EGUsphere, author comment AC1
https://doi.org/10.5194/egusphere-2022-682-AC1, 2022

Reply on RC1

Sarah A. Brown et al.

Author comment on "Depth-related patterns in microbial community responses to complex organic matter in the western North Atlantic Ocean" by Sarah A. Brown et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-682-AC1, 2022

We will rewrite the Results section to help readers better focus on the points that come up in the Discussion, as suggested by the reviewer. In addition, we will more clearly delineate this study from Balmonte et al., 2019.

L25: The first sentence is of the abstract is too long. Diving into two sentences would help.

We will divide this sentence into two.

L26-27: Please define the depth of mesopelagic and bathypelagic zones in the abstract.

We will add the meso- and bathypelagic depths listed in the Introduction into the Abstract as well.

L35-39: Please be more specific and add some points to discuss the provided results.

We will add specific points from the results section to the abstract.

L74: Please mention the importance of polysaccharides and proteins in marine carbon cycling. This paper would also help to add some ecological context (https://www.biorxiv.org/content/10.1101/2022.08.04.502823v1)

We will add information on the importance of polysaccharides and proteins in the marine carbon cycle in the paragraph before L74 in the introduction, as suggested, by moving the statement on L105-106 up and providing additional information from the literature.

L97: Please provide more information for "the nature of that enzymatic response differed in some key respects". That will also help to define the motivation of the study.

The sentence on L97 is referring to the results described on L88-95. To make this clear, the sentence on L97 will be modified to further explain the key respects that we refer to – specifically that the rate and spectrum of enzymatic activities differed by location.

L102: What does "moderate quantities" mean? Please be more specific.

Moderate quantities is defined as 658 uM of HMW dissolved + particulate organic carbon in the methods section; we will add this information to the introduction.

L231-236: Is there any particular reason to get samples from these stations? Adding some oceanographic key data would help.

We chose these stations in order to investigate the bacterial communities present in the specific water masses in this region (North Atlantic Surface Water, North Atlantic Central Water, and North Atlantic Deep Water) at these two stations. We chose these water masses because we wanted to examine distinct bacterial communities present in distinct water masses; we can clarify this point in the results section. We will also reference an additional manuscript which is focused specifically on the biogeochemistry of this part of the western North Atlantic, which includes more discussion of the physical oceanography of the region.

L247: Please clearly define "endopeptidases". There are some substrates listed in the supplementary figure and it is not clear which ones are endopeptidases.

Endopeptidases refers specifically to trypsin (measured with QAR and FSR) and chymotrypsin (measured with AAF and AAPF) activities. This sentence will be modified to indicate that we are referring specifically to trypsin and chymotrypsin activities when we mention endopeptidases.

Figure 1: Please provide the full names of substrates in the figure or in the legend. Also, using a different scale for amended and unamended could be misleading. Maybe using broken axis or another solution would help?

Given the significant difference between that hydrolysis rates in amended and unamended mesocosms, we have found that plotting them on different axes is the best way to visualize them; plotting them on the same axis tends to make it difficult to see the lower unamended hydrolysis rates. However, we will make it clear in the figure caption that the axes are quite different between the amended and unamended samples.

L266: Please define alpha and beta-glucosidase activities. What do they use for?

What is the difference between them?

α- and -β-glucosidase are both exoenzymes that hydrolyze glycosidic bonds (α- and -β glycosidic bonds, respectively) which are oriented differently. Cleaving these glycosidic bonds in oligosaccharides or polysaccharides results in α- and -β-glucose. Here, we measure α- and -β-glucosidase activities using 4-Methylumbelliferyl- α-D-glucoside and 4-Methylumbelliferyl- β-D-glucopyranoside. We can add further information to the Methods.

L278: For this section, please introduce the polysaccharides used in this study. Short biogeochemical and ecological information would help. What are the sources of these polysaccharides? Why they are important? Why did you select these substrates?

The six polysaccharides we used were chosen because they possess distinct structures and thus different enzymes are required for their hydrolysis, they are abundant in the ocean, and bacteria capable of hydrolyzing these polysaccharides have been identified. We can include additional information on the sources of these polysaccharides, and will give examples of their abundance and complexity, citing relevant literature, in this section.

L316: Please explain why you measure bacterial protein production rates.

We measured bacterial productivity using leucine incorporation in order to measure bacterial protein-based growth rates. Sequencing samples provides a measure of the composition of the community; measuring protein production provides a measure of community activity. Although not all bacteria take up leucine, this method is widely used and is standard in the field of marine microbiology.

Figure 3: Please explain how you classify ambiguous taxa in the legend. Also add the information in the methods section.

Ambiguous taxa means that these sequences could not be assigned to a taxonomy; we will clarify this point in the Figure 3 legend.

Figure 4: Too much information is embedded in MNDS plot. Is it possible to divide this figure into different panels to show the differences between treatments, depth, and time.

Yes, we can split the NMDS plot into 3, highlighting Treatment, Depth, and Time separately from one another.

L475-490: I really like the discussion provided in this paragraph! It would be a very good example for the rest of discussion.

Thank you! We will try to revise the rest of the discussion accordingly.

Figure 5: Very nice summary! Yet, it is difficult to read the next and see the colours within dark background. Please make the background lighter.

We are glad that you like the figure, and will update the colors in Figure 5 so that the legends are easier to see.

L530: There is an elevated chondroitin hydrolase activity in bathypelagic. Why don't you discuss it here?

We will add information on the elevated chondroitin hydrolase activities in the bathypelagic into the discussion section.

L569: For to discuss fucoidan, please also refer this paper: https://www.nature.com/articles/s41467-021-21009-6

We will add this reference to the discussion.

L584: Please provide a more relevant sentence to finalize the manuscript. I cannot see any direct link between your data and the "changing ocean conditions".

We will edit the concluding sentence so that it is more relevant to the data in this manuscript.

Supplementary information: Please provide the full names of used substrates in Supp Fig. 3, 4 and 5

For Supplementary Figures 3, 4, and 5, we will include text in the legends that explains the abbreviated names listed in the figures.