Anonymous Referee #1

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General comments

This manuscript describes a number of measurements characterizing mesozooplankton communities along a productivity gradient in the tropical Pacific. It contains a significantnumber of new observations that will help to understand trophic dynamics andbiogeochemical fluxes in this region. At first the manuscript seems inappropriate forBiogeochemistry, as the objectives are formulated as pure descriptions of mainly thedescription of the taxonomical composition and biomass of the communities, with onlyminor part dealing with biogeochemical fluxes. However, this manuscript apparentlycontains results supporting other accompanying manuscripts derived from the samecruise and more focused in biogeochemistry. Only for this reason the manuscript could be accepted for publication in the same journal but after fixing several issues detailedbelow.

Specific comments

1) The present style is purely descriptive. The objectives are formulated as mere descriptionsof zooplankton communities along a transect. There are no explicit hypothesesbehind their formulation. The need for more data in the study region is a poorjustification for attracting readers in this journal. This is reflected in a long abstractending without a clear conclusion.

Answer

Abstract has been completely rewritten, presenting the main results of the different objectives which have been better balanced between trophic and biogeochemical processes and zooplankton community structure.

In addition, these valuable data need to be accessibleto other future users by storage in a data repository (e.g. PANGAEA). The authorsneed to consider this later point and add the appropriate reference **to data storage** inthe revised version.

Answer

Data will be stored in the data base of the INSU-CNRS cruise data base. http://www.obs-vlfr.fr/proof/php/outpace/outpace.php.

2) Because of the descriptive conception of the manuscript thewriting is wordy, with a poor synthesis reflected by a large number of tables and figuresin the main text. There is an unbalanced treatment of the objectives: much detail inthe description of zooplankton communities (5 tables and 9 figures) but only one tableand one figure to present the results for the second objective. This treatment confounds the reader and loses the focus on the implication of the different compositionof the communities for the biogeochemistry of this region. The authors must consider reducing the description of the communities to a lower number of tables and figures.For instance focusing in multivariate analyses and leaving complementary indicators (as rank and diversity index) to supplementary materials, will help to understand the second objective.In addition, there are some results not clearly justified from the beginning.For instance, the record of zooplankton swimmers in the traps seems a bit odd in a general description of communities (unless it is used as an indicator of the migratory activity or of the potential for degradation of the sedimented matter).

Answer

As already mentioned, the different objectives have been rebalanced between trophic and biogeochemical processes and zooplankton community structure. Therefore, we strongly reduced the description of zooplankton community structure with reduction and recomposition of figures and tables, and focusing more on the multivariate analyses.The two other objectives on the Interactions with diazotroph microplankton and on the fluxes related to zooplankton have been developed with new data analysis synthesized in tables.

We agree on the referee's comment on the swimmers in sediment trap which is often very difficult to interprete. However, we kept the data from Caffin et al. (2018) to compare to our estimated mesozooplankton rates.

3) Theoverall style of the manuscript indicates careless writing, with a number of mistakesand poor editing. This poor presentation greatly difficult the review process and affects the understanding of the authors' interpretations. Particular attention must be takenwith the use of acronyms (requiring definition at first use) and species names (seesome specific corrections required below).

Answer

We hope that the new structuration of the manuscript make the paper easier for reading. We have been careful to have acronyms and species names correctly defined and spelled. The text has been read by a native speaker. However, we are aware that some sentences should still be reworded

Methods

4) Methods (p 5, L 18): indicate samplingtime (day or night) for the "regular" zooplankton stations. This is an important informationas changes in day and night abundance and biomass have been found in the5d-sampled stations.

Answer

It has been added in the text.

5) Methods (p 7, L 7). Indicate analytical and measurement error for isotopic determinations.

Answer

This point has been added in the text.

Stable nitrogen isotope analysis was performed with an Integra CN, SerCon Ltd. EA-IRMS. δ15N values were determined in parts per thousand (‰) relative to the external standard of atmospheric N. Repeated measurements of an internal standard indicated measurement precision of ± 0.13 ‰ for $\delta^{15}N$."

6) Methods (p7, L 8). Indicate type of filters and volume filtered for seston determinations.

Answer

For POM analyses, water samples were collected in 4.4L polycarbonate bottlesat depth corresponding to 50% and 1% of light attenuation. The samples were immediately filtered on pre-burnt (450 ° C, 4 h) 25 mm GFF filters and then analyzed by mass spectrometry for the determination of delta 15N naturalness

It has been added in the text.

7) Methods (p7, L 28): define UVP (CTD may be acceptablewithout definition because of generalized use)

Answer

It has been added in the text.

8) Methods (p8, L 12). Indicate the methods used for determining C, N, and P in zooplankton samples.

Answer

We quote the reference (Caffin et al., 2018a) where the methods are presented.

They wrote "Swimmers were both weighted and analyzed separately on EA-IRMS (Integra2, Sercon Ltd) to quantify exported PC and PN. Particulate phosphorus (PP) was analyzed by colorimetric method (880 nm) after mineralization according to Pujo-Pay and 15 Raimbault (1994)."

9) Methods (P9, L 8): why using only these variables for the PCA. Where other variables (e.g.nutrient concentrations) available?

Answer

This point has been added in the text.
We only considered variables pertinent for defining zooplankton habitat (temperature, salinity, food concentration)

10) Methods (p9, L 15) and thereafter: Spearmanrank correlations are generally expressed with the Greek letter rho (ïA¸š). I suggest using this letter instead of "Rs".
Answer
It has been changed in the text.

Results
11) Results (P10, L10). I assume that differencesbetween means were first studied by ANOVA as described but later paired differences were analysed with some kind of 'a posteriori' test. Indicate the type of test used andmark significant means in Table 1 for clarity (e.g. with different letters).
Answer
Post hoc Sheffé test were used to compare the paired difference between zones or LD stations. We have added this information in the method section. An also we have added letters in Tables 1, 2 and 3 to indicate homogeneous groups between zones or LD stations for the different variables.

12) Results(P11, L6 and thereafter). Mean values and variability are mentioned several times inthe text. In some cases the variability is defined as SD (standard deviation). I suggestdefining this form in the first use and then use always the same format (mean_sd).Take into account that SD is also part of the code of some stations and its continueduse in the text may confound the reader (e.g. P11, L31).
Answer
In the text, we now present mean values ± standard deviation. This presentation is defined in the legend of the tables.

13) Results (P12, L29): useonly full genus and species names at the first apparition in the text. Macrosetella gracilisis first cited in P 12, L17. Therefore it must be cited as M. gracilis thereafter (e.g.P12, L 29). Check that all species are cited in this way through the text.
Answer
We followed your recommendation in the new version.

14) Results(P13, L9) and Methods (P9, L24). Why using multiple regression to link environmentalvariables to NMDS first two dimensions? Justify the use of this method in preference toother alternatives (e.g. the BEST procedure in PRIMER V6).
Answer
Thanks for this remark; we applied the BEST procedure (we did not know before) which is more adapted than the multiple regression. We have modified the text accordingly

15) Results (P14, L5-20).Consider expanding the description of the results related to the trophic interaction between phyto- and zooplankton, as this section appears to be the main link between therelated manuscripts of the same cruise and contains the main biogeochemicallyrelevantresults
Answer
New analyses have been done and the part has been rewritten. We added information on respiration, vertical flux and grazing pressure on phytoplankton size classes

At the same time avoid repeating the text of the table heading in the maintext (P14, L11-13) and use subscripts and superscripts for ammonium and phosphate(P14, L11).
Answer
It has been changed in the text.

Discussion

16) Discussion. Consider reducing the length of the section dedicated tothe descriptionof communities (section 4.2) and, in general the titles of the subsections(e.g. 4.1. Characterization of biogeochemical regions; 4.2. Bottom-up controlof zooplankton communities, 4.4.Top-down control of zooplankton on phytoplankton.

Answer

We reduced the section 4.2 and we wrote shorter subtitles

17) Discussion (P15, L22-23): Rephrase the description of correlations. Use “positive”and “negative” (instead of “good” and “inverse”).

Answer

We changed it.

18) Discussion (P15, L24-34). Explainbetter the causes of the change in the correlations between Chla and zooplankton variables.Only the eddy dynamics affect to the mismatch between phyto- and zooplankton?Consider also the different turnover time of phyto and zooplankton organisms (i.e.zooplankton integrate over longer periods).

Answer

We added a sentence to argue for quick zooplankton turnover time linked to high tropical temperature

19) Discussion (P16, L 12). Here is the first time that the study of swimmers is justified as an indicator of activity. It would be appropriate to state this justification earlier in the manuscript (e.g. in the introduction).

Answer

Now “swimmers” are presented in the M&M part 2.7.

20)Discussion (P19, L10-13). Confuse and repetitive sentence. Rephrase to clarify the meaning: covariation of Chla with both N2-fixation and zooplankton variables suggesta link of N2-fixation with zooplankton. Also in P 19, L19: “: : :correlations between keyspecies and diazotroph distributions: : :”

Answer

The discussion has been fully rewritten

21) Discussion (P19, L21-34). All the trophicinterpretation of the link between zooplankton consumers and N-fixers is made by directgrazing of filaments or particles. However, zooplankton can acquire diazotrophic N through microbial food webs, as the excreted DON can be taken up by bacteria, subsequentlyconsumed by protozoans and metazoans (Mulholland, 2007), as interpretedin other studies (e.g. McCarthy et al. 2007; Mompeán et al., 2013).

Answer

The indirect link between diazotroph microorganisms and zooplankton is now discussed in the new version.

22) Discussion (P20, L1): remove italics for *Thecosomata*.

Answer

We changed it.

23) Discussion (P20, L17) define DDA

Answer

We defined it in the introduction

24) Discussion (section 4.4). I find this the most interesting part of the manuscript, dealingwith the top-down effect of zooplankton on the primary production. However severalkey issues were not

mentioned. For instance, does the estimates of zooplankton grazing match with the export (measured by the traps)?
Is feasible to measure any exportwhen zooplankton consumption accounts by >100% of primary production?

Answer
In the revised version we compare our ingestion estimates to the particle carbon export (from Caffin et al 2018) highlighting that only a small fraction of unassimilated ingestion (fecal pellets) would contribute to the material collected in the traps, which goes in the sense of a unbalance between new production and export highlighted by these authors

24) Other importantprocess to take into account is the zooplankton respiration. It can be assumedthat zooplankton respiration would be high also when grazing and excretion is high,thus affecting the net carbon budget (P21, L1). Even when the estimations made frombiomass and using equations from the literature (as in this case) only provide grossestimates of the real processes, they can be useful to detect future research needsand bottlenecks.
Answer
Respiration rates have been calculated and discussed

A list of recommendations derived from the analysis of the fluxes inTable 7 would be appropriate.
Answer
This table has been deeply amended (with new analyses of the data) to better focus on trophic and biogeochemical aspects in the revised version, as recommended by both referees. This complementary information is now more thoroughly discussed

25) The last sentence of the discussion (P21, L33-34) isnot a conclusion and needs further clarification (tuna marine food web?).
Answer:
This sentence has been shifted in the introduction of the paper, as it is a key characteristic of the region. Our study is based on mesozooplankton and we did not study any linkages with the mesopelagic fish.
One main output of the paper is to highlight quite high rates of phyto and zooplankton production (despite rather low stocks) which may explain a consistent trophic flux up to tunas.

Because of the large number of results presented and discussed the final section of the manuscriptwould benefit from having the main conclusions summarized in a synthetic way. For instance, bottom-up and top-down control variability in the different regions.
Answer
We have added a small conclusive paragraph highlight and try to interpret the high variability and high values of the top down (ingestion) and bottom-up (excretion) impacts and of the carbon fluxes associated to zooplankton observed in our study

Additional references:
McCarthy, M.D., Benner, R., Lee, C., Fogel, M.L., 2007. Aminoacid nitrogen isotopic fractionation patterns as indicators of heterotrophy in plankton, particulate, and dissolved organic matter. Geochimica et Cosmochimica Acta 71, 4727-4744.

Mompeán, C., Bode, A., Benítez-Barrios, V.M., Domínguez-Yanes, J.F.,Escánez, J., Fraile-Nuez, E., 2013. Spatial patterns of plankton biomass and stableisotopes reflect the influence of the nitrogen-fixer *Trichodesmium* along the subtropical North Atlantic. J. Plankton Res. 35(3), 513-525.

Mulholland, M.R., 2007. The fate of nitrogen fixed by diazotrophs in the ocean. Biogeosciences 4(1), 37-51.