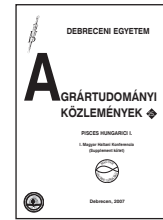


THE FISHFAUNA OF THE CRIȘUL REPEDE RIVER AND ITS THREATENING MAJOR FACTORS

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SUMMARY

The Crișul Repede River is belonging at Cris (Körös) Rivers system which is a tributary on the left shore of Tisa River. In the last decades the fish fauna of the natural waters has undergoing a decline in the species number. The other successive process is the fish species replacement due by the immigration of some exotically fishes and the retirement of some of the native species.

The Crișul Repede fish fauna has registered a decline caused mainly by the river damming, water pollution and eutrophisation. On despite of that negative factors the fishes from the upper river was maintain less affected unlike to the other rivers. Thereafter the economical transition and the industries reorganization process were redounded to diminishing the impact of these harmful factors. The former studies about the Cris fish fauna cited a number of 48 native species and 12 exotic ones. During the research trips carried out since 10 years ago (beginning in 1995) was identified a number of 40 fish species and the presence of the other 8 species are still uncertain. The sturgeon species *Acipenser ruthenus* and the migratory fish *Anguilla anguilla* have a scarce presence and they can not be found in the last decade. A number of 5 exotically fishes are behaved as remarkable intruders in natural waters: *Pseudorasbora parva*, *Carassius auratus gibelio*, *Ictalurus nebulosus*, *Ictalurus melas*, and *Lepomis gibbosus*. Some of the exotically fishes already recorded in the Hungarian stretches of the Crisuri (Körös) was not recorded in the Romanian section of the river (*Mylopharyngodon piceus*, *Ictiobus bubalus*, *Ictalurus punctatus*, *Clarias gariepinus*, *Micropterus salmoides*, *Oreochromis niloticus*, *Perccottus glenii*). The pervading of these species is expecting also in the Romanian section of the rivers.

The present major threatening factors concerning the fish fauna are represented by the habitat changes. The river damming and the riverside levees have a negative influence on the fish fauna. The former phenomenon of water pollution it seems that is replaced by the habitat changes. The dam lakes caused unregulated fluctuations on the water level and temperature downstream of it. The embankment for preventing the flooding was performed through shortening the river meander. The lost meanders of the rivers are representing an optimal habitat for fish spawning.

INTRODUCTION

The Crișul Repede River (the Hungarian name is Sebes Körös) is belonging at the Tisa River System (fig.1). This river has the spring in the Apuseni Mountains located in the north-western Romania. The mountain stretch of Crișul Repede River has a number of tributaries which are less affected by the human activities, excepting the river damming. The middle and lower Crișul Repede River are affected by the multiple factors: spilling of the waste waters or other household wastes, river damming, the extraction of sand and gravel directly from the riverbed, the river channel rectification and the built up the levees along the river sides. Beside the fishfauna changing factors a major effect is generated by the exotic fishes which are now spread in the natural waters. The fish farms and the collecting channels system from the lower river are facilitating factors for growing and spreading of some of the exotic fishes.

Several contributions to the knowledge of fish distribution in the Romanian stretch of the three Criș Rivers have been published by Bănărescu (1953, 1954, 1964 and 1981) and Bănărescu et. Al. (1960, 1997), Telcean et.

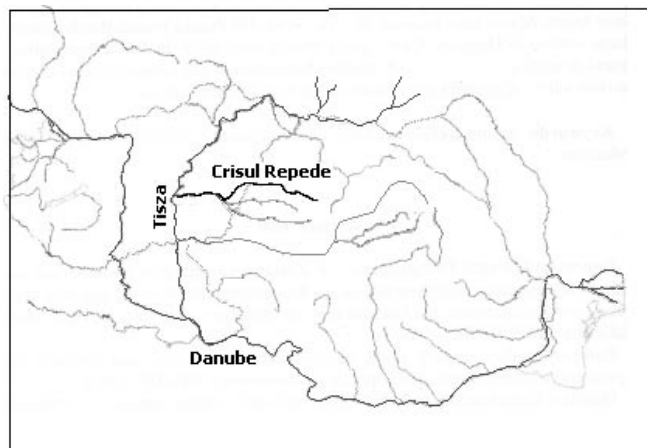


Fig.1 The Crișul Repede River and the Tisa drainage basin

Bănărescu (2002). Recent data concerning the fish fauna from the Hungarian stretches of these rivers are published by Harka (1996, 1997), Harka et. Sallai (2004). In the publications above mentioned, a number of 40 fishes are cited as common species in the Romanian stretch of the Crișuri Rivers and 44 species live in the Hungarian stretch of the Crișuri (Körösok) Rivers (Harka et. Sallai 2004).

The fish fauna changes consist in the species retirement and their replacement. The changes registered by the fish populations are visible in the middle and lower river section there were the main environmental changes are generated by human activities. Some of the rheophilous fishes have registered a numerical regress in the dam lake area. Along the most endangered species from this category are the percidae species *Zingel zingel*, *Z. streber* and the cyprinids *Tinca tinca*, *Leuciscus leuciscus*, *Gobio uranoscopus* and *G. kessleri* (Bănărescu, 2002).

MATERIALS AND METHODS

The data comprised in this study represent the results of ichthyologic investigations carried out during the years 1996-2004. The fish specimens were collected with special fishing nets and electro-fishing gear type I.U.P. 12 (12V, 4-10 A, 360W). Fishes have been collected almost exclusively from river and the adjacent channels that join the Crișul Repede River on the lower stretch. In the water reservoirs located upstream to the hydro-electrical power plant, the fishes were captured only through electro-narcosis. Small specimens (or juveniles) of some species which live in the less deep water of the dam lakes was captured with a special trap.

After the taxonomical identification the fishes was released in the water at the same place from where they was captured. Some fish specimens was preserved with formaldehyde 4% with a view to storage them in the ichthyologic collection. The sample points were located from the upper river downward according to the river changes and the local threatening factors.

RESULTS AND DISCUSSIONS

In the Romanian stretch of Crișul Repede River has been identified a number of 41 native fishes and one of predatory lamprey (*Eudontomyzon danfordi*) (table 1). Beside these fishes a number of 10 exotic species are occurred in the river, ponds and connected channel from the lower river.

The fish samples examined from several river sections is proving that the fish fauna has underwent a numerical decline or a range reduction on sensitive species. Some fishes like the sand gudgeon *Gobio kessleri* and *Chondrostoma nasus* have been replaced by the ubiquitous and opportunistic fishes *Gobio gobio* and *Leuciscus cephalus*. The two gudgeon species *Gobio gobio* and *Gobio kessleri* lives in the middle and lower Crișul Repede. First species occur in the slowly water with muddy bottom and the second in running well oxygenated waters with sandy bottom (Bănărescu, 2002 a, 2002 b). Both species are occurring in the middle and lowland river, but the common gudgeon is favored by the river damming and the organic deposit that is present in downstream towns. The species replacement is caused by the habitat changes.

The river damming and riverbed rectification

These factors can be considered together the water pollution as the most harmful factors concerning the fish fauna (Bănărescu, 1994, 2002). The water level fluctuation and the sudden temperature changes are caused a various effect on the aquatic organisms. The benthic invertebrates have undergoing a numerical decline and the result is the subsequent impoverishment for the fish nurture. Another effect is caused by loosing of diverse microhabitats that is coming after the shortenings of the river backwaters and meanders.

Downstream of reservoirs the most affected fishes are *Gobio uranoscopus*, *Alburnoides bipunctatus*, *Leuciscus leuciscus*, *Chondrostoma nasus*, *Vimba vimba*, *Barbus barbus*, *Sabanejewia aurata balcanica*, *Zingel streber* and *Gymnocephalus schraetser*. The formerly mentioned *Leuciscus leuciscus* (dace) is one of the very rare species in the drainage area of the middle and lower Danube. The species was collected in Crișul Repede River at Oradea and upstream first in 1954 and lather in Barcău and Crișul Negru (Fekete Körös), (Bănărescu, 1954, 1964, Bănărescu et. all.1997). For a time it has believed to be extinct in Romanian rivers. On despite of previous conclusion, three specimens of dace have been collected in August 1994 from the Crișul Repede, downstream the dam lake from Tileagd (Bănărescu et. all.1997). The surviving of *Leuciscus leuciscus* in the middle and lowland Crișul Repede is staked by the water level fluctuation downstream the dam lake. Most rheophilic fish species (according to Bănărescu, 1994, the rheophilic fishes are considered not only those inhabiting mountainous rivers, but also those from lowland rivers which are unable to survive and to spawn in standing water) became extinct from the dammed river stretches. Several fish species have been favored by the damming of river: the bleach *Alburnus alburnus*, the cub *Leuciscus cephalus* and the common gudgeon *Gobio gobio* have increased their abundance. Some species which are typical inhabitants in the standing water become more abundant in the reservoirs from the middle Crișul Repede River (Lugaș and Tileagd): *Rutilus rutilus*, *Carassius auratus gibelio*,

Abramis ballerus, *Blicca bjoekna* and *Perca fluviatilis*. In the last decade the exotic fishes *Pseudorasbora parva* and *Lepomis gibbosus* has extended their populations in this reservoir.

The levees which are built-up along the riverside

The levees have been built along both sides of the river in order to protect the fields against the flood. While in the other rivers (e.g. Timiș River in Banat County and Tisa River in Hungary) the levees are distant, allowing the river to maintain its natural course with meander and flooding ponds, the levees along the Crișul Repede are close to the river bed. The former river meanders and backwaters have been shortened and its alternation of microhabitats was lost. As consequences on long stretches of the river the water velocity and depth became rather uniform. The average velocity in the modified stretches of the river is higher than formerly and it have favored some large-sized fish like *Aspius aspius*, *Barbus barbus*, and the large specimens of *Leuciscus cephalus*, *Chondrostoma nasus* and *Vimba vimba*. The small-sized fishes *Gobio uranoscopus*, *G. kessleri*, *Alburnoides bipunctatus*, *Sabanejewia aurata balcanica* and the great majority of juveniles has been registered a numerical decline in the lowland river. The spawning of fishes is affected in the river stretches there where the levee has been built up.

The water pollution and eutrophisation

These factors owe by the industrialization and urbanization during the last three decades is less affected the Crișul Repede River. There is no extinct fish species as a result of water pollution. The use of fertilizers in agriculture determined the eutrophisation especially in stagnant waters: lakes, ponds and backwaters. The polluted tributary Barcău (Berettyó) was strong affected by the oil extracting industry and its fish fauna are visible affected.

In the last years the spilling of industrial wastes and the amount of wastewaters are reduced. The diffuse pollution with house wastes and the wastewaters spilling from the small villages are still present in the Crișul Repede River. The increased level of eutrophisation downstream to the villages leads to a supplementary increment of algal periphyton on the upper surface of the river bed stones. The result is the increased number of *Chondrostoma nasus* and other fish which are feed with small invertebrates from the bottom and organic detritus: *Gobio gobio*, *Alburnus alburnus*, *Leuciscus cephalus*, *Pseudorasbora parva*, *Cobitis taenia* and *Orthrias barbatulus*. The species *Chondrostoma nasus* became more abundant and extend upstream in many rivers excepting the dammed rivers in which the species can not ascend (Gyurko et. all. 1953, 1956). This fish is the unique representative of the algae feeder group (the main food of this species consist in the benthic algae).

The water pollution and eutrophisation contribute to accentuate decline of the crucian carp *Carassius carassius* and other fishes from standing and shallow waters *Tinca tinca*, *Scardinius erythrophthalmus* and *Gymnocephalus cernuus*. In the running water, the percid fishes *Zingel zingel* and *Z. streber* are the most threatened by the eutrophisation and water pollution. In the river stretches from downstream to the towns these species are not occurring. A special category of pollution is represented by the sawdust spilling in the mountainous rivers. The accumulation of large amounts of sawdust in the riverbed leads to a decreasing of benthic invertebrate fauna and subsequent the decline of entire fish fauna. The negative effect of the resinous sawdust is extended for a long time after the pollution because its putrefaction is slowed down by the resin content.

The sand and gravel extraction directly from the riverbed

The riverbed changes caused by the sand and gravel exploitation are present in the middle and the lowland river. Many of the fish species live close to the river shores because there they found some refugees and find more accessible food. The sand exploitation caused strong modifications along the rivers, and the shore habitat is completely modified. Another consequence of the sand and gravel exploitation directly in the riverbed is the increment on amount of suspension materials that caused permanent water turbidity. The biotopes with less deep waters are transformed in a succession of deep delves. The water velocity is decreased in the excavated area and the bottom is covering with mud in time. No former fish species are occurring here. The small-sized gudgeon species *Gobio gobio*, *G. kessleri* and *G. albipinnatus* and *Sabanejewia aurata balcanica* which live close to the river shores are replaced by the large specimens of predatory fishes *Silurus glanis*, *Aspius aspius*, *Esox lucius* and *Stizostedion lucioperca*. The rheophilic species are not occurring in these habitats.

The exotic fishes

In the Crișul Repede River and backwaters a number of 10 exotic species are present. Five of them are economical valuable fishes: *Oncorhynchus mykiss*, *Salvelinus fontinalis*, *Hypophthalmichthys molitrix*, *H. nobilis* and *Ctenopharyngodon idella*. The remaining five species are behaved as intruders in the natural waters: *Carassius auratus gibelio*, *Ictalurus (Ameiurus) nebulosus*, *I. melas*, *Pseudorasbora parva* and *Lepomis gibbosus*. Only in the thermal pond from the rivulet Petea live another exotic fish species *Lebistes (Poecilia) reticulatus* which is

introduced here. The Prussian carp or the goldfish *Carassius auratus gibelio* is a recent intruder for the fish fauna of the Crişul Repede River there it was introduced after 1950 (Bănărescu et. all.1997). It is now widely distributed in all ponds, lakes and fishery farms in the Crişul Repede drainage area. The goldfish is a most competitive species which is replaced the native species *Carassius carassius* from the standing waters. However the Crucian carp still survives, even in high number, in some isolated dystrophic pools located especially in hilly areas.

Both species representative for the Bagridae family *Ictalurus (Ameiurus) nebulosus* and *I. melas* are predatory and invasive fishes. Their occurrence in the lowland river and ponds contribute to decline of the other native species. Their prey consists in a juveniles or small-sized cyprinid fishes. The species *Ictalurus melas* is a recent intruder in the Crişul Repede drainage area (Wilhelm, 1998).

The pumpkinseed fish *Lepomis gibbosus* is a representative of the Centrarchidae fish family and its origin is North America. There are earlier records in Crişul Repede drainage area (Bănărescu 1964) in the canal connecting the Criş Rivers in Romania. During the 1994-1995 collecting trip it has been found in the Hungarian stretch of river. A few specimens were collected in the Crişul Repede downstream of the dam lake Tileagd. In the last years *Lepomis gibbosus* is increased his population from the lower Crişul Repede and the connecting channels.

Another small-sized fish of East Asian origin is the stone morocco *Pseudorasbora parva*. The species has been introduced as juveniles together with the fry of valuable Chinese carps. In the lowland Crişul Repede it was introduced first in the year 1962 at fishery farm from Cefa. It is now widely distributed thought the drainage area of Crişul Repede in Romania and Hungary, except the mountainous rivers stretch. On spite of his small size, this fish is a competitor for the juveniles of the other cyprinids in the running waters and ponds.

The grass carp *Ctenopharyngodon idella* has been occasionally found in the lowland Crişul Repede and the connector channel. Some specimens escaped from the fishery farm are found sometimes very far from it in the natural waters. It is possible that this species be able to spawn in the natural waters not only in the fishery farms.

The other exotic fish occurred in the Hungarian river stretch *Mylopharyngodon piceus*, *Ictiobus bubalus*, *Ictalurus punctatus*, *Clarias gariepinus*, *Micropterus salmoides*, *Oreochromis niloticus*, *Perccottus glenii* (Harka et. Sallai, 2004) are not occurred in the Romanian waters. The North African catfish *Clarias gariepinus* is farmed in several small ponds from the drainage area of Crişul Repede, but it is not occurring in the natural waters.

CONCLUSIONS

The fish fauna of the drainage area of Crişul Repede River are affected by several factors and its threatening degree is depending on the fish ecology. The rheophilic fishes are affected by the damming of rivers. On this category the large sized cyprinid species *Barbus barbus*, *Chondrostoma nasus* and *Vimba vimba* which undergo upstream migrations during the spawning period are under numerical decline in the dammed river. The chub *Leuciscus cephalus* is an opportunistic fish which is increased their number and partially replacing the three species above mentioned in the middle and lower river.

The water pollution and the eutrophisation contribute to decline of standing water species *Carassius carassius*, *Tinca tinca* and the percid fish *Gymnocephalus cernuus*. There are several sources of water pollution in the Crişul Repede River, namely the urban and industrial waste waters from the town of

Oradea and the waste waters from the pig farm at Cheresig. All these waste waters affect only short stretches of the river.

The sand and gravel exploitation is a major threatening factor from the middle and lower river. Together with the levees that are built up on the riverside, the hydro-technical construction represents the most threatening factors in the drainage area of Crişul Repede River.

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Table nr.1
Occurrence of the fishes in the Crişul Repede River and their threatening factors

SPECIES	River damming and levees built	Water pollution and eutrophisation	Sand and gravel extraction	Species status
<i>Eudontomyzon danfordi</i> (Cyclostomes)	+	+	-	V
<i>Salmo trutta fario</i>	+	-	-	C
<i>Thymallus thymallus</i>	+	-	-	V
<i>Oncorhynchus myckiss</i>	-	-	-	Exo
<i>Salvelinus fontinalis</i>	-	-	-	Exo
<i>Esox lucius</i>	+	-	+	C
<i>Rutilus rutilus</i>	-	-	+	C
<i>Scardinius erythrophthalmus</i>	-	+	+	C
<i>Sc. racovitzai</i>	-	-	-	V
<i>Leuciscus cephalus</i>	-	-	-	C
<i>L. leuciscus</i>	+	-	+	V
<i>L. idus</i>	+	-	-	V
<i>Leucaspis delineatus</i>	-	-	-	C
<i>Aspius aspius</i>	-	-	+	C
<i>Chondrostoma nasus</i>	+	-	+	C
<i>Alburnus alburnus</i>	-	-	-	C
<i>Alburnoides bipunctatus</i>	+	+	+	V
<i>Blicca bjorkna</i>	+	-	+	C
<i>Abramis brama</i>	+	-	+	C
<i>Abramis sapa</i>	+	-	+	V
<i>Abramis ballerus</i>	-	+	+	V
<i>Vimba vimba</i>	+	-	+	C
<i>Tinca tinca</i>	+	+	-	V
<i>Pelecus cultratus</i>	-	-	-	?
<i>Phoxinus phoxinus</i>	-	-	-	C
<i>Rhodeus sericeus</i>	-	-	-	C
<i>Gobio gobio</i>	-	-	-	C
<i>G. uranoscopus</i>	+	+	+	V
<i>G. albipinnatus</i>	+	+	+	C
<i>G. kessleri</i>	+	+	+	C
<i>Barbus barbus,</i>	+	-	+	C
<i>B. peloponnesius petenyi</i>	-	-	+	C
<i>Carassius carassius</i>	+	+	-	V
<i>Cyprinus carpio</i>	+	+	+	C
<i>Orthrias barbatulus</i>	-	-	-	C
<i>Misgurnus fossilis</i>	+	-	+	C
<i>Cobitis taenia</i>	-	-	+	C
<i>Sabanejewia balcanica</i>	+	+	+	C
<i>Perca fluviatilis</i>	-	-	-	C
<i>Gymnocephalus schraetser</i>	+	+	+	V
<i>G. cernuus</i>	+	+	+	V
<i>Stizostedion lucioperca</i>	+	+	+	V
<i>S. volgense</i>	-	+	+	V
<i>Zingel zingel</i>	+	+	+	V
<i>Z. streber</i>	+	+	+	V
<i>Silurus glanis</i>	-	-	+	C
<i>Lota lota</i>	+	-	+	V
<i>Cottus gobio</i>	+	-	-	V
<i>Proterorhinus marmoratus**</i>	-	-	-	?

+ Affected; - Unaffected, V= vulnerable; C= common; ?= unknown status

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