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Interspecific Competition Between Vultures for Preferred Roost Positions

Neil J. Buckley[1]

ABSTRACT.—I recorded the spatial distribution of Black Vultures (*Corogyps atratus*) and Turkey Vultures (*Cathartes aura*) roosting on electricity pylons in south Texas on 14 evenings. Both species clearly preferred to roost on the upper level of the pylons, and when there was little competition for space most vultures used the upper middle section. However, as densities of vultures increased, Black Vultures monopolized the upper level and Turkey Vultures became increasingly concentrated on the lower level. Although there were many potential roosting sites available on other pylons, Turkey Vultures chose to roost on the lower level of occupied pylons rather than move. Their decision to stay suggests that there is a potential cost to moving, perhaps an increased risk of predation. *Received 30 June 1997, accepted 29 Oct. 1997.*

Many birds roost communally, a behavior for which three major selective advantages have been proposed. These are: energy savings through improved thermoregulation (Brenner 1965, Chaplin 1982, Williams et al. 1991); reduced risk of predation (Lack 1968, Gadgil 1972); and enhanced foraging success, either because roosts function as information centers (Ward and Zahavi 1973; Rabenold 1983, 1987; Marzluff et al. 1996; Buckley, 1997) or they serve as assembly points for groups of foraging birds (Evans 1982, Buckley 1996). These potential benefits of communal roosting are balanced by a number of likely costs. Costs include increased exposure to parasites and diseases (Lack 1968), plumage damage caused by the droppings of birds roosting above (Yom-Tov et al. 1979), and the energetic costs of commuting between feeding sites and communal roosts.

Positions within a roost vary in quality because sites differ in their degree of exposure to the elements and in the level of protection they offer against predators. Intraspecific competition for positions within roosts has been described for a wide variety of species. Evidence that lower status birds are forced to occupy inferior positions within communal roosts has been presented for, among others, Red-winged Blackbirds (*Agelaius phoeniceus*; Weatherhead and Hoysak 1984), Rooks (*Corvus frugilegus*; Swingland 1977), and Bramblings (*Fringilla montifringilla*; Jenni 1993). This paper describes apparent interspecific competition between Black Vultures (*Coragyps atratus*) and Turkey Vultures (*Cathartes aura*) for preferred roosting positions on electricity pylons.

METHODS

Observations were made on the 3157-ha Rob and Bessie Welder Wildlife Refuge, Sinton, Texas (28° 06′ N, 97° 22′ W). Black Vultures and Turkey Vultures are common in the area, and at night form communal roosts in trees along the Aransas River and on electricity pylons. The pylons used for roosting (Fig. 1) are about 25 m high and consist of two vertical supports topped by a superstructure. The lower level of the superstructure consists of two approximately 19 m long horizontal beams joined together by cross pieces. Above these beams, supported by a framework of girders, is a slightly more complex upper level. This is made up of three sections: an approximately 10 m long horizontal central section, two 2 m high struts, and two approximately 3.5 m long sloping sections of girder that join the upper and lower levels. Vultures roosted on the horizontal beams, the struts, and the sloping sections of the upper beam. Vultures occasionally perched on the electricity lines suspended from the

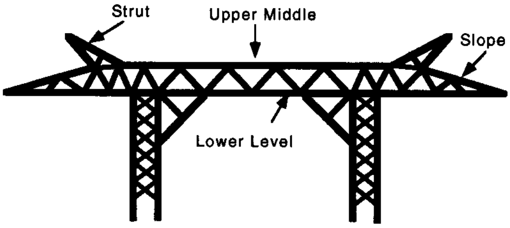

FIG. 1. Electricity pylon showing regions referred to in the text.

[1] Department of Zoology and the Oklahoma Biological Survey, University of Oklahoma, Norman, Oklahoma 73019.

Present address: Department of Biology, University of Vermont, Burlington, Vermont 05405; E-mail: nbuckley@zoo.uvm.edu

TABLE 1. Spatial distribution of vultures perched on electricity pylons from October to December 1991 (winter) and in March and April 1992 (spring) on the Welder Wildlife Refuge, Sinton, Texas.

		Site				
Species	Season	Struts	Upper middle	Slopes	Lower level	Total
Turkey Vulture	Winter	8 (6.6%)	20 (16.5%)	8 (6.6%)	85 (70.2%)	121
	Spring	9 (9.9%)	54 (59.3%)	23 (25.3%)	5 (5.5%)	91
Black Vulture	Winter	57 (11.5%)	318 (64.1%)	84 (16.9%)	37 (7.5%)	496
	Spring	9 (5.7%)	135 (86%)	13 (8.3%)	0	157

struts, but rarely remained there for more than a few minutes before moving to the main structure.

In October 1991, while counting vultures roosting on the pylons, I noticed that more Turkey Vultures than Black Vultures appeared to roost on the lower level. To assess whether this was normal, I counted and plotted the positions of vultures roosting on the pylons on seven evenings between October and December 1991 ("winter"), and on seven evenings in March and April 1992 ("spring"). I used a 15–60 × 60 telescope to observe roosting birds from distances of between 200 m and 400 m, beginning counts up to 45 min before dark and repeating them every 5 min until it was too dark to identify individuals to species. Vultures were assigned to one of four locations on the pylon (Fig. 1): middle section of the upper beams (upper middle), sloping sections of the upper beams (slopes), lower beams, or struts. Because the nightly total of vultures roosting on a single pylon ranged from 4 to 136, I was able to determine the roost positions individuals occupied under a wide range of vulture densities.

RESULTS

On the 14 evenings that I observed vultures roosting on the pylons, the same pylon was occupied by birds on 11 occasions, and that pylon and the adjacent one were occupied on three evenings. Overall, 75.5% of vultures recorded (653 of 865) were Black Vultures. Significantly more vultures (both species combined) used the pylons for roosting in winter ($\bar{x}$ = 88.1, SE = 10.0) than in spring ($\bar{x}$ = 35.4, SE = 7.5; $t = 4.21$, df = 12, $P < 0.01$). Some vultures were present in the roost several hours before dark, but most arrivals occurred in the last hour of daylight, with more than 50% of individuals of both species entering the roost in the last 30 min before nightfall.

Vultures strongly preferred the upper level of pylons over the lower level (Table 1). In spring, when few vultures used pylons for roosting, all Black Vultures perched on the upper level, as did most Turkey Vultures (94.5%). In winter, when the pylons were crowded, most Black Vultures (92.5%) still roosted on the upper level, but a significantly lower proportion of Turkey Vultures (29.8%) did so than in spring [χ^2 (with Yates' correction) = 86.5, df = 1, $P < 0.001$].

Most vultures perched on the upper middle section of the pylons, especially when densities of roosting birds were low. In spring, 86% of Black Vultures and 62.8% of Turkey Vultures roosting on the upper level used the middle section. Similarly, 69.3% of Black Vultures and 55.6% of Turkey Vultures roosted on the upper middle section in winter. In contrast, the struts and slopes were used by fewer vultures. In winter, 28.4% of Black Vultures roosted in these areas, but in spring, when fewer birds were present, only 14% of Black Vultures roosted there (χ^2 = 16.78, df =1, $P < 0.001$). There was no significant difference between winter and spring in the proportion of Turkey Vultures that roosted on the struts (χ^2 = 0.76, P = 0.384; Table 1). However, a significantly greater percentage of Turkey Vultures roosted on the slopes in spring (25.3%) than in winter (6.6%), part of the much greater numbers then roosting on the upper level (χ^2 = 14.49, df = 1, $P < 0.001$).

The more vultures that roosted on the pylons, the greater the proportion (arcsine-transformed) of Turkey Vultures that perched on the lower level (Pearson's r = 0.9464, $P <$ 0.01, Fig. 2). When fewer than 50 vultures were present, 86 of 91 Turkey Vultures (94.5%) roosted on the upper level, but when more than 50 vultures were present only 36 of 121 (29.7%) roosted there (χ^2 = 89.2, df = 1, $P < 0.001$). This pattern does not result from Turkey Vultures being the last to arrive at the roost and so having to occupy whatever places remain. Although similar numbers of sites were available to them, Turkey Vultures and Black Vultures arriving just before dark

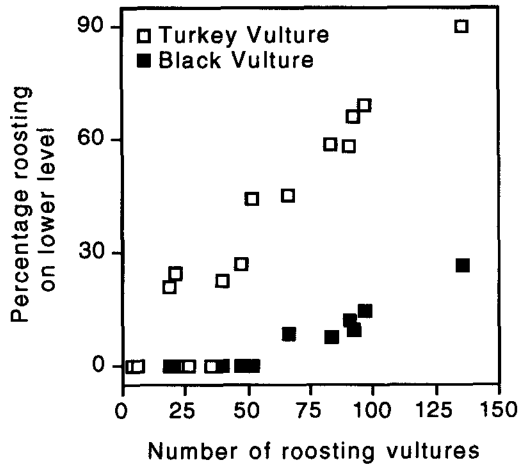

FIG. 2. Relationship between overall number of vultures (of both species) present on a pylon and arcsine transformed proportion of Black and Turkey vultures roosting on the lower level.

differed in their landing sites. In the last 15 min before dark (on six days in winter when from 66 to 136 vultures roosted on the pylons), 91 of 108 Black Vultures (84.2%), landed on the upper level compared to only 5 of 47 Turkey Vultures (10.6%; χ^2 = 75.3, df = 1, $P < 0.001$).

On three nights the birds occupied two adjacent pylons. In one instance, the birds initially settled on a single pylon, but following a disturbance (cause unknown) redistributed themselves between two pylons. In the other two cases, the birds were already occupying two pylons when I arrived. On two nights when there were, respectively, 65 and 51 roosting vultures present, the two species were not evenly distributed between pylons [χ^2 (with Yates' correction) = 28.16, 12.63, both $P < 0.001$]. Instead, most Turkey Vultures roosted on one pylon and most Black Vultures on the other. On the third evening only 10 birds were present, and the distribution of species between pylons did not differ from random (Fisher exact test, $P > 0.05$). Overall, on the three nights that vultures used two pylons, only 1 of 57 Turkey Vultures roosted on the lower level.

DISCUSSION

Vultures did not distribute themselves randomly on the pylons. Instead, when there was little competition for space, most roosted on the upper middle section of the pylon. However, when large numbers of vultures were present, proportionately more Turkey Vultures than Black Vultures roosted on the lower level. Turkey Vultures are less aggressive than Black Vultures and generally subordinate in aggressive interactions at carcasses (Stewart 1978, Wallace and Temple 1987, Houston 1988, Buckley 1996). The observed difference between the species in roosting position when large numbers of birds were present on the pylons is most likely a consequence of the relative aggressiveness of the two species.

The two most likely reasons why the upper level is preferred are that birds on the upper level experience some thermoregulatory benefit or they do not have to endure a rain of droppings from above. Individual vultures probably suffer less heat loss when the upper level is crowded and the birds are pressed close together. Whether such energy savings are a cause or a consequence of communal roosting in vultures is unclear. However, it is known that vultures attempt to conserve energy while roosting. For example, roosting Turkey Vultures allow their body temperature to fall by up to 4° C at night (Heath 1962) to reduce heat loss. The spatial arrangement of branches in tree roosts usually results in vultures being widely separated and limits any thermoregulatory benefits. However, the simple structure of electricity pylons probably promotes energy savings because it presses the birds together in a limited space.

Birds roosting on the lower level of the pylons had to tolerate the droppings of birds roosting above them, but appeared to gain no ameliorating thermoregulatory benefit because they did not crowd together. Thus, birds roosting on the lower level appeared to suffer a cost by doing so. They could have moved to the upper level of an adjacent pylon, but they did not, which suggests they were reluctant to roost alone. This impression is reinforced by the distribution between roosts of Turkey Vultures when two pylons were occupied. On those evenings, the two species segregated between pylons and all but one Turkey Vulture roosted on the upper level. The most likely reason Turkey Vultures are reluctant to roost alone is predation. Reports of predation or attempted predation on vultures are rare (Coleman and Fraser 1986, Stolen 1996), but the potential risk from predators such as Barred Owls (*Strix varia*) and Great Horned Owls (*Bubo virginianus*), both of which occur on the refuge, may be sufficient that individual Turkey Vultures are reluctant to roost alone. Those Turkey Vultures that are compelled to roost on the lower level of pylons seem to be making the best choice available to them. Roosting on the lower level of a pylon is not the preferred choice, but is a more attractive option than roosting alone.

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