IS THERE A CONNECTION BETWEEN GROUNDWATER SEEPAGE AND BROWN TIDE BLOOMS IN LONG ISLAND EMBAYMENTS?

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Blooms of *Aureococcus anophagefferens*, the alga responsible for Brown Tides in Long Island waters, have been hypothesized to occur during years in which groundwater discharge is low. West Neck Bay (WNB), Long Island, NY, represents a paradox to this hypothesis since it receives abnormally high groundwater seepage and is host to Brown Tides more frequently than other embayments on Long Island. To better understand the influence of groundwater inputs on Brown Tides, a two-year sampling campaign was established at "bloom-prone" embayment, West Neck Bay (WNB), Long Island, NY. During 1997 and 1998, changes in water column chemistry and phytoplankton dynamics were observed, along with groundwater composition and flow rates. Groundwater entering WNB was enriched in nitrate (> 250 µM). During 1997 and 1998, elevated levels of dissolved nitrate (1 – 25 µM) were measured in the water column of WNB during the annual peak in groundwater flow. Peak nitrate levels were followed by mixed assemblage phytoplankton blooms that were succeeded by monospecific Brown Tides with densities > 5 x 10^5 cells mL^{-1}. Interannual differences in groundwater seepage were reflected in the magnitude of water column nitrate concentrations and phytoplankton biomass. Fifty percent more groundwater recharge in the Spring of 1998, as compared to the Spring of 1997, resulted in levels of nitrate and chlorophyll in 1998 (25 µM and 25 µg L^{-1}, respectively) exceeding those of 1997 (1 µM and 15 µg L^{-1}). Phytoplankton blooms preceding Brown Tides may supply *Aureoccocus* with organic nutrients, as annual bloom densities seemed dependent on the magnitude of dissolved organic nitrogen inputs prior to Brown Tides. A multivariate regression model is presented which accounts for 72% of the variability in Brown Tide densities during the two-year study period at WNB. A highly significant correlation between groundwater seepage and *Aureococcus* densities in the model suggests that rather than repressing Brown Tides, groundwater inputs to WNB can indirectly stimulate *Aureococcus* growth by initiating phytoplankton blooms prior to the Brown Tide (Figure 1A), which supply remineralized organic carbon and nitrogen when groundwater flow rates are reduced (Figure 1B).

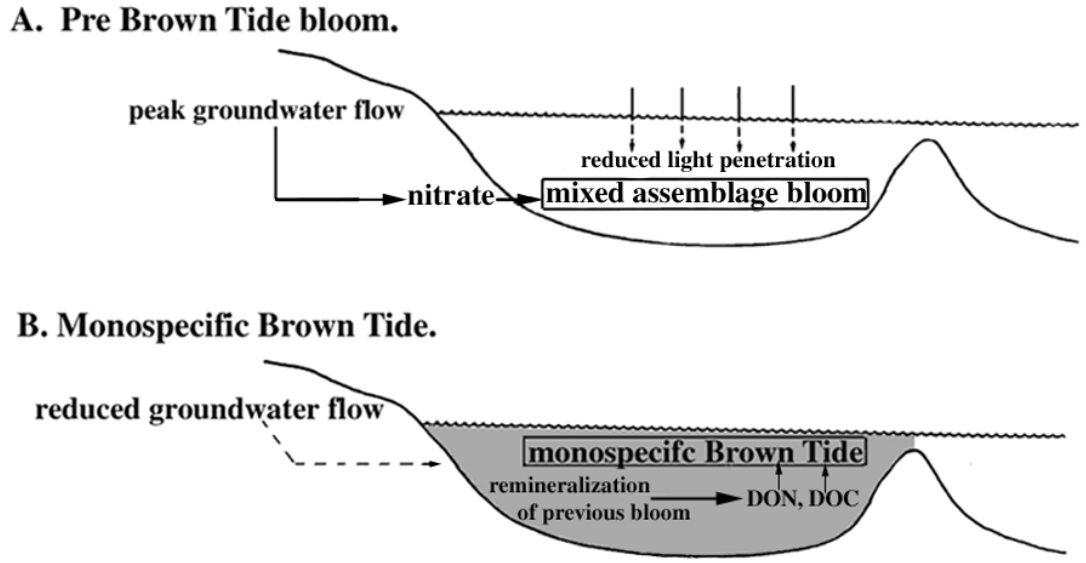

Figure 1. Conceptualized diagram of the temporal progression of groundwater flow and Brown Tide blooms in WNB during 1997 and 1998. A. During peak groundwater flow periods mixed assemblage phytoplankton blooms develop. B. The Brown Tide becomes monospecific as groundwater flow and light levels are reduced, initial non-Brown Tide algal blooms are remineralized and concentrations of DON and DOC become elevated.