FOUR *ROTYLENCHUS* SPECIES NEW FOR ROMANIA WITH A MORPHOLOGICAL STUDY OF DIFFERENT *ROTYLENCHUS ROBUSTUS* POPULATIONS (NEMATODA: HOPLOLAIMIDAE)

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Summary. Specimens of *Rotylenchus lobatus*, *R. buxophilus*, *R. capensis*, *R.* cf *uniformis* and *R. robustus* were collected primarily from habitats located in the Romanian Carpathians. Brief redescriptions, measurements, illustrations and data referring to the habitat are given for these species. The morphological variation of five populations of *R. robustus* is discussed.

This paper refers to *Rotylenchus* species found in some preserved samples stored at the Institute of Biological Research.

So far, three species of *Rotylenchus* have been reported from Romania. *R. breviglans* Sher, 1965 was reported by Popovici (1989, 1993) from the Retezat Mountains (Southern Romanian Carpathians).

R. robustus (de Man, 1876) Filip'ev, 1936 was first found by Micoletzky (1921 quoted by Andrássy, 1959) in Bucovina. The species was later collected by Andrássy (1959) from the Transylvanian Alps. Several papers published by Popovici (1974, 1993, 1998) and Popovici and Ciobanu (1997) reported *R. robustus* from several habitats distributed mostly in the Romanian Carpathians.

More recently, *R. jagatpurensis* Sultan, 1985 was found by Ciobanu *et al.* (1999) at Băile Turda salted area, in the Transylvania province. Data on the presence and distribution of the seven species are included in the Romanian nematode database.

MATERIALS AND METHODS

Soil samples were collected between 1985 and 1997 by the third and first author. Twelve sites located in grassland, coniferous and deciduous forests from the Romanian Carpathians and the Someşan Plateau in Transylvania 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 on *Rotylenchus* species: Castillo *et al.* (1993), Geraert and Barooti (1996) 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 Soils Classification (1980).

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

Site no.	Locality	Altitude (in m)	Geographical position	Plant association	Soil type
1	Căliman Mts[1].	1000	47°19'N- 25°08'E	*Campanulo abietinae-Festucetum nigricantis*	Brown argilluvic
2	Căliman Mts.	1150	46°59'N- 25°02'E	*Leucanthemo waldsteinii-Fagetum*	Brown earth
3	Căliman Mts.	1790	47°14'N- 25°20'E	*Rhododendro myrtifolii-Pinetum mugi*	Not available
4	Gurghiu Mts.	830	46°45'N- 25°01'E	*Symphyto cordati-Fagetum*	Brown acid
5	Harghita Mts.	1500	46°35'N- 24°23'E	*Hieracio rotundati- Piceetum*	Brown acid
6	Maramureş Mts.	1300	47°43'N- 24°26'E	*Hieracio rotundati- Piceetum*	Brown acid
7	Metaliferi Mts.	1000	46°26'N- 23°17'E	*Violo declinatae- Nardetum*	Brown argilluvic
8	Parâng Mts.	1750	45°25'N- 23°22'E	*Hieracio rotundati- Piceetum*	Alpine meadow
9	Parâng Mts.	2050	45°28'N- 23°29'E	*Violo declinatae- Nardetum*	Ferrilluvic podzol
10	Rodnei Mts.	1560	47°25'N- 24°54'E	*Hieracio rotundati- Piceetum*	Brown acid
11	Rodnei Mts.	2270	47°25'N- 24°54'E	*Primulo- Caricetum curvulae*	Alpine meadow
12	Someşan Plateau	350	46°45'N- 23°35'E	*Jurineo transsilvanicae- Stipetum pulcherimae*	Chernozem

[1] Mts.-Mountains.

DESCRIPTIONS

ROTYLENCHUS LOBATUS Sultan, 1984
(Table II and III; Fig. 1 A-D)

Female head region continuous, conical with 4-5 annules. Stylet well developed, 26-28 µm long. Lateral field areolated only in the oesophageal region. Uterus containing one egg, although a rounded, offset, empty spermatheca was found. Phasmids situated 0-8 annules anterior to anal level. Tail convex-conoid, with slight to prominent ventral projection, annulated or not.

Male not found.

Distribution: Gurghiului Valley (Eastern Romanian Carpathians), site no. 4 (Table I).

Remarks: the preliminary identification using the key of Geraert and Barooti (1996) indicated that our specimens probably belong to *R. alpinus* Eroshenko, 1976. By comparing the similarities and differences in the morphological characters and measurements of our specimens with other closely related *Rotylenchus* species, we finally identified them as *R. lobatus* Sultan, 1984 (Table II).

Romanian specimens correspond to the description and illustrations given by Sultan (1984), reported by Castillo *et al.* (1993). However, our specimens have 4-5 head annules *vs.* 5-6, and lateral field not areolated near phasmids *vs.* areolated. This species is remarkably similar to *R. pakistanensis* Maqbool and Shahina, 1986 and probably *R. pakistanensis* is a synonym of *R. lobatus*.

This species was not found in Poland (Brzeski, 1998). This is the first record of *R. lobatus* from Romania and Europe as well.

ROTYLENCHUS BUXOPHILUS Golden, 1956
(Table III; Fig. 2 A-C)

Female head region continuous, hemispherical with four annules. Stylet well developed, 32 µm in length. Lateral field areolated only in the oesophageal region.

Table II. Comparison of the Romanian specimens considered as *Rotylenchus lobatus* Sultan, 1984 with other closely related *Rotylenchus* species.

Taxa	Similar	Different	Distribution
R. alii Maqbool and Shahina, 1986	Head width and height, c′, vulva position, tail shape, phasmid position	Stylet length 26-28 µm *vs.* 22-24 µm	Pakistan
R. alpinus Eroshenko, 1976	Head annules, c′, vulva position	Stylet length 26-28 µm *vs.* 28-30 µm, tail convex-conoid, with slight to prominent ventral projection, annulated or not *vs.* tail terminus rounded, annulation continuous to tip	Russia, Tajikistan
R. capsicumi Firoza and Maqbool, 1991	Stylet length, c′, phasmid position	Head height 4.0-4.5 µm *vs.* 9-10 µm, V=60.8-66.6% *vs.* 59-61%	Pakistan
R. caudaphasmidius Sher, 1965	Stylet length, c′, vulva position	4-5 *vs.* 5-6 head annules, tail convex-conoid, with slight to prominent ventral projection, annulated or not *vs.* tail tip hemispherical, phasmid situated 0-8 annules anterior to anal level *vs.* phasmid on tail	Peru, South Africa
R. pakistanensis Maqbool and Shahina, 1986	Head annules, head width and height, c′, stylet length, phasmid position, tail shape	Tail with slight to prominent ventral projection, annulated or not *vs.* slight ventral projection ventrally curved	Pakistan
R. phaliurus Siddiqi and Pinochet, 1979	Head annules, stylet length, vulva position, c′	Tail convex-conoid, with slight to prominent ventral projection, annulated or not *vs.* smoothly rounded tail terminus, terminal annules greatly enlarged, phasmid situated 0-8 annules anterior to anal level *vs.* phasmid on tail	Costa Rica
R. pumilus (Perry in Perry, Darling and Thorne, 1959) Sher, 1961	Head annules, stylet length, vulva position	Oesophageal lobe with 5 nuclei, tail more hemispherical, phasmid on tail	USA, Austria, Poland, Hungary, Sweden, Great Britain, Bulgaria, Tajikistan, Russia

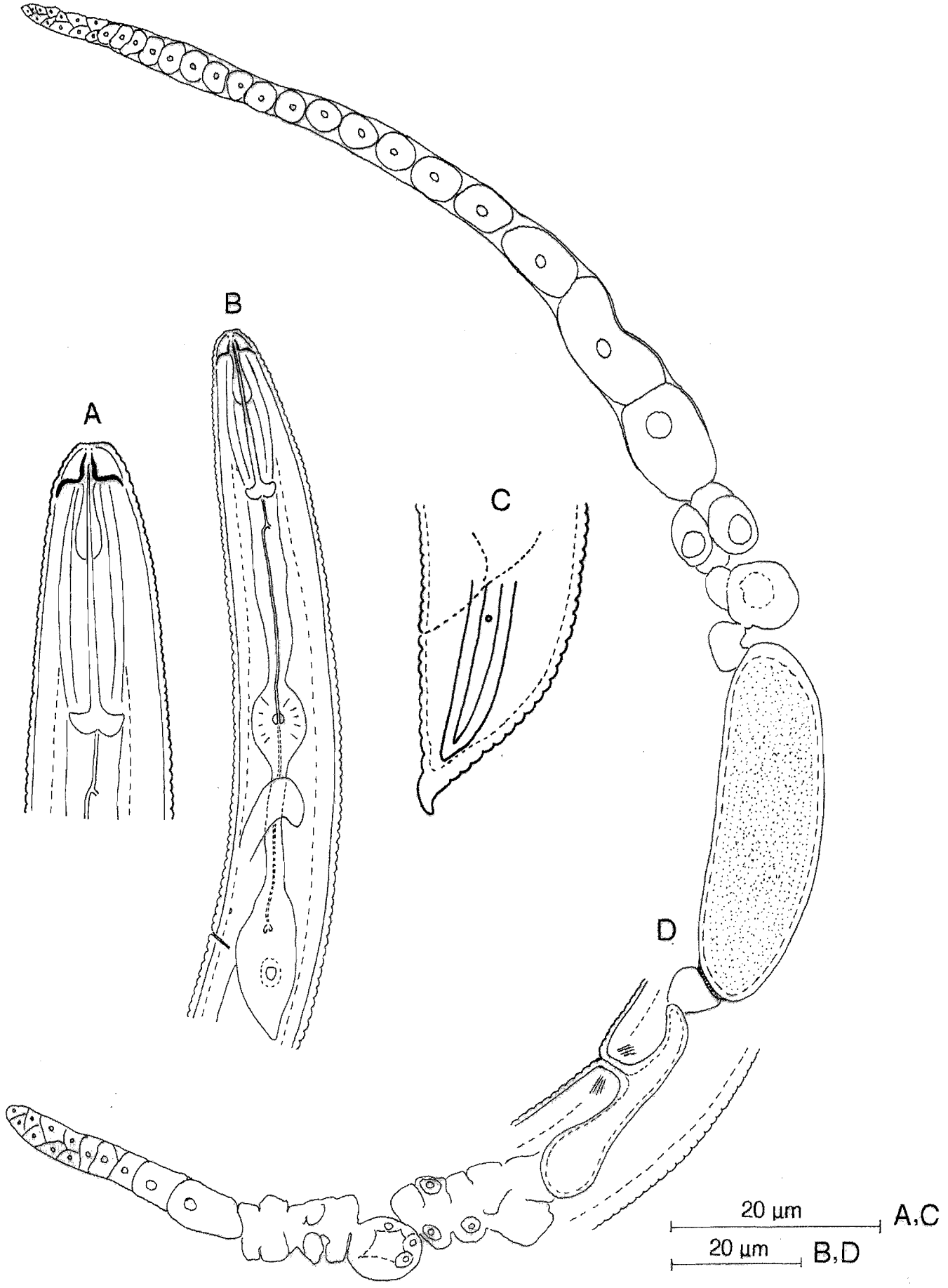

Fig. 1. *Rotylenchus lobatus*: females; A, head; B, anterior end; C, tail; D, reproductive system.

Table III. Measurements of *Rotylenchus lobatus*, *R. buxophilus*, and *R. capensis*.

Species:	*R. lobatus*	*R. buxophilus*	R. capensis	
Site location:	Gurghiu Mts.	Someşan Plateau	Someşan Plateau	
N	7♀♀	3♀♀	♀	♂
L	603 (526-711)	864 (852-876)	810	757
A	27.3 (25.5-29.2)	31.2 (29.2-33.2)	25.3125	30.2
B	5.0 (3.8-6.7)	6.5 (6.0-7.0)	6.3	6.0
C	40.5 (35.1-51.1)	49.5 (46.1-53.3)	67.5	39.8
c'	1.0 (0.8-1.4)	1.0 (0.8-1.1)	0.6	1.3
V%	63.7 (60.8-66.6)	56.6 (54.7-58.5)	57.4	-
Conus	13.9 (13.5-14.0)	15.6 (15.0-16.0)	15.0	14.0
Shaft	13.4 (12.5-14.0)	16.4 (16.0-17.0)	14.0	14.0
m %	50.9 (50.0-51.9)	48.6 (46.9-50.0)	51.7	50.0
Oesophagus	122.0 (106.0-153.0)	133.7 (123.0-143.0)	128.0	-
MB	57.7 (47.7-64.2)	56.9 (54.5-59.3)	57.0	-
Excretory pore	103.2 (96.0-116)	114.1 (111.0-118.0)	119.0	113.0
Head - vulva	384.0 (330.0-441.0)	489.0 (479.0-498.0)	465.0	-
Tail	15.0 (12.0-17.0)	17.6 (16.0-19.0)	12.0	19.0
Tail annules	(7-10)	(7-11)	10	-
Body width	22.1 (19.0-25.0)	27.9 (26.0-30.0)	32.0	25.0
Anal body width	14.8 (11.0-19.0)	18.0 (17.0-19.0)	20.0	-
Head width	7.9 (7.5-8.5)	8.8 (8.5-9.0)	10.0	-
Head height	4.2 (4.0-4.5)	5.0 (5.0-5.0)	6.0	-
O	24.8 (22.6-28.6)	-	-	-

Rounded offset spermatheca contained ovoid, not elongated, sperms. Phasmids located 6-12 annules anterior to anal level. Tail convex-conoid, tail tip annulated or not.

Male not found.

Distribution: Fânaţele Clujului (scientific botanical reserve), site no. 12 (Table I).

Remarks: the characters and morphometrics of our specimens correspond well with those of the original description given by Golden (1956) quoted in Castillo *et al.* (1993) and with those given by Brzeski (1998). In our specimens spermatheca was found containing sperms *vs.* an empty one as reported in the original description (Fig. 2 C).

ROTYLENCHUS CAPENSIS Van den Berg and Heyns, 1974

(Table III; Fig. 3 A-D)

Female head region distinctly offset, hemispherical with five annules. Stylet well developed, 29 µm long in female and 28 µm in male. Lateral field areolated only in the oesophageal region. Spermatheca large, offset, rounded with elongated packed sperms. Phasmids located on the seventh annule anterior to anal level. Tail rounded with annulated tip.

Male slightly shorter than female, spicule about 29 µm long.

Distribution: Fânaţele Clujului (scientific botanical reserve), site no. 12 (Table I).

Remarks: the characters and morphometrics of the two specimens collected (one female and male) are similar with those of the original description given by Van den Berg and Heyns (1974) reported by Castillo *et al.* (1993).

R. capensis was not reported from Poland (Brzeski, 1998). This is the first record of the species from Romania and Europe.

ROTYLENCHUS cf *UNIFORMIS* (Thorne, 1949) Loof and Oostenbrink, 1958

(Table IV; Fig. 4 A-F)

Female head region continuous, conical, sloping and bearing 5-7 annules. Cephalic framework moderately refractive. Stylet robust, 38-45 µm long. Lateral field areolated only in the oesophageal region, not irregularly areolated at mid-body. Body without longitudinal striations. Spermatheca rounded, empty. Vulva with distinct epiptygma. Phasmids located on the 0-12 annule anterior to anal level. Tail rather conoid-rounded than rounded, mostly with annulated tip.

Male slightly shorter than female, spicule 33-34 µm in length.

Distribution: five populations collected only from the Eastern Romanian Carpathians at 1150-1790 m above sea level, in three types of ecosystems: mixed forest on brown earth (site no. 2, Tihul Valley); spruce forests on brown acid soils: sites no. 5 (Harghita-Mădăraş), 6 (Bârjaba Valley), 10 (Pietrosul Rodnei); subalpine scrub: site no. 3 (Negoiul Românesc, Răţitiş Peak) (Table I).

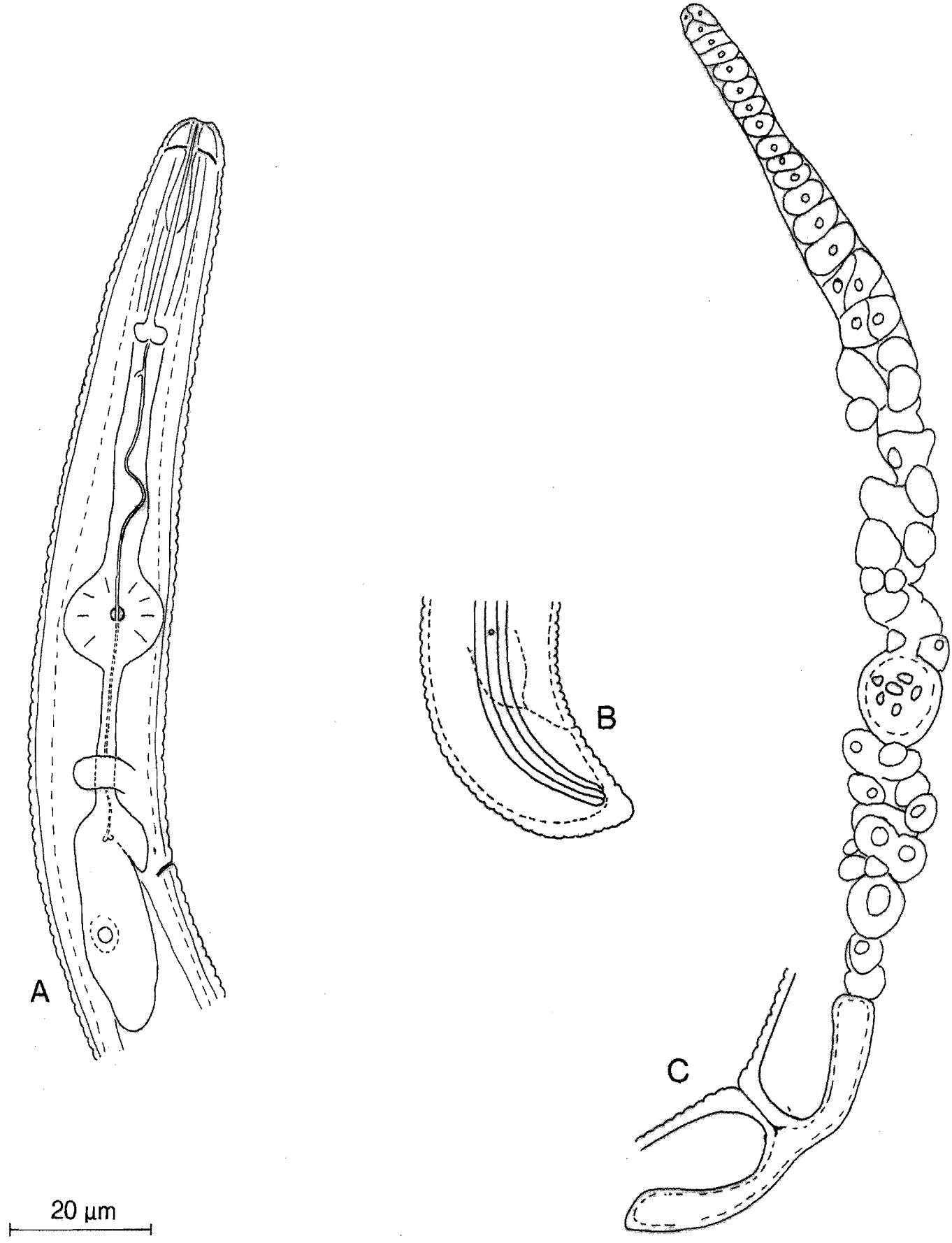

Fig. 2. *Rotylenchus buxophilus*: females; A, anterior end; B, tail; C, reproductive system.

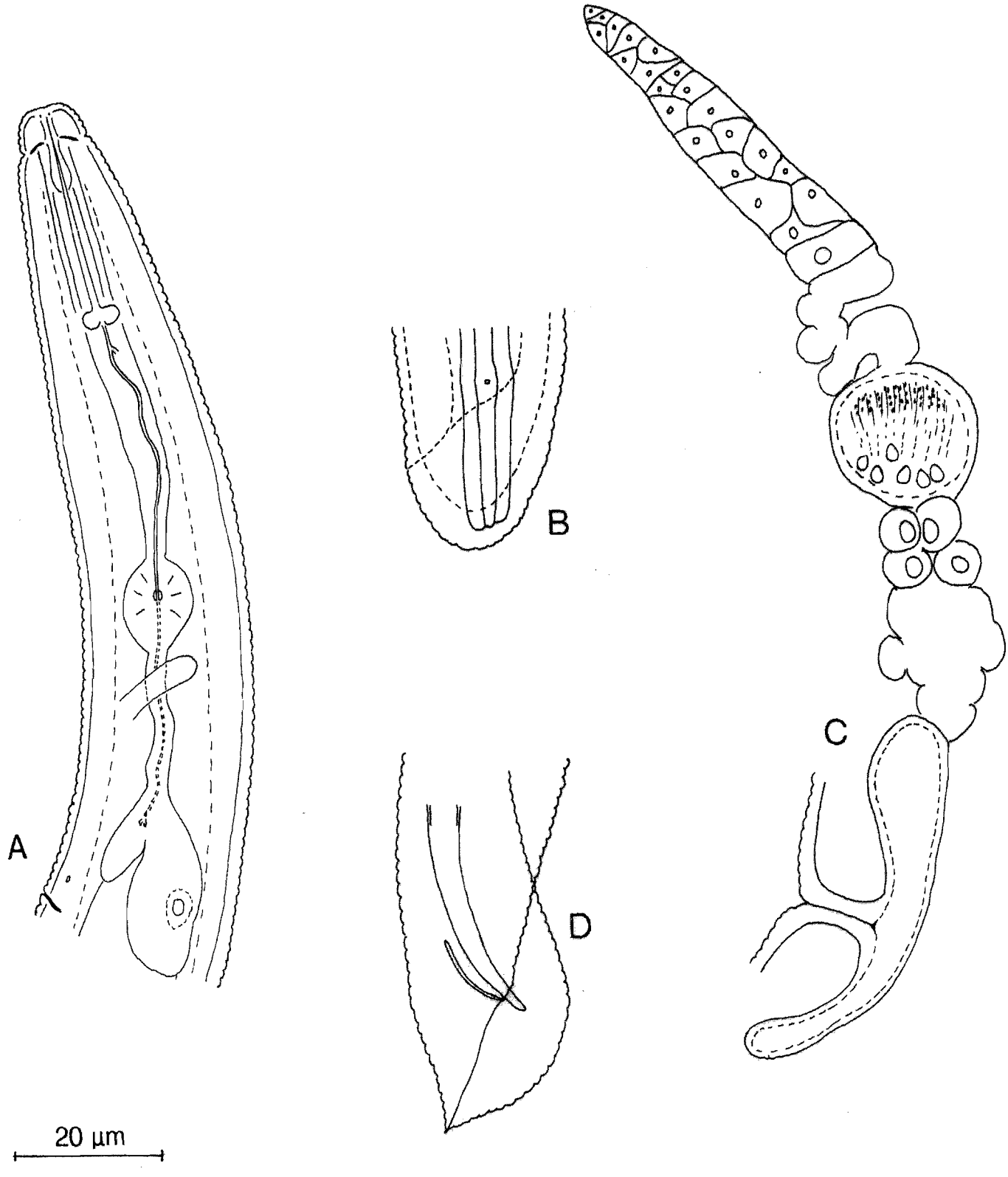

Fig. 3. *Rotylenchus capensis*: A-C female: A, anterior end; B, tail; C, reproductive system; D, male cloacal region.

Remarks: our preliminary identification following the key of Geraert and Barooti (1996) suggested that the specimens might belong to *R. uniformis* (Thorne, 1949) Loof and Oostenbrink, 1958. In this key, the distinctive character between *R. robustus* and *R. uniformis* is an irregularly areolated lateral field at mid-body in *R. robustus vs.* not areolated in *R. uniformis*. Brzeski (1998) on the contrary, described and illustrated *R. uniformis* with the lateral field (sparsely) areolated on the entire body, but *R. robustus* with the lateral field areolated only anteriorly. In all of our specimens the lateral field is areolated only anteriorly. The specimens have continuous, con-

Table IV. Measurements of *Rotylenchus* cf *uniformis*.

Site location:	Rodnei Mts.	Maramureş Mts.	Căliman Mts.[1]	Căliman Mts.[2]	Harghita Mts.
N	8♀♀	5♀♀	1♀	2♀♀	4♀♀
L	1045 (937-1131)	1006 (854-1113)	931	1018 (1008-1027)	1041 (933-1089)
A	28.3 (25.5-31.7)	30.0 (27.4-33.9)	26.6	34.5 (33.6-35.4)	29.1 (24.4-31.4)
B	5.7 (4.9-6.5)	6.2 (5.6-6.8)	5.2	6.4 (6.3-6.4)	6.2 (5.8-6.5)
C	61.4 (45.1-79.1)	69.0 (63.6-75.7)	84.6	53.6 (53.1-54.1)	52.5 (48.5-58.3)
c'	0.8 (0.6-1.2)	0.7 (0.6-0.7)	0.6	0.9 (0.9-1.0)	0.9 (0.8-1.0)
V%	59.8 (56.7-62.2)	62.3 (60.4-64.3)	62.0	62.2 (61.3-63.0)	61.7 (60.6-63.7)
Stylet	40.4 (38.0-43.0)	40.2 (38.0-42.0)	39.5	40.5 (39.0-42.0)	43.0 (40.0-45.0)
Conus	20.6 (19.0-23.0)	21.0 (19.0-23.5)	20.0	20.0	22.1 (20.0-24.0)
Shaft	19.8 (18.0-21.0)	19.2 (18.5-20.0)	19.5	20.5 (19.0-22.0)	20.9 (20.0-21.5)
m %	51.1 (47.5-53.5)	52.2 (50.0-56.0)	50.6	49.5 (47.6-51.3)	51.4 (50.0-53.3)
Oesophagus	185.0 (157.0-210.0)	164.6 (130.0-183.0)	180.0	160.0	161.8 (153.0-169.0)
MB	54.7 (47.6-60.5)	66.4 (60.1-76.9)	57.2	65.6	64.3 (62.1-68.8)
Excretory pore	143.2 (140.0-145.0)	141.8 (134.0-150.0)	147.0	140.5 (140.0-141.0)	150.3 (145.0-155.0)
Head - vulva	624.4 (555.0-671.0)	626.6 (540.0-690.0)	577.0	632.5 (630.0-635.0)	642.5 (565.0-680.0)
Tail	17.5 (13.0-25.0)	14.6 (13.0-16.0)	11.0	19.0	20.0 (16.0-22.0)
Tail annules	(8-14)	(8-10)	8	11	(11-13)
Body width	37.1 (33.0-42.0)	33.6 (30.0-38.0)	35.0	29.5 (29.0-30.0)	36.3 (30.0-44.0)
Anal body width	23.0 (21.0-27.0)	21.8 (19.0-24.0)	20.0	21.0 (20.0-22.0)	23.3 (21.0-26.0)
Head width	10.0 (9.5-10.5)	9.2 (9.0-9.5)	8.5	9.3 (9.0-9.5)	9.5
Head height	5.5 (5.0-6.0)	5.0 (5.0-5.0)	5.0	5.0	5.0
O	30.0	12.8 (11.8-14.6)	-	13.1	12.9 (12.2-14.0)
Phasmid	0-6	0-4	2	0-1	0-2

[1] site no. 2; [2] site no. 3.

ical, sloping head *vs.* clearly offset, hemispherical as in *R. uniformis* (Fig. 4 B, C). A more posterior vulva position in the Romanian individuals can also be noted (V=56.7-64.3% *vs.* V=50-60%). Although these differences make the final identification difficult, we consider our populations temporarily as *R. uniformis*.

ROTYLENCHUS ROBUSTUS (de Man, 1876) Filip'ev, 1936

(Table V and VI; Fig. 5 A-F)

Female head region hemispherical, offset (but sometimes continuous with adjacent body), with 6-8 distinct annules. Cephalic framework strongly refractive. Stylet robust, 30-42 µm long. Lateral field areolated only in the oesophageal region. Spermatheca rounded, empty. Vulva with distinct epiptygma. Phasmids located on the 0-12 annule anterior to anal level. Tail rounded, more curved on dorsal side, with annulated tip.

Male not found.

Distribution: five populations collected from locations distributed along the whole range of the Romanian Carpathians at 1000-2270 m above sea level, as follows: Eastern Carpathians (two locations) sites no. 1 (Şendroaia) and 11 (protected alpine grassland in the area of the Pietrosul Rodnei Biosphere Reserve); Southern Carpathians (two locations) sites no. 8 (Coasta lui Rus) and 9 (Păpuşa Peak); Western Carpathians (one location) site no. 7 (Gheţar-Scărişoara) (Table I).

Remarks: by comparing the similarities and differences in the morphological characters and measurements of our specimens with other closely related *Rotylenchus* species, we finally identified them as *R. robustus* (de Man, 1876) Filip'ev, 1936 (Table V). The Romanian specimens have the lateral field areolated only anteriorly, very similar to *R. fallorobustus* as illustrated by Sher (1965) and *R. robustus* described by Brzeski (1998).

Slight differences were found regarding the morphological characters of specimens collected from the five locations; they were attributed to geographical variation (Table VI and Fig. 5 B-D). The populations collected from Rodnei and Căliman Mts. (altitudes 2270 m and 1000 m respectively), which are two neighbouring mountains located in the Romanian Eastern Carpathians, are characterized by moderately thickened labial framework (Fig. 5 B), short body, stylet, tail and low c' value. On the contrary, individuals collected from Metaliferi Mts. (altitude 1000 m) situated in the Romanian Western Carpathians have a more conspicuous off set head, heavily thickened labial framework (Fig. 5 D), long body, stylet and tail. Specimens collected from Parâng Mts. (altitude above 1700 m) situated in the Romanian Southern Carpathians have intermediary morphological characteristics. This population shows also continuous to slightly off set head and the least thickened labial framework (Fig. 5 C).

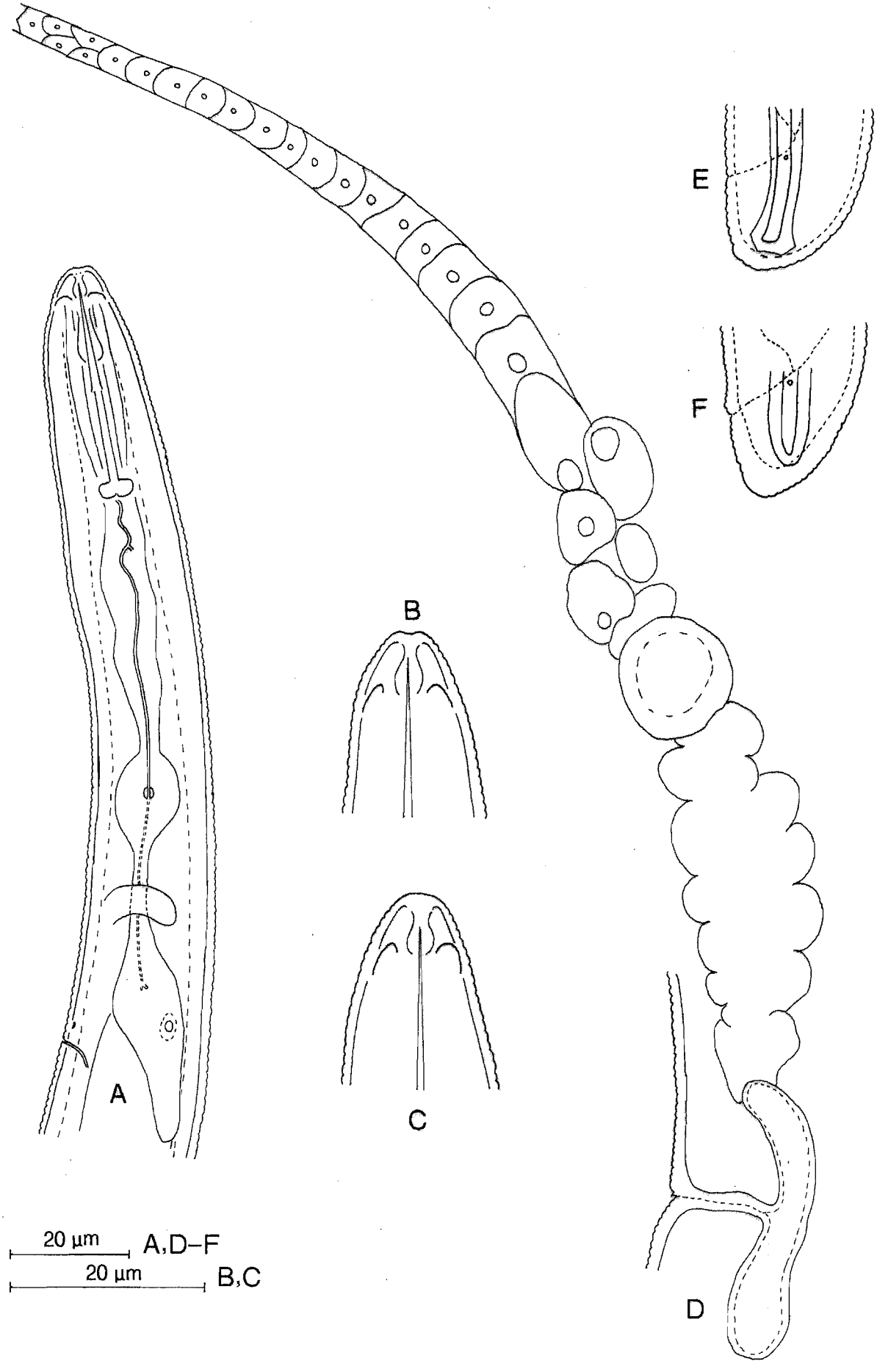

Fig. 4. *Rotylenchus* cf *uniformis*: females; A, anterior end; B, C, head; D, reproductive system; E, F, tail.

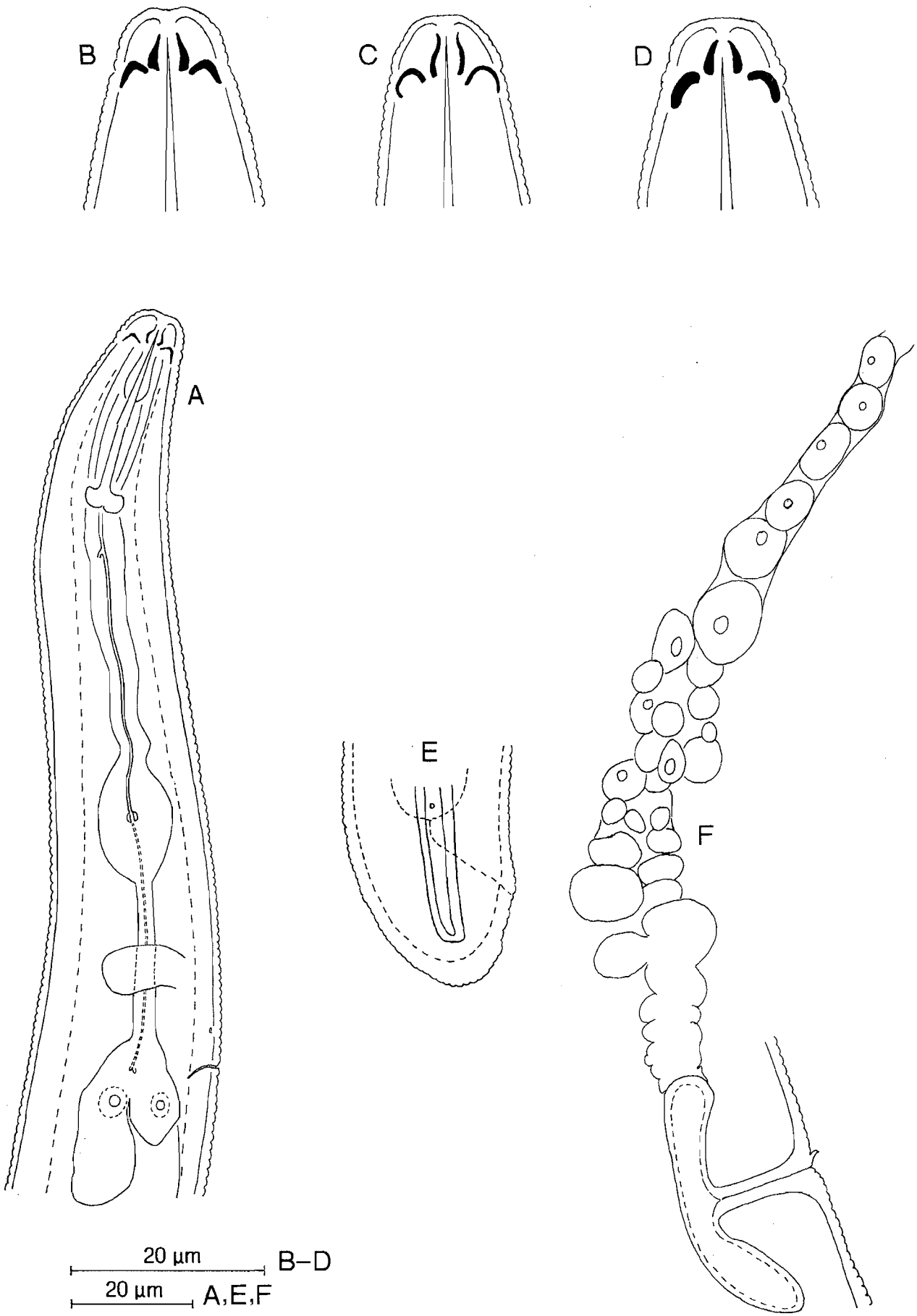

Fig. 5. *Rotylenchus robustus*: females; A, anterior end; B-D head variation: B (population from Călimani Mts.); C (population from Parâng Mts.); D (population from Metaliferi Mts.); E, tail; F, reproductive system.

Table V. Comparison of the Romanian *Rotylenchus robustus* specimens with closely related *Rotylenchus* species.

Taxa	Similar	Different
R. fallorobustus Sher, 1965[1]	Body length, head region hemispherical, slightly or not off set, head annules, lateral field areolated anteriorly only, tail dorsally more curved, body often bulging 1 or 2 annules at level of anus, vulva position, phasmid position	Stylet length 30-42 µm *vs.* 33-37, spermatheca conspicuous *vs.* inconspicuous
R. robustus (de Man, 1876) Filip'ev, 1936 quoted in Castillo *et al.* (1993)	Body length, head region hemispherical, offset, head annules, stylet length 30.1-50 µm, vulva position	Lateral field areolated anteriorly only *vs.* irregularly areolated at mid-body, intestine not overlapping rectum vs. partially overlapping, tail rounded, more curved on dorsal side *vs.* hemispherical, phasmid located on the 0-12 annule anterior to anal level *vs.* varying from 3 annules posterior to 7 annules anterior to anal level
R. capitatus Eroshenko, 1981	Head annules, lateral field areolated anteriorly only, vulva position	Body length 0.8-1.3 mm *vs.* 0.6-0.8 mm, stylet length 30-42 µm *vs.* 26-29 µm, head region hemispherical *vs.* truncate, oesophageal gland not short *vs.* short, tail rounded *vs.* conoid, phasmid located on the 0-12 annule anterior to anal level *vs.* phasmid located on tail
R. incultus Sher, 1965	Head region hemispherical, lateral field areolated anteriorly only, vulva position, tail dorsally more curved, phasmid position	Body length 0.8-1.3 mm *vs.* 0.5-1.0 mm, head offset *vs.* not offset, 6-8 head annules *vs.* 5-6, stylet 30-42 µm *vs.* 19-31, epiptygma conspicuous *vs.* inconspicuous

[1] Considered by Seinhorst (1991) as junior synonym of *R. robustus* (de Man, 1876) Filip'ev, 1936.

Table VI. Measurements of *Rotylenchus robustus*.

Site location:	Rodnei Mts.	Căliman Mts.	Parâng Mts.[1]	Parâng Mts.[2]	Metaliferi Mts.
N	2♀♀	6♀♀	6♀♀	5♀♀	3♀♀
L	978 (860-1095)	972 (868-1090)	1061 (962-1206)	1081 (953-1185)	1255 (1168-1357)
A	25.6 (23.9-27.4)	26.3 (23.6-31.1)	28.7 (26.0-31.7)	28.7 (25.8-30.6)	33.9 (32.4-35.7)
B	6.7 (6.9-6.4)	6.0 (5.6-6.7)	6.7 (6.3-7.1)	6.9 (6.0-7.9)	6.5 (6.3-6.5)
C	60.5 (66.2-54.8)	62.5 (47.7-78.9)	55.7 (47.7-78.2)	54.1 (50.2-58.1)	48.3 (46.7-49.6)
c'	0.6 (0.6-0.7)	0.6 (0.5-0.7)	0.8 (0.6-1.0)	0.8 (0.7-1.0)	0.8 (0.8-0.9)
V%	51.7 (51.9-51.6)	56.5 (54.8-58.2)	55.2 (52.8-57.2)	55.6 (54.6-56.5)	53.6 (52.2-54.8)
Stylet	31.5 (30.0-33.0)	35.2 (32.0-37.0)	36.9 (36.0-38.0)	37.0 (34.0-41.0)	41.3 (40.0-42.0)
Conus	14.3 (16.5-12.0)	17.8 (17.0-18.5)	18.4 (17.5-20.0)	18.4 (17.0-21.0)	21.3 (21.0-22.0)
Shaft	17.3 (16.5-18.0)	17.4 (15.0-18.5)	18.5 (18.0-19.5)	18.6 (17.0-20.0)	20.0 (19.0-21.0)
m %	45.0 (50.0-40.0)	50.5 (48.6-53.1)	49.9 (48.0-52.6)	49.7 (47.2-51.2)	51.6 (50.0-52.5)
Oesophagus	147.5 (125.0-170.0)	160.7 (145.0-175.0)	157.8 (145.0-170.0)	156.6 (145.0-180.0)	194.3 (185.0-208.0)
MB	55.9 (56.0-55.9)	56.6 (54.3-58.6)	59.2 (55.1-62.1)	56.5 (53.8-60.0)	-
Excretory pore	129.0 (113.0-145.0)	140.0 (120.0-155.0)	135.5 (122.0-160.0)	144.0 (135.0-158.0)	168.7 (153.0-183.0)
Head – vulva	505.5 (446.0-565.0)	548.2 (505.0-603.0)	585.0 (532.0-637.0)	601.4 (538.0-653.0)	671.8 (627.5-708.0)
Tail	16.5 (13.0-20.0)	16.0 (11.0-22.0)	19.7 (14.0-25.0)	20.0 (18.0-23.0)	26.0 (25.0-28.0)
Tail annules	14.0 (13.0-15.0)	12.5 (10.0-17.0)	13.7 (11.0-16.0)	13.4 (11.0-15.0)	20.7 (19.0-24.0)
Body width	38.0 (36.0-40.0)	37.2 (35.0-43.0)	37.0 (35.0-39.0)	37.6 (37.0-39.0)	37.0 (36.0-38.0)
Anal body width	25.5 (22.0-29.0)	26.7 (24.0-30.0)	25.7 (25.0-26.0)	25.2 (24.0-27.0)	31.0 (30.0-33.0)
Head width	10.8 (10.5-11.0)	11.5 (11.0-12.0)	11.8 (11.5-12.0)	11.3 (10.5-12.0)	13.0
Head height	5.3 (4.5-6.0)	5.6 (5.0-6.0)	5.8 (5.5-6.0)	5.9 (5.5-6.0)	7.0
O	14.3 (13.6-15.0)	30.6	12.0 (10.7-13.9)	31.8 (27.8-39.7)	-
Phasmid	0-5	4-12	3-10	4-11	4-6

[1] site no. 10; [2] site no. 11.

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