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Discussions

Interactive comment on "Alpha and beta diversity patterns of polychaete assemblages across the nodule province of the Clarion-Clipperton Fracture Zone (Equatorial Pacific)" *by* Paulo Bonifácio et al.

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The paper presents the data on the diversity patterns in polychaetes collected on a cruise that was "aimed at improving species inventories, determining species ranges --" in the polymetallic nodule area of the Clarion-Clipperton Fracture Zone (CCFZ).

Given the importance of the results, for areas that may be subject to disturbance by nodule mining, I do not understand why there is no reference to the distribution of the rest of the major macro-infaunal groups, given that Wilson (2017) showed that different groups respond in different ways. It is important to know whether similar distribution patterns to those found for polychaetes occurred in the other groups in the studied

area.

It is clear that a lot of effort has gone into obtaining and working up this data. It is therefore unfortunate that a poor description of what was done and the reasons for this make it difficult to understand what fraction of the infauna was sampled and the consequences for the overall polychaete biodiversity and the comparisons between different box cores.

Given that the topography of the polymetallic nodules affects local water flow patterns and creates different microhabitats (Mullineaux, 1989). The cruise report gives information on the nodule differences between individual cores but this information does not appear to have been used in analyzing polychaete numbers and distributions, although this should have a major influence on species composition and numbers. I would like to see an analysis of polychaete species distribution and numbers with respect to the differences in nodule topography, numbers and sizes between cores. Treating all box core samples within an area as replicates does not appear to be valid. Similarly no use has been made of the data on species distribution with respect to sediment depth.

There should be an enlargement of the sampled area in Fig. 1 to allow for the individual core stations to be plotted. A section on the differences between samples taken within an individual area would be beneficial, since a lot of information on the ecology has been lost by only comparing means for each area.

Sampling strategy

The sampling strategies need to be clearly explained with reference to the following questions, either by amplification of the text or by giving a references.

1. Since there are 9 APEIs, why was the only one sampled from an oligotrophic area when the exploration blocks sampled were all in mesotrophic areas?

2. Within each block how was it decided where to sample, given the problem of determining the geographic range of species? [see Wilson (2017) for one approach to

this.]

3. Given the known high percentage of species represented by only a single individual in box core samples from red clay polymetallic nodule areas (Hessler & Jumars, 1974 and several later papers), why were such a small number of box cores taken in each area, as opposed to taking the same overall number of box core samples from fewer areas.

4. Why was it decided (apparently post-sampling) to treat every box core sample from a single area as a replicate, given the geochemical differences within some of the areas and also differences in the number, size and depth distribution of the polymetallic nodules in box cores from the same area?

5. Each box core was sliced into 0-3, 3-5 and 5-10 cm depth sections that were sieved separately. Why was this done when the data from each layer were then added for the data analysis? The slicing procedure is not described but when slicing box cores polychaetes are frequently fragmented. What precautions were taken that an individual was not counted more than once, for example by only counting head-ends.

6. The banked data shows that, although most individuals were found in the 0-3 cm layer, in some cores over 20% of the individuals were present in the 5-10 cm layer. It is therefore reasonable to assume that an unknown fraction of the biodiversity was lost in the samples because the cores were not sampled for macrofauna deeper than 10 cm. In some deep-sea sediments (at > 2000 m) polychaetes are known to penetrate over 100 cm below the sediment surface and the major infaunal biomass can often be found below 10 cm sediment depth. Given that some box cores were sampled below 10 cm depth, since nodules were recorded at 25 cm depth, why is no mention made of animals being present below 10 cm? Can the authors cite any reference to deeper sampling for infauna in the working areas? It might have been assumed that only the upper 10 cm of sediment would be disturbed by nodule harvesting, however most nodule-mining prototypes have been based on bottom crawlers that would cause

sediment compression and affect deeper-burrowing organisms.

7. Surface polymetallic nodules do penetrate the sediment to a degree. We are not told now deep this was in the different cores. Even if it was only 1 cm, given the large number and size of the nodules in some cores (see photographs in the cruise report) this would greatly decrease the volume of sediment available for sieving in the 0-3 cm layer and bias the results, considering that all cores were equated only on an area. The fauna results should also be considered with respect to sediment volume.

8. It is unclear what happened to animals collected when the nodules were washed free of sediment. Were these animals added to the 0-3 cm layer and if so was this done before picking animals off the nodules?

9. What happened to the animals picked off the nodules, were these treated as epifauna and not considered here? Some serpulids are included in the species listed in the dataset – were these all epifaunal on the nodules?

10. Polychaetes are known to occur as infauna within the polymetallic nodules (Thiel et. al. 1993). Some polychaete species were only found in crevices within the nodules and knowledge of differences in species composition in nodules from the different exploration blocks would be important information. Was this part of the infauna sampled? Will there be a separate publication dealing with the nodule-associated fauna, since the present manuscript does not cover the habitat of the species within the core samples?

11. Both the biomass and the biovolume of the infauna can affect the geochemistry, were these measured?

Specific Comments

Table 2: the data should be checked and the header clarified. Does the data refer to only polychaetes or all macroinfauna? For example, Table 7 in Wilson (2017) gives a mean polychaete density of 21 individuals 0.25 m-2 for Domes A compared with the 16 given in the present Table 2. It is also necessary to know if like is being compared with

like with respect to combined fractions of samples from the box cores. Since most of the previous studies did not look for cryptic species I think you should give the number of morphologically identified species in parenthesis for the sites recorded in the present study.

Figure 3 needs a lot more explanation and labelling. Below the diagonal some of the plots appear to use mean data from areas and others data from individual cores without a clear explanation.

In Figures 7 and 9 yellow text does not show well on a white background – use a coloured background for the text.

Conclusions: The first paragraph does not belong here – it should be in the introduction.

Supplementary data: It would be useful to have a species list available as a supplement to the paper, although I realise that the taxonomic studies are ongoing.

References

Hessler, R. R. & Jumars, P. A. (1974) Abyssal community analysis from replicate box cores in the central North Pacific, Deep SeaRes., 21: 185-209

Mullineaux, L. (1989) Vertical distributions of the epifauna on manganese nodules: implications for settlement and feeding. Limnol. Oceanog., 32: 1247-1262

Thiel, H. et. Al. (1993). Manganese nodule crevice fauna. Deep Sea Res. Part I 40: 419–423

Wilson, G. D. F.:(2017) Macrofauna abundance, species diversity and turnover at three sites in the Clipperton-Clarion Fracture Zone,. Mar. Biodivers., 47: 323-347

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