

Capilloventer atlanticus gen. et sp.n., a member of a new family of marine Oligochaeta from Brazil

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Abstract

Specimens of a previously undescribed oligochaete from the Bay of Rio de Janeiro, Brazil were determined to belong to a new family of microdiles within the order Tubificida, suborder Enchytraeina. The specimens are characterized by dorsal and ventral hair setae, spermathecae in VII, testes in XI, ovaries in XII, and a clitellum. The number of primitive characters present in the new species indicate that it is a primitive member of the order that diverged early from the evolutionary line leading to the Enchytraeidae.

Introduction

Through the kind efforts of Dr. Christer Erséus, we were provided an opportunity to examine specimens of a previously undescribed oligochaete. The specimens were collected by Dr. Claude Jouin of the Université Paris under the direction of Dr. Jeanete Maron Ramos of the Universitá Santa Úrsula from the Bay of Rio Janeiro, Brazil, in August 1975. These specimens represent a new family of Oligochaeta with several phylogenetic implications.

Material and methods

Nine specimens were examined. All were received mounted on microscope slides and stained with paracarmine. One specimen was removed from the slide, serially sectioned, and stained with hematoxylin. Holotypic and paratypic material (2 specimens) was deposited in the Museum National d'Histoire Naturelle (MNHN), Paris; other paratypic material was placed in the U.S. National Museum of Natural History (USNM 80608-80610) and the Louisiana State University Museum of Zoology (LSU 3241).

Capilloventridae fam. n.

Dorsal and ventral setae two per bundle, one hair and one crotchet. Testes in XI. Ovaries in XII. Spermathecae paired in VII. Male ducts paired, unmodified, opening into copulatory chamber in XII. Female pores in XIII.

Capilloventer gen. n.

Setae beginning in III, one hair and one bifid seta per bundle. Ventral setae of XII modified to form penial setae. Gland cells associated with terminal portion of male duct.

Type species. Capilloventer atlanticus sp.n.

Etymology. capillus L., hair; *venter* L., belly; refers to the ventral placement of hair setae.

Capilloventer atlanticus sp.n. (Figs. 1-4)

Type Locality. Brazil: Bay of Rio de Janeiro, 23°03'S, 43° 17.3'W; August 6, 1975. C. Jouin.

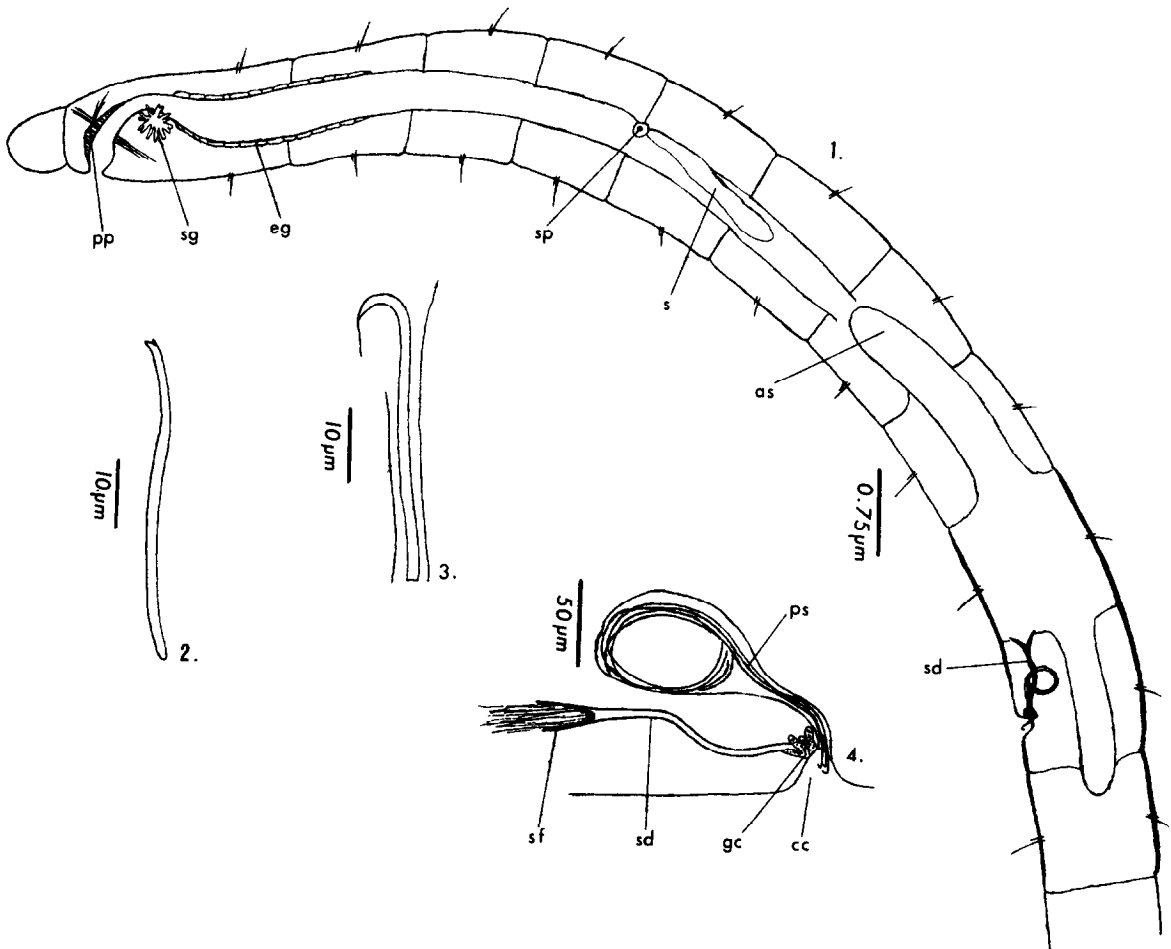
Etymology. Refers to the type-locality, the Bay of Rio de Janeiro, an inlet of the Atlantic Ocean.

Description. Length 2.5–3.8 mm (fixed), 19–22 segments. Diameter in whole-mounted, slightly compressed specimens: 0.09–0.14 mm. Prostomium rounded, slightly longer than width at peristomial junction. Clitellum thin, covering segments XI, XII, XIII. Somatic setae beginning in III, all bundles with 1 (occasionally 2) finely serrated hair, 133–185 μm long; and 1 (occasionally 2) bifid crochet seta, 37–49 μm long. Bifid crotchets all identical in structure, distal tooth much shorter and thinner than proximal. Ventral setae of XII modified to form penial bundles, each bundle with two types of setae: 3–4 thick setae, ca 150 μm long, hooked distally, elongate tip, coiled proximally in

spherical setal pouch, ca 50 μm diameter; 1–2 thin hair setae closely associated with each thick seta, ca 150 μm long. Distal end of penial setal bundle protruding into small copulatory chamber. Male pores paired in XII, in somatic setal planes.

Pharynx with dorsal pharyngeal plate composed of columnar cells. Paired salivary glands present. Esophagus covered with glandular tissue. Chlorogogue sparse. No pharyngeal, esophageal, or intestinal diverticula present. Esophagus and intestine finely ciliated.

Spermathecae paired in VII, ca 160 μm long, up to 50 μm diameter, thin-walled, extending posteriorly to VIII. Spermathecal pores opening laterally in intersegmental furrow 6/7, with associated gland cells. Sperm cells diffuse, not organized in bundles.



Figs. 1–4. *Capilloventer atlanticus* gen. et sp. n. 1. Reconstruction of anterior end of body (freehand drawing). 2. Bifid seta. 3. Distal ends of penial setae. 4. Male duct (freehand drawing). (as = anterior sperm sac; cc = copulatory chamber; eg = esophageal glandular tissue; gc = gland cells; pp = pharyngeal plate; ps = penial setae; s = spermatheca; sd = sperm duct; sf = sperm funnel; sg = salivary gland; sp = spermathecal pore)

Male reproductive system with all structures paired. Sperm funnels conical, 20 μm diameter, 40 μm long, on septum 11/12. Sperm duct ca 180 μm long, 10 μm diameter, not ciliated; without distensions, loops, or coils. Granular, elongate gland cells associated with termination of sperm duct at copulatory chamber. Testes in XI. Anterior sperm sac formed from septum 10/11, extending anteriorly to septum 8/9. Posterior sperm sac formed from septum 11/12, extending posteriorly to XIII.

Ovaries in XII. Female pores in XIII, posterior to intersegmental furrow 12/13.

Habitat. Marine, 22 m depth, coarse sand.

Discussion

One of the unique characters of *C. atlanticus* is hair setae in the ventral bundles. According to Brinkhurst (1982), the presence of ventral hair setae should exclude such an organism from the Oligochaeta. However, such features as a hermaphroditic condition, pharyngeal plate, restriction of the gonadal segments, a clitellum, spermathecae, and characteristics of the male reproductive apparatus clearly relegate *C. atlanticus* to the Oligochaeta, and in particular to the order Tubificida.

While the anterior location of the spermathecae appears to place the new family in the evolutionary line leading to the Enchytraeidae, divergence from this line apparently occurred quite early. We are, therefore, placing the Capilloventridae in the suborder Enchytraeina, following the scheme of Jamieson (1980). The number of plesiomorphic characters retained by *C. atlanticus* lead us to believe that it is the most primitive member of the Tubificida.

The simple, undifferentiated male ducts are not significantly different from those found in the Haplotaxidae, but the multiple gonadal condition typical of that family is lacking. The male funnel is simple, and more characteristic of the suborder Tubificina than the Enchytraeidae. The terminus of the male duct appears to provide some insight into the formation of the enchytraeid penial bulb, as well as the atrium of the Tubificina.

The structure of the distal portion of the male duct is such that several phylogenetic implications can be made. First, the terminal end is surrounded by elongated glandular cells (Fig. 4) that are similar in appearance and likely homologous to the pros-

tate tissue of the Tubificina. The copulatory chamber would need only a narrowing of the neck to be quite similar to the atrium of the Tubificina; we believe that a homology between these two structures is likely. There is, in addition, a possible homology of the copulatory chamber to the 'atrium' of the enchytraeid genus *Propappus* and the penial bulb of the remainder of the Enchytraeidae. We believe that the structure of the terminus of the male duct of *C. atlanticus* is a likely retention of an ancestral condition.

The digestive tract lacks any diverticula or pouches. A 'pharyngeal plate' (Brinkhurst & Jamieson, 1971) is present dorsally; the cells comprising the plate are columnar, and anterior and posterior muscle fibers provide for its apparent protrusion and retraction. Paired glandular structures ('salivary glands') are located at the junction of the pharynx and esophagus. The esophagus extends from the pharynx to segment IV; it is covered with a glandular tissue that is very similar in appearance to the tissue comprising the enchytraeid septal glands.

The presence of hair setae in the dorsal and ventral setal bundles in *C. atlanticus* suggests that hair setae may have been characteristic of the proto-Tubificida, as suggested by Timm (1981). Timm, however, suggested that the hypothetical ancestor of the Oligochaeta possessed hair setae only in the dorsal bundles. The new species tends to suggest that the ancestral condition was hair setae present in both dorsal and ventral setal bundles. The arrangement of somatic setae, one hair and one bifid seta per bundle (a second seta of one type or another being found occasionally, possibly as a replacement), is lumbricine in form, another likely ancestral character retained by *C. atlanticus*. Bifid setae are generally accepted as primitive.

The plesiomorphic condition of the female pores of *C. atlanticus* tends to corroborate Brinkhurst's (1982) view that the condition of female pores located in the intersegmental furrow is apomorphic to the Tubificina. The female duct of *C. atlanticus* is much reduced, a condition typical of other Tubificida.

With regard to two recently published phylogenetic schemes (Timm, 1981; Brinkhurst, 1982), we believe that the gonadal and reproductive inferences of the new species tend to support many of Brinkhurst's concepts. The setal arrangement appears to substantiate many of the concepts of

Timm. Regarding placement of *Propappus*, Brinkhurst felt that it is outside the main line of enchytraeid evolution. However, it appears intermediate between *C. atlanticus* and the remainder of the Enchytraeidae. We agree with Brinkhurst that the major difference between the evolutionary schemes of Brinkhurst and Timm is the placement of the Haplotaxida. The new species provides little insight into rectifying difference of opinion between the two authors other than suggesting that the lack of hair setae in the Haplotaxidae may be a derived condition.

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