

Interactive comment on “Contribution and pathways of diazotroph derived nitrogen to zooplankton during the VAHINE mesocosm experiment in the oligotrophic New Caledonia lagoon” by B. P. V. Hunt et al.

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Received and published: 19 April 2016

Anonymous Referee #1 This manuscript is in general very well prepared and written. Moreover, experimental procedure and concept are thoroughly planned.

I only have some minor specific suggestions:

Abstract and Introduction

As I understood, the scope of the manuscript and experiment is to provide a time series and temporal variability in N₂ fixation rates. This should be mentioned already in the

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abstract. What does the abbreviation VAHINE stand for? Please add!

Author: We will add the full program name: VAriability of vertical and troPHic transfer of fixed N₂ in the south wEst Pacific (VAHINE).

1. Page 3, line 24: Strange wording, please re-write e.g. the identification of the predominating pathway still in question.

Author: We will rewrite this as “. . .the predominant pathways of DDN into marine food webs are still in question (Wannicke et al., 2013).”

2. Please add a list of accompanied manuscripts which deal with the VAHINE mesocosm experiment and their individual scope (I understand that there were a couple more).

Author: We are not sure what the suggestion is here. That this list be added to the manuscript? This seems redundant given that our manuscript would be located in the special issue that houses all of the VAHINE manuscripts. We include citations of all of the relevant VAHINE manuscripts throughout our paper.

Material and Methods

3. Page 5. I would restructure the first paragraph and make separate subheadings for Mesocosm description and Zooplankton sampling and processing

Author: We will make separate subheadings for Mesocosm description and Zooplankton sampling and processing.

4. Page 6, line 24. Add counting error of enumeration.

Author: Following (Gifford and Caron, 2000) we estimated an enumeration error of 6.4% which we will add to the methods.

5. Page 8, lines 23 ff. I doubt that the authors really determined direct grazing using the 15N set-up as it is presented. The microbial loop was likely still present in the

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incubation and recycling via bacteria attached to substrates and bacterivorous nano and microzooplankton might have occurred. Also see comment 13. Direct grazing nevertheless was truly identified via gut content analysis.

Author: We agree that grazing in this case may have included ingestion of bacteria attached to substrates and bacterivorous nano and microzooplankton. We will highlight these pathways in the text.

6. Was zooplankton put in non-labeled food after incubations so that they could purge their guts of non-digested N₂ food? If not the measured N might overestimate nitrogen incorporation.

Author: No, zooplankton were not allowed to clear their guts. We will note this in the revised manuscript, as a source of potential overestimation of diazotroph nitrogen incorporation.

7. How many zooplankton species were pooled for the mass spectrometer analysis?

Author: As highlighted in the methods, we did not identify zooplankton to species level, but rather to order. The contribution of orders to samples is detailed on page 9, paragraph 2 and section 3.2.

8. Also please provide a scheme for experiments and incubation that had been carried out.

Author: We will provide a scheme of the experimental structure.

9. Page 10, line 19. Why did you use a theoretical value for diazotrophs of -2‰ not the one measured during the VAHNE experiment?

Author: We used a theoretical value for diazotrophs as we did not directly measure diazotroph $\delta^{15}\text{N}$ during VAHNE. Following the suggestion of Reviewer 2 we have amended this to include the diazotroph $\delta^{15}\text{N}$ range of -2 to -1 cited by Montoya et al. (2002), and used this range to estimate propagation of error.

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Results and Discussion

10. Page 11, line 13 ff. It may be helpful to add a supplemental graph with phytoplankton data.

Author: Phytoplankton data are reported on extensively in Turk-Kubo et al., 2015. To avoid redundancy we briefly describe these authors findings and include reference to this paper.

11. Page 15, line 4. Please change grazing to e.g. incorporation, as you did not determine direct grazing using the ¹⁵N tracer. See also comment number 5 (the authors also stated on page 19, line 4 “that secondary pathways were also important”).

Author: We will change grazing to uptake.

12. Figure 3. Why not show the actual nMDS plot, instead of showing nMDS dimensions versus time.

Author: We plotted the nMDS values against time to be able to more clearly illustrate how the zooplankton community developed with time. A unit-less nMDS plot would require labelling of all dates for all samples, presenting a more cluttered view of the time series.

13. Figure 6. Please add label and numbers to the x- axis for Trichodesmium.

Author: We will add label and numbers to the x- axis for Trichodesmium.

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2015-614, 2016.

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