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ASSESSMENT OF WATER AND SEDIMENTS QUALITY FROM BRATENI LAKE, BISTRITA NASAUD COUNTY

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Abstract

This article presents a study about sediments and water qualityof Brăteni Lake. This lake is generally used for fishing and leisure. The lands that are close to the lake had been previously used for intensive agriculture. Six surface sediment samples and six surface water samples were collected from three representative points from Brăteni Lake, during two seasons (autumn 2015 and winter 2016). The sediments and water samples were analyzed using a portable multiparameter (WTW Multi 350i). Each sample was analyzed for: total dissolved solids, electrical conductivity, oxido-reduction potential, salinity and pH. Due to the allochtonous materials used in the construction of the dam, the sediment samples collected from near the dam had different parameter values.

Key words*: Brateni Lake, physico-chemical parameters, sediments,water.*

INTRODUCTION

Brateni Lake is located near the Brateni village from Bistrita-Nasaud county.The lake is located in the Transylvanian plain, in an intensive exploited agricultural area. Lands near the lake are used for agriculture: cereal and fodder crops or pasture. Currently the lake is used for fishing and leisure. In the near future, the lake could be an excellent source for irrigating . Due to the intensive agriculture in the study area there were used largequantities of pesticides and chemical fertilizers. Nutrient losses from agriculture are a major constituent of diffuse water pollution (Zhang, 2015). Water pollution from agriculture can affect the ecosystem and causes losses for aquaculture and fisheries (Smith,2015).

MATERIALS AND METHODS

Study area

The investigated water body (Brateni Lake) is approximately 25 hectares. The lake is anthropic, water is retained with one dam, with a length of 176 m.Brăteni Lake is not particularly deep, in only some points it exceeded 2.5 m depth. The geographical coordinates are: latitude of 46 ° 54'25.81 "N and longitude of 24 ° 23'31.91" E. The area is characterized by a moderate continental climate with an annual average temperature of 8.5 degrees C and rainfall between 550 - 650 mm / year.

Geological characteristics

From geologically point of view the area is characterized of Bessarabian and Volhynian floors in Transylvan Plain with strong marl in alternating with sand concretions and sandstone slabs. Near the surface, lithology becomes more sandy and sometimes contains intercalations of conglomerates and tuffs (Szilagy I., 2015).

RESULTS AND DISCUSSIONS

Methodology

Water and sediment samples were collected in November 2015 and February 2016. The samples were collected from 3 different points according to Fig. 1. Sediment samples were collected with stainless steel instruments and

subsequently placed in polyethylene bags.Each sample was between 300 and 500 grams of sediment.Water samples were collected in plastic containers, each containing 500 ml of water. Using a portable multiparameterWTW Multi 350i the collected water samples were analyzed *in situ*, for physico-chemical parameters like pH, total dissolved solids, electrical conductivity, oxido-reduction potential and salinity.At the beginning the sediment samples were air dried in laboratory and after that in a suspension of soil: deionized water of 1:5 v:v ratio were determined the physico-chemical parameters such pH, total dissolved solids, electrical conductivity, oxido-reduction potential and salinity using the same portable multiparameter WTW Multi 350i as in the case of water samples.The device was calibrated using standard solutions before each determination.

Figure. 1. Study area with sampling points

Table 1. Sampling points description

SAMPLING POINTS	DESCRIPTION
P 1.1 A	**SAMPLING POINT ONE FROM FIRST SET, WATER**
P 2.1 A	**SAMPLING POINT TWO FROM FIRST SET, WATER**
P 3.1 A	**SAMPLING POINT THREE FROM FIRST SET, WATER**
P 1.2 A	**SAMPLING POINT ONE FROM SECOND SET, WATER**

P 2.2 A	**SAMPLING POINT TWO FROM SECOND SET, WATER**
P 3.2 A	**SAMPLING POINT THREE FROM SECOND SET, WATER**
P 1.1 N	**SAMPLING POINT ONE FROM FIRST SET, SEDIMENT**
P 2.1 N	**SAMPLING POINT TWO FROM FIRST SET, SEDIMENT**
P 3.1 N	**SAMPLING POINT THREE FROM FIRST SET, SEDIMENT**
P 1.2 N	**SAMPLING POINT ONE FROM SECOND SET, SEDIMENT**
P 2.2 N	**SAMPLING POINT TWO FROM SECOND SET, SEDIMENT**
P 3.2 N	**SAMPLING POINT THREE FROM SECOND SET, SEDIMENT**

RESULTS AND DISCUSSIONS

The data generated from water and sediment analysis is presented in the charts below. In Romania sediment there is no specific legislation which set the maximum admisible limits in terms of physico-chemical paramaters.

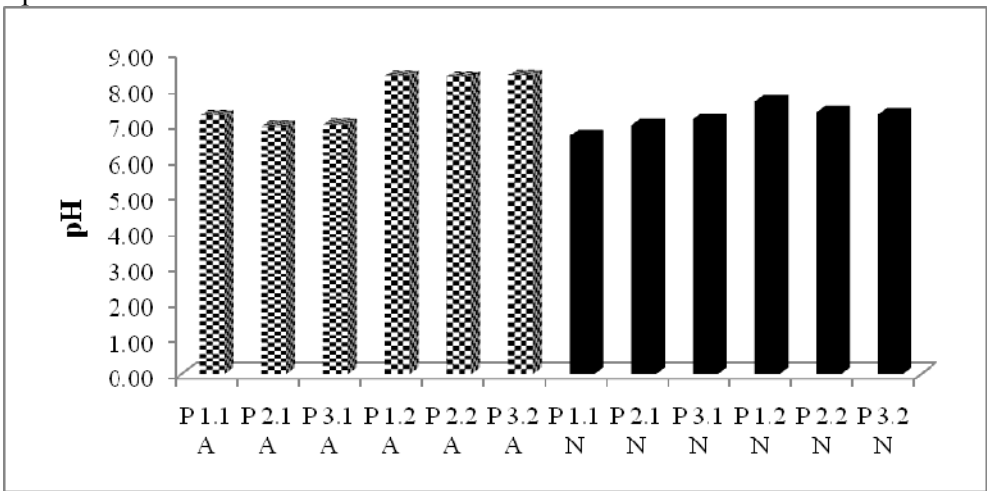

Figure 2. pH values depending on the sampling point (A-water, N-sediment)

In Figure 2 a neutral pH can be observed. Only the second set of water samples is slightly basic, pH values exceeding 8 pH units. A direct proportional correlation between the samples of water and sediment can be observed, but a perfect proportionality cannot be considered.

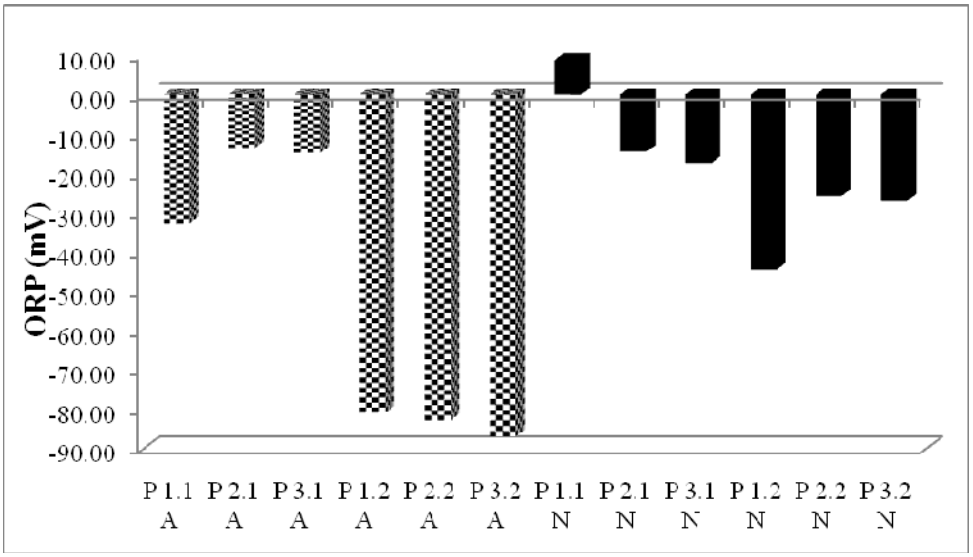

Figure 3. ORP values depending on the sampling point (A-water, N-sediment)

For the second sample set, high values of the oxido-reduction potential were determined. For all three sampling points the ORP values are over -80 mV. For the first set of water samples, only one sampling point had a value close to -40 mV, the other sampling points having lower values. For the sediment samples negative values of the ORP were recorded, with the exception of sample P 1.1 N.

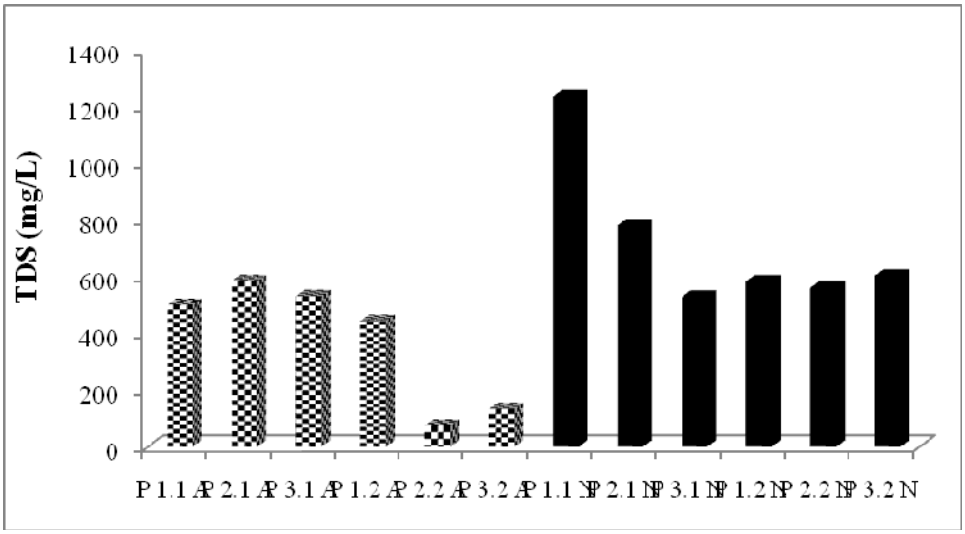

Figure 4. TDS values depending on the sampling point (A – surface water, N-sediment)

For TDS it is observed that sediment samples have higher values compared with water samples. Although the samples are taken from the same points and the same day, with the exception of sediment sample P1.1 N which has a higher value compared to all samples collected in both sampling campaigns.

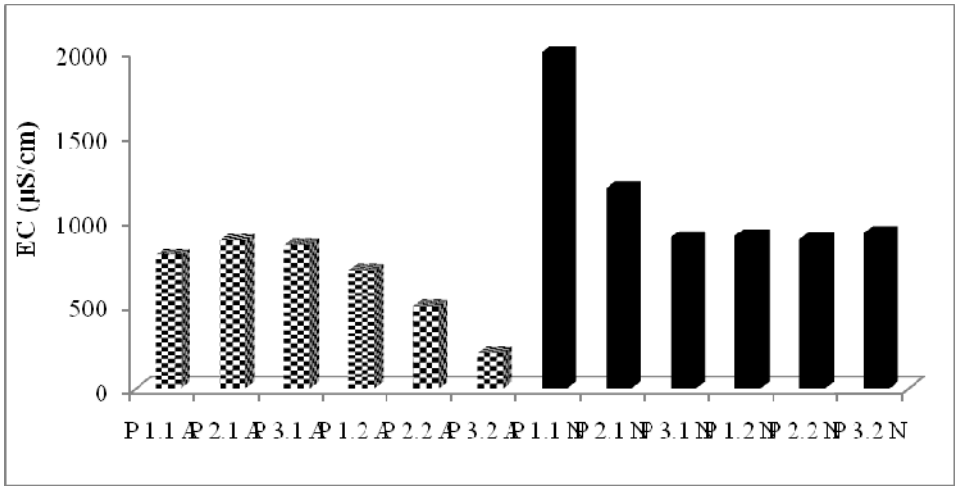

Figure 5. EC values depending on the sampling point (A-water, N-sediment)

In Romania there is not a maximum permissible limit for electrical conductivity regarding the surface water and the sediment. A linear trend can be observed with the exception of sediment sample P1.1 N (wich has a higher value than all other samples, nearly 2,000 µS/cm) and water sample P3.2 A (wich decreases the posibility of a linearity having a considerably lower value compared to all other samples, a value of 211 µS/cm).

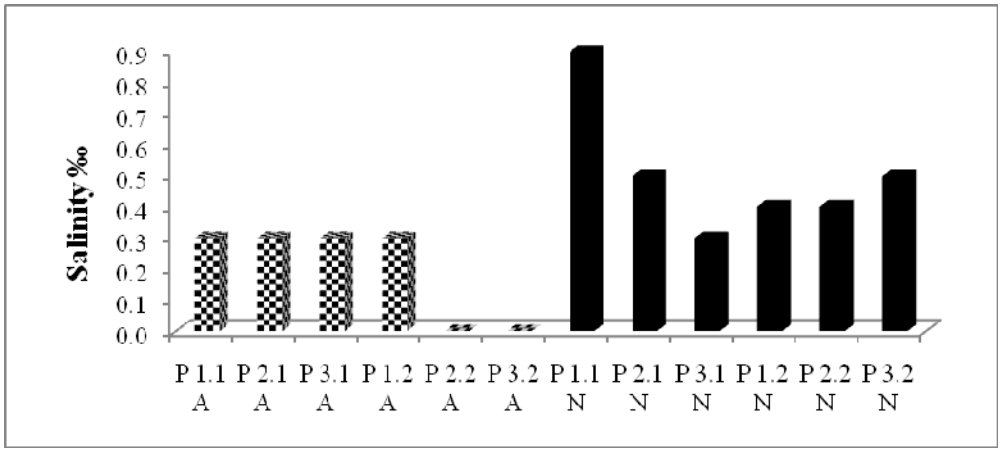

Figure 6. Salinity values depending on the sampling point (A-water, N-sediment)

In terms of salinity values the water samples do not exceed the value of 0.3 ‰. For sediment samples the salinity values were ranged between of 0.3 ‰ and 0.5 ‰. The only sample with a high salinity is sediment sample P1.1 N which had a value of 0.9 ‰, more than 20 % comparative with water sample P3.1 N.

CONCLUSIONS

Sediment sample values did not reach levels that should be of concern, with the highest values recorded of sediment sample P1.1N (with 1995 µS/cm for electro-conductivity and 1237 mg/l for TDS). The ORP value of this sample had a value of 8,8 mV. The different values of this sediment sample compared to the other sediment samples can be due the location of the sample collection point (P1.1N), near the dam. The difference of these values can be attributed to the allohtonous materials used in the construction of the dam. The value of the pH for this sample was also different, having recorded 6.5 units of pH. The water samples had normal parameter values and no major fluctuations were recorded. For the second water sample set (P1.2A, P2.2A and P3.2A) the values of TDS, electro-conductivity and salinity are slightly lower. This fact can be attributed to the decrese in ambient temperature and the freezing of the lake, meaning that in the upper part of the lake the

water is almost purest (distilled). In order to fully understand the fluctuations and interdependence of the parameters, we will continue this study, collecting sample (in all points) for the two other seasons and moreover, we will add supplementary analysis procedures for determining anions and cations in the water samples. Another aspect that must be monitored is heavy metal concentration in the collected samples.

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SECTION 05
CADASTRE