



## Interannual variation in stable carbon and nitrogen isotope biogeochemistry of the Mattaponi River, Virginia

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Limnol. Oceanogr., 51(5), 2006, 2319-2332 | DOI: 10.4319/lo.2006.51.5.2319

**ABSTRACT:** Seasonal and interannual variation of the stable carbon (C) and nitrogen (N) isotope composition of suspended particulate organic matter (POM) was measured in the brackish and tidal freshwater regions of the Mattaponi River, a tributary of the York River, Virginia, and a pristine end member on a continuum of anthropogenic modification within Chesapeake Bay. A principal components analysis indicated that seasonal variation was related to physical mixing and river discharge. Freshwater POM had high C:N (>12), depleted particulate organic carbon isotopic composition ( $\delta^{13}\text{C}_{\text{POC}}$ , -26‰ to -30‰), and depleted particulate nitrogen isotopic composition ( $\delta^{15}\text{N}_{\text{PN}}$ , 2-10‰) compared to brackish water POM, which had lower C:N and enriched  $\delta^{13}\text{C}_{\text{POC}}$  (-24‰ to -27‰) and  $\delta^{15}\text{N}_{\text{PN}}$  (7-15‰). During high discharge events, the  $\delta^{13}\text{C}_{\text{POC}}$  was enriched, the  $\delta^{15}\text{N}_{\text{PN}}$  depleted, and the C:N high relative to low discharge periods, indicating a large contribution from terrestrial-derived material. Within tidal freshwater, POM was comprised of humic-rich sediment, vascular plant matter, and phytoplankton produced in situ. Nonconservative mixing behavior was observed. Endogenously produced phytoplankton increased POC concentrations in tidal freshwater and oligohaline portions during base flows. Where estuarine and riverine POM mixed, the isotopic composition of the POM was homogenized, blurring source-specific characters observed upriver and thereby emphasizing the need to characterize the freshwater end member of estuaries carefully in order to identify POM sources.

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