

THE INFLUENCE OF THE HABITATS UPON THE FISHFAUNA OF THE LOWER
SECTOR OF CRISURI RIVERS (NORTH-WESTERN ROMANIA)

AZ ÉLŐELYI KÖRNYEZET HATÁSA A HALFAUNA ÖSSZETÉTELÉRE
A KÖRÖSÖK ALSÓ RÉGIÓJÁBAN

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Summary

The paper deals the results of ichthyological research on the lowland Crisuri Rivers (Crisul Repede/Sebes-Körös; Crisul Negru/Fekete-Körös and Crisul Alb/Fehér-Körös). The studies were carried out beginning the year 1996 till the present. It was aimed to identify the local fish communities and the biotope influences upon the species diversity. We found in these rivers three characteristic fish communities based on a number of six or seven fish species. A variable number of associated species are accompanying the characteristic fishes. Regarding to the fish species occurrences and their characteristic biotope along the lowland channels of the Crisuri rivers we found some dissimilarities. The fish community's structures are according with the ecological division of the rivers fish fauna only for the lower Crisul Repede River. The other Crisuri Rivers (Crisul Negru and Crisul Alb) have an atypical zone located inside the typical ecological zone of "barbel" and/or in the "nose zone" depending on the rivers. A remarkable peculiarity of the lowland Crisul Alb river is the presence of a relatively long sector in which the river have a predominant sandy bottom and the water flowing is very uniform. The discussed zone is included between the ecological zone of the "nose" from the upstream river and the "barbel zone" which is settled downstream to the locality Chisneu-Cris. Along each of the three lowland rivers we found a specific fish communities all of them having different species and occurrences. The fish's occurrence in the lowland Crisuri Rivers is mainly determined by the local biotope characteristics.

Összefoglalás

1996 óta folytatott ökofaunisztikai kutatásaink során három olyan élőhelytípust tudunk megkülönböztetni a Körösök alsó régiójában, amely hosszabb folyószakaszokat jellemez, és amelyeknek a fajösszetétele is jelentősen eltér egymástól:

1. A Sebes-Körös Tarian és Cheresig/Körösszeg között húzódó, kavicsos aljú és sebes vízi szakaszának 7 kiemelkedő halfaja van: *Leuciscus cephalus*, *Chondrostoma nasus*, *Vimba vimba carinata*, *Barbus barbus*, *Alburnoides bipunctatus*, *Gobio kessleri* és *Gymnocephalus schraetser*. Teljes halközössége alapján ez a szakasz a paduczónának felel meg.

2. A Fekete-Körös Tamaşda/Tamáshida és Ant közötti, mélyen erodált és gazdag vízi növényzetű szakaszán szintén 7 meghatározó faj alkotja a halfaunát: *Rutilus rutilus*, *Abramis ballerus*, *Gobio gobio*, *Carasus gibelio*, *Alburnus albrnus*, *Zingel zingel* és *Gymnocephalus baloni*. Hozzájuk számos halfaj társul még, de a halközösség atipikus, átmenetet képez a dévérzóna és a márnazóna között.

3. A Fehér-Körös Ineu/Borosjenő és Chisineu-Cris/Kisjenő közötti, homokos medrű és sekély vízi szakaszán nagyon szegényes a halfauna, mivel az élőhelyek egy kb. 20 km-es szakaszon nagyon egyöntetűek. A halfauna meghatározó fajai: *Gobio alpinatus*, *Gymnocephalus schraetser*, *Stizostedion lucioperca*, *Perca fluviatilis* és *Sabanejewia aurata*. A folyószakasz halközössége eltér a tipikus márnazónáétól, itt a *Barbus barbus* ritka.

Introduction

The lower sectors of the Crisuri Rivers comprise the lowland troughs of the three rivers (Crisul Repede/Sebes-Körös; Crisul Negru/Fekete-Körös and Crisul Alb/Fehér-Körös) that are shedding in the Tisa River in Hungary (fig.1). The local biotopes of the rivers and the

environmental conditions from their lowland channels are distinctive and it generates specific fish associations. The previous studies (Bănărescu, P., 1954, Bănărescu, et al., 1960a, 1960b; Bănărescu et al., 1963) are focused on the fish diversity and the species spreading along the Romanian rivers. Useful data concerning the biology of *Chondrostoma nasus* populations from Crisul Repede and other Romanian rivers was published by Gyurko et al. (1955, 1959). Another study about the location of the nose zone along the main Transylvanian rivers was published by the same author (Gyurko et al., 1956). In that paper the authors mention the fish species which are associated in the nose zone with *Chondrostoma nasus*. The first recording of the species *Vimba vimba* from the Crisul Repede River is due to Bănărescu (1953) and the author mentions that this fish is frequent associated with *Chondrostoma nasus* in the “nose zone”. The extension of “nose” ecological zone far downstream from Oradea is presented in this paper as a peculiarity of the river Crisul Repede fishfauna. Recent studies concerning the fishfauna changes in the left shore tributaries of Tisa River and its major threatening factors are focused on the fish communities and their structure changes under the human influences (Telcean & Bănărescu, 2002; Telcean et al., 2006). The species distribution along the Hungarian stretches of the Crisuri Rivers and recent distribution maps was attained by Harka and Sallai (2004). The occurrence of typical species in the lowland Crisuri Rivers near the state border reveals the establishment of the typical barbel zone.

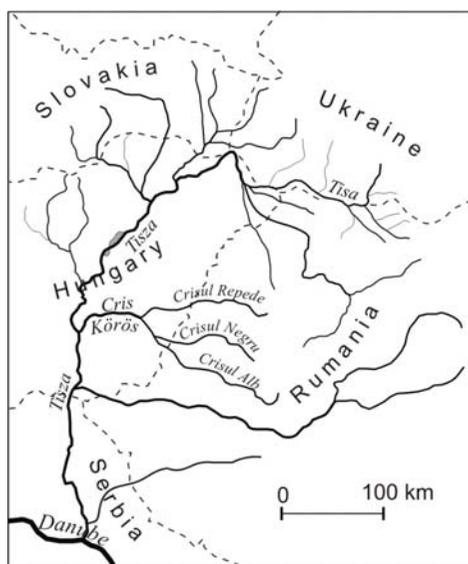


Fig.1. The Crisuri River System and their location on the Tisa drainage basin
1. ábra. A Körösök földrajzi helyzete a Tisza vízgyűjtőjén

The ecological division of the fish fauna according to the rivers biotopes is ample discussed by Bănărescu (1964). He presents in the same study a lot of peculiarities regarding to the fish fauna division along the small rivers that is located in the hilly areas. The present principle regarding to the ecological division of the fish fauna from the main rivers comprises five ecological zones. Each of them has a single characteristic fish species that is prevalent there. In the rivers that are originated in the mountainous area the ecological division of the fish fauna are as following (Bănărescu, 1964): the trout zone (characteristic species in this zone is the brown trout *Salmo trutta fario*), the grayling zone (*Thymallus thymallus*); the nose zone (*Chondrostoma nasus*), the barbel zone (*Barbus barbus*) and the

carp zone (*Cyprinus carpio*). In some of the rivers between the main ecological divisions is possible to find a small atypical zones in those the characteristic fishes are not the same as in the adjoined river areas. The lowland Crisul Negru and Crisul Alb have such of these atypical zones that are colonized by fish association based on the common species that usually live in this river sections.

Materials and methods

The study was attained by a numerous collecting trips during the years 1996-2007. The captured fishes was identified and recorded at the sampling sites and then was delivered in the river. The specimens of each species were numbered in order to calculate the percentage of the species from the site. It was collected more than 2600 mature and juveniles specimens that representing a total number of 41 fish species. Few atypical specimens were needed to be conserved with formaldehyde 5% and then studied in the laboratory aiming to establish their species membership.

The collecting methods were combined using both the fishing nets and the electro-narcosis devices. The electric-gear type IUP 12 (12V, 4-10A, 360W) was used in the less deep water together with the fishing nets - the so called stop-nets. In order to obtain intercomparable results we explored at each sampling site a river section equivalent of one hour fishing effort. For more accuracy on each sampling site was explored each biotope type.

Results and discussions

The biotopes sequence along the lowland section of the three Crisuri Rivers (Crisul Repede/Sebes-Körös; Crisul Negru/Fekete-Körös and Crisul Alb/Fehér-Körös) are determined a specific fish associations. According to the ecological division of the rivers fishfauna, the species that live in the river Crisul Repede are concordant with those of the typical "nose zone". The local fishfauna from the lowland Crisul Negru and Crisul Alb are atypical, the species from there are established a local association that comprising a group of ubiquitous fishes. The local biotopes and their fish communities will be presented below.

The fish associations from the lower Crisul Repede river

It was studied the river section between the localities Tărian and Cheresig / Körösszeg. The biotopes have characteristic a stony and gravely bottom that are not covered by sediments. The water flow is predominantly fast (0.5-1m/sec.) and the water depth not exceed 1.5-2m, occasionally under the riverside being deeper than 2.5 m. The fishfauna from this river section are characteristic for the hilly river stretches because of their fast water flow. The predominant fish from here is *Chondrostoma nasus* (the nose) that are the unique native species which use to browse the algal layer from the boulders surface. The "nose zone" is very long in the Crisul Repede River, this exceeding its lengths in the others Crisul Negru and Crisul Alb rivers.

The representative species from the studied river section are *Chondrostoma nasus*, *Leuciscus cephalus*, *Vimba vimba*, *Barbus barbus*, *Alburnoides bipunctatus* and *Gobio kessleri* (Table 1).

Together with this species there are present a number of eight fishes that are associated here: *Rutilus rutilus*, *Gobio gobio*, *Alburnus alburnus*, *Aspius aspius*, *Abramis ballerus*, *Cyprinus carpio*, *Sabanejewia aurata* and *Zingel streber* (Table 1).

The occurrence of the characteristic species in the studied river section reveals a maximal percentage for *Chondrostoma nasus* (35%) followed by *Leuciscus cephalus* (20%), *Alburnoides bipunctatus* (10%), *Vimba vimba* (7%), *Barbus barbus* (8%) and *Gobio kessleri* (3%). The associated fishes from here are totalizing only 17% and it are represented by seven native species (Fig.2). There was captured few juveniles specimens of *Leuciscus leuciscus*,

one of the endangered fish species in the Romanian rivers. Because of its scarce occurrence this species was not comprised in the associated species list.

Table 1. The fish species from the lower Crisul Repede river between Târian and Cheresig localities
1. táblázat. A Sebes-Körös halai Târian és Körösszeg között

Characteristic species	Occurrence in the fast flowing water	Occurrence in the slow flowing water
<i>Chondrostoma nasus</i>	++	-
<i>Leuciscus cephalus</i>	+	+
<i>Vimba vimba</i>	++	-
<i>Barbus barbus</i>	++	-
<i>Alburnoides bipunctatus</i>	+	-
<i>Gobio kessleri</i>	++	-
Associated species		
<i>Rutilus rutilus</i>	-	+
<i>Aspius aspius</i>	+	-
<i>Alburnus alburnus</i>	+	+
<i>Abramis ballerus</i>	-	+
<i>Gobio gobio</i>	-	+
<i>Cyprinus carpio</i>	-	+
<i>Sabanejewia aurata</i>	+	-
<i>Zingel streber</i>	+	-
Exotic species		
<i>Pseudorasbora parva</i>	-	+
<i>Carassius gibelio</i>	-	+
<i>Lepomis gibbosus</i>	+	+
<i>Ictalurus nebulosus</i>	-	+

+ present; ++ numerous; - absent

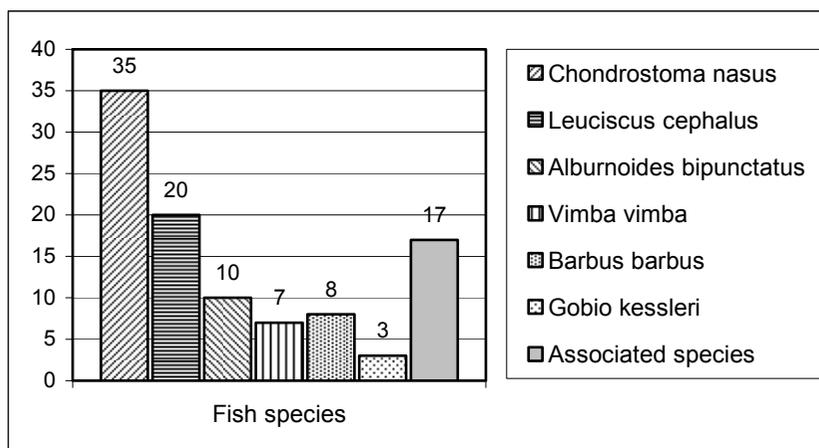


Fig. 2. The fish species and their occurrence in Crisul Repede River (percents from total number)
2. ábra. A halfajok és egyedszámbeli gyakoriságuk a Sebes-Körösben (%)

Referring to the fishfauna structure and its dynamic on the lowland Crisul Repede river is necessary some remarks. It was observed that some fishes like *Vimba vimba* and *Barbus*

barbus are passing upstream from the barbel zone that is located close downstream from Cheresig locality. The presence of these species on the “nose zone” it seems to be more frequent in the last five years. Also the population of *Chondrostoma nasus* from Crisul Repede river was extended its zone upstream to Aleşd locality. Hereby many of the rheophilic species are extending their area in the upper river and the local fish communities are changed.

The exotic fishes that live in the studied sector of the Crisul Repede river represent another category. There are occurred four fishes, two of them are originated from south-Asia (*Pseudorasbora parva* and *Carassius gibelio*) and the others are originated from North America (*Ictalurus nebulosus* and *Lepomis gibbosus*).

The fish associations from the lower Crisul Negru river

In the lowland river Crisul Negru, between the localities Tâmaşda and Ant the water flow has alternate fast and slow sectors and the channel bottom are partially covered by sediments or it is gravely. The water depth exceed frequent 1,5-2m and the aquatic vegetation is rich in some portions. As a local peculiarity here exists a large diversity of biotopes. There exist many paces with slow flowing waters and muddy bottom that are located close to the riverbanks. On the middle river channel are present the deep water and a strong flow. The bottom from here is in someplace wearing down on petrification clay and there is tacking shape longitudinally trenches. As a consequence the local fishfauna on this part of river are rich. According to the ecological division of the fishfauna this river sector is atypical because here the prevailing species are other than the barbel (*Barbus barbus*) or the nose (*Chondrostoma nasus*).

Table 2. The fish associations from the lower Crisul Negru river between Tâmaşda and Ant localities
2. táblázat. A Fekete-Körös halai Tâmaşda és Ant között

Characteristic species	Occurrence in the fast flowing water	Occurrence in the slow flowing water
<i>Rutilus rutilus</i> ,	-	+
<i>Abramis ballerus</i>	+	+
<i>Gobio kesseri</i>		
<i>Gobio gobio</i>	-	+
<i>Alburnus alburnus</i>	++	+
<i>Zingel zingel</i>	+	-
<i>Gymnocephalus baloni</i>	-	+
Associated species		
<i>Leuciscus cephalus</i>	+	+
<i>Chondrostoma nasus</i>	++	-
<i>Barbus barbus</i>	++	-
<i>Scardinius erythrophthalmus</i>	-	++
<i>Rhodeus sericeus</i>	-	++
<i>Cobitis danubialis</i>	-	+
<i>Silurus glanis</i>	-	++
<i>Esox lucius</i>	-	++
Exotic species		
<i>Pseudorasbora parva</i>	-	+
<i>Carassius gibelio</i>	-	+
<i>Ctenopharyngodon idella</i>	+	+
<i>Lepomis gibbosus</i>	+	+

<i>Ictalurus nebulosus</i>	-	+
+ present; ++ frequent; - absent		

The fishfauna of this river sector are intermediary between the two ecological zone of barbel and the nose. The fewer occurrences of *Barbus barbus* from here is due by the inadequate biotopes in which the deep water and strong flow are alternated with the slow running waters. Also the *Chondrostoma nasus* species have a fever occurrence in this river section because of the riverbed that is bereaved by gravel and boulders. The characteristic fishes from here are *Rutilus rutilus*, *Abramis ballerus*, *Gobio kessleri*, *Gobio gobio*, *Alburnus alburnus*, *Zingel zingel* and *Gymnocephalus baloni*. The associated species are *Leuciscus cephalus*, *Chondrostoma nasus*, *Barbus barbus*, *Scardinius erythrophthalmus*, *Rhodeus sericeus*, *Cobitis danubialis*, *Esox lucius*, and *Silurus glanis* (Table 2).

The large majority of fishes are adapted in slow running water and this resemble with the fishfauna structure from the typical "barbel zone". However the barbel zone is present downstream the locality Ant and their influence can be observed here.

The exotic fishes from there are *Pseudorasbora parva*, *Carassius gibelio*, *Ctenopharyngodon idella*, *Lepomis gibbosus* and *Ictalurus nebulosus*. Their geographic origin was discussed above. A special remark is need for *Ctenopharyngodon idella* a species that is enlarging their distribution in the rivers. Some specimens were escaped from the fish farms and it seems that these are able to survive and breed in the natural waters.

The occurrences of the species from this river sector reveal a large percentage of associated species (27%). This is due by the frequent biotopes with shallow waters and aquatic vegetation, which are adequate for the majority of cyprinid fishes (Fig. 3).

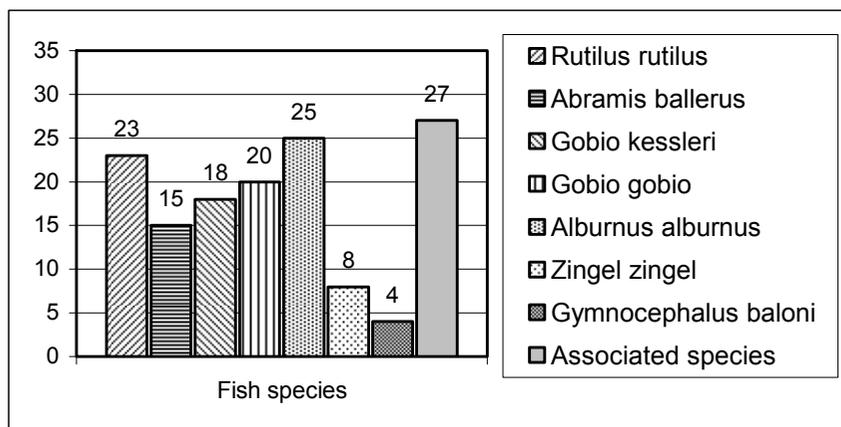


Fig. 3. The fish species and their occurrence in Crisul Negru River (percents from total number)
3. ábra. A halfajok és egyedszámbeli gyakoriságuk a Fekete-Körösben (%)

The large percentage of *Rutilus rutilus* (23%) and *Alburnus alburnus* (25%) are due to the adequate biotope in which is present a lot of aquatic plants. *Gobio kessleri* (18%) is present only in some places in which the bottom are not covered by sediments and the aquatic vegetation is absent. In these places the specimens are organized in fish schools each of that comprising many individuals. The less frequent are the *Gymnocephalus baloni* (4%) but it is their natural density in that the populations are not constituted by numerous specimens.

The fish associations from the lower Crisul Alb river

In the lowland river between the localities Ineu and Chisineu-Cris we find a very uniform biotope characterized by the less deep water and sandy bottom. The river channel has a rectangular shape because of the river regularizations and embankments. As a consequence the local fishfauna comprise a small number of species. Regarding to the ecological division of the fishfauna, there is a river section in that the local biotope is inadequate for the settlement of barbel zone or for the nose zone. This river sector along 20km downstream from Ineu locality till Chisineu-Cris is an intermediary zone between the proper “nose zone” located upstream Ineu and the “barbel zone” from far downstream Chisineu-Cris. The fishfauna from there comprise predominantly *Gobio albipinnatus*, *Gymnocephalus schraetser*, *Stizostedion lucioperca*, *Perca fluviatilis* and *Sabanejewia aurata*. The characteristic biotopes for this species are which sandy bottom and less deep water. The associated fishes are *Chondrostoma nasus*, *Leuciscus cephalus*, *Barbus barbus*, *Gobio gobio*, *Alburnus alburnus*, *Rhodeus sericeus* and *Cobitis danubialis* (Table 3). About the occurrence of both fishes *Chondrostoma nasus* and *Barbus barbus* that are dominant in the zones from upstream and downstream of the studied sector we observed that this species use to transit this river portion. This is due by the inadequate biotopes that are settled here, and especially the uniformity of water flow, the less deep water and the sandy bottom.

Table 3. The fish associations from the lower Crisul Alb river between Ineu and Chisineu-Cris localities.
3. táblázat. A Fehér-Körös halai Borosjenő és Kisjenő között

Characteristic species	Occurrence in the fast flowing water	Occurrence in the slow flowing water
<i>Gobio albipinnatus</i>	+	++
<i>Gymnocephalus schraetser</i>	+	++
<i>Stizostedion lucioperca</i>	+	++
<i>Perca fluviatilis</i>	+	++
<i>Sabanejewia aurata</i>	++	-
Associated species		
<i>Chondrostoma nasus</i>	+	-
<i>Leuciscus cephalus</i>	++	+
<i>Barbus barbus</i>	+	-
<i>Gobio gobio</i>	-	++
<i>Rhodeus sericeus</i>	-	++
<i>Alburnus alburnus</i>	+	+
<i>Cobitis danubialis</i>	-	++
Exotic species		
<i>Pseudorasbora parva</i>	-	+
<i>Carassius gibelio</i>	-	++
<i>Lepomis gibbosus</i>	+	+
<i>Ictalurus nebulosus</i>	-	+

+ present; ++ frequent; - absent

The associated species has a less occurrence in this river sector (9%) and their populations are fluctuant. The species *Leuciscus cephalus*, *Alburnus alburnus*, *Rhodeus sericeus*, *Gobio gobio* and *Cobitis danubialis* are encountered permanently in this river sector. The others associated species *Chondrostoma nasus* and *Barbus barbus* has unstable presence in this river place.

Exotic fishes from here are encountered close to the riverbanks there is shallow water and in which are overgrowing the aquatic vegetation.

The most frequent species are *Gobio albipinnatus* (43%) and *Sabanejewia aurata* (17%) which are typical inhabitants in the lowland sandy rivers (Fig.4). The percid fishes are present in a less number: *Gymnocephalus schraetser* (12%), *Stizostedion lucioperca* (8%) and *Perca fluviatilis* (11%).

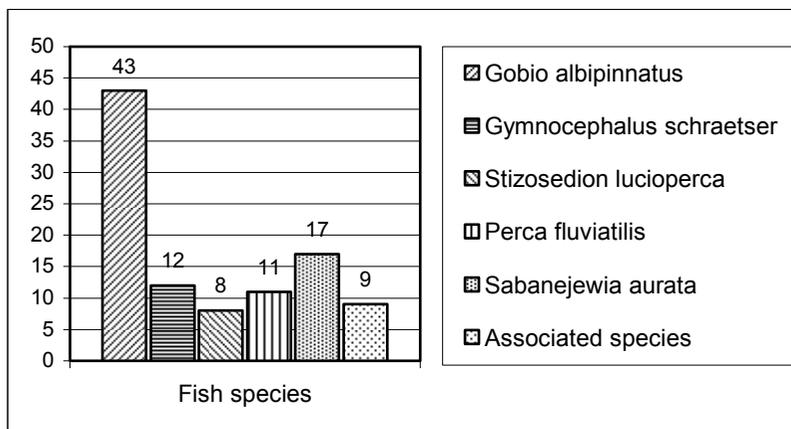


Fig. 4. The fish species and their occurrence in Crisul Alb River (percents from total number)
4. ábra. A halfajok és egyedszámbeli gyakoriságuk a Fehér-Körösben (%)

Conclusions

- The fish fauna from the lowland rivers Crisul Repede/Sebes-Körös, Crisul Negru/Fekete-Körös and the Crisul Alb/Fehér-Körös, has many dissimilarities regarding of their fish communities structure. The main promoters for the local fish communities' assemblage are the aquatic biotopes.
- The characteristic fish species from each local community (i.e. from Sebes-Körös) are not characteristic for the other fish communities which is established in the other river in which exist significant differences of the biotope.
- The associated fish from each river sector are represented by those species that are accompanying the characteristic species. Their presence on those river stretch are quite fluctuant and they are not have a distinctive adaptation for the local biotope.
- The large percent of associated fish was encountered in the lowland Fekete-Körös in which the river channel has a large diversity of aquatic biotopes.
- The uniformity of the aquatic biotope along to many kilometers of the river Crisul Alb/ Fehér-Körös is given rise the less diversity of fish fauna and also it determine the large sized fish to traverse this river section. Moreover, the uniformity of aquatic biotope and especially those of the riverbed are determining the fluctuation in fish communities' structure.
- According to the ecological division of the rivers fishfauna, the lowland sector of Crisul Repede is corresponding to the "nose zone" while the others lowland rivers Crisul Negru and Crisul Alb has atypical zones in which the species of the "nose zone" or "barbel zone" are partially replaced. This atypical fishfauna are present in these rivers as a discontinuity on their ecological division of the general fishfauna that characterize the entire rivers.

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