



## Dissolved carbon dioxide concentration controls baseline stable carbon isotope signatures of a lake food web

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**ABSTRACT:** Temporal variation in the baseline stable carbon isotope ( $\delta^{13}\text{C}$ ) value of a well-studied, productive lake was examined over a 26-yr period using archived samples of the herbivorous zooplankter *Daphnia galeata* as a proxy because of its phytoplankton diet. The baseline  $\delta^{13}\text{C}$  value was strongly correlated with pH and the concentration of dissolved carbon dioxide in the lake as well as with the  $\delta^{13}\text{C}$  value of a predatory zooplankter. An isotopic fractionation model incorporating algal physiology (the growth rate, surface area, and carbon content of the main phytoplankton species) and the dissolved carbon dioxide concentration in the lake was used to predict, successfully, the baseline  $\delta^{13}\text{C}$  values of the lake over the study period. In aquatic ecosystems where the concentration of dissolved carbon dioxide is temporally variable, the baseline  $\delta^{13}\text{C}$  value can be more clearly defined by taking the concentration of  $\text{CO}_2$  into account. This approach will allow food web relationships to be quantified more accurately.

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