

Recent change in patterns of vole dynamics – for better or for worse?

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Over the last decade, several reports on arvicolid rodent populations have presented evidence of a change in lemming and vole dynamics, from regular high-amplitude density oscillations to acyclic fluctuations at relatively low level. Most studies have focused on the arctic region of Europe (above 60° N), and they indicate that the fading of multiannual cycles has been caused by climate warming, which is most pronounced in the winter season. Less persistent snow cover might be responsible for dramatic declines in the numbers of wintering voles. In this report we present data indicating similar changes in open habitats of Poland (49°-54°N). The population dynamics of two vole species, *Microtus oeconomus* and *M. arvalis*, examined over the last 25 years, exhibit marked changes in the pattern of density fluctuation: the fairly regular population fluctuations observed until the late 1980s or early 1990s have subsequently become more erratic, reaching significantly lower levels, on average. When searching for the most probable causes of these changes, we examined which winter climate factors had the greatest influence on the successful overwintering of a population of the root vole *M. oeconomus* in the open marshland of eastern Poland. Using long-term weather data from a local meteorological station, and precise data on root vole dynamics collected over a 12-year period, we found that the duration of snow cover, combined with winter severity and the duration of the thermal winter were the best predictors of the number of winter survivors. According to 48-year weather records, all of these variables indicate a gradual decrease in the severity of winters, with the most apparent change in the duration of snow cover at the end of 1980s. This indicates that climate warming could be responsible for changes in vole dynamics also in more temperate regions of Europe. The main positive effect of the change to lower-level, erratic fluctuations in vole density would be a reduction in the damage they cause to field crops, while the main negative effect may be a decrease in animal species diversity in farmland and in more natural open habitats. We present indirect evidence suggesting that decreasing availability of voles - the main prey species of many predators - has increased predator pressure on alternative prey, mostly small and mid-sized birds and mammals.

Keywords: alternative prey, climate warming, fading cycles, *Microtus arvalis*, *M. oeconomus*, species diversity, winter