

Tipping point arises earlier under a multiple-stressor scenario

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Abstract

Anthropogenic impacts and global changes have profound implications for natural ecosystems and may lead to their modification, degradation or collapse. Increases in the intensity of single stressors may lead to ecological thresholds, which can create abrupt shifts in biotic responses. The effects of multiple interacting stressors may create synergistic or antagonistic interactions, leading to non-linear responses. Here we combine both concepts – ecological thresholds and interactions between multiple stressors – to understand the effects of multiple interacting stressors along environmental gradients, and how this can affect the occurrence of thresholds. Using an experimental approach to investigate the effect of nutrient enrichment and saltwater intrusion on mortality in the zebra mussel, *Dreissena polymorpha*, we show that multiple stressors can create thresholds at lower levels of an environmental gradient. Our results reveal that by treating the concepts of ecological thresholds and multiple stressors individually we risk underestimating widespread anthropogenic impacts. Our results reveal a major shortcoming in how we currently investigate these two ecological concepts, as considering them separately may be causing underestimation of thresholds and stressor-interaction impacts.

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