Resilience of the biomass pyramid to increasing disturbance regimes

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Abstract

Ecological pyramids, which represent the distribution of abundance and biomass among body sizes or trophic levels, depict one of the most striking similarities among the world's ecosystems. As a general rule, larger organisms, higher in the food chain, are less abundant than smaller ones lower in the food chain. The metabolic theory of ecology provides theoretical baselines regarding the shape of such ecological pyramids in undisturbed environments. However, while climate change is expected to increase the frequency and intensity of disturbances such as storms, fires or drought, it remains unclear how growing disturbance regimes may affect ecosystem structure and dynamics. We experimentally investigated the response of ecological pyramids to varying disturbance regimes using protist communities that cover a wide range of body sizes, feeding types and have populations with densities varying over orders of magnitudes. We disentangled the links between disturbance regime, organism growth rates and community resilience to build a size-based theory that predicts the level of disturbance an ecological pyramid can recover from.

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