**Reviewer #1:**

The authors carefully addressed my comments in this revised version of their manuscript. The revisions provide clarifications that I think will help the overall understanding of the manuscript and its scope (e.g. L101, L250, Fig.1). The recommendations have been clarified. The authors highlight the different lacks of coverage and consensus in studies on temporal trends, provide guidelines to better describe the temporal features of the studies on trends, and present them as a first critical step for further analyses on the temporal scaling of biodiversity trends (L319-332). Figure 1 is now much clearer.

>>> Thank you.

I also read the responses to Reviewer #2, and I wonder whether the interesting discussions raised from several comments on the interpretation of the direction of the temporal trends could also be shared with the readers, maybe by reorganizing the discussion a bit to highlight this point. I have no more major comments on this manuscript.

>>> Good point. From the several comments, the two that we find worth mentioning are those related to different trends in different metrics and to YYY. Concerning the interpretation of the temporal trends of different metrics, we have added a note on this (L222):

*“We caution that the direction of a trend has different meaning according to the metric considered (e.g. an increase of species richness does not bear the same meaning than an increase of spatial beta-diversity).”*

Concerning YYY, we …

Line-by-line comments:  
  
L314 Fig 1D

>>> Done.  
  
L326: I am not sure to see the difference between point 5 and point 7. Point 5 sounds redundant to me as another temporal feature you did not define. Are the temporal extent and temporal lag not sufficient to describe the clustering between the points? For instance, in Figure 1, I would say that the temporal lag in 2000 is equal to x and the temporal extent to 3 x, which gives an idea of the points spread. In 2010, the temporal lag would take two different values: one short interval between the first two points and one longer between the last two, which indicates that some points are more clustered in time.

>>> We now specify in the revised text (lines XXX) that by “lag” we mean the average distance between samples. This definition allows for the duration of the temporal interval to vary, and this also applies to spatial and temporal grain, which is the average area of sites or average duration of sampling events respectively. We now explicitly state this in the introduction:

*“temporal grain is the average duration of an event during which biodiversity is measured, i.e. the duration of a one-time sampling session or the duration for which a metric is computed (Fig. 1C, 1D, respectively), while temporal extent of a study refers to the temporal span between the earliest and latest sample in a study (Adler & Lauenroth, 2003; Fig. 1B).* *Another aspect of scale is temporal or spatial lag, which refers to average spatial or temporal distance between sampling sites or events respectively. The term average is important here: we only get to grain by averaging area across multiple sites, or averaging durations across multiple events. This means that grain can be defined even when area of sites or duration of events varies, and lag can be defined even when distance varies.”*

L369 I think only 11 articles are presented for Europe in Figure 2.

>>> Corrected.  
  
Table 1: Consider adding the reference for the examples, as done for Faith's PD.

>>> Done.  
  
Table 2: To be consistent with Figure 1, the legend could specify that the temporal features described in the table refer to the analysis conducted.

>>> Added.  
  
Figure 2: By reading your argument about the differences in coverage between the northern and southern hemispheres again, I think that perhaps figure 2 does not capture this result well. Maybe the message would get across better if the figure displayed a half-empty world map, but I understand it's not very convenient.

>>> We do agree that it would represent better the lack of spatial coverage. However, it would make the display and reading of the references inconvenient. Thus, we prefer to keep the maps as they are.

**Reviewer #2:**

The paper is much improved. The additional recommendations/guidelines provided are also very appreciable.  
I think this paper would be useful and is timely considering the current increase in temporal analysis of biodiversity.  
  
There is still one missing element. It's easy to include and would change significantly the clarity and novelty of the contribution:  
In the introduction, either for spatial but even more for temporal scales (grain and extent), the authors should provide an example of process that could explain an observed discrepancy among biodiversity trends calculated at different scales. I mean why is it possible and expected at the first place that biodiversity can have a different trend when measured at local vs regional scale? No need to be exhaustive about those processes, but this would help considerably the reader to understand what this review is supposed to capture. What are the fundamental reasons to check that temporal trends are affected by the temporal extent? What could cause this dependancy? If not specified, the proposed analysis is somewhat unjustified.

>>> Good point. The ecological reasons of the spatio-temporal scaling of biodiversity dynamic are part of a still ongoing debate in the literature. We cite here the studies focusing on this topic that we know of: Chase et al. (2019), Jarzyna et al. (2015), Jarzyna & Jetz (2018), Keil et al. (2018), Leroy et al. (in prep.). As a matter of fact, temporal trends of taxonomic diversity are resulting from 3 ecological processes, namely colonization, extinction and persistence which are themselves scale dependent (Jarzyna et al., 2015; Jarzyna & Jetz, 2018; Keil et al., 2018; Leroy et al., in prep.). Also, processes such as dispersion, extirpation or carrying capacity of an ecosystem can drive the shape of the temporal change scaling (Chase et al., 2019). However, concerning the temporal scaling of biodiversity trends, literature is almost non-existent and only assumptions can be made. This is because (and this is what we emphasize on in this present manuscript), temporal features (especially temporal grains) are not always reported in the studies. Even if they are reported, aggregating temporal grains together is challenging as they are often heterogeneous. A personal analysis conducted on local surveys of Czech birds resulted in no temporal scaling of biodiversity trends, while spatial scaling was clear (Leroy et al., in prep.).

We added a short version of this paragraph in the introduction L68-72:

*“**In fact, the magnitude of the ecological processes responsible for the temporal change of biodiversity such as colonization, extinction, persistence, dispersal or extirpation are themselves scale dependent leading to different spatial scaling of biodiversity changes (Chase et al., 2019; Jarzyna et al., 2015; Jarzyna & Jetz, 2018; Keil et al., 2018).”*

It still remains unclear why some studies using abundance based metrics were discarded. The response in the letter is I think not completly justified (it would generate too many studies to consider). I understand for very specific indicators focused on particular groups of birds (thermal tolerant, farmland birds...) but many studies have described biodiversity dynamics using multiple species abundance based metrics. It connot be simply considered "out of the scope" of this paper. After all, those metrics are telling something essential to understand local and global biodiversity trends. For instance, why Rosenberg et al. 2019 Decline of the North America avifauna, Science. is not considered? Or Burns et al. 2021 Abundance decline in the avifauna of the European Union reveals cross-continental similarities in biodiversity change, Ecology and Evolution? There is an elusive mention, late in the discussion, that those "abundance-based metrics are beyond the scope our study" (l290). This is not convincing. Of course it is legitimate to focus on species numbers but we need to better understand why and what is missed by doing so. I suggest this is more emphasized in the introduction and in the interpretations. You could have observed a stable trend in species richness and a massive loss in abundances of each species. Would you conclude that "biodiversity" is "stable", I hope not. Your interpretations in the discussion tend to suggest that species numbers is a good proxy for "biodiversity". I think you won't lose the interest of your analysis by being much more nuanced about this and expanding much more the importance of tracking changes in abundances.

>>> We first emphasize in the introduction that trends of abundance-based and incidence-based can differ (L107-109):

*“Also, we caution that population-based metrics represent other facets of biodiversity (i.e. overall number of individuals, ecosystems conservation…), and that the sign of their change can be opposite to incidence-based metrics.”*

Second, we have modified the discussion and specified that the local increases of species richness coincide with loss of bird individuals (and we cite Burns et al. 2021 *Ecology and Evolution*; Rosenberg et al. 2019 *Science*). Also, we emphasize on the fact that better understanding the link between abundance and incidence-based metric should be explored L297-301:

*“We stress that those abundance-based metrics show clear decline (Barnagaud et al., 2017; Burns et al., 2021; La Sorte & Boecklen, 2005; Rosenberg et al., 2019), confirming that increases of incidence-based metrics can be observed together with decreases of abundances. Also, we see an opportunity for future comparisons of trends of both species-based and non species-based metrics in order to better understand how they influence each other’s.”*

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