

THE ECOLOGICAL STATE OF THE TISA RIVER AND ITS TRIBUTARIES INDICATED BY THE MACROINVERTEBRATES

András Szitó

Abstract

People start to be aware of the possibility to use the tolerant species as environment indicators. Covering up the ecological demand of different species, we would be able to understand more and more from their signals and to use them in qualification of the ecological changes.

The ecological qualification may be on a species level only. The upper species categories are not enough for this work. The lack of benthic invertebrates may be often due to the lack of the sediment, like in the Upper Tisa Region.

The high individual density of a species may be caused by the optimal food source for them, but extraordinary high in hypertrophic situation sometimes. Oligochaete species often produce extreme high individual density, but the species richness is reduced to one or two species only. *Limnodrilus hoffmeisteri* is the most tolerant species in our investigated regions, it is present in hypertrophic relations.

The lack of the tolerant indicator species in an ecosystem may indicate continuous or temporary oxygen depletion, moreover high organic material pollution or chemical poisoning.

The monitoring data show a temporary picture about the state of the investigated ecosystems. The continuous and complex works may detect and present the ecological changes.

Clean water indicator, moderate tolerant and tolerant species were identified.

Keywords: river ecology, invertebrata, benthos, indicator species

Introduction

The biomonitoring is a continuous quality investigation and control system, which shows the environmental quality changes by the species composition and individual density changes in the communities. The scientific background of the monitoring is the fact that environmental factors affect the plants and animals. The affecting

biological and abiotic environmental factors provide them with the opportunity to find their essential conditions, to settle down and to reproduce.

The biologists already recognized more than 150 years before that the demands of the organisms for the environmental factors are different. The most sensitive organisms were used as environmental quality indicators, because the positive environmental changes are productive for their presence, reproduction and individual density. Their response to negative effects results in their individual decrease and the disappearance from the ecosystem. This realization is used by the specialists for the qualification of different water ecosystems. The qualification of the different water ecosystems by indicator species is a complementary, but important method for the chemical analyses.

The quality of a water ecosystem is determined by chemical and biological parameters of the water and sediment, but their complex effect could be indicated by the quality and quantity changes of the communities. The biomonitoring produces temporary information about the state of the investigated ecosystem, but this periodical data collection offers a continuous picture. The presence of species, their individual density or disappearance are such informations which can be used for qualification of the changes in the community structures and the ecological state changes. If we know the environmental demands of the species, we are able to describe the quality of the ecosystem by their presence or disappearance.

We use a lot of plant and animal species as environmental indicators, especially the steno-types, because they indicate one or two environmental factors only, which are as follows: pH, light, temperature, food, water currency, chemical pollution. The eury-type species can survive the extreme effects, therefore they were not used as indicators.

In the last years scientists try to use the taxons over the species (genus, family etc.). These people don't think that it is a mistake. The reactions of the species are different to the environmental factors inside a family or a genus. For example: there are Oligochaete and Chironomid species which indicate the clean water, the others the polluted waters, moreover a lot of Oligochaete and Chironomid species live only in standing waters, in running waters, but we can find some other species living both in standing and running waters. The qualification of the ecosystems by the presence or disappearance of the taxons over species is an ostrichism only, instead the relations of the education and training of specialists to solve this complex education problem at state level (Szító, 1998a).

If the river was able to eliminate the organic and inorganic pollutants, the species composition of the community signalized this process downstream (Nuttall *et al.*, 1974). The species composition and structure of macrobenthos was used for evaluation of water quality of Scioto River System (Olive *et al.*, 1975). The Chironomids were used at Hungary in the River Tisa monitoring similarly (Szító, 1981).

The big and continuous, organic pollution results in oxygen depletion on the sediment surface in the big rivers too, thereafter the macrobenthos community disappears (Dratnal *et al.*, 1980).

The tolerant species of the macroinvertebrates were used for indicating the environment quality changes by the heavy metal pollution (Waterhouse et al., 1985). Increasing the number of private farms resulted in the pollution of the small streams with organic materials, in which a new macrobenthos community formed with tolerant species (Schofield et al., 1989). The community structure of a river changed hard in the town part. The sensitive species for environment changes disappeared from here and only the tolerant ones were present. The fauna regenerated slowly downstream the town (Hynes et al., 1989). Similar changes of the macroinvertebrate communities were recognized in the Transylvanian rivers and river systems (Sztó, 1995, Sztó et al., 1997; 1999; Sztó, 1998a,b; 1999a-c, 2000a-c).

Increasing the trophic level by non-point pollution effects of the agriculture, therefore the individual density of the macrobenthos community increased too. The consumers did not follow the hard developed epilithic algae in individual densities (Delong et al., 1998).

The species number was much lower on the chemically or physically disturbed parts, than on the undisturbed sites. The larvae drifted from the drifted parts to the nondisturbed sites. The species composition showed better the disturbance downstream, than the changes of the heavy metal concentration (Ruse et al., 2000).

Our monitoring work may give up-to-date pictures about the environment quality changes in different rivers and the recommendations help the modifications of the negative progressions.

Material and Methods

Qualitative samples were taken from the surface of the stone and gravel piece by washing into a drifting net in each profiles. Sampling sites were at various distances from the left, the right bank and in the main current as well when it was possible.

Each sample was washed through a metal screen with pore mesh size of 250 µm and preserved in 3-4 % formol solution. The retained material was separated into groups of Oligochaetes, Chironomids and other groups of animals with a Zeiss stereomicroscope in the laboratory, with a 4 to 6 times magnification, and animals were preserved in 80 % ethylic alcohol.

For taxonomic identification the following works were used: (Bíró, 1981; Brinkhurst and Jamieson, 1971; Cranston et al. 1983; Ferencz, 1979, Fittkau, 1962; Fittkau et al. 1983; Pinder et al. 1983; Pop, 1943, 1950).

Results and Discussion

The species presence, disappearance, individual density

Dikerogammarus haemobaphes fluviatilis and *Rivulogammarus balcanicus dacicus* (Amphipoda) formed the shrimp fauna in the River Mureş/Maros in 1991. This species were present between the region of source and Suseni. The effects of both the reservoir upper Târgu Mureş and the sewage water of the town resulted in a big

change in the species composition. Downstream Târgu Mureş, the tolerant *Caenis* species appeared near Sintimbru only, when the quantity of the pollutants decreased because of the self purification of the river (Table 1).

Oligochaete were tolerant to pollution and the environment quality changes therefore its species richness was high. *Limodrilus profundicola* by Târgu-Mureş, *Isochaeta virulenta* by Deva and *Limnodrilus hoffmesiteri* by Deva had high individual density and showed hypertrophic environment in this river part. The deep sediment was rich in organic material, too (Table 2).

The presence of predator Chironomid species depended on the food source, therefore they indicated the environment quality only indirectly.

The epiphytic Chironomid species were rare between the source region and Rastolita in this clean river part. The epilithon was very poor on the surface of gravels and boulders, the food source was poor. No species appeared between Târgu-Mureş and Alba Julia, in spite of the river bed covered by gravels in this river part (Table 3). Benthic Chironomid species appeared first in Rastolita, because some sediment was found here. *Microchironomus bicolor*, *Microtendipes chloris* and *Polypedilum convictum* indicated the clean river part by Rastolita. *Chironomus thummi* (*fluviatilis*), *Chironomus riparius*, *Chironomus plumosus*, *Chironomus semireductus*, *Dicrotendipes nervosus*, *D. pulsus* and *Paratendipes albimanus* needed eutrophic environment, therefore they were tolerant to organic pollution. Some tolerant Chironomid species disappeared between Gura Aries and the influent, *Cryptochironomus redekei*, *Paracladopelma camptolabis*, *Tripodura* (*Polypedilum*) *scalaenum* and *Robackia demeijerei* were present (Table 3).

The control investigations showed in 1999 that both the species richness and individual density of Oligochaete increased between the source region and Senetea, between Ungheni and Sintimbru they decreased and they increased by Pecica (Figure 1). Both the species richness and the individual density of Chironomid increased between the source region and Senetea, which was the clean river part in 1991, which fact indicated sedimentation and pollution in this area, too. The epilithic Chironomid fauna increased by Senetea, 9 species were found here and they were present in sampling places downstream.

The number of benthic Chironomid species was 5 in Senetea, and 11 in Pecica (Figure 1). Both the species richness and individual density indicated rich food sources and eutrophic relations. The species richness with 9 and 12 epilithic species in Senetea and Salard area was that same as in Vintu de Jos, but the high species abundance was formed by benthic Chironomids by Pecica. Presence of *Cladotanytarsus*, *Dicrotendipes*, *Chironomus* and *Einfeldia* species indicated standing water relations near the river banks and high diversity of the investigated river parts. The lack of *Beckidia zabolotzkyi*, *Paralauterborniella nigrohalteralis*, *Paratendipes albimanus*, *Paratendipes (intermedius) nudisquama* indicated that the River Mureş/Maros had communal and industrial pollution from Târgu-Mureş to Pecica (Table 4).

During the investigations of the Someş/Szamos River System between 1-22, August, 1992, the presence of *Isochaeta mischaelseni* indicated clean water river part, while its disappearance showed the increase of organic and other pollutants. Eutrophic

and hypertrophic relations were indicated by *Limnodrilus hoffmesiteri*, *Tubifex ignotus* and *Psammoryctides moravicus* between Cluj and Gherla. Data show that the self purification of the river was not effective enough on an about 50 km long distance. The pollution level was lower between Beclean and the mouth, than on the upper river part (Table 5).

Anatopynia plumipes and *Apsectrotanypus trifascipennis* (Chironomidae, Tanypodinae) indicated clean and cold water river part. Species of Orthocladiinae were found as living in epiphyton and epilithon. Their species richness showed the high diversity of the investigated river part, but low individual density of *Eukiefferiella brevicealcar*, *Eukiefferiella coerulea*, *Euorthocladus (Orthocladus) thienemanni*, *Orthocladus saxicola*, *Prosilocerus paradoxus*, *Psectrocladius barbimanus*, *Psectrocladius obivius*, *P. simulans*, *Monodiamesa bathiphyla* and *Corynoneura scutellata* indicated clean water in the Someşul Cald/Meleg Szamos River and R. Someşul Rece/Hideg Szamos, and upstream Cluj. The phytophyle Chironomid species disappeared between Cluj and Gherla because of hypertrophic relations (Table 6).

Continuous increasing of the number of benthic Chironomids upstream Cluj indicated the sedimentation process and some food source for them. They disappeared between Cluj and Gherla because of hypertrophic environmental relations in sediment, their both low species richness and individual density showed a polluted river part from the confluence with Arin brook to the mouth (Table 6).

The ecological state of the Crişul Alb/Fehér Körös River was investigated in 1994. Regarding the Oligochaete fauna, *Limnodrilus claparedeianus*, *Limnodrilus hoffmesiteri* and *Limnodrilus profundicola* indicated eutrophic relations between Brad and Ineu, the pollution level decreased by Chişineu Criş because of the self purification (Table 7). The Chironomid fauna indicated eutrophic relations, the organic material content of the sediment was moderate, the fauna was diverse because of the high species abundance (Table 8).

The complex evaluation of the ecological state of the Crişul Negru/Fekete Körös River was made in 1994. Both the species richness and individual density of Oligochaete and Chironomids indicated eutrophic relations between Poiana and Sarkad. The presence of the only one species of *Branchiura sowerbyi* and the lack of other species showed the temporary oxygen depletion (Table 9). The species richness of benthic Chironomid fauna was high only in Tinca, but the larvae of this species lived in epilithon, like in Poiana, Ştei (Petru Groza) and Borz (Table 10).

The ecological state of the Crişul Repede/Sebes Körös River was investigated in 1995. Oligochaete appeared in Şaula, 3443 ind./m² of *Limnodrilus hoffmeisteri* indicated eutrophic relations here, but the individual density of *Limnodrilus claparedeianus*, *Limnodrilus udekemianus* and the *Tubifex* sp. confirmed our conclusion. The individual density of Oligochaete was low between Ciucea and Fughiu, they disappeared by Stâna de Vale, but showed eutrophic relations by Cheresig (Table 11).

The phytophyle Chironomid fauna showed moderate eutrophic relations. *Orthocladus saxicola* and *Cricotopus trifasciatus* indicated the clean water part (Spring area, Aleşd, Ciucea, Oşorhei). The individual density was low for all species.

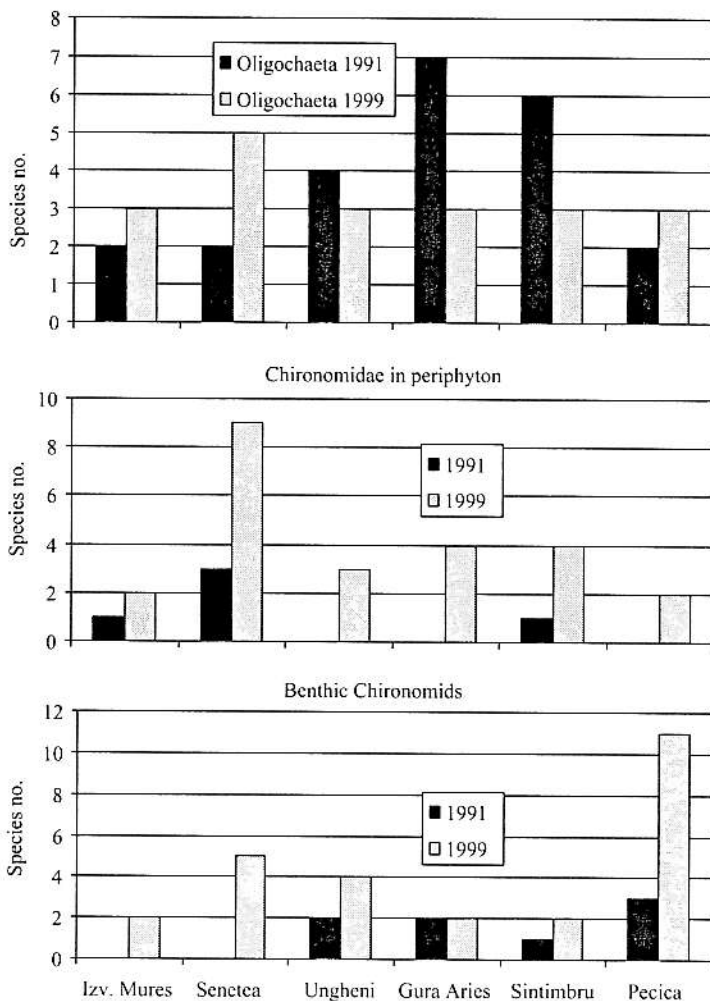


Fig. 1. Invertebrata species number in the River Mureș/Maros

The benthic Chironomid fauna showed diverse relations. *Chironomus* sp., *Cladotanytarsus mancus* and *Cryptochironomus redekei* were frequent in the sediment near the banks, *Paratendipes (intermedius) nudisquama* and *Paracladopelma rolli* appeared, indicated the rivers, which were found in Mureș/Maros earlier (Table 12).

A very important data collection was made in the international expedition, to cover up the Oligochaete and Chironomid fauna on the Upper Tisa Region and its tributaries, because there were no similar data and information from here.

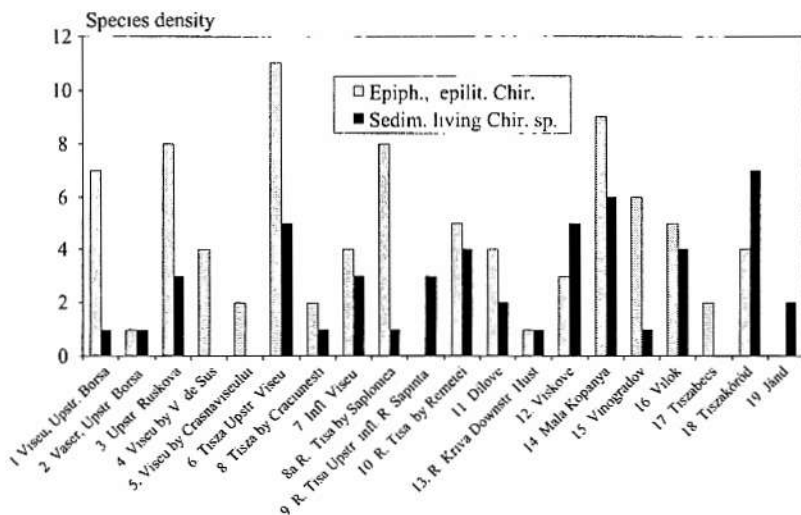


Fig. 2. Species composition of the Chironomid fauna in Upper Tisa Region (10-19 Sep., 2000)

The river beds were covered by boulders and gravels, sediment was found only rarely and it was not characteristic of this region. That was the reason why the macrozoobenthos was poor in species and individuals, too. The species and individual richness was bigger in the epiphyton than in the sediment.

Pollutants cannot concentrate because of lack of the sediment, but these materials were transported downstream and diluted. Anthropogenic pollution effects were not detected during the expedition, but the Chironomid species *Prodiamesa olivacea* was not present in the river at Rahiv. The disappearance of this species showed that some pollution effects existed periodically in this river region (Figure 2).

The investigations and the indicator species showed that Ung, Latorica, Ondava, Laborec Rivers and Bodrog River were mostly clean. The rivers were polluted on some sampling areas as follows:

The River Latorica had no benthos by Chop upstream (place 6). The River Ung by Pavlovce (place 7) was rich in food sources for benthos. 18 individuals of *Chironomus riparius*, 12 ind. of *Polypedilum nubifer* and 13 ind. of *Tripodura scalaenum* were present here. The presence of *Chironomus riparius* and *Polypedilum* species, and their individual richness showed a probability of temporary human pollution (Table 13).

River Latorica by Velky Kapusany downstream: the sediment was deep, clay *Limnodrilus hoffmeisteri* (Oligochaeta) and *Chironomus riparius* was present with 12 ind./m² and indicated communal pollution.

The presence of 6 individuals of the predator chironomid *Apsectrotanypus* suggested a food richness for them in the Laborec River by Koskovce downstream (place 9). Those Chironomid species which were commonly living both in the periphyton and sediment were present.

The Laborec River was poor in species by Stretavka downstream (place 11). The deep and organic material rich sediment had a poor zoocenose. 6 individuals of the tolerant *Limnodrilus hoffmeisteri*, 8 ind. of *Chironomus riparius*, and 4 ind. of both the *Polypedilum nubifer* and *Polypedilum convictum* showed an eutrophic environment on the left bank river side (Table 14).

The sediment of Latorica River was rich in organic material by Zlatin (place 12), but the left river bank side was bad in species. 6 ind. of *Limnodrilus hoffmeisteri*, 8 ind. of *Chironomus riparius*, and 4 ind. of both the *Polypedilum convictum* and *Polypedilum nubifer* were present here. Both the species and their individual richness indicated the probability of the richness of the organic materials in the sediment (table 14).

River Bodrog by Vinický showed deep muddy sediment (place 13). Only one individual of *Branchiura sowerbyi* (Oligochaete) was found. It was the only one from the investigated area during the expedition. We do not know its earlier data from these rivers, and its presence indicated the food richness in sediment, as well as *Limnodrilus hoffmeisteri*, which was present with 13 individuals, too. The *Corethra plumicornis* and *Cloëon dipterum* were also present here. Moreover, 5 chironomid species were detected, the presence and high individual richness of *Chironomus riparius* showed an eutrophic sediment (Table 14).

The mouth area of River Ondava by Brechov had deep sediment. The *Gomphus flavipes* was the only species here. Some species presence of Oligochaete and chironomid would be prognostized with high individual richness by the environment, but we don't know the cause of their lack.

River Bodrog by Bodrogolaszi (place 19). The sediment was rich in organic materials by right side of the river bank. The very tolerant *Limnodrilus hoffmeisteri* (Oligochaete) species was present only, but the tolerant chironomid species disappeared.

River Bodrog by Felsőberekci (place 18). The sediment was deep, with aerobic surface. The lack of the fauna was surprising (Table 14).

River Bodrog by Bodrogkeresztúr, mouth area (place 20). It was rich in organic materials. 4 species found. The *Limnodrilus hoffmeisteri* was the only Oligochaete species present here, 3 chironomid species were present with 1-2 individuals only. The fauna was poor both in species and individuals (Table 14).

The sediment fauna was formed by *Perla* sp and 10 chironomid species in River Laborec by Certizne upstream, in spring area. All the species were clean water indicators.

The presence of 6 individuals of the predator chironomid *Apsectrotanytus* suggested a food richness for them in River Laborec by Koskovce downstream (place 9). Those Chironomid species were present which were commonly living both in the lithon and sediment.

Tables

Table 1. Changes of the species and their individual density from the spring to the estuary of the River Mureş/Maros

1	Profile (section)	1	2	3	4	5
2	Sampling site	Izv. Mureş	Senetea	Suseni	Sârmaş	Răstoliţa
3	Individ/m ²					
4	Crustacea					
5	Amphipoda					
6	<i>Dicerogammarus haemobaphes</i> fluv. Mart.	564	195	24		
7	<i>Rivulogammarus balc. dac. Dobr.-Man.</i>		36	72	24	
8	Insecta					
9	Ephemeroptera					
10	<i>Siphonurus arnatus</i> Etn.		18	18	186	114
11	<i>Siphonurus lacustris</i> Etn.			12		12
12	<i>Siphonurus linneanus</i> Etn.				54	6
13	<i>Ameletus inopinatus</i> Etn.				24	
14	<i>Baëtis atrebatinus</i> Etn.				18	
15	<i>Baëtis muticus</i> L.				6	12
16	<i>Baëtis niger</i> L.				6	
17	<i>Baëtis rodani</i> Pict.			6	6	
18	<i>Baëtis pumilus</i> Burn.			12		18
19	<i>Baëtis scambus</i> Etn.		84	72	510	18
20	<i>Ecdyonurus insignis</i> Etn.				54	6
21	<i>Ephemerella notata</i> Etn.				36	
22	<i>Caenis horaria</i> L.				12	42
23	<i>Caenis macrura</i> Steph.					6
24	<i>Caenis moesta</i> Bengtss.					
25	<i>Caenis rivulorum</i> Etn.					12
26	<i>Caenis robusta</i> Etn.					6
27	<i>Potamanthus luteus</i> L.				12	6
28	Simuliidae					
29	<i>Simulium ornatum</i> Meig.		6			204
30	<i>Simulium sublacustre</i> Davies					6
31	<i>Simulium equinum</i> L.					6

1	6	7	8	9	10	11	12	13	14	15
2	Târgu Mureș	Ungheni	Gheja	Gura Arieș	Sintimbru	Alba Iulia	Deva	Zam	Pecica	Szeged
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22					6					
23										
24					6					
25					18					
26					6					
27										
28										
29										
30										
31										

Table 2. Oligochaeta species and their individual density in the River Mureş/Maros (in 1991)

1	Sampling site	Izv. Mureş	Senetea	Suseni	Sărmaş	Răstoliţa
2	Oligochaeta					Ind./m ²
3	<i>Aurodrilus limnobius</i> Bretsh.					
4	<i>Branchiura sowerbyi</i> Bedd.					
5	<i>Eiseniella tetraedra</i> Mich.					
6	<i>Isochaeta virulenta</i> Point.					6
7	<i>Limnodrilus claparedeianus</i> Rat.					
8	<i>Limnodrilus hoffmeisteri</i> Clap.					6
9	<i>Limnodrilus profundicola</i> Brinkh.	6				60
10	<i>Limnodrilus udekemianus</i> Clap.					6
11	<i>Lumbricillus lineatus</i> Mich.		6			
12	<i>Peloscolex speciosus</i> Hrabe					
13	<i>Potamotheix hammoniensis</i> Brinkh.					
14	<i>Potamotheix vejrowskyi</i> Hrabe	12	6			12
15	<i>Thalassodrilus prostatus</i> Kn+H.				6	12
16	<i>Tubifex ignotus</i> Stolz				6	18
17	<i>Tubifex nevaensis</i> Mich.					
18	Ind.	18	12	0	12	120
19	Species richness	2	2	0	2	7

1	Târgu Mureș	Ungheni	Gherla	Gura Arieș	Sintimbru	Alba Iulia	Deva	Zam	Pecica	Szeged
2										
3				30						
4								6		42
5				12						
6							4152			
7					6					
8	48	804	180	48	12	61	30856	894		58
9	7152	54	348		30				24	
10		12	6		18		30			30
11										
12				48						
13				6	12		66			
14		12		12			766	18		30
15										
16			6							
17	6		24	12	6		24		48	
18	7206	882	564	168	84	61	35894	918	72	160
19	3	4	5	7	6	1	6	3	2	4

Table 3. Chironomid species as environment indicators (Mureş/Maros, 1991)

1	Profile (section)	1	2	3	4	5
2	Sampling site	Izv. Mureş	Senetea	Suseni	Sărmaş	Răstoliţa
3		ind./m ²				
4	Chironomidae					
5	<i>Procladius choreus</i> Meig.					18
6	<i>Tanypus punctipennis</i> Meig.					
7	<i>Thienemannimyia lentiginosa</i> Fries					
8	<i>Thienemannimyia northumbrica</i> Edw.					
9	<i>Thienemannimyia</i> sp.					
10	<i>Brillia modesta</i> Meig.					6
11	<i>Cricotopus bicinctus</i> meig.		24			
12	<i>Cricotopus sylvestris</i> Fabr.		6			
13	<i>Metriocnemus hygropetricus</i> Kieff.		6			
14	<i>Prodiamesa olivacea</i> Meig.	6				36
15	<i>Chironomus fluviatilis</i> Lenz					
16	<i>Chironomus plumosus</i> L.					
17	<i>Chironomus riparius</i> Meig.					
18	<i>Chironomus semireductus</i> Lenz					
19	<i>Cryptochironomus redekei</i> Krus.					24
20	<i>Dicrotendipes nervosus</i> Staeg.					
21	<i>Dicrotendipes pulsus</i> Walk.					
22	<i>Einfeldia pectoralis</i> Kieff.					
23	<i>Microchironomus bicolor</i> Zett.					6
24	<i>Microtendipes chloris</i> Meig.					186
25	<i>Paracladopelma camptolabis</i> Kieff.					
26	<i>Paratendipes albimanus</i> Meig.					6
27	<i>Polypedilum convictum</i> Walk.					114
28	<i>Polypedilum nubeculosum</i> Meig.					
29	<i>Tripodura</i> (<i>Polypedilum</i>) <i>scalaenum</i> Schr.					6
30	<i>Robackia demeijerei</i> Krus.					

1	6	7	8	9	10	11	12	13	14	15
2	Târgu Mureș	Ungheni	Gherla	Gura Arieș	Sîntimbru	Alba Iulia	Deva	Zam	Pecica	Szeged
3										
4										
5	102				6					
6	6									
7					6					
8					6					
9					6					
10										
11										
12										
13										
14										
15	12		6							
16	192									
17	78									
18										
19	24			24						
20			24							
21			18							
22	6									
23										
24										
25						6			6	
26										
27										
28		312								
29	96	6	6	12	18			6	126	12
30									18	

Table 4. Benthic and epilithic Chironomid species and their individual density in different parts of the River Mureş in 1999

Species	Izvorul Mureş	Senetea	Sălard	Ungheni	Sintimbru	Gura Arieş	Sintimbru	Vinţu de Jos	Pecica
	27. 07	27. 07	27, 07	02. 09	15. 09	06.09	26. 09	19. 09	21. 09
	Ind./m ²								
Nematoda									47
Oligochaeta									
Amphicaeta leydigii Tauber	3								
Ophidonais serpentina Müller	17	13							
Enchytraeus buchholzi Vejd.			3						
Limnodrilus hoffmeisteri Claparède		33				80	163	23	10
Limnodrilus profundicola Verrill						27			
Potamothrix vej dovskiyi Hrab e		63	10	23					
Pristina bilobata Bretsch.	550	277	23		10		2387	17	
Stylaria lacustris Linnaeus				27	10				27
Tubifex nevaensis Mich.		340	33	120	10	53	227	420	23
Oligochaeta (ind./m ²)	570	727	70	170	30	160	2777	460	60
Oligochaeta (species richness)	3	5	4	3	3	3	3	3	4
Chironomidae									
Tanypodinae									
Psilotanypus imicola Kieff.		7							
Tanypus punctipennis Meig.				3		177	687	143	37
Krenopelopia binotata Wied.	7		50		13	3		20	10
Corynoneurinae									
Corynoneura validicornis Kieff.							3		
Orthocladiinae									
Acricotopus lucens Staeg.				3					
Briophaenocladus nitidicollis Goetgh.								3	
Cricotopus bicinctus Meig.		80	223				70	77	7

Table 4. (continued)

Species	Izvorul	Senetea	Sălard	Ungheni	Sintimbru	Gura	Sintimbru	Vințu	Pecica
	Mureș	27. 07	27, 07	02. 09	15. 09	Arieș	26. 09	de Jos	21. 09
	27. 07	27. 07	27, 07	02. 09	15. 09	06.09	26. 09	19. 09	21. 09
Species	Ind./m ²								
<i>Cricotopus cylindraceus</i> Kieff.		157	70	3					
<i>Cricotopus fuscus</i> Kieff.									
<i>Eukiefferiella brevicar</i> Kieff.								3	
<i>Eukiefferiella claripennis</i> Lundbeck			60						
<i>Eukiefferiella coerulea</i> Kieff.		37							
<i>Eukiefferiella devonica</i> Edwards			47						
<i>Heleniella thienemanni</i> Gowin	17	3			20			7	
<i>Monodiamesa bathyphila</i> Kieff.						3		120	
<i>Nanocladius bicolor</i> Zett.		3						20	
<i>Orthocladus barbatus</i> Cindea			3						
<i>Orthocladus olivaceus</i> Kieff.								7	
<i>Orthocladus rivulorum</i> Kieff.			60						
<i>Orthocladus saxicola</i> Kieff.		153	1527		140	3	30	750	180
<i>Parakiefferiella bathophila</i> Kieff.			17						
<i>Prodiamesa olivacea</i> Meig.		13							
<i>Prodiamesa rufovittata</i> Goetgh.			10						
<i>Psectrocladius psilopterus</i> Kieff.		47	260		300				
<i>Trissocladius brevipalpis</i> Kieff.								397	
<i>Zavrelimyia nubila</i> Meig.			60						
Orthocladiinae (Ind./m²)	23	500	2387	10	473	187	827	1663	293
Orthocladiinae (Species richness)	2	9	12	3	4	4	5	12	2
Chironominae									
Chironomini									

Table 4. (continued)

	Izvorul	Senetea	Sălard	Ungheni	Sintimbru	Gura	Sintimbru	Vințu	Pecica
	Mureș	27. 07	27, 07	02. 09	15. 09	Arieș	26. 09	de Jos	21. 09
Species	Ind./m ²								
<i>Chironomus riparius</i> Meig.						20			
<i>Chironomus salinarius</i> Kieff.				3			10	13	10
<i>Cryptochironomus redekei</i> Krus.			3						
<i>Cryptotendipes pseudotener</i> Goetgh.									3
<i>Dicrotendipes nervosus</i> Staeg.									
<i>Einfeldia dissidens</i> Walk.							3	7	10
<i>Einfeldia pectoralis</i> Kieff.									
<i>Parachironomus tenuicaudatus</i> Mall.		3							
<i>Paracladopelma camptolabis</i> Kieff.		33		17		123	330	207	520
<i>Polypedilum convictum</i> Walk.		10	13	3				27	760

Table 4. (continued)

	Izvorul Mureș	Senetea	Sălărd	Ungheni	Sintimbru	Gura Arieș	Sintimbru	Vințu de Jos	Pecica
	27. 07	27. 07	27, 07	02. 09	15. 09	06.09	26. 09	19. 09	21. 09
Species	Ind./m ²								
Polypedilum nubeculosum Meig.									
Polypedilum sordens v.d. Wulp		3	950						3
Tripodura scalaenum Schrank			7	80					167
Tanytarsini									
Cladotanytarsus mancus Walk.	3								23
Rheotanytarsus curtistylus Goetgh.			20		27		13	33	40
Tanytarsus curticornis Kieff.									17
Tanytarsus gregarius Kieff.					37				57
Simulida	13	10							
Chironominae (Ind./m ²)	3	50	993	103	63	123	357	287	1610
Species richness	2	5	4	4	2	1	4	5	11

Table 5. Oligochet fauna and the individual density in the Someș River System (1-22 August, 1992)

1		Eiseniella	Enchytraeus	Isochaeta	Limno.	Limno.	Pelosc.	Pelosc.	Pot.
2		tetra.	buchholzi	michaelseni	hoffm.	udek.	speciosus	ferox	hamm.
3		ind./m2							
4	1. Someș Cald.	4		7	0	0	0		
5	2. Someș Rece	34		21	0	0	0		
6	3. Upstr. Cluj				2	0	1		
7	4. Downstr. Cluj				9000	0			
8	5. Upstr. Gherla				7660	301			
9	6. Confl. With Arin brook	5	1	1	4				
10	7. Sângeorzi Bâi	4		4			4		
11	8. Downstr. Năsăud								
12	9. Downstr. Beclean				683				
13	10. Downstr. Dej				2			1	
14	11. Someș Odorhei				13				1
15	12. Sălsig				20				
16	13. Pomi				12				1
17	14. Păulești				4	12			
18	15. Vetiș				65				
19	16. V. namény				96				
20	Frequency (%)	7	1	7	22.8	3.2	3.2	1	3.2

1	Potam.	Psammoryct.	Psammoryct.	Stilodr.	Stylaria	Tubifex	Tubifex	Tubifex	Species
2	vejd.	morav.	barbatus	heringe.	lac.	nevae.	ignotus	tubifex	
3									
4	0	0		0	0	0	0		2
5	11	0		4	0	0	0		4
6	2	0			1	1	0		5
7		0					1000		2
8		1204					3400		4
9									4
10									3
11							2		1
12	33						532		3
13	9					17	7		5
14						7			3
15			1			4	14	4	5
16			1			68	34	6	5
17						12	7		4
18						4	12		3
19						36	22		3
20	7	1	3.2	1	1	15.6	18.7	3.2	

Table 6. Chironomid species and their density in the Someş/Szamos River System (1-22 August, 1992)

1	Sampling sites									
2	Feeding type	1. S. Cald	2. S. Rece	3. Upstr. Cluj	4. Downstr. Cluj	5. Upstr. Gherla	6. Confl with Arin brook	7. Sângeorzi Băi		
3	Species	ind./m ³								
4		Tanypodinae								
5	Pre-dators	<i>Anatopynia plumipes</i> (Fries, 1823)			2					
6		<i>Apsectrotanypus trifascipennis</i> (Zett., 1838)	1	2						
7		<i>Macropelopia notata</i> Meig.				1				
8		<i>Natarsia punctata</i> Fabr.				1				
9		<i>Procladius choreus</i> Meig.								
10		<i>Tanypus punctipennis</i> (Meig., 1818)				1				
11		Orthoclaadiinae								
12	P h y t o p h i l e f a u n a	<i>Brillia longifusca</i> (Kieff., 1921)			1					
13		<i>Bryophaenocladus nitidicollis</i> Goetgh.					1			
14		<i>Cricotopus bicinctus</i> Meig.				11				
15		<i>Cricotopus fuscus</i> Kieff.								
16		<i>Cricotopus trifascia</i>								
17		<i>Eukiefferiella brevicar</i> Kieff.	2	1						
18		<i>Eukiefferiella clypeata</i> Kieff.								
19		<i>Eukiefferiella coerulescens</i> Kieff.		1						
20		<i>Eukiefferiella gracei</i> (Edw., 1929)								
21		<i>Eukiefferiella lobifera</i> Goetgh.	1	1						
22		<i>Eukiefferiella similis</i> Goetgh.	11	5	1					
23		<i>Euorthocladus</i> <i>Orthocladus thienemanni</i> Kieff.				1				
24		<i>Isocladus</i> (<i>Cricotopus</i>) <i>sylvestris</i> Fabr.	1							
25		<i>Nanocladus bicolor</i> Zett.				1				
26	<i>Orthocladus saxicola</i> Kieff.				6					
27	<i>Orthocladus</i> sp.				7					
28	<i>Paracladius conversus</i> Walk.				8					
29	<i>Propilocerus danubialis</i> (Bom. et Albu, 1956)	1		2						
30	<i>Propilocerus paradoxus</i> Lundstr.			1						
31	<i>Psectrocladius barbimanus</i> Edw.	1								

1									
2	8. Downstr. Năsăud	9. Downstr Beclan	10. Downstr. Dej	11 Someș Odorhei	12. Sălsig	13. Pomi	14. Păulești	15. Vetiș	16. V.namény
3									
4									
5									
6									
7									
8									
9								1	
10		1							
11									
12									
13	2								
14	3	12	39	127	12				
15									1
16			1						
17									
18	2					36	21	5	22
19									
20	2								
21									
22	2								
23									
24	8								
25			16						
26									
27									
28	3								
29		1							2
30									
31									

Table 6. (continued)

1	2	Feeding type	Sampling sites						
			1. S Cald	2. S Rece	3. Upstr Cluj	4. Downstr. Cluj	5. Upstr Gherla	6. Confl with Arin brook	7. Sängeorzi Băi
32		<i>Psectrocladius obivius</i> (Walker, 1856)	1						
33		<i>Psectrocladius similans</i>			3				
34		<i>Smittia aterrima</i> Meig.							
35		<i>Thienemannia gracilis</i> (Kieff., 1909)	1		1			1	
36		<i>Zalutschia mucronata</i> (Brundin, 1949)							
37		Diamesinae							
38		<i>Monodiamesa (Prodiamesa) bathypila</i> (Kieff., 1918)			2				
39		<i>Prodiamesa olivacea</i> Meig.			1			7	
40		<i>Pseudodiamesa branichii</i> Now.	1						
41		Corynoneurinae							
42		<i>Corynoneura scutellata</i> Win.	4						
43		Ind. density of phytophile fauna	24	9	45	0	0	9	0
44		Species richness	10	5	13	0	0	3	0
45		Chironominae							
46		Chironomini							
47	B	<i>Chironomus annularius</i> Meig.							22
48	e	<i>Chironomus riparius</i> Meig.			5		1		
49	n	<i>Cryptochironomus defectus</i> Kieff.		2					
50	t	<i>Cryptochironomus holsatus</i> (Lenz, 1959)			1				
51	h	<i>Cryptochironomus redeketi</i> Krus.							
52	i	<i>Endochironomus tendens</i> (Fabr., 1775)							
53	c	<i>Microtendipes chloris</i> (Meig., 1818)			10				
54		<i>Microtendipes pedellus</i> d. Geer			20				
55	f	<i>Microtendipes tarsalis</i> Walk.			8				
56	a	<i>Paracladopelma camptolabis</i> (Kieff., 1913)		6					
57	u	<i>Polypedilum convictum</i> Walk.							
58	n	<i>Polypedilum laetum</i> Meig.			2				
59	a	<i>Stictochironomus crassiforceps</i> Kieff.			38				

1									
2	8. Downstr. Näsäud	9. Downstr. Beclan	10. Downstr. Dej	11 Someş Odorhei	12. Sälsig	13 Pomi	14 Päuleşti	15. Vetiş	16 V namény
32									
33									
34	6								
35									
36									2
37									
38									
39									
40									
41									
42									
43	28	13	56	127	12	36	21	5	27
44	8	2	3	1	1	1	1	1	4
45									
46									
47									
48				1					
49									
50									
51	2		26				3		
52	1								
53									
54									
55									
56									
57			3	1					
58									
59				1					

Table 6. (continued)

1		Sampling sites							
2	Feeding type		1. S. Cald	2. S. Rece	3. Upstr. Cluj	4. Downstr. Cluj	5. Upstr. Gherla	6. Confl. with Arin brook	7. Sângeorzi Bâi
60		<i>Tripodura (Polypedilum) scalaenum (Schrank, 1803)</i>		45					
61		<i>Zavreliella marmorata (v. d. Wulp, 1858)</i>			6				
62		Tanytarsini							
63		<i>Micropsectra apposita (Walker, 1856)</i>						1	
64		<i>Micropsectra junci (Meig., 1818)</i>			2				
65		<i>Paratanytarsus lauterborni Kieff.</i>							
66		<i>Rheotanytarsus curtistylus Kieff.</i>	1						
67		<i>Tanytarsus gracilentus (Holmgr., 1883)</i>			2				
68		<i>Tanytarsus gregarius Kieff.</i>	43	6	6				
69		Ind. density of Chironomini	44	59	100	0	1	1	22
70		Species richness	3	4	11	0	1	1	1
71		Total ind. density	69	70	150	0	1	10	22
72		Species density	13	10	30	0	1	4	1

1	2	8.	9	10.	11.	12.	13.	14.	15.	16.
		Downstr. Näsäud	Downstr. Beclean	Downstr Dej	Someş Odorhei	Sälsig	Pomi	Păuleşti	Vetş	V.namény
60				5	8		2		2	1
61										
62										
63										
64										
65			1							
66										
67										2
68										
69		3	1	34	11	0	2	3	2	3
70		2	1	3	4	0	1	1	1	2
71		31	15	90	138	12	38	24	8	30
72		10	4	6	5	1	2	2	3	5

Table 7. Quantitative data of the Oligochaete in the River Fehér Körös (Crişul Alb, in 1994)

Species	Sampling places				
	Criş	Brad	Aciuţa	Ineu	Ch. Criş
	ind./m ²				
<i>Limnodrilus claparedeianus</i>		171	302	3006	40
<i>Limnodrilus hoffmeisteri</i>		2313	845	306	
<i>Limnodrilus profundicola</i>		428	181	982	30

Table 8. Chironomid fauna in the River Crişul Alb (Fehér Körös, in 1994)

Species	Spring area	Brad				Ch. Criş	Aciuţa	Ineu	Gyula	
	main current	near the bank	fresh alder leaves in water	navvy holes	river bed					
ind./m ³										
P	<i>Brillia longifusca</i> K.		8	19						
h	<i>Cladopelma laccophila</i> K.				19				11	
y	<i>Cricotopus sylvestris</i> Fabr.								8	
t	<i>Eukiefferiella coerulea</i> K.					4				
o	<i>Limnophies prolongatus</i> K.		15							
p	<i>Orthocladius olivaceus</i> K.	11								
h	<i>Orthocladius saxicola</i> K.			4		8		19		
i	<i>Parakiefferiella bathophila</i> K.						19			
l	<i>Paralauterborniella nigrohalteralis</i> Mall.						4			
e	<i>Psectrocladius barbimanus</i> Edw.					446	4			
s	<i>Rheocricotopus effusus</i> Walk.		8							
p	<i>Syndiamesa branickii</i> Now.		4							
e	<i>Thienemanniella flavescens</i> Edw.		4							
e	<i>Thienemanimyia lentiginosa</i> Fries	79	38		132	4	87	42		
c.	Ind. density	91	76	23	151	450	12	114	61	19
	Species number	2	6	2	2	2	4	2	2	

Table 8. (continued)

Species	Spring area	Brad				Ch. Criș	Aciuța	Îneu	Gyula
	main current	near the bank	fresh alder leaves in water	navvy holes	river bed				
B	<i>Chironomus thummi</i> (fluviatilis Lenz)					11			
e	<i>Chironomus plumosus</i> Linnaeus				8	4			
n	<i>Cladotanytarsus mancus</i> Walk.	4					4		
t	<i>Conchapelopia pallidula</i> Mg.				4	15			
h	<i>Cryptochironomus defectus</i> K.				49				
i	<i>Cryptochironomus redekei</i> Krus.	4			38		23	15	
c	<i>Cryptotendipes anomalus</i> K.				57			4	4
	<i>Dicrotendipes nervosus</i> Staeg.								19
s	<i>Dicrotendipes pulsus</i> Walk.								8
p	<i>Dicrotendipes tritonus</i> K.							4	
e	<i>Einfeldia insolita</i> K.				4				
c	<i>Einfeldia pectoralis</i> K.	4			4				
i	<i>Endochironomus intextus</i> Walk.			11					
e	<i>Krenopelopia binotata</i> Wied.							4	
s	<i>Macropelopia nebulosa</i> Mg.	4							42
	<i>Micropsectra praecox</i> Mg.	110	8					8	
	<i>Micropsectra trivialis</i> K.								8
	<i>Microtendipes chloris</i> Mg.						4	4	
	<i>Parachironomus arcuatus</i> Goetgh.				23				
	<i>Parachironomus monochromus</i> v.d. Wulp								11
	<i>Paratanytarsus lauterborni</i> K.	4	4			4		8	
	<i>Pentapetilum sordens</i> v. d. Wulp	4	8	34		30			

Table 8. (continued)

Species	Spring area	Brad				Ch. Criş	Aciuţa	Ineu	Gyula
	main current	near the bank	fresh alder leaves in water	navvy holes	river bed				
<i>Polypedilum minutum</i> Krug.			15	0	34	11	23		
<i>Polypedilum nubeculosum</i> Mg.		4	4	23					11
<i>Polypedilum nubifer</i> Skuse				8					
<i>Tripodura (Polypedilum) scalaenum</i> Schr.	11	15			64			4	4
<i>Procladius choreus</i> Mg.		4		15					
<i>Robackia demetjerei</i> Krus.						8			
<i>Tanytus punctipennis</i> Mg.				19					
<i>Tanytarsus curticornis</i> K.	8			8	11		4	4	11
<i>Tanytarsus gregarius</i> K.							4		
Ind. density	151	42	64	257	174	23	64	45	117
Species number	9	6	4	13	8	3	6	8	9
Total ind./m ²									
	242	117	144	408	646	34	178	106	136
Species richness									
	11	12	6	15	10	5	10	10	11

Table 9. Species richness and quantitative data of the Oligochaete in the River Fekete Körös (Crişul Negru), River Kettős Körös and River Hármas Körös (August 10-17, 1994)

Species	Sampling places								
	Poiana	Ştei	Borz	Tinca	Zerind	Gyula	Sarkad	Békés, R. Kettős K.	Csongrád, R. Hármas K.
	Ind./m ²								
<i>Branchiura sowerbyi</i>				59					59
<i>Eiseniella tetraedra</i>	200		51						
<i>Limnodrilus claparedeianus</i>		401							
<i>Limnodrilus hoffmeisteri</i>		987	89		182				44

Table 10. Chironomid fauna in the River Crişul Negru (Fekete Körös, in 1994)

Species		Poiana		Ştei		Borz	Tinca	Zerind		Sarkad
		bank	gravels	sandy sediment	gravels	gravels	sediment	sediment	phyto-tecton	clay sediment
P h y t o p h i l e s p e c i s	<i>Brillia longifusca</i> K.		8							
	<i>Brillia modesta</i> Mg.	4								
	<i>Briophaenocladus nitidicollis</i> Goetgh.		4							
	<i>Cricotopus bicinctus</i> Mg.					4				
	<i>Cricotopus trifascia</i> Edw.				4					
	<i>Eukiefferiella longicalcar</i> K.				8					
	<i>Eukiefferiella similis</i> Goetgh.				8					
	<i>Eukiefferiella tshernovskii</i> Pankr.				106					
	<i>Limnophies pusillus</i> Eaton		4							
	<i>Metriocnemus hygropetricus</i> K.		8							
	<i>Orthocladus olivaceus</i> K.				23					
	<i>Orthocladus saxicola</i> K.				15					
	<i>Parakiefferiella bathophila</i> K.			4						
	<i>Paralauterborniella nigrohalteralis</i> Mall.				4	8	4		8	
	<i>Potthastia longimana</i> K.	4								
	<i>Prodiamesa olivacea</i> Mg.	87					4			
	<i>Propilocerus danubialis</i> Botnariuc et Albu				11					
	<i>Psectrocladius barbimanus</i> Edw.				19					
	<i>Synorthocladus semivirens</i> K.		8							
	<i>Thienemanniella clavicornis</i> K.	4								
Ind. density	98	30	4	196	11	8	0	8	0	
Spec. number	4	5	1	9	2	2	0	1	0	

Table 10. (continued)

Species		Poiana		Ștei		Borz	Tinca	Zerind		Sarkad
		bank	gravels	sandy sediment	gravels	gravels	sediment	sediment	phyto-tecton	clay sediment
B	<i>Arctopelopia sp.</i>	4								
e	<i>Chironomus fluvianilis</i> Lenz					15				
n	<i>Chironomus riparius</i> Mg.					8				
t	<i>Cladotanytarsus mancus</i> Walk.							11	19	
h	<i>Conchapelopia pallidula</i> Mg.					15				
i	<i>Cryptochironomus redekei</i> Krus.					4		4		
c	<i>Cryptotendipes anomalus</i> K.					4	249			
	<i>Demicryptochironomus vulneratus</i> Zett.		19							
s	<i>Dicrotendipes nervosus</i> Staeg.					4				
p	<i>Macropelopia nebulosa</i> Mg.	4								4
e	<i>Micropsectra praecox</i> Mg.		4							
c	<i>Micropsectra trivialis</i> K.	23								
i	<i>Microtendipes chloris</i> Mg.						4			
e	<i>Microtendipes pedellus</i> de Geer						15			
s	<i>Paracladopelma camptolabis</i> K.						4			4
	<i>Paratanytarsus lauterborni</i> K.					8				
	<i>Pentapedilum sordens</i> v. d. Wulp	34	11		4					
	<i>Polypedilum minutum</i> Krug.	113	42			34			12	
	<i>Polypedilum nubeculosum</i> Mg.	634	8							
	<i>Procladius choreus</i> Mg.	23				4	8			
	<i>Protanypus morio</i> Zett.		8							
	<i>Tanypus punctipennis</i> Mg.					4	11			
	<i>Tanytarsus arduensis</i> Goetgh.						4			
	<i>Tanytarsus curticornis</i> K.	4			4	4				

Table 10. (continued)

Species	Poiana		Ștei		Borz	Tinca	Zerind		Sarkad
	bank	gravels	sandy sediment	gravels	gravels	sediment	sediment	phyto-tecton	clay sediment
<i>Tanytarsus gracilentus</i> Holmgr.						15			
<i>Tanytarsus gregarius</i> K.		8			4				
<i>Thienemannimyta lentiginosa</i> Fries	102	110							
<i>Tripodura (Polypedilum) scalaenum</i> Schr.					53				
<i>Trissopelopia longimana</i> Staeg.	4								
Ind. density	944	208	0	15	151	310	15	31	8
Spe number	10	8	0	3	12	8	2	2	2
Total ind.	1042	238	4	211	162	317	15	38	8
Species richness	14	13	1	12	14	10	2	3	2

Table 11. Oligochaete and their quantity in the River Crișul Repede (Sebes Körös, in 1995)

Species	Sampling places							
	Șaula	Ciucea	Bologa	Stâna de Vale	Vadul Crișului	Aleșd	Fughiu	Cheresig
	Ind./m ²							
<i>Limnodrilus claparedeianus</i>	328				6			266
<i>Limnodrilus hoffmeisteri</i>	3443	56	561			12	17	5665
<i>Limnodrilus profundicola</i>	11							
<i>Limnodrilus udekemianus</i>	439		27					54
<i>Tubifex tubifex</i>	859	6	53		13	46	3	742

Table 12. Chironomid fauna of the River Crişul Repede/Sebes Körös in 1995.

1	2	3	Spring area		Aleşd				Bologa			Downstream Ciucea			
			bank	main current	bank	2 ms from the bank	bank	26 ms from the bank	bank	2 ms from the bank	main current	right bank	main current	left bank	
4	5	6	Ind./m ²												
p	<i>Cardiocladius fuscus</i> K.														
h	<i>Cricotopus albiforceps</i> K.														
y	<i>Cricotopus algarum</i> K.		4	8	4										
t	<i>Cricotopus annulator</i> Goetgh.		8												
o	<i>Cricotopus bicinctus</i> Mg.														
p	<i>Cricotopus fuscus</i> K.														
h	<i>Cricotopus sylvestris</i> Fabr.														
i	<i>Cricotopus tremulus</i> Linnaeus		8												
l	<i>Cricotopus trifasciatus</i> Edw.	15	15		8									4	
e	<i>Eukiefferiella breviceps</i> K.														
	<i>Eukiefferiella quadridentata</i> Tshern.	19													
s	<i>Eukiefferiella tshernovskii</i> Pankr.	8													
p	<i>Limnophyes prolongatus</i> K.										15				
e	<i>Limnophyes pusillus</i> Eaton		8												
c	<i>Metricnemus hygropetricus</i> K.			4											
i	<i>Nanocladius bicolor</i> Zett.														
e	<i>Orthocladius saxicola</i> K.	11	90		11								4		
s	<i>Orthocladius thienemanni</i> K.	23	4	11	38		8								
	<i>Paracladius conversus</i> Walk.														
	<i>Parakiefferiella bathophila</i> K.			5											
	<i>Potthastia gaedi</i> Mg.														
	<i>Procladius olivacea</i> Mg.	4													

1	Upstream Oşorhet						Fughı u		Cheresig				Szeg-halom	
2	2 ms from the bank	bank side	bank side	6 ms from the bank	main current	6 ms from the bank	2 ms from the bank	bank side	main current	bank side	2 ms from the bank	main current	main current	2 ms from the bank
3														
4							0		15					
5							4							
6							4			8				
7														
8		11												
9							8							
10							4							
11														
12							26							
13		8												
14														
15														
16														
17														
18														
19					4		4		4					
20	4	11	8		4		11		19					19
21	11			4			15	8				11		
22									83					
23														
24									26					
25								79						

Table 12.(continued)

1	2	Spring area		Aleşd			Bologa			Downstream Ciucea			
		bank	main current	bank	2 ms from the bank	bank	26 ms from the bank	bank	2 ms from the bank	main current	right bank	main current	left bank
3	Species	Ind./m ²											
26	<i>Psectrocladius barbimanus</i> Edw.									4			
27	<i>Psectrocladius dilatatus</i> v. d. Wulp	125			4								
28	<i>Symptostocladus lignicola</i> K.												
29	<i>Thienemannella vittata</i> Edw.												
30	<i>Trissocladus fluviatilis</i> Goetgh.									38			
31	Ind. density	204	136	23	69	0	8	0	4	53	4	4	0
32	Species number	7	7	3	6	0	1	0	1	2	1	1	0
33													
34	B <i>Apsectrotanyptus trifascipennis</i> Zett.												
35	e <i>Chironomus (fluviatilis) Lenz) thummi</i>												
36	n <i>Chironomus riparius</i> Mg.												4
37	t <i>Cladopelma laccophila</i> K.												
38	h <i>Cladotanytarsus mancus</i> Walk.			155		465	41				4		4
39	i <i>Clinotanyptus nervosus</i> Mg.												
40	c <i>Corynoneura celeripes</i> Wtn.	8											
41	<i>Corynoneura lemnae</i> Frauenfeld												
42	s <i>Cryptochironomus redekei</i> Krus.			38		72	15					4	4
43	p <i>Cryptotendipes anomalus</i> K.												
44	e <i>Demicyptochironomus vulneratus</i> Zett.									11			
45	c <i>Dicrotendipes nervosus</i> Staeg.												
46	i <i>Dicrotendipes tritonus</i> K.												
47	e <i>Einfeldia pectoralis</i> K.												4
48	s <i>Glyptotendipes cauliginellus</i>			4									

1	Upstream Oşorhei						Fughtu		Cheresig				Szeghalom	
2	2 ms from the bank	bank side	bank side	6 ms from the bank	main current	6 ms from the bank	2 ms from the bank	bank side	main current	bank side	2 ms from the bank	main current	main current	2 ms from the bank
3														
26														
27								4	4				8	
28									15					
29			4											
30														
31	15	30	11	4	8	0	76	91	166	8	0	19	19	0
32	2	3	2	1	2	0	9	3	7	1	0	2	1	0
33														
34							15							
35				23			140	8					4	
36							8	15						
37														4
38		8	4	4		4	26							34
39					4									
40														
41								4						
42				8	11		15	4			45	23	49	
43			4										4	
44														
45							11		11			8	72	
46			8	11			125				4	4		
47														
48														

Table 12.(continued)

1		Spring area		Aleşd			Bologa			Downstream Ciucea			
2		bank	main current	bank	2 ms from the bank	bank	26 ms from the bank	bank	2 ms from the bank	main current	right bank	main current	left bank
3	Species	Ind./m ²											
49	<i>Kiefferulus tendipediformis</i> Goetgh.												
50	<i>Lenzia flavipes</i> Mg.												
51	<i>Paracladopelm a camptolabis</i> K.			8		11							
52	<i>Paracladopelm a rolli</i> Kirp.												
53	<i>Macropelopia nebulosa</i> Mg.												
54	<i>Micropsectra praecox</i> Mg.				4					8			
55	<i>Microtendipes chloris</i> Mg.												8
56	<i>Parachronomus arcuatus</i> Goetgh.												
57	<i>Paratendipes intermedius</i> Tsh.												4
58	<i>Paratendipes connectens</i> Lipina												4
59	<i>Pentapedilum sordens</i> v. d. Wulp	4		11	8							15	
60	<i>Polypedilum minutum</i> Krug											4	
61	<i>Polypedilum nubeculosum</i> Mg.			4		8							
62	<i>Polypedilum scalaenum</i> Schr	26	4				4				4	4	196
63	<i>Procladius choreus</i> Mg.			11		26							
64	<i>Procladius conversus</i> Walk.												
65	<i>Camptochronomus tentans</i> Fabr.												
66	<i>Thienemannimyia lentiginosa</i> Fries								4	4		11	
67	<i>Tanypus punctipennis</i> Mg.					4							
68	<i>Tanytarsus curticornis</i> K.												

1	Upstream Oşorhej							Fughi		Cheresig				Szeg- halom
2	2 ms from the bank	bank side	bank side	6 ms from the bank	main current	6 ms from the bank	2 ms from the bank	bank side	main current	bank side	2 ms from the bank	main current	main current	2 ms from the bank
3														
49							4							
50				4										
51				4			4					8		
52														8
53						4	30	15						
54	4			11				19	4	4		4	4	
55		4						11						
56								4						
57			4	4				19						
58														
59	11	19						30	8					
60	4	4		4		4	4	4						
61			4				15	4				4	8	4
62	15	11	8	64	8		45	98		83	242	128	491	30
63			8					4						
64							4							
65				4										
66		8	4			4		4		4		4		
67														
68			4									8	4	

Table 12.(continued)

1		Spring area		Aleşd			Bologa			Downstream Cucea			
2		bank	main current	bank	2 ms from the bank	bank	26 ms from the bank	bank	2 ms from the bank	main current	right bank	main current	left bank
3	Species	Ind./m ²											
69	<i>Tanytarsus gracilentus</i> Holmgr.	19											
70	<i>Tanytarsus gregarius</i> K.								4				
71	Ind. density	57	4	230	12	585	60	0	8	23	8	38	227
72	Species number	4	1	7	2	6	3	0	2	3	2	5	8
73													
74	Total ind./m ²	261	139	253	81	585	68	0	11	76	11	42	227
75	Species richness	11	8	10	8	6	4	0	3	5	3	6	8

1	Upstream Oşorhei						Fughiu		Cheresig				Szeghalom	
2	2 ms from the bank	bank side	bank side	6 ms from the bank	main current	6 ms from the bank	2 ms from the bank	bank side	main current	bank side	2 ms from the bank	main current	main current	2 ms from the bank
3														
69														
70	4	42		4			15		19					
71	38	94	45	144	23	15	461	242	42	91	291	196	661	45
72	5	7	9	12	3	4	13	14	4	3	3	11	7	4
73														
74	53	125	57	147	30	15	536	332	208	98	291	215	680	45
75	7	10	11	13	5	4	22	17	11	4	3	13	8	4

Table 13. The macrozoobenthos in River Bodrog and its tributaries (2-16 August, 1999)

1		Ung	Ung	Ung	Ung	Ung	Ung	
2	Sampling sites	1. Storožhnica		2. Nevickeupstr.	Nevicke upstr.	Nevicke upstr.	3. Uzhok	3/a
3	Species	stagnant w.	current w.	the main current	muddy	near bank	spring area	Stavne upstr.
4	Individuals in samples							
5	<i>Chironomus anthracinus</i> (gr.)							
6	<i>Chironomus riparius</i> (Meigen 1804)		5			15		
7	<i>Chironomus lacunarius</i> (Wülker 1973)					2		
8	<i>Chironomus aprilinus</i> (Meigen 1830)			1				
9	<i>Cryptochironomus defectus</i> (Kieffer 1913)		2			1	1	
10	<i>Cryptochironomus redekei</i> (Kruseman 1933)		2					
11	<i>Glyptotendipes pallens</i> (Meigen 1804)		1					
12	<i>Demicryptochironomus vulneratus</i> (Zetterstedt 1838)							1
13	<i>Einfeldia carbonaria</i> (Meigen 1804)			1				
14	<i>Endochironomus tendens</i> (Fabricius 1775)							
15	<i>Microtendipes chloris</i> (Meigen 1818)		1				1	
16	<i>Cladotanytarsus mancus</i> (Walker 1856)					3		
17	<i>Constempellina brevicosta</i> (Edwards 1937)							
18	<i>Micropsectra atrofasciata</i> (Kieffer 1911)							
19	<i>Micropsectra junci</i> (Meigen 1818)			1				
20	<i>Rheotanytarsus curtistylus</i> (Goetghebuer 1921)			1			1	
21	<i>Tanytarsus gregarius</i> (Kieffer 1909)		2		2		1	
22	<i>Tanytarsus gregarius</i> (Kieffer 1913)							
23	<i>Dicotendipes nervosus</i> (Staeger 1838)		1	14				

1	Latorca	Latorca	Latorca	Ung	Latorca	Laborec	Laborec	Laborec
2	4. Pidpolozja	5. Pasika	6. Chop upstr.	7. Pavlovce	8. Velk. Kap.	9. Certizne upstr.	9/a Koskowce downstr.	10. Petrovce downstr.
3	the main current					spring area		
4								
5						1		
6				18	12			
7								
8								
9								
10								
11								
12								
13								
14		1						
15								
16								
17		8						2
18	2							
19								
20							11	
21	4	2						
22						1		
23							4	

Table 13. (continued)

1	Ung	Ung	Ung	Ung	Ung	Ung	Ung
2 Sampling sites	1. Storozhnica		2. Nevickeupstr.	Nevicke upstr.	Nevicke upstr.	3. Uzhok	3/a
3 Species	stagnant w.	current w.	the main current	mudy	near bank	spring area	Stavne upstr.
4	Individuals in samples						
24 <i>Dicrotendipes tritonus</i> (Kieffer 1916)		5					
25 <i>Parachironomus arcuatus</i> (Goetghebuer 1919)							
26 <i>Paracladopelma nigrifulva</i> (Goetghebuer 1942)					1		
27 <i>Paralauterborniella nigrohalteralis</i> (Malloch 1915)				3			
28 <i>Polypedilum convictum</i> (Walker 1856)							
29 <i>Polypedilum laetum</i> (Meigen 1818)							2
30 <i>Polypedilum nubifer</i> (Skuse 1889)							
31 <i>Tripodura scalaenum</i> (Schränk 1803)	5				1		1
32 <i>Pentapedilum sordens</i> (van d. Wulp 1874)							1
33 <i>Sergentia longiventris</i> (Kieffer 1924)			1				
34 Ephemeroptera							
35 <i>Baëtis pumilus</i> (Burmeister 1839)							
36 Plecoptera							
37 <i>Perlodes microcephalus</i> (Pictet 1833)			1				1
38 <i>Perla sp.</i>							
39 Species no.	13	13	8	9	10		14

1	Latorca	Latorca	Latorca	Ung	Latorca	Laborec	Laborec	Laborec
2	4. Pidpolozja	5. Pasika	6. Chop upstr.	7. Pavlovce	8. Velk. Kap.	9. Certizne upstr.	9/a Koskowce downstr.	10. Petrovce downstr.
3	the main current					spring area		
4								
24								
25						2		
26								
27						2		
28		1				2		3
29	1	4					2	
30				12				1
31								
32		28				4		
33								
34								
35		2						
36								
37							3	
38						1		
39	6	13	0	2	2	11	10	6

Table 14. The macrozoobenthos in River Bodrog and its tributaries between August 2-16, 1999

	Laborec	Latorca	Bodrog	Ondava	Ondava	Ondava	Ondava	Bodrog	Bodrog	Bodrog
	11. Stretawka down- stream	12. Zatin	13 Vmicky	14. Nizny Milosow	15. Cicava	16. Horovce	17. Brehov	18. Felső- berecki	19. B. olaszi	20. Bodrog- keresztúr
Species	spring area									
Oligochaeta	Individuals in samples									
<i>Branchiura sowerbyi</i> (Beddard 1892)			1							
<i>Limnodrilus hoffmesitieri</i> (Claparède 1862)	8	6	13						5	1
<i>Tubifex nevaensis</i> (Michaelsen 1903)	8									
Chironomidae										
Tanypodinae										
<i>Anatopynia plumipes</i> (Fries 1823)			6							
<i>Apsectrotanypus trifascipennis</i> (Zetterstedt 1838)				12						
<i>Procladius choreus</i> (Meigen 1804)										1
Orthoclaadiinae										
<i>Cricotopus bicinctus</i> (Meigen 1818)				3						1
<i>Cricotopus flavocinctus</i> (Kieffer 1924)						2				
<i>Eukiefferiella brevicar</i> (Kieffer 1911)				2		1				
<i>Eukiefferiella clypeata</i> (Kieffer 1923)				8						
<i>Prodiamesa olivacea</i> (Meigen 1818)					1					
<i>Rheocricotopus effusus</i> (Walker 1856)				4						
Chironomini										
<i>Chironomus riparius</i> (Meigen 1804)	12	8	7							
<i>Paracladopelma camptolabis</i> (Kieffer 1913)			1							

Table 14. (continued)

	Laborec 11. Stretawka down- stream	Latorca 12. Zatin	Bodrog 13. Vinicky	Ondava 14. Nizny Milosow	Ondava 15. Cicava	Ondava 16. Horovce	Ondava tork. vid. 17. Brehov	Bodrog 18. Felső- berekci	Bod- rog 19. B. olaszi	Bodrog 20. Bodrog- keresztúr
Species				spring area						
<i>Paralauterborniella nigrohalteralis</i> (Malloch 1915)										2
<i>Pentapedilum sordens</i> (van d. Wulp 1874)				22	1	1				
<i>Polypedilum convictum</i> (Walker 1856)			4							
<i>Polypedilum nubifer</i> (Skuse 1889)	6	4								
<i>Tripodura scalaenum</i> (Schrank 1803)			1	2	1	17				
Tanytarsini										
<i>Tanytarsus gregarius</i> (Kieffer 1909)						3				
Amphipoda										
<i>Dikerogammarus haemobaphes fluvialilis</i> (Martinov 1919)					34	2				
Odonata										
<i>Gomphus flavipes</i> (Charpentier 1825)					1		1			
Ephemeroptera										
<i>Baëtis pumilus</i> (Burmeister 1839)				10						
<i>Cloëon dipterum</i> (Linnaeus 1761)			2			1				
<i>Habrophlebia fusca</i> (Curtis 1831)					4					
Culicidae										
<i>Chaoborus crystallinus</i> (De Geer 1776)			7							
Species richness	4	4	8	8	6	7	1	0	1	4

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SZÍTÓ A.

Institute for Fisheries

Aquaculture and Irrigation, Szarvas

Anna-liget 8., H-5540 Szarvas

Hungary