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BENTHIC ECOSYSTEM ENGINEERING: EXPERIMENTAL EVIDENCE ON THE FUNCTION OF THE  
LUGWORM *ARENICOLA MARINA*

In the marine benthos, burrowing macrofauna affect community structure and material fluxes not only by feeding but also by the provision of burrow structures and by reworking and irrigating sediment. Burrowing macrofauna not only directly interact with other species, but also mediated by the altered physical environment. The deep burrowing lugworm *Arenicola marina* is an important reworker of sediment on tidal flats in the North Sea and is hypothesized to have considerable impact on community structure and ecosystem functioning in the Wadden Sea.

A large scale and permanent lugworm exclusion experiment was initiated to quantify the direct and indirect effects on habitat properties and benthic community structure. This was done by inserting a 1mm meshed gauze at a depth of 10 cm, blocking the vertical shafts and preventing lugworm settlement. In order to reveal the full spectrum of potential effects, the scale chosen for this experiment was much larger than in former benthic exclusion experiments. Six exclusion areas, each 400m<sup>2</sup>, and corresponding control and reference areas were established on an intertidal sandflat.

Lugworms have a significant impact on other benthic species. They temporarily reduce abundances of tube building polychaetes and the settlement of bivalves. On the other hand, the orbinid polychaete *Scoloplos cf. armiger*, a free-burrowing subsurface bacterivore, prefers the ambient lugworm flat, probably because the irrigation performed by the lugworms benefits its microbial prey. Other species might be influenced indirectly by gradual changes in habitat properties. The lugworm free sites became more muddy, due to a higher proportion of fine material, higher organic and water content and higher nutrient loading. These processes might contribute to higher Chlorophyll concentrations in the upper sediment layer. The polychaete *Nereis diversicolor*, a surface deposit feeder with deep burrows presumably took advantage of the higher food availability and immigrated into enclosure plots. Foraging birds like golden plovers were more frequent at enclosure plots. There they apparently foraged on nereid worms, which feed on the surface and then are an accessible prey to visual hunters with a short bill.

The first results of a permanent large-scale lugworm exclusion experiment indicate a cascade of effects through the entire benthic community, mostly due to the ecosystem engineering properties of this large burrowing polychaete.

- Theme 1: *Biodiversity in enclosed and semi-enclosed seas*
- Theme 2: *Artificial habitats and restoration of degraded systems*