WATER QUALITY OF THE STORAGE LAKE SURDUC IN 2005 AND THE DEMANDS OF ECOLOGICAL RESTAURATION

CALITATEA APEI DIN LACUL DE ACUMULARE SURDUC ÎN 2005 ŞI CERINŢELE DE RESTAURARE ECOLOGICĂ

Alina-Georgeta NEACŞU, I. BORZA, G.-G. ARSENE, Alina-Margareta ARSENE

Agricultural and Veterinary University of the Banat, Timişoara, România
Corresponding author: Alina-Georgeta NEACSU, e-mail: alne76@yahoo.com

Abstract: *Lake Surduc is the most important storage lake of the Western Piedmonts, with a surface of 362 ha and water volume of 14110 mil. m^3. This study presents the results of the chemical analysis for the parameters measured in 2005. Following the processing of the data obtained, it was qualitatively established that the water has a moderate quality. At the same time, we also suggest a few measures of ecological restoration for the studied area.*

Rezumat: *Lacul Surduc este cea mai importantă acumulare din Piemonturile Vestice, având suprafaţa de 362 ha şi volumul apei de 14110 mil. m^3. În lucrare prezentăm rezultatele analizei chimice pentru parametrii măsuraţi în 2005. În urma prelucrării datelor obţinute, din punct de vedere calitativ, s-a stabilit că apa are calitate moderată. Totodată propunem şi câteva măsuri de restaurare ecologică pentru zona studiată.*

Key words**:** *Surduc, chemical parameters, water quality, ecological restauration*
Cuvinte cheie**:** *Surduc, parametri chimici, calitatea apei, restaurare ecologică*

INTODUCTION

The storage lake Surduc, created in 1975, is situated on the river Gladna, at km 12+700 at the mouth of the rivulet Minişel, between the localities Surducu Mic, Fârdea and Mâtnicu Mic, 90 km away from Timişoara. It stretches over 362 ha, and water volume is of 14,110,000,000 m^3, being the biggest storage in the Western Piedmonts.

Situated in a floodable depression (at the height of 198 m, 45^0 45' N, 22^0 09'), the lake is enclosed by a homogenous dam of rock platforms. The water surplus is directed until the exit to the Surduc gullet. The main purpose of the storage lake is to provide drinking water for the area of and around Timişoara and to ensure against flood.

Regarding the type of major habitat, the storage lake is part of the category of sweet water/damp areas habitat (the eco-region of the Carpathian Mountains). The legal status is that of (mixed) Protected Region – Lake Surduc (2748), a regulation made by Law no. 5/2000, H. C. J. no.19/1995. The land is state property, administered by the National Administration „Romanian Waters" Water Department Banat – Timişoara. There has not been developed yet a management plan for the area. Anthropic activities practiced within the protected area: fishing, hydro-technical arrangements, tourist arrangements, tourism, pleasure, traffic lines.

MATERIAL AND METHOD

It was taken into account the water sampling (according to the recommendations comprised in the series SR ISO 5667/2002) and their chemical analysis (according to the quality standards comprised in norm no. 161/2006 issued by the Ministry of Environment and Water Administration). The analysis of the samples drawn was accomplished in the laboratory of the National Administration „Romanian Waters" Water Department Banat – Timişoara and consisted in determining the oxygen regime, of the nutrients, pH, the suspension and total water hardness.

RESULTS AND DISCUSSIONS

Table 1

The result of the chemical analysis performed for the water sample drawn from the storage lake Surduc (according to analysis AT 51, 02.11.2005)

No.	Analysed parameters	U/M	Method of analysis	Obtained value	Quality class – acceptable limits				
					I	II	III	IV	V
1.	Ammoniacal Nitrogen ($N\text{-}NH_4^+$)	mg N/l	SR ISO 7150/2	< 0.01	0.4*	0,8	1,2	3,2	> 3,2
2.	Nitrites ($N\text{-}NO_2^-$)	mg N/l	SR ISO 6777/96	0.014	0.01	0,03*	0,06	0,3	> 0,3
3.	Nitrates ($N\text{-}NO_3^-$)	mg N/l	SR-7890/3-2000	3.6	1	3	5,6*	11,2	> 11,2
4.	Phosphates/ phosphorus ($P\text{-}PO_4^{3-}$)	mg P/l	SR EN 1189-2000	0.04	0.1*	0,2	0,4	0,9	> 0,9
5.	Dissolved oxygen (O_2)	mg O_2/l	SR EN 25813-2000	9.19	9*	7	5	4	< 4
6.	Permanganate index (CCO-Mn)	mg O_2/l	SR EN ISO 8467/01	5.42	5	10*	20	50	> 50
7.	CBO_5	mg O_2/l	SR ISO 5815/89	0.93	3*	5	7	20	> 20
8.	pH	-	SR ISO 10523-97	7.52	6.5 – 8.5				
9.	Suspensions	mg/l	STAS 6953-81	17	-				
10.	Total hardness	^{0} Ge	STAS 3026-76	3.5	-				

Following the analyses performed, the data presented in table 1 were obtained:

- *Ammoniacal nitrogen ($N\text{-}NH_4^+$)* was determined through method SR ISO 7150/2, in a concentration of <0.01 mg N/l, a value which belongs to quality class I and which represents 2.5% of its value (0.4 mg N/l);
- *Nitrites ($N\text{-}NO_2^-$)* were determined through method SR ISO 6777/96, with a concentration of 0.014 mg N/l, are part of quality class II and represent 46.(6)% of its value (0.03 mg N/l).
- *Nitrates ($N\text{-}NO_3^-$)* have the value of 3.6 mg N/l, is part of quality class III and represent 64.28 % of its value (5.6 mg N/l). The method of analysis used was SR-7890/3-2000.
- *Phosphates ($P\text{-}PO_4^{3-}$)* have a concentration of 0.04 mg P/l, belong to quality class I and represent 40 % of its value (0.1 mg P/l). The value was determined using the method SR EN 1189-2000.
- *Dissolved oxygen (O_2)* was determined through the method SR EN 25813-2000. 9.19 mg O_2/l is the registered concentration, the value corresponding to quality class I (9 mg O_2/l);
- *Permanganate index (CCO-Mn)* was determined by the potassium permanganate

method SR EN ISO 8467/01. It has a concentration of 5.42 mg O_2/l, is part of quality class II and represents 54.2 % of its value (10 mg O_2/l).

- *The biochemical consumption of oxygen (CBO_5)* has the value of 0.93 mg O_2/l which corresponds to quality class I and represents 31 % of its value (3 mg O_2/l). For determination, it was used the method SR ISO 5815/89.
- *The pH* is of 7.52, a fact which indicates a water almost neutral chemically. It is situated within the acceptable limits, of 6.5 – 8.5, for each of the 5 quality classes.
- *The suspensions* were determined by method STAS 6953-81. The obtained value is of 17 mg/l.
- *Total hardness* is of 3.5^0 Ge ($0 – 4$ dH^0 – very soft waters). For determination, it was used the method STAS 3026-76.

From the analysis of these data it is found that the storage lake Surduc is part of class III from the point of view of water quality, namely it has a moderate quality.

Water quality, as in fact the entire „atmosphere" around the lake, can be improved. The restoration measures of the area must attend to mainly: the integration of the built areas with the environment, the finalization of infrastructure (as there is no sewage system there can appear great problems relating to infiltrations, the finalization of the works of energy supply, the solving of the litter problems), the strict monitoring of forbidden fishing, of illegal wood clearing, of tourism.

In favour of these facts, we mention again that Timiş County has an extraordinary natural potential, sustained by the great variety of landscape, flora and fauna. Lake Surduc must be definitely mentioned here. The recreation area of the lake benefits from a very valuable landscape, which allowed the creation of a special recreational micro-climate: amusement, aquatic sports, fishing (it was registered that among the weekend preferences of the tourists 70% is represented by fishing), hunting, possibly cycling. Surduc represents for Timişoara one of the few recreation areas which can be exploited at the end of the week. [In the vicinity of the lake there are numerous interesting places: the locality Surducu Mic, Traian Vuia's native village, the locality Băteşti, with the botanical reserve „The daffodil glade", the locality Zolt, with the wooden church, a special monument of religious architecture, the locality Coşava, a Paleolithic settlement which is remarkable by its traditional costumes and fabrics, the locality Tomeşti, with the well-known glass factory, Jupânesti, a locality in which pottery, the picturesque Valley of Liman, the locality Pietroasa renowned for its cave with a chromatic predominance of Pietroasa blue, the locality Poieni, with a water mill, the hut Căpriorul, etc].

CONCLUSIONS

1. The storage lake Surduc is part of class III from the point of view of water quality, meaning it has a moderate quality. The apparition and development of an inhabited area on the lake shore, as well as the phenomena of water flourishing which were observed during the last three years, justify the conclusion that the lake has registered a decline in quality.
2. We suggest the following measures of limiting the pollution and allowing the ecological restoration:
   - the construction of a sewage system for the buildings in the near proximity of the lake;
   - the organization of a centralized system of periodical collection of domestic litter;
   - stopping the wood clearings on the slopes which shape the lake cuvette;
   - enforcing restrictions regarding the fertilization and use of pesticides on the

lands around the lake;
- limiting the recreation activities (fishing and aquatic sports) for certain parts of the lake and for certain periods of the year and day, so that it the activity of birds and fish be not disturbed;
- avoiding great oscillations in the water level during the period of laying of spawn;
- monitoring and eliminating invasive species of plants from the vicinity of the lake and, inasmuch as it is possible, of those species of fish from the lake.

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