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Discussions
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Interactive comment on "Food availability and pCO_2 impacts on planulation, juvenile survival, and calcification of the azooxanthellate scleractinian coral, *Balanophyllia elegans*" *by* E. D. Crook et al.

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Referee #1 General Comments:

Comment 1: This paper on the effects of pCO2 and food provisioning on the coral B. elegans by Crook et al. presents an interesting dataset on the responses of an azooxanthellate coral species to CO2, and warrants publication. Much of the raw data is included in the supplement which is a definite improvement over many acidification studies, however, a number of details are still lacking and should be included prior to

publication. In addition there may be better ways to present some of the data and the paper requires editing. Reply: We appreciate the support of reviewer #1 with regard to the importance of our work. In the following comments, we hope to address all of the reviewer's concerns and our latest manuscript includes a significant amount of detail over our previous one. Additionally, we have included 8 new data tables in the main text as well as edited the text substantially. Again, we thank the reviewer for their support of our work.

Specific Comments

Comment 2: Give the concentration or other estimation of quantity of artemia used. Reply: The stock of artemia used has a manufacturer-guaranteed live yield of approximately 255,000 nauplii per gram of dry cysts, which equates to approximately 185,000 nauplii for each liter of hatch seawater. This in turn means that roughly 10-15,000 nauplii were present in each jar at each feeding. We have inserted this into the text.

Comment 3: What material was used for the airtight screw cap? Reply: We used a double-layered rubber membrane, we have now inserted this into the text.

Comment 4: Give details on the paddle used – size, movement rate, etc. Reply: We have now included a clearer description of our paddle apparatus in the text, including the size of the paddle and the rate of movement.

Comment 5: Were individual larvae tracked such that growth parameters can be expressed relative to age? – since the planulation season went from Oct.-Dec, planulae had a range of post-planulation ages which could in-turn give variation in apparent growth rates if a fixed time point was used for assessing final growth. Reply: Thanks for making this important point. We agree that it would be useful to be able to assess growth rates over time, but we were very limited in our ability to measure these changes. When the corals are newly settled, it is difficult to determine the difference between skeleton and polyp (the polyp can not fully retreat into the skeleton, making skeletal measurements very tricky). While we did image the corals at various time

points in an attempt to measure growth rates, because our final measurements were made with just the skeleton (i.e. cleaned of all tissue), it would be very difficult to compare the two data sets. Additionally, these corals are very slow-growing (hence the 8-month duration of the experiment), making the difference of a few weeks growth almost negligible. Based on our measurements of the early stages of growth, all differences in size due to differences in post-planulation ages were not significant after 3 months of growth.

Section 2.3 Comment 6: Are the pH values presented in the supplementary table based on DIC and Alk? or are they the measured pH values? If the daily pH values are not given, give them, also discuss if values differed between replicate containers and specify how the electrode was calibrated. Reply: The pH values presented in the supplementary are based on DIC and TA values, not the daily measurements made by the pH electrode. We have made this more clear in the text, and have also noted that values did not differ between replicate containers (we also now include this supplementary table in the main text). The pH electrode used, a hand-held Oakton WD-35613 meter, was not Tris compatible and was calibrated using NIST standards; thus, the hand-held measurements were not as accurate as the DIC and TA readings. We mainly used the pH probe to track daily trends to make sure that the water chemistry in the jars remained stable between water changes, not to obtain pHT values. Therefore, we are hesitant to report these values as we don't feel that they would add to our data set. We can, however, include them if necessary.

Comment 7: At what time point were the alk/DIC samples taken relative to the cleaning/water replacement schedule? Do they capture the true variability to which corals were exposed in each container or just input water? I suggest including Alk and DIC values in the supplementary materials since these were measured parameters. Reply: The water samples were obtained on the days that the jars were cleaned, but before cleaning took place (i.e. when water was at its "dirtiest.") We have attempted to make this clearer in the manuscript. Additionally, we have added our DIC and TA values, as

we agree that this information is very important considering all other calculations are based on these values.

Comment 8: No mention of the constants used for calculations is given. Reply: Thank you for mentioning this error, we have now included constants used in calculating saturation state in CO2sys.

Comment 9: I suggest a figure for crystal growth measurements – there are various potential means of estimating the start and end of an individual crystal still contained within the skeleton, and it should be clear where/how measurements were made (since it often isn't clear where a crystal ends versus being masked by other crystals – a figure would make this clearer). Reply: We now include an SEM figure in the supplementary material, as we feel it did not have a critical place in the main text, although as the reviewer mentioned we still feel it is noteworthy.

Comment 10: Were there differences between replicate containers? was this assessed in the statistics? Reply: We have edited our data reporting to make our statistical analyses much clearer, as well as included tables which include analyses of the replicates. We hope that no further confusions exist.

Data presentation

Comment 11: Please give a table with statistical results and not just p values in the results. Also consider adding significance to figures. Reply: We have added a stats table for each analysis as requested (a total of 8 tables in all, including N-values), and now include the chemistry data in Table 1 in the main text. Additionally, significance (while it was on our figures before) has been made easier to see by making data points on the graphs open circles or squares.

Comment 12: Figure 2 – was planula release by individual (female) adults quantified? If so, could the data be expressed as such and error bars added? If planula cannot be linked to parent coral, could the number of females in each container be specified

and data expressed relative to females – otherwise variations in male/female ratio may affect interpretation of the data. If data were collected on males v females, this might be of interest as well given work suggesting differences in growth between males and females of some coral species. Reply: Unfortunately, we did not obtain data for the number of males vs. females in each jar for this experiment, as to do so would require that we sacrifice our adults. Since our entire stock of adults (60 individuals) were used, to sacrifice them would not enable us to continue these lines of investigation in the future if necessary (they can take years to reach sexual maturity). Additionally, as space was extremely limited for this experiment, we were not able to quantify the number of planulae released by individual adult females (to do so would require that we separate each adult coral, as planulation occurs slowly and over a several month period). While we agree that both of these pieces of information would indeed have been useful, it was not plausible given our experimental constraints.

Comment 13: Figure 3 & 4 – reduce # of different symbols to just high and low food Reply: Thank you for this suggestion, this makes our figures much more concise.

Comment 14: Figure 4c – plot against external omega or pH, discuss CF omega in the text. Reply: We agree with this assessment, and can remove discussion of the crystal aspect ratios entirely. While we find the trends in CF omega interesting, we have few paired data points (hence the large error bars) and are only able to speak of trends. As this discussion doesn't appear until the end, it plays a minor role in the paper and has no bearing on our conclusions.

Comment 15: 7772 line 15 I suspect measuring calcification and normalizing it to surface area is at least as common. Reply: We agree that there are several ways to measure calcification, and normalizing it to surface area is certainly as common. We have changed our wording to reflect that there are many different ways to calculate calcification.

Comment 16: The text requires editing, for instance, I think +/- is often meant in place of

+, abbreviations are not necessarily given next to the term which is being abbreviated etc. Reply: Thank you for catching some of these edits. Many were in place in our original manuscript, but we missed the edits when it was sent to the typesetter. We hope to have addressed all of these issues. Additionally, we have thoroughly scanned the text for edits concerning abbreviations.

Comment 17: The authors may wish to reference the following paper on a related topic: Drenkard, E., Cohen, A.L., McCorkle D.C., de Putron S.J., Zicht, A., Starzcak, V. (2013) The Impact of Heterotrophic Feeding on the Coral Calcification Response to Ocean Acidification. Coral Reefs, DOI 10.1007/s00338-013-1021-5 Reply: This reference is very relevant and we have inserted it into the text when we discuss the importance of nutrition to zooxanthellate coral calcification in the introduction.

Interactive comment on Biogeosciences Discuss., 10, 7761, 2013.