

Interactive comment on “Effect of ocean acidification and elevated temperature on growth of calcifying tubeworm shells (*Spirorbis spirorbis*): An *in-situ* benthocosm approach” by Sha Ni et al.

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General comments

The paper by Ni et al. describes a very timely benthocosm approach to investigate the impact of temperature and CO₂ on growth and calcification of a tubeworm. The location and the association of the tubeworms with seaweed leaves is intriguing as the Baltic Sea itself has a highly variable seasonal carbonate chemistry, on top of which the tubeworms experience a strong daily cycle of the carbonate chemistry in the diffusive

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boundary layer on the leaves of the seaweed. The paper is within the scope of BGD and the title clearly reflects the contents of the paper. It contributes new data, the authors give proper credit to related work and clearly indicate their own contribution. The abstract provides a concise and complete summary of the paper and the overall presentation of the manuscript is well structured and clear. In general, the language is fluent and precise. Because the paper is very comprehensive with lots of information and references, the authors could have considered writing two companion papers: One dealing with growth and population dynamics and another focussing on calcification and shell corrosion (please note this is just a remark and no requirement).

The description of the experiments and calculations are sufficiently complete and precise to allow their reproduction by fellow scientists. I suggest to add a picture of the benthocosm system. The scientific methods and assumptions are valid, clearly outlined and the results support the interpretations and conclusions. It should be mentioned, however, that mesocosm experiments, although closer to natural variability, also suffer from inherent drawbacks such as limited control compared to laboratory experiments. As such, the authors had no control on food availability, salinity nor day-length. This requires some additional discussion as outlined under “specific comments”. Last but not least, the amount and quality of the supplementary material is appropriate.

Specific comments

If the selection of “Healthy *F. vesiculosus* plants bearing intermediate amounts of live *S. spirorbis* were collected for 4 seasonal experiments in less than 1.5 m water depth in Eckernförde Bay” was representative for the population in the field and all individuals on these leaves were considered for later analysis, fig. 5 is showing that reproduction occurs between spring and summer! This indicates that the authors are comparing two different cohorts that can have different sensitivities. Not just juvenile vs. adult but also generations affected by different starting (acclimation) conditions. This is known for physiological tolerance ranges (e.g. salinity) from organisms growing in different monsoon periods.

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As stated before, mesocosm experiments suffer from limited control of certain parameters such as food availability, salinity or day-length. I wonder how well the applied normalisation e.g. for daylength (“simplified insolation index”) works. I would appreciate some discussion about this as it is a critical seasonal parameter.

This maybe silly, but I wonder if the authors checked if all specimens were alive at the end of the experimental period?

I wonder if alkalinity changes were taken into account as the authors claim that “Enhanced calcification at higher salinities may potentially provide an explanation for enhanced growth of adult *S. spirorbis* during the autumn and winter experiments.” Alkalinity scales with salinity. I suggest to provide full carbonate chemistry details.

Technical corrections

Fig. 4: I would expect to see a Michaelis-Menten type of kinetics. Please apply.

Fig. 9: Looks like the specimen in b) (“+CO₂+T”) grew ca. twice as much in length as the control under a). This seems counter-intuitive.

Fig. 14: Units on the y-axis are missing. In the caption it says “The effect is only seen in the juvenile specimens, . . .”. Please add that this is equivalent to the “autumn small population”.

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