

## Notes and Discussion

### Prairie Dog Aboveground Aggressive Behavior Towards Black-footed Ferrets

**ABSTRACT.**—Black-footed ferrets typically prey upon prairie dogs at night while prairie dogs are presumably sleeping. Prairie dogs can act aggressively towards aboveground ferrets in daylight and we observed prairie dog aggression towards ferrets four times in South Dakota and Montana. Ten behaviors by prairie dogs were recorded during aggressive interactions with ferrets including chasing, blocking, and physical contact. One of the aggressive prairie dogs was confirmed as an adult male and three of four encounters occurred Jun. through Jul. Interactions lasted <10 min and neither the prairie dog nor ferret were visibly injured.

#### INTRODUCTION

Black-footed ferrets (*Mustela nigripes*) are obligate predators of prairie dogs (*Cynomys* spp.) and use prairie dog burrows for shelter (Biggins *et al.*, 2006). Ferrets typically hunt prairie dogs, a diurnal rodent, at night while prairie dogs are presumably sleeping in burrows or occasionally in early morning hours by ambush (Eads *et al.*, 2010). Nighttime hunting by ferrets may be an evolutionary strategy related to predator avoidance (Biggins, 2000; Biggins *et al.*, 2011) but is also an advantageous time period to overtake similar-sized prey. Body mass of yearling and adult black-tailed prairie dogs (*Cynomys ludovicianus*) averages 705 g (range = 253–1390 g; Hoogland, 2006) whereas body mass of adult black-footed ferrets averages 1104 g (range = 965–1330 g) for males and 715 g (range = 592–797 g) for females (Santymire *et al.*, 2012). A consequence to prairie dogs of being diurnal and colonial is increased nocturnal vulnerability of individuals to ferret predation (Hoogland, 1981, 1982), and predation by ferrets may have shaped diurnal aggressive behaviors used by prairie dogs towards ferrets.

Potential reasons for prairie dog diurnal aggression towards ferrets are increasing survival of the aggressor as well as protection of coterie members including vulnerable young. Hillman (1968), working in Mellette County, South Dakota, documented aggressive behavior by black-tailed prairie dogs towards ferrets during the morning, particularly when ferrets approached burrows containing young prairie dogs. Chases sometimes involved the prairie dog running in front of the ferret, presumably to change the direction of the ferret (Hillman, 1968; Fortenbery, 1972). Prairie dogs have also engaged in mobbing behavior by following, approaching, or harassing a black-footed ferret and interment behavior by covering a ferret-occupied burrow with dirt (Henderson *et al.*, 1969). Other aggressive behaviors by prairie dogs towards ferrets include physical contact, bluff charges, ramming, wrestling, and nipping (Hillman, 1968; Henderson *et al.*, 1969; Fortenbery, 1972; Jachowski, 2007).

We visually observed black-tailed prairie dog aggression towards black-footed ferrets on four occasions, of which three observations were filmed and can be viewed at <http://www.prairiewildlife.org/amermidnat.html>. We identified 10 behaviors by prairie dogs during aggressive encounters with ferrets (Table 1).

#### OBSERVATIONS

On 15 Jun. 2002 at 1000 h BJM observed an encounter between a black-tailed prairie dog and an adult female black-footed ferret on the Main Locke prairie dog colony in UL Bend National Wildlife Refuge, Montana. The prairie dog chased the ferret six times and blocked three times. Many other prairie dogs observed the encounter but did not participate. During one chase sequence, the prairie dog ran ahead of the ferret toward a burrow mound and leapt in a blocking motion as the ferret, with bared teeth, ran past the prairie dog and burrow mound. After 3.5 min of aggressive pursuit by the prairie dog, the ferret descended into a burrow and did not observably resurface that day.

On the afternoon of 13 Sep. 2007, DSL observed an encounter between a black-tailed prairie dog and a male black-footed ferret kit in Wind Cave National Park, South Dakota. The captive-raised ferret had been released less than a minute before the observed encounter. The ferret ran from the release location and stopped when a prairie dog approached within a few meters. When the ferret resumed running the prairie dog immediately charged and contacted the posterior of the ferret, with the prairie dog's momentum carrying it several meters past the ferret. The prairie dog immediately charged again, contacting the ferret in the head, and the ferret ran again. The prairie dog chased and twice contacted the posterior of the ferret, knocking it over each time. The prairie dog then stood upright and watched

TABLE 1.—Prairie dog behaviors observed during aggressive aboveground encounters with black-footed ferrets

Behavior	Definition
Contact	Direct physical contact such as biting, kicking, ramming
Chase	Active pursuit of ferret <sup>1</sup>
Runaway	Runs away from ferret <sup>1</sup>
Tooth chatter	Using teeth to produce a chattering sound
Interment	Covers up or kicks dirt into a burrow occupied by ferret <sup>1</sup>
Block	Leaping in front of or running across the path of ferret to re-route or change course
Stare	Gaze fixed upon ferret, often in close proximity
Approach	Carefully walking towards ferret
Jump-off	Jumping back quickly away from ferret occupied burrow
Scratch	One rear leg scratching the side

<sup>1</sup> Adapted from Hoogland (1995)

the ferret run ~20 m away and descend down a burrow. The prairie dog may have been naive toward ferrets as the latter had been extirpated from the park for several decades until a release of four ferrets on 4 Jul. 2007 at a site ~800 m away. Although the ferret was captive raised, it was exposed to prairie dogs as part of the prerelease conditioning process (Biggins *et al.*, 1998).

On 19 Jun. 2009, TML and PDM observed an encounter between an adult male black-tailed prairie dog and an adult male black-footed ferret in Conata Basin, Buffalo Gap National Grassland, South Dakota. The ferret was observed before prairie dog emergence. After emergence a prairie dog charged at the ferret at 0709 h as it attempted to move between burrows. The ferret retreated to an in-burrow alert posture (Clark *et al.*, 1986) and attempted to vacate the burrow several times. The prairie dog responded with charges six times, twice coupled with a leaping block, before the ferret was able to run past the prairie dog, which then gave chase. The prairie dog continued to chase the ferret and attempted one more block. The ferret, with bared teeth, attempted to bite the prairie dog once during a block by the prairie dog. The ferret submerged, fully or partially, into four burrows while chased by the prairie dog. The prairie dog approached and partially submerged into the occupied burrow several times, jumped off the burrow mound (Halpin, 1983) possibly in response to vocalization or feign by the underground ferret, frequently scratched using either rear leg, stared directly at the ferret when the ferret peeked aboveground and, after the ferret submerged into the final burrow, demonstrated interment behavior by kicking dirt into the burrow. Teeth chattering by the prairie dog (Hoogland, 1995) was also detected. After a jump-yip call (Hoogland, 1995) the prairie dog made a short retreat (~5 m), presumably to the burrow that may have contained the other coterie members. The encounter lasted ~5 min and a total distance of 37 m was traveled.

On 22 Jul. 2009, TML observed an encounter between a black-tailed prairie dog and an adult female black-footed ferret in Conata Basin, Buffalo Gap National Grassland, South Dakota. At 0606 h the ferret moved to a burrow mound and lay prone on the mound with her head faced into the burrow mouth (ambush attack posture; Eads *et al.*, 2010) and at 0634 h dove into the burrow without obvious provocation. Four min later the ferret emerged and moved to an adjacent burrow at 0640 h and returned to the original burrow at 0641 h. An adult prairie dog approached at 0642 h and chased the ferret approximately 20 m to another burrow where the ferret remained in-burrow alert until the prairie dog retreated at 0645 h.

#### DISCUSSION

Our observations of prairie dog antagonistic behavior towards black-footed ferrets are similar to those made by Hillman (1968), Henderson *et al.* (1969) and Fortenbery (1972). White-tailed prairie dogs (*Cynomys leucurus*) at Meeteetse, Wyoming, did occasionally display aggressive aboveground behaviors towards ferrets in daylight (D. E. Biggins, pers. comm.). We did not observe mobbing behavior (multiple prairie dogs following, chasing, or attacking) as reported by Mead (1885) and Henderson *et*

*al.* (1969). Instead, most of our observations were of aggression initiated by individual prairie dogs and did not appear to be defensive responses to direct attack by a ferret as Hillman (1968) and Henderson *et al.* (1969) reported. Neither the prairie dog nor ferret appeared to be injured during our observations.

The aggressive prairie dog was confirmed as an adult male in at least one of our four observations and three of our four observations were made Jun.–Jul., within 1–2 months after prairie dog pup emergence (Hoogland, 1995). Hillman (1968) stated that adult male black-tailed prairie dogs will proactively defend their vulnerable young against ferrets. Jachowski (2007) observed two different adult male prairie dogs displaying antagonistic behavior toward a ferret. Loughry (1987) reported that male prairie dogs were the principal harasser of snakes and fathers dealt more with snakes than nonfathers. Prairie dogs have only been reported to display aggressive behaviors towards one other terrestrial predator that can enter burrows (snakes; Halpin, 1983) and one avian predator, red-tailed hawks (*Buteo jamaicensis*), that cannot enter burrows (Stromberg, 1974). Hoogland (1995) noted that resident adult male prairie dogs enhance juvenile prairie dog survivorship by chasing small predators away and defending the home coterie against infanticidal male prairie dogs. Perhaps adult male prairie dogs categorize the threat posed by a black-footed ferret similar to an invading infanticidal male prairie dog; a predatory threat to vulnerable young. Other male ground squirrels defend their young against infanticide [*e.g.*, Arctic ground squirrels (*Spermophilus parryii*); McLean, 1983] but male prairie dogs may be unique among Sciurids by defending vulnerable young against a predator.

Black-footed ferret populations declined rangewide throughout the 20th century and were extinct in the wild by 1987 (Miller *et al.*, 1996) thus several generations of prairie dogs never experienced predation by ferrets. Endangered ferrets were reintroduced back into the wild beginning in 1991 and our observations suggest that prairie dogs at some reintroduction sites can recognize ferrets and behave accordingly, lending support to the multipredator hypothesis for persistence of antipredator behavior when prey are separated from some, but not all predators (Blumstein, 2006). In our observations prairie dogs reacted to ferrets in a similar manner as reported for snakes (Halpin, 1983). Snake predation on prairie dogs may have helped prairie dogs maintain ferret antipredator behavior in the absence of ferrets or prairie dogs may simply have instinctive anti-ferret responses. Further observations of prairie dogs and ferrets should be made in other seasons to investigate any aggressive antipredator behaviors at other times of the year. We also suggest research into the reproductive success (fitness) of prairie dogs that proactively defend their young from ferrets and if ferrets may benefit from any information provided by aggressive adult prairie dogs.

*Acknowledgments.*—We appreciate the assistance, additional information, reviews, and helpful comments by B.H. Muenchau, D.A. Eads, M.R. Matchett, B. McAnally, E. Pivorun, D. White and D. Post.

#### LITERATURE CITED

- BIGGINS, D. E. 2000. Predation on black-footed ferrets (*Mustela nigripes*) and Siberian polecats (*Mustela eversmannii*): conservation and evolutionary implications. Ph.D. Dissertation, Colorado State University, Fort Collins. 185 p.
- , J. L. GODBEY, L. R. HANEbury, B. LUCE, P. E. MARINARI, M. R. MATCHETT, AND A. VARGAS. 1998. The effect of rearing methods on survival of reintroduced black-footed ferrets. *J. Wildl. Manage.*, **62**:643–653.
- , ———, M. R. MATCHETT, AND T. M. LIVIERI. 2006. Habitat preferences and intraspecific competition in black-footed ferrets, p. 129–140. *In*: J. E. Roelle, B. J. Miller, J. L. Godbey, and D. E. Biggins (eds.). Recovery of the black-footed ferret – progress and continuing challenges. U.S. Geological Survey Scientific Investigations Report 2005-5293.
- , L. R. HANEbury, B. J. MILLER, AND R. A. POWELL. 2011. Black-footed ferrets and Siberian polecats as ecological surrogates and ecological equivalents. *J. Mammal.*, **92**:710–720.
- BLUMSTEIN, D. T. 2006. The multipredator hypothesis and the evolutionary persistence of antipredator behavior. *Ethol.*, **112**:209–217.
- CLARK, T. W., L. RICHARDSON, S. C. FORREST, D. E. CASEY, AND T. M. CAMPBELL. 1986. Descriptive ethology and activity patterns of black-footed ferrets. *Gr. Bas. Nat. Mem.*, **8**:115–134.

- EADS, D. A., D. E. BIGGINS, D. S. JACHOWSKI, T. M. LIVIERI, J. J. MILLSPAUGH, AND M. FORSBERG. 2010. Morning ambush attacks by black-footed ferrets on emerging prairie dogs. *Ethol., Ecol. & Evol.*, **22**:345–352.
- FORTENBERRY, D. K. 1972. Characteristics of black-footed ferrets. U.S. Fish and Wildlife Service Resource Publication 109. 8 p.
- HALPIN, Z. T. 1983. Naturally occurring encounters between black-tailed prairie dogs (*Cynomys ludovicianus*) and snakes. *Am. Midl. Nat.*, **109**:50–54.
- HENDERSON, F. R., P. F. SPRINGER, AND R. ADRIAN. 1969. The black-footed ferret in South Dakota. South Dakota Game, Fish and Parks Technical Bulletin No. 4. 37 p.
- HILLMAN, C. N. 1968. Life history and ecology of the black-footed ferret in the wild. M. S. Thesis, South Dakota State University, Brookings. 32 p.
- HOOGLAND, J. L. 1981. The evolution of coloniality in white-tailed and black-tailed prairie dogs (Sciuridae: *Cynomys leucurus* and *C. ludovicianus*). *Ecol.*, **62**:252–272.
- . 1982. Reply to a comment by Powell. *Ecol.*, **63**:1968–1969.
- . 1995. The black-tailed prairie dog: social life of a burrowing mammal. The University of Chicago Press, Chicago, Illinois. 557 p.
- . 2006. Demography and population dynamics of prairie dogs, p. 27–52. *In*: J. L. Hoogland (ed.). Conservation of the black-tailed prairie dog: saving North America's western grasslands. Island Press, Washington, D.C. 350 p.
- JACHOWSKI, D. S. 2007. Notes on black-footed ferret detectability and behavior. *Pr. Nat.*, **39**:99–104.
- LOUGHRY, W. J. 1987. The dynamics of snake harassment by black-tailed prairie dogs. *Behav.*, **103**:27–48.
- MCLEAN, I. G. 1983. Paternal behaviour and killing of young in Arctic ground squirrels. *Anim. Behav.*, **31**:32–44.
- MEAD, J. R. 1885. Notes on two Kansas mammals. *Bull. Washburn Coll. Lab. Nat. Hist.*, **1**:91–92.
- MILLER, B., R. P. READING, AND S. FORREST. 1996. Prairie night: black-footed ferrets and the recovery of endangered species. Smithsonian Institution Press, Washington, D.C. 254 p.
- SANTYMIRE, R. M., S. M. WISELY, T. M. LIVIERI, AND J. HOWARD. 2012. Using canine width to determine age in the black-footed ferret *Mustela nigripes*. *Sm. Carn. Cons.*, **46**:17–21.
- STROMBERG, M. R. 1974. Group response in black-tailed prairie dogs to an avian predator. *J. Mammal.*, **55**:850–851.

TRAVIS M. LIVIERI<sup>1</sup>, Prairie Wildlife Research, P.O. Box 308, Wellington, Colorado 80549; DANIEL S. LICHT, National Park Service, 231 East Joseph Street, Rapid City, South Dakota 57701; BRENDAN J. MOYNAHAN<sup>2</sup>, College of Forestry and Conservation, University of Montana, Missoula, 59812; and PATRICK D. McMILLAN, Department of Biological Sciences, Clemson University, 132 Long Hall, Clemson, South Carolina 29634. *Submitted 20 April 2012; Accepted 15 November 2012.*

<sup>1</sup> Corresponding author: tlivieri@prairiewildlife.org

<sup>2</sup> Present address: National Bison Range, 58355 Bison Range Road, Moiese, Montana 59824