



RESULTS OF HYDROCHEMICAL RESEARCH OF THE BLACK SEA BASIN RIVERS

Tea Mchedluri

Iakob Gogebashvili Telavi State University, Georgia. Kartuli University Street 1, Telavi,
Doctor of Biological Sciences. Professor. E-mail: t.mchedluri@yahoo.com

Mirangula Liparteliani

Batumi Shota Rustaveli State University. Georgia, 32/35 Rustaveli/Ninoshvili St, Batumi.
PhD student (Biology). E-mail: mirian.liparteliani@yahoo.com

Neli Goginashvili

Gori State Teaching University, Georgia. 53 Chavchavadze Ave, Gori.1400
Doctor of Agricultural Sciences. E-mail: ne.goginashvili@gmail.com

Article history:		Abstract:
Received	December 30 th 2020	The Black Sea is one of the largest inland continental seas. It can be posed an ecological problem by the rivers that flow into it. Rivers can pollute with large amounts of biogenic substances and various organic pollutants. Therefore, the study of the ecological status of rivers is crucial (<i>Mchedluri., T. 2020</i>) The aim of our research was to determine the ecological status of the sediments of the rivers of the Black Sea basin of Georgia, Natanebi and Choloki. For this purpose, studies were conducted in the summer of 2020 and its hydro-chemical parameters were evaluated. Physico-chemical parameters of water (pH, electrical conductivity, temperature, dissolved oxygen in the water, odor, and turbidity) were determined in the analytical samples. Some heavy metals (Cu, Fe, Zn, Al, Ni, Cr, Mn, As), basic ions (HCO_3^- , Cl^- , Ca^{2+} , Mg^{2+} , Na^+ , K^+ , SO_4^{2-}). Samples were taken, packaged and transported in accordance with ISO and EPA standards. Based on the results of the study, we can conclude that the basic ions in water do not exceed the maximum permissible concentrations. The content of heavy metals in the floating sediments of the river Natanebi is significantly increased compared to the bottom sediments. Presumably, these elements are accumulated in the terrigenous material generated by the washing of the soil surface. The hydro-chemical characteristics of the Natanebi River and the Choloki River are close to each other. In the downstream of the Natanebi River, all the studied features are practically within the background and no obvious ecological problems occur. As for the river Cholokhi, it is possible to show signs of eutrophication in it, which will be caused by natural conditions, due to the gentle flow of the parallel riverbed. At present, the anthropogenic pollution of rivers does not reach dangerous levels and their ecological condition is satisfactory
Accepted:	January 11 th 2021	
Published:	January 30 th 2021	
Keywords: The Black Sea, Hydro-chemical research, the river Natanebi, The river Choloki, Heavy metals		

1.INTRODUCTION:

The Black Sea is a landlocked sea between south-eastern Europe and Asia Minor. It joins the Mediterranean Sea with the Bosphorus Strait and the Marble Sea, and the Sea of Azov with the Kerch Strait. With the growth of the economy and transport infrastructure of the Black Sea countries, the risk of environmental pollution increases. The rivers pose a significant ecological problem to the rivers, which flow into it and carry a large amount of biogenic substances, various types of organic pollutants (oil and its products, pesticides, phenols, resins, etc.). The Black Sea is under a strong anthropogenic load, so the study of marine ecological problems is one of the priorities for the countries of the region, as evidenced by the international conventions and agreements on the protection of the Black Sea, of which Georgia is a member (Representatives of all Black Sea countries signed a strategic plan for the protection of the Black Sea in October 1996). The study of the ecological status of wastewater rivers plays an important role in the study of sources of marine pollution (*Mchedluri., T. 2020*).

Due to this problem, our study aimed at the hydro-chemical study of the rivers of the Black Sea basin of Georgia - Natanebi and Choloki in the summer of 2020.

The Natanebi River, which is the smallest river in the region, originates on the northern slope of the Meskheti Range, at 2548 m above sea level near the peak Sakornia. River with a length of 60 km. and basin area - 657 km, joins the Black Sea near the village of Shekvetili. It feeds on rain, snow and groundwater. The watershed of the river Natanebi is located at the western end of the Adjara-Trialeti fold system [Georgian Soviet Encyclopedia.1997].

The Choloki River is a left tributary of the Natanebi River and originates on the north-western slope of the Meskheti Range. Its length is 29.5 km. The area of the basin is 159 km². It feeds on rain, ground and snow water. It is characterized by floods caused by rains throughout the year, especially in autumn and winter. It joins the Natanebi River near the sea shore. [Georgian Soviet Encyclopedia.1997].

2.RESEARCH METHODS:

Hydro-chemical analyzes are carried out using modern methods that meet and comply with European standards, such as: ion-selective chromatography(ICS-1000) ISO100304-1: 2007), spectral-photometry Specord 205ISO7150-1: 2010;Membrane filtration ISO9308-1, ISO7899-2, Atomic-absorption method-Plasmaemission spectrometer ICP-MS, field portable device Horiba (ISO 6058:1984; ISO6059:1984; ISO 9297:1989)

3.RESULTS AND DISCUSSION:

The object of our research was the rivers of the Black Sea basin - Natanebi and Choloki. The researches were conducted in the summer of 2020. Physico-chemical parameters of water (pH, electrical conductivity, temperature, dissolved oxygen in the water, odor, turbidity) were determined in the analytical samples. Some heavy metals (Cu, Fe, Zn, Al, Ni, Cr, Mn, As), basic ions (HCO₃⁻, Cl⁻, Ca²⁺, Mg²⁺, Na⁺, K⁺, SO₄²⁻). The results of the hydro-chemical study of the rivers are given in Table №1.2. 3.4.

Table 1. Basic hydro-chemical parameters of rivers

Ingredients to be determined	River Natanebi	River Choloki
Sampling time	Summer 2020	
temperature, t ⁰ C	22.3	23.0
Smell, points	1.0	3.0
Turbidity, NTU	3.88	4.5
pH	7.6	7.5
dissolved oxygen. mg / l	7,9	7.4
Electrical conductivity mS/лø	0.130	0.149
BOD ₅ , mg / l	5.45	6.72
mineralization, mg/l	105.0	116.0

Table 2. Content of basic ions in water

Ingredients to be determined	River Natanebi	River Choloki
Sampling time;	Summer 2020	
Hydro carbonate	68.3 mg/l	104.9 mg/l
Chloride	92.9 mg/l	7.1 mg/l
Calcium	15.6 mg/l	12.8 mg/l
Magnesium	10.6 mg/l	8.8 mg/l
Sodium	45.1 mg/l	18.0 mg/l
Calcium	2.9 mg/l	2.3 mg/l
Sulfates	14.0 mg/l	9.6 mg/l
Σi	249.4	163.5

The results of the study showed (Table 1.2) that the oxygen content in river water is satisfactory. Dissolved oxygen content is within the norm (river sediments - 7.9 mg / l, river 7.4 mg / l). BOD₅ in the river Natanebi is - 5.45 mg / l, and in the river Choloki - 6.72 mg / l. Water mineralization - 105 mg / l - 116 mg / l. Concentrations of basic ions (HCO₃⁻, Cl⁻, Ca²⁺, Mg²⁺, Na⁺, K⁺, SO₄²⁻) do not exceed the maximum allowable concentrations

Table 3. Metal content in river bottom sediments

Description	Natanebi	Choloki
Time of taking samples	Summer 2020	
Nickel	82 mg /kg	90 mg /kg
Arsenicum	3.0 mg /kg	1.4 mg /kg
Copper	76 mg /kg	75 mg /kg
Chromium	182.3 mg /kg	210 mg /kg
Zinc	80 mg /kg	90 mg /kg
Iron	5.1%	6.05 %
Manganum	0.080 %	0.120 %
Aluminum	5.80 %	5.75 %

Table 4. Metal content in the floating sediments of the river Natanebi

Description	Natanebi
Time of taking samples	Summer 2020
Nickel	58,8 mg /kg
Copper	158.0 mg /kg
Chromium	320.0 mg /kg
Zinc	160.0 mg /kg
Iron	6.0 %
Manganum	0.278 %

In the floating sediments of the river Natanebi the content of Cu, Zn, Cr, Fe and Mn is significantly increased compared to bottom sediments (Table 4). Presumably, these elements are accumulated in the terrigenous material generated by the washing of the soil surface. The results show that the chemical characteristics of the Natanebi and Choloki rivers, as well as the characteristics of the bottom sediments are close to each other. It can be said that practically all the studied features in the sediment of the downstream of the river Natanebi are within the background and no distinct ecological problems take place. As for the river Cholokhi, it is possible to manifest eutrophication, which will be caused by natural conditions (the parallel bed of the bank flows gently).

4.CONCLUSION:

As a result of our studies, the physical-chemical parameters of the Black Sea Basin Rivers - Natanebi and Choloki, the content of basic ions in the water, the content of metals in the floating sediments and bottom sediments were determined. Based on the results of the study, we can conclude that the basic ions in water (HCO_3^- , Cl^- , Ca^{2+} , Mg^{2+} , Na^+ , K^+ , SO_4^{2-}) do not exceed the maximum allowable concentrations. The content of heavy metals (Cu, Zn, Cr, Fe and Mn) in the sediments of the river Natanebi is significantly increased compared to the bottom sediments. Presumably, these elements are accumulated in the terrigenous material generated by the washing of the soil surface. The hydro-chemical characteristics of the Natanebi River and the Choloki River are close to each other. In the downstream of the Natanebi River, all the studied features are practically within the background and no obvious ecological problems occur. As for the river Cholokhi, it is possible to show signs of eutrophication in it, which will be caused by natural conditions, due to the gentle flow of the parallel bed of the bank.

REFERENCES:

1. Georgian Soviet Encyclopedia, Apkhazava I., Tbilisi, Vol. 11, 1987, p. 146
2. Mchedluri, T. „RESULTS OF ECOLOGICAL RESEARCH OF THE BLACK SEA (ADJARA TERRITORY) BASIN RIVERS“. International Conference. August 20, 2020. San Francisco, California, USA
3. Mchedluri, T. (2012). Hydrobiology. Telavi
4. Mchedluri, T. (2009). Monitoring and bioindication of processes of microbe self clearing of open water bodies of Eastern Georgia. Tbilisi.Universal.
5. ISO 6058:1984 – ISO 6058:1984. Water quality – Determination of calcium content-EDTA titrimetric method.
6. ISO 6059:1984 –ISO 6059:1984. Water quality – Determination of the sum of calcium and magnesium –EDTA titrimetric method.
7. ISO 9297:1989 – ISO 9297:1989. Water quality – Determination of chloride - Silver nitrate titration with chromate indicator (Mohr's method).

8. Common Implementation Strategy for the Water Framework Directive (2000/60/EC), Guidance Document No 2, IDENTIFICATION OF WATER BODIES.
9. European Union Water Framework Directive (2000/60/EC)