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Biogeosciences Discussions

Interactive comment on "Zooplankton diel vertical migration and downward C into the Oxygen Minimum Zone in the highly productive upwelling region off Northern Chile" *by* P. Tutasi and R. Escribano

Anonymous Referee #2

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The manuscript (ms) entitled "Zooplankton diel vertical migration and downward C into the Oxygen Minimum Zone in the highly productive upwelling region off Northern Chile" by Tutasi and Escribano showed the results of day and night zooplankton vertical distribution at two oceanographic stations at 20oS and another at 29oS, in an area influenced by the coastal upwelling off Chile and the presence of a sharp oxygen minimum zone (OMZ). This is a quite interesting and valuable data set about the vertical distribution of the different groups and species of zooplankton in relation to the OMZ. They also showed the diel movements of the different zooplankton groups and species and their

range of migration in relation to the OMZ. Moreover, they estimate migrant biomass and active flux by zooplankton. However, the ms has many problems related to presentation of results and estimation of migrant biomass and active flux. The authors showed migrant biomass in a rather peculiar way, as a rate, something introduced as a new concept. This reviewer (and therefore the future readers) was not able to understand the concept as biomass should be given as a weight per volume (or area). It is even more bizarre to give a value of active carbon flux (even in the abstract) without given any detail at all about how it was estimated. Moreover, the active flux value is one or two orders of magnitude higher than any other estimate in the literature. This reviewer and the future reader would be quite interested to know how active flux was assessed in order to compare with other procedures. Thus, I recommend major revision submitting a complete new version following the comments below.

Migrant biomass (mgC m-2) is the difference between day and night biomass in the upper layer affected by primary production and seasonal variability of the physical frame (to be defined for the specific region), or the same difference in the mesopelagic zone. Migrant biomass is normally estimated as the biomass difference in the defined upper layer. The mentioned boundary should be well defined as carbon exported downward towards the permanent thermocline should remain there for long period. In the oceanic warm waters this is known and normally the 150-200 m layer (below the seasonal thermocline) is considered the boundary layer. The biomass difference between day and night is the migrant biomass as stated above, but keep in mind to calculate this biomass as the integration of biomass in the different layers sampled during day and night. I suggest to revise the concept of rate of DVM. To me, and probably future readers, this concept is rather confusing. The authors could state the migrant biomass of each group or species and their proportion in relation to the total abundance or biomass. This could be, probably, more informative.

Active flux (mgC m-2 d-1) should be migrant biomass multiplied by the rates (respiration, excretion, mortality,. . .) estimated for these organisms at depth (the residence depth during the day). The most popular procedure is to use the equations of Ikeda (1985, 2014) using body weight and temperature to derive respiration (respiratory flux). Then, excretion, gut flux, and mortality could be estimated from equations relating respiration with the excretion,... rates. These physiological community rates will be estimated only for the residence time at depth (normally around 12 hours depending on season and latitude). In any case, the authors should give details of the procedure used to assess these rates.

In order to present abundance and biomass data, I suggest to produce Figures showing the night (left, dark) and day (right, white) values in the five layers sampled but for each station (different Figures) and displaying average (and SD) values for each layer. Mean values of day and night biomass as displayed in Figures 6 and 7 are not informative. The authors should represent the real data.

Other comments:

Page 1, Line 15: Community structure is related to species abundance and biomass better than size composition.

Page 1, Line 21-22: Re-write this phrase as it is difficult to understand.

Page 1, Line 26: Migrants biomass units cannot be as in the text. It should be mgCÂům-2.

Page 1, Line 27: This value of active flux is extraordinarily high. Please, revise your calculations.

Page 2, Line 21: "in according" should be "according".

Page 4, Line 13: Later should Layer?

Page 8, Figure legend: Describe in the legend what is OMZ-UB, OMZ-UC,... for better reading and understanding of Figure.

Page 9, Table legend: Define what is SC, LC, AC,... As in the above example it is

defined in the text but the Table could be better explicative if it is stated in the legend or in the proper Table.

Page 12, Figure 4. This Figure is difficult to understand. Why not to display abundance during day and at night in the same level? This is the best way to compare the community structure during the diel cycle. Please, give details about units in the X- axis. Why there are no organisms in the mixed layer during night in T3?

Page 13, Line 1: had should be was.

Page 14 Figure 5 (and also Figure 3): Better to show day values as white dots and night values as black dots.

Page 16, Line 1-2: Re-write the phrase. Perhaps, "were found" should be deleted.

Page 19, Line 3: Biomass of these taxa was... Which taxa?

Page 19, Figure 8: This Figure is difficult to understand as for instance in T6 small and large copepods are observed at depth during day but not at night at any level. Any explanation?

Page 21, Figure 9: Define the values expressed in light and dark blue.

Page 23, Line 9: Plan should be play?

Page 26, Line8-9 and Table 7: It is not clear which is the primary production value as in line 9 is about 1 000 mgC m-2 d-1 and in Table 7 is 10 000 mgC m-2 d-1. Please, estimate primary production for each station from remote sensing data.

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