
A quarter of alpine plant species in the French Alps in decline over the last century

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Abstract

Quantifying the impact of global change on biodiversity has become a major focus of scientific interest and is pivotal to inform policy and conservation decisions. However, demonstrating that past global change has resulted in a net loss of biodiversity remains a challenge, mainly due to data quality. While mountain ecosystems are among the most vulnerable to climate change, they also represent a biodiversity hotspot, making them ecosystems of great interest. With the aim of measuring changes in alpine plant diversity by identifying and characterizing winners and losers, we analyzed 11 million occurrences of about 4800 species in the French Alps over the period 1900-2020. We applied a detection framework to correct statistically for spatio-temporal biases in the data (i.e. Frescalo; Hill 2012). We found that a quarter of alpine plant species significantly decreased their distribution, while about twenty percent can be considered as winners. Identified losers tend to be indigenous species, while winners tend to be exogenous species. We further characterized the functional strategies of losers and winners by studying their traits, and we asked whether species with similar distribution trends were more closely related in the phylogeny than species with different responses. This study represents an important descriptive step to identifying biodiversity trends in alpine plant species which is needed to perform an attribution framework to understand what are the drivers of these winning and losing trends.

Keywords: Biodiversity change, Winners, Alpine plants, French Alps, Spatiotemporal Analysis

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