

Interactive comment on “The regulation of coralline algal physiology, an *in-situ* study of *Corallina officinalis* (Corallinales, Rhodophyta)” by Christopher James Williamson et al.

Christopher James Williamson et al.

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We thank the reviewer for their assessment of our work and are happy that they find this submission to “provide an important contribution to our knowledge on the physiology of the important ecosystem engineer *C. officinalis*” and that the submission is “well written, organised and thorough”. We apologise for the delay in our responses, which was due to a long field-work commitment.

Responses to the reviewer’s specific comments are provided below:

Methods: Comment 1: Line 191: What is the NG_NIGHT_LIGHT treatment? Did the

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authors provide artificial illumination at night? Or do they consider moonlight = light and the chambers in opaque bags = dark during night conditions? Please make this more clear. Also, why is there no corresponding R_NIGHT-LIGHT?

Response 1: In order to maintain a balanced and fair experimental design, both light and dark treatments were performed during both day and night-time incubations. For night-time incubations, no artificial irradiance was provided, but as the reviewer has assumed, light treatment chambers were positioned in ambient conditions, i.e. typically complete darkness, but allowing for the potential influence of moonlight conditions, whilst dark treatments were placed into opaque bags as during daytime incubations. Given that conditions were dark, i.e. no measureable PAR, during night-time incubations in all seasons, we found no significant difference between light or dark treatment night-time incubations for respiration or calcification rates during any month, and thus data were pooled for presentation (Figure 6), as stated in Lines 339-3344, Lines 370-372, and Figure 6 figure legend.

To make this experimental design more clear we have added information to Line 169 of the methods describing the positioning of incubations chambers during daytime and night-time, which now reads: “Incubation chambers were...positioned in an upper shore rock pool to maintain ambient irradiance and temperature conditions (both during day and night-time). The remaining six chambers...were placed in opaque bags to create dark conditions during daytime incubations (or shield from moonlight during night-time) and placed within the same rock pool to maintain ambient temperature.”

Comment 2: Lines 230-232: How did the authors obtain the P-E curves? Did they pool the incubations from the different seasons and tidal emersion periods? I understood that in each season, the incubations were only done under two light conditions: light or dark. Since there seem to be 8 major groups of light intensities, I assume the authors used the mean PAR values from Fig. 2, but its not completely clear.

Response 2: The reviewer is correct, data from all incubations (light/dark and start/end

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of tidal emersion periods) were pooled across the annual cycle to model annual trends in productivity, calcification and respiration rates. As the comparator to this, mean PAR values for each incubation experiment were used as the reviewer assumed. We have now added this information into Line 260-262 to make this more clear, which now reads: “All *C. officinalis* NP/R and NG data measured across all seasons were plotted as an exponential function P-E of the average ambient irradiance E ($\mu\text{mol photons m}^{-2} \text{s}^{-1}$) recorded over each incubation experiment.”

Discussion:

Comment 3: The opening paragraph seems more suited for a closing paragraph of the discussion. I would suggest removing the last sentence and simply stating that you further discuss how your results on production/respiration and calcification improve our understanding of the ecophysiology of *C. officinalis* within a larger perspective.

Response 3: The authors agree with the reviewer and have amended the opening paragraph of the discussion as suggested. The final sentence has been removed, and a new sentence inserted which reads: “The findings presented here are discussed in regards to the ecophysiology of *Corallina officinalis* and coralline algae in general, within the larger perspective of global change.”

Comment 4: Line 385: “Whilst inclusion of water temperature and carbonate chemistry into models did not improve predictive ability, co-variance between predictors may have hindered interpretation of their influence.” This argument seems weak, since it contradicts the statement in lines 357-358 that “addition of water temperature and/or carbonate chemistry. . .increased the goodness-of-fit. . .of the models to NG data. . .”

Response 4: We appreciate the reviewers comment in regards to our presentation of the relationships between irradiance, temperature, carbonate chemistry and productivity / calcification rates. Our findings demonstrated that whilst all three predictors showed significant relationships to calcification, only irradiance was a significant predictor of productivity. However, we also identified significant correlations between

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irradiance and water temperature ($r = 0.42$, Line 324) and irradiance and carbonate chemistry ($r = 0.19$, Line 324). Given the strong relationships identified between all three predictors and calcification rates, we understand that it may appear paradoxical to argue that co-variance between predictors may explain a lack of predictive ability when irradiance and carbonate chemistry were included into models with productivity data, and we have adjusted the discussion accordingly (removed the sentence commented on). We do, however, feel that information on correlations between environmental stressors should remain within the results section for clarity with regards the data.

Comment 5: Figure 7: It is not clear where the irradiance measurements are from. Are they the mean values during each incubation, pooled from both seasons? See above comment for methods.

Response 5: As noted in response 2, we have now updated the methodology to make this more clear. In addition, the figure legend for Figure 7 has also been updated to read: “Relationship of (a) net/production. . . .and (b) net calcification. . .to the average irradiance measured during respective incubations. . .”

Comment 6: Technical Corrections Line 471 insert “neither” after “Although” Response 6: Many thanks, this has been amended.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2017-135/bg-2017-135-AC1-supplement.pdf>

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-135>, 2017.

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