Investigating the use of macrophyte stable C and N isotopic ratios as indicators of wetland eutrophication: Patterns in the P-affected Everglades

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ABSTRACT: We investigated the use of stable C and N isotopic ratios as indicators of shifts in nutrient limitation of aquatic macrophytes in native *Typha* (*Typha domingensis* Pers.) and *Cladium* (*Cladium jamaicense* Crantz) communities growing along the well-established phosphorus enrichment gradient of Water Conservation Area 2A of the Florida Everglades. Both *Typha* and *Cladium* had significantly different δ'¹⁵N (~4‰ and 6‰, respectively) in affected areas, with live leaves of *Typha* showing elevated δ'¹⁵N up to 7 km from nutrient inflows. In contrast, changes in δ'¹³C were inconsistent, with an ~2‰ increase in *Typha* and a corresponding 2‰ decrease in *Cladium* of nutrient-affected areas. The isotopic patterns of live leaves were well represented in standing dead leaves of *Cladium*, but not for *Typha*, indicating a significant alteration of isotopic signature during senescence for this emergent species. Correlations of isotopic values with tissue nutrients (total C, N, and P) indicated a greater effect of P on the δ'¹³C of both plants and the δ'¹⁵Nof *Typha*, and a greater importance of N content in determiningδ'¹⁵N of *Cladium*. These results support the use of macrophyte biomass δ'¹³C and δ'¹⁵N as an indicator of eutrophication and shifts between N and P limitation. However, the results also highlight potential pitfalls arising from differences in species-specific response to nutrient enrichment.