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The DNAqua-Net initiative: A COST Action dedicated to the development of pan-European molecular bioassessment tools for aquatic ecosystems

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Healthy and functioning aquatic ecosystems provide a crucial resource to humanity: clean water. Under ever-proliferating anthropogenic pressures, it is imperative to monitor changes and to counterbalance adverse impacts by adequate mitigation measures.
Monitoring of pan-European aquatic ecosystems is regulated by two important pieces of legislation that serve to protect and restore aquatic ecosystem function: the Water Framework Directive (WFD; Directive 2000/60/EC) and the Marine Strategy Framework Directive (MSFD; Directive 2008/56/EC).
To comply with these regulations, a plethora of national assessment systems is used that are based on quantification of changes in the structure of biological communities in response to alterations of an ecosystem, benchmarked against reference conditions. Typically, WFD- and MSFD compliant description of ecological status relies on the morphological characterization and enumeration of abundance and occurrence patterns of indicator taxa to infer biotic indices that are used to inform management decisions.
CA 15219 DNAqua-Net is dedicated to the development and implementation of approaches using molecular data to characterize communities and assess ecological status of water bodies — effectively the implementation of biomonitoring 2.0.
Recent achievements in high-throughput sequencing pave the way to analyse ecological communities based on meta-barcoding or meta-genomic approaches. DNAqua-Net focuses on the cultivation of these tools in applied ecology. We face a unique challenge through the necessity to reliably and consistently quantify communities across manifold taxonomic groups, ecosystem types and pressure gradients. Moreover, we need to observe strict legal constraints to ensure comparability and congruence of assessment results obtained through existing assessment protocols and through molecular data.
Consequently, our action is focused on different fields — development and completion of reference libraries for indicator taxa and their ecological traits, development and calibration of biotic indices inferred from molecular data, development and implementation of standardized field and lab protocols, development and application of analytical pipelines, adaptation and regulation of the proposed tools and solutions in compliance with existing European jurisprudence — to propose a sustainable and reliable molecular bioassessment scheme.
DNAqua-Net has an inclusive scope and hitherto comprises more than 300 experts and stakeholders from more

than 40 European countries. Our efforts entail internal task force groups on inter-calibration of existing methods and DNA-based assessment results, reliability and consistency of molecular community assessment, and CEN standardization and application of molecular tools in standard biomonitoring approaches. In addition, we discuss potential of molecular data when integrated into existing assessment systems and prospects of using molecular data only. Preliminary results are promising, and we are confident to deliver the crucial base line for future pan-European molecular bioassessment.