

# Estuarine biodiversity and ecosystem functioning under benthic and pelagic sediment change

Mestdagh Sebastiaan<sup>1</sup>, Braeckman Ulrike<sup>1</sup>, Ysebaert Tom<sup>2</sup>,  
Moens Tom<sup>1</sup>, Van Colen Carl<sup>1</sup>

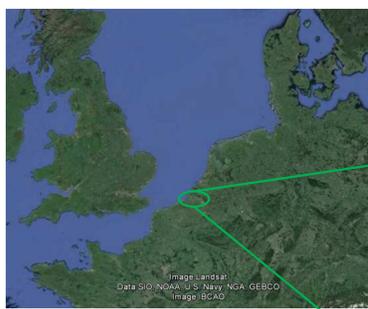
<sup>1</sup> Marine Biology Research Group, Department of Biology, Ghent University, Krijgslaan 281/S8, 9000 Ghent, Belgium; E-mail: sebastiaan.mestdagh@ugent.be

<sup>2</sup> Netherlands Institute for Sea Research (NIOZ-Yerseke), Korrिंगaweg 7, 4401 NT Yerseke, The Netherlands

## INTRODUCTION

In aquatic ecosystems, matter and energy are exchanged between the sediment and the water column in a process called benthic-pelagic coupling. This coupling provides an important link in the biogeochemical cycling within estuaries and between an estuary and the coastal ocean. Benthic-pelagic coupling is driven by physical (e.g. sediment resuspension) and biological factors (e.g. macrobenthic bioturbation and –irrigation). Changes in the balance between sediment resuspension and deposition will affect biodiversity and ecosystem functioning through alterations of the macrobenthic community. These interactions between turbidity and the macrobenthos can induce critical changes in soft-sediment ecosystem functioning.

(Van Colen et al. 2012; Pratt et al. 2014)



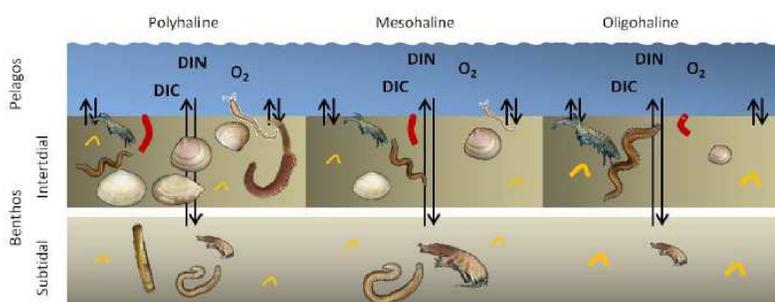
## OBJECTIVES

The Westerschelde estuary (SW Netherlands) is heavily impacted by human activities (Ysebaert et al. 2002). Construction works and dredging have resulted in profound changes in sediment dynamics. To assess the effects of these changes on macrobenthic functioning, we study in each salinity zone:

- Natural biogeochemical fluxes and macrobenthic activity
- Fluxes and macrobenthic activity under different suspended sediment concentrations
- Fluxes and macrobenthic activity under increased sediment deposition

All results will be integrated to provide a basis for modelling the interaction between physical and biological sediment properties along the estuarine gradients.

## NATURAL CONDITIONS



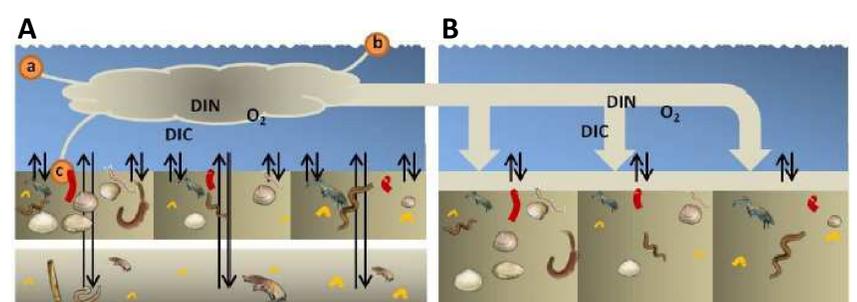
Measuring natural biogeochemical fluxes of:

- O<sub>2</sub>
- Alkalinity
- Nutrients (NO<sub>x</sub>, NH<sub>x</sub>, PO<sub>x</sub>, Si)

Measuring macrobenthic activity:

- Bioturbation  
→ Luminophore tracer technique
- Bioirrigation  
→ Bromide tracer

## MANIPULATED CONDITIONS



A) Suspended sediment:

- Mesocosms with different sediment concentrations
- Measure fluxes
- Assess macrobenthic activity  
→ Luminophores + behaviour

B) Deposited sediment:

- Added sediment layer on top of natural surface
- Measure fluxes
- Measure activity

## References

Pratt, D.R., et al. (2014). *Journal of Sea Research* 92: 170-177

Van Colen, C., et al. (2012). *PLoS ONE* 7(11): e49795. doi:10.1371/journal.pone.0049795

Ysebaert, T., et al. (2002). *Marine Ecology Progress Series* 225: 79-95

Illustrations composed by C. Van Colen; animal pictures from World Register of Marine Species (WoRMS), <http://www.marinespecies.org>