

Population Status of Prairie Dogs (*Cynomys ludovicianus*) in the San Pedro River Basin, Sonora

Efrén Moreno-Arzate and Carlos A. López González
Universidad Autónoma de Querétaro, Querétaro, Mexico

Gerardo Carreón Arroyo
Naturalia A. C. Hermosillo, Sonora, Mexico

Abstract—The black tailed prairie dog (*Cynomys ludovicianus*) is a species of conservation concern for Mexico, the United States and Canada. Populations in Mexico (including those in Sonora), which are considered endangered by the Mexican authority, require additional conservation efforts to maintain them on the long term. Our objective was to determine population size and density of the colonies in Sonora, as a first step to translocate individuals into a new colony in the region (Los Fresnos Ranch). The size of prairie dog colonies is 93 ha for La Mesa and 58 ha for Las Palmitas. La Mesa was surveyed between November 2010 and December 2011, and Las Palmitas from May to December 2011. Density was calculated with distance-based transect counts, using sampling software (Distance 4.0) for the analysis of the data. Our density estimates for La Mesa range from 1.03 to 5.29 individuals/ha, with an estimated peak population size of 488 individuals. In Las Palmitas, densities ranged from 1.50 to 6.45 individuals/ha, with an estimated peak population size of 362 individuals. Our results suggest that a controlled but limited translocation effort will allow the establishment of a new colony at Los Fresnos without compromising the long-term persistence of extant colonies.

Introduction

Prairie dogs (*Cynomys* spp) are considered keystone species as they contribute to increase regional biodiversity (Ceballos and Pacheco 2000; Cully and others 2010; Royo-Marquez and Baéz-Gonzalez 2001; Winter and others 2002). The genus *Cynomys* is restricted to North America and includes five species of which two occur in Mexico: the Mexican prairie dog (*C. mexicanus*) and the black-tailed prairie dog (*C. ludovicianus*). Black-tailed prairie dogs in Mexico are distributed in two populations (Ceballos and Pacheco 2000), one in the grasslands of northwestern Chihuahua (Ceballos and Mellink 1993) and the other in northern Sonora (Castillo 2004).

Currently, this species is present in 2% of its historical range (Ceballos and Mellink 1993; Ramirez and Keller 2010). Population declines have been partially attributed to poor livestock husbandry and agricultural practices that result in the loss, fragmentation, and disturbance of natural habitats; poisoning campaigns, plague (*Yersinia pestis*), and recreational shooting (Hoogland 2006; Ramirez and Keller 2010) have also contributed to declines. Prairie dog population declines have been relatively well documented for northwestern Chihuahua

(Avila and others 2012) but little is known about population changes in northern Sonora. The two colonies in Sonora are located on the edge of their distribution (Hoogland 1996) so that their abundance may be lower than those presented in the distribution center (Lawton 1993). The colonies have no genetic connectivity with the colonies of Chihuahua and, in the case of Arizona, were considered extirpated long ago (Knowles and others 2002). Although recent mapping efforts indicate that the prairie dog colony in La Mesa Ranch lost 60 ha (34% loss) between 2004 and 2011 (Moreno-Arzate and López-González 2012), no study has documented changes in population numbers in Sonora. Our objective was to determine the population status of the only two colonies left in Sonora, La Mesa and Las Palmitas, based on visual counts and distance-based methods. With this information, we expect to determine whether these populations are able to support extractions of individuals for translocation efforts in the region.

Study Area

The study area is located near the international border between Sonora and Arizona in the upper San Pedro River Basin. The colonies are located between parallels 30°37'12" and 31°19'48" N, and between meridians 109°48'36" and 110°37'12" W (fig. 1). This area is dominated by Chihuahuan desert grasslands. Elevation ranges between 1400 and 1500 m with an average annual rainfall of 300 to 750 mm. The area has been impacted by livestock pressure causing changes in the structure and composition of plant communities, including an evident spread of mesquite (Castillo 2004).

In: Gottfried, Gerald J.; Ffolliott, Peter F.; Gebow, Brooke S.; Eskew, Lane G.; Collins, Loa C., comps. 2013. Merging science and management in a rapidly changing world: Biodiversity and management of the Madrean Archipelago III; 2012 May 1-5; Tucson, AZ. Proceedings. RMRS-P-67. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

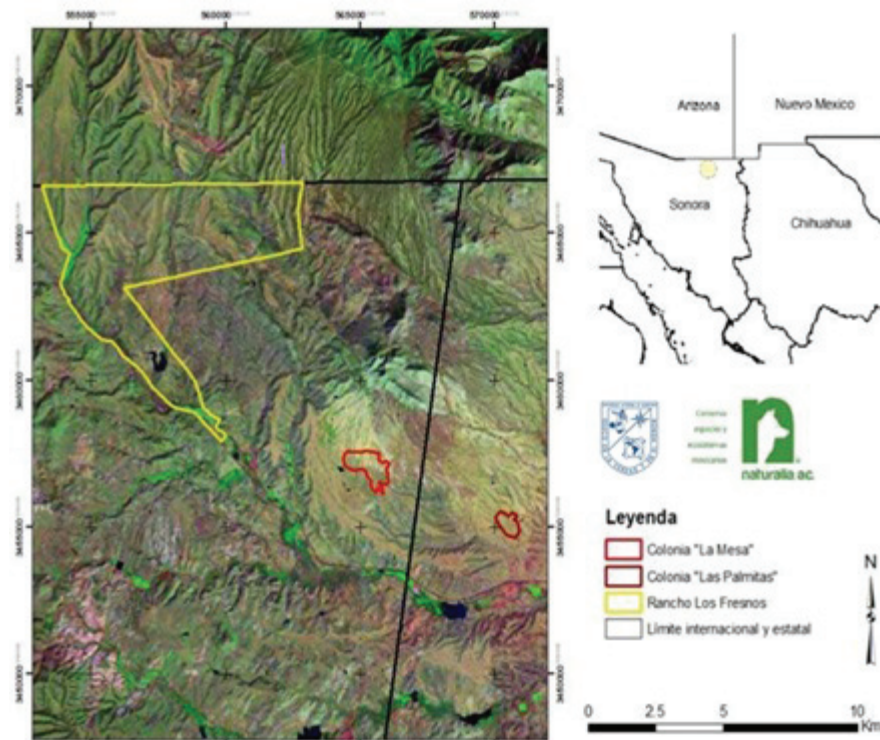


Figure 1—Geographic location of black-tailed prairie dog colonies in Sonora.

Methods

La Mesa was surveyed between November 2010 and December 2011, and Las Palmitas from May to December 2011. We used strip transects (Burnham and others 1980) delineated approximately through the center of each colony to conduct visual counts of prairie dogs. The transect length in the colony of La Mesa was 2100 m, while the transect in the colony at Las Palmitas was 1100 m long. Each transect was surveyed twice a day, once between 0700 and 0800 hr and once between 1400 and 1500 hr for 2 consecutive days. We slowly walked each transect and recorded both the position and distance of each individual prairie dog during our daily surveys.

The distance from the observer to the observed prairie dog was calculated using a rangefinder. We also recorded the distance from the start of each transect to the observation point, documenting the position of the animal to either left or right side of the transect. We used the program Distance v4.0 (Thomas and others 2005) to estimate the population density within each colony. We identified significant changes in density throughout the year comparing monthly data with one-way ANOVAs.

Results

Density

The highest density at La Mesa was documented in March (5.0 individuals/ha) and July (5.3 individuals/ha). However, we found significant differences among sampled months throughout the study period ($F = 11.90$, $df = 11$, $p = 0.0001$). In the case of Las Palmitas, we documented the highest densities in September and July (6.3 and

4.5 individuals/ha, respectively) and the lowest in November (1.2 individuals/ha). Significant differences ($F = 21.7$, $df = 6$, $p = 0.0001$) between the months are shown in figure 2.

Population Size

After the surveys at colony La Mesa and using the highest monthly density (July with 5.29 individuals/ha), we estimated a peak population size of 488 individuals. The highest density at Las Palmitas produced a peak population size of 362 individuals during September.

Discussion and Conclusions

During the months from May to July, the densities calculated in La Mesa and Las Palmitas colonies showed an increase that coincided with the beginning of the rainy season and continued after heavy rainfall from July to September. This finding could be attributed to an increase in pasture growth, available biomass, reflected in the prairie dogs feeding activity (Hoogland 1996, 2003) and an increase in the activity of juveniles. A different pattern was observed for the months closer to the winter, where cold temperatures and the available biomass decreases, which caused a decrease in activity.

Population size estimated for both colonies confirmed that it is possible to carry out the translocation of individuals to create a new colony in the region. In the case of the colony La Mesa, which presents a population estimate above 400 individuals, this number allows the extraction of a group of prairie dogs that could range between 60 to 100 individuals. The latter number, which represents about 25% of the estimated population, might be interpreted as the number of prairie dogs that can be extracted without having a demographic impact on

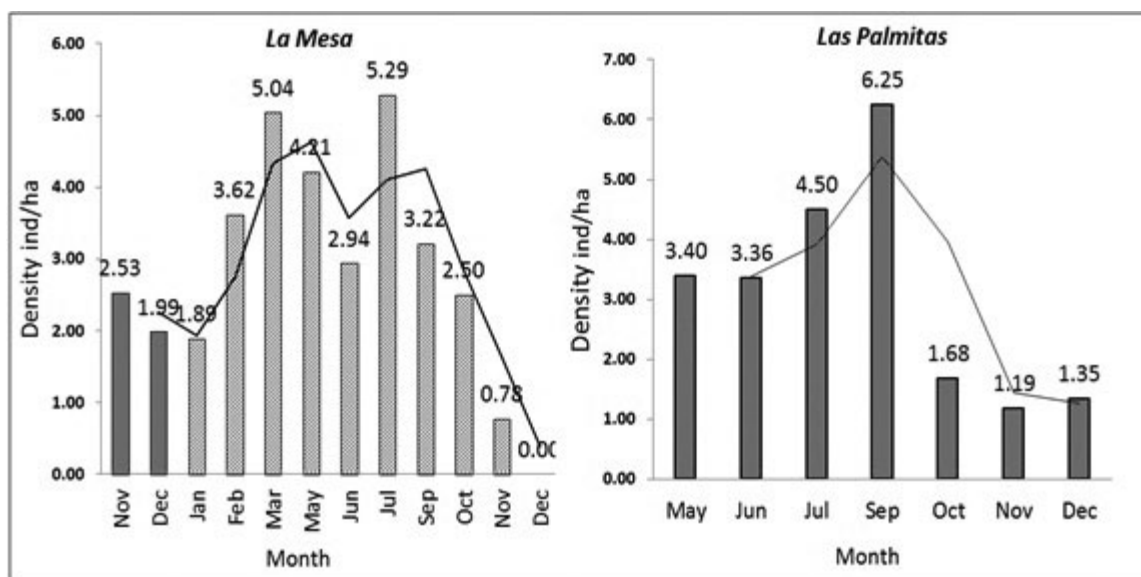


Figure 2—Monthly density estimated for the two prairie dog colonies surveyed in Sonora, Mexico.

the founder colony (Robinette and others 1995; Dullum and others 2005). Similarly, a translocation effort could be supported by the Las Palmitas colony as it has a population of over 350 individuals in which one could draw between 70 and 90 individuals ($\leq 25\%$) without compromising the long-term sustainability of that colony. It is important to continue monitoring in both colonies to estimate trends in the population and identify the most appropriate dates where all the necessary elements for a successful translocation may occur.

References

- Avila-Flores, R., G. Ceballos, A. Villa-Meza, [and others]. 2012. Factors associated with long-term changes in distribution of black-tailed prairie dogs in northwestern Mexico. *Biological Conservation*. 145: 54–61.
- Biggins D.E., J. G. Sidle, D. B. Seery and A. E. Ernst. 2006. Estimating the abundance of prairie dogs. 2006. In: *Conservation of the Black-Tailed, Prairie Dog*. John L. Hoogland, ed. Island Press, E.U., pp.107-94.
- Burnham, K. P., D. R. Anderson and J. L. Laake. 1980. Estimation of density from line transect sampling of biological populations. *Wildlife Monographs*. 72: 1-202.
- Castillo, A. R. 2004. Evaluación de las poblaciones del perrito llanero (*Cynomys ludovicianus*) y su hábitat en Sonora, México. Informe técnico final presentado a World Wildlife Fund Programa Desierto Chihuahuense.
- Carreón, A.G., N. E. Lara, A. Gonzalez, H. Coronel, C. López, R. E. Jiménez. 2010. Fortalecimiento e implementación de un programa de monitoreo de especies clave para la Reserva Forestal Nacional y Refugio de Fauna Silvestre Ajos-Bavispe y la RPC Cuenca del Río San Pedro. Reporte final al FMCN. NATURALIA, A.C. - Universidad Autónoma de Querétaro. 97pp.
- Ceballos G. and R. L. Mellink. 1993. Distribution and conservation status of prairie dogs *Cynomys mexicanus* and *Cynomys ludovicianus* in Mexico. *Biological Conservation*. 63:105-112.
- Ceballos, G. and J. Pacheco. 2000. Los perros llaneros de Chihuahua. *Biodiversitas*. CONABIO, México D.F. 31:3-5.
- Cully, J.F. Jr., S.K. Collinge, R.E. Van Nimwegen, [and others]. 2010 Spatial variation in keystone effects: Small mammal diversity associated with black-tailed prairie dog colonies. *Ecography*. 33: 667-677, 2010
- Dullum, J. A., K. Foresman, Marc R. Matchett. 2005. Efficacy of translocations for restoring populations of black-tailed prairie dogs. *Wildlife Society Bulletin*. 33(3): 842-850.
- Hoogland, I. J. 1996. *Cynomys ludovicianus*. *Mammalia Species*. 53:51-10.
- Hoogland, I. J. 2006. Conservation of the black-tailed, prairie dog. Island Press, E.U. 357 p.
- Knowles, C., J. Proctor and S. Forest. 2002. Black-tailed prairie dog abundance and distribution in the Great plains based on historic and contemporary information. *Great Plains Research. A Journal of Natural and Social Sciences*. 12: 219-254.
- Lawton, J. H. 1993. Range, population abundance and conservation. *Trends in Ecology and Evolution*. 8:409-413.
- Moreno-Arzate, E. and López-González, A.C. 2011. Protocolo para la Traslocación de Perritos de la Pradera cola negra (*Cynomys ludovicianus*) en la Reserva Los Fresnos, Cuenca del Río San Pedro, Sonora. Reporte Técnico para Naturalia A.C.: Mayo-Junio-Julio y Resumen de los monitoreos realizados en La Mesa en el periodo de noviembre del 2010 a Julio del 2011.
- Ramírez, J. and G. Keller. 2010. Effects of landscape on behavior of black-tailed prairie dogs (*Cynomys ludovicianus*) in rural and urban habitats. *The Southwestern Naturalist*. 55:167-171.
- Robinette, K.V., W.F. Andelet and K.P. Burnham. 1995. Effect of group size on survival of relocated prairie dogs. *Journal of Wildlife Management*. 59:867-874.
- Royo-Marquez, M., and A. D. Baéz-González. 2001. Descripción del hábitat de áreas colonizadas y sin colonizar por perrito llanero (*Cynomys ludovicianus*) en el noroeste de Chihuahua. *Técnica Pecuaria Mexicana*. 39:89-104.
- Severson, K. E., and G. E. Plumb. 1998. Comparison of methods to estimate population densities of black-tailed prairie dogs. *Wildlife Society Bulletin*. 26:859-866.
- Thomas, L., J.L. Laake, S. Strindberg, [and others]. 2005. Distance 5.0. Release 5.0. Research Unit for Wildlife Population Assessment, University of St. Andrews UK. <http://www.ruwpa.st-and.ac.uk/distance/>.
- Winter, S.L., J.F. Cully, Jr., and J.S. Pontius. 2002. Vegetation of prairie dog colonies and non-colonized short-grass prairie. *Journal of Range Management*. 55:502-508.