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From molecules to monitoring: integrating genetic tools into freshwater quality assessments

Beentjes, K.K.

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Author: Beentjes, K.K.

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PROPOSITIONS

accompanying the PhD thesis

FROM MOLECULES TO MONITORING

Integrating genetic tools into freshwater quality assessments

Kevin K. Beentjes

1. The potential and limitations of DNA-based monitoring are very different from those of traditional collecting and identification. Trying to make DNA-based monitoring adhere to the standards of current assessment methods outlined in the Water Framework Directive only serves to stifle advances in molecular methodologies (this thesis).
2. Temporal dissimilarities in freshwater species composition are larger than spatial dissimilarities, yet sampling strategies hardly ever take the former into account. Studies comparing multiple sites will have to be mindful of inflated dissimilarities due to sampling time frames (this thesis).
3. Ecological impact assessments can benefit greatly from the improved resolution that environmental DNA offers over traditional monitoring (this thesis).
4. Barking deer provide useful insights into the overestimation of diversity in metabarcoding samples (this thesis).
5. Terminology is key, as can be observed in the never-ending discussions regarding what constitutes "environmental DNA" (Pawlowski et al. 2020).
6. Large-scale DNA (meta)barcoding campaigns have only increased the taxonomic impediment. While increased efforts in descriptive taxonomy are commendable, the only practical solution for current and future biodiversity assessments is the incorporation of MOTUs, BINs or similar interim nomenclature to describe these "dark taxa" (Hebert et al. 2016).
7. The integration of molecular techniques into biological assessments does not only require researchers to investigate the implications of technical challenges, but also to translate these implications into decision-making frameworks (Darling & Mahon, 2011).
8. Experimental design and reporting standards are increasingly important, as the reproducibility crisis impedes our ability to effectively understand the biodiversity crisis (Baker 2016).
9. Scientific dissemination should not be limited to peer-reviewed journals.
10. There is an inverse correlation between the air temperature during field work and the level of disappointment when experiments do not provide the expected results.
11. You must unlearn what you have learned.