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***Interactive comment on* “Controls on microalgal community structures in cryoconite holes upon high Arctic glaciers, Svalbard” by T. R. Vonnahme et al.**

Anonymous Referee #1

Received and published: 21 August 2015

Controls on microalgal community structures in cryoconite holes upon high Arctic glaciers, Svalbard Author(s): T.R.V. Vonnahme et al. MS No.: bg-2015-237

general comments This is an interesting and overall well written manuscript describing the physical and community characteristics of cryoconite holes. The manuscript further attempts to determine how both the physical features of the environment and tropic level interactions may affect the biology of the system. Few previous studies have treated cryoconite holes in this manner and this manuscript compliments these earlier works well.

specific comments Page 11752 Line 6 Suggest at examples of the “grazers” Line 11

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Add comment mentioned in the conclusions that the positive relationship could be caused by similar environmental requirements of grazers and microalgae Line 18 Bird guano is a nutrient input not just a proxy. Page 11753 Suggest a comment on the life span of a cryoconite hole, i.e. do they form in the same location each year forming around the dark cryoconite on the glacier surface? Can they be considered a “semi-permanent” habitat? Lines 16-18. Delete the truism that only organisms adapted to the cryoconite holes can survive there. Page 11754 Line 12 Give some idea of sizes. Small is a relative term. Line 18 Expand on the “adaptation”. In what way? Page 11755 Line 3. Suggest beginning each “group” with a Roman numeral, i). . . . Page 11756 Include in the Site description something on the life span of the cryoconite holes. Are they formed new each year or does the cryoconite ensure they form in the same location each year? How many months of the year are they present? When does the surface snow clear from these glaciers? See comment about page 11753 Line 10. Not very clear how many samples taken on the Ebbabreen. Page 11757 Section 2.2. State where the lab work was undertaken. At field camp or were the samples returned to the mainland? Line 5. State that there were no organisms in the supernatant. Was this examined? Please state what keys were used for the identifications. How were these ids performed? Where is the identified material deposited? Section 2.3 Line 18. How was “wet supernatant” judged? Small differences in water content will have large differences on the determined densities. Line 19. Diluted with “meltwater”? Where did this originate? From collected ice? Page 11758 Lines 1-4. Some references are required to support these divisions of filtering classes. Especially as these become a major point in the ms later. Line 6. Reference required for photosynthetic activity occurring only in the first few μm of the sediment. Line 15. Has the work in 2012 been published? If not, some details on the sequencing of the 16S rRNA required. Line 26. When were these measured? Line 28. Please define “saturated sediment” more clearly. How was the excess water removed first? Page 11768 Line 21. Please explain ‘lateral thermal conductivity’ and how this results in a thin grain layer. Page 11769 Line 2. Consider using full site names in the text rather than abbreviations (e.g. HC and NC). It is easier

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for the reader to follow. Page 11770 Lines 3-7. This is a rather awkward sentence. Page 11771 Line 13. Define more clearly what the 'strong selective pressure' is to etc. Section 4.6 This is rather awkward to read and I suggest a re-write. Page 11772 Section 4.7 This sections feels a bit repetitive from earlier sections and would benefit from reducing or focussing more clearly. Page 11773 Line 13. Grazer abundances are related to the impact of birds not impact of birds to grazers as the text currently implies.

technical corrections

The English is generally very good but there are some grammar errors that should be addressed. Here are a few examples.

Page 11753. Line 25. Delete comma after "found" Page 11754 Line 9 replace suitable with able. Page 11756 Line 5. 'In' Svalbard, not 'on' Svalbard. Page 11760 Line 5. past should be in uppercase. Page 11762 Line 15. Should 'microalgae' actually read 'invertebrate'? Page 11763 Line 9. Lower case for species common names. Page 11765 Line 13. Suggest replace land with terrain.

Table 2 It is unclear to me why site NR appears in the column but not the row and NL occurring in a row but not a column? Fig 1. Suggest a map locating Svalbard. Suggest simplifying the map, e.g. less detail, fewer contours, to enable the site locations and names to be more easily read.

Fig 2 can be deleted. This system is basically a large pooter and could be referenced to Southwood and P A Henderson 2000 Ecological Methods. Blackwell. Figs 3 and 5a are only understandable in colour. Can these be adjusted to be clear in B&W?

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