

Biogeosciences Discuss., author comment AC1
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Reply on RC1

Ádám T. Kocsis et al.

Author comment on "Not all biodiversity richspots are climate refugia" by Ádám T. Kocsis et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-179-AC1>, 2021

Referee: This is a well-written manuscript that describes an analysis of the correlation between biodiversity richspots and climate change refugia. The results are not surprising but still good to have as evidenced.

I only have a few comments, mostly have the presentation of the results.

A: We are thankful for the kind words and the constructive feedback.

R: The opening of section 3.3 seems like an important conclusion that is unnecessarily downplayed in the abstract (although the marine part is appropriately highlighted there). Contrast the wording there to this in the abstract, which almost seems like spin that does not appropriately represent the results, "The results suggest that although terrestrial and freshwater richspots have been and will be somewhat less affected than other areas, they are not excluded from the impacts of global warming. Their characteristic biota is expected to witness similar forcing as other areas, including range shifts and elevated risk of extinction." It seems like this is worded to get attention to a misunderstanding that I don't/didn't think exists - that people think that climate refugia, and thus biodiversity hot/richspots, and thus perhaps biodiversity?, will be completely unaffected by climate change.

The message that refugia will warm is not novel; indeed this has been repeatedly stated in the literature (eg see Morelli et al. 2020 or any of the papers in the Special Issue on Climate-Change Refugia in *Frontiers in Ecology and the Environment*). It is probably worthwhile to show that globally though.

Answer: Our phrasing in the abstract reflects on the initial null hypothesis that richspots are expected to represent refugia, which we tested. Several of the cited studies stated this was the case but they only studied a limited selection of such richspots. Given that we provide some evidence that this might be true to some extent in some locations at least (the majority of richspots in the terrestrial and freshwater realms are in fact expected to face less pronounced changes) we found it noteworthy to be mentioned in the abstract. However, we agree, and will change the wording of the abstract to better reflect the current consensus regarding the effects of climate change in biodiversity richspots. This will also be

emphasized in the main text by including some of the papers that the Reviewer mentioned (e.g. Morelli et al.).

Referee: The difference between marine and terrestrial richspots is likely (also) related to what drives diversity in marine versus terrestrial systems, where connectivity is so different and geography often differing drastically between life stages. There is a short mention on line 192 but I suggest saying more. The connection to tropical marine diversity is mentioned but the distinction between processes there (187-190) and in the terrestrial tropics is not clear.

Answer: Including more information about the differences among realms is a good idea (for example, relative endemicities across the three environments, which reflect their connectivity, might lead to different reactions of richspots to climate change). We will expand this section somewhat during the revisions.

Referee: A few minor suggestions:

107: Move "(hereafter called Myers)" to after (2015)

120: into not to 1

55: seems a bit repetitive

156-159: This is a bit hard to follow. Suggest listing the Terrestrial richspots...part before talking about freshwater. Also not clear what "less within than outside with all three stages" means

161: suggest rewording as "with highest and lowest projected warming in the northern and southern polar regions, respectively.

Answer: We are grateful for the suggested changes in the wording and will incorporate these in the revised version of the manuscript.