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Interactive comment on "PHYTOBASE: A global synthesis of open ocean phytoplankton occurrences" *by* Damiano Righetti et al.

Anonymous Referee #3

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The MS entitled "PHYTOBASE: A global synthesis of open ocean phytoplankton occurrences" by Righetti et al. represents an interesting effort of combining major existing marine phytoplankton diversity information gathered by microscopy observation, discrimination, identification and, for some of them cells and colony counts, all over ocean systems around the Globe. The authors take into account not only abundance (quantitative) but also presence (qualitative) information in the same database, as well as different sampling methodologies which have an impact on the results obtained, considering bigger or smaller organisms (according to mesh/silk size discrimination and/or microscopy limitations), delicate or robust species (which will not be disrupted by mesh collection), rare or abundant species (depending on the volume of sample analysed). The description of the data as well as the combination methodology, quality control,

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flagging and taxonomic relevance/correction of the datasets before and after merging them, are clear. The authors make it possible to address a more complete picture by providing a direct and easier access to current knowledge of phytoplankton distribution all over the oceanic realm, identifying properly the uneven distribution od sampling effort and, consequently, of biodiversity assessment or phytoplankton in large areas mainly identified in the Southern Hemisphere. Moreover, they made also an assessment of which are the taxa well known in comparison which the taxa relatively poorly known, mainly concerning small phytoplankton. Finally, they clearly demonstrate the new possibilities in developing ecological models and predictions on the distribution of phytoplankton taxa in open ocean systems.

I therefore recommend this MS to be published in Earth System Science Data after some small technical corrections (see below).

Some general considerations:

One issue to be reminded is that one cannot state for sure, even considering areas which have been well sampled for decades, that some species are not present in a precise area, mostly because, in the corresponding esxisting databases, studies combining different sampling approaches and, to some extent, also different approaches for considering either morphology, molecular or functional diversity, are scarce.

It remains important then to make this new database as informative as possible, not only concerning the correct nomenclature to be used (and a big effort for make old and new names was also carried out by the present work) but also by considering biases due to different sampling strategies (either nets or tows, Niskin bottles, continuous pumping at a considered depth). One recommendation would be to maintain taxonomic and phylogenetical research as a complement of routine monitoring efforts, providing more accurate consideration of rare species by considering higher sample volumes, concentration by different manners and, the most important, taxonomist expertise which, combined to molecular phylogeny, will certainly make it possible to ex-

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tract more information rom metabarcoding and metagenomic approaches. Moreover, it is also important to consider also new automated approaches which would make it possible to extend the sampling effort on different platforms, addressing most of the time a most limited taxonomical resolution but recalling on functional diversity which, to some extent, would complete taxonomical information included in a marine phytoplankton global database.

Some details:

Page 3 line 74: "...onto a 270 μm silk roll..." as it is important to remind the particular sampling conditions of CPR.

Page 6 line 170; what about other essential metadata as "collection device" and "analytical tool" (type of microscope) and "volume analysed"? Would this information be available/included/easy to access? Page 16: Figure 5 caption: "...temperate seas...of Southern Hemisphere (E), cold seas ...of Southern Hemisphere (F)..."

Page 18 lines 419-420: what about other biases of CPR collection as fragile unarmored species, small but also big as ciliates? An extra comment on this issue will be welcomed, as these surveys are one of the most sustained and complete surveys of plankton in some targeted areas.

Page 20 Figure 8 caption: References García et al. 2013; Locarinio et al., 2013 and de Boyer Montegut, 2004 are missing from the reference list.

Page 22 line 500: To what extent DNA sequencing have really become an alternative to microscopy for characterizing phytoplankton biogeography instead of a complementary and, to some extent supplementary to morphological microscopic identification?

Page 23 line 535: to what extent have you only considered photosynthetical microbial organisms only, especially in some major taxa where both heterotrophs and pigmented cells (mixotrophs or autotrophs) occur? Thanks for precising this in the Materials and Methods section.

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