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Breeding Dispersal of a Burrowing Owl from Arizona to Saskatchewan

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**ABSTRACT.**—We document a female Burrowing Owl (*Athene cunicularia*) that nested in Arizona and dispersed 1,860 km to Saskatchewan, where she successfully raised seven young during the same breeding season. The dispersal path between these two locations has not been documented previously. This is the longest distance ever recorded for breeding dispersal for any raptor within the same breeding season and possibly for any bird species. Received 24 May 2010. Accepted 21 January 2011.

Dispersal has important implications for population biology and evolution (Greenwood 1980, Wiens 2001). Breeding dispersal has been defined as movement between two successive breeding areas or social groups (Clobert et al. 2001). Breeding dispersal in birds is typically used to refer to movements between 2 years (Greenwood 1980, Greenwood and Harvey 1982), but within-year breeding dispersal can also occur when individuals move between two subsequent breeding attempts (Rosier et al. 2006).

Renesting (defined by Fankhauser 1964) has been documented for numerous species after an initial nesting attempt fails (Newton 1979). Second nesting attempts (those initiated after a successful attempt during the same breeding season, also termed double brooding) are rarely observed in raptors, and are thought to be uncommon due to the length of the breeding cycle (Marti 1969). The frequency of renesting and second nesting attempts is likely underestimated because the female must be individually marked and observed at both nests (Fankhauser 1964). Thus, instances of renests and second nests primarily have been those initiated at or near the initial nest site (Marti 1969, Millsap and Bear 1990, Marks and Perkins 1999). Distances moved

between first and second nesting attempts within a breeding season (i.e., within-year breeding dispersal) are frequently not available and are likely underestimated for most, if not all, species.

Migration has been defined as the movement of an organism from one location to another either permanently (dispersal) or on a seasonal cycle (Roff and Fairburn 2001). Migration routes of Burrowing Owls (*Athene cunicularia*) have been poorly documented (Haug et al. 1993) due to low (1.5%) band encounter rates (Harman and Barclay 2007). Burrowing Owls from the Canadian Great Plains migrate east of the Rockies, in a southeastern direction, based on 10 band encounters in the records of the U.S. Geological Survey's (USGS) Bird Banding Laboratory (BBL) through 2008, and nine owls with transmitters located in wintering areas (Holroyd et al. 2010). Encounters of 16 Burrowing Owls from British Columbia banded west of the Rocky Mountains revealed they migrated southwest to the U.S. Pacific Coast states (Holroyd et al. 2010).

We document two nesting attempts of a female Burrowing Owl within the same breeding season in widely separated locations (Arizona and Saskatchewan) that required crossing the Rocky Mountains in between the two previously known migration routes.

### CHRONOLOGY OF 2003 BURROWING OWL NESTING EVENTS

We located a Burrowing Owl nest site at Davis-Monthan Air Force Base (32.2° N, 110.9° W) on 14 April 2003 during an intensive demography study in Tucson, Arizona, USA (Ogonowski 2007, Ogonowski and Conway 2009). A male owl was at the burrow entrance and, using an infrared video probe, we found a female 2.5 m below ground whose body posture was indicative of a bird sitting on eggs. On 27 April we observed a pair standing at the burrow entrance and, on 30 April, we trapped and banded both birds. The adult female Burrowing Owl was banded with a USGS band and an anodized black aluminum rivet band (Acraft Sign and Nameplate Co., Edmonton, AB, Canada) with vertical letters H

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over M (hereafter HM). She had a vascularized brood patch and weighed 176 g, conditions indicative of an incubating female. We viewed the burrow entrance every 3–5 days over the next month. On 11 and 14 May we observed a pair; the female had a black Acraft band, but we were unable to read the alphanumeric code. On 18 May, we recorded one adult at the nest entrance and, on 21 May, using an infrared video probe, we detected one juvenile in the nest burrow. The juvenile was estimated to be 13 days of age, based on comparison to a Burrowing Owl photographic age guide modified from Priest (1997); this implies it hatched on ~8 May suggesting that HM began incubating between 10 and 16 April using a 22-day incubation period (Conway et al. in review).

We observed only the male at the nest entrance on 25 May and, on 29 May, the same male was still present. A new female was in attendance and subsequently trapped, at which time we observed three eggs. This new female had been banded on 22 April (black Acraft band with 9 vertical bar 7; hereafter 97) at a nest burrow where she had five eggs, and she was last seen there on 27 April. Female 97's first nest was 900 m from HM's nest and that nest failed between 27 and 30 April; one egg was found outside the burrow on 30 April and female 97 was not seen then or subsequently at her first nest burrow. This new pair (female 97 and HM's male) was still present at HM's nest burrow on 31 May, but on 13 June we found four abandoned eggs and no owls present. We found no owls on four subsequent nest visits in June.

Female HM was seen next on 12 July 2003 in the Nashlyn Prairie Farm Rehabilitation Act pasture (49.1° N, 109.5° W) in southern Saskatchewan, Canada, when we were conducting brood counts in the area. We captured HM with an unbanded male and 7 young on 18 July 2003. Her brood patch was starting to grow in with pin feathers and she weighed 137 g. We confirmed both bands while she was in hand. This pasture is 1,860 km north of the nest at which she was banded in Arizona.

We estimated the oldest young to be 24–26 days of age on 18 July, while one young was much younger, based on the length of primary 9 and tail measurements (T. I. Wellicome, unpubl. data). We estimated HM's first egg was laid on 27 May based on a 22-day incubation period which started mid-way through the laying period, a 1.5-day laying interval between eggs, and a seven-egg

clutch (Haug 1985, Wellicome 2005, Conway et al. in review).

## DISCUSSION

The identification of this owl is certain because we trapped her in both locations and the U.S. Geological Survey and Acraft bands were confirmed in hand. This female Burrowing Owl laid and incubated a clutch (and hatched at least 1 nestling) in Tucson, Arizona and then moved 1,860 km north and successfully nested in Saskatchewan. We do not know which of the two females were present on 11 and 14 May so the departure date when HM left Tucson is unknown (we believe she likely departed just after her clutch hatched on 8 May). Female 97 could not have hatched the nestling (hatch date ~ 8 May) since she was involved in her own first nesting attempt until at least 27 April. Two other examples of females abandoning young nestlings and moving to initiate second nests with a new male have been observed at the Tucson study site (CJC, unpubl. obs.). This is the first time a second brood has been documented following long-distance dispersal by a Burrowing Owl.

Burrowing Owls have been documented with renests and second broods in California (Gervais and Rosenberg 1999, Catlin 2004, Rosier et al. 2006), in Florida (Millsap and Bear 1990), and in Arizona (Conway et al. in review). The intervals between fledging or failure of the first attempt and initiation of the subsequent attempt ranged from 16 to 150 days. Rosier et al. (2006) documented eight owls to disperse up to 54.1 km (mean = 14.9 km) but not all owls bred at the dispersal site that season. A. M. Fuentes Romero and M. Marquez Olivas (unpubl. data) documented a banded pair of Burrowing Owls in Texcoco, Distrito Federal, Mexico (19.5° N, 98.9° W) successfully producing two broods of three young each that hatched in March and December 2008. Catlin (2004) documented two pairs that produced three and four clutches after eggs were experimentally removed in California. These examples were from non-migratory populations and the females remained in the same nest burrow or only moved short distances (max = 54.1 km; Rosier et al. 2006) between nest attempts.

Encounters of Burrowing Owls banded in Canada indicate two migration patterns, one for Burrowing Owls east of the Rocky Mountains through the Great Plains, and the second for British Columbia along the west coast of North

America (Holroyd et al. 2010). The dispersal movement of the female Burrowing Owl reported in this paper crossed between these two migration 'corridors' from Arizona to Saskatchewan.

Our observation indicated this burrowing owl dispersed 1,860 km between two nesting attempts within the same breeding season. This is the longest distance ever recorded for breeding dispersal for any raptor (and possibly for any bird species) within the same breeding season. The female was not seen again the following year on either study site. The possibility of other species dispersing between two nesting attempts in the same breeding season has been indicated by stable isotope analysis (Hobson and Robbins 2009, Rohwer et al. 2009). We suggest the possibility of other examples of long distance breeding dispersal events within the same breeding season should be investigated. These dispersals have important implications for population genetics (Korfanta et al. 2005) and population dynamics (Clobert et al. 2001, Wiens 2001).

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