HYPORHEIC FAUNA FROM INTERSTITIAL OF THE SOMEŞ RIVER BASIN (TRANSYLVANIA, NORTHWESTERN ROMANIA)

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Abstract. Biodiversity in hyporheic habitats (interstitial water habitats in river bank sediments) has been studied on Someşul Cald (Warm Someş) and Someşul Rece (Cold Someş) River (north western Romania, Transylvania), from March to October 2004. pH and electrical conductivity were measured monthly at each site, and animals were collected with the Karaman-Chappuis method and by filtering water through a hand-net. The relative abundance of the best-represented hyporheic invertebrates (oligochaetes and insect larvae) was higher in Someşul Cald interstitial habitats than in Someşul Rece. The focus was directed to the role of water mites (*Acari, Hydrachnidia*), cyclopoid copepods (*Crustacea, Copepoda, Cyclopoida*) and oligochaetes (*Annelida, Oligochaeta*) in hyporheic communities. Nine water mites and five cyclopoid species were identified in five sampling sites of the two rivers. Their higher diversity was recorded in two stations on the Someşul Cald River. The cyclopoid copepod *Diacyclops disjunctus* (Thallwitz, 1927) is a new record for Romania. As for oligochaetes, 17 species were identified and their higher diversity was recorded on Someşul Rece River. Canonical Correspondence Analysis (CCA) shows that presence of some water mites and cyclopoid species can be associated with measured physicochemical parameters (pH, electrical conductivity).

Key words: hyporheic communities, interstitial, water mites, cyclopoids, oligochaetes, biodiversity, statistical analyses.

1. INTRODUCTION

According to ORGHIDAN (1955), the hyporheic zone is defined as a particular subterranean habitat, represented by the water circulating between the interstitial voids constituted by the sediments of the streambed. The hyporheic is known as an active ecotone between surface and groundwater and shows features of both adjacent areas (VERVIER *et al.,* 1992; GIBERT *et al.,* 1994; BOULTON *et al.*, 1998). The hyporheic zone is considered an important refuge for several surface invertebrates (HOSE, 2005), due to the relatively constancy of its physical and chemical parameters and a subterranean realm, being a habitat for both stygobiontic and stygophilic forms.

The study of hyporheic fauna (hyporheos) is of particular interest due to their ability to provide signals of declining water quality in subterranean ecosystems (HANCOCK *et al.*, 2005). Several surveys performed in this habitat of surface rivers revealed the significance of water mites, cyclopoid crustaceans and oligochaetes with their functional role in groundwater communities (PLEŞA *et al*., 1964; BOTEA, 1968; BOTEA, 1969; ROUCH and LESCHER-MOUTOUÉ, 1992; DOLE-OLIVIER *et al*., 2000; POSPISIL and DANIELOPOL, 2000; MARY and MARMONIER, 2000; GALASSI, 2001; GIANI *et al*., 2001; LAFONT and MALARD, 2001; CÎMPEAN and PAVELESCU, 2002–2003; CÎMPEAN *et al*., 2003; GERECKE *et al*., 2005; CÎMPEAN, 2006; LAFONT and VIVIER, 2006). The water mites is the most important group of *Acari* that live in interstitial freshwater (SCHWARZ *et al*., 1998) and oligochaetes are known as regular inhabitants of hyporheic zone (LAFONT and VIVIER, 2006). *Cyclopoida* is one of the best-represented groups in freshwater communities, with 740 species known from groundwater, 23.2% living in interstitial zone (ROUCH, 1994).

Previous research focused on the structure of hyporheic invertebrate communities of the Someş catchment area (PLEŞA *et al*., 1999; MOLDOVAN *et al*., 2001; CÎMPEAN *et al*., 2003; MOLDOVAN *et al*., 2005). PLEŞA *et al*. (1999) began sampling fauna in this area and stated a general overview about the invertebrate communities inhabiting the interstitial waters of Someşul Cald River. Several hypotheses were further formulated and concerned the influence of organic pollutants on groundwater fauna: a) organic pollutants stored in interstitial water sediments can intensify the pollution effects on groundwater fauna; b) biodiversity is higher in clean interstitial waters; and c) Someşul Cald River is a depository of a rich unknown groundwater fauna (MOLDOVAN *et al*., 2001; MOLDOVAN *et al*., 2005). Ten water mite and 5 oligochaete species were identified in the hyporheic zone of Someşul Rece River (CÎMPEAN *et al.,* 2003).

The present study aims to relate the structure of hyporheic invertebrate communities to two physicochemical parameters in two tributaries of Someşul Mic River (Someşul Rece and Someşul Cald rivers), and to determine whether the seasonal changes in water chemistry affect the diversity and distribution of hyporheos.

2. MATERIAL AND METHODS

2.1. STUDY AREA

The study area is located in Apuseni Mountains, northwestern Romania. Someşul Mic belongs to the Someş hydrographical basin and has two main tributaries, Someşul Cald and Someşul Rece (Fig. 1). The river has a total length of 166.6 km, 21.4 m^3/s discharge, and a catchment area of 3804 km^2 (UJVARI, 1972). The main tributary, Someşul Cald River (64 km in length) rises from limestone area of Bihor-Vlădeasa Mountains, while Someşul Rece River (45 km in length) is located in the southeast part of the Someş basin and originates in the Mare Mountain. The Someşul Rece River flows over crystalline schist sediments while Someşul Cald over calcareous sediments.

Water sediments and fauna samples were collected from five sites: three sampling sites are located in Someşul Cald River: Someşul Cald Gorges (site 1), Bătrâna (site 2), upstream Doda Pilii (site 3); and two on Someşul Rece River, upstream Blăjoaia (site 4) and downstream Măguri Răcătău (site 5) (Fig. 1). Sediments are formed in gravels and sands. Site 1 is located at an altitude of 1134 m (a.s.l) and has no anthropogenic impact. The sediments are here represented by gravels. Site 2 (1160 m a.s.l.) is located at the confluence with Bătrâna Valley, with gravel and sand sediments. Site 3, located at 1011 m a.s.l., has cobbles and gravel sediments. Site 4 (1310 m a.s.l.) is situated downstream of an old wooden dam. The sediments of this site consist of gravels, rocks and wood remains. Site 5 (600 m a.s.l.) has sediments formed in gravels and rocks.

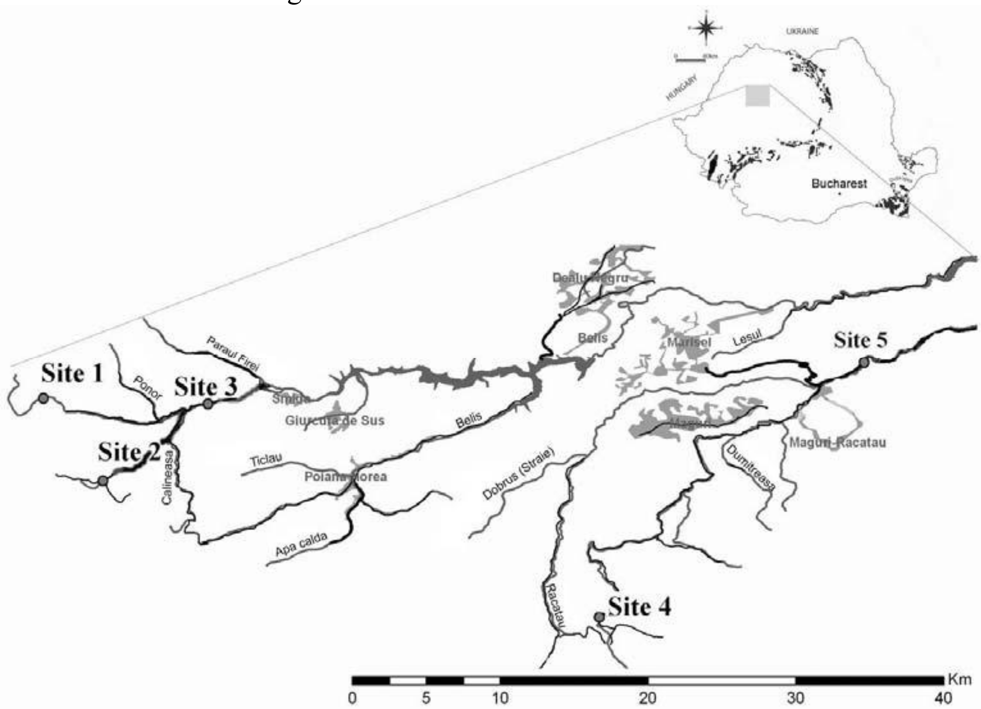

Fig. 1. – Someşul Mic basin location in northwestern Romania with sampling sites position.

2.2. SAMPLING METHODS

The sites were sampled from March to October 2004. The Karaman-Chappuis method was used to collect the groundwater fauna (MOTAŞ, 1962; SCHWOERBEL, 1970; BOU, 1974). Approximately 10 l of groundwater of each site were filtered through a 250 µm mesh-sized hand-net. Fauna samples were conserved in 4% formaldehyde solution and sorted in the laboratory using a Nikon SMZ645 stereomicroscope. Fauna was stored in 70% ethanol until further species identification. The water mites were conserved in modified Koenike solution (DI SABATINO *et al.,* 2000). The water mites, cyclopoid copepods and oligochaetes were identified to species level, while, all the other groups, (*i.e.* nematodes, ostracods, amphipods, insect larvae) were identified only to higher levels, such as order, family or genus. The fauna of hyporheic zone (hyporheos) was classified based on habitat affinity according to GIBERT, 2001. Two physicochemical parameters were measured in the field in all sampling sites using portable instruments, except in March and May when the sampling locations were flooded. pH was measured with a CONSORT P902 pH meter (Consort NV, Belgium) and electrical conductivity with CONSORT 52 conductivity meter (Consort NV, Belgium).

2.3. STATISTICAL ANALYSIS

Shannon-Weaver Index was used to illustrate the diversity of water mites in hyporheic zone of Someşul Mic basin. Statistical tests were performed with PAST – PAlaeontological STatistics, ver. 0.93 (HAMMER *et al*., 2002). Water mites and cyclopoid copepod assemblages were defined in relation to physicochemical parameters using Canonical Correspondence Analysis (CCA). Analyses were performed in XLSTAT 2007.

3. RESULTS AND DISCUSSION

3.1. WATER CHEMISTRY

The pH values varied between 6.92 and 8.44, with low monthly fluctuations (Table 1). The highest value was recorded in summer at site 1 (Someşul Cald Gorges) and the lowest in autumn at site 5 (downstream Măguri Răcătău). The highest pH values variation among sites was registered in autumn, with the highest value at site 1 and the lowest at site 5. Electrical conductivity (EC) varied from 11.93 µS cm^{-1} at site 4 to 305 µS cm^{-1} at site 2. The highest values were registered in summer, when EC varied from 18.92 µS cm^{-1} at site 4 to 305 µS cm^{-1} at site 2. Permanently higher EC values at site 2 can be explained by the high organic input from the peat marsh and anthropogenic activity existing here.

3.2. COMPOSITION OF HYPORHEIC FAUNA

Ten invertebrate groups were identified in the interstitial of the two rivers (Table 2). The hyporheic assemblages from almost all sites were dominated by oligochaetes (59%), insect larvae (28%) (mainly *Diptera*: *Chironomidae*, *Simulidae*,

Table 1

Physicochemical parameters of groundwater in Someşul Cald and Someşul Rece rivers (northwestern Romania)

	Sampling sites	**Alt. (m a.s.l.)**	**Month**	**pH**	**Electrical conductivity (μS cm^{-1})**
Site 1	Someşul Cald Gorges	1134	May June August September October	– 7.43 8.44 8.08 7.45	– 78.0 64.4 106.4 67.6
Site 2	Bătrâna	1160	May June August September October	8.19 7.25 7.31 7.06 7.98	175.2 195.0 305.0 215.0 157.6
Site 3	Upstream Doda Pilii	1011	May June August September October	8.12 7.67 7.50 – 7.6	61.0 93.1 94.5 – 68.3
Site 4	Upstream Blăjoaia	1310	May June August September October	7.96 – 7.48 – 7.64	11.9 – 18.9 – 15.5
Site 5	Downstream Măguri Răcătău	600	May June August September October	– – – – 6.92	82.1 – 94.8 – –

Table 2

Hyporheic fauna in interstitial of Someşul Cald and Someşul Rece rivers (individuals number/sample) (*Hydr*. – *Hydrachnidia*; *Cycl*. – *Copepoda*, *Cyclopoida*; *Olig*. – *Oligochaeta*; *Nem*. – *Nematoda*; *Harp*. – *Copepoda, Harpacticoida*; *Ostr*. – *Ostracoda*, *Amph*. – *Amphipoda*; *Ins*. – *Insecta*)

Sites/Taxa	***Hydr.***	***Cycl.***	***Olig.***	***Nem.***	***Harp.***	***Ostr.***	***Amph.***	***Ins.***	**TOTAL**
St.1 Summer	10	0	100	14	2	6	4	114	**250**
St.1 Autumn	0	0	47	5	0	0	0	212	**264**
St.2 Spring	0	0	110	4	0	5	0	86	**205**
St.2 Summer	3	1	500	14	0	0	0	12	**530**
St.2 Autumn	1	2	505	7	2	16	0	19	**552**
St.3 Spring	0	0	2	0	1	0	1	19	**23**
St.3 Summer	3	39	22	1	7	1	4	47	**124**
St.3 Autumn	0	3	1	0	0	0	0	8	**12**

St.4 Spring	0	0	31	9	0	0	2	25	**67**
St.4 Summer	3	15	108	59	22	7	2	49	**265**
St.4 Autumn	0	0	322	22	20	41	2	218	**625**
St.5 Spring	0	0	28	3	0	0	1	10	**42**
St.5 Summer	1	2	61	7	1	2	2	18	**94**
St.5 Autumn	9	2	0	3	1	31	0	25	**71**
TOTAL	**30**	**64**	**1837**	**148**	**56**	**109**	**18**	**862**	**3124**

Blepharoceridae, *Tipulidae*; *Plecoptera*, *Ephemeroptera*, *Trichoptera* and *Coleoptera*) and nematodes (5%). Low abundance was registered for the other groups: ostracods (3%), cyclopoid copepods (2%), harpacticoid copepods (1.5%), water mites (1%) and amphipods (0.5%). The total hyporheic invertebrate abundance ranged from 12 individuals in autumn at site 3 to 625 individuals in autumn at site 4.

Oligochaetes have generally dominated the hyporheic communities in our study. The dominance of oligochaetes was previously also remarked in several surveys on hyporheos (MARY and MARMONIER, 2000; MOLDOVAN *et al*., 2001). Oligochaetes high abundance can be related with the worm-shaped body, well fitted to conditions of this habitat (GIBERT *et al*., 1998). The oligochaetes were also among the most diverse groups encountered in the hyporheic of Someş River. 17 species were identified that belong to six families (Table 3). The higher oligochaete species richness belong to *Enchytraeidae*: *Bryodrilus diverticulatus* Cernosvitov, 1929, *Cernosvitoviella* sp. Nielsen & Christensen, 1959, *Cognettia glandulosa* (Michaelsen, 1888), *Cognettia sphagnetorum* (Vejdovský, 1878), *Fridericia reducata* Dózsa-Farkas, 1974, *Fridericia* sp. and *Mesenchytraeus armatus* (Levinsen, 1884). *Naididae* and *Lumbriculidae* are represented by three species as follows: *Nais communis* Piguet, 1906, *Pristina (Pristina) aequiseta* Bourne, 1891 and *Pristina (Pristinella) jenkinae* (Stephenson, 1932) for *Naididae* and *Lumbriculus variegatus* (Müller, 1774), *Stylodrilus heringianus* Claparede, 1862, *Trichodrilus* sp. for *Lumbriculidae*. *Tubificidae* is represented by two genera, each with one species: *Rhyacodrilus coccineus* (Vejdovsky, 1876) and *Spirosperma ferox* Eisen, 1879. *Haplotaxidae* was represented by *Haplotaxis gordioides* (Hartmann, 1821) and *Lumbricidae* by *Eiseniella tetraedra* (Savigny, 1826).

Two oligochaete species (*Cernosvitoviella sp*. and *Trichodrilus sp*.) were widespread at all sites. *Trichodrilus sp*. is a typical stygobiont (BOTEA, 1965). Besides the species mentioned above other groundwater oligochaetes were also recorded: *Stylodrilus heringianus*, *Rhyacodrilus coccineus, Pristina* sp. and *Pristinella* sp. The first two species were recorded only at site 4 and 5. *Haplotaxis gordioides* was present only at site 4 and is a cosmopolite species frequently found in groundwater (JUGET and DUMNICKA, 1986). *Eiseniella tetraedra* was recorded at site 2 and 5 and is a typical groundwater hyporheophile and eurytopic species (BOTEA, 1969). *Nais communis* was recorded at site 1, 2 and 4 and is an epigean species, with high sensitivity to pollution

Table 3

Oligochaete species list in hyporheic of Someşul Cald and Someşul Rece rivers

Taxa	Sites				
	1	2	3	4	5
Fam. Naididae					
Nais communis	+	+		+	
Pristina (Pristina) aequiseta	+			+	+
Pristina (Pristinella) jenkinae	+	+		+	+
Fam. Tubificidae					
Rhyacodrilus coccineus				+	+
Spirosperma ferox					+
Fam. Haplotaxidae					
Haplotaxis gordioides				+	
Fam. Lumbriculidae					
Lumbriculus variegatus				+	
Stylodrilus heringianus				+	+
Trichodrilus sp.	+	+	+	+	+
Fam. Enchytraeidae					
Bryodrilus diverticulatus	+	+		+	
Cernosvitoviella sp.	+	+	+	+	+
Cognettia glandulosa		+		+	+
Cognettia sphagnetorum	+			+	
Fridericia reducata		+	+		
Fridericia sp.	+	+	+		+
Mesenchytraeus armatus		+			
Fam. Lumbricidae					
Eiseniella tetraedra		+			+

in fine sediments (FRENZEL, 1983). Although *Nais communis* is a typical epigean species, several morphological and physiological adaptations to subterranean life were observed (LAFONT and MALARD, 2001). The presence of *Nais communis* in site 1 can relate to lower anthropogenic impact at this site. From all investigated sites, the highest oligochaete species richness was registered at site 4 with 12 species. Eight groundwater oligochaete taxa identified in this study were described in LAFONT *et al*., 1992 as Active Exchange Describers between surface waters and groundwaters: *Nais communis, Pristina* sp.*, Pristinella* sp.*, Cernosvitoviella* sp.*, Stylodrilus* sp*, Rhyacodrilus* sp., *Spirosperma* sp.*,* and *Trichodrilus* sp.

Insect larvae are also abundant (28% of total hyporheic invertebrate abundance) in all sites. Their higher abundance was recorded at site 4 in autumn, followed by values registered at site 1 in spring and summer. The dominance of insect larvae at sites 1 and 3 can reveal the unstable stream conditions (FOWLER and DEATH, 2001).

The nematodes (5%) were recorded at all sites, except site 3, where one specimen was present in summer and no longer in the other seasons. The ostracods (3%) have an irregular distribution among sites. This group was more abundant in autumn for sites 2, 3, 4 and 5. At site 1 the nematodes were only present in summer.

The cyclopoid copepods were a minor component of the hyporheic fauna from Someşul Mic sediments, representing 2% from the total number of individuals. Five cyclopoid species were identified at all sites and belong to two subfamilies, *Eucyclopinae* and *Cyclopinae* and three genera: *Paracyclops*, *Megacyclops* and *Diacyclops*. The identified species are *Paracyclops fimbriatus* (Fischer, 1853), *Megacyclops viridis* (Jurine, 1820), *Diacyclops bisetosus* (Rehberg, 1880), *Diacyclops languidoides* (Lilljeborg, 1901) and *Diacyclops disjunctus* (Thallwitz, 1927). With the exceptions of *D. disjunctus* and *D. languidoides,* which are stygophiles, all the other taxa are stygoxenes, frequently find in groundwater habitats (GALLASI, 2001; DUSSART and DEFFAYE, 1995). *D. disjunctus* belong to the *languidoides*-complex and is a new record for Romanian groundwater (STOCH and POSPISIL, 2000). This species occurs together with *Megacyclops viridis* at site 4 during the summer.

With the exception of *M. viridis*, which occurs in autumn at sites 3 and 4, all five cyclopoid species were permanently found in summer at sites 2, 3, 4 and 5 (Table 4). No cyclopoid species was recorded at site 1 and in spring.

Table 4

Relative abundance (%) of cyclopoid copepods in hyporheic of Someşul Cald and Someşul Rece rivers

Taxa	Sites				
	1	2	3	4	5
Subfam. Eucyclopinae					
Paracyclops fimbriatus	0	0	0	0	100
Subfam. Cyclopinae					
Megacyclops viridis	0	0	14.3	7.15	0
Diacyclops sp.	0	0	78.6	85.70	0
Diacyclops bisetosus	0	0	2.4	0	0
Diacyclops languidoides	0	100	4.7	0	0
Diacyclops disjunctus	0	0	0	7.15	0

The harpacticoid copepods (1.5%) are more abundant in summer at site 4, and they were present in low abundance or absent in spring at all sites.

The water mites were present only in a low relative abundance (1%). At every site, the population abundance peaks were registered during summer (Table 2). Nine water mite species belonged to seven families (*Torrenticolidae*, *Lebertiidae*, *Sperchontidae*, *Aturidae*, *Hygrobatidae*, *Hydryphantidae* and *Momoniidae*) and nine genera (*Torrenticola*, *Lebertia*, *Sperchon*, *Ljania*, *Woolastookia*, *Kongsbergia*, *Atractides*, *Wandesia* and *Stygomomonia*) (Table 5). *Aturidae* was represented by three species: *Kongsbergia* sp. Thor, 1899, *Ljania macilenta,* Koenike, 1908 and *Woolastookia rotundifrons* (Viets, 1922), while the other families include only one species. Six water mite species (*Atractides* sp. Koch, 1836; *Kongsbergia* sp.; *Ljania macilenta* Koenike, 1908; *Wandesia thori* Schechtel, 1912; *Woolastookia rotundifrons*

(Viets, 1922) and *Stygomomonia latipes* Szalay, 1943) are known for their preferences for hyporheic habitat. They have small body size, flattened body, and are well adapted to oligotrophic conditions (GERECKE, 1994; DI SABATINO *et al*., 2000). The high occurrence of water mite species in the sampling sites 1–3 (Someşul Cald) (Fig. 2) can be related to the limestone component of the substratum, as was previously emphasised by SCHWOERBEL (1961).

Table 5

Relative abundance (%) of water mites in hyporheic of Someşul Cald and Someşul Rece rivers

Taxa	**Sites**				
	1	2	3	4	5
Fam. Lebertiidae					
Lebertia sp.	0	0	0	0	90
Fam. Torrenticolidae					
Torrenticola amplexa	0	0	33.33	0	0
Fam. Aturidae					
Ljania macilenta	20	0	0	0	0
Woolastookia rotundifrons	40	0	0	0	0
Kongsbergia sp.	0	0	33.33	0	0
Fam. Momoniidae					
Stygomomonia latipes	30	0	33.33	100	10
Fam. Hygrobatidae					
Atractides sp.	0	67	0	0	0
Fam. Sperchontidae					
Sperchon sp.	0	33	0	0	0
Fam. Hydryphantidae					
Wandesia thori	10	0	0	0	0

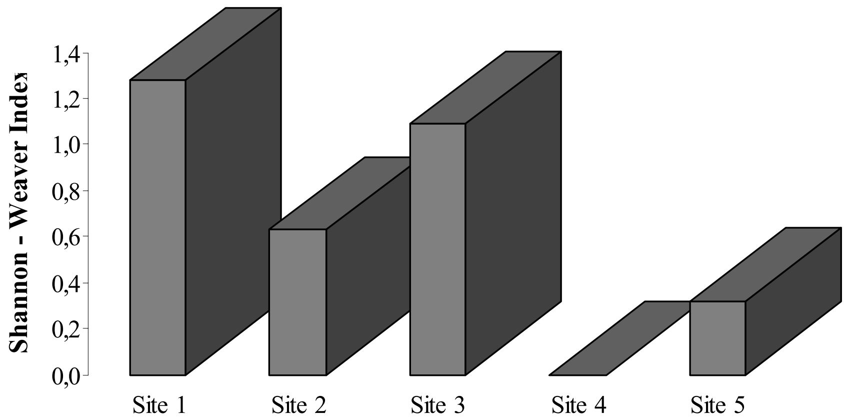

Fig. 2. – Biodiversity of water mites inhabiting the hyporheic of Someşul Mic River using the Shannon–Weaver Index.

The least abundant taxa were the amphipods (0.5%) that belong to two genera: *Niphargus* classified as permanent hyporheos (BOULTON, 2000) and the common widespread genera in surface waters *Gammarus* (Table 2). The high relative abundance of amphipods has been recorded in summer at sites 1 and 3.

With the exception of amphipods, the lower relative abundance of all taxa in Someşul Cald River was registered seasonally at site 3. In all sites from Someşul Cald River, with few exceptions, population abundance peaks were registered during summer. For Someşul Rece River, the highest occurrence of all taxa was registered at site 4 in summer and autumn. This high abundance of organisms was probably due to the organic matter content, as a food resource derived from the decomposition of the wood remains present in sediments. On the other hand, the lower abundance of taxa was recorded at site 5, which was probably affected by the organic pollution of an anthropogenic origin at this site.

Comparing the sites from both rivers, it can be seen that the relative abundance of the best-represented taxa (oligochaetes and insect larvae) and the relative abundance of water mites and cyclopoid copepods are higher in Someşul Cald River. In Someşul Rece River, the highest abundance was registered for nematodes, harpacticoid copepods and ostracods (Table 2; Fig. 3).

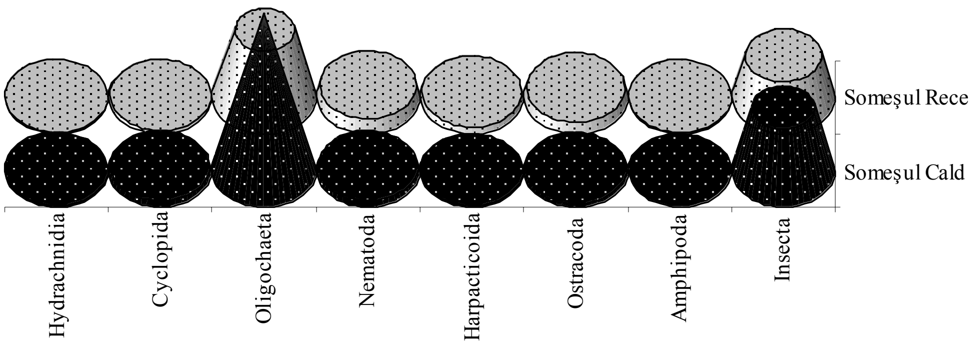

Fig. 3. – Major taxa (individuals/sample) from hyporheic of Someşul Cald and Someşul Rece rivers.

A Canonical Correspondence Analysis (CCA) was performed in order to explain the relationship between the identified species and physicochemical parameters (Fig. 4; Table 6). The first CCA axis is a gradient of increasing pH and EC and accounts for 66.4 % of the organisms-environment relationship. Two water mite species were accounted on this axis (*i.e. Ljania macilenta* and *Sygomomonia latipes*), suggesting that these taxa occurred at high pH and EC location (site 1, in September) and at high pH (site 1, in August). Further the presence of *Diacyclops bisetosus* is correlated with EC value (site 3, in June). The second CCA axis is primarily a gradient of increasing EC and decreasing pH and accounts for 33.6% of the organisms-environment relationship. Three species were recorded in locations with high EC and low pH: at site 2, in June the cyclopoid *Diacyclops languidoides*;

at site 3, in August, the cyclopoid *Megacyclops viridis* and the water mite *Torrenticola amplexa*. The water mites *Woolastokia rotundifrons* and *Wandesia thori* were recorded in the same location (site 1, in June) with medium values of EC (78 µS cm^{-1}) and pH (7.43).

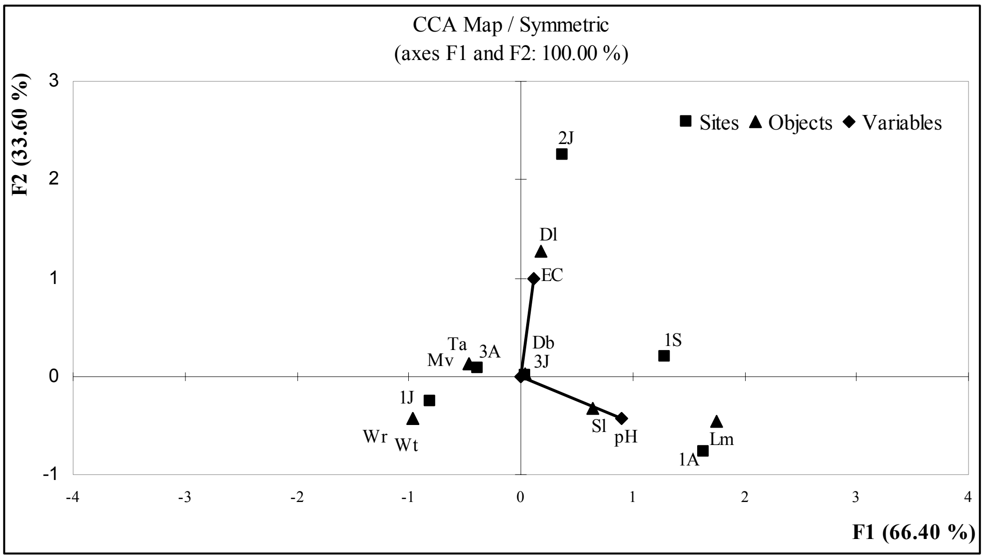

Fig. 4. – Canonical Correspondence Analysis based on water mites and cyclopoid species (triangles) and physicochemical parameters (rhomboids) of the hyporheic zone of the five sites (squares) from Someşul Cald and Someşul Rece rivers.
1J – site 1 in June; 1A – site 1 in August; 1S – site 1 in September; 2J – site 2 in June; 3J – site 3 in June; 3A – site 3 in August; Lm – *Ljania macilenta;* Sl – *Stygomomonia latipes*; Ta – *Torrenticola amplexa*; Wt – *Wandesia thori*; Wr – *Woolastookia rotundifrons*; Db – *Diacyclops bisetosus*; Mv – *Megacyclops viridis*; Dl – *Diacyclops languidoides*.

Table 6

Goodness of fit: Eigenvalues and canonical correlation of the discriminant functions

Function	**Eigen value**	**Constrained inertia (%)**	**Cumulative %**	**Canonical correlation**
F 1	0,702	66,397	66,397	0,757
F 2	0,355	33,603	100.000	0,592

4. CONCLUSIONS

The hyporheic environment of the rivers Someşul Cald and Someşul Rece supports abundant and complex invertebrate communities. Ten invertebrate groups were identified. Some of these groups include species of a true interstitial origin, but the majority are common, eurytopic species occurring in surface waters. The relative abundance and species richness varied over the three seasons. The largest invertebrate groups abundance was registered in summer, with the exception of ostracods that are more abundant in autumn. The oligochaetes are the dominant taxa within the hyporheic communities of both rivers. The high abundance and diversity of water mites in all sites along Someşul Cald River can be related to the calcareous substratum and a low anthropogenic impact. *Diacyclops disjunctus* (*Copepoda*, *Cyclopoida*) is a new record for Romania.

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