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A comparison of filtrate and sediment samples of Cladocera in Hungarian shallow lakes to characterise the types of wetland

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INTRODUCTION & AIM

Wetlands are essential parts of the ecosystems that sustain plant and animal life on Earth. Wetlands are facing anthropogenic pressure, and climate change (Schmieder, 2004). Cladocera species are found in different wetlands and the zonations where found may vary based on elements such as water quality, and macrophytic organisms present in the ecosystem. Through wetlands modification and degradation, recent anthropogenic activities are showing significant negative impacts on the quality of the wetlands and habitat. Cladocera's remains in sediments have assisted us in identifying past environmental conditions. Wetlands should be closely observed and evaluated to yield data useful for restoration efforts. Cladocera subfossil assemblages are applicable in community analysis which allows direct observation of community dynamics over long periods. We analysed species richness and community composition of subfossil Cladocera assemblages from water filtrate and sediment samples collected from small ponds in Hungary. A comparison between the sediment Cladocera fossils and the filtrate samples provided helpful information about whether the sediment and filtrate samples show the same occurrence or are quite different. The findings will contribute to our understanding of the patterns of biological community, distribution, and sediment analysis as a functional tool for bio-identification of the status of the wetland quality. A comparison between the sediment and filtrate samples may be useful as a biological indicator tool to track how species are responding to changes in their natural or altered habitat. Multivariate statistical approaches were used for this study.

METHOD

We analyzed the sediments, and the water samples collected from the small lakes of Hungary for physical-chemical parameters and Cladocera assemblage. The methodology (figure 1) adopted included fieldwork data collection in 35 lakes using gravity corer, laboratory analysis and then statistical data analysis. Based on the Corine Land Cover (CLC) database, five categories of land use were used. The samples were gathered from lakes categorised by lake size. Water samples were obtained from the water column. Three duplicates of 30L of water were filtered (mesh size 35 µm) in situ at a depth of 0.5 to 1 metre to obtain filtrate samples. The filtrate samples and residues were preserved in a 25 mL test tube with the addition of ethanol. Sediment samples were obtained from the lake's deepest region. The sediment layers were sectioned, with the deepest layer represented by the top 2 cm. Subsequently, we analysed the slides with a microscope (B–183, OPTIKA Microscope, Italy) at magnifications of 100 and 400, counting to 100 Cladocera remains from each sample or 25 slides if the 100 individual count was not achieved (Błędzki & Rybak, 2016; Korosi et al., 2013; Szeroczynska et al., 2007).

Field Work
- 1st sampling
  Sediments samples collected in 2017
- 2nd sampling (June-August 2023 (protected and none protected marshland lakes
  Preservation of samples for Laboratory analysis

Laboratory Analysis
- Elemental analysis (October –November 2021)
  Water samples analysis (December 2021)
- Laboratory Cladocera fossils examination (June 2022–May 2023, Jan- May 2024
- Elemental and Cladocera's analysis of the second samples

Data Analysis
- Redundancy analysis for environmental variables species abundance.
- PCA analysis –patterns of variations in species
- Shannon wiener diversity index (Spp) composition and diversity)

Figure 1: Methodology

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RESULTS & DISCUSSION

Environmental variables and Cladocera assemblage

We analysed the environmental variables for the study sites and results are presented graphically in figure 2 and 3.

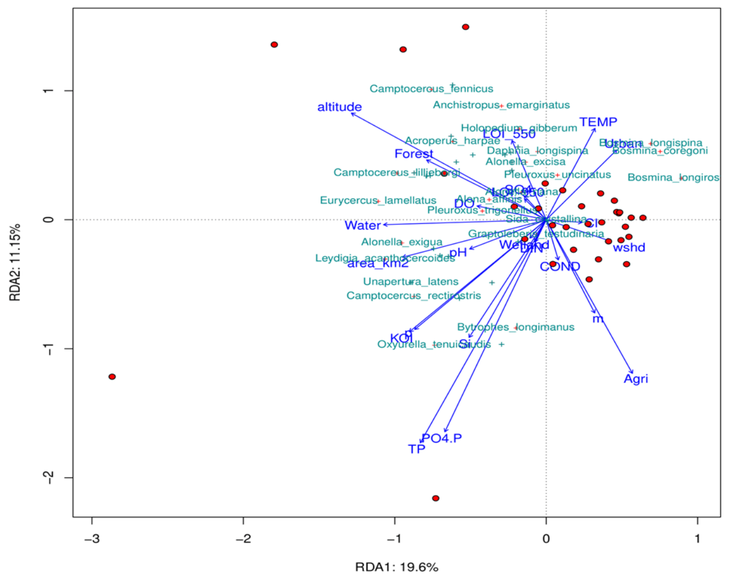


Figure 2 : RDA analysis showing the relationship of the

The RDA Analysis (figure 2) showed no significant relationship of environmental variables such as temperature, LOI, DO, TP, and PH with the Cladocera assemblage and abundance in the sample sites. Noting that there was variation among the physical and chemical variables of the sampled lakes.

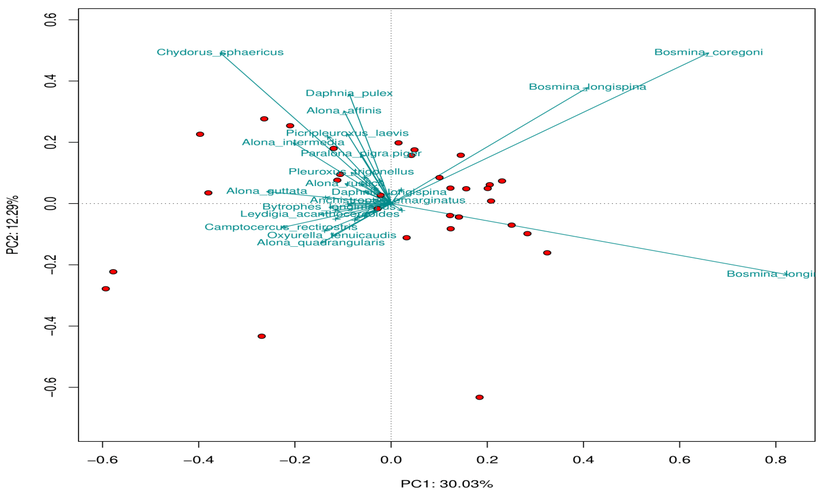
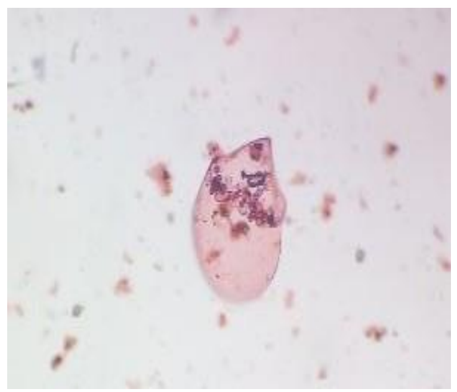


Figure 3: Principal component analysis showing the density of the Cladocera taxa in the sampled lakes.



Picture 1 : Chydorus sphaericus headshield

PCA (figure 3) revealed high densities of Bosminids species, *B. coregoni* ,*B.longirostris* and *B. Longispina* and *C. sphaericus* (picture 1). Other Cladocera remains found notably identified are *Daphnia spp*, *Alona spp and Chydorus spp*. The total number of Cladocera detected were reordered and the highest values were observed in these lakes as listed: Fegyverneki Holt-Tisza, Arlói-tó, Zis-tó, Sós-tó , Kunfehértó horgász tó, Cibakházi Holt-Tisza Nagyrév és Cibakháza tó. However, only a small number of Cladocera were found in the lakes Tihanyi Belsto, Kolonto, Törökszentmiklósto, Csárda-szék magánto KMT, and Szalmato. In Tasskertes tó halastótelep samples, Bács and no clearly recognisable Cladocera remains.

CONCLUSION

We found out that there were less notable significant differences between the physical-chemical variables and the Cladocera species recorded. From the water filtrate samples, we did not get enough representation of Cladocera samples from the lakes. However, there was notable variation in the physical and chemical parameters of the lakes within Hungary. We are still investigating for more notable differences in Cladocera occurrences, distribution, richness, and abundance in the small lakes under different lake types.

FUTURE WORK/REFERENCES

We would be investigating the diversity differences between the different types of lakes and evaluate the physical-chemical differences between the lake samples.

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