

## INFLUENCE OCCURRENCE LAKES BICAZ AND POIANA TEIULUI ON FISH COMMUNITIES IN THE BISTRITA RIVER

*Ionuț Stoica, Klaus Werner Battes, Maria Prisecaru*

**Key words:** *fish fauna, abundance, biodiversity, Bicz lake*

### INTRODUCTION

The works of rivers have a global impact on the environment, because a certain length of the natural river changes completely. Thus instead of a river natural flow regime with a pencil and diverse aquatic fauna nature, install an artificial acavtic controlled drainage regime and aquatic fauna changed, perhaps dramatically, compared to the natural installed.

Changing river Bistrita began with the emergence of Lake Izvorul Muntelui Bicz, which was completed in the 1960. Subsequently, on the river have been furnished seven reservoirs (Pângărați, Vaduri, Bâta Doamnei, Reconstructia, Racova, Lilieci, Șerbănești), thus forming the first the hydropower system in Romania. The last building of its kind on the Bistrita River, Poiana Teiului is upstream of Lake Bicz, was opened in 2004.

The emergence of these reservoirs on river deep alter environmental conditions and thus altering the structure and function of aquatic biocenosis both the lake and the river. It appears that the affected part of the of biocenosis was fish fauna, which changed the structure due to the impossibility of achieving specific migrations with the advent of dams.

Upstream of Piatra Neamt, appearance Bicz lake and dam lakes Pângărați, Vaduri and Bâta Doamnei, caused more quantitative changes, while between Piatra Neamt and Bacau, because water pollution, the changes are more than an order quality (Battes K., 1977).

Habitats have a characteristic structure in the river bed with many boulders, gravel and sand sometimes. Only in the hilly nature of the habitat is modified by sandy and muddy facies occurrence.

### MATERIAL AND METHODS

To determine the actual composition of the fish fauna were conducted with gill-nets fished two collection points at the end of August 2001 (at the right end of the lake villages Ceahlău and Rotaru - 6 km from Bicz lake bottom in the bay of the locality Hangu). In 2005, of fish were sampled from mid-

September to end of the lake Bicz - upstream of the viaduct, and the Lake Poiana Teiului - halfway between the dam and the lake bottom (see Figure 1).

Collecting fish trammel made with mesh size 18, 20 - without nets, 40, 50 and 60 mm - with trammel nets to capture all species dimensional spectrum. Nets were left in water 12 to 18 hours during the night interfering with and their location was made perpendicular to the shore, at water depths of 5 - 10 to 15 m.

To highlight the influence that carries the two reservoirs on fish fauna reofile data were compared with those taken from Bistrita River, upstream (Stoica et al., 2013) and downstream (Stoica et al., 2003) of these lakes. In this case, the sampling was made from electrofishing without sacrificing individuals (see figure 1).

### RESULTS AND DISCUSSIONS

The purpose of this study was to determine the actual composition of the paint quality of the fish fauna, and the influences exerted on both of fish fauna reofile paint upstream and downstream of it.

Table 1 presents the fish species collected during 2001 to 2005 in Bicz lake and Poiana Teiului.

From the above data it can be seen that the seven species were collected, most of which are represented by the cyprinids at a rate of approx. 81% and the remaining 19% of perch. In general these species, except common nase, are indifferent to the dynamic nature of the environment and high valence adjustment to changed nutrient regime in the stagnant water of Lake Bicz (perch, bleak, chub, bream).

Also, common nase, species moving average distance adapted to consuming perfiton of the flowing water with rocky bottom is poorly represented in the lake (2.45%). This species prefers rivers is well represented at the bottom of the lake (26.78%) in samples from the river lowered.

The presence of perch, there was the formation of the lake and there has been no 70 years, appearing in the last 20 years with increasing frequency, even dominant, at approx. 30% by 1996 (Miron L.) to about 37% in the period 2001-2005.



The lake appeared again immediately upstream of Lake Bicaz, inaugurated in 2004, environmental conditions are slightly modified from those in the river by the fact that there is a noticeable trend throughout the lake, the water depth changes only and probably after warping and the nature of the bottom.

Collecting performed indicates a very low presence of fish in this lake Bicaz lake compared with the situation immediately upstream fish fauna. There were only collected four specimens belonging to two species. One cause may be that the whole surface of the lake there are numerous gas release whose nature we do not know (hydrogen sulfide or methane). Another explanation could be that the lake was completely evacuated in the winter 2004 - 2005, due to heavy ice.

In relation to the lake, the lake Bicaz fish fauna is richer quantitative, but made of high ecological valence species (chub, bleak, perch), some unwanted invasive species and a flowing water feature – common nase. The situation of this species is uncertain because it is a species that migrate upstream (average distance potamodrom species) will be affected by the presence dam Lake Poiana Teiului. It must be ensured during April-May (when species reproduce) if she can pass this hurdle, the fish ladder at the dam at landscaped Poiana Teiului.

These species potamodrom - medium distance migratory, breeding would perform migration only Lake Poiana Teiului, where this lake on sedentary populations represented numerically.

On reproductive migrations from Lake Bicaz, Bistrita river upstream, pending Lake Poiana Teiului this phenomenon has been observed since the early 1974 to 1976.

Stable populations of migratory lake Bicaz short (bleak, gudgeon common - species potamodrom short) had massive populations upstream of the lake to the bridge at Zahorna (5-10 km upstream of the lake), but specimens found to Zugreni will be less affected than species potamodrom medium distance (common nase, barbell) whose populations have climbed far above the Bistrita (Lesul Ursului massive populations and breeding Zugreni disparate specimens to Vatra Dornei and Iacobeni). For them, the transition to the new dam at Poiana Teiului will be greatly hampered (if not stopped). Also huchen and brown trout (lake) in Lake Bicaz, reproductive migration will be prevented. Have tested the effectiveness of the new fish ladders to climb upstream (which is problematic) and created a new path of migration for these species in revegetation (meander channel realization, the great length between the upstream and downstream of Lake Poiana Teiului without cascades, which can be climbed without the great efforts of migratory species. Otherwise, these stable populations will suffer Bicaz lake by preventing natural reproduction Bistrita river upstream.

To observe the changes in the structure of fish communities caused by the emergence of two accumulations, in Table 2 the absolute abundance of two collection points on the Bistrita River, one upstream from Lake Poiana Teiului (1 - Bistrita - Galu) and other downstream of Lake Bicaz (2 - Bistrita - Bicaz City) (see Table 2). The emergence of these accumulations influenced ihtiocenozelor structure of Bistrita River, both upstream and downstream of them.

Table 2. Absolute abundance collection points Bistrita River, upstream of Lake Poiana Teiului (Stoica et al. 2013) and downstream of Lake Bicaz (Stoica et al. 2003)

No	Species		Sampling sites			
	Scientific name	Common name	1. Bistrita – Galu		2. Bistrita – Bicaz City	
			No	%	No	%
1.	<i>Barbus petenyi</i> Heckel, 1852	Mediterranean barbel	104	39,8	3	2,41
2.	<i>Squalius cephalus</i> (Linnaeus, 1758)	Chub	69	26,4	28	22,5
3.	<i>Orthrias brabatus</i> Linnaeus, 1758	Stone loach	38	14,5	5	4,03
4.	<i>Phoxinus phoxinus</i> Linnaeus, 1758	Eurasian minnow	34	13,0	53	42,7
5.	<i>Eudontomyzon danfordi</i> Regan, 1911	Carpathian lamprey	5	1,91	-	-
6.	<i>Gobio obtusirostris</i> Valenciennes, 1844	Common gudgeon	3	1,14	25	20,2
7.	<i>Cobitis danubialis</i> Băcescu, 1993	Spined loach	3	1,14	-	-
8.	<i>Cottus poecilopus</i> Heckel, 1836	Alpine bullhead	2	0,76	-	-
9.	<i>Perca fluviatilis</i> , Linnaeus, 1758	European perch	2	0,76	-	-
10.	<i>Chondrostoma nasus</i> Linnaeus, 1758	Common nase	1	0,38	-	-
11.	<i>Salmo fario</i> Linnaeus, 1758	Brown trout	-	-	7	5,64
12.	<i>Alburnoides bipunctatus</i> Bloch, 1782	Schneider	-	-	1	0,8
13.	<i>Rhodeus amarus</i> (Bloch, 1782)	Bitterling	-	-	9	7,25
Total			261	100%	124	100%
No species			10		8	

Upstream of Lake Poiana Teiului at the point of collection 1 - Bistrita - Galu, fishing communities have undergone a number of changes from the situation existing before human impact after 1960. There were identified 10 species, some typical rivers (mediterranean barbel, stone loach, minnow, alpine bullhead, common nase) and species characteristic of standing water (perch, bitterling) who stepped in lake. Here moioaga dominant, species typical flowing water, which outlines a real fishery zone to Vatra Dornei. It replaced the former common nase zone of the section Broșteni - Bicaz lake, common nase was identified only in a single specimens. In addition they were identified and species resistant to various environmental conditions (chub and common gudgeon), who adapted very well to the new conditions.

Downstream of Lake Bicaz, the collection point 2 - Bistrita - Bicaz city, the number of species identified is reduced to 8. In this case the situation is

not so good because there dominating species resistant to various environmental conditions (chub and common gudgeon) and common nase formerly a real form fishery zone and barbel has not been identified in our collections. Formerly important species are poorly represented (mediterranean barbel, schneider), with typical species occurring reofile (browun trout, loach, minnow) lowered the tributary Bicaz and species typical of water bodies (bitterling) who arrived in the reservoirs. Downstream of the two lakes, fish fauna of the river Bistrita changed much deeper due to strong fragmentation of the river course by the appearance of four lakes in the mountainous area downstream from Bicaz Lake and Bicaz city due to strong populații and surrounding localities.

In Table 3 are presented indexes ecological calculated in each of the two collection points.

Table 3. Ecological indices calculated on collection points Bistrita River, upstream of Lake Poiana Teiului (Stoica et al. 2013) and downstream of Lake Bicaz (Stoica et al. 2003)

No	Sampling sites	The numeric stock (specimens /100 m <sup>2</sup> )	The gravimetric stock (g./100 m <sup>2</sup> )	Biodiversity index (H')		IBI	
				No species	Value	Index value	Classes of integrity
1.	Bistrița – Galu	54,4	80	10	1,441	61	I
2.	Bistrița – oraș Bicaz	64,1	1072	8	1,633	57	I

Although the stock numeric (specimens / 100 m<sup>2</sup>) recorded a higher value downstream of the two lakes (64 specimens/100 m<sup>2</sup>), the situation is not good because species with large numbers of individuals are of the higher valence regime food and environmental conditions. Stock gravimetric also recorded a much higher collection point downstream of the two lakes, although the number of species is reduced and the number of individuals within each species captured is much lower. This high value is due to large individuals, especially in the category of species with large valences on food and environmental conditions.

Biodiversity index calculated at these two values are quite high (1.4-1.6), which suggests the presence of a balanced fish community. It has a slightly lower value in point 1 - Bistrita - Galu, although the number of species is higher (10).

Index of Biological Integrity (IBI) calculated in the two points indicates a very good value (I), but regarding points accumulated in point 1 - Bistrita - Galu, community fishery is much closer than the one existing.

## CONCLUSIONS

The two reservoirs were collected seven species, most of which are represented by the cyprinids at a rate of approx. 81% and the remaining 19% of percide. In general these species, except common nase are indifferent to the dynamic nature of the environment (euritope) and high valence to adapt to a changed nutrient regime in the lake Bicaz slow (perch, bleak, chub, bream).

Also, common nase, medium-distance migratory species adapted to consuming perfiton rocky bottom lotic environment is poorly represented in the lake (2.45%). This species prefers rivers is well represented at the bottom of the lake (26.78%) in samples from the river lowered.

The presence of perch, there was the formation of the lake and there has been no 70 years, appearing in the last 20 years with increasing frequency, even dominant, at approx. 30% by 1996 (Miron L) to about. 37% in the period 2001-2005.

The Lake Poiana Teiului collection show done very little presence of fish compared to Lake Bicaz and fish fauna situation immediately upstream. Four specimens were collected belonging to the two

species. One cause may be that the whole surface of the lake there are numerous gas release on the bottom

To observe the influences caused by the emergence of two accumulations samples were analyzed from two points of collection Bistrita River, one upstream from Lake Poiana Teiului (Bistrita - Galu) and the other downstream of Lake Bicaz (Bistrita - Bicaz City). Upstream of the two lakes specific diversity is high, this species dominates typical rivers and low temperatures. Although IBI is very good value (I) zoning fish river course upstream of the two lakes has changed mediterranean barbel area, replacing the former area of the common nase.

Downstream of the two lakes, although ecological indexes calculated values are much better compared to the situation upstream, here are the dominant species resistant to high valences (chub, common gudgeon), which replaced the old area of the nase. This is due to strong fragmentation of stream flow and water pollution by Bicaz and settlements in the area.

### ABSTRACT

To highlight the changes in the structure of fish communities through the advent of Bicaz lakes and Poiana Teiului samples were taken both from the two lakes, using trammel and the upstream river areas (Bistrita - Galu) and downstream (Bistrita - City Bicaz) them.

The two lakes were identified higher valences species to environmental conditions and food (perch, bleak, chub) except nase identified Bicaz lake, which with the advent dam at Poiana Teiului, probably will not be able to migrate on the river, leading to the reduction and disappearance of the numbers of the lake.

By sampling upstream and downstream, by calculating some ecological indices in the two collection points is apparent influence they have two lakes on the fish fauna of the river. Fish community structure is slightly modified in the upstream of the two lakes. Downstream river course due to strong fragmentation and water pollution, fish community structure is changed by the dominance resistant species with broad valences.

This is less evident in the calculated IBI as there are a number of species typical of the river, they got off the Bistrita river right tributary of Bicaz.

### REFERENCES

1. BATTES, K.W., 1999 - Influence of the hydrotechnical development and of Bistrita river s pollution on the natura fish population, *Studii și Cercetări, Biologie*, 4, Universitatea Bacău, 283-294;
2. BĂNĂRESCU P., 1964 – Fauna R.P.R., Pisces-Osteichthyes, XIII, Ed. Acad., București;
3. FROESE, R., PAULY, D. (eds.), 2014, FishBase, World Wide Web electronic publication, [www.fishbase.org](http://www.fishbase.org), version (02/2014);
4. NALBANT Th., 2003 – Checklist of the fishes of Romania. Part one: Freshwater and brackishwater, în *Studii și Cercetări, Biologie*, 8, Universitatea din Bacău, p.122-127;
5. STOICA I., PRICOPE F., BATTES K.W., URECHE D., 2003 – Modificările structurale ale asociațiilor piscicole din bazinul amenajat hidrotehnic al râului Bistrița, *Analele Univ. Oradea, Fasc. Biologie*, T X, 9-22p;
6. STOICA I., 2009 - Starea actuală a ihtiofaunei din bazinul hidrografic al Râului Bistrița, teză de doctorat, Universitatea „Al.I. Cuza” Iași, Departamentul de Biologie, Iași, 182p.;
7. STOICA, I., BATTES, K.W., PRICOPE, F., PRISECARU, M., 2013 - Research on the status of the fish communities of the upper course of Bistrita River, în *Studii și Cercetări, Seria Biologie Animală*, Universitatea „Vasile Alecsandri” din Bacău, Editura Alma Mater Bacău, ISSN 1224 919 X, 22 / 2, p. 66-73.

### AUTHOR'S ADDRESS

STOICA IONUȚ, BATTES KLAUS WERNER, PRISECARU MARIA - „Vasile Alecsandri” University of Bacau, Faculty of Science, Department of Biology, Marasesti Street, 157, Romania, e-mail: [ionut\\_stoica23@yahoo.com](mailto:ionut_stoica23@yahoo.com); [klaus\\_battes@yahoo.com](mailto:klaus_battes@yahoo.com); [prisecaru\\_maria@yahoo.com](mailto:prisecaru_maria@yahoo.com);