

THE GENERA *PARATYLENCHUS* MICOLETZKY, 1922 AND *GRACILACUS* RASKI, 1962 IN ROMANIA (NEMATODA: TYLENCHULIDAE)

M. Ciobanu¹, E. Geraert² and I. Popovici¹

¹ Institute of Biological Research, Department of Taxonomy and Ecology, 48 Republicii Street, 3400 Cluj-Napoca, Romania

² Vakgroep Biologie, Ledeganckstraat 35, 9000 Gent, Belgium

Summary. Data on the occurrence and distribution of five species of *Paratylenchus*: *P. curvittatus*, *P. microdorus*, *P. neoamblycephalus*, *P. nanus*, *P. projectus*, and two species of *Gracilacus*: *G. acicula* and *G. straeleni* are given. Specimens of *P. nanus*, *P. microdorus*, *P. projectus* and *G. straeleni* collected from various habitats located in the Romanian Carpathians are studied by light microscopy. Brief descriptions, measurements, illustrations and data referring to the ecological conditions are provided.

Some species of *Paratylenchus* and *Gracilacus acicula* have already been reported from Romania. They are: *P. curvittatus* van der Linde, 1938 reported by Popovici (1974) from three locations (two grasslands and one arable field close to Cluj-Napoca town); *P. microdorus* Andrassy, 1959, collected by Popovici and Ciobanu (1997) and Popovici (1998) from grasslands located in the Vlădeasa Mass (Apuseni Mts.), Retezat Mts., Parâng Mts. (Southern Carpathians) and Ciucaş Mts. (Eastern Carpathians); *P. neoamblycephalus* Geraert, 1965 reported from timberline spruce forests, sub-alpine scrubs and grasslands located in the Retezat Mts. (Popovici, 1993); and *G. acicula* Brown, 1959 (Raski, 1962) collected from grasslands and arable field near Cluj-Napoca (Popovici, 1974) and more recently, from grasslands located in the Retezat Mts., Mehedinţi Mts. and Cernei Mts. (Popovici, 1998).

More morphometrics, illustrations and data referring to their habitat are provided for four species of *Paratylenchus*: *P. nanus* Cobb, 1923, *P. microdorus*, *P. projectus* Jenkins, 1956 and *Gracilacus straeleni* (De Coninck, 1931) Raski, 1976 collected during a nematological survey in the Romanian Carpathians and deposited in the nematode collection at the Institute of Biological Research, contributing to an inventory of the species belonging to these genera in Romania.

Data on the presence and distribution of seven species are included in the Romanian nematode database.

MATERIALS AND METHODS

Soil samples were collected between 1986 and 1999 by the third and first author. Six sites located in grasslands, deciduous and mixed forests from the Romanian Carpathians and one technogenic soil were investigated (Table I). Nematodes were extracted using the centrifugal method of de Grisse (1969), killed and preserved in a 4% formaldehyde solution heated at 65 °C, mounted in anhydrous glycerin (Seinhorst, 1959) and examined by light microscopy.

The following papers were used for the identification, taxonomy and comments of species: Raski (1975a, b; 1976) and Brzeski (1998).

All measurements in the tables are in µm; average values and range were calculated for each measurement.

The plant association classification used was that of Coldea (1991). Soil types were classified according to the Romanian System of Soil Classification (1980).

Table I. Site locations, vegetation and soil types of a nematological survey in Romania.

Site no.	Locality	Altitude (m)	Geographical position	Plant association	Soil type
1	Făgăraş Mts. ¹	740	45°43'N-24°23'E	<i>Carpino-Fagetum</i>	Brown acid
2	Făgăraş Mts.	900	45°44'N-24°41'E	<i>Pulmonario rubrae-Fagetum</i>	Brown acid
3	Harghita Mts.	1650	46°35'N-24°23'E	<i>Festuco rubrae-Agrostetum</i>	Brown acid
4	Maramureş Mts.	490	47°41'N-23°36'E	<i>Symphyto cordati-Fagetum</i>	Brown acid
5	Parâng Mts.	1850	45°21'N-23°33'E	<i>Violo declinatae-Nardetum</i>	Alpine meadow
6	Rodnei Mts.	525	47°25'N-24°46'E	-	Technogenic soil ²
7	Trascău Mts.	400	46°30'N-23°41'E	<i>Melico-Phleetum montani</i>	Lithic rendzina

¹ Mts.-Mountains; ² soil from mining spoil containing Pb and Zn impurities under bioremediation.

DESCRIPTIONS

PARATYLENCHUS NANUS Cobb, 1923

(Table II; Fig. 1 A-C)

Female body ventrally bent, cuticular annulation distinct; lateral field with four lines; head continuous, labial plate not protruding; stylet 28-30 μm long. Spermatheca ovoid, filled with sperms, but in one female was found empty; advulval flaps distinct, rounded. Tail end variable, mostly pointed, distinctly annulated on tip.

Male without stylet and with degenerated oesophageal region, spicule 20 μm .

Distribution: deciduous and mixed forests located on Jibra and Bâlea Valleys (Southern Carpathians), sites no. 1 and 2 (Table I).

Remarks: *Paratylenchus nanus* is closely related to *P. bukowinensis* Micoletzki, 1922 from which it differs according to Brzeski (1998) by: 1) tail tip pointed and annulation near tail tip distinct in *P. nanus* vs. tail tip rounded, annulation indistinct in *P. bukowinensis* (Fig. 1 D); 2) male stylet very weak, 12-18 μm in length in *P. bukowinensis* vs. male without stylet in *P. nanus*.

Brzeski (1998) reported *P. nanus* as a common species in meadow soils, and the rhizosphere of cereals. We found this species in forests on acid brown soils located at altitudes above 700 m *s.l.*. Our finding suggests that this species is not restricted to lowland habitats and grass vegetation. This is the first record of *P. nanus* in Romania.

PARATYLENCHUS MICRODORUS Andr ssy, 1959

(Table II; Fig. 1 E-F)

Female body ventrally bent; cuticular annulation distinct; lateral field with four lines; head continuous, anteriorly flat, lips amalgamated, not protruding; stylet 15-16 μm long. Spermatheca ovoid-rounded, empty; advulval flaps distinct, rounded. Tail slowly tapering to pointed or minutely rounded annulated tip.

Male not found.

Distribution: alpine meadow near C lcescu Lake (Southern Carpathians), site no. 5 and grassland located in the Tureni Gorges (Apuseni Mts.), site no. 7 (Table I). Following the reports by Popovici and Ciobanu (1997) and Popovici (1998) this record extends the information on the geographical distribution of *P. microdorus* in Romania.

Remarks: Brzeski (1998) reported *P. microdorus* as a common species in meadows, sometimes also found in the rhizosphere of *Zea mays*. He suggested that Gramineae are probably the main host. Our data also indicate that this species prefers Gramineae vegetation.

PARATYLENCHUS PROJECTUS Jenkins, 1956

(Table III; Fig. 2 A-B)

Female body ventrally bent; cuticular annulation distinct; lateral field with four lines; head conical, truncate, labial plate not protruding. Stylet 27-30 μm long. Spermatheca empty; advulval flaps distinct. Tail conoid with rounded terminus; annulation on tail tip not distinct.

Male not found.

Distribution: spoil dumped from mine under bioremediation at Rodna Veche, site no. 6 and grassland located at Harghita-M d raş, site no. 3 (both sites located in the Eastern Carpathians) (Table I).

Remarks: Brzeski (1998) and Raski (1975a) reported *P. projectus* as a common species in various soil types, in the rhizosphere of different plant species belonging to various families. This species seems to be an opportunist colonizer and dominates the nematode community in the mine spoil dump at Rodna Veche (Paşca *et al.*, 1997). The habitat is characterized by low nutrient resources and by high content of Pb and Zn impurities. These data suggest that *P. projectus* has no preference for natural or polluted habitats.

This is the first record of *P. projectus* in Romania.

Table II. Measurements of *Paratylenchus nanus* and *P. microdorus*.

Species:	<i>P. nanus</i>		<i>P. microdorus</i>	
	F�g�raş Mts. ¹	F�g�raş Mts. ²	Par�ng Mts.	Trasc�u Mts.
N	♀	4 ♀♀	3 ♀♀	♀
L	289	309.8(289-329)	261.0(230-280)	344
A	20.6	23.1(20.6-25.8)	20.6(19.2-21.5)	22.9
B	3.8	3.6(3.5-3.8)	3.4(3.2-3.5)	4.2
C	14.5	14.7(13.1-16.4)	13.3(12.8-13.7)	12.7
V%	82.0	81.5(80.2-82.4)	84.2(83.5-84.6)	83.4
Conus	20.0	19.5(19.0-21.0)	10.2(9.0-11.5)	10.0
Shaft	10.0	9.0(8.0-10.0)	5.2(4.5-6.0)	5.0
Conus/shaft%	66.7	68.4(65.5-72.4)	66.2(60.0-71.9)	66.7
Oesophagus	76.0	85.0(82.0-89.0)	76.7(73.0-80.0)	81.0
Excretory pore	61.0	74.0(71.0-78.0)	65.3(60.0-73.0)	69.0
Head - vulva	237.0	252.3(235.0-264.0)	220.0(192.0-237.0)	287.0
Tail	20.0	21.3(19.0-25.0)	19.7(18.0-21.0)	27.0
Body width	14.0	13.5(12.0-15.0)	12.7(12.0-13.0)	15.0

¹ site no. 1; ² site no. 2.

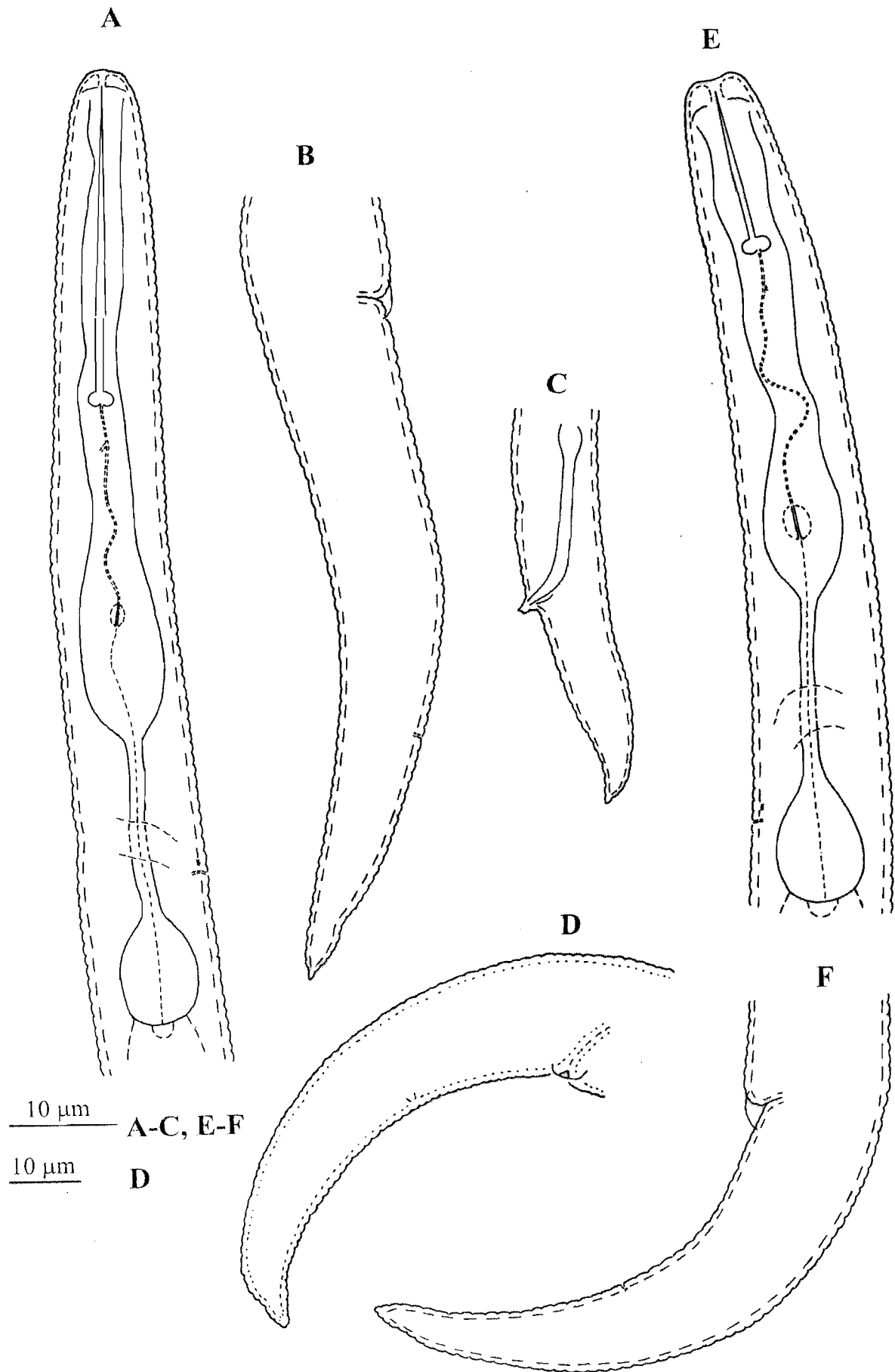


Fig. 1. *Paratylenchus nanus*: A, anterior part of female; B, posterior part of female; C, posterior part of male. *P. bukowinensis*: D, posterior part of female (after Brzeski, 1998). *P. microdorus*: E, anterior part of female; F, posterior part of female.

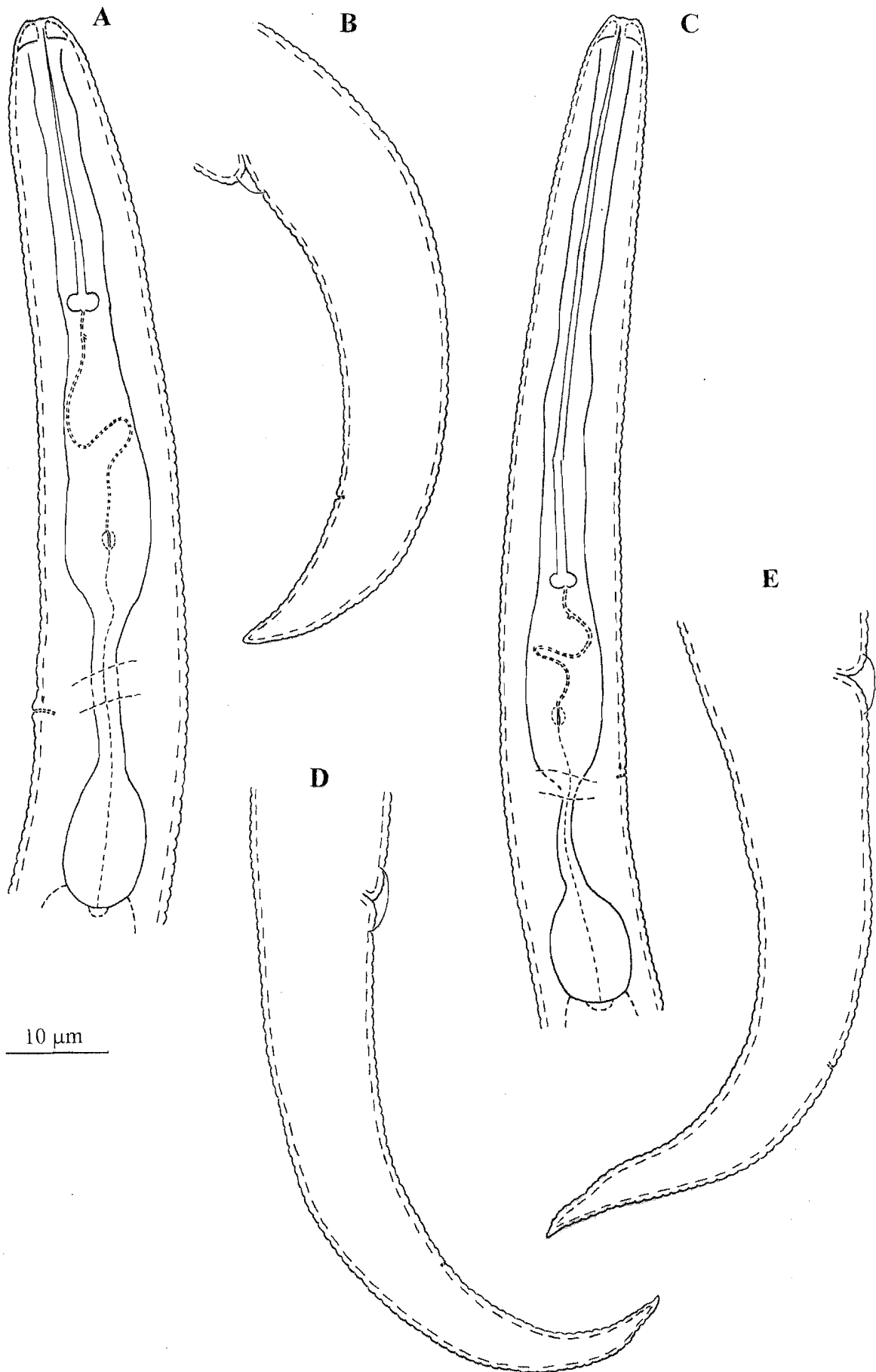


Fig. 2. *P. projectus*: A, anterior part of female; B, posterior part of female. *Gracilacus straeleni*: C, anterior part of female; D-E, posterior part of females.

GRACILACUS STRAELENI (De Coninck, 1931)**Raski, 1976**

(Table III; Fig. 2 C-E)

Female body ventrally bent; cuticular annulation distinct; lateral field with four lines; head conical; labial plate not protruding. Stylet mostly arcuate, 55-58 μm long. Spermatheca ovoid-rounded, filled with sperm; advulval flaps distinct. Tail conoid with pointed tip, annulation on tail tip not distinct.

Male not found.

Distribution: deciduous forests located on Jibra Valley (Southern Carpathians), site no. 1 and Ferneziu (Eastern Carpathians), site no. 4 (Table I).

Remarks: our data confirm the occurrence of *G. straeleni* mainly in wet forest soils as shown by Brzeski (1998) and Raski (1976).

This is the first record of *G. straeleni* in Romania.

Table III. Measurements of *Paratylenchus projectus* and *Gracilacus straeleni*.

Species:	<i>P. projectus</i>		<i>G. straeleni</i>	
	Rodnei Mts.	Harghita Mts.	Făgăraş Mts.	Maramureş Mts.
N	5 ♀♀	♀	4 ♀♀	2 ♀♀
L	338.0(312-365)	383	340.5(324-373)	397.0(391-403)
A	22.5(19.2-24.8)	22.5	23.3(20.7-24.9)	23.4(23.0-23.7)
B	3.8(3.4-4.2)	4.1	3.3(3.1-3.6)	3.5(3.4-3.5)
C	13.7(13.4-14.1)	14.7	13.1(12.0-14.7)	12.0(11.9-12.2)
V%	84.4(84.0-85.0)	83.3	81.7(80.2-82.7)	81.9(80.4-83.4)
Conus	19.0(18.0-20.0)	20.0	43.5(41.0-45.0)	42.5(42.0-43.0)
Shaft	9.8(9.0-11.0)	6.0	13.0(12.0-14.0)	14.5(14.0-15.0)
Conus/shaft%	66.0(63.3-67.9)	76.9	77.0(74.5-78.6)	74.6(74.1-75.0)
Oesophagus	88.6(85.0-93.0)	93.0	103.5(101.0-105.0)	114.0(114.0-114.0)
Excretory pore	76.0(67.0-81.0)	78.0	77.5(75.0-80.0)	91.5(91.0-92.0)
Head - vulva	285.2(262.0-307.0)	319.0	278.3(260.0-305.0)	325.0(324.0-326.0)
Tail	24.6(23.0-27.0)	26.0	26.3(22.0-31.0)	33.0(32.0-34.0)
Body width	15.2(13.0-19.0)	17.0	14.8(13.0-18.0)	17.0(17.0-17.0)

ACKNOWLEDGEMENT

We thank Mrs. N. Smol for the constant and prompt help provided during the study. This work would not have been possible without the financial support generously offered to the first author by the University of Gent, which is gratefully acknowledged. Adonis foundation is acknowledged for providing the financial support needed to travel to Belgium.

LITERATURE CITED

- Anonymus, 1980. Sistemul român de clasificare a solurilor. *ASAS, ICPA, Bucureşti*, 178 pp.
- Brzeski M.W., 1998. *Nematodes of Tylenchina in Poland and temperate Europe*. Muzeum i Instytut Zoologii Polska Akademia Nauk Warszawa, 395 pp.
- Coldea G., 1991. Prodrome des associations végétales des Carpates du Sud-Est (Carpates Roumaines). *Documents Phytosociologiques, Camerino* 13, 539 pp.
- De Grisse A., 1969. Redescription ou modification de quelques techniques utilisées dans l'étude des nématodes phytoparasitaires. *Mededelingen Rijksfaculteit Landbouwwetenschappen Gent*, 34: 351-369.
- Paşca D., Crişan R., Muntean V., Kiss S., Popovici I., Fabian L., Harşia T. and Ciobanu M., 1997. Monitoringul ecologic al solurilor tehnogene. *Studii şi cercetări (Ştudii Naturii)*, 3: 211-225.
- Popovici I., 1974. Nematodele din sol în relațiile lor dinamice cu natura solului și a vegetației. *PhD thesis, "Babeş-Bolyai" University, Cluj*, 280 pp.
- Popovici I., 1993. Structura și dinamica comunităților de nematode (Nematoda). Pp. 200-214. *In: Popovici I. (ed.), Parcul Național Retezat-Studii ecologice (Retezat National Park-Ecological Studies)*. West Side, Braşov.
- Popovici I., 1998. Structure of nematode communities in mountain grasslands from Romania. Pp. 221-240. *In: R. De Goede and T. Bongers (eds), Nematode communities of northern temperate grassland ecosystems*. Focus Verlag, Giessen.
- Popovici I. and Ciobanu M., 1997. The nematode diversity of the vegetated cliffs from the Romanian Carpathians. *Proceedings Symposium "Research, Conservation, Management"*, Aggtelek, Hungary, pp. 447-459.
- Raski D.J., 1975a. Revision of the Genus *Paratylenchus* Micoletzky, 1922 and descriptions of new species. Part I of Three Parts. *Journal of Nematology*, 7: 15-34.
- Raski D.J., 1975b. Revision of the Genus *Paratylenchus* Micoletzky, 1922 and descriptions of new species. Part II of Three Parts. *Journal of Nematology*, 7: 274-295.
- Raski D.J., 1976. Revision of the Genus *Paratylenchus* Micoletzky, 1922 and descriptions of new species. Part III of Three Parts. *Gracilacus*. *Journal of Nematology*, 8: 97-115.
- Seinhorst J.W., 1959. A rapid method for the transfer of nematodes from fixative to anhydrous glycerin. *Nematologica*, 4: 67-69.