Global Change Asymmetrically Rewires Ecosystems

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January 31, 2025

Abstract

Global change is altering ecosystems in ways that threaten the critical functions on which biodiversity depends. Despite this, we know very little about how drivers of global change broadly affect food webs. While an industry of studies documents shifts in whole carbon pathways within food webs in response to anthropogenic pressures, a comprehensive synthesis is lacking. To address this, we provide empirical examples across diverse ecosystems and conduct a systematic literature review to reveal the prevalence of asymmetric rewiring – a phenomenon whereby drivers of global change consistently but disproportionally alter the flow of some carbon pathways relative to others. Further, using food web models, we show how asymmetric rewiring erodes resilience and disrupts key functions, such as primary and secondary production. Global change is complex and multidimensional, making it challenging to understand how human activities affect ecosystem processes. Our work critically synthesizes empirical evidence to uncover a remarkably general response in food webs to global environmental change that needs to be better understood to protect nature and the services that human societies rely on in a rapidly changing world.

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