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WINTER ROOST-SITE USE BY FEMALE AMERICAN KESTRELS (*Falco sparverius*) IN LOUISIANA

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ABSTRACT.—Roosting ecology of American kestrels (*Falco sparverius*) wintering in southcentral Louisiana was studied during the winters of 1988–89 and 1989–90. Twenty-eight roost sites were found for 26 kestrels. Twenty-four (85%) roost sites were man-made structures and four (15%) were natural roosts. Roost times averaged 2.1 ± 0.15 (SD) min before sunset (N = 46). Median height of man-made roost perches was 5.0 m (N = 20, range = 2–50 m); mean height of natural roost perches was 6.3 ± 2.94 m (N = 4, range = 3–10 m). Kestrels did not roost communally; however, a male and a female roosted together for at least 10 d just prior to spring departure. Man-made roosts seemed to be preferred by migrant, female kestrels in southcentral Louisiana, as few females utilized natural roosts. Within areas of sufficient foraging quality, man-made roost sites may be a limiting factor for migrating kestrels.

KEY WORDS: *American kestrel*; Falco sparverius; *Louisiana*; *roost site*; *winter*.

Uso de perchas en invierno por hembras de *Falco sparverius* en Louisiana

RESUMEN.—Le ecología de perchado de *Falco sparverius* invernantes en el centro-sur de Louisiana, fue estudiada durante los inviernos de 1988–89 y 1989–90. Se encontraron 28 percas para 26 individuos de *F. sparverius*. De estas perchas, 22 (85%) correspondían a estructuras hechas por el hombre y cuatro (15%) eran naturales. El tiempo promedio de perchado antes del atardecer (N = 46) fue de 2.1 (SD = 0.15). La altura promedio de las perchas artificiales fue de 5.0 m (N = 20, rango = 2–50 m); el promedio de altura de las perchas naturales fue de 6.3 m (SD = 2.94; N = 4, rango = 3–10 m). Los individuos de *F. sparverius* no se ubican en las mismas perchas, sin embargo, un macho y una hembra se percharon juntos por al menos 10 días, antes de la partida en primavera. Las estructuras hechas por el hombre parecieron ser preferidas por las hembras migrantes de *F. sparverius* en el centro-sur de Louisiana y pocas utilizaron perchas naturales. En áreas de alimentación de suficiante calidad, los sitios de perchas artificiales pueden ser un factor limitante para la migración de *F. sparverius*.

[Traducción de Ivan Lazo]

In contrast to more traditional studies that have focused on breeding populations of American kestrels, (*Falco sparverius*) (Brewster 1925, Bent 1938, Roest 1957, Willoughby and Cade 1964, Heintzelman and Nagy 1968, Mueller 1971), more recent studies have focused on their winter ecology (Craighead and Craighead 1956, Koplin 1973, Balgooyen 1976, Mills 1976, Layne 1980, Bildstein 1987, Smallwood 1987). Because kestrels wintering in Louisiana spend up to 6 mo there each year (Table 1), investigations into their wintering habits are necessary if we are to understand their complete biology. Roosting ecology of American kestrels has been little studied, and quantitative data are lacking (Bortolotti and Wiebe 1993). Mills (1975) observed kestrels entering old buildings and barns and a hollow tree at dusk, and noted that an important territory requirement appeared to be the availability of a roost. Quantified descriptions of roost-site characteristics are restricted to limited observations in Saskatchewan, Canada (Bortolotti and Wiebe 1993), and the potential importance of roost sites in winter territory acquisition has not been examined.

My objective was to document roost-site use of female kestrels, to comment on the potential advantages of roosting in man-made structures, and to speculate on the potential importance of roost sites in the winter territory selection of migrant females.

STUDY AREA AND METHODS

American kestrels were observed on Ben Hur Research Farms, an agricultural extension of Louisiana State University, located in the southwest corner of East Baton Rouge Parish (30°22′N, 91°11′W) during two winters. I observed kestrels in the winter of 1988–89 and became familiar with both the existing habitat and the habits of settled, migrant females. The following winter (1989–90)

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I examined and quantified roosting patterns. Kestrels are not permanent residents on the study area (Peterson 1980, Van Remsen pers. comm., pers. obs.). The study was limited to females due to the absence of males in the study area.

The study area is bordered by the Mississippi River to the south, wooded bottomlands to the west, urban areas to the north, and open habitat (<1% canopy cover) to the east. An area of 7 km^2 was surveyed from unimproved roads that served as survey routes between fields. Vegetation was grazed pasture during the winter and early spring. Woody canopy, consisting of scattered oaks (*Quercus* spp.), pecans (*Carya illinoensis*), and willows (*Salix nigra*), which flank ditches on the site, was estimated at <5% using a spherical densitometer. I searched for birds on weekdays between 0800 and 1000 H and again between 1500 and 1800 H from 1 September 1989–30 March 1990. These times were chosen for two reasons: 1) I was able to observe kestrels going to roost each evening, and 2) kestrels were found to be most active during morning and late afternoon hours. This I noted while observing kestrels 3 d/wk in February and March 1989. Each survey consisted of driving the length (3.5 km) of each transect and stopping to observe each bird for up to 20 min. Transects were then run in reverse producing four surveys per day. Evening surveys included watching kestrels go to roost. A vehicle enabled observations of up to five individual kestrels going to roost per evening. Birds were viewed through 7× binoculars and the few areas that were inaccessible by vehicle were surveyed on foot.

As sunset approached, I observed individual kestrels to determine when and where they roosted. I located roosting kestrels at night to determine the height of roost-perches. Daily sunset times were obtained from the Department of Meteorology, Louisiana State University. Barns were differentiated from sheds in that the latter had at least two open sides and barns generally were higher than sheds.

Individual kestrels were distinguishable from one another because they used the same perches repeatedly throughout the winter and were watched until dusk when they went to roost. Kestrels could be found near their respective roosts each day, and moved closer to them as dusk approached. For example, a 0.5 hr evening transect would typically reveal kestrels near the same roosts, perched in the same perches (e.g., branches of a tree), or hunting the same area surrounding those roosts. Two individuals were recognized by their respective breast-feather color anomalies, and were used to test the above criteria.

Because birds were not banded or radiotagged, positive identification was not assured. On occasion in 1989, individual kestrels were watched the entire day and were found to stay relatively close to the structure in which they would eventually roost. It is unlikely that kestrels switched roost sites, but females may have displaced other females during the study. Smallwood (1987), however, found no such displacement for 650 kestrel territories in peninsular Florida.

RESULTS

Roosts were identified for 14 female kestrels in winter 1988–89 and for 12 in 1989–90. Twenty-four (85%) roosts were in man-made structures and four (15%) were in trees. Trees used included two water oaks (*Quercus nigra*) and two black willows (*Salix nigra*). In three of these a cavity was used Mean height of tree roosts was 6.3 ± 2.94 m (range = 3–10 m). Two of the four tree-roosting kestrels abandoned their respective roosts within 40 d of their first sighting.

Eleven kestrels were recorded going to roost 46 times on evenings in January and February 1990. Mean roosting time was 2.1 min before sunset (SD = 0.15 min; range = 0.6–3.8 min).

Most barns and sheds had up to three open sides and roosting kestrels entered through all of these. Roost-perches were usually horizontal wooden rafters but some were metal I-beams (e.g., a tower-roosting bird). Median height of man-made roost-perches was 5.0 m (N = 20, range = 2–50 m). Height of roost perch varied with the respective structure. One kestrel roosted 50-m high in a radio tower Another roosted in a 1 × 2 × 2 m shelter, 2 m above ground. Kestrels were easily disturbed when at roost even late at night, and would fly to the nearest tree after being flushed.

Thirteen barns and sheds were determined to be favorable for roosting kestrels due to their structure and surrounding habitat. Nine (69%) were used in winter 1988–89, and eight (62%) were used in 1989–90. Kestrels used eight barns and sheds both winters, while three barns and sheds were vacant both winters. Two of those three were second structures within a kestrel's territory. Four females defended areas which encompassed two or more man-made structures. Three of these chose to roost in only one of the structures, while the fourth utilized two sheds as roost sites. One female was believed (due to the uniqueness of its roost site—a henhouse vent) to roost in the same structure for two consecutive years. Kestrels did not roost communally.

Areas (4 km^2 total) with no man-made roosts were either avoided or deserted by females, despite being similar in hunting habitat to areas with such structures. One open area (0.8 km^2) in particular was hunted by females early during both winters but was deserted later in the season.

Females who hunted adjacent areas showed no agonistic behavior, except in late September and October when kestrels first began to arrive (Table 1) I witnessed no aggressive interactions between females (eight different individuals) perched within 15 m of one another on 27 occasions in 1989–90.

Table 1. Length of stays of female American kestrels wintering in southcentral Louisiana.

DESCRIPTION	$\bar{x}$	SD	RANGE	N
Arrival date	30 Sept.	17.0 d	15 Sept.–26 Oct.	11
Departure date	14 Mar.	7.6 d	28 Feb.–28 Mar.	29
Length of winter stay	166 d		126–195 d	29

All of these females were "neighboring females," or those hunting adjacent areas, and most perches were utility lines. In contrast, 18 high-flying "transient" kestrels were harassed by kestrels who had already chosen a roost. In six of these cases, two adjacent females simultaneously attacked "high-flying transients." In eleven instances I observed females displaying in a series of climbs and dives at heights of 5–15 m. The displays were continuous as the females circumnavigated areas encompassing man-made roosts. The displays were often interrupted by chases initiated by the displaying female and were usually accompanied by a series of "klee" notes. Nineteen chases were directed toward "unfamiliar" females (females who did not hunt in adjacent areas), and one female briefly chased a "neighboring" female.

DISCUSSION

Wintering kestrels seemed to prefer man-made structures as roosts in southcentral Louisiana. All females in my study that had man-made structures in their territories roosted in them. Most of these structures were barns or sheds. Three of four tree-roosting kestrels had no man-made structures in their territories. The fourth had access to one building, but it contained no sheltered perch, which seemed to be a requirement for roosting kestrels. Roost sites were extremely variable in structure and height. It would appear, therefore, that any sheltered perch might suffice, regardless of height above ground as evident in the tower-roosting bird.

Kestrels I observed generally went to roost around sunset, but Miller (1954) observed one female going to roost an average of 13 min after sunset. Bortolotti and Wiebe (1993) observed kestrels roost between 5–15 min after sunset. Female kestrels on my study area did not actively hunt just prior to roosting, but generally perched close to the roost, as reported by Bortolotti and Wiebe (1993).

Bortolotti and Wiebe (1993) observed seven agonistic intraspecific reactions between kestrels of both sexes in a short time period in Saskatoon, Canada. These interactions were the first reported for migrant kestrels around roost sites. Such interactions were commonplace in my study area, particularly in the early weeks of arrivals (Table 1). However, "neighboring" females (migrants which have hunted near one another) defending adjacent areas often perched next to one another for extended lengths of time without agonistic behavior. The abundance of prey and apparently suitable habitat might repress the need for territory defense (chasing, contact) against a "familiar" female by a kestrel who does not wish to displace its neighbor.

Man-made structures as roosts may be advantageous to wintering kestrels. The introduction of nest boxes was probably responsible for the increase of kestrels nesting in Pennsylvania (Nagy 1963) and in Wisconsin (Hamerstrom et al. 1973). Areas encompassing preferred roost sites could similarly attract higher densities of kestrels than areas lacking such structures. The man-made structures on my study area allowed females to roost close to apparently suitable foraging habitat (e.g., open pasture with scattered trees).

Alternatively, female kestrels may choose man-made structures as potential roost sites due to their visibility; man-made structures may simply be easier to locate than natural cavities. I noted that while none of the three tree cavities were used in consecutive winters, eight buildings were utilized both winters. Another advantage for kestrels roosting in man-made structures may be protection from severe weather. Kestrels in Saskatchewan, Canada roosted in spruce trees (Bortolotti and Wiebe 1993). Balgooyen (1976) postulated that roosting in conifers (vs. deciduous trees) was thermally advantageous for kestrels, as did Warkentin and West (1990) for Merlins (*Falco columbarius*).

Smallwood (1988) suggested that a kestrel's arrival date on wintering areas was the principal determinant of the foraging quality of habitats still available for occupancy. In my study a lack of kestrels within seemingly favorable areas existed

throughout each winter. These areas, however, differed from areas hunted by kestrels in that they did not contain man-made roosts.

Where a surplus of apparently suitable hunting habitat exists, roost sites may be important for females in the location of their winter territories. Additional observations, however, particularly at different locations with variable roost-site availability, are needed to reveal the ultimate importance of roost-site selection in winter territory establishment. Roost-site use of wintering males, which have been shown to utilize different habitats than wintering females (Koplin 1973, Mills 1976, Stinson et al. 1981), also should be investigated.

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LITERATURE CITED

BALGOOYEN, T.G. 1976. Behavior and ecology of the American kestrel (*Falco sparverius*) in the Sierra Nevada of California. *Univ. Calif. Publ. Zool.* 103:1–87.

BENT, A.C. 1938. Life histories of North American birds of prey, part 2. *U.S. Natl. Mus. Bull.* 170, Washington, DC U.S.A.

BILDSTEIN, K.L. 1987. The behavioral ecology of red-tailed hawks, rough-legged hawks, northern harriers, and American kestrels in southcentral Ohio. *Ohio Biol. Surv. Notes No.* 18. Ohio State Univ., Columbus, OH U.S.A.

BORTOLOTTI, G.R. AND K.L. WIEBE. 1993. Roosting American kestrels (*Falco sparverius*) during migration in Saskatchewan. *J. Raptor Res.* 27:47–49.

BREWSTER, W. 1925. The birds of the Lake Umbagog region of Maine. *Bull. Mus. Comp. Zool.* 66(2):211–402.

CRAIGHEAD, J.J. AND F.C. CRAIGHEAD, JR. 1956. Hawks, owls, and wildlife. Stackpole Co., Harrisburg, PA U.S.A.

HAMERSTROM, F., F.H. HAMERSTROM AND J. HART. 1973. Nest boxes: An effective management tool for kestrels. *J. Wildl. Manage.* 37:400–403.

HEINTZELMAN, D.S. AND A.C. NAGY. 1968. Clutch sizes, hatchability rates, and sex ratios of sparrow hawks in eastern Pennsylvania. *Wilson Bull.* 80(3):306–311.

KOPLIN, J.R. 1973. Differential habitat use by sexes of American kestrels wintering in North Carolina. *Raptor Res.* 7:39–42.

LAYNE, J.N. 1980. Trends in numbers of American kestrels on roadside counts in southcentral Florida from 1968 to 1976. *Fla. Field Nat.* 8(1):1–36.

MILLER, L. 1954. A sparrow hawk's roosting schedule. *Condor* 56:230–231.

MILLS, G.S. 1975. A winter population study of the American kestrel in central Ohio. *Wilson Bull.* 87:241–247.

———. 1976. American kestrel sex ratios and habitat separation. *Auk* 93:740–748.

MUELLER, H.C. 1971. Displays and vocalizations of the sparrow hawk. *Wilson Bull.* 83(3):249–254.

NAGY, A.C. 1963. Population densities of sparrow hawks in eastern Pennsylvania. *Wilson Bull.* 75(1):93.

PETERSON, R.T. 1980. A field guide to the birds of eastern and central North America. Houghton-Mifflin, Boston, MA U.S.A.

ROEST, A.I. 1957. Notes on the American sparrow hawk. *Auk* 74:1–19.

SMALLWOOD, J.A. 1987. Sexual segregation by habitat in American kestrels (*Falco sparverius*) wintering in southcentral Florida: Vegetative structure and responses to differential prey availability. *Condor* 89:842–849.

———. 1988. A mechanism of sexual segregation by habitat in American kestrels (*Falco sparverius*) wintering in southcentral Florida. *Auk* 105:36–46.

STINSON, C.H., D.L. CRAWFORD AND J. LAUTHNER. 1981 Sex differences in winter habitat of American kestrels in Georgia. *J. Field Ornithol.* 52:29–35.

WARKENTIN, I.G. AND N.H. WEST. 1990. Ecological energetics of wintering merlins (*Falco columbarius*). *Physiol. Zool.* 63:308–333.

WILLOUGHBY, J. AND T.J. CADE. 1964. Breeding behavior of the American kestrel (Sparrow Hawk). *Living Bird* 3:75–96.

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