Rodent Seed Supply and Burrows of *Peromyscus* in Cultivated Fields

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Abstract

Food supply, in the form of seeds, was investigated in corn and soybean fields in Vigo County, Indiana, to determine what effect availability of this food had upon the distribution and abundance of prairie deermice, *Peromyscus maniculatus bairdii*, and house mice, *Mus musculus*. Food was abundant in all study areas and did not adversely affect the distribution or abundance of either species.

Twelve burrows constructed by *P. m. bairdii* were examined and sketches of two of these are presented. The burrows averaged 16.0 feet long, 4.1 inches deep, and had 6.0 branches with only one opening per burrow. The branch nearest the opening commonly had a deep V-shaped tunnel which may serve as shelter during periods when the ground is being worked. Chambers containing feces, nesting material, or food caches of seeds were frequently found.

Introduction

Food supply has often been thought of as an important factor limiting distribution and abundance of animals (1, 5), but there are conflicting reports (2, 3, 4) which indicate that food is not an important factor limiting the distribution of *Peromyscus*. The present paper is an attempt to determine if food, in the form of seeds, is a critical factor influencing the distribution and/or abundance of two common rodents, *Peromyscus maniculatus bairdii* and *Mus musculus*, in cultivated habitats of Vigo County, Indiana.

Peromyscus maniculatus bairdii constructs burrows, but there are apparently no previous reports describing the burrows. Burrows examined during this study are described.

Study Areas

Three separate areas totaling approximately 2,800 acres were chosen for study, with corn and soybeans being the most prevalent cultivated crops. Area (Secs. 21, 22, 27, 28, T13N, R9W), 1,100 acres, 3 miles north of Terre Haute, Indiana, was adjacent to the Wabash River and was part of the Wabash Floodplain. Area 2 (Secs. 25, 36, T13N, R9W, Secs. 29, 30, 31, T13N, R8W), 800 acres on the Wabash River terrace, was approximately 2 miles northeast of North Terre Haute, and was composed of 4 separate fields. Area 3 (Secs. 3, 4, 5, 8, 10, T12N, R8W), 900 acres on an upland site, was 1 mile northwest of Seelyville, Indiana, and contained 4 separate fields.

Methods

Maps of each area were constructed using aerial photographs and vegetation maps. A scale of 1:4800 was used. Each map was divided into sampling plots of 76 by 76 feet numbered in rows from west to east

and with the first row to the north. Ten plots per area per trapping period were randomly selected for study. Plots not in cultivated fields were omitted. In each plot, 25 traps were set in 5 lines of 5 traps, with 15 feet between each trap and 7.5 feet between the outer traps and the edge of the plot.

Mammals for this study were collected during four trapping periods: July 1970; August 1970; September-October 1970; and December-January 1970-71. All specimens were taken by means of standard snap-back mousetraps baited with peanut butter. Traps in each area were checked each trapping period for 4 consecutive days, resulting in 12,000 trap-nights for the entire study.

A square foot of soil, sampled to a depth of one-half inch, was collected in each study plot for seed analysis. Seeds were isolated according to a technique described by Malone (6). The seeds from each sample were placed in marked Petri dishes, dried in an oven, identified by comparison to known samples, and counted.

A Chi-square goodness-of-fit test was used to determine significance of differences in the numbers of mice taken per trapping period. A completely randomized design of analysis of variance was used to determine significance of: 1) differences in the numbers of mice per species per study area, 2) differences in the total number of seeds per sampling period, 3) differences in the total number of seeds per study area. A t-test was used in cases where a significant F value from Analysis of Variance was obtained.

Twelve burrows were examined in Area 2 during February and March 1970. Attempts at locating burrows in Areas 1 and 3 were unsuccessful due to the absence of snow and the onset of cultivation. Traps placed near the burrow openings yielded only *Peromyscus maniculatus bairdii*; thus the burrows were presumed to be those of *P. m. bairdii*.

Results and Discussion

Rodent, Population and Seed Supply

During this study 414 prairie deermice (*Peromyscus maniculatus bairdii*), 252 house mice (*Mus musculus*), 22 woodland deermice (*Peromyscus leucopus*), 3 jumping mice (*Zapus hudsonius*), 2 prairie voles (*Microtus ochrogaster*), and 1 rat (*Rattus norvegicus*) were taken. The totals for *P. m. bairdii* and *Mus musculus* were divided into numbers of mice per study area and per trapping period. There were no significant differences between the average number of *M. musculus* per plot in the floodplain (2.0), river terrace (2.4), and upland area (2.0) ($F = 0.29$, 119 df), indicating similar populations in the 3 areas. Average numbers of *P. m. bairdii* per plot in the floodplain (6.0), river terrace (2.7), and upland area (1.3) were significantly different ($F = 28.96$, 119df). Study plots in the floodplain area had more *P. m. bairdii* than those in the river terrace area ($T = 5.04$, 78 df), while those in the river terrace area had more *P. m. bairdii* than those in the upland area ($T = 2.44$, 78 df).

TABLE 1. *Numbers of seeds per sampling period and per study area taken in Vigo County, Indiana, 1970-71* ($\bar{X}$ = *average number of seed per sample.*)

Average Number of Seeds per Area

Seed Species	July 1970	$\bar{X}$	Aug. 1970	$\bar{X}$	Sept.-Oct 1970	$\bar{X}$	Dec-Jan. 1970-71	$\bar{X}$
Chenopodium and *Amaranthus*	1,495	49.8	1,860	62.0	1,178	39.3	1,388	46.3
Unid. spores	462	15.4	411	13.7	430	14.3	326	10.9
Unid. mustard	397	13.2	336	11.2	268	8.9	253	8.4
Setaria faberii	252	8.4	240	8.0	1,044	34.8	587	19.6
Others	382	12.8	370	12.3	297	9.9	429	14.2
Totals	2,988	99.6	3,217	107.2	3,217	107.2	2,983	99.4

Average Number of Seeds per Sampling Period

Seed Species	Area 1	$\bar{X}$	Area 2	$\bar{X}$	Area 3	$\bar{X}$	Total	$\bar{X}$
Chenopodium and *Amaranthus*	442	11.1	4,521	113.0	958	24.0	5,921	49.3
Unid. spores	819	20.5	403	10.1	407	10.2	1,629	13.6
Unid. mustard	35	0.9	322	8.1	897	22.4	1,254	10.5
Setaria faberii	135	3.4	1,369	34.2	619	15.5	2,123	17.7
Others	477	11.8	480	12.0	521	13.0	1,478	12.3
Totals	1,908	47.7	7,095	177.4	3,402	85.1	12,405	103.4

Avrage numbers of *P. m. bairdii* per plot in July 1970 (3.0), August 1970 (4.4), September-October 1970 (3.1), and December-January 1970-71 (3.3), indicated similar populations during all 4 trapping periods ($F = 0.96$, 119 df). Average numbers of *M. musculus* per plot in July 1970 (1.9), August 1970 (1.9), September-October 1970 (3.5), and December-January 1970-71 (1.1), indicated an increase in late autumn followed by a decrease in winter ($F = 4.29$, 119 df). These results agree with those of Whitaker (7), who found that *P. m. bairdii* remained at roughly similar population levels throughout the year while *Mus* moved out of areas when ground cover decreased.

Information on the number of seeds taken was summarized according to sampling period and study area (Table 1). Species which had an average number of seeds per sample greater than 5.0 are listed. Other species less frequently found were *Datura stramonium, Cerastium vulgatum, Aster* sp., *Polygonum* sp., *P. pensylvanicum, Ambrosia trifida, Brassica kaber, Hypericum perforatum, Rumex crispus, Glycine max, and Zea mays.*

There were no significant differences in the mean number of seeds per sample per sampling period ($F = 0.09$, 119 df). There were, however, significant differences in the mean numbers of seeds per sample per study area ($F = 51.60$, 119 df), with the extremes in Area 1 of 47.7 seeds versus Area 2 with 177.4 seeds. Significant differences were also found in the mean numbers of seeds per sample between Areas 2 and 3 ($T = 5.88$, 78 df).

If food in the form of seeds is a critical factor, mouse numbers should be influenced by seed availability. Since no significant differences were found in the mean numbers of seeds per sampling period (99.6, 107.2, 107.2, 99.4), while significant differences were found in the number of *M. musculus* per sampling period, seeds as a food source apparently did not limit *M. musculus* numbers. The floodplain area had the fewest seeds per sample (47.7), yet this area contained the most *P. m. bairdii* per plot (6.0). No significant differences were found in the number of *M. musculus* per plot per area ($F = 0.29$, 119 df).

The number of seeds per sample apparently did not influence the abundance of either *P. m. bairdii* or *M. musculus.*

Burrow Studies

Burrows were most easily found when snow cover was present. The burrows constructed by *P. m. bairdii* appeared to offer an adequate habitat for living, feeding, and nesting. Two burrows are diagrammed (Fig. 1).

The 12 burrows averaged 16.0 feet in length (range, 5 to 35 feet), and 4.1 inches in depth (range, 1 to 12 inches). The average burrow had 6.0 branches (range, 1 to 12), and was 6.3 inches at its deepest point. Burrows ranged from 0.75 to 1.50 inches in diameter. Only one opening was found for each burrow. All of the burrows had a drop of 2 to 3 inches from the opening, then a relatively straight tunnel of 4 to 6

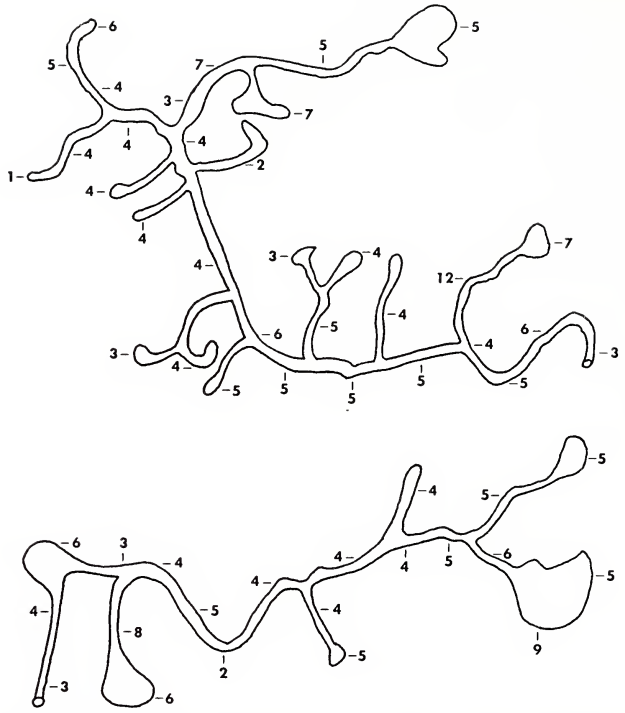

FIGURE 1. *Top view of two* Peromyscus maniculatus bairdii *burrows in Vigo County, Indiana. Numbers indicate depth of burrows in inches. Linear scale:* ½ *inch* = 2 *feet.*

inches before the first turn. The deepest point in the burrow was frequently found in the branch nearest the opening. This branch commonly had a steep decline of 30 to 40°, then an abrupt incline at the same angle which opened into a chamber. Three of the burrows had caches of uneaten seeds, mainly *Setaria,* at this chamber site, indicating food storage by this species. The deep, V-shaped tunnel may serve as shelter during periods when the ground is being worked. Most of the burrow would be destroyed but this area would remain. Many of the other tunnels had similar chambers, but without the steep slope or incline before them. In 6 of the burrows, feces were found in these chambers. Eight burrows terminated in a large chamber and three of these contained nesting material of finely chewed grass, straw, leaves, and paper. In all cases, the main tunnel was free of debris. These findings indicate a high degree of burrow utilization by *P. m. bairdii.*

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