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THE POCKET GOPHER AS A PEST IN MEXICO

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ABSTRACT: Pocket gophers of the genus *Orthogeomys* and *Pappogeomys* are major pests in rangeland and agricultural areas throughout Mexico. Control relies on the indiscriminate use of fumigants and poison baits. These controls are applied in a haphazard manner; do not provide long-term benefits and the non-target hazards and public safety risks are perceived to be extremely high. Studies indicate that as a result of reinvasion of treated areas or territory expansion of animals surviving the control procedure, controls relying on removal of animals may be limited unless applied at frequent (every three months or less) intervals.

KEYWORDS: *Pappogeomys merriami merriami*, Geomyidae, Rodentia, pocket gophers, Mexico, damage, control methods

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INTRODUCTION

The creation of large cultivated areas, the change in soil conditions and a reduction in the number of natural predators has resulted in an increase in abundance of pocket gophers throughout Mexico. Species comprise those of the genera *Orthogeomys*, *Pappogeomys*, *Zygomys*, *Geomys*, and *Thomomys*. Of these, species of *Orthogeomys* and *Pappogeomys* are the most economically significant, causing major damage to crops and rangeland.

Crops, including wheat, potatoes, cocoa, bananas, corn, alfalfa, and sugarcane suffer significant damage. Damage to tree fruit crops is also considerable. In the state of Michoacán, pocket gophers damage young avocado trees. They also cause significant damage to trees of up to four years in forest regeneration areas. Structural damage occurs in irrigation canals, roads, building foundations and underground cables.

Currently, losses due to damage by pocket gophers in Mexico have only been estimated for corn. For this crop, indications are that pocket gophers consume 52 kilos of grain per year and damage 1,441 stalks resulting in losses of approximately 4%. In sugarcane, where the crop remains in the ground for several years and it is not possible to replant during that period, losses may be much higher.

Control measures are generally only applied once the problem has been noticed and significant damage has already occurred. Techniques used include burrow fumigation with car exhaust, butane gas, and aluminum phosphide; use of poison baits including zinc phosphide, 1080, anticoagulants (primarily second generation anticoagulants); and traps. Strychnine is prohibited from use. Use of poison baits is excessive, with applicators receiving little or no training on dose or application rates and safe handling and storage of poisons. Consequently, public health risks and non-target hazards are perceived to be extremely high.

Despite their significance as pests, very little is known about the ecology and habits of the species and the impacts of control on their populations and reducing damage. In an attempt to provide some quantitative

information on the activity and impacts of pocket gophers in rangeland, a study of the species *Pappogeomys merriami merriami* was initiated in 1993.

P. m. merriami is probably one of the least studied pocket gophers in Mexico. It occurs in the southern part of the Valley of Mexico and Sierra de las Cruces, Sierra de Ajusco, Mount Popocatepetl and Mount Iztaccihuatl bordering the valley. It also occurs from Lerma at the eastern end of the Valley of Toluca eastward into Western Puebla. It may be found at elevations of up to 13,500 feet and above the timber line on Mount Popocatepetl, but most specimens have been taken at places between 7,300 and 10,500 feet elevation.

It is a large pocket gopher with head-body lengths as high as 180 mm (females) to 253 mm (males) and an average weight of 800 g (Villa-C 1989). Color ranges from pale yellowish-brown to glossy black. The brown phases are more common at lower elevations and tend to be replaced by the dark phase at higher altitudes.

Studies of the reproductive biology of this species indicates that these pocket gophers reproduce throughout the year with a peak in reproductive effort occurring from October through March (Villa-C and Engeman 1993). They have two young per litter.

P. m. merriami create mounds that are 20 to 30 cm in height and up to 1 m in diameter (Whisson and Villa-C 1994). The burrow systems are extensive with the length of the main tunnel being up to 60 meters (Villa-C 1989). Villa (1953) recorded a depth of 50 cm (approximately 20 inches) for the main tunnels of this species in loose volcanic soils of the Valley of Mexico. Mound building activity is variable throughout the year with most activity observed during the dry period rather than during the wet season. The burrow systems and mounds cause serious problems in crops by interfering with harvesting operations, irrigation systems and causing erosion. In rangelands, they can have a significant impact on plant species composition and biomass as well as being hazardous to livestock.

As control measures are applied haphazardly, they seldom provide long-term benefits. Only a small

proportion of the pocket gopher population may be removed during a control program so that the population is able to recover in a very short period of time. Furthermore, control is usually applied to small areas so that there is high potential for reinvasion to occur.

This study was undertaken to investigate the impact of control procedures based on removal of animals, on pocket gopher activity in a rangeland.

METHODS

The study was undertaken at Ranch Lorenzo, Tres Marias (3000 m elevation), 53 km south of Mexico City. Two sites of approximately 1.3 ha each were chosen. Each of these sites were bordered by open forest. The fields were occasionally grazed by sheep during the study period.

The amount of pocket gopher activity in each site was assessed each month over the 11 month period May 1993 to March 1994. Prior to sampling, all pocket gopher signs (earth mounds and plugs) were erased by leveling mounds and scraping soil over plugs. In each of the following four days, the site was systematically searched and the location and type of sign recorded.

In one site, pocket gophers were removed by trapping every three months (May 1993, August 1993, November 1993, and March 1994). Trapping sessions were between five and eight days long. During each of these sessions, an attempt was made to catch and remove all pocket gophers in the field. Unbaited leg-hold traps were set in burrow systems that showed signs of recent pocket gopher activity. The number of traps set during each trapping session depended on the amount of fresh activity and varied between 10 and 35 per day.

Each pocket gopher caught was immediately euthanized and necropsied. The location of capture, sex, and weight was recorded for each individual.

RESULTS

A total of 26 pocket gophers comprising 15 females and 11 males were trapped during the four trapping sessions of the study. From sign counts following pocket gopher removal, it was apparent that a proportion of individuals were able to elude being trapped. Mature individuals were trapped in all trapping sessions. Two

pregnancies were recorded in August, and juveniles were trapped in May and November. Weights ranged between 368 g and 751 g for females and between 453 g and 900 g for males (Table 1).

The effect of pocket gopher removal on the amount of activity in following months is shown in Figure 1. There was an immediate decrease in the number of mounds and plugs in the month following removal. However, this decrease was only temporary and within three months, the number of sign had increased to similar levels as before animal removal. An increase in the amount of sign within a 20 m radius of the point of capture two months following removal of the pocket gopher indicates that other pocket gophers had either invaded the site or shifted their home range to utilize the vacated burrow system (Table 2).

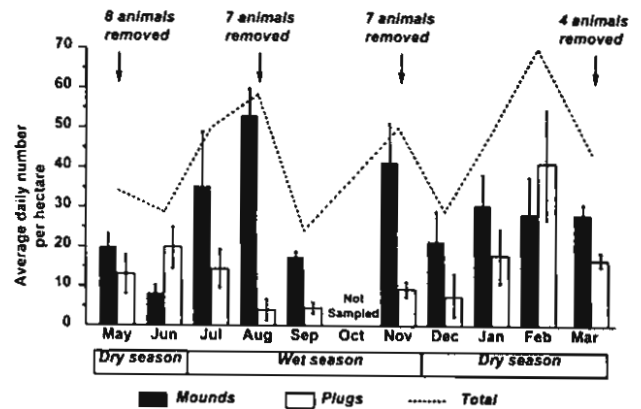


Figure 1. Activity and number of pocket gophers removed from the site over the period May 1993 to March 1994.

Although removal of animals only resulted in a temporary reduction in the amount of activity within the field, overall activity throughout the year was lower than in the field where no control was practiced (Figure 2). In that field, activity was extremely variable throughout the year with a peak in activity occurring from December to February (dry season).

Table 1. Characteristics of pocket gophers trapped in each trapping session

Trapping Session	Mature Females	Mature Males	Juvenile Females	Juvenile Males	Weight Range Females (g)	Weight Range Males (g)
May 1993	2	2	3	1	368-700	453-840
August 1993	4	3	0	0	650-751	650-900
November 1993	2	2	2	1	450-650	310-775
March 1994	2	2	0	0	625-750	625-725
TOTAL	10	9	5	2	368-751	453-900

Table 2. Amount of activity within 20 m of capture points.

Trapping Session	Month	Number of Mounds	Proportion of Total Mounds Within the Site
May	May 1993	27	0.47
	June 1993	8	0.24
	July 1993	37	0.27
	August 1993	34	0.16
August	August 1993	93	0.44
	September 1993	13	0.19
	November 1993	60	0.36
	December 1993	16	0.20
November	November 1993	45	0.17
	December 1993	16	0.20
	January 1994	29	0.24
	February 1994	41	0.36

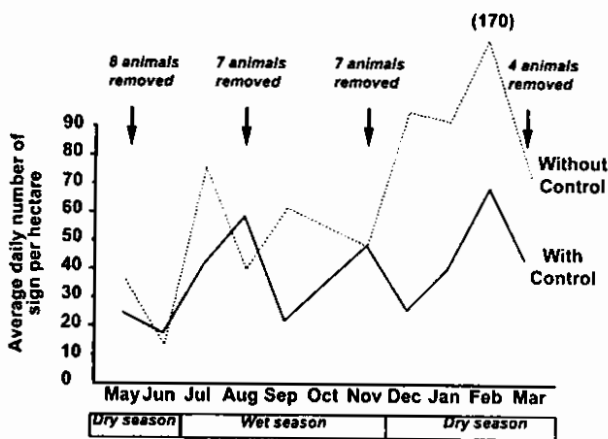


Figure 2. Pocket gopher activity in sites with and without control.

Figure 2. Pocket gopher activity in sites with and without control.

CONCLUSIONS

Pocket gophers are significant pests of agriculture and rangelands throughout Mexico, yet little is known of the ecology and habits of the species which are responsible for the damage. Likewise, there is no information pertaining to the efficacy of current control procedures.

Deep burrow systems and the large size of pocket gophers causing damage to rangeland and agricultural areas of Mexico contribute to difficulties in being able to control these pests. This study indicates that although control relying on removing animals may provide short-term benefits, the population recovers in a short period of

time (within three months) and activity increases to a level similar to that prior to the control treatment. It is also likely that this short-term benefit is far outweighed by the costs of implementing the control procedure, and it is questionable if control procedures are even able to reduce activity and damage to a tolerable level in the short-term.

Economic losses due to damage by pocket gophers in Mexico will continue to be high unless research is undertaken to: a) investigate ways of optimizing current control practices (e.g., use of burrow builder); and b) explore possible alternative control measures (e.g., burrow ripping), to provide more effective long-term control.

Education of those applying chemical control measures, to reduce non-target and public safety hazards should also be a priority.

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