The sceptical optimist: challenges and perspectives for the application of environmental DNA in marine fisheries - DTU Orbit (24/08/2019)

Application of environmental DNA (eDNA) analysis has attracted the attention of researchers, advisors and managers of living marine resources and biodiversity. The apparent simplicity and cost-effectiveness of eDNA analysis make it highly attractive as species distributions can be revealed from water samples. Further, species-specific analyses indicate that eDNA concentrations correlate with biomass and abundance, suggesting the possibility for quantitative applications estimating abundance and biomass of specific organisms in marine ecosystems, such as for stock assessment. However, the path from detecting occurrence of an organism to quantitative estimates is long and indirect, not least as eDNA concentration depends on several physical, chemical and biological factors which influence its production, persistence and transport in marine ecosystems. Here, we provide an overview of basic principles in relation to eDNA analysis with potential for marine fisheries application. We describe fundamental processes governing eDNA generation, breakdown and transport and summarize current uncertainties about these processes. We describe five major challenges in relation to application in fisheries assessment, where there is immediate need for knowledge building in marine systems, and point to apparent weaknesses of eDNA compared to established marine fisheries monitoring methods. We provide an overview of emerging applications of interest to fisheries management and point to recent technological advances, which could improve analysis efficiency. We advise precaution against exaggerating the present scope for application of eDNA analysis in fisheries monitoring, but also argue that with informed insights into strengths and limitations, eDNA analysis can become an integrated tool in fisheries assessment and management.

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