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Biogeosciences 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.

Anonymous Referee #2

Received and published: 1 July 2013

1. One of the major problems with this paper is that the experiment lacks proper replication. Both larval planulation and juvenile growth experiments were conducted in 2 closed beakers including several individuals. Though these two beakers are replicates, each individual within the beaker are pseudo-replication. Since the statistical analysis used are not entirely sound, it is unclear the definition of replicates and how authors deal with the pseudo-replication problem. Also the result of ANOVA is not fully shown (ANOVA table would be informative), which makes difficult to evaluate the accuracy of the results.

2. Another issue is that the seawater carbonate chemistry is not fully shown. (please add salinity, TA and nutrient data). Additionally, since the present study focused on the effect of ocean acidification on corals living in upwelling coast where the seawater chemistry (pH, CO2, DO, TA, temperature, salinity and nutrient) highly change with season, and the present experiment was conducted for 8 months including seasons of high upwelling, the seawater chemistry during the experiment is expected to have strongly oscillated. Therefore, detail information about the seawater chemistry used throughout the 8 months experiment is thought to be critical. Results and interpretation of the results also might be able to be improved by adding these information.

3. The method used for measuring the volume of the juvenile is unclear.

Following are the specific comments:

Abstract

7762 line 21-23 Description for the conclusion would be more informative than writing what you pretend to discuss.

Introduction

p.7763 line 22 More basic information about the interaction between nutrition and energetic resources and calcification would be helpful for better understanding the background of the present study.

p. 7763 line 28 Please add more specific information about the seawater chemistry of coastal water around Monterey Bay. In what range seawater pCO2, pH alkalinity, temperature, DO, nutrient, salinity change, duration of upwelling, seasonal change etc. . .

p. 7765 line 1 What you mean by the sentence “coral’s energy budget is fixed under normal circumstances”

p. 7765 line 5 None of the papers referenced here sounds to be proper to indicate

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that “when provided with excess nutrients, some species can maintain 100% of their calcification rates despite under-saturation conditions”. The paper such as Edmunds 2011 might be more relevant.

Material and method

7766 line 14-16 Please give any justification for the given amount of food as high food condition (3 day food) and low food condition (3 weeks food). Also please indicate how much amount of artemia was given every time. What was the density of the “concentrated *Artemia nauplii”*?

p. 7767 line 12 Please describe briefly about the environmental condition and how the corals were maintained during the 2 years before used to the experiment.

p. 7767 line 18 Please describe in more detail about the used seawater in the present study. From where the ambient seawater was taken? What was the seawater chemistry of the flowing ambient seawater during the collection of larvae? Are these flowing seawater used to prepare the seawater used for the following 8 months experiment?

p. 7768 line 9 Please add results for the seawater DIC, TA

p. 7768 line 14 Show the seawater carbonate chemistry for the two experiments, Oct 2011- Jan 2012 and Nov 2011-July 2012, separately.

p. 7768 line 14 Please describe how the seawater salinity was measured and add the data in the result.

p. 7768 I would like more information about the seawater chemistry throughout the 8 months experiment. As authors mentioned in the introduction, since the seawater carbonate chemistry in the coast of California, where the experiment have been conducted, highly change naturally by upwelling event (higher pCO2, low DO, high TA, high nutrient, low temp), information about the seawater carbonate chemistry (TA, pCO2, pH, salinity, nutrient and DO) used through the 8 months experiment would add important information. Additionally, I expect that the seawater pH might change seasonally

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due to the change of seawater chemistry (salinity, TA, nutrient) if you have controlled the pH by bubbling using a gas with constant CO2 concentration. Please explain that point.

p. 7768 line 18 The volume of the corals were measured before or after removing the tissue? If the volume of the skeleton were measured, I am not convinced that this method (measuring by calipers the height and diameter) is accurate enough to measure the skeleton volume. I suggest that authors conduct different measurement principally because the difference between CO2 conditions seems to be very small and authors are concluding that the density of this coral are affected by CO2.

p. 7768 Please add any reason why the sample for 770 µatm was excluded.

p. 7769 The statistics that the authors use to analyze their data are not entirely sound. Please write in detail the "additive model" applied in the present study of planulation. The coral settlement experiments have problem of pseudoreplication. Please write in detail how the authors work with the statistics to eliminate these problems.

p. 7769 line 17 What is the number of data for each results? Define the number of data used to calculate the mean and standard error for each results.

Results

p. 7770 line 7 I could not understand how these statics were conducted.

p. 7770 line 8 How the survival of juvenile corals was evaluated. The method is completely similar to that applied in the long term experiment?

p. 7770 line 15 Please add ANOVA table for all results

Please add statistic result in the figures.

Image of the juvenile skeleton would be more informative than Fig. 1. Additionally SEM image of the skeletons at Fig. 4 also would be informative.

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Discussion

p. 7771 line 8 Why “early stages” of marine organisms in “upwelling regions” are “particularly sensitive” to OA? Or you mean the early stages of marine organisms in upwelling regions are “particularly susceptible” to OA? The all paper referenced here ‘Kroeker et al. 2010, 2013, Hetting et al. 2012” seems to be not relevant since though these papers describe the effect of OA on early stages, these papers are not evaluating the particular sensitivity of marine organisms in upwelling regions.

p. 7771 line 13-15 Why the data showing that the number of planula release increase at high food condition suggest that the female may delay the release of larvae until feeding condition become optimal?

p. 7771 line 25 Justification for the conclusion that, survival of juvenile will decrease at high CO2 (pH 7.6), is enable to be qualified before explanation about the statistical and data analysis.

p. 7772 line 9 When you say size (volume) is that mean the volume of the skeleton or skeleton + tissue? According to that the meaning of “density” will change. Since “food amount” is suggested to affect the tissue mass please clear that point. Additionally, if the volume of the skeleton has been measured, the way of measuring the diameter and height with calipers (+0.1mm) assuming that the juveniles are cylinders in shape sounds to be not enough accurate.

p. 7772 line 15 I could not found results showing the “calcification rate”. The value showed at Fig 3 b are calcification rate (g/y) or is just dry weight (g)?

p. 7773 line 22-29 If the aragonite saturation at calcifying fluid does not differ between low and high food concentration, what is the expected mechanism that “excess food counteract the negative impacts of low pH”?

p. 7773 line 8-10 This discussion seems to be contradict with the present data and previous discussion that the aragonite saturation was not elevated by food concentration.

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p. 7774 line 14-16 This discussion seems to be contradict with the sentence wrote at p. 7771 line 3 (early stages of marine organisms in upwelling regions are “particularly sensitive to OA).

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