Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-399-RC2, 2019

Biogeosciences Discussions

Interactive comment on "Assessing annual variability in the shell thickness of the pteropod *Heliconoides inflatus* in the Cariaco Basin using micro-CT scanning" *by* Rosie L. Oakes and Jocelyn A. Sessa

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Received and published: 5 December 2019

This manuscript is described that biological responses Below are the comments:

This manuscript describes the biometrics of pteropod shell and its degradation based on sediment trap samples in the Cariaco Basin. This kind of works of pteropod shells using the sediment trap samples are insufficient, so it is very important to trace the biological responses to the ocean acidification and related ocean environmental changes. Especially the information of tropical species is less. In this sense, this work has the

potential to become the base and develop criteria for this kind of study. Below I pointed out some concerning issues for this ms and make the comments

1. The relationship between shell length and whorls. According to photos in supplemental document, the aperture of some shells was damaged or showed bad preservation. The author inferred that shell diameter and whorl does not show clear relationship, but if a part of aperture had lost by dissolution and/or physical damage, its relationship between shell length and whorl might become uncertainty. If the plankton tow samples are available, the authors should use those plankton samples, not sediment trap ones. Or at all possible, the authors should use the only perfect shell in order to interpret length-whorl relationship.

2. Shell dissolution: How and when? 2. shell dissolution: How and when The authors described that preservation states of shells in the sediment trap was not related to the duration time, so it might be negligible dissolution in the sediment trap collection cups. If this is correct, shell dissolution occurred at the water column, and it was associated with microzoo/bacterial activity which was decomposing organic tissues. My questions are that 1) in this case, does shell dissolution occurred at the inside, and outside of shell is sufficiently preserved? Can the authors show this evidence? Based on the photographs on the supplement material, surface texture of some shells looks like cloudy and lost their luster, indicating dissolution of outer shell. I am wondering that the decision of less dissolution in the sediment trap collection cups based on the result of relationship between residence time and LDX might be insufficient. In other words, I infer that shell dissolution occurs not only by microorganisms/bacterial activity but also postdepositional oxidization in the sediment trap cups, as authors mentioned. I am understanding that this certification is very difficult, but the authors are using SEM, so please show some possibilities from the direct observations of materials. Another possibility, is it available the comparison between organic carbon of the samples and LDX ? Highly input of organic carbon flux induce carbonate dissolution at the inside of sediment trap cup. 2) Relating to above, I understood this study is the first, and

make the baseline of this kind of pteropod study, but it is bit unclear the main subject and purposes. If the authors interpretation is correct, does the pteropod shell of this species /or in this region not become an index of ocean acidification? I suppose that the authors want to make the criteria as OA index by using pteropod shell, but in this case, I think that shell preservation states indicate microorganisms activity in the pteropod shell.

3. I think it is very important finding that shell thickness does not have relationship with surrounding omega value (but still supersaturated). I strongly agree with the authors that they have resistance characteristics to small changes of saturation states and depends on available food to build their shells. However, the authors did not show what kind of food is important for their prey. If their main food is phytoplankton, please show their annual variations through a year instead of nutrient concentrations (Or is it possible to show the number of diatom bulbs in the sediment trap cups?) Because their food is particulate matters, not chemical component. It might be a good evidence to indicate their food availability.

4. The authors did not touch the phylogenetic variation of the species, but I am wondering the possibility of mixture of some lineages of this species. H. inflatus is certificated as a single-genetic species around the Cariaco basin? Or exists some cryptic species? If the author has this kind of information, please mention it for just confirmation. It is possible that the plasticity of shell (shell length, number of whorls) of this species that author mentioned is related with the phylogenetic variations.

5. Can the author interpret about morphological implication from the microXCT analysis? Because it is very powerful tool and shows huge possibility for morphological information. If the authors want to indicate some suggestive issues, please make comment for following researchers and future study

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