Author Response to Referee Comments
Macrofaunal Colonization across the W. Indian Margin Oxygen Minimum Zone
Author(s): L. A. Levin et al.
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Reviewer 1 L. Menot (Referee)

General comments : This paper describes short term colonisation patterns and early carbon processing of deep-sea macrofaunal assemblages along a gradient of oxygen concentrations in the Oxygen Minimum Zone of the Indian margin. The study is within the focus of Biogeosciences and relies on an original combination of short term colonization and isotopic tracing in situ experiments. The manuscript is well structured and well written. The conclusions are generally well supported by the results though the sample size and level of replication are low, which may question the relevance of some of the stastical tests used (see below).

Specific comments Introduction: The introduction gives a wide overview of colonisation experiments in the deep sea. The objectives and hypotheses regarding colonization patterns in the OMZ of the Indian margin are clearly stated. The isotopic tracing experiment however in not mentioned nor the rational for these measurements, this should be clarify.

We have added text introducing the rationale behind the trace experiments to the final paragraph of the introduction.
Both macrofaunal and foraminiferal uptake of phytodetritus was examined through the introduction of ^{13}C-labeled diatoms in a subset of colonization trays deployed across an oxygen gradient. Depending on the nature of seafloor disturbance, early colonists (in nature) may experience local enhanced availability of phytodetritus (e.g., accumulating in pits), or a decrease due to removal of surficial sediments or diminished surface production. These experiments explore both the influence of phytodetritus on the colonization process and the extent to which a 'disturbance' adapted fauna may function to process carbon.

Methods and results: The sampling design is nested in transect x depth x treatment but depth is unbalanced among transects and the level of replication for treatments is low (2 replicates). In such a case statistical tests are not advised. In particular ANOSIM tests for the influence of transect and depth may be biased as all samples from transect 1 in the analysis were collected at 800 m while most samples from transect 2 were collected from 1140 m. The influence of the two factors can not be reliably tested. Instead, it might be more relevant to group samples according to oxygen concentration.

The suggestion to group colonization tray samples by oxygen concentration is a good one. It yields the identical MDS and ANOSIM analysis as a depth grouping, since the 800-m stations all have lower oxygen than the 1100 m stations. Thus we relabel Fig. 7B to include both oxygen and depth, and omit the original Fig. 7c. This is now reflected in the discussion.

Furthermore, I don't understand the multidimensional scaling plots. It seems to me that the same 9 trays were used to compute the similarity matrix for plots B to D shown on Figure 7. I thus don't understand why the ordination of the trays is different in these 3 plots.

The reviewer is correct and caught an error. The ordinations for the fig. 7 plots with colonization trays (7B, 7C) are now identical. Including both panels helps to illustrate the influences of oxygen and algae on composition.

The text now reads: *Multidimensional scaling analysis of tray colonizers revealed a significant difference in community composition between colonizers at the site with lower oxygen (802/817-m) and those where oxygen was higher (1147-m site) (R = 0.50; P = 0.024) (Fig. 7B) There was a significant difference in composition between colonization tray and background fauna (R= 0.263: P=0.002; Fig. 7A).*

Discussion: The high colonisation rates reported in this study at 1100 m are unusual for the deep sea. Menot et al. (2009), relying on the mass effect hypothesis, suggested that communities under natural disturbances would show higher colonisation rates driven by opportunistic species able to maintain populations in patchly distributed disturb areas. This may fit with the results of this study although Menot et al.'s experiments were carried out at 1300 and 4000 m depth near the Congo canyon and not in the OMZ as stated in the manuscript (p9470, l.26).

We have introduced the concept above, and corrected our reference to Menot et al. 2009's results, no longer mentioning the OMZ. The relevant section of the discussion of our study's lack of response to phytodetritus reads.

In a study of colonization response to organic enrichment on the W. African margin, the results of Menot et al. (2009) suggested that communities under natural disturbances would exhibit high colonization rates driven by opportunistic species able to maintain populations in patchly distributed, disturbed areas. In our experiments, additions were designed to detect phytodetritus consumption rather than enhance organic matter availability. Thus the addition of phytodetritus represented a <1% enrichment of carbon in the surface 1 cm of sediment. Nevertheless, similar organic matter additions have prompted benthic community responses in previous studies (e.g., Menot et al. 2009). This may have been partly due to the freshness or high 'food quality' of added organic matter compared to that which normally arrives at the deep-sea floor (e.g. Woulds et al., 2007). The lack of response to phytodetritus observed in our colonization trays is consistent with findings at an oligotrophic setting at 4000 m on the West African Margin, where macrofaunal densities were not positively correlated with organic enrichment, but different from those at 1300 m where 0.3% and 1% enrichment yielded enhanced macrofaunal densities (Menot et al., 2009).