

Interactive comment on “Impact of tidal dynamics on diel vertical migration of zooplankton in Hudson Bay” by Vladislav Y. Petrushevich et al.

Anonymous Referee #3

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General

This work exploits acoustic data from an ADCP moored over an annual cycle, backed with zooplankton identification in sediment trap samples, to document the seasonal dynamics of zooplankton DVM at a seasonally ice-covered site in Hudson Bay. The data analyses sound complete but the highlighted results do not seem particularly novel in the way they are presented. Maybe one approach to deal with this perception is to work on a more thorough comparison of the patterns observed in Hudson Bay with other regions. More in-depth interpretation of the linkages between the acoustic observations and zooplankton biology would also help this work. In particular, tidal effects on DVM seem to be emphasized by the title but this does not appear that well in the Discussion.

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The structure of the manuscript needs to be better strengthened as there are pieces of different sections that should belong to other ones, as detailed in the specific comments. The title takes into account only one aspect addressed by this work.

There is also an important issue that should be addressed either in the Introduction or the Discussion: is the trap a valid way to identify the scatterers?

Specific comments

Title

The title does not reflect the scope of this work properly since the tidal effects was only one part of the Discussion

Abstract

Line 13-14: Give the information on potential migrators instead of telling that they could be identified.

Line 14: “migrating scatters”? what does that mean? How can a scatter migrate?

Introduction

Line 20: I would remove “synchronized” from the sentence, as DVM doesn’t have to be synchronized to transport C and N to depth. Furthermore, “synchronized” is used in the following sentence that explains DVM.

Line 28: Explain better why this question needs to be addressed

Line 39: remove “to” after “help”

M&M

Line 79: It is “Macrozooplankton” we are talking about here and not “Microzooplankton”

Line 80: “Parasagitta” instead of “Sagitta”

Lines 83-85: This information does not fit in here in the description of the study area.



The authors should find a more proper place to use it if needed. The whole paragraph on zooplankton should be moved somewhere else.

Line 92: the sampling area of this trap is very small and may cause a bias in zooplankton catching toward the smaller individuals that need to be addressed.

Line 137: a citation is needed to back the information on the size fraction effectively sampled by the ADCP

- “Motoda” instead of “Motodo”

Results Line 143: Does that mean that in a matter of a few days, the ice thickness reached 0.4 m?

Line 145: remove “the”

Line 146: replace “were” by “are”

Line 154: replace “scatters” by “scatterers”, here and elsewhere. This sentence is a piece of the Methods and would fit better in the previous section

Line 156: the part on DVM in this sentence is interpretation of Results and would fit better into the Discussion.

Line 158: statistics?

Line 160: “midnight bottom scatters layer” by “layer of midnight bottom scatterers”

Line 162: “maxima” instead of “maximums”

Line 164: remove “observed”

Line 166: “shape shows a similar overall shape . . .” too many “shape” and “overall” here

Line 205: remove brackets

Line 208: It is “libellula”, not “libellua”

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Line 208-209: This sentence does not provide results information.

OSD

Discussion

The first paragraph of a discussion should give justice to the Results and novel knowledge provided by the work and entice the reader to learn more about the issue. I would turn the first sentence differently so that it would not look so much like it emphasizes the weakness of the ADCP-based method to study zooplankton patterns.

Interactive comment

Line 215: Studies like the one by Makabe et al (2016) address the issue of the usefulness of sediment trap samples for the description of zooplankton community composition and seasonal change by comparing zooplankton caught in sediment traps with ones sampled by plankton nets. What is found in the trap samples does not necessarily give a good picture of the zooplankton composition in the water column. The trap might miss the importance of scatterers that are not well sampled by the small-aperture trap. *Themisto* might be quite under sampled by the small trap. Furthermore, traps are known to oversample pteropods that stop swimming and sink when they touch the mooring line. Some change in behavior influencing the depth range of zooplankton will also have an impact on trap catching efficiency. This has to be kept in mind and mentioned.

Makabe, R., Hattori, H., Sampei, M., Darnis, G., Fortier, L., Sasaki, H., 2016. Can sediment trap-collected zooplankton be used for ecological studies? *Polar Biol.*, doi:10.1007/s00300-00016-01900-00307.

Line 235: DVM patterns have already been documented in another part of Hudson Bay (Runge and Ingram 1991). The authors should give credit to the pioneer study in this paragraph.

Runge, J.A., Ingram, R.G., 1991. Under-ice feeding and diel migration by the planktonic copepods *Calanus glacialis* and *Pseudocalanus minutus* in relation to the ice algal production cycle in southeastern Hudson Bay, Canada. *Mar. Biol.* 108, 217-225.

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Line 245: Well, we do not have the elements of information yet to tell if this pump is important or not. Importance would depend on the real scatterers, and depth and stratification state of the water column.

Line 246: "DVM" and not "DMV"

Line 247: "vertical transport of elements" instead of "vertical energy transfer"

Line 248: I don't think that it is worth introducing the next sections in that way. Normally a logical suite of sub-sections should be enough.

Or replace by something like : "the acoustic data at hand are not valid to quantify zooplankton biomass involved in DVM. However, we can use them to document and understand better important aspects of DVM, such as: links between its seasonal cycle and dynamics of sea-ice cover and under-ice illuminance, and the effects of wind storms and tides on DVM patterns".

Line 252: "south" instead of "southern location". In any case, this sentence should be rewritten to improve its clarity. Make the message straighter.

In general, there are too many figure citations in this section. If the Results section is clearly written, there is no need to cite those figures again. The Discussion should take on from the Results described in the previous section.

Line 271: by definition, the trap does not measure abundance but a rate of capture or sinking in the case of inert particles. Thus, I fear that it can be too misleading to use the term "abundance" in that case even though it is mentioned that it is the abundance in the trap sample after 35 days of opening. This is because the rate will not necessarily be related to the abundance of organisms in the water column. This is a tricky issue that should be addressed carefully.

Line 280: one alternate explanation that should be discussed is that of different feeding patterns. Some non-visual predators like chaetognaths might not need to move that much if their zooplankton prey change their migration patterns as well etc..

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Interactive
comment

Line 281: Is it disruption of masking of the DVM signal? From the interpretation, it is not possible to understand if the storms act on the zooplankton responsible for the DVM patterns, or if other physical action produce backscatter that prevent the visualization of DVM. The paper should relate storms to zooplankton behavior or change the title of this sub-section, which then would much less relevant.

Line 288: remove “present”

Line 291: “amount of” and not “amount in”; “provides” and not “provide”

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