

Interactive comment on “Geochemical and microstructural characterisation of two species of cool-water bivalves (*Fulvia tenuicostata* and *Soletellina biradiata*) from Western Australia” by Liza M. Roger et al.

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Received and published: 1 March 2017

Reviewer report 2

We thank reviewer No.2 for their constructive comments and recommendations. Each recommendation was carefully considered and changes made accordingly. Point-by-point modifications are described below.

1. There is no detail environmental data demonstrated in this manuscript during the period of each shell growing including water temperature, salinity, and nutrients, and so on. The authors insist in introduction part that the geochemical signatures are so

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important to reconstruct the past changes in environment. However, it is not demonstrated and discussed well in this manuscript and makes difficult to judges whether any of difference and changes of geochemical composition in microstructures are not related to environmental changes or not.

»No detailed environmental data is presented here because this study uses comparison of shells (collected from live animals) that experienced the same seawater conditions throughout their lifespan. This study investigated similarities and differences within and between species' mineral and chemical composition on the basis that documentation of variations in modern shell composition is a pre-requisite of ancient material.

2. There is no detail explanation of the localization of shell mineralogy. The finding different mineral phase other than aragonite but calcite and high magnesium calcite must be one of the most distinct results in this paper. The lack of this explanation leads difficult to understand the mechanisms of the formation of each of mineral phase. On the other word, if the authors could show the mineral phase could be varied with environmental changes, for example, it could be great finding in this wider area of science.

»The detailed mineral composition was obtained using powder XRD which is a bulk method that does not provide spatial information. For crystallographic mapping CRM was used. Figure 6a shows a map of aragonite. Through peak intensity, Figure 6a shows where aragonite is concentrated and where it is not. The areas where the intensity is low are areas where calcite and Mg-calcite are present. The mapping of these phases is difficult considering the peaks overlap. The software used for the data analysis did not allow for the demixing of peaks. We agree that this would be a great finding but unfortunately, the software capabilities were too limited to show such findings.

3. There is no direct evidence to explain the geochemical difference among the spec-

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iments and changes along growth direction. The organic materials in the shell microstructures seems to be one of reasons to explain it, but without any direct evidence, for instance, the content of organic materials, it is hard to conclude it. The demonstration of the geo-chemical results obtained by different technique such wet chemistry will help to explain this because laser ablation method is good to get high resolution data but difficult to avoid the material background effects including the content of organic materials.

»We agree that there is no direct evidence and the organic matrix is one factor that can explain the microstructure found in the shells studied here. Wet chemistry is not particularly suited for molluscs because the organic matrix is composed of soluble and insoluble macromolecules. Some dissolve during wet chemistry and some do not. Also, we know from experience that insoluble macromolecules form a residue on the surface of the liquid when wet chemistry is used. The results found using this method still includes part of the soluble fraction of the organic matrix. The method that would help here would be a direct analysis of the composition of the organic matrix but this technique was too time costly to be included in the present work. It is definitely a consideration for future studies.

(All changes can be found in the supplement text)

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/bg-2016-343/bg-2016-343-AC2-supplement.pdf>

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-343, 2017.

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