Anonymous Referee#3, 9 June 2022

The present manuscript by Francois et al., 2022 presents a field study of Caribbean tropical foraminifera in the Puerto Morelos reef Lagoon. Six stations were sampled in October 2011 along a broad natural pH gradient generated by submarine springs. The study of spatial variability on foraminifera fauna driven by pH gradient is an original approach. This work shows interesting results that corroborate knowledge already known/suggested in previous studies. However, this manuscript deserves to be restructured and clarified on some major points before publication.

Major comments:

- It should be kept in mind that specimens come from the natural environment (not a controlled experiment) so multiple stresses can potentially influence calcification (salinity, eutrophication, pollution, warming...) these other parameters should be further discussed according to what is known about the site in previous studies.

- There is a need for the bibliography to be more up to date especially those published on LBF and µCT. I suggest this non-exhaustive list: Charrieau et al., (2022); Kinoshita et al., (2021); Kuroyanagi et al., (2009); Fox et al., (2020); Iwasaki et al., (2019) …

- In this paper, it is unclear about the use of live and dead fauna, if rose bengal staining has been done you must describe in the manuscript the assemblage of the foraminiferal fauna at each station and perform the ecological analyses on the live fauna. The dead fauna cannot be treated with the live fauna. If you want to study dead fauna it must be done in a separate section and clearly stated in the manuscript as "live fauna" or "dead fauna". If you study dead fauna, you must describe the assembly of dead fauna. The fact that there are few living foraminifera may be related to the seasonality of the site (previous studies?). This site may be a place of sedimentary deposition, accumulation, and currents… (1cm corresponds to what period? Previous studies?). You should discuss the sampling method used if most of the living fauna live on substrates, it could be interesting to think about a new sampling method?

- You need to clarify which data are common with the paper by Martinez et al., (2018). It seems to me that you have the same dataset or a selection of them. If you share other data from this previous paper, please indicate it clearly (this can also help to reduce the manuscript).

- Your data are related to the impacts of a natural pH gradient on a series of stations at a specific date (October 2011). You are therefore looking at spatial variability of foraminifera along a pH gradient and not at temporal variability. If you want to discuss temporal projections, I will discuss this in a discussion section. To discuss temporal projections, you need to be more nuanced because you need to know the seasonal variability of the living fauna and their interannual variability and species metabolisms (maybe you have some previous studies on this site).

- The result and discussion should be restructured, and the discussion needs major parts or titles.

Minor comments

-The title does not indicate the content of the paper I would specify LBF or tropical and the study area (to be reconsidered in the light of the new orientation of the paper)

-L41 $CaCO_3$ = calcium carbonate

-Can you clarify what you call “small or smaller foraminifera”

-L209 “live fauna” or “dead fauna”? clarify this section

-L211 Table S1 corresponds to Raw data of functional and test type groups. I think there is a file problem where is the faunal description?

-L215 Considering a 3 % contribution cutoff. Why 3%?

-L119 normally a minimum of 300 live foraminifera should be picked if the density is high

-L143 breakage and dissolution of the shells. Do you have a precise reference to do this work (quantitative approach) or is it a subjective approach?

-L154 Dissolution can affect live foraminifera and it has already been shown that some decalcified foraminifera can survive (ex. Charrieau et al 2018 Biogeosciences). To detect living foraminifera, it is either the coloration (rose bengal) or a mobility test to know if the specimen is alive or not.

-L261 p-value = 0.00 not correct (p-value < 0.001 for example)

-L165 they are many papers about CTnumber please add references

To compare µCT specimens, it is recommended to remove the ontogeny effect (growth-related), and therefore to compare the specimens they need to have the same size (standardized by the average of the maximum diameter of the individuals). It is always nice to see µCT on foraminifera, but you need to discuss that few individuals have been scanned and therefore be critical with the inter-individual variability.

-L248 For the CCA, one of the axes is not significant, it would be interesting to make an Ordistep pre-selection to select only the parameters which contribute to the CCA, and to have the two significant axes. It would be necessary to revise the design of the figure to put the variables in another color for more clarity and to put the complete legend of all the parameters used.

The legends of all figures should be complete – we need to be able to understand a figure without reading the text all the time.

-L63 Fig.4e and not 4a

-L284 add fig. 5 in the first sentence