

Interactive comment on “Nitrogen and phosphorus recycling mediated by copepods in Western Tropical South Pacific” by Valentina Valdés et al.

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Received and published: 27 April 2018

Attending to the general comments:

First, the title has been modified to better fit to the paper content which mostly focuses on comparisons of remineralization and bacterial response in three contrasted areas. The conclusion has been rewritten and now focused on the observations made at each station, avoiding general conclusions for the whole study area. These stations were selected for their different biogeochemical characteristics and chosen along an oligotrophic gradient so that our study was performed over a heterogeneous and contrasting region. Studies in this region are very scarce and even scarcer for the role of

C1

zooplankton in nutrient recycling, thus comparing our results with other studies become difficult. Even that, we are confident that our work provides key insight and information about the environmental significance of nitrogen and phosphorus regeneration as mediated by marine copepods. One of the difficulties in our experimental studies is simulating the in situ conditions in a more realistic way. Research on zooplankton, especially on copepods, commonly use experimental densities much higher than those encountered in the field. In our case, since the nutrient concentrations in the study area were quite low, particularly for ammonium, it was necessary to concentrate the number of copepods in incubations. We have now deeper discussed this issue. Although we are aware that our results could be overestimated, our conclusions are also supported by a set of previous works in the field (Perez-Aragon et al., 2011; Valdes et al., 2017; Valdes et al., 2017).

2) SPECIFIC COMMENTS 2a) Introduction: p.2 lines 20, 25, 26. Copepods may excrete much more than 53% of their body nitrogen in the form of ammonia and this percentage is highly variable (as said in line 25). There are many papers on this subject, including review papers.

We agree. We have now provided a better assessment of the subject and improve citations.

p.3 lines 16-17: How is the presence of an oligotrophic gradient supported? Nutrient values from the only three stations are insufficient. Nutrient and/or Chla data from more stations would be helpful.

This paragraph was rephrased. An explanation of the gradient selection and its support was given in detail in the Methods section. Briefly, the three LD stations were chosen along a regional gradient in oligotrophy and they were selected using satellite imagery, altimetry and Lagrangian diagnostic (Moutin et al., 2017). A complementary approach included the abundance of selected diazotrophs nifH gene copies (on board; Stenegren et al., 2017). In the revised text, we removed the oligotrophic gradient from

C2

the description of the study area and now focus only in the general study area: WTSP. Details on how the oligotrophic gradient was determined were added to the Methods section.

2b) Methodology: General remark for the experimental set up: an additional control with copepods only would have been very helpful. p.3 line 22: please define "long duration".

We have now defined long duration stations in Material and Methods section.

p.3 line 22: please add coordinates of the stations.

Coordinates were added. Additionally, we have now added a map of the transect during the cruise with the stations.

p.3 lines 24-25: please add maximum and minimum values of chlorophyll-a.

Details about the chlorophyll values and about sampling strategy during OUTPACE cruise are available in Moutin et al., 2017. We have now provided the reference for this in Methods section as well as the chlorophyll-a values in the DCM in Table 1, which is the depth in which we took the seawater for our experiments.

p.4 lines 2-4: please specify if tow was vertical (or oblique), tow speed, net diameter.

We have now provided these sampling details in "Mesozooplankton sampling" section.

p.4 line 13: the field composition of copepods and other zooplankton should be also shown in Table S1.

More details about the compositions of copepods and other zooplankton in the field were provided in Carlotti et al., (this issue), and the abundance of copepods in the study area was provided in the second paragraph of Discussion section.

p.4 lines 23-24: please specify % of mortality.

We have now provided the percentage of mortality during the incubations in the "Prepa-

C3

ration of the microcosm and experimental setup" section.

p.8 lines 21: check that Redfield ratio of organic nutrients is $< 16:1$.

Results were checked and modified accordingly.

p.9 lines 7-8: unclear meaning.

These lines were clarified.

2c) Results: General remark. Do not repeat values that can be found in tables or figures unless necessary. Table 1: use either 2 or 3 decimals depending on the precision of the method for each parameter.

Done.

Table 1: add Temperature, Chla, DON, DOP, values at DCM.

The information was added. DON-DOP and Chla were extracted from Moutin et al., (this issue) and from Dupoy et al., (this issue), respectively.

p.7 line 25: "first treatment", replace by "treatment with copepods".

Done.

p.8 line 4: "significant difference in time,". Please add results of statistical test.

We added the information to the text.

2d) Discussion: General remark. Do not repeat detailed description of results, but only briefly giving outcome in connection with related literature. p.10 line 15 and line 17: Table 1 shows that MA stations (LD A & LD B) are characterized by higher inorganic nitrogen but not higher inorganic phosphorus concentration than SG (LD C).

The information was checked and corrected accordingly.

p.10 line 25: "influence on biogeochemical variability": not clear.

C4

We have now clarified this section in the text.

p.10 lines 31-32: Since there was no significant difference between treatments in LD A for bacterioplankton abundance (p.8 lines 26-27), a conclusion on an effect of zooplankton cannot be made.

This issue was discussed in the discussion section.

p.11 lines 7 to 10. LD B is not in the South Pacific Gyre (p.1 line 24). Check and eventually move this part to the discussion on LD C which is in the South Pacific Gyre.

We have now restructured this section to make it pertinent to the station sampled.

p.13 lines 33-34: Too general conclusion on the role of zooplankton metabolism, not supported by manuscript's observations.

We have now rewritten our conclusion, which focuses more on our observations.

2e) Bibliography: References to articles in preparation should be avoided.

We modified the text accordingly.

3) TECHNICAL CORRECTIONS p.2 line 2, p.8 line 18, p.10 line 12, p.10 line 15, p.12 line 32, p.13 lines 8-9: English grammar mistakes.

These sections have been revised and modified accordingly.

p.2 line 10: change order of references.

We have now modified the order of the references.

p.3 line 3: ". . .in a phosphorus limited. . ."

Corrected.

p.3 line 5: ". . .Gasol, 2007"

Corrected.

C5

p.3 line 8: ". . .zooplankton-produced DOM by bacterial communities. . .": unclear expression.

We have now clarified this expression.

p.4 line 14: "acclimation" instead of "acclimatization".

Corrected.

p.4 line 21: "such that 6 bottles were added in that case": not clear.

We have now clarified this sentence.

p.5 line 23: correct "u sing".

Corrected.

Please correct typing mistakes and journal names abbreviations in bibliography.

Done.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2017-563/bg-2017-563-AC1-supplement.pdf>

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-563>, 2018.

C6

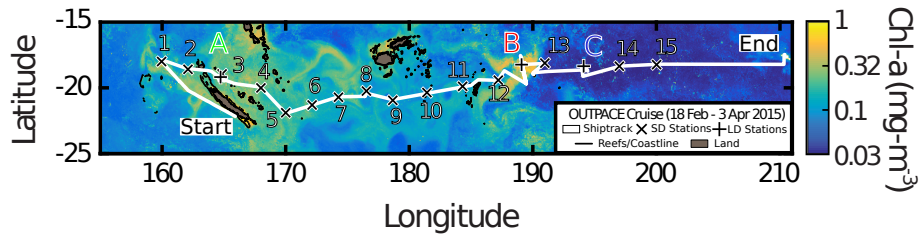


Fig. 1.