We would like to thank the reviewer for the thorough and constructive comments. These suggestions have been carefully considered and have helped us to improve the manuscript. Below, we provide a detailed response to each comment.

General comments:

-Missing taxa: *Clausocalanus* and *Ctenocalanus*, the first being a dominant genus in the open Mediterranean Sea and the latter also co-occurring commonly and with high relative abundance (e.g., Siokou-Frangou et al., 2010). I do not see these genera in any of the categories considered in Table 2. This is an important problem that must be addressed and solved.

The semi-automatic taxon recognition process is done on images from Zooscan, with pixel size of 10.3 µm. Therefore, some taxa can be identified down to species level, but other are only identified at genus, family or order. The issue is that the majority of calanoid copepods have not been identified beyond the order. So Clauso- and Ctenocalanus are not missing in the counts, but they are pooled with other calanoids, in the 'undetermined Calanoida' (around 50% of total abundance) group, which is then not mentioned in Table 2.

A new version of the Table 2 has been now defined. This does not solve the above-mentioned limitation, which is inherent to the use of semi-automatic taxonomic recognition in EcoTaxa. However, the revised table avoids possible confusion by showing only representative taxa, those that account for at least 1 % of the total abundance within that specific category.

Category	Abbreviation	Representative Taxonomic Group identified by ZooScan
Appendicularians	App	Oikopleuridae, Fritillariidae, Appendicularia undetermined
Chaetognatha	Cha	Chaetognatha undetermined
Cnidaria	Cni	Cnidaria (ephyra), Hydrozoa, Siphonophorae, Physonectae, Trachylinae (*Aglaura*, *Solmundella*), Diphyidae
Copepoda	Cop	Calanoida undetermined, *Oithona*, *Centropages* (*Centropages typicus*, *Centropages* undetermined), Oncaeidae, *Pleuromamma* (*Pleuromamma* undetermined, *Pleuromamma abdominalis*), Corycaeidae (Corycaeidae undetermined, *Urocorycaeus*), *Euchaeta*
Eumalacostraca	Eum	Euphausiacea larvae, Amphipoda (*Phronima*, Amphipoda undetermined, Hyperiidae undetermined), Eumalacostraca undetermined, Decapoda (Dendrobranchiata), Euphausiacea undetermined
Foraminifera	For	Foraminifera undetermined
Thaliacea	Tha	Doliolida, Thaliacea undetermined, Salpida (Salpida undetermined, *Salpa fusiformis*)
Other Organisms	Oth	Limacinidae, Ostracoda, Errantia, Pteropoda (Pteropoda undetermined, Cymbuliidae), Crustacea (Crustacea undetermined, nauplii)

Explanatory paragraph included in the manuscript:

The semi-automatic taxon recognition process was performed on Zooscan images with a pixel size of 10.3 µm. Consequently, some taxa could be identified to the species level, while others could only be determined at the genus, family, or order level. Some taxa are either too small or could not be precisely recognized by Ecotaxa for other reasons (e.g., sample quality, image quality during Zooscan scanning) and therefore were not identified to species. Instead, they were grouped at the finest taxonomic level that Ecotaxa could assign, which in some cases is only the order. For example, 65 % of the total copepods were classified as "Calanoida undetermined" for these reasons. Table 2 therefore does not show all recognized taxa within each of the eight categories, but only those that account for at least 1 % of the total abundance within that specific category.

- Problematic trophic categories: many behavioural studies have demonstrated that copepods do not "filter" the food particles as pelagic tunicate instead do. Some copepods create feeding currents that convey water with food particles to the mouth appendages, and *Temora* is one example. *Acartia* and *Centropages* instead have a mixed feeding strategy, they can switch from feeding currents to ambush predation, according to the

type of prey prevailing in the environment. These three genera have been pooled in the “Copepod filter-feeders” category in Table 2, where also *Pleuromamma* is included. But *Pleuromamma* swims very fast, with a motion behavior that does not allow creating feeding currents. Oncaeidae are placed in the category of “Copepods cruise-feeders”, but these cyclopoids exhibit a "jerky, hop-and-pause" motion (Hwang & Turner, 1995) as it clearly appears from observing live oncaeids.

- ➔ Given these inaccuracies, trophic groups add little value and risk misinterpretation. Therefore, I recommend to 1) remove section 3.4.3 (trophic groups) and Figure 8, 2) focus the analysis on taxonomic composition, ensuring all major taxa (including *Clausocalanus* and *Ctenocalanus*) are properly represented. If trophic roles are critical to interpret the community distribution patterns, discuss them in the Discussion section, citing behavioral literature to support functional interpretations.

We agree that the trophic categories as originally presented were problematic. Accordingly, we have removed all trophic-related content, including the corresponding column in Table 2, section 3.4.3, and Figure 8. The analysis now focuses on taxonomic composition.

This limitation is mainly due to the fact that most calanoid copepods could not be identified beyond the order level, while they span across all trophic groups. Therefore, the taxonomic resolution was not sufficient to assign trophic categories in a reliable way.

Additional needs of improvement:

-The title reflects the content but could be more engaging by briefly highlighting the main finding (e.g., the NBF’s role as a boundary rather than an accumulation zone).

We agree and propose the following revised title:
“The North Balearic Front as a zooplankton boundary: fine-scale distribution patterns in late spring.”

-In the abstract, "largely unknown" (line 4) should be replaced by "still insufficiently known" for greater precision.

This change has been made as suggested.

- Regarding the language, the manuscript requires thorough English editing to improve clarity and flow. The current style is heavy, with redundancies and repetitions. The Results section is overly detailed and should be streamlined for conciseness.

The manuscript has been revised accordingly

- In synthesis, this study provides useful data on zooplankton distribution across the NBF but would be significantly improved by a substantial revision focused on 1) refining the taxonomic resolution, 2) removing the trophic classification, 3) tightening the writing.

These points have been revised in the new version of the manuscript.

Specific comments:

Introduction

1. The current description of the study area (lines 51-66) is too detailed for the Introduction. Please reduce this to just a few lines that introduce the study's aims. The detailed geographical and hydrological information should be moved to a dedicated "Study Area" subsection (2.1) in Materials

and Methods. This subsection should be separate from the sampling strategy and should include a map of the northwestern Mediterranean showing the key hydrological structures and the BioSWOT-Med survey area (clearly framed).

Map suggestion:

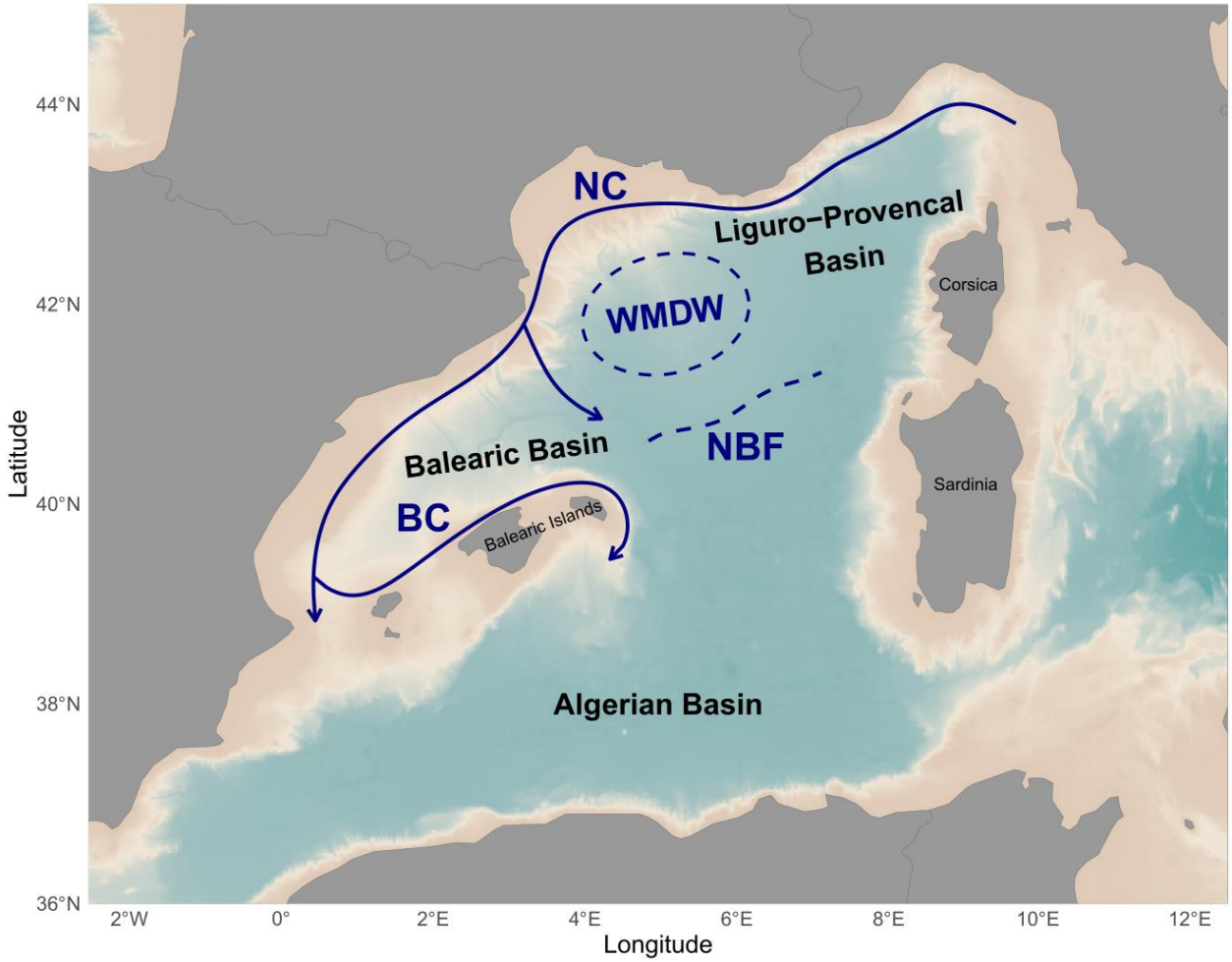


Figure 1. Maps of the NWMS showing the major oceanographical currents and front (NC: Northern Current, BC: Balearic Current, NBF: North Balearic Front, WMDW: Western Mediterranean Deep Water formation area) of the northern part of the NWMS. After Millot (1987), López García (1994) and Pinardi and Masetti (2000).

2. At the end of Introduction, 1) the current questions about zooplankton communities should be preceded by a brief description of the cruise's general interdisciplinary scope; 2) the zooplankton study aims should be presented with clear hypotheses rather than only questions.
3. -Improve paragraph flow by moving the first sentence to the end of the first paragraph (better transition to paragraph 2. The second sentence works well as the new opening sentence about frontal zones.
4. Line 35: Avoid repetition - suggest: "...concentrate high phytoplankton abundance, supporting elevated zooplankton stocks and metabolism..."
5. Line 41: Simplify to "...and their predators..."
6. Line 44: Add DVM abbreviation at first mention: "…in zooplankton Diel Vertical Migration (DVM) have also been observed…
7. Line 45-46: Clarify to "...investigating zooplankton distribution at fine scales..."
8. Line 46: Specify what "particles" refers to (e.g., potential prey items?)
9. Line 48: Clarify what "varying widths" describes (height of biomass peaks? frontal features?)
10. Line 67: Briefly present the cruise's interdisciplinary scope before detailing the zooplankton study aims, which should be hypothesis-driven

We thank the reviewer for these detailed suggestions. All points have been adressed: the study area is now in a dedicated subsection, the cruise scope and zooplankton hypotheses are clarified, paragraph flow improved, repetitions reduced, and terms and abbreviations specified.

Mat & Met:

1. For better clarity and structure, subsection 2.1 should be divided into: 2.1 Study Area, and 2.2 Sampling Strategy (not "sample strategy").
   We agree and have split subsection 2.1 accordingly.

2. The sampling approach needs a clarification: the mention of "drifting stations" (line 89) suggests a Lagrangian sampling strategy. Please clarify this point.
   We have clarified the use of drifting stations in the sampling approach.

3. The bathymetric range of the sampled area should be provided.
   We have added the bathymetric range of the sampled area.

4. Include details on how the filtered water volume was measured for zooplankton tow

   The filtered water volume was not measured with a flowmeter but estimated from the net and towing distance.

5. Lines 76–77: This sentence appears to be a figure caption and should either be removed or rephrased.

   This issue has been resolved.

6. Line 78: Explicitly define the acronym SWOT.

   The acronym SWOT has now been defined.

7. Line 79: Clarify what is meant by "high spatial resolution" by providing specific values.

   We have clarified this, specifying the high spatial resolution as 2 km.

8. Line 84: Revise to: "…physical, chemical, and biological properties."

   This revision has been made.

9. Line 85: Specify the range of "fine scale" (e.g., meters, kilometers).

   The range of "fine scale" is now specified as kilometers (typically 2 km)

10. Line 94: Replace "sampled" with "recorded" (CTD measures properties, does not "sample" them).

    This revision has been made.

11. Table 1: Add a column indicating sonic depths.

    If this refers to the bottom depth, the modification has been made (see below)

Campaign Stage	Station Name	Water Mass	Date - Time	Latitude	Longitude	Depth (m)
1st transect	a1_D	A	25/04 - 12:38	41.240	4.553	>2500
	a1_N	A	26/04 - 00:02	41.224	4.563	>2500
	f1_D	Front	26/04 - 12:11	41.099	4.423	>2500
	f1_N	Front	27/04 - 00:32	41.102	4.456	>2500
	b1_N	B	28/04 - 00:17	40.874	4.388	>2500
	b1_D	B	28/04 - 12:28	40.884	4.389	>2500
Storm	m_N	M	02/05 - 00:37	39.555	4.101	1350
	m_D	M	02/05 - 12:22	39.493	4.087	1500
2nd transect	b2_D	B	04/05 - 12:16	40.795	4.933	>2500
	b2_N	B	05/05 - 00:13	40.849	4.936	>2500
	f2_D	Front	05/05 - 11:49	41.175	5.108	>2500
	f2_N	Front	06/05 - 00:45	41.134	5.308	>2500
	a2_N	A	07/05 - 00:13	41.412	5.24	>2500
	a2_D	A	07/05 - 12:15	41.376	5.253	>2500
Return water mass M	m2_D	M	10/05 - 11:31	39.671	3.957	1150
	m2_N	M	11/05 - 00:31	39.629	3.902	1200
	m2_D'	M	11/05 - 11:53	39.603	3.885	1300
Return water mass B	b3_D	B	12/05 - 12:15	40.782	5.152	>2500
	b3_N	B	12/05 - 23:58	40.746	5.112	>2500

Table 1. Station details. In Station Name, 'D' stands for Day and 'N' stands for Night. Depth values are approximate (±50 m) for the station within the water mass M. Depths indicated as ">2500" correspond to stations deeper than 2500 m.

12. Line 105: State the name and location of the shore-based laboratory.

    This issue has been resolved.

13. Line 106: Clarify whether "each sample" refers to: separate samples from the 200 µm and 500 µm nets, or a merged sample combining both.

    This revision has been made.

14. Line 109: Explain how the approximate number of individuals (~1500) was determined *a priori*.

    This has been clarified.

15. Table 2: See General Comments regarding content. In addition, the trophic group "All" (including "Other organisms") is misleading; I suggest renaming it "Undefined"

    This has been taken into account, as Table 2 was revised following the removal of the trophic groups as well as certain taxonomic groups identified by Zooscan.

16. Line 125: Rephrase for clarity. Were the 200 µm and 500 µm samples merged before ZooScan analysis, or were they processed separately and the counts later combined (summed)?

    This has been rephrased: "The 200 µm and 500 µm net samples were processed separately using ZooScan, and their resulting counts were subsequently combined"

17. Subsection 2.5: The method of deriving zooplankton abundance/composition for the layers 100–200 m and 200–400 m by subtracting data from 0–100 m, 0–200 m, and 0–400 m is unconventional. While inevitable due to the sampling design and gears, this approach introduces potential errors (e.g., contamination between layers, negative abundances, as observed here for Eumalacostraca and Cnidaria). Please discuss: the limitations of this method, and how potential biases were addressed (or acknowledged).

We acknowledge that patchiness certainly leads to significant variations in abundances between hauls, as the three net hauls were carried out within two hours. This patchiness is visible in Figure 2, where abundances do not always decrease consistently with depth. In particular, abundances in the 100–200 m layer may be misestimated at certain stations. To provide context, we can compare our data with reference values from Di Carlo (1984), which report relative abundances of approximately 57% in 0–100 m, 27% in 100–200 m, and 16% in 200–400 m.

In our study, the observed mean relative abundances were 46.2 ± 18.2% in the 0–100 m layer, 26.9 ± 18.5% in the 100–200 m layer, and 26.8 ± 15.5% in the 200–400 m layer.

While Di Carlo (1984) did not differentiate between day and night sampling and used different net mesh sizes, this comparison provides useful context.

We also note that abundances in the 0–100 m layer are accurate, and no concerns apply to analyses for this layer; uncertainties remain for the two deeper layers, which cannot be fully resolved.

18. Line 155: Why were eight copepod taxa selected as the "most abundant" rather than another number (e.g., ten)? Clarify: the percentage these eight taxa represent within the total copepod assemblage, and the rationale behind choosing this specific number.

    For the analyses, only copepod subgroups with abundances greater than 1% of the total copepods were considered.

Results:

1. I recommend streamlining the text to improve clarity and flow while preserving key findings (with the exception of subsection 3.4.3, which should be reconsidered -see below).
2. **Given the methodological concerns raised in my General Comments, I suggest focusing the community composition analysis on taxonomic groups only, removing section 3.4.3 (trophic groups) and the related Figure 8. Discussion of trophic roles, particularly for key groups influencing zooplankton distribution across water masses, should instead be addressed in the Discussion section.**

    We have removed subsection 3.4.3 and all analyses on trophic groups, as suggested.

3. Additionally, the term **"**intermediate**"** (when referring to depth layers) is unnecessary and potentially misleading; it should be removed from both the text and figure captions.

    The term "intermediate" has been removed from the text and figure captions.

4. Line 239: Specify that the data refer to the 0–200 m depth layer.

    This has been specified.

5. Line 241: From Figure 3, it appears that the 500 µm mesh net also effectively captures Appendicularia and Chaetognatha, not just the listed taxa. Include these groups.

    Appendicularia and Chaetognatha have been added as suggested.

6. Line 247: Remove the speculative statement *"*This intermediate layer likely reflects a transitional zone where DVM results in taxonomic shifts." Such interpretations should be moved to Discussion.

    The statement has been removed from the Results section.

7. Section 3.3: This section is overly verbose and should be condensed.

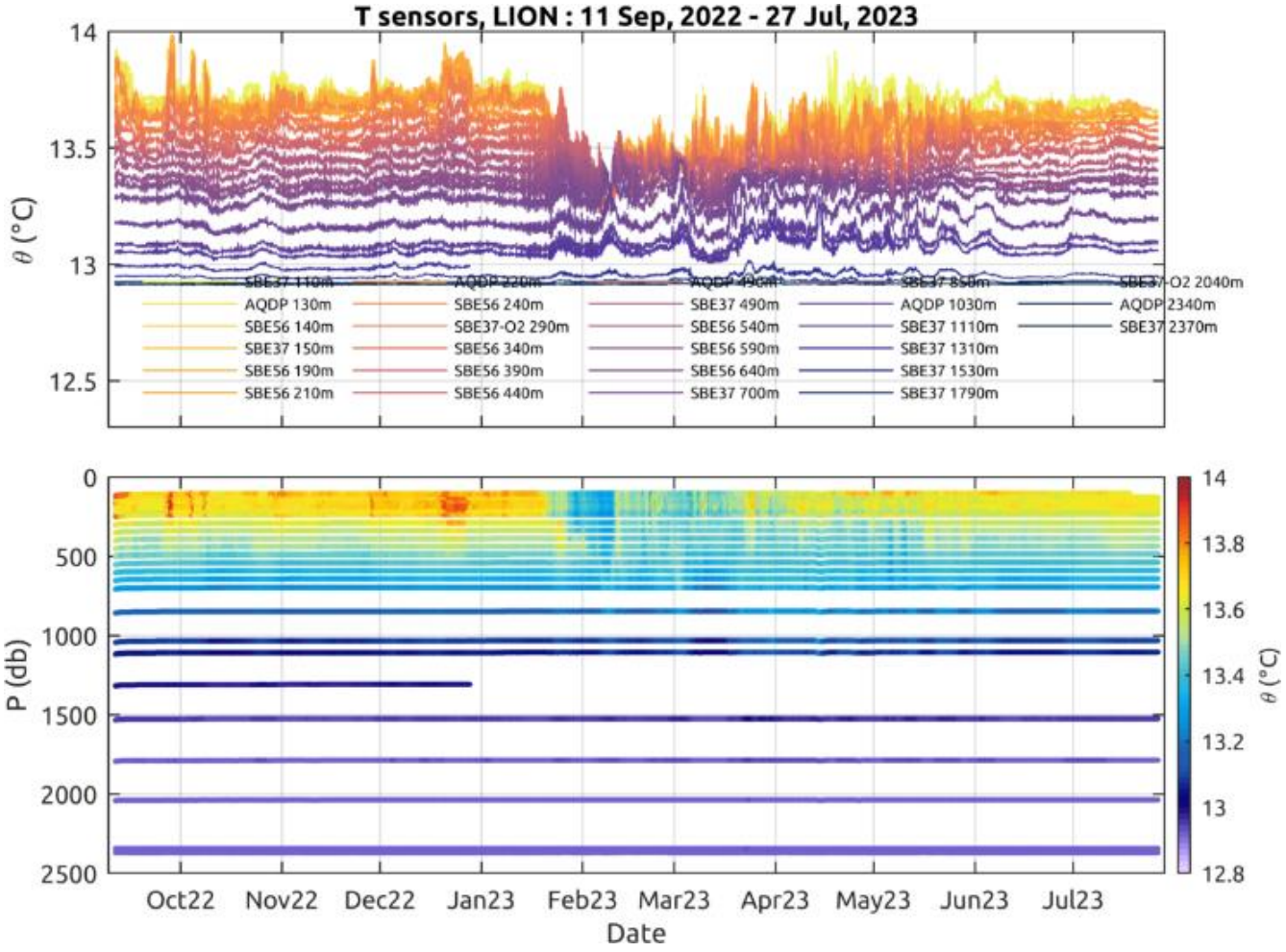
   Section 3.3 has been condensed for clarity, notably by removing the analysis based on biovolume (former Fig. 2b and 2c), in line with the suggestions of the second reviewer.

8. Lines 252–256 are redundant. The term "less structured composition" is vague, define what this means. The link to diel vertical migration (DVM) is speculative without direct evidence. Move this discussion to the Discussion section. The details on layers and Hellinger distances would be better organized in a table for clarity.

   These points have been addressed

9. Line 395: The claim that the cruise occurred during the **"** the post-bloom period, when phytoplankton biomass levels are already too low to sustain optimal growth of specific zooplankton groups" lacks supporting data. Either provide referenced evidence, or remove the statement unless it can be substantiated by presenting data.

   The convection occurred in mid-February 2023 (at Mouillage Lion, see figure below; A. Bosse, pers. comm.), and restratification took place in April, so the cruise occurred after the bloom peak.



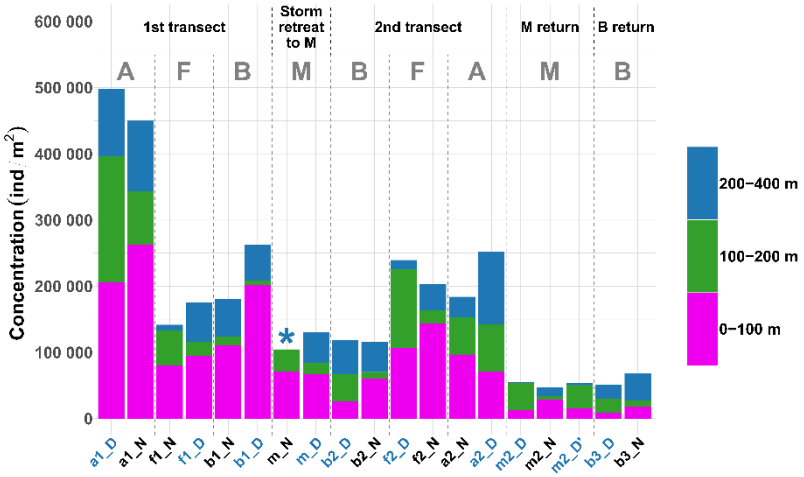
Moreover, chlorophyll fluorescence profiles are provided in Supplementary Figure A3, showing a deep chlorophyll maximum at all stations with concentrations around 0.5–0.7 mg/m³, which is low.

Figures:

1. Figure 2: The current caption is confusing and needs revision.

   The biovolume analyses have been removed following Referee 2's comments.

   New Figure 2:



Clarify if **"**Total abundance**"** includes all organisms across the full-size spectrum?

Yes, "Total abundance" includes all organisms across the full-size spectrum. Clarified in the text.

2. The caption reports ESD (Equivalent Spherical Diameter), while the text refers to ECD (Equivalent Circular Diameter**)** (Lines 110, 128, 132, 133). Ensure consistency.

   This has been corrected for consistency between caption and text.

3. Asterisk means "the net could not be analyzed," yet data appear in the histogram. Revise or clarify this discrepancy.

   Revised: "The asterisk (*) indicates that the 200–400 m net at station m_N could not be analysed."

4. The stations located at the front should be more evidently and immediately identifiable.

   Letters indicating water mass have been added to Figure 2 (see above)

5. Figure 3: For easier interpretation, reorganize the histograms so that Copepoda are at the base, followed by Cnidaria, Thaliacea, and other groups.

   The histograms have been reorganized as suggested:

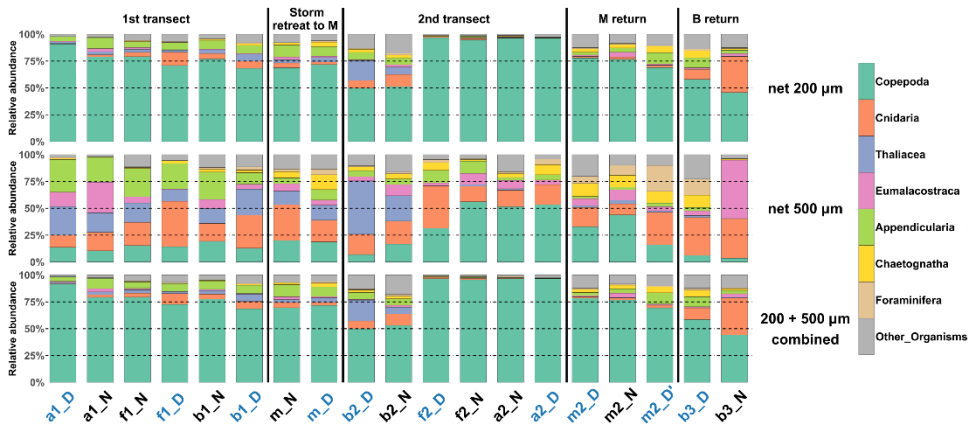


Figure 3

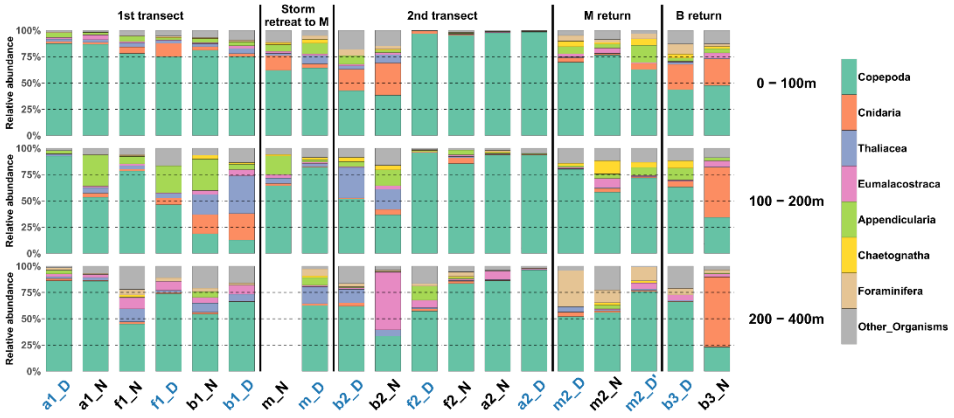


Figure 4

6. Figures 5, 9: Add letters (a, b, c) to distinguish the three panels clearly + add depth

   Letters and depth information have been added to the panels as suggested.

7. Figure 6: The bars are too small and hard to distinguish. Enlarge or adjust for better readability.

   Figure 6 has been redone using the same representation as Figures 3 and 4, as the original boxplot was not correct. Referee 2's comment :

   *"**Figure 6**: If there are only three samples per station (corresponding to depth layers), boxplots may not be appropriate (a boxplot summarises a data distribution with 5 values; if you have only 3, this does not make sense). Consider an alternative method of data representation if that is indeed the case.*

   Figure 6 has been replaced by a new version (see below). The boxplot in the first version used data from both nets (distinguishing 200 µm and 500 µm mesh, as in Figure 3). Since all results are now presented for the merged nets, the figure was replaced by one averaging the three depth layers and ordering stations chronologically, consistent with Figure 4. The previous figure was clearly not valid based on the merged data, and we thank the reviewer for pointing this out."

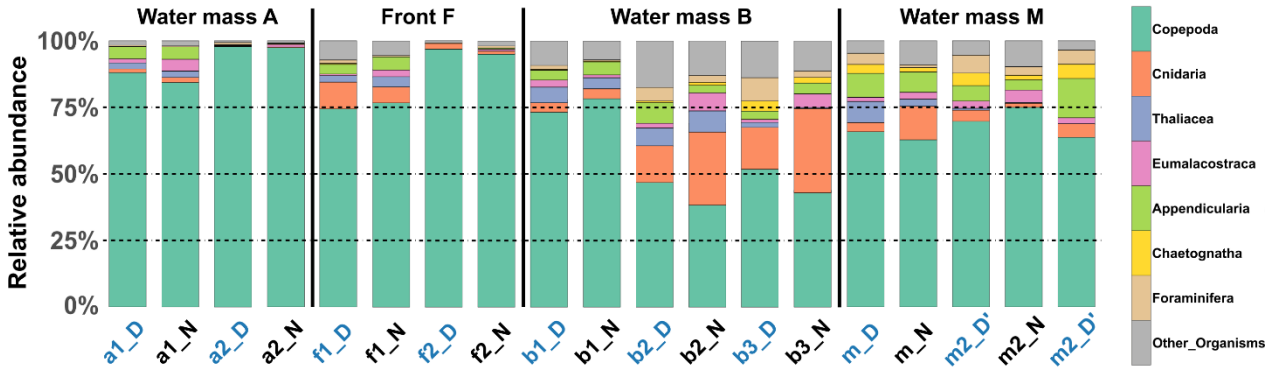


Figure 6

8. Figure 8: It should be removed (see my comments above on the trophic traits).

   Figure 8 has been removed, as suggested.

Discussion:

1. The Discussion is well-developed but could be strengthened with more detailed insights on the species-/genus-level distribution patterns of zooplankton, which would better elucidate adaptations to different water masses. Some structural improvements are necessary.

   We have revised the Discussion following your comments, as explained below. However, for the species-/genus-level analyses are not really possible, as explained previously in relation to the Ecotaxa classification.

2. Currently, there is unnecessary mixing of result interpretation and comparisons with previous studies (e.g., second paragraph of Section 4.1). These should be separated for clarity.

   We have revised the section to separate result interpretation from comparisons with previous studies.

3. A summary table comparing zooplankton abundance/biomass with prior studies in the region would be more effective than textual descriptions.

   A summary table has been added (see below) as suggested.

Campaign	Season	Region	Location	Concentration (ind/m³)	Biomass (mg DW/m³)	Depth range (m)
DEWEX 2013	Winter (February)	DCZ (A)	Near LION Station (42°04′ N, 4°38′ E)	200	5	0-250
		DCZ Periphery / Balearic (B)	North of Menorca Island	650	10	0-250
	Spring (April)	DCZ (A)	Near LION Station	4400	100	0-250
		DCZ Periphery / Balearic (B)	North of Menorca Island	2000	30	0-250
BioSWOT-Med	Late Spring (May)	Water mass A (Transect 1)	see Table 1	1848 ± 133	29 ± 4	0-200
		Water mass B (Transect 1)		881 ± 212	8 ± 3	0-200
		Front F (Transect 1)		615 ± 44	9 ± 2	0-200
		Water mass A (Transect 2)	see Table 1	745 ± 27	7 ± 2	0-200
		Water mass B (Transect 2)		333 ± 9	14 ± 3	0-200
		Front F (Transect 2)		983 ± 155	6 ± 1	0-200

4. The discussion on zooplankton biomass drivers at fronts (4.2) and the front's role as a mixing zone vs. distinct community boundary (4.3) should be merged and condensed to avoid redundancy.

   We acknowledge the reviewer's concern about redundancy. While sections 4.2 and 4.3 have not been merged, both have undergone a substantial reorganization and rewriting in order to improve clarity and reduce overlaps.

Further Comments:

5. Line 406**:** What explains the contrasting responses of Cnidaria/Foraminifera (positively influenced by the front) vs. Thaliacea (negatively affected)? An attempt of explanation is needed.

   Our potential hypotheses are as follows: In our observations, Cnidaria and Foraminifera mainly consisted of small organisms (e.g., Cnidaria were mostly ephyrae) with limited swimming capacity and a carnivorous trophic behavior on small prey. These organisms, and their prey, are likely favored by the accumulation of resources at the front. In contrast, Thaliacea were mostly individuals from salp chains, which display large-amplitude diel vertical migrations. These organisms may actively avoid some of the physical (e.g., turbulence) and trophic (e.g., high particle load) conditions typically observed at fronts.

6. Lines 414–415**:** The overly generic statement "These patterns likely result from interactions between species-specific behaviors and frontal dynamics" should be **r**ephrased with more precise reasoning (e.g., citing known behavioral or hydrographic drivers).

   This statement has been rephrased:

   'In other frontal studies, some taxa have been found more abundant than in adjacent waters (Molinero et al., 2008). Gastauer and Ohman (2024) similarly reported front-related increases in appendicularians, copepods, and rhizarians, underscoring that zooplankton community composition is shaped by species-specific responses. Biomass peaks also depend strongly on the taxa considered (Mangolte et al., 2023). However, in our analyses, we never focus on a single taxon, but rather on groups of organisms (Table 2) or on the whole sampled mesozooplankton.'

7. Lines 423–424: Is there a hypothesis for why certain taxa (Magelonidae, cyphonautes, echinoderm larvae, radiolarians, Heteronemertea) were absent at the front? If speculative, frame it as a question for future research.

   The apparent absence of some taxa (Magelonidae, cyphonautes, echinoderm larvae, radiolarians, Heteronemertea) at the front most likely reflects the limitations of semi-automatic identification in EcoTaxa rather than a true ecological pattern. Moreover, these taxa were extremely rare in the other water masses as well, with only a few individuals observed. This sentence has been then removed.

8. Section 4.5: The title "Storm Impact?" should be assertive (e.g., "Potential Storm Effects")

   In the revised version, the section originally entitled *"Storm Impact?"* has been removed. Instead, we created a broader section entitled *"Confounding factors affecting zooplankton structure"*, in which the potential influence of the storm as well as diel vertical migration are now addressed.

9. Line 461: Provide a reference for the chl a-fluorescence glider data

   A reference has been added: "A. Bosse, pers. comm."

General technical notes:

1. In Methods and Results, all verbs should be in the past tense, while some are now erroneously in the present tense.

   This has been corrected

2. In Methods and results, some taxonomic categories are given in Latin, while others are in English. Ensure uniformity throughout the manuscript (text, tables, figures).

   This has been corrected

3. Maintain consistency throughout the manuscript, always writing the acronyms (which should be made explicit only at the first citation).

   This has been corrected