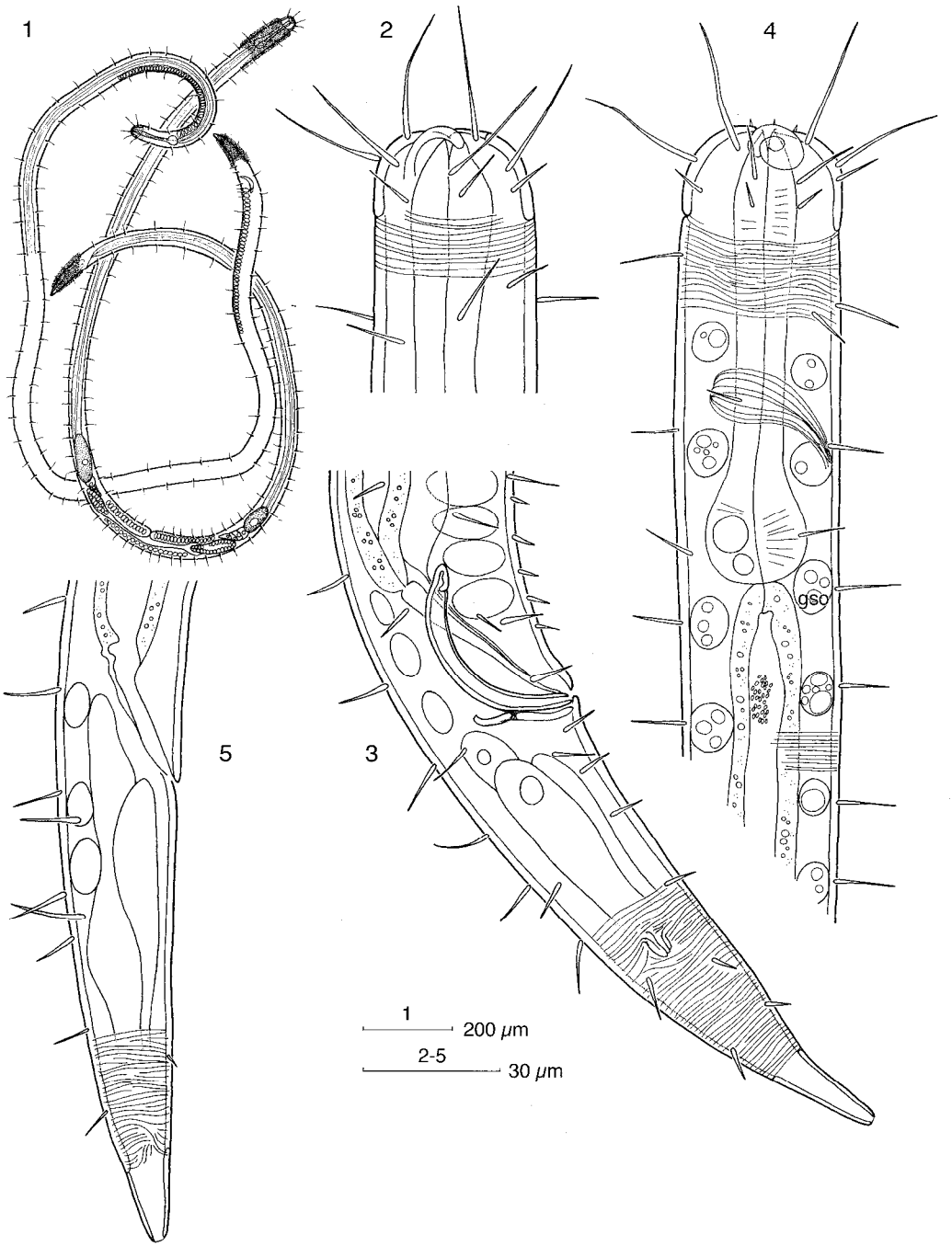
Leptonemella juliae sp.n.

Type material: Holotype: male, L = 2784, a = 70, b = 26, c = 23, NHMW-EV 3825. **Allotype:** female, L = 2890, a = 88, b = 28, c = 26, NHMW-EV 3826. **Paratypes**: male, L = 2818, a = 70, b = 28, c = 25, NHMW-EV 3827; male (Rt Križ), L = 3350, a = 84, b = 29, c = 22, NHMW-EV 3831; female, L = 3153, a = 79, b = 29, c = 28, NHMW-EV 3828; female, L = 2952, a = 80, b = 30, c = 24, NHMW-EV 3829; female (Rt Križ), L = 3288, a = 82, b = 29, c = 22, NHMW-EV 3830; length (L) in µm.

Additional material: several specimens in the authors' collection and those used for SEM.

Type locality: Bay of Veštar, south of the town of Rovinj, Croatia (45°02'8"N, 13°41'1"E), northern Adriatic Sea; moderately well-sorted, coarse sand dominated by biogenic calcareous components low in organic matter; shallow subtidal at 3-4 m water depth.



Figs 1-5: *Leptonemella juliae* sp.n. (1) total view, of holotype (NHMW-EV 3825) and allotype (NHMW-EV 3826); (2) head and (3) caudal region of holotype; (4) anterior end of allotype, showing the pharynx, glandular sense organs (gso) and cervical and postcervical setation; (5) caudal region of allotype.

In addition to the type locality, *L. juliae* was also found in coarse sand mixed with shell gravel in 8-10 m depth near Rt Križ, north of Rovinj, Croatia (45°06'8"N, 13°36'6"E), northern Adriatic Sea. The animals of this location agree in most characters with the specimens found in the Bay of Veštar. There is only one significant difference concerning the tail; with $\overline{x}$ = 149 ± 3 µm (n = 10) the specimens from Križ have a longer tail then those from Veštar ($\overline{x}$ = 120 ± 7 µm, n = 12).

Etymology: The species is dedicated to Julia Neider.

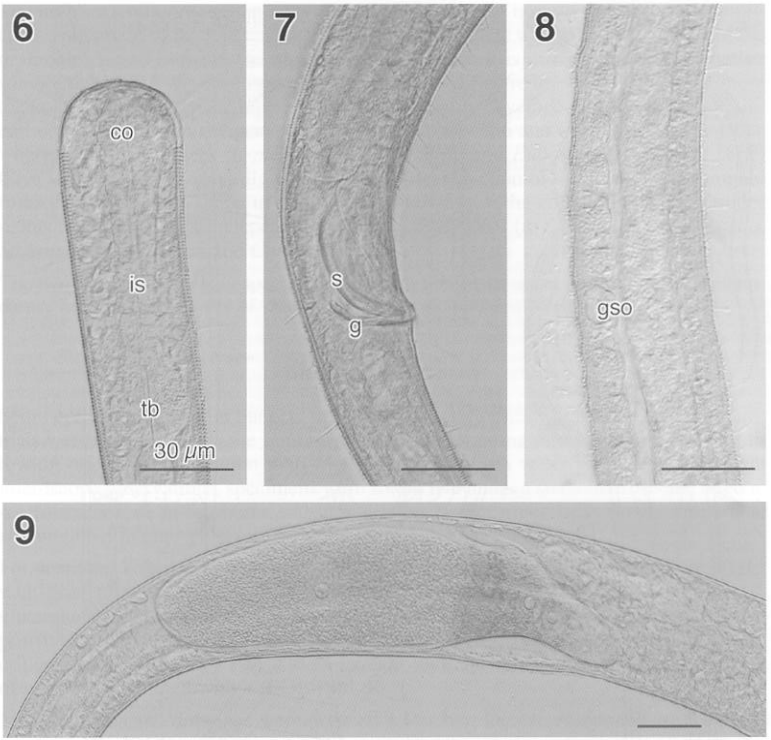
Description: Filiform nematodes with symbiotic bacteria, arranged as a multilayered coat of cocci (1-1.5 µm long) (Figs 13, 14). Bacteria-covered worm white in incident and dark in transmitted light. Body slender, cylindrical, tapering only slightly towards anterior end, tail conical. Solid non annulated cephalic capsule 18-20 µm long and 2 µm thick, slightly rounded and heavily cuticularised (Figs 2, 6, 10). Body cuticle finely annulated (Fig. 11), annuli 0.4-0.5 µm wide (21-24 annuli/10 µm) and curved with an overlapping portion. Annulation beginning approximately 23-26 µm from the anterior end and extending along the whole body, only the tip of the tail (18-23 µm) without annuli (Figs 3, 5, 13). The regular pattern interrupted where setae, branchings, and terminations of annuli are visible. The transition from the body cuticle to the head cuticle characterised by fusion of the anterior annuli with the posterior region of the cephalic capsule.

Large amphids (18-20 µm long) with deeply incised fovea at the anterior end of the cephalic capsule (Figs 2, 4, 12). Amphids with sexual dimorphism: spiral in females with 1.5 turns, shepherd's crook-shaped in males. Head with a circle of six very small labial papillae (1.4 µm long), surrounding the membranous buccal field (Fig. 12). A circle of four long cephalic setae (30-32 µm), followed by two circles of eight subcephalic setae, each. The first subcephalic circle situated at the level of the posterior margin of the amphid, setae 27-29 µm long, the second circle situated a short distance posterior with 9-13 µm long setae (Figs 2, 10). In both circles, the sublateral setae more posterior than the submedian setae. Somatic setae 10-13 µm long, arranged in six rows (except in the cervical region, where eight rows can be seen) over most of the body. Males with a single row of 5-6 small setae (approx. 5 µm) anterior to the cloaca (Fig. 3). Three caudal glands present (Figs 3, 5).

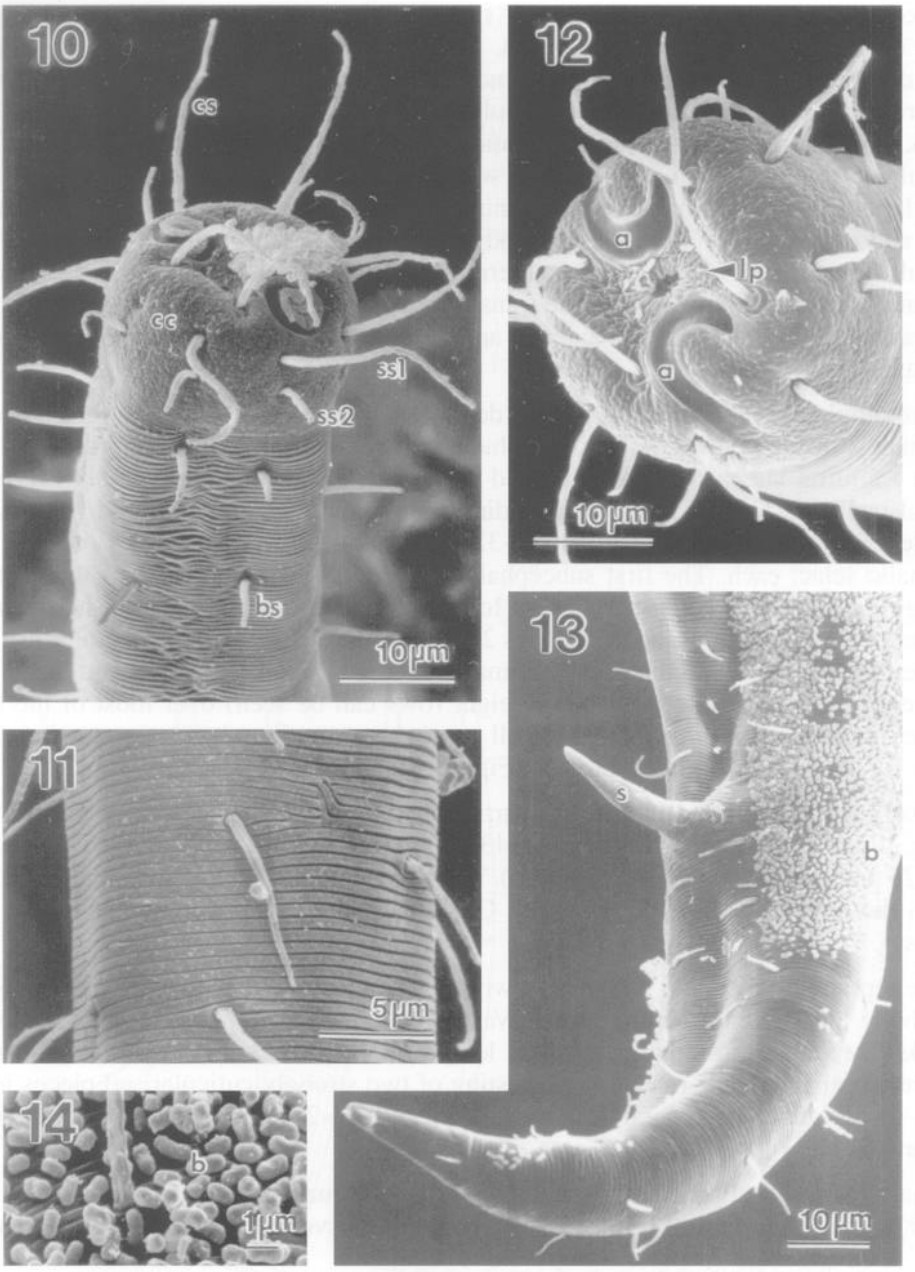
Buccal cavity small and tubular, tri-partite pharynx consisting of a corpus (30-35 µm long, 17µm wide), an narrow isthmus (40-45 µm long, 13 µm wide) and a terminal bulb (21-26 µm long, 24 µm wide) (Figs 4, 6). The nerve ring surrounds the isthmus 31-35 µm from the anterior end of the pharynx. Glandular sense organs present, forming rows (Figs 4, 8).

Male reproductive system monorchic, with outstreched testis. Testis starts at 30-35% of the body length, length 500-600 µm. Vas deferens filled with small granules. Spicula weakly cephalate proximally, arcuate, length 44-48 µm (chord) or 53-56 µm (arch), no velum visible. Gubernaculum consisting of two strongly cuticularised pieces joined by a membranous part, parallel to spicules, length 26-28 µm (Figs 3, 7). Supplements absent.

Female with two opposed antidromous ovaries of equal length, uteri containing large eggs (up to 143 µm long) (Fig. 9). Vulva a small transverse slit at 50% of body length.



Figs 6-9: *Leptonemella juliae* sp.n., interference contrast micrographs of (6) anterior region with the tri-partite pharynx consisting of corpus (co), isthmus (is), and terminal bulb (tb) and (7) cloacal region of male paratype (NHMW-EV 3831) with the spicular apparatus consisting of spiculum (s) and gubernaculum (g); (8) mid body region of holotype, showing the somatic setae which are the outlets of the spherical glandular sense organs (gso) (BAUER-NEBELSICK & al. 1995); (9) posterior gonad of a female paratype (NHMW-EV 3828), showing an egg.



Figs 10-14: *Leptonemella juliae* sp.n., SEM photographs of (10) anterior body region of female, showing cephalic capsule (cc), circle of cephalic setae (cs), two circles of subcephalic setae (ss1+2), and somatic setae (bs); (11) midbody region, showing the annulated cuticle, note the interruption of the regular annulation; (12) frontal view of a male, showing amphids (a), mouth opening surrounded by six labial papillae (lp); (13) caudal region of a male, showing one spiculum (s) protruding from the cloaca, and a part of the bacterial coat; (14) symbiotic bacteria (b), covering the cuticle of the worm.

Discussion

The genus *Leptonemella* COBB, 1920, revised by GERLACH (1950) and by BOUCHER (1975), was established with the type species *Leptonemella cincta* COBB, 1920 collected from a sandy beach in Miami, Florida. GERLACH & RIEMANN (1973) recognised six species in the genus, but BOUCHER (1975) denoted *L. froeyensis* (ALLGEN, 1946) and *L. parabullata* (ALLGEN, 1929) as *species inquirendae* because of the incomplete descriptions. BOUCHER (1975) compared five species in his key, including *Leptonemella granulosa* described in that paper. PLATT & WARWICK (1988), not following the opinion of BOUCHER (1975), recognised seven species. We consider the following species as belonging to *Leptonemella*: *L. aphanothecae* GERLACH, 1950; *L. cincta* COBB, 1920; *L. gorgo* GERLACH, 1950 and *L. granulosa* BOUCHER, 1975. On the basis of material collected close to the type locality in the Maldive Islands we place *Leptonemella sigma* GERLACH, 1963 in the genus *Laxus* using the characters of the cephalic capsule as criteria, as defined in OTT & al. (1995) and URBANCIK & al. (1996 b).

Leptonemella cincta is distinguished from all other *Leptonemella* species by its slit-like amphid. *Leptonemella juliae* differs from *L. aphanothecae*, *L. gorgo* and *L. granulosa* in body size and proportions, especially the short pharynx, and the long somatic setae. The four cephalic setae of *L. juliae* as well as the eight subcephalic setae from the first circle are the longest measured setae from all known *Leptonemella* species. *L. juliae* is much thicker than *L. granulosa*. Moreover the somatic setae of *L. juliae* are twice as long as these setae from *L. granulosa*.

Leptonemella vestari differs from *L. aphanothecae* and *L. granulosa* in body size and proportions, and in the length of the setae in the second subcephalic circle, which are equal to that of the first. In this respect *L. vestari* is similar to *L. gorgo*. It differs, however, from the latter species in the shape of the gubernaculum, which is much more complex in *L. vestari*, and in the number of pre- and postcloacal setae in the midventral line of males, with *L. gorgo* having 5 precloacal and 8 postcloacal setae, *L. vestari* 3 and 4 respectively (Table 1).

Tab. 1. Differental diagnosis using selected features. * Cobb (1920); + Gerlach (1964); # personal observation on paratype R3774 AB (Muséum National d´Histoire Naturelle, Boucher 1975)

species	*L. aphanothecae*	*L. cincta*	*L. gorgo*	*L. granulosa*	*L. juliae*	*L. vestari*
amphid (female)	spiral	slit*,+	spiral	spiral	spiral	spiral
cephalic circle	short (15-20 µm)	medium (27 µm)+	medium (20-27 µm)	short (13-17 µm)	long (30-31 µm)	short (15-17 µm)
subcephalic circles	first circle longer (13-17 µm) than second (8-12 µm)	first circle longer (25 µm) than second (10 µm)+	nearly equal (first: 16-19 µm, second: 16-19 µm at least)	first circle longer (11-15 µm) than second (5-6 µm)	first circle longer (27-29 µm) than second (9-13 µm)	nearly equal (first: 10-13 µm, second: 14-16 µm)
somatic setae	short to medium (7-9 µm)	without*	short (7 µm)	short (3-4 µm)#	long (10-13 µm)	short (7 µm)
no. of pre- / postcloacal setae	0 / 0	0 / 0	5 / 8	3# / 6	5-6 / 0	3 / 4
gubernaculum	medium (15-20 µm); paired, median joined, with curved slender apophysis	medium (24 µm)+; single, one piece, slender, rod-shaped, parallel to spicules	short (17 µm); one rod-shaped piece without apophysis, parallel to spicules	short (15-16 µm); as open groove with two parallel apophyses parallel to spicules	long (26-28 µm); two pieces joined by a membranous part, parallel to spicules, without apophysis	short to medium (16-19 µm); two pieces joined by a plate, forming an angel, without apophysis

At present it is premature to give a revised definition of the genus *Leptonemella* and to formulate a new key. Several species await their description (F. Riemann, pers. comm., J.A. Ott, pers. obs.). The multilayered bacterial coat, the structure of body cuticle and cephalic cuticle - the latter with a dominant median zone (URBANCIK & al. 1996b) - the simple construction of the tri-partite pharynx, and - in those species where the amphid has not been reduced to a pore or slit - the sexual dimorphism of this organ can be used as distinctive characters for *Leptonemella*.