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NEMATODE COMMUNITIES IN BEECH FORESTS IN "STRANDZHA" NATURAL PARK, BULGARIA
I. SPECIES COMPOSITION

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Abstract

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A study on soil nematode communities was conducted in beech forest associations in two plant climatic zones designated as "rodhodendron area" and "high area". Samples were collected in April, June, August, October and December, 2009, and April, June, August and October, 2010 from three sites: i) Protected Zone "Marina reka" and ii) Protected Zone "Bjalata prast" in the rhododendron area, and iii) "Propada" locality in the high area. The species composition, the trophic structure and the functional guilds of the communites were described.

134 nematode species from 38 families and 12 orders were identified. The highest species diversity was established on site "Propada" (104 species), and the lowest on site "Bjalata prast" (49 species). Only 29 species were common for all three studied localities. Nineteen species and genus *Kochinema* represent new geografic records for Bulgaria.

The greatest species diversity was established for the guilds of bacterial feeders Bf_2 and fungal feeders Fu_2, followed by epidermal and root hair feeders Pf-e and omnivores Om_4. Regardless of the rich undergrowth vegetation in the studied localities, few plant parasitic specimens and species were found and some of the taxonomic groups common for the temperate region were not represented.

Key words: soil nematode, species composition, trophic groups, functional guilds, *Fagus orientalis*
Abbreviations: Ba – bacterial feeders; Ba_1, Ba_2, Ba_3 and Ba_4 – bacterial feeders from functional guilds with c-p value 1, 2, 3 and 4; BP – Protected Zone "Bjalata prast"; Fu – fungal feeders; Fu_2, Fu_3, Fu_4 and Fu_5 – fungal feeders from functional guilds with c-p value 2, 3, 4 and 5; MR – Protected Zone "Marina reka"; Om – omnivorous; Om_4 and Om_5 – omnivorous from functional guilds with c-p value 4 and 5; Pf – plant feeders; Pf-a – sedentary endoparasites; Pf-d – ectoparasites; Pf-e – epidermal cell and root hair feeders; PR – locality "Propada"; Ca – predators; Ca_2, Ca_3, Ca_4 and Ca_5 – predators from functional guilds with c-p value 2, 3, 4 and 5

Introduction

"Strandzha" Natural Park in southeast Bulgaria is the largest protected territory in the country (1161 km^2). The specific sub-Mediterranean climate is significantly influenced by the Black Sea on the north slopes of the mountain. The average temperature in January is relatively high: 2–3.2°C. The annual precipitation is also relatively high (average between 500–1000 mm) with a well pronounced winter maximum. Forests cover 80% of the park's territory. Many of the plants are relicts of the Tertiary period, preserved because of their remote location with respect to northern glaciations in the Quaternary. More than 56 types of habitats were identified in the park (Biserkov and Gussev, 2011).

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The park's soil nematode fauna was investigated in three different studies (Gateva et al., 1991; Iliev, 1992; Lazarova et al., 1998) and 10 species were reported. Its composition remains largely unknown, since there are currently about 600 soil nematode species reported in the country (Ilieva and Iliev, 2000).

The aim of the present study is to describe the species composition and the trophic and functional structure of the soil nematode communities in three forests with edificator *Fagus orientalis* Lipsky in "Strandzha" Natural Park.

Materials and Methods

Sampling sites

Protected zone "Marina reka" – 250 m a.s.l., N 42°06′41,7″ E 27°45′53″; Soil type: Haplic Alysols; Soil texture: light sand-clay (20–30% of physical clay particles < 0.01 mm after Kachinski, 1970); pH: 4.9 in H_2O; Vegetation: forest of *Oriental beech – Fagus orientalis* Lipsky and Oriental durmast – *Quercus polycarpa* Schur. with dense undergrowth of evergreen bushes of *Rhododendron ponticum* L. and single *Daphne pontica* L., *Ruscus hypoglossum* L., *Cyclamen coum* Mill., and *Lusula* sp.

Protected Zone "Bjalata prust" – 278 m a.s.l., N42°05′47.7″ E27°39′55″; Soil type: Haplic Alysols; Soil texture: light sand-clay (20–30% of physical clay particles < 0.01 mm after Kachinski, 1970); pH: 4.7 in H_2O; Vegetation: *Oriental beech – F. orientalis* with undergrowth of Caucasian whortleberry – *Vaccinium arctostaphylos* L. and pincushion moss – *Leucobryum glaucum* (Hedw.) Angstr.

Location "Propada" – 385; a.s.l., N41°58′54″ E27°29′32″; Soil type: Chromic Cambisols; Soil texture: light to medium sand-clay (20–40% of physical clay particles < 0.01 mm after Kachinski, 1970); pH: 5.3 in H_2O; Vegetation: *Oriental beech – F. orientalis* and single trees of European hornbeam *Caprinus betulus* L., with undergrowth of *D. pontica*, *C. coum*, *Asperula odorata* L., and others.

Sampling, Extraction and Processing

Ten bulk samples were collected in each locality in months IV, VI, VIII, X and XI, 2009 and IV, VI, VIII and X, 2010. Each bulk sample consisted of 10 soil auger subsamples taken at 20 cm depth. Nematodes were extracted from the soil using a modified Bearman method with 72 h exposition (Bezooijen, 2006), counted alive and fixed gently at 50°C with 4% formaldehyde. Up to 200 nematodes per sample were mounted on temporary slides (Paramonov, 1963) for quantitative analysis. The rest of the specimens were mounted on permanent slides in glycerol (Seinhorst, 1959).

Analysis

The diversity of the nematodes in the different localities was assessed. The nematodes were categorized according to their trophic group (Yeates et al., 1993 with corrections of Okada et al., 2002, 2005; Okada and Kadota, 2003) and type of life strategy (Bongers and Bongers, 1998; Bongers, 1999). The similarity between the studied habitats was measured by the Sørensen index (Sørensen, 1957).

Results

In the studied habitats, 134 species of 38 families and 12 orders were identified (Table 1). Nineteen species marked in the Table 1 with "#" are new for the Bulgarian fauna. All of them are rare satelite species. The genus *Kochinema* is also new for the fauna of the country. Ninty four species marked with "*" are new for "Strandzha" park.

The PR habitat is most diverse with 104 species followed by MR with 81 species and BP with 49 species. Only 29 species are common for all habitats.

In the functional guilds, the species diversity and the similarity were variable. For the period of the study, Bf1 were generally represented by juveniles. Four of the 6 identified species were common for the habitats of MR and PR and only one was found in BP. The most diverse guild of bacterial feeders was Bf2 with 23 species, 8 of which were common for all three localities.

Fourty-two species of bacterial feeders were found in the three habitats. The richest guild was Bf2 and the similarity between the studied habitats was relatively high (Table 2). Generally, with respect to the Bf guilds, the MR and PR habitats had more common species in comparison with BP.

Twenty-seven species of fungal fedeers were found in the habitats. The most diverse guild was Fu_2 and again the similarity between the studied habitats was relatively high (Table 2). Only in MR, the guild Fu3 was represented by a single species: *D. vanoyei*. Only two species of the Fu4 guild were common for all studied habitats although the similarity between each couple of sites was relatively high – above 57%.

Twenty-one omnivorous species were established, with Om4 as the richest guild. Again, relavely higher similarity was observed between MR and PR while BP had lower similarity to both of these habitats.

Predatory nematodes comprised 21 species. The diversity in MR and PR was high and these two habitats showed high similarity (100%), while BP was characterized by fewer species and variable similarity levels (Table 2).

Plant feeding nematodes were represented by 21 species and their diversity in the studied habitats was dif-

Table 1

Species list of the established nematodes with number of positives samples at the studied localities, total frequency of occurrence [%] in beech forests of "Strandzha" Park (Trophic groups – Bf – bacterial feeders; Fu – fungal feeders; Om – omnivores; Ca – carnivores; Pf-a – sedentary plant parasites; Pf-d – ectoparasites; Pf-e – epidermal and root hair feeders). (cp = allocation of species to cp groups 1–5)

Trophic group	c-p	Species/Family/Order	Locality			Frequensy, %
			MR	BP	PR	
1	**2**	**3**	**4**	**5**	**6**	**7**
Ordo DORYLAIMIDA Pearse, 1942						
		APORCELAIMIDAE Heyns, 1965				
Om	5	*Aporcelaimellus obtusicaudatus* (Bastian, 1865)	73	69	82	83%
Om	5	**Aporcelaimellus paraobtusicaudatus* (Micoletzky, 1922)	0	14		5.2%
Om	5	**Aporcelaimellus* sp.			38	14%
Ca	5	**Aporcelaimus* cf. (superbus (de Man, 1880)	43	28	41	41.5%
Ca	5	#*Metaporcelaimus labiatus* (de Man, 1880)	23		34	21%
Ca	5	**Metaporcelaimus parangalitzi* (Ilieva et Eliava, 1993)	29		21	19%
Ca	5	**Paraxonchium laetificans* (Andrassy, 1956)	31	13	22	24%
Ca	5	#*Sectonema* cf. *demani* Altherr, 1965	15		23	14.1%
		DORYLAIMIDAE de Man, 1876				
Ca	5	**Mesodorylaimus bastiani* (Buetschli, 1873)	14		22	13.3%
Ca	5	*Mesodorylaimus meyli* (Andrassy, 1958)		14	19	12%
Ca	5	#*Prodorylaimus acris* (Thorne, 1939)	14			5.2%
		LONGIDORIDAE Thorne, 1935				
Pp	5	**Longidorus intermedius* Kozlowska and Seinhorst, 1979	9	11		7.4%
		NORDIIDAE Jairajpuri et Siddiqi, 1964				
Om	4	#*Enchodelus altherri* Vinciguerra et de Francisci, 1973			11	4.1%
Om	4	##*Kochinema longum* Argo et Van den Berg, 1971			14	5%
Pf-d	4	*Pungentus silvestris* (de Man, 1912)	61			22.6%
		NYGOLAIMIDAE Thorne, 1935				
Ca	5	**Nygolaimus brachyuris* (de Man, 1880)	21		17	14.1%
		QUDSIANEMATIDAE Jairajpuri, 1965				
Om	4	**Allodorylaimus andrassyi* (Meyl, 1955)	25		19	16.3%
Om	4	**Ecumenicus monhystera* (de Man, 1880)	31		16	17%
Om	4	#*Epidorylaimus lugdunensis* (De Man, 1880)	21	12	16	18.1%
Om	4	**Eudorylaimus iners* Bastian, 1865	9			3%
Om	4	#*Eudorylaimus jurassicus* (Altherr, 1953)			12	4.4%
Om	4	#*Eudorylaimus* cf. (paramonovi Eliava et Bagaturia, 1968)			7	3%
Om	4	**Eudorylaimus similis* (de Man, 1876)	14			5.2%
Om	4	**Eudorylaimus* sp.1	8	13	15	13%
Om	4	**Eudorylaimus* sp.2		7		2.6%
Om	4	#*Microdorylaimus modestus* (Altherr, 1952)	18		23	15%
Om	4	**Microdorylaimus parvus* (de Man, 1880)	26		21	17.4%
Om	4	**Takamangai ettersbergensis* (De Man, 1885)	32			12%
Om	4	#*Takamangai rhopalocercus* (de Man, 1876)			13	4.8%
		TYLENCHOLAIMIDAE Siddiqi, 1969				
Fu	4	**Tylencholaimus minimus* de Man 1876			37	13.7%
Fu	4	**Tylencholaimus mirabilis* (Buetschli, 1873)	29	17		17%
Fu	4	#*Tylencholaimus proximus* Thorne, 1939			13	4.8%

* new record for the Strandja region
# new record for the Bulgarian fauna

Table 1 **continued**

1	2	3	4	5	6	7
Fu	4	#*Tylencholaimus teres* Thorne, 1939	32	19	51	38%
Fu	4	#*Tylencholaimus terrestris* Peña-Santiago & Coomans, 1996	18	6	33	21.1%
Ordo MONONCHIDA Jairajpuri, 1969						
		ANATONCHIDAE Jairajpuri, 1969				
Ca	4	**Anatonchus* sp.			11	4.1%
Ca	4	*Miconchus studeri* (Steiner, 1914)	41	17	22	29.6%
		MONONCHIDAE Filipjev, 1934				
Ca	4	*Clarcus papillatus* (Bastian, 1865)	77	51	61	70.0%
Ca	4	**Coomansus parvus* (de Man, 1880)		22	37	21.9%
Ca	4	**Prionchulus muscorum* (Dujardin, 1845)		33	39	26.7%
		MYLONCHULIDAE Jairajpuri, 1969				
Ca	4	*Mylonchulus brachyuris* (Buetschli, 1873)	14		17	11.5%
Ca	4	**Mylonchulus sigmaturus* (Cobb, 1917)	31			11.5%
Ca	4	#*Mylonchulus sigmaturellus* Mulvey, 1961	16			5.9%
Ordo TRIPLONCHIDA Cobb, 1920						
		DIPHTEROPHORIDAE Micoletzky, 1922				
Fu	3	**Diphterophora vanoyei* de Coninck, 1931	12			4.4%
		PRISMATOLAIMIDAE Micoletzky, 1922				
Bf	3	**Prismatolaimus intermedius* (Buetschli, 1873)	19	21	17	21.1%
		TRIPYLIDAE de Man, 1876				
Ca	3	**Tripyla affinis* de Man, 1880	8	13	16	13.7%
Ca	3	*Tripyla filicaudata* de Man, 1880	19		9	10.4%
Ca	3	**Tripyla glomerans* Bastian, 1865			15	5.6%
Ca	3	**Tripyla infia* Brzeski & Winiszewska-Slipinska 1993	7	2		3.3%
Ca	3	*Tripyla setifera* Buetschli, 1873			13	4.8%
Ca	3	**Tripylella intermedia* (Butschli, 1873)		8		3.0%
Ca	3	#*Trischistoma monohystera* Andrássy 1967			6	2.2%
Ordo AREOLAIMIDA de Coninck et Shc. Stekhoven, 1933						
		DIPLOPELTIDAE Filipjev, 1918				
Bf	3	*Cylindrolaimus communis* de Man, 1880	21		9	11.1%
Ordo CHROMADORIDA Chitwood, 1933						
		ACHROMADORIDAE Gerlach & Riemann, 1973				
Bf	3	**Achromadora micoletzkyi* (Stefanski, 1915)	5			1.9%
Bf	3	#*Achromadora pseudomicoletzkyi* van der Linde, 1938			4	1.5%
Ordo ENOPLIDA Chitwood, 1933						
		ALAIMIDAE Micoletzky, 1922				
Bf	4	**Alaimus parvus* Thorne, 1939	22		10	11.9%
Bf	4	**Alaimus primitivus* De Man, 1880	16		19	13.0%
Bf	4	#*Paramphidelus uniformis* (Thorne, 1939)			21	7.8%
Ordo MONHYSTERIDA de Coninck et Sch. Stekhoven, 1933						
		MONHYSTERIDAE de Man, 1876				
Bf	3	*Eumonhystera* cf (filiformis (Bastian, 1865)			12	4.4%
Bf	3	**Geomonystera villosa* (Buetschli, 1873)	41	36	61	51.1%

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Table 1 **continued**

1	2	3	4	5	6	7
Ordo DESMODORIDA de Coninck, 1965						
		DESMODORIDAE Filipjev, 1922				
Bf	3	*Prodesmodora circulata* (Micoletzky, 1913) Micoletzky, 1925			8	3.0%
Ordo PLECTIDA Malakhov, 1982						
		AULOLAIMIDAE Jairajpuri & Hooper, 1968				
Bf	3	**Aulolaimus oxycephalus* de Man, 1880			31	11.5%
		BASTIANIDAE De Coninck, 1935				
Bf	3	**Bastiania gracilis* De Man, 1876		25	17	15.6%
		ODONTOLAIMIDAE Gerlach et Riemann, 1974				
Bf	3	**Odontolaimus chlorurus* de Man, 1880			21	7.8%
		PLECTIDAE Örley, 1880				
Bf	2	**Anaplectus granulosus* (Bastian, 1865)		31	26	21.1%
Bf	2	**Ceratoplectus armatus* (Bütschli, 1873)	0	22	41	23.3%
Bf	2	**Ceratoplectus assimilis* (Bütschlii, 1873)	0	19		7.0%
Bf	2	#*Chiloplectus andrassyi* (Timm, 1971)	27		15	15.6%
Bf	2	**Plectus acuminatus* Bastian, 1865	41	19	59	44.1%
Bf	2	*Plectus cirratus* Bastian, 1865	18	22	31	26.3%
Bf	2	**Plectus geophilus* de Man, 1880		14	9	8.5%
Bf	2	**Plectus longicaudatus* Buetschli, 1873	44	27	48	44.1%
Bf	2	**Plectus minimus* Cobb,1893	14		21	13.0%
Bf	2	**Plectus parietinus* Bastian, 1865			19	7.0%
Bf	2	**Plectus parvus* Bastian, 1865	21	17	34	26.7%
Bf	2	**Plectus rhizophilus* de Man, 1880	13	6		7.0%
Bf	2	**Tylocephalus auriculatus* (Buetschli, 1873)		16	20	13.3%
		TERATOCEPHALIDAE Andrassy, 1958				
Bf	3	**Teratocephalus costatus* Andrassy, 1958	14		9	8.5%
Bf	3	**Teratocephalus terrestris* (Buetschli, 1873)		8		3.0%
Ordo RHABDITIDA Chitwood, 1933						
		CEPHALOBIDAE Filipjev, 1934				
Bf	2	**Acrobeles ciliatus* Linstow, 1877	29		21	18.5%
Bf	2	**Acrobeloides nanus* (de Man, 1880) Anderson, 1968	38	45	51	49.6%
Bf	2	#*Acrobelophis minimus* (Thorne, 1925) Andrássy, 1984	13			4.8%
Bf	2	**Cephalobus persegnis* Bastian, 1865	21		30	18.9%
Bf	2	**Eucephalobus mucronatus* (Kozlowska & Roguska-Wasilewska, 1963) Andrássy, 1967	24	33	51	40.0%
Bf	2	**Eucephalobus oxyuroides* (de Man, 1876) Steiner, 1936	14	22	29	24.1%
Bf	2	**Heterocephalobus elongatus* (de Man, 1880) Andrassy, 1967	31	20		18.9%
Bf	2	**Stegelletina devimucronata* (Sumenkova, 1964) Bostroem et de Ley, 1996			15	5.6%
		NEODIPLOGASTRIDAE Paramonov, 1952				
Bf	1	*Fictor fictor* (Bastan, 1965) Paramonov, 1957			17	6.3%
Bf	1	**Pristionchus lheritieri* (Maupas, 1919) Paramonov, 1952	8		19	10.0%
		PANAGROLAIMIDAE Thorne, 1937				
Bf	1	**Panagrolaimus multidentatus* (Ivanova, 1958) (Ivanova, 1976)	4		12	5.9%
Bf	1	**Panagrolaimus rigidus* (Schneider, 1866) Thorne, 1937	18		13	11.5%
		RHABDITIDAE Orley, 1880				

* new record for the Strandja region
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Table 1 **continued**

Bf	1	**Mesorhabditis spiculigera* (Steiner, 1936) Dougherty, 1953	31	36	29	35.6%
Bf	1	**Rhabditis terricola* Dujardin, 1845	8			3.0%
Bf	1	#*Ablechroiulus* sp.	6	10		5.9%
		STEINERNEMATIDAE Filipjev, 1934				
IvS		*Steinernema* sp.	41	8	19	25.2%
Ordo APHELENCHIDA Siddiqi, 1980						
		APHELENCHIDAE Fuchs, 1865				
Fu	2	**Aphelenchus avenae* Bastian, 1865			31	11.5%
		APHELENCHOIDIDAE (Scarbilovich, 1947) Paramonov, 1953				
Fu	2	**Aphelenchoides composticola* Franklin, 1957	23			8.5%
Fu	2	**Aphelenchoides saprophilus* Franklin, 1957	18	11	29	21.5%
Fu	2	**Aphelenchoides ritzemabosi* (Schwartz, 1911) Steiner et Buhrer, 1932			7	2.6%
Fu	2	**Aphelenchoides* sp.1	25		12	13.7%
		PARAPHALENCHIDAE Goodey, 1951				
Fu	2	**Paraphelenchus pseudoparietinus* (Micoletzky, 1922) Micoletzky, 1925			22	8.1%
Ordo TYLENCHIDA Thorne, 1949						
		ANGUINIDAE Nicoll, 1935				
Fu	2	**Ditylenchus acutus* (Khan, 1965) Fortuner et Maggenti, 1987	31	45	19	35.2%
Fu	2	**Ditylenchus brevicauda* (Micoletzky, 1925) Filipjev, 1936			16	5.9%
Fu	2	**Ditylenchus intermedius* (de Man, 1880) Filipjev, 1936	19		28	17.4%
Fu	2	**Ditylenchus myceliophagus* Goodey, 1958	31	22	41	34.8%
Fu	2	#*Ditylenchus longicauda* Choi & Geraert, 1988	22			8.1%
Fu	2	#*Ditylenchus longimatricalis* (Kazachenko, 1975) Brzeski, 1984	42	13	30	31.5%
Fu	2	**Ditylenchus* sp.1			6	2.2%
Fu	2	**Ditylenchus* cf. (*anchilisposomus* (Tarjan, 1958) Fortuner, 1982)			18	6.7%
Fu	2	**Ditylenchus* sp.3			4	1.5%
Fu	2	**Ditylenchus* sp.4			3	1.1%
		BELONOLAIMIDAE Whitehead, 1960				
Pf-d	3	**Geocenamus microdorus* (Geraert, 1966) Brzeski, 1991	41		69	40.7%
Pf-d	3	**Geocenamus nothus* (Allen, 1955) Brzeski, 1991			34	12.6%
		CRICONEMATIDAE Taylor, 1936				
Pf-d	3	**Criconema* sp.			4	1.5%
Pf-d	3	**Ogma menzeli** (Stefanski, 1924) Sch. Stekhoven et Teunissen, 1938		24		8.9%
Pf-d	3	#**Ogma murrayi** Southern, 1914	12			4.4%
Pf-d	3	***Ogma** sp.		9		3.3%
		HETERODERIDAE Filipjev et Sch. Stekhoven, 1941				
Pf-a	3	**Meloidogyne* sp			26	9.6%
		NEOTYLENCHIDAE Thorne, 1941				
Iv/Fu	2	**Deladenus durus* (Cobb, 1922) Thorne, 1949			7	2.6%
		TYLENCHULIDAE Scarbilovich, 1947				
Pf-d	2	**Gracilacus goodeyi* (Oostenbrink, 1953) Raski, 1962	15		37	19.3%
		TYLENCHIDAE Orley, 1880				
Pf-e	2	**Aglenchus agricola* (de Man, 1884) Meyl, 1961	18			6.7%
Pf-e	2	**Basiria duplexa* (Hagemeyer & Allen, 1952) Geraert, 1968	22		30	19.3%
Pf-e	2	#*Basiria flandriensis* Geraert, 1968	12		2	5.2%
Pf-e	2	**Basiria graminophila* Siddiqi, 1959			38	14.1%

* new record for the Strandja region
\# new record for the Bulgarian fauna

Table 1 **continued**

Pf-e	2	**Basiria* sp.			7	2.6%
Pf-e	2	**Boleodorus thylactus* Thorne 1941	11			4.1%
Pf-e	2	**Boleodorus volutus* Lima et Siddiqi, 1963			14	5.2%
Fu	2	**Filenchus discrepans* (Andrassy, 1954) Raski et Geraert, 1986	51	29	67	54.4%
Fu	2	**Filenchus misellus* (Andrássy, 1958) Raski & Geraert, 1987	41			15.2%
Fu	2	#*Filenchus quartus* (Szczygiel, 1969) Lownsbery et Lownsbery, 1985	24	31	24	29.3%
Fu	2	**Filenchus* sp.			1	0.4%
Fu	2	**Filenchus vulgaris* (Brzeski, 1963) Lownsberry et Lownsberry, 1985	17		9	9.6%
Pf-e	2	**Lelenchus leptosoma* (de Man, 1880) Meyl, 1961	12		25	13.7%
Pf-e	2	#*Malenchus andrassyi* Merny, 1970		19		7.0%
Pf-e	2	**Malenchus bryophilus* (Steiner, 1914) Andrassy, 1980	37	39	29	38.9%
Pf-e	2	**Neopsilenchus magnidens* (Thorne, 1949) Thorne et Malek, 1968	12		52	23.7%

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Table 2

Similarity of the species in the different functional guilds and trophic groups in the three studied habitats

Guild	Total number of species in the guild	Sørensen index for each couple of habitats			Common species for all habitats
		MR/BP	MR/PR	BP/PR	
Bf1	6	33%	80%	33%	2
Bf2	23	67%	59%	71%	8
Bf3	10	29%	50%	36%	1
Bf4	3	0%	80%	0%	0
Fu2	21	67%	60%	50%	6
Fu3	1	0%	0%	–	0
Fu4	5	67%	57%	57%	2
Om4	18	27%	58%	35%	2
Om5	3	67%	67%	50%	1
Ca3	7	67%	50%	25%	1
Ca4	8	44%	55%	80%	2
Ca5	6	50%	100%	50%	2
Pf-a	1	–	–	–	0
Pf-b	0	–	–	–	
Pf-c	0	–	–	–	
Pf-d	9	25%	44%	0%	0
Pf-e	11	22%	53%	20%	1
IvS	2	100%	67%	67%	1

ferent. Again MR and PR were characterized by more ectoparasites and root hair feeders than BP. Perhaps this was a result of the less diverse, scarcer undergrowth in the BP forest. In MR, there are small grasses and dense bush vegetation. In PR, the grass vegetation is richer. Nevertheless, several groups of plant parasitic nematodes which are common in both antropogenic and natural habitats in Bulgaria were absent from all of studied localities (e.g. species of Hoplolaimidae and Pratylenchidae.). Perhaps there are no host plants of these groups on the studied sites and/or the specific edafic conditions are not suitable for their development.

Discussion

In previous studies of the soil nematode fauna of the park, Gateva et al. (1991) reported 7 species of family Criconematidae but most of them were in different habitats and localities and only *Ogma menzeli* was found again. Iliev (1992) and Lazarova et al. (1998) reported 3 species of *Tripyla* and in the present study *T. filicaudata* and *T. setifera* were confirmed. Several other species were reported from Veleka River which passes through the territory of the park (Stoychev et al., 2011).

The soil nematode communities in the studied beech forest habitats are less diverse in comparison with habitats in Slovakia (Háněl and Čerevková, 2010, 2010) or similar in diversity (Popovici, 1989; Alphei, 1998) but distinct for the Strandzha region. The specific soil type established in MR and BP (Haplic Alysols) is generally very rare in Europe and its nematode fauna is unknown. The above ground vegetation also differs with regard to the edificatory species (*F. orientalis*), the undergrowth vegetation (evergreen tertiary relicts such as *Rhododendron ponticum, Daphne pontica*, *Vaccinium arctostaphylos)* and the generally poor grass cover. More diverse communities of nematodes are expected in other habitats (oak and mixed forests; pastures) and the relative nematode diversity in "Strandzha" Park should be at least twice higher than the one confirmed in the present study.

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