

***Olavius nicolae*, a new gutless marine tubificid species
(Oligochaeta) from Belize**

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Abstract.—*Olavius nicolae*, a new species from shallow water sediments at Carrie Bow Cay, on the barrier reef off Belize in Central America, is described. It belongs to an apomorphic group within the gutless genus *Olavius* Erséus, 1984, characterized by small, oval atria, large copulatory sacs, and dorsal spermathecae (the latter located in the middle of segment X). It differs from the closely related, Hawaiian species, *O. parapellucidus* Erséus & Davis, 1989, by its more slender body form and longer clitellum, its more numerous somatic setae, and the more dorsal position of its spermathecal pores.

The barrier reef off Belize in Central America (Caribbean Sea) provides suitable habitats for several species of gutless Tubificidae within the genera *Inanidrilus* Erséus, 1979, and *Olavius* Erséus, 1984 (Erséus 1990, Diaz & Erséus 1994). The Smithsonian Institution's Carrie Bow Cay Field Laboratory in Belize was therefore chosen as a site for the collection of material of various gutless taxa, as part of an ongoing research project on evolutionary and biogeographical aspects of the symbiosis of gutless Tubificidae with sulphur oxidizing bacteria (N. Dubilier, C. Erséus and O. Giere, principal investigators; see Giere et al. 1995). While at Carrie Bow, one previously unknown species of *Olavius* was found by the present authors. This species is described herein.

Tubificid worms were sorted live from sieved organic material extracted from sediment samples collected in shallow water on the reef platform surrounding Carrie Bow Cay. Specimens to be used for light microscopy examination were fixed in Bouin's fluid overnight, preserved in 70% ethanol for some weeks, and then stained in (alco-

holic) paracarmine, dehydrated in an alcohol series and mounted whole in Canada balsam. For transmission microscopy examination of body wall and symbiotic bacteria, mid-body or posterior fragments of a few worms were fixed in Trump's fixative (McDowell & Trump 1976), buffered with cacodylate. After embedding (Spurr's resin) ultrathin sections were mounted on copper grids, contrasted in aqueous uranyl acetate and lead citrate and inspected in a ZEISS EM 902A.

The type specimens are deposited in the United States Museum of Natural History (USNM), Smithsonian Institution, in Washington, D.C., and the Swedish Museum of Natural History (SMNH), in Stockholm.

Olavius nicolae, new species
Figs. 1–2

Olavius n. sp.; Giere et al. 1995:table 1.

Holotype.—USNM 171048, whole-mounted specimen.

Type locality.—Immediately E of N tip of Carrie Bow Cay (16°48'N, 88°05'W), bar-

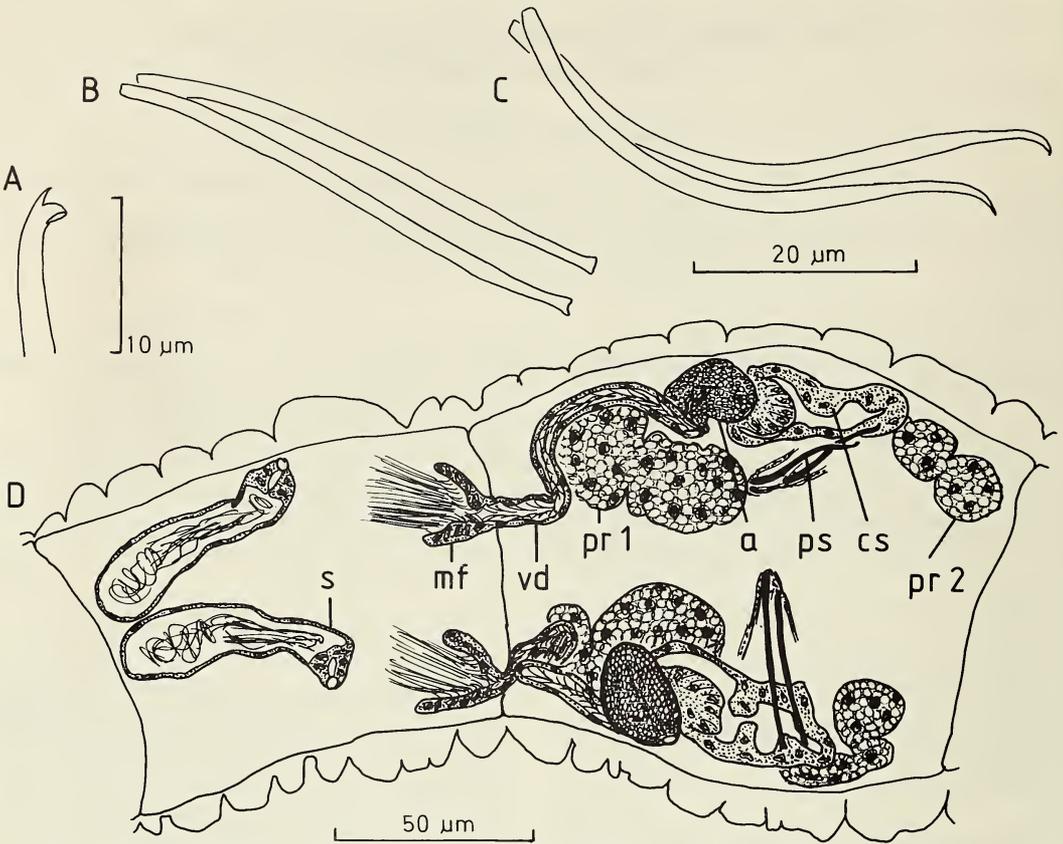


Fig. 1. *Olavius nicolae*, new species. A, Somatic seta; B, penial setae of one specimen; C, penial setae of another specimen; D, horizontal view of genitalia in segments X–XI. Abbreviations: a, atrium; cs, copulatory sac; mf, male funnel, pr1, anterior prostate gland; pr2, posterior prostate gland; ps, penial seta; s, spermathecae; vd, vas deferens.

rier reef of Belize, Central America, inner end of *Thalassia* bed (about 5 m from beach), barely subtidal, fine to medium, heterogeneous sand; 6 March 1993.

Paratypes. — USNM 171049–171051, three specimens, and SMNH Type coll. 4676–4682, seven specimens; all whole-mounted, from type locality.

Description. — Length of (only) three complete specimens, 4.6–5.0 mm, 35–38 segments. Width at segment XI, 0.09–0.19 mm; but worms much narrower in other parts of body, at posterior end (of complete specimens) only about 0.04 mm wide. Prostomium generally elongate, pointed triangular. Secondary annulation of body wall vari-

able, not always distinct, with 5–8 annuli per segment in postclitellar part of body; in some specimens irregular, large annuli giving worm a “knotty” appearance. Clitellum extending over $\frac{2}{3}$ X–XII plus anterior margin of segment XIII. Somatic setae (Fig. 1A) bifid, with upper tooth shorter and much thinner than lower, and with subdental ligament. Bifid setae 21–33 μ m long, about 1–1.5 μ m thick, three or four per bundle anteriorly, two or three per bundle in postclitellar segments. Penial setae (Fig. 1B–C, D) slender, two per bundle, ventrally in segment XI, 38–56 μ m long, about 2 μ m thick. In front view, penial setae appearing straight, with chisel-shaped tips (Fig. 1B); in side

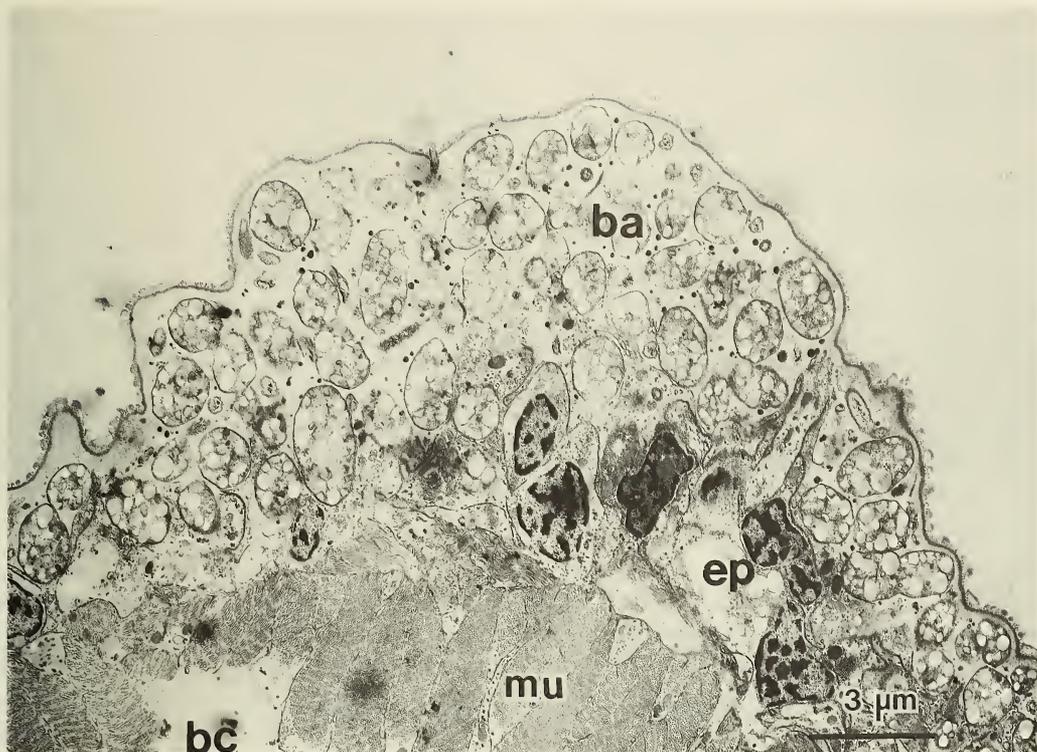


Fig. 2. *Olavius nicolae*, new species, TEM micrograph. Cross-section through dermal-muscular layer with numerous bacteria (ba) between cuticle and epidermal tissue (ep); bc, coelomic body cavity; mu, longitudinal musculature.

view, penial setae sigmoid, with tips appearing sharply single-pointed and very thin (Fig. 1C). Penial setae tightly parallel within bundle, either obliquely directed towards posterior, sometimes even approaching a horizontal position in segment (a withdrawn position), or more or less erect in segment, i.e., perpendicular to long axis of worm (a protruded position). Male pores paired, in line with ventral setae, posterior to middle of segment XI. Spermathecal pores paired, in line with dorsal setae, in middle of segment X.

Alimentary canal absent. Body wall with numerous subcuticular bacteria (Fig. 2; see Remarks). Male genitalia (Fig. 1D) paired. Vas deferens non-muscular, ciliated, 6–8 μm wide, much longer than atrium, entering apical end of latter. Atrium oval, only 26–30 μm long, 16–19 μm wide, with very thin

outer lining and granulated inner epithelium (internal ciliation probably present, but not seen). Atrium opening into inner end of complex copulatory sac. Sac with folded walls of varying thickness, generally with a distinct papilla near entrance of atrium. Sac everted in a few specimens. Anterior prostate gland larger than posterior one, located anterior to atrium; attachment with atrium, however, not seen. Posterior prostate gland located posterior to copulatory sac, attached to atrium by long stalk. Spermathecae (Fig. 1D) slender, generally club-shaped, 60–75 μm long, consisting of very short ducts, and thin-walled ampullae; latter 15–28 μm wide, with loose masses of, or somewhat bundled, sperm. Spermathecal ampullae generally directed towards the anterior.

Etymology.—Named for Dr. Nicole Dubilier (Biolabs, Harvard University, Cam-

bridge, MA), friend and collaborator in our joint symbiosis project, who participated in the collection of gutless Tubificidae at Carrie Bow Cay.

Remarks.—The subcuticular bacteria (Fig. 2) are of the same morphotype and arrangement as first described for *Inanidrilus leukodermatus* (Giere, 1979) by Giere (1981), and as found also in other related species (Giere et al. 1995, for details).

Distribution and habitat.—Known only from Belize. Barely subtidal heterogeneous sand associated with seagrass. At the type locality, it co-occurs with other gutless taxa: *Inanidrilus reginae* Erséus, 1990, *Olavius* (*O.*) *tantulus* Erséus, 1984, and *O. imperfectus* Erséus, 1984.

Discussion

Olavius nicolae belongs to a group of small species within *Olavius*, all characterized by (1) the location of the spermathecal pores in the middle, rather than the anterior, of segment X, (2) the dorsal, rather than ventral or lateral, location of the same pores, and (3) the very small atria, opening at the inner end of large, convoluted copulatory sacs. Other taxa in this group are *O. tenuissimus* (Erséus, 1979), *O. cornuatus* Davis, 1984, *O. pellucidus* Erséus, 1984, *O. macer* Erséus, 1984, *O. bullatus* Finogenova, 1986, *O. parapellucidus* Erséus & Davis, 1989, *O. finitimus* Erséus, 1990, *O. tannerensis* Erséus, 1991, and *O. rallus* Erséus, 1991, some of which are from the Atlantic, others from the Pacific Ocean.

The new species appears most closely related to *O. parapellucidus*, only known from Hawaii. This species has penial setae, two per bundle, with chisel-shaped tips (Erséus & Davis 1989), almost identical to those of *O. nicolae*. A number of differences are noted, however. *Olavius nicolae* is very slender, with the mid-body and posterior parts considerably narrower than clitellar region, whereas *O. parapellucidus* is more or less evenly wide throughout body (unpublished

observation on material in CE collection). Moreover, in *O. parapellucidus* the clitellum covers most of segment XII, but never extends into XIII as in the present species. The somatic setae (about 2 μm thick in *O. parapellucidus*) are more numerous in *O. nicolae* (setae maximally three per bundle anteriorly, two per bundle posteriorly, in *O. parapellucidus*). Finally, the spermathecal pores are in the lines of the dorsal setae in *O. nicolae*, but between these lines and the lateral lines in *O. parapellucidus*.

With the addition of *O. nicolae*, a total of 60 species of marine Tubificidae are known from the barrier reef off Belize (cf. Erséus 1990).

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Literature Cited

- Davis, D. 1984. *Olavius cornuatus* sp. n. (Oligochaeta, Tubificidae) from Georges Bank (NW Atlantic).—*Zoologica Scripta* 13:273–275.
- Diaz, R. J., & C. Erséus. 1994. Habitat preferences and species associations of shallow-water marine Tubificidae (Oligochaeta) from the barrier reef ecosystems off Belize, Central America.—*Hydrobiologia* 278:93–105.
- Erséus, C. 1979. Taxonomic revision of the marine genus *Phalodrilus* Pierantoni (Oligochaeta, Tubificidae), with descriptions of thirteen new species.—*Zoologica Scripta* 8:187–208.
- . 1984. Taxonomy and phylogeny of the gutless Phalodrilinae (Oligochaeta, Tubificidae), with descriptions of one new genus and twenty-two new species.—*Zoologica Scripta* 13:239–272.

- . 1990. The marine Tubificidae (Oligochaeta) of the barrier reef ecosystems at Carrie Bow Cay, Belize, and other parts of the Caribbean Sea, with descriptions of twenty-seven new species and revision of *Heterodrilus*, *Thalassodrilides* and *Smithsonidrilus*.—*Zoologica Scripta* 19:243–303.
- . 1991. Two new deep-water species of the gutless genus *Olavius* (Oligochaeta: Tubificidae) from both sides of North America.—*Proceedings of the Biological Society of Washington* 104: 627–630.
- . 1992. A generic revision of the Phallo-drilinae (Oligochaeta, Tubificidae).—*Zoologica Scripta* 21:5–48.
- , & D. Davis. 1989. The marine Tubificidae (Oligochaeta) of Hawaii.—*Asian marine Biology* 6:73–100.
- Finogonova, N. P. 1986. Six new species of marine Tubificidae (Oligochaeta) from the continental shelf off Peru.—*Zoologica Scripta* 15:45–51.
- Giere, O. 1979. Studies on marine Oligochaeta from Bermuda, with emphasis on new *Phalldrilus* species (Tubificidae).—*Cahiers de Biologie Marine* 20:301–314.
- . 1981. The gutless marine oligochaete *Phalldrilus leukodermatus*. Structural studies on an aberrant tubificid associated with bacteria.—*Marine Ecology Progress Series* 5:353–357.
- , C. Nieser, & C. Erséus. 1995. A comparative structural study on bacterial symbioses of Caribbean gutless Tubificidae (Annelida, Oligochaeta).—*Acta Zoologica (Stockholm)* 76:000–000 (in press).
- McDowell, E. M. & B. F. Trump. 1976. Histologic fixatives suitable for diagnostic light and electron microscopy.—*Archives of Pathology and Laboratory Medicine* 100:505–514.