Copepods promote nitrogen retention in estuarine sediments

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During the past century anthropogenic activities have dramatically increased the amount of reactive nitrogen on Earth. It has been estimated that nitrogen inputs have increased as much as ten-fold in coastal ecosystems. As a result, these originally nitrogen-limited areas have become severely eutrophied.

Denitrification is an essential step in the nitrogen cycle as it is capable of counteracting eutrophication by removing the excess of reactive nitrogen from the ecosystem. In the past decades, much research has been devoted to unravelling which organisms affect nitrogen cycling in intertidal sediments. Until now, these studies almost exclusively focussed on the influence of microphytobenthos or macrofauna on denitrification. The effects of meiofauna (e.g. nematodes and copepods), the intermediate trophic level, on the N fluxes have almost completely been neglected, notwithstanding the fact that these abundant organisms interact in numerous ways with bacteria, microphytobenthos and macrofauna.

The aim of this study was to investigate the impact of the meiofauna and its interactions with diatoms and bacteria on denitrification in marine sediments.

To this end, we used a microcosm approach in which (1) copepods, (2) spent medium from copepods, (3) diatoms (*Navicula* sp.) or (4) a combination of copepods and diatoms were added to defaunated estuarine sediments. The microcosms were incubated for seven and a half days, after which the nutrient concentrations and denitrification potential (a proxy for the denitrification activity in the microcosm) were measured. The excretion products of copepods proved to be an important source of both ammonium and phosphate. Furthermore, the presence of copepods and their excretion products reduced denitrification rates in the microcosms. By providing the system with more nutrients through their excretions and reducing the amount of active nitrogen that was lost through denitrification, copepods seemed to enhance eutrophication. This would benefit the copepods as it will promote the growth of their food sources, i.e. bacteria and diatoms. However, these findings should be interpreted with care, as field verification remains necessary. This is the first study that provides clear evidence for the impact of meiofauna on denitrification.