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## ***Interactive comment on “Density and distribution of megafauna at the Håkon Mosby Mud Volcano (the Barents Sea) based on image analysis” by E. Rybakova (Goroslavskaya) et al.***

### **Anonymous Referee #1**

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This manuscript presents new data on the megafaunal assemblages of the Haakon Mosby Mud Volcano. A substantial number of images of the seafloor was used for the quantitative analysis of the density and distribution of the megafauna but I think that the working hypotheses have to be formulated in a more straightforward manner and some of the methodological approaches have to be clarified.

Specific comments:

The introduction is a rather lengthy account of the research history at HMMV. In my opinion much of the information is not of direct interest to the results presented in the ms. On the other hand, there is no reference to other studies focusing on megafaunal

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distribution in cold seeps. What is the current knowledge on these assemblages from cold seeps?

The approach used for the multivariate analysis is confusing; the authors refer in the introduction that they aim “to identify an effect of a habitat type on the structure of benthic communities” but they do not define clearly in the methodology which are the groupings used for the ANOSIM tests – Are these the three habitat types (bacterial mats, pogonophoran fields, light-coloured sediments)? Or are these groupings based on given combinations of % cover of tubeworms and bacterial mats? Figure 3 is not very helpful in clarifying this because the different habitat types cannot be easily recognized. For instance which are the samples representing the “plain light-coloured sediments”? I do not understand why the authors are performing separate analyses (ANOSIM) for bacterial mat sites, pogonophoran sites and plain sediments instead of an integrated analysis. It is rather confusing. For instance an image with 0% bacterial mats could be an image with 100% pogonophoran cover or an image with plain sediments but certainly these represent very different assemblages. Conversely an image with 0% pogonophorans could be 100 % bacterial mat or plain sediment! My recommendation is: 1. Define clearly the habitat types (if needed included more than the three categories to accommodate for mixed habitats); 2. Ascribe each image to one (and only one) habitat type; 3. Perform a single ANOSIM analysis to assess the effect of habitat type on the megafaunal assemblages and if significant verify the pair-wise comparisons and perform SIMPER. 4. Finally, perform the Kruskal Wallis and Mann-Whitney tests when applicable

The discussion could be more structured in different sections

Technical comments

P17477 L7 “diaperism” – change to “diapirism”

P17481 L17: “In total 1604 images were examined using a stereo microscope.” – Why was a stereo microscope used to examine the images?

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P17481 19-20: “Images with hard substrata (boulders, carbonate rocks and crust) were excluded” – Hard substrata are a source of environmental heterogeneity that usually contributes to enhance biodiversity; A justification for the exclusion of these images should be given.

P17482 L15: use the term “square root” instead of symbol

P17482 L17-18: “Analysis of similarity (ANOSIM) was used to determine the degree of separation of images from. . .” – rephrase; ANOSIM is used for hypothesis testing, it assesses the significance of the difference among a series of samples included in predefined groups – “determine the degree of separation” is not the most exact phrasing.

P17484 L15: “two groups of images similar to groups revealed by ANOSIM” – ANOSIM does not reveal groups, it is a test applied to predefined groups

P17490 L22-25: “ANOSIM revealed significant differences in megafaunal composition and density on images taken inside the caldera on light-coloured sediments devoid of bacterial mats and pogonophorans and images outside the caldera (Global  $R = 0.378$ ,  $p = 0.001$ ) indicating significant differences” – significant differences is repeated in the beginning and at the end of the sentence.

P 17492 L3-12: In their inventory of the benthic taxa known for the HMMV the authors include megafaunal as well as infaunal groups/species. In this case it would be important to incorporate also the results published by Decker et al 2012. The table 2 shown in the supplementary material should also be a complete inventory.

P17493 L6-9: Rephrase or define the terms “specialist” and “opportunistic”

Figure 3: Figures 4 and 7: the authors have very nice photographs of the seabed – these should be valorized (presented in a larger format).

Fig 5: use log scale on Y axis (instead of broken bars) – it also improves visualization of smaller bars

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Figure 8: Why is “Area coverage of bacterial mats: (0) 0 %, (1) <10 %, (2) 10–50%, (3) 50– 80 %, (4) >80 %; Archeolinum contortum: (0) 0 %, (1) <10 %, (2) 10–50 %, (3) >50 %.” included in the caption?

Supplement Table 2: the caption should be changed because the taxa listed are not exclusively megafauna.

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