Behavioral responses of Allegheny woodrats to fluctuating enrichment stimuli and their implications for reintroduction programs

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The reintroduction of extirpated species from captive populations is an important tool for the recovery of endangered species; however, behavioral deficits (e.g. lack of anti-predator and proper foraging behaviors) among released individuals limit the success of these programs. Furthermore, the development of abnormal repetitive behaviors (ARB) has the potential to limit reproductive success. Allegheny woodrats (*Neotoma magister*) are a rapidly declining species, and a captive-breeding program was designed to augment remnant populations. The goal of this study was to stimulate a broad repertoire of natural behaviors and reduce the development of ARB in captive-reared woodrats using a rotation of various types of enrichment. At weaning each woodrat (13; 7 females and 6 males) was randomly assigned to a rotation of the following treatments: food allocation (food that was buried in sand, hidden in a box, or scattered throughout the individuals' enclosure); nesting material (a cedar plank that could be shredded, crinkle paper placed in a mesh container requiring the animals to work to remove it, or facial tissue placed in the same mesh container); and running wheel (present or absent). Items within each treatment were rotated weekly. Five behavioral categories (active, inactive, maintenance, enrichment interaction, and unknown) were recorded by instantaneous scan samples every 10 minutes, 3 days each week, for 5 weeks. Time budget data was analyzed as a GLM and square root transformed for normality. ARBs were recorded at the same intervals and summed for a GLIM analysis with Poisson distribution. Behavioral patterns varied among individuals ($F_{4,11}=63.99$, $P<0.001$). Woodrats spent the most time inactive and the least performing maintenance behaviors ($P<0.05$). However, none of the enrichment treatments altered observed behavior budgets. ARB observations significantly increased when a running wheel was present compared to days when it was removed ($\chi^2=54.0$, $P<0.001$). Overall, these results suggest that the presence of a running wheel increased the display of ARBs in captive-reared woodrats, but overall the enrichments provided did not affect general time budgets.