Article

# Assigning hydrogen, carbon, and nitrogen isotope values for phytoplankton and terrestrial detritus in aquatic food web studies

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## Abstract

Studies designed to assess the resources supporting aquatic consumers using stable isotope analysis require measurements of the potential end members (basal resources). While some basal resources are easily measured, it is often difficult to physically separate phytoplankton (one potential end member) from other components in seston. Further, terrestrial materials entering aquatic ecosystems undergo diagenetic change, potentially altering isotope composition and making it difficult to assign end member values. We tested techniques for determining the isotopic hydrogen ($\delta^2H$), carbon ($\delta^{13}C$), and nitrogen ($\delta^{15}N$) values of terrestrial and phytoplankton end members in seston. Long term *in situ* leaf decomposition experiments were performed. No appreciable change was found in the isotope values of degraded material (mean change 3.6‰ for $\delta^2H$, 0.0‰ for $\delta^{13}C$, and −0.1‰ for $\delta^{15}N$). We conclude that the isotope values of terrestrial plant material can be used to assign end members for terrestrial detritus. Using samples collected from 10 lakes with phytoplankton-dominated seston, we compared 3 published methods for estimating the $\delta^{13}C$ and $\delta^{15}N$ of phytoplankton. One method, which corrected bulk particulate organic matter (POM) isotope values based on a $\delta^2H$ mixing model, accurately predicted measured phytoplankton $\delta^{13}C$. Another method, which used a C:N mixing model to correct bulk POM, also performed well. A new method, proposed here, modified seston isotope values using the difference in C:N of phytoplankton and terrestrial material in a $\delta^2H$ mixing model and correctly predicted measured phytoplankton $\delta^{15}N$. We recommend estimating phytoplankton $\delta^{13}C$ and $\delta^{15}N$ by correcting bulk POM using a $\delta^2H$ mixing model, with the C:N modification proposed here for $\delta^{15}N$.

**Key words:** food web, mixing models, phytoplankton, stable isotope analysis, terrestrial organic matter

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