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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 #2

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In this manuscript, the authors, G. Li and D.A. Campbell studied the effect of light and nitrogen on growth rates and RUBISCO content of two centric diatoms : T. pseudonana and T. punctigera. This is a well conducted studied, easy to read, with a lot of detailed parameters and well documented; a lot a recent references, which is appreciable.

Actually, authors sought to test an hypothesis obtained in a previous study (Wu, Y., Jeans, J., Suggett, D. J., Finkel, Z. V., and Campbell, D. A.: Large centric diatoms allocate more cellular nitrogen to photosynthesis to counter slower RUBISCO turnover rates, Front. Mar. Sci., 1, doi:10.3389/fmars.2014.00068, 2014). Author should specify this point before the discussion part in the manuscript and take this base for all the

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paper. As you can see in my comments, there are inconsistencies in some major points of the study. In some case, authors were a little bit optimists in their assumption considering the results. Furthermore, experiments were made with only two species (a large and a small centric diatom), so can we generalize to all small and large diatoms? Some figures are not well numbered.

In conclusion, I think this manuscript is not ready for publishing and need majors corrections. A special attention will have to be carried to correct or clarify the inconsistencies (if the authors think there was a misunderstanding with the reader).

TITLE

Same comment as in the interactive discussion : light is missing.

MATERIALS AND METHODS p. 16649 L4-5 : 30, 180 and 380 μmol photons m$-$2 s$-$1 for T. pseudonana and to 30, 90 and 180 μmol photons m$-$2 s$-$1 for T. punctigera . Why did not use the same growth light intensity for both species ?

p. 16649 L21 : OD680 Please define this term.

p.16652 L24 : The μg Chl a mL$-$1 extract was estimated following (Jeffrey and Humphrey, 1975): Please replace The μg Chl a mL$-$1 extract by the concentration of the chlorophylle a in the extract (μg Chl a mL$-$1) .

p.16652 L24 : rinsed with 10 mL of 50 mmol HCl L$-$1 to remove inorganic carbon Do you have any reference to support this procedure ? Usually, to remove inorganic carbon of sample, after filtration, dry filters are placed overnight in a desiccator saturated with HCl fumes (example http://epic.awi.de/17559/1/Kna1996a.pdf.)

RESULTS

Table1 : C:N ratio is presented but not discussed in the paper.

p. 16653 L14-15 : to moderate levels (âĹij 180 μmol photons m$-$2 s$-$1) Why did you consider 180 μmol photons m$-$2 s$-$1 as a moderate light level for T. pseudonana and

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as a high light level for T. punctigera ?. This comment re-joined the notice p. 16649 L4-5 in the MATERIALS AND METHODS.

p. 16654 L13-16 : T. punctigera showed scatter among replicates in pg protein cell-1 with a weak downward trend with increasing light T. punctigera showed scatter among replicates in pg protein cell-1 with a weak downward trend with increasing light only for high nitrogen media (HN). but again showed higher pgproteincell-1 in low nitrogen media (Table 1) This is not true. The highest amount of protein per cell is for 30 μmol photons m-2 s-1 in a HN 5703 $\pm$ 893.

p. 16655 L8 : For T. pseudonana under low growth light, and for T. punctigera across the growth lights growth in low nitrogen media had a surprising effect of increasing the cellular content of RUBISCO, with parallel effects upon cellular protein content . It's not a surprise, it's a result. Maybe reformulate the sentence and say that it's not the result that you're waitting for.

p. 16655 L23-24 : in parallel with the pattern for Chl a per cell (Table 1; Fig. S1 in the Supplement) . Why not just indicate the mathematical relations with statistical results between the two parameters in the text?

p. 16656 L4: indicating the high media N source inhibits the rate of electron transport away from PSII (Kolber et al., 1998). This sentence is confused. It maybe pertinent to specify that τ1 reflects the kinetic of QA- re oxidation. As the QA-re oxidation time is slower, the rate of electron transport away from PSII is inhibited.

p. 16656 L14: the apparent RUBISCO turnover rate : Please define this parameter. How did you calculate it?

p. 16656 L16-21: Please check the figure numbers in the text. (Fig. 5b) becomes (Fig. 4b) and (Fig. 5a and c) becomes (Fig. 4a and c). Same thing with Fig. 6.

p.16656 L18 : 1/τ1 the rate constant for electron transport away from PSII, shows a saturating pattern when plotted vs. RUBISCO N : total N, for all treatments (Fig. 5a and

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c) (Zorz et al., 2015). Looking the figure 4c, your affirmation is not so evident, specially for T. pseudonana, for which the majority of data are outside of the 95 % confidence intervals on the fitted curve.

DISCUSSION

p. 16656 L25-26 a finding consistent with our findings herein (Fig. 2g and h, closed symbols, high growth light) The figure 2g and h shows the opposite... 2h) Large diatom has the highest allocation of cellular nitrogen to Rubisco when growing under low nitrogen media. And there is no trends with the growth light, as said in the results p. 16655 L8. 2g) there is a trend with the growth light only for HN and lower allocation in the HN than in the LN media... Something is wrong with this sentence. You have to reconsider it.

p16657 L17 : This situation is however species- specific since lower nitrogen inhibited the growth of the smaller T. pseudonana but stimulated the growth of the larger T. punctigera (Fig. 1). It could be interesting to test others species to be sure of this assumption. Can we generalize to Âń small Âż and Âń large Âż diatoms?

p16658 L1-2 : showing differential effects of lower N source on the amount and achieved activity of RUBISCO in small and large diatoms Same thing as earlier. Can we generalize?

NOTATIONS, FIGURES AND TABLES:

Please standardize the following notations: - M or mol L^{-1} - m2 $quanta^{-1}$ Or mol photons m^{-2} s^{-1}

Table 1: is it molar or mass C:N ? Please replace attomoles cell-1 by amol cell-1 and specify (PsbA, amol cell-1) for Photosystem II PsbA subunit.

Figure 2: Letters on the top left corners not big enough. Maybe place it in the top right corner and in bold, and bigger for more clarity. Same thing with the name species: Bigger and in the center for both species (See also figure 3 and 4). Figure 2C: please

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correct the name Y axis: Chl a N : total N

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