

Two new and three redescribed species of *Viscosia* (Nematoda, Oncholaimidae)

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Abstract

Viscosia coomansi sp. nov. and *Viscosia heterolaima* sp. nov. are described from Lake Grevelingen and Eastern Scheldt (The Netherlands). *Viscosia glabra* (Bastian, 1865) de Man 1890, *Viscosia franzii* Boucher 1977, and *Viscosia viscosa* (Bastian 1865) de Man 1890 are redescribed, taking into account new important characters. Juvenile specimens are depicted for *V. viscosa*. *Viscosia carnleyensis* Ditlevsen, 1921 is synonymized with *Viscosia glabra* (Bastian, 1865). *Mononcholaimus viscosus* Allgén, 1930 and *Mononcholaimus elegans* sensu Schuurmans-Stekhoven, 1942, 1950 (nec. Kreis, 1924) are synonymized with *Viscosia viscosa* (Bastian, 1865).

Introduction

The identification of a *Viscosia*-species is a difficult task due to the enormous number of species described and the tentative information within the descriptions. Moreover, about 70% of the known species are recorded only once in the literature, and often only one or few specimens were found, indicating that information on variability is lacking.

Five *Viscosia*-species from different habitats are compared and their similarities and differences discussed. We tried to improve the descriptions taking into account the important and new characteristics pointed out by Smol (in prep.).

Materials and methods

Localities

Dievengat: A polyhaline brackish water pool in the southern part of the nature reserve 'Het Zwin', situated in the extreme north-western corner of Belgium. A more detailed description is given by Smol *et al* (1981).

Sediment: well sorted fine sand underlying a 2–3 mm layer of detritus.

Coordinates: 51°21'00"N, 03°22'30"E. Salinity 8–40‰.

Sampled: October 1973–September 1977.

Eastern Scheldt: 51°32'40"N, 03°59'50"E.

Fine sandy sediment. Sampled: June 1979–May 1980.

Lake Grevelingen: 51°46'00"N, 03°56'00"E.

Fine medium sand. Sampled: June 1979–May 1980.

Techniques

All samples were fixed in 4% formaldehyde at 70 °C. The nematodes were transferred to dehydrated glycerol (Seinhorst, 1959; De Grisse, 1965) and mounted on Cobb-slides for identification.

The drawings were made with the aid of a camera lucida on a Leitz Dialux 20 EB and a Wild M20 microscope.

All measurements, except ratios, are in micrometers. The values in the measurement formula indicate:

cephalic setae	nerve ring	ventral pore	pharynx	vulva/M	anus/cloacal aperture	total length
corresponding body diameter (c.b.d.)						

The buccal index formula, explained in the abbreviations, is used to describe the morphology of the buccal cavity:

$$BI = \frac{B}{LV} ; \frac{br}{D} \frac{RV}{RV} \quad (\text{modified after Belogurov \& Belogurova, 1977})$$

Spicula are measured along the arc.

We use the terms 'ventral' pore and 'ventral' gland as the excretory function of these structures has not been proven. Other terminology is adapted from Coomans (1978).

The distinction between papillae and setae is made as follows:

$\leq 2 \mu\text{m}$ = papillae;

$> 2 \mu\text{m}$ = setae.

One male and one female of each species described in this paper are deposited in the collection of the Instituut voor Dierkunde, Rijksuniversiteit, Gent, Belgium.

Abbreviations

a	body length/ max. body diameter
b	body length/ pharyngeal length
br	length basorabdion/length buccal cavity (%)
c	body length/ tail length
c'	tail length/ anal body diameter
a.b.d.	anal body diameter
c.b.d.	corresponding body diameter
n	number of specimens examined
s.d.	standard deviation
$\bar{x}$	arithmetic mean
B	length/ width of buccal cavity
BI	buccal index
D	length dorsal tooth/ length buccal cavity (%)
L	body length (in micrometer)
LV	length left ventrosublateral tooth/ length buccal cavity (%)
M	middle of body
RV	length right ventrosublateral tooth/ length buccal cavity (%)
S	spicule length (in micrometer)
V	position of vulva from anterior as a percentage of the total body length

Viscosia viscosa (Bastian, 1865)

(Figs. 5 & 6 and Plate 5)

syn. nov.: *Mononcholaimus viscosus* Allgén, 1930*Mononcholaimus elegans* sensu Schuurmans-Stekhoven 1942, 1950

Locality: Dievengat, Belgium

Measurements

	$\delta\delta$ (n = 10)			♀♀ (n = 10)		
	$\bar{x}$	$\pm$ s.d.	range	$\bar{x}$	$\pm$ s.d.	range
L	1728.1	± 41.6	(1372–2051)	1897.4	± 43.6	(1453–2291)
a	38.7	± 6.2	(37.4–60.3)	52.2	± 7.2	(38.2–66.2)
b	6.2	± 2.5	(5.7–6.9)	6.3	± 2.5	(5.2–7.3)
c	17.8	± 4.2	(15.3–19.9)	17.1	± 4.1	(14.4–20.6)
c'	4.9	± 2.2	(4.3–5.4)	5.3	± 2.3	(5.1–6.1)
Vulva				49.9	± 7.1	(46–61)
Spicules	28.6	± 5.3	(26–31)			
δ_1	7	168	205	301	–	1788
	15	34	33	35	35	21
	a = 54.2		b = 6.3	c = 17.4		1897 (slide No. 509)
δ_2	7	168	198	309	–	1806
	15	33	34	35	35	21
	a = 54.4		b = 6.2	c = 19.4		1904
♀_1	6	167	210	280	847	1687
	16	34	35	39	39	21
	a = 46.1		b = 6.4	c = 16.1	V = 47.1%	1799 (slide No. 510)
♀_2 (gravid)	6	179	213	315	1065	2163
	15	34	36	39	39	22
	a = 58.3		b = 7.2	c = 20.3	V = 46.8%	2275
BI_{δ_1} :	2 ; 43%		$\text{BI}_{\text{♀}_1}$:		1.8 ; 41%	
	46%	46%	96%		38%	41%
					90%	

Description

Males: body slender, filiform, tapering slightly anteriorly. Maximum width already reached at the end of the pharynx.

Cuticle smooth. Scattered setae over the body.

Lip region slightly demarcated. Lips with 6 minute internal labial papillae and 10 setae: 6 external labial (7 μm) and 4 cephalic (6 μm).

Amphids with cup-shaped fovea and oval aperture, 9 μm wide (55–60% of c.b.d.) and situated at 5 μm from the anterior end.

Buccal cavity with heavily sclerotized walls, 17 μm deep, 9 μm wide (range: 17–19 $\times$ 9–10 μm). Large ventrosublateral tooth on the right side, sharp, apex reaching anterior to the level of the setae. Left ventrosublateral tooth weakly sclerotized, typically M-shaped in lateral view, apex behind the middle of the buccal cavity. Dorsal tooth small, seen as a small elevation of the dorsal wall; situated at the same level as the small ventrosublateral tooth.

Pharynx cylindrical, in its foremost part the lumen is provided with a valve.

Nerve ring conspicuous, situated slightly behind the middle ($\pm 55\%$) of the pharynx.

Ventral pore about 35 μm posterior to nerve ring; ventral gland postpharyngeal, on the right side of the intestine, posterior margin about 200 μm from the base of the pharynx.

Cardia prominent, triangular, 21 μm long.

Reproductive system with two opposed, outstretched testes. Vas deferens separated from the muscular ejaculatory duct by a sphincter (Fig. 5E, H) at the level of second caudal gland.

Spicules typically curved, slightly cephalated, distally 'forked', length 1.5 $\times$ a.b.d. 5 pairs of perianal setae present. Gubernaculum absent.

Tail conoid in proximal part and cylindrical more posteriorly, curved ventrally, provided with setae. A typical constriction and subsequent widening in the tail is observed (cf. Riemann, 1966) (Plate 6).

Caudal glands with preanal cell bodies, located 147, 294 and 368 μm from cloacal opening, the anteriormost one on the right side, the two other on the left side.

Females: in general similar to the males, although larger.

Reproductive system with two equally developed branches; antidiromously reflexed ovaries on the right side of intestine. A maximum of four eggs was observed in the uterus; eggs measuring 76–130 $\times$ 24–28 μm .

Demanian system typical for the genus (cf. Rachor, 1969) with an elongation of the ovarian sac and an osmosium. Tail devoid of setae.

Juveniles

	J ₁ (n = 3)			J ₂ (n = 7)			J ₃ (n = 10)			J ₄ (n = 10)		
	$\bar{x}$	$\pm$ s.d.	range	$\bar{x}$	$\pm$ s.d.	range	$\bar{x}$	$\pm$ s.d.	range	$\bar{x}$	$\pm$ s.d.	range
L	502.0 $\pm$ 1.7		(500–503)	744.0 $\pm$ 69.0		(617–819)	1108.4 $\pm$ 70.4		(1047–1241)	1584.9 $\pm$ 134.5		(1435–1876)
a	29.3 $\pm$ 3.6		(25.2–31.4)	33.4 $\pm$ 3.0		(30.3–38.3)	39.4 $\pm$ 6.7		(31.6–51.1)	48.7 $\pm$ 5.9		(39.0–59.9)
b	3.0 $\pm$ 0.1		(2.9–3.1)	4.0 $\pm$ 0.2		(3.7–4.4)	4.8 $\pm$ 0.3		(4.3–5.3)	5.9 $\pm$ 0.6		(5.1–6.9)
c	6.0 $\pm$ 0.9		(5.4–7.0)	10.0 $\pm$ 1.0		(8.5–11.5)	12.7 $\pm$ 1.1		(11.5–14.6)	15.6 $\pm$ 1.3		(13.9–17.8)

J₁ (Fig. 6:A, J & K)

Body less slender than that of the adults; maximum width at the level of the pharynx; clearly tapering behind the base of the pharynx.

Head end: papillae difficult to see, setae 3 μm long. With the light microscope it was difficult to determine whether outer labial setae and cephalic setae were separated in two circlets or not.

Buccal cavity narrow and long, about 3 times as long as wide. At first sight only the large right ventrosublateral tooth was distinct, but careful examination revealed the existence of a dorsal tooth and a small left ventrosublateral tooth.

Pharyngeal valve, nerve ring and ventral gland as in the adults; ventral pore inconspicuous.

Amphideal fovea large and deep: 4 μm = 45% c.b.d.

Tail less prominent. Caudal glands in tandem.

Genital primordium consisting of two oval bodies connected by a strand of tissue, lying at about 250 μm from the anterior end. Each oval body contains a single large centrally located spherical germinal nucleus and two smaller somatic nuclei. Total length of the primordia is about 41 μm .

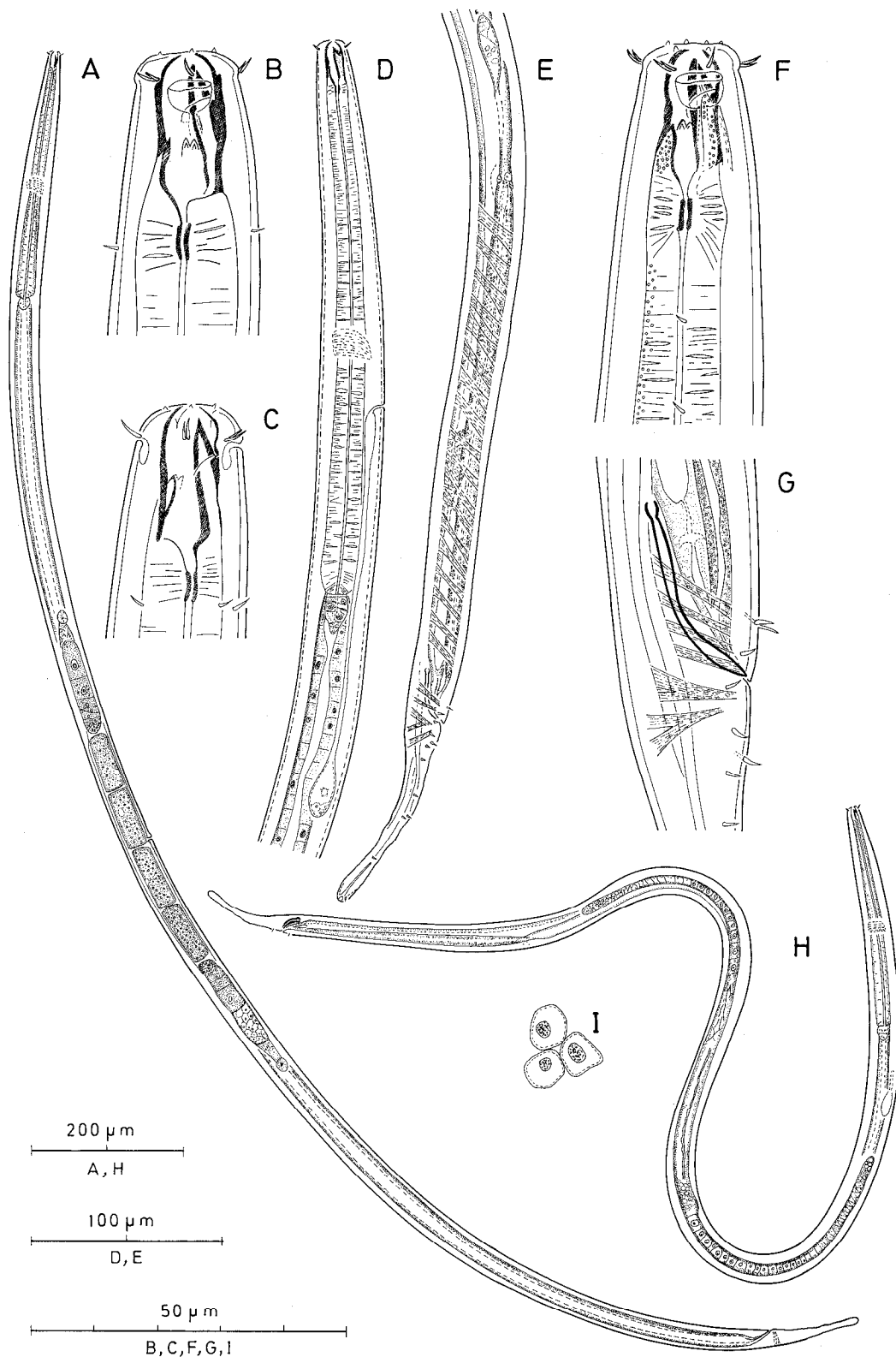


Fig. 5. *Viscosia viscosa* (Bastian, 1865)

A. Total view ♀₂; B. Head end ♂₁; C. Head end ♀₁; D. Pharyngeal region, ventral gland ♂₁; E. Tail shape, caudal glands ♂₁; F. Head end ♀₂; G. Spicular apparatus ♂₁; H. Total view ♂₁; I. Sperm cells ♂₁.

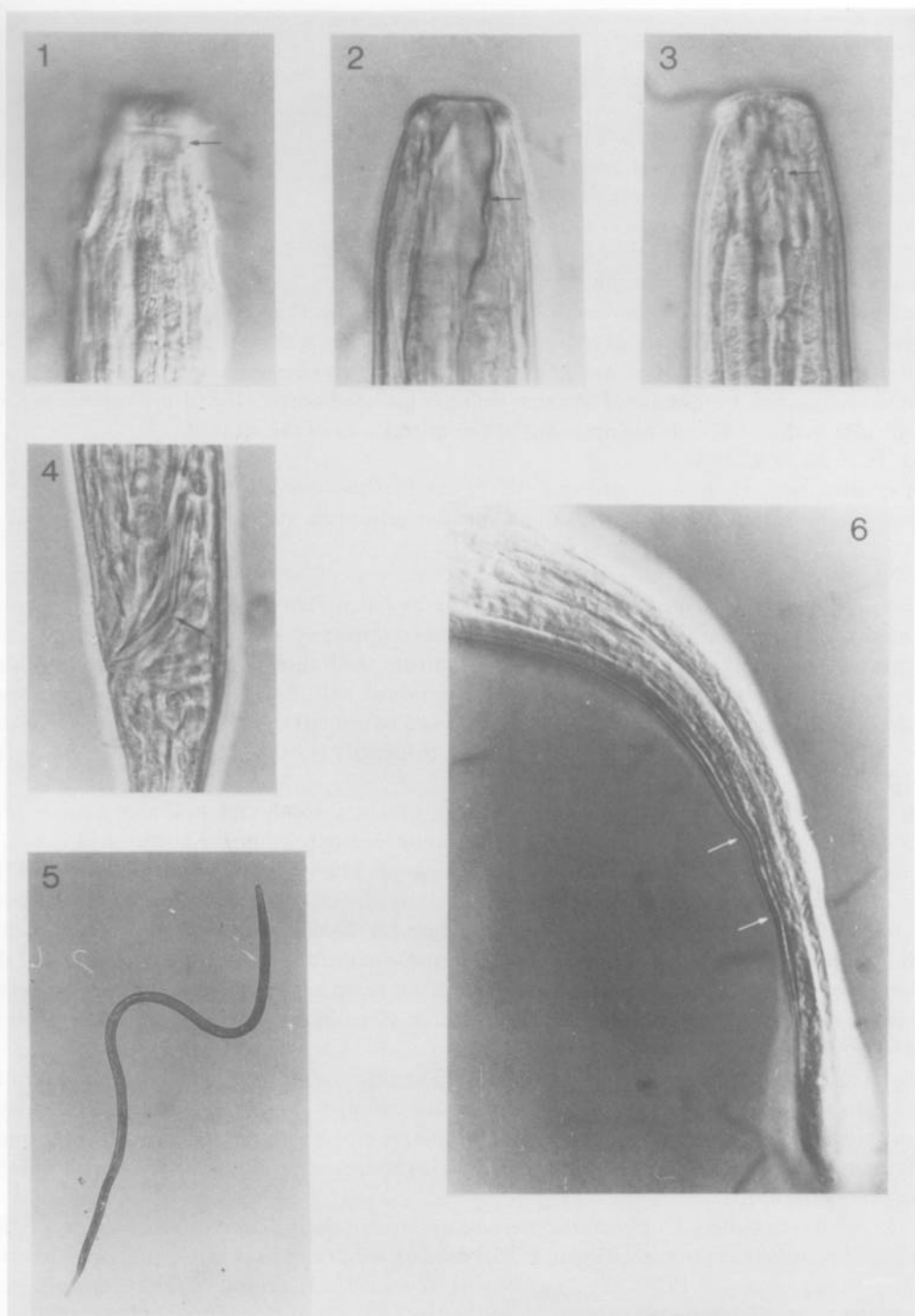


Plate 5. *Viscosia viscosa* (Bastian, 1865)

1. Amphid (lateral view) ♂; 2. Dorsal tooth (lateral view) ♂; 3. Left ventrosublateral tooth (lateral view) ♂; 4. Spicular apparatus: curved spicule ♂; 5. Total view ♂; 6. Tail with constrictions ♂.

J₂ (Figs. 6: B, I & L)

This stage is recognized by its longer size and the development of the genital primordia.

The a-, b-, & c-index increases.

The amphid is larger and constitutes more than 50% of the c.b.d.

The buccal cavity is about 2.5 times as long as wide.

The caudal glands lie fairly close to each other.

Within this stage the number of nuclei is doubling.

J₃ (Fig. 6: C, H & M)

The body is more or less of equal width throughout its length

The buccal cavity broadens and becomes twice as long as wide; its shape is similar to that of the adults.

The genital primordia enlarge probably by multiplication of both the germinal and somatic cells, but without using staining techniques, it is impossible to distinguish between both types of cells.

Sexes can be recognized. In the case of females, cells are grouped around the future vagina; in the case of males spicular primordial cells are arranged at the dorsal wall of the rectum.

J₄ (Fig. 6: D, E, F, G, N & O)

Although smaller, body shape and head end are very similar to those of the adults.

Genital tract clearly visible, enlarged; vulva and spicular primordia very distinct.

Discussion

Viscosia viscosa was first described by Bastian in 1865 as *Oncholaimus viscosus*. This description and especially the drawings are very poor. His measurements completely agree with our specimens, but the drawing of the buccal cavity disagrees as there are 3 prominent teeth shown, of which the 2 large ones are of equal length. This pattern is repeated for other oncholaimids as well. As this is not in accordance with the diagnostic character of one large ventrosublateral tooth and two small teeth; we suppose that the drawings lack accuracy and we refer to the measurements as a basis to identify our specimens as *V. viscosa* as described by de Man (1890).

V. viscosa is characterized by a prominent right ventrosublateral tooth and an inconspicuous M-shaped left ventrosublateral tooth. This M-shaped small tooth is quite unusual among the numerous *Viscosia*-species (see Smol, in prep.). According to this *V. viscosa* is most closely related to *V. franzii* Boucher (1977) and *V. coomansi* sp.n. With *V. coomansi* it shares the minute teeth (dorsal and left ventrosublateral) positioned posterior to the middle of the buccal cavity, but *V. coomansi* is much longer and has straighter spicules.

V. viscosa is related to *V. franzii* in size and general shape, but differs in the position and size of the small teeth: the dorsal tooth being more prominent and positioned more anteriorly in *V. franzii* (midway buccal cavity); and in the shape of the tail (typical constriction for *V. viscosa*) and in the shape of the spicule which is typically curved in *V. viscosa*.

We synonymize *Mononcholaimus viscosus* Allgén, 1930 with *V. viscosa* as the measurements of the only juvenile described falls completely within the range of our juveniles, and the indices presented by Allgén (1930) are very close to those of a specimen with comparable length. It is clear that Allgén has overlooked the two small teeth, which are indeed minute. Moreover, this juvenile was also found in a brackish water habitat as is the case for *V. viscosa*.

Wieser (1953, p. 105) considers *Mononcholaimus elegans* sensu Schuurmans-Stekhoven, 1942, 1950 to be a synonym of *Mononcholaimus viscosus* Allgén, 1930, based on the presence of an amphid (which is lacking in *Mononcholaimus elegans* Kreis, 1924). We do agree with Wieser (1953) but for a different reason; we can not consider the males of *Mononcholaimus elegans* described by Schuurmans-Stekhoven (1942, 1950) without a gubernaculum to be synonymous to the males of *M. elegans* described by Kreis (1924) and depicted with a gubernaculum. This argument has also been discussed by Vitiello (1970, p. 196). We do agree with Wieser (1953) and Vitiello (1970) and consider *Mononcholaimus elegans* sensu Schuurmans-Stekhoven, 1942, 1950 as different from *Mononcholaimus elegans* Kreis, 1924. The numerical data of the former completely agree with our data for *V. viscosa* and therefore *Mononcholaimus elegans* sensu Schuurmans-Stekhoven, 1942, 1950 (nec. Kreis, 1924), found in the Camargue (brackish) is synonymized with *V. viscosa* (Bastian, 1865).

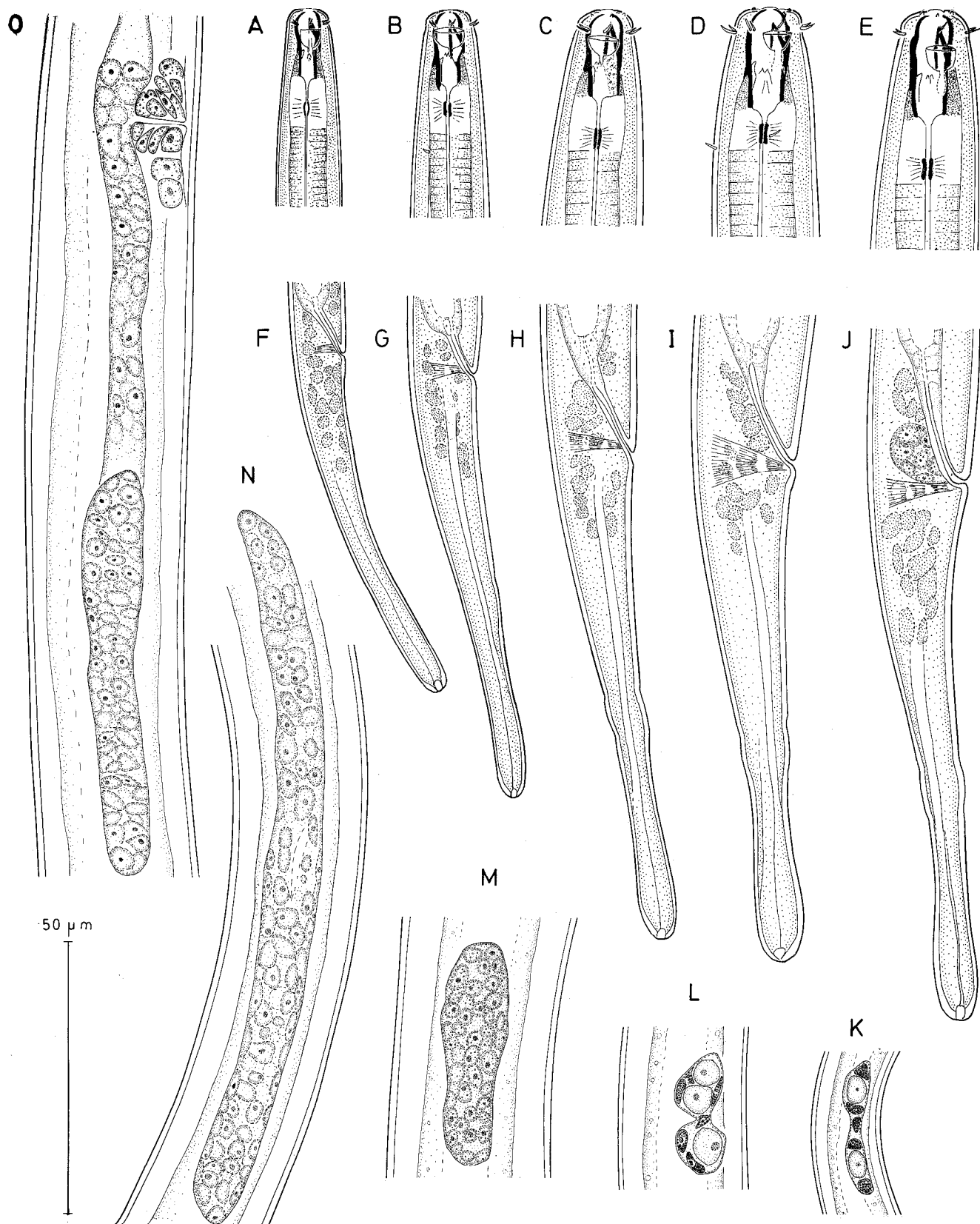


Fig. 6. *Viscosia viscosa* (Bastian, 1865)

A. Juv₁: head end; B. Juv₂: head end; C. Juv₃: head end; D. Juv₄: head end (♀); E. Juv₄: head end (♂); F. Juv₁: tail; G. Juv₂: tail; H. Juv₃: tail; I. Juv₄: tail (♀); J. Juv₄: tail (♂); K. Juv₁: genital primordia; L. Juv₂: genital primordia; M. Juv₃: genital primordia; N. Juv₄: genital primordia (♂); O. Juv₄: genital primordia (♀).