

**A new symbiotic marine nematode,
Adelphos rolandi gen.n. sp.n. (Stilbonematinae),
from the Caribbean Sea**

J.A. Ott*

Abstract

Adelphos rolandi gen.n. sp.n. is described from shallow subtidal sands near Carrie Bow Cay (Belize Barrier Reef). It resembles the genus *Eubostrichus* (GREEF, 1869) from which it is distinguished by the lack of enlarged subventral setae in the cervical region and the possession of a unique row of mid-ventral thornlike setae posterior to the pharynx. Its ectosymbiotic bacteria are crescent-shaped and arranged as in *E. parasitiferus* and *E. topiarius*.

Key words: Stilbonematinae, new genus, new species, Caribbean.

Zusammenfassung

Adelphos rolandi gen.n sp.n. wird aus seichtem, sublitoralen Sand bei Carrie Bow Cay (Belize Barrierriff) beschrieben. Die neue Gattung ähnelt der Gattung *Eubostrichus*, von der sie sich durch das Fehlen vergrößerter subventraler Borsten in der Halsregion und durch den Besitz einer Reihe von medioventralen, dornenartigen Borsten hinter dem Pharynx unterscheidet. Die ekto-symbiontischen Bakterien sind bogenförmig und wie bei *E. parasitiferus* und *E. topiarius* angeordnet.

Introduction

The Stilbonematinae (Nematoda-Adenophorea, Desmodoridae) are remarkable for ectosymbiotic sulfur-oxidizing chemoautotrophic bacteria covering their cuticle in regular species-specific patterns. The nematodes feed on the attached bacteria and most probably derive almost all their nutrition in this manner. In exchange the worms provide the bacteria with the necessary supply of reduced sulfur (sulfide, maybe also thiosulfate) and electron acceptors (oxygen, maybe also nitrate) by migrating into or through the redox potential discontinuity layer of marine sediments (for a summary of the biology and further references see OTT & al. 1991 and OTT 1995). Although diverse in eidonomy the group is monophyletic based on morphological (structure of a special glandular sense organ, BAUER-NEBELSICK & al. 1995) and molecular (sequence of 18S rRNA, KAMPFER & al., in press) evidence.

Although several species have been reported from temperate seas, the highest diversity of Stilbonematinae is found in tropical calcareous sands in the shallow subtidal. The sands around the island Carrie Bow Cay and neighbouring islands on the Belize Barrier Reef are especially rich in these worms, both in terms of species diversity and population density.

* Dr. Jörg A. Ott, Institut für Zoologie, Universität Wien, Althanstr. 14, A-1090 Wien, Austria.

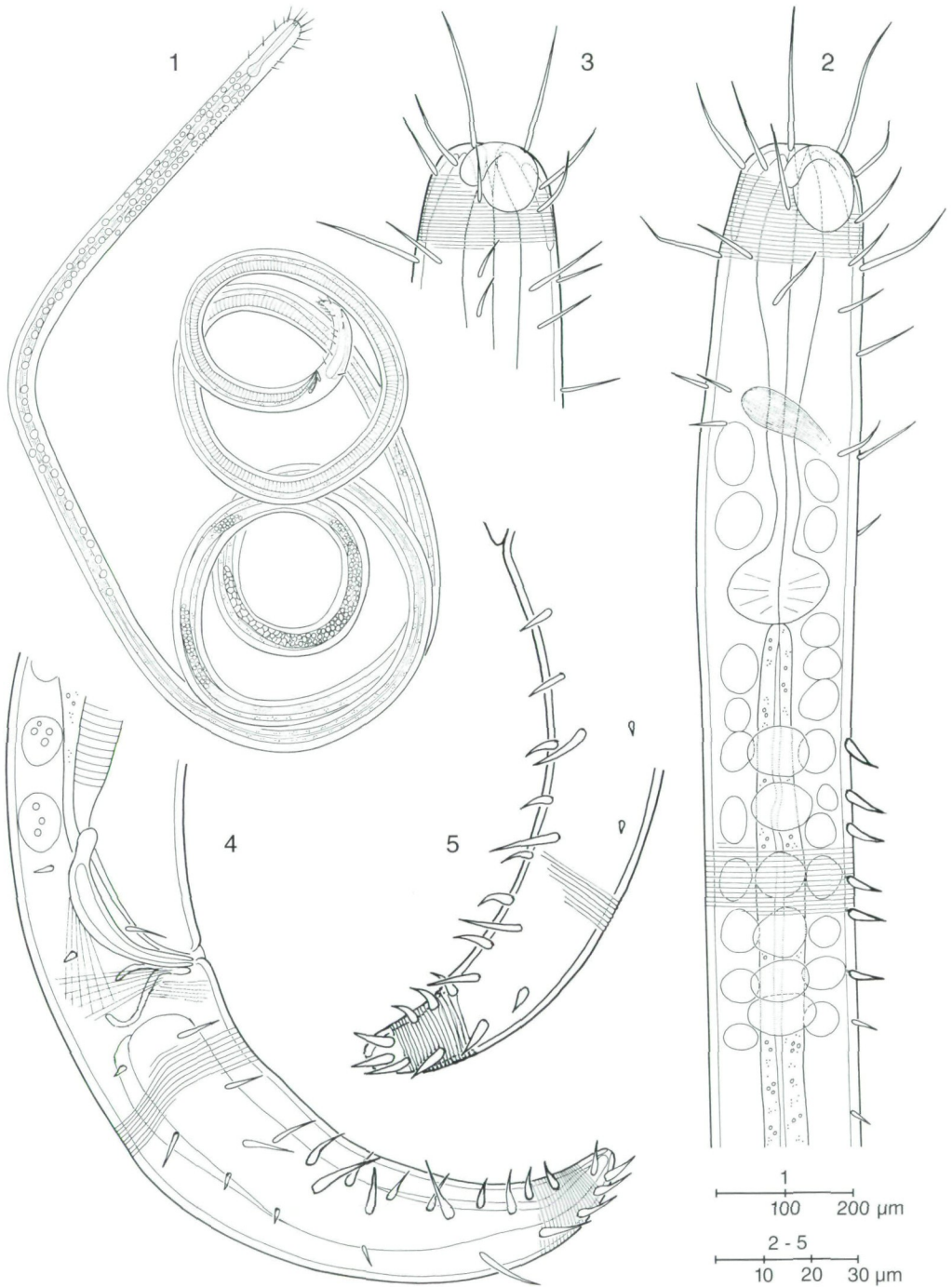


Fig. 1 - 5: *Adelphos rolandi* sp.n. (1) holotype, total view, (2) anterior body region of holotype showing cervical and postcervical setation, (3) anterior end of paratype NHMW-EV Nr. 3635, (4) spicular apparatus and tail of holotype, (5) ventral side of tail of paratype NHMW-EV Nr. 3636.

Material and Methods

The sand containing the new species representing a new genus was collected in February 1984 during a survey of meiofauna together with W. Sterrer (Bermuda). Approximately 5 liters of sand were scooped up with a bucket on several patches of sand between sparse coral growth in 1-1.5 m depth north of Carrie Bow Cay and extracted using decantation after anesthetization in MgCl_2 . Worms were sorted live under a stereomicroscope, fixed in 4% formaldehyde in sea water, transferred into glycerol:water 1:9, slowly evaporated and mounted in pure glycerol.

Measurements and drawings were done using a camera lucida on a Reichert Diavar or Zeiss Axioplan. The latter microscope was also used for the Nomarsky Interference Contrast micrographs.

The material consisted of 4 adult males and one juvenile. Types are deposited in the Evertebrata Varia collection of the Natural History Museum in Vienna, Austria (NHMW-EV) and the National Museum of Natural History, Washington, DC, USA (USNM).

Adelphos gen.n.

Diagnosis: Stilbonematinae; with finely annulated cuticle surrounding the amphid; a cuticular thickening at the anterior end forming a cephalic capsule, tripartite pharynx with distinctly swollen corpus, adults with one row of thorn-like setae medioventral posterior to the neck region (probably only in males); paired rows of thorn-like setae subventral on tail; symbiotic microbes as in *Eubostrichus parasitiferus* or *E. topiarius*.

Type species: *Adelphos rolandi* sp.n.

Ethymology: adelphos (gr. ἀδελφός) = brother

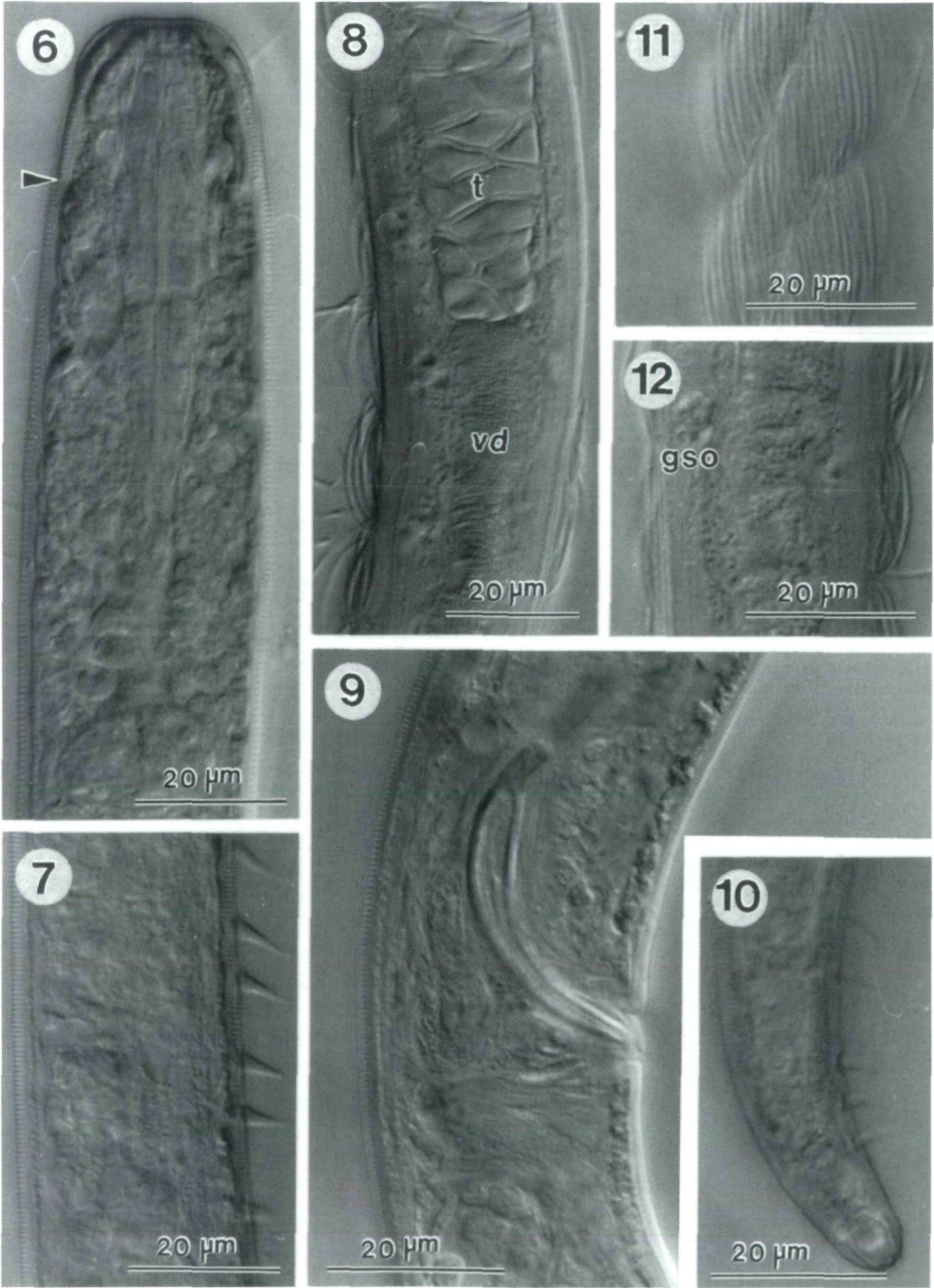
Adelphos rolandi sp.n.

Holotype: male, L=5470, a=152, b=54.7, c=39.4, NHMW-EV Nr. 3634. **Paratypes:** male, L=5370, a=134, b=49.9, c=33.6, NHMW-EV Nr. 3635; male, L=5700, a=170, b=53.7, c=37.8, NHMW-EV Nr. 3636; male, L=4430, a=132, b=51.5, c=41.8, USNM Nr. 177667; juv., L=4230, a=126, b=40.0, c=36.2, USNM Nr. 177668.

Type locality: Carrie Bow Cay, Belize, Caribbean Sea; coarse to medium sand, 1-1.5 m depth north of the island.

Etymology: The species is dedicated to my brother Roland on occasion of his 50th birthday.

Description: Body slender, cylindrical, only slightly tapering towards the anterior end, tail conical (Fig. 1). Cuticle finely annulated, annules 0.6-0.7 μm wide. Annulation surrounding the amphid and extending along the whole body, only the tip of the tail without annules. Head with a cephalic capsule 19-22 μm long and 2 μm thick. Cephalic capsule not consisting of the ring bodies of the median layer of the cuticle. Amphids large (13-17 μm long, 13-15 μm wide), consisting of a flat, not annulated disc derived from a ventrally wound spiral. One circle of four long (22-29 μm) cephalic setae, followed by two circles of eight subcephalic setae. The first of these close to the anterior end, the submedian setae longer (15-18 μm) than the more posterior sublateral setae (14-16 μm) which flank the amphids. Second circle situated just posterior to the cephalic capsule, again the submedian setae longer (19-21 μm) than the sublateral setae (12-15 μm) (Figs 2, 3). Cervical



Figs. 6 - 12: *Adelphos rolandi* sp.n., Nomarsky Interference Contrast micrographs. (6) anterior body region of paratype NHMW-EV Nr. 3635 showing cephalic capsule and pharynx, (7) begin of ventral row of thorn-like setae in holotype, showing the first 6 setae, (8) testis/vas deferens transition, (9) cloacal region of holotype showing right spiculum (10) tip of tail of paratype NHMW-EV

region with 10-12 μm long setae in eight slightly irregular rows, on remainder of the body - except for the tail - short ($<5 \mu\text{m}$ long) somatic setae or only the tubular canals of the glandular sense organs (gso) visible. Ventromedian row of 15-16 thorn-like setae (Figs 2, 7) starting 100-125 μm from the anterior end and extending for approximately 200 to 235 μm , setae getting progressively smaller, from 9-10 μm at the beginning to 1-3 μm at the end of the row, obviously not connected to gso. Tail with conspicuous thorn like setae in submedian position, four dorsally close to the tip, 8-10 μm long and a row of 11 extending from the cloaca to the tip of the tail getting progressively shorter, stouter and more thorn-like (Figs 4, 5, 10).

Buccal cavity small and tubular, the tri-partite pharynx (Fig. 6) consisting of a 40-45 μm long cylindrical corpus (diameter 11-13 μm), a 40-50 μm long cylindrical isthmus (5 μm) and a round terminal bulb which is slightly wider (20-22 μm) than long (15-17 μm). The nerve ring surrounds the isthmus between 50 to 65 μm from the anterior end. Gso present, forming single lateral and median rows, lateral gso considerably larger (diameter 13-15 μm) than median ones (5-7 μm).

Single testis starts at 30-35% of body length, on right side of gut, length 420-450 μm . Spicula slightly cephalate proximally, arcuate (Figs 5, 9), length 35-36 μm (chord) or 45 μm (arch). Gubernaculum with a slightly s-shaped median piece directed dorsally and weak paired curved apophyses directed dorsocaudally.

Symbiotic microorganisms (Figs 11, 12) are 16-18 μm long, crescent shaped and arranged in a spiral pattern as described from *E. parasitiferus* CHITWOOD, 1936 and *E. topiarius* BERGER & al., 1996.

Discussion

Of the 8 so far described genera belonging to the subfamily Stilbonematinae, seven appear to be valid taxa (*Stilbonema* COBB, 1920, *Leptonemella* COBB, 1920, *Catanema* COBB, 1920, *Laxus* COBB, 1894, *Eubostrichus* GREEFF, 1869, *Robbea* GERLACH, 1956 and *Squanema* GERLACH, 1963). *Laxonema* COBB, 1920 should be synonymized with *Stilbonema*. *Adelphos* gen.n. appears in many respects closely related to *Eubostrichus*. Similarities are the fine annulation of the cuticle which extends over the whole body, the presence of thorn-like setae in subventral position on the tail and the construction of the pharynx with its small, circular to transversely oval bulb which appears to have only weak musculature and to be largely glandular. The swelling of the corpus, which is mentioned for *E. topiarius* by BERGER & al. (1996) and - on close inspection - is present in practically all *Eubostrichus* specimens I have seen, is much more strongly pronounced in *Adelphos* and appears muscular (Fig. 6). Differences are the lack of enlarged subventral setae in the cervical region, the presence of the single median row of thorn-like setae posterior to the pharynx and the distinct cephalic capsule.

The shape and special arrangement of the symbiotic microorganisms also suggest a relationship with *Eubostrichus*. In view of the large differences in morphological characters between different genera of Stilbonematinae (URBANIČ & al. 1996 a,b) and even between

Nr. 3635 showing the right subventral row of thorn-like setae, (11) symbiotic bacteria arranged in spiral pattern, midbody region of paratype USNM Nr. 177667, (12) optical section through midbody region of paratype USNM Nr. 177667, showing typical attachment of the crescent-shaped bacteria with both ends on the host cuticle.

species classified in the same genus I refrain to give a species definition unless at least a second species of *Adelphos* is described.

The presence of the peculiar ventral row of thorn-like setae is another example of the high plasticity found along the mid-ventral line in many nematodes, especially in the cervical and postcervical region and pre- and postcloacal region in males. In the Stilbonematinae one can find a wide variety of structural modifications along the ventral line, ranging from postcervical "'acorn-shaped' accessory organs" in *Stilbonema brevicolle* COBB, 1920 to the sucker-like cervical papillae in males of the genus *Robbea*. In my collection of yet unpublished material there are species of the genus *Catanema* with button-like bumps in the preanal or postcervical region, respectively. All these structures are obviously not connected to gso which open through cuticular canals in connection with normal somatic setae (NEBELSICK & al. 1992). A dense packing of gso has, however, been described in *Laxus cosmopolitus* OTT & al., 1995 for the above mentioned regions and in addition for the pre- and postvulvar region in females (OTT & al. 1995).

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