

## ***Interactive comment on “Effect of ocean acidification on the early life stages of the blue mussel (*Mytilus edulis*)” by F. Gazeau et al.***

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Referee Comment for bg-2010-92, Effect of ocean acidification on the early life stages of the blue mussel (*Mytilus edulis*):

General comments: This manuscript does an excellent job in demonstrating how changes in ocean acidification (OA) projected for the end of this century could negatively impact the shell structure and development of blue mussel larvae. This is the first study to date to investigate the effects of OA on larvae of this major mollusk species. The methods of this paper closely follow the draft of ‘best practices’ by the European Project on Ocean Acidification (EPOCA), which is very important for future comparisons among studies. These authors have conducted a thorough investigation for this species, and we recommend it for publication in Biogeosciences and provide comments

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below for improving the document.

Reviewers: Stephanie Talmage and Dr. Christopher Gobler

General comment:

Through most of the manuscript, the authors refer to pH levels. We are concerned that casual readers of this manuscript not intimately familiar with carbonate chemistries (e.g. benthic ecologist) may be lead to believe that changes in pH alone may impact mollusk larvae. While the authors did a fine job of explaining, in detail, how pH interacts with the carbonate system to alter calcium carbonate solubility in the introduction, we suggest it would be useful to include pCO<sub>2</sub> measurements with the pH levels at least in the abstract and perhaps to use pCO<sub>2</sub> &/or saturation states more frequently through the body of the text including section 2.2 where pH levels alone are described and perhaps in the discussion.

Specific comments:

Introduction: Shellfish are an important food source for a multitude of marine organisms beyond birds.

A statement regarding the natural variation in pH and CO<sub>2</sub> in coastal ecosystems in the introduction would place this work in a broader context, beyond OA.

Methods:

Page 2932, line 8. It would be useful to describe the general conditions of the Oosterschelde here such as pH and pCO<sub>2</sub> ranges, as it would allow readers to understand the environment the adult mussels were adapted to.

Given that OA best practices are transitioning into the use of spectrophotometric pH measurements, providing as much details as possible regarding the pH measurements used in this study will instill confidence in future readers. We suggest reporting the level of analytical precision and detection limit, but feel the more information supplied on this

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topic, the better.

Sampling and analytical measurements: Page 2933, Line12: We have noticed bivalve larvae can be sensitive to acid washing of treatment vessels, and have found it is important to very liberally rinse vessels following acid.

Sampling and analytical measurements: Page 2933, Line 19: We acknowledge the difficulty of conducting these experiments at such a large volume (130 liters), and understand why the authors estimated larval abundance by counting larvae 500  $\mu$ l subsets. We believe it would be useful for the authors to provide any available data demonstrating that this volume of aliquot adequately represented the entire volume of the experimental vessel. This might include within replicate precision.

Page 2934, line 8: If the authors can demonstrate that the GFF filtration step did not / does not alter the TA of the sample, it would be useful; a priori, one would assume it might alter pCO<sub>2</sub> and in turn TA.

Page 2935: Should the data regarding conditions in the Oosterschelde be presented in the past tense since these measurements were already made and since the system may be different in the future?

Page 2938 line 7: The introduction invokes the presence of amorphous calcium carbonate in larvae as one reason for their sensitivity to OA. Might it make sense to revisit this concept here, rather than focus solely on aragonite saturation?

Page 2938, line 20: The point regarding fluctuations in pH in coastal zones could be expanded to include upwelling (Feely et al 2009) and large changes in net metabolism due to higher rates of primary production and respiration associated with anthropogenic nutrient loading.

Technical corrections:

Page 2929: Line 13: should have a space between to and slight Page 2931, line 15: remove capital M in Molluscs Page 2939: Line 2 and 4, should read Talmage and

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Gobler (2009), not Talmage et al.

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Interactive comment on Biogeosciences Discuss., 7, 2927, 2010.

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