Harvesting can stabilize population fluctuations and buffer the impacts of climate change

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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 population models for a range of life histories and an empirical reindeer case study to show that 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 intra-specific resource competition. Simulations from our population models show that even low levels of proportional harvesting may prevent overabundance, thereby dampening population fluctuations and reducing the risk of population collapse and quasi-extinction induced by environmental perturbations. Thus, depending on the species' life history and the strength of density-dependent environmental drivers, harvesting can improve population resistance to increased climate variability and extreme weather expected under global warming.

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