Developing tidal microcosms for studying diatom-nematode interactions: preliminary results

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Experimental systems (e.g. microcosms) for biodiversity-ecosystem functioning (BDEF) research have been criticized for being unrealistic representations of complex natural ecosystems. In order to increase their external validity, it is essential that experimental set-ups closely mimic the natural environment. For studies of intertidal systems, this implies a proper simulation of tides, as this affects many crucial ecosystem properties of these systems. For example, EPS production by diatoms, which affects sediment stability and is an important substrate for bacteria, increases during low-tide exposure. Most laboratory experiments addressing interactions between tidal flat organisms hitherto have used closed, non-tidal microcosm approaches. Our study focusses on intertidal microphytobenthos and meiofauna, nematodes in particular. We will investigate how nematodes modify primary production and EPS secretion and what the underlying mechanisms are.

We have developed a microcosm in which we are able to control diversity, composition and biomass of organisms as small as 1.2µm, whilst simulating a daily tidal regime. These microcosms enable us to incubate diatoms and nematodes in a more realistic environment for BDEF experiments. Filter membranes in the microcosms efficiently retain inoculated organisms and exclude intrusion of species from outside, while still allowing drainage and flooding of water at realistic rates during tide simulation. Furthermore, these filters allow exchange of gases and nutrients.

Pilot studies show that the growth of diatoms as well as the survival rate of nematodes in the microcosms is high. Results of preliminary experiments suggest that nematodes modulate biofilm growth.