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**ECOLOGICAL CONDITION
MONITORING OF THE RIVER
TEMERNIK WITHIN THE BOUNDARIES
OF THE SEVERNY RESIDENTIAL AREA
OF ROSTOV-ON-DON**

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This article studies ecological problems of the Temernik, located within the boundaries of the residential area "Severny" of Rostov-on-Don. Nowadays the river is under the threat of disappearance. The authors analyze water hydrochemical indicators using short-term tests and compare it with normative requirements for water-quality of fishing water bodies. Water samples were taken in different places of the river with the total length of 2.8 km.

Keywords: the Temernik, ecological situation, hydrochemical indicators, fishing water body, main pollutants.

Introduction. The length of the river Temernik within the boundaries of Rostov-on-Don is about 18 km. It flows in different parts of the city and for many decades the ecological state of the river has been deteriorating every year. The worst part of it is in the place where it flows into the river Don, where it turned into a gutter bounded by concrete. At the same time in the city, there are houses, urban recreation areas, organized beaches on its banks. The river flows through the zoo, Botanical garden, i.e. it is an important part of the urban ecosystem. In recent decades, several city programs for cleaning of the river Temernik were developed, which did not lead to the improvement of the ecological situation. Currently, a new project is being implemented, the aim of which is not just cleaning, but full rehabilitation of the river by 2025. The task involves not just cleaning the river from debris, but also the complete restoration of the aquatic ecosystem.

Main part. Hydrochemical characteristics of the reservoir on the parameters that determine the living conditions of hydrobionts is one of the objective characteristics of its ecological state. Therefore, the purpose of this work was to study the most important for hydrobionts water indicators in the selected section of the river from the source in Surp Khach area to the dam located in the BSMP-2 area. The

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**МОНИТОРИНГ ЭКОЛОГИЧЕСКОГО
СОСТОЯНИЯ р. ТЕМЕРНИК
В ГРАНИЦАХ МИКРОРАЙОНА
«СЕВЕРНЫЙ» РОСТОВА-НА-ДОНЕ**

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Рассмотрены экологические проблемы реки Темерник, расположенной в границах микрорайона «Северный», г. Ростова-на-Дону. В настоящее время река находится на грани исчезновения. Проанализированы гидрохимические показатели с использованием экспресс-тестов. Проведено сравнение с нормативными требованиями к качеству воды для рыбоводных водоемов. Пробы воды были отобраны в разных точках реки общей протяженностью 2,8 км.

Ключевые слова: река Темерник, экологическое состояние, гидрохимические показатели, рыбоводный водоем, основные загрязнители.

length of the river suggests that in different parts of the city its environmental condition may differ. The study area is characterized by the presence of a large underground source and a wide water plane supported by two dams located at a short distance from each other. The shores of the reservoir are densely populated, there is an outdoor water park, organized recreation areas and the city beach.

The length of the river, where water samples were taken, is about 2.8 km. Four stations were selected for sampling (Fig. 1).



Fig. 1. Sampling points on the Temernik: 1 — area of Surp-Khach spring;
2 — under the bridge on Volkova street; 3 — the area of the dam;
4 — urban area of the beach in front of BSMP before the 2nd dam
(Yandex. Maps)

The most significant for the life of hydrobionts indicators of water were determined.

The concentration of oxygen dissolved in water is one of the main indicators affecting the life of hydrobionts. It is necessary for breathing for all aquatic organisms. Its optimal content is associated with species characteristics. For most fish, sufficient oxygen concentration is at the level of 5-6 mg/l. An important function of oxygen in the reservoir is also determined by its role in the process of mineralization of organic substances.

Hydrogen index (pH) (concentration of free hydrogen ions) in the reservoir is determined mainly by the ratio of free carbon dioxide and bicarbonate. Neutral pH is most favorable for fish. Deviation from these concentrations leads to a decrease in the respiratory intensity of fish. However, resistance to pH depends on the fish species. Thus, pike is tolerant to fluctuations in pH between 4.8 and 8.0; trout — 4.5–9.5; carp — 4.3 to 10.8 units [1].

All nitrogen compounds have a great influence on the production of organic matter in water bodies. Nitrate and ammonia nitrogen are most important in terms of bioproduction. However, the high content of nitrogen compounds in the reservoir can cause poisoning of hydrobionts. The most toxic compounds are ammonium and nitrites.

Phosphorus also has a significant impact on the development of organic life of water bodies. Intensive development of algae occurs at the initial content of mineral phosphorus from 0.08 to 0.32 mg/l. An increase in the phosphate content to several milligrams per liter points, as a rule, to the pollution of the reservoir.

For freshwater fishponds, these indicators should correspond to the values presented in table 1.

Table 1

Requirements to water quality in fishponds (Kozlov V. I., 1998)

Indicators	Optimum values	Permissible vLUEA
Oxygen, mg/l	Not less than 4.0	2.5
Violent reaction (pH)	7.0	6.5–8.0
Ammonium nitrogen (NH_3/NH_4), mg/l	0.5–1.0	1.5
Free ammonia (NH_3), mg/l	0.01	0.07
Nitrites (NO_2), mg/l	0.5–1.5	15.0
Nitrates (NO_3), mg/l	1.0–2.0	30.0
Phosphates (PO_4), mg/l	0.2	2.0

Sampling for the study was carried out on October 20, 2017 at the air temperature of $+6^0\text{ C}$ and water temperature of $+11^0\text{ C}$. These conditions correspond to the end of active vegetation processes in the reservoir and can be further used to compare seasonal changes in water parameters in this area of the Temernik.

Hydrochemical study of samples was carried out using rapid tests of the company "Sera" according to the established methods.

Water samples were taken into the glass bottles with a stopper without fixation. The parameters were determined immediately. The data obtained are presented in table 2.

The data obtained show that the permissible concentrations of nitrate and phosphate compounds are 7.5 and 2 times higher, respectively.

Table 2

Hydrochemical parameters of water of the river Temernik on the study area

NN Station	pH	NO_2 , mg/l	NO_3 , mg/l	NH_3/NH_4 , mg/l	NH_3 , mg/l	PO_4 , mg/l	O_2 , mg/l
1	7.5	0.1	20	1.0	0.006	1.0	0.4
2	8.5	4.0	40	5.0	0.770	1.0	4.0
3	8.0	4.0	40	5.0	0.727	1.0	5.0
4	8.5	4.0	40	5.0	0.770	1.0	3.5

The greatest pollution of the reservoir is with ammonia compounds, and concentration in water of the most toxic form — free ammonia exceeds permissible indicators in fishponds by 11 times.

At the same time, such important hydrochemical parameters as violent reaction and the concentration of dissolved oxygen in water are within the normal limits, except for the oxygen content in the water samples at station 1.

Thus, we can say that in this area of the river Temernik there is a significant pollution with nitrogen and phosphorus compounds. In the area of the outlet of the underground source (station 1)

hydrochemical parameters meet the requirements of the water quality for fishponds (except oxygen). Industrial or private sewage are not noted on this site, but there are several pipes with storm drains. In addition, there is contamination of the reservoir and its shores by household garbage.

Conclusion. Probably, the significant concentrations of nitrogen and phosphorus compounds in the river are primarily associated with the strong overgrowth of the reservoir and the destruction processes of dead plants combined with its weak flowage in the study area.

References

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