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High-resolution monitoring of toxic dinoflagellate species and their biogeographic distribution in the North Atlantic and Polar Seas

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Dinoflagellate species of the genus *Dinophysis* have become target organisms for surveillance and monitoring of microalgae as they may produce potent diarrhetic shellfish toxins and therefore have negative socio-economic impacts. The formation of *Dinophysis* blooms as well as toxin composition and cellular toxin content depends on several multifactorial climate and environmental drivers and it might be expected that the occurrence of toxic events becomes more intense, widespread, frequent and unexpected in future decades due to climate variability. Conventional methods for the identification of microalgae e.g. microscopy, still have some deficiencies as they are very time-consuming and need special knowledge and experience, especially in case of difficult morphological species distinction. Standard quantification methods also might fail to detect and determine *Dinophysis* species due to their typically low cell densities and their spatial heterogeneity (=patchiness). Therefore innovative technologies for environmental monitoring of toxic microalgae are needed to prevent humans and aquatic environments from toxic threats and damage. We analysed the occurrence, abundance and dispersal of toxic dinoflagellate species in Nordic seas and the Arctic Ocean. Genetic analyses included a modular composed autonomous rRNA biosensor approach that allows rapid, precise and economically efficient high-resolution quantification and identification of microalgae in aquatic environments. Next generation sequencing (Illumina) was used to get additional information on distributional patterns of the most common dinoflagellate species in the observation area.

Keywords: microalgae monitoring, toxic dinoflagellates, rRNA biosensor

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