



DOES OCEAN DUMPING AFFECT MARINE MICROBIAL COMMUNITIES?



Introduction

Microbial communities of benthic marine habitats are highly affected by sediment composition. Mineral and organic compounds as well as geochemical processes influence their community structure and function. Environmental changes, as ocean dumping, lead most likely to an altered biogeochemistry and hence microbial community. The influence of dumping potentially polluted sediments on bacterial communities of "pristine" coastal sediments is barely investigated. We examined the microbial communities over one year at a dumping site in the German Bight (North Sea, Germany) via ARISA fingerprints referring to analytical parameters.

Sampling site

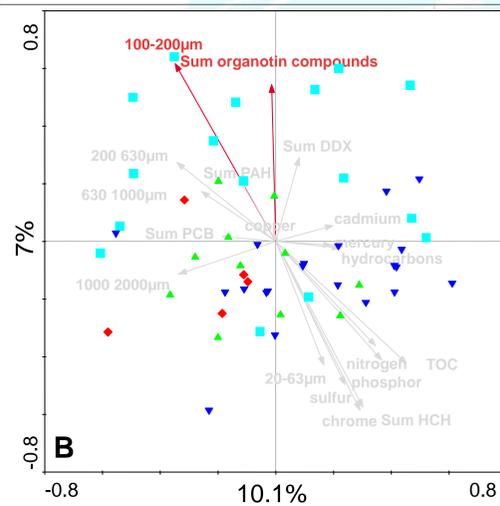
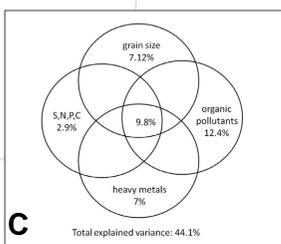
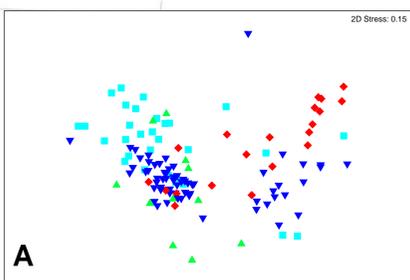
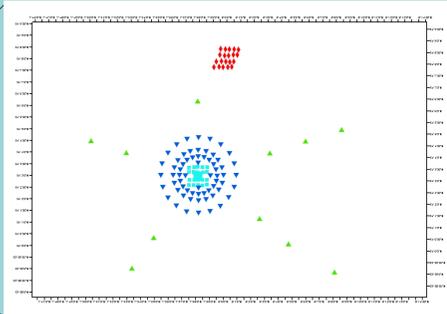


Fig. 1

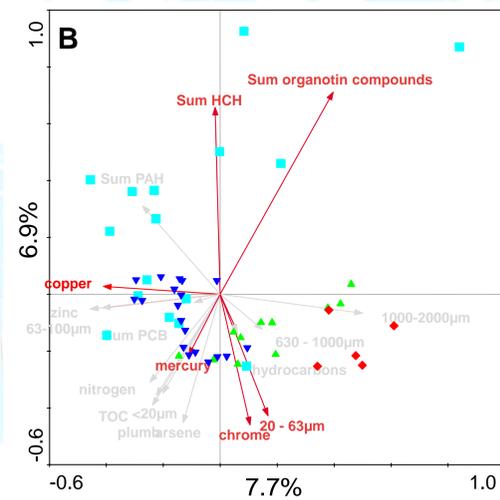
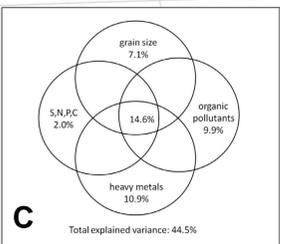
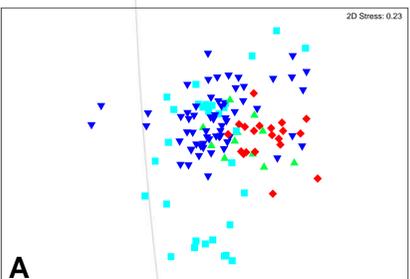
I-III: August 2009, April 2010, August 2010

A: nMDS Plots showing the bacterial community pattern at the dumping center (■); dumping surrounding (1-3km) (▼); streams (6-12km) (▲) and reference (◆) (Jaccard Index).

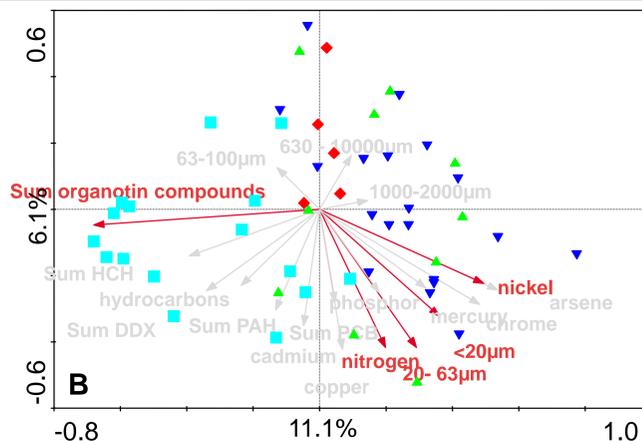
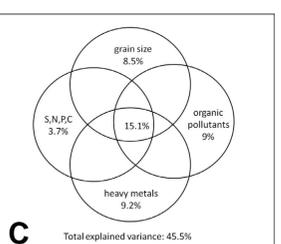
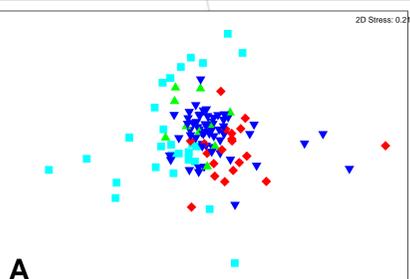
B: Biplots showing intersample distances (RDA) of bacterial community fingerprints (ARISA*) using contextual data. Arrows pointing to increasing values and correlation. Community of dumping center (■); dumping surrounding (▼); streams (▲); reference (◆). Significant factors are red. Parameters VIF > 15 were excluded.

C: Variance partitioning: grain size contains < 20µm, 20-63µm, 63-100µm, 100-200µm, 200-630µm, 630-1000µm, 1000-2000µm; organic pollutants contains Sums of PAH, PCB, HCH, organotin compounds, hydrocarbons, DDX; Heavy metals contain cadmium, mercury, arsenic, nickel, chrome, plumb, copper; S,N,P,C contains sulphur, nitrogen, phosphorus, TOC. P < 0.05

I: 18 months since last dumping



II: two months since last dumping



III: six month since last dumping



Results

- Microbial community appears very dynamic over space and time (according to nMDS and ANOSIM; Fig. 1 I-III A)
- Organotin compounds were determined to have significant conditional effects ($p < 0.05$) in all redundancy analyses (RDA) (Fig. 1 I-III B)
- Partitioning of the variance in the microbial community structure revealed highest contribution for organic pollutants and heavy metals and lowest for S,N,P,C (Fig. 1 I-III C)

CONCLUSION

- RAPID CHANGES IN MICROBIAL COMMUNITY STRUCTURE DEMONSTRATE ITS POTENTIAL OF ADAPATION TO ENVIRONMENTAL CHANGES QUICKLY
- SIGNIFICANT CHANGES IN THE COMMUNITY OF THE CENTRE AFTER DUMPING AND HIGH CONTRIBUTION OF ORGANIC POLLUTANTS (VARIANCE PARTITIONING) GIVE EVIDENCE FOR AN IMPACT OF CONTAMINANTS ON COMMUNITIES IN THE IMMEDIATE DUMPING AREA