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Sun-bathing by Greater Roadrunners – A Neglected Aspect of Their Range Extension

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Running head: Sun-bathing by Greater Roadrunners

Sun-bathing or basking is a behavior seen in birds for a variety of reasons (e.g., Kennedy 1969). One function is passive rewarming after spending the night in a state of torpor or hypothermia. While many birds can drop their body temperature during the night (McKechnie and Lovegrove 2002), passive rewarming may commonly be exhibited in only 4 species of caprimulgids and the Greater Roadrunner (*Geococcyx californianus*) (Geiser *et al*. 2004). Lowering the body temperature at night saves energy, but initially it was thought that arousing from daily torpor may be energetically costly, negating energy saved at night. However, passive rewarming expends almost no energy and is a way to rapidly raise body temperatures (Geiser *et al*. 2004). In the deserts of the Southwest, roadrunners have been reported to sun-bath, particularly after cold nights. Ohmart and Lasiewski (1971) demonstrated that this behavior significantly increased the roadrunner's body temperature following periods of hypothermia associated with those cold nights. The skin on the back of the roadrunner is black and exposed during sun-bathing by drooping wings and orienting the back towards the sun (Figure 1). This behavior is always discussed in terms of surviving cold winter nights in the desert, and has not been mentioned as a possible factor in the range extension of the Greater Roadrunner.

Beginning in the late 1930s, roadrunners began to expand their range to the east into eastern Oklahoma (Baumgartner and Baumgartner 1992), southwestern Arkansas (Baerg 1950), and northern Louisiana (Lowery 1955), possibly because of dry conditions during the Dust Bowl (Johnson 1947) and with over grazing of grasslands (Allan 1950). At least in the Ozarks, birds were associated with arid cedar glades (Brown 1963).

Using Christmas Bird Count data, Root (1988) analyzed the winter distribution of roadrunners, and concluded that it coincided with at least 140 clear (cloud-less) days, but not with temperature or precipitation. Maxon (2005) thought a combination of cloudy days, cold temperatures, prolonged snow cover, lack of woody vegetation, and scarce winter food might limit the range of roadrunners, at least to the north. While severe winters with cold temperatures and prolonged snow pack can decimate these eastern roadrunner populations (e.g., Norris and Elder 1982), the ability to survive cold nights by going into hypothermia and sun-bathing the next morning has been ignored in explanations of their range extension.

Here we document several instances of roadrunners sun-bathing after cold nights in northwestern Arkansas. Sightings of roadrunners have become more common in urban areas here within the last decade, such that roadrunners have now been seen sunbathing on several occasions.

Our first observation was made by Neal and Reynolds on the morning of 21 November 2012 in Rogers, Benton Co., Arkansas. The bird was displaying the typical sun-bathing behavior, exposing the black skin on the back to the sun (Figure 1). The bird was observed at about 8:00 after a night when the temperature was -3.3 °C. This occurred in a suburban neighborhood built around a golf course.

Figure 1. Roadrunner sunbathing on 21 November 2012 in Rogers, Arkansas. This is the classic pose with black skin on the back exposed to the sun. (Photograph by Joseph Neal).

The second observation was made by Smith and others and occurred at the Fayetteville Municipal Airport, Washington Co., on 18 December 2016 at about 7:30. The bird was sitting on a tarred road with a light dusting of snow, but moved off the road and continued to sun-bath when we stopped to look at it. The temperature the previous night was -15 °C and the temperature was only -9 °C at the time of observation.

A third observation was made by Neal and Reynolds on the side of the road near the Rocky Branch Marina on Beaver Lake, Benton Co., on 7 January 2017. The temperature at the time of the sighting was -6.1 °C. A lot of mobbing by American Crows (*Corvus brachyrhynchos*) appeared nearby. The roadrunner was sunning in an open patch of lawn adjacent the road and a thicket composed mostly of Eastern red cedar (*Juniperus virginiana*). Suddenly it stopped sunning and just froze in place, and squatted down. Then the mob got a lot louder, and as the roadrunner started to dash into a nearby cedar thicket, a Red-tailed Hawk (*Buteo jamaicensis*) swooped down on it, just missing the roadrunner as it disappeared into the thicket. Maxon (2005) was of the opinion that roadrunners were too fast for diurnal predators, but they would appear to be vulnerable to predators if sun-bathing while coming out of hypothermia. There are reports of hawks with dead roadrunners (Stevenson and Meitzen 1946), roadrunner remains in hawk pellets (Pache 1974), and attempts by raptors to capture roadrunners (Sutton 1977; Beal and Beal 1978).

All of our sightings occurred after nights when the temperatures were below freezing. The 18 December 2016 sighting followed the second coldest night of the month. While probably not directly associated with the range extensions of roadrunners to the east and north, the ability to go into daily hypothermia followed by passive warming the next morning would appear to be a significant adaptation associated with maintaining populations in these areas of range extension. Hughes (2011) also attributed this combination of physiological and behavioral adaptations to explain this once desert species now occupying new habitats as diverse as the foothills of the Rockies in Colorado to the pine forests of western Louisiana.

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