**Title: Assessing biodiversity changes across a continuum of spatio-temporal scales**

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**Abstract:** Magnitude assessment of biodiversity changes is challenging, even in well surveyed groups such as birds. Especially, trends of biodiversity can be driven by the spatial and temporal scales considered, specifically by spatial grains (*i.e.* area of a sampling unit), geographic extent (*i.e.* size of the area of interest), temporal grain (*i.e.* duration of a sampling event) and temporal extent (*i.e.* length of the time series). However, the influence of spatio-temporal scales on biodiversity trends is seldom documented. Here, we empirically address this issue by using high-quality spatially and temporally heterogenous time-series on bird biodiversity of Czech Republic. A first dataset comes from atlases of Czech Republic and represent the highest spatial and temporal scales. The second one is composed of local time series with high resolution spatial and temporal scales. We show that trends of species richness are stronger with increasing spatial grains, showing that the intensity of macroecological processes varies with spatial scaling. The same analysis is conducted on colonization and extinction processes. We also found that biodiversity reaches a plateau with increasing temporal grains allowing inference of an optimal census time. In addition, we use tree-based ensemble models to predict biodiversity metrics at locations, spatial grains and temporal grains for which data are lacking. Together with the unprecedented biodiversity data, these machine learning methods 1) highlight the link between biodiversity metrics and spatio-temporal scales and 2) hold promises for estimation of biodiversity trends in data-poor regions.