THE PREVAILING ANTHROPOGENIC EFFECTS ON CERTAIN SMALLER NORTHWESTERN ROMANIAN RIVERS

Sándor Wilhelm, Ákos Harka, Zoltán Sallai

Abstract

In the course of the research of Barcău, Crasna and Ier rivers the particular damaging effects of the anthropogenic factors were proved and the indicator role of some fish species came into limelight.

Keywords: ichthyofauna, anthropogenic effects, pollution, water draining

Introduction

The large-scaled common undertaking of the Pro Europa League from Târgu Mureş and Tisza Klub from Szolnok resulted in useful outcomes. Naturally, such a considerable task took sight at larger rivers above all and less attention was drawn to smaller rivers.

During our research we set ourselves the task of doing a detailed fish-faunistic investigation of those rivers which had been studied to a smaller extent or hadn't been studied at all. Thus, in 1997 we investigated the Barcău, in 2000 the Crasna, and in 2001 the Ier. In the course of our work we were able to notice the effects of the anthropogen interference on the fish-fauna.

Methods

Lengthwise the rivers already mentioned we used electric fishing machines and, where it was possible, pulling fine-holed nets to take samples from the places appointed in advance.

We let the identified fish back into the river. These results we compared with literature data at our disposal which mirror the earlier condition of the rivers, preceeding the anthropogenic effects, or at least, reflect the former conditions of the rivers.

Results

On the Barcău, on the reaches beneath Suplacu de Barcău, prevail the polluting effects of crude-oil products due to the activity of refineries. According to the head of the water-station in Marghita, the last greater pollution was in 1994. However, the media presents periodically news about pollution in the area and even in the Sălard area there are petroleum derivates in the silt-layer of the shores. The powerful self-purification process is prevented by the communal sewage of Marghita that flows into the river.

The rich fish stock beneath Suplacu de Barcău has been drastically reduced both in quality and quantity due to the mentioned effects (Harka et al., 1998) (1st table). At Cohani we were able to collect 8 specimens of 3 species altogether, from these 6 were the representatives of the *Pseudorasbora parva* species that presented generalistic characters; one was the chub *(Leuciscus cephalus)* and one was the schneider *(Alburnoides bipunctatus)*, that might have been carried off from the upper reaches of Suplacu de Barcău.

In the area of Marghita we collected 81 specimens of 7 species. Nevertheless the overwhelming majority were *Pseudorasbora,* while the one piece of mud loach *(Misgurnus fossilis)*, collected from an area which is not home for this species, also demonstrated eutrophication.

On the rolling country reaches from Suplacu de Barcău to Sâniob, this being the area most exposed to pollution, the disappearance or the significant damaging of the species typical to rolling country could be noticed.

We weren't able to collect sand-gudgeon *(Gobio kessleri)* although Bănărescu (1964, 1980/81) still found it. Another species that can be declared extinct is the dace *(Leuciscus leuciscus)*. We had caught the last specimen of this species in 1994 at Sâniob, but during the collection in 1997 we weren't able to find it. The stock of chub *(Leuciscus cephalus)* and bleak *(Alburnus alburnus)* has also thoroughly decreased in number, while the schneider *(Alburnoides bipunctatus)* could not be find at any extent downward Suplacu de Barcău. Of two typically rolling country species, the nose *(Chondrostoma nasus)* disappeared from the most polluted reaches, moreover, lengthwise the region we were able to find only a portion of population. The barbel *(Barbus barbus)* died out on the whole reach. The balcan spined loach *(Sabanejewia aurata)* is also represented only in the upward zone of the main polluting source, then a portion of population is met on the lowest point of the rolling-country zone, where self-purification prevails to a certain extent.

The effects of the draining of the moorland and the shaping of the river bed can be noticed on the Crasna and the Ier. On the Crasna, the moor of Ecedea was drained in the period between 1895-1898 (Újvári, 1972). Thus there were gained 37.000 ha of arable land of which Romania's share is 92.000 ha. Althrough a thorough assessment of the conditions before the draining hadn't been done, Herman (1887) published a few data about the fish fauna of the moor and the Crasna.

If we compare these data with the results of our own research (Harka, Sallai, Wilhelm, 2001), it can be proved that valuable native fish species of the area had disappeared, such as the crucian carp *(Carassius carassius)*, the tench *(Tinca tinca)*,

the mud loach *(Misgurnus fossilis)* and the mudminnow *(Umbra krameri)* that is under international protection (2nd table).

On the upper reaches of the Crasna, above Varsolt, there was built a dam and the water-pool made here provides Zalău and Şimleul Silvaniei with water. The effects of the dam on the fish fauna is illustrated in 3rd table. Allthrough we didn't study the fish-fauna of the pool, it was obvious that under the dam the fish-fauna is rather poor; the 7 species being represented by 861 specimens. Nevertheless, 800 specimens of these are represented by 2 species: the perch *(Perca fluviatilis)* and the sunfish *(Lepomis gibbosus)*, which feel themselves well in the small, slowly flowing lake, polluted with the dirt of the water filter sets. There is hardly any water in the river bed downward the barrage, so above Şimleul Silvaniei the bleak *(Alburnus alburnus)* totals half of the 261 specimens of 10 species. The communal polluting effect of Şimleul Silvaniei gives a sewer's character to the reaches of the river that flows through the town. In this manner there are only 11 species, but the common gudgeon *(Gobio gobio)*, which endures well the eutrophic waters, totals almost half of the number of specimens. The moorworld of the valley of the Ier was extinguished by 1970, thus 27.600 ha of land were reclimed in Bihor county (Sabău, 1997). The dug bed of the Ier was limited by dams so the waterflow, which was slow before the shaping of the area, speeded up substantially. The process influenced negatively the stagnophile elements, which were in overwhelming majority up to that time, but favoured the spreading or the rheophile species.

Unfortunately through assessment of the period preceeding the draining hadn't been done. All the data at our disposal results from the occasional collection made between 1968-1990 (Bănărescu et al., 1997). When comparing these data with the results of our regular collections (Wilhelm, Sallai, 2001), we can still draw interesting conclusions (4th table). In the course of our research we weren't able to find it, so we can declare extinct the crucial carp *(Carassius carassius)* and the bream *(Abramis brama)*. The wels *(Silurus glanis)* has also disappeared. However, we put it on our former species-list on the basis of past fishermen's reports. The number of specimens and the number of homes of the mudminnow *(Umbra krameri)* have also decreased substantially. It is particularly prominent that the mud loach *(Misgurnus fossilis)*, which due to the great stock before the draining gave birth to a special kind of fishing along the Ier, has decreased so much nowadays that it is threatened with extinction.

On the other hand, the number of rheophile elements has increased. The dace *(Leuciscus leuciscus)*, the asp *(Aspius aspius)* and the whitefin gudgeon *(Gobio albipinnatus)* have appeared. Moreover, we have found the sand-gudgeon *(Gobio kessleri)* and the stoneloach *(Barbatula barbatula)* on the upper reaches. Interestingly enough, after the draining we collected ruffe *(Gymnocephalus cernuus)*, but in the course of our last study we were able to find the rheophile balon-ruffe *(Gymnocephalus baloni)* instead of it.

Table 1. The ichthyofauna of the river Barcău

Crt nr.	Species	Romania											Hungary			
		under the spring	Tusa	Sub-cetate	Nuş-falău	Suplacu de Barcău	Cohani	Mar-ghita	Sân-lazăr	Sânıob	Sălard	Roşiori Bihor	Pocsaj	Berettyó-újfalu	Darvas	Szeg-halom
1	*Eudontomyzon danfordi*		1													
2	*Anguilla anguilla*															+
3	*Rutilus rutilus*								60	20	150	200	120	200	200	200
4	*Scardinius erythrophthalmus*								[1]				110	10	4	20
5	*Leuciscus leuciscus*									1						
6	*Leuciscus cephalus*		20	80	60	60	1	10	30	15	4	8	100	10		3
7	*Leuciscus idus*															1
8	*Aspius aspius*															+
9	*Leucaspius delineatus*					1										2
10	*Alburnus alburnus*			10	20	7		3	30	120	10	3	280	100	100	300
11	*Alburnoides bipunctatus*		30	300	35	250	1									
12	*Blicca bjoerkna*								4		4	1	3	20	7	10
13	*Abramis brama*															2
14	*Abramis ballerus*													1		3
15	*Abramis sapa*															?
16	*Chondrostoma nasus*				7	1			5							?
17	*Tinca tinca*												2			10
18	*Barbus barbus*				2											+

Table 1. (continued)

Crt nr.	Species	Romania											Hungary			
		under the spring	Tusa	Sub-cetate	Nuş-faläu	Suplacu de Barcău	Cohani	Mar-ghita	Sân-lazăr	Sâniob	Sălard	Roşiori Bihor	Poesaj	Berettyó-újfalu	Darvas	Szeg-halom
19	*Gobio gobio*		15	100	25	7		2	500	30	60	10	5			1
20	*Gobio albipinnatus*								2	20	200	300	10	200	100	200
21	*Pseudorasbora parva*						6	60	400	100	6	3	10	2	1	20
22	*Rhodeus sericeus*				1	2			10	60	20	15	150	1	100	800
23	*Carassius carassius*															?
24	*Carassius auratus*				1	1		2		3		1	300			40
25	*Cyprinus carpio*												1			4
26	*Barbatula barbatula*		150	100	6			3	40				2			
27	*Misgurnus fossilis*							1								70
28	*Cobitis taenia*			2	2				6	20		2	5	30	8	100
29	*Sabanaewia aurata*			25	10	30				1						
30	*Silurus glanis*															2
31	*Ictalurus nebulosus*												1		1	
32	*Ictalurus melas*								[6O]				1			3
33	*Salmo trutta fario*	30	30													
34	*Esox lucius*								2				3			4
35	*Lepomis gibbosus*								2	2			1	1	1	5
36	*Perca fluviatilis*								4	3	1	1	3	1		5

Table 1. (continued)

Crt nr.	Species	Romania											Hungary			
		under the spring	Tusa	Sub-cetate	Nuş-falău	Suplacu de Barcău	Cohani	Mar-ghita	Sân-lazăr	Săniob	Sălard	Roşiori Bihor	Pocsaj	Berettyó-újfalu	Darvas	Szeg-halom
37	*Gymnocephalus cernuus*												1			
38	*Gymnocephalus baloni*															1
39	*Stizostedion lucioperca*															1
40	*Cottus gobio*		40													
41	*Hypophthalmichthys molitrix*															+
42	*Hypophthalmichthys nobilis*															+
43	*Ctenopharyngodon idella*															+

Notes: [ ] from the tributaries
+ data from fishermen
? uncertain data

Table 2. Comparing data regarding the fish fauna of Crasna river

Crt. nr.	Species	Herman, 1887	Eced Moor	Herman, 1887	Crasna River	Bănărescu, 1964	Harka, Sallai, Wilhelm, 2001
1	*Rutilus rutilus*					+	+
2	*Rutilus pigus virgo*						!
3	*Scardinius erythrophthalmus*				+	+	+
4	*Leuciscus leuciscus*						!
5	*Leuciscus cephalus*				+	+	+
6	*Leuciscus idus*						!
7	*Aspius aspius*				+		!
8	*Alburnus alburnus*					+	+
9	*Alburnoides bipunctatus*					+	+
10	*Blicca bjoerkna*						+
11	*Abramis brama*				+		+
12	*Chondrostoma nasus*						!
13	*Tinca tinca*		+		+	+	
14	*Barbus barbus*						!
15	*Barbus petenyi*						+
16	*Gobio gobio*					+	+
17	*Gobio albipinnatus*					+	+
18	*Pseudorasbora parva*					+	+
19	*Rhodeus sericeus*					+	+
20	*Carassius carassius*		+		+		
21	*Carassius auratus*					+	+
22	*Cyprinus carpio*				+	+	
23	*Barbatula barbatula*						+
24	*Cobitis taenia*					+	+
25	*Misgurnus fossilis*		+				
26	*Silurus glanis*				+		!
27	*Ictalurus nebulosus*					[+]	+
28	*Ictalurus melas*						+
29	*Umbra krameri*		+				
30	*Esox lucius*		+		+	+	!
31	*Lota lota*				+		!
32	*Lepomis gibbosus*						+
33	*Perca fluviatilis*		+		+	+	+
34	*Gymnocephalus cernuus*					[+]	

Notes: + present
[+] maybe present
! only on Hungarian reaches

Table 3. The ichthyofauna of the Crasna

Crt nr.	Species	Romania										Hungary		
		Cizer	Horoatu Crasnei	Varsolt	Şimleul Silvaniei	Sărmăşag	Supuru de Sus	Acăs	Craidorolt	Moftinu Mare	Berveni	Vallaj	Kocsord	Vásárosnamény
1	*Rutilus rutilus*		3		4		30	30	60	90	150	30	50	25
2	*Rutilus pygus virgo*												2	
3	*Scardinius erythrophthalmus*						1		2	5	15			
4	*Leuciscus leuciscus*											2		
5	*Leuciscus cephalus*	15	100	1	35	200	100	80	70	40	6	25	20	100
6	*Leuciscus idus*											3		10
7	*Aspius aspius*											1		6
8	*Alburnus alburnus*	50	50	40	150	100	100	100	150	150	170	25	70	300
9	*Alburnoides bipunctatus*							1	10	10				1
10	*Blicca bjoerkna*						3	7	15	80	70	3	1	
11	*Abramis brama*				1		1		1	1	20			
12	*Chondrostoma nasus*													4
13	*Barbus barbus*													30
14	*Barbus petenyi*	15	60			6	1	1						
15	*Gobio gobio*	1	20		1	300	60	50	25	4	1	10		30
16	*Gobio albipinnatus*					30	10	20	40	10	1			
17	*Pseudorasbora parva*			5		2	2	2	4	10	1			
18	*Rhodeus sericeus*			5	3	6		30	100	100	300	150	900	100
19	*Carassius auratus*						12	3	40	15	60	10		15

Table 3. (continued)

Crt nr.	Species	Romania										Hungary		
		Cizer	Horoatu Crasnei	Varsolt	Şimleul Silvaniei	Sărmăşag	Supuru de Sus	Acăs	Craidorolt	Moftinu Mare	Berveni	Vallaj	Kocsord	Vásárosnamény
20	*Barbatula barbatula*	300	40		5	3		1						
21	*Cobitis taenia*		10	10	30	30	60	25	50	150	130	4	6	50
22	*Silurus glanis*													3
23	*Ictalurus nebulosus*								2		2			
24	*Ictalurus melas*						1				3			
25	*Esox lucius*												1	
26	*Lota lota*													2
27	*Lepomis gibbosus*			300	2	1			1		2			
28	*Perca fluviatilis*		6	500	30	1								

Table 4. Comparing data regarding the fish fauna of Ier river

Crt.nr.	Species	Banarescu et al., 1997	Wilhelm, Sallai, 2001
1	*Umbra krameri*	+	+
2	*Esox lucius*	+	+
3	*Rutilus rutilus*	+	+
4	*Scardinius erythrophthalmus*	+	+
5	*Leuciscus cephalus*	+	+
6	*Leuciscus leuciscus*		+
7	*Leucaspius delineatus*	+	+
8	*Aspius aspius*		+
9	*Alburnus alburnus*	+	+
10	*Blicca bjoerkna*	+	+
11	*Abramis brama*	+	
12	*Rhodeus sericeus*	+	+
13	*Gobio gobio*	+	+
14	*Gobio albipinnatus*		+
15	*Gobio kessleri*		+
16	*Pseudorasbora parva*	+	+
17	*Cyprinus carpio*	+	+
18	*Carassius carassius*	+	
19	*Carassius auratus*	+	+
20	*Tinca tinca*	+	+
21	*Barbatula barbatula*		+
22	*Misgurnus fossilis*	+	+
23	*Cobitis taenia*	+	+
24	*Silurus glanis*	+	
25	*Ictalurus nebulosus*	+	+
26	*Ictalurus melas*		+
27	*Perca fluviatilis*	+	+
28	*Gymnocephalus cernuus*	+	
29	*Gymnocephalus baloni*		+
30	*Lepomis gibbosus*		+

Conclusions

Fish, as any other organisms living in water, are more at the mercy of the effects that influence the given environmental conditions than the species living on land. Among them, there are only a few generalist species that bear a vast ecological spectrum. During our research the *Pseudorasbora parva* of allochton origin proved to suit this description first of all, and perhaps the common gudgeon *(Gobio gobio)* and the roach *(Rutilus rutilus)*. However, the overwhelming majority of fish species have specialist character, thus they are good indicators of the environmental changes that have occurred. This is all the more valid since the fish suffer not only because of the direct effect of the changes of the abiotic factors, but since the majority of them are on a higher level of the food chain, they experience the effects of the changes on the food organisms and thus also the indirect effect.

As we have seen, the water-technical interferences have a drastic effect that change the quality and quantity of the fish-fauna. So we disapprove the construction of the water pool on the reaches upward Suplacu de Barcău on the Barcău, thus changing the fish fauna of a river reaches that we found close to natural.

As far the Ier is concerned, we made the proposal plan, with necessary reasons, of the backmooring of the area. Nevertheless the competent authorities haven't done further steps since the drafting of the plan. Reducing the chemical pollution, the resettlement of the nose *(Chondrostoma nasus)*, and the barbel *(Barbus barbus)* on the rolling hills reches of the Barcău might be possible if the remaining population have drawn up successfully and survived in the branch rivers. The study of this question figures in our plans for this year, all the more since during the assessment of the fish fauna of the Bistra stream (Wilhelm, 1991) we noticed promising signs. However, it is to be feared that if the waterpool being in construction will have the same effects on the water condition of the Barcău, as the waterpool of Varsolt on the Crasna: the extinction of the remaining population instead of the resettlement of the missing population can't be left out of account.

The upset ecological balance resulting from human interference, the numerous fish populations that have grown weaker or disappeared have created the possibility of the settlement of allochtone species which have occupied the ecological niches that remained vacant. After the German carp *(Carassius auratus)*, the brown bullhead *(Ictalurus nebulosus pannonicus)* and the sunfish *(Lepomis gibbosus)* has appeared the black bullhead *(Ictalurus melas)*, that were first showed in the Ier (Wilhelm, 1998), but we have also found it in the Barcău (Harka et al., 1998) and in the Crasna (Harka, Sallai, Wilhelm, 2001). As a conclusion, the appearance of new fish species can be expected in the foreseeable future.

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SÁNDOR WILHELM
RO-3750 Săcuieni, P-ţa Libertăţii 24/7
wilhelms@rdslink.ro

ÁKOS HARKA
Kossuth Lajos Gimnázium
6350 Tiszafüred, Tántits M. u. 1, Hungary

ZOLTÁN SALLAI
Nymphaea Nature Conservation Society, Szarvas
5421 Túrkeve, P.O. Box 33
Hungary