

The impact of decades of environmental change on phytoplankton communities in the Belgian part of the North Sea

Nohe Anja¹, Goffin Annelies², Tyberghein Lennert², Lagring Ruth³, De Cauwer Karien³, Vyverman Wim¹ and Sabbe Koen¹

¹ Laboratory of Protistology & Aquatic Ecology, Department of Biology, University of Ghent, Krijgslaan 281 S8, 9000 Gent, Belgium

E-mail: anja.nohe@ugent.be

² Flanders Marine Institute (VLIZ), Wandelaarkaai 7, 8400 Oostende, Belgium

³ Belgian Marine Data Center (BMDC), Operational Directorate Natural Environment, Royal Belgian Institute of Natural Sciences, Gulledele 100, 1200 Brussels, Belgium

Long-term time series are crucial for identifying trends and changes in the biomass and structure of marine communities in the context of environmental and climate change resulting from natural and anthropogenic causes (e.g. eutrophication and modified nutrient cycles). In Belgium phytoplankton research has been conducted since the 1970s in the framework of several independent research projects. In the course of the Belspo BRAIN-be project 4DEMON (4 DEcades of Belgian marine MONitoring), an initiative to recover and integrate (historical) marine biodiversity and environmental data in the Belgian part of the North Sea (BPNS), phytoplankton diversity and biomass data from the 1970s to the 2000s were compiled, standardized and analyzed, with a focus on diatoms and dinoflagellates.

Comparison of diatom and dinoflagellate communities between the 1970s and the 2000s revealed significant changes, including a marked increase in both diatom and dinoflagellate abundance and shifts in phenology, with an earlier start of the diatom spring bloom and the emergence of a pronounced dinoflagellate summer bloom. In addition, the annual phytoplankton community composition has become more similar the whole year round. The observed changes are probably a result of complex bottom-up and top-down interactions. On the basis of environmental datasets, such as historical abiotic data measured in the BPNS (4DEMON), EU LifeWatch ERIC data series, and Dutch long-term monitoring (Rijkswaterstaat) programs, we hypothesize that the observed changes may be partly related to a combination of increasing (winter) water temperatures, clearer water conditions and changing nutrient ratios.

Keywords: diatoms; dinoflagellates; time series; Belgian part of the North Sea