Coupling of near-bottom seston and surface sediment composition: Changes with nutrient enrichment and implications for estuarine food supply and biogeochemical processing

Carmichael, R. H., I. Valiela

Limnol. Oceanogr., 50(1), 2005, 97-105 | DOI: 10.4319/lo.2005.50.1.0097

ABSTRACT: We compared near-bottom seston and surface sediment composition in Cape Cod estuaries receiving different N loads to determine whether eutrophic-driven changes in seston and sediment composition occur in tandem and what implications such coupling has for the quantity and quality of particles available as food for benthic consumers. $\delta^{15}N$ signatures in seston and sediment increased with increasing N loads to estuaries and linked particles in nearshore seston and sediment to land-derived wastewater sources. $\delta^{13}C$ signatures in seston and sediment reflected C inputs primarily from microalgae. Sediments, however, were consistently lighter in $\delta^{15}N$ and heavier in $\delta^{13}C$ compared with seston among our estuaries and in other estuaries worldwide, which suggests a seston-sediment biogeochemical coupling that may be independent of estuary-specific differences. In Cape Cod estuaries, N enrichment increased microalgal production in seston and sediment in nearshore areas, and higher N loads decreased C:N in sediments, but not in seston. The biogeochemical coupling reflected in isotopic signatures in seston and sediment persisted despite these changes associated with N enrichment and differences in grazer abundance, salinity, and flushing times across estuaries. Differences in isotopic signatures in benthic algae compared with phytoplankton were consistent with isotopic differences in sediment compared with seston, and microalgal production was the only aspect of composition that responded similarly to N loading in both seston and sediment across estuaries. The consistent coupling between seston and sediment composition, therefore, was likely related to differences in microalgal composition and, in turn, the type and quantity of particles available as food to consumers at the sediment-water interface.