Reply to comment on essd-2022-324 (https://doi.org/10.5194/essd-2022-324-RC3) by Ellen Thomas

The authors would like to thank Ellen Thomas for the time on reading and reviewing the manuscript. We sincerely acknowledge all the Reviewer suggestions that aimed to improve the manuscript readability and usability of the BENFEP database.

Our responses (plain text) to point-by-point comments are listed after Reviewer comments (italic and bold font) followed by the main changes to the manuscript (italic font). Please, refer to the annotated manuscript and companion files.

Remark 1

In my opinion research on paleoceanographic use of benthic foraminifera is indeed (as stated by the authors of this manuscript) greatly hampered by the lack of integration of (the many) published data, which at least in part is caused by the problems on integrating taxonomy. In this manuscript the authors 'unify' the taxonomy to the WORMS database, which is a good first goal. However, the authors do not evaluate the taxonomic concepts of different authors, and do not aim to do so. In fact, that task might be difficult to impossible, because none of the compilated papers provides good descriptions and/or figures of all taxa mentioned. This database does not include descriptions and/or figures of the taxa, thus the user remains uncertain about the uniformity of the species concepts included in this study. I would think that definitely some of the more 'difficult taxa', e.g., various species names of Gyroidina/ Gyroidinoides, of Lagena, of Lenticulina could well be used differently by different authors, a problem not (fully) resolved by the synonymies given in WORMS. One also cannot exclude authors making mistaken identifications. As an example, Nuttallinella florealis White has been extinct since the end Paleocene benthic foraminiferal extinction, thus is unlikely to have been found in surface samples, and was probably misidentified by Liu, 2001. Obesopleurostomella brevis and many other uniserial taxa with a complex aperture became extinct in the mid-Pleistocene benthic foraminiferal extinction event (Hayward et al., 2012, Cushman Foundation Foram Res vol 43), and have been marked as 'fossil only' in WORMS. Taxa with such a relatively recent extinction date have been found in surface samples by e.g., Brady in the Challenger Report: see Hayward and Kawahata, 2005, Extinct foraminifera in Brady's Challenger Report, J Micropalont. 24, 171-175, who list O. brevis as such, as well as P. alternans, also listed in the Supplement. This of course might be caused by the age of the surface-sediment sample not being not well controlled (see below, Remark 2). The authors should in my opinion say something about the possibility of mistaken identification, possibly where they are discussing taxa mentioned by one author only (lines 244-on), or where they are discussing 'taxonomic concepts (section 3.6.1). In my opinion, this lack of detailed checking of the taxonomy definitely does not invalidate the present manuscript. The goal of comparing data from different authors (thus taxonomic 'schools of thought'), as well as different collection methods is a very good and worthwhile first step: after all, the Paleobiology Database is extremely useful for the community without all taxonomic confusion having been solved. In fact, this database effort will make taxonomic evaluation in the future easier to do since so many disparate datasets are here collated. However, I think that the authors should mention the potential problems due to taxonomic misidentification and non-realized synonymies.

We acknowledge the suggestions made by the Reviewer. This is an interesting question which is not limited to the present study, but to all micropalaeontological databases that include data generated by different authors. Unsatisfactory documentation of taxonomic resolution, divergent taxonomic criteria and/or human errors might lead to some errors in the database (e.g., Siccha and Kucera 2017 referenced in the manuscript).

In the reviewed version of the manuscript, section 3.6.1, we now mention the possibility of some species being misidentified.

Changes to the text: Text rephrased (section 3.6.1).
Despite the effort to harmonize the taxonomy, it is likely that incorporating data from different authors with diverse taxonomic concepts (e.g., there are 499 species identified by a single author) and potential misidentifications (e.g., see Supplement File 4) could have artificially biased the number of species.

In order to make clear to the potential users the taxonomic concepts provided by each author, and to bring more transparency to the harmonization procedure, we have now included the following documents in the Supplement section:

Changes to the Supplement: Please, refer to new Supplement section.

-The new Supplement File 2 includes the original authors taxonomic concept for each species harmonized in BENFEP (now BENFEP_v1)

-The new Supplement File 3 includes specific remarks on the harmonization procedure.

-The new Supplement File 4 collates the original authors´ indications about potentially reworked species and comments about some potential misidentifications. We cross referenced this file with the "remark_2" of the database.

Remark 2:
The apparent occurrence of various extinct species in the database: I suggest that the authors mark it in the Supplement (Species list) if the species is given as 'fossil only' in WORMS, in order to warn the reader/user. In such a case, the explanation could be one or more of the following: the species may be misidentified (would be interesting to know whether it was tagged as 'living'), the species may not be extinct (in disagreement with WORMS), or the surface sample may in fact not be recent (or even Holocene) in age. Many of the sampling methods described will not recover 'undisturbed' sediment, i.e., the sediment/water interface will not be recovered in most samplers except multicorers. Could the authors say something about this, either in the text or in the description of sample methods? They mention this in line 296, but could they have added a bit more information, e.g., as described above?
It would e.g., be good to know if the authors of the cited article did radiocarbon dating to determine a Holocene age. It would be specifically of interest to know if species described as 'fossil only' in WORMS had been stained and recognized as 'living'.

We acknowledge the Reviewer suggestion. Indeed, BENFEP_v1 includes 109 taxa identified to species-level considered "fossil only" by WoRMS. The "fossil only" species are treated as the considered extant species. We justify our decision with the following arguments. Firstly, we wanted to provide the users with an unabridged version of the original data. We followed the same criteria for any other non-numerical data originally provided by the authors (section 2.2). Secondly, as the Reviewer indicates in her comments, there are several reasons why a benthic foraminiferal species taken from a surface sediment sample might appear as fossil: a) It is an actual fossil specimen. In that case, the species might be reworked from nearby older sediments; b) it could represent a mistaken identification in the original source or c) the species is not a "fossil only" species but it has been inaccurately attributed as such by WoRMS. The latter is subject to change as new knowledge emerges; therefore, we consider important to retain the information as it appears in WoRMS. Eventually, this study might lead to revisiting the "fossil range" of some species.

In the new version of the manuscript, we have added the following information that could help the users to find whether a species is extinct or extant (according to WoRMS):

-In new section 2.4 we have now indicated that harmonized species include those considered "fossil only" according to WoRMS.

Changes to the text: Text added (new section 2.4, Taxonomic harmonization, previously section 2.5).
Some taxa included in BENFEP_v1 are considered as "fossil only" by WoRMS. Nevertheless, we kept those in the database. There are several reasons to explain the occurrence of a species categorized as "fossil only" in a sample; it represents a true displaced fossil species from ancient sediments (reworking), a mistaken identification, and, an extant species inaccurately attributed as "fossil" by WoRMS. As it is not clear which of these circumstances applies in each case, we decided to maintain the species to prevent information losses in case of future re-evaluation of the "fossil range" by WoRMS.

-Changes to the Supplement: Please, refer to the new Supplement section.

The new Supplement File 1 now includes a column dedicated to the "fossil range" according to WoRMS. We re-named the column as "occurrence" to indicate whether a species is extinct or extant. The Supplement File 1 incorporates more comprehensive taxonomic information (status, rank, order, family, class, AphiaID, etc) about the species harmonized in BENFEP (now BENFEP_v1) than the previously submitted file.

-Changes to the BENFEP_v1 files: Please, refer to the new files.
The BENFEP_v1 database will be provided in short and long format. The long format was specifically suggested by three reviewers. Please, refer to the new section 2.5 of the reviewed version of the manuscript (integrates former sections 2.4 and 2.6). There we explain the structure of the two formats of the database.

The long-format version integrates all the information provided in the short format plus taxonomic information for each species (File 1) and each author´ species assignations (File 2). Therefore, users of BENFEP_v1_long will have the information about the taxa "occurrence" in a column alongside the taxonomic designation.

-In new section 3.6.4 we have expanded on the information collated from the publications about age estimates of the surface sediment, foraminiferal preservation and potentially reworked species. The latter was specifically mentioned by some authors. We indicate that in the "remark_2" column of BENFEP_v1 files, which guides the users to look for specific information in the new Supplement File 4. Please, refer to comment above about this file.

Changes to the text: text added (section 3.6.4, The representativeness of the surface sediment assemblages, previously section 3.6.3).

One of the purported applications of BENFEP_v1 is to provide a quantitative estimate of recent benthic foraminiferal assemblages that could be later used in palaeoenvironmental interpretations (e.g., Fig. 6). The database integrates quantitative data obtained from oceanic regions with different depositional environments, sedimentation rates, carbonate preservations and types of assemblages, collected over different sampling years and using an array of sampling devices that might result in diversion from recent conditions. For example, dead benthic foraminifera obtained from surface sediments might not be representative of the surface if the sampling device fails to recover the sediment-water interface or sedimentation rates are very low. The 36% of the surface sediment samples were retrieved using different types of coring devices (gravity, piston, dart and Phleger corer, calculations using "dev_1"), which are sampling techniques that can cause perturbation or miss-sampling of the surface sediment (Weaver and Schultheiss, 1990). Since the studies included in our database did not date the surface sediment (except for Palmer et al., 2020), we cannot discard that some samples correspond to pre-Holocene conditions. The most comprehensive compilation of sedimentation rates from core-top samples is from the equatorial Pacific and shows highly variable values, ranging from 0.8 to 14.2 cm/ka (Mekik and Anderson, 2018), meaning that surface sediment samples in this region correspond to recent conditions (assuming that no perturbation occurred during sampling). Reworking, downslope transport and carbonate preservation might be other factors influencing the composition of the assemblages obtained from the surface sediments. The presence of "potentially fossil" species reworked from ancient outcrops (see "remark_2" and Supplement File 4) is included in the datasets of Bandy and Arnal (1957), Echols and Armentrout (1980), Ingle et al. (1980) and Zalesny (1959). Still, they represent less than 5% of the assemblage. The contribution of specimens displaced specimens from shallower locations is also low, as indicated by Bandy and Arnal (1957); Ingle et al. (1980); Harman (1964), Pettit et al. (2013), Uchimura et al. (2017) and Zalesny, 1959).

Finally, Pettit et al. (2013) in the Gulf of California, and Boltovskoy and Totah (1987) and Resig (1981) off South America in samples below the carbonate compensation depth, are the only authors mentioning poor preservation of calcareous benthic foraminifera.

Remark 3:
I am not sure whether I am convinced by the authors that the eastern equatorial Pacific should get priority for such a compilation (maybe there are more data for the Atlantic?). However, the question whether this is the highest priority region on Earth for such a compilation - which could be made because we are looking at a large part of the largest ocean on Earth - is unimportant. After all, we must start somewhere with a global database, and exactly where we start does not really matter - as long as the database is open for extension in the future (see below).

We totally agree with Ellen Thomas on the idea that data sharing and homogenization will definitively enlarge our knowledge about the biogeography of benthic foraminifera, starting from the Eastern Pacific.

The Eastern Pacific was prioritized because authors' previous expertise includes work in this region, and thus being more familiar with the existing literature in this region (e.g., Diz et al 2018, 2020). Besides this "convenience", the OMZ in the Eastern Pacific are the most extensive in the Earth's ocean. Since numerous studies reconstructing the OMZ used benthic foraminifera as the main proxy, we consider that improving the knowledge about the biogeography of this group would be highly beneficial for the palaeocommunity.

In the reviewed version of the introduction, we have indicated the OMZs as a unique feature of the Eastern Pacific and clarified the scientific motivation to build a database for this region.

Changes to the text: Text rephrased (section1, Introduction).
In an historical context, the increase in ocean temperatures and the expansion of the already existing extensive oxygen minimum zone (found about 100 to 900 m water depth, Karstensen et al., 2000) are the major threats to shallow and deep-water benthic ecosystems from the Eastern Pacific (Sweetman et al., 2017; Breitburg et al., 2018; Yasuhara et al., 2019). These attributes make the Eastern Pacific an area of interest for assessing the past, present, and future of the marine ecosystem status and its response to expected environmental changes (e.g., Calderon-Aguilera et al., 2022).

Remark 4: The authors mention that BENFEP is indeed open to such expansion (e.g., lines 23-24), and my earlier remarks indicate that it would indeed be important for the community if BENFEP can be expanded. However, the potential pathway(s) to such extension, e.g., into different oceans, adding additional sources (e.g., articles by Saidova published in Russian), is not very clearly spelled out. How do the authors envisage to keep BENFEP going and growing?
Are they proposing to supervise and/or impose quality control on the database? Will there be an opportunity for community input? Which entity (university? Museum? Association?) will; hoist the database in the long term? Potential cooperation which groups hosting databases for other microfossils?

Unfortunately, we could not have access to the meaningful work of Saidova (1975) for the Pacific Ocean. This is the reason why we did not mention it in the manuscript.

The Reviewer is right in that we did not expand enough on the updating process. In order to facilitate updating, we have re-named BENFEP to BENFEP_v1 along the manuscript and in the PANGAEA repository. Besides, we have now clarified in the reviewed version of the manuscript how we plan to update BENFEP_v1 in the future.

Changes to the text: Text added and rephrased (new section 5. Data availability and future plans, previously section 6).
The BENFEP_v1 database can be accessed from https://doi.org/10.1594/PANGAEA.947086 (Diz et al., 2022b). This database is conceived as a springboard to store future quantitative data of benthic foraminifera in the East Pacific and make them available to the scientific community. It will be open for any new quantitative data entry and thus, it welcomes any new data published or provided by any contributor. The database will be updated by the authors once a considerable number of new entries need to be incorporated or changes are required to update taxonomic categories to an existing version. New

versions of BENFEP will be submitted and curated in PANGAEA. Collaborations with individual researchers and institutions are welcomed specially regarding potential expansion to other ocean basins.

The current reviewing processes and several interactions during conferences over the last couple of months have been insightful in understanding which the needs and the interest of the benthic foraminifera community are. Expanding BENFEP_v1 and extending the concept to other oceans requires external funding (e.g., for quality control and to host the database in a dedicated server and to migrate and upgrade it to PostGIS or similar), active community input and establishing/strengthening collaborations with other researchers and open access repositories.

We will undertake steps in that direction, and it is in our mind to expand the scheme presented here (i.e., the improvements that might come) to other basins.

Notes by line number:
23-24: the authors say ' We complement BENFEP with an additional database integrating metadata and stations geolocation of benthic foraminiferal studies dearth of quantitative data'. I do not understand the English in this sentence. I see in lines 93-94 and section 4 (lines 305-on) that this is a database containing qualitative record, but this sentence does not explain that. Maybe the authors want to say that they add these because there are so few quantitative datasets? What data does this data What data does this database contain: presence -absence, or such data as 'rare, few, common, abundant'?

It was unfortunate the way we named the database BENFEPqual and the way we described its content because resulted in confusion.

"BENFEPqual" contained geolocations of samples which carried out benthic foraminifera assemblage studies but whose data were not available in the publications but presented in graphs, as non-quantitative information (rare, dominant, abundant) or species presence. The application of "BENFEPqual" is to geolocate samples/studies in the Eastern Pacific, identify the author, and the type of data and refer to the original source for species information.

Because this dataset is creating confusion, we re-organized the text referring to it as follows:

-We now refer to the dataset as a collection of geolocations of studies that could not be included in BENFEP_v1 because they do not meet the criteria for quantitative data. We provide access to the file in the main text and in the caption of Figure B1.

Changes to the text: Text added (section 2.2).
There are 31 documents published between 1929 and 2019 characterizing assemblages of living and dead assemblages of benthic foraminifera from surface sediments in the Eastern Pacific that could not be incorporated in BENFEP_v1 because species assemblage data are provided in graphs, as species presence or range of abundances (e.g. common, rare, abundant). The geolocation of the samples and the authors of those publications can be accessed from https://doi.org/10.1594/PANGAEA.947114 (Diz et al., 2022a) and they are represented in Figure B1.

Figure B1. Spatial distribution of samples in the Eastern Pacific from studies which do not provide quantitative assemblage data. The numbers refer to each author´s dataset. Sample geolocation and metadata can be found in https://doi.org/10.1594/PANGAEA.947114 (Diz et al., 2022a). The procedure for stations´ georeferencing and column coding follows the indications of sections 2.3 and 2.5. The map was made using ArcGIS software version 10.8.2. The global relief model integrates land topography and ocean bathymetry (Sources: Esri, Garmin, GEBCO, NOAA NGDC, and other contributions).

-We have removed references to the database by the name of "BENFEPqual" along the text.
Consequently, we have eliminated previous section 4 "Complementary information to BENFEP: BENFEPqual"

We considered that these changes will contribute to alleviate confusion and improve the readability of the text.

36-37: for the eastern equatorial Pacific, I think that the statement ..'ongoingdeoxygenation..induced by coastal eutrophication' is incorrect or at least incomplete. After all, the eastern equatorial Pacific is the location of the largest open-ocean Oxygen Minimum Zone not linked to coastal eutrophication (see e.g. Breitburg et al., 2018, Declining oxygen in the global ocean and coastal waters. Science 359, eeam7240). Comparison of figure 1 and the figure in Breitburg et al shows clear overlap of the studied sites with that open ocean OMZ, and the authors refer to deep-water deoxygenation in line.

The Reviewer is right. Therefore, we have rephrased the sentence in this section to make clear that the Eastern Pacific is an open ocean OMZ region, and it is not influenced by ocean eutrophication.

164-165: The authors say: 'see Supplement for full species description'. Either I am missing something, or the supplement contains a full list of species, but there is no description of species (i.e., description of their morphology). Please change this text to explain what actually is in the Supplement.

We have re-phrased the sentence referring to Supplement File 1 as follows:
File 1 indicates the systematics of benthic foraminiferal species listed in BENFEP_v1 following the concepts of the World Foraminifera Database (Hayward et al., 2022, last accessed on 22-12-08).

181-190: Text and Caption figure 2. why use words such as 'epipelagic', mesopelagic, bathypelagic, etc.? I think that the words 'xxx-pelagic' are defined for planktonic and nektonic organisms, not for benthos. For example, in general (and in oceanographic textbooks) benthic organisms are described as bathyal or hadal, planktic organisms as bathypelagic or hadal pelagic. The cited paper by Costello & Breyer does not use these xxxpelagic terms for benthos, they use them for planktonic organisms, and for benthics they give the not very useful word 'deep-sea' for benthos below 2000 m. Benthic foram users commonly follow van Morkhoven et al., 1986 depth zones:
< 200 m depth: Neritic
• coastal: 0–30 m,
• inner neritic: 30–50 m,
• middle neritic: 50–100 m
• outer neritic; 100–200 m
200-2000 m depth: bathyal
• 200-600: upper bathyal
• 600-1000: middle bathyal
• 1000-2000: lower bathyal
>2000 m depth: abyssal
• 2000-3000: upper abyssal
• >3000 m: lower abyssal

Including Costello and Bryden pelagic divisions was a mistake. We have changed the bathymetric ranges to follow the ones indicated by the Reviewer (and described by Morkhoven et al., 1986) and we have modified Figure 2, Figure 6E (former Fig. 7E) and figure captions accordingly. Please, refer to the new figures.

Figure 2: Distribution of samples with water depth and latitude. Horizontal dashed lines separate the neritic (0- 200 m), the bathyal (200-2000 m) and, the abyssal zones (>2000 m) following bathymetric divisions of van Morkhoven et al. (1986).

Figure 6: Geospatial representation of selected species relative abundance (A, B) and presence (C), total number of taxa (D) and selected species mean relative abundance with water depth (E) in BENFEP_v1. Water depth ranges in figure E are as follows: neritic (0-200 m), upper bathyal (200-600 m), middle bathyal (600-1000 m), lower bathyal (1000-2000 m) and abyssal (>2000 m).

194: delete 'being'.

Done as suggested

213-217: maybe add a remark that nowadays Rose Bengal staining is not thought to be very reliable as indicator of actually living specimens at the time of collection?? e.g. Bernhard, J., 2006, Comparison of two methods to identify live benthic foraminifera: A test between Rose Bengal and CellTracker Green with implications for stable isotope paleoreconstructions, Paleoceanography 21, PA4210 states: 'On average, less than half the Rose Bengal–stained foraminifera were actually living when collected'. In my opinion the authors thus should add some information on the concept of 'stained' vs. 'living.

We acknowledge the point raised by the Reviewer. We agree with her, and we have amended the text accordingly. We have now explained what living, dead, and living and dead (now renamed as living plus dead) means in the reviewed version of the manuscript (section 3.3). We expanded on the issue of using living or dead assemblages for modern analogue construction or to trace changes in the assemblages over time (new section 3.6.4).

Changes to the text: Text added and rephrased (section 3.3).
The Rose Bengal staining (Walton, 1952) is the only method used by authors to distinguish dead (non-stained) from living (stained) foraminifera at the time of sampling. Living plus dead refers to an assemblage were living (stained) and dead (non-stained) are counted together in the same sample.

Changes to the text: Text added and re-phrased (new section 3.6.4, previously section 3.6.3).
BENFEP_v1 includes information of living, dead, and living plus dead assemblages whose suitability for building recent analogues is under discussion among the scientific community. The use of Rose Bengal as "vital" staining could be controversial because attached bacteria or algae, decaying protoplasm of dead individuals might stain, resembling the staining of the protoplasm of a "true" living individual (see review in Schönfeld, 2012). However, it is still the most widely used method to distinguish "living" (stained) from "dead" (non-stained) foraminifera and it is considered reliable if used cautiously. It might be argued that only living foraminifera should be used to consider baseline studies (Schönfeld, 2012). However, it might also be considered that living assemblages represent a "snapshot" of the foraminifera living at the specific time of sampling and do not hold the time-averaged representativeness of the dead assemblages (Murray, 2000).

In the main text, we referenced the review of Schönfeld (2012), which detailed the development of the methodology of benthic foraminifera over time and alluded to the meaningful findings of Bernhard et al. (2006).

222-225: The definition of studied grain sizes is confusing. The text states: For example, 62.5% of the samples were analysed in the >61-74 µm size fraction, 6% in the > 88-106 µm size fraction and 10.5% in the > 125-150 µm size fraction. I think this must mean that the lower boundary of the studied grainsize is in the stated interval, e.g. ' the >61-74 µm size fraction' means that the full range of grainsizes >63 µm was investigated (as listed in Table A1). I think this must be so, because that is what most people do (e.g. Loubere 1994). However, the text appears to read either as if only specimens in between 61 and 74 µm were studied, or as if specimens >71 µm were studied, either of which is incorrect. Similarly, people study either the 125 µm or >150 µm size fraction, but definitely do not limit themselves to specimens between 125 and 150 µm. Then the caption of Figure 5 shows different numbers again, i.e. instead of >63 µm or >61-74 µm the piechart shows (60, 80) (which I think is the same size fraction). Please standardize this to make sure that the reader understands what is listed unequivocally.

We are sorry that the text and the figure were not clear enough. We now provide an alternative version of the figure and rephrased the text accordingly. We believe this new plot is clearer than the former one.

Changes to the text: Text added and rephrased (section 3.3).
Most of benthic foraminiferal assemblages were analyzed in the smallest size fraction commonly used in benthic foraminiferal studies. For example, 65.4% of the samples were analyzed using 42, 61, 62, 63 and 74 µm as the lower end of size fraction (e.g. assemblages where studied in the >42 µm, >61µm, >62 µm size fraction, etc.). The 6.1% is using 88 and 105µm and 17.7% the 125, 149, 150, 200, 212 and 500 µm as the lower end of size fraction.

Changes to the Figures: new Figure 4 (previously Figure 5).
In the reviewed version of the manuscript, we have re-done Figure 4. We have calculated the relative contribution of each size fraction (>61, >62, etc) independently and represented it as a portion of the pie chart in the new Figure 4.

234: 'valid taxa' - I assume this includes subspecies, varieties and such? could the authors add the number of species? below-species level groups may be included in the species by other researchers, thus making species diversity lower. Again, note that some of the species in this database are listed as extinct, and might have been misidentified. The authors mention how many of the species in their list are 'rare' according to Murray 2013. Could they say a bit more about the total number of species - how many of the more common ones are overlapping with Murray?

Yes, the numbers in the text wrongly included subspecies and varieties. We have now indicated the species, subspecies, and varieties separately in the text (section 3.4) and following the upgraded version of BENFEP_v1. Please, refer to the new Supplement File 1.

Changes in the text: text rephrased (section 3.4):

The BENFEP_v1 dataset includes a total of 1091 valid taxa (1073 species, 14 varieties, 4 subspecies) plus two taxa of uncertain status (Serpula lobata and Ammonia avalonensis) corresponding to 335 foraminiferal genera belonging to the classes; Globothalamea (64%), Tubothalamea (11.3%), Nodosariata (19.6%), Monothalamea (4.8%).

Changes to BENFEP_v1 files:

The species numbers we presented in the submitted version have changed in the new version because we have received additional datasets (Mallon, 2011; Glock et al., 2020; Tetard et al., 2021) and we have included them. Besides, we have added the living counts of Smith (1964, 1973), Patterson et al. (2000), removed some samples with zero total abundance (wrongly included in the previous submission), and we have detected a few errors which are now amended.

In the new version of the manuscript, we have briefly discussed some species numbers:

-section 3.4 (Benthic foraminiferal species): *The BENFEP_v1 database contains 292 valid species (excluding varieties and subspecies) that can be considered rare, with a mean relative contribution lower than 1% (Murray, 2013)*
and
-section 3.6.1 (Taxonomic concepts): *Despite the effort to harmonize the taxonomy, it is likely that incorporating data from different authors with diverse taxonomic concepts (e.g., there are 499 species identified by a single author) and potential misidentifications (e.g., see Supplement File 4) could have artificially biased the number of species.*

The number of rare species in BENFEP_v1 is high, much higher than the 120 species for which Murray (2013) provided a detailed biogeography. In despite of the fact that we agree with the Reviewer about the interest of analyzing the species overlapping with Murray, or even with other works, this kind of analysis is far for being simple and it would deserve a detailed study and analysis. In this sense, we believe that due to its complexity, it goes beyond the scope of this study.

235: please provide reference for these Classes- who defined these?

These are the classes as they appear in WoRMS. We provide Hayward et al. (2022) as a reference in the figure caption.

Figure 5: Number of valid species per foraminifera genus and its distribution among the classes indicated by WoRMS (Hayward et al., 2022, last accessed on 22-12-08). Only genera with 5 or more species are represented in the figure.

248: are these all (90) at the species level or including below species level taxa?

We have rephrased the text in the new version of the manuscript: *Furthermore, the highest number of taxa (90) is found in a station studying dead individuals located in the South Pacific at 1800 water depth (Ingle et al., 1980, Fig. 6D).*

The number is from a sample studied by Ingle et al., (1980). The sample does not include taxa below species level but it includes all authors species-level identifications plus "sps".

The number of varieties (14), subspecies (4) in BENFEP_v1 is low compared to the number of total valid taxonomic assignations: 1093 (1091 plus 2 taxa of uncertain status)

251: typo in Nuttallides (spelled with two letters t)

This has been changed in the species list.

Figure 7: figurer 7D says 'Biodiversity' but plots number of species. the Number of species is NOT how diversity is defined, it is 'species richness'.

The Reviewer's comment is right. We acknowledge his/her suggestion and changed the figure caption accordingly to "number of taxa".

256: what is a 'heatmap'?

We have considered that a heatmap (or a density grid) is the best option to visualize the volume of locations or events in a dataset directing the viewers towards areas with intensive survey sampling. It is used to analyse point data by transforming the points into a regular grid. Each resulting grid cell is assigned a value that is determined by the proximity of nearby points. The colour palettes represent the values from low to high.

261: 'made' or 'drawn' rather than 'elaborated'.

Amended and changed to "The slides for the video were made using QGIS"

286: rounding could lead to both >100 as well as < 100%?

Yes, the Reviewer is right, and rounding might lead to any of both results.

The percentages summing more and less than 100% were a source of continuous concern during the building up of the database, because unfortunately, that is a common feature in data archived as percentages. For datasets that had to be machined or manually digitized we cross-validated the typed entries before adding them to BENFEP_v1. Human errors, either in the original publication or during the digitization step, cannot be completely ruled out.

316-on (section 5): here the authors should have mentioned that presently many journals require making data available, and will not publish papers without such data, which must be provided not just in the journal, but in an accepted database such as Pangaea. They are escribing some of the broadly accepted FAIR data practices: Findable, Accessible, Interoperable, and Reusable. Their text here should have pointed this out: in many cases 'authors should not be encouraged' - they will be required to do so by reputable journals. -
https://www.nature.com/articles/sdata201618

We agree with the Reviewer that it should be bolder and we rephrased the text to: *Publishers should commit to FAIR data practices (Wilkinson et al., 2016) and the authors must share their published data in a readily accessible format and in public repositories to avoid the irreversible loss of valuable quantitative data.*

It is worth mentioning that some of the datasets included in this database published during the last five years were not available in Pangaea or similar repositories. They had to be machine digitized or requested to their authors. For some others, we obtained negative answers after data were requested and consequently, data could not be incorporated in BENFEP_v1. We also found that some journals that in principle comply with FAIR data practices, published papers which included statements about the data availability such as 'data available upon request', which obviously does not meet the FAIR practices. It would be invidious to cite them here, but these situations just highlight the problems of open-access data still in XXI century.

Table A1: for studies describing 'living + dead', it is possibly to provide the information how many of these species were observed as 'living', how many as 'dead' (with overlap, some species could be present both living and dead)? it would be good information to know whether species were present both as living and as dead.

Living plus dead (LD) refers only to studies that specifically stated that they studied living (Rose Bengal stained) and dead (un-stained) assemblages from the same sample. We have now explained what living, dead and living plus dead means in the reviewed version of the manuscript section 3.3, as indicated in the reply to a comment above.

We would like to explain that we did not artificially sum live and dead counts and when we curated "LD" is because the authors provided the living and dead counts combined. However, in three entries we did not include the Living assemblage which the author provided separately. This happened in Smith (1964, 1973) and Patterson et al., (2000). We have now included these living samples in the reviewed version of BENFEP_v1.

Table B1: I think there are mistakes in N200, N300, which are both described as ' It indicates whether sample counts are equal to or higher than 100 individuals'. I think this should be 200 and 300, respectively.

The Reviewer is right, they are mistakes. They have been amended and corrected in the reviewed version of the manuscript and Tables C1 and C2 of the Appendices section.

Note to supplement:
There are two entries for Oridorsalis tener (681, 682). meant or mistake?

The URLs referring to these two entries were different. The mistake appeared because we accidentally removed the variety in one of the species name. This is amended in the new Supplement (File 1), which provides an updated and more comprehensive taxonomic information of the species curated in BENFEP_v1.