SHORT COMMUNICATIONS

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NEST-DEFENSE BEHAVIOR OF THE AMERICAN CROW IN URBAN AND RURAL AREAS[1]

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Key words: *Crow; nest defense; persecution;* Corvus brachyrhynchos.

The American Crow (*Corvus brachyrhynchos*) has traditionally been persecuted as a pest and hunted for sport. As recently as 1980 there were an estimated 4,530,000 crow hunter-days in the United States (USDI and USDC 1982a). In recent decades crows, which in the past were typically rural birds, have begun nesting in cities where ordinances prohibit the discharge of firearms. As a result of this colonization of urban areas, two adjacent crow populations exist in many regions, a persecuted rural one and a protected urban one. We took advantage of this situation to examine how the nest-defense behavior of crows has been modified by the presence or absence of persecution. We examined two complementary hypotheses: (1) in an area of high human density and low persecution, crows should habituate to human beings near their nests and (2) in areas of high persecution, crows should show avoidance behavior to human intruders near their nests.

METHODS AND STUDY AREA

We examined these two hypotheses in May and June 1985 in the city of Madison and in rural Dane County, Wisconsin. Madison has a population of about 172,583 people and has had nesting crows for the past several decades (Schorger, unpubl. data). Dane County is a mosaic of cultivated crops, pastures, and woodlots. Rural Wisconsin crows are heavily persecuted and have been since at least 1900 (Schorger 1941). As late as 1980 an estimated 103,900 crow hunter-days occurred in Wisconsin (USDI and USDC 1982b). A city ordinance prohibits the discharge of firearms in Madison, thereby protecting crows and other wildlife.

Assuming that calls, dives, and nearest distance approached by crows to us reflected nest-defense aggressiveness, and that nest-defense aggressiveness is influenced by human persecution, we measured the following crow behavior at 18 rural and 20 urban nests: (1) the distance from us (always the same two human beings) to the nest when a crow first called (we used only nests that allowed an unobstructed line of sight of at least 300 m from us to the nest) and the distance to the nest from us when a crow first flew from the nest, (2) whether a crow called during a 5-min period while we stood at the base of the nest tree, (3) the number of calls and the closest distance approached by a crow during a timed ascent by one individual to the nest (the other individual remained standing at the base of the nest tree), and (4) the number of calls, whether or not a crow dived, and the closest distance approached by a crow during a 5-min period while one observer was at the nest. Distances were determined either by pacing or using a rangefinder. In each instance, one adult approached closer to us than the other(s); in our analyses we used the responses of the closest crow during our nest visit. All nests contained young (range 1–18 days old), and there were no differences in age of nestlings between the two study areas. In a previous study (Knight and Temple 1986) we showed that nestling age did not alter significantly nest-defense intensity by parents.

RESULTS AND DISCUSSION

The data supported our first hypothesis; nesting crows in Madison did not call or fly off as we approached their nests whereas rural crows always did so (Fisher exact test, both P values < 0.001; Table 1). Additionally, urban crows almost never called when we stood at the base of their nest trees whereas rural crows frequently did so (Fisher exact test, $P = 0.044$). When we began climbing to the nests or were at the nests, however, crows in both areas usually called (climbing to nest: Fisher exact test, $P = 0.52$; at nest: Fisher exact test, $P = 1.0$).

The data also supported our second hypothesis; rural crows showed less aggressive nest-defense behavior than urban crows. Rural crows never dove while one of us was at the nest, but urban crows occasionally did (Fisher exact test, $P = 0.30$; Table 1). Additionally, rural crows did not approach us as closely, either while one of us climbed to the nest (Mann-Whitney test, U =

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TABLE 1. Responses of nesting crows to human intruders in urban and rural areas, Dane County, Wisconsin.

Response of crows to intruders	Responses in indicated areas: Urban (20 nests)	Rural (18 nests)
Proportion of nests where a crow called as we approached nest	0/20	18/18
Proportion of nests where a crow flew off as we approached nest	0/20	18/18
Proportion of nests where a crow called as we stood at base of nest	2/20	9/18
Proportion of nests where a crow called as we climbed to the nest	17/20	14/18
Proportion of nests where a crow called when intruder was at nest	18/20	18/18
Proportion of nests where a crow dove at intruder at nest	2/20	0/18
Distance (m) from intruder to nest when crow flew from nest ($\bar{x} \pm$ SD)	[a]	208.1 ± 109.4
Distance (m) from intruder to nest when crow first called ($\bar{x} \pm$ SD)	[a]	141.1 ± 106.6
Rate of calling (calls/min) by crow to intruders at base of nest tree ($\bar{x} \pm$ SD)	0.2 ± 0.8	1.7 ± 2.7
Closest approach (m) of crow to intruder climbing to nest ($\bar{x} \pm$ SD)	22.2 ± 16.7	200.0 ± 110.5
Rate of calling (calls/min) by crow at intruder climbing to nest ($\bar{x} \pm$ SD)	23.1 ± 19.6	8.4 ± 17.3
Closest approach (m) of crow to intruder at nest ($\bar{x} \pm$ SD)	24.5 ± 17.4	206.4 ± 138.4
Rate of calling (calls/min) by crow at intruder at nest ($\bar{x} \pm$ SD)	23.7 ± 14.1	7.3 ± 7.9

[a] No birds responded.

339.0, $P < 0.0005$) or while at the nest (Mann-Whitney test, U = 337.5, $P < 0.0005$; Table 1). Finally, rural crows had significantly lower call-rates than urban crows, while we were climbing to the nest (Mann-Whitney test, U = 186.0, $P < 0.005$) and at the nest (Mann-Whitney test, U = 284.5, $P < 0.0005$).

Our findings support the generalization that human persecution alters animal behavior. Fraser et al. (1985) suggested that human persecution plays an important role in determining flushing distances in nesting Bald Eagles (*Haliaeetus leucocephalus*), and Newton (1979) listed several species of Falconiformes that showed less aggressive nest-defense behavior in areas with a longer history of human persecution. Knight (1984) found that Common Ravens (*Corvus corax*) were more cautious in defense of their nests in an area of frequent nest destruction by humans than in an area of infrequent nest destruction. Knight (1984) proposed that reduced nest defense in areas with frequent human persecution might be adaptive by reducing the chances of adults being killed or the nest being found and destroyed. This explanation is certainly true in our rural crow population; crows easily stayed outside of gun range and flew from the nest at distances which would give a human few clues in finding a nest. Additionally, the results of Knight's (1984) study coupled with our study indicate that nest-defense behavior of some corvids is influenced more by the outcome of bird-human interactions than just the number of these interactions. Ravens and crows showed the most aggressive nest-defense behavior in areas of low persecution even though the ravens were in an area of low human density and the crows were in an area of high human density. Ravens and crows that showed the greatest avoidance behavior occurred in areas with high human persecution levels although they also occurred in areas with moderate human densities. The number of bird-human interactions may be important in influencing how quickly birds learn to respond to humans. More probably there exists an interaction between the number and outcome of bird-human interactions which determines the response of nesting birds to human presence.

Crows can minimize energy expenditures and disruptions of their activity patterns by habituating to human presence. Urban crows, protected from direct persecution have apparently habituated to human beings on the ground. When nests are threatened by human intruders, however, urban crows did actively defend their nests. Rural crows, which are persecuted, were much more timid toward human intruders.

Boyle and Sampson (1983, 1985) indicated that human activities, such as persecution, can result in changes in wildlife distribution and habitat use. Our results suggest that recent colonization of cities by nesting crows may be in part a response to different levels of persecution in urban and rural areas. Houston (1977) has expressed similar views for crows in Canada.

Whether the reduced nest-defense aggressiveness in rural crows is learned or the result of a change in gene frequencies due to persecution of more aggressive or less wary individuals is not known. Our observations suggest strong selective or learning pressures have occurred in crows as a result of each areas's regime of human activities.

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ACORN WOODPECKER PREDATION ON CLIFF SWALLOW NESTS[1]

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Unlike many other woodpeckers that feed on wood-boring insects and larvae, Acorn Woodpeckers (*Melanerpes formicivorus*) feed primarily on acorns, insects caught by flycatching, and sap (Bent 1939, MacRoberts 1970, MacRoberts and MacRoberts 1976). They also supplement their diets with an occasional small lizard (Koenig, pers. comm.), fruit, oak catkins, and wild oat seeds (MacRoberts and MacRoberts 1976). Acorn Woodpeckers are also known to eat eggs that have been removed from two-female communal nests (Mumme et al. 1983). Other unusual predatory behavior includes a single report of predation on a Western Wood-Pewee (*Contopus sordidulus*) nest (Bryant 1921) and the mutilation of two Red-breasted Sapsucker (*Sphyrapicus ruber*) nestlings (Shuford 1985). These incidents, however, appear to be opportunistic; the Acorn Woodpecker does not regularly prey on other vertebrates.

We report here on an instance when nest predation by Acorn Woodpeckers may have harmed a colony of Cliff Swallows (*Hirundo pyrrhonota*) nesting in the Stanford Quadrangle at Stanford University, Stanford, California. The colony consisted of 56 mud nests concentrated under overhanging shingles from the roof of the east-facing main archway of the quadrangle. An additional 10 to 15 nests were dispersed throughout the colony. The nests were constructed in corners bordered by roof supports and shingles, ranging from 3 to 8 m off the ground. We observed eight Acorn Woodpecker visits to this colony during the week of 28 May through 3 June 1985, between 08:00 and 09:00. Though attempts at predation sometimes failed when mobbing Cliff Swallows induced the Acorn Woodpecker to flee, in four (50%) of these visits the woodpecker succeeded in stealing an egg from a nest. In another instance, an Acorn Woodpecker also appeared to have taken a nestling. Acorn Woodpeckers were nesting in two palm trees less than 25 m from the Cliff Swallow colony. After removing an egg, the woodpecker would fly towards its nesting site with the egg still intact in its beak. Unfortunately, we were unable to discover what the woodpeckers did with the Cliff Swallow eggs, though

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