

Distribution and Abundance of Rodents in Cultivated Ecosystems

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Introduction

The prairie deer mouse (*Peromyscus maniculatus bairdii* Hoy & Kennicott) and the house mouse (*Mus musculus* L.) occur commonly in Vigo County, Indiana (3). Important previous studies have examined food habits (2), and various aspects of habitat relationships of these rodents (1,3,4,5).

During a study from 1970 through 1974, information was gathered about rodent distribution and abundance in relation to season, habitat, and cover solely in agricultural habitats of Vigo County, Indiana. The specific objective of this report is to relate those findings to explain the occurrence of these rodents in cultivated field ecosystems and to compare my results with those of previous studies to determine what changes, if any, have occurred in the distribution and abundance of these rodents in cultivated field ecosystems.

Methods and Materials

Trapping was conducted in approximately 1133 ha of cropland in west-central Indiana from July 1970 to October 1974 by snap traps baited with a mixture of peanut butter and rolled oats. Fields were divided into plots of 25 x 25 m and sampling plots were randomly selected. In each plot, 25 traps were set in 5 lines of 5 traps, with 5 m between each trap and 2.5 m between the outer traps and the edge of the plot. Traps were checked each day for 4 consecutive days and rebaited when necessary. Sampling times were divided on the basis of season (winter, spring, summer, fall), type of habitat (corn, soybean, corn stubble, soybean stubble, plowed field) and amount of herbaceous cover (good, fair, poor). A description of cover types may be found elsewhere (4). All mammals taken were identified and sexed. A Chi-square goodness-of-fit test was used to determine significance of occurrence by season, type of habitat, and amount of cover. In all tests, the 0.05 level of significance was used.

Results and Discussion

A total of 497 *P. m. bairdii* (317 males, 180 females) and 281 *M. musculus* (166 males, 115 females) were taken from 177 plots. For each species, significantly more males than females were collected. Although undetermined, these differences may have reflected either true population sex ratios or trapping method influences (activity patterns including greater amount of movement by males, trap responses, bait selection, etc.).

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TABLE 1. Seasonal Distribution of *Peromyscus maniculatus bairdii* and *Mus musculus* in Cultivated Fields of Vigo County, Indiana. (number of plots shown in parentheses below respective season)

		Season							
Species	Sex	Winter Dec-Feb (33)		Spring Mar-May (42)		Summer June-Aug (65)		Fall Sept-Nov (37)	
		# of Mice	Mice/ Plot	# of Mice	Mice/ Plot	# of Mice	Mice/ Plot	# of Mice	Mice/ Plot
		<i>P. m. bairdii</i>	Male	60	1.8	35	0.8	159	2.5
	Female	35	1.1	29	0.7	74	1.1	42	1.1
	Both	95	2.9	64	1.5	233	3.6	105	2.8
<i>M. musculus</i>	Male	21	0.6	8	0.2	71	1.1	66	1.8
	Female	12	0.4	7	0.2	43	0.7	53	1.4
	Both	33	1.0	15	0.4	114	1.8	119	3.2

Seasonal distributions were summarized by species and sex (Table 1). Both species showed significant differences of distribution in relation to season than would be expected by chance alone. More *P. m. bairdii* were taken in summer and fewer in spring than expected, while values for fall and winter were as expected. Fewer *M. musculus* were taken in winter and spring and more in fall than expected; values for summer were as expected. These seasonal differences may act to minimize competition for food and space, thus enabling the two species to successfully inhabit these ecosystems. Whitaker (4) found that both species occurred together in a variety of habitats but at different rates dependent upon the quality of each habitat. Thus in response to the seasonal changes and the corresponding changes in habitat quality (cover, food, etc.), the seasonal distribution and abundance of these rodents also changed. An analysis by sex indicated that significant differences existed for male *P. m. bairdii* but not for females, and again, may have reflected true sex ratios or trapping method influences. Males were most frequent in summer and least frequent in spring, while more males than females were taken in winter, summer, and fall. No differences between sexes were noted for spring. Seasonal differences were found for both male and female *M. musculus*. Both sexes were most frequent during fall and least frequent during spring. Males were taken more frequently than females in winter and summer; no differences were found for spring or fall.

Habitat relationships were summarized by species and sex (Table 2). Significant differences were found for each species and for each sex per species in relation to habitat distribution than would be expected by chance alone. Both male and female *P. m. bairdii* occurred more frequently in soybean and plowed fields and less frequently in stubble fields than expected; occurrence in corn was as expected. Whitaker (4) reported numbers of mice per plot for prairie deer mice to be 0.9 for corn and corn stubble and 2.1 for soybean habitats. My values indicate slightly over a three-fold increase of *P. m. bairdii* in corn with smaller increases in corn stubble and soybean habitats. No comparable figures are available for soybean stubble or plowed field habitats. For *M. musculus*, both sexes occurred more frequently in corn fields and less frequently in stubble

TABLE 2. *Habitat Distribution of Peromyscus maniculatus bairdii and Mus musculus in Cultivated Fields of Vigo County, Indiana. (number of plots shown in parentheses below respective habitat)*

Species	Sex	Habitat									
		Corn		Corn Stubble		Soybean		Soybean Stubble		Plowed Field	
		(72)	(41)	(35)	(19)	(10)					
	# of Mice	Mice/Plot	# of Mice	Mice/Plot	# of Mice	Mice/Plot	# of Mice	Mice/Plot	# of Mice	Mice/Plot	
<i>P. m. bairdii</i>	Male	136	1.9	33	0.8	82	2.3	16	0.8	50	5.0
	Female	75	1.0	17	0.4	44	1.3	14	0.7	30	3.0
	Both	211	2.9	50	1.2	126	3.6	30	1.6	80	8.0
<i>M. musculus</i>	Male	95	1.3	20	0.5	37	1.1	0	0.0	14	1.4
	Female	78	1.1	15	0.4	14	0.4	0	0.0	8	0.8
	Both	173	2.4	35	0.9	51	1.5	0	0.0	22	2.2

fields; occurrence in soybean fields was slightly more than expected for males and slightly less for females while occurrence in plowed fields was as expected for both sexes. In comparison to Whitaker's data (numbers of mice per plot) of 3.7 for corn and 1.6 for corn stubble and soybean (4), my results show reductions of *M. musculus* in corn, corn stubble and in soybean habitats. Thus in at least three cultivated habitats, prairie deer mice appear to have increased in abundance while the numbers of house mice declined. Specific reasons for these changes are not clear at the present time and should be a topic for future study.

A significantly greater number of both species were taken in unharvested fields (corn and soybean) than in harvested fields (stubble and plowed fields). It was felt that movements of the mice in harvested fields were much less than in unharvested fields since food was more readily available as corn and soybeans left on the ground following harvest. Less time would be spent in searching for food and thus a lower catch would be expected.

TABLE 3. *Cover Relationships of Peromyscus maniculatus bairdii and Mus musculus in Cultivated Fields of Vigo County, Indiana. (number of plots shown in parentheses below respective cover type)*

Species	Sex	Cover Type					
		Good		Fair		Poor	
		(41)	(106)	(30)			
	# of Mice	Mice/Plot	# of Mice	Mice/Plot	# of Mice	Mice/Plot	
<i>P. m. bairdii</i>	Male	96	2.3	139	1.3	82	2.7
	Female	52	1.3	86	0.8	42	1.4
	Both	148	3.6	225	2.1	124	4.1
<i>M. musculus</i>	Male	66	1.6	82	0.8	18	0.6
	Female	36	0.9	67	0.6	12	0.4
	Both	102	2.5	149	1.4	30	1.0

Cover relationships were summarized by species and sex (Table 3). Significant differences in distribution were found for each species and for each

sex per species in relation to cover type than would be expected by chance alone. Both species occurred more frequently than expected in plots with good cover and less frequently in plots with fair cover. Plots with poor cover had more *P. m. bairdii* and fewer *M. musculus* than expected. A direct relationship between the amount of cover and the abundance of *M. musculus* was noted. Cover was generally good during fall and poor in spring. In addition, most of the corn plots had good cover. Therefore it appeared that cover quality was the most important factor influencing the distribution of *M. musculus*, and agrees with results reported by Whitaker (4). Presumably the house mice invade areas having fair to good cover and leave when cover decreases. Herbaceous cover appeared less important to *P. m. bairdii*. Houtcooper (1) found that *P. m. bairdii*. made extensive burrows in cultivated fields and therefore the burrows alone may serve as adequate cover. It appeared that the prairie deer mice were permanent residents of the habitats studied.

The results of this study in comparison to those of previous studies suggest that in several cultivated ecosystems (corn, corn stubble, and soybean) of Vigo County, Indiana, the abundance of prairie deer mice has increased while the number of house mice has declined. These demographic changes should be monitored periodically in a continuing effort to assess the influence of these rodents upon cultivated ecosystems.

Literature Cited

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