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ACTIVITY PATTERNS OF THE POCKET GOPHER *PAPPOGEOMYS MERRIAMI MERRIAMII* IN A MEXICAN RANGELAND

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ABSTRACT: Pocket gophers (*Pappogeomys merriami merriami*) are a problem in both crops and rangelands of Mexico. In rangelands, damage results from the animals burrowing habits which cause much soil disturbance, and their feeding on rangeland vegetation. Although considered a pest, to date there have been no quantitative studies of the activity and damage caused this species. This study was initiated to document fluctuations in activity of *P. m. merriami* throughout the year in a Mexican rangeland.

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INTRODUCTION

The pocket gopher (*Pappogeomys merriami merriami*) is found in agricultural areas throughout the Valley of Mexico. It is the largest species of this family having an average weight of 800 grams (Villa-C 1989). Reproduction occurs throughout the year with a peak in reproductive effort occurring from October through March (Villa-C and Engeman 1993). Information pertaining to activity and damage caused by this species is limited despite it being considered a major pest in agricultural areas.

Pocket gopher activity may result in erosion (Ellison 1946), a reduction in forage production (Downhower and Hall 1966; Foster and Stubbendieck 1980; Grant et al. 1980) and a change in plant species composition (Tillman 1983; Grant et al. 1980; Hobbs and Mooney 1985). However, pocket gophers may also have a beneficial effect by loosening the soil and improving soil drainage, which is especially important in heavy clay soils subject to compaction under livestock grazing (Ellison 1946; Ellis and Aldous 1952; Downhower and Hall 1966; Laycock and Richardson 1975).

To date there have been no quantitative studies of the activity and damage caused by *P. m. merriami*. This study was initiated to provide some basic data on seasonal activity and impact of this species in rangeland typical of that found in areas around Mexico City.

METHODS

The study was undertaken at Ranch Lorenzo, Tres Marias (3000 m elevation), 53 km south of Mexico City. The study site was a 1.3 ha field bordered on two sides by open forest (Figure 1). The field was occasionally grazed by sheep during the study period. The field was dominated by a variety of monocot and dicot species including *Erigeron longipes*, *Melampodium repens*, *Sonchus oleraceus*, *Raphanus raphanistrum*, *Cyperus hermaphroditus*, *Lolium multiflorum*, *Trifolium repens*, *Oxalis corniculata*, *Oxalis decaphylla*.

The amount of pocket gopher activity in the site was assessed each month. To begin sampling, all sign of pocket gopher was erased by levelling mounds and scraping soil over plugs. The site was revisited each day over the following six day period and the number of

fresh mounds and plugs recorded. The width of each mound was also noted.

Percentage ground cover of vegetation and species composition was recorded at monthly intervals.

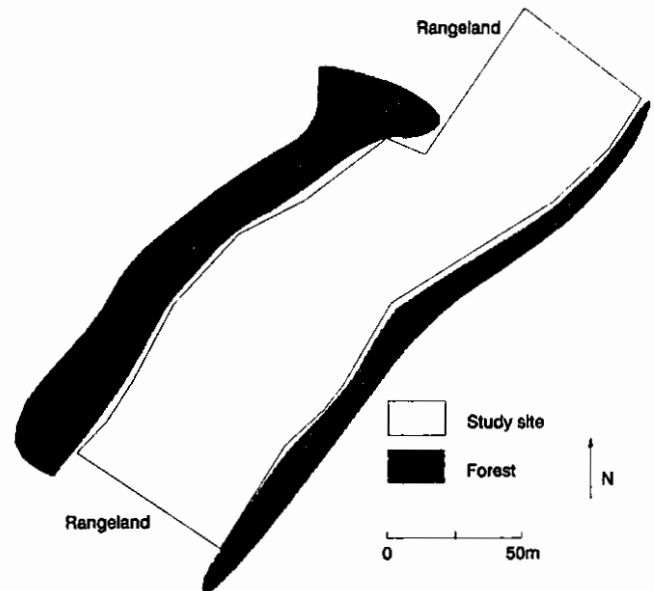


Figure 1. Study Site.

RESULTS

Habitat Characteristics

A month prior to the commencement of the study, the field was disced in accordance with normal rangeland management procedures. As a direct consequence of that and of very dry conditions, at the commencement of the study in May percentage ground cover of vegetation throughout the site was very low (Table 1). Cover increased rapidly over the May to August period with greater than 90% cover being recorded in August. Percentage ground cover of vegetation began to decrease in November with the onset of dry season conditions.

Table 1. Percentage ground cover of vegetation throughout the study period.

Months	Percentage ground cover of vegetation	Dominant species
May - June	0.46	<i>Rumex obtusifolius</i>
July	33.69	<i>Raphanus raphanistrum</i> , <i>Cyperus hermaphroditus</i>
August - October	90.77	<i>Lolium multiflorum</i> , <i>Trifolium repens</i>
November - January	62.41	<i>Trifolium repens</i>

Seasonal Variation in Activity

The mean daily number of mounds and earth plugs observed in the site varied significantly over the period of the study (ANOVA; $p < 0.05$). Daily activity was low at the commencement of the study in May and June, and was highest in December/January (Figure 2). During the wet season (June to November), activity was extremely variable between months.

Distribution

The pattern of distribution of mounds and earth plugs throughout the site varied over the period of the study. During the first three months of the study (May to July 1993), a significantly higher than expected proportion of activity was observed on the perimeter of the field within four meters of the forested area (Chi-square test; $p < 0.05$) (Figure 3). From August to November and also in January 1994, most activity was observed towards the centre of the site.

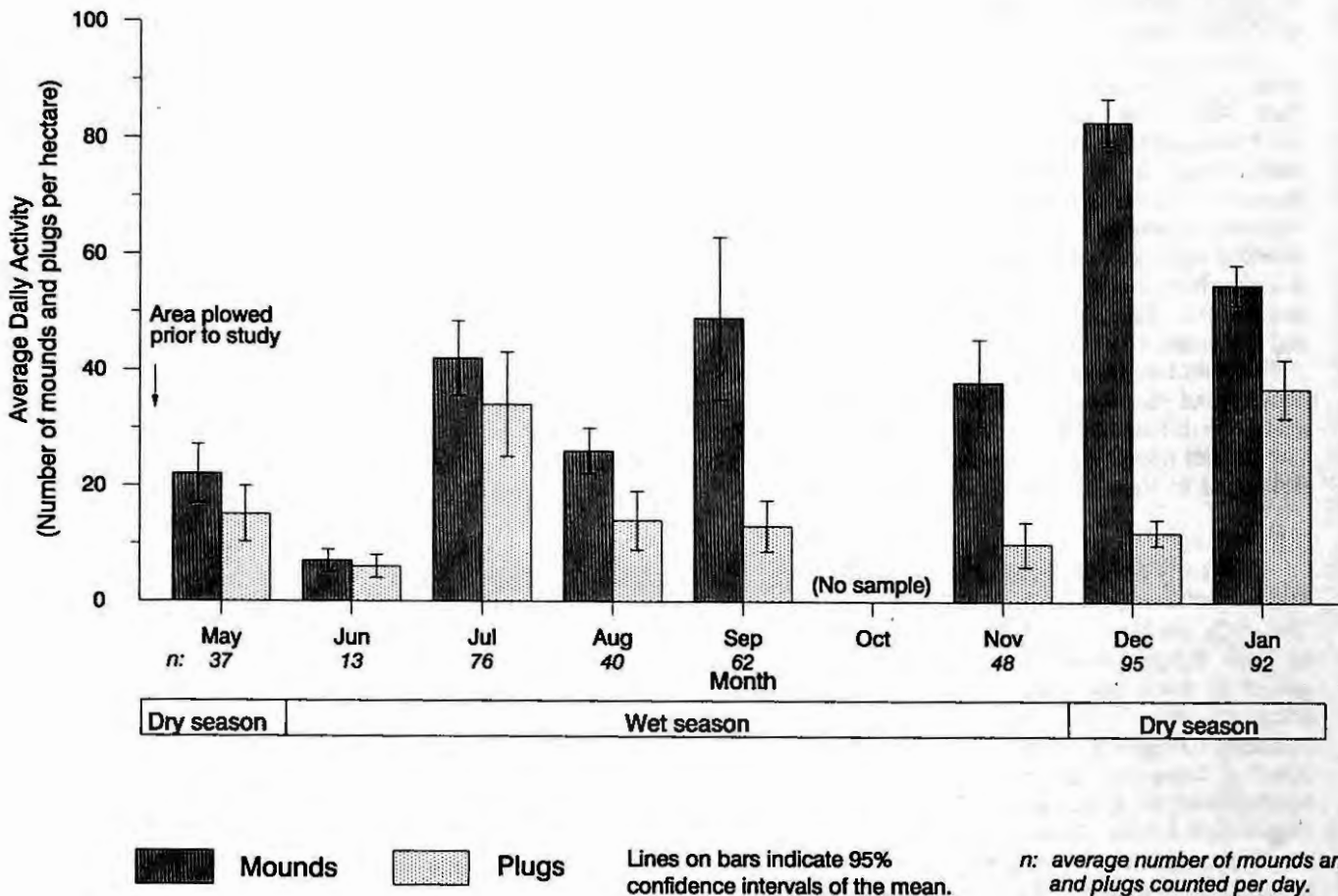


Figure 2. Average daily activity (number of earth mounds and plugs) of the pocket gopher (*Pappogeomys merriami merriami*) in a Mexican rangeland area over the period May 1993 to January 1994.

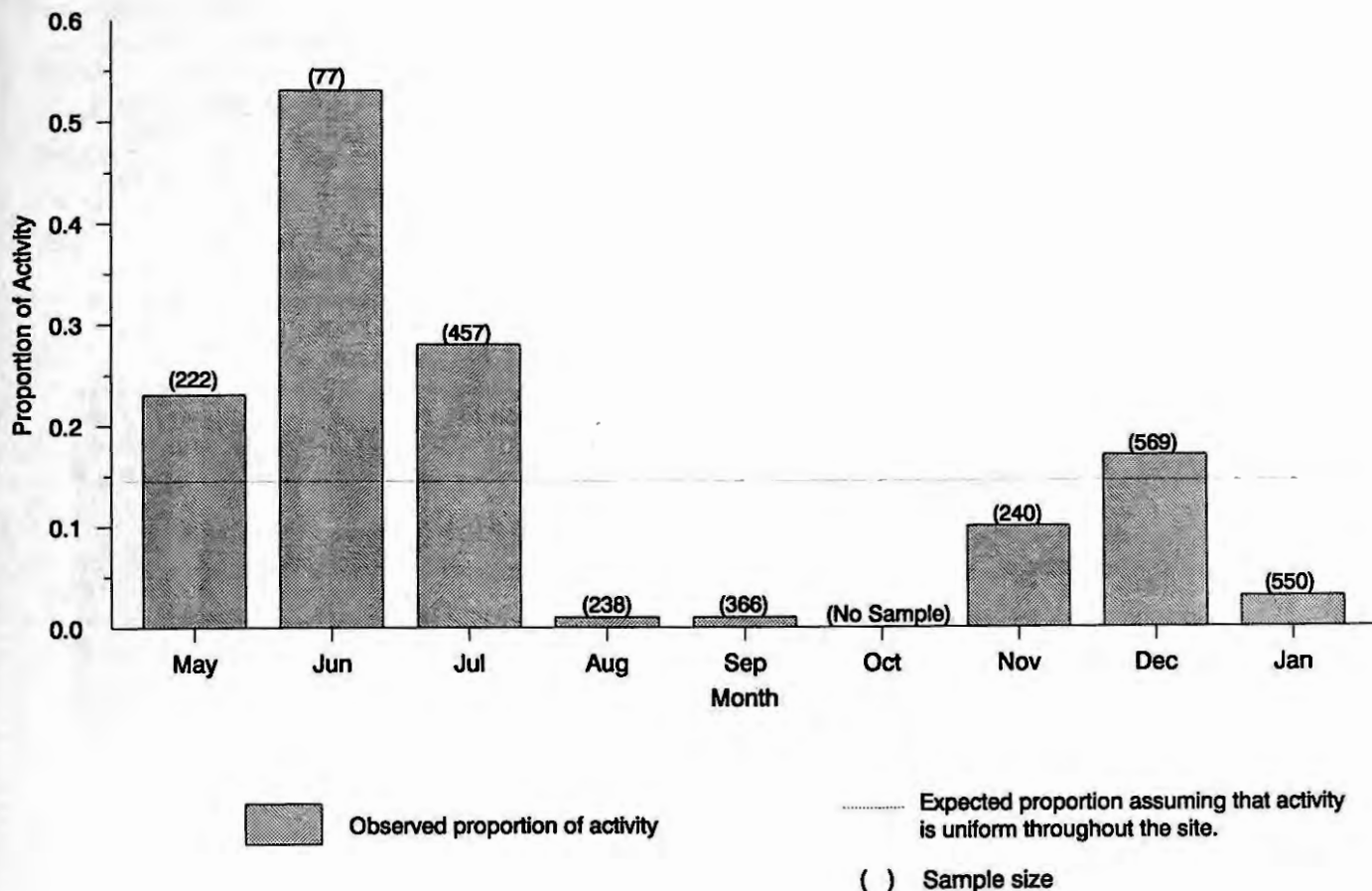


Figure 3. Proportion of total activity (mounds and plugs) within four meters of undisturbed gulches surrounding the study site over the period May 1993 to January 1994.

Mound Size and Soil Disturbance

Average width of mounds varied significantly over the study period (Figure 4). Mound width was greater at the beginning of the study when there was little vegetation and the earth was very dry. Mound width gradually decreased until September after which it remained relatively uniform.

Information pertaining to mound width and the number of mounds produced daily per month was used to provide an estimate of the percentage of the rangeland area affected by the mound building behavior of pocket gophers (Table 2). An estimated 888 square meters of the site had been covered in mounds at the end of the nine month study period. This represented only 6.74% of the total study area. Many of the mounds created prior to and during the wet season had also been revegetated by the end of the study.

SUMMARY

This study is the first quantitative study of activity and impact of the pocket gopher *P. m. merriami* in a rangeland in Mexico.

Activity within the field increased from May/June to July as percentage ground cover of vegetation increased. Initially, most activity was observed on the field edges suggesting that pocket gophers were colonising the field from adjacent, undisturbed open forest. This therefore has important implications for management of this pest. That is, while confined to the forest areas, populations may be much easier to control through either manipulating the forest areas to make them less favorable habitat for pocket gophers; or by applying a baiting treatment.

The results from this study also question the importance of *P. m. merriami* as a pest in rangeland areas. After nine months, only 6.74% of the entire 1.3 ha area had been covered by pocket gopher mounds. Furthermore, during the wet season revegetation of mounds was rapid suggesting that pocket gopher activity had little impact on above-ground vegetation. However, further studies are necessary to determine the effect of mounds on plant species composition. Pocket gopher activity may have also contributed to a higher rate of soil erosion in the field.

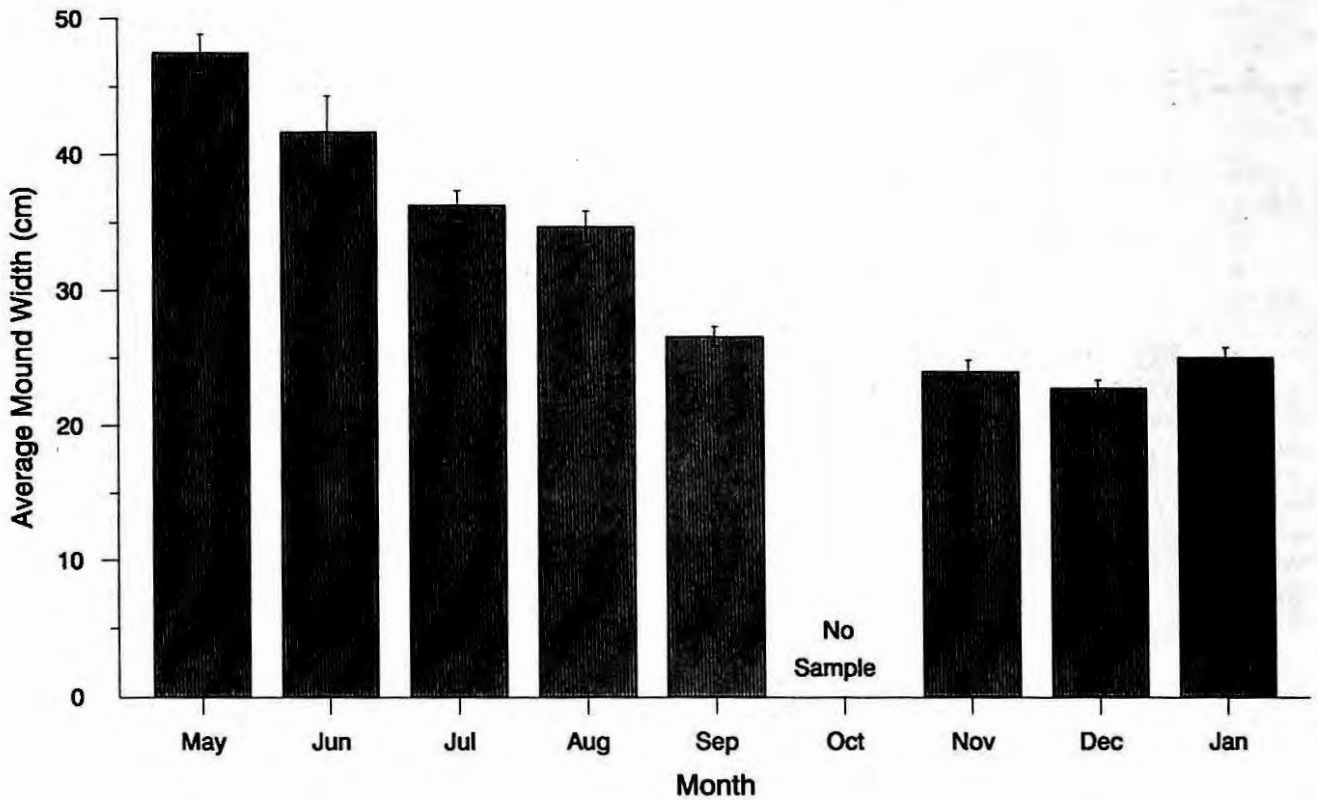


Figure 4. Average width (with standard error bars) of pocket gopher mounds over the period May 1993 to January 1994.

Table 2. Area of soil disturbed each month and the cumulative total throughout the study period.

Month	Mean daily number of mounds	Mean area of each mound	Total area of mounds		% of total area per month
			m ² /day	m ² /month	
May	22	0.19	4.24	131.49	1.00
June	7	0.16	1.11	33.49	1.00
July	42	0.12	5.22	161.97	1.23
August	26	0.11	2.84	88.10	0.67
September	49	0.07	3.28	98.49	0.75
October	-	-	-	-	-
November	38	0.06	2.10	65.03	0.49
December	83	0.05	4.43	137.40	1.04
January	55	0.06	3.46	107.24	0.81
TOTAL				887.99*	6.74

*Total assumes that activity in October was equal to that in November.

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