NEMATODES OF THE SEDIMENT/SOIL INTERFACE IN THE LOWER PRUT

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Abstract. Species and trophic composition of nematode communities, their abundance and spatial distribution of the sediment/soil interface in the Lower Prut (near village Chislita-Prut) were studied. The nematode abundance strongly varied 39.6 – 570.0 ind. thousands m^{-2}. Fifty one species belonging to 42 genera, 27 families and 8 orders were identified. Families Dorylaimidae, Cephalobidae, Tylenchidae and Telotylenchidae are represented by more species and occupied almost the entire sampling area. Higher species diversity of nematodes was noted in the terrestrial than in aquatic samples. A third of the species found in aquatic area belong to taxa, which apparently developed and radiated under terrestrial conditions. Three species were the most frequent and abundant in deep water – *Brevitobrilus stefanskii*, *Panagrolaimus hygrophilus* and *Bursilla monhystera*. The species *Tripyla glomerans, Diplogaster rivalis* and *Chronogaster typicus* are the typical species for freshwater conditions, however their populations were not numerous in deep water. The species from the families Discolaimidae, Leptonchidae, Diploscapteridae, Anguinidae, Hoplolaimoidae, Pratylenchidae, Paratylenchidae were found only in the terrestrial area. Bacterial feeders were the most numerous in the sampling area. Ecological indexes such as species diversity (Shannon-Weaver), species richness (Margalef) and Maturity index (Bongers) were high in the case of nematode communities from the terrestrial habitats.

Keywords: freshwater and terrestrial nematodes, species and trophic composition, abundance, spatial distribution, biodiversity indices, the Lower Prut.

Rezumat. Nematode din sediment/sol şi interacţiunea lor în cursul inferior al râului Prut. Au fost studiate speciile şi compoziţia trofică a comunităţilor de nematode, abundenţa şi distribuţia spaţială a interferenţei sediment/sol, din Prutul Inferior (Chişliţa-Prut). Abundenţa nematodelor variază puternic, de la 39,6 până la 579 mii ind. m^{-2}. Au fost identificate cincizeci şi una specii aparţinând la 42 de genuri, 27 familii şi 8 ordine. Familiile Dorylaimidae, Cephalobidae, Tylenchidae şi Telotylenchidae sunt reprezentate printr-un număr mare de specii şi sunt întâlnite practic pe întreaga zonă studiată. Diversitatea cea mai înaltă a nematodelor a fost identificată pentru probele de sol. Cca. o treime din numărul total de specii de nematode detectate în zona acvatică fac parte din speciile ce se dezvoltă în mediul terestru. Cele mai frecvente şi abundente trei specii pentru probele acvatice au fost: *Brevitobrilus stefanskii*, *Panagrolaimus hygrophilus* şi *Bursilla monhystera*. Speciile *Tripyla glomerans*, *Diplogaster rivalis* şi *Chronogaster typicus*, ce sunt tipice pentru condiţiile mediului acvatic totuşi, nu sunt reprezentate printr-un număr sporit. Speciile ce aparţin familiilor Leptonchidae, Diploscapteridae, Anguinidae, Hoplolaimoidae, Pratylenchidae, Paratylenchidae au fost identificate doar în probele terestre. Bacteriofagii reprezintă grupa cea mai numeroasă pentru zona studiată. Indicii ecologici ca: diversitatea specifica (Shannon), „bogăţia de specii” (Margalef) şi indicele maturităţii (Bongers) au avut parametrii înalţi pentru habitatele terestre.

Cuvinte cheie: nematodele terestre şi acvatice, specii şi compoziţia trofică, abundenţa, distribuţia spaţial, indicii biodiversităţii, Prutul Inferior.

INTRODUCTION

Nematodes are one of the most diverse, abundant and ubiquitous taxa in micro-meiofauna of freshwater ecosystems. They occur in all substrata, soil and sediment types (GIERE, 1993; BARBUTO & ZULLINI, 2005 etc.). High abundance, species richness, diverse functional morphology (especially with regard to feeding type) and short life cycles are important features, making them useful subject for ecological study (PLATT & WARWICK, 1980; BONGERS & FERRIS, 1999). Nematodes can reflect the pollution status of aquatic systems (BONGERS & FERRIS, 1999), their grazing activities can influence microbial activity (GOEDKOOP et al., 1997; TRAUNSPURGER et al., 1997), and their food preferences can alter food webs (PLATT & WARWICK, 1980; BERGTOLD et al., 2005). An explanation for the coexistence of many nematode species could be the high variability in their morphology especially the buccal cavity. Moreover, due to their short life cycle and high turnover rates, nematodes respond rapidly to changes in food availability (BONGERS, 1990, 1999; BONGERS & HAAR, 1998; MICHIELS & TRAUNSPURGER, 2005, 2005a etc.).

Nematodes within the river-influenced littoral area seemed to be adapted to frequent changes in their habitats (OLSEN & TOWNSEND, 2005; DOLE-OLIVER et al., 1997; DOWNES, 1990), and the relative abundances of different feeding types may be influenced by changes in the nature and abundance of biotic and abiotic river-borne particulates (LAYBOURN-PARRY & WOOMBS, 1998; WITTHÖFT-MÜHLMANN et al., 2005, 2006). Knowledge of nematode' assemblages under various environmental factors are necessary for understanding the conditions of survival, stability and ultimately their use as bioindicators of the health of freshwater ecosystems.

The aim of this study is to provide basic information (nematodes species composition, their spatial distributions, abundance, feeding types and biodiversity indices) about the nematode communities in sediment/soil interface by influence of the different environmental conditions along the transboundary Prut River. The present paper devoted to studying the freshwater and terrestrial nematode communities of the Lower Prut is a part of a long-term research.

MATERIALS AND METHODS

Sampling locality

The Prut River is the last large tributary of the Danube River with an annual water discharge of about 2.9 km^3; nowadays, its length of 695 km forms the border between R. Moldova and Romania. It has a hydrographic basin of 27,500 sq km, 7,790 of which in R. Moldova. The studied sample site is 40 km from the Prut River mouth, near the village Chislita-Prut ($45^0$32'814"N, $28^0$09'874"E); river water contact is strong flood event.

Site characteristics

At the study time (autumn 2005) the abiotic parameters of the river in the sampling site exhibited temporal variability. The temperature was 24.2-25.4ºC in water and 22.0-24.4ºC in soil; pH constituted 7.88-8.03 in water and 7.20-7.24 in soil; water content was 38.94% in sediment; soil humidity was 21.81%; organic matter comprised 3.1% in sediment whereas in soil, it ranged from 2.2-2.4%. Dissolved oxygen levels were quite low in water – 5.98 µg/g; suspended matter amounted to 24.4 µg/g (i.e. below the average river level), out which mineral fraction comprised 20 µg/g, whereas organic one – 4.4 µg/g. The levels of nutrients were higher in sediment water than in water. The granulometric parameters of sediment and soil of the river bank showed the predominance of the fractions 0.010 – 0.050 mm (30.3% - soil and 45.9% - sediment) and 0.005 – 0.010 mm (19.9% - soil and 23.6% - sediment), hence silt and clay content. All physical-chemical data of the sampling site have been done by Prof. E. ZUBCOV, Laboratory of Hydrobiology and Ecotoxicology, the Institute of Zoology ASM.

Sampling and processing

Nematode samples were collected in the Prut River (Chislita-Prut) in the autumn of 2005. The sampling site was divided into 24 squares (each square of 2m per 2m) with three distances from water/soil edge (0 – 2 m, 2 – 4 m, 4 – 6 m) in terrestrial area and same distance in aquatic area to the water depth of 80 - 100 cm (Fig. 1). The border line between terrestrial and aquatic areas was chosen conditionally. It is necessary to notice that the pouring rains have displaced natural water/soil edge. Thus, the riverbank with grasses could get in the aquatic sampling squares (A1 – A8) and riverbed (A9 –A12). In each sampling squares a sample included 4 subsamples (using a steel soil core with 25 mm diameter to a depth 5 cm and a plastic core tube with 25 mm diameters for sediment samples). Nematodes were extracted by sieving and decanting using standard methods of brass screens (60, 100, 325 and 500 mesh) and Baermann funnels and fixed in 4% formaldehyde. Nematodes were transferred to glycerin solution by Seinhorst (HALL et al., 1996), mounted on slides and identified to species level following NESTEROV (1979), NICKLE (1991), JAIRAJPURI (1992), GAGARIN (1992, 2001), LOOF (1999), SIDDIQI (2000), ZULLINI (1982, 2005), ANDRASSY (1992, 2005, 2007, 2009), EYUALEM-ABEBE et al., (2006). The slide collection with data of sampling sites and species is stored at the Institute of Zoology ASM. Classification of Phylum *Nematoda* accepted in the "Fauna Europaea" database (www.faunaeur. org) was used.

Terrestrial area				**Aquatic area**		
4 – 6 m	**2 – 4 m**	**0 – 2 m**		**0 – 2 m**	**2 – 4 m**	**4 - 6 m**
T9 489.2 ind. 23 species	**T5** 89.2 ind. 18 species	**T1** 425.6 ind. 15 species	↑	**A1** 39.6 ind. 13 species	**A5** 73.8 ind. 15 species	**A9** 40.0 ind. 17 species
T10 294.4 ind. 19 species	**T6** 570.0 ind. 23 species	**T2** 195.8 ind. 14 species	**WATERCOURSE**	**A2** 325.0 ind. 10 species	**A6** 125.6 ind. 8 species	**A10** 60.0 ind. 15 species
T11 414.0 ind. 20 species	**T7** 56.4 ind. 13 species	**T3** 530.0 ind. 21 species		**A3** 142.0 ind. 12 species	**A7** 88.6 ind. 8 species	**A11** 89.2 ind. 19 species
T12 370.6 ind. 20 species	**T8** 257.0 ind. 19 species	**T4** 193.8 ind. 15 species	↑	**A4** 214.6 ind. 12 species	**A8** 41.0 ind. 12 species	**A12** 205.0 ind. 17 species
Aver±Stand_dev 392.05±81.49	Aver±Stand_dev 305.4±244.02	Aver±Stand_dev 336.3±168.86		Aver±Stand_dev 227.2±92.15	Aver±Stand_dev 82.25±35.08	Aver±Stand_dev 98.75±73.78

Figure 1. Schema of sampling (The Lower Prut, near the village Chislita-Prut): A- aquatic area (A1-A12), T – terrestrial area (T1-T12); data into each square: abundance of nematodes (individuals $x10^3$ m^{-2})/number of nematode species

Figura 1. Schema colectării probelor (cursul inferior al râului Prut, Câslița-Prut): A – zona acvatică (A1-A12), T – zona uscatului (T1-T12); date incluse pentru fiecare pătrat: abundența nematodelor (indivizi x $10^3 m^{-2}$), numărul de specii de nematode.

Data analysis

Nematode abundance (number of individuals per sq m) of each species and communities in soil and sediment was quantified, as well the number of taxa, and basic indices such as the species diversity by Shannon-Weaver (H') index, species richness by Margalef (D) index, evenness by Pielou (E) (MAGURRAN, 1991). Maturity Index (MI) for nematode communities is determined on the basis of faunal composition and differences in the sensitivity of taxa to stress. Taxonomic units (genera and families) are classified into 5 groups, each with differing life-strategy, from colonizers (r-strategists) to persisters (K-strategists) (BONGERS, 1990, 1999; BONGERS et al., 1998; WASILEWSKA, 1997). Based on morphological characteristics of the buccal cavity and on the gut content the identified nematodes were classified (YEATES et al., 1993; TRAUNSPURGER, 1997) into the following trophic types: bacterial feeders, algae feeders, hyphal feeders, plant feeders, omnivorous and predatory. The nematode communities of a river were analyzed by ecological groups (GAGARIN, 2001): hydrobionts including true hydrobionts, freshwater saprobionts and phytoparasitic nematodes of freshwater macrophytes; amphibionts and edaphobionts adapted for the terrestrial conditions and appear in the water casually.

RESULTS AND DISCUSSIONS

Nematode community composition, diversity and abundance

The species and trophic compositions of nematodes communities of riverbank, their number and spatial distribution were under the influence of environmental conditions especially abiotic factors. The density of nematodes strongly varied, 39.6 – 325.0 individuals $x10^3m^{-2}$ with number of species 8 – 15 in the riverbank covered by water (A1 – A8) and 56.4 – 570.0 ind. $x10^3m^{-2}$ with 13 – 23 species in the riverbank without water (T1 –T12). In the riverbed (A9 – A12), the number of species - 15 – 19 and their density - 40.0 – 205.0 ind. $x10^3m^{-2}$ were revealed (Fig. 1).

A total of 51 nematode species belonging to 42 genera, 27 families and 8 orders were identified (Table 1). Most numerous by species and their number were the orders *Dorylaimida* (14 species), *Rhabditida* (12) and *Tylenchida* (15), followed by *Plectida* (3 species), *Aphelenchida* (2), *Triplonchida* (2), *Monhysterida* (1), and *Mononchida* (1). The families *Dorylaimidae*, *Cephalobidae*, *Tylenchidae*, and *Telotylenchidae* are presented by more species and occupied almost the entire sampling area. Higher diversity of nematodes was noted in the terrestrial samples (37 species) than in aquatic (32) ones. A third of the species found in aquatic area belong to taxa, which apparently developed and radiated under terrestrial conditions. Three species were the most frequent and abundant in deep water (A9 – A12) –*Brevitobrilus stefanskii, Panagrolaimus hygrophilus,* and *Bursilla monhystera*. The species *Tripyla glomerans, Diplogaster rivalis,* and *Chronogaster typicus* are the typical species for freshwater conditions; however their populations were not numerous in deep water. Species from the families *Discolaimidae, Leptonchidae, Diploscapteridae, Anguinidae, Hoplolaimoidae, Pratylenchidae, Paratylenchidae* were found only in the terrestrial area.

The species *Mesodorylaimus pseudobastiani, Ecumenicus monohystera, Filenchus misellus, Bitylenchus dubius, Bursilla monhystera, Acrobeloides nanus,* and *Eucephalobus mucronatus* were common and numerous in all habitats.

Table 1. List of the nematode species from the aquatic/terrestrial interface of the Lower Prut (including abundance - thousands m^{-2}, number of species, ecological indexes and trophic groups)

Tabel 1. Lista faunistică a speciilor de nematodelor a interferenţei sediment/sol a cursului inferior al râului Prut (ce include abundenţa – mii m^{-2}, numărul de specii, indecii ecologici şi gruparea trofică).

Families/Species	Trophic group/ Ecologic group	Aquatic area			Terrestrial area		
		Distance from edge water/soil					
		4-6 m (A9-A12)	2-4 m (A5-A8)	0-2 m (A1-A4)	0-2 m (T1-T4)	2-4 m (T5-T8)	4-6 m (T9-T12)
Tobrilidae							
Brevitobrilus stefanskii (MICOLETZKY 1925)	EF/HB	5.2-13.2	-	-	-	-	-
Tripylidae							
Tripyla glomerans (BASTIAN 1865)	PR/HB	-	3.0	-	-	-	-
Dorylaimidae							
Mesodorylaimus bastiani (BUTSCHLI 1873)	OM/AB	-	-	-	6.8-11.2	8.4	-
M. litoralis LOOF 1969	OM/AB	0.8	2.0-5.8	4.4-34.8	4.8-15.6	3.2-12.0	-
M. mesonyctius (KREIS 1930)	OM/AB	-	1.6	3.4-16.6	-	-	-
M. pseudobastiani LOOF 1969	OM/AB	2.0-7.6	5.4-45.6	9.0-30.0	8.8-13.8	12.8-23.0	-
Aporcelaimidae							
Aporcelaimellus obscurus (THORNE & SWANGER 1936)	OM/AB	-	1.0-7.2	2.2-19.2	3.2-12.6	1.2-8.8	6.4-7.2
Nordiidae							
Dorydorella pratensis (DE MAN 1880)	OM/AB	4.8	-	2.4	6.2-18.4	2.0	-
Pungetus marietani ALTHERR 1950	OM/AB	-	-	-	-	5.2	-
Quidsinematidae							
Ecumenicus monohystera (DE MAN 1880)	OM/AB	0.4-3.6	8.0	-	21.2	1.0-7.0	4.2-10.8
Eudorylaimus acuticauda (DE MAN 1880)	OM/AB	3,6	9,6	2,6-17,6	-	-	-
E. iners (BASTIAN 1865)	OM/AB	-	-	-	-	-	14,0
Thonus solus (ANDRASSY 1962)	OM/EB	-	-	-	4.4-12.8	3.8-11.4	5.0-11.4
Thornia steatopyga (THORNE & SWANGER 1936)	OM/EB	3.8	2.6	-	5.4	-	-
Discolaimidae							
Discolaimus major THORNE 1939	PR/EB	-	-	-	4.0	2.6	9.6
Leptonchidae							
Doryllium uniforme COBB 1920	FF/EB	-	-	-	7.0-10.6	-	15.0
Mononchidae							
Mononchus aquaticus COETZEE 1968	PR/HB	0.4	-	-	-	-	-
Rhabditidae							
Bursilla monhystera (BUTSCHLI 1873)	BF/AB	1.2-6.4	2.8-19.6	9.6-23.2	7.8-8.8	17.2-52.8	25.2

Poikilolaimus oxycerca (DE MAN 1895)	BF/AB	-	-	-	-	28.6	12.4-16.4
Diploscapteridae *Diploscapter rhizophilus* RAHM 1928	BF/EB	-	-	-	17.8	3.6-17.6	23.0
Cephalobidae *Acrobeles complexus* THORNE 1925	BF/EB	-	-	-	-	-	20,6
Acrobeloides nanus (DE MAN 1880)	BF/EB	8.8-21.0	3.2-24.4	1.4-56.4	14.0-52.0	4.8-25.0	25.8
Cephalobus persegnis (BASTIAN 1865)	BF/EB	1.2-15.6	2.0	-	21.0-23.8	28.0	21.2
Chiloplacus propinquus (DE MAN 1921)	BF/EB	-	-	-	12.2-21.4	9.8-32.8	16.0-17.8
Eucephalobus mucronatus (KOZLOWSKA & ROGUSKA-WASILEVSKA 1963)	BF/EB	4.8-31.6	6.0-15.0	2.8-45.4	13.2-33.0	4.2-35.2	18.6-50.4
Heterocephalobus elongates (DE MAN 1880)	BF/EB	1.4-4.4	4.8	2.2	12.4-18.2	5.2-23.2	14.6
Panagrolaimidae *Panagrolaimus hygrophilus* (BASSEN 1940)	BF/HB	1.6-22.4	2.6-15.4	4.4-15.6	-	-	-
P. rigidus (A.SCHNEIDER 1866)	BF/AB	-	-	-	-	15.6-22.0	16.8-38.4
Diplogasteridae *Diplogaster rivalis* (LEYDIG 1854)	BF/HB	11.0	-	-	-	-	-
Plectidae *Anaplectus granulosus* (BASTIAN 1865)	BF/AB	0.8-11.0	-	-	-	-	-
Plectus tenuis BASTIAN 1865	BF/AB	0.8-7.2	2.0	9.0	-	-	-
Chronogastridae *Chronogaster typica* (DE MAN 1921)	BF/HB	0.8	-	-	-	-	-
Monhysteridae *Geomonhystera villosa* (BUTSCHLII 1873)	BF/HB	2.8-8.2	-	-	-	-	-
Tylenchidae *Filenchus misellus* (ANDRASSY 1958)	PP/EB	4.4-5.6	3.8	4.0-32.4	11.0-57.0	4.8-32.0	22.8-32.4
F. orbus (ANDRASSY 1954)	PP/EB	-	-	-	-	3.6-15.6	24.8
F. thornei (ANDRASSY 1958)	PP/EB	1.8-5.2	1.8-16.8	2.4-21.6	16.0-43.0	5.2-37.6	10.8-32.0
Tylenchus davainei BASTIAN 1865	PP/EB	3.2-8.4	-	2.8-19.8	15.8-33.4	4.0-23.4	9.4-17.0
Cephalenchus leptus SIDDIQI 1963	PP/EB	-	-	-	-	5.8	-
Anguinidae *Ditylenchus myceliophagus* GOODEY 1958	PP/EB	-	-	-	13.2-19.4	4.4-17.0	10.0
D. intermedius (DE MAN 1880)	PP/EB	-	-	-	-	6,0-13,0	-
Hoplolaimidae *Helicotylenchus erythrinae* (ZIMMERMANN 1904)	PP/EB	-	-	-	-	5.0-19.6	17.8
Rotylenchus capitatus EROSHENKO 1981	PP/EB	-	-	16.4	15.6-34.8	4.6	21.0
Paratylenchidae *Paratylenchus nanus* COBB 1923	PP/EB	-	-	-	-	13.6	16.8-21.2
Pratylenchidae *Pratylenchoides* sp.	PP/EB	-	-	-	-	-	11.8
Telotylenchidae *Amplimerlinius socialis* (ANDRASSY 1962)	PP/EB	6.8	-	22.4	-	30.6	26.8-30.6
Bitylenchus dubius (BUTSCHLII 1873)	PP/EB	2.0-20.6	1.6-13.6	2.8-51.0	17.6-32.4	7.2-56.0	28.8-29.4
Tylenchorhynchus sp.	PP/EB	-	-	18.8	16.8-38.8	15.6	-
Psilenchidae *Psilenchus hilarulus* DE MAN 1921	PP/AB	0.4	1.4-2.6	-	-	-	-
Aphelenchidae *Aphelenchus avenae* BASTIAN 1865	FF/EB	0.4-1.6	3.8	-	7.8-17.0	30.8	-
Aphelenchoididae *Aphelenchoides limberi* STEINER 1936	FF/EB	-	2.2	13.4	-	2.4	-
Paraphelenchidae *Paraphelenchus tritici* BARANOVSKAYA 1958	FF/EB	-	2.6	-	-	-	-
Abundance (thousands m^{-2})		40.0-205	41.0-125	36.9-325	194-530	56.4-570	295-489
Number of species		15-19	8-15	10-13	14-21	13-23	19-23
Species diversity (Shannon)		3.25-3.92	2.66-3.53	3.19-3.60	3.58-4.21	3.48-4.35	4.08-4.35
Evenness (Pielou)		0.79-0.93	0.88-0.94	0.93-0,99	0.93-0.95	0.94-0.96	0.96
Species richness (Margalef)		2.30-3.02	1.14-2.36	1.22-2.26	1.88-2.53	2.12-2.78	2.46-2.81
Maturity index (Bongers)		2.0-2.28	2.0-3.0	2.21-3.12	2.14-2.46	2.0-2.47	2.46-2.81
Trophic structure (% mean value):							
Plant parasite (PP)		18.2	19.3	39.8	45.4	33.4	44.3
Fungal feeder (FF)		1.6	2.5	2.0	6.0	8.0	1.3
Bacterial feeder (BF)		57.0	45.4	27.2	28.8	41.5	39.8
Algae feeder (AF)		10.0	-	-	-	-	-
Predator (PR)		3.6	2.6	6.1	2.2	2.0	3.8
Omnivore (OM)		9.6	30.2	24.9	17.6	15.3	10.8
Ecological grouping (% mean value):							
Hydrobionts (HB)		26.2	9.0	3.3			
Amphibionts (AB)		19.8	48.2	32.7			
Edaphobionts (EB)		54.0	42.8	64.0			

Spatial distribution of nematodes in aquatic and terrestrial areas

Nematodes are the most diverse and numerous invertebrate groups both in the aquatic and riverbank habitats. Therefore nematodes can be the good object for studying of their spatial distribution. The schema of sampling (Fig. 1) was developed to study the spatial distribution of nematode species in aquatic and terrestrial areas in a locality of the Prut River.

According to the obtained quantity-quality data of nematode species and their number of individuals in each sampling square from aquatic to terrestrial areas have not clearly shown the natural conformity of their spatial distribution. As the riverbank habitats are under climatic influences and sporadically flooded that is directly reflected in the species composition and their number in the nematode communities. Such species as *Mesodorylaimus litoralis, M. pseudobastiani, Aporcelaimellus obscurus, Ecumenicus monohystera, Bursilla monhystera, Acrobeloides nanus, Cephalobus mucronatus, Heterocephalobus elongates, Filenchus misellus, F. thornei, Tylenchus davainei,* and *Bitylenchus dubius* were found in all sampling squares from aquatic to terrestrial habitats. Most of these species are typical for the terrestrial habitats; however, they have ability to survive on the terrestrial sites covered with water or on the real aquatic habitats.

Trophic composition and ecological grouping

Abundance of the different nematode feeding types reflected their nutritional strategies in response to varying trophic parameters. The use of trophic species features could become an effective tool in describing highly dynamic littoral benthic system (WITTHOFT-MUHLMANN et al., 2006). Only some typical species of hydrobionts such as the algae feeder *Brevitobrilus stefanskii*, predators *Tripyla glomerans,* and *Mononchus aquaticus,* bacterial feeders *Chronogaster typicus* and *Geomonhystera villosa* were found in benthic sediment (sampling squares A9-A12) (Table 1). Such poor nematode species diversity of typical hydrobionts can be induced by the specific structure of the Prut River' channel with the enough abrupt river banks and high stream in the sampling place. The species of typical hydrobionts (Table 1) were only 26.2 % in the benthic nematode community, edaphobionts – 54% and amphibionts – 19.8 %. Therefore the benthic nematode community (A9-A12) was formed by bacterial feeders' species (57%) and plant parasites (18.2%) washed off the river banks. These species are able to keep their viability in the water condition (Figure 2).

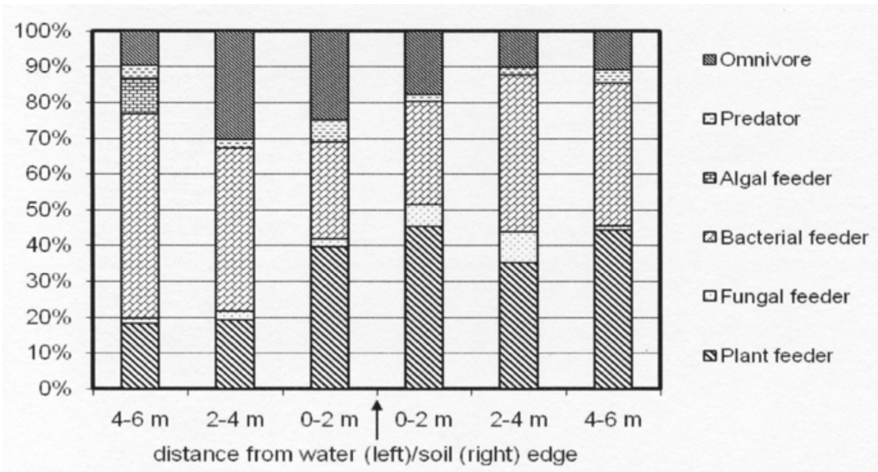

Figure 2. Correlation of the nematode trophic groups (by YEATS et al 1993) from the sampling squares with different distance from water/soil edge.

Figura 2. Corelația grupurilor trofice (după YEATS et al 1993) din locurile colectării cu diferite distanțe dintre apă/sol hotar.

In most of the sampling sites, the bacterial feeders and plant parasites prevailed both as number of species and abundance (Table 1, Fig. 2). Among bacterial feeders, *Bursilla monhystera, Acrobeloides nanus, Cephalobus persegnis, Eucephalobus mucronatus,* and *Heterocephalobus elongatus* were the most numerous. Bacterial feeders such as *Panagrolaimus hygrophilus* were numerous in aquatic area, but *P. rigidus* - in terrestrial habitats. Among plant parasites (mostly non-obligatory plant parasites), *Filenchus misselus, F. thornei, Tylenchus davainei, Bitylenchus dubius,* and *Amplimerlinius socialis* were found in both aquatic (A1-A8) and terrestrial areas (T8-T12). Among omnivores, the species of the genus *Mesodorylaimus* were numerous everywhere.

Ecological indexes (Fig. 3; Table 1)

Shannon's diversity (H′) was estimated between 2.66–3.92 in aquatic and 3.48–4.35 in terrestrial habitats. Species richness (Margalef) was 1.14–3.02 in aquatic and 1.22–2.81 in terrestrial habitats.

Maturity Index (MI) for nematode communities is determined on the basis of faunal composition and differences in the sensitivity of taxa to stress. Taxonomic units (genera and families) classified into 5 groups each with differing life strategy, from colonizers (r-strategists) to persisters (K-strategists) (BONGERS, 1990, 1999; BONGERS et al., 1998; WASILEWSKA, 1997). Maturity index varied within range 2.0–2.47 for nematode communities with the prevalence of bacterial feeders, non-obligatory small tylenchids and the fungal feeding aphelenchoids. This index slightly increased 2.21–3.12 for nematode communities including dorylaimids with a long life span and low reproduction rate.

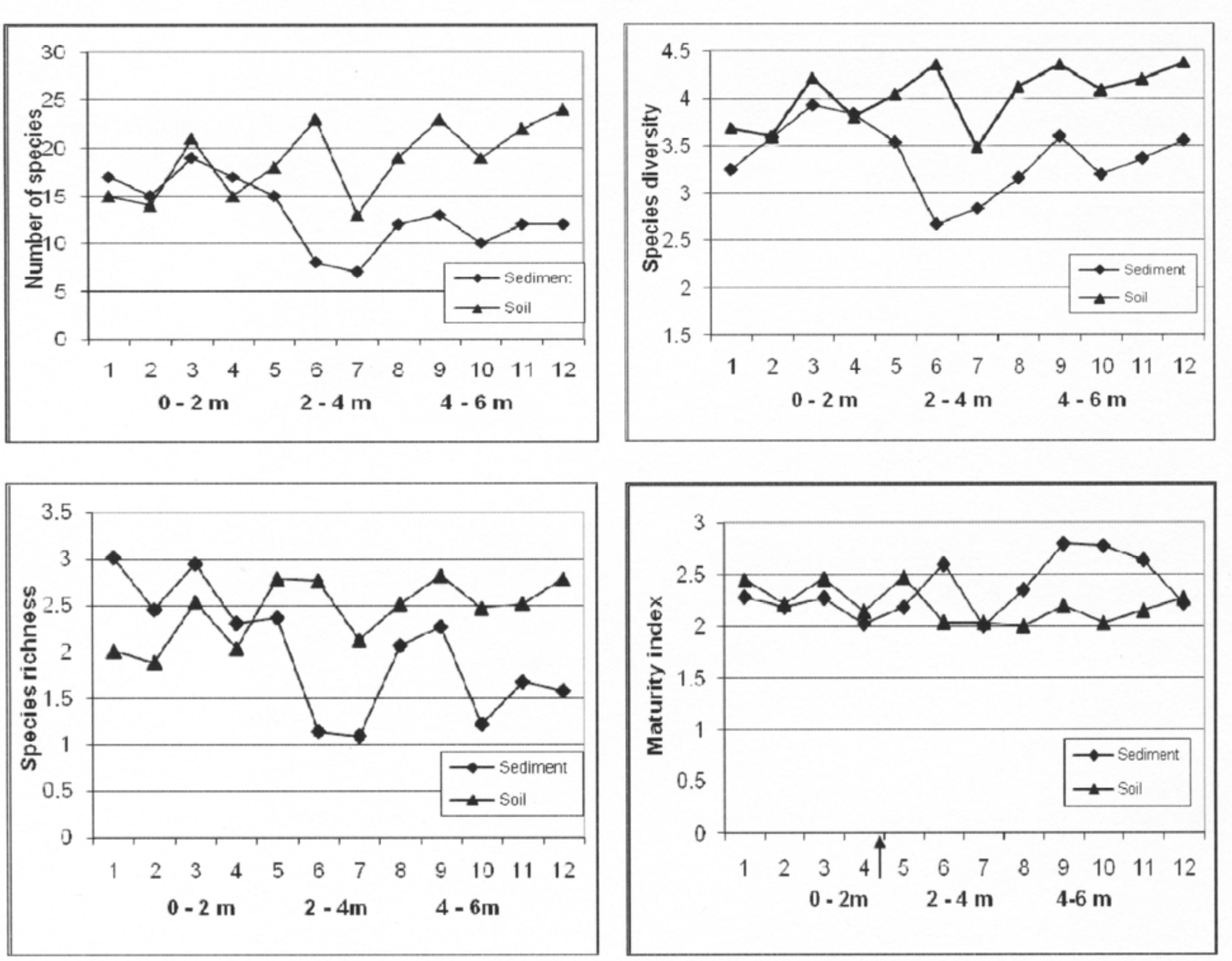

Figure 3. Number of species, species diversity (Shannon-Wiener index), species richness (Margalef index) and Maturity Index per each sampling square.

Figura 3. Numărul de specii, indicele diversității (Shannon-Wiener), indicele „bogăției de specii" (indecele Margalef) și Indicele Maturității pentru fiecare suprafață colectată (conform schemei Fig. 1).

The MI is a sensitive instrument for measuring disturbance in ecosystems and decreases of MI in sediment have been shown to correspond to a gradient of pollution.

The values of the ecological indexes of nematode communities are slightly similar in the studied sampling sites close to water/soil edge. The values of these indexes increase for terrestrial nematode communities and decrease for freshwater nematode communities at removal from water/soil edge.

CONCLUSIONS

Species and trophic composition of nematode communities, their abundance and spatial distribution in riverbed/riverbank covered with water/riverbank of the Lower Prut (near village Chislita-Prut) were studied. The nematode abundance strongly varied between 39.6 and 570.0 ind. thousands m^{-2}. Fifty one species belonging to 42 genera, 27 families and 8 orders were identified. The families **Dorylaimidae, Cephalobidae, Tylenchidae** and **Telotylenchidae** registered the most species and occupied almost the entire sampling area. Higher species diversity of nematodes was noted in the terrestrial samples (37 species) than in aquatic (32). Only some typical species of hydrobionts such as the algae feeder *Brevitobrilus stefanskii*, predators *Tripyla glomerans* and *Mononchus aquaticus*, bacterial feeders *Chronogaster typicus, Panagrolaimus hygrophilus,* and *Geomonhystera villosa* were found in benthic sediment. A third of the species found in the aquatic area belong to taxa, which apparently developed and radiated under terrestrial conditions. Such poor nematode species diversity of typical hydrobionts in benthic sediment can be induced by the specific structure of the Prut River' channel with the enough abrupt river banks and high stream in the sampling place. The species from the families **Discolaimidae, Leptonchidae, Diploscapteridae, Anguinidae, Hoplolaimoidae, Pratylenchidae, Paratylenchidae** were found only in the terrestrial area. Bacterial feeders were the most numerous in our sampling area. Ecological indexes such as species diversity (Shannon-Weaver), species richness (Margalef) and Maturity index (Bongers) were high for nematode communities of the terrestrial habitats.

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