Freshwater molluscs from the Criş/Körös[1] rivers

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Abstract

The authors studied the communities of fresh-water molluscs in Criş/Körös Rivers. According to the prelevance of the species and to the composition of the communities, they draw an inference concerning the condition of the water. The negative influence of pollution and of hydrotechnical works upon molluscs is very emphasized. The authors call attention to the importance of the relict mollusc fauna in the thermal springs of Criş/Körös Basin and they also underline the necessity of their protection. At some sites the unionids have a high diversity, but are indicated also cases of mortality.

Keywords: Bivalvia, *Unio crassus*, dynamic of growth.

Introduction

Freshwater molluscs from the three Criş rivers haven't been much researched so far. Literature indicates only a few species without mentioning their sites. Grossu (1962,1986, 1987, 1993) described various species from the Criş rivers without mentioning their sites. Richnovszki, Pintér (1979) and Pintér et all. (1977) summarised several researches data and described the freshwater mollusc fauna from the Hungarian regions of the Körös rivers. There hasn't been any study to examine these rivers from their spring to their discharges into the Tisza river.

Material and Methods

Samples were collected from the three Criş rivers and the Barcău/Berettyó river all along their reaches for many years. The Crişul Negru/Fekete-Körös was partially

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

researched in 1985, Crişul Alb/Fehér-Körös on Romanian territory in 1993. Crişul Negru and Crişul Alb were examined all through their lengths in 1994 on the occasion of the ecological expedition. Crişul Repede/Sebes-Körös and the Barcău river were examined in 1995. In 1995 we went back to Crişul Alb to check most of the samples from the previous years. The molluscs were collected either by hand or by means of various implements: shell-sake, rectangular and triangular dredges, limnological net, Peterson and Eckman bottom-samplers and with a surber. The research aimed mainly at the riverbeds and only occasionally at their flood areas.

Results and Discussion

The identified species of the **Crişul Alb** river are indicated in Table 1. From the spring down to the site at Mihăileni the river shows the characteristics of a mountain brook. Such species as *Ancylus fluviatilis* and - in the slow-flowing parts of this reach of the river - *Radix peregra* can be found here. At Mihăileni the building operations of the dam-lake have perturbed the river-bed and as a result the favourable living conditions of the *Ancylus fluviatilis* have disappeared. The river after Brad was found polluted with industrial and household waste water; this pollution caused the disappearance of all the molluscs from the river-bed. Although the structure of the river-bed and of the sediments are compatible with the existence of the unionid shells, these probably disappeared because of the pollution. Down to Almaş (site 5) we can only find more resistant species like *Radix peregra* and *Galba truncatula*. The process of natural purification re-establish the favourable conditions for *Ancylus fluviatilis* which reappears from this site on. At site 5 we first found the unionids represented by the species *Unio crassus*, living in small groups close to the riverbanks. At Ineu site we noticed a significant diversity and abundance of unionids: an average 63 specimens on $1m^2$ at the examined site. At Chişinău-Criş the bad effects of the dam-system are relevant in the increase of the course speed and in the accumulation of the rough sediments; these two phenomena restrict the living conditions of the shells. The *Unio crassus* is the only species which has adapted to these conditions. From Gyula the water recovers it slow flowing character, contributing to the appearance of the *Anodonta cygnaea*, however the silty sediments generate the processes of putrefaction, which breaks up the area of the unionids from the river-bed. Normally the *Pseudanodonta complanata* should inhabit the entire lower reach of the river. But the hydrotechnical operations and their consequences hinder this possibility.

Crişul Negru (Table 3.) shows a similar state as that of Crişul Alb: the upper reach is inhabited by *Ancylus fluviatilis*, and a polluted section follows after site Ştei which interrupts the area of this species. The straight at Borz promotes the processes of natural purification of the water and thus the appearance of a relatively diverse malacofauna. The

Table 1. Range of the mollusc species in the Crişul Alb/Fehér-Körös river. Sampling Points Index: 1 = Criş; 2 = Mihăileni; 3 = Brad; 4 = Acinţa; 5 = Almaş; 6 = Ineu; 7 = Chişinău Criş; 8 = Gyula. In the table 0 = occurance in the flood area; + = presence in the riverbed.

No.	Species	1	2	3	4	5	6	7	8
1	*Viviparus acerosus* Bourg.								+
2	*Litoglyphus naticoides* C. Pfeiff.					+	+	+	+
3	*Bithynia tentaculata* L.								
4	*Physa acuta* L.						+		
5	*Lymnaea stagnalis* L.					0			0
6	*Stagnicola palustris* O.F.Müll.					0			
7	*Radix auricularia* L.						+	+	+
8	*Radix peregra* O.F.Müll.	+	+		+				
9	*Galba truncatula* O.F.Müll.		+		+	+			
10	*Ancylus fluviatilis* O.F.Müll.	+				+			
11	*Planorbis planorbis* L.			0		0			0
12	*Planorbarius corneus* L.					0			0
13	*Succinea oblonga* Drap.			0	0				
14	*Unio pictorum* L.						+		
15	*Unio tumidus* Philips.						+		
16	*Unio crassus* Philips.					+	+	+	+
17	*Anodonta cygnaea* L.								+
18	*Anodonta anatina* L.						+		
19	*Anodonta woodiana* Lea						+		+
20	*Pseudanodonta complanata* Rossm.						+		

most diverse association of unionids (5 species) were found at Tinca site. At Zerind site the dam-system and the river regulation again affect negatively the diversity of the malacofauna. Some sections of slower course, however, favour the settling of the *Bithynia tentacula* and *Viviparus acerosus*. Two species registered on the red list of freshwater molluscs as endangered species, the shells *Sphaerium corneum* and Sphaerium riviculum were identified here. From Gyula on, abundant populations of the adventive species of Anodonta woodiana and Physa acuta could be examined. Onwards and down to its discharge into the Tisza river, Crişul Negru shows a canal-like character, its dams shape a river-bed resembling a ditch.

Crişul Repede (Table 2.) is profoundly affected by the hydrotechnical operations which have completely changed the original river-bed. In the submontane section - where the Criş springs, no species of molluscs have been found because of the particular hydrotechnical conditions, accompanied by residual household water entering the river at

Table 2. Range of the mollusc species in the Crişul Repede/Sebes-Körös river.
1 = Zerna; 2 = Drăgan; 3 = Iad Remeți; 4 = Iad upstream of the confluence; 5 = Şaula; 6 = Bologa; 7 = Ciucea; 8 = Stâna de Vale; 9 = Vadu Crişului; 10 = Aleşd, upstream of the lake; 11 = Aleşd lake; 12 = Aleşd, downstream of the lake; 13 = Fughiu; 14 = Cheresig; 15 = Szeghalom. In the table 0 = occurance in the flood area; + = presence in the riverbed.

No.	Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	*Viviparus acerosus* Bourg.															+
2	*Viviparus contectus* Mill.															+
3	*Litoglyphus naticoides* C. Pfeiff.														+	+
4	*Bithynia tentaculata* L.														+	+
5	*Physa acuta* L.												+			
6	*Stagnicola palustris* O.F.Müll.												+			
7	*Radix auricularia* L.										+ 0		+		+	+
8	*Radix peregra* O.F.Müll.		+	+	+											
9	*Ancylus fluviatilis* O.F.Müll.		+	+			+	+	+		+					
10	*Planorbis planorbis* L.												+			+
11	*Gyraulus albus* O.F. Müll.															+
12	*Succinea putris* L.								0							0
13	*Unio pictorum* L.														+	
14	*Unio tumidus* Philips.														+	+
15	*Unio crassus* Philips.													+	+	+
16	*Anodonta cygnaea* L.											+				+
17	*Anodonta anatina* L.													+		
18	*Anodonta woodiana* Lea													+	+	+
19	*Pisidium amnicum* O.F.Müll.	+	+													
20	*Sphaerium riviculum* Lam.														+	
21	*Sphaerium lacustris* O.F.Müll.														+	

Table 3. Range of the mollusc species in the Crişul Negru/Fekete-Körös river, Kettös-Körös river and Hármas-Körös river.
Sampling sites: Crişul Negru: 1 = Poiana; 2 = downstream Poiana; 3 = Ştei; 4 = Borz; 5 = Tinca; 6 = Zerind; 7 = Gyula; Kettős-Körös: 8 = Békés; Hármas-Körös: 9 = Szentes.

No	Species	1	2	3	4	5	6	7	8	9
1	*Theodoxus fluviatilis* L.									+
2	*Viviparus acerosus* Bourg.						+	+	+	+
3	*Litoglyphus naticoides* C. Pfeiff.				+	+	+			+
4	*Bithynia tentaculata* L.						+			
5	*Bithynia leachi* Schepp.								+	
6	*Physa fontinalis* L.						+			
7	*Physa acuta* L.							+	+	
8	*Lymnaea stagnalis* L.								+	+
9	*Radix ovata* Drap.				+	+			+	
10	*Radix peregra* O.F.Müll.				+					
11	*Galba truncatula* O.F.Müll.			+						
12	*Ancylus fluviatilis* O.F.Müll.	+	+		+					
13	*Planorbis planorbis* O.F.Müll							+	+	+
14	*Planorbarius corneus* L.								+	+
15	*Unio pictorum* L.						+		+	
16	*Unio tumidus* Philips.					+	+	+		+
17	*Unio crassus* Philips.				+	+	+	+	+	+
18	*Anodonta cygnaea* L.								+	
19	*Anodonta anatina* L.				+	+	+			
20	*Anodonta woodiana* Lea					+		+	+	+
21	*Pseudanodonta complanata* Rossm.					+				
22	*Dreissena polymorpha* Pall.									+
23	*Pisidium amnicum* O.F.Müll.					+				
24	*Sphaerium corneum* Lam.					+	+			
25	*Sphaerium riviculum* L.						+			

this section. The river here has a rapid flow and a stony river-bed where only Ancylus fluviatilis can survive.

In the Drăgan Creek we found a very abundant population of Pisidium amnicum, starting from the discharge of the Zerna brook into the Drăgan dam-lake, along the Drăgan Valley to its discharge. In the Criş Strait the high speed (1,5 m/second) of the water makes it impossible for any species of molluscs to settle into the river. Before Aleşd the river starts to reflect the bad effects of the waste water, but the rapid flow assures a significant increase

Table 4. Range of mollusc species in the Barcău/Berettyó river
Codes of the sampling sites: 1 = downstream the spring; 2 = Boghiş;
3 = Suplacu de Barcău; 4 = Sântimreu; 5 = Szeghalom
+ = living individuals; ± = recently dead individuals.

No.	Species	1	2	3	4	5
1	*Viviparus contectus* Mill.					+
2	*Litoglyphus naticoides* C. Pfeiff.					+
3	*Bithynia tentaculata* L.					+
4	*Radix peregra* O.F.Müll.	+	+			
5	*Ancylus fluviatilis* O.F.Müll.	+	+			
6	*Planorbis planorbis* O.F.Müll.					+
7	*Planorbarius corneus* L.					+
8	*Unio crassus* Philips.		+			
9	*Anodonta cygnaea* L.					±
10	*Sphaerium riviculum* L.				+	

in oxygen and preserves the submontane aspect of the river. The first dam-lake is situated after Aleşd . In the fresh sediments of the lake we found an specimen of Anodonta cygnaea, which probably will multiply here. In the old river-bed we found species which had populated the flood area some time before: Physa acuta, Radix auricularia, Stagnicola palustris and Planorbis planorbis. The old river-bed has an extremely reduced amount of water, because the water is directed towards the new river-bed with cemented banks; on the other hand, the reduced amount of water assures favourable conditions for the molluscs. At Fughiu an other dam-lake is being built, the constructions have significantly modified the natural river-bed. However in some sections there are abundant associations of Unio crassus, Anodonta woodiana and in a small quantity of Anodonta anatina. Although past Oradea, at Cheresig we noticed the bad effects of dirty water, we found many species of molluscs: Sphaerium riviculum, Sphaerium lacustris, Unio tumidus, Unio pictorum, etc. At Szeghalom the river slows down, and so the following Gastropod species appear: Viviparus acerosus, Viviparus contectus, Litoglyphus naticoides, Bithynia tentaculata, Planorbis planorbis, Gyraulus albus, etc. The abundance of the unionids is reduced because of eutrophic and polluted water. In the autumn of 1996 we observed here at this site as well a mortality of 10-15%.

The connecting canal of the Criş rivers used to be populated by its only species, the Anodonta woodiana in large numbers, but by the time of the research, a huge mortality rate was noticed. We think this is the consequence of the dry years when the canal wasn't refilled with fresh water.

Cefa fish-ponds. The fauna of molluscs of the 1000 ha wide Cefa fish-ponds is quite rich but it has not been studied in detail so far. It is this place where the species Anodonta woodiana first penetrated in Europe together with fish introduced from China in 1960 and 1962 (Sárkány 1986). This species got later as far as the Tisza and Danube with the mediation of Criş/Körös Rivers.

Kettős-Körös and Hármas-Körös. Beside the euribiontic species, Theodoxus fluviatilis and Dreissena polymorpha coming from the Tisza river can be found at Szentes.

In the Criş Basin there are two other important regions with thermal water which have preserved some relict mollusc species:

1. Episcopeşti Baths. Apart from the endemic species of Melanopsis parraeyssi Phil. (Paucă, 1936) we can find Theodoxus prevostianus and several cosmopolitan species.

2. In the thermal springs and in the brook at Răbăgani the significant species are: Thedoxus prevostianus and Fagotia acicularis, and some other common species (Jurcsák, 1969).

The Barcău river (Table 4.), from the spring and to Boghiş, has a characteristic submontane mollusc fauna. Here we find the Ancylus fluviatilis and Radix peregra species, and sporadic specimens of Unio crassus also.

Above Suplacu de Barcău and until Sântimreu we didn't find living molluscs. In this region the river is polluted with petrol and waste water.

At Sântimreu we found some living specimens of Sphaerium riviculum.

At Szeghalom, beside the euribiontic gastropod species we identified a 2 years old dead specimen of Ancylus fluviatilis, its soft body was still in its shell.

Conclusions

The rivers in the Criş Basin suffer from the pollution and the hydrothermical works. Thus, the biodiversity of the freshwater molluscs is in general reduced. In the case of unionids the situation is more favourable at Ineu (Crişul Alb) and at Tinca (Crişul Negru).

The polluted river sections at Brad (Crişul Alb) and at Ştei (Crişul Negru) break up or reduce the spreading area.

The lower sections of the rivers, where the dams are too close to the river-bed, make the flood area disappear, which has damaging effects on the freshwater molluscs.

The presence of the dam-lakes on the Crişul Repede accelerates the process of eutrophication and completely changes the composition of the malacological fauna. The cemented river-beds are disadvantageous to living beings.

The phenomena of mortality, often noticed on Crişul Alb and Crişul Repede prove the presence of xenobiontic elements in the polluted water.

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