Use of Woodchuck Burrows by Small Mammals in Agricultural Habitats

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Notes and Discussion

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**ABSTRACT.**—Meadow voles (*Microtus pennsylvanicus*) and white-footed mice (*Peromyscus leucopus*) used areas within 2 m of woodchuck (*Marmota monax*) burrows more extensively than areas 10–14 m away from 86 burrows in orchards and hayfields. Short-tailed shrews (*Blarina brevicauda*) were captured with equal frequency ≤2 m and 10–14 m from burrows. Most adult meadow voles captured near burrows were reproductively active females. If woodchuck burrows function as nursery sites, their abundance and distribution could influence growth rates of meadow vole populations, potentially increasing crop damage.

**INTRODUCTION**

Woodchucks (*Marmota monax*) commonly occupy farmlands of eastern North America. These semi-fossorial herbivores are capable of altering vegetation by feeding, gnawing and burrowing (Merriam and Merriam, 1965; Swihart, 1991; Swihart and Conover, 1988; Swihart and Picone, 1991, 1994). Farmers sometimes view woodchucks as pests (Phillips *et al*., 1987), because their activities can reduce crop yields (Swihart, 1991; Swihart and Picone, 1994).

Woodchucks also may indirectly increase levels of damage to agricultural crops by making habitats more suitable for other pest species, although this possibility has not been explored. For instance, if burrows, by serving as refuges, enhance either survival or fertility rates of other pests, damage caused by these pests could increase. Woodchuck burrows serve as refuges for a variety of other wildlife species, commonly being occupied by eastern cottontails (*Sylvilagus floridanus*), Virginia opossums (*Didelphis virginiana*), striped skunks (*Mephitis mephitis*), raccoons (*Procyon lotor*), red foxes (*Vulpes vulpes*), white-footed mice (*Peromyscus leucopus*), house mice (*Mus musculus*) and short-tailed shrews (*Blarina brevicauda*) (Hamilton, 1934; Grizzell, 1955; Dolbeer *et al*., 1991). Although some of these species can cause occasional problems for farmers, none are serious pests. However, meadow voles (*Microtus pennsylvanicus*) are broadly sympatric with woodchucks, and they can be serious pests in farmland regions, particularly during population surges (Johnson and Johnson, 1982; Byers, 1985). Herein, we test whether woodchuck burrows serve as activity foci for meadow voles and other small mammals in agricultural habitats.

**STUDY AREA AND METHODS**

We studied use of woodchuck burrows by small mammals in two hayfields and three commercial orchards in central Connecticut. The hayfields (3.7 ha and 2.0 ha) were dominated by alfalfa (*Medicago sativa*) and orchard grass (*Dactylis glomerata*). Scattered amounts of campion (*Lychnis alba*), Kentucky bluegrass (*Poa pratensis*), curled dock (*Rumex crispus*) and winter cress (*Barbarea vulgaris*) also were present. The hayfields were separated by an 8-m wide paved road characterized by moderate traffic volume. Roads of this size severely inhibit movements of small mammals (Swihart and Slade, 1984, and references therein); hence, we considered the hayfields to be occupied by distinct populations. The orchards were 8–31 ha, separated by >1 km and comprised primarily of semidwarf apple trees with a ground cover of orchard grass, red clover (*Trifolium pratense*), white clover (*T. repens*), dandelion (*Taraxacum officinale*) and common plantain (*Plantago major*).

Small mammals were live-trapped in the hayfields and orchards during September and October 1990. At each woodchuck burrow, five Sherman live traps were spaced evenly along the perimeter of a 2-m radius circle centered on the burrow, and a sixth trap was placed at the mouth of the burrow. Five traps also were placed along the perimeter of a 2-m radius circle with center 12 m from each burrow, and a sixth trap occupied the center of the circle. The direction from a burrow was selected randomly, subject to the constraint that no other burrow was within 12 m. After baiting with peanut butter and rolled oats in the morning, traps were checked twice daily for 3 successive days. Sex, body mass and reproductive condition were recorded for each capture of a meadow vole, and new captures were given a unique toe clip to permit individual identification. Reproductive condition of males was determined by position of testes (scrotal or abdominal), whereas reproductive condition of females was assessed by recording condition of the nipples, vagina and pubic symphysis. If ≥2 of these features indicated
reproductive activity, the female was categorized as reproductive. McCray and Rose (1992) demonstrated that use of this “majority” criterion for females is more accurate than reliance upon any single external measure of reproductive activity. Voles were released at the site of capture after processing, and whenever possible we recorded whether they entered a woodchuck burrow. A Chi-square test was used to compare frequencies of occurrence of individuals ≤2 m and 10–14 m from burrows.

RESULTS

Trapping in the vicinity of 86 woodchuck burrows (54 in hayfields, 32 in orchards) for 2064 trap nights yielded captures of 99 individuals of four species. Too few meadow voles (n = 2) were captured at the orchard burrows to permit comparisons between orchards and hayfields; thus, data from these areas were pooled. Meadow voles and white-footed mice occurred more frequently ≤2 m from burrows than 10–14 m from burrows (27 meadow voles were captured only ≤2 m from burrows, 2 were captured only 10–14 m from burrows, \( \chi^2 = 21.6, P > 0.001 \); corresponding figures for white-footed mice are 30 and 2, \( \chi^2 = 27.1, P < 0.001 \)). Five meadow voles and one white-footed mouse were captured at both distances. Similar numbers of short-tailed shrews were captured ≤2 m (n = 19) and 10–14 m (n = 13) from burrows (\( \chi^2 = 1.1, P > 0.25 \)). The only capture of a meadow jumping mouse (Zapus hudsonius) occurred ≤2 m from a burrow.

Upon release, 53% (17) of meadow voles and 61% (19) of white-footed mice captured ≤2 m from burrows entered burrows. In addition, one of six meadow voles captured 12 m from a burrow and released, traveled to the burrow and entered it, pausing periodically en route to feed on leaves of alfalfa.

Of 52 meadow voles captured at burrows, 21 (66%) were females; the tendency for a female-biased sex ratio at burrows was not significant (\( \chi^2 = 3.1, P = 0.08 \)). When only adult voles (>35 g) were considered, a highly skewed sex ratio (\( \chi^2 = 10.7, P < 0.005 \)) consisting of 86% (18 of 21) females resulted. Moreover, 72% (n = 18) of these females were scored as reproductively active.

To verify that meadow voles were indeed using areas near woodchuck burrows and were not simply moretrapable when in the vicinity of burrows, we revisited 54 arbitrarily chosen burrows in May 1994. The area within 2 m of each burrow was searched for runways and holes dug by voles. A search also was conducted within an area of equal size 12 m from each burrow, with placement of the sampling area determined using the same criteria described for the live-trapping portion of the study. Signs of activity were evident at 21 burrows but at only 10 of the paired sites 12 m away (\( \chi^2 = 3.9, P < 0.05 \)). Because holes are more indicative of nest sites, we examined this index separately. Holes occurred <2 m away from 16 woodchuck burrows, whereas only two of the paired sites contained holes (\( \chi^2 = 10.89, P < 0.001 \)).

DISCUSSION

Grizzell (1955) recorded use of woodchuck burrows in Maryland by the four species we caught, although he did not provide data on their frequency of occurrence. Dolbeer et al. (1991) observed three Peromyscus in 97 burrows excavated following fumigation trials with gas cartridges. Schmeltz and Whitaker (1977) used snap traps at 94 burrows in western Indiana to sample small mammals. In 1480 trap nights they caught 104 white-footed mice, 32 house mice, 29 deer mice (Peromyscus maniculatus), 10 short-tailed shrews, and two each of meadow jumping mice, meadow voles and masked shrews (Sorex cinereus). None of these studies compared data from burrows with data collected from nonburrow areas, although Schmeltz and Whitaker (1977) indicated that meadow voles were abundant in the general vicinity of the burrows.

Our results indicate that meadow voles used woodchuck burrows as refuges. In addition to catching meadow voles at burrows disproportionately often, we noted abundant signs of meadow voles within 2 m of burrows, and holes presumably dug by voles occurred <2 m from the mouth of woodchuck burrows more often then in nonburrow areas 12 m away. Voles made frequent use of woodchuck burrows as well as these smaller holes upon release.

The highly female-skewed sex ratio and the preponderance of reproductively active females captured at woodchuck burrows suggest that burrows serve as important refuges for female meadow voles during autumn. Analysis of meadow vole home ranges indicates that mothers exhibit more site fidelity than either males or reproductively unsuccessful females (Sheridan and Tamarin, 1988). Moreover, our study
encompassed the time during which breeding female meadow voles exhibit territorial behavior toward other breeding females, although sharing of territories with offspring may extend well past weaning as autumn progresses (Madison and McShea, 1987). Consequently, burrows may function as, or facilitate construction of, nursery sites for breeding females, resulting in kin groups of meadow voles clustered at woodchuck burrows. It also is possible that males and nonreproductive females were underrepresented in our samples, although intersexual differences in trappability generally are slight (Krebs et al., 1969). Unfortunately, our sample sizes for animals captured away from burrows were too small to permit comparison.

Woodchuck burrows, by functioning as refugia and breeding sites for meadow voles, may enhance the rate at which local populations of voles increase. In agricultural areas, serious damage by voles usually occurs in years characterized by rapid population growth of voles that is undetected by farmers (Byers, 1985). Thus, the influence of burrows on vole populations deserves further examination.

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Literature Cited


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