Microphytobenthos increases denitrifier and total bacterial abundances in intertidal sediments of a temperate estuary

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Surface sediments are important systems for the removal of anthropogenically derived inorganic nitrogen in estuaries. They are often characterized by the presence of a microphytobenthos (MPB) biofilm, which can impact bacterial communities in underlying sediments for example by secretion of extracellular polymeric substances (EPS) and competition for nutrients (including nitrogen). Pyrosequencing and qPCR was performed on two intertidal surface sediments of the Westerschelde Estuary characterized by a two-fold difference in MPB biomass but no difference in MPB composition. Doubling MPB biomass disproportionately (ten-fold) increased total bacterial abundances but had no effect on general community structure, despite significantly lower bacterial richness and distinct community membership, mostly for non-abundant taxa. Denitrifier abundances also increased ten-fold while community structure, both for nirS and nirK denitrifiers, remained unchanged, suggesting that competition with diatoms for nitrate is negligible at concentrations in the investigated sediments (appr. 1 mg/l NO_3^-). Stimulation of bacterial growth in underlying sediments, possibly linked to higher EPS content, appeared taxon-specific, resulting in increased relative abundances of other bacterial taxa than typically associated with diatoms, namely Firmicutes, TM7 and Betaproteobacteria. This study provides evidence for MPB biomass increase to have an significantly positive effect on total bacterial and denitrifier abundances, with specific stimulation of previously unrecognized MPB coupled bacteria.