

# Benthic habitat modifications as a result of chronic dredged material dumping

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**Introduction:** Environmental changes in and near the bottom of the sea are reflected by the state of the macrobenthos. Therefore, macrobenthos can be used as bio-indicator to monitor human activities, such as the disposal of dredged material [1]. Impact can be direct, such as burial of organisms immediately after a dumping event (cf. foraging capacity, mobility) [2], or can be indirect, such as habitat alteration as a result of deviating sediment properties of the dumped material (e.g. mud content, median grain size). Substantial dredging activities take place in the navigation channels and Belgian harbours throughout the year and the dredged material is disposed at 5 designated areas. The ecology at those dumping sites was yearly monitored during 2004-2012. The present study evaluates changes within the benthic habitats at those sites, taking into account benthic biodiversity, productivity and functioning, and the ecological value of the area.

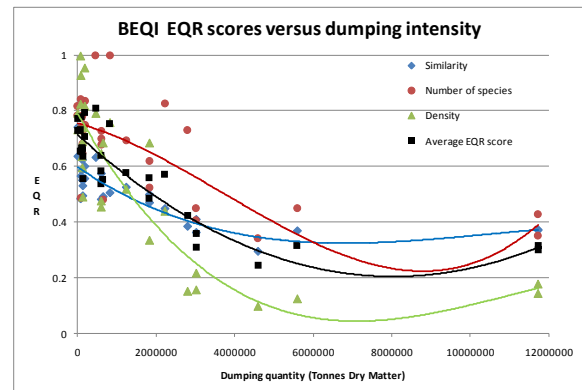
**Methods:** The assessment of the changes on the benthic habitat was based on a control/impact design monitoring featuring impact stations, border stations and reference stations. To summarize the effect of the dumping intensity on the status of the benthic habitat, the Benthic Ecosystem Quality Index (BEQI, [www.beqi.eu](http://www.beqi.eu)) was calculated.

**Results:** Dumping sites “Zeebrugge” and “Oostende” are located in *Macoma balthica* habitat, which is naturally species poor. During the monitoring, we observed only minor differences in species diversity, density and species composition between impact and control stations of both sites, despite the relatively high dumping intensity at Zeebrugge.

Dumping sites “Nieuwpoort” and “S1” are located in *Abra alba* habitat, which is naturally a species rich and productive environment. Chronic dumping in high amounts ( $\pm 6.000.000$  tonnes of dry matter per year) leads to a clear impoverishment of the benthic habitat (lower diversity and densities) at site “S1”. At the site “Nieuwpoort”, we observed no effect on the benthic habitat, due to the fact that the dumping amounts were very low (max 100.000 tonnes dry matter). At the fifth dumping site “S2”, located in a sandy environment, we observed changes in the species composition, due to the dumping of muddy

sediments. This is related to the appearance of ‘mud-loving’ species in a sandy environment.

The observations at the different sites were confirmed by the decreasing BEQI EQR values with increasing dumping intensities (**Error! Reference source not found.**).



**Fig. 1:** BEQI average score and scores for species composition (similarity), diversity (number of species) and density

**Discussion:** Most benthic species can resist limited disposal intensities and are able to recover between consecutive dumping events [2]. However, their recoverability is not sufficient to withstand high and chronic dumping intensities. Results of the present study indicate that the diverse *A. alba* habitat is more sensitive to chronic dumping and more susceptible to changes in habitat characteristics than the less diverse *M. balthica* habitat. This is due to the fact that some important habitat structuring species (e.g. *Owenia fusiformis*) do not survive chronic dumping, leading to losses in ecosystem functioning. In contrast, the species occurring in the *M. balthica* habitat were mainly short living, small and opportunistic species. Therefore, attention has to be paid to the value of the ecosystem and its resilience in managing dredged material disposal.

**References:** [1] Rees et al. (2006) *Environmental Science* 9:496-508; [2] Bolam et al. (2011) *Environ Monit Assess* 181:13-27.