ESSD-2025-207

Long-term plankton and environmental monitoring dataset from the Marine Protected Area of the Iroise

Laetitia Drago et al.

Answers in this document as well as modifications in the manuscript were done in blue.

Review N°1

This manuscript presents a valuable long-term dataset of phytoplankton (2010–2022) and zooplankton (2010–2023) collected across 15 stations in the Iroise Marine Natural Park, France's first marine protected area, located off the coast of Brittany. The biological data are complemented by temperature and salinity measurements.

While this long-term dataset is highly valuable, its full potential is underutilized in the manuscript presentation due to the coarse taxonomic resolution applied (Table 3). The zooplankton classifications- limited to phylum (e.g., Cnidaria, Chaetognatha), class (e.g., Copepoda, Appendicularia), or occasionally order (e.g., Decapoda) - represent a significant reduction compared to the original EcoTaxa classifications. I would like to read -in the manuscript- some comments about this aspect. As a side note, I believe ZooScan/Ecotaxa have greater potential for taxonomic identification than what is reflected in the available dataset (Drago et al., 2025), especially when trained by an expert taxonomist.

We thank you for this comment. The coarse taxonomic resolution listed in Table 3's "groups" column follows the approach used in a previous publication on this region using a subset of the data presented here (Benedetti et al., 2019). While this resolution does reduce the taxonomic richness of the dataset, it was applied only for Figures 6 and 7 to ensure readability and facilitate interpretation of long-term trends across major taxonomic groups. In Table 3, the order of the groups was reorganised following an alphabetical order, as in Benedetti et al. (2019).

The data published on SEANOE retains the full EcoTaxa taxonomic resolution in separate abundance and biovolume columns, allowing users flexibility in their analyses. People can either utilize the fine-scale taxonomic classifications directly or aggregate the data following Table 3's groupings depending on their study objectives. This approach maximizes the dataset's utility while maintaining the higher taxonomic resolution capabilities of the EcoTaxa system that you correctly highlight.

In summary, I find the article suitable for supporting publication of the associated dataset, provided the suggested revisions are implemented. The dataset itself is valuable, demonstrating good quality and utility. My detailed review of the zooplankton component confirms its completeness, though the current organization should be improved to enhance reusability (as noted in my comments on Section 7). While the study is well-designed and generally clearly

presented, several issues require attention to strengthen the manuscript for publication in ESSD.

We thank the reviewer for their review. We have addressed each comment point by point below. Our responses are in blue.

SPECIFIC COMMENTS

1. **Introduction**

This section provides a clear and well-structured background. I have suggested minor technical revisions in the corresponding section ("Technical Corrections").

A specific concern regards the i**maging approach (Line 51).** The claim that imaging methods allow for rapid processing of "large sample volumes" should be rephrased. A more accurate description would be that they enable "faster processing of more samples", which is distinct from handling larger individual volumes.

Thank you for your suggestion. We included this change in the text.

1. **Study site**

I find no issues with this section. Both the content and presentation are clear and well-structured.

1. **Material and Methods**

Some methodological clarifications are necessary. Please specify: (1) the criteria used for selecting sampling stations, and (2) the time required to complete all station sampling during each cruise.

(1) Criteria for sampling station selection: Transects were strategically chosen and positioned within water masses that are influenced by front dynamics when the front is established. Along each transect, sampling stations were positioned at regular intervals to ensure capture of multiple water masses, given that the front position varies.

(2) Sampling duration: Field sampling is conducted by two teams of four people each: one team covers the northern transect and one covers the southern transect. Each team consists of a boat pilot, one person for Niskin bottle operations and filtration, and two people for net operations. The complete sampling of all stations is typically accomplished within a single day, requiring approximately 10 hours of fieldwork from sample collection through sample fixation (excluding pre-cruise preparation and bottle preparation time).

Both of these points were clarified in part 3.1. Sampling:

“Transects were strategically chosen and positioned within water masses that are influenced by front dynamics when the front is established. Along each transect, sampling stations were

positioned at regular intervals to ensure capture of multiple water masses, given that the front position varies (Cadier et al., 2017b; Chevallier et al., 2014).”

“Field sampling was conducted by two teams of four people each: one team covering the northern transect and one covering the southern transect. All stations were sampled within a single day by the two teams, requiring approximately 10 hours from sample collection to fixation.”

The methodology for temperature measurements is unclear and contradictory. Lines 120–121 state that temperature was measured in water samples collected with Niskin bottles, stored in flasks, and analyzed on land—an unusual approach, as temperature is typically measured immediately onboard to prevent changes. However, Section 3.1.1 (line 127) mentions that temperature was measured using a WTW probe, with CTD sensors added in 2017 (line 129). This inconsistency is critical and requires thorough clarification.

Thank you for this comment. The IDHESA laboratory was used for nutrients and chlorophyll *a* measurements that were unfortunately not complete enough to be published in the dataset. Therefore, we removed the corresponding sentence in the data paper.

As for temperature, it was measured at sea using a WTW probe in the bottle before 2016. From 2016 onwards, a CTD was used to create a profile at each station. It has been clarified in the manuscript lines 146-151.

The phytoplankton sampling method is not described. Additionally, it is unclear whether the shift to sampling at 15 m depth in 2016 (lines 131–132) replaced: only the near-bottom sampling, or both the sub-surface and near-bottom sampling. This ambiguity needs resolution.

Thank you for pointing out the lack of information on the phytoplankton sampling. We added this to the text in section “3.1.2. Phytoplankton sampling”:

“For phytoplankton sampling, 250 mL of water was collected from the 5 L Niskin bottle and preserved in 250 mL transparent glass flasks with 1 mL of Lugol's solution and stored at ambient temperature in darkness.”

As for the shift to sampling at 15 m depth, here is a clarification with a table that was added to the manuscript at lines 150-151 :

Sampling	Before 2017	2017-2019	After 2019
Environment (Temperature, salinity)	With WTW probe	With CTD	
Phytoplankton (transect stations)	Subsurface and bottom sampling		Subsurface and 15 m depth sampling (chlorophyll *a* peak)
Phytoplankton	Subsurface sampling		

(coastal stations)	

The text was also modified accordingly at 153-161:

“For phytoplankton sampling, 250 mL of water was collected from the 5 L Niskin bottle and preserved in 250 mL transparent glass flasks with 1 mL of Lugol's solution and stored at ambient temperature in darkness. At coastal stations, it was sampled bi-monthly at sub-surface only.

For the transect stations (D1 through D6 and B1 through B7), phytoplankton was initially sampled at sub-surface and bottom depths before 2017 (see Table 2). Following the introduction of CTD profiling in 2017, vertical profiles from 2017-2018 revealed that at offshore stations (B5-B7 and D5-D6), the chlorophyll a maximum, when present, consistently occurred between 15-18 m depth. At coastal stations (up to 40 m deep), strong vertical mixing typically maintained a homogeneous water column with no deep chlorophyll maximum, though when present, it also occurred at approximately 15 m depth. Based on these observations, bottom sampling was discontinued in 2019 and replaced with sampling at 15 m depth to better capture phytoplankton biomass.”

There are inconsistencies regarding picoplankton analysis. The text states that "the employed methodology precluded identification and measurement of picophytoplankton" (line 166), yet Cyanobacteria (a picophytoplankton group) are later mentioned (lines 316, 320) and their abundances appear in Figures 4 and 5. This contradiction requires clarification (were Cyanobacteria quantified via a different method?).

We thank the reviewer for highlighting this apparent inconsistency, which we clarify as follows.

The terms "picophytoplankton" and "cyanobacteria" represent two classification systems that overlap only partially. Our methodology limitation stated in line 166 refers specifically to small picophytoplankton (organisms < 2 µm), which cannot be identified or quantified using standard optical microscopy and require specialized methods such as flow cytometry, pigment analysis, or molecular biology techniques.

However, the cyanobacteria identified and quantified in our study (mentioned in lines 316, 320 and shown in Figures 4 and 5) were large colonial and filamentous forms belonging to the Chroococcaceae and Oscillatoriaceae, Microcoleaceae (genus Trichodesmium) families. These organisms exceeded 100 µm in size (trichome length and colony diameter), placing them in the microphytoplankton size class rather than the picophytoplankton category. Consequently, they were readily identifiable and quantifiable using our standard optical microscopy methodology.

In summary: our methodology precluded analysis of small picophytoplankton (< 2 µm) but was fully adequate for the large cyanobacterial forms (> 100 µm) that we actually observed and reported.

We clarified this distinction in the revised manuscript to avoid future confusion lines 194-197:

“Indeed, due to their size, the cyanobacteria identified in this study were large colonial and filamentous forms (> 100 µm) from the Oscillatoriaceae, Microcoleaceae (genus Trichodesmium), and Chroococcaceae families, and hence belonging to the microphytoplankton size class.”

For zooplankton collection, two key methodological details are missing: 1) was the deployed cable angle accounted for to accurately determine the sampled water layer height? 2) was the net thoroughly rinsed after retrieval to ensure all organisms were collected and none remained trapped in the mesh? These procedural details are essential for reproducibility and data reliability.

1) Thank you for pointing out this element which was unclear. We modified this part of the text (see lines 176-178) by saying that the net was always equipped by a flowmeter and that in case of malfunction, “*the filtered volume was estimated by multiplying the net's mouth area by the length of cable deployed and it was flagged in the sample_comment column of the corresponding EcoTaxa table*”.
2) This point was also clarified in the text (see lines 179-182) : “*After initial rinsing, the cod-end tap was opened and the sample was collected in a 25 cm diameter sieve with 200 µm mesh. The tap was then closed, the net was rinsed again, and the tap reopened to collect any remaining organisms in the sieve. This rinsing and collection procedure was repeated 2-3 times depending on sample density to ensure complete organism recovery.”*

In zooplankton digitalization and identification, some details are missing:

-How many analysts processed the zooplankton samples? Were inter-calibration exercises conducted to ensure consistency, given potential operator bias during the sample fractionation and handling?

Here is the list of analysts who processed the samples:

Operator’s first name and last name	Total number of scans	Proportion (%)
Solene Motreuil	339	27.0
Lucas Courchet	338	27.8
Juliette Maury	120	9.9
Laëtitia Jalabert	102	8.4
Corinne Desnos	93	7.6
Louis Caray-Counil	89	7.3
Camille Merland	68	5.6

Olivier Bun	24	2
Anthea Bourhis	20	1.6
Hugo Berrenger	10	0.8
Andrea Freire	8	0.7
Emmanuelle Martins	4	0.3
Dodji Soviadan	2	0.2

Based on our records, summarised in this table, 13 analysts processed the zooplankton samples across the study period. They were all trained by Laëtitia Jalabert following the same protocol (see Jalabert 2024, https://doi.org/10.5281/zenodo.13949803).

While formal inter-calibration exercises were not conducted, several quality control measures ensured consistency:

(1) systematic taxonomic validation by Laëtitia throughout the study period, with consistency achieved at the taxonomic group level. For the time period from 2018, she did a supplementary retro validation. However, taxonomic expertise increased across the early projects (pre-2018), and the lowest-level Ecotaxa categories may not be mutually exclusive for samples processed before 2018;

(2) standardized processing protocols at the PIQv platform following strict quality control procedures (see Jalabert 2024, https://doi.org/10.5281/zenodo.13949803), with automated quality control implemented from 2018 onwards;

(3) mandatory adherence to platform-specific protocols by all operators.

While we acknowledge that some taxonomic uncertainty may persist at finer classification levels, particularly for pre-2018 samples, the combination of standardized protocols, systematic validation procedures, and platform-specific quality controls (enhanced from 2018) provides confidence in the overall data consistency and reliability across all operators involved in sample processing at least for the group level.

We added this to the text lines 305-310 in the Data Quality Control section to clarify this point:

“While all identifications have been reviewed by at least one human operator, we cannot fully guarantee the correctness of each of the >655k identifications. Some taxonomic uncertainty may persist at finer classification levels, particularly for samples processed before 2018 when taxonomic expertise was fully standardized across operators. However, standardized protocols and systematic validation procedures established during the study period provide confidence in data consistency at the taxonomic group level.”

-Approximately how many organisms were analyzed per scanned sample?

On average, per scan, there were 1.152 ± 1.030 (mean ± sd) elements (living and not living combined) for the large fraction (organisms exceeding 1 mm) and 2.160 ± 1.581 elements for the small one (organisms smaller than 1 mm), which corresponded to an average per scan of 545 ± 513 living objects for the large fraction and 1.337 ± 1.107 living objects for the small fraction.

This precision was added to the article section “3.2.3. Zooplankton image processing”

-How were overlapping structures (e.g., copepod antennules) resolved during digitization?

Thank you for pointing out this element that needed clarification in the text.

We added this at lines 218-221:

”To minimize measurement bias from overlapping objects, each subsample underwent manual separation of touching organisms and detritus particles on the scanning tray prior to imaging. These "multiple" images, which can affect abundance and biovolume estimates, were manually separated as recommended in (Vandromme et al., 2012) following the protocol detailed in Jalabert et al. (2024).”

I have a general concern regarding taxonomic resolution: why are large, distinct copepods (e.g., the Pontellidae female in Fig. 3A) only identified to the order Calanoida? Higher resolution seems feasible, since Pontellidae (as well as other calanoid families) are reported in the zooplankton dataset (Drago et al., 2025).

Thank you for pointing out this error. The image was replaced in Figure 3.

While Pontellidae are indeed classified in our dataset in their own category, this particular example was incorrectly selected. These organisms are primarily surface dwellers and rarely encountered in our vertical net samples.

Our dataset provides taxonomic classifications at the finest level possible for each organism, with more detailed identifications when morphological features allow, and broader categories when needed, following approaches similar to Benedetti et al. (2019).

The review/validation of classified images was only applied to samples from 2018 onwards (lines 200–204, 256–259). What quality assurance measures were in place for pre-2018 data? This gap risks inconsistencies in the long-term dataset.

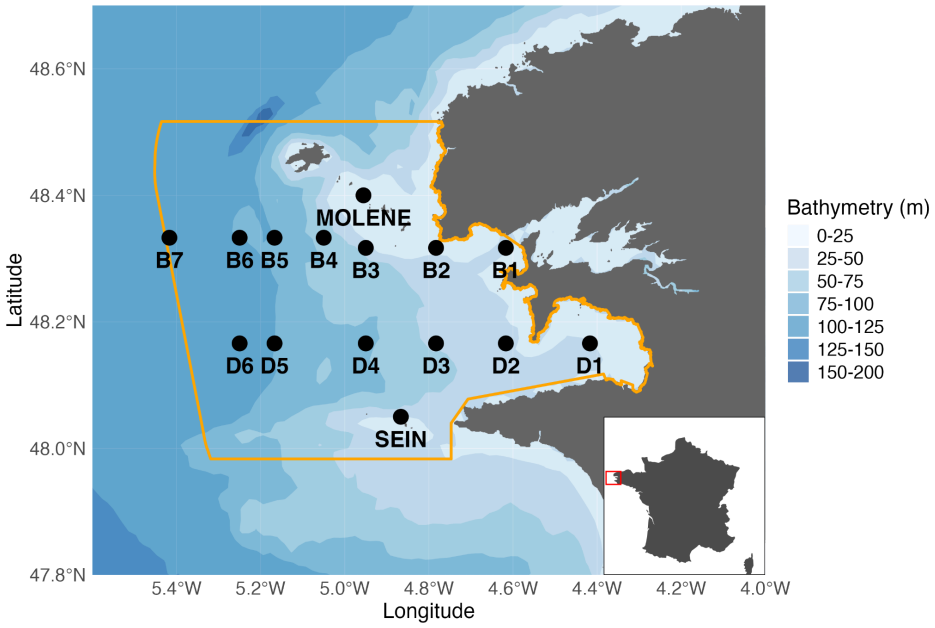
For pre-2018 samples, classification was performed by trained personnel following the same standardized protocols detailed in Jalabert et al. (2024), though without the systematic retro-validation implemented for samples dating from 2018 onwards. While we considered retrospective validation of earlier samples, this was not feasible due to funding constraints that prioritized processing of ongoing continuous samples.

However, we can ensure consistency at the major taxonomic group level throughout the entire dataset. Large, morphologically distinct groups (e.g., copepods, salps, appendicularians) maintain reliable separation across all years, as misclassification between these major categories is highly unlikely given their very distinct morphological characteristics. The potential for classification inconsistencies primarily concerns finer taxonomic resolution within groups (e.g. small copepods, rare taxonomic groups) rather than between major taxonomic categories.

Rather than viewing this as an inconsistency, the data can be utilized appropriately according to different analytical approaches: (1) when aggregated to major taxonomic groups, the data provide reliable relative abundance estimates across the entire time series; and (2) when including finer taxonomic categories (child categories of major groups), the pre-2018 data can be used for occurrence/presence-absence analyses rather than quantitative abundance comparisons. This tiered approach allows for robust long-term trend analysis while acknowledging the enhanced precision available in post-2018 samples.

Figure 1 would benefit from an accurate revision. The map should be enhanced by 1) clear delineation of the boundaries of the Iroise MPA, 2) improved visibility of isobaths to better relate station positions to bathymetry, 3) inclusion of station B7 (mentioned in line 101 and figure caption), 4) accurate representation that transect B extends further north than transect D (line 102). Moreover, the background of temperature data should be removed as it represents results rather than methods, and the two 2016 snapshots are not representative for a long-term study.

We thank you for your suggestions and recommendations. We replaced Figure 1 with this one that highlights the zone better.



1. **Database structure and analysis**

In this section (lines 265-294), the phytoplankton dataset should be presented as the first one, before zooplankton (second dataset), like it is presented in the methodological section and in sections 5.2 and 5.3.

Thank you for pointing this out. The order was changed in the text.

For phytoplankton, the unit should be “cells/L”, not “individuals/L” (line 289 and somewhere else).

Yes, you are right. That was also corrected.

Phytoplankton cell concentration was considered for the surface and bottom abundance (lines 289, 290). What about the samples collected only at 15 m depth since 2016 (see line 132)?

Thank you for pointing that out. You are correct. As detailed in the new Table 2 added to the paper and explained in the text (see modifications presented with the Table pages 3-4 of this document), phytoplankton sampling strategy evolved based on CTD profiling results. From 2019 onwards, bottom sampling was replaced with sampling at 15 m depth at all transect stations, as this depth consistently captured the chlorophyll a maximum when present.

Therefore, for the period 2019-2023, phytoplankton cell concentrations represent surface and 15 m depth samples rather than surface and bottom samples. To reflect this change in sampling strategy, we have added temperature and salinity measurements at 15 m depth to the data published on SEANOE, providing environmental context for the 15 m phytoplankton samples. Because of that, we also added a disclaimer to the SEANOE page advising users to associate phytoplankton abundances from 2019 onwards with temperature and salinity at 15 m depth rather than with bottom depth data. Temperature and salinity are now provided at three depths (surface, 15 m, and bottom) in separate columns. We retained the bottom temperature and salinity measurements as they remain valuable indicators for characterizing the water column structure.

This sampling adjustment was implemented to better capture phytoplankton biomass distribution based on the consistent observation that the deep chlorophyll maximum, when present, occurred between 15-18 m depth at both offshore and coastal stations.

The description of the data in the section “5.1. Database structure” was also modified accordingly.

1. **Concluding remarks**

It should be explained which were the “conditions” that were recorded to decrease in small pelagic fish (line 360).

The term “condition” was replaced by “stored energy” to clarify the sentence.

Are there planktonic data in the Iroise Sea outside the MPA or in other Atlantic European MPAs that can be compared with the present dataset?

Within the Iroise Sea, no comparable multi-station planktonic datasets exist outside the one that we're presenting in this paper. Other coastal monitoring programs (SOMLIT for chlorophyll a, REPHY for toxic phytoplankton) provide limited single-point data but lack the spatial coverage for meaningful comparison.

Regarding regional Atlantic European datasets, several surveys offer potential for broader comparison, though with varying degrees of methodological compatibility. We added this to the text (see lines 423-435):

"*While no comparable pluriannual multi-station planktonic datasets exist within the Iroise Marine Natural Park, other french coastal monitoring programs (e.g., SOMLIT for chlorophyll a (Goberville et al., 2010; Savoye et al., 2024), REPHY for toxic phytoplankton (Chenouf et al., 2022)) provide only limited single-point data lacking spatial coverage for meaningful comparison.*

Yet, several regional surveys offer potential for broader comparative analyses: the PELGAS survey (Bay of Biscay, 2006–2015) primarily focused on small pelagic fish, also provides phytoplankton data, vertically integrated chlorophyll-a biomass (Doray et al., 2018), and microphytoplankton taxonomic composition (Houliez et al., 2021). For zooplankton, the same sampling and scanning methodology was used, providing vertically integrated mesozooplankton biomass (Doray et al., 2018), as well as the complete dataset (Grandremy et al., 2024).

EVOHE surveys (Bay of Biscay, since 1987) provide autumn data on phyto- and microzooplankton taxonomy and abundance, as well as mesozooplankton taxonomy and size-class biomass (see https://sextant.ifremer.fr/record/709a4b9f-557e-46cb-9af2-d1453b491f98/). The PELTIC program (English Channel, Celtic Sea, and Bristol Channel, 2012-2023) could also provide comparative phytoplankton abundance data but is similarly limited seasonally (Cefas, 2024).

These comparisons underscore the importance and uniqueness of the comprehensive PNMI dataset presented here."

These datasets provide valuable opportunities for large-scale comparative studies and investigations of plankton dynamics in other MPAs, although the broad taxonomic classification may restrict some functional trait-based analyses (e.g., to size and biovolume structure).

We thank the reviewer for this comment. However, we would like to clarify that functional trait-based analyses of ZooScan data can be effectively conducted using morphological measurements at the individual level (as demonstrated in Perhirin et al. 2024, https://onlinelibrary.wiley.com/doi/10.1111/1755-0998.13907), and these analyses are actually independent of taxonomic resolution. The morphological measurements were not published in this dataset since they are already accessible on the Ecotaxa projects listed in Supplementary Table 3 for users who need them.

1. **Data availability** (Plankton datasets)

The plankton abundance data are reported with inconsistent decimal precision (1–6 decimal places for zooplankton –file .csv; 0-3 decimal places for phytoplankton – file .csv). Consistency would improve clarity.

The taxon listing in the zooplankton dataset seems disorganized without a clear logical structure. For better usability, the taxa should be organized taxonomically (from Ctenophora to Tunicata), presenting species/genera/families in alphabetical order within their respective group (e.g., within copepods, or cladocera, or tunicates, etc….).

Thank you for pointing that out. We have addressed both concerns in the revised dataset:

- Decimal precision: We standardized decimal precision to 3 decimal places for both zooplankton and phytoplankton abundance data to ensure consistency across the dataset.
- Taxonomic organization: We reorganized the taxon columns following an alphabetical structure: major taxonomic groups are arranged alphabetically, and within each major group, taxa are also listed alphabetically. This organization follows the same structure used in EcoTaxa, facilitating data interpretation for users who may not specialize in fine taxonomic classification.

TECHNICAL CORRECTIONS

1. **Introduction**

The assertion in the first sentence is a well-documented and widely accepted knowledge in biological oceanography, so it does not need citation support. Moreover, the reference ‘Grigoratou’ (cited as ‘in press’ on line 33) is missing from the References section and thus inaccessible to readers.

Thank you for noticing this. This article has now been published and we added the reference to the References section as (Grigoratou et al., 2025)

L 35- Suggested change: ….this carbon passively through the sinking of molts, carcasses and fecal pellets, and actively through diel vertical migration…..

Done.

L36- Suggested change: At the base of aquatic…

Done.

L37- Suggested change: ….(e.g., Chavez…..

Done.

L43- Suggested change: …into plankton dynamics across…

Done.

L52,53- Remove repetition: “traditional taxonomic identification and novel trait-based analyses (Irisson et al., 2022; Orenstein et al., 2022).” is already said on line 48.

Done.

1. **Material and Methods**

L106- The three coastal stations should be named here and Fig 1 should be cited.

Done.

L109- It should be clarified what does it mean that two stations (Douarnenez and D1) were “treater together”.

Done.

L124, 125- “is” must be replaced by “was”.

Done.

L125- it must be clarified which depth is considered “subsurface”.

Done.

L127-129, 207- Temperature should be always mentioned before salinity for coherence.

Done.

L131- Suggested change: At the transect stations….

Done.

L132- Suggested change: At costal stations…

Done. (“*At coastal stations…*”)

L133- Clarification: specify if the glass of the flask was dark.

We added in the text (see lines 153-154) that the flasks were transparent. They were then “*stored at ambient temperature in darkness*”.

L133-135- Suggested change: The present dataset comprises 785 phytoplankton samples in total (Fig. 2). Their number varied annually……..conditions. The sampling effort increased notably from 2010 until a peak of 97 samples in 2017 and then gradually decreased to about 50 samples in 2022.

Thank you for this clarified version of this paragraph. It was modified in the text (see lines 162-165).

L149- Suggested change: ….57 cm mouth diameter…

Done.

L150- Suggested change:…was deployed vertically to a maximum depth……

We added some precision to this sentence that is now "*At the sampling site, the WP2 net was deployed as vertically as possible to a maximum depth of 5 m above the sediment. However, the dynamic sea conditions in this area usually resulted in the cable forming a small angle.*" (see lines 174-175)

L154- The "1:3 sample-to-formaldehyde ratio" here reported is wrong. It should be the opposite, i.e., 1:3 formaldehyde-to-sample ratio.

There was indeed an error in this sentence. Thank you for spotting it. We modified the sentence that is now "T*he collected zooplanktonic organisms were transferred into a 250 ml double-sealed polypropylene flask and preserved by adding buffered formaldehyde in a 2:1 formaldehyde-to-sample ratio to achieve a final concentration of 4%.*" (see lines 182-184)

L154- a verb is missing: The annual number of zooplankton samples *ranged* from …

Done.

L155- It should be explained what exactly means "reflecting variations in sampling strategy".

We changed this part of the sentence to "*reflecting variations in sampling frequency due to weather conditions"* (see line X-X) to clarify things.

L159- Remove "then"

Done.

L166- "measurements" should be replaced by "counts".

Done.

L173- Suggested change: sieving the samples through a 1000 µm mesh….

Done.

L179, 180- This info is already given on line 168. Repetitions should be removed.

Done.

L196- Remove: (J) Centropagidae

Done.

L197- Instead of “Podon”, this category should be better named Podonidae, because both *Podon* and *Pleopis* may occur in coastal zooplankton samples and their images are not easily distinguishable.

We thank you for this comment. “Podon” and “Evadne” were grouped in “Podonidae” at the Ecotaxa level. Their group remains “Branchiopoda” as modified in Table 3. We also modified the SEANOE dataset that now contains the columns "conc_Podonidae", "total_biov_Podonidae" and "mean_biov_Podonidae". Figure 3 was also modified accordingly with the 20th group entering the top 20 being Hydrozoa.

1. **Data quality control**

This section compiles information that has already been discussed in previous sections.

For example, on lines 252-254 (already on lines 159-161) and on lines 256-259 (already on lines 200-204). Repetitions should be removed.

Thank you for your comment.

We removed “*Phytoplanktonic organisms were counted under a microscope by Beatriz Beker, who is a specialized phytoplankton taxonomist from the French network RESOMAR (Réseau des Stations et Observatoires Marins). She has been consistently performing these analyses from 2010 to present.*” line 159-161 to only keep this information in the data quality control section.

We also removed “*For samples collected between 2018 and 2023, experts from the PIQv reviewed and validated the classified objects, making corrections where necessary, serving as a strong quality assurance indicator. This validation process ensured taxonomic homogenization across projects during these years. This dual approach - combining efficient computational methods with expert biological knowledge - optimizes the balance between processing speed and taxonomic precision. It allows for the reliable analysis of large-scale plankton datasets while maintaining high standards of scientific rigor.*” that was on lines 200-204. The last two sentences were added to the end of the data quality control section.

1. **Database structure and analysis**

L296, 297- Suggested change: Figure 4 shows the mean annual phytoplankton abundances across the sampling area, highlighting the remarkable temporal and spatial variability throughout the study period. .

Done.

L298- Suggested change: ….and 2022 in transect B, with ….

Done.

L299- Suggested change: In transect D, remarkable abundance…..

Done.

L312, 313- Suggested change: In surface waters, the phytoplankton composition showed interannual and spatial variations along both transects.

Done.

L318- Suggested change:…coast-offshore gradient.

Done.

L344- Suggested change: …at offshore stations…

Done.

1. **Concluding remarks**

L365- Suggested change: …health in the Iroise Marine Natural Park. Beyond its ecological significance, this MPA and the Iroise Sea hold particular…..

Done.

Figure 2- In my opinion the last sentence is not appropriate in a figure caption, and it should be moved to the concluding section.

Thank you for the suggestion. We removed this sentence and added this one instead in the concluding remarks *"Publishing comprehensive long-term datasets in open access formats demonstrates their scientific value to funding agencies and supports the continuation of costly but essential ecological monitoring programs."* (see lines 451-453)

Figure 4- "Transect B" and "Transect D" should be indicated on the upper and lower panels, respectively

We thank the reviewer for this suggestion. The transect information is detailed in the figure caption, which specifies that "*the upper panel displays the B transect (B1-B7) and the Molène coastal station, while the lower panel shows the D transect (D1-D6) and the Sein coastal station*." We believe this provides clear identification of the transects for readers. To maintain visual clarity and avoid potential clutter on the panels, we have opted to retain the current format with the transect information in the caption.

Figure 5- L324-326 (Each stacked bar….at that station) provide a redundant info with respect to line 324.

We thank you for this comment and have removed the sentence "*The figure shows the proportional composition based on total abundance of phytoplankton at each station*".

Table 3- Commas for decimals in the "%" column should be replaced by points.

Thank you for spotting this. The commas were replaced by points in the table.

Why some "annotation categories" are not considered in the "groups" column"? It seems that "nauplii<Crustacea", "megalopa<Brachiura, "Ostracoda", "Cirirpedia" - just to mention some categories as example- have not been included in the groups considered for the present dataset. If this is not the case, the names should be repeated in the "groups" column.

As mentioned above, these annotation categories were not included in the 'groups' column because we followed the taxonomic grouping scheme established by Benedetti et al. (2019) to ensure future comparisons with this previous study. However, users are welcome to modify the grouping of EcoTaxa annotations according to their specific research needs.

It should be said in the caption that the groups are listed in decreasing number of images

This was added to Table 3 description see line 276-279.

References

The following references seem incomplete. In some cases, the link should be provided.

Berthou et al, 2010

Chamberlain and Vanhoorne 2023

Duhamel et al., 2011

Picheral et al 2017

Thank you for noticing these elements. We modified the references list accordingly.

The key figure is well-designed, but station B7 (referenced in the text and included in Supplementary Table 1) is missing. Additionally, I recommend centering the inset map of France more effectively by shifting it slightly to the right, ensuring the full study area boundary is visible.

Thank you for the suggestion. The map of France was moved to the bottom right of the figure to allow more visibility of the study area.

Supplementary Table 1

The legend for the orange and green colors used to highlight rows requires clarification. The term “classification” is ambiguous—does it refer to “taxonomic identification”? If so, this should be explicitly stated, as it is critical for dataset quality and reusability. Additionally, the specific inconsistency in classification (e.g., whether species were grouped at genus level, genera at family level, etc.) during some years should be clearly explained. For example, does orange indicate years where identifications were resolved only to higher taxonomic levels?

You are correct that 'classification' is ambiguous. We used this term as it is standard in machine learning, but we could have specified 'taxonomic identification' for clarity.

Orange was therefore changed as “Orange: The taxonomic classification is not homogeneous between years and projects.”

Green was changed as “Green: The taxonomic classification is homogeneous between years and projects.”

Importantly, we did not group taxa differently across years. The taxonomic resolution and identification criteria remained homogeneous throughout the study period, with the difference being the level of validation applied (systematic retro-validation from 2018 onwards versus the original validation protocols for pre-2018 samples) as explained above and in the manuscript (lines 305-310) .

If the same color scheme applies to the “coastal station sampling plan”, the legend should also be included in the second sheet of the file.

The legend also applies to the second sheet of the file and was added to it.

Lastly, in the table caption, “Colored colors” should be corrected to “Colored cells”.

That was also modified. Thank you for spotting it.

Supplementary Table 2

The profiles of turbidity, oxygen, fluorescence reported in this table are not mentioned in the text.

Indeed, they were very sparse and so we decided to not include them in the published dataset. We removed this mention in the text.

Supplementary Table 3

The Ecotaxa ID and the names of the projects would be more useful if accompanied by links that give access to the projects.

Thank you for the suggestion. A column containing the links for each project was added to this table.

Additional comments to the editor and the reviewers:

In this revised version of the document, we have also made the following changes.

- We noticed an inconsistency in the legend colors between figure 6 (Decapoda in green) and 7 (Decapoda in brown) and corrected it.
- The number “832,830” presented at line 221 did not correspond to “individual images of zooplankton organisms” but to the total number of images before the extraction of zooplankton images. After removing artefacts, 655,930 images of zooplankton organisms remain. The number was changed and a precision was added see lines 256-258: “*resulting in a dataset containing a total of 655,930 individual images of zooplankton organisms after removing artifacts and non-target objects (e.g. parts of organisms, seaweed)*.”
- While reviewing the identification protocol, we found an imprecision in the description. Beatriz Baker performed the phytoplanktonic identification of all transect samples. For the coastal station, another taxonomist (Sylvain Coulon) conducted the identification of samples acquired between 2010 and 2018, identifying 241 of the 336 coastal samples in the dataset. This information was conveyed in the text in lines 291-294 with the following sentence:
  “*For coastal station samples, another taxonomist (Sylvain Coulon) conducted identifications for samples from Douarnenez (2013-2018), Sein (2013-2020), and Molene (2013-2017), representing 241 of 336 coastal samples, using the same taxonomic reference list as Béatriz Beker, while Béatriz Beker identified the remaining coastal samples.*”. We also modified the introduction line 73 with “*conducted by two taxonomists*”. His name was also added to the acknowledgments “We also thank Sylvain Coulon for his valuable contribution to phytoplankton identifications for coastal stations.”
- While rerunning the codes following your review, we identified an error in the zooplankton data processing that slightly altered the ranking order of taxa without

affecting the proportional distribution of the data or the top 20 most abundant taxa. Table 4 and Figure 3 have been updated accordingly.

- We modified the names of the sections 3.2.2 from “3.2.2. Zooplankton digitization and identification” to ““3.2.2. Zooplankton digitization” and 3.2.3 from “3.2.3. Zooplankton image processing” to “3.2.3. Zooplankton image processing and identification” which corresponds better to the content of each section.

Review N°2

This manuscript presents long-term phytoplankton and zooplankton monitoring data, with the associated environmental parameters, from the Iroise Marine Natural Park, Iroise Sea, a place of cultural and economic importance to France’s sardine fishery. These datasets were collected to support current and future studies into plankton community dynamics and biodiversity patterns in the Iroise Sea.

While useful, this manuscript could be strengthened by improving on the taxonomic resolution of the identifications or an explanation of the reasoning behind the current resolution. Additional information could be provided to support some of the statements by the authors in regards to the background and importance of the area and the research conducted. Better connections could be built between the Introduction and Concluding Remarks to more comprehensively connect the paper together. Greater detail into the QA/QC procedures could be included, ffas well. Lastly, the Figure captions could be improved by removing some parts and unifying the text of others.

In conclusion, I find the manuscript suitable for publication with the associated datasets, if the following issues are addressed prior to publication.

We thank the reviewer for these constructive comments and suggestions for improvement.

Regarding taxonomic resolution, the coarse resolution in Table 3 and Figures 6-7 follows the one used by Benedetti et al. (2019) for comparison and for visualization purposes only. Indeed, the full EcoTaxa taxonomic resolution is preserved in the published SEANOE dataset, allowing users flexibility to work at the finest taxonomic level or at any aggregated level, as needed.

Regarding background and importance, we appreciate this suggestion and have strengthened the Introduction by adding more specific information about the ecological significance of the Iroise Sea and its role in the regional marine ecosystem. We moved the suggested sentences from the Concluding remarks to the study site presentation.

Regarding QA/QC procedures, we have expanded the Quality Control section to provide more detailed information about our validation procedures. This includes the systematic taxonomic validation process, the inter-operator consistency checks, and the enhanced quality control measures that have been in place since 2018.

Regarding figure captions, we have revised all figure captions following your recommendations.

Specific comments:

1. **Introduction**

Minor revisions suggested in “Technical Corrections” section.

Thank you, we have made the necessary modifications following your recommendations.

2. Study site

This section could be re-written to more clearly explain the scientific importance of the site. See “Technical Corrections”.

Thank you, we have made the necessary modifications following your recommendations.

3. Material and Methods

Line 113, Figure 1 caption: Not sure why the temperature data is included on these figures for the specific days. Differences between spring and summer? If it is relevant, it could be better explained why. Since the addition of temperature data represents only specific days, it is probably better removed.

We thank the reviewer for this comment. We have removed the temperature background data and replaced the figure with a single, clearer figure that better displays bathymetry information as well as the boundaries of the marine park.

Lines 120-121: “Samples were promptly divided into flasks and delivered to IDHESA laboratory (Brest site accreditation no. 1-1827 and Quimper site accreditation no. 1-1828) for analysis of temperature and salinity.”

Temperature was not measured immediately?

We thank the reviewer for this clarification request. Temperature was indeed measured immediately at sea, not in the laboratory. Before 2016, temperature was measured directly in the sampling bottle using a WTW probe. From 2016 onwards, temperature profiles were obtained using a CTD at each station. We have clarified this in the manuscript to avoid confusion lines 145-148, as well as with the addition of Table 2.

Line 164-165: “Taxonomic identification was performed to the lowest feasible level, …”

The data as presented in the manuscript shows only phylum-level. Why?

We thank the reviewer for this important clarification. The phytoplanktonic taxonomic identification in the dataset was indeed performed to the lowest feasible level (species/genus when possible). The phylum-level groupings shown in the manuscript figures were used solely for readability and visualization purposes. The full, fine-scale taxonomic resolution is preserved and available in the published dataset on SEANOE, allowing users to access the detailed taxonomic classifications or aggregate them as needed for their analyses.

To clarify this point, we added this sentence lines 197-199:

“The dataset provided on SEANOE (see Data availability section) contains the lowest identification level. For readability and visualization purposes, we decided to present phytoplankton data regrouped at the phylum level and zooplankton at a coarser level compared to the Ecotaxa definition.”

4. Data quality control

Lines 244-259: This whole section seems repetitive of previous information given.

We thank the reviewer for this observation. We have modified this section by consolidating all quality control related information here in order to reduce repetitions throughout the manuscript.

6. Concluding remarks

Information from here could be used earlier. Minor revisions suggested in “Technical Corrections” section.

Thank you, we have made the necessary modifications following your recommendations.

Technical corrections:

Line 33: “… marine and freshwater ecosystems (Grigoratou, in press).”

Please update the reference now that this article is published.

Grigoratou, M., Menden-Deuer, S., McQuatters-Gollop, A., Arhonditsis, G., Artigas, L. F., Ayata, S.-D., Bedikoğlu, D., Beisner, B., Chen, B., Davies, C., Diarra, L., Elegbeleye, O., Everett, J., Garcia, T., Gentleman, W., Gonçalves, R., Guy-Haim, T., Halfter, S., and Hinners, J.: The immeasurable value of plankton to humanity, BioScience, biaf049, https://doi.org/10.1093/biosci/biaf049, 2025.

Thank you, it has been done.

Line 34: (Simon et al., 2008).

Is there a more recent reference?

Thank you for this comment, we replaced this reference by more recent ones (Iversen, 2023; Siegel et al., 2023).

Line 38: "… with substantial economic implications."
Please mention one or two of these implications.

We thank you for highlighting this needed precision and enriched this sentence with examples of implications lines 36-40:

"At the base of the aquatic food webs (Ikeda, 1985), these organisms sustain diverse marine life, from marine mammals, birds and fish (Chavez et al., 2008; Frederiksen et al., 2006), with substantial socio-economic implications as water quality indicators (Suthers et al., 2019) and as food source for fisheries (Lehodey et al., 2006; van der Lingen et al., 2006), but also potential negative impacts on aquaculture, human health and activities during harmful bloom events (Griffith and Gobler, 2020)."

Line 49: "… providing unprecedented views into the diversity and distribution of zooplankton and phytoplankton."

Add a line about what the diversity and distribution of plankton can tell us.

We thank you for this comment and have added this in lines XX-XX:

"These diversity and distribution patterns reveal how plankton communities respond to environmental changes and drive ecosystem processes. As Essential Ocean and Climate Variables, plankton provide critical insights into food web dynamics, carbon cycling efficiency, and ecosystem health (Grigoratou et al., 2025; Miloslavich et al., 2018)."

Line 59: "… significant challenges remain …"

Provide an example(s) of the challenges.

Thank you for your comment. We modified the sentence to clarify this point:

"Despite these technological advances, significant challenges remain in making plankton datasets widely accessible and useful for the broader scientific community, particularly given the substantial costs and human resources involved in marine sampling campaigns, including varying detection capabilities across instruments and lack of standardized data formats across platforms, and insufficient metadata documentation."

Line 77-79: “The MPA’s monitoring activities align with two major European directives: the Water Framework Directive (WFD/DCE) for coastal waters and the Marine Strategy Framework Directive (MSFD/DCSMM) which aims to achieve Good Environmental Status of marine waters.”

Please reference the policy instruments.

We added the policy number of the directives as well as a sentence to clarify the implications of these directives lines 83-90:

“The MPA’s monitoring activities align with two major European directives: the Water Framework Directive (WFD/DCE, 2000/60/CE, https://eur-lex.europa.eu/eli/dir/2000/60/oj) for coastal waters and the Marine Strategy Framework Directive (MSFD/DCSMM, 2008/56/CE, https://eur-lex.europa.eu/eli/dir/2008/56/oj) which aims to achieve Good Environmental Status of marine waters. In the context of the Iroise Marine Natural Park (IMPN), this translates into a regulatory framework requiring high levels of protection with regulated activities. Implementation includes governance actions such as the management council providing guidance on agricultural activities that may impact eutrophication and initiatives to enhance the purifying role of coastal wetlands.”

Line 81-83: “Their monitoring is particularly relevant for MPAs like the Iroise Marine Natural Park, as the rapid responses of these organisms to environmental changes can serve as early warning signals of ecosystem shifts.”

How are the early warning signals relevant to the Iroise Marine Natural Park in particular? As the sentence is written, the first half of the sentence and second half don't relate.

We have clarified this sentence to better connect the two parts lines 92-94:

“Monitoring planktonic communities is particularly relevant for MPAs like the Iroise Marine Natural Park, as their rapid responses to environmental changes provide early warning signals of ecosystem shifts, such as harmful algal blooms, that are crucial for adaptive management strategies.”

Line 83: “It is also particularly relevant for fisheries …”

How fisheries relate to the MPA could be more clearly explained.

By moving the three sentences previously located at lines 90-94 earlier in the paragraph (see below), we believe this point has been made clearer.

“*As a result, the Iroise Sea also holds significant economic and cultural importance for France's sardine fishery. A substantial portion of France's sardine catches come from this region and adjacent waters, with the port of Douarnenez serving as a historic sardine fishing hub and*

exemplifying a traditional sardine fishing community (Le Floc'h et al., 2020). Beyond its ecological and conservation value, this economic and cultural heritage contributed to the creation of the Iroise Marine Natural Park as the first Marine Protected Area in France."

Line 85: "The Iroise area also serves as a natural laboratory …" for what?

We modified this sentence to make it clearer, see line 103-104:

"*The Iroise area also serves as a natural laboratory for studying planktonic community responses to climate change and understanding connections between lower trophic levels and fisheries*."

Line 90-94: Moving these two sentences earlier in the paragraph would answer earlier questions.

Done.

Lines 81-94 could be re-written for clarity and taking into account the comments made in the Concluding Remarks.

Thank you. We took into account your comments and rewrote this part of the manuscript following your recommendations:

"*Their monitoring is particularly relevant for MPAs like the Iroise Marine Natural Park, as the rapid responses of these organisms to environmental changes can serve as early warning signals of ecosystem shifts. It is also particularly relevant for fisheries (Benedetti et al., 2019; Berthou et al., 2010; Duhamel et al., 2011), as small pelagic fishes like sardines (Sardina pilchardus) feed on plankton (Garrido et al., 2008). As a result, the Iroise Sea also holds significant economic and cultural importance for France's sardine fishery. A substantial portion of France's sardine catches come from this region and adjacent waters, with the port of Douarnenez serving as a historic sardine fishing hub and exemplifying a traditional sardine fishing community (Le Floc'h et al., 2020). Beyond its ecological and conservation value, this economic and cultural heritage contributed to the creation of the Iroise Marine Natural Park as the first Marine Protected Area in France. This makes the long-term monitoring of plankton communities crucial not only for biodiversity conservation but also for preserving the economic and cultural heritage that led to its designation as France's first Marine Protected Area.*

The Iroise area also serves as a natural laboratory for studying planktonic community responses to climate change and understanding connections between lower trophic levels and fisheries. This is due to its complex oceanography, particularly the seasonal Ushant thermal front (Le Boyer et al., 2009; Pingree et al., 1975) which can act as a barrier for the dispersal of planktonic organisms between the Lusitanian biogeographical province in the South and the Boreal biogeographical province in the North (Ayata et al., 2010). This front, along with an inner front and distinct surface-bottom dynamics, creates diverse habitats that support rich plankton

communities and overall marine biodiversity (Cadier et al., 2017a; Ramond et al., 2021; Schultes et al., 2013).”

Line 104: “(See Supplementary Table 1).”
Suggest adding "Transect sampling plan" for clarity, since there are two sheets in the Excel.

Done.

Line 105: “Since that year, the sampling frequency has … “

Suggest "From 2017 until 2023, the sampling frequency increased from three to ...."

Done.

Perhaps mention that in 2020, sampling frequency was only three times and why.

The sampling for late winter didn’t occur in 2020 because of COVID-19 restrictions. This is now specified in the text lines 130-131:

“Additionally, late winter 2020 sampling was interrupted due to COVID-19 restrictions.”

Line 106-107: “… every month (Supplementary Table 2).”

Suggest adding "...across the indicated time periods in Supplementary Table 2."

Done.

Lines 107-108: “The highly variable weather of the region occasionally prevented comprehensive sampling of hydrobiological variables and plankton at all stations.”

Could this be connected to the comment at Line 105. Could also add “.."such as in 2020 ...", if they are connected.

We specified in the first submission of the data paper that sampling was planned for three times a year before 2017 and that the frequency was increased to four from 2017 on:

“Transect cruises were scheduled to capture seasonal variations, with sampling conducted in late spring, mid-summer, and mid-autumn, covering three of the four seasons until 2017 (See transect sampling plan in Supplementary Table 1). From 2017 until 2023, the sampling frequency has increased from three to four times per year (see Supplementary Table 1 for details).”

We added the precision of the seasons that could not be sampled in the sentence see lines 128-129:

"The highly variable weather of the region occasionally prevented comprehensive sampling of hydrobiological variables and plankton at all stations, as occurred in fall 2012 and spring 2016 for the transect sampling sites, while coastal stations were less affected."

Lines 119-120: "… following the Service d'Observation en Milieu LITtoral (SOMLIT) (Cocquempot et al., 2019) and Institut Universitaire 120 Européen de la Mer (IUEM) protocols."

Might be worth briefly summarizing these protocols. Or are the protocols what is explained in 3.1.1-3 below?

The sampling and analysis protocols for phyto and zooplankton used in this study are inspired by the SOMLIT protocol while the water protocol follows the SOMLIT protocol. Our specific methodology is detailed in sections 3.1.1-3.1.3, while the complete SOMLIT protocol is available in the referenced literature (Cocquempot et al., 2019).

Lines 131, 132, 149: Replace "was" with "were" for agreement across paragraphs.

Thank you for pointing this out. It was changed in the text.

Line 144-145: "Indeed, the funding agency needed to be reassured on the fact that collecting this data was useful given its cost."

These two sentences should be removed and developed further in Concluding Remarks (see next comment as well). Suggest: "The funding agency needed to be reassured that collecting this data was useful given its cost." Does "this data" refer to both phyto and zoo? Or just zooplankton data? Please clarify.

Thank you for the suggestion.

"This data" was referring to phytoplankton, zooplankton and physical parameters.

We removed the two sentences in the description of the figure and added the second sentence to the Concluding remarks (see lines 452-454):

"Publishing comprehensive long-term datasets combining phytoplankton, zooplankton, and environmental data in open access formats demonstrates their scientific value to funding agencies and supports the continuation of costly but essential ecological monitoring programs."

Please clarify that the collection went ahead by other methods? Or went ahead with reduced effort? 2014 is not included in the Supplementary files sampling plans, but some sampling data is included in Figure 2.

Thank you for pointing out this element. Indeed, in 2014, sampling was conducted only at the Douarnenez station for phytoplankton. The phytoplankton sampling plan was added to the supplementary files as supplementary table 2. It is now mentioned in the text line 125.

Line 145-146: “Publishing such datasets in open access is then a way to reassure the funders that collecting such datasets is indeed useful for the scientific community.”

Could remove this sentence and develop this point more fully in the Concluding Remarks. Add here, “See Concluding Remarks.”

Or alternatively, could say something along the lines of “Sampling was (suspended/reduced) in 2014, then resumed in 2015 after reassuring the funders of the utility of this data. See Concluding Remarks.”

We added this sentence lines 131-132 to clarify this point:

“Sampling was reduced in 2014, then resumed in 2015 after reassuring the funders of the utility of continuing collecting phytoplankton, zooplankton, and physical parameter data in the Iroise Marine Natural Park.”

Line 165-166: “… generally identified to genus and species.”

Suggest “generally identified to genus or species.”

Done.

Line 212 – is the renaming of the station relevant here? Does it appear elsewhere in the ms or appendices? If not, suggest deletion of line. If so, please link more clearly.

We feel that this information is relevant for interpreting Figures 4-7 and for dataset users. The Douarnenez coastal station shares the same location as the D1 transect station, so it was labeled as D1 in the figures while retaining the "Douarnenez" tag in the dataset. Since coastal and transect stations have different sampling frequency, we felt this clarification was necessary.

Line 221: is it ‘Ecotaxa’ or ‘Ecostaxa’?

Thank you for spotting this typo. It was modified in the manuscript.

Line 251: “… removal based on a 0.001 quantile threshold.”

This was not mentioned earlier in section 3.3.1.

Thank you for pointing that out. The corresponding sentence was moved to 3.3.1

Line 254: Is Beatriz part of NMBAQC or any similar QA/QC programmes? Yes, consistency is good with one analyst, but what about checking accuracy of taxonomic ID? How is that accounted for?

Beatriz participates in quality assurance programs to ensure taxonomic accuracy. She is required to participate in the "Phytoplankton Proficiency Test" organized by the Marine Institute-IOC-BEQUALM-NMBAQC, along with all other analysts in the PHYTOBS network (see https://hab.ioc-unesco.org/ipi-home/ for more details).

Sylvain collaborates with Ifremer specialists for taxonomic validation and regularly participates in REPHY and PHYTOBS networks (workshops, intercalibration exercises) to ensure consistent phytoplankton identification standards.

This was mentioned in the text lines 291-299:

"She participates in quality assurance programs including the Phytoplankton Proficiency Test organized by the Marine Institute-IOC-BEQUALM-NMBAQC to ensure taxonomic accuracy. Sylvain Coulon collaborates with Ifremer specialists for taxonomic validation and regularly participates in REPHY (REPHY-French Observation And Monitoring Program For Phytoplankton And Hydrology In Coastal Waters, 2023) and PHYTOBS (https://www.phytobs.fr/) networks (workshops, intercalibration exercises) to ensure consistent phytoplankton identification standards."

Line 262-263: "This temporal heterogeneity in sampling effort should be considered when interpreting long-term trends in plankton communities from this dataset."

Possible influences of this heterogeneity on interpretation?

Yes, this could potentially affect how the community dynamics are interpreted in the dataset. Although the park organizers designed their sampling plan for the earlier years to capture periods before (spring), during (summer), and after (fall) the presence of the thermal front, fewer seasons were sampled in the years prior to 2017. There is less frequent data for the earlier years, compared to the later years of the project, which may affect the detection of seasonal patterns and short-term variability in those periods.

This sentence was therefore modified as:

"This temporal heterogeneity may affect the detection of seasonal patterns and short-term variability, particularly in the earlier years (2010-2016) where fewer seasons were sampled compared to the more frequent sampling in later years (2017-2022), potentially influencing the interpretation of long-term trends and seasonal dynamics."

Line 292: "(Chamberlain and Vanhoorne., 2023)."

Remove the "." after Vanhoorne.

Done, thank you for pointing that out.

Line 301-302: “Interestingly, there does not appear to be a consistent coastal-to-offshore gradient in phytoplankton abundance throughout the years in either northern and southern stations.”

Remove "Interestingly"; tell us why it is interesting or what can be interpreted from this lack of consistent gradient.

We removed 'Interestingly' and provided a potential explanation for the lack of consistent gradient (see lines 357-359):

“This absence of a clear gradient likely could result from temporal averaging across seasons, which obscures the spatial effects of the seasonal Ushant thermal front that would be evident in season-specific analyses.”

A comprehensive ecological analysis examining these seasonal and spatial patterns is currently in preparation, but as this is a data paper focused on dataset description and accessibility, we chose not to delve deeply into the ecological interpretations of the data. Alternatively, this sentence could be removed if the reviewers think that it may not be suited for this data paper.

Lines 307-308, Figure 4 : “… with different colours indicating the absolute abundance of each phylum.”

Suggest “… with the size of each coloured bar indicating …” for clarity, especially since the last sentence of the caption says “Each phylum is represented by a distinct colour …”

Thank you for this suggestion. It has been implemented in the manuscript.

Lines 323-326: There is some repetition in the first and second sentence that can be combined for clarity.

We only kept one sentence following reviewer 1’s advice:

“*Each stacked bar represents the community composition at a sampling station, with the proportion of each phylum calculated as the percentage of the total abundance of individuals counted at that station.”*

Lines 327-328, Figure 5: “Each phylum is represented by a distinct colour.”

Suggest the same as in Figure 4 caption, “Each phylum is represented by a distinct colour as shown in the legend.”

Done.

Figures: Figure 5,6 and 7: x axis labels are not legible. Can you maybe move the legend to underneath the graphs, allowing more space for the labels?

Thank you for the suggestion. We have done it for figures 4 through 7.

Line 340: "… as it only contains 3 images."

Suggest "… as it contains only 3 images."

Done.

Line 341: "The zooplankton community shows clear spatial gradients in dominant groups (Fig. 7)."

Does this tell us anything in particular?

This spatial gradient is consistent with known coastal-offshore patterns in marine ecosystems, where nearshore waters typically support different zooplankton assemblages than offshore waters. While a detailed ecological interpretation is beyond the scope of this data paper, this example illustrates the potential of the dataset for investigating spatial patterns in plankton community structure.

Lines 350-356: In this caption, there is some repetition in describing the Figure. Suggest combining or eliminating parts of the first and second sentences, with the fourth sentence.

Thank you for pointing this repetition out. The figure caption has been simplified.

Line 354, Figure 7: Line 340: "… as it only contains 3 images."

Suggest "… as it contains only 3 images."

Done.

Line 357, Figure 7: "Each faunistical group is represented by a distinct colour."

Suggest the same as in Figure 4 and 5 captions, "Each phylum is represented by a distinct colour as shown in the legend."

We didn't represent phylum in this figure but faunistical groups. We modified the word "phylum" that was wrongly used instead of "group" in this sentence: "*Each stacked bar represents the community composition at a sampling station, with the proportion of each group calculated as the percentage of the total number of individuals counted at that station*."

We also added "*as shown in the legend.*" to the last caption sentence in Figure 7.

Lines 360-362: “... highlighting the critical importance of long-term monitoring of plankton communities (Holland et al., 2025) which constitute their primary food resource (Brosset et al., 2016; Sommer et al., 2018).”

This point could be made much more strongly in the previous sections and explicitly reinforced between lines 80-95.

We thank you for the suggestions and have modified the paragraph between lines 80-95 accordingly as shown earlier.

Lines 367-369: “This makes the long-term monitoring of plankton communities crucial not only for biodiversity conservation but also for preserving the economic and cultural heritage that led to its designation as France's first Marine Protected Area.”

This point as well could be made more explicit earlier in the text, such as between lines 80-95.

We thank you for the suggestions and have modified the paragraph between lines 80-95 accordingly as shown earlier.

Line 371: Again, but how is the analyst’s work QA/QCed?

Thank you for this comment. We answered it above with your earlier question for Line 254.

Key Figure

The inset boundary appears to cut off the study area.

Thank you for spotting this issue. This has been modified.

Supplementary Table 1

It is unclear what the colour scheme means.

Following reviewer 1’s suggestion, we modified the color scheme to be:

Orange: The taxonomic classification is not homogeneous between years and projects.

Green: The taxonomic classification is homogeneous between years and projects.

Supplementary Table 2

Supplementary Table 3

It would be useful to include links to the Ecotaxa projects.

Thank you for the suggestion. This was added to the Supplementary table 3.

Citation: https://doi.org/10.5194/essd-2025-207-RC2

Bibliographie

Benedetti, F., Jalabert, L., Sourisseau, M., Becker, B., Cailliau, C., Desnos, C., Elineau, A., Irisson, J.-O., Lombard, F., Picheral, M., Stemmann, L., Pouline, P., 2019. The Seasonal and Inter-Annual Fluctuations of Plankton Abundance and Community Structure in a North Atlantic Marine Protected Area. Front. Mar. Sci. 6, 214. https://doi.org/10.3389/fmars.2019.00214

Berthou, P., Masse, J., Duhamel, E., Begot, E., Laurans, M., Biseau, A., Pitel-Roudaut, M., Duhamel, E., Begot, E., Laurans, M., Biseau, A., Pitel-Roudaut, M., 2010. La pêcherie de bolinche dans le périmètre du parc naturel marin d'Iroise.

Cefas, 2024. Phytoplankton abundance data from pelagic surveys in the Celtic Seas and English Channel for autumn 2017 to 2023. https://doi.org/10.14466/CEFASDATAHUB.156

Chavez, F.P., Bertrand, A., Guevara-Carrasco, R., Soler, P., Csirke, J., 2008. The northern Humboldt Current System: Brief history, present status and a view towards the future. Prog. Oceanogr. 79, 95–105. https://doi.org/10.1016/j.pocean.2008.10.012

Chenouf, S., Merzereaud, M., Raux, P., Pérez Agúndez, J.A., 2022. Dataset for Estimated Closures of Scallop (Pecten maximus) Production Areas Due to Phycotoxin Contamination along the French Coasts of the Eastern English Channel. Data 7, 103. https://doi.org/10.3390/data7080103

Doray, M., Petitgas, P., Romagnan, J.B., Huret, M., Duhamel, E., Dupuy, C., Spitz, J., Authier, M., Sanchez, F., Berger, L., Dorémus, G., Bourriau, P., Grellier, P., Massé, J., 2018. The PELGAS survey: Ship-based integrated monitoring of the Bay of Biscay pelagic ecosystem. Prog. Oceanogr. 166, 15–29. https://doi.org/10.1016/j.pocean.2017.09.015

Duhamel, E., Laspougeas, C., Fry, A., 2011. Rapport final du programme d'embarquements à bord des bolincheurs travaillant dans le Parc naturel marin d'Iroise.

Frederiksen, M., Edwards, M., Richardson, A.J., Halliday, N.C., Wanless, S., 2006. From plankton to top predators: bottom-up control of a marine food web across four trophic levels. J. Anim. Ecol. 75, 1259–1268. https://doi.org/10.1111/j.1365-2656.2006.01148.x

Garrido, S., Ben-Hamadou, R., Oliveira, P., Cunha, M., Chícharo, M., Van Der Lingen, C., 2008. Diet and feeding intensity of sardine Sardina pilchardus: correlation with satellite-derived chlorophyll data. Mar. Ecol. Prog. Ser. 354, 245–256. https://doi.org/10.3354/meps07201

Goberville, E., Beaugrand, G., Sautour, B., Tréguer, P., Somlit, T., 2010. Climate-driven changes in coastal marine systems of western Europe. Mar. Ecol. Prog. Ser. 408, 129–147. https://doi.org/10.3354/meps08564

Grandremy, N., Bourriau, P., Daché, E., Danielou, M.-M., Doray, M., Dupuy, C., Forest, B., Jalabert, L., Huret, M., Le Mestre, S., Nowaczyk, A., Petitgas, P., Pineau, P., Rouxel, J., Tardivel, M., Romagnan, J.-B., 2024. Metazoan zooplankton in the Bay of Biscay: a 16-year record of individual sizes and abundances obtained using the ZooScan and ZooCAM imaging systems. Earth Syst. Sci. Data 16, 1265–1282. https://doi.org/10.5194/essd-16-1265-2024

Griffith, A.W., Gobler, C.J., 2020. Harmful algal blooms: A climate change co-stressor in marine and freshwater ecosystems. Harmful Algae 91, 101590. https://doi.org/10.1016/j.hal.2019.03.008

Grigoratou, M., Menden-Deuer, S., McQuatters-Gollop, A., Arhonditsis, G., Artigas, L.F., Ayata, S.-D., Bedikoğlu, D., Beisner, B.E., Chen, B., Davies, C., Diarra, L., Elegbeleye, O.W., Everett, J.D., Garcia, T.M., Gentleman, W.C., Gonçalves, R.J., Guy-Haim, T., Halfter, S., Hinners, J., Horaeb, R.R., Huggett, J.A., Johnson, C.L., Kavanaugh, M.T., Lara-Lopez, A., Lindemann, C., López-Abbate, C., Messié, M., Möller, K.O., Montes, E., Muller-Karger, F.E., Neeley, A., Olaleye, Y., Palacz, A.P., Poulton, A.J., Prowe, A.E.F., Ratnarajah, L., Rodríguez, L., Rodríguez-Flórez, C.N., Rodriquez-Santiago, A., Rousseaux, C.S., Saad, J.F., Santi, I., Soccodato, A., Stern, R., Våge, S., Varkitzi, I., Richardson, A., 2025. The immeasurable value of plankton to humanity. BioScience biaf049. https://doi.org/10.1093/biosci/biaf049

Houliez, E., Lefebvre, S., Dessier, A., Huret, M., Marquis, E., Bréret, M., Dupuy, C., 2021. Spatio-temporal drivers of microphytoplankton community in the Bay of Biscay: Do species ecological niches matter? Prog. Oceanogr. 194, 102558. https://doi.org/10.1016/j.pocean.2021.102558

Ikeda, T., 1985. Metabolic rates of epipelagic marine zooplankton as a function of body mass and temperature. Mar. Biol. 85, pages1-11.

Iversen, 2023. Carbon Export in the Ocean: A Biologist's Perspective. Annu. Rev. Mar. Sci. 15, annurev-marine-032122-035153. https://doi.org/10.1146/annurev-marine-032122-035153

Le Floc'h, P., Alban, F., Merzéréaud, M., Duhamel, E., 2020. Identification des points de rupture dans la série longue des productions de sardine en France (1900-2017). Rev. Déconomie Ind. 49–78. https://doi.org/10.4000/rei.9023

Lehodey, P., Alheit, J., Barange, M., Baumgartner, T., Beaugrand, G., Drinkwater, K., Fromentin, J.-M., Hare, S.R., Ottersen, G., Perry, R.I., Roy, C., van der Lingen, C.D., Werner, F., 2006. Climate Variability, Fish, and Fisheries. J. Clim. 19, 5009–5030. https://doi.org/10.1175/JCLI3898.1

Miloslavich, P., Bax, N.J., Simmons, S.E., Klein, E., Appeltans, W., Aburto-Oropeza, O., Andersen Garcia, M., Batten, S.D., Benedetti-Cecchi, L., Checkley, D.M., Chiba, S., Duffy, J.E., Dunn, D.C., Fischer, A., Gunn, J., Kudela, R., Marsac, F., Muller-Karger, F.E., Obura, D., Shin, Y.-J., 2018. Essential ocean variables for global sustained observations of biodiversity and ecosystem changes. Glob. Change Biol. 24, 2416–2433. https://doi.org/10.1111/gcb.14108

REPHY-French Observation And Monitoring Program For Phytoplankton And Hydrology In Coastal Waters, 2023. REPHY dataset - French Observation and Monitoring program for Phytoplankton and Hydrology in coastal waters. Metropolitan data. https://doi.org/10.17882/47248

Savoye, N., Lizon, F., Breton, E., Claquin, P., Joly, O., Sultan, E., Bozec, Y., Jung, J.-L., Boulard, C., Rimmelin-Maury, P., Leynart, A., Agogué, H., Pineau, P., del Amo, Y., Conan, P., Mostajir, B., Grégori, G., Mousseau, L., Fabrice, M., 2024. SOMLIT (Service d'Observation en Milieu Littoral) time series (French Research Infrastructure ILICO): long-term core parameter monitoring of French coasts. https://doi.org/10.17882/100323

Siegel, D.A., DeVries, T., Cetinić, I., Bisson, K.M., 2023. Quantifying the Ocean's Biological Pump and Its Carbon Cycle Impacts on Global Scales. Annu. Rev. Mar. Sci. 15, 329–356. https://doi.org/10.1146/annurev-marine-040722-115226

Suthers, I., Rissik, D., Richardson, A., 2019. Plankton: A Guide to Their Ecology and Monitoring for Water Quality. Csiro Publishing.

van der Lingen, C., Hutchings, L., Field, J., 2006. Comparative trophodynamics of anchovy *Engraulis encrasicolus* and sardine *Sardinops sagax* in the southern Benguela: are

species alternations between small pelagic fish trophodynamically mediated? Afr. J. Mar. Sci. 28, 465–477. https://doi.org/10.2989/18142320609504199