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CAPTURE RATES OF REPTILES AND AMPHIBIANS ON BLACK-TAILED PRAIRIE DOG (*CYNOMYS LUDOVICIANUS*) COLONIES AND ON UNCOLONIZED PRAIRIE IN COLORADO

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Abstract.—Prairie dog eradication negatively affects dependent wildlife. Assessing the effects of prairie dog activities on reptiles and amphibians may depend upon the efficacy of trapping designs. We compared capture rates of reptiles and amphibians on black-tailed prairie dog (*Cynomys ludovicianus*) colonies and on adjacent uncolonized short-grass prairie, using funnel traps and pitfall traps with drift fences, as well as ground captures. We captured 152 reptiles and amphibians representing 10 species. We captured 51.3% of all reptiles and amphibians on colonies, compared to 48.7% from uncolonized sites. Overall, captures of reptiles and amphibians were similar on colonies and uncolonized sites for all capture methods combined. We achieved higher capture rates on uncolonized sites using funnel traps and pitfall traps but higher capture rates on colonies for ground captures. For all years on all sites combined, we captured significantly more animals in funnel traps (52.6%), surpassing pitfall trap captures (23.0%) and ground captures (24.3%). We recommend using multiple Y-shaped drift fence arrays ≥7.6 m in length, funnel traps with double-ended openings, and black-colored pitfall traps with opening diameters ≥30 cm.

Key words: Cynomys ludovicianus*, reptiles, amphibians, capture rates, prairie.*

Black-tailed prairie dog populations throughout North America have declined by over 98% since the turn of the century (Marsh 1984). Eradication of prairie dog colonies has had a negative effect on many animals dependent on these colonies, although studies of reptiles, amphibians, and prairie dogs (Kretzer and Cully 2001, Lomolino and Smith 2003, Shipley and Reading 2006) have demonstrated that populations of reptiles and amphibians can be negatively and positively affected by prairie dogs. Assessment of the effects of prairie dog activities on reptiles and amphibians may depend upon the efficacy of trapping designs. Because few studies have addressed the effectiveness of reptile and amphibian capture methods in short-grass prairie, we used funnel traps, pitfall traps, and ground captures to compare capture rates of reptiles and amphibians on black-tailed prairie dog (*Cynomys ludovicianus*) colonies and on adjacent uncolonized short-grass prairie.

We conducted the study at the Plains Conservation Center (PCC) in Arapahoe County, Colorado (39°39′N, 104°44′W), during May–September from 2001 to 2003. The PCC consists of 445 ha of short-grass prairie, spanning an elevation range of 1728–1783 m. We selected 3 prairie dog colonies and matched them to uncolonized sites (2 in 2001 and 3 in 2002–2003) within the PCC. A portion of 1 of the uncolonized sites in 2002 was colonized by prairie dogs, so data from this site were excluded from analysis. Uncolonized sites were established at distances of 582–878 m from colonies and selected based on topographic and vegetative similarities to their corresponding study colonies.

Within each colony and uncolonized site, we constructed 2 drift fence arrays (Jones 1986) at randomly selected locations, incorporating pitfall and funnel traps (modified from Fitch 1987) into an array design following Shipley and Reading (2006). We employed 40 pitfall traps (24 on colonies and 16 on uncolonized sites) and 30 funnel traps (18 on colonies and 12 on uncolonized sites) in 2001. In 2002–2003, we used 48 pitfall traps (24 on colonies and 24 on uncolonized sites) and 72 funnel traps (36 on colonies and 36 on uncolonized sites). While checking traps, we conducted visual surveys for reptiles and amphibians on the ground. We performed the surveys at the same time each morning, with 2 people entering and exiting each site from the same access point. Areas between arrays on each site were

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TABLE 1. Reptile and amphibian species captured using different trapping methods on black-tailed prairie dog (*Cynomys ludovicianus*) colonies and on uncolonized sites in Colorado, 2001–2003. FNL = funnel trap, PF = pitfall trap, GR = ground capture.

	All sites combined				On colonies				Uncolonized sites			
Species	FNL	PF	GR	All	FNL	PF	GR	All	FNL	PF	GR	All
Thamnophis radix	8	2	0	10	4	1	0	5	4	1	0	5
Thamnophis elegans	4	0	2	6	1	0	2	3	3	0	0	3
Crotalus viridis	22	2	17	41	12	1	15	28	10	1	2	13
Pituophis catenifer	29	0	4	33	11	0	2	13	18	0	2	20
Tropidoclonion lineatum	1	0	1	2	0	0	0	0	1	0	1	2
Phrynosoma hernandesi	1	3	9	13	1	3	9	13	0	0	0	0
Eumeces multivirgata	0	5	2	7	0	2	1	3	0	3	1	4
Ambystoma tigrinum	8	10	1	19	3	1	1	5	5	9	0	14
Scaphiopus bombifrons	7	9	0	16	4	1	0	5	3	8	0	11
Pseudacris triseriata	0	4	1	5	0	2	1	3	0	3	0	2
TOTAL	80	35	37	152	36	11	31	78	71	32	7	74

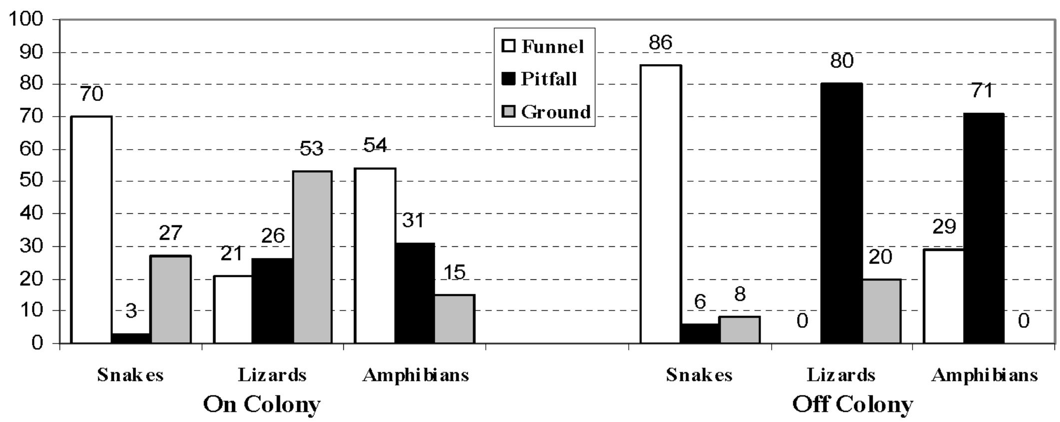

Fig. 1. Percent of total reptiles and amphibians captured using different trap methods on black-tailed prairie dog (*Cynomys ludovicianus*) colonies and on uncolonized sites in Colorado.

included. On any particular day, the same people performed all surveys, although availability of specific volunteers on a given day was subject to change. Maximum sight radius on either side of the walking line was limited to approximately 5.5 m.

Beginning in mid-May of each year, we opened traps for 7–10 days twice a month, checking traps daily, until mid-September. We compared capture rates between methods (i.e., funnel traps, pitfall traps, and ground captures) using the Pearson chi-square test for goodness-of-fit. We compared colony sites and uncolonized sites using the Pearson chi-square test with a Yate's correction.

During the 2001–2003 study (Shipley and Reading 2006), we captured 152 reptiles and amphibians, representing 10 species (Table 1). We captured 51.3% (n = 78) of all reptiles and amphibians on colonies, compared to 48.7% (n = 74) on uncolonized sites. We pooled capture data from 2001 through 2003 for the analyses of capture rates. Overall, captures of reptiles and amphibians were similar on colonies and on uncolonized sites for all capture methods combined (Yate's $\chi^2 = 2.10$, df = 1, $P = 0.15$). We achieved higher capture rates on uncolonized sites using funnel traps (Yate's $\chi^2 = 5.20$, df = 1, $P = 0.02$) and pitfall traps (Yate's $\chi^2 = 9.26$, df = 1, $P < 0.01$), but higher capture rates on colonies for ground captures (Yate's $\chi^2 = 8.94$, df = 1, $P < 0.01$).

For all years on all sites combined, we captured significantly more animals ($\chi^2 = 61.76$, df = 2, $P < 0.001$) in funnel traps (52.6%, n = 80), surpassing pitfall trap captures (23.0%, n = 35) and ground captures (24.3%, n = 37; Fig. 1). Captures of lizards on colonies were limited to ground captures of short-horned lizards (*Phrynosoma hernandesi*) on 1 colony only (see also Fair and Henke 1997) and 2 many-lined skinks (*Eumeces multivirgata*), 1 on each of 2 other colonies. *Phrynosoma hernandesi* was not found on uncolonized sites. Lizard captures on uncolonized sites consisted entirely of *Eumeces multivirgata*, primarily from pitfalls, followed by ground captures, while none were from funnel traps.

Amphibians were captured on colonies by all methods, primarily by funnel traps and secondarily by pitfalls, while ground captures were limited to 1 each of tiger salamander (*Ambystoma tigrinum*) and western chorus frog (*Pseudacris triseriata*). On uncolonized sites, amphibians were captured primarily by pitfalls and secondarily by funnel traps. We made no ground captures of amphibians on uncolonized sites.

Prairie dog activities on colonies may have contributed to variations in our trapping results. Reduced vegetation on colonies, a condition created by prairie dog activity (Whicker and Detling 1988, Winter et al. 2002), likely enhanced both the visual detection of reptiles and amphibians and the probability of capture compared to uncolonized sites. Significantly higher snake captures on colonies, compared to uncolonized sites ($\chi^2 = 6.84$, df = 1, $P < 0.01$), were due at least in part to larger numbers of prairie rattlesnake (*Crotalus viridis*), which were present seasonally and easily observed in the shorter vegetation. Fewer large snakes (3%), such as *Crotalus viridis* and bullsnakes (*Pituophis catenifer*), were trapped in pitfalls than small snakes (11%), such as the plains garter snake (*Thamnophis radix*), western terrestrial garter snake (*Thamnophis elegans*), and lined snake (*Tropidoclonion lineatum*). A higher capture rate of small snakes than of large snakes in pitfall traps suggests that larger snakes can escape from, or avoid falling into, pitfall traps; however, the few pitfall captures of both large and small snakes precluded statistical analyses. We captured only 2 specimens of the fossorial snake *Tropidoclonion lineatum*, both on uncolonized sites in a funnel trap and via ground capture. These small snakes seem to avoid pitfalls, perhaps because of their secretive behavior and small home ranges, which reduce encounters with pitfalls (Crosswhite et al. 1999).

Comparatively few studies report on reptile and amphibian trapping efficacy in grassland habitat. In Kansas short-grass prairie, Kretzer and Cully (2001) used Y-shaped drift fences with funnel traps and pitfalls but did not report capture rates. In spinifex grasslands of Australia, Morton et al. (1988) found that drift fences increased capture rates. Specifically, drift fences with crossing arms were more effective than those with single arms, and pitfalls of larger diameter captured more animals than pitfalls of smaller diameter. In semiarid grasslands of South Africa, Douglas (1995) reported that funnel traps caught 68% of reptiles and amphibians when used with drift fences, compared to pitfalls alone. In mixed mesquite shrubland–prairie grassland, Fair and Henke (1997) captured *Phrynosoma cornutum* almost equally with pitfalls and funnel traps used with Y-shaped drift fences, although systematic visual searching proved more effective. We found similar results for *Phrynosoma hernandesi*. Christiansen and Vanderwalle (2000) found that turtles in relict sand prairie were more apt to be caught in funneled wire box traps (Iverson 1991) and flip-top pitfalls used with single-line drift fences, whereas open-top pitfalls more effectively captured amphibians, lizards, and small mammals.

Our results indicate that trapping success can vary significantly between sites on prairie dog colonies and sites on uncolonized grassland. Susceptibility of reptiles and amphibians to trapping may be affected by numerous biological factors (Bury and Corn 1987, Fitch 1992, Douglas 1995, Fair and Henke 1997, Enge 1998, Jorgensen et al. 1998, Crosswhite et. al. 1999, Jenkins et al. 2003, Shipley and Reading 2006) and species' behavioral responses (Enge and Wood 1998). Trapping design may also influence species' catchability (Morton et al. 1988, Greenberg et al. 1994, Enge 1997, 1998, 2001, Fair and Henke 1997, Webb 1999). To maximize trapping efficiency on prairie dog colonies and adjacent grassland, we recommend using multiple Y-shaped drift fence arrays with lengths ≥7.6 m, funnel traps with double-ended openings (Greenberg et al. 1994, Crosswhite et al. 1999), and black-colored pitfall traps (not used in our study; Crawford and Kurta 2000) with opening diameters ≥30 cm (Morton et al. 1988, Thompson et al. 2005).

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