

## ***Interactive comment on “The trophic and metabolic pathways of foraminifera in the Arabian Sea: evidence from cellular stable isotopes.”***

**R.M. Jeffreys et al.**

We gratefully acknowledge the comments and suggestions raised by the two anonymous reviewers and thank them for their thorough review of the manuscript. Both the referees have given our manuscript positive reviews and all the comments raised were minor. We have made some minor revisions to the manuscript considering each of the reviewer's comments and have tried to incorporate their comments where appropriate. A detailed response to the reviewer's comments is provided below.

### **Response to Anonymous reviewer #1**

Our response is below the reviewer's comments in italics.

- 1) Data for  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  POM is available for the Pakistan margin, not for Oman margin. Authors state in the discussion part that foraminifera seems to select for fresh phytodetritus on the Pakistan margin (p. 18162, line 17-23) based on POM data while Oman margin foraminifera reflect SOM signatures (p. 18162, 23). Could it be possible that foraminifera from the Oman margin also feed on fresh phytodetritus but it has not been detected as POM data is missing? In line 4 of the same page the  $\delta^{13}\text{C}$  of Oman margin foraminifera is said to be typical for phytoplankton.  
*We have amended this section to take into account the comments raised above.*
- 2) Can you please provide short information on how the Hydrogen Index is calculated (p. 18151, line 3)? Its use is later given on page 18154 (line 6). This could be moved also to the M&M part.  
*We have included information on how the Hydrogen index is calculated now in section 2.1. of the Materials and Methods.*
- 3) The results part is very informative and detailed. Yet the reading is a bit exhausting. Especially the naming of the used statistical tests and the  $p$  and  $F$  values distract from the results. I would recommend to provide the information and outcome of statistical tests in form of (supplementary) tables.

*We have reduced the results section, removing insignificant p values from the text. As this is a results section we felt it appropriate to leave the outcomes (p and F values) of significant statistical tests in the text.*

Technical corrections (errors are underlined)

*We have made all of the technical corrections suggested below.*

p. 18150, line 24: „... in (Breuer et al. 2009).“

p. 18157, line 13: “... did not differ significantly across ...”

p. 18162, line 20: “... below the OMZ at the Pakistan margin Foraminifera below the OMZ ...” (In both sentences the same phrase is used. Maybe try to omit one.)

p.18164, line 4: “at the Oman margin could lead its more efficient benthic ...” p. 18165, line 19: “... fatty acid biomarkers,. Larkin (2006)”

Fig. 1: If possible, please mark the two smaller maps with “(a)” and “(b)” or draw arrows from the larger map to the two others.

Fig 3 caption (line 1): “... foraminifera (> 300 mm) from ...“

Fig 5 caption (line 1): “... foraminifera (> 300 mm) from ...”

Fig 5 caption (line 4): “... . The isotopic compoistion ...”

Table S2 caption: Please explain the abbreviations of the different zones (UTZ, LB, SHB). Explanations are not given in the manuscript text.

Table S2 caption: “The Tubothalamea marked i and ii and have agglutinated ...“

## **Response to Anonymous reviewer #2**

Our response is below the reviewer’s comments in italics.

## General comments

This is a well-written paper providing a full analysis of the trophic ecology of foraminifera in the Arabian Sea. It provides a lot of detail for benthic ecologists particularly interested in foram ecology but is also of wider interest as foraminifera is an important trophic link to higher organisms. It is thus suitable for publication in Biogeoscience. I have one general comment; going through the results section is quite tiring for the reader. It almost felt like every possible test was done in order to find out something significant but I would urge the authors to pick only what is an ecologically meaningful or interesting comparison and then use statistics to test for that. I am giving some examples in the detailed comments below.

*We have scaled back the results section and removed irrelevant statistical tests.*

## Detailed comments

1. I would suggest the inclusion of a sentence in the abstract explaining why we see these differences in the sediment properties between the two margins, e.g. differences in upwelling, productivity etc. This information comes only later in the discussion but it's important to know from the start why the two margins are compared.  
*We have included a sentence in the abstract stating why we compared these two margins.*
2. Page 18148, line 7: do you mean "and population growth"?  
*We have changed this to 'and population growth'*
3. Page 18151, line 3: please briefly explain how HI is calculated and why it can be used here as OM quality index.  
*We have included information on how the Hydrogen index is calculated now in section 2.1. of the Materials and Methods.*
4. Page 18154, line 6: the hydrogen index abbreviation has been defined previously  
*We have changed this to HI.*
5. Page 18154, lines 14-17: I think you may be referring to the Pakistan margin since C8091 there are no such depth stations in Oman. In any case, since this information is already in a Table, I'd just omit this sentence as it is not hugely important for the interpretation of the results. To know every single difference in SOM d13C between depths.

*We have changed the wording to Pakistan margin and referred the reader to the Table 2.*

6. Page 18155, lines 2-10: I am a bit confused here, the calcareous species at 140

and 300 m are compared separately but for the textulariids these two depths are combined. It would be better to decide beforehand whether or not to combine 140 and 300 m and keep it the same for all groups.

*We have scaled back the results and compared isotopic composition for foraminiferal species between depths and seasons at the Pakistan margin. This was not possible for the Oman margin owing to a lower number of samples and so we have compared isotopic composition of foraminifera between higher taxonomic groups at the Oman margin.*

7. Page 18155, lines 14-23: this paragraph is exactly what I meant in my general comment. Why do we need to know specifically about *Uvigerina* when a few lines before the same result is mentioned for all calcareous species, including *Uvigerina*? Why specific mention to *Reophax* when nothing significant is reported? All this information could be in the supporting document for those interested but here it's just making reading difficult.

*See commented above, point 6.*

8. Page 18156, lines 5-10: same here. Not sure that a p value of 0.048 is worth mentioning as significant. Also why mention that there was no difference in isotopic composition between *Uvigerina* and *Reophax* at 300 m?  
*We have left this information in as this allows us to compare response between two different foraminiferal test types.*
9. Page 18161, lines 17-20: it's not clear to me how you draw this conclusion; it doesn't follow from what is mentioned previously in the paragraph.  
*We have amended these lines and inserted some text to clarify our arguments.*

10. Page 18162, lines 17-22: this sentence gives exactly the same information as the one before (lines 12-17), the only difference being that it refers specifically to depths below the OMZ instead of the whole transect. Is it necessary?  
*Lines 17-22 refer to sites below the OMZ where less OM is available yet differences in isotopic composition are still evident. These lines further support the information given in lines 12-17.*

11. Page 18165, line 1: does OM here mean Oman margin?

*Yes and we have changed the text.*

12. Page 18170, lines: 20-22: why do you think this is happening? Could the lower O<sub>2</sub> concentrations in the Pakistan margin play a role?

*Lower oxygen concentrations could play a role and we have mentioned this in the conclusions.*