

Compositional changes in the microalgae communities of the Scheldt Estuary: a result of improving water quality?

Buyze Evelyn¹, Jeroen Van Wichelen¹, Els van Burm², Pieter Vanormelingen¹, Tom Maris³, Patrick Meire³, Koen Sabbe¹ and Wim Vyverman¹

¹ Protistology and Aquatic Ecology, Biology Department, Ghent University, Belgium
E-mail: Evelyn.buyze@Ugent.be

² Quantitative and Applied Ecology, School of Botany, University of Melbourne, Australia

³ Ecosystem Management Research Group, Biology Department, University of Antwerp, Belgium

The river Scheldt has an estuarine zone that extends 160km inland. Due to high anthropogenic pressures and pollution during the second half of the twentieth century, water quality in the freshwater tidal reach was very poor, characterized by severe hypoxia and high ammonium conditions. Wastewater treatment since the 1990's has led to an improved water quality and caused a shift from a heterotrophic to an autotrophic system (Cox *et al.*, 2009).

Since 1996, the microalgae communities of the Scheldt freshwater estuary have been monitored as part of the OMES project. Here we describe the spatial-temporal changes in phytoplankton biomass and composition and link these with bottom-up (hydrology and abiotic parameters) and top-down (zooplankton) control mechanisms.

From 2003 onwards, the gradual increase in oxygen and decrease in ammonium concentration were associated with the formation of intense summer diatom blooms. Moreover this biomass increase was characterized by a shift from small centric diatoms, including *Cyclotella scaldensis*, to the larger *Actinocyclus normanni*. Laboratory experiments suggest that ammonium concentrations may have been an important driver for this shift, as *Actinocyclus normanni* showed very low tolerance for ammonium. However, other factors, appear to determine the relative success of small *versus* large centric diatoms as since 2011 *Cyclotella scaldensis* became again the dominant diatom species while ammonium concentrations remain low. Another remarkable change involved the development of a *Thalassiosira nodulinea* bloom in the brackish part of the estuary since 2008. The general increase in diatom biomass in the brackish and freshwater reaches of the Scheldt Estuary is considered as an indicator for an improving water quality and is in line with an increase in zooplankton abundance (Tackx *et al.*, 2005), suggesting a more direct energy flow to higher trophic levels.

References

- Cox T., T. Maris, K. Soetaert, D. J. Conley, S. Van Damme, P. Meire, J. J. Middelburg, M. Vos and E. Struyf. 2009. A macro-tidal freshwater ecosystem recovering from hypereutrophication: the Schelde case study. *Biogeosciences* 6:2935-2948.
- Tackx M., F. Azemar, S. Bouletreau, N. De Pauw, K. Bakker, B. Sautour, S. Gasparini, K. Soetaert, S. Van Damme and P. Meire. 2005. Zooplankton in the Schelde estuary, Belgium and the Netherlands: long-term trends in spring populations. *Hydrobiologia* 540:275-278.