

Interactive comment on “Factors controlling plankton productivity, particulate matter stoichiometry, and export flux in the coastal upwelling system off Peru” by Lennart Thomas Bach et al.

Anonymous Referee #1

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Factors controlling plankton productivity, particulate matter stoichiometry, and export flux in the coastal upwelling system off Peru by LT Bach et al

General Comments The overall quality of this paper is good because it provides new insight for production processes of a very important region of the oceans. Nevertheless, there is a basic concept that needs to be carefully considered, mainly that Production is phytoplankton biomass mg C m^{-3} and Productivity is carbon production in $\text{mg C m}^{-3} \text{d}^{-1}$. Please revise because biomass was measured and change it accordingly, or explain. This is a crucial point.

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I think the Discussion is too long. It takes 21 pages out of 54. I cannot suggest how it can be shortened. Maybe move some ideas to the description of the results? Or make new comparative Figures for stoichiometric results?

Finally, authors refer in the Discussion in Line 677 that. . . there was little potential to detect treatment differences, especially in light of the large differences in the starting condition that induced considerable variance between replicates. Therefore, they decided to focus on the analyses of temporal developments of ecological and biogeochemical processes rather than on detecting treatment differences. Maybe just to make it clear, this point about variance should not be left aside and they should add a paragraph about Plankton patchiness, insufficient replicates??

Two questions are asked 1) How do plankton community structure and associated biogeochemical processes change following an upwelling event. This first question was addressed by simply monitoring the developments within the mesocosms for a 50 days' period. 2) How does upwelling of water masses with different OMZ-signatures influence plankton succession and pelagic biogeochemistry

Specific comments Abstract 1. The phytoplankton communities were initially dominated by diatoms but shifted towards a pronounced dominance of the mixotrophic harmful dinoflagellate (*Akashiwo sanguinea*) when inorganic nitrogen was exhausted in surface layers. It is not clear if the phrase refers to the mesocosms enclosed waters or the natural Pacific surface layers 2. It is not clear why the increase and dominance of one dinoflagellate species is not considered a bloom? 3. Authors state that numerous biotic and abiotic factors modify productivity and biogeochemical processes. It is not clear why they simplify at the end only to nutrients and light? 4. Mesocosm study revealed key links between ecological and biogeochemical processes. . . Please expand and be specific here.

Introduction Eastern boundary upwelling systems (EBUS) are hotspots of marine life. References from other EBUS are missing. Please add. Moreover most self-references

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for the coastal upwelling system off Peru are reiterated in lines 69 to 86. Lines 100-101 . . .the observed patterns of productivity and export in the Peruvian upwelling system (and elsewhere). . .change elsewhere at least to Perú-Chile Current or give references. Lines 103-4 . . .climate change (Add here the reference of Gruber, 2011 through warming up, turning sour, losing breath) and alterations in productivity could disrupt one of the largest fisheries in the world (maybe a different reference here).

Methods Details of very careful physical and chemical procedures are presented. Figure 2 is very unclear. Please improve Line 137 Surrounding Pacific as in line 183 should say surrounding Pacific water. Line 238 says Pacific surface waters. Please keep this nomenclature. Therefore, later in the results and Discussion the term “Pacific” would be better understood. Pacific is an Ocean so this is confusing specially referring to Redfield ratios.

Results The legend of Figures need to be homogenized. It's difficult to understand them when different denominations are used: surface and bottom waters versus uppermost and the lower water column Fig 3 The black or white lines on top of the contours show the depth integrated water column average- I don't see the white lines. Figure 4. Inorganic and organic nutrient concentrations . . .Add to legend mesocosmos in colour lines. Line in black Pacific is the control water? Very interesting to compare NO₃- + NO₂- and DON opposite behavior in control and mesocosmos Figure 5. Chlorophyll a concentration. . . please describe what is the black line Fig 10 Brown blob is not a very nice representation of the dinoflagellate Akashiwo. At least add the flagella

Discussion First, 4.3.1. Productivity is a rate. . . Please change to biomass production. See my General Comments. Line 1051 Altogether, our study revealed some important factors controlling plankton productivity. Authors measured Chl-a. This needs to be clarified in the whole manuscript.

Second, I don't understand why Orni-eutrophication was not included in the Abstract, I think it is a very interesting result: Orni-eutrophication during the last 10 days enabled

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rapid phytoplankton growth through the relief from N-limitation and high light intensities in the uppermost meters. Bird defecation triggered intense phytoplankton blooms in most mesocosms in the uppermost part of the water column where light was plentiful. N inputs through these excrements were directly utilized and converted into organic biomass whereas the defecated P remained unutilized and sank through the water column directly into the sediment traps. Line 702 what seabirds typically add to the water column of the Pacific in this region (Otero et al., OP CIT).

Third, Export flux: I think authors should again compare their results with other sites in the HCS such as i.e. Gonzalez et al 2009, Carbon fluxes within the epipelagic zone of the Humboldt Current System off Chile: The significance of euphausiids and diatoms as key functional groups for the biological pump. Line 902.

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