

ABSTRACT

To determine anthropogenic load of the Bílina river ecosystem we monitored concentrations of selected heavy metals (As, Cd, Hg, Pb, V, Zn) and specific organic substances (PAH, PCB, HCH, HCB, DDT) in three different matrices: surface water, biofilms and sediments. In the longitudinal profile of the river, four sampling profiles were determined (B1 – B4), mapping different parts of the river. The monitoring took place from 2005 to 2008. Concentrations of the substances monitored in surface water showed a decrease in load compared to the values from ten years ago. The concentrations found in surface water showed clear tendency of pollution in the longitudinal profile; the load increased downstream and profiles B3 and B4 mid- and downstream had the highest concentration. In the case of some concentrations of substances in surface water there is a trend of the majority of values being below the detection limit by the given methods of analysis. This shows a decrease of load in the river but the positive trend was invalidated by variations in maximum concentrations. Even though these variations were rare and short-term the concentration values were often extremely high (Hg, sum of PAH and DDT), which can have major negative impact on how the ecosystem functions. Such concentration values can significantly damage the ecosystem.

During the monitoring the concentrations of the monitored substance in biofilms and sediments was found that the concentrations detected in these matrices were three to six times higher. The highest accumulation capabilities were found in specific organic substances (HCB, sum of DDT). In some pollutants, I detected dependency in the concentrations in biofilms and sediments (Cd, Hg, sum of PCB, sum of DDT, strong dependency for V), and for vanadium in the concentrations in surface water and both solid matrices. The results of the monitoring of the solid matrix contamination have also pointed out higher load mid- and downstream (profiles B3 and B4). The monitoring of vanadium led to interesting results: seasonal concentration variability due to the stream overgrowing with macrophytes (*Potamogeton pectinatus*). Concentrations of substances in biofilms and sediments were also influenced by one-off variations of maximum concentrations that endanger the functioning of the river ecosystem. For some concentrations there was a sudden increase in relation to the existence of point sources of pollution in the sampling area. These trends were found primarily for V, Hg, HCB and the sum of DDT where there were higher concentrations in the B3 (V) and the B4 (Hg, HCB, sum of DDT) profile.

Therefore, on the basis of the measurement of contamination of solid matrices we can consider the load of the stream for heavy metals (As, Pb, Zn) as medium, with varying concentrations in the longitudinal profile and with a higher load for mercury mid- and downstream. The opposite concentration trend where the highest concentrations were found in the first, B1 profile due to natural resources (geological environment) was found for cadmium. The load by specific organic substances is highest for PCB (throughout the whole profile) and for HCB and the sum of DDT (the load is clearly concentrated in the B4 profile). Because the maximum concentration of the monitored substances is concentrated mainly in the downstream B4, profile the Bílina river (even though not important in terms of water content) negatively influences the Elbe river due to its contamination by pollutants (especially Hg, HCB, metabolites and DDT and HCH isomers).

On the basis of the monitoring performed, biofilms were evaluated and chosen as suitable matrices for the monitoring of the contamination of the river ecosystem. The following standardisation recommendations for biofilm sampling were formulated:

- Sample biofilms from various available surfaces in the monitored profile (taking into account their proportional representation);
- Sample biofilms of similar macroscopic appearance;

- Take into account the changes in biofilm composition when using samples from different seasons of the year.

In this thesis we sampled biofilms of gelatinous consistency and brown colour. Such biofilms were easy to find in the winter. In the summer we had to avoid sampling from bright places with high green algae content. Microscopic observation of the composition of the collected biofilms revealed that more than half of each sample was made of diatoms (*Bacillariophyceae*). Due to this finding we can note that the concentrations of the monitored substances in biofilms reflect the situation in the river and are not affected by the qualitative composition of the biofilm.

Generally, the results of the monitoring of all matrices show that even though there has been a significant decrease in contamination of the Bílina river the ecosystem remains heavily loaded. There is a considerable concentration of the monitored substances in solid matrices (biofilms, sediments). The most important contaminants are the following: Hg, V, PCB, PAH, HCH, HCB and DDT (including metabolites). The profiles that are loaded the most are the B3 profile in the town of Želenice and the downstream B4 profile in the city of Ústí nad Labem.