

MSc project

Modelling transport of environmental DNA in river networks

We are looking for an enthusiastic MSc student who will be working on the development and testing of species distribution models based on environmental DNA collected in rivers. The project involves extensive computational tasks and is part of a larger research program (based in the Altermatt lab at Eawag/UZH).

Background

Environmental DNA (eDNA) is a method for biodiversity assessment consisting in the detection of genetic traces of organisms from environmental samples (in particular, stream water). In rivers, eDNA measurements are hard to interpret because DNA molecules are transported downstream by stream water, and because they are impacted by decay. A recently developed model (eDITH – **eDNA Integrating Transport and Hydrology**) makes use of hydrological concepts to correctly interpret eDNA data and produce species distribution maps and biodiversity assessments across river networks.

Aim

The following possible MSc projects on this topic build upon the eDITH model:

- Model-based evaluation of optimal strategies for biodiversity assessment in river networks that merge eDNA measurements and direct observation of organisms. This study is mainly simulation-based (with the possibility of analyzing existing datasets).
- Production of an R package that implements the eDITH model. This project is based on existing chunks of code that need to be expanded and merged.

Requirements

Interest in ecological modelling, programming skills (R language), robust mathematical background.

Starting date

Any time.

Contact/Supervision

Prof. Dr. Florian Altermatt (florian.altermatt@ieu.uzh.ch), University of Zürich and Eawag Dübendorf;
Dr. Luca Carraro (luca.carraro@eawag.ch, day-to-day supervisor)

References

Carraro, L., Mächler, E., Wüthrich, R., & Altermatt, F. (2020). Environmental DNA allows upscaling spatial patterns of biodiversity in freshwater ecosystems. *Nature communications*, 11(1), 1-12. <https://doi.org/10.1038/s41467-020-17337-8>
Carraro, L., Stauffer, J. B., & Altermatt, F. (2021). How to design optimal eDNA sampling strategies for biomonitoring in river networks. *Environmental DNA*, 3(1), 157-172. <https://doi.org/10.1002/edn3.137>