

# Benthic algae control sediment[water column fluxes of organic and inorganic nitrogen compounds in a temperate lagoon

**Tyler, Anna Christina, Karen J. McGlathery, Iris C. Anderson**

Limnol. Oceanogr., 48(6), 2003, 2125-2137 | DOI: 10.4319/lo.2003.48.6.2125

ABSTRACT: Coastal lagoons are a common land-margin feature worldwide and function as an important filter for nutrients entering from the watershed. The shallow nature of lagoons leads to dominance by benthic autotrophs, which can regulate benthic-pelagic coupling. Here we demonstrate that both microalgae and macroalgae are important in controlling dissolved inorganic as well as organic nitrogen (DIN and DON) fluxes between the sediments and the water column. Fluxes of nitrogen ($NH_4^+$, $NO_3^-$, DON, urea, and dissolved free and combined amino acids [DFAA, DCAA]) and O2 were measured from October 1998 through August 1999 in sediment cores collected from Hog Island Bay, Virginia. Cores were collected from four sites representing the range of environmental conditions across this shallow lagoon: muddy, high-nutrient and sandy, low-nutrient sites that were both dominated by benthic microalgae, and a mid-lagoon site with fine sands covered by dense macroalgal mats. Sediment-water column DON fluxes were highly variable and comparable in magnitude to DIN fluxes; fluxes of individual compounds (urea, DFAA, DCAA) often proceeded simultaneously in different directions. Where sediment metabolism was net autotrophic because of microalgal activity, TDN (total dissolved nitrogen) fluxes, mostly comprised of DIN, urea, and DFAA, were directed into the sediments. Heterotrophic sediments, including those underlying macroalgal mats, were a net source of TDN, mostly as DIN. Macroalgae intercepted sediment-water column fluxes of DIN, urea, and DFAA, which accounted for 27-75% of calculated N demand. DON uptake was important in satisfying macroalgal N demand seasonally and where DIN concentrations were low. Up to 22% of total N uptake was released to the water column as DCAA. Overall, macroalgae assimilated, transformed, and rereleased to the water column both organic and inorganic N on short (minutes-hours) and long (months) time scales. Microalgae and macroalgae clearly regulate benthic-pelagic coupling and thereby influence transformations and retention of N moving across the land-sea interface.