

## ***Interactive comment on “High nitrate to phosphorus ratio attenuates negative effects of rising $p\text{CO}_2$ on net population carbon accumulation” by S. A. Krug et al.***

**Anonymous Referee #1**

Received and published: 30 August 2011

Review of the manuscript ‘High nitrate to phosphorus ratio attenuates negative effects of rising  $p\text{CO}_2$  on net population carbon accumulation’ by Krug et al. The authors evaluate interacting effects of ocean acidification and nutrient supply ratios. General comments: -The manuscript is well written and the experimental approach seems appropriate. It contains relevant data and contributes to the on-going controversial discussion on OA effects on calcifying phytoplankton growth. However, I am not really convinced that the authors fully explored what can be taken from Fig 3 and the corresponding analysis, or better say there seems to be more in when changing the angle a bit. The main conclusion is that no CO<sub>2</sub> effects on  $\mu\text{max}$  are detectable at Redfield nutrient supply, but there is an increase in  $\mu\text{max}$  with increasing CO<sub>2</sub> at high N:P. This

C2733

tells us that growth at Redfield is non-limited and increasing CO<sub>2</sub> changes something in resource use efficiency, as the authors’ state. By the way, any idea what the mechanisms might be? I also agree that this increase in growth rate at high N:P attenuates negative OA effects. The authors however point several times at the importance of stationary phase phytoplankton growth and system productivity. If we look at the final densities in Fig 3 it seems that there is a decrease in total abundance with increasing CO<sub>2</sub> at Redfield and an increase in total abundance at high N:P. Maybe I just missed some information on that, but I think it is necessary to talk about this result and the possible reasons for contrasting reactions on increasing CO<sub>2</sub>. -Aside from the usually discussed negative OA effects on calcifying issues (and the fertilising effects of increased CO<sub>2</sub> as shown by Iglesias-Rodriguez, et al. (2008), which was not confirmed by this study) there is also competition which seems to be influenced by increasing CO<sub>2</sub>. *E. hux* is a ‘low P specialist’ and as shown in this study, is even able to increase its’ P allocation efficiency. In terms of competition that means that *E. hux* might benefit from OA if competing species does not respond in the same way. That might be an additional point worth being integrated into the discussion. -One thing I do not really understand is that the authors did not analyse phosphorus. The authors state that P is important, the manipulate N and P but did only investigate N (along with C). I can see no reason other than that N comes for free with the C analysis which justifies the decision to present N but no P data (especially when studying a low P specialist). Having this lack of data in mind one can even argue that the ms might benefit from just focussing on C and excluding the whole N dataset (which would not change the main conclusion of the ms and prevent questions regarding the biological meaning of the decreasing C:N later on in the specific comments).

Specific comments: -Abstract The abstract is rather long and does not read smooth. There are lots of words which can be deleted (e.g. L17 Thereby cell size and total cell abundance was taken into account can be deleted and cell size and total abundance could be mentioned in the sentence before together with PIC and POC. Further: L18 Corresponding to literature can be deleted. Additionally, same sentence, the re-

C2734

sults did not show any response, it was the algae. L11ff Rewrite -Introduction Mention somewhere that loss of DIC by primary production cannot be immediately balanced by atmospheric exchange. This would help understand why you did not supply CO<sub>2</sub> in the corresponding partial pressure continuously. -Results: L166ff I got lost several times while reading this paragraph and had to start again. Please read it carefully and check if it can be improved. Fig 2B Is there a biological explanation for the decrease in C:N? Looking at Fi 1 there is a very slight decrease in POC and a very slight increase in N, which results in the decreasing C:N. Does it mean anything? Conclusions:

Technical corrections: Throughout the text: Decide for either ':' or '/' to express ratios. You use both right now. L178 cells instead of cell L184 Fig 2A is Fig 2B Fig 2 Why cicles and squares? -Check the reference list. The Deep Sea Research references are unclear. Deep Sea Res I or II, or even Part A? Further give species names in italics. The words in the titles of several references are in caps. And so on. All typical errors based on downloading from different databases. Check your EndNote/ReferenceManager or whatever database.

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Interactive comment on Biogeosciences Discuss., 8, 6833, 2011.

C2735