Introduction

Sulfate reduction rates

Surprisingly, determination of sulfate reduction rates along a 5 m long sediment core revealed activity peaks in subsurface sediments. These rates reached values close to those measured in the near surface layers (Fig. 3).

In situ abundance of SRB

The relative contribution of targeted SRB to the microbial community was low at sediment surface, but increased with depth (Fig. 4).

Deeper layers were characterized by a SRB community numerically almost constant with depth and accounting for up to 7% of all cells detected. However, the SRB communities at single layers significantly differed with respect to their composition.

A predominance of Desulfotalea relatives was shown over the entire sediment column. Desulfobacula-related bacteria were also found in all layers and partially dominated the SRB community. Desulfosarcina-related bacteria gave generally low counts of less than 1% of all DAPI stained cells.

Fig. 1 Recovering sediment cores from intertidal flats

Results

Cultured SRB

Cultivation was performed in liquid dilution cultures inoculated with sediment from four different depths (50 - 400 cm). Lactate, acetate, or hydrogen served as electron donors to enrich SRB with different physiological capacities.

All enrichments showed sulfide production and, therefore, growth of sulfate reducers. In most cases, highest sulfide-positive dilutions were dominated by a single morphotype (Fig. 5).

Screening by PCR-DGGE and sequencing of selected DGGE bands revealed a variety of partial 16S rRNA genes, mostly related to known marine SRB of the Delta proteobacteria (Fig. 6).

Fig. 2 Sampling location ‘Janssand’ in the backbarrier of the island Spiekeroog

Conclusions

- We found elevated activity of SRB in deep sediment layers of an intertidal sand flat within the German Wadden Sea.
- The presence of SRB utilizing a variety of potential electron donors along the entire sediment column demonstrates the nutritional versatility of the SRB community in situ.
- Desulfotalea-related bacteria formed a dominant fraction as proven by cultivation as well as quantification of in situ abundance using CARD-FISH.
- Our findings suggest a coincidence of local maxima of both sulfate reduction rates and active, metabolically diverse groups of SRB.

References


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