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Interactive comment on "Stable isotopes as ecological tracers: an efficient method for assessing the contribution of multiple sources to mixtures" *by* M. N. Bugalho et al.

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The authors use a linear programming approach to provide estimates of the minimum and maximum possible contribution of each source to a consumer. Also, a graphical solution depicts the convex hull, which shows the range of feasible solutions for consumers given the mixture of sources. The Bugalho et al. (2008) model can address

questions such as, "which sources are present in all mixtures; which sources are absent in all mixtures" and a variety of similar questions. The proposed tools are useful for identifying the feasible solution space for analyses where the number of sources greatly exceeds the number of isotopes. This form of uncertainty is common to many stable isotope analyses (Phillips and Greg 2003). We see that the paper also demonstrates the need to address two other forms of uncertainty that affect all stable isotope analyses: variability in isotope signatures and isotopic fractionation.

Bugalho et al. (2008) uses linear programming to identify consumer solutions that are infeasible. They suggest that the tolerance of the linear programming step can be altered to accept infeasible solutions that are ecologically sensible. We note that if uncertainty in isotope signatures were included, previously infeasible solutions may be accepted. That is, a consumer solution may plausibly reside in the feasible solution space after accounting for the uncertainty that results from measurement error, fractionation, and multiple tissue types. These forms of uncertainty may be addressed using a Bayesian-mixing model that estimates probability distributions for the proportional source contributions to a consumer (Moore and Semmens 2008, Parnell 2008). Bayesian analysis places probabilities on solutions with uncertainty included, whereas the convex hull analysis either accepts or rejects potential solutions based on their feasibility with uncertainty ignored. Explicitly incorporating uncertainty negates the need for a qualitative adjustment of tolerance to include plausible solutions. Hence we see the Bugalho et al. (2008) model as another useful tool for analyzing stable isotope data, but feel there is still an opportunity to expand its utility by including uncertainty in the analysis.

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BGD

5, S1201–S1203, 2008

Interactive Comment

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