

## The spatio-temporal evolution of a newly created mussel bed and its effects on benthic communities

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As sea levels keep rising and the pressure on coastal settlements increases, there is a need for sustainable coastal protection. In the past few years, nature-based solutions received increasing recognition in order to safeguard the coasts from erosion, floods and storms. The Coastbusters project aims to develop such a nature-based solution for coastal erosion by creating biogenic reefs built by mussels in front of the Belgian coast. The creation of a mussel bed in a soft-sediment environment is a complex endeavor as its development depends on many external factors. In order to benefit the mussel bed development, dropper lines and hard substrate bags were installed in situ. Creating a new mussel bed is also expected to have an impact on the underlying macrobenthic communities. Therefore, this study aimed to explain the spatio-temporal variability of the mussel bed and its effects on the macrobenthos.

In order to test these effects, a BACI (before/after control/impact) - approach was followed. Mixed models were used to detect the effect of the reef site on the macrobenthic density and diversity. The spatio-temporal variability of the mussel bed itself was qualitatively analysed based on video material. Mussel bed patterning, its temporal variability and the observed associated fauna were assessed.

Mussel beds were only present from the summer months till the beginning of fall. Predation by *Asterias rubens*, *Carcinus maenas* and *Psammechinus miliaris* and winter storms characterized by higher wave action were identified as possible factors limiting the development of the mussel beds. On the spatial scale, mussels didn't seem to prefer the hard substrate bags over the bare sediment in between. A minor impact on the underlying macrobenthic communities was observed. Only diversity indices differed significantly between control and reef sites, with lower values observed in the reef site. Regardless of the low dissimilarity in community composition between both sites, oligochaetes were slightly more abundant in the reef site and contributed most to this dissimilarity. These results might be a first indication of a shift towards a lower diversity and oligochaete dominated community as a response to the organic enrichment of the sediment by mussel biodeposits. Long-term observations and changes in the sampling design will be needed to draw hard conclusions on the spatio-temporal variability of the mussel bed and its effects on the underlying macrobenthic communities.

Keywords: Coastal protection; Biogenic reefs; *Mytilus edulis*; Ecosystem engineer; Softsediment; Benthic impact