Density-dependence in Vital Rates and Population Growth in Mountain Goats: Population Regulation or Limitation?

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Abstract: Density-dependence plays a central role in wildlife management. Most harvesting scenarios assume that if density is lowered by harvest, recruitment will be stimulated by reduced intraspecific competition for resources. We used 15 yr of longitudinal data on the growth, survival, and reproduction of marked mountain goats (*Oreamnos americanus*) at Caw Ridge, Alberta to assess the effects of population density on vital rates and population growth rate. We found very little evidence of density-dependence in population dynamics. Despite an 88% increase in total population and a 69% increase in the number of adult females, there was no decline in kid production and survival to 1 yr, no increase in age of primiparity, and only minor negative effects on the mass of juveniles. However, population growth and kid survival to one year correlated with the average mass of yearling males in mid-July, suggesting that yearly changes in resource availability affected the population dynamics of mountain goats. Average mass of yearling females was not correlated with population growth rate or kid survival. In years when fecal crude protein in early June was high, kids were heavier by mid-summer. We suggest that the mountain goat population on Caw Ridge was mostly food-limited and that its growth essentially was independent of population density. Predation played a limited role on population dynamics. Predation on small, isolated populations of mountain ungulates could vary with the behavior of individual predators in a density-independent manner, and therefore may be highly unpredictable. Although it is likely that over the very long term some goat populations may reach carrying capacity and display density-dependence, our long-term research on Caw Ridge provides little support for a consumptive management strategy based on the assumption of density-dependence or compensatory mortality in native populations.

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