Sediment quality and sediment flux: a silver bullet for predicting macrobenthos productivity in the freshwater Scheldt?

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The energy needed to sustain estuarine food webs comes from two main sources: autotrophic production (micro-algae, plants) and heterotrophic production from detritus. The importance of these sources for the food web on mudflats changes from the upstream border of the estuary to the mouth. In the freshwater to oligohaline part of the Sea Scheldt, the macrobenthic biomass is dominated by detritus-feeding Oligochaeta that make up >95% of the benthic AFDW. In the brackish to saline parts of the estuary, bivalves feeding on phytoplankton dominate the benthic biomass. Intertidal benthic biomass is a good quality indicator of production and carrying capacity for benthic fish (e.g. European flounder) and especially (overwintering) birds. Understanding what drives Oligochaete biomass therefore is crucial to manage the ecosystem. Modelling Oligochaeta biomass from coincidental variables comprising granulometry, total organic mass fraction and tidal parameters, retained only height in the tidal window as relevant. But such a simple model cannot explain differences among different sites along the estuary nor can it predict temporal changes.

We therefore choose to switch from these more distal variables to a more proximate one: food availability. The most abundant Oligochaeta species in the Scheldt, *Limnodrilus hoffmeisteri*, feeds on detritus, more specifically on the labile fraction. As we want to improve both spatial and temporal predictive power of the benthos model, we need a way to link labile carbon to a widely available and well-known variable. Thus we formulated the hypothesis that the Biological oxygen demand of organic compounds (Carbonaceous BOD or CBOD, measured as part of OMES) measured in the water column can be used to predict the availability of labile detritus for Oligochaetes on adjacent mudflats. A first necessary next step is to establish the spatial and temporal pattern of (labile) POC deposition on mudflats. Next we will need to relate this to CBOD measurements in the water. INBO will start to develop this new research line from 2025 onwards. On mudflats in equilibrium, elevation changes are small, and deposition of (labile) POC presents itself as a flux of material that is deposited and eroded again with each tide. During the deposition phase, detritivores collect freshly deposited material to feed themselves. Therefore identifying the quantity and quality of the flux material is essential. Earlier experiments have shown a strong effect of the amount of labile POC in sediment on Oligochaeta production and standing biomass. As a last step, we will need to build-up similar knowledge for the dominant *Limnodrilus hoffmeisteri* in the Scheldt Estuary, to translate flux quality to benthos. All this should lead to a spatially explicit model to explain benthos productivity in the largest part of the Sea Scheldt estuary.