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

Anonymous Referee #1

Received and published: 18 March 2013

General comments: Andersen et al. report their results about CO₂ effects on the early development of *Pecten maximus*. As molluscs larvae appear to be sensitive to elevated pCO₂ and at the same time CO₂ effects are species specific this is a timely study. However, the authors should be cautious and do not draw to extensive conclusions from their results as the incubation period was relatively short and the larvae were not fed which may have amplified the CO₂ effects especially in the later experimental phase. Additionally, the really high pCO₂ levels in the starting phase may have confounded the results. The authors may include more recent literature about CO₂ on larval development and about their adaptation potential, see references below. The authors may restructure some parts of the manuscript to make it more accessible

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for the reader.

The manuscript might be suitable for publication after considering the following specific comments:

Introduction: The general structure of the introduction requires some editing.

P 3283 line 15 Please specify 'effects' and consider CO₂ treatment and experimental duration. This list is partly repetitive (compare line 23)

P3284 line 7 The authors need to clarify that CO₂ induced changes of calcification rates observed by Ries et al. depend on the taxa specific physiology, within each group the response is much more homogeneous.

P3284 line 11 The Authors need to consider the really short experimental period which may not allow any acclimation.

Material and Methods: P 3286 line 1 How many females and males were used in total? When were eggs transferred to the experimental tanks, immediately after fertilization?

P 3286 line 7 How was the water used for the experiment treated (e.g. filtering, uv-radiation)?

P 3286 line 7 Why do you provide only data from three replicates for the 1184 ppm group? P 3286 line 11 Did you use normal pressurized air or were CO₂ concentrations adjusted to treatment levels?

P 3286 line 12 Why were larvae not fed? Recent studies suggest the important correlation between energy status and the ability to maintain/produce shell (e.g. Melzner et al. 2011).

P 3286 line 27 Please provide your measured salinity and alkalinity data. Further, calculate and present all relevant carbonate system parameters in table 1

Results: For regression analyses single replicate data and not mean of all replicates

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should have been used which displays the real variability better. Further, to quantify CO₂ effects the authors should provide the ANOVA results for all measured parameters.

P 3290 line 1 and following and Fig 5 The % of deformed larvae on day 2 and 7 does not appear to be linearly correlated to pCO₂ rather deformation seems to increase drastically in the highest CO₂ treatment.

Discussion: The discussion should be restructured into more logical section. Section 4.2 Please do not mix the discussion of survival and shell size but discuss them consecutively.

P 3295 line 16 Please cite a more recent and better publication on pteropods. Orr et al. did not provide any carbonate system data.

P 3295 line 18 The authors need to consider that living animals may react completely different than empty shells. Clearly dissolution is only a minor factor influencing overall shell production rate.

P3295 line 24 Please point out why this is important in this section

Section 4.5 Please include a paragraph on adaptation potentials which may mitigate negative effects. As the title of this paragraph is 'bivalves' data on crustaceans should be removed

Technical corrections: The authors should consider modifying the graphs and raise their overall quality.

P 3283 line 13 Please correct shows

P3284 line 22 correct grammar

P 3289 line 22 This classification should be moved to and explained in more detailed in the material and method part

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P 3291 line 16 Please correct grammar

Suggested References:

Melzner et al. 2011 Food supply and seawater pCO₂ impact calcification and internal shell dissolution in the blue mussel *Mytilus edulis*.

Parker et al. 2011 Populations of the Sydney rock oyster *Saccostrea glomerata* vary in response to ocean acidification.

Parker et al. 2012 Adult exposure influences offspring response to ocean acidification in oysters.

Sunday et al. 2011 Quantifying rates of evolutionary adaptation in response to ocean acidification.

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

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