

I would like to thank Piwoni-Piórewicz and co-authors for providing a new and updated version of the manuscript. However, for future reference, please indicate line numbers with all your changes in your response to reviewers comments, and provide a manuscript with tracked changes / or highlighted changes in text. This way, the reviewer can quickly see the changes and improvements made by the author (also changes based on comments from another reviewer/editor), just a response like: "These issues have been discussed more clearly in the revised version of manuscript." is not sufficient in my opinion.

Some specific comments on the response to the author document:

- In the 'Author response' they do state that there is no protocol they could have used ('we do not believe there is a single accepted protocol for bivalve shells, that is tested and validated for a large range of trace elements'), however, if the whole aim of your study is to compare such a wide range of elements in different shells, maybe some method development should have taken place before. Even (relatively) simple comparison of shell fragments of a single shell with different cleaning treatment (versus no cleaning) applied, could have make their dataset more robust. I highly suggest that for future work cleaning methods as well as the impact of organics should be investigated!

-Authors: In the revised version of the manuscript, we emphasise that the contribution of the organic matter to the elemental variation is likely to be relatively minor considering that bivalve and barnacle shells contain, in general, less than 5% organic matter (Bourget, 1987; Marin and Luquet, 2004; Rueda and Smaal, 2004)

- Reviewer: 5% in weight? Is there any idea about the concentration of certain elements in this organic matter? Even if it is 5% of the total weight, if the concentration of e.g. Na is very high, this still leads to a biased E/Ca for the CaCO₃. Also you refer to Takesue et al., 2008, who found e.g. 19% organic matter.

-After comments by both me and the other reviewer, I still do not see any discussion on the fact that lager (and thus older) shells have also experienced more time, and more environmental fluctuations. Can the authors comment on this directly?

Minor comments:

(General comment) The manuscript is incredibly dense in information. Of course it is great to have numerous references and explanations for observed patterns, but also makes it sometimes difficult to absorb the main take home messages. Be careful for repetition, for instance, please check overlap between paragraph 2.2 and 4.3.

Line 17: please add clearly you work on bulk material

Line 27: "Moreover, the elemental concentrations tend to be lower in larger than in smaller shells." This is confusing, suggesting to change to something like "lower in the large size class compared to the smaller size class"

Line 41-43: changes in font size

Line 44: consider changing metals to trace metals or trace elements.

Line 45: consider rephrasing, you mean the pathways of trace metals into the CaCO₃? What do you mean with multistage process? Do the organisms form their shell through meta-stable phases of CaCO₃?

Line 124: remove 'it'

Line 124-125: I disagree. You demonstrate the study area is highly fluctuating, so the older specimens will have experienced different environmental conditions. Change e.g. to '.. we can try to disentangle...'

Line 135: renumber your figures, this should be fig. 1, since it is the first figure you reference). Check full manuscript

Line 169: So this is then Fig. 2.

Paragraph 2.3 As requested before, please add the sample time(month) in the manuscript, not only in the table.

Line 259: Is this 20% error propagated into the SD/values reported in Table 3?

Line 221: change to 'based on the size'

Line 235-238: Samples were split and measured by both ICP-OES and ICP-MS?

Line 254: What was the precision (%) compared to the reference values?

Line 272-274: "However, the concentrations of given metals were different between shells of *Cerastoderma glaucum*, *Mya arenaria*, *Limecola balthica*, *Mytilus trossulus* and *Amphibalanus improvisus*, showing high variability (Table 3, Fig. 3)." This sentence is confusing, please clarify the meaning. The variability was within a species, or between species?

Line 367: change 'contained'

Line 364: in inorganic precipitated carbonate, precipitation rate is inversely correlated to Mn incorporation (i.e. higher precipitation equals less Mn, Lorenz, 1981). Why is the opposite suggested for organic carbonates?

Line 368: change to 'is in some degree regulating'

Line 382: trace metal, not trace metals

Line 394-395: Please look into these sentences and your references. Takesue et al., 2008 showed actually the organic content was 19% for their studied species, and say aragonitic shells have 'large component of non-lattice-bound Mg and Mn'. This is actually suggesting the opposite: at least Mg and Mn might be impacted by % organic matter.

Line 394: separate ref for Sr? if not, remove

Line 399-401. I totally agree, and believe this should also be mentioned in the abstract. (e.g. line 28: add composition and contribution of organic material)

Discussion: Please also include organic material as a factor contributing to difference in (at least) Mg and Mn.

Line 410-4111: I do not follow this logic. The larger shells (adults) still experienced a full year of environmental fluctuations

Line 571 factors instead of features? Also, precipitation rate is a biological control? I would leave it at growth rate.

581-583: It does not connect to the previous sentence, maybe rephrase or remove? This will never be possible from field samples, since it is impossible to know the biological impacts (growth, feed rate etc.).

Table 2. Typo for size class I of *Mytilus* (should be 6-15)?

Figure 3. Consider also adding a symbols/column with values from other studies on the same species, maybe as a supplementary figure, if figure 2 becomes to information dense. I see the authors added Table 4, but I would strongly advise to change this to a graphical presentation.