Harvesting can stabilize population fluctuations and buffer the impacts of extreme climatic events

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Abstract

Harvesting can magnify the destabilizing effects of environmental perturbations on population dynamics and, thereby, increase extinction risk. However, population-dynamic theory predicts that impacts of harvesting depend on the type and strength of density-dependent regulation. Here, we used logistic population growth models and an empirical reindeer case study to show that low to moderate harvesting can actually buffer populations against environmental perturbations. This occurs because of density-dependent environmental stochasticity, where negative environmental impacts on vital rates are amplified at high population density due to intraspecific resource competition. Simulations from our population models show that even low levels of harvesting may prevent overabundance, thereby dampening population fluctuations and reducing the risk of population collapse and quasi-extinction following environmental perturbations. Thus, depending on the species' life history and the strength of density-dependent environmental drivers, low to moderate harvesting can improve population resistance to increased climate variability and extreme weather expected under global warming.

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