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RESEARCH ON THE CURRENT STRUCTURE OF THE ICHTHYOFAUNA OF THE RIVER VÂLSAN

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Key words: *Romanichthys valsanicola, Vâlsan River, sculpin perch*

INTRODUCTION

In the Romanian geographical area, Arges River Basin distinguishes by its origin from the most imposing mountain range Făgăraş, and its picturesque landscapes, followed by a wide variety of landforms, from the high peaks of the mountains to the Romanian Plain where it joins the Danube.

Arges River, with its tributaries, is one of the major river systems of the country in terms of hydropower potential and water supply for villages and towns, industrial systems and agricultural land.

The special interest in Vâsan River, a tributary of Arges river (fig. 1), is due to the presence of *Romanichthys valsanicola* species (sculpin perch), fish fauna endemic of Romania and the Danube basin, which appears on the Red List of I.U.C.N-resolution D-46 of EC, the category "Critically Endangered." It was originally present in Argeş, Vâlsan and perhaps Doamnei Rivers, but its area was highly restricted, being currently represented in a small sector of Vâlsan River (International Union for Conservation of Nature and Natural Resources).

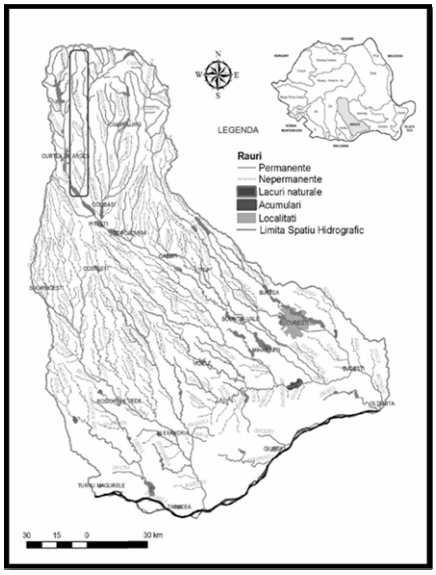

Fig. 1 The location of the river basin Vâlsan

Its status both as species and endemic type with extremely limited spread drew attention to the scientific community worldwide. The species is interesting particularly in terms of phylogenetics, and common features with European genres as well as other North -American genres from Percidae family.

The discovery of the *sculpin perch* triggered a series of investigations to clarify the interrelationship between family genres. It is said to be the phylogeny key to Percidae family (Bănărescu, Vasiliu – Oromulu, 2004).

It is now considered the most endangered species of fish fauna in Europe due to its limited habitat (over a length of about 5 km on Vâlsan River) and the very small number of samples.

In the past, Vâlsan River used to provide some peculiarities of the biotope that allowed the presence, development, evolution and, not least, the survival of species in this mountain river.

Early research on Vâlsan River was closely linked to the history of the *sculpin perch*. Until its discovery there were only few data on fish fauna in Arges river basin including Vâlsan, published in various works.

Therefore, one should mention Gregory Antipa's work *Fish Fauna of Romania* (1909) which shows the first indication of *sculpin perch* in the river basin: *Cottus gobio* in the upper course of Dâmboviţa, Doamnei River, Târgului River, the upper course of Argeş and Vâlsan, and *Lota lota*, *Silurus glanis* and *Leuciscus cephalus* in Argeş, without mentioning the precise place.

There should also be added a series of papers published between 1943 – 1960 by M. Băcescu, G.D. Vasilescu, G. Sova, S. Cărăuşu and P. Bănărescu which make reference to a series of fish species in Arges River, without mentioning their presence in Vâlsan River.

In 1956, following a study of fish fauna in Vâlsan River for his undergraduate work, N. Stoica, a student at the University of Bucharest, collected four samples of fish in Galeş village which he could not determine, therefore asked his scientific coordinator, Mrs. Margareta Dumitrescu for some help.

Based on these samples and the fifth one collected by P. Bănărescu in the same village in 1957, it is described a new type *Romanichthys* with

one species - *Romanichthys valsanicola* (Dumitrescu, Bănărescu, Stoica). After thorough studies on fish fauna in the upper basin of Arges and Topolog River, a tributary of Olt River, it is noticed *Romanichthys valsanicola* species in Arges, known to locals as the the *freshwater fish* (sculpin perch) for the other tributaries of Arges - Bratia, Târgului River, Argeşel and Dâmbovița – as well as Topolog, the species being totally unknown to locals.

Between 1958-1967, P. Bănărescu, initially alone, then supported by T. Oprescu and Gh. Stănescu, did some research on Arges and Vâlsan to establish the species habitat. As the construction of the two dams - Vidraru in Arges and Vâlsan Basin led to major changes in the biotope and fish fauna, the species disappeared completely in Arges River and was drastically reduced in Vâlsan.

In 1971 Gh. Stănescu published an article in which he concluded that the species had disappeared both in Arges and Vâlsan, finding later that the species had survived in Vâlsan.

After 1977, Gh. Stănescu, P. Bănărescu and A. Georgescu took a series of actions to save the species.

In 1997, Gâldean, Nalbant and Dragomirescu published a work in which they revealed that the freshwater fish (sculpin perch) feeds exclusively on benthic invertebrates, with a share of 54.4% *Rhithrogena semicolorata* larvae (Insecta, Ephemeroptera), 13.2% Ephemeroptera larvae, 10.9% plecoptera larvae, 6.5% trichoptera larvae, 9.5% blephariceridae, 4.7% chinoromidae larvae. Data were obtained by the stomach contents of specimens sampled during 1959-1962.

The most comprehensive study on Vâlsan River was conducted between 1999 - 2003 within the Project **LIFE NAT- 99/RO 006429 SURVIVAL OF *ROMANICHTHYS VALSANICOLA*** at the Biology Institute of the Romanian Academy, coordinated by Acad. P. Bănărescu and funded by the European Union. The study was complex from all aspects – biotope and biocenosis – with an overall objective to restore the ecosystem of Vâlsan Valley and to establish an action plan and a monitoring system for the survival of the most threatened fish species in Europe - *Romanichthys valsanicola*.

The study was followed by several scientific articles that capitalized results regarding the current state of fish fauna on Vâlsan River, the area of *sculpin perch*, estimation of population, assessing human impact on the basin, and data on the structure of benthic zoocenosis.

In the past 10 years there have been a number of studies that resulted in the publication of articles, the most important being:

2007 - D. Ureche, K. W. Battes and I. Stoica - ***The current state of fish fauna in the upper and middle course of Arges River.*** The research was conducted in 2006 and followed the current state of fish fauna in the upper and middle course of Arges River. The material was collected from 33 collection points, including Vâlsan River. There were identified 19 species of fish (3 acclimatized). Different ecological indexes were used to assess the state of fish fauna. The basin under research was confined based on its biological integrity index in order to determine the quality of the aquatic ecosystem. It is worthy of note that no *sculpin perch* was caught.

2009 - A. Ionaşcu and N. Crăciun - ***Use of telemetry in the conservation of the endangered fish species: Romanichthys valsanicola Dumitrescu, Bănărescu & Stoica, 1957 (Pisces: Actinopterygii: Perciformes: Percidae)*** – the study describes the behaviour of 10 samples of *sculpin perch* (*Romanichthys valsanicola*, Dumitrescu, Bănărescu & Stoica, 1957) implanted with radio transmitters. They were followed in Vâlsan River from autumn 2004 to summer 2005, as the first study of *sculpin perch* in its natural environment.

Efforts to track fish movements focused on estimating the vital area of *sculpin perch*. There was obtained basic information on fish movements and habitat use during 24-hour cycles. This information provided distances, travel times and the movement rate between successive locations. Certain data also showed fish fidelity for a specific site.

The analysis of movements suggests that *sculpin perch* spends most of its time motionless or it moves in width from one shelter to another. From time to time the fish moves downstream to another area. The pattern of movements and the activity of fish suggest an alternating behaviour with extended shifts in 24 hours, both day and night.

2011 - I. Telcean, Cicort - Lucaciu, Sas and Covaciu - Marcov - ***"Romanichthys valsanicola is still fighting! How can we help?"***- besides presenting *sculpin perch's* "odyssey" and a comprehensive analysis of the causes leading to the decline of species, the study indicates catching a sample of *Romanichthys* in 2011, which shows that the species would survive despite human pressure. The authors propose a series of measures to save it.

Based on these considerations, the paper presents data on the structure of fish fauna in Vâlsan River during 2014 - 2015, the distribution of species along the river and a comparative analysis of current data with the specialized studies.

A particular interest is given to establishing the current habitat of ***Rhomanichthys valsanicola*** species.

MATERIALS AND METHODS

To characterize fish fauna in Vâlsan River during 2014 - 2015, there were three fishing periods in November 2014, March and May 2015. 16 fishing stations were established (Table 1) in the inflow sector of Poieni Vâlsan (Fig. 2).

Extraction of biological material was made by an electric fishing device EL 64 GI HONDA GX

390, consisting of Honda GX 390 motor, generator, control box, gripping rod to anode cable, copper strip to anode, switch, 100m cable, Totmann socket. The device is approved and complies with the European legislation.

Classic fishing nets were used behing the camera operator handling the electric fishing device in order to ensure total catch of fish in the respective areas.

Table 1. Areas of scientific inquiry/fishing stations

Crt No.	Sample	GPS coordinates		Date	Locațions
		N	E		
1.	SP1	45°19'80"	24°45'43"	26.11.2014	Bariera Brădetu
2.	SP2	45°19'13"	24°45'18"	26.11.2014	Uzina de apă
3.	SP3	45°18'52"	24°45'46"	26.11.2014	Pod Brădetu
4.	SP4	45°16'23"	24°46'50"	29.11.2014	Galeş
5.	SP5	45°16'55"	24°46'54"	29.11.2014	Brăduleț
6.	SP6	45°18'38"	24°45'49"	29.11.2014	Brădetu
7.	SP7	45°18'46"	24°45'44"	27.03.2015	Sanatoriu Brădetu
8.	SP8	45°19'28"	24°44'55"	27.03.2015	Intrare Chei Vâlsan
9.	SP9	45°21'70"	24°43'53"	27.03.2015	Chei Vâlsan 1
10.	SP10	45°21'44"	24°43'25"	27.03.2015	Chei Vâlsan 2
11.	SP11	45°18'52"	24°45'36"	08.05.2015	Brădet
12.	SP12	45°15'59"	24°46'44"	08.05.2015	Pod Galeş
13.	SP13	45°59'00"	24°45'16"	09.05.2015	Mălureni
14.	SP14	45°11'01"	24°46'32"	09.05.2015	Zărnești
15.	SP15	45°04'44"	24°47'28"	09.05.2015	Mineşti
16.	SP16	45°10'01"	24°47'15"	09.05.2015	Vâlsăneşti

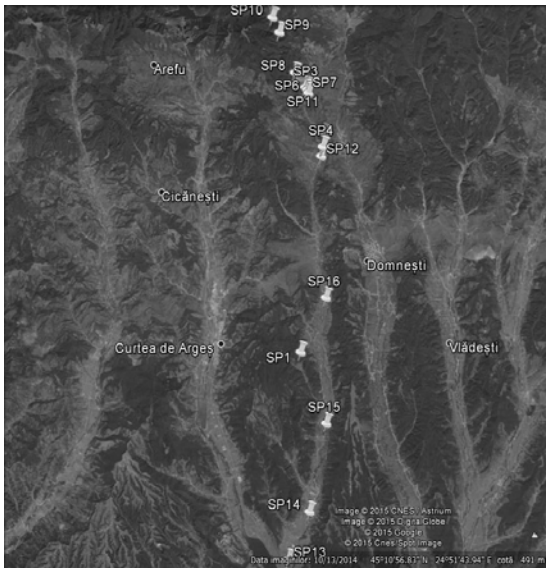

Fig. 2. Location of sampling stations

The surface for the extraction of biological material/fishing station was determined on 100m upstream and 100m downstream from the location of the electric generator. Considering an average bed width of 4 m, we obtain an average size of 200 x 4 = 800 m / station. Fish populations are reported per unit area - 100 samples /sqm in order to determine their cenosis. Inquiry of fish cenosis consisted in:

- extracting biological material by electric fishing device;
- identification / determination of species sampled;
- somatic measurements;
- release of biological material in the natural environment;
- characterization of fishing station.

Somatic measurements on species / individual comprise:

- total length of the body (L) - the distance between the mouth and the caudal fin. The average length of the samples was calculated by the formula

$$\frac{\sum_{i=1}^{n} Li}{n}$$

I – number of individuals
N- total number of individuals in a species / station
Li - total length of the individual.

RESULTS AND DISCUSSIONS

There were caught 1224 samples, with the following species: *Barbus meridionalis, Cottus gobio, Gobio uranoscopus, Phoxinus phoxinus, Romanichthys valsanicola* (Fig. 3)*, Sabanejewia aurata, Salmo trutta fario, Squalius cephalus (Leuciscus cephalus).*

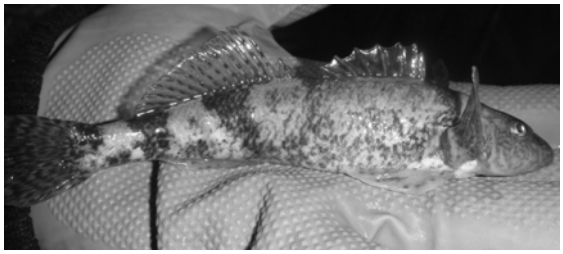

Fig. 3 *Romanichthys valsanicola* captured in November 2014

Station distribution and average value of samples for each species is shown in Table 2.

There were identified 8 species belonging to 4 orders - *Salmoniformes* (1 species), *Cypriniformes* (5 species), *Scorpeniformes* (1 species), *Perciformes* (1 species) - 5 families - Salmoniformae (1 species), *Cypriniformae* (4 species), *Cottidae* (1 species), *Percidae* (1 species).

Tabel 2. The ichtyofauna of the River Valsan - species, location, measuring somatic

Crt. No.	Sample	Specie	No. individuals	Average length (cm)
1.	SP1	*Barbus meridionalis*	2	9.35
2.	SP1	*Barbus meridionalis*	2	12.85
3.	SP1	*Barbus meridionalis*	5	14.72
4.	SP1	*Barbus meridionalis*	6	9.83
5.	SP1	*Cottus gobio*	1	11.70
6.	SP1	*Phoxinus phoxinus*	11	6.50

7.	SP2	*Barbus meridionalis*	1	8.10
8.	SP2	*Barbus meridionalis*	4	11.78
9.	SP2	*Cottus gobio*	1	7.20
10.	SP2	*Cottus gobio*	2	7.83
11.	SP2	*Cottus gobio*	2	6.80
12.	SP2	*Phoxinus phoxinus*	1	4.25
13.	SP3	*Barbus meridionalis*	1	13.80
14.	SP3	*Phoxinus phoxinus*	4	6.50
15.	SP3	*Phoxinus phoxinus*	7	6.10
16.	SP4 -100	*Squalius cephalus*	17	9.91
17.	SP4+100	*Barbus meridionalis*	120	13.45
18.	SP4+100	*Sabanejewia aurata*	7	8.35
19.	SP4-100	*Barbus meridionalis*	23	10.36
20.	SP4-100	*Phoxinus phoxinus*	2	7.05
21.	SP4-100	*Sabanejewia aurata*	9	8.66
22.	SP5+100	*Barbus meridionalis*	78	15.15
23.	SP5+100	*Phoxinus phoxinus*	6	6.54
24.	SP5+100	*Sabanejewia aurata*	9	9.03
25.	SP5+100	*Squalius cephalus*	77	10.2
26.	SP5-100	*Barbus meridionalis*	4	7.9
27.	SP5-100	*Phoxinus phoxinus*	19	6.85
28.	SP5-100	*Sabanejewia aurata*	7	9.03
29.	SP5-100	*Squalius cephalus*	57	12.2
30.	SP6	*Barbus meridionalis*	18	11.37
31.	SP6	*Cottus gobio*	3	11.32
32.	SP6	*Phoxinus phoxinus*	4	7.05
33.	SP6	*Romanichtys valsanicola*	1	13.30
34.	SP6	*Squalius cephalus*	1	18.5
35.	SP7 - 100	*Barbus meridionalis*	5	12.25
36.	SP7 - 100	*Phoxinus phoxinus*	7	7.45
37.	SP7 - 100	*Sabanejewia aurata*	1	9.80
38.	SP7 - 100	*Squalius cephalus*	4	13.05
39.	SP7 – 100	*Cottus gobio*	1	12.07
40	SP7 + 100	*Barbus meridionalis*	7	11.70
.41.	SP8 - 100	*Barbus meridionalis*	7	12.71
42.	SP8 + 100	*Barbus meridionalis*	5	14.96
43.	SP9 – 100	*Barbus meridionalis*	13	13.21
44.	SP9 + 100	*Barbus meridionalis*	22	14.81
45.	SP9 + 100	*Salmo trutta fario*	1	10.20
46.	SP10	*Salmo trutta fario*	1	10.93
47.	SP 10	*Barbus meridionalis*	3	11.54
48.	SP11+100	*Barbus meridionalis*	21	12.46
49.	SP11+100	*Cottus gobio*	2	10.45
50.	SP11+100	*Sabanejewia aurata*	11	8.70
51.	SP11-100	*Squalius cephalus*	1	13.05
52.	SP12+100	*Barbus meridionalis*	13	9.96
53.	SP12-100	*Barbus meridionalis*	20	9.82
54.	SP12-100	*Squalius cephalus*	3	8.50
55.	SP13+100	*Barbus meridionalis*	10	9.33
56.	SP13+100	*Sabanejewia aurata*	23	8.30
57.	SP13+100	*Squalius cephalus*	36	11.76
58.	SP13-100	*Barbus meridionalis*	9	7.34
59.	SP13-100	*Sabanejewia aurata*	9	6.97
60.	SP13-100	*Squalius cephalus*	8	9.23
61.	SP14+100	*Barbus meridionalis*	32	9.06
62.	SP14+100	*Sabanejewia aurata*	3	8.10
63.	SP14+100	*Squalius cephalus*	2	11.85
64.	SP14-100	*Barbus meridionalis*	21	9.82
65.	SP14-100	*Sabanejewia aurata*	11	9.30
66.	SP14-100	*Squalius cephalus*	28	13.27
67.	SP15+100	*Barbus meridionalis*	36	10.00
68.	SP15+100	*Gobio uranoscopus*	1	8.70
69.	SP15+100	*Squalius cephalus*	58	12.97
70.	SP15-100	*Barbus meridionalis*	39	10.67
71.	SP15-100	*Gobio uranoscopus*	1	11.40
72.	SP15-100	*Sabanejewia aurata*	11	9.57
73.	SP15-100	*Squalius cephalus*	58	11.89
74.	SP16±100	*Barbus meridionalis*	99	11.28
75.	SP16±100	*Phoxinus phoxinus*	7	6.00
76.	SP16±100	*Squalius cephalus*	50	13.50
The total number of individuals			1224	

Data show that the largest number of individuals caught (Fig. 4) belongs to *Barbus meridionalis* (620 individuals), followed by *Squalius cephalus* (400 individuals). Species with the lowest number of individuals were *Salmo trutta fario* (2 individuals) and *Romanichthys valsanicola* (1 individual).

The overall share of families (Fig. 5) shows that *Cyprinidae* prevail (91%), followed by *Cobitidae* 8%, *Cottidae* 1%, *Percidae* one sample, *Salmonidae* 2 samples.

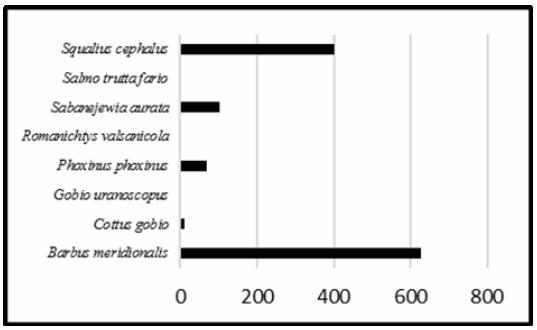

Fig. 4. Species identified and total number of individuals for each species

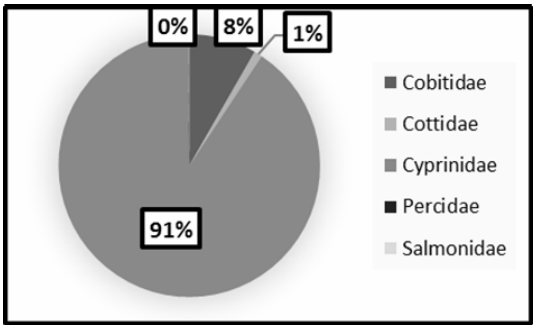

Fig. 5. General share of families

The share of families in different sectors of the river (Fig. 6 - 9) shows the following:

Downstream Muşeteşti sector there were identified samples belonging to Cyprinidae (Vâlsăneşti 100%, Zărneşti 86%) and Cobitidae (Vâlsăneşti 0%, Zărneşti 14%)

In Muşeteşti-Brădetu sector the situation is similar to the downstream region – Cyprinidae 100% (Galeş Bridge) and 91% to Galeş, along with Cobitidae;

Brădet Sanatorium, the dairy factory sector recorded the highest diversity of families, 4 out of 5 families being identified, excepting Salmonidae. The only sample of *Romanichthys valsanicola* was also caught here.

Bariera-Water plant sector is represented by Cyprinidae 96% and Cottidae 55%. Vâlsan gorge is dominated by Cyprinidae 100%, and Salmonidae 5%.

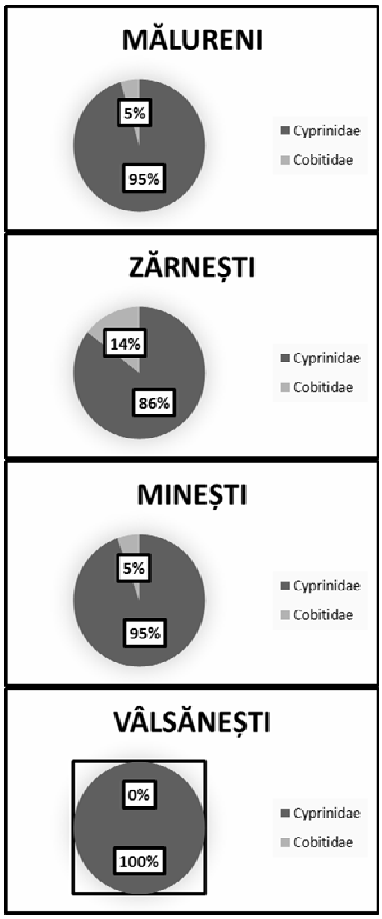

Fig.6. Family share in the sector Muşeteşti - River mouth

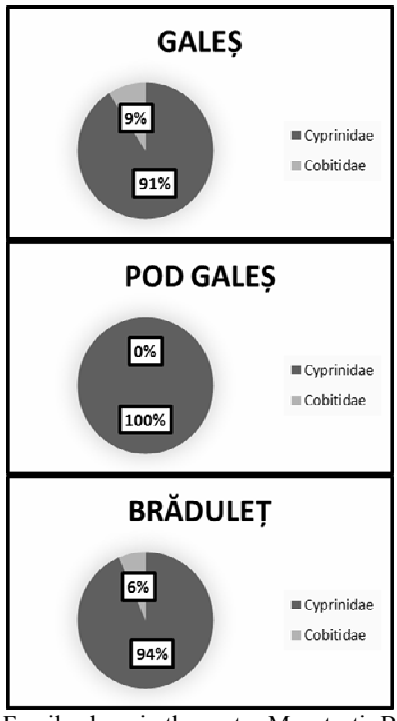

Fig. 7. Family share in the sector Muşeteşti -Brăduleț

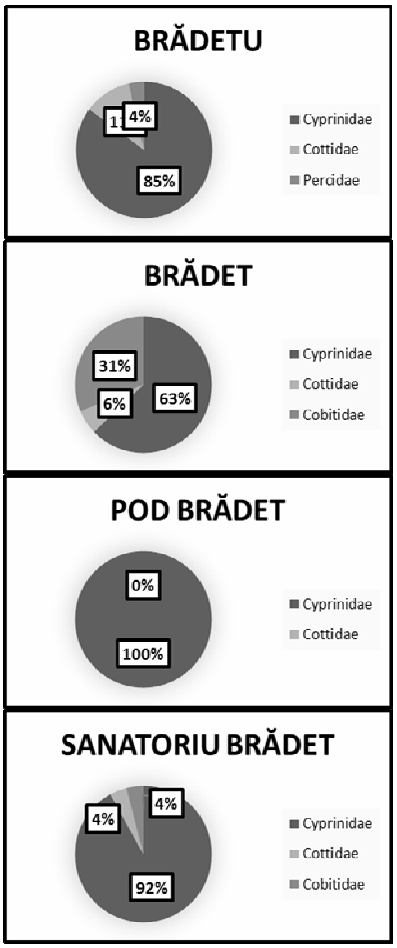

Fig. 8. Family share in the sector Brădetu – Brădet Sanatorium

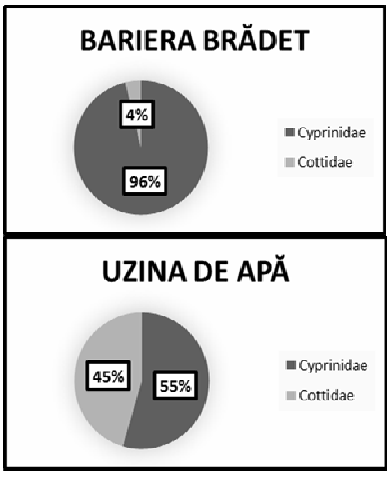

Fig. 9. Family share in the sector Brădet–Water plant

CONCLUSION

In addition to data in bibliography, our observations reveal some new aspects:

✓ fish fauna of Vâlsan River, a tributary of Argeş River is made up of

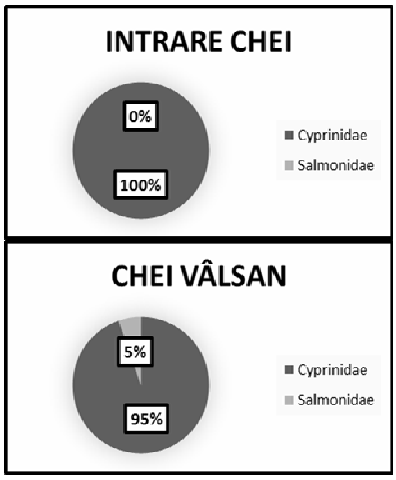

Fig. 10. Family share in the sector Vâlsan gorge

✓ fish species belonging to 13 genera and 5 families.
✓ compared to the data from the specialized studies, research on the composition of fish fauna in Vâlsan River identified 8 species of fish belonging to 8 genera and 5 families.
✓ representatives of Cyprinidae and Cobitidae families prevail among the species.
✓ from an ecological point of view, Vâlsan River comprises two areas: trout area, between Vâlsan gorge and Brădet and mountain barbell area between Brădet and the junction with Arges River.
✓ ecological changes in Vâlsan River have resulted in depletion of fish fauna and endangered species: *Romanichthys valsanicola, Gobio uranoscopus fears, Cottus gobio.*
✓ *Eudontomyzon mariae (Cyclostomes)* and *Chondrostoma nasus* species have disappeared from Vâlsan fish fauna. Others such as *Alburnoides bipunctatus, Alburnus alburnus* or *Orthrias barbatulus* have not been identified at least during the research study.
✓ *Romanichthys valsanicola* habitat was highly reduced, being present only in Bradet and perhaps Galeş area.
✓ it would be appropriate to take all measures for the protection of Vâlsan biocenosis.

ABSTRACT

The Vâlsan river (surface - 358 km^2, length - 84.6 km) springs from the bottom of Făgăraş mountains from the glacial hollow, from an altitude of 2310 m, flows parallel with Argeş river, wonder through the same relief group up to the river mouth, in Merişani.

In the year 1967, the Vâlsan river had suffered important modifications by constructing upstream of Vâlsan gorge a storage lake and also a hydroelectric–plant. The special interest of Vâlsan River is the presence of the fish species *Romanichthys valsanicola* (sculpin perch), an endemic species to the Danube basin.

It is considered the most endangered species of European ichthyofauna because of its narrow range (only a sector of Vâlsan) and small number of individuals.

The paper presents data referring to the structure of the ichthyofauna of the Valsan River, during the period 2014 - 2015, distribution of species along river and a comparative analysis of the structure ichtyofauna, now and in the past.

Biological material was sampled at 16 sites. 1224 individuals were captured. A total number of 8 fish species were identified, including *Romanichthys valsanicola*.

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