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Interactive comment on “An isotopic ($\Delta^{14}\text{C}$, $\delta^{13}\text{C}$, and $\delta^{15}\text{N}$) investigation of particulate organic matter and zooplankton biomass in Lake Superior and across a size-gradient of aquatic systems” by P. K. Zigah et al.

Anonymous Referee #2

Received and published: 16 July 2012

Review of Zigah et al. (bgd-9-4399-2012)(Anonymous 2) Using stable isotopes ratios and radiocarbon measurements, Authors aimed to delineate carbon flow through the bulk zooplankton of Lake Superior before and during summer thermal stratification. They also present data obtained previously (2004) in “small” Canadian lakes and, adding oceanic data from literature review, try to established a relation between the percentage of autochthonous primary production contributing to zooplanktonic diet and the size of studied ecosystems. Their working hypothesis is that greater is the size of the aquatic ecosystem, greater is the contribution of “young” autochthonous carbon to

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zooplanktonic biomass. In their mat & met, Authors stated they have collected many physico-chemical parameters (Chla, Ph, Oxygen,...) during their cruises. These data are not presented and are not used in this paper. In the same order of idea, stable isotopes composition in the way they were measured (bulk POM, bulk zooplankton) are not very informative and they are not used for mixing model (the main part of this ms) which is run with radio-carbon data. Sampling design is no represented on a map, and, it is difficult for the reader to estimate which area of the lake is covered by the sampling and how the sampling is representative of general functioning of the lake. It is unclear for me how many samples were use for ^{14}C analysis and if these analyses were done for each sampling point. Author do not discuss critically of the representativeness of their data at the scale of the lake Superior or the possible spatial and seasonal variability in lake Superior functioning (the largest freshwater volume in the world, Dixit the Authors). When comparing Lake Superior and Canadian small lakes, Authors use two very different sampling protocols (different years, different month, different sampling design, notably zooplankton net used to catch bulk zooplankton). There is no critical discussion about these differences, nor on the fact that zooplankton specific composition is different between Lake Superior and small Canadian lakes (i.e. Copepod-dominated vs. Cladoceran-dominated). Authors use Baysian mixing model to calculate contributions of different C source is the diet of bulk zooplankon. They use only their ^{14}C data (one isotopic ratios). But basically, such models are conceived for multi-(stable) isotopes (generally $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) data (and sometimes forced by elemental data). They do not discuss about the influence on model calculation of this choice. Authors try to make very general relation between lake size and origin of carbon used by zooplankton. But I think is too general considering they compare lakes from same latitude and globally sharing main feature (except the size). Moreover, they use only their data for lake and no data from literature inside or outside North America. Therefore, their very general conclusion is not so general or, at least, representative of lake diversity and variability (other than size). Discussion should be more critical about that and/or would gain in generalisation if literature data from lake were used. Globally,

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I found the ms original, notably, by combining the use of radiocarbon data with mixing model application. But I think that some aspect must be more critically discussed in relation to existing literature.

specific Fry 1991 missing (check for other reference)

Interactive comment on Biogeosciences Discuss., 9, 4399, 2012.

BGD

9, C2447–C2449, 2012

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