Response to Reviewer 2: anonymous (https://doi.org/10.5194/bg-2023-169-RC2)

General comments:

The manuscript presents an observational study documenting the abundance of living and dead calcareous foraminifera and their dissolution condition, in conjunction with estimates of cable bacteria abundance and their associated acidification of porewaters. The study sampled 3 intertidal study sites of a macrotidal estuary on one occasion each. The data collected are of high quality (vis-à-vis the identification, quantification, and imaging of the forams by SEM and cable bacteria by qPCR and microsensor profiling), and are a valuable contribution to the literature.

Despite the rigor of the data collection, I am concerned that the study places strong emphasis on concluding the role of cable bacteria based on a limited number of samples and range of conditions (n=3). As presented by the authors, a priori, there is strong evidence to suggest that high cable bacteria activity acidifies porewaters in marine and estuarine settings more than other microbial activities, and strong theoretical evidence that the impacts of this acidity on the saturation state of calcium carbonate may drive dissolution of calcareous foraminiferal tests, with implications for their interpretation as bioindicators or paleoproxies. However, the activity and impact of cable bacteria on porewater acidity may have large variability over space and time, which remains poorly characterized, while foram test dissolution is presumably a property integrated over months or longer. We would like to clarify that experimental data show a much shorter timescale for dissolution processes in the tests of living foraminifera, of the order of a few days to a few weeks (Le Cadre et al., 2003; Charrieau et al., 2018, 2022; Daviray, pers. com.). These microorganisms are capable of recalcifying their test following acidification events with the same daily to weekly dynamics. This dynamic is relatively comparable to that of cable bacteria, as are the oxidation processes of the reduced mineral phases that can generate acidification of the sediment. We therefore assume that the shells of dead specimens incorporate the variability of these dynamics to a greater or lesser extent. This information will be added to the manuscript.

Therefore, I think the assertion that cable bacteria activity is the main driver of foram dissolution (or the singular driver, as implied in the manuscript) should be treated as far more tentative than the manuscript presents. Although I recognize the authors make an effort to identify that their conclusions that cable bacteria cause acid dissolution of foraminifera tests are tentative by including “potential” in the title, I nevertheless think some statements and the organization of the text tends to oversell the conclusive role of cable bacteria, based on the new data presented. I provide some specific suggestions below which I hope the authors will find useful.

Specific comments:

I think the authors should consider re-framing the narrative as foremost a report of dissolution stages of foraminiferal tests in intertidal sediments, with the examination of the role of cable bacteria as secondary. This suggestion implies reorganizing the title, Abstract, Introduction, Results, and Discussion to put the examination of the foraminifera first, and the examination of cable bacteria second. (E.g., Dissolution rates of hard shelled benthic foraminifera and potential contribution of cable bacteria activity). The opening statement of the Conclusions is similarly overstated in my opinion and should be edited (i.e., “... *strongly* suggests that sediment acidification caused by CBA could be responsible for significant calcareous test foraminifera dissolution patterns”). [emphasis mine]. We agree to the reviewer that we were sometimes too enthusiastic about our work hypothesis. Nevertheless, we believe that our choice to structure the Discussion section remains relevant by attempting to identify the factors behind the acidification process before discussing its effects. We suggest replacing in the titles of Discussion sections 4.2 and 4.3 “*Impact of cable bacteria*” with “*Impact of porewater*

acidification". We also consider to moderating our comments by replacing "*CBA*" with "*acidification process*" in the text body. Discussion section 4.1 will develop further other processes that could generate this acidification in these transitional environments (see response to reviewer 1). Discussion sections 4.2 and 4.3 will be slightly reorganised to develop more about implications of pH on living and dead foraminifera shell integrity and assemblages according to the literature to better bring our hypothesis to the reader as a very likely hypothesis that deserves consideration and further work by the community. Eventually, apart from the "*strongly*" which will be deleted, we believe our conclusion is not too assertive and invites the community to consider cable bacteria activity as a phenomenon that could cause misinterpretation in analysing benthic foraminifera as bio- or paleoindicators.

Line 25 states that strong and weak cable bacteria activity was associated with pH 5.8. This seems to contradict the previous statements that cable bacteria activity was assessed with pH microsensors. Please clarify. Indeed, our wording can lead to confusion. We propose to modify it as follows: "*Highly contrasting CBA (from low to very intense) were described with sediment acidification from 1.0 to 2.4 ∆pH*".

(Note that qPCR quantifies cable bacteria abundance or density, which likely scales with activity, but is not strictly equivalent). We agree and are aware about it.

Technical Corrections

It is probably up to the discretion of the authors, but I recommend minimizing unnecessary acronyms, like Cable Bacteria and Cable Bacteria Activity, to improve readability. This suggestion will be considered to aid readability.

Line 20: no parentheses or hyphen required for "until 5 cm depth". We agree. They will be deleted.

lines 357 and 358: check spelling of author names These mistakes will be corrected.

References

Le Cadre et al., 2003 (10.2113/0330001)

Charrieau et al., 2018 (10.1016/j.marenvres.2018.03.015)