The analysis of the main perturbing factors and the physical–chemical description of the Vâlsan hydrographic basin, in the conditions of year 2005

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Introduction

The Vâlsan is part of the Argeş basin and springs from the glacial hollow placed under the Scărişoara Mare peak (2495 m) at 2310 m altitude; it is 83 km long, covers 358 square kilometers and flows into the Argeş at 312 m altitude in Merişani (UJVARI, 1972). In rendering profitable the hydroelectric potential of the Argeş hydrographic basin, they have also included the planning of the Vâlsan and its tributary Dobroneagu, whose flow gathered in the Vâlsan Lake, went through the hydroelectric power station to the Vidraru Lake. This work is the main cause of the biocoenotic disturbance because the accumulation doesn't leave any servitude flow upstream the dam; the river waters recover their flow due to the tributaries potential and phreatic resources. The accumulation has led to the continuous decrease of the phreatic layer, which caused an important change in its contribution to the river supply; in the dry years a decrease of the flow has been recorded (BĂNĂRESCU et al., 2003). Downstream, the Vâlsan tends to maintain its natural conditions.

Material and methods

The water samples were gathered in August 2005. Detailed sampling sites can be seen on Figure 1. In placing the stations the following criteria have been under consideration: influence of the hydro-technical planning; anthropogenic factor (disorganized tourism, rural planning); river ability of self-filtering and restoration.

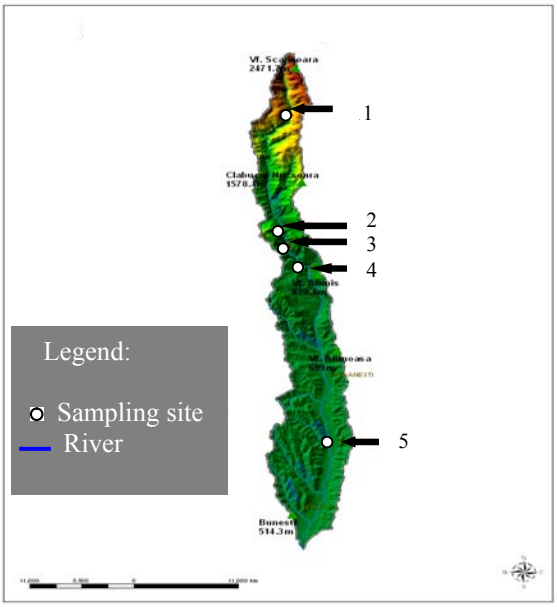

Figure 1. Sampling sites: 1.Upstream lake, 2. Vâlsan gorges entrance, 3. Vâlsan gorges exit, 4. Brădet, 5. Mălureni

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The research has aimed at describing each section from morphologic, climatic, hydrologic and physical-chemical point of view. The chemical water analysis has been effectuated in the Faculty of Science Piteşti, Laboratory of Hydrobiology, using the standard procedure.

Results and Discussions

The geological substrate is siliceous for all the five stations of sampling, the basinal surface is seasonally varying between 57- 130 Km^2, and the annual average quantity of rainfall is ranging between 1200 and 557 mm (Table 1).

Table 1. Catchments area parameters

Sampling sites	Dominant geology	Basin surface in the reference section (square km)	Yearly pluviometric average (mm)
Upstream lake	Siliceous	57	1200
Vâlsan gorges entrance	Siliceous	92	900
Vâlsan gorges exit	Siliceous	106	800
Brădet	Siliceous	110	750
Mălureni	Siliceous	130	557

The main morphological, hydrological, and climate characteristics of the analysed sections of the river are presented in Table 2.

Table 2. Morphologic, climatic and hydrographic parameters of the sampling sites

Sampling sites	The structure of the river bed	Slope (‰)	River depth (m)	River width (m)	Altitude (m)	Yearly air temperature average (0^0c)	Medium flow l/s/km^2
Upstream lake	Stones and gravel	30	0.2	4	986	0	29
Vâlsan gorges entrance	Stones and gravel	24	0.3	4	852	4	27
Vâlsan gorges exit	Stones and gravel	20	0.3	3	683	6	26
Brădet	Stones, gravel and sand	18	0.3	8	661	8	33
Mălureni	Stones, sand and mud	12	0.5	11	423	12	41

The results obtained from the physical and chemical analyses (Table 3) were compared to the values recorded during the period 1999 – 2000 by the Agency for Environment Protection, Pitesti.

Table 3. Physical – chemical description of the sampling sites

Physical chemical parameters	Upstream lake	Vâlsan gorges entrance	Vâlsan gorges exit	Brădet	Mălureni
Electric conductivity (µs/cm^2)	85	105	229	241	275
Alkalinity (mev/l)	0.7	0.9	1.6	1.9	2.3
pH	7.53	7.48	7.56	7.6	7.7
Dissolved oxygen (mg/l O_2)	8.9	8.4	8.6	8.4	7.4
CBO_5 (mg/l O_2)	1.31	1.4	1.45	1.5	1.8
CCO-Mn (mg/l O_2)	2.2	2.2	2.4	3.3	2.5
P-PO_4 (mg P/l)	0.047	0.047	0.043	0.051	0.049
NH_4^+ (mgN/l)	0.090	0.090	0.00	0.00	0.13
NO_2^- (mgN/l)	0.002	0.002	0.029	0.010	0.006
NO_3 (mgN/l)	0.655	0.701	0.655	0.140	0.130
Fe total (mg/l)	0.294	0.041	0.0174	0.020	0.040
Mn^{2+} (mg/l)	0.0196	0.0065	0.0084	0.04	0.020
Pb^{2+} (µg/l)	0.0	0.0	0.0	0.0	0.0
Zn^{2+} (mg/l)	0.0024	0.004	0.0071	0.0	0.0
Cu^{2+} (mg/l)	0.0001	0.0007	0.0007	0.0	0.0
Ni^{2+} (µg/l)	0.039	0.0408	0.039	0.0	0.0

A decrease in the water pH from 8 – 8.1 in 1999, to an average of 7.5 in 2005 it was found. The same situation was observed for the dissolved oxygen, for which values of 8.4 mg/l (Vâlsan gorges entrance), 8.6 mg/l (Vâlsan gorges exit), and respectively 8.4 mg/l (Brădet), were determined in 1999, as compared to 10.1 mg/l, 9.4 mg/l, and respectively 10.4 mg/l, recorded in 2000 at the same stations of sampling.

In both periods of report, the quantity of Zn, Cu and Ni was proved to be infinitesimal, as well as that of nitrates, nitrites, and phosphates, while Pb was lacking. No phenols, detergents or oil products were found in the analysed samples.

Values for Mn varied between 0.0065 – 0.04 mg/l, being lower than those allowed by the EU requirements for the drinking water (0.60 mg/l).

The only regular polluting source in the catchment area of the Vâlsan River is the wastewater of the Brădet Sanatorium (hospital, block of flats and hotel). The flow of the wastewater in the Vâlsan is: medium flow - 3.50 l/s; maximum daily flow - 3.80 l/s; maximum hour flow is 4.00 l/s.

Every year, a quantity of 110.000m^3 of wastewater is discharged to the Vâlsan. Before the discharge, the wastewater goes through the filtering station made up of an IMHOFF vertical decanter, a bio-filter and a chlorination station.

Within the river section considered (Brădet), apart from the water samples collected from the river, samples from the residual water discharged from the local Sanatorium were subjected to chemical analysis.

The only exceedings were recorded for the indicators CBO_5 (5.2 mg/l, versus an admissible value of 5 mg/l for the first category of quality, and CCO – Mn (11.3 mg/l, versus an admissible value of 10 mg/l), respectively.

The comparison of the determined values for samples collected upstream and downstream of the Sanatorium showed that the residual waters have a very limited harmful influence, but this doesn't exclude the necessity for cleansing.

The analysis results according to Order no. 1146 from 27.03.2002 for the endorsement of the System of Norms concerning the reference objectives for classifying the surface water quality, in all the five sections, the Vâlsan River goes to category I of quality.

The decrease in water quality is also caused by high concentration of polluting local sources (dwellings not connected to the canal system, disorganized camping, sheep desinfestation).

Other perturbing factors that have affected the aquatic, geographic and biocoenotic ecosystem are: radical transformation of biotope as a sequence of constructing hydrotechnic centers; lack of servitude flow, the river being dried downstream the dam; important variation of the Vâlsan flow caused by the use of the lake water to produce power; depreciation of the river bed in the process of stone, gravel and sand extraction used in constructions which has a negative effect on the benthonic species; damming and deviation of the Dobroneagu tributary; intensive deforestation and road constructions; water disturbing by trailing the logs along the river beds; negative effects caused by Diesel oil leak, use of fertilizers, pesticides washed in the river beds; inobservance of the Romanian legislation on environmental protection.

In 2005, the climate changes represented an important ecologic perturbing factor in the Vâlsan basin. The huge rain quantity caused freshet and torrents, which carried tree-trunks and stones downstream and eroded the riverbanks. This destroying effect was also enhanced by massive deforestation (Fig. 2 - 3).

The importance of the Vâlsan as a unique area of sculpinperch or Romanian Darter (*Romanichthys valsanicola*) required its establishment as a National Reservation, which involves further ecologic measures: reduction of negative impact of the anthropogenic activities on the aquatic environment by improving the filtering station parameters in the Brădet Sanatorium; area monitoring program; respecting the "protected area" status; prohibiting the excavation of the river bed, poaching and disorganized camping; judicious use of the lake for maintaining an upstream ecologic flow; construction of a decanter lake upstream dam.

Figure 2. Vâlsan River – the riverbank eroded by the flooding

Figure 3. Vâlsan River after the freshets and torrents – August 2005

Summary
The present work contains the presentation of the aquatic ecosystem, laying emphasis on the physical – chemical description of the basin and on the analysis of the main perturbing factors, which have led to the ecologic disturbance and changes in the Vâlsan biocoenotic structure. At present the Vâlsan is under a cumulative effect of the upstream perturbing factors caused by the hydroelectric constructions and the human activity and undergoes some depreciation of the water quantity and quality. This requires urgent measures to diminish them. Restoring the Vâlsan ecologic equilibrium is a necessity, which can be achieved by providing a minimum flow for aquatic flora and fauna protection as well as a proper quality of the flooding waters.

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