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STRUCTURAL PARTICULARITIES OF CERTAIN SPRINGS WITHIN THE LOWER HYDROGRAPHIC BASIN OF THE JIU RIVER

CIOBOIU Olivia, BREZEANU Gheorghe

Abstract. The lower hydrographic basin of the Jiu River is characterized by a complex ecosystem structure (springs, rivulets, and reservoirs). Each category is defined by geomorphologic, hydrologic, and structural-biocoenotic particularities. Thus, we mention springs and streams, which, within the Preajba Valley hydrographic basin, can be considered the representative factor for the geographical space of Oltenia Plain.

Keywords: springs, biodiversity, the Preajba Valley, the Oltenia Plain.

Rezumat. Particularităţile structurale ale unor izvoare din bazinul hidrografic inferior al Jiului. Bazinul hidrografic inferior al râului Jiu se caracterizează printr-o structură ecosistemică complexă (izvoare, mici râuri şi lacuri de baraj). Fiecare categorie se defineşte prin particularităţile geomorfologice, hidrologice şi structural-biocenotice. În acest sens se disting izvoarele şi pâraiele, care în ansamblul bazinului hidrografic Valea Preajba constituie factorul reprezentativ pentru spaţiul geografic al Câmpiei Olteniei.

Cuvinte cheie: izvoare, biodiversitate, Valea Preajba, Câmpia Olteniei.

INTRODUCTION

The lower hydrographic basin of the Jiu is characterized by a complex ecosystem structure (springs, streams, and reservoirs). Along its lower sector, the Jiu River receives a small tributary – the Preajba Valley stream. Located within a plain area, the hydrographic basin of the Preajba Valley is mainly characterized by the presence of a large number of springs, which generates and determines the configuration and functioning both of the stream itself and of the small reservoirs built along its course. An important factor for the physical-geographic structuration of the area is represented by the presence of more than 40 springs (BREZEANU & GRUIȚĂ, 2002; BREZEANU *et al.*, 2011; CIOBOIU, 2002; CIOBOIU & BREZEANU, 2002).

These springs supply small rivulets, which are biotopes that ensure the development of certain specific biocoenosis. Consequently, when globally analysing the structural features of the entire Preajba Valley basin, we consider that the springs and the small rivulets they supply are a representative factor for the entire basin (Fig. 1).

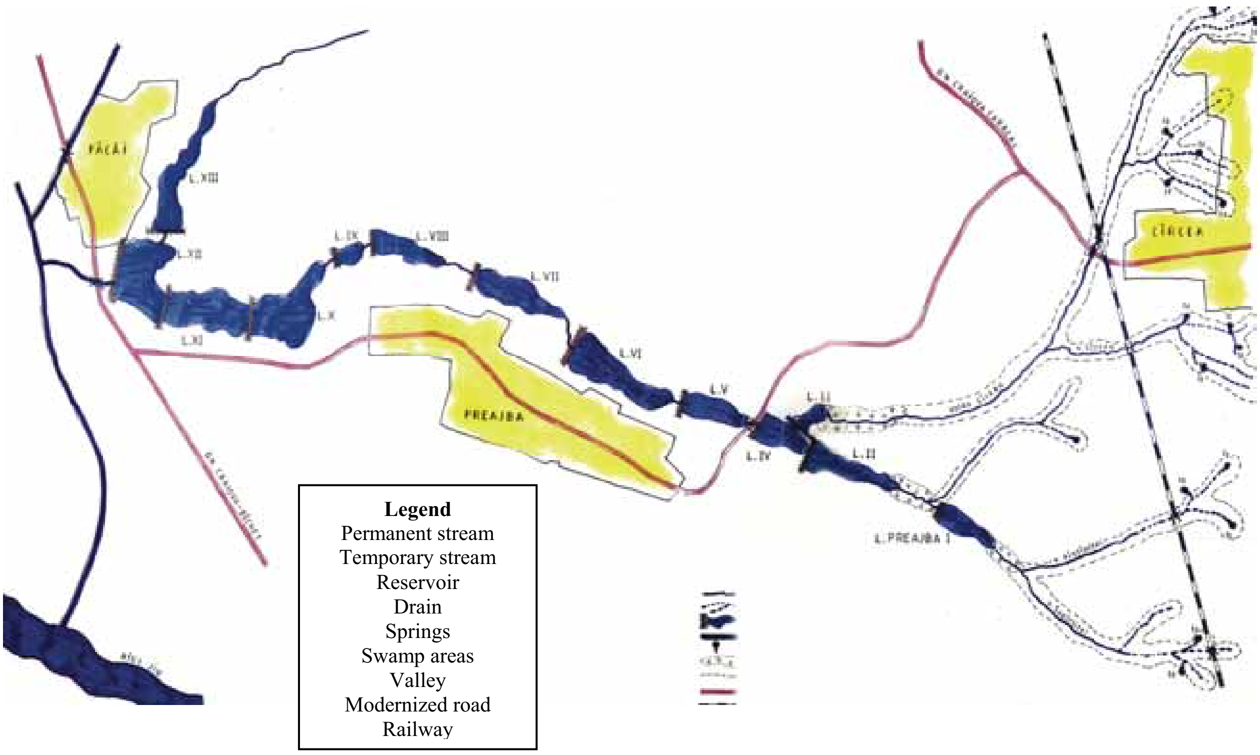

Figure 1. The plan of the Preajba Valley Hydrographical Basin (after CIOBOIU, 2002).
Figura 1. Schiţa bazinului hidrografic Valea Preajba (după CIOBOIU, 2002).

MATERIAL AND METHOD

According to the geomorphologic and hydrologic specificity of these types of ecosystems, there were adapted and used corresponding materials. Thus, in order to gather the water samples, there were sampled one-litter recipients from the established points. The determination of planktonic and benthic structures was made based on the collection of qualitative and quantitative samples by means of planktonic net and limnological netting (BREZEANU & ENĂCEANU, 1964; CIOBOIU, 2011).

RESULTS AND DISCUSSIONS

From the ecological point of view, the springs that are to be found on a surface of only 10-15 ha are grouped into two main categories: reocrene and limnocrene and their combination, namely limno-reocrene. In case of reocrene springs, the physical-chemical features are distinct from those of other types. Thus, the values of fixed residues, chlorine, sulphites and nitrates are two times higher than those of other springs. These higher quantities may be induced by the fact they wash a greater surface of the substratum they cross and, consequently, dissolve and carry greater quantities of the aforementioned elements. The other categories, the limnocrene and limno-reocrene ones, display relatively similar values of the analysed elements. The concentrations are for limno-reocrene springs (Fig. 2).

The springs are characterized by very small 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). These are mainly induced by different anthropogenic pollution factors, which have a more reduced influence on springs (CIOBOIU, 2003; ZUBCOV *et al*., 2002) (Table 1).

Table 1. Physical-chemical composition of springs.
Tabel 1. Compoziţia fizico-chimică a izvoarelor.

Analysed indicators	Cârcea			Analysis method
	Reocrene spring	Limnocrene spring	Limno-reocrene spring	
Conc. of hydrogen ions (pH), unit. pH	7.21	8.04	7.43	STAS 6325-75
Electric conductivity (µs)	1250	670	4	STAS 7722-84
Fixed residue mg/l	620	335	495	STAS 9187 - 84
Alkalinity ml HCl 0,1	10.8	8.1	11.5	-
Oxidable organic substances CCOCr mgO_2/dm^3	21.6	25	22	SR ISO 6060- 96
Total hardness, German degrees	34.1	31.6	31.2	STAS 3026-76
Ammonia (NH_4), mg/l	0.06	0.11	0.05	STAS 6328-85
Calcium (Ca^{2+}), mg/l	172.8	156.8	120	STAS 3662-62
Magnesium (Mg2+), mg/l	44.8	43.9	63.9	STAS 6674-77
Nitrates (NO_3), mg/l	62.04	45.32	25.6	STAS 3048-90
Nitrites (NO_2), mg/l	SLD	0.03	SLD	STAS 3048- 77
Chlorides (Cl), mg/l	81.6	42.6	31.9	STAS 3049- 86
Phosphates ($PO^3{}_4$), mg/l	0.19	0.28	0.23	STAS 3265-66
Sulphates (SO_4), mg/l	89	44	37	STAS 3002-87
Sodium mg/l	79	36	59	STAS 3223-52
Potassium mg/l	1.7	1.1	1.5	STAS 3223-52

Figure 2. The area of limno-reocrene springs supplying the streams in the upper sector of the Preajba Valley hydrographical basin.
Figura 2. Zona izvoarelor limnoreocrene care alimentează pâraiele din sectorul superior al bazinului hidrografic Valea Preajba (original).

From the qualitative viewpoint, the water of the springs belongs to the first category. It is freshwater and the water table they come from is a valuable resource used for the water supply of Craiova city.

Springs, most of them reocrene, form small pools on the clayish-sandy soil. The clean and transparent water presents a 12 – 13°C temperature even during summer (LUNGU & DUŢOIU, 1996).

The rivulets that appear on the slopes eroded the clayish soil developing up to one meter deep beds. The water speed is of about 0.50 m/sec. and it gathers at the foot of the slope forming the upper sector of the stream Bătrâna Valley and the Preajba Valley. The slow speed of the stream even along this sector determines the presence of a silty-sandy bottom. Water temperature during summer reaches 18 – 20°C in the upper sector and more than 24°C in the lower sector, in the proximity of the first reservoir.

Around the springs, pools, and rivulets there were identified the following macrophytes: *Mentha aquatica* LINNAEUS 1758, *Heleocharex palustris* LINNAEUS 1758, *Polygonium amphibium* LINNAEUS 1758, *Carex riparia* LINNAEUS 1758. On the surface of the plants stems and leaves, as well as on the substratum around them, it was noticed the almost exclusive presence of diatomeae that love lower temperatures, clean and rich in silicates water (NICOLAESCU *et al*., 1999).

The taxonomic structure of zooplankton is reduced: a ciliate species (*Vorticella microstoma)*, four of testaceae (*Arcella arenaria, Centropyxis discoides, C. aculeata, Diflugia globulosa*) and one species of rotifers (*Rotaria magna*) (PARPALĂ *et al*., 2002).

The benthonic fauna is made up of the following groups: ostracods, gamarids, gastropods, bivalves, chironomids, ephemeropteres, heteropteres. Molluscs are on the first place due to their numerical density and ecological role in the fauna of the streams. We mention that their presence was mainly noticed in the lower sector of the streams that are characterized by a great floristic and faunistic diversity.

The numerical and biomass density place the gastropods on the first place; they are mainly represented by the following species: *Valvata (Cincina) piscinalis* O. F. MULLER, 1774, *Esperiana esperi* (A. FERUSSAC 1823), *E. (Microcolpia) daudebardii acicularis* (FERUSSAC 1823), *Physa fontinalis* (LINNAEUS 1758), *Aplexa hypnorum* (LINNAEUS 1758), *Stagnicola palustris* (O. F. MULLER 1774), *Radix labiata* (ROSSMASSLER 1835), *Galba truncatula* (O. F. MULLER 1774), *Planorbis planorbis* (LINNAEUS, 1758) (Table 2).

Table 2. Gastropod species present in the lower sector of the Preajba Valley hydrographical basin.
Tabel 2. Speciile de gastropode întâlnite în pâraiele din sectorul superior al bazinului hidrografic Valea Preajba.

Class **GASTROPODA** CUVIER 1798 Subclass PROSOBRANCHIA MILNE EDWARD 1848 Order MESOGASTROPODA THIELE 1925	
Family Valvatidae THOMSON 1840	*Valvata (Cincina) piscinalis* O. F. MULLER 1774
Family Thiaridae TROSCHEL 1857	*Esperiana esperi* (A. FERUSSAC 1829) *E. (Microcolpia) daudebardii acicularis* (A. FERUSSAC 1823)
Subclass PULMONATA CUVIER 1917 Order BASOMMATOPHORA A. SCHMIDT 1855	
Family Physidae FITZINGER 1833	*Physa fontinalis* (LINNAEUS 1758) *Aplexa hypnorum* (LINNAEUS 1758)
Family Lymnaeidae RAFINESQUE 1815	*Stagnicola palustris* (O. F. MULLER 1774) *Radix labiata* (ROSSMASSLER 1835) *Galba truncatula* (O. F. MULLER 1774)
Family Planorbidae RAFINESQUE 1815	*Planorbis planorbis* (LINNAEUS 1758)

Esperiana (Microcolpia) daudebardii acicularis (A. FERUSSAC 1823) is a common species of streams forming large populations together with *Esperiana esperi* (A. FERUSSAC 1829). Their dimensions range between 15 and 20 mm high, 5 and 8 mm wide, a conic shell and oval aperture.

Aplexa hypnorum (LINNAEUS 1758) is senestre, displaying a fusiform-elongated, transparent, brown-yellowish, shiny shell of 9-13 mm. It prefers streams, living in numerous populations, but it can be also found in springs and pools.

Stagnicola palustris (O. F. MULLER 1774), even if it is characteristic to slow waters, it is quite frequent in streams and springs in the plain area, as it is the case of the studied ecosystems. Its dimensions range between 20 and 30 mm high and 10 and 15 mm wide.

Radix labiata (ROSSMASSLER 1835), a small gastropod, (h = 20-21 mm, w = 12 mm) has an oval, yellow-reddish and resistant shell. It prefers highly eutrophic lakes, but, sometimes, it can be found in rocky-bottom streams.

Galba truncatula (O. F. MULLER 1774) is a typically reophile species identified in springs, small waters, swamps, holes, marshes directly on silt or rocks, often in numerous populations. It has a small, elongated-oval, reddish-brown and thick aspect shell with a well-developed spire.

Planorbis planorbis (LINNAEUS 1758) is characterized by its discoidal shell (h = 3.5 mm, l = 15-17 mm). It lives in stagnant waters with silty bottom, as well as in the streams with rich vegetation; it is often found in lacustrine ecosystems from Romania (CIOBOIU, 2002; GROSSU, 1986, 1987, 1993).

Unio pictorum LINNAEUS 1758 is a species frequently met in the studied ecosystems. Even if it is not too numerous, it plays an important role in the coenotic bioeconomy of the area due to its high capacity of filtering the water (NEGREA *et al*., 2004).

CONCLUSIONS

Through their geographical position, the springs and streams represent a very important segment in the assembly of the Preajba Valley hydrographical basin. The 40 springs are the characteristic element of the area as, within a limited geographical space (10-15 ha), they are the representative factor of Oltenia Plain. It is well-known that this area displays a dry climate and the presence of the springs and streams represents a characteristic feature of Oltenia Plain from the ecological viewpoint.

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Cioboiu Olivia
The Oltenia Museum, Craiova,
Str. Popa Şapcă, No. 8, 200422, Craiova, Romania
E-mail: oliviacioboiu@gmail.com; cioboiu.olivia@yahoo.com

Brezeanu Gheorghe
The Romanian Academy, Institute of Biology,
Str. Splaiul Independenţei No. 296, 060031, Bucharest, Romania
E-mail: aurelia.brezeanu@ibiol.ro

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