

## Two oncholaimid species from a South African estuary (Nematoda, Oncholaimidae)

Johan P. Furstenberg<sup>1</sup> & Magda M. Vincx

Laboratorium voor Morfologie en Systematiek der Dieren, Instituut voor Dierkunde,

K. L. Ledeganckstraat 35, B-9000 Gent, Belgium; <sup>1</sup>On leave from the University of Port Elizabeth, P.O. Box 1600, Port Elizabeth 6000, Republic of South Africa

Received 10 March 1988; accepted 7 October 1988

**Key words:** marine, nematodes, systematics, oncholaimids, demanian system

### Abstract

*Adoncholaimus papillatus* Kreis, 1932 and *Viscosia erasmi* sp.nov. are described from an intertidal area of the Sundays River Estuary, South Africa.

*Adoncholaimus papillatus* females have an, up to present, unknown organization of the demanian system: the main duct is connected with the two spermathecae by means of a strongly curved ductus uterinus. There is only one osmosium situated at the anterior part of the main duct (anteriad of the vagina). The uvette and the ductus entericus are absent. The main duct extends to the swollen part of the tail where it opens in one or two terminal pores.

*Viscosia erasmi* sp.nov. is mainly characterized by the bifid apical part of the buccal cavity, three distinct teeth with the right ventrosublateral one the largest and by the setiform head sensilla.

### Introduction

One *Adoncholaimus* species and one new *Viscosia* species are described from the Sundays River Estuary, South Africa. *Adoncholaimus papillatus* Kreis, 1932 occurs in muddy sediments with low salinity and *Viscosia* sp.nov. in sandy and muddy sediments with salinities ranging from 3–35‰.

### Material and methods

Intertidal samples were taken with a copper corer 60 cm in length and 3.6 cm in diameter. Samples were taken at LWS and MWS at a depth of 0–45 cm.

Extraction was done by decantation. The specimens were fixed in hot (60 °C) neutral formalin and mounted in glycerine after dehydration.

Drawings were made with the aid of a drawing tube on a Leitz Dialux 20 microscope with interference contrast equipment.

All measurements are in micrometers; curved structures are measured along the arc.

Values in the formula (measurements) are as in Vincx *et al.* (1982).

Seven specimens of *Adoncholaimus papillatus* and nine specimens of *Viscosia erasmi* sp.nov. were encountered – all from Sundays River Estuary, South Africa.

## Results

### *Adoncholaimus papillatus* Kreis, 1932

#### Description:

Specimens measured: four males, three females. Male ♂ 1 (slide no. 981) and female ♀ 1 (slide no. 982) in the Nematode Collection of the Instituut voor Dierkunde, Gent, Belgium. Other specimens in the same collection.

*Locality:* Sundays River Estuary (25°52'E – 33°43'S).

- 1) intertidal sample 9a. Salinity 7‰, LWS. Very fine sediment, grey clay, sticky. Sample 9b: HWS, same salinity and sediment.
- 2) intertidal sample 8a, 2 km from 9a. Same sediment. Salinity 11‰, LWS.

Sampling date 9th February, 1987.

#### Measurements:

male:  $\frac{7 \ 209 \ 211 \ 422 \ M \ 2374}{21 \ 55 \ 58 \ 58 \ 58 \ 34} 2520 \mu\text{m}$   
(slide no. 981)  
a = 43.4; b = 6.0; c = 17.3; c' = 4.3; spic. 40  $\mu\text{m}$

female:  $\frac{7 \ ? \ ? \ 445 \ 1128 \ 2120}{22 \ ? \ ? \ 60 \ 60 \ 35} 2270 \mu\text{m}$   
(slide no. 982)  
a = 37.8; b = 5.1; c = 15.1; c' = 4.3; v = 49.7%

#### Other specimens:

	Males (n = 3)	Females (n = 2)
L:	2241–2871 $\mu\text{m}$	2163, 2740 $\mu\text{m}$
a:	40.7–49.5	35.0, 37.1
b:	6.5–6.8	5.7, 6.1
c:	17.9–21.5	14.6, 20.9
c':	3.8–4.8	4.1, 5.6
spic./V	38–41 $\mu\text{m}$	50.5, 52.1%

#### Males:

Long, slender body, tapering slightly towards anterior end, with demarcated filiform tail end.

Cuticle smooth with scattered setae over body.

Six lips each with an internal labial papilla; the six external labial papillae and the four papilliform cephalic sensilla are arranged in one circle. Between both circles of anterior sensilla, the cuticle shows six horse-shoe shaped (in lateral view) structures, from which the lateral ones are the largest (Fig. 1). In apical view, the inner border of these cuticular structures is invaginated. The real nature of these structures is not clear.

Amphideal fovea, cup-shaped with an elliptical aperture, 9  $\mu\text{m}$  wide (i.e. 33% of c.b.d.), anterior border of the aperture located 18  $\mu\text{m}$  from anterior end. The canalis is very prominent. Buccal cavity 40  $\mu\text{m}$  long, 14  $\mu\text{m}$  wide (range: 34–40  $\times$  14–15  $\mu\text{m}$ ; i.e. about three times as long as wide). Prominent right ventrosublateral tooth; the left ventrosublateral tooth and dorsal tooth smaller and equal in size. The right tooth apex is only 5  $\mu\text{m}$  from oral opening, the other two 12  $\mu\text{m}$ . Each tooth is provided with an inner canal through which a pharyngeal gland opens. Anterior from the implantation of the teeth, the stomatal lumen is hexaradial, posteriad to that level, the stomatal lumen is irregularly triangular, although the composite plates are not clearly distinct. The buccal cavity is partly surrounded by pharyngeal tissue.

Pharynx cylindrical, muscular. Cardia 22  $\mu\text{m}$  long. Intestine with small lumen and a 32  $\mu\text{m}$  long rectum.

Nerve ring at 50% of pharyngeal length. Ventral pore 100  $\mu\text{m}$  anterior to the nerve ring; ventral gland cell on left side of intestine, 281  $\mu\text{m}$  from base of pharynx.

Reproductive system with two opposed, outstretched testes on right side of intestine. Spicules slightly curved 38–41  $\mu\text{m}$  long, gubernaculum consists of two spoon-shaped lateral pieces (13  $\mu\text{m}$  long), which are interconnected by a thin dorsal plate (Fig. 1, F). Copulatory musculature well developed. Pre- and postanal setae numerous (n = 20–22 pairs) bilaterally arranged on both sides of longitudinal axis of tail region.

Tail with a posterior filiform part demarcated from swollen anterior part; the swelling extends to the proximal ends of the spiculae. More setae are

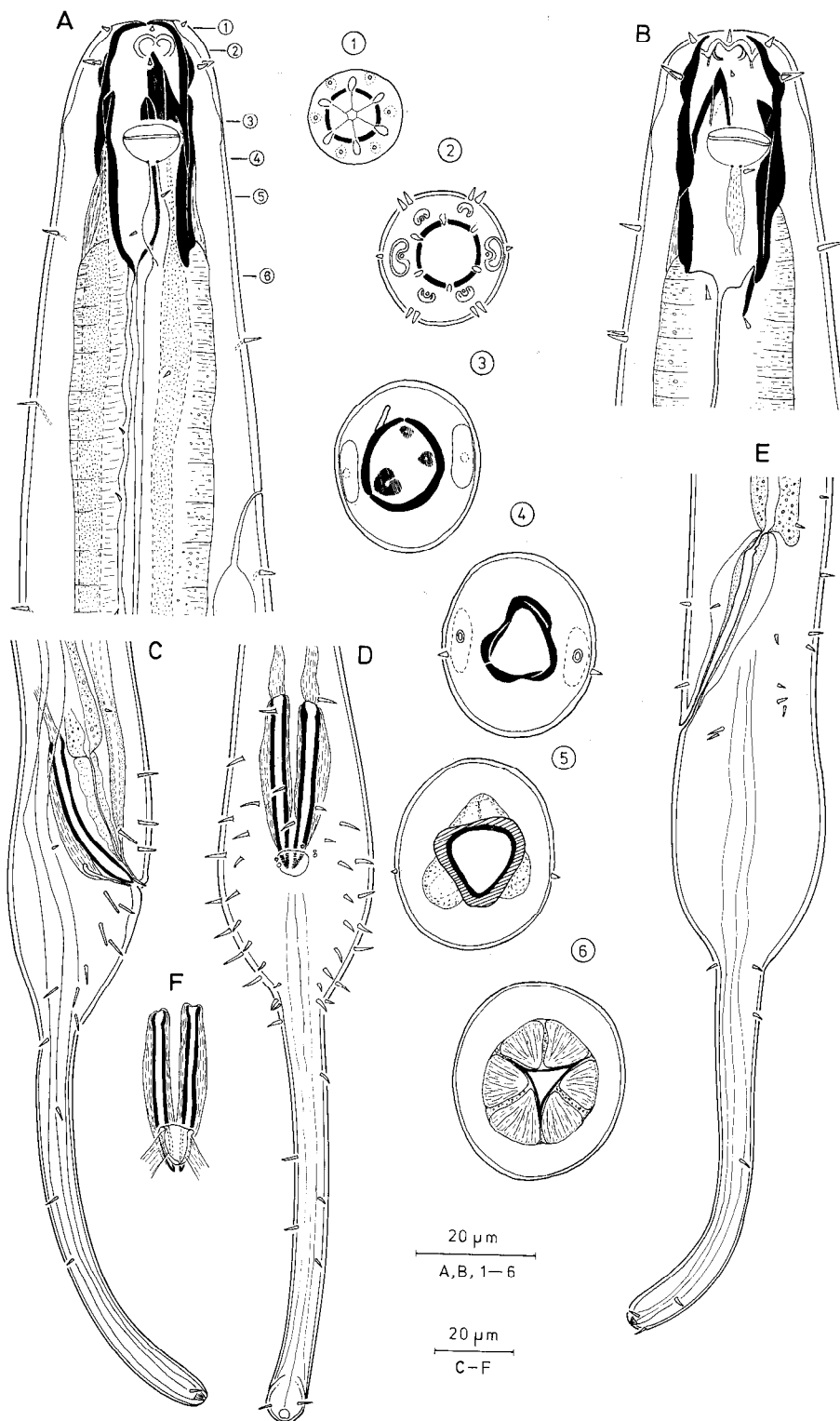


Fig. 1. *Adoncholaimus papillatus* Kreis, 1932. A: Anterior end of holotype ♂ 1, A1-A6: En face views; B: Anterior end of paratype ♀ 1; C: Tail view of holotype ♂ 1; D: Tail, ventral view of paratype ♂ 2; E: Tail view of paratype ♀ 1; F: Spicules, dorsal view, paratype ♂ 2.

found on the swollen part. Three conspicuous caudal glands 65, 112 and 147  $\mu\text{m}$  from cloaca. The anterior one is situated at the right, the posterior ones at the left of the intestine.

#### Females:

Resemble males in most aspects.

Didelphic, amphidelphic with two equally developed branches; ovaries antidromously reflexed with ventrally bent tips. A spermatheca is present as a ventral extension of the proximal part of each uterus. Up to five eggs are found in the uteri (Fig. 2, E). The demanian system is a well developed tubular system. It is dorsally situated and consists of the following parts: the main duct is connected with the spermathecae by a strongly curved ductus uterinus; the inner wall of the d. uterinus is strongly sclerotised. One osmosium is present on the anterior part of the main duct (anterior of the vagina), although the osmosium is not always very clear.

The uvette and the ductus entericus are absent. The main duct extends until the swollen part of the tail, where one or two terminal ducts (interstitial canals) open in one ventral or two lateral (or one ventral and one lateral) copulation pores. No sperm cells were observed in the demanian system.

#### Discussion

*Adoncholaimus papillatus* is characterised by a very long buccal cavity (i.e. about three times as long as wide), by the shape of the tail (swollen anterior part, filiform posterior part), by the length of the spicules and by the unique structure of the demanian system. The South African specimens and those of Kreis (1932, 1934) are almost identical. The following imperfections are found in Kreis' description:

- the amphid is not the cuticular structure at the level of the anterior sensilla; the fovea is situated at the mid-level of the buccal cavity.
- the position of the three caudal glands is not exactly the same (compare Fig. 134c, p. 253 in Kreis, 1934). In the South African speci-

mens the position of the caudal glands in relation to each other is also quite variable. The position with respect to the intestine is constant (see description).

- the setae in the cloacal region are more numerous in the South African specimens. The organisation of the tubular demanian system resembles that which is schematically proposed for *Adoncholaimus* in Fig. 28 p. 140 by Rachor (1969). However, the following differences should be noted:
  - the uvette and the ductus entericus are lacking
  - the ductus uterinus is a strongly curved structure, which connects the spermatheca with the main duct
  - the osmosium is situated between both ducti uterini, at the level of the anterior uterus
  - the terminal pores are located on the tail.

Rachor (1969) described the demanian system of *Adoncholaimus* as follows: 'Es ist entsprechend den paarig-symmetrischen Gonaden durch eine langgestrecktes dorsale Hauptrohr gekennzeichnet, dessen Terminaldukte kurz vor dem After liegen. Das Vorderende des Hauptrohres, der Ductus entericus, liegt ventral in der Region des vorderen Ovars und verbindet sich in nur einem Osmosium mit dem Darmepithel.'

Thus, the primary symmetry of the tubular system is reduced, since the posterior osmosium is absent and the main duct extends to the caudal part of the body. Moreover, the terminal ducts are dislocated and multiplied (Rachor, 1969).

Rachor (1969) mentioned some aberrations on this organisation, e.g. in *A. thalassophygas* (de Man, 1876) and in *A. lepidus* (de Man, 1889), the uvettes and the ducti uterini are not very clear.

The number and the position of the terminal pores is also variable within the genus. Most species have two preanal terminal ducts (pores), except *A. islandicus* (two pairs of terminal ducts; see Kreis, 1963) and *A. panicus* (numerous preanal terminal pores; see Rachor, 1969). Belogurova (1978) drew two postanal terminal pores in *A. fuscus* (Bastian, 1865); this observation is in agreement with the arrangement of the terminal pores in *A. papillatus*.

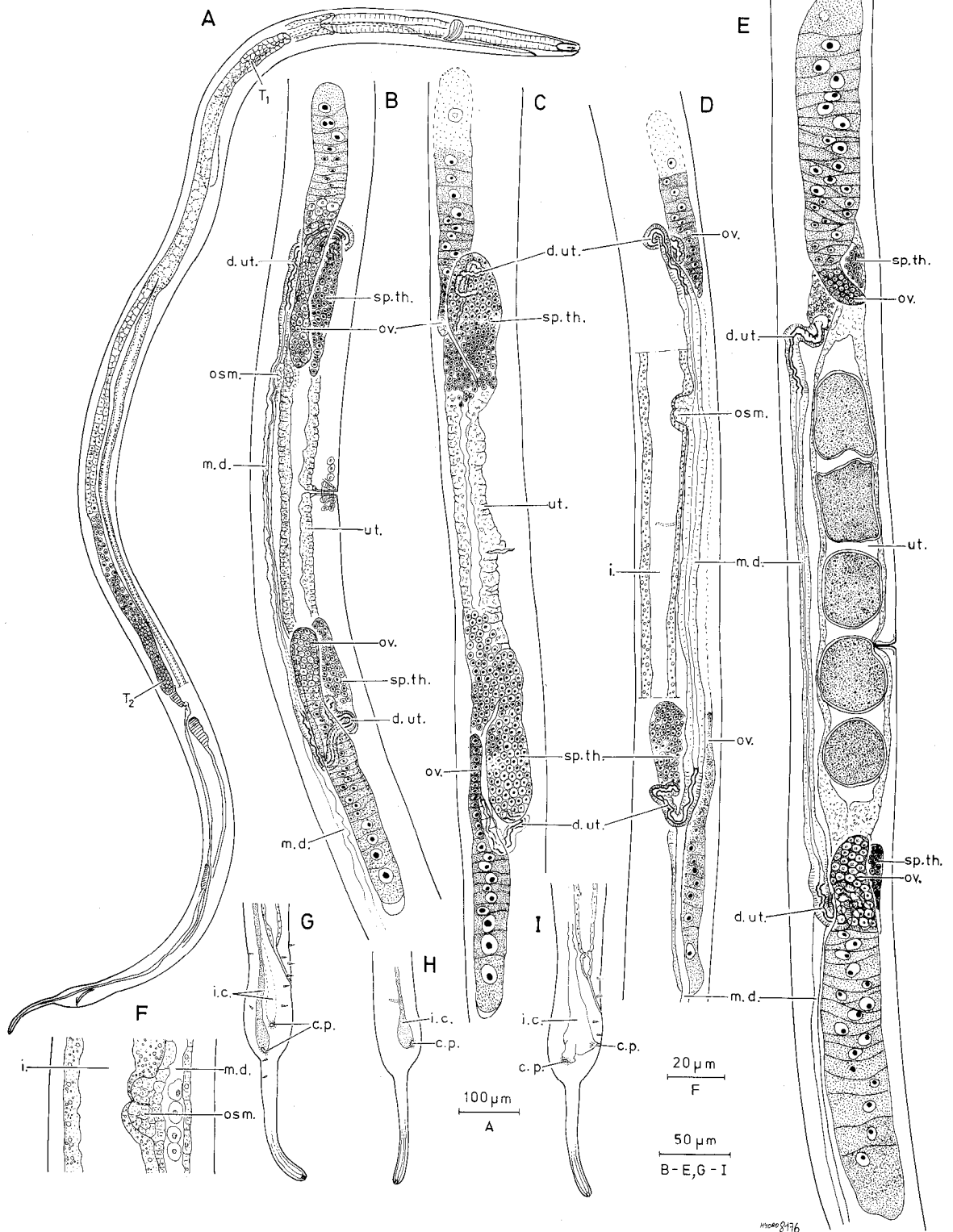


Fig. 2. *Adoncholaimus papillatus* Kreis, 1932. A: Total view of holotype ♂ 1; B: Genital system of paratype ♀ 1 showing Demanian system – lateral view; C: Genital system of paratype ♀ 2 showing Demanian system – ventral view; D: Genital system of paratype ♀ 2 showing Demanian system – dorsal view; E: Genital system of paratype ♀ 2; F: Osmonium of paratype ♀ 2; G: Tail view of paratype ♀ 1 showing copulation pores; H, I: Tail view of paratype ♀ 2 showing copulation pores. d.ut: ductus uterinus; osm: osmosium; m.d: main duct; ut: uterus; ov: ovarium; sp.th: spermatheca; i.c.: interstitial channel; c.p.: copulation pores; i: intestine; T1: anterior testis; T2: posterior testis.

*Viscosia erasmi* sp.nov.

This species is named after Professor Theuns Erasmus of the University of Pretoria who was the first Head of the Department of Zoology at the University of Port Elizabeth.

**Description**

*Specimens measured*: 5 males and 4 females.

*Type specimens*: Holotype male ♂ 1 (slide no 983) and paratype ♀ 11 (slide no 984) in the Nematode Collection of the Instituut voor Dierkunde, Gent, Belgium. Other paratypes in the same collection.

*Type locality*: Sundays River Estuary (25° 52' E; 33° 43' S). Intertidal samples 1a/9, 6a/4, LWS. Sand and clay sediment. Salinity 35‰ (sand) and 21‰ (clay). Sampling date: February 9th, 1987.

*Other locality*: Sundays River Estuary. Intertidal samples 1a/2, 1a/9, 3b/2, 6b/8, LWS and HWS. Sand and clay sediment. Salinity ranging from 3‰ to 35‰. Sampling date February 9th, 1987.

*Measurements*:

Holotype	–	165	?	336	M	1785	
♂ 1		20	30	?	32	32	1905 μm

(slide no. 983)

a = 59.5; b = 5.7; c = 15.9; c' = 5.0; spic. 32 μm

Paratype	–	178	?	352	948	1869	
♀ 1		18	42	?	45	57	1985 μm

(slide no. 984)

a = 34.8; b = 5.6; c = 17.1; c' = 3.5; V = 47.8%

*Males*:

Long, slender appearance, tapering only slightly towards an anterior end.

Cuticle apparently smooth. Somatic setae very scarce.

The six lips are demarcated from the head; they

can be intruded (Fig. 3A). The six external labial papillae are not always found. The six external labial setae (5 μm) and the four cephalic setae (3 μm) in one circle.

Amphids with cup-shaped fovea, not always distinct, 12 μm wide, 57% of c.b.d., located 7 μm from anterior end. Aperture prominent.

Buccal cavity 23 μm long and 10 μm wide (range: 20–27 × 8–11 μm). The apical part of the buccal cavity has a bifid sclerotisation in longitudinal section; an inner plate almost closes the lumen of the buccal cavity (not clear in apical view) and is probably continuous with the cuticular lining of the six lips; the outer apical part of the buccal cavity is more sclerotised than the inner part and is continuous with the head cuticle.

The right ventrosublateral tooth is the largest, its apex is 2–4 μm from the anterior end of the buccal cavity. The dorsal tooth is situated at the same level as the left ventrosublateral tooth and is situated in the anterior half of the buccal cavity (apex of the two teeth at 7–9 μm from the front end). Only the larger tooth is hollow and a pharyngeal gland opens at its outer part.

Nerve ring at 50–57% of pharyngeal length. Ventral pore not found; bottom of ventral gland cell located at 47 μm from the base of the pharynx on left side of intestine.

Cardia 27 μm long.

Reproductive system with two opposed testes. Spicules straight, 27–35 μm. Gubernaculum absent.

Three preanal caudal glands, two to the right and one to the left of the intestine.

Tail conoid in the proximal part and cylindrical posteriorly, provided with many setae, especially in the ventral field, ranging from 2–5 μm in length. A ventral papilla is situated at 20 μm from the cloacal opening (Fig. 3, J). In lateral view (Fig. 3, H) an invagination is visible in that region.

*Females*:

Similar to males except in the following aspects: reproductive system with two antidromously reflexed ovaries, on right side of the intestine; eggs 105–129 × 36–48 μm.

Demanian system consisting only of an ovarial

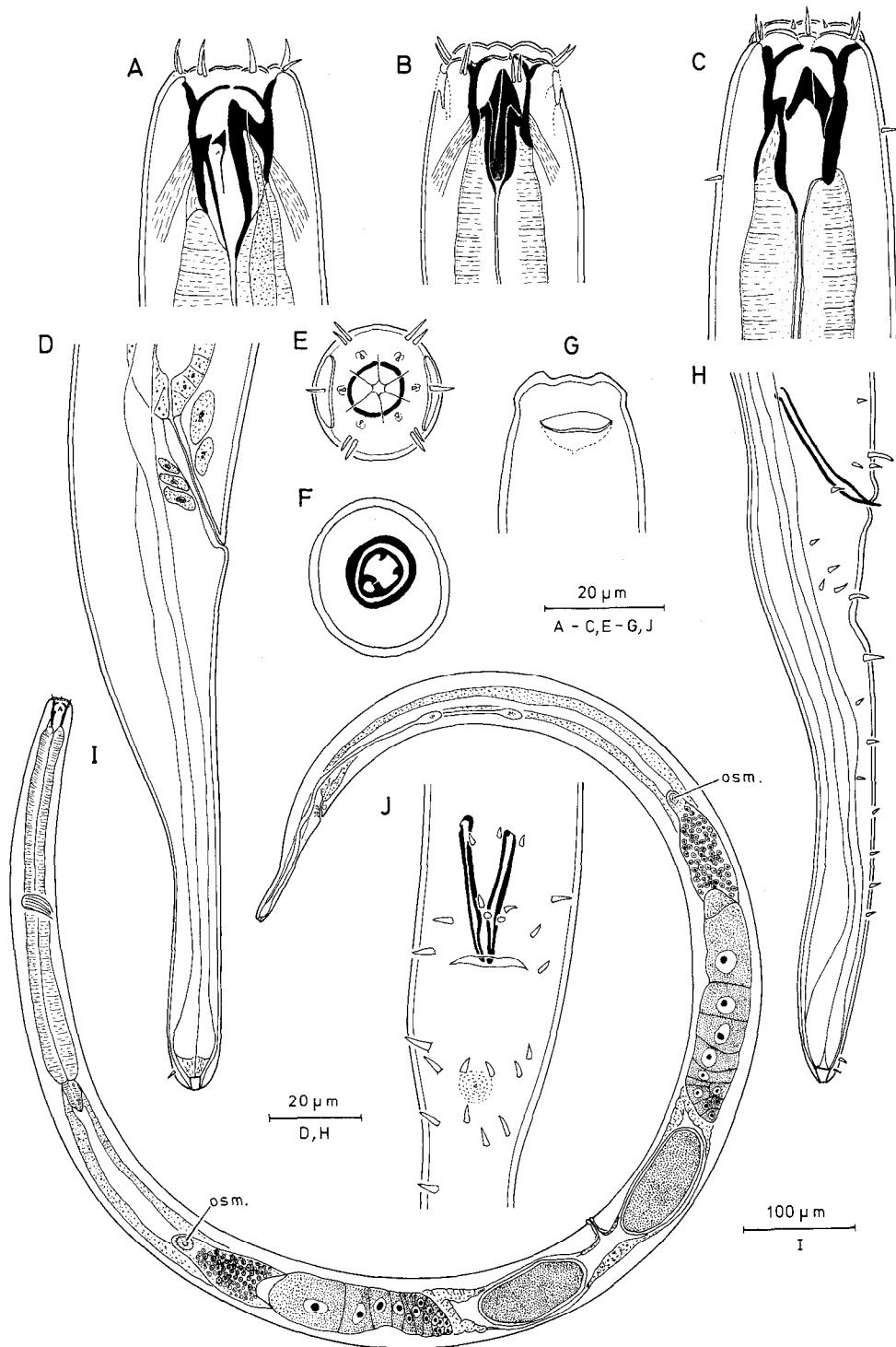


Fig. 3. *Viscosia erasmi* sp.nov. A: Anterior end of paratype ♀ 3; B: Anterior end, ventral view of holotype ♂ 1; C: Anterior end of paratype ♀ 1; D: Tail region of paratype ♀ 1; E: En face view of a paratype (level of amphideal fovea); F: En face view of a paratype (tooth level); G: Lateral view of amphideal fovea of paratype ♂ 2; H: Tail region of paratype ♂ 3; I: Total view of paratype ♀ 1; J: Spicules, ventral view of paratype ♂ 4; osm.: osmosium.

sac filled with sperm cells and an osmosium at the 'outer' ends of the genital system.

Ventral setae are lacking on the tail.

### Diagnosis

*Viscosia erasmi* sp.n. is characterized by the bifid apical part of the buccal cavity, three distinct teeth (with the right ventrosublateral tooth the largest, and the other teeth with the apex in the anterior part of the buccal cavity), setiform outer labial and cephalic sensilla, ventral setae on the males tail together with a postanal ventral gland.

### Discussion

A similar bifid apical part of the buccal cavity is only present in *Viscosia papillatula* (Chitwood, 1950). However, this species is characterized by a circumanal ala containing six pairs of papillae in the males, a much longer tail and papilliform head sensilla.

### Acknowledgements

We thank Prof. A. Coomans for discussions; Errie Heyns, Rita van Driessche, Wilfried

Decraemer and Johan Furstenberg (Jnr) for valuable assistance; Mrs. A. J. Gerber for typing the manuscript.

J. P. Furstenberg also thanks the Zoology Institute of the State University of Gent, Ledeganckstraat 35, Gent, Belgium for providing facilities and the University of Port Elizabeth, Port Elizabeth, South Africa for financial support.

### References

- Belogurov, O. I. & L. S. Belogurova, 1978. Systematics and evolution of Oncholaiminae (Nematoda). 3. System of Oncholaiminae. *Biol. Morya* 2: 22-31 (in Russian).
- Kreis, H., 1932. Freilebende marine Nematoden von den Sunda-Inseln II. Oncholaiminae. (Papers from Dr. Th. Mortensen's Pacific Expedition 1914-16 61). *Vidensk. Meddr dansk naturh. Foren.* 93: 23-69.
- Kreis, H., 1934. Oncholaiminae Filipjev 1916. Eine monographische Studie. *Capita zool.* 4(5): 1-271.
- Rachor, E., 1969. Das de Mansche Organ der Oncholaimidae, eine genito-intestinale Verbindung bei Nematoden. *Z. Morph. Ökol. Tiere* 66: 87-166.
- Vincx, M., J. Sharma & N. Smol, 1982. On the identity and Nomenclature of *Paracanthonus caecus* (Bastian, 1865), with a redefinition of the genus *Paracanthonus* Micoletzky (Nematoda, Cyatholaimidae). *Zoologica Scripta*, 11, 4, 243-263.