

In this paper led by James McLaughlin et al., the authors investigate the rates of CaCO₃ production and O₂ production/consumption (i.e., photosynthesis and dark Respiration) on different species (green algae, red algae, and corals) to scale up to the community level in a remote island in the Indian Ocean on the west coast of Australia. I greatly appreciated the efforts made by this team to study the functioning of benthic communities, and it is undeniable that much work was done to write this study. However, the writing of the article is still a bit shaky, especially in the references, which are not up-to-date. I do not doubt that this study will be significantly improved after revision and make an excellent reference in benthic functioning.

Abstract.

There is a lot of information missing. Especially on the M&M. I mainly see the introduction and the results in this abstract. It would be wise to reduce the results to keep only the key results, add at least two sentences about how you did the experiments (and when), and a sentence in the discussion/conclusion. For example, your M&M part in the abstract stated only: "Specimens of the dominant coral and algal taxa were collected from the reef platform of Browse Island located on the mid-shelf just inside the 200 m isobath off the Kimberley coast. During experimental light/dark incubations, ..." And then, you are already talking about results.

How many species? Light/dark incubations in situ, ex-situ? How many incubation, and how long? What about calcification?

- L22-23: Try to be consistent. One time you do a range of values X - X; another time, you do X to X. stick to one (I prefer the second one)

This comment is valid for the whole manuscript!

Introduction.

I had some trouble with the introduction. The ideas are there, but maybe not well arranged. If I followed you correctly, here is your plan: CO₂ rising > Functioning and Reef Health > OA and calcification > Algae and calcification > Community metabolism (Calcification and photosynthesis) > Change in pH > Question.

You will see it in my comments below, but I won't just focus on CO₂ since you're not looking at it specifically in this study. I will talk about threats more in general. The paragraph on community metabolism and functioning reef health could also be coupled, but I understand your strategy. I might have appreciated a more fluid introduction, but it is still functional. See my comments below.

- L41-43, the way to write it is clumsy. Please rephrase.

I'm a little confused here because you're right to talk about the threats of climate change. But I don't understand why you focus on the OA only when you have the chance to study a remote island: I mean, there is a lower / even zero anthropic pressure (nutrient run-off, sedimentation...). I will expand it in this paragraph.

REF :

1) Hughes, Terry P., et al. "Coral reefs in the Anthropocene." *Nature* 546.7656 (2017): 82-90.

2) Hughes, Terry P., et al. "Global warming and recurrent mass bleaching of corals." *Nature* 543.7645 (2017): 373-377.

- L57: Pretty close to what you are doing. I think a similar study to cite would be, especially if you refer to health by looking at metabolism :

1) Carlot, Jeremy, et al. "Scaling up calcification, respiration, and photosynthesis rates of six prominent coral taxa." *Ecology and Evolution* 12.3 (2022): e8613.

- L60: when you talk about Respiration, please use the standard terminology: "Dark Respiration".

- L65: There are lots of references here. Notably, all the works from Perry et al. (2008, 2012); an older reference would also be Vecsei et al. (2004).

<https://scholar.google.com/citations?user=7v8lXzYAAAAJ&hl=en&oi=sra>

- L67: If I advocate for the devil, some encrusting corals bring nothing strictly in terms of 3D. I am not sure it is relevant to mention 3D here, especially in this study.

- L69: REF

- L75: A more recent study would be welcome to discuss future projections...

1) Cornwall, Christopher E., et al. "Global declines in coral reef calcium carbonate production under ocean acidification and warming." *Proceedings of the National Academy of Sciences* 118.21 (2021): e2015265118.

- L80: This statement is critical, given your discussion, and you do not mention the work of Houlbreque et al., in the discussion. Too bad...

- L82: I'm a bit confused about this formulation. Although mass bleaching events are due to thermal stress, bleaching can occur from another cause (i.e., oxic stress due to pollution or disease...). I will remove "during bleaching event" or rephrase it.

- L91: Turf can enhance the productivity of the general system by feeding fish, but not in the way you mean here, in terms of benthic productivity. Am I wrong?

- L95: REF

Remove "like corals" or write "like coral reefs", but it is not necessary; it just bloats the sentence to lose the reader.

- L96, 99: REFs

- L100: What is the ref of the Caribbean?

- L102: It's a little bit fair to extrapolate to the globe with a single reference from 1988 in Tahiti (French Polynesia). Add refs or rephrase

- L123: It's not so difficult to define it, actually. But it becomes very challenging "in situ". Add it.

- L139: This is an excellent paper, but he has updated his results since. It would be nice to see if you are still in the same category.

1) Halpern, Benjamin S., et al. "Recent pace of change in human impact on the world's ocean." *Scientific Reports* 9.1 (2019): 1-8.

M&M.

Overall, it was pretty good. There is some information missing, but I was able to follow everything. I would have appreciated a figure showing the experimental protocol. That would have helped a lot. I'm not sure I understood why there were three dates, maybe I lost the info, or it's not explained. I'm a bit more concerned about the seasonal effect, especially with algae, but I'll come back to that in the discussion. What were the units obtained for Respiration and calcification? Did you do any conversions?

- L158-160: I'm not familiar. Is that a lot for this system? It seems relatively low to me, especially for a remote system

- L174: I'm not sure that estimating the age is relevant. What does it bring to you?

- L185: There is some information missing here. Volume?

- L189: Why 12 for Sargassum and 6 for the others?

- L199: Why 24 cores? I do not understand. Where does 24 come from?

- L210: It's great to have defined the surface, but for the turf, you have mainly defined the surface you extracted. Did you make sure to select the strict minimum? How? There are a lot of limits on this turf component. How did you do in 2017 to have the turf without the substrate (Fig 2)?

- L231: How many replicates triplicates for alkalinity? I am surprised not to see the Dickson et al. (2007) reference in this section.

1) Dickson, Andrew Gilmore, Christopher L. Sabine, and James Robert Christian. Guide to best practices for ocean CO₂ measurements. North Pacific Marine Science Organization, 2007.

- L241: Referencing problem with R

- L244: What about the flow? Which pump? What about the light intensity? What about bacterial Respiration?

Results.

This part was the weakest. There are some discussion parts in it. See specific comments.

- L273-275: Mix of Discussion / Results, a useless first sentence. Rephrase.

Suggestion: "Nutrient concentrations were low and similar among sampling trips (Table 2)."

- L275-277: Why are you only talking about 2017 values?

- L279-280: Compare what is comparable. First light and then temperature but not light with temperature.

- L281: Which differences?

- L288: Sometimes, a comma would be really useful to understand the flow of your sentence. This is more of a general comment.

- L289-290: Are you talking about bacterial Respiration? If so, please be explicit. This is too bad that you did not apply a correction, even a small one. It would have shown the accuracy of your results.

- L300-302: This part goes into the discussion.

Also, OK, it's a good point, but not necessarily; it can be a response to oxygen stress due to the chamber (according to the EPA, your organisms should not have an oxygen concentration lower than 80%, did you look at it?).

Also, the 9cm diameter for corals is not that small. Especially when you estimated that your corals were up to 7 years old at the beginning!

- L304-306: I think it is better to talk about significance. Indeed, it seems non-significant. I'd prefer to see what's significant or not; mentioning the range of change is great but not enough (you need both). Add this information.
- L315: Once again, minor = non-significant
- L317: The adjusted R2 is not small for ecological models. Would it be better to look only at species? The fact here is that you do not have a lot of samples, and this is why you got lower R2 than your expectations
- L322: That is surprising. Even at night, calcification activity should be less but not negative. Check with other papers for a response to the review.
- L324: Is the ratio Daylight/Night equal to 1 in your location? It would be more accurate to check it instead of assuming it
- L326: Strongly correlated: Prove it (Hint: R2)
- L330: Intertidal, which categories in Fig 7? The high reef platform, I assume. Say it. Add also error bars. It might be significantly different
- L333: It would be good to recall the cover in Halimeda to get an idea of the contributions
- L338: It would be nice to have a value or a percentage to judge the negligible.

Discussion.

Overall it's good. I wish you would have talked about seasonality, which is totally ignored. It would be nice to compare your values obtained with different methods to support the robustness of your results. Also, it would be interesting to discuss them in the face of climate change since you went in that direction in the introduction. The last paragraph of the discussion before the conclusion is excellent.

- L344: at line 155, only 5m, now more than the double!
- L346: I prefer the word "composed" rather than "inhabited" – the second one being more used in the scientific literature for humans.
- L352-353: Do not get the sentence. Rephrase.
- L369: OK, this is fair, but were results for Halimeda or coral different in other studies?
- L376: I wouldn't necessarily use the terms "Functional groups" since you are always looking at the same functions with different species. I would say species or taxonomic groups.
- L382: Yes and no. They remain autotrophic but get heterotrophic supplies. There is probably a mountain of Houlbreque refs to quote here.

<https://scholar.google.com/citations?user=gbjGctUAAAAJ&hl=en&oi=sra>

- L386, 414, 422: Only one / add Refs!
- L422: Here, it's good to know what base units you had.
- L463: Excellent paragraph!
- L472: I'm not sure I understood? How do you estimate metabolism aerially? On the other hand, relief is possible with photogrammetric methods.

Figures and Tables.

You have not discussed the nutrients in slide 2. You can refer to the work of Jacob Allgeier to help you.

<https://scholar.google.com/citations?user=1IUg8lwAAAAJ&hl=en&oi=sra>