

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

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Project Number 173

The aims of this study were essentially the same as those described in the report on this project for the summer of 1969. In brief, between May and October, 1974, several physiological parameters were examined in the montane vole (Microtus montanus) under natural conditions. The physiological responses of these rodents are being correlated with seasonal changes in several environmental variables. The collection of data was essentially the same as outlined in the 1969 report.

Field Observations

Field observations at the Research Station were carried out over three study periods: spring (May), summer (July and August), and fall (October).

A. Spring Study Period (May):

The winter of 1973-74 apparently had been extremely favorable for the survival of Microtus. In the spring of 1974 the population density was higher than it had been in any spring since the beginning of this study. Litter sizes were somewhat smaller than those seen in the spring of 1973. Also, Microtus had started breeding on a population-wide basis in 1974 somewhat later than in 1973. Nevertheless, in view of the high initial breeding population in the spring of 1974 the attainment of very high population density could be expected during the rest of 1974.

B. Summer Study Period (July-August):

In view of the record high numbers of Microtus found during the spring study period, it was surprising that the summer population density appeared to be not much higher than that recorded in the spring. Indeed, the summer 1974 population density appeared to be lower than that seen in 1973. In other words, the population growth rate had leveled off dramatically since the spring period. Litter sizes were unusually small for both, subadult and adult females. Furthermore, it appears that females frequently failed to remate in post partum estrus. Resorption of embryos was also observed.

The impaired reproductive performance of Microtus is most probably linked to the unusual weather conditions in Jackson Hole during the summer of 1974. Ordinarily June is a month of high precipitation. This is also the period of growth for herbaceous plants on which Microtus feed. The

amount of precipitation during June, therefore, exerts a profound effect on the quality and quantity of food available to these rodents. Jackson Hole experienced a drought during 1974 (rains did not start until early August). The drought had a dramatic effect on the vegetation which was unusually short and sparse in the summer of 1974. Previous laboratory and field studies have shown that the quality of diet significantly affects the reproductive status of Microtus. The summer's observations, therefore, again support my earlier contention that the duration of any one population cycle in Microtus is governed to a significant degree by environmental variables.

Another factor which further reduced the population growth rate during the summer of 1974 was the appearance of large numbers of weasels (Mustela erminea and M. frenata). The numbers of weasels that entered Microtus traps in the summer of 1974 was twice that of the summer of 1973.

#### C. Fall Study Period (October):

The fall population in the study area was somewhat lower than that recorded during the summer. This probably was the result of a number of factors, such as continued poor reproductive performance and high predation pressure. Furthermore, in contrast to the fall of 1973 no pregnant animals were obtained in the fall of 1974. This result has additional significance since the fall study was conducted more than a week earlier than that in 1973.

Materials collected in the field are currently being processed at the Department of Biological Sciences, University of New Orleans. The final analysis of the 1974 data is incomplete at the present.

It is difficult to predict whether a crash will occur in the winter of 1974-75. Five years have elapsed since the last crash (winter of 1969-70). Five years is generally considered to be the maximum population density cycle length for Microtus. Still, the population size entering the winter of 1974-75 is lower than that which entered the previous winter (when a crash did not occur). Although the fall 1974 population is lower than that of the fall of 1973, it still represents a high density of Microtus. Coupled with a possible shortage of food and/or cover (due to the poor herbaceous crop) the ecological-physiological conditions may lead to a crash.

#### Acknowledgments

I wish to thank Stephen Leftwich, John Lorenzen, Jean Rainey and Janet R. Smith for their help during various phases of the study.