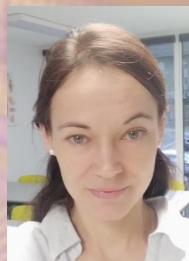


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BENTHIC DIATOMS AS INDICATOR OF ENVIRONMENTAL IMPACT OF WETLAND+® TECHNOLOGY FOR TREATMENT OF HCH-CONTAMINATED WATER

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10µm



Introduction

The Wetland+[®] demonstration prototype
put in operation in September 2021



The use of diatoms as bioindicators:

Diatoms are used to assess organic and nutrient pollution for a practical evaluation of water quality

The European Water Framework Directive (2000/60/EC) requires evaluation of water quality in rivers in EU countries and the ecological state of rivers in the EU is also evaluated by using benthic diatoms

Benthic diatoms are used **as indicators** of the environmental impact of Wetland +[®] on the water environment



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Introduction

Phytobenthos are microscopic and macroscopic algae that live attached to submerge objects and substrates

The major group of phytobenthos are benthic diatoms, microscopic unicellular algae (*Bacillariophyceae*), which are common in almost all types of water

They are sensitive to various environmental factors (light, temperature, current speed, oxygen content, pH, salinity, nutrient and organic matter concentration, pollution with toxic substances)



very **good bioindicators** of changes in the local environment



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Introduction

EVALUATION OF WATER QUALITY

physicochemical examination (A) detects water quality only at the time of measurement

phytobenthos analysis (B) assesses water quality in the longer term





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Methods

Phytobenthos samples were surveyed along the Ostrovský Creek (the recipient of HCH-contaminated leachate) in August 2021 and 2022 and in the Wetland+® in August 2022

The uncontaminated tributary of the Ostrovský Creek was chosen as the Reference Creek, sampled only in 2021





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Methods

Samples were taken from submerged stones and various surfaces (submerged plants, leaves, and branches of trees and shrubs) and from the mud surface layer with fine detritus



brushing the upper surfaces

The determination of the diatom species was processed by light microscopy using standard European methods

The relative abundance of diatoms (the proportional representation of different diatom taxa within the community) was evaluated by enumeration of frustules



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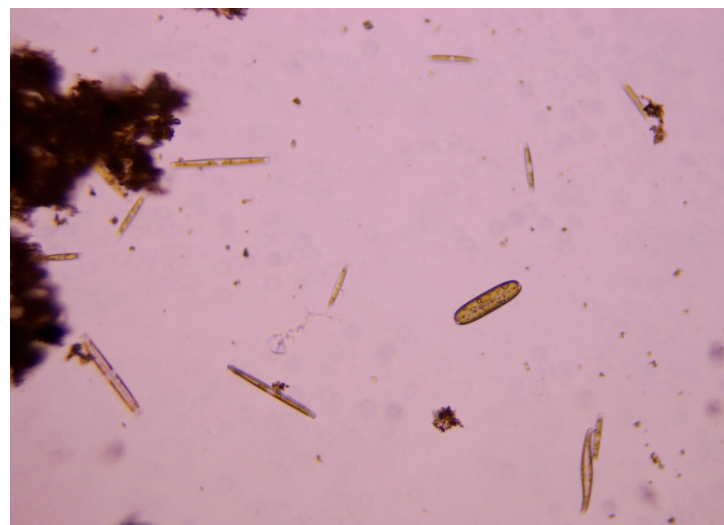


Methods

For evaluation of diversity of the diatom community, the Shannon diversity index was used (counted using the OMNIDIA 6.1.2 software, France)

This index expresses the diversity of species where it takes into account the number of species (richness) and their relative abundance (evenness)

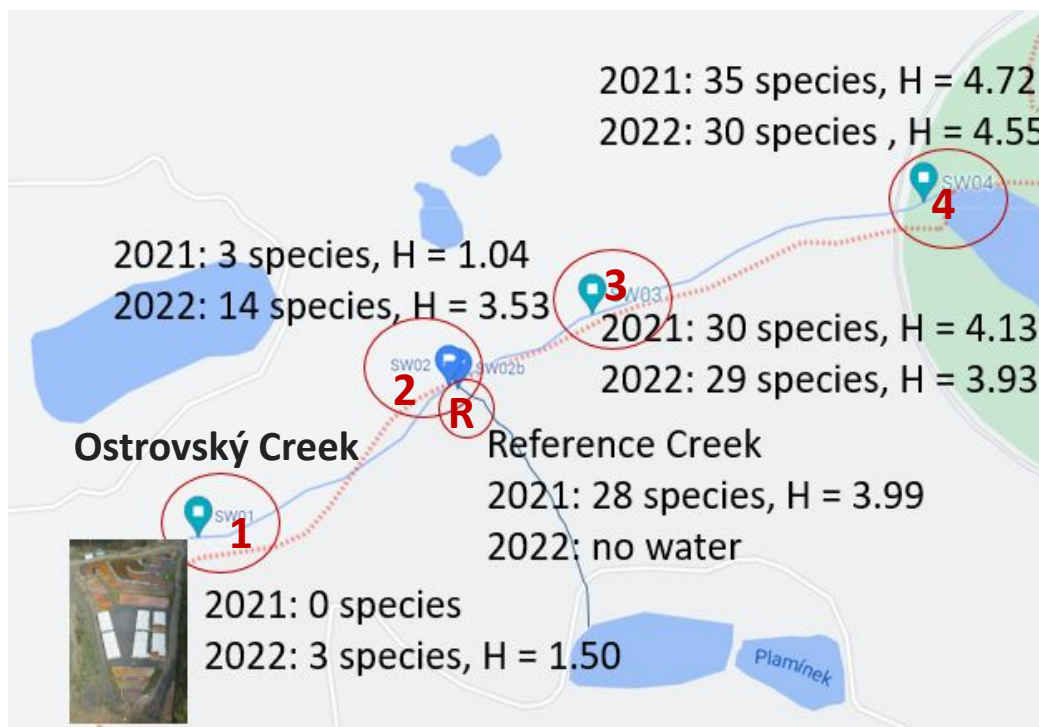
The larger the index,
the greater the diversity in the sample





Results

The number of diatom species and the value of the Shannon diversity index (H) in August 2021 and 2022





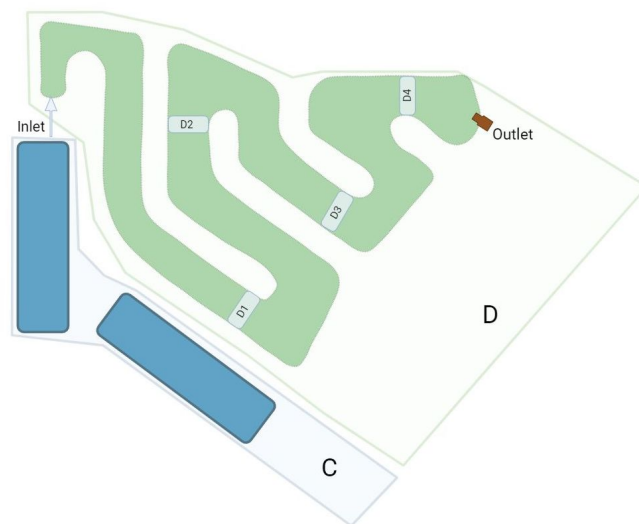
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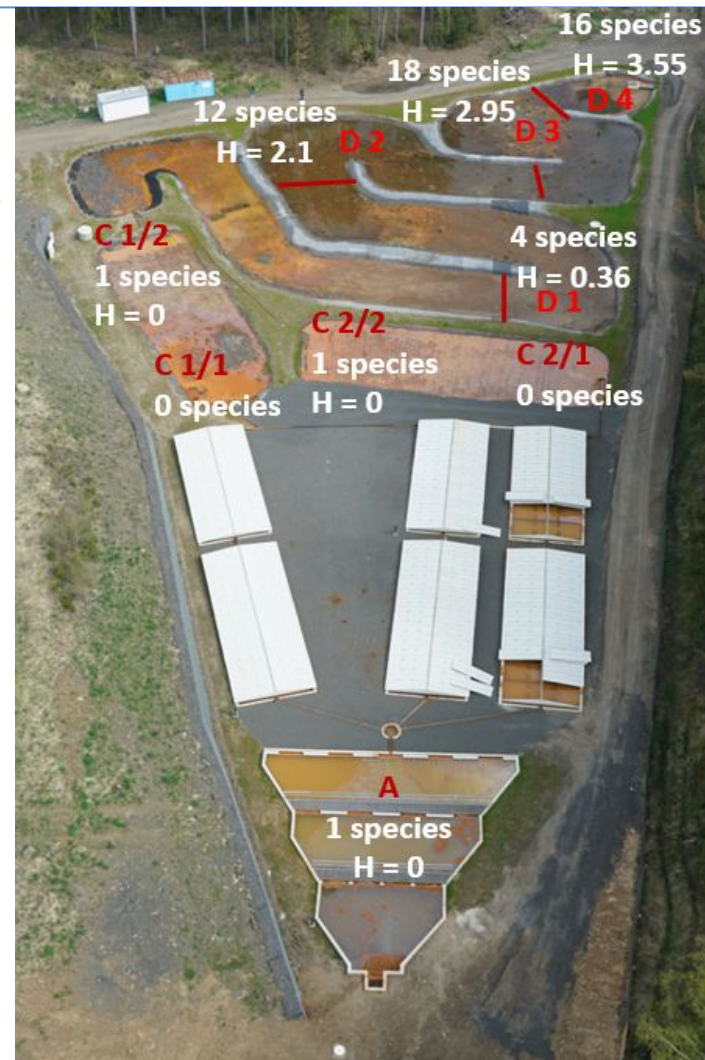
Results

Wetland+®



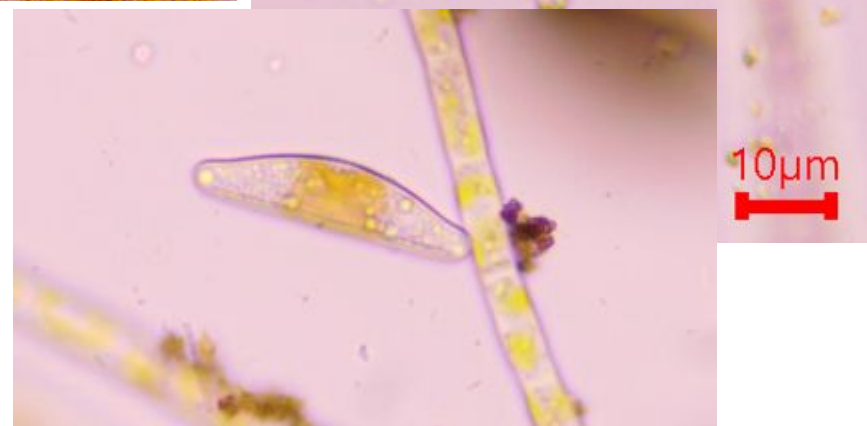
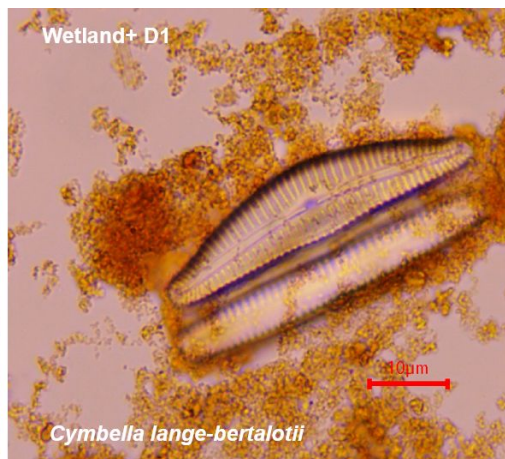
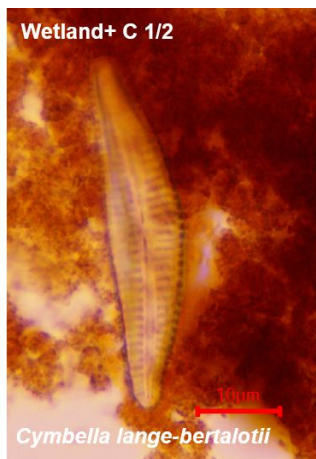
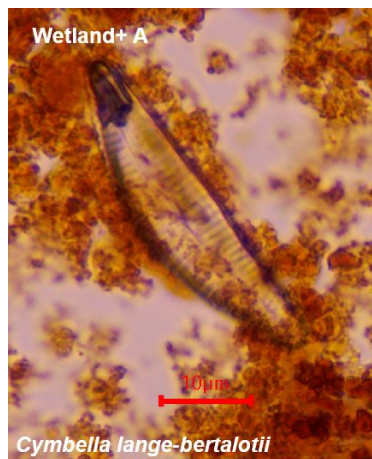
The number of species and the value of the
Shannon diversity index (H) in August 2022

32 species of diatoms were found in the Wetland+®





Cymbella lange-bertalotii from the Wetland+ August 2022

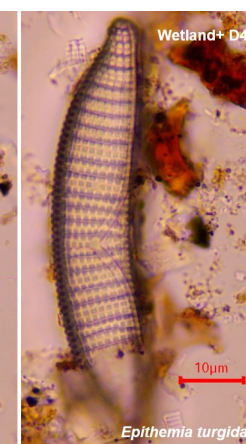
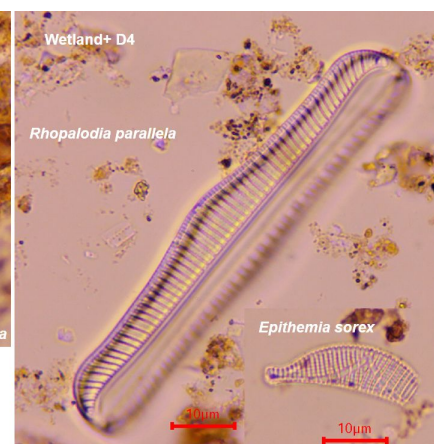
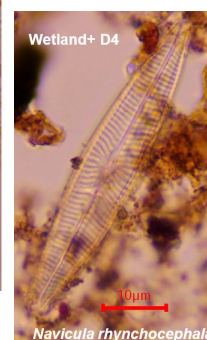
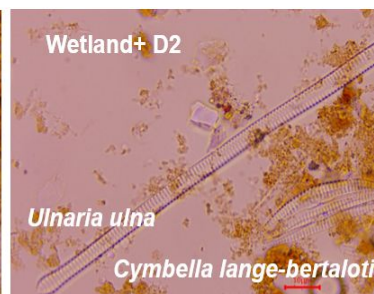
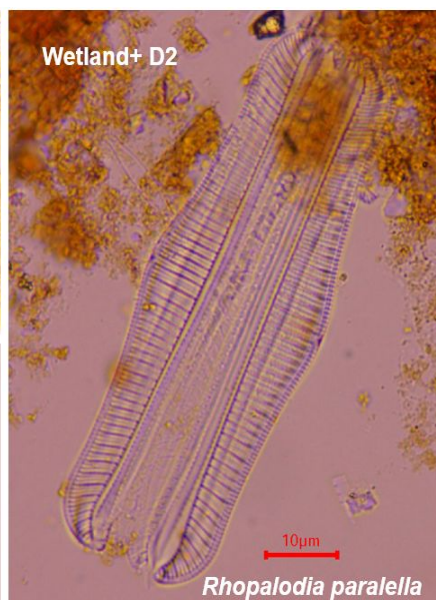


- Only this species was observed in sections with the greatest HCH pollution (A and C)
- Observed in all investigated sites, except profile 4



Diatom species from the Wetland+ D, August 2022

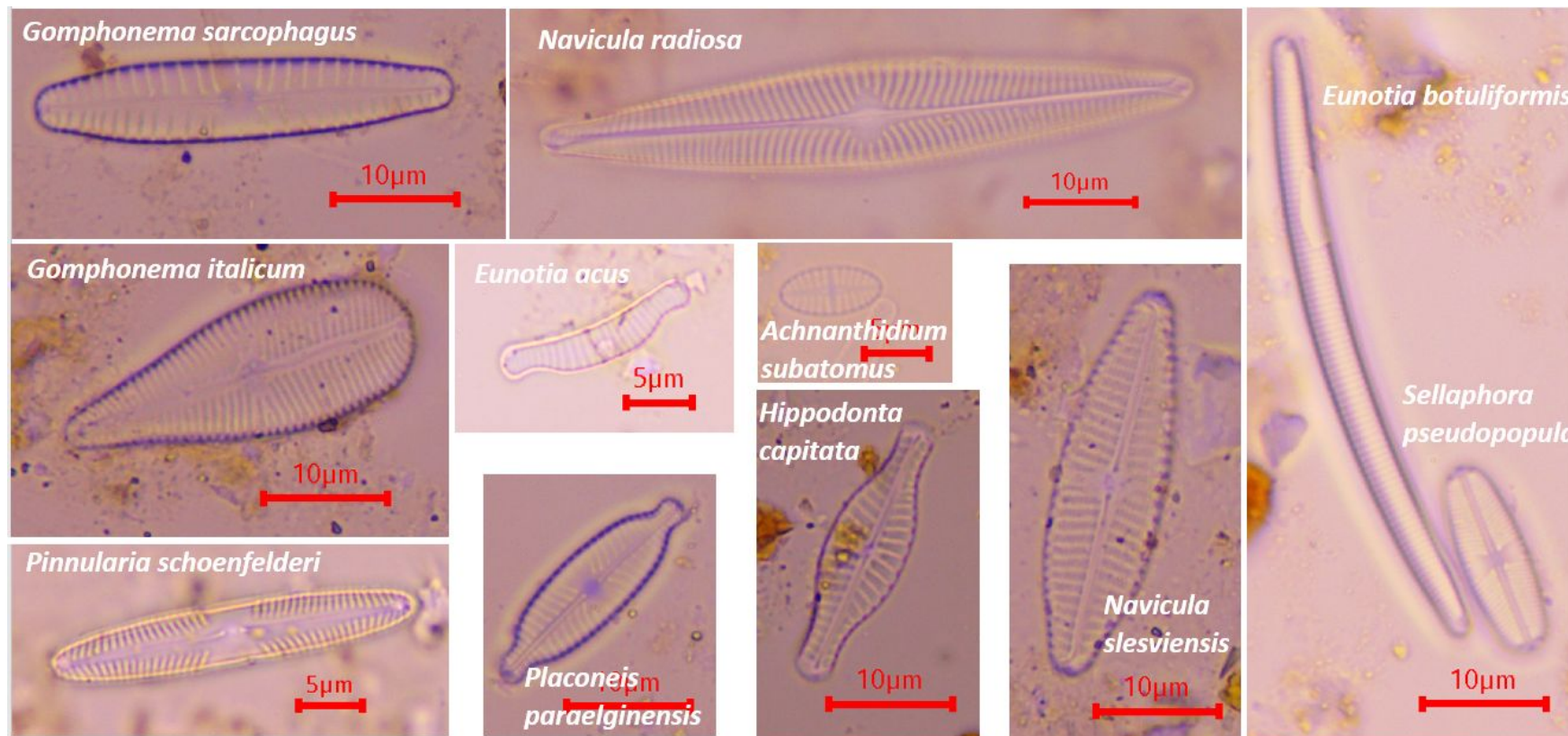
32 species





Various diatom species from the Ostrovský Creek, August 2022

64 species





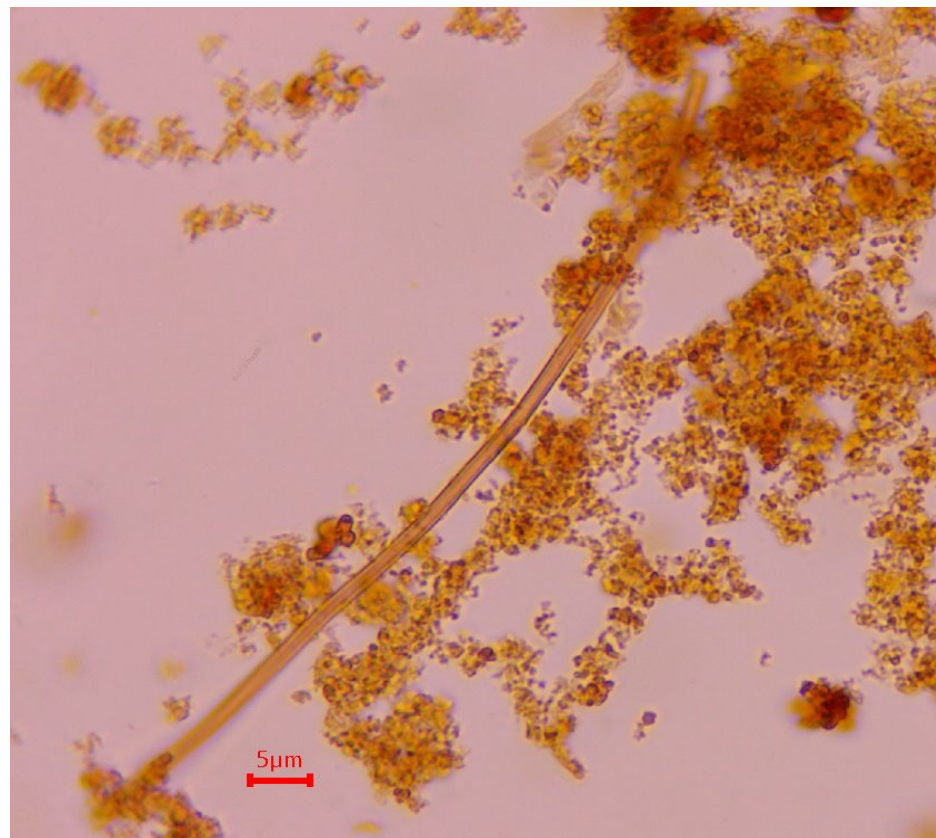
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Results

A bacterium *Leptothrix ochracea*





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Conclusions

- Each benthic sample contained from 0 to 35 species of diatoms and values of the Shannon diversity index ranged from 0 to 4.72
- Before Wetland+[®] was put into operation (August 2021), the results showed an increasing trend of the number of diatom species identified in profiles along the Ostrovský Creek



It fits well with the descending trend of HCH concentration in surface water
due to dilution and attenuation processes



Conclusions

- We noticed changes in the composition of the diatom community and in diatom cell density before and after the start of Wetland+[®]
- After one year of running the Wetland+[®], a significantly greater number of diatom species were observed in profiles 1 and 2, while the numbers of diatom species in profiles 3 and 4 were similar before and after the start of Wetland+[®]



Long-term monitoring in the changes of composition of diatom communities seems to be **a suitable indicator of the impact of Wetland+[®] on the water ecosystem**



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Thank you for your attention



10um