

## **Review of [names omitted]**

This paper describes the concentrations of mercury in four lakes in upstate New York, one of which is highly polluted, and concentrations of Hg in mussels in multiple locations in each of the lakes. The paper demonstrates that zebra mussels bioaccumulate Hg and can be used as bioindicators. To be useful, we would need to know what concentration of Hg in mussels corresponds to what concentrations of Hg in lake water.

I enjoyed reading this paper. The writing is simple and direct. The main points are clearly elaborated.

## **General comments**

It would be good to identify more clearly what is the most important contribution of this paper. The fact that zebra mussels can be used as bioindicators has already been established, right? Was there any reason to doubt that they would work here, since they work in Europe? If there are specific reasons to expect that the results might differ, perhaps these could be explained. They would help give justification for your study.

It seems to me that for a bioindicator to be useful, we need to know the relationship between the contaminant concentration in the organism and the environment. Is there a good relationship between the Hg concentration in the lakes and that in the mussels? You don't show this relationship graphically. I'd like to see mussel Hg as a function of lake Hg, with symbols for the different lakes (and sites, maybe, in the case of Onondaga). If the relationship is linear within each lake (or site) but different across sites, we would know that the mussels could be used as bioindicators but that the relationship needs to be established for each application.

Is the issue of mussel size an important contribution of the paper? This issue gets only one sentence in the introduction. In the Discussion, you discuss the issue at more length. Could you test any hypotheses with your data? If so, the question of size effects should get more attention in the introduction. You say that high growth rates should result in lower Hg concentrations. Do you have the data to test this relationship? I would like to see a graph of mussel Hg as a function of lake Hg, with a regression for each size of mussel.

It's too bad you don't have a measure of mussel age that is independent of size. They don't make annual growth rings, or go through developmental stages? You also don't have a very good measure of the environments to which the mussels have been exposed. The infrequent sampling of lake water is a weakness of the study that should be addressed in the Discussion. Bioaccumulation occurs over a long time period (can you provide an estimate of the age of your mussels?), so an instantaneous lake concentration might not be expected to predict mussel concentrations very well. Is April a particularly good (or bad) time to sample?

The interaction of growth rate (accompanied by dietary Hg uptake) with environmental uptake seems very interesting. You could address it more explicitly, if you could analyze your data accordingly. Did you say you are still continuing your study? It would be great if you add data to make it possible to answer some questions in this area.

## **Specific comments**

The first sentence of the Introduction suggests that interest in this paper would be due to interest in Onondaga Lake. I think you have a wider audience in mind. Your second paragraph might be a better place to start (value of biomonitors). Then you could introduce Onondaga Lake and we would see it as a case study, rather than as the focus of your problem statement.

64-65 "to provide a robust analysis of reference data" doesn't mean much to me. Can you say why you have these lakes? You said that Otisco was the most similar to Onondaga. Is

Skaneateles the cleanest? You could say so, if it's true (in the Results I think you say that it's surprising that it didn't have the lowest Hg concentrations). You could say that the four lakes are in close proximity, or are there other lakes in the area of your map? It might be nice if you mentioned all the lakes.

87 What about mussels smaller than 15 mm? Say that you discarded them, or say that there weren't any (how small is the smallest mussel?)

116 "for the lakes and the sites" I'm not sure what you mean. Compare the lakes, with sites as reps? Compare the sites? Maybe you should remind us that your replication within site is 10 mussels (which size?)

130 What samples are included in this regression? Is the experimental unit one mussel? If so, should there be a blocking factor for lakes (or sites)? Were all sizes of mussels included?

134 These variables were added, in addition to Hg?

136-138 I don't understand your interpretation. Maybe it belongs in the Discussion section?

Your sections on variation among and within lakes treat only the mussels. Should you have a parallel analysis of the Hg concn lake water?

187 Can you speculate as to why? Same location? Same methods? Do you think it's change over time?

Why didn't you add mussel size to your regression?

On the last page, you explain that more rapid growth might be related to low Hg concentrations. I think this is true only for the environmental exposure to Hg, not to the dietary exposure. Or does it depend on growth efficiency?

The kinetic model of Reinfelder is not described well enough for us to see how it would improve the use of your bioindicator. Maybe you should give the direction of some of these effects. It's certainly not clear that this model better explains your results (219). All you have is the large mussels having low Hg in Otisco, which is in agreement with the simple model.

228 This is an important outcome of your study. I think you should be more explicit: what is your recommendation for how size should be accounted for? Do you really have a recommendation about weight differences in mussels of the same length? I didn't see this in your Results, maybe you need to emphasize it more if I missed it. 232 as well.

Table 1 could be text in the Methods section. I don't think it needs to be a table; you don't expect us to refer to it. It didn't help me understand about Nine Mile Creek (note inconsistency in spelling).

### **Comments not requiring a response**

Page numbers would be helpful.

39 First you said that biomonitors are good because they concentrate trace metals. You didn't say, explicitly, that they are inexpensive.

48 For these reasons

50 Do you mean primary consumers? What does this have to do with higher trophic levels?

51 Italicize Latin names (and all words that aren't English)

55 What kind of citation is this?

55-56 I don't get it. Did the other lakes have it and Onondaga was the last? I would guess something like "the invasion of these central New York lakes by zebra mussels makes it

possible..." what? To test the zebra mussel as a bioindicator? Or to compare Hg contamination in the lakes?

67 What organisms do you mean? If you want to talk about other organisms, maybe you should do it before you get to the Objectives. Maybe you did! So stick to what you're going to do. The justification for the approach comes earlier.

78 'urbane' is a word, but I think you want "urban"

I think Figure 1 should be cited in the Introduction as well as in the methods section.

79 The second sampling site is not always very remote from the first, according to your map! "...locations were selected for sampling, one near a boat launch and the other at some distance from it." Were there other criteria used in selecting locations that you could mention here? They had to have solid substrate at shallow depth, I learn in the next section. I think you should put all the information about sampling locations in this paragraph.

You can't start a sentence with "Hg." Use "Mercury".

97 When did you subsample? When the tissue mass was less than...

109 I think the sentence about collecting the sample should go before analyzing it.

111 which elements?

112 I think you should have a separate sentence for analysis of Hg. Is this done in the lab? So you had to bring a sample back?

115 specify variables

118 ak = awkward. I think you have two sentences here.

122 was very high at sampling site L2, which had ...; the other sites averaged ...

128 I think past tense is good for Results.

130 Mercury concentrations in lake water explained..., based on linear regression of ..

134 Don't introduce SC if you don't need to use it.

144 the mussels, not the lake.

180 We don't know where Ninemile Creek is, so it's hard to make sense of this sentence.

190 You're hinting as to the effect of size. Be more explicit. And why didn't you test the effect of size, to see how well it improves your regression?

195-6 You should describe this pattern in the Results section.

204 Not clear. Your data? If other data, please describe. Maybe the placement of the citations is confusing. If they are about the relationship of size to growth, this probably belongs earlier in the paragraph.

305 Location of sampling sites in the four lakes we studied.

Figure 2: We need to know if these are dry weights or fresh weights. The "n=" labels seem misplaced. Do the boxes need to be shaded?

Figure 3 should present the results in the same order as Figure 2.