

Dear Steve,

thank you very much for the revised version of your manuscript and the point-by-point reply to the concerns raised by the reviewers and other colleagues. I think your paper is almost ready for type setting and I'd like to conditionally accept it. However, there's a few things left to do.

Dear Dr. Helge Niemann,

Thank you for these useful comments. We have done our best to respond to them and include modifications in the manuscript that are listed below.

Best,

Steeve

Comment 1: *What is missing here is any statement as to what the effect of using mixed coral- vs mono-species communities could be (I presume none except that you would have had to use many more flumes for incubating sediments alone, the different coral and the different algae species alone?).*

Response 1: The objective of this study was to explore the effects of OA on communities assembled in flumes. As our introduction describes, this is a logical (and necessary) extension from recent and ongoing work (by others as well as ourselves) on single organisms. Respectfully, we suggest an additional statement to this effect in our manuscript would result in a lack of clarity, and therefore we have not added a new statement.

Comment 2: *Furthermore, I missed in the intro and discussion/conclusion some sentences about the effects of OA on organisms beyond the reef-builders and sediments (cf eg Fabricius, K. E., De'ath, G., Noonan, S., and Uthicke, S.: Ecological effects of ocean acidification and habitat complexity on reef-associated macroinvertebrate communities, Proceedings of the Royal Society B: Biological Sciences, 281, 2014) and what your results will/could imply for the reef ecosystem.*

Response 2: Thank you for this excellent suggestion. Effects of OA on organisms beyond reef builders are now discussed in the introduction lines 36-38 "*Differential organismic sensitivities to OA potentially could lead to changes in coral community structure, and in turn this could affect habitat complexity (Fabricius et al. 2011, 2014).*" and in the discussion lines 339-342 "*In addition to the direct effects of OA on reef builders, the associated loss of three-dimensional framework might impact a large variety of marine organisms by reducing habitat complexity, and the availability of refuges (Fabricius et al., 2014).*".

In addition, there's a few more, rather small issues that need to be addressed (see below).

Best, Helge (Editor)

Comment by Eyre on ripple formation etc. This probably addresses infiltration of SW into sediments when it flows over ripples, which is coupled to the upwelling of (reduced) pore water (ripples create a pressure gradient when overflowed, similar to aeroplane wings; see papers by Huettel and colleagues).

Please can you clarify what you would like done with respect to this issue? We're hesitant to add additional material to the text unless it is absolutely necessary, as this will make our submission unfocused.

L38 ff entire sentence reads odd. Check grammar (RE using "now")

This sentence has been reformulated lines 39-42: "*Critically, most of the studies on coral reef organisms have been performed on individuals maintained in isolation in laboratory conditions, and studies performed at the scale of whole communities are scarce (Leclercq et al., 2002; Jokiel et al., 2008; Andersson et al., 2009; Dove et al., 2013).*"

L 42: change "to studying" to "for studying"

Done.

L 43: use adverb (ie "firstly")

Done.

L 45: use adverb

Done.

L 46: change to "... and has not yet been used to.."

Done.

L 47: use adverb

Done.

L 47: reef communities can not be created, that would be a 'divine' act ;). Rephrase to "assemblages of reef communities can be monitored in ex situ experiments with (re)constructed reef communities" or the like.

It has been reformulated as suggested.

L 64 ff. entire sentence. This belongs to the material and method section.

This sentence has been reduced to: "*Given the aforementioned results that highlight the importance of sediments in the community calcification of entire coral reefs, we included reef carbonate sediments into the constructed communities.*"

L 69 ff. This is far, far too much detail for an introductory section, and you repeat it in the M&M section. Lower level of detail to something like: We investigated the response of constructed reef communities to OA in flumes at ambient seawater- and elevated pCO₂. Calcification rates (measured at three levels of biological function: whole community, sediments, and macro-calcifiers) showed... ADD ONE SENTENCE WITH THE MOST IMPORTANT RESULT

This section has been shortened to (lines 68-72): "*We investigated the response of constructed reef communities in flumes to OA filled with seawater maintained either at ambient pCO₂ (i.e., ~ 400 μatm) or elevated pCO₂. Net calcification rates were measured at three levels of biological function: whole community, sediments, and macro-calcifiers to determine the sensitivity to OA of each compartment of the community.*". Respectfully, however, we do not think it would be best to further reduce detail in this section. We have found the OA community, especially as it relates to coral reef studies, to be highly attentive to detail, and indeed uses such material to evaluate quality of the science. Less detail would have the unfortunate effect of making our study appear sloppy.

L 85: remove "2013", this is redundant as you mentioned this before.

Removed.

L 87: 2013 is redundant

Removed.

L 90: do you mean "Richard B. Gump South Pacific Research Field Station"?

Yes, corrected.

L96 ff: "it was not possible" reads oddly as if there were some technical constraints in sampling the sediments. It's ok, that you didn't measure redox gradients or the like, so rather write something like "...to allow chemical stratification to re-establish (note that chemical stratification was not monitored)...."

Modified as suggested.

L102, add a comma after "flume"

Done.

L 104/L105: be consistent: either "XX cm (diameter - and rather use inner diameter)" or XX cm-diameter

Changed to XX cm (inner diameter).

L 140: as the total alkalinity method was the cause for some controversy in the reviews, I'd appreciate if you'd provide a very brief (!) description of the principal of this technique.

Brief description has been added lines 134-136: "*Net calcification rates were measured using the total alkalinity anomaly method (Chisholm and Gattuso, 1991), which is based on the stoichiometric relationship of 2 moles of A_T being removed/added for each mole of CaCO₃ precipitated/dissolved.*"

L 165: I presume you mean repeated “measures” ANOVA?
Modified.

L 174: see above RE ANOVA
Modified.

L 251: change to: “... 1996) was also ...”
Done.

L 253: change to: “...conditions are also similar...”
Done.

L 270: specify country to which Heron Island belongs to
Done.

L 281: “conditions of double ambient pCO₂” reads oddly. Change to something like “..was detected at night when CO₂ levels in the flume where equivalent to 2-fold elevated pCO₂ in ambient air”
Modified as suggested.

L 287 change to “has previously been shown to..”
Done.

L 293 change to: “..alone accounted for a decrease..” (exhibited a decrease doesn’t read well)
Done.

L 299 ff. This sentence doesn't read well and I don't really understand what you wan to express (that your measurements of calcification rates of corals and coralline algae are similar and that this similarity underscores the validity of your approach to calculate calcification rates?)

For clarity, this sentence has been reformulated lines 300-304: " *The proportional decrease (i.e., ~ 29%) in calcification rate for corals and coralline algae recorded in the present study under a tripling of present pCO₂ alone supports the validity of our experimental approach, which assumes that calcification of macro-calcifiers is equal to the difference between net sediment calcification and net community calcification.*"

L 311: “utility” doesn’t really fit here. I think that “suitability” or “usefulness” is better.
"Utility" was replaced by "suitability".

L 509: specify what each bar shows (I presume Fx indicates different flumes?)
Yes, this information was added.