



REVIEW ARTICLE

DETERMING THE PHOSPHATES IN THE LITORAL AREA OF LAKE OHRID

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ABSTRACT

Ecological system depends on every link in the food chain. Last decades the majority of surface water is preserved into canals or collectors of waste water from urban environments. Phosphates and nitrates from artificial fertilizers, different detergents in large amounts reach the surface water and may change the ecological system, which cause the appearance of new types of algae and other aquatic plants. This phenomenon is an indicator of water pollution with phosphates. Object of study of our paper was to define the quantity of phosphates in the water of Lake Ohrid. For this purpose we have made determinations in three sample: Peshtan locality, in the beach of Ohrid and the location near the town of Struga - Kalishta. Phosphates were analyzed by the SF Method UV - VIS-type DR / 2000 Hatch - Lange.

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INTRODUCTION

In the planet, nature has not given the perfect environment to human kind. Unlike other creatures, man does not fit and does not obey nature, but adjusts nature to himself. Such behavior is dangerous to mankind because it destroys the foundations of nature over which the social system develops.¹ To raise the welfare of life, economic development is needed. The last one depends on the industry development, energetic, metallurgy, processing technology etc. These developments carry with them the very negative consequences regarding the environment. Therefore, the need to undertake in terms of protecting the environment from their effects, without slowing economic growth, namely the achievement of balance between economic development and environmental.²

Lake Ohrid

It is located in Southeastern Europe, between Albania and Macedonia. Lake Ohrid is characterized by a rich biodiversity, which is the result of very old age, approximately two to three million years.³ Lake Ohrid is the largest and deepest lake in the group of Desaret Lakes in the Aegean area. According Stanković, is "living fossil museum" and provides a living environment for many sweet water organisms that in the Balkan Peninsula and Central Europe can be found only in fossil form. There should be special care for the fact that the enrichment of nutrients in water will accelerate the ongoing eutrophication of this lake. Eutrophication is the proces of enriching water with nutrients, resulting in increased primary production, actually the reproduction of aquatic plants. This may adversely affect the utilization of water resources for other purposes.

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Great poliferation of aquatic plants results in increased composition of organic materials that dissolve under the influence of bacteria producing bad smell, spending oxygen and affecting the growth of other types of aquatic organisms.⁴

Context

Phosphates are very important ions, which on land and in water appears in different organic and inorganic forms. Terms of its use by living organisms, one of the most important is ortophosphorus (PO_4^{3-}) which is formed during the oxidation process of mineralization of organic substances containing phosphorus.⁵ Phosphate ions on land are very little movable, because of the powerful absorb in iron oxides and hydroxide, aluminium, magnesium, clay particles and with ions of calcium give calcium phosphate.⁶ As a nutrient, phosphorus is an important biogenic element, the fact that it plays a special role in biological metabolism and its quantity is limited to the hydrosphere. Natural content of phosphorus in. pure water systems oscillates at values less than $25 \mu\text{g}/\text{dm}^3$ due to human activity these concentrations are greater than $50 \mu\text{g}/\text{dm}^3$.⁷

Experimental Engagement Material Gathering and Working Methods

To have a clearer picture regarding the state of Lake Ohrid analysis of phosphate have been made in the location of Peshtan, in the city beach of Ohrid and in the locality Kalisht - near the City Struga. Phosphates were analyzed by SUV-VIS method, DR/2000 hatch-lange type.

DISCUSSION OF THE RESULTS

Obtained results indicate that Lake Ohrid in the proces of eutrophication is enriched with nutrient in the last century. However,

¹ Ecologija I, University of Split, Mrčelić Sliskovic & Jelic, lectures, material taken from the internet, www.pomorski.fakultet.unizg.hr

² Is Anthropogenic Nutrient Input Jeopardizing Unique Lake Ohrid? Mass Flux Analysis and Management Consequences- Diss.ETH no.16390 by Andreas Matzinger.

³ Suzana Aliu, Environmental pollution of Ohrid Lake – Toxicological parameters in food chain. Lambert Publishing Book, Germany, 2010.

⁴ Limnological Investigations of Ohrid and Prespa Lakes, vol 3 & 4 – Hydrobiological Institute, Ohrid 2005.

⁵ T.Naumovski, phosphoric load of Ohrid Lake us.Dokt.Diser.Univ."St Kiril and Methodius", biology institution PMF, Skopje 2000. p.1-37

⁶ Nexhat Daci, Environmental Chemistry, Pristina 1998

⁷ Donald A.Quarries and Peter A.Mc Rock, General Chemistry called Audition 1991

Image of parts of Lake Ohrid



Locality of Pestani



Locality of Kalista Beach



Ohrid City



Struga City



Image of dirty parts of Lake Ohrid



EXPERIMENTAL RESULTS

Achieved results are presented in charts / graphics as follows:

Table 1. Concentration of phosphate in the location Peshtan¹¹

Month	Absorbance	Concentration of the PO_4^{3-} / mg dm^{-3}
June	0.036	0.016
July	0.040	0.020
August	0.038	0.017
September	0.028	0.009

Table 2. Concentration of phosphate in the city beach of Ohrid¹¹

Month	Absorbance	Concentration of the PO_4^{3-} / mg dm^{-3}
June	0.031	0.011
July	0.035	0.015
August	0.040	0.020
September	0.040	0.020

Table 3. Concentration of phosphate in the locality Kalisht¹¹

Month	Absorbance	Concentration of the PO_4^{3-} / mg dm^{-3}
June	0.035	0.015
July	0.040	0.020
August	0.030	0.010
September	0.040	0.020

Table 4. Classification of the quality of aquatic ecosystems by UNECE compared with phosphates (content in $\mu\text{g}/\text{dm}^3$).⁸

Category	P total
Quality I	< 10
Quality II	10 - 25
Quality III	25 - 50
Quality IV	50 - 125
Quality V	> 125

⁸Ivan Filipovic, Stjepan Lipanović, the General and Inorganic Chemistry, school book, Zagreb 1987, pp.353-359

To have better visual access the following results are presented in figures form

The presentation of Charts

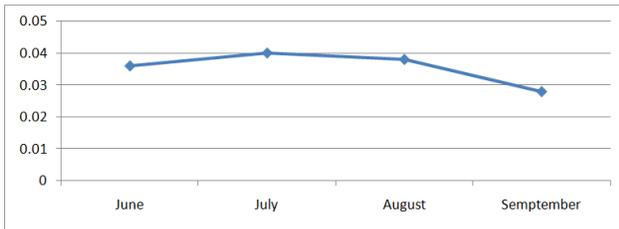


Chart.1 - Concentration of phosphate in the location Peshtan ¹¹

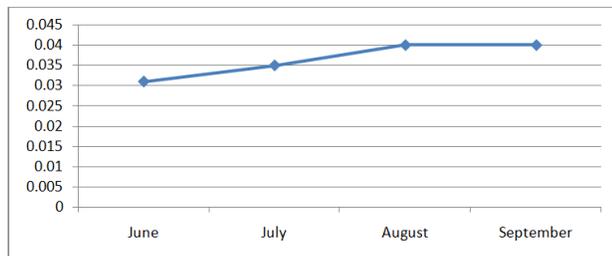


Chart.2 - Concentration of phosphate in the city beach of Ohrid¹¹

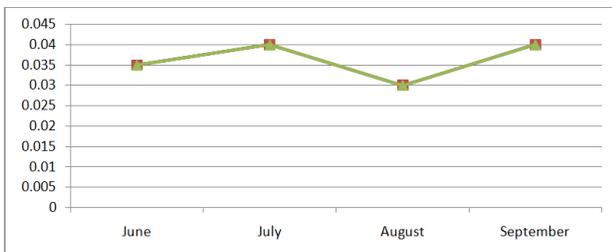


Chart.3 - Concentration of phosphate in the Locality Kalisht¹¹

Lake Ohrid is oligotrophic system, contains small amounts of phosphorus. The results range from 8 to 1500 µg/l. Based on simulated results, the addition of P in Lake Ohrid leads to higher productivity in the lake, and as a consequence we have a higher influx of sedimentation and mineralization of the lake. Both these processes are subsequently reducing the amount of oxygen in the deep waters of the lake. If the air temperature increases for 4°C in the next century, as predicted, the amount of P should be reduced by 50%, to have enough oxygen for the fauna that develops at the bottom of the lake. It should be noted that the highest phosphate concentration value in the lake belongs to littoral part of its range from 8 to 42 µg/dm³ to the part where River Sateska flows into the Lake Ohrid and generally in places where other rivers (Velgoska, Koselska) flow into the lake; and at points where water flows from Lake Prespa, as the water of Lake Prespa contains about 7 times more phosphate than the water of Lake Ohrid.

The highest concentration recorded in the River Black Drin, at the entrance of river water at the collector, while 825 µg/dm³ into the collector; about 1500 µg/dm³ output. According to the Economic Commission for Europe United Nations (UNECE) waters are classified depending on the amount of phosphates contained as in the table below.

Conclusions

This paper will be a contribution towards the provision of information on the current situation in the lake Ohrid on the concentration of phosphates in it, and the presence of phosphorus as a nutrient, which together with other nutrients pollute the water environment in this lake. Greater presence of nutrients such as phosphorus, nitrogen etc; contribute greatly disrupting the food chain in this environment, the fact that they stimulate proliferation of algae, because they are food for them. Algae, while they feed on the above nutrients, multiply too. When they waste their food, they die and this leads to their massive peg out to the bottom of the lake. These remains are hosts of bacteria. In the process of their destruction by bacteria, oxygen is spent in the depths of the lake where other types of flora and fauna in the lake die. So it comes to the disruption of the aquatic eco – system, namely the Lake Ohrid. Results show that the concentration of phosphates in the pool waters of Lake Ohrid is small. In some sample sites is higher than the first category of waters. Therefore we think that rigorous measures should be taken for protection from this phenomenon that leads to eutrophication of Lake Ohrid.

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