Temperature rise improves harvest sustainability in a model system despite reduction in carrying capacity

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Abstract

Stage-structured population models parameterized from benchtop trials of individual growth, reproduction and survival predicted that temperature rise should make populations of Daphnia magna more resilient to periodic harvest perturbation, despite reduced stock abundance. We tested these predictions under controlled laboratory conditions on 24 populations maintained under constant levels of food abundance, but subjected to weekly harvest events over 10 weeks. As predicted, unperturbed Daphnia populations raised at 15*C were substantially more abundant by the end of 10 week trials than those raised at 25*C, but abundance declined sharply with harvest intensity and Daphnia populations collapsed entirely at the highest harvest rate, whereas those populations raised at 25*C were little affected by perturbation. Our findings suggest that projected patterns of climate change should tend to make populations whose growth rates and rate of maturation increase with temperature better capable of coping with periodic harvest perturbation, despite declining levels of abundance.

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