

Interactive comment on “Biogeochemical cycling and phyto- and bacterio-plankton communities in a large and shallow tropical lagoon (Terminos Lagoon, Mexico) under 2009–2010 El Niño Modoki drought conditions” by Pascal Conan et al.

Anonymous Referee #2

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GENERAL COMMENT:

Conan et al propose in this paper an interesting case study providing records of biological and geochemical variables in a large and shallow tropical lagoon during an important drought period. This study gives an original overview of the potential links between biological and geochemical variables taking place in this environment during such climatic condition. Such data are still scarce in the literature and are urgently needed to better understand the dynamic of these transitional land/sea areas under direct and indirect pressures. However, these data were obtained during a single sam-

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pling campaign without any replication. The authors need to be careful about the importance of this study as a way to assess how long-term climate change may affect the structure and functioning of planktonic communities (as mentioned in the Introduction). This study is a snapshot of the situation at a given time that cannot be extended to the understanding of climate change effects on lagoon ecosystems. The main force of this study is the link between geochemical variables and microbial communities structure/function. Globally, this manuscript is well organized, excepted for introduction and objectives sections that don't mention anywhere why PAH and PAH-degraders were specifically analyzed further. The demonstration of the link between PAH, enzymatic activities and microbial community diversity is an important section of the study and introduction need to be revised in order to better reflect the results discussed by the authors. This study produces quite interesting original results but, in its present form, the aims presented in the introduction do not fit well with the results and discussion presented, especially concerning the PAH-relative measurements.

SPECIFIC COMMENTS

Abstract:

- The abstract states that the study will help to “understand how the severe drought period . . . influenced biogeochemical cycling and phyto- and bacterio-plankton communities”, nevertheless the study does not compare the data obtained during this period to any other records (maybe due to the fact that they do not exist) obtained during in more “classic” situation. This statement needs to be nuanced.
- “Coupling between top-down and bottom-up controls accounted for the diverse responses in phytoplankton productivity” : I didn't see any demonstration of top-down control in the study.
- The PAH-relative measurements need to be better integrated in the global aim of the study.

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Introduction:

- Overall the introduction is too much climate change orientated in regards to the results presented in the manuscript. Introduction needs to be more focused on the local dynamic of this lagoon and on the importance of considering PAH in this specific area. This study is more focused on the dynamic of land/sea transitional coastal areas under combined climatic and chemical pressures than on climate change effects.
- The importance of PAH in the studying area is not mentioned anywhere in the introduction or in the objectives. However, PAH concentrations and PAH-degraders appeared as a substantial part of the results and discussion sections. If PAH is an important factor to consider in the lagoon, this should be clearly presented in the objectives of the study.

Material and Methods:

- Section 2.1 (last paragraph): I suggest including the sub-sampling information in the relative subsequent technical sections. Is there any available data concerning water circulation in this lagoon? This information could be relevant for your study.
- Section 2.6: Only free bacteria can be measured according to this protocol not "total bacteria" as mentioned in the text (attached bacteria are not measured)
- Section 2.7: In turbid waters, such prefiltration step may lead to the retention of attached bacteria on the filter and induce a bias in bacterial diversity assessment. This method is adequate to collect the bacteria present in aquatic sample but this bias need to be mentioned in the discussion section.
- Section 2.9: The authors used a mixture of 6 PAHs for MPN but there is no explanation of this choice. In addition, what is the ratio of each PAH in the mixture? Why did they use a 10 $\mu\text{g}/\text{mL}$ final concentration (is this concentration realistic when dealing with environmental samples)? Additional information is required in this section.

Results:

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- PAH concentrations should be included in section 3.2
- Section 3.4: Biomass is the total amount of living material in a given habitat, population, or sample. Specific measures of biomass are expressed in dry weight per unit area of land or unit volume of water. In this section, you report bacterial abundance (cells/ml) and not bacterial biomass.
- The standard deviation values for MUF-P and MUF-Lip are higher than the measured mean values. The use of a range of values would be more suitable. In addition the values presented in the text do not fit with the values presented in the legend of Figure 4. This needs to be corrected.
- Section 3.5: As previously mentioned, flow cytometry does not consider attached bacteria. The protocol used for MPN determination allows the growth of free and attached PAH-degraders. As a consequence, the measured percentage is not accurate.

Discussion

- Lines 352-361: No grazing activity was measured in this study, so this statement need to be presented as a other way to explain the data and not as an affirmation.
- Section 4.3 : Please explain the last sentence of the section

Conclusion

- No demonstration of any top-down control in this study
- The conclusion gives a nice overview of the main results obtained in the lagoon but does not respond to the climate change questions mentioned in the introduction. This needs clarification or rephrasing of the introduction.

TECHNICAL AND TYPOS CORRECTIONS

L59: environmental importance and protected status are ...

L81: Are hydrocarbons always detrimental to bacterial diversity and activity?

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L131: what is the fluorometric detection reagent used? How long were the samples stored before being processed in the laboratory

L183: Indicate the name of the company providing SYBR Green

L282: river mouths

L285-L290: values do not fit with the values presented in Figure 4

L403: Verify the first sentence of section 4.2

L784 : Put the 4 in index for phosphate

Figure 5B : Correct the unit of PAHs concentration on the figure

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