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Interactive comment on "Technical Note: Artificial coral reef mesocosms for ocean acidification investigations" *by* J. Leblud et al.

Anonymous Referee #1

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First I want to point out that the technician of our team (who has a good experience in coral husbandry and mesocosm design) and myself performed this review together. This technical note describes methods used to maintain artificial coral reef communities in aquarium during several years. The particularity of this method is that it was performed in a closed system (i.e., with reduced water changes) and that part of the control of the chemistry was mediated trough biological control. The manuscript is generally well written and presents an interesting scientific approach to reef tank husbandry. Nevertheless, the methods presented here are maybe not highly novel and the authors' view of established equilibrium is only a relative term. The authors obviously know how to take care of a reef tank and are showing it with good data that backs up the idea that it is possible to replicate coral reefs away from the ocean. However, the authors tend to make a leap by saying that the tank is its own established ecosystem

whose nutrients are perfectly cycled and doesn't need any form of natural seawater input (food addition, water changes, filtering, etc. are similar to seawater inputs). I have included below a list of specific comments.

Comments:

Introduction - The introduction is rather long and the tone is overall negative for the other studies (i.e. everything was bad before), maybe the authors should think about revising it.

-p15466: l-15-18: I don't think that high flow rate was the reason for the use of HCl. Bubbling pure CO2 is very efficient to decrease pH and can be used in open flow system.

Design: - p15468: l-20-25: I don't really understand what is the goal of the "main tank". It will be very helpful to explain the role plaid by this tank and why it is important to have a separate "main tank" and a "sump".

- p15470: l-05-10: Could you indicate what was the maximal PAR value in the tanks?

- p15470: l-05-10:These bulbs are known to change spectrum after 4-6 months of use. Did you switch them out?

- p15470: l-20: Which aquarium were equipped with the speed Tunze, the main tanks or the experimental tanks?

-p15471: Why did you choose to couple a refugium for each experimental tank rather than using a larger one on the sump/main tank? It seems that the use of one main refugium would have limited the differences between experimental tanks.

-p15472: l-13-16: This is a long statement between parenthesis, reformulate.

-p15472: l-21-24: What was the average quantity of zooplankton added?

-p15473: l-10-13: How did you control the bacterial community?

-p15472: l-20–p15473: l-13: This section as a lot of wordage for describing what people do all around the world to maintain aquariums. The water changes should also be mentioned here, as they are probably important to control the nutrient levels.

-Carbonate system: I have a problem with this section. If the goal is to let the biology impact the diel cycle of pCO2 you should not manipulate the water in the experimental tank with a pH stat (that is designed to maintain the pH constant), but rather manipulate the pCO2 of the seawater before it enters the experimental tanks.

- Why did you use calcium hydroxide to increase pH rather than CO2-free air? Calcium hydroxide is known to spike TA locally, which can impact the biology.

-p15476: l-01: Please indicate the quality of your measurements (xx ±SD umol from the CRM).

-p15476: l-24: This sentence is not clear, please reformulate.

Results

-p15479:l-8: "although it is hard...", hard in your case or in general? It is actually quit easy with a pH-stat...

-p15479:l-13: Why didn't you use the pH-stat to recreate lower pCO2 at night since you were artificially manipulating the pCO2 in any case?

-p15479:l-120-25: Any ideas on why the pH increased? More turf algae?

-p15480: l-06: The variations in TA in the tanks were relatively important (SD> 100 umol), you should include explicitly this information in the results.

-p15480: l-13-16: This is not a result.

-p15481: l-13-22: Could the difference between OA and ambient be due to higher photosynthesis and respiration in the OA refugia?

Discussion

-p15482: l-10-15: I think that this statement is overstated: your mesocosms are equipped with pH-stats, skimmers, CaCO3 reactors, Ca(OH)2 reactors, and you also make water changes, add zooplankton, and remove manually some organisms. In that case it is hard to claim that organisms are controlling the chemistry in your aquariums.
-p15483: l-1-5: I would really like to see some discussion on the importance of water changes to control nutrients, etc. It seems that this part has been omitted in the manuscript.

-p15483: l-12: Predation keeps the biomass in the system. In your case you remove it from the system.

- Generally the authors claim that the system is "equilibrated". I am not sure this is the correct term, as the system requires water changes, addition of zooplankton, and different types of reactor and filtering. It is maybe "artificially stable" but not "equilibrated".

-p15483: l-21-30: This part is highly subjective...

-p15485: l-09 and l-11: I don't think that the use of "..." is recommended.

-p15486: l-14-19: Was this difference in [Ca] taken into account in the calculation of the saturation states?

- p15486: l-20: See also Jury et al. 2013 (5, 1303-1325; doi:10.3390/w5031303 Water).

-p15487:l15 - p15488:l-10: This section is very confused and should be revised.

Interactive comment on Biogeosciences Discuss., 11, 15463, 2014.