Response to Anonymous reviewer #1.

Abstract

Line 11, “fauna” becomes “macrofauna.”
Line 21 “suggesting the importance of anaerobic metabolism at all stations” This sentence is removed from the abstract, as it pertains to a hypothesis proposed in the discussion.

Introduction

Page 3. Line 22. “macrofaunal”, cannot be replaced with “macrofauna” because it is used as an adjective in the term “macrofaunal assemblage structure.”
Throughout: “deep sea sediments replaced” with “deep-sea sediments”

Methods

p.9 15-16. **Reviewers comment**: “This matrix shows high levels of co linearity between the environmental variables. As such only ambient oxygen availability and sediment C:N ratio, were used as descriptors of each station during analysis.” It is not clear to me that CN ratio shows high linearity with other environmental parameter. However, I am not used to this kind of data plot. Perhaps a more simple correlation table with the correlation co-efficients and they significance values would me more clear to a reader.
Authors’ Response: Scatterplot matrices are an increasingly common method of visualising the level of correlation and co-linearity between multiple variable. Given the number of potential variables a table would be correlation table would be difficult to read, due to the 9 x 9 matrix of variables. We have rephrased the passage in the methods to clarify which variables show o-linearity.

Results

Page 10 section 3.1. **Reviewers comment:** “I would move the final paragraph to the section 3.2 as the title of 3.1 is “assemblage”. I would also introduce one or two paragraph brakes for now the 1st paragraph of section 3.1.”
Authors Response: We have broken the first paragraph into two paragraphs, as suggested. The first paragraph provides a description of the broad changes in faunal abundance and biomass. The second paragraph describes the changes in taxonomic composition of the macrofauna.
We are reluctant to move the final paragraph into section 3.2, as the natural isotopic signatures of the macrofauna provide an important aspect of the macrofaunal assemblage, indicating the trophic structure of this assemblage. This data is required to understand the stable isotope labelling experiments, but it is our opinion that this data be kept within the description of the macrofaunal assemblage were it is ecologically relevant.

Discussion

p.14. Lines 6-10. I find the references for the non-impacted sites a little far away from the actual study site. Could authors find other continental slope references, which may be more appropriate?
Author’s Response: Unfortunately there are comparatively few studies of benthic macrofaunal assemblages within continental margin sediments. Most of the studies conducted in the Arabian Sea have focussed upon the Oxygen minimum zone (e.g. Levin et al., 2000; 2009; Woulds et al., 2007; 2009; Hughes et al., 2009). Unfortunately we could not find any data from non-impacted continental margins at a similar latitude.

p.16 lines 13-16 (and elsewhere) Authors must be a little careful with such a strong conclusion for oxygen controlling the feeding pattern of macrofauna. After all they only have two stations depths, 800 and 1100m, so it is natural to see a trend in a data.
Author’s Response: We have redrafted the pertinent sections of the discussion to reduce the emphasis upon oxygen availability as a control on macrofaunal feeding behaviour. Instead we

highlight the strong correlations observed between changes in macrofaunal assemblage structure and changes in macrofaunal C and N uptake, and discuss the relationship with oxygen availability in more cautious terms. Indicating its potential role as a driver of macrofaunal assemblage structure.
The passage highlighted by the reviewer now reads "Macrofaunal feeding responses were strongly correlated with changes in macrofaunal assemblage structure, exhibiting significant relationships to station-specific oxygen concentrations between 800 and 1100 m. Thus, oxygen availability may drive changes in macrofaunal assemblage structure that control POC and PON processing across the lower OMZ boundary."

Question to authors
What does the large natural isotope variations among macrofauna mean?
Response: We have included some further discussion of the natural abundance isotopic signatures (lines 395 – 398), to explain the isotopic variations. These are most likely to reflect differences in the quality of the organic matter within the sediments.

Figures
Figure 3. **Reviewer Comment:** Some parts of the legend are not readable. For example in the lower figure I can not see if Nyphtidae or Sabellidae or Aphroditidae is the abundant taxa represented by the small-dot pattern. Authors could try to make the legend a bit larger and consider using different fill patterns.
Authors' Response: We accept the reviewer's critique and have amended figure 3 to improve its readability.

Response to A. Norkko.

Comment.
While oxygen is shown to be strong driver of the macrofaunal assemblages and therefore patterns of uptake, the quantitative link to other environmental drivers, including habitat characteristics remain somewhat elusive. - I was left wondering if not more could have been done in terms of characterising what is driving the patterns, e.g. using distance-based linear models (e.g. DISTLM/dbRDA) to partition some of the variance by an extended set of environmental predictors (now in the appendix)? However, as acknowledged by the authors there is strong co-linearity and there are also obvious limitations in the sampling design that are understandable considering the significant logistic constraints of experimenting in this type of environment.

Author's Response: Unfortunately it was not possible to investigate the role of other environmental drivers using the present dataset. This was primarily because of high levels of co-linearity between environmental parameters which when combined with the relatively limited replication within the present dataset limit our capacity to conduct statistical modelling. The reviewer does however, highlight a potentially important priority for future research for inviestigating macrofauna contributions to C and N cycling. Future studies should be conducted to investigate how changes in assemblage structure across predictable environmental gradients influence C and N uptake patterns.

Line 156-158: how many additional cores? **Response:** we have added further details regarding the number of additional background cores into the methods section.

Line 226: check spelling of Akaike. **Response:** This has been corrected.

Line 265-269: you might want to highlight these taxa, with heavy N15 as being typically predatory?
Response: At Lines 395 – 398 we have included further discussion of the natural abundance isotopic signatures highlighting the potential role of δ15N values as indicators of the trophic position of fauna.

Table 1: there is a marked difference in temperature between the 800 and 1100 m sites. Does this matter for uptake rates?
Response: Temperature can play an important role in determining faunal uptake rates (e.g. Moodley et al., 2005). In the present study, differences in biomass-specific C and N uptake between stations were relatively small, suggesting that the influence of temperature was relatively low. This is consistent with previous studies conducted by Woulds et al., 2007; 2009) at the OMZ-impacted Pakistan margin.

Figs 4 & 5: what are the error bars?
Response: Error bars represent standard deviations, this is now stated in the legend to rectify this oversight.

Further Changes to the manuscript.

Table 1: Oxygen and temperature data displayed were from an uncalibrated dataset. The table has been revised, replacing these data with Oxygen and temperature readings published by Hunter et al. (2011).

Figure 7 has been revised to reflect the change in Oxygen readings from table 1.

Line 109 & throughout: All reference to oxygen concentrations and temperature within the text have been altered to the new values in table 1.

References

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