



Conference Abstract

# The use of eDNA and DNA metabarcoding in monitoring the ecological condition of Norwegian lakes

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## Abstract

Biodiversity assessments using molecular identification of organisms through high-throughput sequencing techniques have been a game changer in ecosystem monitoring, providing increased taxonomic resolution, more objective identifications, potential cost reductions, and reduced processing times. The use of DNA metabarcoding of bulk samples and environmental DNA (eDNA) is now widespread but is not yet universally implemented in national monitoring programs. While bulk sample metabarcoding involves extraction of DNA from organisms in a sample, eDNA analysis involves obtaining DNA directly from environmental samples, which can include microorganisms, meiofauna-size taxa and macrofauna traces such as larval stages, skin and hair cells, gametes, faeces and free DNA bound to particles.

In Norway, freshwater biomonitoring in compliance with the EU Water Framework Directive (WFD) is conducted on several administrative levels, including national monitoring programs for running water, small and large lakes. These programs typically focus on a fraction of the actual biodiversity present in the monitored habitats (Weigand 2019). DNA

metabarcoding of both bulk samples and eDNA samples are relevant tools for future freshwater biomonitoring in Norway.

The aim of this PhD project is to develop assessment protocols based on DNA-metabarcoding and eDNA of benthic invertebrates, microcrustaceans and fish that can be used as standard biomonitoring tools to assess the ecological condition of lakes. The main topics addressed will be:

- Development of protocols throughout the eDNA-metabarcoding workflow (i.e. sampling, filtration, preservation, extraction, amplification and sequencing) suitable to execute biodiversity assessments and determine the ecological status of lakes.
- Comparison of the results obtained using molecular tools and traditional morphology-based approaches in order to assess the feasibility of such techniques to be incorporated as standard biomonitoring tools, such as the ones implemented under the provisions of the WFD.
- Evaluate the effect of improved taxonomic resolution from molecular techniques on determining the ecological status of lakes, both by broadening the number of taxa analyzed and by identifying more taxa to species level.
- Assess the feasibility of using eDNA extracted from water samples, taken at different depths and fish densities, to measure fish abundance/biomass as a proxy to calculate the ecological quality indices regulated in the WFD.
- Analyze the coverage and resolution provided by reference libraries for certain taxa, such as crustacea, in order to assess the reliability and precision of taxonomic assignments.

## **Keywords**

eDNA / DNA Metabarcoding / Freshwater Biomonitoring

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## References

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