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Biogeosciences Discussions

Interactive comment on "Key Arctic pelagic mollusc (*Limacina helicina*) threatened by ocean acidification" *by* S. Comeau et al.

Anonymous Referee #2

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General comments

This ms deals with the effects of decreasing seawater pH on calcification rates of a key species of Arctic epipelagic plankton communities, the pteropod Limacina helicina. Due to its aragonite shell and a boreal/arctic habitat, L. helicina may be among the first species being threatened by ocean acidification since climate change effects with respect to alterations in pH and temperature are projected to be most pronounced in the Arctic and undersaturation with respect to aragonite is projected only in a few years time. So this is surely valuable work addressing a very up-to-date topic. Calcification rates were measured using 45Ca incubations at two different pH values according to 1990 and end-of-century conditions and revealed 28% lower calcification at lower pH. Qualitative examinations of shell growth were performed using the fluorochrome

calcein and showed that linear extension was lower in animals kept at lower pH. Overall, I think the ms should be published after some minor modifications as described below:

Specific comments

- Please give a size-range of the experimental pteropods in order to give readers an idea of the developmental stage you have been working with (might be valuable information for future related work).

- Was the linear shell extension in calcein staining for all individuals in the same range as shown in Fig 2? I agree with Ref #1 that you should be a bit more precise here and include a plot on shell growth.

- It is not clear to me how often you sampled sea-water in the field (surface?): in 2.2 it seems to me you collected regularly but in the first paragraph of the results section, L14 you report on only one fjord water sample. Please clarify this.

Discussion:

L 17–20 (Surface waters . . . of 765 yatm."): In principle I agree with your argumentation here. However, since your statement is based on only one fjord water sample (right?), I think this is too much of a generalization and needs some balancing. Hydrography in Kongsfjord is quite complex specifically in the transition from spring to summer, when water properties are highly variable on a spatial and local scale due to freshwater influence from fjord-ice and glacier melting as well as river run-off. During the time of your investigation for example, CTD data taken on 23rd and 27th of May revealed some freshening in the very upper surface (S: 31.47–33.92) as indication for a possible onset of spring/summer surface freshening that is usually strongest in June (Ito and Kudoh 1997, Proc NIPR Symp Polar Meteorol, 11:211–232). Therefore vulnerability with respect to aragonite undersaturation is probably also variable. So, I think it is important to tell us when you took this field water sample (beginning, mid, end of the investigation?) and rephrase your argumentation accordingly in order to provide readers more infor-

mation to assess the whole situation. In the same context you should also make clear, that experimental (laboratory) water that was bubbled came from some 80 m depths (so it is quite likely that you bubbled some kind of “Atlantic-type Water”, Cottier et al. 2005, J Geophys Res 110, C12005, doi:10.1029/2004JC002757). This, too, will not change your overall conclusion, but it should be clear what is compared or respectively where water used in the experiments came from, for during other times of the year more pronounced differences with respect to alkalinity/undersaturation might occur.

Technical/typing corrections

Introduction:

L21: “. . . the present century.” This sentence lacks a reference.

L22: 12% and 55% relates to what? Carbonate ion decrease at different localities?

Material & Methods, first paragraph

L4: Sampling period started 19 May 2008 (not 10 May).

L5: In English Spitsbergen is written with "s“ not "z“

L10: The laboratory in Ny Ålesund has a specific name that should be mentioned: Kings Bay Marine Laboratory.

2.3

L8: Calcein staining: 50 mg 1-1, you mean l-1?

Interactive comment on Biogeosciences Discuss., 6, 2523, 2009.