

The comparative study of ephemeroptera fauna in the Crişul Repede/Sebes-Körös river and in one of the Mureş/Maros¹ section

Kinga E. Csia, Andrei Sárkány-Kiss

Abstract

Examining the groups of living organism in rivers we can evaluate their condition. Larvae of Ephemeroptera can offer much information, because this group is present all along the running waters; some species are present in upper zones, another species like hilly and lowland zones and at last, there are species that like both places. The occurrence of Ephemeroptera larvae is determined by the geographical conditions, they depend on the substratum, are conditioned by the quantity and quality of the food and by the ecological conditions of the running water. Based on Ephemeroptera larvae, which have been collected in Crişul Repede we consider that its water has good quality. But the influence of dams and organic materials load can be felt. In some places the Ephemeroptera larvae are totally absent.

Keywords: Insecta, larvae of Ephemeroptera, Crişul Repede river, benthos

Introduction

Each river presents some individual characteristics. Many researchers succeeded in their classification, based on biological criteria e.g. macrophytes (Butcher, 1933), fishes (Thieneman, 1925). Others take in consideration all the biocenosis that exists in water (Illies and Botoşăneanu, 1965).

The ecological demand of organisms determines the presence or absence of species in biotope. If we know their ecological requirements and the fact that water organisms are very sensitive to ecological changes, we can use them as environmental bio-indicators.

1 The first name is Romanian, and the second Hungarian.

The Ephemeroptera larvae are useful in characterising the biological zones of running waters (Gâldean, 1992). These insects can be found all along the running waters, principally in middle or lower reaches of river, other is present in the upper part. In the same time these larvae display a dependence on the substratum, their existence being conditioned by the main type of food, by the food quantity and by oxygen-concentration in water.

Being aware of all these facts, with the full acknowledge of the geographical circumstances of the river, with searching for groups of living organisms, presence or absence of these, we can allow us to inspect the condition of the river and quality of its water.

Materials and methods

The samples were collected from the spring to the country frontier in 13 sections. We have collected samples also from two sections of the two biggest tributaries of Crişul Repede: Drăgan and Iad, Creeks.

The samples were collected with a simple dredge, with the sampling net or directly with the pincers from the substratum. In fast flowing waters we handled the dredge on the substratum, washing it directly in the dredge.

The sampling was made on several types of biotopes:

- stones and gravels with lithorheophilic fauna
- sandy, clayous or silty bottoms
- aquatic macrophytes
- accumulations of coarse debris (leaves, wood)
- accumulations of fine debris (especially in the slow portions of the running waters).

The samples were preserved in 29% formol. In the laboratory all samples were sorted and the larvae were stored in glass tubs containing 70° alcohol.

Special works and keys were used for identification (Bogoescu, 1958; Bucşa, 1975; Gâldean, 1992; Macan, 1972; Schoenemund, 1930; Újhelyi, 1959). We used the index-saprobity of Kolkwitz and Marson (Mălăcea, 1969).

Results and discussion

Based on existence of Ephemeroptera larvae, the Crişul Repede river, with its affluence also, can be divided in three parts:

- spring area
- mountain district
- hill and lowland area

At Şaula (4,5 km from the spring) the biotope, the unfavourable conditions don't allow the formation of a richer fauna of the Ephemeroptera. In this case we sampled only four exemplars of *Baetis fuscatus*. This species is characteristic of hilly-country running waters.

In Drăgan and Iad the biotopes are characteristic of the upper reaches of running waters, which permits the formation of varied fauna of Ephemeroptera. Here we have found larvae, which like the clean, oxygen-abundant, fast waters, e.g. *Rhithrogena semicolorata*, *Ecdyonurus* sp., *Epeorus assimilis*.

The presence of *Ephemera danica* species in Drăgan (near Tranişu village), in Iad (before it reaches in Crişul Repede), demonstrates that in these samples there is an accumulation of sandy, clayous sediment among stones, because this larvae likes these living places.

At Ciucea we found typical lithorheophylic species. Next to riverside, where the water stream is slow, the aquatic plant *Potamogeton crispus* L. offers living space for *Potamanthus luteus* and *Ephemerella ignita* larvae.

At Bologa the omogenous substratum, with medium-sized and fine gravels and low flowing water, the biotope isn't favourable for Ephemeroptera larvae. The biotecton and the leaves are absent, too. We have collected a few specimens from ripal zone where the water plants are present near the big stones that are embedded in the substratum in some places. As a consequence, the Ephemeroptera fauna is poor.

In Criş Strait the river presents the characteristics of mountain area. The Ephemeroptera community formed on stones and gravels, includes many species, most of them are typical rheophilic forms, liking the well-oxygenated waters.

At Aleşd the number of lithorheophilic species have been reduced and species of Ephemeroptera typical for hilly areas are preponderous. (The second area interferes with the third one).

The biotope is made up from biotecton covered stones; upon on a gravel and sandy bed, accumulations of fine organic debris occur among the stones.

Taking into consideration the low altitude, the water temperature of 21°C and its strong turbidity, we didn't expect to find a high variety of species. Instead of this, we found a rich fauna. It can be explained with the accumulation of organic debris, which assure the

required quantity of food for this biocenose and with the strong flow of water, providing a good oxygenating.

We stress the importance of *Oligoneuriella rhenana* larva. This species is very sensitive to diminution of oxygen contents in water. It is characteristic of that part of river, where the transportation phenomena has prevalence (corresponds to the metharithron of Illieş and Botoşăneanu, 1963), where the substratum is formed from middle sized stones, among which organic debris, gravels and sand are accumulated. We have found this larva in 1994-1995 in Mureş river, near Brâncoveneşti village. The place where we collected the samples was situated at the upper part of Middle Reach, where the influence of Mureş Strait is felt. There, *Oligoneuriella rhenana* formed stable population, fact that is proved by many samplings. The biocenosis is rich in Ephemeroptera fauna, because it is formed on medium sized gravels, stones, with sand and agglomerations of organic debris. This fauna includes: *Potamanthus luteus* L., *Oligoneuriella rhenana* Imh., *Baetis alpinus* Pict., *B. fuscatus* L., *B. rhodani* Pict., *B. melanonyx* Pict., *Centroptilum pennulatum* Etn., *Caenis macrura* Steph., *Habroleptoides modesta* Hagen, *Paraleptophlebia submarginata* Steph., *Ephemerella ignita* Poda, *Torleya belgica* Lest., *Ecdyonurus insignis* Etn., *Ecdyonurus* grupa dispar (*E. fluminum* Pict., *E. dispar* Curt.), *E. venosus* Fabr., *Heptagenia sulphurea* Müll.

In Crişul Repede at Aleşd we collected a few exemplars of *Oligoneuriella rhenana*.

At Tileagd, next to the lake, under the catchment area, most of the species, which were founded at Aleşd, disappeared. We collected only three species between the stones, covered with algae and water macrophytes.

At Fughiu we also found a reach Ephemeroptera fauna. The biotope is rather similar to the sampling place in Aleşd. The *Polymitarcis virgo* species is preponderant. This species is living in big waters, where the transportation phenomena are prevalent. There were found less *Oligoneuriella rhenana* specimens than at Aleşd.

At Cheresig the Criş gives the aspect of a typical lowland river, with a wide riverbed. The accumulation phenomena is dominant in sandy, clayous and silty bottom. The Ephemeroptera larvae were totally absent due to pollution. In the near lakes have been collected some specimens of *Cloeon dipterum*.

Conclusions and proposals

The saprobic indexes of the collected larvae are oligosaprobic and a-mezosaprobic, based on Kolkwitz and Marsson system (Mălăcea, 1969).

According to Ephemeroptera fauna, the upper part of the river, including the affluence, may be considered having good quality. There were collected mainly a-mezosaprobic

species and at the same time we found oligosaprobic species, too, e.g. *Rhithrogena semicolorata*, *Oligoneuriella rhenana*, liking the oligosaprobic and a-mezosaprobic zones.

But at Cheresig we didn't find larvae of Ephemeroptera in the river. There the ecological conditions aren't favourable for these delicate larvae.

With full acknowledge of these facts, we suggest the diminution of the load of organic material and we propose the purification of the industrial and communal outlet waters.

Larvae of Ephemeroptera are an important link of trophic web in rivers; their destruction endangers the equilibrium of all river ecosystems.

Table 1. Range of Ephemeroptera species in the Crișul Repede/Sebes Körös Basin

RI = Indicatives from the Red List; 1 = Zerna streamlet; 2 = Valea Drăganului;

3 = Iad under Remeți village ; 4 = Iad, before it reaches in Crișul Repede ;

5 = Șaula; 6 = Bologna; 7 = Stâna de Vale ; 8 = Vadul Crișului; 9 = Ciucea;

10 = under Aleș; 11 = Tileagd; 12 = Fughiu; 13 = Cheresig.

No	Species	RI	1	2	3	4	5	6	7	8	9	10	11	12	13
1	<i>Polymitarcis virgo</i> Oliv.	V										+			
2	<i>Ephemera danica</i> Müll.	V		+		+									+
3	<i>Potamanthus luteus</i> L.	V							+	+	+	+			+
4	<i>Oligoneuriella rhenana</i> Imh.	E										+			+
5	<i>Baëtis alpinus</i> Pict.	V	+		+	+									
6	<i>Baëtis fuscatus</i> L.	R			+		+								
7	<i>Baëtis muticus</i> L.	R									+			+	
8	<i>Baëtis rhodani</i> Pict.	rC		+	+	+		+	+		+	+			
9	<i>Baëtis vernus</i> Curt.	K							+						
10	<i>Baëtis scambus</i> Etn.	K													+
11	<i>Cloëon dipterum</i> L.	rC													+
12	<i>Caenis macrura</i> Steph.	rC								+	+	+	+	+	+
13	<i>Habrophlebia lauta</i> Mc.L.	K				+						+			
14	<i>Torleya belgica</i> Lest.	K													+
15	<i>Epeorus assimilis</i> Etn.	R	+												
16	<i>Ecdyonurus insignis</i> Etn.	V									+	+	+		
17	<i>Ecdyonurus grupa</i> dispar			+					+		+	+			
	<i>E. fluminum</i> Pict.	V													
	<i>E. dispar</i> Curt.	V													
18	<i>Ecdyonurus venosus</i> Fabr.	V	+	+		+			+			+			
19	<i>Rhithrogena semicolorata</i> Curt.	R	+						+						
20	<i>Heptagenia sulphurea</i> Müll.	R													+
21	<i>Ephemerella ignita</i> Poda	rC		+	+	+		+	+	+	+	+	+	+	
22	<i>Baëtis</i> sp.									+					
23	<i>Ecdyonurus</i> sp.			+					+	+	+				

References

- Bogoescu, C. (1958): Ephemeroptera-Fauna R.P.R., Insecta.-Edit. Acad., București, VII, 3
- Botoșăneanu, L. (1963): InsecteLarhitecți și constructori sub apă (Creative and constructive Insects of Waters).-Edit. Științifică, București
- Bucșa, Z. (1975): Studiul larvelor de efemeroptere din Munții Apuseni (The study of Ephemeroptera larvae in Apuseni Mountains.- Lucrare de diplomă, Cluj
- Felföldy, L. (1981): A vizek környezettana (The environmental study of waters).-Mezőgazdasági Kiadó, Budapest
- Gâldean, N. (1992): Contribution to the zoogeography of mayflies (Insecta, Ephemeroptera) of Romania.-Trav. Mus. Hist.nat. Grigore Antipa, XXXII, 425-444
- Gâldean, N. (1992): Utilisation of mayflies (Insecta, Ephemeroptera) for dividing some Romanian running waters into zones.-Trav. Mus. Hist. Nat. Grigore Antipa, XXXII, 399-423
- Hamar, J., Sárkány-Kiss, A. (1995): The Maros/Mureș River Valley.-Tiscia monograph series
- Illieș, J., Botoșăneanu, L. (1963): Problemes et methodes de la classification et de la zonation ecologique des eaux courantes, considerees surtout du point de vue faunistique.-Mitt. Int. Ver. Limnol., 12, 1-57 (80)
- Imreh, Șt. (1968): Dinamica larvelor de insecte din Someșul Cald (The dynamics of larvae insects in Someșul Cald).-Lucrare de diplomă, Cluj
- Macan, T., T. (1970): A key to the nymphs of the British species of Ephemeroptera with notes on their ecology.-Fresh Water Biol. Assoc., Sci. Publ., 20, 1-55
- Mălăcea, I. (1969): Biologia apelor impurificate (The biology of impurificated waters).-Edit. Acad., București
- Schoenemund, E. (1930): Eintagsfliegen oder Ephemeropter.-in Die Tierwelt Deutschlands, 19, 63-106
- Újhelyi, S. (1959): Kérészek-Ephemeroptera in Fauna Hungariae V (5).-Akadémiai Kiadó, Budapest
- Újvári, J. (1972): Geografia apelor României (The geography of Romanian waters).-Edit. Științ., București

Kinga E. Csia
Liceul Teoretic "Székely Mikó" Kollégium
4000-Sfântu-Gheorghe
Str. Școlii Nr. 1.
Romania

Andrei Sárkány-Kiss
Babeș-Bolyai University
Department of Ecology - Genetic
Clinicilor 5-7
3400 Cluj, Rmania