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The impact of sediment resuspension on non-cyanobacterial nitrogen fixation along the Southern Baltic coastline

Tina Liesirova¹, Tobias Aarenstrup-Launbjerg², Lasse Riemann², and Maren Voss¹

¹Leibniz Institute for Baltic Sea Research in Warnemünde (IOW), Biology, Germany (tina.liesirova@io-warnemuende.de)

²Marine Biological Section, Department of Biology, University of Copenhagen, Helsingør, Denmark

Benthic nitrogen fixation by heterotrophic non-cyanobacterial diazotrophs (NCDs) is common in anoxic marine sediments, however, it is currently unclear how resuspension of sediments affects this activity. Moreover, physical mixing processes are strongest in shallow coastal waters where permeable sediments prevail and anoxic conditions rarely occur. It is therefore of interest to understand whether such coastal sites provide ecological niches for NCDs. In order to gain insight into NCD nitrogen fixation during sediment resuspension, slurry incubations were carried out with nearshore sediments from stations along the Southern Baltic coastline and, for comparison, with anoxic sediments from the Gdansk Deep. Parallel to this, we carried out separate incubations treated with sodium molybdate, an inhibitor of sulfate reducing bacteria (SRB), to differentiate SRB activity from total NCD activity. Our data show low rates of nitrogen fixation by NCDs and indicate that SRBs (e.g. *Desulfovibrio*) are actively fixing nitrogen. Nitrogen fixation rates varied greatly between locations, influenced by sediment grain size and POC-loading. Interestingly, nitrogen fixation took place despite of micromolar concentrations of inorganic nitrogen, which implies that NCDs may be more resilient towards N-stress than formerly expected. In conclusion, our experimental study supports previous findings of stimulation of nitrogen fixation by sediment resuspension, even in permeable sediments, however, at low rates.