

A NEW BRANCHIOBELLLID (ANNELIDA)
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ABSTRACT

A new branchiobdellid, *Cambarincola smalleyi*, from freshwater crabs of the family Pseudothelphusidae in Costa Rica is described. A somewhat primitive member of the genus, this species is assumed to be a southern survivor of a Pleistocene migration of cambarine crawfishes and their epizoic commensals. It is hypothesized that the branchiobdellids survived in Costa Rica by passing from their former hosts to the winners of the interglacial or post-Pleistocene competition between crawfishes and crabs.

Branchiobdellid annelid worms, usually found as epizoic commensals on freshwater crawfishes of the family Astacidae, have been known from Mexico for some time (Rioje, 1940, 1943). They recently have been recorded from hosts other than astacid crawfishes (Hobbs and Villalobos F., 1958; Holt, 1963). The finding of them on freshwater crabs of the family Pseudothelphusidae in Costa Rica by Alfred E. Smalley of Tulane University, is, nonetheless, worthy of note. First, this discovery adds another to the rapidly increasing list of crustacean families which serve as hosts for the branchiobdellids. In addition, the southward extension of their range from the Isthmus of Tehuantepec in Mexico through approximately seven degrees

of latitude to the highlands of Costa Rica is of some zoogeographical interest.

I am grateful to Dr. Smalley for making the four mature worms which he recovered from specimens of *Pseudothelphusa tumimanus* Rathbun (Pseudothelphusidae) available to me for study and take pleasure in naming the new species of the genus *Cambarincola* which they represent in his honor.

The procedures I use in the study of branchiobdellids have been described elsewhere (Holt, 1960). My studies are supported by a grant, NSF-GB372, from the National Science Foundation.

Cambarincola smalleyi, n. sp.
(Figs. 1-4)

Diagnosis. Medium-sized members of the genus; head, approximately equal in diameter to that of segment I and the sucker, showing external evidence of being composed of four segments; prosomites of body segments not appreciably greater in diameter than metasomites; jaws homodont and isomorphic, dental formula 6/6. Male reproductive system: the prostate about two-thirds the size of the spermiducal gland in length and diameter and histologically different from the latter, the prostate lacking an ental

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bulb; the spermiducal gland without deferent lobes; the bursa elongate pyriform in shape. Female reproductive system: spermatheca with a long ectal duct and an ental process.

Description. Since only four specimens of *Cambarincola smalleyi* are known, measurements are of little value. The type specimen, however, as some indication of the size of these animals, has the following dimensions: total length, 2.82 mm; head length, 0.43 mm; head diameter, 0.29 mm; diameter, segment I, 0.30 mm; diameter, segment VI, 0.51 mm; diameter, sucker, 0.39 mm. The smallest specimen is 1.93 mm long.

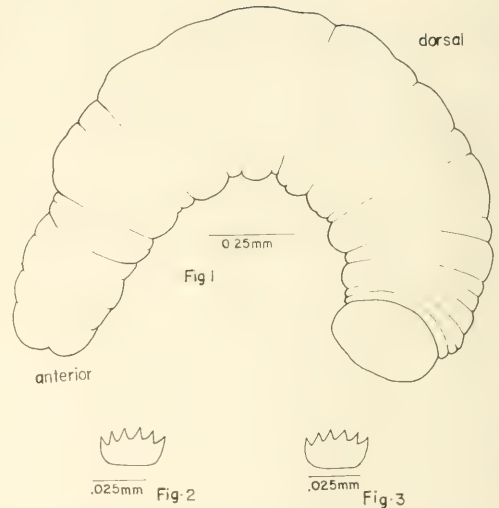
The worms are somewhat corpulent in appearance; the greatest diameter of the holotype is one-sixth the total body length. The prosomites are not markedly greater in diameter than the metasomites, the body wall lacking the supernumerary muscles which produce this condition in some branchiobdellids. The sucker is of usual appearance and somewhat greater in diameter than the head or segment I.

The head shows obvious external signs of being composed of four segments (Fig. 1). Other branchiobdellids are known to have four vascular commissures in the head, but in *C. smalleyi* these commissures are readily apparent in the specimens mounted entire. The peristomium is, as usual, divided into dorsal and ventral "lips"; each lip is subdivided by a slight median emargination. No oral papillae are present.

The jaws (Figs. 2 and 3) are unusual. The upper and lower jaws are similar in size and shape and the number of teeth (six) is the same for each jaw. The teeth, furthermore, are subequal in size and their points form a gently curved arc in dorsal view. The jaws are sub-rectangular in dorsal view. They contrast, then, in these respects, with the triangular jaws with fewer teeth of most species of the genus. The dental formula of 6/6 is diagnostic of *C. smalleyi*.

The anterior nephridiopore, located as usual for the genus, is unusually prominent. The "bladder" and outlet duct formed by the junction of the two nephridia are thick-walled and glandular in appearance. Whether or not this reflects a real difference or the accidents of preservation cannot be determined from the material available.

The prostate is composed of large vacuolated glandular cells, the spermiducal gland



Figures 1-3. *Cambarincola smalleyi*, n. sp. 1. Outline drawing of type specimen. 2. Dorsal jaw, paratype. 3. Ventral jaw, paratype.

of more densely granular cells, but the prostatic ental bulb is absent. The short, relatively thick, differentiated prostate without an ental bulb, a condition not described for any other branchiobdellid, is characteristic of *C. smalleyi*.

The spermiducal gland is perhaps somewhat smaller in proportion to the total size of the animal than in most other species of the genus, but otherwise is not remarkable. The same statement can be made about the other organs of the male reproductive system.

A clitellum is present on segments VI and XII. The spermatheca has a rather long ectal duct and the spermathecal bulb has a small, but distinct, ental process (Fig. 4).

Type locality. Rio Hondura, eight miles north of San Jeronimo de Moravia, San José Province, Costa Rica.

Host. *Pseudothelphusa tumimanus* Rathbun.

Disposition of types. The holotype, U. S. N. M. No. 30940 and one paratype, U. S. N. M. No. 30941 are deposited in the collections of the Division of Marine Invertebrates, United States National Museum. One paratype is in the collection of Dr. Smalley at Tulane University and the remaining one is retained in my collections kept at the Virginia Polytechnic Institute (PCH 1702).

Distribution. *Cambarincola smalleyi* is known only from the type locality.

Remarks. *Cambarincola smalleyi* most closely resembles *C. vitrea* Ellis, 1919, in jaw structure but differs in the larger number of teeth borne by the jaws of the former and in the fact that the same number of teeth is present on each jaw. The general body form is like that of many species of the genus, differing in the more obvious signs of segmentation of the head. The male reproductive system in the histologically differentiated prostate is like that of Hoffman's (1963) *philadelphica* section of the genus, which includes *C. vitrea*, but differs in the absence of a prostatic bulb. One can speculate that *C. smalleyi* is related in a greater or lesser degree to *C. vitrea*, a species which is widespread in the mid-continental plains region of the United States, or to *C. mesochorea* Hoffman, 1963, likewise a mid-continental species. *C. mesochorea* has an undifferentiated prostate without an ental bulb, but has an ental spermathecal process, present in *C. smalleyi* and absent in *C. vitrea*.

Cambarincola smalleyi extends the known range of branchiobdellids almost 500 miles southward from southern Mexico to Costa Rica. Presumably it represents a montane survivor of a population representing the pre-Pleistocene North American fauna which moved southward during one of the Pleistocene glaciations. The species must have reached Costa Rica more recently than the late Miocene or early Pliocene closing of the Central American water gaps, if these gaps existed as is generally believed. The northern, temperate distribution of branchiobdellids would argue against them being a part of the Neotropical Cenozoic fauna of North America.

Though the jaws of *C. smalleyi* are presently thought to reflect a primitive branchiobdellid condition (Ellis, 1919) and the segmentation of the head is undoubtedly primitive, the species does not appear markedly primitive in other respects. The most reasonable conclusion would seem to be that it is a descendant of an already relatively advanced cambarincolid, pre-Pleistocene stock intermediate between *Cambarincola mesochorea* and *C. vitrea*.

Finally, some notice must be taken of the host of *C. smalleyi*. Presently, branchiobdellids are known from astacine, cambaroidine, and cambarine crawfishes, isopods of the genus *Asellus* (Holt, 1963), and grapsid crabs (Hobbs and Villalobos F., 1958).

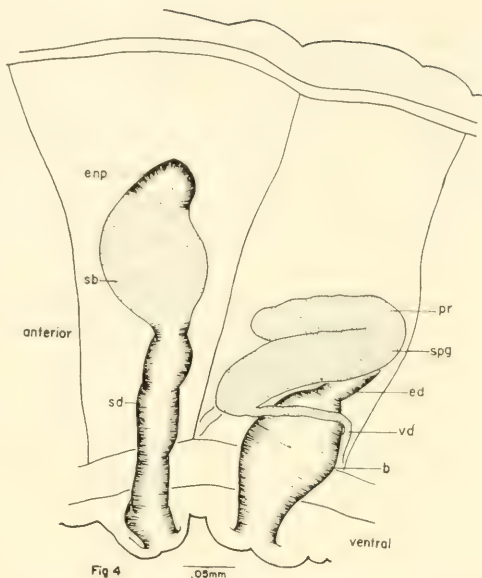


Figure 4. *Cambarincola smalleyi*, lateral view of reproductive systems of type specimen. Abbreviations: *b*, bursa; *ed*, ejaculatory duct; *enp*, ental process of spermatheca; *pr*, prostate; *sb*, bulb of spermatheca; *sd*, ectal duct of spermatheca; *spg*, spermiducal gland; *vd*, vas deferens.

Their occurrence on the tropical, freshwater, pseudoscorpionid crabs takes them considerably beyond the range of the cambarine crawfishes which reach their southern limits in the Guatemalan highlands. Unquestionably, branchiobdellids are primarily commensals of astacid decapods, but no longer can be assumed to be confined to these hosts. Yet cambarine crawfishes must have carried them to Costa Rica, lost in competition with the tropical crabs, and passed their commensals to their conquerors.

The hypothesis that the branchiobdellids passed from crawfishes to crabs in southern Mexico and hence by repeated transfers and migrations southward to other crabs in Costa Rica may be, on the contrary, the correct explanation: it seems to me less likely.

Summary. A new branchiobdellid, *Cambarincola smalleyi*, from freshwater crabs of the family Pseudoscorpionidae in Costa Rica is described. Although a somewhat primitive member of the genus, it is not markedly so, and is assumed to be a southern survivor of a Pleistocene migration of cambarine crawfishes and their epizoid commensals. The branchiobdellids presumably survived in

Costa Rica by passing from their former hosts to the winners of the interglacial or post-Pleistocene competition between crawfishes and crabs.

REFERENCES CITED

- ELLIS, MAX M. 1919. The branchiobdellid worms in the collections of the United States National Museum, with descriptions of new genera and new species. *Proc. U. S. Nat. Mus.* **55**: 241-265.
- HOBBS, HORTON H., JR. and ALEJANDRO VILLALOBOS F. 1958. The exoskeleton of a freshwater crab as a microhabitat for several invertebrates. *Virginia J. Sci. (N. S.)* **9**: 395-396.
- HOFFMAN, RICHARD L. 1963. A revision of the North American annelid worms of the genus *Cambarincola* (Oligochaeta: Branchiobdellidae). *Proc. U. S. Nat. Mus.* **114**: 271-371.
- HOLT, PERRY C. 1949. A comparative study of the reproductive systems of *Xironogiton instabilus instabilus* (Moore) and *Cambarincola philadelphica* (Leidy) (Annelida, Oligochaeta, Branchiobdellidae). *J. Morph.* **84**: 535-572.
- 1960. The genus *Ceratodrilus* Hall (Branchiobdellidae, Oligochaeta), with the description of a new species. *Virginia J. Sci. (N. S.)* **11**: 53-77.
- 1963. A new branchiobdellid (Branchiobdellidae: Cambarincola). *J. Tennessee Acad. Sci.* **38**: 97-100.
- RIOJA, ENRIGUE, 1940. Estudios Hidrobiológicos II. Datos sobre los Branchiobdellidae de Xochimilco, Zempoala y Texcoco. *Anales del Instituto de Biología* **11** (1): 249-253.
- 1943. Estudios Hidrobiológicos IX. Anotaciones sobre branquiobdellidos Mexicanos. *Anales del Instituto de Biología* **14**(2): 541-545.