Carolina; Philadelphia, Pennsylvania).

Bdellodrilus philadelphicus MOORE, Journ. Morph., vol. 10, 1895, p. 498.

6. *Cambarincola macrodonta*, new species.

Boulder, Colorado, from *Cambarus diogenes*.