

Dear Prof. Karem Azmy,

We want to thank very much Karem Azmy for the very constructive, helpful and valuable comments and corrections, which helped us to ameliorate the manuscript. Please find below my responses to all comments:

Title: Variation in brachiopod microstructure and isotope geochemistry under low pH–ocean acidification–conditions

Authors: Facheng Ye, Hana Jurikova, Lucia Angiolini, Uwe Brand, Gaia Crippa, Daniela Henkel, Jürgen Laudien, Claas Hiebenthal, and Danijela Šmajgl

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The responses to referees are structured following this sequence using different colors:

(1) Comments from Referees;

(2) Author's response;

(3) Changes in the manuscript: original sentences/revised sentences

Comments from K. Azmy (Referee): Received and published: 13 August 2018

I have read the manuscript by Ye et al entitled “Variation in brachiopod microstructure and isotope geochemistry under low pH–ocean acidification–conditions”, which test the ultrastructural and stable isotope geochemical variations in the shell of *M. venosa* shells that were partially cultured under different pH conditions. The subject of the manuscript fits well within the scope of BG and the paper present a novel application to brachiopods that are known to archive the climatic and oceanographic conditions of the ambient seawater.

The title reflects the paper contents and the abstract is concise and to the point. The authors used the proper methodology and utilized the most suitable tools to perform their investigation that lead to clear and reliable and good results that will contribute significantly to the subject of study. The experimental procedure is clear and the statistical analyses utilized are suitable. The references are up to date and the general structure of the manuscript is appropriate.

I have some minor comments that I list hereby below.

1) Page 7 Line 6: How were samples transported? in what type of containers and under what conditions of transportation. Provide couple of lines that describe the conditions during transportation and how they were maintained to simulate the original environment as close as possible.

Answer:

We agree with the referee’s suggestion and we have added the requested information in the revised manuscript.

Page 7 Line 6:

In summary, *M. venosa* individuals sampled in Chile were transported to Germany and cultured under controlled environmental setting in a climate laboratory.
changed to

In summary, individuals of *M. venosa* have been collected and were kept in plastic bags filled with seawater for transport to GEOMAR, Germany. After they arrived they have been cultured under controlled environmental setting in a climate laboratory.

2) Page 11 Line 7: “Four sub-zones (C2, A1, A2, A3)”, a figure is needed to be cited here to show the positions of those sub-zones.

Answer:

We have added the legend showing positions in the revised figure 4.

Page 11 Line 7:

Four sub-zones (C2, A1, A2, A3) were defined according to their position along the posterior-anterior direction,
changed to

Four sub-zones (C2, A1, A2, A3) were defined according to their position along the posterior-anterior direction (Figure 4),

3) Page 15 Line 3: after “microdrill” add here at "low speed"

Answer:

We have added it in the revised manuscript.

Page 15 Line 3:

microdrill with tungsten–carbide milling bit.

changed to

microdrill at low speed with tungsten–carbide milling bit.

4) Page 16 caption of Table 5: “are marked in bold style”. There nothing is marked in

bold font in the table. Mark those values in bold font. Also replace “style” by “font” or you can delete the entire word “style” and leave it as “marked in bold”. Change to “N” into "n" in italic font and fix it in the rest of table headings. This way you do not need to repeat it in the following table captions

Answer:

We have made all these corrections in the caption and in Table 5.

Page 16 caption of Table 5:

are marked in bold style

changed to

are marked in bold

5) Page 17 Line 12: “worth noting” change to “noteworthy”

Answer:

We have changed it in the revised manuscript.

Page 17 Line 12:

However, it is worth noting that in the most anterior part

changed to

However, it is noteworthy that in the most anterior part

6) Caption of Table 6: What does this mean? " "â´S~a: Specific zones see to Figure 7". Something is wrong. Delete "to" Also no specific zones marked on Figure 7. This is confusing and similarly in the Caption of Table 7.

Answer:

We have made this correction in the revised manuscript.

specific zones marked on Figure 7

changed to

for the position of zones (C2, A1, A2, A3) see Figure 7

7) Is STD 1 sigma or 2 sigma. Replace by the correct value and use the Greek proper letter. Fix it in the rest of the manuscript and table captions when applicable If you used excel for your calculations, then this is =STDEV.P .

Answer:

We have made the correction in the table caption, and fixed it in the rest of the manuscript and table captions.

We have added this sentence in the captions of Tables 5, also changed STD to σ in the other tables (6-10):

Population standard deviation (σ) was calculated using the Excel STDEV.P function.

8) Page 28 Line 27: “which in”, delete “in” and replace by “during”. Also add “s” to “expansion”

Answer:

We have made this correction in the revised manuscript.

Page 28 Line 26:

Endopunctae, which in life are filled with mantle expansion,

changed to

Endopunctae, which during life are filled with mantle expansions,

9) Page 31 Line 6, add “,” after “inconspicua”

Answer:

We have added it in the revised manuscript.

Page 31 Line 6:

For the Antarctic brachiopod *Liothyrella uva* and the New Zealand brachiopod *Calloria inconspicua* no ocean acidification effects on shell growth were detected by Cross et al. (2015, 2016, 2018),

changed to

For the Antarctic brachiopod *Liothyrella uva* and the New Zealand brachiopod *Calloria inconspicua*, no ocean acidification effects on shell growth were detected by Cross et al. (2015, 2016, 2018),

10) Page 33 Line 22: replace “similarly” by “and similar”

Answer:

We have made this correction in the revised manuscript.

Page 33 Line 22:

Thus, in bivalves, similarly to our observations,

changed to

Thus, in bivalves, and similar to our observations,

11) Page 34 Line 9: “We exclude: : : : : : : : : : :” The structure of this sentence is wrong. Rewrite it.

Answer:

We have rewritten this sentence:

Page 34 Line 9:

We exclude that this drop may be produced by shell material added later, during the during–culturing shell thickening, as the samples were taken from the mid-shell layer and not from the shell interior.

changed to

Since the samples were taken from the mid-shell layer and not from the shell interior, we can exclude that the isotope negative shift was produced by shell material added during the during–culturing shell thickening. This small drop may be an artefact of both sampling and analytical uncertainties. However, it does not distract from the drop observed with culturing.

12) Page 34 Line 11: add “a” before “similar”

Answer:

We have added it in the revised manuscript.

Page 34 Line 11:

negative isotope excursions of similar magnitude were recorded

changed to

negative isotope excursions of a similar magnitude were recorded

13) Page 34 Line 16: delete “also” and put it after “been” and delete the other “also in” after “observed”

Answer:

We have made these corrections in the revised manuscript.

Page 34 Line 16:

Negative shifts in both, $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values during ontogeny have also been observed also in in the brachiopod *Terebratella dorsata*,

changed to

Negative shifts in both, $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values during ontogeny have been also

observed in the brachiopod *Terebratella dorsata*,