
Concurrent density dependence and independence in populations of arctic ground squirrels

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No population increases without limit. The processes that prevent this can operate in either a density-dependent way (acting with increasing severity to increase mortality rates or decrease reproductive rates as density increases), a density-independent way, or in both ways simultaneously¹⁻³. However, ecologists disagree for two main reasons about the relative roles and influences that density-dependent and density-independent processes have in determining population size^{4,5}. First, empirical studies showing both processes operating simultaneously are rare⁶. Second, time-series analyses of long-term census data sometimes overestimate dependence^{7,8}. By using a density-perturbation experiment⁹⁻¹² on arctic ground squirrels, we show concurrent density-dependent and density-independent declines in weaning rates, followed by density-dependent declines in overwinter survival during hibernation. These two processes result in strong, density-dependent convergence of experimentally increased populations to those of control populations that had been at low, stable levels.