

UNUSUAL DIURNAL ROOSTING BEHAVIOR BY TURKEY VULTURES (*Cathartes aura*) DURING A SOLAR ECLIPSE

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Unusual behavior has been reported among many species of birds during solar eclipses, both in the scientific literature (Christy *et al.* 1933; Wheeler *et al.* 1935; MacCarone 1997; Trigunayat 1997; Tramer 2000), and by citizen scientists on web-based forums (e.g., Van Doren *et al.* 2017). In general, these reports describe behaviors ordinarily associated with dawn or dusk, when normally diurnal species cease activity and retire to roosting sites, and crepuscular and nocturnal species (including nocturnal migrants) become active (Wheeler *et al.* 1935; MacCarone 1997; Trigunayat 1997; Tramer 2000). The simplest inference is that the expression of these atypical behaviors during eclipses is in response to diminished light levels (Tramer 2000). We here describe unusual communal roosting behavior among Turkey Vultures (*Cathartes aura*) in Dutchess County, New York, during a partial solar eclipse on 21 August 2017.

The eclipse (magnitude = 1.0306) occurred when the moon passed between the earth and sun casting an umbral shadow that spanned the continental United States from the Pacific to Atlantic coasts (<https://www.nasa.gov>). Conditions of near-complete darkness prevailed in the Zone of Totality (ZT), a narrow (ca. 115 km wide) corridor extending across 14 states (<https://svs.gsfc.nasa.gov/4518>). The total eclipse began in the continental United States on the Oregon coast (1015 hr PDT), progressed eastwards, and ended when the umbral shadow passed over Charleston, South Carolina (1441 hr EST). During this period, areas outside of the ZT experienced a partial (annular) solar eclipse with varying levels of diminished light intensity, but not complete darkness (<https://www.nasa.gov>).

Our observations were made at the Joseph A. Sgaggero Memorial Park (41°44.32'N; -73°33.94'W) in Dover Plains, Dutchess County, New York where

Turkey Vultures and lesser numbers of Black Vultures (*Coragyps atratus*) roost communally in riparian forest along Ten-Mile River. This roosting area is structurally similar to others reported in the literature (Prather *et al.* 1976; Coleman and Fraser 1986; Buckley 1996), and consists of large hardwood trees, including American Sycamore (*Platanus occidentalis*) and Eastern Cottonwood (*Populus deltoides*) with a dense, inter-locking canopy. Based on observations made during August-September 2016 and August 2017, we conservatively estimate that a minimum of 25-30 Turkey Vultures and 5-7 Black Vultures frequent the roost. Ingress into the roost during August and September typically begins about 1700 hr with the last birds arriving between 1815-1830 hr; egress occurs the following morning, usually between 0900-1000 hr (Platt and Rainwater, unpubl. data).

The solar eclipse in Dutchess County, New York began at 1323 hr and terminated at 1444 hr. Dutchess County was well beyond the ZT and experienced only a partial eclipse with a 50-75% reduction in light levels (<https://www.nasa.gov>). At 1230 hr, one of us (SGP) entered a concealed observation post in an abandoned storage shed that was regularly used to surveil the vulture roost. The northern and northeastern approaches to the roost are visible from this vantage point, although birds entering the roost from the south and southwest cannot be seen owing to the dense canopy foliage. The weather at our study site on the afternoon of 21 August 2017 was clear with a high temperature of about 30°C.

There were no vultures in the vicinity of the roost until 1335 hr when a single Turkey Vulture was observed soaring overhead. This bird was quickly joined by five other Turkey Vultures, and at 1340 hr, a single Black Vulture (hitherto undetected) entered the roost, followed by a Turkey Vulture at 1405 hr. From 1430-1451 hr, 13 additional Turkey Vultures flew into the roost. Other Turkey Vultures that were soaring overhead slowly descended and appeared to be entering the roost from its southern approaches. Considerable activity was evident within the roost as vultures frequently shifted positions and moved between trees. At 1523 hr a limited egress began when one Turkey Vulture left the roost, landed at a waterhole near the observation post, and began drinking. Seven additional Turkey Vultures departed the roost between 1538 and 1558 hr; one of these vultures also paused to drink at the waterhole, while another landed atop a nearby mound of dirt and assumed a spread-wing posture (described by Kirk and Mossman 1998). Shortly thereafter Turkey Vultures began gathering overhead and slowly descending into the trees; at least 21 were counted entering the roost (1600-1635 hr). The discrepancy between the number of vultures leaving the roost immediately following the eclipse (N = 8) and the larger number that returned (N = 21) suggests that not all of the vultures which frequent the roost returned during the eclipse. SGP terminated observations at approximately 1645 hr and additional vultures probably arrived at the roost later in the afternoon.

To briefly summarize our observations, Turkey Vultures began gathering above the roost shortly after the eclipse commenced. Ingress was initiated by a Black Vulture with most Turkey Vultures entering the roost after the eclipse was well underway; the last vulture entered the roost shortly after the eclipse had passed. After a brief lull in activity (about 30 minutes), some (but apparently not all) Turkey Vultures left the roost. Only a few minutes after this partial egress ended, a larger number of Turkey Vultures returned to the roost, likely as part of the daily ingress, albeit somewhat earlier than usual. It should be noted that during the eclipse, the sun assumed a subdued dull hue, but otherwise there was little perceptible diminution of light (at least to SGP).

Our observations are noteworthy for two reasons. First, to our knowledge, this is the only report describing the behavior of Turkey Vultures during a solar eclipse. Second, most atypical behaviors reported among birds during solar eclipses occur when light levels are reduced to near-darkness (Christy *et al.* 1933; Wheeler *et al.* 1935; Trigunayat 1997; Tramer 2000). Indeed, in a review of 1350 checklists compiled during the eclipse and submitted to eBird.org, Van Doren *et al.* (2017) noted that observers were less likely to report unusual behaviors where solar obscuration was < 95%. In contrast, we observed Turkey Vultures entering their roost when there was little perceptible diminution of ambient light levels, which appeared near-normal for an August afternoon. Roosting behavior is thought to be triggered when illumination levels fall below (ingress) or rise above (egress) some critical threshold value, although time of day also appears important (Krantz and Gauthreaux 1975; Eiserer 1984). The fact that our observations occurred under conditions of almost full sunlight suggests that either Turkey Vultures are sensitive to even a slight reduction in light level or were responding to as yet unrecognized stimuli.

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