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<AT>Environmental warming accelerates extinctions but does not alter extinction debt

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<ABS-HEAD>Abstract

<ABS-P>Climate change is predicted to contribute to the present wave of extinctions; however, these extinctions may not immediately follow temperature increases and other climate change effects. We examined how predator species composition and increased temperatures affected bacterivorous protist community extinction debt (the number of species that will go extinct) and relaxation time (the amount of time it takes for the extinction debt to be paid off). We found that neither affected relaxation time, but that the presence of a generalist predatory protist species increased extinction debt through its role as a keystone predator. Warming also significantly decreased how long it took communities to lose half of the species that were to eventually go extinct. That this half-relaxation time was shorter in warmed communities than in unwarmed communities in this system indicates that extinctions were front-loaded in the warmed communities compared to the unwarmed communities. Our findings suggest that even if increased temperature is not expected to increase extinction debt, it could still accelerate the rate at which those extinctions will occur. This in turn narrows the time window for taking actions to prevent a large portion of the extinction debt from being paid off.

<KWD>Keywords: climate change; microcosm; protist; relaxation time

Introduction

While the current species extinction rate is 100 to 1000 times higher than the background rate, the future extinction rate may be 10 times higher than it is now (Millenium Ecosystem Assessment 2005, Scholes et al. 2010, de Vos et al. 2014, Ceballos et al. 2015). This suggests that the Earth is undergoing its sixth mass extinction (Bellard et al. 2012). Habitat destruction is believed to be the largest threat to global biodiversity currently; however, climate change could become a larger threat within the next few decades due to its increasing effects on communities that range from global to local (Stork 2009, Leadley et al. 2010). Although surprisingly few extinctions have been attributed to climate change so far, that is likely to change (Cahill et al. 2012). Unfortunately, estimating how many extinctions will occur due to climate change

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