

THE DESCRIPTION
OF *MONHYSTRELLA PARELEGANTULA*
(DE CONINCK) (NEMATODA,
MONHYSTERIDAE), A FREE-LIVING
NEMATODE SPECIES NEW FOR
THE BELGIAN COASTAL FAUNA

by

G. VRANKEN, M. VINCX & L. K. THIELEMANS

ABSTRACT. — *Monhystrella parelegantula* (De Coninck, 1943) Andrassy, 1981, a new nematode record for the Belgian coastal area, has been isolated from two brackish water lagoons, the Dievengat near Knokke and the Sluice Dock of Ostend. This paper presents the first detailed morphological and morphometric data for the different stages of the life cycle, including the rare males. The systematic position and the ecological importance of the species are discussed.

INTRODUCTION

Monhystrella parelegantula (De Coninck, 1943) Andrassy, 1981, a newly recorded nematode species for the Belgian coastal area, has been recently studied in our laboratory with respect to its ecology and behaviour (VRANKEN *et al.*, 1981).

Earlier descriptions of this species have been given by DE CONINCK (1943), GERLACH (1951), MEYL (1954, 1955), PAETZOLD (1955, 1958), TIMM (1963) and HOPPER & MEYERS (1967).

Culture conditions and aspects of its life cycle are studied by HOPPER & MEYERS (1966), VON THUN (1968) and recently by VRANKEN *et al.* (1981). Females described in this paper are from cultured populations, males on the contrary were sampled directly from the field. The cultures provided us with large amounts of individuals, enabling us to make a morphological study of the juvenile stages. This paper gives the first detailed drawings of the males.

MATERIAL AND METHODS

Bottom samples were taken from the Sluice Dock in Ostend, a polyhaline-marine pond and from the Dievangat, a polyhaline-brackish water pond near Knokke. The sediment from the Sluice Dock consists mainly of fine sand (median grain size of the sand fraction : 0.122 mm, 85 % sand, 13 % silt and 2 % gravel, mainly shell fragments) ; the sediment of the Dievangat is a well sorted fine sand (medium grain size : 0.233 mm) covered by large amounts of detritus from reed beds (*Phragmites communis*).

Extraction from the sediment, maintenance and cultivation methods of the species are given by VRANKEN *et al.* (1981) and GERAERT *et al.* (1981). *M. parelegantula* is cultivated in a solid (0.8 %) bacto-agar layer (made with water from the habitat) with salinity of 30‰ for the Sluice Dock and 20‰ for the Dievangat, containing 1 % Vlasblom medium and 0.5-1.0 % silica (15 g/l). Unidentified bacteria served as food supply. The Vlasblom enrichment has the following composition : FeSO₄ · 7H₂O : 0.278 g ; NaH₂PO₄ · 2H₂O : 3.000 g ; NaNO₃ : 30 g ; MnCl₂ · 4H₂O : 0.47 g ; glycine : 50 g ; distilled water : 1 l.

The nutritional constitution of the Vlasblom medium is listed here again, because previous papers by VRANKEN *et al.* (1981) and GERAERT *et al.* (1981) contain some printing errors. Nevertheless the previously published medium can also be used for cultivation, giving analogous results.

The material is deposited in the collection of the Instituut voor Dierkunde, Rijksuniversiteit, Gent, Belgium, on slides N° 288 (♀ 1) and N° 289 (♂ 1). All measurements (except the ratios) are in micrometers. Values in the formula indicate :

level of						
cephalic	nerve ring	pharynx	vulva	anus		
setae			M	cloaca		
						total length
corresponding body diameter						

RESULTS

Material examined : 74 females, 5 males and 8 juveniles.

Measurements (in micrometers) :

♀ 1	$\frac{- 49 \ 79 \ 222 \ 295}{5 \ 11 \ 13 \ 19 \ 9}$	491	a = 22.1	b = 5.3	c = 3.4	V = 53
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$$\sigma 1 \quad \frac{-41 \ 66 \ M \ 274}{5 \ 12 \ 13 \ 15 \ 11} \quad 356 \quad a=29.6 \quad b=5.0 \quad c=4.1$$

Following table gives mean values \pm standard deviation (minimum-maximum value) :

	Total length	a	b	c	V or spic.l.
females (n = 74)	413 \pm 17 (375 - 455)	26.0 \pm 4.0 (16.6 - 36.5)	5.6 \pm 0.3 (5.1 - 6.3)	3.3 \pm 0.2 (3.1 - 3.6)	48.7 \pm 2.1 (43.0 - 55.0)
males (n = 5)	315 \pm 20 (330 - 381)	29.6 \pm 3.9 (25.4 - 36.0)	5.0 \pm 0.2 (4.9 - 5.3)	4.3 \pm 0.5 (3.3 - 4.6)	37 \pm 3 (34-42)
juvenile 1	152 154 156	22.4 26.5 32.2	3.1 3.1 3.2	3.3 3.3 3.7	
juvenile 2	175 177	22.5 30.0	3.3 3.4	3.3 3.5	
juvenile 3	274	33.7	4.3	3.3	
juvenile 4	317 334	32.8 30.7	4.4 5.1	3.1 3.5	

Description (Figure 1, A-E ; Figure 2, A-H) :

Female : very small slender species ; dark appearance due to dense particles in the intestinal cells ; pseudocoelomocytes (?) clearly visible and very numerous. No cuticular striation noticed. Anterior end rounded and not off set. Six internal labial sensillae papilliform ; six external labial sensillae (1 μ m) and four cephalic sensillae (1 μ m) setiform and in one circle. Cephalic body diameter at the level of the setae 5 μ m. Buccal cavity small and cyathiform, without denticles. Amphidial fovea circular (2 μ m \varnothing) with thick wall, anterior margin situated at 13 μ m (2.3 head \varnothing) from the anterior end. Ventral gland and pore not seen. Nerve ring 49 μ m from the anterior end or at 62% of the pharyngeal length. One ventral somatic seta observed posterior to the amphids, and anterior to the base of the pharynx. Pharynx cylindrical with faint terminal swelling. First intestinal cells off set (10 μ m), described as a progaster (STEINER, 1958 ; CHITWOOD & MURPHY, 1964 ; HOPPER & MEYERS, 1967).

Genital apparatus prodelfhic, monodelphic with outstretched ovary situated at the right side of the intestine. Vulva at 53% of the total body length ; immature oocytes are arranged in two rows, maturing oocytes are

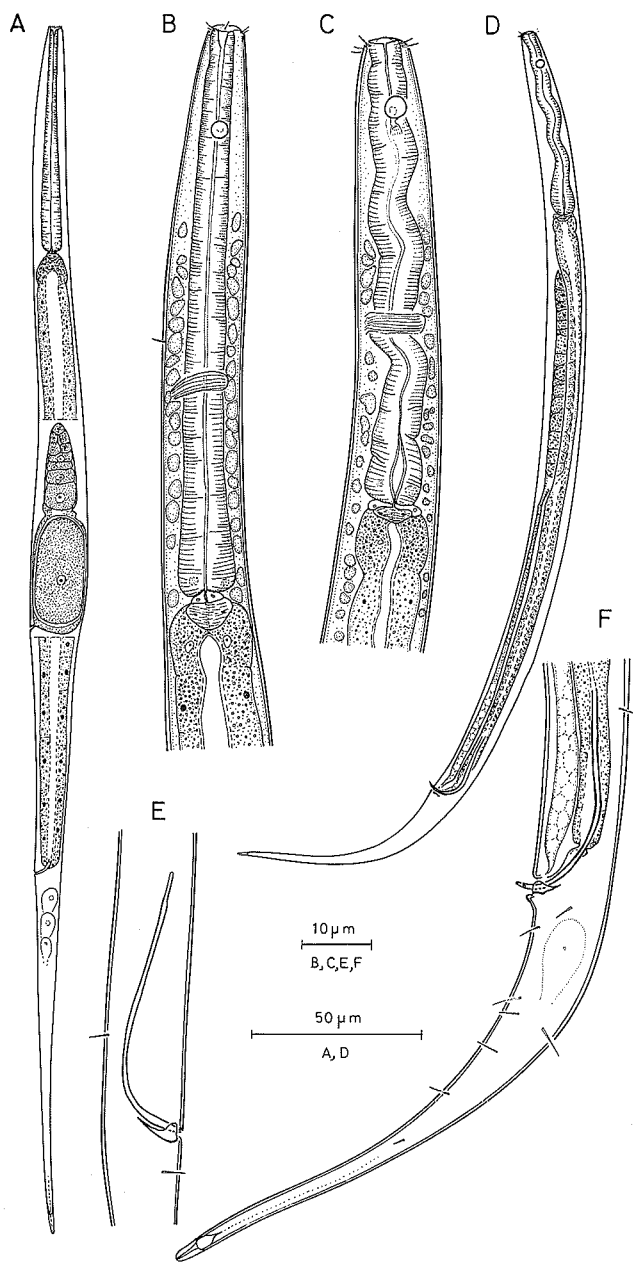


FIG. 1. — *Monhystrella parelegantula*.

A : total view ♀ (intestine omitted in the region of the genital apparatus) ; B : anterior end ♀ ; C : anterior end ♂ ; D : total view ♂ ; E : spiculum ; F : tail ♂ .

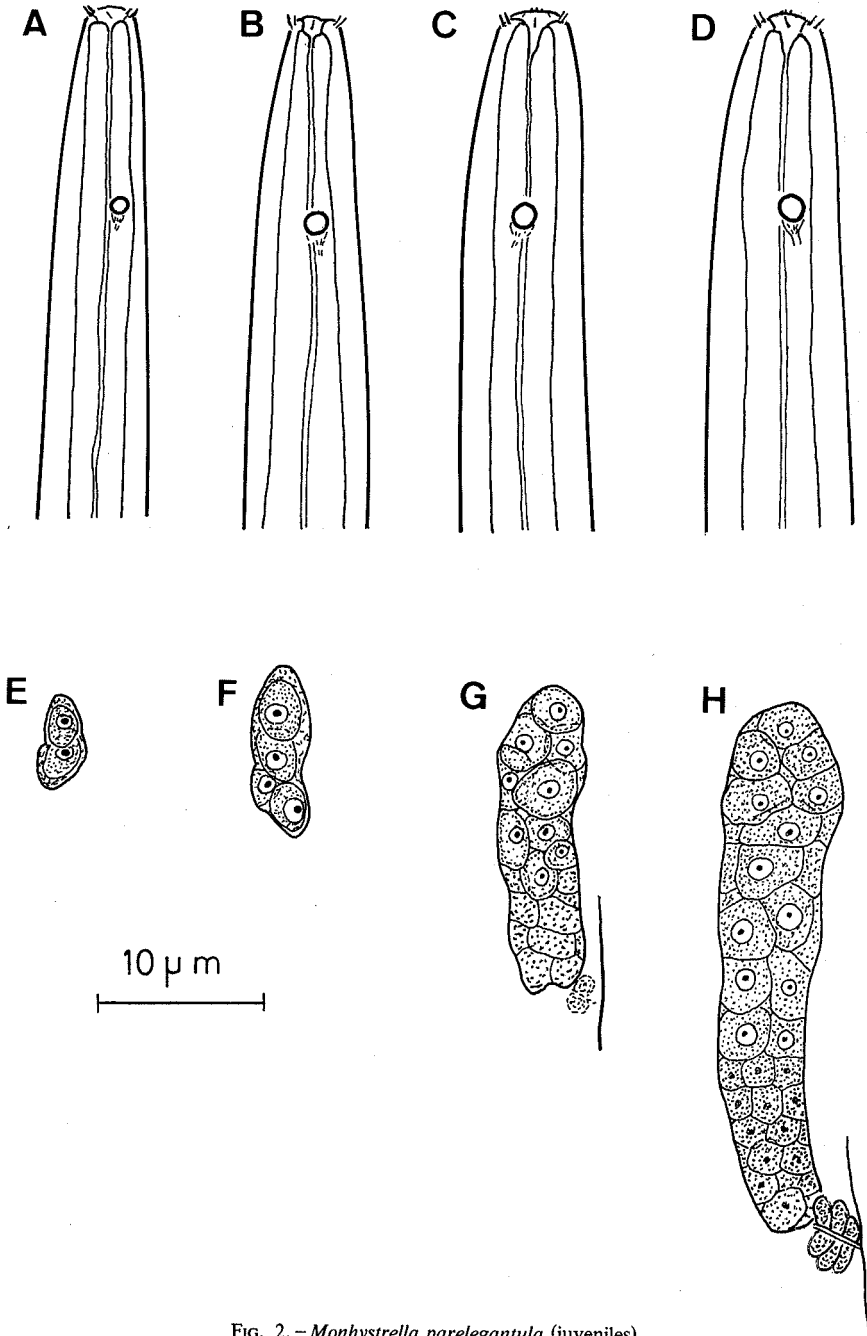


FIG. 2. — *Monhystrella parelegantula* (juveniles).
 A-D : Head ends ; A : Juv 1 ; B : Juv 2 ; C : Juv 3 ; D : Juv 4.
 E-H : genital primordia ; E : Juv 1 ; F : Juv 2 ; G : Juv 3 ; H : Juv 4.

arranged in a single row and pass into the uterus where only a single shelled egg (23 μm by 13 μm) is present at a time.

Long slender tail (126 μm ; $c' = 14$) ending in a terminal tube-like spinneret (6 μm). Three caudal glands with cell bodies situated in the anterior fourth of the tail. A postanal seta is present about 7 μm posterior to the anus and two other setae are usually observed on the tail in variable positions, occasionally they may be absent.

Male: similar to the female except for the following: smaller body length. Somatic setae more numerous especially on the tail. Amphidial fovea (3 μm \varnothing) larger than in the females, at 10 μm ($2 \times$ head diameter) from the anterior end. Nerve ring at 41 μm from anterior end (62% of the pharyngeal length). Monorchic with outstretched anterior testis at the right side of the intestine. Spicula 37 μm long (along the arc), proximal region very slightly cuticularized, straight and parallel to the lumen of the intestine, distal region uniformly curved; very small tooth-like differentiation on the lateral side of the distal end of the spicule. Gubernaculum 5 μm long, parallel to the spicula (other males: gubernaculum between 5-9 μm long).

Tail 87 μm ($c' = 8$), shorter than the female tail and gradually tapering to a shorter tubiform spinneret (4 μm). Nine setae (3 μm) present on the tail.

Juveniles: the general body shape of the juveniles is similar to that of the adults. Only female juveniles are considered as parthenogeny is the common reproductive strategy. The distance of the amphidial fovea to the anterior end is approximately the same in the four juvenile stages (10-12 μm , Figs. 2 A-D). The progaster is always very distinct. The tubiform spinneret varies between 3-4 μm in length.

The study of the genital primordia, in order to recognize the different juvenile stages, is not easy in view of the small size of the animals. Juvenile 1 has two germinal cells and probably two somatic ones; juvenile 2 has four germinal cells and four somatic ones; juvenile 3 has ten germinal cells and ten somatic ones + two cells which are at the position of the future vagina; juvenile 4 has 20 (?) geminal cells and 18 (?) somatic ones + six cells around a slit-like vagina (Figs. 2 E-H).

DISCUSSION

This paper gives a detailed description of males, females and juveniles of *Monhystrella parelegantula*. The reproductive system of this species has

never been illustrated before. We therefore found it useful to examine these morphological structures.

Only De Coninck (1943) mentioned a single post-anal seta, other descriptions do not report somatic setae. We want to draw attention to the presence of setae in the cephalic region and on the tail of the males. A variable number of setae are present in the pharyngeal region and three setae instead of one on the tail of the female. Several setae (maximum nine) are noticed on the tail of the males.

Our female specimens are very close to the ones described by DE CONINCK (1943), PAETZOLD (1955), TIMM (1963) and HOPPER & MEYERS (1967). Nevertheless, De Coninck's original description (holotype not available at the present time) and Timm's paper do not mention the tubiform spinneret and the prominent progaster, but other features (total length, buccal cavity, position of the amphidial fovea, structure of the pharynx, position of the vulva, length and shape of the tail) are in good agreement with our animals. PAETZOLD (1955) does not report these structures either, but in a figure (Fig. 10b, PAETZOLD, 1958) he illustrates a tubiform spinneret for the males. The description given by HOPPER & MEYERS (1967) fits very well with our animals. The spicula (36 μm) are longer than those measured by Timm (1963) and PAETZOLD (1958), respectively 17 μm and 10.7 μm . This difference can be attributed to the very weak cuticularization of the proximal end and to their parallel, sometimes even superimposed position to the lumen of the intestine. We have also overlooked their total length at first. PAETZOLD (1958) does not mention a gubernaculum.

Recently ANDRÁSSY (1981) revised the system of the "non-marine" Monhysterida. In our opinion, systematics should not be delimited on the basis of geographic or ecological occurrence. A review of a genus should consider all the species of that genus and not only those of "soil and inland waters" as Andrassy worked out. Therefore in Andrassy's (1981) paper, comprising several brackish water inhabitants, comparison with marine forms was desirable. On the other hand, ANDRÁSSY (1981) gives a clear diagnosis of the genus *Monhystrella*, in which he places 14 valid species including *M. parelegantula* (DE CONINCK, 1943), but regrettably without referring to the previous synonymisation by GERLACH & RIEMANN (1973). They have synonymized "*Monhystera filiformis* sensu Gerlach (1951) and *Monhystera filiformis* subsp. *salina* Meyl, 1954 with *Monhystera parelegantula* De Coninck, 1943" probably because of the following common characteristics: slender and small appearance, long filiform tail, same position of the amphids, same position of the vulva,

parthenogenetic mode of reproduction (males are rarely found), identical shape of the spicula.

The original *Eumonhystera filiformis* (BASTIAN, 1865) Andrassy, 1981 sensu De Coninck, 1935 differs from *M. parelegantula* by the much longer spinneret (12 μm) (DE CONINCK, 1935 ; Fig. 43). But as already noticed by JOUBERT & HEYNS (1980), there is some confusion and uncertainty about the identity of *Eumonhystera filiformis* (BASTIAN, 1865). BASTIAN (1865) mentioned a long filiform tail, while DE MAN (1880) described the same species with a completely different elongate-conoid tail. After DE MAN (1880) most authors "prefer" the elongate-conoid tail for *Eumonhystera filiformis* in contrast with the first description.

Monhystrella iranica Schiemer, 1965, a closely related species differs from *Monhystrella parelegantula* by the more forward position of the amphid (see ANDRÁSSY, 1981).

Monhystrella parelegantula differs from the other twelve *Monhystrella* species by the following features :smooth cuticle, ten cephalic setae, amphids 2-3 head diameters from anterior end (this is the first reason why the position of *M. parelegantula* in Andrassy's key is incorrect), no tooth at the base of the mouth cavity, pharynx without obvious bulb, distinct cardia and progaster, long spicula with parallel positioned gubernaculum, elongated tail ($c' = 14$ (♀ ♀) ; $c' = 8$ (♂ ♂)), posterior uterine-sack absent, obvious somatic setae on the tail. Furthermore, *M. parelegantula* can not be classified as a continental species (second reason for incorrect position), due to its occurrence in the Black Sea, Red Sea, Arabian sea, Bay of Florida (GERLACH & RIEMANN, 1973) and estuary of the Scheldt (personal observation).

ECOLOGICAL NOTES

Distribution and importance : *M. parelegantula* has been collected from widely scattered places (see GERLACH & RIEMANN, 1973). MEYL (1954) and PAETZOLD (1955, 1958) investigating brackish water lagoons from the German inland and using Baermann's funnel for collecting the nematodes, considered *M. parelegantula* as a typical brackish water species with a wide salinity tolerance. The species occurs in a range from 4.2‰ to 36.2‰ salinity. The species is also one of the dominant species (up to 60%) in the habitats they have investigated.

Due to its small size (gravid females have a maximum width of 20 μm and an average juvenile only 9 μm), *M. parelegantula* could have been overlooked in faunal surveys, the more because the smallest mesh size of

the sieves used by most meiobenthologists is 38 μm . For this reason and because *M. parelegantula* is always one of the first species to appear in the agar-plates containing detritus spots, it is quite reasonable to suppose that *M. parelegantula* occurs in much higher densities than is assumed up till now. Presumably this species can be ecologically important as a prey organism for predators such as large predatory nematodes. Paetzold (1955) already mentioned *M. parelegantula* as one of the prey organisms eaten by the large predatory nematode *Oncholaimus oxyuris* (DITLEVSEN 1911). The hypothesis, that *M. parelegantula* is a potential food organism in the Dievengat and in the Sluice Dock, can be supported by the occurrence of *Oncholaimus oxyuris* in the Dievengat and by the closely related *Metoncholaimus pristiurus* (ZUR STRASSEN, 1894) in the Sluice Dock.

Reproduction : under culture conditions *M. parelegantula* has a parthenogenetic mode of reproduction. During a culture-period of more than twenty successive generations, only one male has been found. Eight other males were collected directly from the Sluice Dock during winter. At deposition (which happens very quickly – a few seconds) the eggs are squeezed, afterwards the eggs change shape and become spherical-ovoid (29 by 26 μm). They are deposited one at a time, in the single cell stage. At 25°C and 30‰ salinity, development until adulthood take somewhat more than one week (VRANKEN *et al.*, 1981).

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REFERENCES

- ANDRASSY, I. (1981). Revision of the order Monhysterida (Nematoda) Inhabiting Soil and Inland Waters. *Opusc. Zool. Budapest* XVII-XVIII, 13-47.
- BASTIAN, H. C. (1865). Monograph on the Anguillulidae, or free Nematoids, marine, land, and freshwater ; with descriptions of 100 new species. *Trans. Lin. Society London* 25 : 73-184.

- CHITWOOD, B. G. & D. G. MURPHY (1964). Observations on two marine Monhysterids – their classification, cultivation, and behaviour. *Trans. Am. microsc. Soc.* **83** : 311-329.
- DE CONINCK, L. A. (1935). Contribution à la connaissance de Nématodes libres du Congo Belge. I. Les Nématodes libres des marais de la Nyamuamba (Ruwenzori) et des sources chaudes du Mont Banze (Lac Kivu). *Revue zool. Bot. Afr.* **26** : 211-232 and 249-326.
- DE CONINCK, L. A. (1943). Sur quelques espèces nouvelles de nématodes libres des eaux et des terres saumâtres de l'Islande. *Biol. Jb. Dodonaea* **10** : 193-220.
- DITLEVSEN, H. (1911). Danish freeliving nematodes. *Vidensk. Meddr dansk naturh. Foren.* **63** : 213-256.
- GERAERT, E., REUSE, C., VAN BRUSSEL, D. & G. VRANKEN (1981). The female reproductive system in *Monhystera* (Nematoda : Monhysterida). *Biol. Jb. Dodonaea* **49** : 148-154.
- GERLACH, S. A. (1951). Freilebende Nematoden aus Varna an der bulgarischen Küste des Schwarzen Meeres. *Arch. f. Hydrob.* **45** : 193-212.
- GERLACH, S. A. & F. RIEMANN (1973). The Bremerhaven checklist of aquatic nematodes. *Veröff. Inst. Meeresforsch. Bremerh.* **4** (Suppl.) : 1-404.
- HOPPER, B. E. & S. P. MEYERS (1966). Aspects of the life cycle of marine nematodes. *Helgoländer wiss. Meeresunters.* **13** : 444-449.
- HOPPER, B. E. & S. P. MEYERS (1967). Follicolous marine nematodes on turtle grass, *Thalassia testudinum* König, in Biscayne Bay, Florida. *Bulletin of Mar. Sci.* **17** : 471-517.
- JOUBERT, A. P. & J. HEYNS (1980). Freshwater nematodes from South Africa. 4. The genus *Monhystera*, Bastian, 1865. *S. Afr. Tydskr. Dierk./S. Afr. J. Zool.* **15** (3) : 190-197.
- MAN DE, J. G. (1880). Die einheimischen frei in der reinen Erde und im süßen Wasser lebenden Nematoden. *Tijdschr. Nederl. Dierk. Ver.* **5** : 1-104.
- MEYL, A. H. (1954). Die Fadenwürmer (Nematoda) einiger Salzstellen südöstlich von Braunschweig. *Abh. Braunschw. Wiss. Ges.* **VI** : 84-106.
- MEYL, A. H. (1955). Freilebende Nematoden aus binnenländischen Salzbiotopen zwischen Braunschweig und Magdeburg. *Arch. f. Hydrobiol.* **50** : 508-614.
- PAETZOLD, D. (1955). Untersuchungen an freilebenden Nematoden der Salzwiese bei Aseleben. *Wiss. Z. Univ. Halle. Math.-Nat.* **4** (5) : 1057-1090.
- PAETZOLD, D. (1958). Beiträge zur Nematodenfauna mitteldeutscher Salzstellen im Raum von Halle. *Wiss. Z. Halle, Math.-Nat.* **8** (1) : 17-48.
- SCHIEMER, F. (1965). Über einige Funde der Gattung *Monhystrella* (Nematoda, Monhysterinae) in binnenländischen athallassohalinen Salzgewässern. *Wiss. Arb. Bgld.* **34** : 59-66.
- STEINER, G. (1958). *Monhystera cameroni* n.sp. – a nematode commensal of various crustaceans of the Magdalen Islands and Bay of Chaleur (Gulf of St. Lawrence). *Can. J. Zool.* **36** : 269-278.

- THUN, W. VON (1968). Autökologische Untersuchungen an freilebenden Nematoden des Brackwassers, Ph. D. Thesis, University of Kiel.
- TIMM, R. W. (1963). Marine nematodes of the suborder Monhysterina from the arabian Sea at Karachi. *Proc. Helminth. Soc. Wash.* **30** (1) : 34-39.
- VRANKEN, G., L. K. THIELEMANS, C. HEIP & M. VANDYCKE (1981). Aspects of the life-cycle of *Monhystera parelegantula* (Nematoda : Monhysteridae). *Mar. Ecol. Progr. Ser.* **6** : 67-72.
- ZUR STRASSEN, O. L. (1894). Über das röhrenförmige Organ von *Oncholaimus*. *Z. wiss. Zool.* **58** : 460-474.

Rijksuniversiteit Gent,
Laboratorium voor Morfologie en Systematiek der Dieren,
(Dir. Prof. Dr. A. Coomans),
K. L. Ledeganckstraat 35,
B-9000 Gent.