FISH AND OTHER SPECIES WERE PERISHED FOR SOILING AND ECONOMY CLEARING IN TISZA RIVER AT LATEST DECADES

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Abstract
Water pollution and remediation options for multi-source contaminations in freshwaters are happening sometimes, particularly in River Tisza after the cyanide and heavy metals spills of Romanian origin in 2000. The eco-toxicological effects, degradation and bioaccumulation rates of heavy metals have been followed in the next two years. Here the aim was to follow the bioremediation program and present the renewed economy of River Tisza. High concentration of arsenic, lead, mercury and cadmium was measured in the periphython and sediments samples both of the Rivers Tisza and Szamos. International rehabilitation program was planned and accomplished. Here we demonstrate the renewed economy of Tisza with living flora and fauna after 20 years, and the birth of day of May-fly again.

Introduction

Water pollution and remediation options for multi-source contaminations in fresh-waters are happening sometimes, particularly in River Tisza after the cyanide and heavy metals spills of Romanian origin in 2000. Chronic eco-toxicological effects, degradation and bioaccumulation rates of heavy metals have been followed in the next two years.

Changes in the composition of the phytoplankton are also in support of the affect that the algae do not only utilize mineral salts but also amino acids, carbohydrates, vitamins of decomposing organic materials as well as plant hormones. This should be also considered when establishing the indicator value of algae. Saprophytes and trophity are mutually related not only because the organic materials producing saprophytes increase trophity, but also because the algae are able to directly incorporate some of the organic materials. Mixotrophy can also exhibit differences within species [1].

Periphyton plays role in bio-accumulation. Furthermore, its suitability in bioindication biological monitoring is also applied. This is an essential nutrient source for the zoo-organisms, *i.e.* for the animals of other heterotrophic communities, such as some fish. In the Körtvélyes and Mártély backwaters of the River *Tisza* the alga flora have been studied from 1940 and 1982 sezonaly because the *alga* population changed. Periphyton is a complex of organisms that produce organic material and oxygen by binding light energy and taking up inorganic plant nutrients. Periphyton plays a bioaccumulation role, as well as on its suitability for bioindication and applied in biological monitoring. This is an essential nutrient source for the zoo-organisms, *i.e.* for the animals of other heterotrophic communities, such as some fish.

The littoral zone of Tisza and Szamos, as a transitional region between watercourses and lands, had remarkable conservational and environmental significance too. In the Körtvélyes and Mártély backwaters of the Tisza *River,* the alga flora has been studied from 1940 and 1982 seasonally because the alga population changed but also the fauna. Periphyton is a complex of organisms that produce organic material and oxygen by binding light energy and taking up inorganic plant nutrients.

In this work our aim was to follow the bioremediation program and present the renewed economy of River Tisza with living flora and fauna after 20 years. Furthermore we are looking into the data given on the results of eco-toxicological tests from sediment and water samples nowadays.

Results

Here we demonstrate the renewed economy of *Tisza* with living flora and fauna after 20 years. International rehabilitation program was planned and accomplished. They monitored several contamination effects where the aquatic ecosystem was considered of top priority. High concentration of arsenic, lead, mercury and cadmium was measured in the periphython and sediments samples both of the Rivers Tisza and Szamos. We also followed the birth of May-fly from the bridge in Szeged again (Figure 1 and 2).

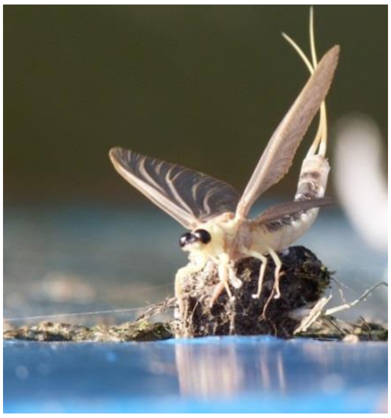

Figure 1: The birth of day, May-fly (*Palingenia longicauda L.)* in Szeged, 2011.

Some metals, hormones or their derivatives can serve as a stress pollution causing disaster in the rivers. After the disaster of Tisza River it was monitored several contamination effects where the aquatic ecosystem was considered of top priority. The littoral zone of Tisza and Szamos, as a transitional region between watercourses and lands, had remarkable conservational and environmental significance too. 17beta-Estradiol (E2) and 17alpha-ethinyl estradiol (EE2), which are environmental estrogens, have been determined with LC-MS in fresh water [2]. Their sensitive analysis needs derivatization and therefore it is very hard to achieve in multiresidue screening. Samples were analyzed from all the large and a few small rivers (River Danube, Drava, Mur, Sava, Tisza, and Zala) of the Carpathian Basin and from Lake Balaton in Hungary. Average levels of E2 and EE2 were 0.61 and 0.084 ng/L, respectively, in rivers, and Lake Balaton together (without city canal water). EE2 was less abundant, but it was still present in almost all of the samples.

Figure 2: The Tisza River at 2018.

The contamination of heavy metals was measured by Sakan et al. [3] in the sediments taken from the Tisza River and its tributaries. The chemical fractionation of Ni, Cu, Zn, Cr, Pb, Fe, and Mn, carried out by using the modified Tessier method, points to different substrates and binding mechanisms of Cu, Zn and Pb in sediments of the tributaries and sediments of the Tisza River. The calculated enrichment factors (EF) indicated that metal contamination (Cu, Pb, Zn and Cr) was recorded in the sediments of the Tisza River, while no indications of pollution were detected in the tributaries of the Tisza River and the surrounding pools. The maximum values of the EF were close to 6 for Cu and Pb and close to 4.5 for Zn (moderate enrichment). [4] The final conclusion is that the contamination of the Tisza River from the mining area in Northern Romania has been continuous and is still ongoing.

The elements were measured using microwave plasma-atomic emission spectrometry (MP-AES): Cu, Cr, Ba, Fe, Mn, Pb, Sr, and Zn by Balogh et al. [5] Among the oxbows studied, one was a protected oxbow, three were used for fishing, and one was contaminated with sewage. Our results indicated that the year of contamination is still observable in the vertical profile of the sediment cores. In the case of Cu, Pb, and Zn, the contamination which originated in year 2000 was detected in the layers of the sediment cores. The contamination levels of Cu, Pb, and Zn were high or moderate in the studied oxbows. All oxbows were moderately contaminated by Mn, and for Fe in the protected oxbow, one fishing oxbow, and the sewage-contaminated oxbow. In the fishing oxbows, a low level of was found for Fe and Sr. The level of Sr was low in the protected oxbow. The pollution index scores indicated that the contamination level for Ba and Cr was low in the sediment cores of the oxbows. These results indicated that the contamination of the Tisza River from the mining area in Northern Romania has been continuous and is still ongoing [6].

Nowadays we have a possibility using new insight into the biological and physiological cellular responses to arousal stress.

In the beach of river pollutants, arousal stress can significantly modify the antioxidative defense system (AOS) response of hibernators during recovery from hibernation (i.e., frogs, in spring). Prokić et al. [7] have determined the relationship between seasonal variations of accumulated metals and AOS parameters in the skin and muscle of two frog species from the *Pelophylax esculentus* complex (*P. ridibundus and P. esculentus*) inhabiting two localities (the Danube-Tisza-Danube canal and the Ponjavica River) with different levels of pollution during pre- and post-hibernation periods, respectively, in autumn and spring. The results showed that even though there were differences in the concentrations of accumulated metals and antioxidative defense system, the AOS parameters of localities and species, the frogs displayed the same patterns of AOS variations during seasons, with a higher AOS response observed in spring. The parameters, *i.e.* SH groups, GSH, GR and SOD had contributed most rather than others. This indicates that the oxidative stress during the post-hibernation period was mainly caused by the organisms' recovery from hibernation, and the accumulated metals did not significantly modify the AOS response. Besides Hungarian resources, significant amount of support was received from foreign countries to recover the flora and fauna, from algae through higher animals, of a living river.

Conclusion

The cleanness of *Tisza River* is satisfying momentary because after 10 and 20 years of the disaster as shown by most of the species of flora and fauna as indicators of living river. The more thorough study of the backwaters of the River Tisza is ongoing. It would be more useful to compare the phytoplankton of the backwaters of the Tisza with plants, one another, with that of the river itself.. In the latest years several studies have been conducted to investigate the state of the River Tisza. Scientist evaluated background values which may affect assessing the anthropogenic heavy metal pollution in sediments from Tisza River in Serbia. This paper is underlining the significance of the *River Tisza* in our life. This is maybe the same situation in the area of Szeged and Csongrad county sides in Hungary too.

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