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Hydrology and Earth System Sciences Discussions

Interactive comment on "Cyanobacterial and microcystins dynamics following the application of hydrogen peroxide to waste stabilisation ponds" *by* D. J. Barrington et al.

D. J. Barrington et al.

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Thank you for taking the time to review our manuscript and provide many insightful and helpful suggestions to improve its quality. We will integrate these into a revised version of the manuscript, which we believe will enhance the quality of the paper.

We appreciate your understanding that the value of our paper resides in the comparison of pre- and post- treatment data, both in the laboratory and at the full-scale. This work has added to the understanding of the processes occurring when hydrogen peroxide is used to treat cyanobacterial blooms, rendering it of importance to both water researchers and practitioners. Despite the lack of replication in the studies, this

work has provided valuable insights which will assist in steering the direction of further research and management of cyanobacterial blooms. In the revised manuscript we will provide further details regarding the lack of replication. As you indicate, there has been some misunderstanding around errors; the standard errors detailed in the manuscript were calculated using multiple measurements of cyanobacterial biomass, and processing multiple samples for cyanotoxins. It is understood now that these are 'pseudo-replicates'. Error bars will be removed where no replicates were tested.

More specifically, we are happy to address your other comments in the revised manuscript:

Comment 1: We will include further information on the enumeration methods of Hotzel and Croome.

Comment 2: We will incorporate a short discussion on the difference between maturation and facultative ponds, and how we selected our study site.

Comment 3: We are happy to alter the naming of our laboratory enclosures to microcosms.

Comment 4: We will incorporate a discussion of how differing spatial scales may have impacted upon our results.

Comment 5: As stated earlier, we will remove error bars where 'pseudo-replication' has occurred, and note these weaknesses in the text, particularly in the 'Data Analysis' section.

Comment 6: Quantitatively, we observed a rapid increase in apparent cyanobacterial concentration following hydrogen peroxide addition, followed by a decrease in the days following. As you have noted, we discuss this in the manuscript as being caused by the method of cyanobacterial measurement. In the revised manuscript we will also include qualitative discussion around the reduction of cyanobacteria, as it was clear from visual (and smell!) observations that cyanobacteria was killed following hydrogen

peroxide addition.

Comment 7: We will investigate whether presenting our data normalised to the control would result in it being easier to interpret. We have some concern over whether this will make the cyanobacteria data more difficult to interpret given the large increase in the hours following hydrogen peroxide addition. However, we agree that it will make the cyanotoxin behaviour, in particular, easier to understand, and it may thus be a better way of presenting the data. We will prepare figures in this manner and compare their ease of interpretation to the originals.

Comment 8: We will alter lines 8-10 on page 2068 to read 'total phytoplankton chlorophyll a led to the lysis of cyanobacterial cells, in turn causing the release of dissolved microcystins into the environment', and change 'death/killed/ to 'lyse/lysis' throughout the paper

Comment 9: We will capitalise Chlorophyta throughout the manuscript

Comment 10: As noted above, we will include discussion around how waste stabilisation ponds function, and how this impacted on the selection of our study sites.

Comment 11: On page 2068, line 23 we will insert a period after 'animals'.

Comment 12: On page 2074, line 19 we will insert a reference for "the resulting absence of fluorescence indicates a reduction in viable phytoplankton biomass".

Comment 13: The dissolved fraction was stored in the same manner as the intracellular fraction, and we will mention this in the manuscript.

Comment 14: We calculated total microcystin concentrations by summing the intracellular and dissolved concentrations, and we will include this in the revised manuscript.

Comment 15: We did not extract cyanotoxins in our 2011 study, but we did develop the extraction technique based upon other studies, which will be cited in the revised manuscript.

Comment 16: The intracellular samples were pooled because they were subsequent extractions of the same filter paper, to ensure that the maximum amount of cyanotoxins were extracted. We will ensure this is clear in the revised manuscript.

Comment 17: On page 2078, line 19 we will quantitatively define how much microcystin concentrations increased.

Comment 18: On page 2080, line 18 we will quantify the term 'low'.

Comment 19: The reference to Figure 3a (page 2081, line 3) is correct- the statement is that Chlorophyta increased in abundance following hydrogen peroxide addition, which is shown in this figure.

Comment 20: We would be happy to alter the order of the sub-figures in Figure 3 in the revised manuscript, as it does make more sense than the current ordering.

Thank you once again for your helpful suggestions. We hope that our willingness to incorporate such improvements to the manuscript will result in us being given the opportunity to submit a revised manuscript for publication in HESS.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 2067, 2013.