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SATELLITE BURROW USE BY BURROWING OWL CHICKS AND ITS INFLUENCE ON NEST FATE

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Abstract. We examined the importance of satellite burrows to Burrowing Owls (*Athene cunicularia*) nesting in western Nebraska in 1991 and 1992. With few exceptions, prefledgling chicks used active black-tailed prairie dog (*Cynomys ludovicianus*) burrows either in greater proportion than their availability or in proportion to their availability within a 75-meter radius of the nest burrow. Successful owl nests (those fledging one or more chicks) had more active prairie-dog burrows within a 75-meter radius of the nest burrow than did unsuccessful nests. Efforts to control prairie-dog populations in the Great Plains states are detrimental to Burrowing Owl populations. State- and federally supported prairie-dog control programs should be reevaluated to ensure that adequate populations of prairie dogs and associated species can persist.

EL USO DE MADRIGUERAS ALTERNATIVAS DE LOS POLLOS DEL BÚHO LLANERO Y SU INFLUENCIA EN LA PRODUCCIÓN DEL NIDO

Sinopsis. Examinamos en 1991 y 1992 la importancia de las madrigueras alternativas para los Búhos Llaneros (*Athene cunicularia*) que hacen sus nidos en el oeste de Nebraska. Con pocas excepciones, los pollos en nido usaban madrigueras activas del perro llanero de cola negra (*Cynomys ludovicianus*) ya sea en proporción mayor a su disponibilidad o en proporción a ella dentro de un radio de 75 metros desde la madriguera del nido. Los nidos con éxito (aquellos que producen por lo menos un pollo volantón) tenían más madrigueras activas de perro llanero de cola negra dentro de un radio de 75 metros del nido que los nidos sin éxito. Los intentos para controlar las poblaciones del perro llanero de cola negra en los estados de la Gran Llanura han sido perjudiciales para las poblaciones de los Búhos Llaneros. Los programas de control del perro llanero de cola negra auspiciados por los gobiernos estatales y el gobierno federal requieren nuevas evaluaciones para asegurar la perduración adecuada de las poblaciones del perro llanero de cola negra y de sus especies asociadas.

Key Words: *Athene cunicularia*; *Cynomys ludovicianus;* prairie-dog colony; prairie-dog control; satellite burrow.

The western subspecies of Burrowing Owl (*Athene cunicularia hypugaea*) is a native grassland bird that depends heavily on black-tailed prairie dogs (*Cynomys ludovicianus*) for nest burrows in the Great Plains. Once abundant, black-tailed prairie dog populations have declined by 98% since the beginning of the twentieth century because of agriculture, disease, and control programs (Summers and Linder 1978, Miller et al. 1994). Today black-tailed prairie dog colonies are fragmented and degraded in quality. Federal- and state-sponsored control programs have played a major role in population reductions (Miller et al. 1990) and currently remain among the biggest threats to the fragmentation and loss of this ecosystem (Miller et al. 1994).

Most research on the nesting requirements of Burrowing Owls in prairie-dog ecosystems has addressed questions at the level of the prairie-dog colony (Butts 1973, Plumpton 1992, Hughes 1993, Pezzolesi 1994). Prairie-dog colonies are highly dynamic, and habitat characteristics can vary widely within a single town (Hoogland 1981). Little is known about owl nest choice within a town. Several authors have commented on satellite burrow use by Burrowing Owl chicks (Thomsen 1971, Butts 1973, Thompson 1984, Plumpton 1992), but use has not been examined quantitatively.

Ten to 14 d after hatching, Burrowing Owl chicks begin to emerge from their nest burrow. Although initially reluctant to move past the immediate vicinity of the nest burrow, they are quickly distributed among neighboring burrows. On one occasion, an adult female was observed using food to lure chicks away from the nest burrow to nearby burrows (M. Desmond, pers. obs.); this occurred at dawn and took 0.5 hr. Although we have observed this behavior only once, we think it is a common behavior for distributing chicks among burrows. As chicks become older, they readily move among burrows on their own. Butts and Lewis (1982) and Green and Anthony (1989) have suggested that using satellite burrows may reduce overcrowding in the nest burrow or may be a response to ectoparasite loads. Because of their terrestrial nature and large broods, prefledgling Burrowing Owls are often highly visible and thus vulnerable to predation. Using satellite burrows may be a defense against predation, as an entire brood is less likely to be lost to a predator if chicks are distributed among several burrows (Desmond 1991).

This paper examines the importance of prairie dogs and particularly satellite burrows to prefledgling Burrowing Owls. We have observed both adult and young owls using active prairie-dog burrows. Burrow use is particularly important to prefledgling Burrowing Owls because of their vulnerability to predation. We hypothesized that chicks would be selective in their choice of satellite burrows, and we predicted that they would exhibit a preference for active rather than inactive prairie-dog burrows because active burrows are better maintained. We also predicted that Burrowing Owl nest fate would be positively influenced by the number of active prairie-dog burrows in the vicinity of nest burrows.

STUDY AREAS AND METHODS

Research was conducted in 16 black-tailed prairie dog colonies in Banner, Box Butte, Morrill, Scotts Bluff, and Sioux Counties in western Nebraska in the spring and summer of 1991 and 1992. We searched prairie-dog colonies for nesting Burrowing Owls throughout the month of May each year. We located nests by carefully observing towns when the owls were courting and by walking line transects through each town such that we covered the entire town. Burrowing Owl nests were easily located because of the owls' propensity to line their nest entrances with shredded cow or horse dung. We mapped satellite prairie-dog burrow use by prefledgling owl chicks on a weekly or biweekly basis, depending on the location of the site, for 51 of 60 successful nests. Nine nests were omitted because of logistical problems in getting to the sites often enough and for long enough periods to record burrow use. Successful nests were defined as nests that fledged one or more chicks (42 d posthatch; Haug 1985). We measured the distance and angle from each owl nest burrow to each satellite prairie-dog burrow used by chicks, and we recorded the status of each satellite burrow as either active or inactive. Sighting of a prairie dog, fresh fecal pellets, or digging indicated active prairie-dog burrows; the presence of live, unclipped vegetation on the mound, spider webs covering or in the burrow entrance, or the absence of fresh fecal pellets indicated inactive burrows.

In late July we counted all satellite burrows within 75 m of each nest burrow and recorded their status as active or inactive. We chose 75 m because this typically was the farthest distance chicks ranged from their nest before fledging. Most 75-m circles around nests were non-overlapping; there were a few instances, however, where nests were close enough that the 75-m circles partially overlapped. In the latter cases, the direction in which the chicks spread out from the nest burrow may have been influenced by the presence of other owls rather than the number of active burrows. We used Chi-square contingency analysis for each nest ($N = 51$) to determine if Burrowing Owl chicks used active prairie-dog burrows in proportion to their availability. A Student's t-test was used to determine if there was a difference between the number of active prairie-dog burrows surrounding successful and unsuccessful nest burrows.

RESULTS

Burrowing Owls used a mean ($\pm$ SE) of 10 ± 0.98 satellite prairie-dog burrows (range 0–36) within a 75-m radius of the nest. Chicks at 29 nest burrows exhibited a preference for active prairie-dog burrows ($P < 0.05$). Chicks at two nest burrows used active burrows less than expected ($P < 0.05$); however, both of these nests were in heavily controlled prairie-dog colonies that had few remaining prairie dogs. Chicks at 11 nest burrows used active prairie-dog burrows in proportion to their availability. For 7 of these 11 nests, nearly 100% of the satellite burrows within 75 m of the nest were active prairie-dog burrows. Nine nest burrows did not have any active prairie-dog burrows within 75 m of the nest.

We monitored 164 nests over the 2-yr period. Successful nests (fledging ≥ 1 chicks; $N = 60$) had more active prairie-dog burrows within a 75-m radius of the nest burrow ($\bar{X} \pm$ SE $= 96 \pm 5.1$) than did unsuccessful nests (26 ± 3.8; $N = 104$; Student's t-test: $t = 7.6$, $df = 162$, $P < 0.001$).

DISCUSSION

Our data indicate that Burrowing Owl chicks preferentially used active prairie-dog burrows. Active prairie-dog burrows are better maintained than inactive burrows and therefore may be more suitable for owl occupation. In inactive burrows, vegetation may partially obstruct entrances, and tunnel systems may collapse with disuse. Burrow longevity is likely related to soil type (Thompson 1984) as well as to prairie-dog activity. In Oklahoma, Butts and Lewis (1982) noted that abandoned prairie-dog colonies were not recognizable as prairie-dog colonies within 3 yr of abandonment, and Butts (1973) observed that burrows were often useless to Burrowing Owls within 1 yr of a prairie-dog control program being instituted. Such observations indicate how quickly prairie-dog burrows may degenerate without active maintenance.

Prairie-dog activity in the vicinity of Burrowing Owl nests appears to strongly influence nest fate. In Colorado, Hughes (1993) found that Burrowing Owls nested at higher densities in towns where 90% or more of the prairie-dog burrows were active. Also in Colorado, Plumpton (1992) observed that Burrowing Owls nested in areas with higher burrow densities in 1 of the 2 yr of his study. Our results indicate that active prairie-dog burrow density in the immediate vicinity of a Burrowing Owl nest may have a strong impact on nest fate. Our mean of 96 active burrows within 75 m of successful nests was high compared to our mean of 26 for unsuccessful nests.

Burrowing Owls may benefit from the presence of prairie dogs. Prairie-dog alarm calls may alert the owls to predators. Also, the owls may benefit from the dilution effect. Predators may prey more heavily on prairie dogs because they are more abundant than Burrowing Owls (Desmond et al. 1995). Prairie dogs may also be a preferred food source because of their greater biomass. Numerous prairie-dog burrows in the vicinity of a Burrowing Owl nest allow an owl brood to be distributed among several burrows, reducing the chance that an entire brood will be lost to a predator.

Preferential use of active prairie-dog burrows by Burrowing Owl chicks, and the positive influence of prairie-dog activity on nest success, support the need to preserve prairie-dog colonies for Burrowing Owl populations. We suggest that conservation agencies closely monitor prairie-dog and associated owl populations. Such assessments should include the location of prairie-dog/Burrowing Owl colonies, sizes of colonies, and owl and prairie-dog densities. State- and federally supported control programs should be reevaluated to ensure that adequate populations of prairie dogs remain to support species associated with this ecosystem.

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