

## ***Interactive comment on “Diversity of intact polar lipids in the oxygen minimum zone of the Eastern Tropical North Pacific: Biogeochemical implications of non-phosphorus lipids” by Florence Schubotz et al.***

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### General comments

This study examines the intact polar lipid (IPL) distribution in suspended particulate matter (SPM) from four stations in the oxygen minimum zone (OMZ) of the Eastern Tropical North Pacific (ETNP). It aims to link the IPL distribution of different water column zones with the microorganisms found there and to examine the ecophysical adaptations to the different zones of the OMZ. This is an extensive data IPL set and au-

C1

thors have theorized which groups of microorganisms are responsible for which IPLs. The strength, as I see it, in this study is the examination of how the IPL distribution changes across the different zones of the water column due to the changes in the biogeochemical environment. Indeed, due to the generic nature of many of these IPLs it is only possible to put forward tentative assignments of their sources, whereas examining changes in the lipid composition with changing environmental parameters provides more solid information. Overall, I recommend this article for publication with the following edits and with suitable responses to my questions on the analytical methods.

### Specific comments

I have two specific comments.

My first specific comment relates to the extraction and analysis of these samples. The manuscript states that the samples were collected in 2007 and (presumably soon after) that they were extracted using Soxhlet-extraction with DCM:MeOH for 8 hours. From an IPL perspective this seems a “harsh” extraction method that has potential to destroy certain IPLs, resulting in a IPL distribution unrepresentative of that in nature. Could the authors comment on whether this would be their preferred method of extraction for IPLs or whether IPL analysis was not the original reason for the chosen extraction method? Indeed the first author has described utilizing the much gentler modified ‘Bligh and Dyer’ extraction method in other publications relating to IPLs. The authors also describe two different analytical methods used to quantify and to identify structures. Can you state whether analysis occurred soon after extraction in both cases? If not, how were the extracts stored and for how long? If the two analyses were carried out at different times, did extract storage introduce changes in the lipid distribution? I noted that the reference for the second LC-MS method applied (Wörmer et al., 2013), was published 6 years after the samples were collected.

Based on the authors’ replies, suitable discussion of these issues should be included in the method section.

C2

My second specific comment relates to the length and depth of the discussion. This is a subject I find very interesting and yet I felt rather weighed down in information at certain points. I feel it would aid the reader if this was shortened and made more succinct.

Technical corrections

Line 52 - change to "the subsequent"

Line 70 - change to "(ENTP), situated off the . . ."

Line 93 - change to "(IPL) are the main building blocks of cellular membrane and may"

Line 98 - change to "the North Sea"

Line 100 - you could also include in your reference list here the Western English Channel (White et al., 2015).

"The combined effects of seasonal community succession and adaptive algal physiology on lipid profiles of coastal phytoplankton in the Western English Channel. D.A.White , C.E.Widdicombe, P.J. Somerfield, R.L. Ains, G.A. Tarran, J.L. Maud, A. Atkinson. *Marine Chemistry* 177 (2015) 638–652."

Line 129 - Remove 'here' to read "Notably, replacing. . ."

Line 141 - change to "extension of that of Xie"

Line 142 - change to "at two stations described here (station 1 and 8)"

Line 159 - Should this be "VERTEX I and II" ?

Line 160 The Martin et al. (1987) reference is missing from your reference list.

Line 177 - should define GFF at first use.

Line 223 - insert "response could not be corrected for"

Line 350 - The term amino lipid and betaine lipid seem to be used interchangeably

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throughout the manuscript. Could this be defined at one point?

Lines 434-439 - This introductory sentence is too long to read and needs to be broken up or shortened.

Line 436 - replenishment that produces

Line 454 - "Podlaska et al. (2012)"

Line 482 - "by Xie et al. (2014)". I have noticed this citation format error in more places. Please change throughout.

Line 489 - "coinciding with high Chl-a concentrations, reflecting"

Line 489 - What do you mean eukaryotic rather than microbial? Eukaryotes can be microbes and microbes can be eukaryotic. Do you mean eukaryotic rather than prokaryotic? But also in your results section, 3.1, you state that *Prochlorococcus* (not eukaryotes) were an important component of the photoautotrophic community. Hence I think the correct thing would be to say "photoautotrophic rather than heterotrophic". Is this not what you wanted to say here? Check you have this correct throughout the manuscript.

Line 497 - pluralize "IPLs"

Lines 540 - 551 - This section is confusing because you contradict each statement. You state that Eukaryotic phytoplankton and cyanos are assumed to be a major source of PG-DAG. Yet you then state that heterotrophic bacteria can also be a dominant source. Maybe using conjoining words "however" and "although" would make this section flow nicely.

Line 547 - change to "we therefore suggest that"

Line 547 - remove heterotrophic bacteria. Cyanobacteria are not heterotrophic bacteria.

C4

Line 576 - insert "abundance of less"

Line 586 - change to "fatty acid" or "acyl" rather than "fatty acyl"

Line 601 - change to "are <20"

Line 637-638 - remove tab within word "thaumarchaeota"

Line 648 - insert commas "zone, and that. ...1993), became"

Line 667 - replace "microbial" with "bacterial"

Line 679 - remove "shallower" as it is redundant.

Lines 694 - 670 - Please make this long sentence shorter or break it into two. You repeat the same words "exported, fossil and signal" twice.

Line 767 - insert "waters of the phosphorus-limited"

Line 768 - insert "to the phosphorus-replete"

Line 770 - insert "observation, the relative abundance"

Line 808 - change to "a myriad of bacterial sources"

Table 1 - Make the columns wider so that the cell contents all lie on one line.

Table 1 caption - should this read "where  $p < 0.05$ "

Figures 1,2,3 and 5 - Can you indicate the four water column zones on these figures. Perhaps with lines that join the specific depths at which the regions are defined (as was done in figures 4 and 6).

Figure 2 - unnecessary brackets around nitrite in panel b

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