Interactive comment on "Zooplankton diel vertical migration in the Corsica Channel (north-western Mediterranean Sea) detected by a moored ADCP" by Davide Guerra et al.

Anonymous Referee #2

Answers (*A*) to reviewer's comments (*R*) are written in *italics*.

General comments

The paper by Guerra et al is a study of diurnal vertical migration of zooplankton in the Corsica Channel observed with an Acoustic Doppler current profiler for a period of about two and a half years. The study produced interesting results about the vertical and temporal variation of zooplankton distribution and its relation to environmental conditions. The introduction and methodology sections are in general well written. However, some important information regarding the statistical analysis is missing in the methodology section *(A: These parts have been added when required)*. The results and discussion section requires several changes and a few additions, as some of the text is not easy to follow and understand, and some of the text is not clearly supported by the present graphs *(A: changes have been made according to specific comments below)*. The length of conclusions section should be significantly shortened *(A: has been shortened)*, as it is largely a repetition of the results and discussion section, through a more synthetic writing. As the results are interesting *(A: thank you)*, I suggest publication after the issues presented below are addressed.

Specific comments

R: Although authors appreciate that the MVBS is only a proxy of zooplankton biomass, they use the term biomass to refer to variations in MVBS. Biomass should be replaced with absolute backscatter or another appropriate term to avoid reader confusion, as details regarding their difference are given only in later sections.

A: We have added a sentence where we say that in the following parts of the paper the term zooplanktonic biomass will be used when referring to results coming from MVBS data

R: Results should be presented in the past tense.
A: We decided to keep our style, which is used consistently throughout the paper.

R: Please add units that are missing in several figures and use equation editor for the units in figure captions, not text.
A: Added, but did not see the need to use equation editor. Some apexes in the text of the captions have been corrected.

R: Please consider adding density profiles to figure 2 and refer to the pycnocline instead of the thermocline when mentioning stratification.
A: Since T is leading density, the thermocline is equivalent to the pycnocline. Adding density would therefore not add any useful information and would just take up space. We added a small text in the caption explaining this

R: Please distinguish between primary (phytoplankton) and secondary (zooplankton) bloom throughout the text (or at least once in each paragraph). In some cases, it was obvious from context which one was meant, in others, it was a bit confusing.
A: Done, thanks

R: p.3, l.21-24: Please consider expanding a bit the discussion on the drivers of DVM.
A: We think that the Introduction is already very long to go further in detail. However, all the relevant previous works are there, so the reader can find the sources.

R: p.3, l.25: van Haren, J. Plankton Res., 2014 and Ursella et al, Deep-Sea Res., 2018 are two additional ADCP studies on zooplankton in the Mediterranean Sea. Please consider including them.
A: Done

R: p.3, l.28: ": : :to infer the composition in the Ligurian Sea: : :". This is incorrect, they only suggest that a change in composition is probable. Please remove.
A: Done

R: p.4, l.6-8: Please consider including Brierley et al, Deep-Sea Res., 1998.
A: Done

R: p.5, l.18-24: Please consider moving "The operating : : : (Thomson and Emery, 2014)." to introduction and merge the rest of this paragraph with the next one.
A: Done

R: p.5, l.32: Do you mean composition instead of ": : :consistency: : :"?
A: We actually meant consistency (in the sense of texture…).

R: p.6, l.1-2: "Therefore, : : : quantitative." Repetition (also on p.4, l.6). Please consider removing.
A: This part has been moved to the introduction, and reworded

R: p.6, l.5: Please consider moving "The four : : : signals." to the previous paragraph which explain the operation principles.
A: The previous part has been moved to the introduction, but this is too technical, and has been left in Materials and Methods. However 3.1 and 3.2 has been merged, the new title of this section is "3.1 ADCP settings, and data quality control and estimation of the Mean Volume Backscatter Strength"

R: p.6, l.6: Please replace ": : :is upward looking: : :" with ": : :is placed at an upward looking position: : :". The way is stated, one might understand that this particular ADCP can be used only in an upward looking position, which is incorrect.
A: Done

R: p.6, l.16-20: This paragraph could be removed.
A: Done

R: p.6, l.27: Please explain symbols H and θ.
A: Done

R: p.7, l.1: There is one PG per transducer and an average PG. Which one was used? The average, the minimum of all separate transducers or something else?
A: Our data are collected in Earth Coordinates, consequently the four Percent Good values represent (in order):
PG1) The percentage of good three-beam solutions (one beam rejected);
PG2) The percentage of good transformations (error velocity threshold not exceeded);
PG3) The percentage of measurements where more than one beam was bad; and
PG4) The percentage of measurements with four-beam solutions.
We have used PG4 discarding values below 90%.

R: p.7, l.13: What data were used for the calculation of the absorption coefficient ?
A: As it is written in the text, the sound absorption coefficient was computed using a matlab script that needs 3 input parameters: the frequency of the sound pulse in Hz (76800 Hz in this case), temperature in °C (Tx) and pressure (atm). All data were considered at the depth of the ADCP

2

R: p.8, l.18: Perhaps you meant ": : :complemented: : :" instead of ": : :integrated: : :"?
A: Yes you're right

R: p.8, l.22: Please take also into consideration that large organisms can escape the 200 m mesh. Moriarty et al, Earth Syst. Sci. Data, 2013.
A: We have mentioned it explicitly in the amended version of the manuscript. at p.8l22 we added: "Some undersampling is possible since large organisms can avoid nets with a small mesh size (Moriarty et al., 2013)."

R: p.9, l.9: The sentence seems incomplete.
A: Reviewer 1 suggested modifications, now it should be clearer. Source for moon phases has been added to the list.

R: p.9, l.12: Please provide more information on spectral analysis. Are the data de-trended, windowed, block-band averaged, which is the number of segments for the spectral estimate, what is the segment overlap? These are necessary for the calculation of confidence intervals.
A: The spectrum was computed with a straightforward FFT, without segmentation and overlapping. Especially when looking for the long periods, segmentation would not have allowed to detect them. This is why we could not compute the confidence intervals here. We smooth out the text a bit to take into account that we don't know how much we can trust these peaks.

R: p.9, l.15: Please consider replacing ": : :verify: : :" with ": : :investigate: : :".
A: Done

R: p.9, l.18-28: "". Repetition (also on p.4, l.15-24). Please consider removing.
A: We have cancelled from L21 to 28, the rest was kept to very shortly introduce the Results section

R: p.10,l.4: Please consider moving the DCM definition to p.5, l.10-15 and add some information regarding its variability from literature.
A: DCM is a widely accepted definition which refers to the region below the surface of water with the maximum concentration of chlorophyll. We moved its definition to section 3.3. Variability is strongly dependent on season and region, so no general reference concerning it would be meaningful

R: p.10, l.10: It is not clear to me which this interface is.
A: It is the interface between AW and IW, in the text we have reworded the sentence to make this clear

R: p10, l.18-23: I think that "Vertical : : : range." should be moved to methodology.
A: We left this part here, since it is not really about methods, but what are the implication of this method for the results that we can obtain

R: p.10, l.26: "All considerations : : : bottom." Repetition (p.7, l.3-4). Please consider removing.
A: Even in this case we consider that this is important to state, to be clear that we are aware of the limitations that we are faced with.

R: p.11, l.3: The daily cycle is embedded in the plot, but it is not distinguishable. Please consider including a representative subplot with time span of a few days.
A: To show this cycle in detail we included the fig.3b to 3g. Another plot would be repetitive

R: p11, l.7: "June-July 2016". I think it's around April, not June-July.
A: There was a problem with the labels in Fig. 3b-f, they were misplaced, the correct ones were those of Fig. 3g. So June-July was correct.

R: p11, l.9: ": : :a pattern : : : organisms." Please add reference.

3

A: Done.

R: p.11, l.22: ": : :daily values are slightly higher than nocturnal values: : :". Please include a supporting graph or mean daily and night MVBS values.
A: The difference between day and night is well evident from fig. 3b to 3g, because the lines are showing the hour of the day of sunset and sunrise, so "day" is everything between the two black curves, while "night" is everything below the lower curve and above the upper curve. Therefore we think that no supporting additional graph is needed here.

R: p.11, l.33-34: Please include a plot of integrated MVBS as the argument is not evident from figures 3 - 4.
A: We think that the Fig. 3a and especially 4a show this, the colourbar shows high values over large parts of the water column between Nov/dec (late fall) and Apr (spring)

R: p.12, l.3: I think it's ": : :intra-annual: : :" instead of ": : :interannual: : :".
A: No. we meant interannual, maybe is not ''marked'', we replaced with "clear". The variability is high when you consider the same months of different years and average them, so "interannual" is the right term

R: p.13, l.5 and figure 4c-4f: Since light intensity was found to be the governing factor controlling DVM (e.g. figure 3), the x axis should be hours relative to sunrise and sunset instead of hour of the day for the W ADCP to be more representative of actual zooplankton migrating velocity. Qualitatively, the results will be the same as those in figure 4d and 4f, but I expect that the duration of upwards and downwards motion will last less time than is shown in the present plot. Please consider, either including a plot with such an x axis, or adding some text explaining that the vertical velocity values are not optimally presented in this plot.
A: The plot would look like the same, because the x axis represents the actual measurement time, which has a 2-hours interval. Since the plot is an average situation over the whole blooming (or non blooming) we cannot compute the hours relative to sunrise and sunset, because they change every day. An average value of the hour relative to sunrise or sunset would not be so significant and difficult to interpret.

R: p.14, l.4: ": : :or does not involve a large number of organisms." This applies only (and partially) to MVBS spectra. The way it is stated both MVBS and W are meant, which is incorrect.
A: We modified the text accordingly

R: p.14, l.6 and 8: The smallest annotated period in figure 5 is 4.45 hours. It is 4.75 hours in the text.
A: In the text it is 4.75 hours which is the same as 4 <u>hours</u> and 45 <u>minutes</u>, denoted in the figure.

R: p.14, l.30-31: "The community is essentially composed by organisms that do not migrate significantly: : :". Please add reference.
A: We have added "Scotto di Carlo, B., Ianora, A., Fresi, E., and Hure, J.: Vertical zonation patterns for Mediterranean copepods from the surface to 3000 m at a fixed station in the Tyrrhenian Sea, J. Plankton Res., 6, 1031–1056, 1984."

R: p.15, l.10: Please replace ": : :which is accompanied: : :" with ": : :which is possibly accompanied: : :" as the lack of surface data hampers further investigation.
A: Done

R: p.15, l.11-12: Please add reference.
A: Done

R: p.15, l.17: Is the distinguish between shallow and deep layers based on the photic layer depth or on another criterion?
A: We used a simple depth criterion, as it is written in the text, with the data we have we could not use any other definition. The water column was split in half, and the limit of 200m corresponds to about the interface

4

between AW and IW (the values 73m, 201, 378m are the mean bin depths that were used to divide between surface and deep layers).

R: p.15, l.27: ": : :that well correlate: : :". The Chl- and MVBS time series should be pre-whitened (i.e. remove autocorrelation) before a conclusion is drawn regarding their degree of correlation.
A: We have now prewhitened the times series (smoothing and detrending), and correlation is even higher, although lags changes a bit. We have modified the text accordingly. Thank you for this comment.

R: p.15, l.32: Please consider replacing ": : :a surface value: : :" with ": : :an exponentially weighted near-surface value: : :".
A: Done

R: p.15-16, l.29-13: Please consider placing the part of literature that supports/contradicts the findings of this study at the beginning of the paragraph and then present possible explanations for this agreement/disagreement. I was confused.
A: We have rearranged this part

R: Conclusions section: I think that this part should be rewritten to avoid repetition of results. Instead, the relation of the results of the present study with the relevant literature should be stressed. Also, the length of this section should be substantially shortened.
A: We have shortened and rewritten some parts of the conclusions

R: figure 1: Please include information about the data set of SST field in the data availability section.
A: Done

R: figure 4a and 4b: The x axis is month or climatological month? It was not clear to me from the text. If climatological please add this to the axis label. Otherwise, state which year the plot refers to.
A: They are the monthly averages of all available data (average of all Januaries, of all Februaries…). However this is not a proper climatological value. In the caption it is written "monthly mean". We have added this also in the text in this version.

R: figure 5: Please add confidence intervals. This is particularly important for the low-passed series (5c and 5d) and subsequent interpretation of results.
A: The spectrum was computed with a straightforward FFT, without segmentation and overlapping. Especially when looking for the long periods as in Fig. 5c and 5d, segmentation would not have allowed to detect them. This is why we did not compute the confidence intervals here. We smooth out the text a bit to take into account that we don't know how much we can trust these peaks.

R: figure 6a: It seems redundant to me as the three numbers in this plot are already present in the text.
A: Ok you're right, we removed it.

R: figure 7b: Please add confidence intervals.
A: Done

R: table 1: Please explain symbols in table caption or replace B, L, D, C with blank distance, etc.
A: The symbols are already explained in the text were the equations are presented. No need for repetition is therefore required according to us.

R: table 2: I think that this table is redundant, as the useful information of taxonomic analysis has been already presented in the text. Please consider removing.
A: We decided to keep this table, to summarize the net sample findings, which are not entirely described in the text.

5

Technical corrections

Comments	Correction
Please add the data availability section that is missing (required by journal).	*Done*
Bibliography is not formatted according to journal standards. Number of volume and pages are missing. Also, doi representation is not consistent among references (some are doi:: : : others are https://doi...).	*Done*
p.3, l.16: Please merge the two sentences or rephrase.	*Rephrased. Done.*
p.4, l.5: ": : :by the depth of the depth: : :". Typo.	*Done.*
p.4, l.7: ": : :attempts to calibration: : :". Typo.	*Done.*
p.4, l.17: ": : :Data collections: : :". Typo.	*"collected".*
p.4, l.22: Perhaps replace ": : :is completed by: : :" with ": : :concludes with: : :"?	*Modified*
p.5, l.18: Please replace ": : :as sediments: : :" with ": : :such as sediments: : :". Typo.	*Done.*
p.6, l.5: ": : :increments to each other: : :". Typo.	*Done.*
p.6, l.28: #7 deployment is missing. Typo.	*Done.*
p.7, l.3: Perhaps replace ": : :will be done: : :" with ": : :will be made: : :"?	*Done.*
p.9, l.15: Please consider replacing ": : :results to be: : :" with ": : :is a relevant: : :".	*I replaced.*
p.9, l.31: Please replace ": : :servicing: : :" with ": : :mooring maintenance: : :".	*Done.*
p.9-10, l.31-3: please consider merging the two sentences.	*We prefer to keep the sentences separated*
p.10, l.1: ": : :are representative of: : :" instead of ": : :represents: : :". Typo.	*Done.*
p.10, l.4: ": : :in correspondence with: : :" instead of ": : :in correspondence of: : :". Typo.	*Done.*
p.11, l.24: Perhaps replace ": : :much lower." with ": : :much weaker."?	*As suggested by both reviewers we replaced with "hardly seen"*
p.14, l.4: ": : :take place: : :" instead of ": : :take places: : :". Typo.	*Done.*
p.14, l.24: Please consider replacing ": : :by far the most abundant group were the copepods: : :" with ": : :the copepods were by far the most abundant: : :".	*Ok*
p.14, l.29: Please consider removing "more" in ": : :more western: : :".	*Done.*
p.15, l.3: Please consider replacing ": : :more superficial: : :" with "shallower".	*Done.*
p.15, l.9: "Fig." instead of "fig.". Typo.	*Done.*
p.15, l.26: ": : :are shown: : :" instead of ": : :is shown: : :". Typo.	*Done.*
figure 1: Please change "IW=Intermediate Water" to "IW=Intermediate Water path-way" or something similar.	*Done*
table 1. ": : :-400 mis: : :". Typo.	*Done. "400 m is".*