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A COMPARISON OF THREE TRAPS FOR REMOVAL OF COLUMBIAN GROUND SQUIRRELS

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ABSTRACT: A study to determine the relative effectiveness of three trap types for Columbian ground squirrel (Spermophilus columbianus) removal was conducted during May and July 1985 in Missoula County, Montana. A Two-way Analysis of Variance was used to test for differences in reduction of burrow activity between conibear, box, and live traps versus controls. All trap types significantly reduced ground squirrel activity when compared to the controls for each month, but no trap type was significantly more effective than the others. Ground squirrels are more easily caught in July; trapping during both months is recommended for maximum reduction in ground squirrel populations.

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INTRODUCTION

Columbian ground squirrels have been a persistent source of agricultural damage in Montana for a least 75 years (Birdseye 1912). An estimated $1.2 million of damage occurred in western Montana during 1972 (Seyler 1973 in Record 1978). Ground squirrels are effectively controlled with various rodenticide baits (Record 1978, Matschke et at. 1982, Salmon and Schmidt 1984, Sullivan 1986). However, concerns about environmental hazards, especially to nontarget wildlife (Miller 1988, Record and Marsh 1988, Sullivan 1988), have resulted in limitations on use of rodenticides. The Environmental Protection Agency's new program to protect threatened and endangered species will likely result in localized restrictions on some rodenticides that are currently registered. These restrictions and use limitations require the development of additional control methods. In relatively small areas, or where use of toxicants pose special problems, trapping is the logical alternative control method, but information is not available on efficacy of trapping and the comparative merits of various trapping methods. The purpose of this study was to determine the efficiency of box traps, live traps, and conibear traps during May and July for reducing Columbian ground squirrel activity.

METHODS

Study Area

The study was conducted on Lindbergh Cattle Company property, in the Blackfoot Valley, approximately 56 km east of Missoula, Montana. Vegetation was a sagebrush (Artemisia tridentata) and bluebunch wheat grass (Agropyron spicatum) community, adjacent to irrigated hay pastures. At this latitude and elevation, squirrels first emerge from hibernation in late March and immerge in early August. The young appear above ground in early June (Moore 1937).

Study Design

The study area was divided into 24 0.5-ha (50 x 100- m) plots. Two factors, trap type (box traps, live traps, conibear traps, and an untrapped control) and trapping period (May and July) were examined during this study. Three plots were randomly assigned to each of the eight factor cells (trap type x trapping period). Because ground squirrel density varied among plots, an index to population reduction (burrow activity), was the variable used for this analysis. All active burrows, identified by open, unobstructed holes with fresh digging or runways, were numbered within each plot, and 20 were randomly selected and covered with dirt 3 days prior to trapping, and again immediately after trapping. The number of burrows uncovered was counted when trapping began, and again 3 days after trapping. Percent reduction in ground squirrel burrow activity was determined by the following formula:

$$\frac{\text{Burrows opened pretreatment} - \text{Burrows opened post-treatment}}{\text{Burrows opened pretreatment}} \times 100 = \%$$

Two-way Analysis of Variance was used to test the hypothesis of equal mean reduction in the ground squirrel burrow activity (Sokal and Rohlf 1984:321-367). Percent reduction in burrow activity was transformed using the arcsine transformation. Transformed data complied with analysis of variance assumptions of normality and homogeneous variances. Duncan's multiple range test was used to determine which treatments were different when the null hypothesis was rejected. Chi-square tests of fit were used to test for differences in sex ratios (Sokal and Rohlf 1984:702).

Eight burrows within each plot, except for controls, were randomly assigned traps. The box trap[a], a 10-cm wood cube with bottom and one side open, contained a spring-loaded wire that caught squirrels at the neck or shoulders when the baited trigger was pulled. Conibear traps (size 110) were manufactured by the Woodstream Corporation[b], Lititz, Pennsylvania. Live traps, 15 x 15 x 48 cm, were manufactured by the Tomahawk Trap Company, Tomahawk, Wisconsin. Traps were baited with rolled oats, peanut butter, and apples. Oats were used to prebait traps 1 day prior to trapping. All traps were placed within 0.5 m of active burrows. Each month trapping ran for 4 consecutive days; sex and age (yearling or adult in May and juvenile or adult during July) were determined for all captured squirrels,

[a]Box traps were obtained from Joseph Cook, 11508 Keith Drive, Whittier, CA 90606.
[b]Note: The use of trade names and /or manufacturers' names is not intended to constitute an endorsement.

and reproductive status of females in May was determined by examining reproductive tracts (Murie et al. 1980). The daily percent of total captures within a plot was averaged for each trap type to calculate a mean percent capture per day.

RESULTS

A total of 263 ground squirrels were captured; 100 between 19 and 22 May, and 163 between 7 and 10 July. Sex ratio of captures did not deviate from an expected 50:50 for total (49:51; $X^2 = 0.103$; $P > 0.1$), May (46:54; $X^2 = 0.516$; $P > 0.1$), or July (50:50; $X^2 = 0.0027$; $P > 0.1$) capture periods. Proportion of adults captured was 81% and 51% for the May and July trapping periods, respectively. All adult females were lactating during May. The mean percent of captures was low on day 1 for the box trap (Fig. 1), and mean percent of captures on day 4 ranged from 18% for the live traps to 28% for the conibear traps.

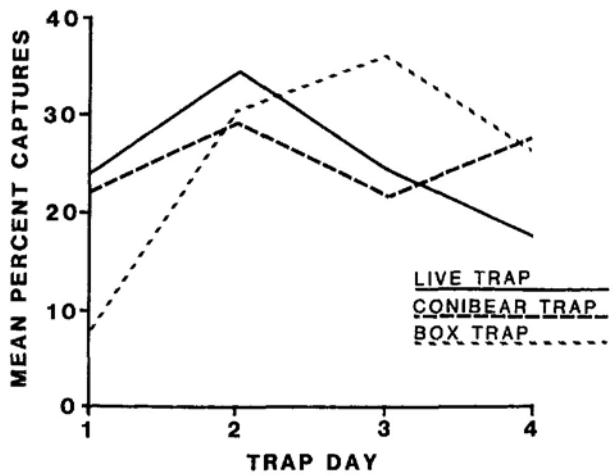

Fig. 1. Mean percent Columbian ground squirrel captures per day for three trap types, May and July 1985.

Trapping period and trap type were both significant factors in reduction of ground squirrel populations based on the burrow activity index (Fig 2). All treatments were significantly different from the control plots ($F = 4.90$; d.f. = 3, 16; $P = 0.01$), but no difference in percent reduction was observed among trap types. Percent reduction in burrow activity ranged from 40% for the live traps to 42% for the conibear traps. Mean percent reduction in burrow activity for all traps was greater in July than in May ($F = 5.19$; d.f. = 1, 16; $P = 0.04$). There were no interactions between the two factors ($F = 0.91$; d.f. = 3, 16; $P = 0.46$).

DISCUSSION

Trap efficiency was similar for conibear, box and live traps. Trap selection will therefore depend upon other factors such as objectives, cost, effort required to trap, and trap maintenance. Live traps may be used to remove ground squirrels from a localized area and release them unharmed. Live traps have the added advantage that nontarget species can be released (Salmon and Schmidt 1984); however, traps need to be checked regularly to prevent death of animals from heat stress. With respect to cost and trapping effort, the box trap was least expensive and intermediate in time required to set the trap. Live traps were most expensive, but quickest to set. Conibear traps, intermediate in cost, required the greatest amount of time to set.

The mean percent captures indicate that ground squirrels responded to the live and conibear traps immediately, but at least 1 day was required before box traps became effective. Mean percent captures were relatively high on the fourth day of trapping, and the mean percent reduction in burrow activity never exceeded 50% for the three trap types during either month. Therefore, additional trapping would be needed to control ground squirrel populations.

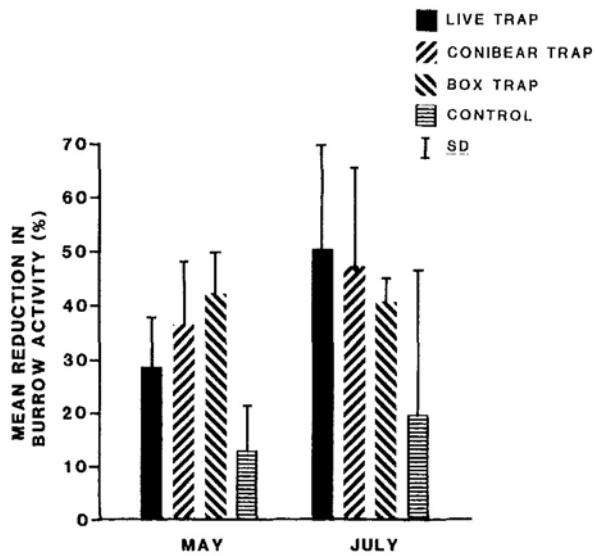

Fig. 2. Mean reduction in percent Columbian ground squirrel burrow activity by month and trap type.

Trapping during both May and July would result in the greatest population reduction. During the May trapping period, 81% of the captures were adults, almost half of which were females; all adult females were lactating. We assume that removal of a lactating female results in the death of some or all of her young (Balfour 1983). However, Columbian ground squirrel preference for succulent forage will reduce the acceptance of most baits during the early trapping period (Record 1978). Thus, undetected mortality of young will occur during May, but ground squirrels will be easier to trap during July when the bait is more attractive. Above-ground squirrel density is increased due to the emergence of juveniles in June, and they will account for a large percentage of the total capture.

Trapping is labor intensive, and will only be acceptable in circumstances where other methods are undesirable or restricted. Traps should be prebaited 1 or 2 days to increase trapping effectiveness. Trapping should be conducted during spring and summer, and for more than 4 days each time.

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