

## ***Interactive comment on “Zooplankton communities fluctuations from 1995 to 2005 in the Bay of Villefranche-sur-Mer (Northern Ligurian Sea, France)” by P. Vandromme et al.***

**Anonymous Referee #2**

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The manuscript "Zooplankton communities fluctuations from 1995 to 2005 in the Bay of Villefranche-sur-Mer (Northern Ligurian Sea, France)" submitted for publication to the Journal Biogeoscience presents an integrated analysis of the Ligurian Sea pelagic ecosystem. The authors used data on zooplankton, nitrate, chlorophyll-a, sea water temperature, salinity and density as well as air temperature, precipitation and irradiance for their analyses. The authors suggest that the patterns in ecosystem trophic state (lower nutrients and zooplankton – higher chlorophyll vs. higher nutrients and zooplankton – lower chlorophyll) they observed are mainly due to winter forcing on the upwelling of nutrients and that the grazing impact of the zooplankton controls phytoplankton in well mixed years. Other factors (e.g. light availability in spring/summer)

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were employed to explain years with contradicting patterns.

General comment: Principally, the paper lies within the scope of BG. The title clearly reflects the contents of the paper and the applied methods and statistics are presented in a traceable way. However, there are some major issues which have to be clarified before the manuscript is ready to be published.

The authors themselves report on similar studies previously conducted at the same sampling site which covered a much longer period of sampling (Molinero/Garcia-Comas) but did not include nutrients etc. – even if the present paper includes more background data (nutrients, weather etc.) it does not include data on the whole pelagic plankton community (i.e., phytoplankton and microzooplankton composition) which would have completed the picture of the pelagic ecosystem and would strengthen the conclusions of the authors in a more robust way (they themselves suggest that in their last paragraph). The authors should give a stronger statement what exactly is the novel concept of their study especially with respect to the short investigation period in comparison to previous works at the sampling station. I see also a problem with the conclusion that spring/summer irradiance (April-August) can counteract or reinforce the effect of winter convection and that phytoplankton was not nutrient but light limited. The authors should clarify the mechanisms they see behind this pattern. Data on Secchi depth (turbidity), stratification and mixing depth and also phytoplankton composition (Nitrogen-fixing cyanobacteria?) should be taken into account, at least be discussed to see a clear relationship between irradiance and zooplankton abundance. I also see no cause for discussing NAO if there are no significant influences measurable and no data or figure is shown in the results part!

Specific comments:

Generally English should be checked throughout the whole manuscript, as there are several mistakes that are consistently present (e.g. lacking articles, plural/singular mistakes). Especially the results section should be improved significantly.

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Abstract:

9177 line 4: it is “decapod larvae” (see throughout the manuscript and in figures also)  
line 12: please specify: it is chlorophyll-a not phytoplankton you measured!

Introduction:

Garcia-Comas 2010 is cited several times throughout the whole manuscript but is not available to the public yet, therefore the authors should give details on hypotheses (e.g. 9179 line 23) and results when they refer to this paper to make it more easy for the reader to follow the arguments of the authors.

9179 line 26: it is “occur” line 28ff: wrong citation - in Molinero 2008 there was also weekly sampling and data afterwards monthly means were calculated!!! The authors also refer to monthly means or less in their figures, so what is the novel strategy? 9180 line 7: it is “nitrate concentrations” line 9: it is “parts”

Material and methods:

9182, line 19: add “see” Fig. 2. . . line 28: better “time period” instead of lag 9183 line 2: please rephrase the sentence - why you start “Results will focus. . .”? 9184 line 1: please specify what  $\beta$  is.

Results:

The whole section needs proof-reading for English!!!

Only few examples: 9184 line 6: it is “terms” line 7: please rephrase: The less abundant. . . “The year with the lowest abundance. . .” also several other similar sentences in this section! line 11: “The” spring peak. . . line 23-26: The sentence needs to be rephrased! line 27: “highlights” 9185 line 1-2: does that average biovolume reflect changes in composition of zooplankton (I guess so) and why do you not show these in figures (e.g. pie charts)? line 16: in year 2000 copepods also showed a negative anomaly whereas pteropods were already positive. Probably you wanted to say:

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Copepods reacted earlier with a positive trend than the bigger zooplankton species. . . ?

Section 3.2.1: it is always “nitrate concentrations”!

9187 line 1: from “the” average. . . line 2: between “week 4 and 17” of the year line 5: “constant difference” line 11: “would not have changed”

Section 3.2.4: The title is misleading – you show no data on phytoplankton growth! Even more important would be to show data on light availability during winter/early spring which can directly affect the spring bloom development, which you do not show here – why?

Discussion:

9189 line 14: “1980’s onwards” line 24: “benefit from” line 26: “supported” 9190 line 11-15: verb is lacking line 23: “the condition of the 1980’s in the first years of 2000” line 24: “did not occur” 9191 line 9: “was observed” line 12: “river flow” line 20: “salinity anomalies” 9192 line 5: “the year 2005” line 8: “nutrient availability” line 9: “was always” line 12: showing data on the “quality of phytoplankton” (i.e. functional groups like diatoms and flagellates or size classes) would significantly improve the quality of the manuscript. . . line 13: please rephrase: zooplankton identified taxonomic groups??? line 14: “levels was” line 17: “A striking result” line 17ff-9193 end: The “strong top down control” of zooplankton on phytoplankton should be discussed with greater attention for other grazers like microzooplankton. These have been shown the most important grazers on phytoplankton (not the mesozooplankton!!! compare Calbet and Landry 2004 *Limnol. Oceanogr.*, 49(1), 2004, 51–57, Calbet 2001 *Limnol. Oceanogr.*, 46(7), 2001, 1824–1830) and are most possibly the most important food source for the mesozooplankton in the Ligurian Sea as well (phytoplankton carbon channelled through microzooplankton to mesozooplankton).

9193 end: Are there no top down factors on zooplankton like fish etc. ?

9194 line 1ff: I see now reason for discussing the “mach-missmatch” hypothesis.

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Section 4.3: As already stated above I have problems with the light limitation in spring/summer and its influence on zooplankton. line 23ff: The irradiation values were integrated over 75 meters of depth - stratification should not reach this depth and therefore phytoplankton which circulates in the upper water should receive a lot more light than the calculated values. Is turbidity from terrestrial discharge really a problem at station B if so – there is a great need for the addition to the model as the authors themselves stated in this section. 9195 line 10ff: Not necessary but interesting: could you go into more detail which zooplankton groups would show a time lag and why - plus cite more literature on that issue?

Section 4.4: It is “microzooplankton” not microplankton! The whole conceptual scheme should be improved according to the additional information added (phytoplankton, microzooplankton, light availability). line 26ff: The interaction between mesozooplankton and microzooplankton is more complex than the two examples that are discussed, you should go into more detail.

9196 line 9/12: “moderated” line 13: sentence is incomplete – please rephrase line 14: “was weak with regard to winter...high with regard to...” line 28/29 “increases” “decreases”

9197 line 12: “proposed”

Section 4.5: I see no reason for discussion NAO in a whole section as there is no significant influence detectable (see also comment above).

Conclusions

This section should be adjusted according to the changes and improvements of the manuscript.

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