

EGUsphere-2022-576 - Reply to comments reviewer 1

Dear reader,

We would like to thank Reviewer 1 for the positive review of our manuscript, and for the helpful comments that will allow us to improve it. Below, we reply to the review comments point-by-point and explain how we plan to make changes in the manuscript following the reviewer's suggestions.

de Winter et al. present a comprehensive dataset on trace elements in scallops and giant clams. The data are robust and they do a good job presenting them. My comments are minor and mostly deal with adding to the discussion and referencing previous works. I recommend to publish with minor changes.

We are glad to read that the reviewer thinks our contribution merits publication after minor revisions, and will do our best to revise our manuscript in reply to the issues raised below.

Abstract

Reads too positive – should be toned down.

We appreciate that we might have stated these claims too optimistically, and rephrased them as follows:

E.g.:

"now enable the use of mollusk shells for paleoenvironmental reconstructions at a daily to sub-daily resolution"

Rephrased to: "now allows *in situ* determination of the composition of mollusk shell volumes precipitated at daily to sub-daily time intervals"

"We find significant expression of these periodicities"

Rephrased to: "We find weak but statistically significant expression of these periods, and conclude..."

L518-519 – be more explicit and less colloquial. "There is some discussion"? In the published literature? Maybe say previous studies... Then "This study's" – are you referring to the citations in the previous sentence or are you referring to the work you present here?

Also, "the same year in the same environment" as what?

L521 "arguing against a simple temperature dependence for Mg/Ca" – maybe say agreeing with previous studies

Following these suggestions, we rephrased the section in L518-521 as follows:

"Previous studies demonstrate that Mg/Ca ratios in pectinid shells are at most partially related to temperature and/or salinity (Lorrain et al., 2005; Poitevin et al., 2020). The fact the studied *P. maximus* specimens, which all grew during the same year in the same environment, do not show a synchronous Mg/Ca pattern (Fig. 2) agrees with previous work and argues against a simple temperature dependence for Mg/Ca in *P. maximus*."

L523 – Lorrain et al. 2005 also found this – state that here

Agreed, we rephrased to: "...hints at compositional heterogeneity within the shells, in agreement with findings by Lorrain et al. (2005)."

L536 Gillikin et al. 2006 (doi:10.1016/j.gca.2005.09.015) discuss separating the background Ba/Ca from the peaks. If these shells all grew in the same salinity they should all have similar background values. Do you see this? I think this should be commented on here.

Our LA-ICP-MS results do not show consistent background Ba/Ca values in all specimens grown in the same environment (Fig. 2), which would argue against the statement by Gillikin et al. (2005). We wish to comment on this by adding the following sentence in line 535, between "(Fröhlich et al., 2022)." and "This relationship":

"Interestingly, our results (**Fig. 2**) show that background Ba/Ca values are not equal in the shells of *P. maximus* and tridacnid specimens grown in the same environment. This contradicts the assessment by Gillikin et al. (2005) that background Ba/Ca concentrations are a function of environmental conditions and can be consistently subtracted from Ba/Ca records to separate peak from background values."

L541 – the subheader here is wrong, this section is about scallops

Correct, this should read: "Short-term changes in shell compositions in *P. maximus*" and will be rephrased accordingly.

L599 – should discuss Carre et al 2006 (already cited) and Gillikin et al. 2005 (doi: 10.1029/2004GC000874) here.

We propose to refer here to the conceptual model for membrane permeability through Ca^{2+} -channels put forward by Carré et al. (2005), and argue against the hypothesis that Sr uptake is controlled by discrimination during mineralization from the extrapallial fluid into the shell (as proposed in Gillikin et al., 2005). This model is in better agreement with the most recent studies into tridacnid shell mineralization (cited in this paragraph). In the revised version, we conveyed this point by adding the following sentences after line 594:

"...such as Sr^{2+} (Ip and Chew, 2021). This mechanism follows the biomineralization model by Carré et al. (2006) and is supported by the high affinity of Sr^{2+} with Ca-channels (Hagiwara and Byerly, 1981) and the high ionic fluxes supported by this pathway, allowing enough membrane permeability to support the fast shell formation in tridacnids (Coimbra et al., 1988; Sather and McCleskey, 2003). Following this line of reasoning, the preconcentration of Sr^{2+} in the extrapallial fluid through Ca-channels should have a larger effect on shell Sr/Ca ratios than the discrimination against Sr^{2+} (or other trace elements) through shell organic matrix during mineralization of the shell from this fluid (as proposed in Gillikin et al., 2005). This model could explain the indirect link ..."

Hagiwara, S. and Byerly, L.: Calcium Channel, Annual Review of Neuroscience, 4, 69–125, <https://doi.org/10.1146/annurev.ne.04.030181.000441>, 1981.

Coimbra, J., Machado, J., Fernandes, P. L., Ferreira, H. G., and Ferreira, K. G.: Electrophysiology of the Mantle of Anodonta Cygnea, *Journal of Experimental Biology*, 140, 65–88, <https://doi.org/10.1242/jeb.140.1.65>, 1988.

Sather, W. A. and McCleskey, E. W.: Permeation and selectivity in calcium channels, *Annual review of physiology*, 65, 133–159, 2003.

Gillikin, D. P., Lorrain, A., Navez, J., Taylor, J. W., André, L., Keppens, E., Baeyens, W., and Dehairs, F.: Strong biological controls on Sr/Ca ratios in aragonitic marine bivalve shells, *Geochemistry, Geophysics, Geosystems*, 6, <https://doi.org/10.1029/2004GC000874>, 2005.

Section 4.4.2 – I don't think this section clearly shows how your data contribute to this idea. It's mostly a discussion of previous studies. A sentence or two blending your results into this would bolster this discussion.

Agreed, we propose to rephrase the following segment to better explain how the effect of the processes we describe from the literature can be observed in our data:

We rephrased

"This highlights another difference between the environments of pectinid and tridacnid specimens investigated in this study which could contribute to the variable expression of periodicity in the trace element composition of their shells." (L796-798)

into

"This difference is also reflected in the periodicity of shell composition, with the tridacnids having overall higher percentages of their variance explained by daily and tidal variability than pectinids (**Fig. 6**), showing that aperiodic (potentially weather-controlled) variability in shell composition has a stronger influence on the pectinids which grew in the stormier Bay of Brest."

Later in the paragraph (L804-805), we already refer to our results and the proposed pathway by which variability in trace element composition we measured can be explained.

Many citations are missing journal names (e.g., L895, L903, L919, L924, L927, L929, L936 and many others...)

We will go through the reference list and add all missing information during our revision.