

Investigating water level changes in Lake Balaton over the past 500 years

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INTRODUCTION & AIM

The water level of Lake Balaton has been subject to constant change, caused by both nature and human intervention. These changes can be traced not only by historical records but also by palaeolimnological and palaeoecological studies. Our aim was to detect these changes using subfossil Cladocera remains in sediments.

METHOD

The 64 cm sediment column was sampled on 03/07/2017 using a gravity sediment sampler with a tube length of 100 cm and a diameter of 7 cm.

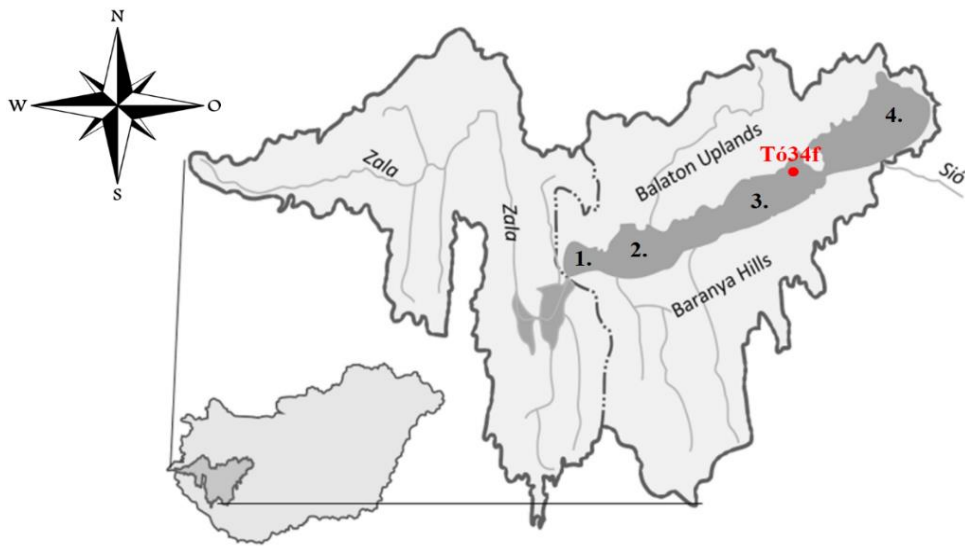


Figure 1: The catchment area of Lake Balaton and the location of the sub-basins: 1: Keszthelyi basin, 2: Szigligeti basin, 3: Szemesi basin and sampling site (red dot: Tó34f sampleing point), 4: Siófok basin.

To determine the age of the sediment column, isotopes ¹³⁷Cs, ²⁴¹Am, ²¹⁰Pb and ²²⁶Rn were used. Activity concentrations were determined using a narrow-window, broad-energy gamma spectrometer. Linear extrapolation was used to generate the final age-depth model.

The excavation of Cladocera remains from sediments was carried out according to the standard method (Korhola and Rautio 2001). From every 2 cm³ of sediment column, 1 cm³ of sediment was heated in KOH (c.10%) solution at 70 °C for 30 min, and after filtration, staining and preservation, the residues were examined under a light microscope. From each sample, 25x100 µl or 100 individuals were examined.

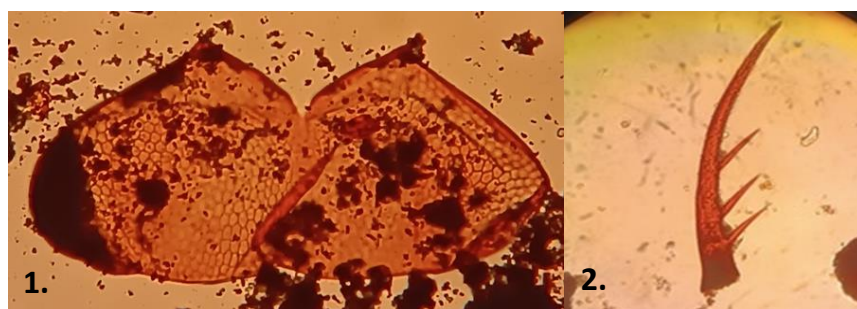


Figure 2: Prepared remains from the sediment column. 1: *Bosmina coregoni* (double shield) 2: *Sida crystallina* (furca).

FUTURE WORK / REFERENCES

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RESULTS & DISCUSSION

The age shift derived from ²⁴¹Am increases with depth, and the age determination accuracy of ²¹⁰Pb and ²²⁶Rn isotopes becomes less reliable as you go down into the deeper layers. Below 34 cm, no further isotopic age determinations could be obtained. In the layers below this, age was determined using the assumed sediment accumulating time.

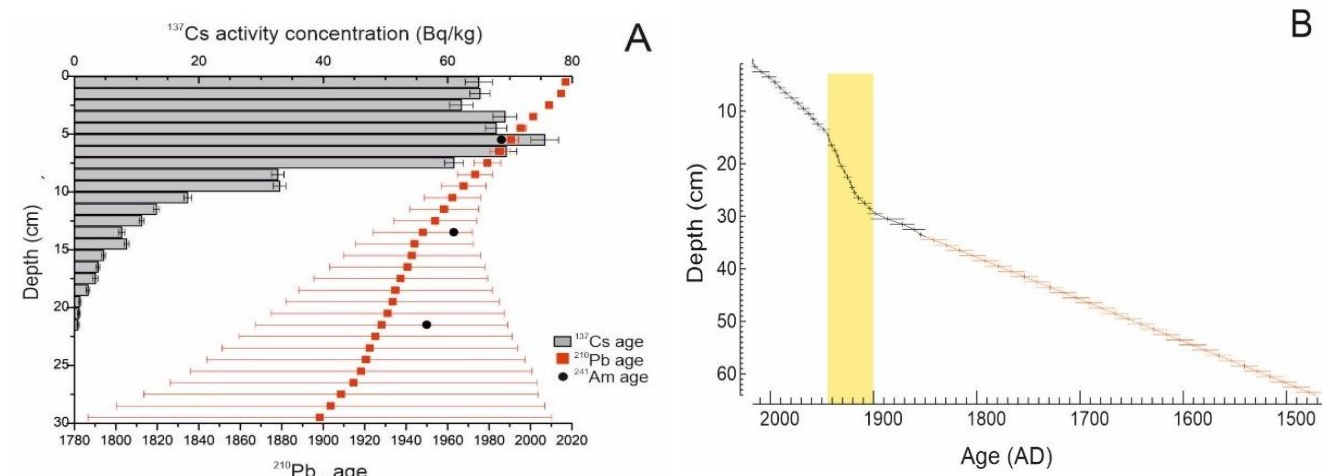


Figure 3: Ageing results by radioactive isotope (A) and sedimentation rate (B).

In total, the remains of 20 littoral and 4 pelagic species were found. The littoral species were significantly more abundant and more numerous than the pelagic species. Overall, the most abundant pelagic species was *Bosmina (Eubosmina) coregoni*, which showed a significant increase in abundance from the 1980s onwards. The vegetation-associated species (*Alonella sp.*, *Pleuroxus sp.*, *Glaptoleberis testudinaria*) occurred in many layers but in very low numbers. Our results suggest that the vegetation cover from the 1500s to the early 1900s may have been greater than today. The decrease in water levels in the first half of the 1800s led to an increase in the proportion of certain littoral species, which is in line with our expectations, but the opposite occurs in the early 2000s, where the proportion of pelagic *Bosmina* species increases, even at lower water levels. The presumed reason for this may be a response to fish predation rather than water level fluctuations.

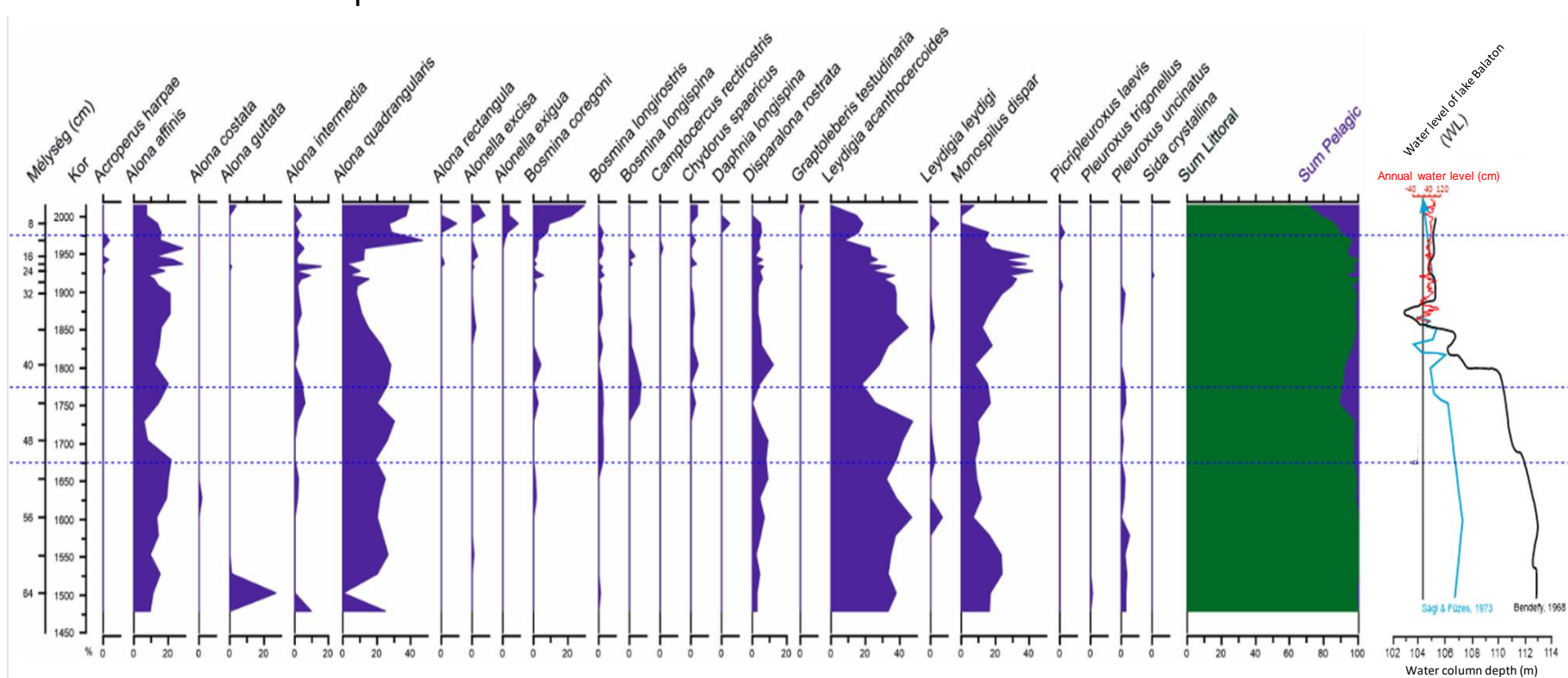


Figure 4: Cladocera fauna and water level changes of the Szemesi-basin over the last 500 years.

CONCLUSION

The subfossil Cladocera community in the Szemesi basin clearly shows the variation in vegetation cover of the lake, and at least in one place there is evidence of water level fluctuations. However, at several sites the community is not sensitive to water level changes and the variation in abundance is more likely to be related to fish predation by fish introductions and competition between Cladocera species.