THE INFLUENCE OF THE NATURAL FACTORS ON THE EVOLUTION OF THE PEŢEA THERMAL HYDRO-GEO-ECOSYSTEM IN THE PERIOD 2009-2012

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Abstract

The purpose of the present research is the study of the influence of the natural factors on the evolution of the Peţea thermal hydro-geo-ecosystem in the period 2010-2012.

One took water samples from Ochiul Mare and the analysed indicators were physical and biological.

The results confirm the direct determinism between the meteorological-climatic factors (rainfall) and the geothermal water source.

Key words: hydro-geo-ecosystem, protected natural area, habitat, environmental impact, extinction

INTRODUCTION

Bihor county holds 64 natural areas of national importance: category III and IV IUCN - International Union for Conservation of Nature, 61 mentioned in the Law No. 5/2000, regarding the approval of the Plan concerning the management of the national territory– Section III– protected zones and 3 natural areas mentioned in the Government Decision no. 2.151/2004, regarding the institution of the condition of protected natural area for new zones.

The Peţea River natural reservation was established in the year 1932, the status of natural reservation being reconfirmed in the year 1985 by the decision no. 22 of the Council of ministers. According to the decision no. 19/1995 of the Bihor County Council, from the standpoint of the biological representation it is a mixed reservation: botanical and zoological, having, due to the location, a landscape value as well (Danciu V., 2005).

By the Order no. 1964 from the 13th of December 2007 regarding the institution of the condition of protected natural area of the sites of community importance, as integral part of the European ecological network Natura 2000 in Romania, one institutes the condition of protected natural area as site of community importance for Peţea lake.

The site Natura 2000 ROSCI0098- Peţea Lake, with a surface of 51 ha, includes the protected area Peţea River, declared as such at national level.

The Peţea River natural reservation of national interest, with code 2177, IUCN category IVb, surface of 4 ha is situated on the administrative territory of Rontău village (Vicaş, 2012).

The site represents the only place in Romania where there naturally exists the type of priority habitat 31A0-thermal waters in Transylvania covered with lotus (Gafta D., 2008, Standard Form Natura 2000).

The natural thermal ecosystem, unique in Romania harbours unique, endemic or rare species: the thermal water lilly– *Nymphaea lotus L. Var. Thermalis*, represents the only case in which a tropical plant species lives spontaneously in a temperate climate (Doniţă N., 2005).

The thermophile cenoses built by *Nymphaea lotus* var. *thermalis* develop in warm waters, with temperature of 20–30°C (Burescu P., 2002).

The dominant species of *Nymphaea lotus* var. *thermalis* is considered tertiary relict and represents „a tropical oasis in the middle of a Euro-Siberian vegetation" (Borza A., 1924). In the composition of the phytocenosis also take part:

- *Ceratophyllum demersum, Sparganium erectum,* ssp. *neglectum, Butomus umbellatus, Alisma plantago-aquatica,* and rare specimens of *Phragmites australis.*
- *Melanopsis parreysii Muhlfeld* – endemic relict snail species
- *Scardinius erythrophtalmus racovitzai* – rudd, endemic fish species
- *Sabanejewia aurata and Cobitis taenia*, fish species, enumerated in annex II of the Council Directive 92/43/EEC
- *Unio crassus* and *Chilostoma banaticum,* invertebrate species enumerated in annex II of the Council Directive 92/43/EEC

The *Nympheae lotus var. thermalis, Melanopsis pareysi* and *Scardinius erythrophtalmus var racovitzai* species - tertiary relicts, require the adoption of special preservation measures, taking into account their scientific value. Dihoru G., 1994)

From an ecological standpoint, in time, between these and other species of flora and fauna, trophic and habitat relations were established and consolidated, the disturbance of which may endanger their existence.(Dalea A.,2003)

The *Nympheae lotus var. thermalis* species harnesses the mineral and organic substrate of the Peţea River hydro-geo-ecosystem, ensuring for the most part, as main photosynthesizing agent, the biological productivity of the ecosystem.(Şoldea V., 2003)

At the same time it constitutes microhabitat for the larval and juvenile forms of the *Melanopsis pareysi* and *Scardinius erythrophtalmus var. racovitzai* species, also protected species. (Vicaş G., 2012)

The organic substrate generated by the thermal water lily and the other vegetal hydrobionts is harnessed by the phytoplankton and zooplankton of

the ecosystem, which constitute the trophic basis for the heterotrophic species which compose the biodiversity of the ecosystem(insects, fish, amphibians, ophidians and birds).

The determinant factor which defines and ensures the whole ecosystem from a functional standpoint is the geothermal water deposit (Doniță N., 2005).

In this sense, the basic physical indicators are temperature, the relative constancy of which ensures a minimum of conditions required for the carrying out of the normal biological circle of the protected species (Gâstescu P., 2009).

MATERIAL AND METHOD

The purpose of the present research is the study of the influence of the natural factors on the evolution of the Pețea thermal hydro-geo-ecosystem in the period 2010-2012, characterized by significant variations with regards to temperature and rainfall.(Cristea M., 2003)

One took water samples from Ochiul Mare, in spring, when explosive development phenomena of the diatom forms (Bacillariophyceae) occur and in autumn, when the thermal condition determines the dominance of the inferior forms (Cyanophyceae).(Mălăcea I., 1969)

Physical (temperature, water depth) and biological indicators were analysed.(Nicoară M., 2009), Varduca A., 2000)

The field and laboratory research was based on:

- observation method for identifying the macroscopic species (Godeanu S., 2002);
- numbering for the assessment of the stock;
- relating the stock to the unit area, for density and coverage degree.

For the determination of the biological parameters one proceeded to microscopic examinations, followed by the statistical data processing according to the ecological methods H. Knopp and Pantle-Buck.

RESULTS AND DISCUSSIONS

The results of the determinations are rendered in table no. 1

Table 1

Indicator		2010		2011		2012	
		April	August	April	August	April	August
Water Temperature, °C		30	28,1	28	29	25	26
Air Temperature, °C		15,8	16,7	18	23	7	37
Depth of water, m		3,2	3,8	2,0	2,0	0,4	0,2
Density (ex./l)		19250	549	736	785	910	950
Oligosaprob Bioindicators		1450	72	123	47	33	20
β mesosaprobic Bioindicators		10350	343	420	467	608	680
α Mesosaprobic Bioindicators		5200	134	193	270	269	359
Polisaprobic Bioindicators		0	0	0	1	0	5
Level of cleaning,c%(Knoop)		77,09	75,18	73,24	71,12	69,05	50,42
Pantle-Buck	Saprob index	2,23	2,11	2,10	2,29	2,26	1,80
	Saprob area	β	β	β	β	β	β,α
Simpson	Simpson index (D)	0,05	0,09	0,06	0,09	0,07	-
	Diversity index (I-D)	0,95	0,91	0,94	0,91	0,93	-
	Mutual index (I/D)	18,42	11,58	15,52	11,47	14,88	-
Quality Class		II	II	II	II	II	II-III

By analysing the obtained values one notices:

- under the conditions of maintaining the temperature gradient air-water, approximately constant, the water depth in Ochiul Mare dropped circa 8 times, from 3,2 m in April 2010 to 0,4 m in April 2012;
- the determinations for phytoplankton and zooplankton evidence the abundance of Bacillariophyceae in the samples examined in spring;
- in the year 2012 one recorded a numerical growth of the β mesosaprobic and α mesosaprobic forms, the latter becoming equal or even slightly dominant in August;
- the quality class suffers a deterioration during the year 2012, from category II(β), to category II-III(β,α);

- the surface of the water sparkle and the number of thermal water lily specimens drop dramatically

CONCLUSIONS

1. The reduced level of rainfall in the period 2011-2012 determined the drop of the flow of the Ochiul Mare spring, which led to the drop in water depth;
2. The fact that in the same period one noticed a significant drop of the water temperature in Ochiul Mare, confirms the direct determinism between the meteorological-climatic factors (rainfall) and the geothermal water source (Vicaş G., 2012);
3. The biological cycle of the Nymphaea lotus var. thermalis species and that of the other protected species is strictly conditioned by the existence of the mud and of a relatively constant level of the geothermal water;
4. The marked drought of the year 2012 directly affected the living conditions of the mentioned specimens, dramatically endangering their existence;
5. Given the imminent danger of the extinction of the protected species we consider to be opportune the establishment of an aquaculture centre which would ensure biological material for their perpetuation(Vicaş., 2012);
6. The aquaculture centre can ensure the genetic preservation and perpetuation of the protected species in situations of natural or anthropic risk;
7. At the same time one creates the premises required for expanding the area for the three protected species.

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