Biogeosciences Discussions

Interactive comment on "Effect of increased $p\mathrm{CO}_2$ on early shell development in great scallop (*Pecten maximus* Lamarck) larvae" *by* S. Andersen et al.

Anonymous Referee #3

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I fully agree with Referee #1 that the results of this - nevertheless important - study should be taken with a grain of salt because of the specific settings used, i.e. starved larvae exposed to initially high CO2 concentrations. To which extent these conditions may or may not limit the general validity of the study's findings have to be discussed critically, taking into account the most recent literature on related issues. I would also support the view of referee M. Byrne that this manuscript would have provided the opportunity to take a more systematic approach towards the presently available information on bivalve larval response to OA. So far the authors missed the opportunity to expand their story into a "meta-analysis" that would prove extremely valuable for the community.

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Regrettably, the authors see their study purely descriptive (last para of introduction). I reckon that, based on the present state of knowledge, it would be possible to formulate distinct questions / hypotheses to be answered / tested.

The summary on OA effects in calcifying larvae neglects the publications on echinoid larva which may present a useful addition, e.g. Brennand et al. 2010, PLoS ONE 5(6): e11372. doi:10.1371/journal.pone.0011372.

In the following I will try not to repeat remarks made in previous public reviews / comments on this manuscript.

Apparently there is a contradiction in the results: on p3289 it is stated that "...The relationship between survival and pCO2 was linear ...", which is a daring statement based on 4 data points, anyway, but also that "...survival at ambient pCO2 was higher than at 821 and 1627 ppm (p < 0.003), but not at 1184 ppm (p = 0.055). ..." Furthermore, why was 0.003 set as an arbitrary significance level here?

p3289 "In day 7 veligers both hinge and edge deformity was observed." ??

The results chapter 3.3 shell deformities appears a bit confusing to me. It is not easy to catch the general picture as, e.g., the statements switch back and forth between normal and deformed shells. Looking at one side would be sufficient. It seems neither correct to use the term "ratio" for percentages.

In para 4.1 Variation in pCO2-level the 3rd sentence repeats the 1st one.

The discussing of larval survival rates shows clearly why a extended meta-analysis of the available data would be helpful: I reckon a comparison between different species (and even populations) rather fruitless, if external drivers are not considered, e.g., experimental temperature and corresponding larval development time / stage. or, as mentioned by the authors, inherently stressful experimental setups. Furthermore, using on pCO2 unit would help, too.

I find the suggestion of differential mortality (higher in deformed larvae) quite plausible

(p3294). It is a pity that dead larvae were not collected during the experiment... Again, the discussion suffers from the non-systematic approach to the existing data. The authors mention may factors that may cause shell deformation, but there is no statistical evidence that may even lead to recommendations how future OA experiments should be designed to either avoid such effects or to quantify them.

Legends to figures should display regression models and significance levels when appropriate.

The data in Fig.5 indicate non-linear relationships. With just 4 dots these are impossible to model, but the fact should be mentioned.

Fig.6 is quite confusing. I would use composite bars here.

Interactive comment on Biogeosciences Discuss., 10, 3281, 2013.

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