

Ecological study regarding the aquatic invertebrate communities from the Someșul Mic River

Daniel ȚURA^{1,*}, Camelia IONESCU¹, Claudia PAVELESCU^{2,*}

¹ Msc student, Babeș-Bolyai University, Faculty of Biology and Geology, Clinicilor Str., No. 5-7, 400006, Cluj-Napoca,

² PhD student, Babeș-Bolyai University, Faculty of Biology and Geology, Clinicilor Str., No. 5-7, 400006, Cluj-Napoca,

* Contact persons: D. Tura: turadaniel21@yahoo.com, C. Pavelescu: claudipav@yahoo.com

Abstract. The present paper represents a quantitative study concerning benthic communities from the Someșul Mic River. Aspects of water quality assessment were also considered. Three sampling sites were strategically located along the river, in order to point out different ecological conditions. As expected, the analyses revealed that the upper course of the river was undisturbed, due to little or no human impacts. On the other hand, the sites located downstream Cluj-Napoca recorded lower water quality.

Keywords: the Someșul Mic River, benthic communities, diversity, density, water quality.

Introduction

The aim of this paper was to analyze the benthic communities from the Someșul Mic River not only from a qualitative but also from a quantitative point of view. Some of the organisms that were found at the sites located in the study area are considered sensitive indicators of water quality alteration process. Hence, biological samples, together with physical and chemical analyses were considered to assess water quality at the sampling sites. The city of Cluj-Napoca is considered to be the main polluter of organic matter, pharmaceutical and textile industry in the area (Szatmari & Boloș 1999).

Similar analyses were made on the Someșul Mic River, at the same sampling sites considered for this particular study (Tudorancea & Tudorancea 1998; Petrovici 2001; Cimpean 2004; Pavelescu et al. 2003).

Material and Methods

Three illustrative sampling sites were chosen for the study area. The first sampling site, Gilău is located at 15 km upstream of Cluj-Napoca. The other two stations were situated downstream of Cluj-Napoca, at Apahida (15 km downstream of Cluj) and at Gherla (50 km, respectively).

The zoobenthos was sampled seasonally (except winter) at

three locations for each chosen sampling site, during the year 2001 (May the 16th, August the 11th and November the 29th).

The biological samples were collected using a Surber sampler (mesh size: 250μm, net surface: 1060m²) for quantitative sampling, and preserved in 4% formaldehyde solution in the field. In the laboratory they were sorted and identified to taxonomic group level under a stereomicroscope.

Physical and chemical factors were measured in the field during every sampling period. These parameters were recorded as follows: conductivity (μS/cm), salinity (mg/l), water temperature (°C), pH, dissolved oxygen (%, mg/l). Depending on seasonal variation of water level, the average water depth was estimated for each sampling site (Table No. 1).

Results

The main water physical and chemical factors recorded in the sampling sites are presented in table 1.

Several benthic organism groups were identified, as follows: chironomids (Diptera), oligochaetes (Oligochaeta), caddis flies (Trichoptera), beetles (Coleoptera), odonats (Odonata), ceratopogonids (Diptera), nematodes (Nematoda), may flies (Ephemeroptera), water mites (Acari, Hydrachnidia), copepods (Crustacea), cladocerans (Crustacea), leeches (Hirudinea), isopods (Isopoda).

Table No. 1. The physical and chemical parameters measured at the three sampling sites in the year 2001

SAMPLING SITE	GILĂU			APAHIDA			GHERLA		
ALTITUDE (m)	350			300			300		
DATE	May	Aug.	Nov.	May	Aug.	Nov.	May	Aug.	Nov.
DEPTH (cm)	45	26	30	40	40	30	50	60	45
Conductivity (μS/cm)	361	374	0	535	395	0	614	440	0
Salinity (mg/l)	193	199	0	275	210	0	330	224	0
Water temp. (°C)	14	17.4	3.1	15.5	16.2	5.7	16.4	19.7	4.9
pH	8.15	8.3	8.39	7.25	7.64	7.68	7.45	7.2	8
Oxygen (mg/l)	8.4	7.3	8.06	6.9	6.4	7.56	6.7	4.6	7.61
Oxygen (%)	81	76	60.1	69	64	60.4	69	50	59.5

Quantitative analyses included the calculation of the density (ind/m^2), the numerical percentage abundance (%), as well as the diversity of benthic groups in three seasons (spring, summer and autumn). Figures 1 to 3 depicts the numerical percentage abundance of the main benthic groups from the Someșul Mic River in the three sampling sites.

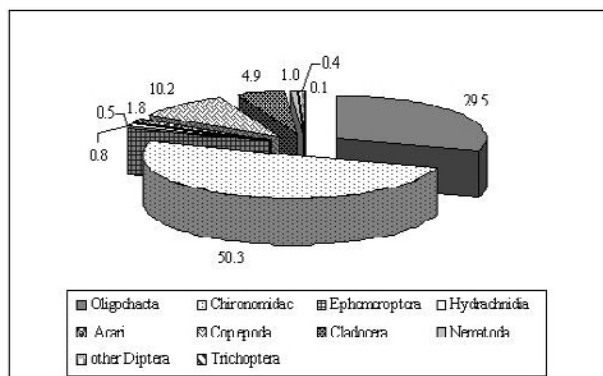


Fig. 1 Numerical percentage abundance of main zoobenthic groups from Gilău sampling site

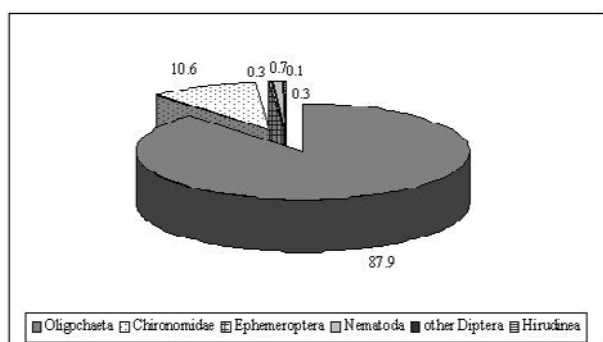


Fig. 2 Numerical percentage abundance of main zoobenthic groups of organisms from Apahida sampling site

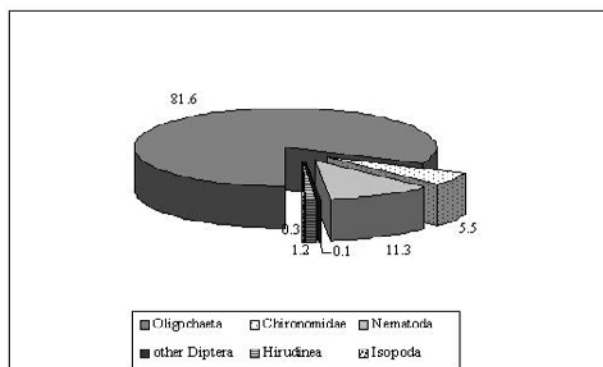


Fig. 3 Numerical percentage abundance of main zoobenthic groups from Gherla sampling site

Discussions

As concerns physical and chemical parameters, conductivity and salinity recorded higher values at

Gherla and lower values at Gilău. Water temperature values were higher at Gherla compared to those recorded at Gilău and Apahida. The pH values generally ranged from 7.2 to 8.39. As concerns dissolved oxygen concentration, it recorded higher values in November and lower values in August at all sampling sites (except Gilău). The highest dissolved oxygen values were found at Gilău (8.4mg/l, compared to 4.6mg/l at Gherla), probably due to the fact that this particular station was located upstream from Cluj-Napoca, considered to be the main organic matter polluter from the Someșul Mic River.

Qualitative and quantitative structure of benthic communities from the Someșul Mic River differed from one station to another.

Quantitative estimations showed generally oligochaetes and chironomids as dominant groups at all stations. Moreover, the highest diversity was recorded upstream of Cluj-Napoca, decreasing downstream (see fig. 1, 2, 3).

Numerical percentage abundance of chironomids in the benthic communities of the Someșul Mic River was higher at Gilău (50.3%) and lower at Apahida (10.6%) and Gherla (5.5%). On the other hand, oligochaetes reached higher abundance values at Apahida, exceeding 87%, compared to Gilău (29.5%) and Gherla (81.6%). The Oligochaeta species *Tubifex sp.*, known as an indicator of organic polluted waters, was observed at Gherla (Pavelescu 2003). Copepods and cladocerans were well represented at Gilău, recording high abundance values (fig. 1). Their presence was irrelevant at the other two stations. Nematodes recorded the highest abundance values at Gherla (exceeding 11%), and the lowest values at Apahida (0.7%). Leeches, generally considered to be a poor water quality indicator, were present with the highest abundance values at Gherla (1.2%) and lowest values at Gilău. The zoobenthic taxa that recorded very low abundance values were not present in the figures 1, 2, and 3.

Chironomids and oligochaetes recorded high density values at all of sampling sites. The oligochaetes were dominant, except for Gilău station, where chironomids recorded higher density values, especially in May and November. Zooplanktonic organisms as copepods and cladocerans recorded significant densities at Gilău and low densities at the other two stations. This might be due to the fact that these organisms are characteristic to lentic ecosystems, like the Gilău dam reservoir, located upstream of the Gilău sampling site.

Because chironomids and oligochaetes recorded the highest density and abundance values at all sampling sites, these organisms must have wide tolerance limits and can withstand large variations of ecological factors.

Zoobenthos community diversity was estimated on the basis of the Shannon-Wiener function (H'). The highest diversity was recorded at Gilău in August ($H'=1.668$), but it decreased with water temperature. The lowest diversity was found at Apahida in May ($H'=0.1029$). The biodiversity of invertebrate groups

and their densities varied from one sampling site to another, probably due to differences in water quality and nature of the substratum (Pavelescu 2003).

Physical and chemical factors, together with the structure and density of benthic communities showed degradation in water quality on going downstream.

References

- Cîmpean, M., (2004): Evaluarea influenței antropice asupra calității apei râului Someșul Mic și a afluenților săi utilizând Indicele Biotic Extins. Muzeul Brukenthal – Studii și Comunicări – Șt. Nat. 29: 179-190
- Petrovici, M., (2000/2001): Structure, Abundance and Seasonal Dynamics of Mayfly Communities (Insecta: *Ephemeroptera*) from Someșul Mic River (România). Annals of West Univ. of Timișoara, Series of Biology, 3-4: 115-123
- Pavelescu, C., Toadere, E., Tudorancea, C. (2003): The Structure of *Oligochaeta* communities and the dynamics of the common species from Someșul Mic River during 1998. Annals of University of Bacau, Series of Biology, 8: 95-99
- Szatmari, T., Bolos, F., (1999): Influența orașelor Cluj- Napoca și Oradea asupra comunității zoobentonice din râurile Someșul Mic și Crișul Repede. Annals of West University of Timișoara, Series of Biology, 2: 215-235
- Tudorancea, M., Tudorancea, C. (1988): On the communities structure of larval Chironomidae (Diptera) in the Rivers Crișul Repede and Someșul Mic (România). Trav. Mus. Nat. Hist. Nat. Gr Antipa, 40: 475-495