

Interactive comment on “Ocean acidification reduces mechanical properties of the Portuguese oyster shell with impaired microstructure: a hierarchical analysis” by Yuan Meng et al.

Anonymous Referee #1

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General comments

Meng et al. propose here to further our knowledge of the negative effects of Ocean Acidification on marine calcifiers, i.e. reduced calcification, by characterizing various properties of shells of oyster *Crassostrea angulata*. This study describes the effects of experimentally induced OA on the shell surface, structure, crystallographic composition, crystallographic orientation, mechanical strength and density of *C. angulata* exposed to four different pH treatments (including the control treatment). This multi-modal characterization and imaging approach adds to the scientific understanding of the effects of OA of the shell structure of a commercially important species of oyster.

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The science presented here is sound, as are the statistical analyses associated to the findings. The main issues here reside with the redaction of the manuscript itself, the wording and terminology. Parts of the Methods, Results and Discussion sections are confused, and I do have a couple of questions regarding the methods (e.g. control treatments, and testing under hydrated conditions) that could expand the discussion further.

This study warrants publications but the text needs to be reworked to avoid confusion and some references need to be added.

It took some time to carefully annotate the pdf file to help with wording and English but the authors should be more careful in future. The confused English distracts from the data and information presented. I hope this helps.

Specific comments

1. Title: consider changing title to “Ocean acidification affects mechanical and structural properties of Portuguese oyster shells (*Crassostrea angulata*)”.

2.Wording and vocabulary:

- “corrode/corrosion”: this relates to metal not carbonates, “dissolution” is more adapted to carbonate calcification;

- “loose”: my understanding is that this work is used for structural studies in engineering, not in crystallography. If the authors insist on using this word, I think it should be defined clearly in the ms;

- “microstructure”: this word refers to the structure of the crystals themselves, not the structure of the shell. So if you are talking about crystal orientation or shell porosity you are talking about structure not microstructure. Please review the ms and change the terminology accordingly;

- “down-sifting”: can’t you just say decrease (?) why make it complicated;

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- “bottom-up”: this is more of an ecological (i.e. food chain interactions) or physical oceanography (i.e. seawater mixing) term. I would just delete this term from the ms totally - “erode/erosion”: this is a geological term, use “dissolution” instead.

3. Methods and Discussion: I was wondering whether the authors considered the fact that certain carbonate materials produced by marine calcifiers have increased strength when hydrated. For example, pearl oysters are very solid underwater but very brittle once dried. Using ethanol to preserve the samples is the easiest way but could it have affected the shell strength by extreme dehydration?

Is micro-CT and nano-indentation doable in a medium that would preserve the shell (i.e. neutral)? Please discuss

Technical corrections See pdf document

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2018-204/bg-2018-204-RC1-supplement.pdf>

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-204>, 2018.

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