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Consequences of scale dependence on biodiversity change

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DESCRIPTION

Recent estimates of biodiversity change are still disputed, unreliable, and rarely evaluated for their functional ramifications. Here, they report that evidence of temporal biodiversity change is influenced by the spatial size and kind of biodiversity assessment. They demonstrate a pervasive scale dependency of temporal trends in Taxonomic Diversity (TD) and Functional Diversity (FD) for record of global extinctions and an approximately 50-year record of bird assemblages from the North American Breeding Bird Survey. Everywhere but the world scale, the average TD and FD grew. Functional robustness was signaled by the fact that TD change surpassed FD change toward large scales. Assemblage turnover (replacing species or functions) and temporal dissimilarity decreased with scale, although nestedness (assemblages' propensity to be subsets of one another) grew (Caminade C, 2019).

The patterns of FD change among food and foraging guilds were very different. They argue that a scale-explicit paradigm is necessary for monitoring, policy, and conservation in order to take into consideration the ubiquitous impact that scale has perceived biodiversity change. Globally, the state of biodiversity and its numerous roles is changing quickly, with a wide range of potential effects on human well-being. The ability to recognize the signature of anthropogenic impacts, assess the human costs of biodiversity loss, and inform monitoring and conservation initiatives all depend on an accurate measurement of this shift. But the evidence of local biodiversity change is frequently still ambiguous and inconsistent. Notably, that investigation combined information from sites with area differences of up to eight orders of magnitude (Courchamp, 2018).

Despite the fact that it is acknowledged that taxonomic diversity, or species richness, does not take into account the numerous ecological functions that the species that make up communities perform, it continues to be the primary indicator of biodiversity. As a result, it may not take into account the effects of a change in biodiversity on how ecosystems function and the services they provide to humans. The functional implications for ecosystems of the loss or gain of some species may be significantly greater than those of other species, and the impact on assemblage functional diversity may differ. Understanding the processes responsible for the geographical and temporal dynamics of species occurrence and community assembly is recognised as fundamental for understanding the functional characteristics of species, and is increasingly considered crucial for conservation prioritising. FD change has, however, rarely been examined in a scale-dependent setting (Ellwanger, 2002).

Here, they demonstrate a pervasive scale and metric dependence of taxonomic and functional diversity change using especially suited, detection-corrected, and near-continental data from the North American Breeding Bird Survey (BBS) over a period of nearly 50 years, extended to extinctions at the global scale. However, growth in TD outpaced change in FD toward large scales, indicating high trait redundancy at those scales. They find that TD and FD rose at all save the world scale. Diet and forage guilds showed quite different patterns of reduction in functional diversity, raising worries about the loss of essential ecological processes. According to their findings, monitoring, policy, and conservation efforts should adopt a scale-explicit approach to take into consideration the pervasive influence that scale has on perceived biodiversity change (Fan, 2019).

Scale is implied in the management, monitoring, and policy procedures that are pertinent to all targets even when it is not expressly expressed. Their results show how scale affects evidence of biodiversity change as well as its ramifications. The detection and management of biodiversity change may need to be reconciled with the spatial and temporal scale most pertinent to the question. Gains or apparent stasis at one scale may be fully reconcilable

with losses at others. Their functional implications will vary by scale and functional component. This finding supports the requirement for cross-scale integration of the evidence of biodiversity change supported by models and remote sensing, as well as a better assessment of the functional dimensions of change (Wang, 2022).

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