

Dear authors,

Following the edits and updates you have made to the manuscript, I went ahead and re-reviewed your contributions. I have suggestions for revisions, and I annotated the track-changed version of your manuscript (see attached) for your reference.

Please let me know if you have any questions, and thank you for adding more relevant dataset. Handling this manuscript was quite unusual, but we all want published manuscript to BG to be at its best version. Thanks for your perseverance.

Best wishes,  
Voary

We thank the editor for another thoughtful review of this manuscript and have responded to the editor's remarks below. We have copied the comments from the track-changes version of this manuscript that was sent back to the authors. Please find the author responses in blue.

Line 120: I think the SEM method needs further details in this manuscript.  
We added a few lines of extra detail here.

Line 158: Change "for mineralogical analysis" to "for mineralogy". Add here the details about the XRD on L165-167.  
Done.

Line 163: If it is scanned, is the method still XRD?  
We asked the analyst to clarify methods, and yes, this is still a method of XRD.

Line 168: You may need to distinguish between probe and XRD, entirely different things.  
The analyst also advised us to change "probe" to analyze".

Line 181: Why is this technique suggested here? I don't follow the logic.  
This technique of radiometric dating was mentioned because these corals presented an unusual internal structure, or lack thereof. This presents challenges regarding establishing chronology and determining where to accurately sample so that we progress through time. This paragraph has been reworded to clarify that intent.

Line 185: The linear regression is built upon what? Isotopes vs depth or vs.  $\delta^{13}\text{C}$ ? The isotopic range is quite wide, so this needs more clarification.  
We have clarified the table to state the regression details ( $\delta^{18}\text{O}$  vs  $\delta^{13}\text{C}$ ) and changed the caption to refer to Fig.5 instead of Fig 4.

Line 211: I would recommend saying average than bulk, as "average" best reflect what you present here and not a bulk analysis This figure is referred in Table 2 above, but I struggle to understand how the linear relationship was calculated.  
We have added the word "calculated" to the "bulk" values. We are also sure to include quotation marks to denote that they are not a true bulk measurement. We prefer to keep this terminology as the calculated "bulk" data represent one of the possible sampling methods that has been used in

other works (Samperiz et al., 2020). We have also changed the reference from Table 2 as it was incorrectly pointing to this figure, we meant instead for it to reference Figure 5.

Line 251: Delete this "infinitesimally", it is an exaggeration! Just say with 5% aragonite.  
Done.

Line 256: Delete this "for this discussion"  
Done.

Line 257: Why O'Neil 1969 is chosen as there are many equilibrium equations too, explain your rationale in choosing their equation.

This equation was chosen because it was appropriate for our coral specimens (established for calcite-water fractionation at low temperatures) and it allowed our calculations to be directly comparable to those of Samperiz et al. (2020). Part of our discussion includes our data presented as an offset from isotopic equilibrium with seawater. We compare these quantities to the Samperiz et al. (2020) compilation (Figure 6), and therefore we prefer to use the same equations for a comparable discussion. If a different equilibrium equation was used for our calculation (e.g., Kim and O'Neil, 1997), the comparison to the Samperiz et al. (2020) compilation would not be accurate. We have added a statement to the text to clarify our choice and edited this paragraph slightly to clearly state the choice for each equilibrium equation.

Line 274: If you say strong, what is the p-values?

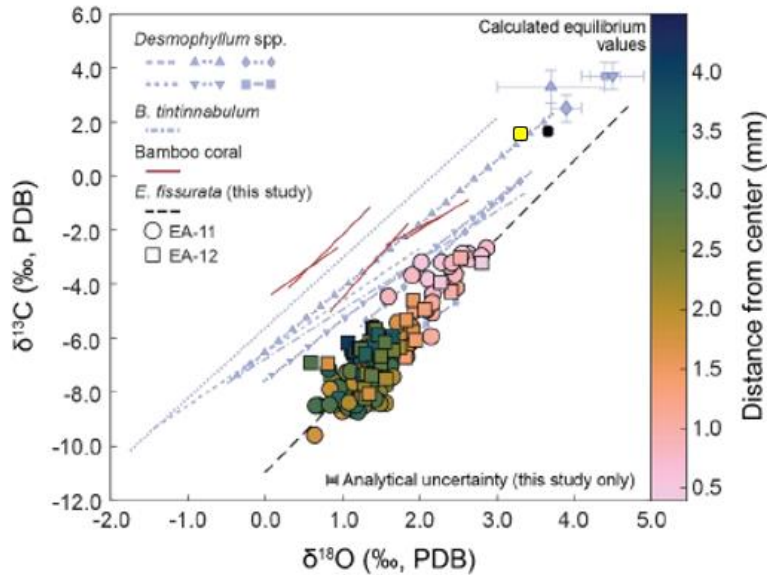
We have added the p-value ( $p < 0.001$ ) a few lines down with the other linear regression parameters and also in the caption for Figure 5.

Line 278: This is only true as you used one equilibrium equation, have you tested with different equation and was there any differences? This is the reason why I asked above for you to provide a rationale for why you chose O'Neil equation.

The statement to which the editor is referring remains true for different equilibrium equations. We describe the observation of coral isotope ratios from the center of the disc being closer to equilibrium than the values from the outer sections. The two most appropriate calcite-water equilibrium fractionation equations for this work are from O'Neil et al. (1969) and Kim and O'Neil (1997). These works conducted calcite precipitation experiments over a range of temperatures including 0°C, which is closest to our study site with a temperature of  $\sim -0.1^\circ\text{C}$ . For this manuscript, we calculated  $\delta^{18}\text{O}$  equilibrium for calcite at 3.66 ( $\pm 0.06$ ) ‰. For this review, we also calculated calcite  $\delta^{18}\text{O}$  equilibrium using the equation from Kim and O'Neil (1997) to be 3.38 ( $\pm 0.06$ ) ‰. This value is very close and would only minimally shift the equilibrium point (see yellow marker in figure below). We also used this calibration to remain consistent for comparing to equilibrium calculations in the literature.

**“Figure 5:** Linear regressions of  $\delta^{18}\text{O}$  vs  $\delta^{13}\text{C}$  values for *E. fissurata* compared to aragonitic scleractinian and calcitic bamboo corals. Colors of circles (EA-11) and squares (EA-12) correspond to distance from the coral center, see color bar at the right. Calculated seawater equilibrium value for *E. fissurata* is also shown as a black rounded square (uncertainty is smaller than the square). The dashed black line represents the line of best fit for the isotopic values measured here ( $\delta^{13}\text{C} = 2.88 (\pm 0.14) * \delta^{18}\text{O} - 10.94 (\pm 0.22)$ ;  $p < 0.001$ ). Linear regressions for *Desmophyllum* spp. are reported by Adkins et al. (2003) and include *Desmophyllum* sp. (purple line with squares) and *D. dianthus* (all other *Desmophyllum* lines). The dashed lines with shapes have corresponding equilibria displayed

(matching shape with error bars in upper right corner). The *Bathypsammia tintinnabulum* was reported by Emiliani et al. (1978) and Bamboo coral data are from Hill et al. (2011). Lines for external data are not extrapolated beyond the range of reported  $\delta^{18}\text{O}$  values. The slope of the linear regression produced in this study is similar to those reported for other deep-sea corals, with a similar decrease in both isotopic ratios from equilibrium. The measured values here that are closest to equilibrium are those toward the center of each coral disc.”



Line 294: Just curious, did they use the same equation as you used in this study? I may have missed this before.

Yes, when we compare our data to the published works, we are sure to use calcitic specimens for which equilibrium values were similarly calculated.

Line 319: Fig. 4 is this the correct figure ref.? I don't see that strong variations in there, while accounting for the wide isotopic range.

We thank the editor for this catch, it is very difficult to see the values we mention on Figure 4, so we have changed the reference to direct the reader to Table 2 where the values are listed.

Line 323: See comments above, use average.

We have responded above to a similar comment.

Line 337: are (delete "were determined to be")

Done.

Line 337: Deletion of this last portion of this sentence.

Done.

Line 345: So when you say scanned, is this a different method than XRD?

No, this is still an XRD method.

Line 373: Refer to the suppl. figure if this is what you meant?

This sentence was meant to summarize the findings of Black and Andrus (2009), and we see that it was unclear. We have edited this sentence to clarify.

Line 376: Refer to suppl. and if possible, show the other figures of EA-22 and 23 instead of EA 24 alone, and indicate whereabouts in the sample this image was taken. The scale for SEM and the whole sample is different.

We added a reference to the supplement, but unfortunately, we do not have images of EA-22 or EA-23. We have noted in the Figure captions of S4 and S5 that the scales are different (the scale bars are in the images).

Line 522: This method, if used, should be described further up (or some writing here need to be rephrased to make the meaning more accurate.

We agree that the wording was not clear about future applications of this method, so this section has been edited.

Line 543: See comments above about "bulk".

Again, we think that using the term "bulk" allows the reader to easily compare to other works wherein a true bulk measurement was made by drilling (e.g., King et al., 2018; Samperiz et al., 2020). We have placed quotation marks around each use of "bulk", and added the word "calculated" in front of it when the value was calculated to differentiate that it was not a true bulk measurement.