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Ichthyofauna of Rimava river basin

A Rima vízgyűjtőjének halfaunája

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Kulcsszavak: hal közösségek, ökológiai guildek, Rima folyó, veszélyeztetett fajok

Abstract

Between 2007 and 2012 altogether 14 samplings in 13 locations within the Rimava river catchment area have been performed using electrofishing device. Within the Rimava river and its five selected tributaries (Gortva, Rimavica, Barca, Mačací brook, Dechtársky brook) altogether 22 fish species belonging to five families (Balitoridae, Cobitidae, Cyprinidae, Percidae, Salmonidae) were recorded. Bitterling (*Rhodeus amarus*), chub (*Squalius cephalus*) and spirlin (*Alburnoides bipunctatus*) belonged to eudominant species, while Stone loach (*Barbatula barbatula*) and Danubian spined loach (*Cobitis elongatoides*) were the most frequently occurred species within the study sites.

The fish assemblage composition, relative abundance, eco-ethological requirements, threat categories and conservation status of occurring species was evaluated. Our survey focused especially on the verification of occurrence of protected and threatened species. Given the lack of current data on the fish assemblage composition of the Rimava river catchment, the data obtained may serve as the basis for local nature conservation authorities administrating within the issued territory. Altogether 8 species of the European importance and one species of the national importance were recorded within the study area, what supports the idea of designation of separate Natura 2000 site (SCI – Site of Community Importance) encompassing the Rimava river and certain tributaries.

Kivonat

2007 és 2012 között az Alsó-Rima vízgyűjtő területén összesen 14 mintát vettünk 13 mintaterületen. A halállományt elektromos halászgép segítségével mértük fel. A felmérési pontokat a vizsgált területen a Rima folyón és öt Rimába torkoló vízfolyáson jelöltük ki (Gortva, Rimavica, Barca, Macskás-patak/Mačací patak, Détéri-patak/Dechtársky patak). Felmérésünkkel összesen öt családba tartozó 22 halfajt (Balitoridae, Cobitidae, Cyprinidae, Percidae, Salmonidae) mutattunk ki a vizsgált területen. A relatív abundancia (relatív egyedszám arányok) szempontjából a szivárványos ökle (*Rhodeus amarus*) a fejes domolykó (*Squalius cephalus*) és a sujtásos küsz (*Alburnoides bipunctatus*) eudomináns előfordulásúak voltak. A vizsgált mintaterületeken leggyakrabban előforduló fajok a kövi csík (*Barbatula barbatula*) és a vágó csík (*Cobitis elongatoides*).

A gyűjtött adatok segítségével az egyes mintaterület halközösségeinek összetételét, az előforduló fajok relatív abundanciáját és az öko-etológiai igényeket értékeltük ki. A felmérés további célja a védett és veszélyeztetett halfajok előfordulásának igazolása volt. Tekintettel arra, hogy a Rima vízgyűjtőjére vonatkozó halfaunisztikai adatok szerények, a védett és ritka fajok előfordulását kimutató adatok a helyi természetvédelmi szervezeteknek szolgálhatnak a terület (fajok) védelmének biztosításában. Felmérésünk kapcsán összesen nyolc európai jelentőségű fajt és egy országos jelentőségű fajt jegyeztük fel a tanulmányozott mintaterületeken. Munkánkkal szeretnénk támogatni a Natura 2000 hálózat területeinek bővítését, mely magában foglalná a Rima folyó alsó folyását, és az egyes mellékvízfolyásait.

Introduction

The Rimava River is a right tributary of the Slaná River (Tisa basin) in southeastern part of the middle Slovakia. It springs at the altitude of 1126 m below the Fabová hoľa hill in the Veporské mountains. Its total length is 88 km and the catchment area is 1 379,6 km^2. The average discharge in Rimavská Sobota city is 4,7 m^3/s, respectively 7,1 m^3/s at its mouth to the Slaná river (Annonymus 2011). The river flows southwards through the towns Tisovec, Hnúšťa and Rimavská Sobota, then turns into the south-east direction and close to the village Lenártovce meets the Slaná River at the altitude of 145 m a.s.l. (Sičáková 1996).

The major polluters of the river were mostly in the second half of the last century, the factories in Hnúšťa and Rimavská Sobota, which caused its permanent pollution and high mortality of fishes (Kux & Weisz 1964). According to the ichthyological classification the upper stretch of Rimava, upstream the Rimavská Píla village has a character of trout zone (epirithral) and downstream of this village acquires the character of submountain (metarithral) stream, corresponding to the grayling zone (Kohút & Pilková 2000, Zontág 2006). The lower stretch of river, approximately from village Čerenčany to its mouth, acquires the character of barbel zone (Kux & Weisz 1964).

The Rimava River and the majority of its tributaries were significantly affected by river regulation during the last century (Kux & Weisz 1964). Formerly meandering streambeds were changed into a narrow channels. Our study focuses on the fish assemblage composition of the Rimava River and its five tributaries (Gortva, Rimavica, Barca, Mačací brook, Dechtársky brook). Samplings were conducted in order to obtain data on the current species composition, relative abundance, ecological requirements and on the occurrence of protected and threatened species, as well as to compare the current status of ichthyofauna with available data from previous studies.

Material and methods

Altogether 14 ichthyological samplings were conducted between 2007 and 2012 at 13 sampling sites, including the Rimava River and its several tributaries (*Fig. 1, Table 1*).

Table 1. Overview of sampling sites
1. táblázat. A mintaterületek áttekintése

No.	Site name	Site code	Situation	Date	x-coord.	y-coord.
1.	Rimavica	Rm	Kokava n. Rimavicou	15.5.2007	48.546405	19.853034
2.	Rimava	Ri1	Vrbovce n. Rimavou	15.5.2007	48.448223	19.960891
3.	Mačací brook	Mp1	Drňa	19.6.2008	48.266566	20.114330
4.	Mačací brook	Mp2	Hostice	19.6.2008	48.231462	20.071307
5.	Dechtársky brook	Dp	Gemerské Dechtáre	19.6.2008	48.237837	20.035220
6.	Gortva	Go1	upstream Petrovce	19.6.2008	48.182749	20.009771
7.	Gortva	Go2	Studená	19.6.2008	48.161695	19.957729
8.	Gortva	Go3	over Tachty reservoir	19.6.2008	48.149037	19.921526
9.	Gortva	Go4	Cifra	20.6.2008	48.297106	20.055304
10.	Gortva	Go5	over Hajnáčka	20.6.2008	48.208491	19.955527
11.	Rimava	Ri2	Dubovec	24.8.2012	48.284978	20.146317
12.	Rimava	Ri3	Rimavská Seč	24.8.2012	48.298198	20.255202
13.	Gortva	Go6	Cifra	25.8.2012	48.297106	20.055304
14.	Barca	Ba	Číž	25.8.2012	48.316966	20.281404

Fish were sampled using one way electrofishing (battery powered electrofishing gear, type: IUP 12: 350V and type LENA: 240-310V). Samplings were performed by wading, in order to cover all microhabitats occupied by fish. Samples were determined into species,

measured and released back into the water on individual sites. The standard body length (SL) was measured according to Holčík & Hensel (1972). The species relative abundance was calculated in % of their observed proportion in individual sites (Losos et al. 1984). Cluster analysis based on the species presence/absence data was performed by hierarchical clustering using the Past program (Hammer et al. 2006).

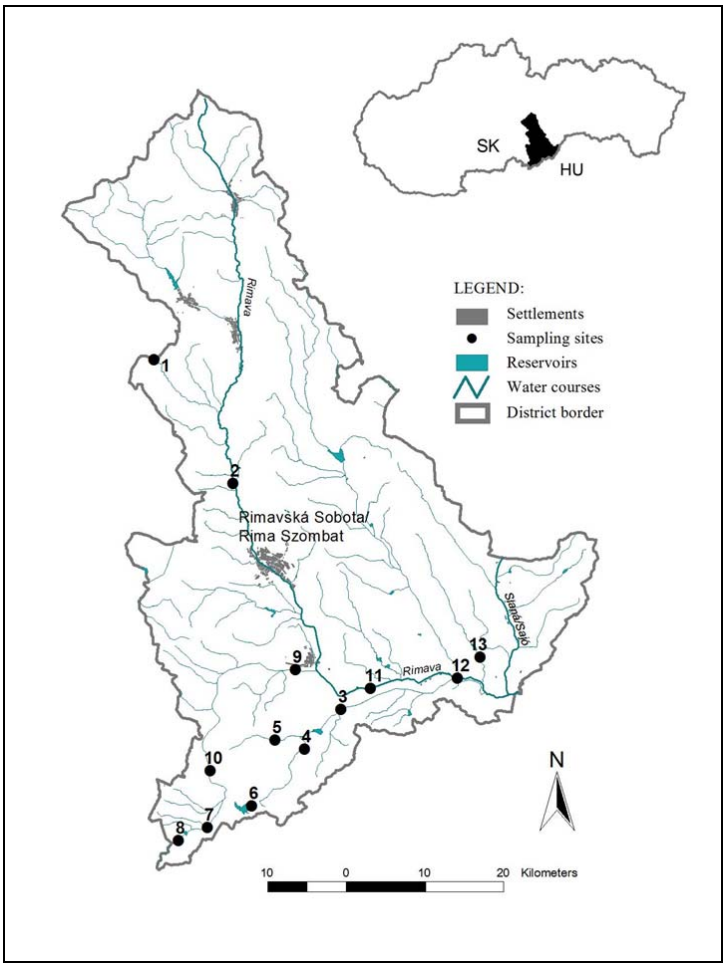

Fig. 1. Map of the Rimava River catchment and sampling sites
1. ábra. A Rima folyó vízgyűjtőnek térképe a mintavételi helyekkel

Diversity and equitability indices were calculated using the *Diversity* tool of the same program. Individual species were classified into eco-ethological guilds in relation to flow preferences (Schiemer & Waidbacher 1992), feeding preferences (Aarts & Nienhuis 2003) and reproduction substrate preferences (Balon 1975). The threat categories were evaluated according to the current Red list of fishes and lampreys of Slovakia (Koščo & Holčík 2008). Conservation status of the species recorded is in accordance with the current Slovak legislation (Decree no. 24/2003 Coll.). The situation map of sampling sites was processed in GIS environment using ArcView 3.2 software.

Results and discussion

According to our samplings and available published data, altogether one lamprey and 28 fish species are documented for the Rimava River basin (Kux & Weisz 1964, Kohút & Pilková 2000, Zontág 2006, Koščo et al. 2008). Compared to the data of recent studies, one lamprey species and 45 fish species are stated for the Slaná River (Koščo et al. 2000, Harka et al. 2007). Thus the Rimava River encompasses 58,7 % of fish diversity of the Slaná River. During our survey between 2007 and 2012, altogether 22 fish species belonging to five families were recorded, among which, six species were not reported by previous studies concerning the Rimava River catchment (*Table 2*).

Table 2. List of fish species recorded in Rimava river catchment. FP – flow preference, FG – feeding guild, R – reproductive guild, O – origin, T – threat category, C – conservation status
2. táblázat. A Rima vízgyűjtőn talált halfajok listája. FP – vízáramlás preferencia, FG – táplálék preferencia, R – reprodukciós guildek, O – eredet, T – veszélyeztetettségi kategória, C – természetvédelmi státusz

Data source /species	Kux & Weisz (1964)	Kohút & Pilková (2000)	Zontág (2006)	our data (2007-2012)	FP	FG	R	O	T	C
Eudontomyzon danfordi	+	-	+	-	Re-a	Dt/Pi	Li	Au	NT	EU
Abramis brama	+	-	-	-	Re-b	Be	PL	Au	LC	-
Alburnoides bipunctatus	+	-	-	+	Re-a	Po	Li	Au	LC	SR
Alburnus alburnus	+	+	-	+	Eu	Pl	PL	Au	LC	-
Barbatula barbatula	+	+	-	+	Re-a	Be	Ps	Au	LC	-
Barbus barbus	+	-	-	+	Re-a	Be	Li	Au	LC	-
Barbus carpathicus	+	+	-	+	Re-a	Be	Li	Au	LC	EU
Carassius gibelio	-	-	-	+	Eu	Po	Ph	Al	-	-
Cobitis elongatoides	+	-	-	+	Re-a	Be	Ph	Au	LC	EU
Esox lucius	+	-	-	-	Eu	Pi	Ph	Au	LC	-
Gobio gobio	+	+	-	+	Re-a	Be	Ps	Au	LC	-
Hucho hucho	-	-	+	-	Ri	Pi	Li	Au	VU	EU
Chondrostoma nasus	+	-	-	+	Re-a	Pf	Li	Au	NT	-
Leuciscus leuciscus	+	-	-	+	Re-a	Be	Li	Au	NT	-
Misgurnus fossilis	+	-	-	+	Lim	Be	Ph	Au	NT	EU
Perca fluviatilis	+	+	-	+	Eu	Be/Pi	PL	Au	LC	-
Phoxinus phoxinus	-	-	-	+	Ri	Be/Pl	Li	Au	LC	-
Pseudorasbora parva	-	-	-	+	Eu	Po	Eu	Al	-	-
Rhodeus amarus	+	-	-	+	Lim	Po	Os	Au	LC	EU
Romanogobio kessleri	+	-	-	+	Re-a	Be	Li	Au	EN	EU
Romanogobio vladykovi	-	-	-	+	Re-a	Be	Ps	Au	NT	EU
Rutilus rutilus	+	-	-	-	Eu	Po	PL	Au	LC	-
Sabanejewia balcanica	+	+	-	+	Re-a	Be	Ph	Au	NT	EU
Salmo trutta m. *fario*	-	+	+	+	Ri	Be/Pi	Li	Au	LC	-
Sander lucioperca	-	-	-	+	Re-b	Be/Pi	Ph	Au	LC	-
Scardinius erythrophtalmus	-	+	-	-	Lim	M	Ph	Au	LC	-
Squalius cephalus	+	+	-	+	Eu	Po	Li	Au	LC	-
Thymallus thymallus	-	+	-	-	Ri	Be	Li	Au	LC	-
Zingel streber	-	-	-	+	Re-a	Be	Li	Au	VU	EU
Number of species	19	10	3	22						

In terms of the species origin, two species, Giebel carp (*Carassius gibelio*) and topmouth gudgeon (*Pseudorasbora parva*) are non-native, also considered as invasive species in Slovak basins (Kováč et al. 2007, Koščo et al. 2010). The origin of brown trout (*Salmo trutta*) is questionable, due to possibility of its hybridization with stocked Atlantic lineages (Weiss

et al. 2001). According to previous studies (Kohút & Pilková 2000, Zontág 2006), and as also has been suggested by our records, the occurrence of salmonids is reported within the trout and grayling zones of the Rimava River, upstream the village Čerenčany (*Table 3.*). In our samplings, bitterling (*Rhodeus amarus*), spirlin (*Alburnoides bipunctatus*) and chub (*Squalius cephalus*) were eudomintant species (>10%), followed by barbel (*Barbus barbus*), stone loach (*Barbatula barbatula*) and gudgeon (*Gobio gobio*), that can be considered as dominant (>5%). Subdominant position (>2%) reached the Carpathian barbel (*Barbus carpathicus*), Danubian spined loach (*Cobitis elongatoides*) and white-finned gudgeon (*Romanogobio vladykovi*). The rest of species reached less than 2% of their relative abundance (*Table 3*).

Table 3. Relative abundance of fish species and diversity (H´) by individual sampling sites during our survey (Abbreviations according to Table 1)
3. táblázat. Az egyes mintaterületeken talált halfajok relatív abundanciája és diverzitása (H´) (Rövidíttések 1. táblázat szerint)

Species	Rm	Ri1	Mp1	Dp	Mp2	Go1	Go2	Go3	Go4	Go5	Ri2	Ri3	Go6	Ba
Alburnoides bipunctatus	12,5	74,6	-	-	-	-	-	-	-	-	19,9	32,4	-	-
Alburnus alburnus	-	-	-	-	-	-	-	-	0,5	-	3,7	-	-	-
Barbatula barbatula	-	3	11,1	-	-	-	93,3	81,8	13	-	18	1	8	-
Barbus barbus	-	-	-	-	-	-	-	-	-	-	3,1	18,6	-	-
Barbus carpathicus	-	13,4	-	-	-	-	-	-	1	-	2,5	8,8	1,1	-
Carassius gibelio	-	-	-	-	-	-	-	-	-	-	-	-	1,1	-
Cobitis elongatoides	-	1,5	66,7	-	50	-	6,7	-	4,8	-	-	0,5	19,5	-
Gobio gobio	-	-	-	-	-	-	-	-	11,5	20	1,9	5,4	11,5	10,7
Chondrostoma nasus	-	-	-	-	-	-	-	-	-	-	-	3,4	-	-
Leuciscus leuciscus	-	-	-	-	-	-	-	-	1	-	-	1,5	1,1	-
Misgurnus fossilis	-	-	11,1	-	-	-	-	-	-	-	-	-	-	-
Perca fluviatilis	-	-	-	100	50	-	-	18,2	-	-	-	-	-	-
Phoxinus phoxinus	25	-	-	-	-	-	-	-	-	-	-	-	-	-
Pseudorasbora parva	-	-	-	-	-	-	-	-	-	-	0,6	-	-	5,4
Rhodeus amarus	-	-	11,1	-	-	100	-	-	43,3	80	9,3	5,9	51,7	60,7
Romanogobio kessleri	-	-	-	-	-	-	-	-	-	-	-	5,4	-	-
Romanogobio vladykovi	-	-	-	-	-	-	-	-	-	-	3,1	6,4	-	-
Sabanejewia balcanica	-	-	-	-	-	-	-	-	-	-	-	0,5	-	-
Salmo trutta m. fario	62,5	1,5	-	-	-	-	-	-	-	-	-	-	-	-
Sander lucioperca	-	-	-	-	-	-	-	-	-	-	-	0,5	-	-
Squalius cephalus	-	6	-	-	-	-	-	-	25	-	37,9	8,8	5,7	23,2
Zingel streber	-	-	-	-	-	-	-	-	-	-	-	1	-	-
no. of species	3	6	4	1	2	1	2	2	8	2	10	15	8	4
no. of Individuals	8	67	9	3	6	5	15	55	208	5	161	204	87	56
diversity index H´	0,9	0,89	1	0	0,69	0	0,24	0,47	1,48	0,5	1,76	2,11	1,43	1,04
equitability	0,82	0,49	0,72	0	1	0	0,35	0,68	0,71	0,72	0,76	0,78	0,69	0,75

In terms of the frequency of occurrence, the bitterling, stone loach and the Danube spined loach have occurred to 50% sampling sites and more (*Table 3*). According to data from the second half of the last century, common nase (*Chondrostoma nasus*) and the Kessler´s gudgeon (*Romanogobio kessleri*) were reported to dominant species within the lower stretch of Rimava River (Kux & Weisz 1964). During our survey the proportion of both mentioned species was very low (*Table 3*). From species reported by previous studies (Kohút & Pilková 2000, Zontág 2006) we have not recorded the Carpathian lamprey (*Eudontomyzon danfordi*), grayling (*Thymallus thymallus*) and the Danube salmon (*Hucho hucho*). The worth mentioning is also the absence of pike (*Esox lucius*), roach (*Rutilus*

rutilus), rudd (*Scardinius erythrophtalmus*) and bream (*Abramis brama*) in our samplings (Kux & Weisz 1964, Kohút & Pilková 2000).

According to the results of cluster analysis based on the species presence/absence data (*Fig. 2*), the sampling sites may be grouped into three categories – 1) the upper stretch of Rimava River and its tributaries, falling within the trout and grayling zones (hereinafter "upper stretches"), 2) lower stretch of the river, falling within the barbel zone (hereinafter "lower stretches") and 3) lower tributaries originating in the Rimava valley and adjacent highlands (hereinafter "lower tributaries").

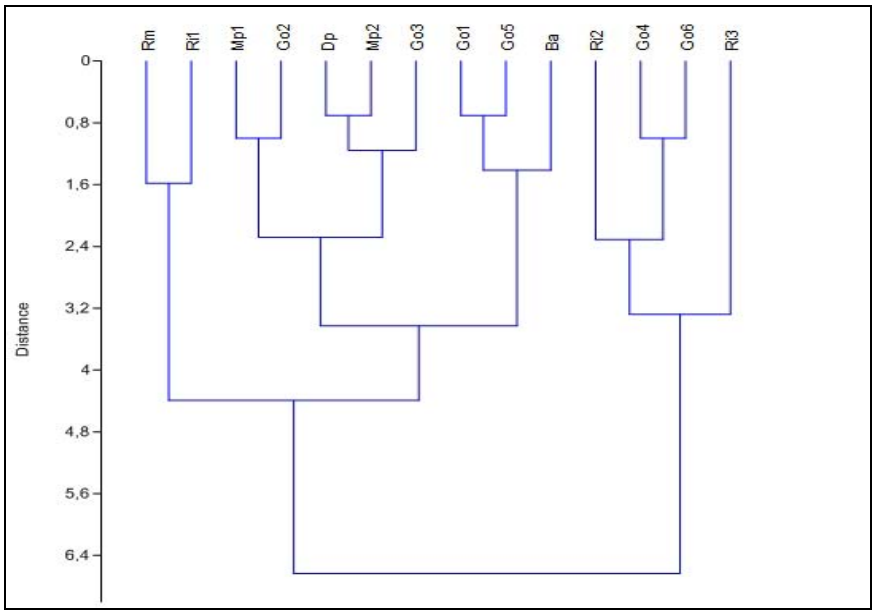

Fig. 2. Cluster analysis based on the species presence/absence data
2. ábra. Clusteranalízis a fajok előfordulása alapján

In terms of the flow preferences in upper stretches (sites 1, 2), the reophils accounted the proportion of 84% and rithral species 10,7%. Spirlin was the most abundant fish species. In terms of feeding preferences, the polyphagous group dominated in upper stretch (73,3%). In terms of reproduction the lithophils represented the major component of the fish community in upper stretch (98,7%).

In terms of flow preferences within the lower stretch of Rimava (sites 11,12), the guild of A-reophils dominated (68,77%), followed by eurytopic (23,56%) and limnophilous species (7,40%). In terms of feeding preferences the polyphagous (56,16%) and zoobenthophagous species (40%) represented the major proportion. In terms of the reproduction substrate preferences, lithophils outweigh (72,60%) the psammophils (17,26%) and ostracophils (7,40%).

In terms of flow preferences within the lower tributaries (sites 3-10,13,14) A-reophils and limnophils constituted the major proportion of the fish community. In comparison to the river itself, the proportion of eurytopic species was significantly higher in lower tributaries (>20%). In terms of feeding preferences the polyphagous and zoobenthophagous species have prevailed. In terms of the reproduction preferences, the ostracophils (39,87%) and psammophils (30,07%) represented the dominant groups.

Regarding the occurence of threatened species in the upper stretches, 100% of recorded species fall into category of *least concern*. Within the lower stretches ten species were *least concern*, four *near threatened*, one *vulnerable* and one *endangered*. In lower tributaries nine

species *least concern* and one *near threatened* were recorded. Regarding the occurence of threatened species, it can be concluded, that the most important from the conservation point of view, is the lower stretch of the Rimava River with six species listed in one of the „higher" categories of threat. Although, within the upper stretches no particularly threatened species were found during our survey, it is necessary to emphasize the occurrence of the endemic Carpathian lamprey (*Eudontomyzon danfordi*) recently confirmed by previous survey (Zontág 2006). Regarding the occurrence of protected species, situation partially follows the occurence of threatened species. Thus, the majority of protected species is concentrated within the lower stretches, where their proportion exceeded 49% based on the relative abundance data. As already has been mentioned above, the upper stretches are important given the occurence of endemic Carpathian lamprey, as well as several indigenous species (*Table 3*).

Conclusions

According to our results based on the species presence/absence data, the sampling sites within the Rimava River catchment were grouped into three categories. The upper stretch of Rimava River, seems to be important habitat for Carpathian lamprey and several species of national and European importance. The lower tributaries seems to be suitable habitats for Danubian spined loach, bitterling and sporadic occurrence of limnophilous weather loach. Altogether seven species of the European importance and one species of the national importance were recorded in the lower stretch of the Rimava River. Thus this river section seems to be the most important in terms of the occurrence of protected species, as well as the most importnat from the conservation point of view. In the future it would be important to extend the present research into upper (epirithral) and middle (metarithral) section of the Rimava River, in order to obtain more conclusive data on the potential occurrence and population status of several threatened species, such as Carpathian lamprey or bullheads (*Cottus* sp.). Thus can be concluded, that the Rimava River is still populated by valuable ichthyocoenoses, nevertheless it is also heavily affected by human interventions (regulations, barriers). Therefore it is essential to initiate the systematic restoration of the Rimava River aimed primarily at the removal of existing migration barriers or building efficient fish passages.

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