

Investigation of nutrient release from pore water of Küçükçekmece Lake sediment (Istanbul)

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Introduction: Conservation of biological diversity and ensuring the sustainability of natural resources are very important for the future of our world. Gradual reduction and pollution of water sources threaten natural life. Küçükçekmece Lake and Basin are adversely affected in this respect. However, Küçükçekmece Lake is a surface water source for various purposes, a wetland of international importance, a shelter and feeding area for large number of water birds, and a lagoon rich in biodiversity [1]. But, growing industrialization, settlements lacking basic infrastructure and uncontrolled discharge of wastewater in the region greatly influence the lake. As a result of discharge of untreated industrial and domestic wastewater into the lake or the streams feeding the lake, pollution load of Küçükçekmece Lake elevates continuously. With the accumulation of pollutants not only in the water body but also in the lake sediment, the sustainability of the lake is adversely affected [2].

The aim of this study is to determine dissolved nutrients in the sediment pore water and release of them to the surface water of Küçükçekmece Lake and to evaluate the results statistically.

Methods: Samples were taken with a corer on a monthly basis from October 2006 to February 2008 in four stations. To obtain pore water, sludge samples were split into layers of 0-2 cm, 2-5 cm, 5-10 cm and 10-15 cm which were in turn put into the bags. Then, the samples were brought to the laboratory in the ice box. Pore water extraction was carried out by centrifugation. pH and redox potential were measured immediately. Extracted pore water was filtered through GF/C filter for nutrient analysis. To measure sediment nutrient release, lake water taken from 1 cm, 5 cm and 10 cm above the sediment and distilled water were added to core samples which were filtered and analysed for nutrient after 4 hours and 12 hours. Nutrient release was calculated according to Aller and Benninger (1981) [3]. Relationships of the stations and nutrients with each other and the differences were assessed by ANOVA and Correlation analysis.

Results: The data from pore water showed that the mean Total Nitrogen (TN) value was 102.52 mg l⁻¹,

and the mean Total Phosphorus (TP) value was 2.63 mg l⁻¹.

When differences between the whole sediment column and the stations were examined, no differences were observed in pH, redox potential and nitrite values among the stations, while significant differences were found in values of nitrate, Total Nitrogen, SRP, Total Phosphorus and Total Carbon between the station 1 and the others (<0.05).

From *in situ* measurements of core samples, the values of lake surface water were as follows: mean TN was 28.46 mg l⁻¹, and mean TP was 3.15 mg l⁻¹. On the other hand, laboratory measurements indicated mean values of 12.77 mg l⁻¹ and 1.18 mg l⁻¹ for TN and TP, respectively.

According to these results, there are important differences between nutrient levels of the deep station and the costal stations in the lake, although laboratory results show no significant differences (<0.05).

Discussion: The results obtained suggest that nutrient load is extremely high in the lake sediment, and it is estimated that significant amounts of nutrients are released to the lake. In deep and anoxic station, both amount of nutrients which are transferred from the sediment into pore water and nutrient release are higher in comparison with costal stations. These results indicate that without any external nutrient inputs, only lake sediment is an important resource for the excessive algal blooms in Küçükçekmece Lake.

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[2] Altun et al (2008). *Environmental Monitorin and Assessment*, 151 (1-4): 345 – 362

[3] Aller, R. C., Benninger, L. K., (1981) *Journal of Marine Research*, 39 (2), 295 – 314