

FIELD METABOLIC RATS IN MICROTINE RODENTS

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Objectives

Microtus montanus populations manifest large scale periodic fluctuations in density. Populations of Microtus longicaudus inhabiting the same environment do not exhibit such fluctuations. This study seeks to compare the energetic requirements of the two species at different seasons and among the cohorts that are born successively during the breeding season. From these data we expect to gain a better understanding of the adaptive physiological responses of both species to their environment.

Procedures

We are using stable isotopes (^{18}O , D/H) to measure field metabolic rates in free-ranging Microtus. This technique involves the injection of a small volume (150 micro liters) of doubly labelled water D_2^{18}O into a Microtus after it is captured. After the isotopes equilibrate in the body water (1 hour), a small blood sample is taken and the animal is released. Three days later the animal is recaptured and another blood sample is taken. Using a very sensitive isotope ratio mass spectrometer, the concentrations of the two isotopes are measured from the initial and final samples of blood. Carbon dioxide output can be calculated from these data.

Results

During the 1987 field season we tested the isotope technique in Microtus montanus in Jackson Hole populations. This permitted us to determine appropriate dosage and effective washout half-lives of the isotopes in free-ranging Microtus of different sizes. In the Jackson Hole environment, the washout half-life of doubly-labelled water is about 1.4 days. The ideal time for taking final blood samples with this technique is between 2-3 half-lives. Recapturing the animals between 50-72 hours after initial sampling gave good results. This technique is now operational for data collection in the 1988 field season.

Associated with the isotope energetics study is our investigation of cohort growth rates. Previously, in a stable marsh environment, we found that cohorts of Microtus montanus born at different times of the season exhibited very different growth, maturation and survival rates (Negus, et. al. 1986). During 1987, from May to October, we monitored growth and maturation rates of four cohorts in Microtus montanus populations in the fluctuating environment at Jackson Hole. Analysis of these data is currently underway. In 1988, we will also monitor cohort responses in Microtus longicaudus and Microtus pennsylvanicus. These data together with our isotope metabolic studies may lend considerable insight to the differential dynamics of various species of microtine rodents.

Literature Cited

- Negus, N. C., P. J. Berger and B. W. Brown. 1986. Microtine population dynamics in a predictable environment. *Can. J. Zool.* 64:785-792.