

RC1:

Review:

“Western Indian Ocean bottom water temperature calibration – are benthic foraminifera Mg/Ca ratios a reliable palaeothermometry proxy?” Larsson & Jung, 2024

The manuscript provides a new dataset of various element/Ca ratios, focusing on Mg/Ca ratios, for three benthic foraminifera species. The data originate from the western Indian Ocean and were checked by the authors for their applicability as a paleothermometer proxy for bottom water temperatures. Although the number of samples seems too small to establish a valid new calibration, the manuscript contributes to an improved understanding of benthic foraminifera and their usability as palaeoproxy in this area.

Furthermore, the authors compare their data set with two others from the region and evaluate the quality and relevance of their data as a palaeoproxy in the discussion chapter, under consideration of significant literature. As I myself am not particularly familiar with benthic foraminifera, I cannot make a qualitative statement about the methodology which is used here.

The authors have presented their results in a sufficient number of graphics, although some of them still need a bit of reworking. Furthermore, the language is a little clumsy in some places, but as I am not a native speaker myself, I have only made minor comments here.

Overall, I rate the manuscript as good and recommend publication, although there are still a few points that need to be improved.

Thank you for carefully reviewing our paper and highlighting the inconsistencies.

Be more consistent throughout the manuscript e.g.:

- 1) Line 172 “(Table A1 in Appendix A)” vs. Line 201 “(Appendix A Table A1)”
- 2) Abbreviation of the foraminifera. Sometimes you wrote *Cibicidoides mundulus* vs *C. mundulus*. You can write the entire name throughout the manuscript, but I recommend to write the full genus and species name when you first mention it and then continue throughout the manuscript with the abbreviation.
- 3) Same for figure vs. fig. vs Figure (and table, Table, tab.), choose one and stay consistent.

We thank the reviewer for these comments. Inconsistencies will be reviewed, as suggested, in the final submission.

Figures and Tables

Figure 2 would benefit from gridding the potential temperature.

Figure 2 – We appreciate this comment and will add a version with grided displays of temperature and salinity.

Figure 4: Use either two different symbols or two different colors (best is both), it is hard to distinguish between both.

Figure 4 – two different symbols have been used but we agree that using both different colours and symbols would clarify it further. Please see comment in relation to figure 9.

Figure 6: Same like Figure 4. I find it hard to distinguish between the both triangles, since the dark blue and black do not show a strong contrast, but also the other blue symbols could benefit from a different color. Also, the graphic labelling is confusing here. I would write “Mg/Ca ratio against (a) Fe/Ca ratios, (b) Al/Ca ratio and (c) Mn/Ca ratio in *Cibicidoides spp.* ...”

Figure 6 – appreciate your input on this. We will revise the coloring used in this figure. Please also see comment in figure 9.

Figure 9: Again. Maybe use a circle for *C. spp.* ?

Figure 9 – We will reassess all figures for both consistency in symbols as well as the use of colour.

Table 1: “*Wuellerstrofi*” is written in capital letters, change it.

Table 1 – Thanks for spotting this. We will correct this.

Table A2: Numbers e.g. at 2a, 2g and 3a seem to be smaller.

Table A2 – Thanks for spotting this. We will correct this.

Table A2: Why is the species at samples from 3g to 3i *G. ruber*? I thought it is *Uvigerina spp.* and *Cibicidoides spp.*

Table A2 – Correct, thanks for noticing. That is indeed a mistake, it will be corrected.

Minor revisions:

We thank the reviewer for the very thorough assessment of our manuscript. In relation to the minor revisions comments, we will address all purely editorial issues raised in the list below and correct the text accordingly. Additional comments are added below.

Line 74: One space too many after “i.e.”

Line 92: strange bracket after “(Stripe et al., 2021)” and one space too many
Line 107-109: You say “three” water masses but listed just “two” of them
Line 136: two dots at the end of the sentence

Line 138: One space too many after “(Table 1)”

Line 143: first mention of *G. ruber* -> write the entire name

Line 153: write „In experiment 1” to keep it consistent. Furthermore, mention that you used 6 sets with a varying amount of *G. ruber* somewhere.

Line 162-164: 5.81 ppm and 9.53 ppm, where do these numbers come from? In Table A2 I see three tests with *G. ruber* for the crushing experiment between two glass slides (Ca 0.55, 7.5 and 3.75 ppm = **3.93**) and three tests with *G. ruber* for the crushing experiment using a metal pin (1.68, 5.1, 5.66 = **4.15**). Same for Mg/Ca, can't find the 3.43 and 3.53 mmol mol⁻¹ in A2, especially since sample 1a has incredibly high values of 35.23 mmol mol⁻¹.

We will ensure that tables in the final version contain all data.

Line 170: maybe add “(0.55 to 7.50 ppm in both crushing between two glass slides and when using a metal pin, Table 1A and A2 in Appendix A)” to make sure that the general results, regardless of the method used, are really low.

Thanks for this suggestion.

Line 180-184: For your average values 0.38, 2.91 and 3.01 mmol mol⁻¹, I have 0.37, 2.90 and 3.02 respectively. I suppose this is because you used a higher number of decimals in your original calculation. I am mentioning this in case you want to change it, but I think this is fine. For your mean Fe/Ca ratio of 0.61 mmol mol⁻¹, I have 0.57 mmol mol⁻¹ instead. Please check this again and correct it.

Yes, the difference is a result of different decimals in the original calculation. Thanks for pointing this out. We will check this.

Line 199: (6x25): change sentence: “In the procedure, specimens of *Globigerinoides ruber* (6 sets with a varying amount of 10 - 50 individuals; Table A1, Appendix) picked from ...”

Line 200: remove point after “*Uvigerina...*”

Line 201: (Table A1 in Appendix A) -> see Line 172

Line 214: Make it two sentences: “... proposed by Hasenfratz et al. (2017). This suggests that Mn-oxide...”

Line 228-230: change to (Figure B1 in Appendix

B) Line 262: One space too many

Line 280: Table A3?

Thanks for noting this issue. Figure and table referencing will be corrected where needed in the final version.

Line 299-300: I see **four** samples in water depth deeper than 2500 m and **five** samples in water depth <1500 m. Furthermore, instead of “Below 2500 m” maybe write “In water depth

>2500 m ...”

Yes correct, this is a mistake. It will be corrected in the final version. Thanks for noticing this.

Line 303: *Cibicidoides* in italics

Line 308 – 310: rephrase sentence: „The Mg/Ca ratios of *Cibicidoides spp.*, although higher in their Fe/Ca ratios than >0.1 mmol mol⁻¹, were also included, since they show no correlation between Mg/Ca ratios and Fe/Ca ratios.”

Will do.

Line 310: One space too many between “Table” and “2”. Also, write “Figure 6” in capital letters to stay consistent.

Line 312: *C. mundulus* and *C. wuellerstorfi*, stay consistent.

Line 313: “Figure 9”. Also, remove point after “*Cibicidoides*”. Richtig: *Cibicidoides spp.*

Line 318: “Figure 9”

Line 314 & 320: BWT

Line 321: Sentence in parentheses not in italics

Line 322: “Figure 9”

Line 331: *Cibicidoides spp.*

Line 337: *Cibicidoides spp.*; Also, one space too many between “Table 2” and “When”

Line 353: One space too many between “Table 2” and “It”

Line 356: compared to what? Samples from *Cibicidoides spp.*? Line 359: One space too many between “ratio” and “The” Line 366: “Figure 10”

Line 369: “Figure 10”

Line 398: “Figure 11”

Line 400: space

Line 401: “SW Indian Ocean”

Line 426: Bracket after Figure 6 missing Line 427: Bracket in the wrong place

Thanks for pointing out the above errors.

Line 430 - 432: rephrase sentence e.g.: “Although the leaching procedure by Barker et al. (2003) has been widely used (e.g., ...) the removal of Mn-Mg coatings is still inefficient (Hasenfratz et al., ...).”

Thanks for the suggestion, we will change the wording.

Line 439 – 441: rephrase sentence e.g.: “The high Fe/Ca ratios as well as the high Al/Ca ratios in most samples of all species used here (Table 2) indicate inefficient removal of silicate contaminants, suggesting that the number of rinse/ultrasonication repetitions of

the Barker et al. (2003) procedure is inadequate.”

Thanks for the suggestion, we will change the wording.

Line 449: what is with the value of 0.15 mmol mol⁻¹ in Table 2 for the lowest range of *Uvigerina peregrina*?

*Thanks for noticing this. This is a mistake; the range should be from 0.02 to 2.04 mmol mol⁻¹ in *Uvigerina peregrina*.*

Line 450: add “(... 0.35 mmol mol⁻¹; Table 2)”

Line 451: rephrase term: compared to Fe/Ca ratios in *Cibicidoides wuellerstorfi* below 0.04 mmol mol⁻¹.

Line 455/457: Do you mean Table A3?

Yes, thanks for pointing this out. We will correct this.

Line 457: add “(0.13 and 0.31 mmol mol⁻¹)” behind *Cibicidoides spp.* -> There is also a dot missing after “*spp*”

Line 465: write: “... core depth, water depth, and morphology”

Will be corrected.

Line 474-476: Don't understand this sentence. What is a nearby region here?

Thanks for highlighting this problem. We will rephrase the sentence.

Line 477: I think there is a comma missing between contamination and Fe/Ca ...?

Yes, sentence will be corrected

Line 478: Bracket closed after “Figure 8”

Line 479: Bracket closed after “Figure 7”

Line 498: Missing commas before and after “respectively”, as well as before “but”

Line 507: one space too many between “i.e.” and “*Cib*”

Will be corrected.