

A NEW SPECIES OF THE GENUS *CAMBARINCOLA* (CLITELLATA: BRANCHIOBDELLIDA) FROM CALIFORNIA

Perry C. Holt

Abstract.—*Cambarincola pamela*, new species, is described and compared with its near relative, *C. mesochoreus* Hoffman, 1963. Specimens from California previously assigned to *C. mesochoreus* are reassigned to *C. pamela* and the status of presumptively eastern species of the branchiobdellids on the Pacific versant is discussed.

The branchiobdellids of the Pacific versant in the United States have been studied most recently in a series of papers (Hoffman 1963; Holt 1960, 1967, 1974a, b, a, b, 1981a, b) with no pretensions that these efforts describe the totality of the branchiobdellid fauna of the region. Recently specimens were received for identification from Dr. Pamela Roe of California State College, Stanislaus, Turlock, California. Among them were specimens at first identified as *Cambarincola mesochoreus* Hoffman, 1963. Further examination revealed a distinct difference between the structure of the male bursal complex of the western worms and their more easterly congeners of the Mississippi Valley. This opportunity is taken to describe the new species from California.

Cambarincola pamela, new species

Figs. 1-2

Cambarincola mesochorea Hoffman, 1963:307-311 (in part).

Cambarincola mesochoreus.—Holt, 1973:10; 1981:689 (in part).

Type-specimens.—Holotype, USNM 080687, 4 paratypes, USNM 080688-080691, and 10 paratypes, PCH 4065, taken on *Procambarus* (*Scapulicambarus*) *clarkii* (Girard, 1852) from an irrigation canal that drains into the San Joaquin River in the western part of Stanislaus County, California, by J. A. Meeuwse, 2 Dec 1982.

Diagnosis.—Medium-sized worms (holotype 2.3 mm in length); lips entire; no oral papillae; no dorsal ridges; jaws subequal in size, small, dental formula 5/4; bursa about $\frac{1}{3}$ body diameter in length, elongate ovoid, atrial fold present, penial sheath more than $\frac{1}{2}$ total length of bursa, retracted penis greater in length than penial sheath; spermiducal gland short, thick, with deferent lobes, reflexed; prostate greater in length than spermiducal gland, subequal to latter in diameter, composed of granular cells, without ental bulb; spermatheca with long ectal duct, ovate bulb, subequal to body diameter in total length.

Etymology.—For the discoverer, Pamela Roe.

Description.—Five specimens of *Cambarincola pamela*, including the holotype, have the following approximate dimensions: total length, 2.6 mm; greatest diameter, 0.5 mm; head length, 0.4 mm; head diameter, 0.3 mm; diameter, segment I, 0.3 mm; diameter, sucker, 0.3 mm.

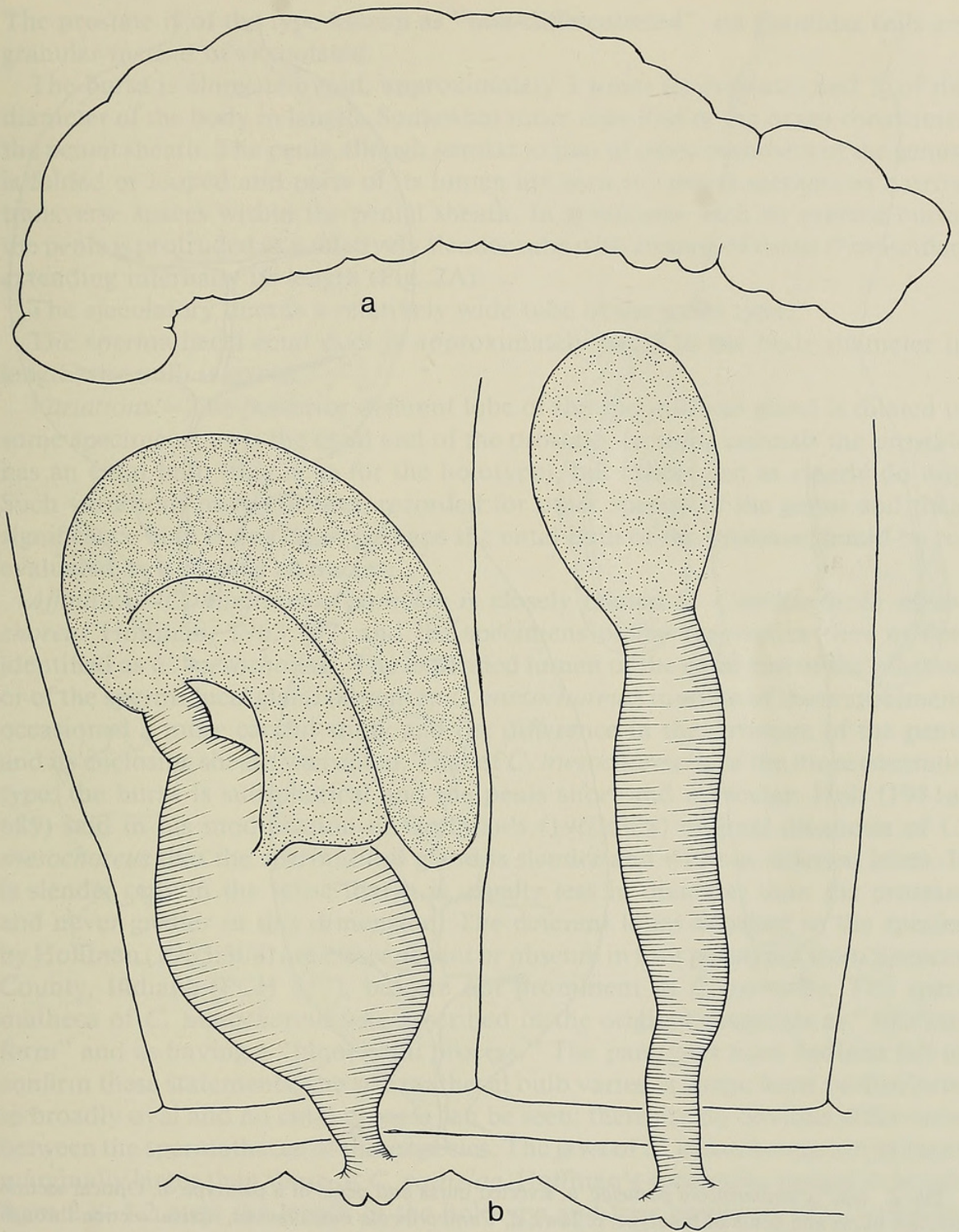


Fig. 1. *Cambarincola pamelae*: a, Lateral view of holotype; b, Lateral view of reproductive systems of holotype.

The lips are without lobes; the margins of the mouth without oral papillae. Mid-ventrally there is a shallow sulcus of the head and internally there is a prominent pharyngeal one. There are no supernumerary muscles, hence the body outline is smooth.

The jaws are small, about $\frac{1}{20}$ that of the head in length, and subequal in size. The dental formula is 5/4.

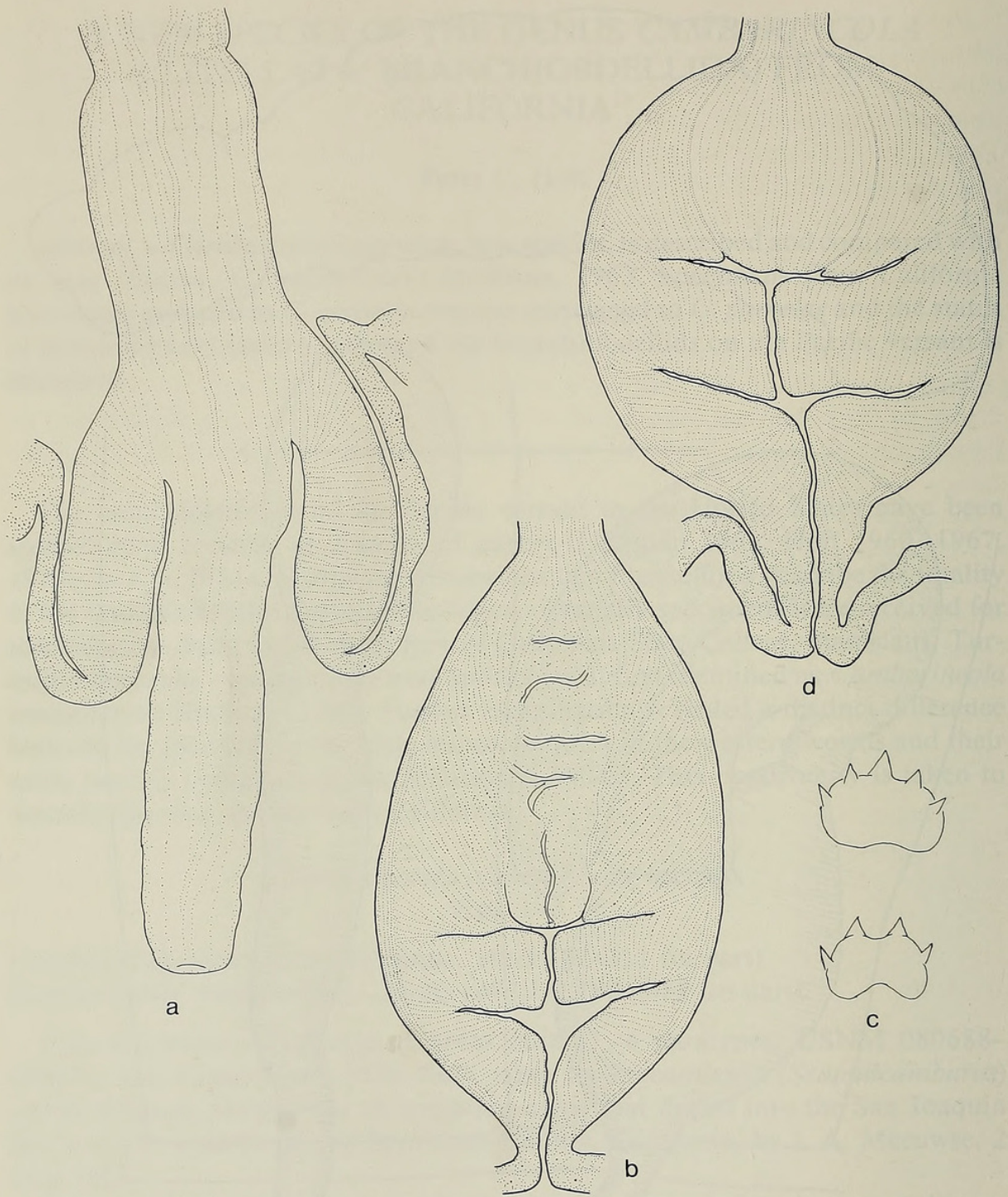


Fig. 2. a-c. *Cambarincola pamelae*: a, Everted bursa and penis of a paratype; b, Optical section through bursa and penis of holotype; c, Jaws; d, *Cambarincola mesochoreus*, optical section through bursa and penis of paratype.

The spermiducal gland is kidney-shaped and often extends to the dorsal border of the gut. Deferent lobes are present. The ental end of the posterior deferent lobe is often expanded with a wider lumen than the ectal part of the gland.

The prostate is about $\frac{2}{3}$ that of the spermiducal gland in width and greater than the latter in length. The lumen of the ental end, as in the spermiducal gland, is in some specimens expanded and in the holotype a clear ental bulb is present.

The prostate is of the type known as "non-differentiated"; its glandular cells are granular instead of vacuolated.

The bursa is elongate ovoid, approximately 3 times its diameter and $\frac{2}{5}$ of the diameter of the body in length. Somewhat more than half of the organ constitutes the penial sheath. The penis, though similar to that of other members of the genus, is folded or looped and parts of its lumen are seen in optical sections as narrow transverse spaces within the penial sheath. In specimens with an everted bursa, the penis is protruded as a relatively slender tube with strands of tissue (? muscular) extending internally its length (Fig. 2A).

The ejaculatory duct is a relatively wide tube of the usual type.

The spermathecal ectal duct is approximately equal to the body diameter in length, the bulb is ovoid.

Variations.—The posterior deferent lobe of the spermiducal gland is dilated in some specimens, as is the ental end of the prostate. In some animals the prostate has an ental bulb (this is so for the holotype), but others just as clearly do not. Such variations have not been recorded for other species of the genus and their significance here is not clear; perhaps the ental bulb of the prostate should be re-evaluated as a specific character.

Affinities.—*Cambarincola pamela*e is closely related to *Cambarincola mesochoreus* Hoffman, 1963:307, and the specimens of the type-series were at first identified as *C. mesochoreus*. The expanded lumen of the ental end of the prostate or of the spermiducal gland (absent in *C. mesochoreus*) in some of these specimens occasioned a more careful study and the difference in the structure of the penis and its enclosing sheath was noted. That of *C. mesochoreus* is of the more common type; the bursa is subspherical and the penis short and muscular. Holt (1981a: 689) said in his modification of Hoffman's (1963:308) original diagnosis of *C. mesochoreus* that the spermiducal gland is slender and without deferent lobes. It is slender only in the sense that it is usually less in diameter than the prostate and never greater in this dimension. The deferent lobes ascribed to the species by Hoffman (1963:308) are either absent or obscure in four paratypes from Spencer County, Indiana (PCH 817), but are not prominent in *C. pamela*e. The spermatheca of *C. mesochoreus* was described in the original diagnosis as "subfusiform" and as having a "blunt ental process." The paratypes from Indiana fail to confirm these statements; the spermathecal bulb varies in shape from subfusiform to broadly oval and no ental process can be seen; there are no obvious differences between the spermathecae of these species. The jaws of *C. mesochoreus* are perhaps marginally larger than those of *C. pamela*e. Hoffman's specimens ranged in length from 2.8–4.2 mm; the length of the holotype and four paratypes of *C. pamela*e extends from 2.5 to 3.3 mm, probably an insignificant difference. The two species are closely related and can be distinguished reliably only by the difference in the penes (Fig. 2b, d).

Host.—*Procambarus* (*Scapulicambarus*) *clarkii*.

Distribution.—The type-series of *C. pamela*e is from the western part of Stanislaus County, California, in the irrigated portion of the San Joaquin Valley. The specimens assigned by Holt (1981a:689) to *C. mesochoreus*, and herewith re-assigned to *C. pamela*e, were all taken from the introduced crayfish, *Procambarus* (*Scapulicambarus*) *clarkii*, in Santa Barbara, Merced and Sonoma counties, Cal-

ifornia. The assumption that *C. pamela* is likewise an introduction is easily made, but not necessarily valid; *Cambarincola gracilis* Robinson, 1954, is undoubtedly indigenous to the Pacific versant, is known from Santa Barbara County northward to southern British Columbia and is associated with *C. pamela* in Santa Barbara and Stanislaus counties on the same host. *Cambarincola barbarae* Holt, 1981, is also associated with *C. pamela* in Santa Barbara and Sonoma counties (Holt 1981a:678–679) and is not known from the east. The report of (Holt 1981a:680) of *Cambarincola fallax* Hoffman, 1963, from Sonoma County, California, from these considerations, becomes suspect: the specimen was identified on the basis of the tentaculated upper lip and the 5/5 dental formula, diagnostic of *C. fallax* in the east. Perhaps *C. pamela* and *C. mesochoreus* form another case of the phenomenon exemplified by *Cambarincola shoshone* Hoffman, 1963, and *Cambarincola branchiophilus* Holt, 1954; *Cambarincola macrocephelus* Goodnight, 1940, and *Cambarincola holti* Hoffman, 1963: pairs of very similar species, one western and the other eastern.

The eastern crayfishes introduced into western waters might be expected to carry their branchiobdellid symbionts with them. But great care is often required to bring branchiobdellids from the field to the laboratory for even short distances. Since it is likely that these introductions were made by people unaware of the worms, it is unlikely that they took the care (moving the animals at low temperatures and avoiding overcrowding) necessary to assure the survival of the branchiobdellids. But the range of none of the species involved is well enough known to allow reasonable conjectures as to the origin of the symbionts of the eastern crayfish introduced into the west. *Cambarincola pamela* may be, though it probably is not, an eastern, introduced species.

Material examined.—The types from Stanislaus County, California, and that previously assigned to *Cambarincola mesochoreus* (Holt, 1981a:689).

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Department of Biology, Virginia Polytechnic Institute and State University,
Blacksburg, Virginia 24061.



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