

Dear Editor,

We would like to express our sincerest gratitude for the tremendous time and efforts you have devoted to developing this manuscript. We carefully considered the report and made the corrections and changes accordingly. Specifically, about the structure issue in Materials & Methods, we came up with an idea to fix it. We used two section titles for the two separate experiments, i.e., settlement assays and recruit experiment. In turn, we only presented two sections in the Results to make it consistent with the M&M structure. In this way, there will be no misunderstanding of the origin of larvae and measurements. Furthermore, thanks so much for improving the phrasing in this paper. We also added the information about the number of replicate recruits measure for each parameter in the figure legends as required, although some of these details have been mentioned in the main text in M&M. Again thanks for this suggestion which will make the figures more readable and understandable. The point-by-point responses are attached below.

Lei Jiang

On behalf of all authors

[General comments]

Based on the comments of previous reviewers and the answer and the changes to the manuscript I would recommend publication after attending to the following:

- The organization of material and methods section makes it still somewhat difficult to understand which batches were used for which measurement. I would recommend transferring section 2.4 on settlement essays to the end of Materials and Methods (but before section 2.7 on data analyses) as it seems that these essays were carried out separately from the rest of the manipulations. Also, please be more specific on how petri dishes were incubated (as requested by one reviewer) in sections 2.2 and 2.4: were the dishes covered? Were they completely submerged or floating in the incubation tanks?

[Reply] Thanks for the advice about the structuring issue. The transferring of settlement assay part to the end of M&M will disrupt the order in Results as well as that in Discussion. Therefore, we came up with an idea to avoid and fix this problem. We only used two section titles for the two experiments, i.e., larval settlement assay and recruit experiment, and mentioned in the previous section 2.2 that planula larvae collected on 22 August 2015 were pooled and two separate groups of larvae were randomly selected for the following two experiments, respectively. In this way, there will be no difficulty and confusion in understanding of the origin of larvae and recruit in the two distinct experiments.

We added further information about the details of incubation of petri dishes in the two experiments. For the settlement assay, dishes were securely covered with lids to minimize evaporation. Afterwards, they were floated and partially (80%) submerged in the seawater within each tank to ensure temperature control. For the recruit experiment, petri dishes with larvae were left floating on the water surface to allow for larval settlement and recruits preparation. Then, dishes with recruits were assigned to each treatment and placed at the bottom of each tank.

Responses to point-by-point comments:

[Comment 1]- It is my understanding that the manipulations described in sections 2.5 and 2.6 were carried out on the "recruits", hence these sections should be placed after section 2.3. (unless the measurements were carried out on the batches for settlement essays in which case they should be moved after the description of settlement essays).

[Reply] As stated before, we fixed this problem by using only two section titles for the settlement and recruit experiments. Furthermore, we clearly defined the selection of two separate batches of larvae for these two experiments, and moved the description of recruit preparation to the start of section 2.5 recruit experiment. So there will be no misunderstanding of the measurements.

[Comment 2]- Similarly, do the results presented in section 3.1 refer only to the settlement essays? Please specify (maybe adding a sentence at the beginning of the 1st paragraph: "During the settlement essays larval mortality was only observed...").

[Reply] Revised as suggested.

[Comment 3]- Figure 2: How many individuals (n=?) were measured for each treatment? This info could be given in the figure or figure legend.

[Reply] Information was added in the figure legend.

[Comment 4]- Table S3: what do the authors mean by "subject" does it actually correspond to treatment? As in "within treatments" and "between treatments".

[Reply] "Subject" is a term which has been employed in the description and explanation of repeated measures ANOVA. Treatments are between-subject factors and time is treated as the within-subject factor. This expression is widely used in literature.

References:

Ulstrup K E, Berkelmans R, Ralph P J, et al. Variation in bleaching sensitivity of two coral species across a latitudinal gradient on the Great Barrier Reef: the role of zooxanthellae[J]. *Marine Ecology Progress*, 2006, 314(8):135-148.

Rodrigues L J, Grottoli A G, Lesser M P. Long-term changes in the chlorophyll fluorescence of bleached and recovering corals from Hawaii.[J]. *Journal of Experimental Biology*, 2008, 211(Pt 15):2502.

Comeau S, Edmunds P J, Spindel N B, et al. Diel pCO₂ oscillations modulate the response of the coral *Acropora hyacinthus* to ocean acidification[J]. *Marine Ecology Progress*, 2014, 501:99-111.

[Comment 5]- Figure 3: How many individuals (n=?) were measured for each treatment? This info could be given in the figure or in the figure legend.

[Reply] Information was added in the figure legends.

[Comment 6]- Figure 4: How many individuals (n=?) were measured for each treatment? This info could be given in the figure or figure legend.

[Reply] Information was added in the figure legends.

[Comment 7]- Section 3.3 p 14-15 lines 298-305 (2nd paragraph): the references to the Tables should be corrected (Table S7 and S8 don't exist and Table S6 only contains information on calcification, I imagine the authors refer to Table S5?).

[Reply] Thanks for finding this error and we have checked all the cited supplementary tables in this section.

[Comment 8]- Section 3.3 Line 307: Can the author provide the info on the numbers of recruits? 97% and 86% survivors out of how many?

[Reply] The numbers of recruits at the start of the experiment in each treatment were added in the figure legend.

[Comment 9] p. 3 line 63-64: remove "on coral reef" and striking".

[Reply] Revised as suggested.

[Comment 10] p. 4 line 73: replace "of equivalent..." with "at equivalent..."

[Reply] Revised as suggested.

[Comment 11] p. 4 line 83: replace "is more suite to the fluctuating than to the constant temperatures..." with "is more adapted to fluctuating temperatures..."

[Reply] Revised as suggested.

[Comment 12] p. 4 lines 85-87: replace "Conversely, evidence for the deleterious effects of diel temperature fluctuations includes the significant reductions in photochemical efficiency, symbiont density and aerobic respiration in corals exposed to fluctuating temperatures compared to those in constant temperatures..." with "Conversely, a significant reductions in photochemical efficiency, symbiont density and aerobic respiration were found in corals exposed to fluctuating temperatures..."

[Reply] Thanks for the suggestion and revised as suggested.

[Comment 13] p. 5 line 110: replace "free-swimming and zooxanthellate..." with "free-swimming zooxanthellate..."

[Reply] Revised as suggested.

[Comment 14] p. 6 line 126: replace "the diurnal range during summer..." with " The diurnal range in temperature variation during summer..."

[Reply] Revised as suggested.

[Comment 15] p. 6 line 128: replace "temperature began to increase around..." with "temperatures began to rise at around..."

[Reply] Revised as suggested.

[Comment 16] p. 7 section 2.2: reorganize as follows "Eight *P. damicornis* colonies were collected at a depth of 3 m on 20 August 2015. Colonies were transported to Tropical Marine Biological Research Station, and placed individually into 20 L flow-through tanks at ambient temperature ($28.7 \pm 0.5^\circ\text{C}$) under partially shaded light conditions (noon irradiance, $\sim 300 \mu\text{mol photons m}^{-2} \text{s}^{-1}$). The outflow of each tank was passed through a cup fitted with a $180 \mu\text{m}$ mesh-size net to trap larvae. Larvae were collected at 07:00 on 22 August 2015, pooled and randomly assigned to the following two experiments: 1) To test the effects of temperature treatments on the photo-physiology, bleaching, calcification and growth of recruits, larvae were transferred to 10-cm-diameter petri dishes which were left floating in a flow-through tank. Twenty hours later, 4 dishes with a total of 35–40 newly settled recruits were assigned to each one of the tanks with the four experimental temperature regimes, respectively. Only recruits that settled individually and at least 1 cm apart from others were selected for the experiment in order to avoid possible contact between recruits during growth. Dishes were rotated daily to avoid the potential positional effects within each tank. 2) For the settlement assays, larvae were transferred to 5.5-cm diameter plastic petri dishes as described in Section 2.6."

[Reply] Thanks so much for the restructuring and revised as suggested.

[Comment 17] p. 7-8, section 2.2, 1st paragraph: reorganize as follows:

"The two temperature regimes, constant and fluctuating, were set for the target temperature levels of 29 °C and 31 °C each. The later temperature value was 2 °C above the ambient and 1 °C above the bleaching threshold for coral communities on Luhuitou reef (30 °C, Li et al., 2012), and within the range of projected increases (Bopp et al., 2013). The pattern and range of temperatures in the two fluctuating treatments were based on in situ records obtained during larval release of *P. damicornis* (Fig. S1d), and the assumption that the predicted 2 °C increase in mean temperature would entail a 2 °C shift over the whole daily temperature cycle (Burroughs, 2007). The 29 °C treatment, corresponding to the ambient temperature at the collection site of adult *P. damicornis*, was used as the control treatment. "

[Reply] Thanks for the suggestion and revised as suggested.

[Comment 18] p. 8 line 160: replace with "All incubations were carried out in four 40L tanks..."

[Reply] Revised as suggested.

[Comment 19] p. 8, line 162: replace with "Temperature regimes were set using..."

[Reply] Revised as suggested.

[Comment 20] p. 9, line 184-189: replace with "The settlement essays were conducted in 5.5-cm-diameter petri dishes on 22 August 2015 and starting at around 09:00."

[Reply] Revised as suggested.

[Comment 21] p. 12 line 241: replace with "reactions often double with a 10 °C rise in temperature."

[Reply] Revised as suggested.

[Comment 22] p. 15 lines 300-305: reorganize as follows:

"The effects of temperature fluctuations on calcification depended on the mean temperature (Fig. 4d), even though the interaction between temperature level and regime was not statistically significant (Table S6.): at 29 °C, the fluctuating regime had no discernible effect on calcification, while in the fluctuating regime with a mean temperature of 31 °C a significant reduction (20%) in calcification was observed when compared to the constant 31 °C regime (Table S7.)."

[Reply] Revised as suggested.

[Comment 23] p. 19 line 389: I am not sure what the meaning of "loner" in this sentence is. Do the authors mean "single" or "longer"?

[Reply] Sorry for this mistake and we lost a letter and we actually meant "a longer exposure". We amended this error in the text accordingly.

[Comment 24] p. 20 line 420: replace with "Clearly, thermal tolerance of corals depends on the ambient..."

[Reply] Revised as suggested.

[Comment 25] p. 22 line 458: replace with: "...by a parabola with an optimum..."

[Reply] Revised as suggested.

[Comment 26] p. 22 line 468: replace with: "First, during the warmest part...."

[Reply] Revised as suggested.

[Comment 27] p. 24 lines 507-508: replace with "Therefore, corals in highly fluctuating environments may have the potential..."

[Reply] Revised as suggested.