

Interactive comment on “Interactive effects of and light on growth rates and RUBISCO content of small and large centric diatoms” by G. Li and D. A. Campbell

Anonymous Referee #3

Received and published: 1 December 2015

The authors Li and Campbell investigate the effects of changing nitrogen levels and light intensity on the growth rate and various photosynthetic parameters of two species of centric diatom of different size. The work presented in this manuscript is an important and necessary contribution to this field of research. While the questions asked, parameters measured and experimental methods presented here are good, the lack of consistency in the results calls for more work to be done or further discussion to clarify the conclusions of the authors.

In addition, further discussion of the findings is needed to explain the trends and to identify possible mechanisms for the difference in response between the two diatom

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species. Overall, the paper is well designed and the experiments are thorough, but before publication the authors must either 1.) Greatly elaborate on discussion of results to clarify author's explanation of the divergence or 2.) increase the amount of data presented in the study including adding a lower nitrogen condition or increasing the number of species measured to increase confidence in conclusions. Either way, the manuscript needs some major additions or to reassess and resubmit with additional data before publication.

One major adjustment that I would suggest is that the objective needs to be more clearly outlined in the abstract and introduction. As it is, the introduction is quite vague. The importance of this work and the previous work by Wu et al., 2014a needs to be outlined clearly earlier on. Also, the discussion of high nitrate levels in specific coastal areas and estuaries at the end of the paper could be moved up to the introduction to justify your choices in nitrogen concentrations and also to again justify the relevance and implications of the work. One problem, however, with this justification is that with the cited values of the estuaries, it seems that a lower nitrogen concentration would have been useful.

P. 16648 L. 5: Clarify what you mean by “representative strains” here. Do you mean representative ecologically in diverse marine habitats or representative because they are different in size.

P.16648 L. 6: Is this size difference correct? It might be useful to also cite the other dimensions of each cell and maybe even provide a bit more details about the differences between the two species including chloroplast number, vacuoles, and even to scale images?

P.16648 L.8-11: This sentence is confusing and not well structured. I would break it up to fully outline the parameters you measured including f_v/f_m etc. This final sentence is also essential for prefacing the paper and highlighting all of the different parameters included in it.

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P.16648 L.20: It would be useful to cite the contents of your medium, primarily [CO₂] as other studies show that RUBISCO content is also dependent on carbon chemistry.

P.16649 L.4: State here briefly why the light conditions differ between the two species.

P.16652 L.1: Give range of RbcL standards

P.16652 L. 6: Provide details of blocking buffer and of antibody solutions

P.16652 L.13: How many replicates of the immunoquantitations were carried about because this protocol inherently has many sources of error

Methods: Method for RUBISCO turn over rate is missing from methods section

P.16654 L.5-9: This sentence breaks up the flow of your discussion of the results and should be moved to the figure caption. The reader will only notice this difference when looking at your figure and thus it can be left out of this section.

P.16656 L. 25: Specify the values used in the Wu et al., 2014a paper you are referring to here as “nitrogen rich” and “high light” so that the reader can think about these values in the context of this manuscript.

P.16657 L. 2: Referring to the diatoms as small and large throughout the manuscript is vague. I would come up with a more quantitative way to portray this i.e. “two diatoms with a xx fold difference in cell biovolume”

P.16657 L. 7: The word “enjoyed” is too informal and I don’t think adequately describes what you mean here.

P.16657 L. 19: The authors need to more robustly outline their hypothesis of the mechanisms behind the stimulation of growth in *T. punctigera* in the low nitrogen treatment. After this finding is stated here, the author discusses mechanisms for maintaining growth rate in general, however do not specifically hypothesize what is happening with *T. punctigera* or what about the large cell might be stimulated by low nitrate/inhibited by high nitrate.

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P.16658 L.12-22: This paragraph would be better supported with either a.) increased nitrogen concentrations or b.) increased species measured. As it is, it is hard to justify the conclusion that these estuaries could be growth limiting for diatoms in general. Especially as the paper does not even discuss the habitats of the two species presented in the paper.

P.16658 L.24: You can no longer call the LN treatment in this study “growth limiting” because the results do not support this description.

P.16659 L. 5: The summary should provide a better summation of the new and important findings of your study and give at least one sentence of the implications of the work for the broader field.

Interactive comment on Biogeosciences Discuss., 12, 16645, 2015.

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