

Phytoplankton composition and biomass changes during the last four decades in the Belgian Coastal Zone – An analysis of historical and present data

Nohe Anja¹, Lennert Tyberghein², Annelies Goffin², Karien De Cauwer³, Ruth Lagring³, Klaas Deneudt², Wim Vyverman¹, and Koen Sabbe¹

¹ Protistology & Aquatic Ecology Laboratory, Biology Department, Ghent University, Belgium
E-mail: anja.nohe@UGent.be

² Flanders Marine Institute (VLIZ), InnovOcean site, Wandelaarkaai 7, B-8400 Oostende, Belgium

³ Royal Belgian Institute of Natural Sciences, Operational Directorate Natural Environment, Belgian Marine Data Centre, Gulledele 100, B-1200 Brussels, Belgium

The Belgian Continental Shelf (BCS) is a complex ecosystem which is mainly influenced by water entering the English Channel and freshwater discharge through the Scheldt River. Developing efficient management strategies for this variable and vulnerable environment requires a robust knowledge of ecological interdependencies and accounts for the need of long-time marine observations regarding eutrophication, contamination and acidification. Although several extensive sampling campaigns were conducted on the BCS during the last decades there is a lack of an integrated dataset combining these research results. For this purpose the 4DEMON project (4 Decades of Belgian marine monitoring; www.4demon.be) was initiated aiming at identification of relevant biotic and abiotic datasets for the Belgian part of the North Sea from the 1970s onwards, integrate, quality check and intercalibrate the data, and finally analyse them for spatio-temporal variation.

Our research is focused on changes in phytoplankton composition, pigment concentration and biovolume, the identification of potential trends and the relation to underlying parameters like temperature, nutrient concentration and turbidity. Microalgae are the main primary producers in the marine food web and are strongly influenced by changing environmental conditions. As a consequence, modifications in phytoplankton biomass and composition affect upper trophic levels. Therefore, the study of phytoplankton is of great importance for the development of management strategies. Unfortunately, long-time phytoplankton datasets are usually scarce. Nevertheless, a few long-time marine datasets are available for Dutch, German and French waters (Cadée and Hegeman 2002; Wiltshire *et al.*, 2008; Hernández-Fariñas *et al.*, 2013). On the BCS regular sampling campaigns have been conducted since the 1990s in which phytoplankton composition, biomass and physico-chemical parameters were measured (Lancelot *et al.*, 2004). It was found that for the 1970s the Projekt Zee (PZ) and the Concerted Research Actions (CRA) are important sources for phytoplankton and environmental data. Furthermore, the involved institutes carried out some intensive research within Master theses and dissertations. However, a lot of those data could not be used for integrated analyses yet as they were often only available on paper. Therefore, a lot of effort was done to digitize those data, link them to their metadata and combine them in one large dataset.

Analysing a dataset which contains data of almost half a century is a challenging task. Difficulties to overcome are the handling of missing metadata, errors in species identification by determination of many different taxonomists, changes of taxonomic nomenclature and the implementation of new measuring methods over time. Furthermore, due to an absence of a common sampling design, sampling was highly variable in time and space. However, a huge amount of metadata has already been identified, taxonomic matches have been conducted and analytical methods are well recorded. In other parts of the North Sea shifts in phytoplankton composition and biomass have been identified (Philippart *et al.*, 2000). The present study will investigate if this is also the case in the Belgian part of the North Sea and identify the factors driving these changes in order to contribute to efficient management strategies and the preservation of this valuable ecosystem.

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