

Applicability of eDNA metabarcoding for biodiversity assessment in the sensitive ecosystems of nature protection areas

Vid Švara, Vanessa Berger, Daniel T. Dalton, Klaus Steinbauer, Michael Jungmeier

Abstract

In the face of global change, novel monitoring methods are immensely important in biodiversity assessment and preservation of protected areas. In particular, the detection of environmental DNA (eDNA) is gaining traction in biodiversity assessments as well as in conservation practices due to standardized, cost-effective, and user-friendly implementation. The eDNA-based biodiversity detection methods have especially large potential to be regularly implemented in biodiversity assessments and conservation actions of protected areas because species detection is based on DNA from environmental samples like water, sediment, soil, air or organic material and has a broad application scope with fast, non-invasive, and comprehensive species identification. Here, we present a case of biodiversity assessment based on eDNA metabarcoding approaches conducted in the frame of our project BioMONITec. We tested practical aspects of the eDNA metabarcoding method in the protected wetland habitats consisting of streams, wet meadows, and a bog, with the aim of developing protocols that can be easily and efficiently used by nature protection area managers for biodiversity assessment. In particular, we tested the efficiency of different sampling approaches (syringe/pump water sampling), compared performance of three eDNA extraction methods, compared sample processing methods in the field and in the laboratory, and time-, cost-, and outcome-efficiency of tested approaches. We determined biodiversity indices of assessed habitats and compared them to samples acquired by traditional sampling methods and indices acquired by metabarcoding of these bulk samples. The results reveal the potential of eDNA metabarcoding to supplement traditional monitoring approaches and contribute to more precise and effective decision-making in protection areas monitoring. The methodological and scientific outcomes of the project will be included into the monitoring global guideline (MoniGloG) and communicated to the managers of protection areas and stakeholders who will apply these methods to their monitoring practices in biosphere reserves and national parks.

Keywords

eDNA, metabarcoding, protected areas, monitoring

Contact

v.svara@fh-kaernten.at