

Interactive comment on “Larval development and settling of *Macoma balthica* in a large-scale mesocosm experiment at different $f\text{CO}_2$ levels” by A. Jansson et al.

A. Jansson et al.

anna.jansson@abo.fi

Received and published: 15 March 2016

Response to comments by Referee #2

We thank the reviewer for the useful and constructive comments, which helped to clarify the manuscript and focus the discussion on the main findings. Our responses including the potential modifications to the manuscript are detailed below

General comments: Using large scale mesocosm units this study explores the role of future pH conditions on the settlement process of the benthic key species *Macoma balthica*. Indeed, the authors suggest that the settling of *M. balthica* larvae was delayed

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



with increasing CO₂ levels. The role of ocean acidification is somewhat of a hot topic within the scientific community. In recent years a large number of publications have been published. That being said, most of the published literature is based on laboratory studies and to a lesser extent on natural or, as in this case, mesocosm experiments. I think this manuscript deserves publication. However, before publication the authors should consider the comments given below. The authors should consider their aims of the study, the results obtained and conclusions drawn. As is evident below, it is not always clear why some aims have been included, how the aims were tested or what results support (or not) the aims.

REVIEWER COMMENT 1 by Referee #2 Abstract Page 20412, line 11: tolerance and development? The authors state that they focus on the tolerance, development and subsequent settlement process. The settlement process is clearly visible, however, tolerance and development is not discussed nor any results given or conclusions made on the topics. If still considered a focus of the study then please add results, discussion and conclusions. If not please delete from abstract.

Author response: Tolerance and development” refers to “survival and growth (measured as average shell size of the community); this will be clarified throughout the manuscript.

REVIEWER COMMENT 2 by Referee #2 Introduction Page 20413, lines 26-29: “The disadvantages of limited ecosystem realism that arise from the exclusion of factors such as currents and large predators, which impact the natural succession and dispersion patterns of the species, nevertheless have to accounted for when interpreting the results.” This all sounds perfectly fine, but did you actually do so in this study? Did you take this into account? I couldn’t find any information on how this was done in the discussion? Please add how these factors could have influence your results

Author response: The role of factors such as currents or predators can naturally not be quantified in this study, but a short discussion on their potential effects is added to the

BGD

12, C10203–C10209,
2016

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



manuscript, together with the need to conduct whole-community studies (first comment of the first reviewer).

REVIEWER COMMENT 3 by Referee #2 Page 20414, lines 4-5 and throughout manuscript: How are the references sorted, not chronologically and not alphabetically?

Author response: The references are sorted chronologically; this will be corrected throughout the manuscript.

REVIEWER COMMENT 4 by Referee #2 Page 20414, line 11: Omstedt et al., 2010 is not available in the reference list, please add

Author response: This missing reference was added to the reference list.

REVIEWER COMMENT 5 by Referee #2 Page 20414, line 14: Almen or as in the reference list Almén?

Author response: This typo was corrected.

REVIEWER COMMENT 6 by Referee #2 Page 20414, lines 23-24: As commented on in the abstract. I do not think you present any data on tolerance and development of the larvae? How do you define development here? Size of the mussel, is that development? How did you measure tolerance? Please add additional information and data on this or consider deleting shed light on. . .

Author response: Same as above: "Tolerance and development" refers to "survival and growth" (measured as average shell size of the community); this will be clarified throughout the manuscript.

REVIEWER COMMENT 7 by Referee #2 Page 20414, lines 27-28: How did you measure/calculate growth? I can't find any information on growth measurements and calculations rather it seems as if the authors" predicted the size of the larvae to decrease along: : :"?

Author response: Page 20414 lines 27-28. "...predicted the growth of the larvae to

BGD

12, C10203–C10209,
2016

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



decrease along the increasing fCO₂ gradient”; We will change “growth” to “size”.

Material and methods REVIEWER COMMENT 8 by Referee #2 Page 20416, line 10: Is it Riebesell et al 2013 a or b?

Author response: 2013a, this missing detail was added to the manuscript.

REVIEWER COMMENT 9 by Referee #2 Page 20416, line 20: bayc? I do not know what this is?

Author response: Bay, this spelling mistake was corrected.

REVIEWER COMMENT 10 by Referee #2 Page 20417, line 1: Dickson et al 2007 is not found in the reference list, please add.

Author response: This missing reference was added to the reference list.

REVIEWER COMMENT 11 by Referee #2 Page 20418, line 27: R core team 2012 is not found in the reference list, please add

Author response: This missing reference was added to the reference list.

Results REVIEWER COMMENT 12 by Referee #2 Page 20420, line 14: why did so few individuals settle in M3? I was not able to find anything on this in the discussion, please add

Author response: We will include a discussion on the potential reasons as why this may have occurred.

Discussion REVIEWER COMMENT 13 by Referee #2 Page 20421, lines 7-10: “Moreover, an indication that *M. balthica* post-larvae settled at a larger size in the high fCO₂ treatments was also observed”. is that really true? In the results section 3.5 the sizes of settling individuals the authors state that “no significant differences were found in the sizes of the settling individuals.” I’m confused, do they or do they not settle at a larger size in the high fCO₂?

BGD

12, C10203–C10209,
2016

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



Author response: Our statement on Page 20421, line 7-10 refers to the size when the larvae START to settle, i.e. their size in the water column, while section 3.5. deals with the larvae that have already settled to the bottom of the mesocosm. To avoid confusion “settling individuals” will be changed to “settled individuals”.

REVIEWER COMMENT 14 by Referee #2 Page 20422, lines 1-4: “Shell growth alone... IS NOT automatically reflecting the overall biomass production and developmental stage of the organism”. Wasn’t development one of the main aims of this paper? If so then why didn’t the authors use an appropriate measure of growth?

Author response: To clarify, we did not measure any other modes of development in this study, so shell growth is used as a proxy. We agree that this does not automatically translate into biomass production, but provides an acceptable substitute.

REVIEWER COMMENT 15 by Referee #2 Page 20422, line 17: Pedersen et al 2008 and Pineda et al 2009 are not found in the reference list, please add

Author response: These missing references were added to the reference list . REVIEWER COMMENT 16 by Referee #2 Page 20423, lines 8-13: This is one of the main arguments for using mesocosms i.e. incorporating factors beyond what is possible in a laboratory experiment. Did you actually test this? I can’t find any results on this. If you didn’t, why not? A quick glance at the manuscripts, currently presented for the special issue, seemingly all necessary data for e.g. food quantity and quality is available. So, as the authors state here this provides an excellent platform to study this, then why didn’t they? If possible please add this to the manuscript.

Author response: As written on page 20423 line 20-25: “In this study, no significant changes were detected in the phytoplankton abundance or the total chlorophyll a concentration within the mesocosms during the main occurrence of *M. balthica* larvae in the water column (until days 10 and 17). An increase in the abundance of phytoplankton and Chl a concentration in the highest fCO₂ mesocosms was, however, found later on during the experiment (day 16 onwards; Crawford et al., 2015; Paul et al., 2015).” By

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



the time the differences in phytoplankton abundance started emerging, most of the *M. balthica* larvae had already settled from the water column. Due to this difference in timing, the potential influence of phytoplankton abundance on *Macoma* was not analysed further.

References REVIEWER COMMENT 17 by Referee #2 For all references please double-check abbreviation e.g. J Marine Syst should probably be J Mar Syst? Sometimes doi, sometimes not? Compare Riebesell et al 2013b o Schulz et al 2013 one has a webpage and the other a doi. Please be consistent throughout the reference section.

Author response: We have corrected the reference list according to the journal's standards.

Tables REVIEWER COMMENT 18 by Referee #2 Table 1: Why aren't the averages for the whole time period presented for aragonite and calcite? On what basis are the later days excluded? Please add to the Materials and methods section.

Author response: The data for aragonite and calcite were shown as averages until day 17, as the majority (>95%) of the larvae had settled until that day. Using the average of the whole experimental duration would obscure the saturation states present during the settling period of the larvae. This is the case as CO₂ was permanently outgassing from the mesocosms, slowly increasing aragonite and calcite saturation states over time. To harmonize the data presentations, we will from now on also report fCO₂ values only for the settling period of *M. balthica* (day 0-17).

Figures REVIEWER COMMENT 19 by Referee #2 Figure 3 and 4, are the graph based on actual or targeted fCO₂ values? Please add explanation to the figure legend/caption. Why the use of SE in fig 3 and SD in fig 4? Why not use the same in both figs??

Author response: The graphs are based on actual fCO₂ values, the explanation is added to the figure legend. In the legend of Figure 4 we noted that SD is not shown for

BGD

12, C10203–C10209,
2016

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



clarity. We will change “SD” to “SE” in the legend, however, to standardize the method used.

Interactive comment on Biogeosciences Discuss., 12, 20411, 2015.

BGD

12, C10203–C10209,
2016

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

C10209

