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Terrestrial, benthic, and pelagic resource use in lakes: results from a three-isotope Bayesian mixing model

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Abstract. Fluxes of organic matter across habitat boundaries are common in food webs. These fluxes may strongly influence community dynamics, depending on the extent to which they are used by consumers. Yet understanding of basal resource use by consumers is limited, because describing trophic pathways in complex food webs is difficult. We quantified resource use for zooplankton, zoobenthos, and fishes in four low-productivity lakes, using a Bayesian mixing model and measurements of hydrogen, carbon, and nitrogen stable isotope ratios. Multiple sources of uncertainty were explicitly incorporated into the model. As a result, posterior estimates of resource use were often broad distributions; nevertheless, clear patterns were evident. Zooplankton relied on terrestrial and pelagic primary production, while zoobenthos and fishes relied on terrestrial and benthic primary production. Across all consumer groups terrestrial reliance tended to be higher, and benthic reliance lower, in lakes where light penetration was low due to inputs of terrestrial dissolved organic carbon. These results support and refine an emerging consensus that terrestrial and benthic support of lake food webs can be substantial, and they imply that changes in the relative availability of basal resources drive the strength of cross-habitat trophic connections.

Key words: *allochthonous; autochthonous; cross-habitat linkages; deuterium; dissolved organic carbon; ecosystem; light extinction; stable isotope; subsidy.*