HYDROCHEMISTRY CHARACTERIZATION OF SMALL DAM LAKES FROM OLTENIA PLAIN AND THEIR USEFULNESS FOR TOURISM AND LEISURE

Elena GAVRILESCU[1], Georgiana GAVRILESCU[2]

[1]University of Craiova, Faculty of Horticulture,
[2] Water Jiu Directorate
Street Al. I. Cuza, no. 13, Craiova, 200585,
Corresponding author: gavrilescu_elena@yahoo.com

Abstract: *Research conducted in the Preajba Valley catchment aimed they introduction on the list of protected nature reserves from our country. Studies in this area were made by Brezeanu Gh, 2003, Cioboiu Olivia, 2002, Pleniceanu V., 2004. Preajba Valley catchment is characterized by a special contribution of groundwater quartered in alluvial deposits of the three levels of terraces from the left of Jiu River. Lakes formed by crossing the river Valea Preajba and its tributary Valea Bătrână, fragmenting them into 14 segments - areas that have formed as many lakes. It is noted that areas of lakes increases from upstream to downstream, fact correlated with their depths. The direction of this catchment is East-West, contrary to other of the Plain of Oltenia. Preajba Basin is highlighted by ecological features of the area. Thus, in an area not exceeding 30 square kilometers are grouped a variety of continentalaquatic ecosystems: springs, streams, rivers, lakes and swamps. Each of these confer own features to biocenosis, plant and animal populations, this providing an image of ecological diversity in a limited geographical range. The study focused on determining the physicochemical parameters from the aquifer, related with the ecosystems biocenosis by which is populated. To determine the physicochemical properties of water were sampled from a variety of locations in order to establish exactly the character of each type of ecosystem and their combination: limnocrene, reocrene, limnoreocrene. This qualification explained largely physicochemical features of each category. The spring water fits in 1-st quality category being exploited in order to supply the Craiova city. The water chemistry shows a high nitrates and phosphates content, being classified in eutrophic waters category. In terms of anion and cation content lakes could be described like bicarbonate sulphate calcic magnesic category, characteristics of mixed mineralization (is notice a high biogenic elements this being a particular character of the lakes). The waters fit in the 2-nd quality category, being used for fish (except salmon culture) as well as tourist and recreational purposes. The originality of the work lies in the classification of hydrological configurations and usage delimitation. The present study, beside to future environmental studies indicate this ecosystem as a new protected area.*

Key words**:** *ecosystem, protected area, hydrobiology, hydrochemistry, saprobiology*

INTRODUCTION

Human impact on natural ecosystems is the key issue of relations between humans and the environment. How these relationships are designed determines ultimately a positive or negative effect aimed at both sides: the natural environment and human society [BERCA M., 2000].

The construction of dams on rivers and lakes can have a double ecological effect on their: positive, by enhancing the diversity of ecosystem types in a given area and by enhancing biodiversity and negative by imbalances of biocenotic structural and disorders physiology and behavior of populations [GAVRILESCU E., 2007].

Studies in this area were made by: CIOBOIU OLIVIA, 2002, BREZEANU GH, 2001 PLENICEANU O., 2005, SAVIN C., 2001.

In the present study are given physico-chemical properties of water from springs, rivers and lakes catchment Valley Preajba, fixing the category of use, ie drinking water sources, fisheries arrangements, tourist and leisure facilities. An organic feature of this basin is that in a limited geographic area are grouped a variety of ecosystems, which confer this area an unique character for the Plain of Oltenia and even for Romania.

MATERIAL AND METHODS

The study was conducted in catchment Preajba Valley, which is characterized by a special contribution of groundwater, quartered in alluvial deposits of the three stages of relief carried out in the left of Jiu River areas. Lakes formed by crossing the river Valea Preajba and its tributary Valea Bătrână, fragmenting them into 14 segments, in these spaces forming as many lakes. It is noted that areas of lakes increases from upstream to downstream, element that is correlated with their depths. Particularities of this river basin are that place on the East-West directions contrary to other river basins of the Plain of Oltenia. This character makes the river Preajba be considered only in the Plain of Oltenia and even in Romania [SAVIN C., 2001].

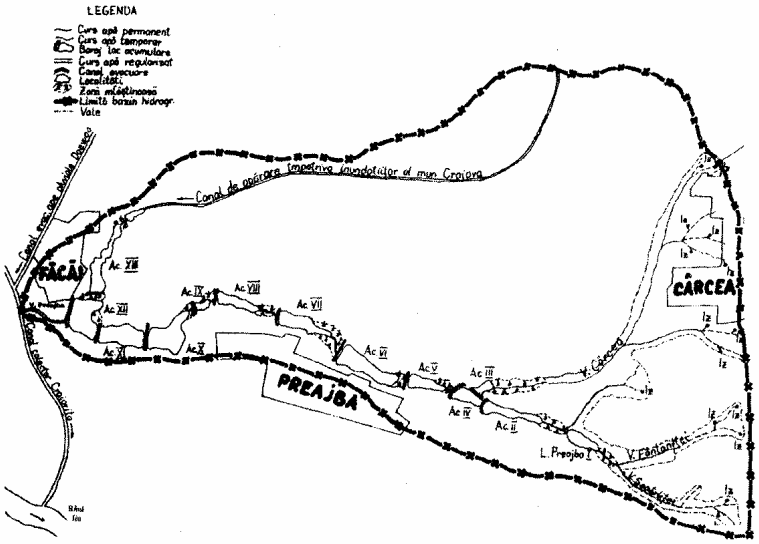

Fig. 1. Preajba Valley basin map

In this context, we studied the hydrological regime, geomorphological structure of the area, features biocenoses determining water chemistry in that ecosystem. The following presents the results of chemical analysis of water from springs feeding the river Preajba, of river and dam reservoirs. Physicochemical analysis determines both the water quality status and the influence of physicochemical parameters on the lives of ecosystems, the aquatic plant and animal populations.

In order to determine chemistry were taken a number of 50 samples from springs, rivers and lakes. Some physicochemical parameters (temperature, pH, conductivity) were determined directly on the ground, the rest being made in the laboratory analysis Quality of environmental factors from the Department of Environmental Engineering Faculty of Horticulture. Equipment used consisted of: pH meter Hanna, Ella conductivymeter, thermometer, DR2000 portable spectrophotometer, kits, etc.., as part of the field kits HAAKE owned mobile autolaboratory.

RESULTS AND DISCUSSIONS

From an environmental perspective, studied springs from Preajba Valley basin are grouped into two main types and their combination: limnocrene, reocrene and limnoreocrene [Cioboiu O., 2002]. This classification largely explains physicochemical features of each category.

The first spring is reocrene, its physical and chemical characteristics differ to some extent by the other types. Such fixed residual values, chlorine, sulphates, nitrates are almost double of other sources (Table 1). Larger amounts may be due to the fact that "washing" a larger area of substrate that crosses it, dissolve and lead to larger quantities of the items.

The third spring, compared with the second (limnoreocrene) have high values in terms of conductivity (48%), fixed residue (47%), alkalinity (42%), magnesium (45%), sodium (63%) and potassium (36%). Other items have higher values for the second spring.

Table 1

Physicochemical composition of springs

Sampling point	pH	Conductivity µs	Fixed residue mg/l	Alcalinity ml HCl 0,1	SO_4^{2-} mg/l	NO_3^- mg/l	NO_2^- mg/l	NH_4^+ mg/l	PO_4^{3-} mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l
Cârcea Izvor 1	7,21	1250	620	10,8	89	62,04	SLD	0,06	0,19	172,8	44,8	79	1,7
2	8,04	670	335	8,1	44	45,32	0,03	0,11	0,28	156,8	43,9	36	1,1
3	7,43	994	495	11,5	37	25,96	SLD	0,05	0,23	120	63,9	59	1,5

Unlike rivers and lakes, springs are characterized by very low concentrations of nitrates and phosphates (NO_3^- - 62,04 mg/l, NO_2^- - 0,03 mg/l, NH_4^+ - 0,11 mg/l, PO_4^{3-} - 0,28 mg/l).

This is because anthropogenic pollution factors have a much smaller influence on the springs.

In terms of quality water springs fall into the first category. They are used as drinking water, the groundwater from which they came, is supply the city of Craiova.

Rivers. The river Valea Preajba and the river Valea Bătrâna are the main component of basin Valea Preajba (Table 2).

pH range of 7.58 to 7.88. Fixed residue is 400, respectively 414 mg / l, fitting the rivers in the category of the aquatic ecosystems with a large amount of salts. They have an alkaline character, alkalinity values ranging from 9.1 to 10.2.

Observe higher concentrations of sulfates, nitrates, nitrites, calcium, magnesium in Preajba River, comparative to Valea Bătrâna.

Table 2

Physiscochemical comp osition of rivers

Sampling point	pH	Conductivity µs	Fixed residue mg/l	Alcalinity ml HCl 0,1	SO_4^{2-} mg/l	NO_3^- mg/l	NO_2^- mg/l	NH_4^+ mg/l	PO_4^{3-} mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l
Preajba River	7,58	800	400	10,2	46	25,08	0,04	0,26	0,8	94,4	71,2	41	1,4
Valea Batrana (Canal Colector)	7,88	828	414	9,1	22	18,92	0,01	13,7	2,8	60,8	55,4	68	9,8

Lakes. Preajba Lakes basin boundaries are part of eutrophic aquatic ecosystems [BREZEANU G., 2001], having a characteristic chemistry. Ionic balance, respectively anions and cations content, fitting the lakes into the category bicarbonate-sulfate-calcium-magnesium, features mixed stage mineralization (Table 3). Content of biogenic elements is their individual

nature. Relatively large quantity of nitrogen 18.56 mg / l is due to the effect of nutrients and organic fertilizers administration on neighboring land and discharge of organic substances from Craiova Penitentiary, which has no treatment plant.

The presence of nitrites NO_2^- which represents the most advanced degree of oxidation in the natural cycle of nitrogen is the consequence of bacterial oxidation of abundant organic matter from water and substrate.

The same explanation can be given phosphate ions (PO43-), whose concentration reaches 7.9 mg / l: training complex fertilizers (N, P, K) of the land by irrigation water (from lakes) and rain waters which flow in lakes. The high concentration of phosphate ions, comparative to the maximum admissible value for surface water, ie 0.5 mg / l, lead to eutrophication of lakes.

Table 3

Physicochemical composition of water lakes

Sampling point	pH	Con-duc-tivity µs	Fixed residue mg/l	Alcalinity ml HCl 0,1	SO_4^{2-} mg/l	NO_3^- mg/l	NO_2^- mg/l	NH_4^+ mg/l	PO_4^{3-} mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l
Lake V	8.29	856	431	9.5	150.4	0.28	0.020	0.049	3.55	124	216	56	1.7
Lake VI	7.29	833	418	9.6	164.1	0.28	0.025	0.145	7.94	131	216	62	1.5
Lake VII	8.20	855	265	6.8	127.5	0.96	0.053	0.141	4.64	76	265	66	2.3
Lake VIII	8.74	560	280	7	49.92	4.2	0.155	0.013	3.82	34	139	80	3.3
Lake IX	8.30	733	365	7.5	19.4	18.56	0.244	0.118	3.97	43	156	84	2.2
Lake X	8.64	610	320	6.9	43.81	0.24	0.038	0.085	3.61	38	4	88	2.2
Lake XI	8.20	566	284	8.1	16.5	0.28	0.045	0.323	3.53	67	301	58	1.6
Lake XII	8.31	690	348	9.3	105.4	1.84	0.091	0.382	4.89	107	179	74	3.1

From ions is noted primarily calcium (Ca^{2+}) derived from sedimentary rocks of lakes sync, but also from the amendments apply to all agricultural land.

The process of eutrophication is manifested by overgrowth of phytoplankton and aquatic macrophytes [PLENICEANU O., 2005]. Have been highlighted a series of dominant phytoplankton groups, such as: *Bacillariophyceae* (540.2 thousand ex. / L), *Chlorophyceae* (eg 386.7 thousand ex. / l) and in summer having an intensive development *Cyanophyceae* (72 thousand ex. / l).

Groups listed forms the highest numerical density and biomass.

By increased eutrophication the dam lakes are in an advanced biological clogging process that results in replacing of the water surface with wetlands cover with vegetation, reducing the depth and area lakes also threatens water reserves for irrigation, and development of some types of algae and macrophytes harm fish and even human life.

CONCLUSIONS

In terms of quality conditions, water springs and rivers fall into class I and small lakes on the river dam Preajba, fall into the category II, may be used for fish (except salmon breeding) and tourism and recreational purposes.

BIBLIOGRAFY

1. BERCA MIHAI, 2000. Ecologie generală şi protecţia mediului, Editura Ceres Bucureşti.
2. BREZEANU GH. şi colab., 2001. Ecologia şi protecţia mediului în România – Fundamente programatice, Revista Geoforum a Academiei Române, Bucureşti, p. 15-22.
3. CIOBOIU OLIVIA, 2002. Gasteropodele lacurilor mici de baraj din Câmpia Olteniei, Sitech.
4. GAVRILESCU ELENA, 2007. Calitatea apelor, vol. I, Editura Sitech, Craiova.
5. PLENICEANU OTILIA şi colab., 2005. Implicaţiile eutrofizării ecosistemelor lacustre de pe râul Preajba. Environment & Progress, Cluj-Napoca, p. 89-95.
6. SAVIN C., Hidrologia râurilor, Editura Reprograph, Craiova, 2001.