

A NEW SPECIES OF THE GENUS *CAMBARINCOLA*  
(CLITELLATA: BRANCHIOBDELLIDA) FROM ILLINOIS  
WITH REMARKS ON THE BURSA OF *CAMBARINCOLA*  
*VITREUS* ELLIS, 1919, AND THE STATUS OF  
*SATHODRILUS* HOLT, 1968

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*Abstract.*—*Cambarincola illinoisensis*, new species, is described and illustrated. Similarities between the everted bursa of this species, that of *C. vitreus* Ellis, 1919, and those of species of *Sathodrilus* Holt, 1968, are illustrated and commented on. The involved genera are not synonymized, since it is expected future work will result in the erection of new genera to contain some species now assigned to each genus.

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Recently, in the process of redescribing *Cambarincola elevatus* Goodnight, 1940, and reassigning the species to *Sathodrilus* Holt, 1968, specimens of *Cambarincola vitreus* Ellis, 1919, and a previously unrecognized species of *Cambarincola* were found with everted bursae. To describe the newly found species and comment on the bursae and penes of the 2 species and those of *Sathodrilus* are the objectives of this report.

The methods I use have been fully stated (Holt 1960): here it might be emphasized that the drawings, made with the aid of a camera lucida, are semi-diagrammatic, with little or no effort to indicate cellular detail, and those of bursae and penes are of optical sections done from animals mounted entire. Measurements are to be regarded as approximations and are given in millimeters with the ranges in parentheses. The initials "USNM" refer to the catalog numbers of specimens in the collections of the National Museum of Natural History; "PCH" to those of specimens in my collection.

I wish to acknowledge the financial aid of the Virginia Polytechnic Institute and State University; the help given me by Horton H. Hobbs, Jr., and his identifications of the host crayfishes; the assistance in collecting of my wife, Virgie F. Holt, and our daughter, Susan E. H. West.

*Cambarincola illinoisensis*, new species  
Fig. 1A–E

*Type-specimens.*—Holotype, USNM 65225, 3 paratypes, USNM 65226, 5 paratypes, PCH 840, taken on *Orconectes virilis* (Hagen 1870) from a prairie stream (? Sugar Creek) north of Stockland, Iroquois County, Illinois, by Perry C. and Virgie F. Holt, 25 July 1958.

*Diagnosis.*—Medium-large, relatively robust worms (holotype 3.2 mm in length); upper lip with 4 obscure lobes, lower with 2; no oral papillae; low dorsal ridges; upper jaw twice that of lower in size, dental formula 5/4; bursa about  $\frac{1}{3}$  body diameter in length, ovate; atrial fold present; protruded penis slender; tu-



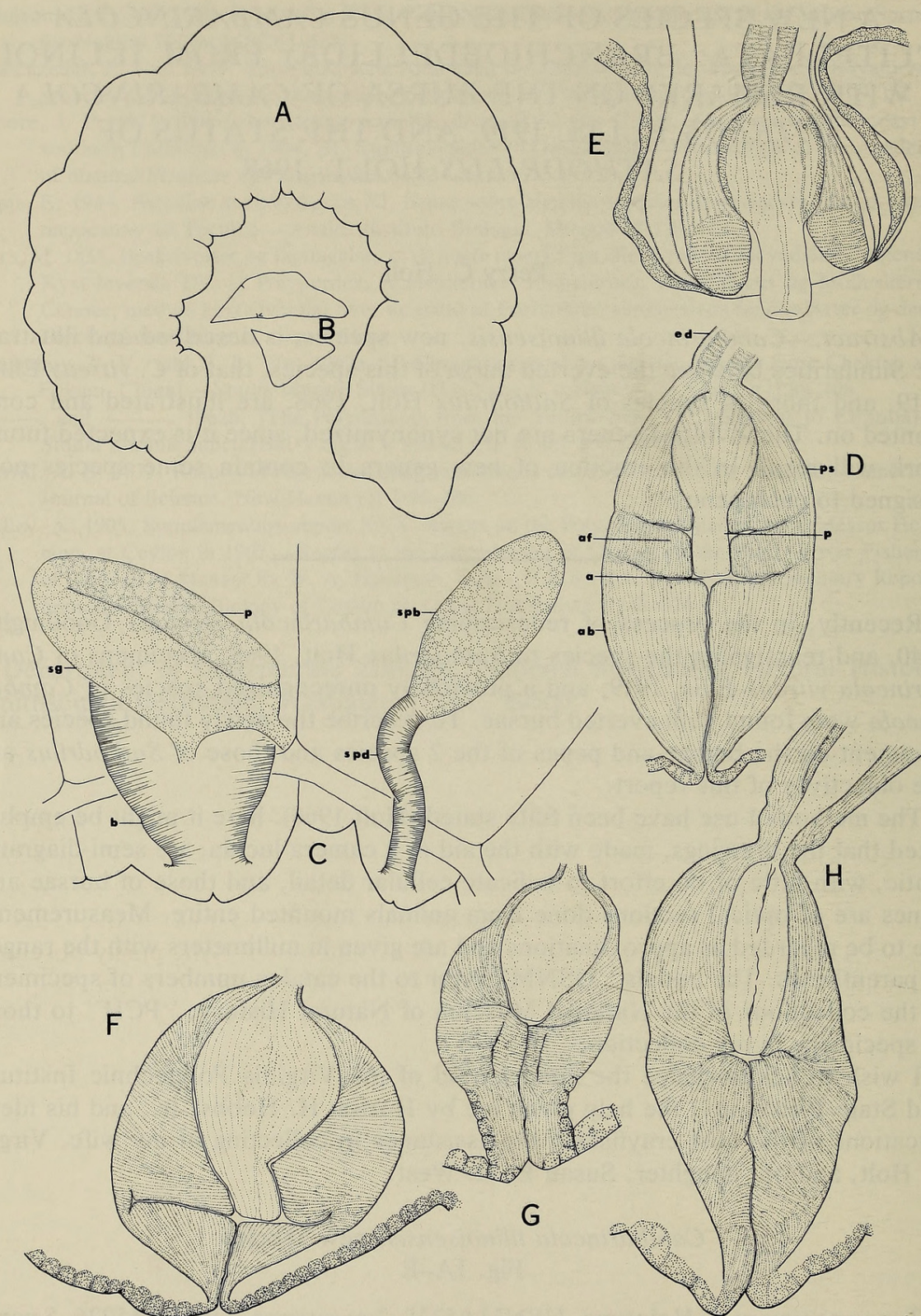


Fig. 1. *Cambarincola illinoisensis*: A, B, Holotype; A, Outline of entire animal, lateral view; B, Lateral view of jaws; C-E, Paratype; C, Lateral view of reproductive systems (b, bursa; p, prostate; sg, spermiducal gland; spb, spermathecal bulb; spd, spermathecal duct); D, Optical longitudinal section through penis and bursa (a, atrium; ab, atrial part of bursa; af, atrial fold; ed, ejaculatory duct; p, penis; ps, penial sheath); E, Optical longitudinal section through everted bursa and penis. *Cambarincola gracilis* from Lincoln County, Oregon: F, Optical longitudinal section through bursa and penis. *Sathodrilus dorfus* from Lincoln County, Oregon: G, Optical longitudinal section through bursa and penis. *Sathodrilus lobatus* from Lincoln County, Oregon: H, Optical longitudinal section through bursa and penis.



bular spermiducal gland about  $\frac{1}{3}$  body diameter in length, and about  $\frac{1}{2}$  its length in diameter; prostate slender, in diameter  $\frac{1}{4}$  to  $\frac{1}{3}$  that of spermiducal gland, composed of densely granular cells, with prominent ental bulb; spermatheca greater than body diameter in length, with long ectal duct, ovate bulb.

*Etymology*.—For the state of Illinois.

*Description*.—Five specimens of *Cambarincola illinoisensis*, including the holotype, have the following dimensions: *total length*, 2.9 (2.5–3.3); *greatest diameter*, 0.5 (0.4–0.6); *head length*, 0.5 (0.4–0.7); *head diameter*, 0.3 (0.3–0.4); *diameter, segment I*, 0.3 (0.2–0.4); *diameter, sucker*, 0.3 (0.2–0.4).

The lobes of the upper lip are very short, broad, and not easily seen in most specimens; there are no oral papillae. External sulci of the head are shallow and broad; the one such sulcus other than the peristomial one is a slight ventral depression. There is one internal pharyngeal sulcus. The dorsal ridges are low and indistinct, but weakly developed supernumerary segmental muscles are present.

The jaws are distinctive: of an irregular triangular shape in lateral view, the upper bears a proportionately huge median tooth and 2 almost undetectable lateral teeth on each side; the lower jaw is from  $\frac{3}{5}$  to  $\frac{1}{2}$  the upper in length and bears 2 prominent paramedian teeth and 2 minute lateral ones.

The spermiducal gland is not unusual in any respect. It is approximately  $\frac{2}{3}$  the body diameter in length and about  $\frac{1}{2}$  its length in diameter, tapering slightly to its junction with the ejaculatory duct, and usually lying obliquely in the coelom of its segment. The vasa deferentia enter the gland at widely separate points, creating the appearance, from some perspectives, of a prominent anterior deferent lobe.

The prostate is unusual: the glandular cells which compose it are finely and densely granular, unlike those of the spermiducal gland which are of the common type, large and coarsely granular. In shape and size, the prostate is slender, in diameter about  $\frac{1}{4}$  that of the spermiducal gland and subequal to the latter in length. The ental bulb is prominent, but the prostate itself, lying partly obscured in lateral view alongside the spermiducal gland, is often difficult to see.

The bursa is elongate ovate, approximately twice its diameter and about  $\frac{1}{3}$  the diameter of the body in length. There is a prominent median atrial fold. The penial sheath comprises about  $\frac{1}{3}$  of the total length of the bursa.

One specimen of the paratype series has an everted bursa (Fig. 1E). The penis is carried to the outside as a relatively slender tube, but it is impossible to tell if it itself is everted.

The ejaculatory duct presents no features of note.

The male efferent apparatus as a whole is proportionately small, lying entirely beneath the gut in some specimens and never extending to the dorsal border of the gut. The necessity of viewing the structures against a background of the gut contents makes it difficult to determine the extent and nature of the spermiducal gland and related structures in whole mounts, the only material available. Fortunately, and most unusually, in one paratype-specimen the ovarian, VII, segment is parasitized by a nematode and, presumably as a result, the spermatozoa that normally fill the coeloms of segments V and VI are absent and all of the male secondary sexual organs are easily seen.

The spermatheca is somewhat greater than the body diameter in total length



and its ectal duct is about twice the length of its bulb which is slender ovate in shape. There is no ental process.

*Variations*.—None, other than those associated with size and degree of contraction, were noticed.

*Affinities*.—*Cambarincola illinoisensis* seems to be closer to *C. jamapaensis* Holt, 1973, than to any other of its congeners. *C. illinoisensis* is composed of larger worms. The reproductive systems are of similar proportions, but differ in the proportionately greater size of the prostate of *C. jamapaensis* which was earlier considered as related to species from the Appalachians with differentiated prostates (Holt 1973:20). *C. acudentatus* Holt, 1973, also has a prostate composed of cells that are densely filled with small granules, but differs from *C. jamapaensis* and *C. illinoisensis* in the absence of dorsal ridges and in the shape and size of its jaws: delicate and light in color with a dental formula of 7/6 (Holt 1973:11–13). The “differentiated” prostate of these 3 species differ from those of such Appalachian species as *C. philadelphicus* (Leidy, 1851) and *C. fallax* Hoffman, 1963, which have prostates that are composed of heavily vacuolated cells: those heretofore described as “differentiated.” The Mexican species, *C. jamapaensis*, thus remains for now as the closest relative of *C. illinoisensis*, but the two are readily separated by the disparity in the size of the jaws in the latter.

*Host*.—*Orconectes virilis* (Hagen, 1870).

*Distribution*.—Known only from the type-locality; it is expected that *C. illinoisensis* will be found widely throughout the Central Plains of the United States.

*Discussion*.—As noted, a specimen among the paratypes has an everted bursa. In addition, 2 specimens of *C. vitreus* with everted bursae were found in the material studied for the paper referred to above (Holt 1978). The occurrence of specimens collected with everted bursae and protruded or everted penes is rare and in this case furnishes an opportunity to comment further on the structure of the bursa and penis in the genera *Cambarincola* and *Sathodrilus*.

The penis of members of *Cambarincola* has been considered non-eversible (Moore 1895:498; Ellis 1912:481; Holt 1949:554; Hoffman 1963:289–290; *inter alia*), while that of species of *Sathodrilus* has been described as eversible (Holt 1968:294). To my knowledge, no one has actually seen either the bursa or the penis evert in specimens of these genera and all these statements (certainly mine and Hoffman’s) are inferences based on the observable structures of dead animals.

If *Cambarincola vitreus* and *C. illinoisensis* were not clearly in other respects congeneric with the type of the genus (*Cambarincola macrodontus* Ellis, 1912), the shape of their almost identical penes carried outward by everted bursae might align them with species of *Sathodrilus*. Indeed, a comparison of illustrations of optical sections, showing in each case the retracted penis (Fig. 1F–H) of representative species of these genera does not reveal any significant differences: those of shape, size, proportionalities of parts and atrial folds are common among the members of both genera. Species of *Sathodrilus* differ from those of *Cambarincola* in lacking prostates, having only what I have called a “prostatic protuberance” (Holt 1968:298), or in having prostates that arise from the spermiducal gland entad to its junction with the ejaculatory duct.

Taxonomists customarily recognize genera as groups of species separated from other such similar groups by one or more morphological “gaps.” Often subse-



quent discoveries or additional studies lead to the obliteration of the "gaps" (Holt 1968:5). Such seems to be the case here: the eversible penis attached by cytoplasmic strands to the inner wall of the penial sheath, if indeed this is the correct description, of some species of *Sathodrilus* and the size and shape of the prostate vary through a series of species until the "gap" between *Sathodrilus* and *Cambarincola* is virtually bridged. However, I do not choose to merge the currently recognized 44 species assigned to *Cambarincola* with the 15 that nominally compose the genus *Sathodrilus*. Rather, I suspect more than 2 genera should be erected for these 59 species and with a refinement of taxonomic concepts and procedures in the study of the branchiobdellids, I expect that this will be done.

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