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INVESTIGATING THE ROLE OF OYSTERS IN ALTERING NET N₂ FLUXES USING NOVEL IN-SITU EXPERIMENTAL DESIGN

Abstract: Coastal nutrient over-enrichment represents one of the most pressing environmental management issues faced worldwide. Oyster aquaculture and restoration are hypothesized to mitigate excessive nitrogen (N) loads via increasing benthic denitrification rates in coastal systems. However, this has not been examined in Northeast US where oyster aquaculture and restoration are prevalent and on-going. Using unique 50L chambers, we conducted in-situ benthic chamber experiments to examine the influence of oyster aquaculture, oyster reef restoration, and cultch (i.e. shell) placement on benthic metabolism and net N₂ fluxes across the sediment-water interface. Both dark and light incubations were conducted seasonally (spring, summer, fall) using the N₂ /Ar technique and flow-through batch chambers in a shallow (~1m) estuary in southern New England, USA. During the spring, denitrification dominated the dark incubations (24-702 &micromol N₂ -N m⁻² hr⁻¹), while net N-fixation became prevalent during summer dark incubations (9-106 &micromol N₂ -N m⁻² hr⁻¹). We relate our net N₂ fluxes to differences in site-specific environmental factors, such as sediment oxygen demand, sediment Chl a, dissolved inorganic nutrient (N, P) availability, and benthic organism abundance and diversity.