

Interactive comment on “Species interactions can shift the response of a maerl bed community to ocean acidification and warming” by Erwann Legrand et al.

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General Comments

The manuscript "Species interactions can shift the response of a maerl bed community to ocean acidification and warming" describes a novel experiment with an interesting approach on community interactions under predicted global climate change that are generally lacking in the literature. Considering ocean acidification and warming are occurring simultaneously and interdependently, experiments that investigate the effects of both factors on marine organisms are important for understanding future changes in physiology and ecology. The authors were able to do this in their study, and not

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only did they investigate effects of ocean warming and acidification on the physiology of single organisms, but also of communities. Through their experimental design, they are able to describe changes in species interactions under future climate change conditions, which is currently rare in the literature. The experimental design is good and the manuscript is well written thorough. My main criticism is that the results could be described more clearly and thoroughly. The interactions between the independent variables should be described more clearly. Interaction plots could help with the interpretation of the statistical analysis of the effect of season, temperature and CO₂ on the independent variables. The authors tested the effect of season on the dependent variables, but they often fail to describe this effect in the results section, and focus only on the CO₂ and temperature effect. They also fail to mention in some cases that temperature ameliorates the negative effect of pCO₂ on some variables, which is important considering both warming and acidification are occurring interdependently. I have made specific comments below.

Specific Comments

Materials and Methods

Line 141-142 "Before incubation, epiphytic algae that spontaneously grew on *L. corallioides* during the experiments were carefully removed and incubated separately." I assume this was done after the assemblage measurements were made? The authors could clarify this here.

Line 156 What buffer solutions were used to calibrate the reactive spots?

Results

In the results headings, the authors mention acidification and warming, but ignore the factor season

Lines 205-208 I think the results can be described more thoroughly here. There actually was not a negative effect of CO₂ and temperature on GI compared to the control.

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Temperature increased calcification rates in the summer. CO₂ alone did not seem to have an effect in either season. The combination of high CO₂ and temperature in summer negated the positive effect of temperature. The authors should mention there was a main effect of season on *P. miliaris*. Excretion was highest under control conditions in the summer. High temperature, CO₂ and the combination of both decreased excretion rates in the summer.

Lines 209-210 It is confusing to say R was positively or negatively affected - please rather describe if it increased or decreased. Also, although there was no temperature or CO₂ effect on R, GI, or E, there was a strong effect of season.

Line 213 Please add the effect of season, e.g. "Living maerl GPP did not differ among temperature and pCO₂ conditions, but there was a strong effect of season, with higher rates in the summer than in the winter."

Line 215 Add the effect of season on chlorophyll a

Line 216 "Temperature had a positive effect on the GI of living maerl. Conversely, GI was significantly reduced under high pCO₂..." The authors fail to mention that in the combined treatment, temperature alleviated the negative effect of pCO₂. This is very important to the story.

Line 220 "Net dissolution, because Gd was negative, was recorded in the winter under high pCO₂ conditions" But dissolution was less in the combined temperature + CO₂ treatment in the winter, so temperature alleviated some of the negative effect of CO₂ in the winter, although net dissolution still occurred.

Line 222 Again, mention the main effect of season

Line 223 I did not see an interaction between season and pCO₂ for GPP in Table 3

Line 225 Mention the effect of season on dead maerl

Line 233 "R was enhanced by the high temperature and pCO₂ conditions..." alone, and

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their combination resulted in the greatest R rates.

Line 238 Add that temperature alone decreased epiphyte biomass in the summer.

Line 240 "No temperature effect was observed..." But all response variables were higher in the summer than in the winter.

Line 248 "In the summer, the interactive effect of temperature and pCO₂ increase was more complex, with a (change to) increase in Gd detected under high temperature conditions only."

Discussion

The authors state that "ocean acidification and warming will strongly destabilize communities through both direct effects on species physiology and changes in the interaction strengths between coralline algae, fleshy algae, and grazers." Based on the assemblage data, I do not think that the effect is so negative, at least in the summer. There is a strong difference in the effect of the combination of CO₂ and temperature in winter and summer. In summer, assemblages exposed to high temperature and pCO₂ combined actually had similar to or even slightly higher light calcification rates than the ambient treatment. In winter, there was a decrease in light calcification compared to the ambient treatment, but the positive effect of temperature and the negative effect of pCO₂ were weakened when the two were combined. I think it is important for the authors to point out that the combination of pCO₂ and temperature often subdued the effects of each single factor, because it illustrates the point that experiments investigating only the effect of pCO₂ or temperature may present more dramatic responses than when the two are combined, which represents a more realistic scenario.

Technical Comments

Line 129: insert "the" before CO₂SYS

It would be helpful to be able to identify statistically significant differences in the figures

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