Burrowing (*Speotyto cunicularia*) Owl Survival in Prairie Canada

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Abstract.—We studied survival of the endangered Burrowing Owl (*Speotyto cunicularia*) using radio-telemetry in both Alberta and Saskatchewan. Adult females exhibited the highest mean survival (0.83) whereas adult male (0.46) and juvenile (0.48) rates were similar. Most mortality occurred during the post-fledging period when there was a peak of activity around the nest. The greatest mortality from vehicle collisions occurred in a fragmented agricultural landscape where predation was also the lowest. Our survival estimates, along with other considerations, suggest that low annual survival is potentially limiting Burrowing Owl populations on the Canadian prairies.

Burrowing Owls (*Speotyto cunicularia*) appear to be declining throughout their U.S. and Canadian range. Range constriction and population declines prompted an 'endangered' classification in 1995 by the Committee on the Status of Endangered Wildlife in Canada.

Despite being a relatively well-studied species, few efforts have explicitly addressed survival. This project was initiated to examine post-fledging Burrowing Owl ecology, to include survival, with the hope of illuminating possible limiting factors for this species on the Canadian prairies.

STUDY AREAS AND METHODS

In 1995 and 1996 field work was conducted in southeastern Alberta near the town of Hanna (51˚39'N, 111˚56'W). Land use in this region is dominated by ranching (<2 0 percent cultivation). Annual precipitation averages 33 cm. Vegetation is dominated by needle-and-thread (*Stipa comata*), blue grama (*Bouteloua gracilis*), and wheat grasses (*Agropyron* spp.).

The project was expanded in 1996 to include a study area in southeastern Saskatchewan, centered on Milestone, SK (50˚00'N, 104˚30'W). This area is hereafter referred to as "Regina", as this is the nearest major center. In sharp contrast to the Hanna study area this region has productive agricultural soils and nearly 90 percent of the land surface under cultivation for cereal crops. Annual average precipitation is 38 cm. Wheat grasses and June grass (*Koeleria macrantha*) dominate the native flora.

A total of 16 adult males, 14 adult females, and 46 juvenile owls were radio-tagged during the course of this project. Adults were trapped near the nest from late incubation onwards using bal-chatris and noose carpets. Juveniles were similarly captured once they were old enough to emerge from the burrow. Both adults and juveniles were equipped with 4 g necklace style radio-transmitters in the 172 MHz range from either Holohil Systems Ltd. (Woodlawn, Ontario, Canada) or Merlin Systems Inc. (Meridian, ID, USA).

Both ground and aerial tracking were employed to monitor Burrowing Owls. All frequencies were relocated daily if possible, but typically only every second or third day from the time transmitters went on (late June) until the last owl left the study area (mid October). Remains of casualties were scrutinized to determine the date and cause of death following Einarsen (1956) and Hamerstrom (1972).

Survival and cause-specific mortality estimates were generated using software produced and discussed by Heisey and Fuller (1985). These estimates are based on the total number of

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radio-days' per time period and are similar to 'Mayfield estimates'. The three survival periods; pre-fledging, post-fledging dependency, and dispersed juveniles, are based on nest chronology and juvenile development.

RESULTS

Daily survival rates are presented for adult males, adult females, and juveniles through the three survival periods (figs. 1, 2, & 3). In Hanna 1995, no females died and all mortality of males and juveniles occurred during the post-fledging period (fig. 1). In Hanna 1996, all juvenile mortality occurred during the post-fledging period and there was no mortality in any group after dispersal of the juveniles (fig. 2). Most mortality occurred during the post-fledging period in Regina 1996 and again no females died (fig. 3).

Survival and cause-specific mortality rates for the entire study period in each area are given in table 1. Survival of adult males and juveniles are similar among years and areas (36 to 60 percent). Radio-tagged adult females

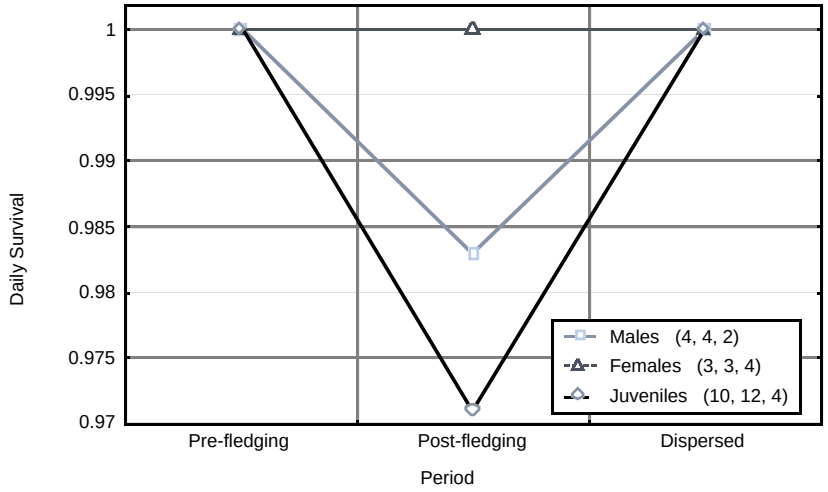

Figure 1.—*Daily survival rates for Burrowing Owls in Hanna, AB 1995. Rates are plotted separately for adult males, adult females, and juveniles across three time periods. Sample size is given in the legend for each time period (chronologically).*

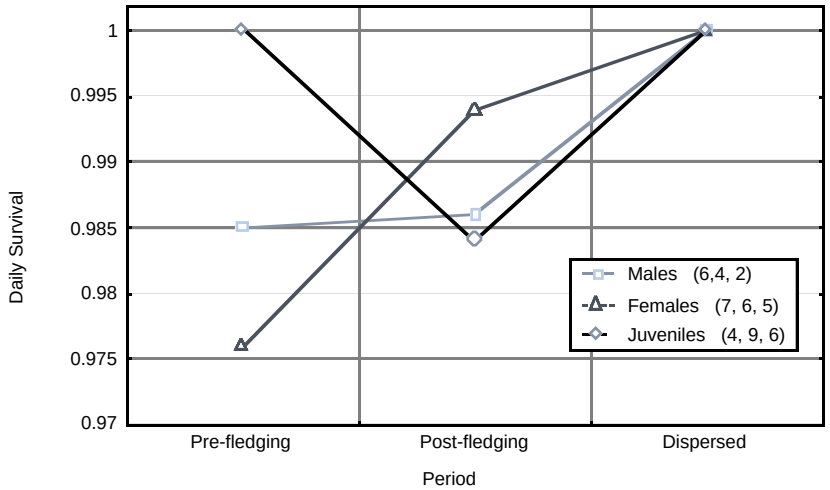

Figure 2.—*Daily survival rates for Burrowing Owls in Hanna, AB 1996. Rates are plotted separately for adult males, adult females, and juveniles across three time periods. Sample size is given in the legend for each time period (chronologically).*

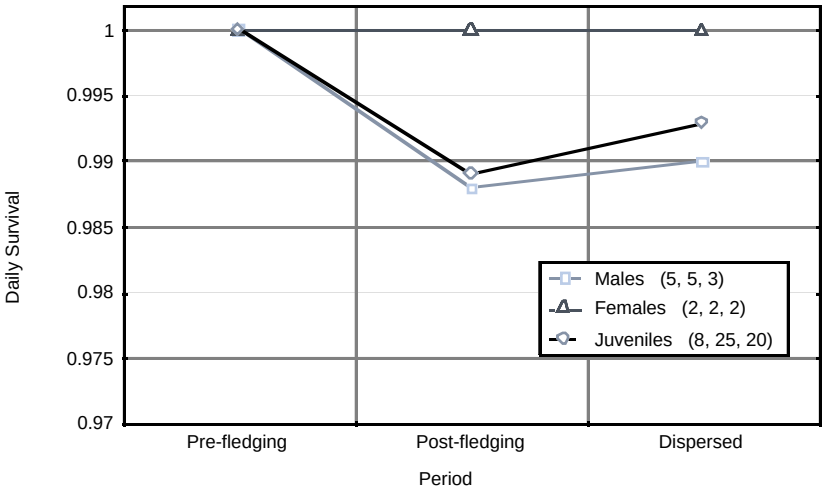

Figure 3.—*Daily survival rates for Burrowing Owls in Regina, SK 1996. Rates are plotted separately for adult males, adult females, and juveniles across three time periods. Sample size is given in the legend for each time period (chronologically).*

Table 1.—*Survival and cause-specific mortality rates for adult and juvenile Burrowing Owls from Hanna, AB and Regina, SK.*

Age/Sex	N	Survival	Cause-specific mortality			
			Raptors	Mammals	Vehicles	Other
Hanna 1995 (30 Jun-12 Oct)						
Adult males	5	0.55	0.45	0.00	0.00	0.00
Adult females	4	1.00	0.00	0.00	0.00	0.00
Juveniles	12	0.36	0.40	0.24	0.00	0.00
Hanna 1996 (28 Jun-21 Oct)						
Adult males	6	0.46	0.54	0.00	0.00	0.00
Adult females	8	0.48	0.31	0.00	0.00	0.21
Juveniles	9	0.60	0.13	0.27	0.00	0.00
Regina 1996 (25 Jun-17 Oct)						
Adult males	5	0.38	0.00	0.18	0.18	0.26
Adult females	2	1.00	0.00	0.00	0.00	0.00
Juveniles	25	0.48	0.08	0.10	0.17	0.17

only incurred mortality in Hanna 1996. With the exception of males in Regina 1996, there were no adult mortalities from mammalian predators. In contrast, juveniles were killed by mammals in all three groups. Mortality from predators, both mammalian and avian, was lowest on the Regina study area. However, vehicle collisions, starvation, and miscellaneous or unidentified sources made up the balance of mortality. All mortality of adult males and juveniles in Hanna came from predators.

SUMMARY AND CONSERVATION IMPLICATIONS

Three general points of summary have emerged with some potential conservation implications.

1. Most owls were killed near the nest during the post-fledging dependency period. This is a time when the juveniles are beginning to explore flight and the adults are actively hunting to feed their still-dependent young. This peak of activity around the nest may serve as a cue to predators.

2. Despite low sample size, survival is comparable between Hanna and Regina for both adult males and juveniles. The interesting differences are in the sources of mortality. The sparsely populated and relatively 'pristine' Hanna study area had no vehicle mortalities, mostly predation. In Regina however, predators and vehicles killed about the same proportion of owls. This extensively cultivated and highly fragmented landscape probably supports lower densities of buteo hawks and canids than the Hanna region.

3. Our estimated mortality over a 5 month period, plus additional losses expected on migrations and over winter, should result in relatively low annual survival, possibly low enough to constitute a population limiting factor.

LITERATURE CITED

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