

Fauna of soil nematodes (*Nematoda*) in Trojmezná hora Reserve

Fauna půdních hlístic (*Nematoda*) rezervace Trojmezná hora

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Abstract

Soil nematodes were studied in five spruce forests and a grassy upland of the Trojmezná hora Reserve in 1989–1991. A total of 54 species was found and they belonged to 9 orders. The species *Deladenus aridus* Andrásy, 1957, *Drilocephalobus humophilus* Zell, 1987 and *Enchodelus arcuatus* Thorne, 1939 were recorded in the Czech Republic for the first time. In the area studied, myco-phytophagous nematodes were the most abundant group and were mainly represented by the species of the genus *Filenchus*. Phytophagous nematodes mostly belonged to the populations of *Aglenchus agricola* (de Man, 1884). Omiphagous nematodes of the genus *Eudorylaimus* were the third dominant group. Species of the genera *Plectus* and *Acrobeloides* prevailed in bacteriophagous nematodes. The total abundance of nematodes varied from 318 to 2070 x 10³ ind.m⁻².

Key words: *Nematoda*, Spruce forests, Šumava Mts., Bohemian Forest, Czech Republic

Introduction

Free-living nematodes are important group of invertebrate fauna in terrestrial and fresh-water ecosystems. In the Czech Republic, data on their distribution and diversity are still scarce especially in mountain ranges of South Bohemia. Soil nematodes in the Šumava Mts. (Czech Bohemian Forest) were first mentioned by HÁNĚL (1992). HÁNĚL (1996, 1998) studied distribution and seasonal changes of nematodes in soil and roots of three spruce forests at the Boubín Mount. Recently, communities of free-living nematodes are studied in climax spruce and beech ecosystems of Žofín National Nature Reserve in the Novohradské hory Mts. (HÁNĚL 1999). No attention was paid to soil nematodes in ecosystems on the territory of Trojmezná hora Reserve and the present paper gives primary information about their fauna in this part of the Šumava National Park.

Localities studied

The territory studied extends from Plešné Lake (1090 m a.s.l.) through Plechý Peak (1378 m a.s.l.) and Trojmezná Peak (1361 m a.s.l.) to Třístoličník Peak (1302 m a.s.l.). The parent rocks belong to Plechý Granite Massif, soils are cambic podzols (spodo-dystric cambisols) in lower parts and podzols with pH(H₂O) 3–4, pH(KCl) 2.5–3 and accumulation of acid litter in humus horizon in higher parts. The area is characterized by a cold climate with mean annual temperature 3–5°C and annual sum of precipitation 800–1200 mm. Localities studied were mostly spruce forests. The first locality (A) belonged to the spruce woodland of *Ca-*

lamagrostio villosae-Piceetum Hartmann in Hartmann et Jahn, 1967 dominated by (*Picea abies* (L.) Karst.) with dense undergrowth of *Vaccinium myrtillus* L., *Calamagrostis villosa* (Chaix.) Gmel., *Avenella flexuosa* (L.) Parl., *Dryopteris* sp., *Polytrichum formosum* Hedw., *Dicranum scoparium* Hedw. The other forest localities (B,D,E,F) belonged to the spruce woodland of *Athyrio alpestris-Piceetum* [Hartmann 1959] Hartmann et Jahn 1967 with *Athyrium distentifolium* Tausch, *Athyrium filix-femina* (L.) Roth, *Vaccinium myrtillus*, *Calamagrostis villosa*, *Luzula sylvatica* (Huds.) Gaud., *Avenella flexuosa*, *Oxalis acetosella* L., *Dicranum scoparium*, *Polytrichum formosum*, *Sphagnum* spp. in understory. The last locality (C) represented a grassy upland dominated by *Nardus stricta* L. between spruce forests and peatland.

Check-list of localities with sampling dates:

A: Spruce forest near Stifterův pomník, 26 August 1990

B: Spruce forest near Plechý peak, 26 August 1990

C: Grassy upland Rakouská louka, 26 August 1990

D: Spruce forest between Rakouská louka and Trojmezí, 27 June 1991

E: Spruce forest at Trojmezí, 4 October 1989

F: Spruce forest at Trojmezí, 27 June 1991

Methods

Soil samples were taken by a cylindrical corer with the area of 10 cm² down to the depth of 15 cm of soil profile in 10 replicated. Soil was thoroughly mixed and nematodes were isolated from four 10 grams of mixed soil by means of the modified Baermann funnel method. Nematodes were killed by and fixed in 3% formaldehyde and studied in glycerin slides.

Results and discussion

A total of 54 species of soil nematodes from 9 orders was found in the area studied and their numbers in individual localities varied from 17 to 37 (Table 1). The species *Deladenus aridus* Andrassy, 1957, *Drilocephalobus humophilus* Zell, 1987 and *Enchodelus arcuatus* Thorne, 1939 were recorded in the Czech Republic for the first time. Greater part of species belonged to the order *Tylenchida*, representing 33.3 % of the total fauna followed by the order *Dorylaimida* with 18.5 % of species.

Table 2 gives abundance of genera and ecological groups of nematodes. Species of the genus *Filenchus* represented the most abundant nematodes, followed by nematodes of the genera *Aglenchus*, *Eudorylaimus*, *Plectus*, *Aphelenchoides*, and *Acrobeloides*. Representatives of these genera together with *Metateratocephalus crassidens* and *Ditylenchus* spp. occurred in all localities studied and constituted the characteristic generic combination of nematodes as to the ecosystems studied concerns. Myco-phytophagous nematodes had greatest populations (mainly species of the genus *Filenchus*). Phytophagous nematodes were the second abundant trophic group followed by bacteriophages and omniphages. Relatively low abundance had mycophagous nematodes and proportion of predacious nematodes was below 1% of the total populations. The average abundance of nematodes in the area was 1182 x 10³ ind.m⁻² and at individual sites varied from 318 to 2070 x 10³ ind.m⁻².

General characteristics of nematode communities in the spruce stands studied were similar to those found in the spruce forests at the Boubín Mount (HANEL 1996). It means the dominant position of myco-phytophagous nematodes of the genus *Filenchus*, high abundance of the genus *Eudorylaimus*; and relatively low number of species and genera which characterize nematode communities in spruce forests in comparison to deciduous forest and meadow eco-

systems (HÁNEĽ 1993a). Lower diversity of nematodes in the area studied than in other regions could be also caused by cold climate and podzol soils with low pH values and slow decomposition of litter as indicated by a low abundance of the genus *Rhabditis*. Abundance of the genera *Aglenchus* was higher whereas that of *Paratylenchus* and *Acrobeloides* lower in Trojmezná hora than Boubín localities. Spruce forest in the Žofín Reserve had greater populations of the species *Malenchus acarayensis*, *Tylenchus davainei*, *Wilsonema schuurmansstekhoveni* and *Tylolaimophorus typicus* than spruce forests in Trojmezná hora (HÁNEĽ 1999). Irrespective of local variations, dominant position of the genera *Filenchus*, *Eudorylaimus*, *Plectus*, and *Acrobeloides* characterized nematode fauna of the three mountain regions in South Bohemia compared.

On the other hand, spruce forests except one in the Ore Mountains (Krušné hory) had much lower abundance of the genus *Filenchus*, very low abundance of the genus *Eudorylaimus*, greater populations of *Acrobeloides nanus* whereas lower abundance of *Plectus* at all sites in comparison to Šumava and Novohradské hory localities. The species of the genus *Malenchus* were completely absent in Ore Mts. spruce forests. These differences were very likely due to the destruction of spruce forest ecosystems in the Ore Mts. by industrial immissions that occurred on both Czech (HÁNEĽ 1993b) and German (RUESS & FUNKE 1995) sides of the Ore Mts range. Such changes (i.e. decrease in the populations of species of the genera *Filenchus*, *Eudorylaimus*, *Plectus*, *Malenchus*, and some others) can be a signal of spruce forest impairment and dispose communities of soil nematodes to be good bio-indicators of ecosystem disturbance.

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Table 1. – Check-list of nematodes species.

Species/Locality	A	B	C	D	E	F
Order: <i>MONHYSTERIDA</i>						
<i>Eumonhystera longicaudatula</i> (Gerlach et Riemann, 1973)		+				
<i>Eumonhystera vulgaris</i> (de Man, 1880)				+		
Order: <i>ARAEOLAIMIDA</i>						
<i>Plectus acuminatus</i> Bastian, 1865	+	+		+	+	+
<i>Plectus cirratus</i> Bastian, 1865	+		+	+		+
<i>Plectus longicaudatus</i> Bütschli, 1873	+	+	+	+	+	+
<i>Plectus parvus</i> Bastian, 1865	+					
<i>Plectus sambesii</i> Micoletzky, 1915		+		+		+
<i>Wilsonema schuurmasstekhoveni</i> (De Coninck, 1931)			+		+	+
Order: <i>TERATOCEPHALIDA</i>						
<i>Metateratocephalus crassidens</i> (de Man, 1880)	+	+	+	+	+	+
<i>Teratocephalus lirellus</i> Anderson, 1969	+					
<i>Teratocephalus stratumus</i> Eroshenko, 1973		+		+		+
<i>Teratocephalus terrestris</i> (Bütschli, 1873)	+	+		+		+
Order: <i>RHABDITIDA</i>						
<i>Heterocephalobus elongatus</i> (de Man, 1880)			+	+		+
<i>Acrobeloides nanus</i> (de Man, 1880)	+	+	+	+	+	+
<i>Drilocephalobus humophilus</i> Zell, 1987	+					+
<i>Rhabditis longicaudata</i> Bastian, 1865					+	+
<i>Rhabditis terricola</i> Dujardin, 1845			+			+
Order: <i>APHELENCHIDA</i>						
<i>Aphelenchoides conimucronatus</i> Bessarabova, 1966	+	+		+	+	+
<i>Aphelenchoides dactylocercus</i> Hooper, 1958					+	
<i>Aphelenchoides saprophilus</i> Franklin, 1957	+	+	+	+		+
<i>Aphelenchoides</i> sp.	+	+				
Order: <i>TYLENCHIDA</i>						
<i>Filenchus discrepans</i> (Andrássy, 1959)	+	+	+	+	+	+
<i>Filenchus hamatus</i> (Thorne et Malek, 1968)	+			+		+
<i>Filenchus misellus</i> (Andrássy, 1958)	+	+	+	+	+	+
<i>Filenchus</i> sp.	+				+	+
<i>Tylenchus davaini</i> Bastian, 1865					+	+
<i>Aglenchus agricola</i> (de Man, 1884)	+	+	+	+	+	+
<i>Malenchus acarayensis</i> Andrásy, 1968	+	+	+			
<i>Lelenchus leptosoma</i> (de Man, 1880)	+	+	+			
<i>Ecphyadophora tenuissima</i> de Man, 1880	+					+
<i>Helicotylenchus pseudorobustus</i> (Steiner, 1914)		+				
<i>Rotylenchus robustus</i> (de Man, 1876)		+		+	+	
<i>Paratylenchus neoamblycephalus</i> Geraert, 1965		+				+
<i>Ogma menzeli</i> (Stefanski, 1924)						+
<i>Ditylenchus filenchulus</i> Brzeski, 1991	+				+	+
<i>Ditylenchus longimatrix</i> (Kazachenko, 1975)			+			+

Table 1. – Continues.

Species/Locality	A	B	C	D	E	F
<i>Ditylenchus parvus</i> Zell, 1988	+	+		+		+
<i>Ditylenchus tenuidens</i> Gritzenko, 1971		+				
<i>Deladenus aridus</i> Andrásy, 1957	+		+			+
Order: <i>ENOPLIDA</i>						
<i>Tripyla affinis</i> de Man, 1880						+
<i>Tripyla setifera</i> Bütschli, 1873		+	+	+		
<i>Alaimus jaulasali</i> Siddiqi et Husain, 1967	+	+	+			+
<i>Paramphidelus dolichurus</i> (de Man, 1876)			+			+
Order: <i>MONONCHIDA</i>						
<i>Jensenonchus sphagni</i> (Brzeski, 1960)			+			+
Order: <i>DORYLAIMIDA</i>						
<i>Epidorylaimus agilis</i> (de Man, 1880)				+		
<i>Epidorylaimus consobrinus</i> (de Man, 1917)						+
<i>Eudorylaimus bureshi</i> (Andrásy, 1958)				+		
<i>Eudorylaimus discolaimioideus</i> (Andrásy, 1958)			+	+		
<i>Eudorylaimus leuckarti</i> (Bütschli, 1873)				+		+
<i>Eudorylaimus silvaticus</i> Brzeski, 1960	+	+	+	+	+	+
<i>Eudorylaimus</i> sp.		+			+	
<i>Dorydorella pratensis</i> (de Man, 1880)			+	+		
<i>Enchodelus arcuatus</i> Thorne, 1939						+
<i>Tylolaimophorus typicus</i> de Man, 1880		+				+
Number of species	25	26	22	25	17	37

Table 2. – Abundance (x 10³ ind.m⁻²) of genera and ecological groups of soil nematodes.

Genus/Locality	A	B	C	D	E	F	Mean abundance	Dominance [%]
BACTERIOPHAGES								
<i>Eumonhystera</i>		5		5			2	0.1
<i>Plectus</i>	108	100	32	152	13	195	100	8.5
<i>Wilsonema</i>			8		3	5	3	0.2
<i>Metateratocephalus</i>	15	58	3	5	5	10	16	1.3
<i>Teratocephalus</i>	15	38		10		20	14	1.2
<i>Heterocephalobus</i>			5	10		10	4	0.4
<i>Acrobeloides</i>	63	28	8	56	5	55	36	3.0
<i>Drilocephalobus</i>	3					25	5	0.4
<i>Rhabditis</i>			5		3	20	5	0.4
<i>Alaimus</i>	35	3	8			5	8	0.7
<i>Paramphidelus</i>			8			5	2	0.2
SUM	238	230	75	238	28	350	193	16.3
MYCOPHAGES								
<i>Aphelenchoides</i>	13	60	3	36	13	170	49	4.1
<i>Ditylenchus</i>	5	23	13	51	3	25	19	1.6
<i>Deladenus</i>	5		3			5	3	0.2
SUM	22	83	18	86	15	200	71	6.0
MYCO-PHYTOPHAGES								
<i>Filenchus</i>	1489	228	18	385	238	435	465	39.4
<i>Tylenchus</i>					10	10	3	0.3
<i>Malenchus</i>	5	38	3				8	0.6
<i>Lelenchus</i>	98	10	5				19	1.6
<i>Ecphyadophora</i>	5					5	2	0.1
SUM	1596	275	25	385	248	450	496	42.1
PHYTOPHAGES								
<i>Aglenchus</i>	4	118	1132	36	5	165	243	20.5
<i>Helicotylenchus</i>		5					1	0.1
<i>Rotylenchus</i>		33		25	15		12	1.0
<i>Paratylenchus</i>		8				70	13	1.1
<i>Ogma</i>						5	1	0.1
SUM	4	164	1132	61	20	240	270	22.8
OMNIPHAGES								
<i>Eudorylaimus s.l.</i>	210	310	148	96	8	55	138	11.7
<i>Enchodelus</i>						5	1	0.1
<i>Tylolaimophorus</i>		13				10	4	0.3
SUM	210	323	148	96	8	70	142	12.0
PREDATORS								
<i>Tripyla</i>		3	25	10		10	8	0.7
<i>Jensenonchus</i>			5			5	2	0.1
SUM		3	30	10		15	10	0.8
TOTAL ABUNDANCE	2070	1078	1428	877	318	1325	1182	100.0
Number of genera	15	18	18	13	12	24	28	