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## DYNAMICS OF AN AMERICAN SWALLOW-TAILED KITE COMMUNAL ROOST AT CORKSCREW SWAMP SANCTUARY, FLORIDA

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**Abstract.**—A survey of a communal roost of American Swallow-tailed Kites (*Elanoides forficatus forficatus*) in Corkscrew Swamp Sanctuary, Collier County, Florida in 1989 revealed that the number of kites rose from 90 on 15 June to a high of 344 on 25 July and declined to 46 on 19 August. The kites roosted exclusively in pond cypress (*Taxodium distichum* var. *nutans*). Pond cypress comprised 60.8% of the trees of the roost site and had a mean basal area of 0.16 m<sup>2</sup>/tree (SE=0.02, n=73), and a mean height of 20.75 m (SE=0.83, n=5).

Little has been reported about the communal roosts of the once widely distributed American Swallow-tailed Kite (*Elanoides forficatus forficatus*) (Cely 1979, AOU 1983). Most studies of this raptor have been of its nesting ecology in the United States (Skutch 1965; Snyder 1975; J. Cely, unpubl. rep.; K. Meyer and M. Collopy, unpubl. rep.). Swallow-tailed Kites have been widely recognized as social birds (Bent 1937, Sprunt 1954, Skutch 1965, Robertson 1988), and communal roosting has been noted (Lehmann 1957, Skutch 1965, Snyder 1975, Paul 1986), but only a few detailed observations of communal roosts have been made. Haverschmidt (1977) studied a small communal roost in South America used by nine kites over 18 months; however, it was not until Millsap's (1987) discovery of a large communal roost where he reported a maximum number of 1339 kites near Lake Okeechobee, Florida that efforts were made to survey a large kite roost. Repeated surveys of the same large communal roost in the same season has not been reported.

The objectives of this study were to monitor use, behavior, and describe the characteristics of a large communal Swallow-tailed Kite roost I found on 15 June 1989 in the National Audubon Society's Corkscrew Swamp Sanctuary, Collier County, Florida. There have been 3 previously reported communal roosts within the sanctuary. J. Hansen and T. Below (in Ogden 1977) reported 63 Swallow-tailed Kites heading to a roost (exact location unknown). K. Meyer and M. Collopy (unpubl. rep.) reported a maximum number of 280 kites in 1988, and R. Wertime (pers. comm.) reported seeing the same kite roost in 1988, but did not record their numbers. This communal roost was approximately 2 km to the south of the roost that I surveyed.

## STUDY AREA AND METHODS

I found the Swallow-tailed Kite roost on the west pond cypress (*Taxodium distichum* var. *nutans*) strand of the North Marsh at Corkscrew Swamp Sanctuary, Collier Co., Florida (Fig. 1). The roost occupied an area about  $200 \times 10$  m long on a north/south line along the edge of the cypress strand. The strand was next to a large marsh consisting primarily of arrowhead (*Sagittaria* sp.), pickerel weed (*Pontedaria cordata*), sawgrass (*Mariscus jamaicensis*), and coastal willow (*Salix caroliniana*). A pond, 50 m in diameter, bounded the roost on the east. Water was not present in the swamp beneath the roost until mid-July; the level rose steadily to an average of about 0.5 m by the end of the study. About 75% of the roost area of the pond cypress strand burned in 1962.

I located the roost on 15 June 1989 and monitored it at 2 to 5 day intervals (except for a 10-day period from 25 June to 5 July 1989) until 19 August 1989. I made surveys from ground level, about 150 m east of the roost using a 20X spotting scope. Surveys were made between 1930 and 2045 h ( $n=15$ ) and 0645 and 0900 h ( $n=2$ ). I recorded the maximum number of kites in the roost, weather, time, behavior, and any other bird species using the roost. I determined kite distribution along the edge of the cypress strand and within the roost by an aerial photography survey on 11 Aug. 1989 and two ground surveys looking for droppings and feathers below the roost trees. The first ground survey was on 1 July 1989 and the second was on 21 July 1989.

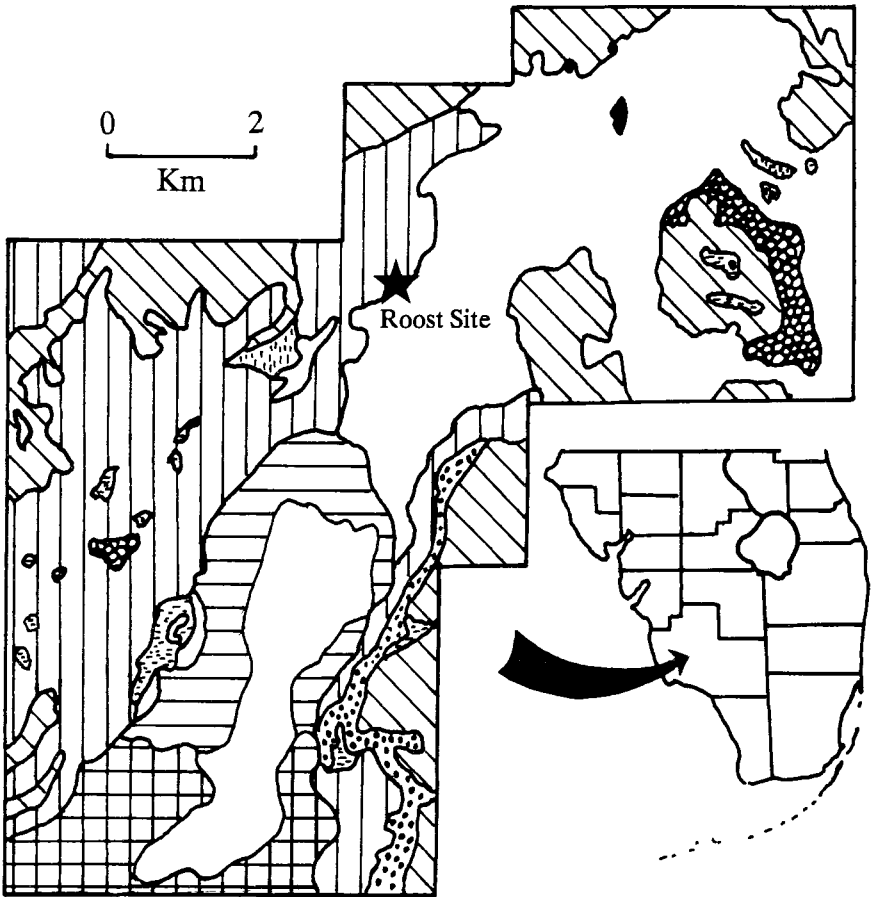
I measured a vegetation plot on 14 August 1989 to describe the roost site. I placed the plot within 10 m of the edge of the cypress strand. It was  $175 \times 4$  m and had two "bends" in it in order to stay within the roost and along the edge of the cypress strand. I recorded a tree as within the plot boundaries if it was located within the stretch of a 2 m long staff held along the midline of the plot. I only measured trees 3.9 cm d.b.h. (arbitrary choice of limit in order to eliminate shrubs) or greater. I measured tree species, basal area, tree status (live, snag, or dead crown branches on the upper third of the canopy), and the height of 5 randomly chosen tall trees. I used a compass to lay out the plot direction and a 100 m fiberglass measuring tape to lay out plot boundaries. I used a clinometer to measure tree heights and a standard d.b.h. tape to measure basal area.

I used aerial photography to measure percentage of upper canopy cover. Photographs were taken at an altitude of 100 m. A grid with 0.5 cm squares was then placed over the  $12.75 \times 7.65$  cm print, and canopy cover was determined by counting the ratio of squares with upper canopy foliage to those without. Black and white film was used to maximize contrast.

## RESULTS

The number of Swallow-tailed Kites using the roost gradually increased to a high of 344 on 25 July (Figure 2). The subsequent decline was relatively abrupt. As the number of kites increased the roost area increased; however, the number of kites per tree remained fairly constant throughout the summer. Kites roosted only in the top one third of the trees along the edge of the strand. Snags, dead-limbed, and live-crowned trees were used for roosting. The kites densely perched within the roost; trees with broad crowns contained up to 50 birds.

The same area of the pond cypress strand was used throughout the summer. I observed kites arriving from 30 minutes before sundown to 5 to 10 minutes after sundown. Most arrivals were single birds or groups of two to five. Large groups of about 20 kites each approached the roost



- |  |                |  |                     |
|--|----------------|--|---------------------|
|  | Bald Cypress   |  | Red Maple Hammock   |
|  | Pine Flatwoods |  | Subtropical Hammock |
|  | Wet Prairie    |  | Oak/Palm Forest     |
|  | Marsh          |  | Pond                |
|  | Pond Cypress   |  | Logged Bald Cypress |

Figure 1. Location of the communal kite roost in relation to habitat types at Corkscrew Swamp Sanctuary, Collier County, Florida.

only twice. On 15 July about 100 kites were observed perched together about 1.5 km from the roost just prior to sundown. Similarly, on 21 July another group of approximately the same size perched about 0.25 km from the roost. These large groups then flew directly to the roost at sundown.

The characteristic three-and-one note klee calls (Snyder 1975, Robertson 1988) often were made when kites arrived at the roost. Despite high densities, aggressive interactions were rarely seen when new kites arrived. Behavior within the roost was primarily preening, just after arrival and before departure, and sleeping. Vocalizations decreased when all kites had arrived at the roost.

Departure from the roost occurred within 30 to 90 minutes after sunrise, with the maximum number of departures occurring around 60 minutes after sunrise. The kites either flew off alone or formed groups of 25-50 birds over the marsh east of the roost. The kites departed the roost chiefly to the south (70%). I never observed the pre-departure wing spread sunning position noted by Haverschmidt (1977).

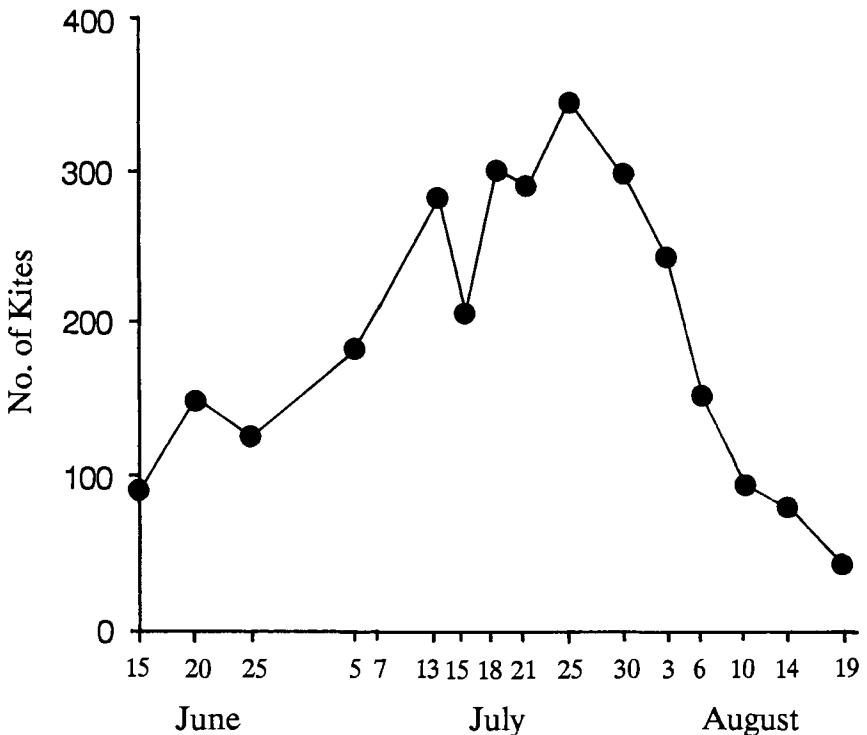


Figure 2. Number of American Swallow-tailed Kites identified during evening surveys from 15 June to 19 August 1989.

During 12 of the 15 evening observations, the entire flock rose from the roost and flew in a compact group along the edge of the cypress strand, about 5-10 m above the trees. The kites flew either north or south for about 0.5-1 km, then turned and flew in the other direction. They repeatedly changed directions, creating an oval pattern. The birds vigorously flapped when flying. There was no apparent reason for this behavior, which always occurred about 30 minutes after sunset and continued for up to 60 minutes. Eventually the kites returned to the roost. On two occasions, in early July, White Ibis (*Eudocimus albus*) joined the kites.

Yellow-crowned Night-Herons (*Nycticorax violaceus*) and Great Egrets (*Casmerodius albus*) were seen occasionally in the roost, but their presence did not seem to affect the kites. There were never more than 5 birds of other species observed in the roost at one time. A Black Vulture (*Coragyps atratus*) roost was located just north of the kite roost, but this was abandoned in mid-July for another site 1.5 km to the southwest. Their presence did not appear to affect the kites.

On five occasions during the "evening flights" a very soft, one-note chirping call was heard. This call was unlike the harsh klee calls (Snyder 1975, Robertson 1988) used at other times. I only heard the call when the kites were flying close overhead.

The kites roosted exclusively in pond cypress, the only species that formed the upper canopy. Based on the aerial photographs, the canopy cover was estimated to be about 75%. Measurements of 75 pond cypress trees yielded the following: mean basal area was 0.16 m<sup>2</sup>/tree (SE = 0.02); density was 0.10 tree/m<sup>2</sup>; percent trees with dead crowns was 34.66 (SE = 5.04); and percent snags was 5.48 (SE = 2.66). The mean height of 5 randomly chosen tall pond cypress trees was 20.75 m (SE = 0.83).

Considering all trees in the roost, the site was comprised of the following proportions: pond cypress 60.8%, wax myrtle (*Myrica cerifera*) 21.4%, coastal willow (*Salix caroliniana*) 10.9%, swamp maple (*Acer rubrum*) 4.0%, red bay (*Persea borbonia*) 1.7%, dahoon holly (*Ilex cassine*) 0.6%, and pop ash (*Fraxinus caroliniana*) 0.6%.

## DISCUSSION

The adaptive significance of the communal roosting behavior of the kites is not well understood. Communal roosts could serve as pre-migration assemblages (Milsap 1987). However, the gradual declines (Fig. 2) suggest that the kites do not migrate in a single large group, but in a protracted migration.

The departure times of the kites were similar to those noted by Haverschmidt (1977). The kites appeared to wait for thermals to develop before leaving the roost. I infrequently observed the large evening

groups seen by Millsap (1987). This may explain why communal kite roosts are infrequently observed. Without large numbers of kites simultaneously flying into a roost, it would be very difficult to locate a roost in the dense, isolated swamp that the kites seem to prefer.

The significance of the previously unreported "evening flights" and chirping call are unknown. I doubt that my presence caused the flight behavior, which occurred both when I was close to the roost and when I was 1.5 km away. On five occasions, the kites returned to the roost while I was still nearby.

The abundance of snags and dead-limbed cypress trees at the roost site was consistent with previous descriptions of roosts (Lehmann 1957, Haverschmidt 1977, Robertson 1988). The location of the roost adjacent to a large marsh was similar to the site described by Millsap (1987). However, the roost I observed was not an "insular, open stand of small cypress trees" surrounded by marsh land as the roost described by Millsap (1987). Nevertheless, the area of snags and dead-limbed trees in the Corkscrew Swamp roost was surrounded by trees with full crowns creating an island of different vegetative structure.

#### ACKNOWLEDGMENTS

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