EFFECTS OF ENVIRONMENTAL VARIABLES ON SOME PHYSIOLOGICAL RESPONSES OF MICROTUS MONTANUS UNDER NATURAL CONDITIONS

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Objectives

Cyclic fluctuations in the population density of microtine rodents have been known since antiquity. However, factors responsible for this phenomenon are not known.

The objectives of this long term study are essentially three-fold. First, to characterize those environmental variables that might affect Microtus montanus in different seasons of the year. Second, to record the growth, maturation and reproductive activity of the voles under natural conditions. Third, to determine the maturational as well as the seasonal pelage changes of these rodents. The data resulting from the execution of the above objectives would be correlated in an attempt to determine the causes underlying the multiannual fluctuations in the population density of these microtine rodents in Grand Teton National Park.

Methods

Microtus montanus were livetrapped and sacrificed as soon as possible after capture. Age estimation for all animals was based on weight, total length, and pelage characteristics. Reproductive organs, the spleen, and the adrenal glands were collected from the animals and preserved in Lillie's buffered neutral formalin for further histological study. Flat skins were prepared from all animals. All tissues are currently being processed at the Department of Biological Sciences, University of New Orleans.

In 1985 field observations in Grand Teton National Park were carried out over two study periods: a spring study period (during the second half of May) and a summer study period (mid-July to mid-August).

Results

Probably the most significant finding was the discovery of a correlation between litter size in one year and population dynamics in the next. The existence of multiannual cycles in population density of Microtus montanus had been documented earlier. However, it was now discovered that litter size also exhibits multiannual cycles. The cycles in litter size, however, precede the cycles in population density by one year. Since the population density cycle tracks litter size cycles by one year, it was concluded that in any given year it is possible to predict population dynamics for the ensuing year. It must be

emphasized that what can be predicted is the direction of the population density trend (an increase or decrease) for the following year. What cannot be predicted is the actual density that will be achieved. However, this is to be expected. If litter size could predict the actual density, this would imply that all other factors (e.g., disease, predation, food quality and quantity) do not affect population dynamics of these rodents. Common sense dictates that this is obviously not the case. Furthermore, in this 17-year study there were two cases when predictions made by litter size in one year did not materialize in the next. Although the precise reasons behind these two exceptions are not entirely clear, it appears that each of the two exceptions was caused by a different factor. Details of these observations have been submitted for publication.

As usual, weasels (Mustela frenata and Mustela erminea) entered the unbaited traps that had been set for Microtus. The population density of weasels in 1985 was high, essentially the same as in the summer of 1984.

A white spotted pocket gopher (Thomomys talpoides) was once again trapped in the summer of 1985. This mutation was discovered in 1982. Three more mutant animals had been trapped in 1983, although none were obtained in 1984. The spotted pocket gopher of 1985 (a subadult) was trapped seven meters from the site that had yielded a mutant animal earlier.

A cooperative study of the endoparasites of small rodents in Grand Teton National Park was initiated with Dr. William O'Dell (University of Nebraska - Omaha) in the summer of 1985.

Conclusions

In the montane vole, Microtus montanus, multiannual fluctuations are exhibited by both, population density and litter size. The fluctuations in litter size precede the fluctuations in population density by one year. Consequently, litter size can be used as a predictor of the direction (increase or decrease) of population dynamics in the ensuing year. It is hoped that these observations will be useful in parts of the world where attempts are made to predict population dynamics of these rodents in order to avert the tremendously high economic losses they can cause.

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