Natural selection on body mass and metabolic rates in root voles, *Microtus oeconomus*

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The relationship between physiological traits and fitness components is poorly studied in free-living populations. We analyzed the relationship between body mass, resting (RMR) and peak (PMR) metabolic rates and winter survival of root voles, *Microtus oeconomus*. We expected higher survival rates of smaller (lighter) individuals having higher mass-corrected RMR and PMR as a reflection of their adaptation to low quality of plant food (characterized as the concentration of silica compounds) and unpredictable weather conditions. We carried out our study for three consecutive winters, when high population density during the first winter was followed by a population crash in the second season and an increase in population density during the third winter. Survival of smaller individuals of both sexes was highest in the first part of winter (November- January). RMR was positively correlated with survival rates at the lowest population density, when the concentration of silica in plants was very high. PMR was positively correlated with survival during the first part of the third winter, which was the coldest period during our study. Our results suggest that food quality and climatic conditions drive natural selection of physiological traits.