The predictability of species contributions to ecosystem stability under multiple stressors

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Abstract

Simultaneous exposure to multiple stressors potentially complicates enormously the challenge of predicting ecological responses to global environmental change. Here, we show that, though the contributions of individual species and functional groups to ecosystem stability may vary under different disturbance types, their contributions to stability under combined stressors can nonetheless frequently be predicted from their contributions under the individual disturbances acting in isolation. By disturbing natural rocky shore communities experimentally with nutrients and sediments and simultaneously simulating extinction of predatory whelks and grazing consumers both separately and in combination, we found that trophic position does not, however, appear to be a useful general predictor of species contributions to stability. We conclude that quantifying contributions of key species and functional groups to stability across a range of environmental contexts may provide a pathway towards predicting the multifaceted responses of ecosystems to distinct combinations of stressors acting simultaneously.

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