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Original Research

Size and Seasonal Fluctuations of an Extra-limital Population of Black-tailed Prairie Dogs, *Cynomys ludovicianus*, in Central Alberta

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Abstract

The black-tailed prairie dog (*Cynomys ludovicianus*) is a Threatened Species with a Canadian distribution limited to southwestern Saskatchewan, in and around Grasslands National Park. If populations were to be decimated or depleted, e.g., by drought or sylvatic plague, an extra-limital black-tailed prairie dog colony in central Alberta could be a source of animals for translocations. This study investigated the size and the fluctuations of this black-tailed prairie dog population from 2013 to 2017, with surveys conducted in early and late June, in late July and in late August. The black-tailed prairie dog colony was quite stable during these years. In spite of good reproduction from 2014 to 2017, the colony did not increase in size and averaged 37.6 (SD = 5.5) individuals in spring. The annual rate of decrease from peak population numbers in late June to the following spring ranged from 55% to 70%, similar to patterns observed in southwestern Saskatchewan and western United States. A portion of the juvenile population could likely be removed in July without an apparent impact on the size of the colony and be translocated in southwestern Saskatchewan. The option of translocating black-tailed prairie dogs from central Alberta to southern Saskatchewan colonies should be further investigated to provide managers with an alternative in the event of a catastrophic loss of colonies. These black-tailed prairie dogs could also be used to establish a new colony in a plague-free area of Alberta.

Key Words: Alberta, Black-tailed Prairie Dog, *Cynomys ludovicianus*, Extra-limital Occurrence, Translocation.

INTRODUCTION

The black-tailed prairie dog (*Cynomys ludovicianus*) is a highly social species that lives in structured colonies (towns), characterized by areas of intensively grazed grass, with numerous conspicuous bare mounds of soil (often 30 to 60 cm high) heaped around burrow openings. It is a Threatened Species with a Canadian distribution limited to southwestern Saskatchewan, in and around Grasslands National Park (COSEWIC 2011). In general, black-tailed prairie dog populations are highly threatened by *Yersinia pestis*, an exceptionally lethal flea-borne bacterium that causes sylvatic plague (Biggins *et al.* 2010; Eads *et al.* 2016). In Canada, the sylvatic plague was confirmed in the black-tailed prairie dog populations in 2010 (COSEWIC 2011), and was responsible for the disappearance of colonies (Trefry and Holroyd 2012). Black-tailed prairie dogs are highly sensitive to droughts (Facka *et al.* 2010; Stephens *et al.* 2018), which may impact on their survival and/or reproduction. The occurrence of plague epizootics in prairie dog colonies might increase with contemporary global warming, which is forecasted to amplify the hydrological cycle, thereby causing an increased occurrence of prolonged droughts interceded by shorter periods of intense precipitation (Sauchyn *et al.* 2002; Intergovernmental Panel on Climate Change 2007; Barrow 2009; Knapp *et al.* 2015). Many studies suggest bouts of drought conditions can favour fleas, and the returning rains can stimulate an epizootic vortex of plague (Eads and Biggins 2017). As Grassland National Park black-tailed prairie dogs and colonies could become endangered, black-tailed prairie dog translocations would be necessary to re-establish colonies or augment the genetic stock of the surviving populations.

While there is no information on genetic structure or variability within Canadian black-tailed prairie dogs, and on dispersal of individuals within the Canadian populations and between Canadian and USA populations (COSEWIC 2011), it is likely that a translocation program would involve animals from proximate populations inhabiting plague-endemic regions in the USA (Biggins *et al.* 2010). On the other hand, Trefry and Holroyd (2012) reported the existence of an extra-limital black-tailed prairie dog colony comprised of animals that escaped from captivity at the former Polar Park, which was owned and operated by late Al Oeming near Edmonton, central Alberta. The captive population was established with 3 black-tailed prairie dogs (1 male and 2 females) captured in 1956 near Grassland National Park, and 5 individuals (2 males and 3 females) taken in 1963 near Sioux Falls, South Dakota (Trefry and Holroyd 2012). Although the Oeming population is situated in aspen-boreal parkland well beyond the historical or present natural range of the species, and is considered artificial and manipulated with no influence on the conservation of the species (COSEWIC 2011), Trefry and Holroyd (2012) made the point that the colony was spatially isolated from plague-infected prairie dog populations (Maher *et al.* 2010), and appeared to be resilient to climate change (Trefry and Holroyd 2012). Whereas the Oeming black-tailed prairie dogs could be a source of animals to re-establish or enhance the genetic stock of colonies in Grassland National Park, little is known about the size of the Oeming population and its variation in numbers from year to year. In April 2011, although Trefry and Holroyd (2012) counted 51 animals, they considered their survey to be incomplete and they estimated the population to be less than 100 prairie dogs. In 2012, in the mid-afternoon of August 7, Trefry and 2 other observers counted 41 adults and 58 young for a total of 99 animals (H. Trefry, 2018, personal communication).

This study aimed to determine the size and the fluctuations of the Oeming black-tailed prairie dog population over a 4-yr period.

STUDY AREA AND METHODS

The study area corresponds to a ~2 ha pasture located within a fenced area (Figure 1), 12 km from the southeast corner of Edmonton, Alberta (53º25'N, 113º10'W). This region is part of the central Parklands ecoregion, which consists of open grassland alternating with groves. This ecoregion is classified primarily as having a sub-humid low boreal climate, which distinguishes it from the drier areas to the south. Drought is not as prevalent as in the Grassland National Park and mean annual precipitation ranges from 375 to 700 mm (WWF 2018).

The study area is on a rolling glacial landscape typical of the Cooking Lake Moraine and at 750 m ASL (above sea level), it is about 100 m higher than the surrounding plain (Trefry and Holroyd 2012). It consists of a mix of native and introduced grasses and forbs, which are sporadically mowed by the current owner Todd Oeming during summer. The area also has scattered mature trees along a dirt road that bisects the prairie dog colony, and is bordered by mixed spruce (*Picea* spp.) and aspen (*Poplar* spp.) stands, and small sloughs (Figure 1).

Black-tailed prairie dogs were never controlled by poisoning or shooting. The area has no large grazers other than white-tailed deer (*Odocoileus virginianus*); it had a small herd of cattle (*Bos taurus*) in late summer and fall 2015 only. I documented the presence of coyotes (*Canis latrans*), red foxes (*Vulpes vulpes*), sporadic black bears (*Ursus*

americanus), and domestic cats (*Felis catus*) and dogs (*Canis lupus familiaris*). Trefry and Holroyd (2018, personal communication) placed remote cameras in the black-tailed prairie dog colony and documented the presence of a long-tailed weasel (*Mustela frenata*), and a coyote carrying a prairie dog. Various raptors inhabit the adjacent forest stands; northern goshawks (*Accipiter gentilis*) have been observed preying on black-tailed prairie dogs (A. Oeming, 2013, personal communication).

In the southern range of the black-tailed prairie dog, the breeding season (i.e., the period when copulations take place) occurs in March-April (Knowles 1987; COSEWIC 2011), with emergence of the young from the natal burrow system normally occurring from mid-May to early June. Every year from 2013 to 2017, I conducted surveys in early

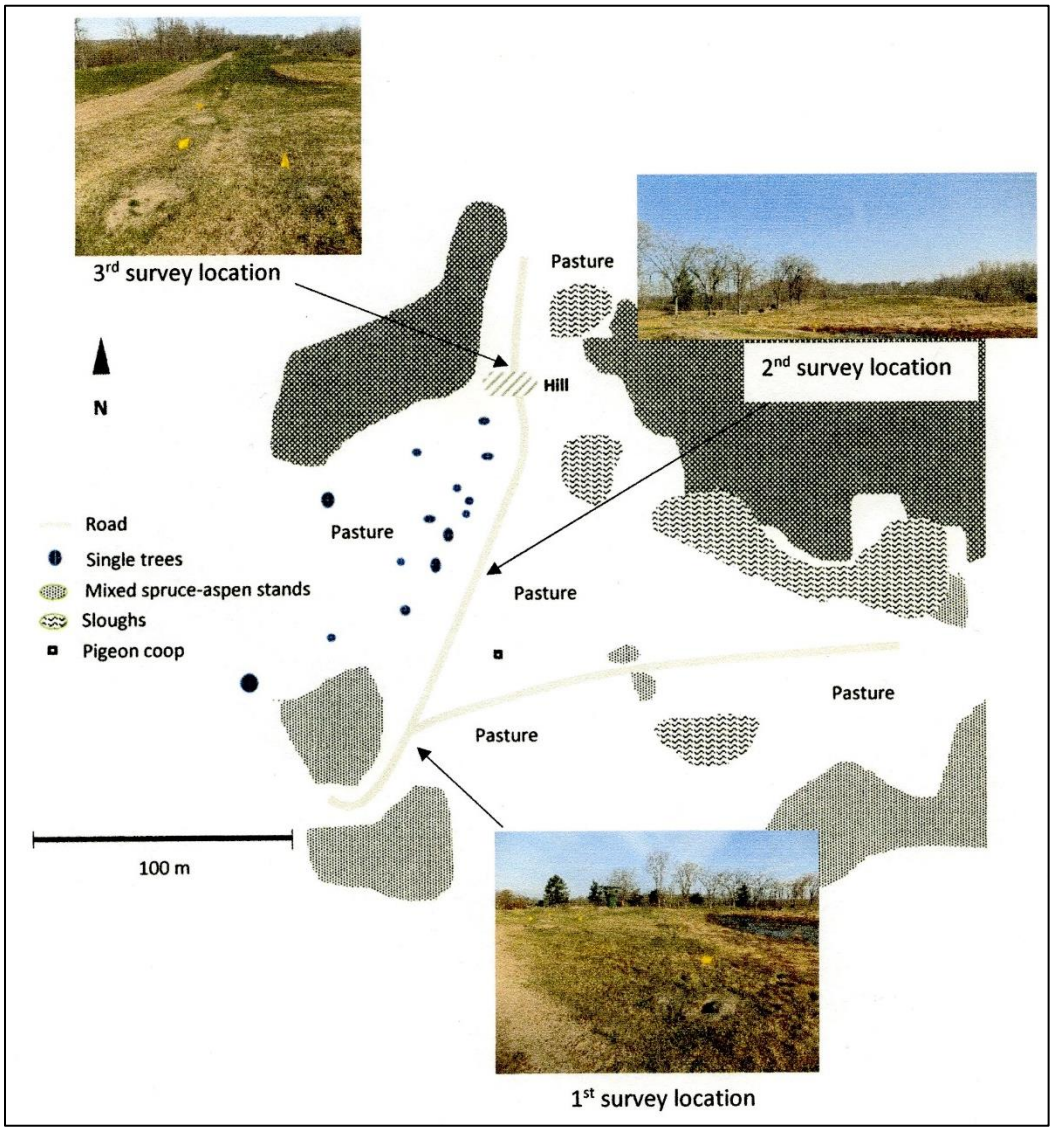

Figure 1. Study area inhabited by the Oeming black-tailed prairie dog colony in central Alberta, and locations where survey counted were conducted in early and late June, late July and late August. Photos taken in late May 2013 (Photos: G. Proulx©).

(9 −13ºC) and late June (15−19ºC), late July (14−20ºC) and late August (10−18ºC). Surveys were conducted between 09:00 and 11:30 hrs during sunny days with low wind speed, and lasted approximately 45 min, i.e., 2 counts of 15 min separated by a pause of 15 min. I drove slowly across the colony and stopped at the same 3 locations during all counts (Figure 1). I counted all the animals from a truck using 12 × 42 binoculars, and mapped their location. In June, I distinguished between adults and young of the year; thereafter, I found it difficult to ascertain the age of the individuals, particularly when the animals remained in burrow openings (Figure 2). Surveys were judged adequate if the total number of animals was consistent between counts. When there was a discrepancy between the counts, I waited an extra 15 min before initiating a third count to determine the maximum number of animals on surface. In 2013, I planted yellow flags to locate burrow openings and monitor the expansion of the prairie dog colony. However, because the flags interfered with mowing, I did not flag the burrow systems in subsequent years.

RESULTS AND DISCUSSION

In June, the number of counted prairie dogs was relatively stable between years, and averaged 37.6 (SD = 5.5) individuals (Figure 3). The lowest number of ≥1-year-old animals was recorded in early June 2015 (n = 29); during other years, however, this number was ≥36. The size of the populations varied from year to year due to the number of young which ranged from 6 in late June 2013 to 34 in late June 2016 (Figure 3). With the exception of 2013, the size of the populations decreased by 33%, on average, from June to July (Figure 3). In 2013, due to the presence of flags, the owner did not mow portions of the colony grounds, particularly on the west side. In these areas, vegetation exceeded 45 cm in height and prairie dogs had difficulty seeing over the vegetation (Figure 4); they disappeared over summer.

From 2014 to 2017, the annual rate of decrease from peak population numbers in late June to the following spring ranged from 55% to 70% (Figure 3). This is comparable with values reported by Hoogland (1995), COSEWIC (2011), and

Figure 2. Black-tailed prairie dogs were surveyed from a truck, 2013-2017, Oeming Farm, Alberta (Photo: G. Proulx ©).

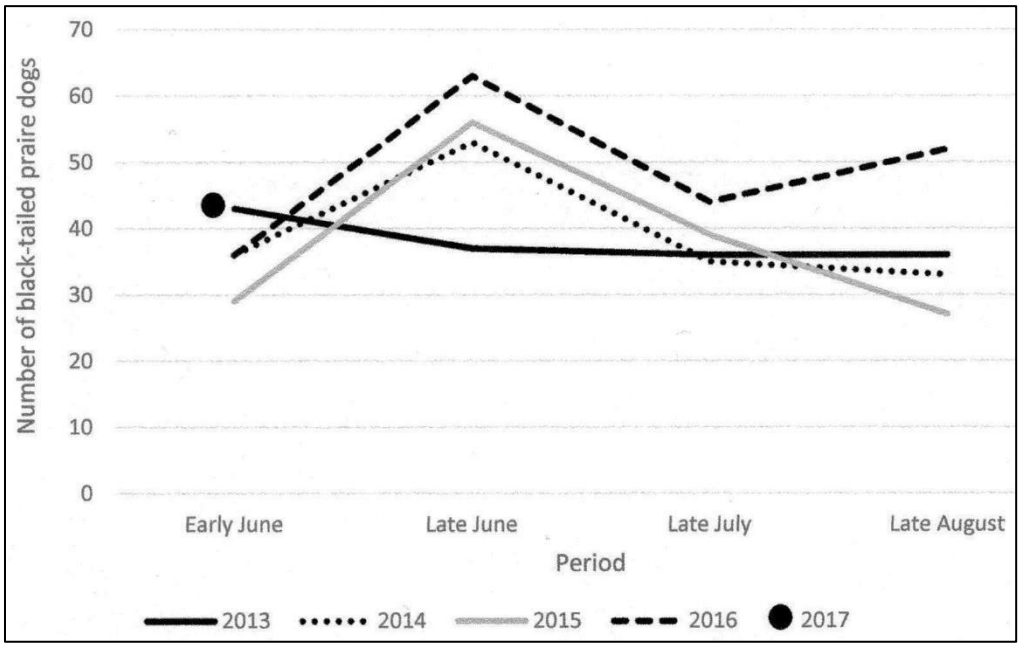

Figure 3. Fluctuations in the number of black-tailed prairie dogs, 2013-2017, Oeming Farm, Alberta.

Stephens *et al.* (2018). Each year, the number of animals inventoried in late August was similar to that of the following spring, thus suggesting that the loss of animals during fall and winter was minimal. In 2015, because of the presence of cows in August, a reliable count could not be conducted. On the other hand, only 3 animals were apparently lost from late July 2015 to early June 2016 (Figure 2). Losses of prairie dogs were likely caused by predation, particularly when vegetation was ≥ 20 cm high and obstructed their view of the horizon (Hoogland 1995). In the past, high mortality rates of black-tailed prairie dogs have been associated with heavy rains and floods (COSEWIC 2011). In my study area, severe rainstorms in June 2014 and 2016 were accompanied by cold weather, and in July 2015, this resulted in water-saturated grounds and localized floods. When this happened, I observed animals that were wet and frail in appearance; I found 1 dead adult after a heavy rain in 2014. Similarly, I found high mortality in Richardson's ground squirrels (*Urocitellus richardsonii*) subject to severe rainstorms (Proulx 2012).

Black-tailed prairie dogs, particularly males, are known to disperse within or between colonies as yearlings or as adults (Hoogland 1995). In this study, however, there were no nearby colonies and surrounding areas consisted of cultivated fields or openings with high herbaceous vegetation, woodlots or human infrastructures. While I noted that some animals used the access road to leave the colony, I did not find prairie dogs outside the study area. Dispersers were likely killed by domestic dogs, coyotes, red foxes, hawks, or vehicles.

MANAGEMENT CONSIDERATIONS

This study showed that the Oeming black-tailed prairie dog colony was quite stable from year to year. In spite of good reproduction from 2014 to 2017, the colony did not increase in size and the number of animals in the spring stayed the same. The reason why the Oeming black-tailed prairie dog colony did not expand in size is unknown. It may be because there were not enough animals to deplete the food within the colony, and therefore, there was no need for animals to disperse. On the other hand, it is likely that the colony would benefit from frequent mowing that would keep vegetation height to <15 cm within and around the colony. An expansion of the colony could result in more animals being produced on a yearly basis (Truett and Savage 1998; Northcott *et al.* 2008).

In the event of a catastrophic loss of black-tailed prairie dog populations in southwestern Saskatchewan, the Oeming black-tailed prairie dog population could be a source of

Figure 4. Black-tailed prairie dogs in ≥45-cm-high vegetation, Oeming Farm, June 2013 (Photos: G. Proulx ©).

animals to re-establish or enhance the genetic stock of these colonies. A portion of the population could likely be removed in July without an apparent impact on the colony. Truett and Savage (1998), Truett *et al.* (2001), and Dullum *et al.* (2005) described recovery projects that were successful at re-establishing prairie dog colonies in grasslands. Of course, genetic investigations should be conducted for the records and to determine how different the Oeming population is from the Saskatchewan colonies. However, a difference in the genetic structure of the populations should not imply that the animals are unfit for translocation. The rationale among managers is that locally adapted populations are most likely to establish and persist under similar environmental conditions; this may not be the case for small threatened populations, particularly when nearby (presumably locally adapted) populations are also small and prone to genetic drift and therefore maladaptation (Lopez *et al.* 2009). Carr *et al.* (2007) and Weeks *et al.* (2011) argued that multiple source populations may facilitate the re-establishment of populations, and there is clear empirical evidence that mixed populations can have high vigour (e.g., Binks 2007). The Oeming black-tailed prairie dog population will likely have limited genetic diversity due to inbreeding. However, moving some of these animals beyond their current range and into Grassland National Park colonies where they could reproduce with prairie dogs with a different genetic signature could become a genetic rescue for the species in Canada. The option of translocating black-tailed prairie dogs from the Oeming population to southern Saskatchewan colonies should be further investigated to provide managers with an alternative in the event of a catastrophic loss of colonies.

Alternatively, black-tailed prairie dogs from the Oeming population could be used to establish a new colony in a plague-free area of Alberta. Further investigations on how an extralimital population functions would be valuable to

identify management actions that may favour the persistence of black-tailed prairie dog colonies in changing landscapes.

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