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NATURAL HISTORY OF THE WHITE-TAILED KITE IN
SAN DIEGO COUNTY, CALIFORNIA

By JAMES B. DIXON, RALPH E. DIXON, and JAMES E. DIXON

For the past 21 years the White-tailed Kite (*Elanus leucurus*) has been increasing in numbers in northern San Diego County, California, until, in 1956, it has become a common breeding bird. From 1900 to 1935 we had never seen a kite in this area, but since that time we have observed the nesting of kites in 35 different localities. A total of 130 occupied nests has been recorded. The study area comprises the northern half of the coastal slope of the county from the Pacific Ocean to the 1000-foot contour on the western side of the Palomar Mountains.

We wish to express appreciation to the following persons who assisted us in the preparation of this report: Loye Miller, Alden H. Miller, and Jane Durham for suggestions concerning the form and scope of this paper; Oliver P. Pearson for identification of skeletal remains in kite pellets; Bernard Bailey for aid in gathering and dissecting kite pellets; Dale T. Wood for information on a kite roost at Vista, California; and Robert T. Orr for identification of various small mammals trapped. Finally thanks are due our many local friends who helped us in this study.

FOOD

In late February of 1954, Dale T. Wood reported a kite roost in a mature avocado grove of about 10 acres at Vista, California. This orchard (fig. 1) was contour planted at 24-foot intervals. A map was prepared of this roost area on which we plotted 112 places where kites had recently roosted. By raking clear each roosting area in the evening and returning the next morning we could record accurately the number of roosting kites. The following is a record of these kites and the pellets collected from March, 1954, to January, 1955:

Date	Number of birds roosting	Number of pellets
March 3-4, 1954	39	32
April 1-2	22	30
May 7-8	28	14
June 10-11	10	19
July 6-7	13	31
Aug. 5-6	4	4
Jan. 4-5, 1955	4	4
Totals	120	144

Since pellets of kites are much more compact than those of owls, we feel certain only kite pellets were collected.

A study of the skeletal remains in these 144 pellets reveals that the White-tailed Kite feeds principally on three species of diurnal mice. Meadow mice (*Microtus californicus*) are the most numerous prey, but house mice (*Mus musculus*) and harvest mice (*Reithrodontomys megalotis*) are also taken as well as shrews and other small mammals (table 1). This is in accord with Hawbecker's (1940, 1942) observations which show that *Microtus californicus* is the most numerous food animal.

We have noted that the number of kites present in a given place is directly related to the abundance of food animals in that area. The maximum number of kites has been found in warm, sandy river valleys where there are a few cottonwoods (*Populus fremontii*), black willows (*Salix nigra*), and arroyo willows (*Salix lasiolepis*). Here, in the

open spaces, a dense growth of brome grass (*Bromus rigidus*) and, in damper places, water cress (*Radicula nastertium-aquaticum*) provides a favorable environment for small rodents. Where these areas have been cleared for cultivation or for pasture land, the natural environment for small rodents has been destroyed and the kites have moved into the nearby orchards where, for the most part, the cover crops are mowed and left to lie as mulch. To this the orchardist often adds manure and straw, thus providing an excellent place for meadow mice to breed and in consequence supplying abundant food for the kites.

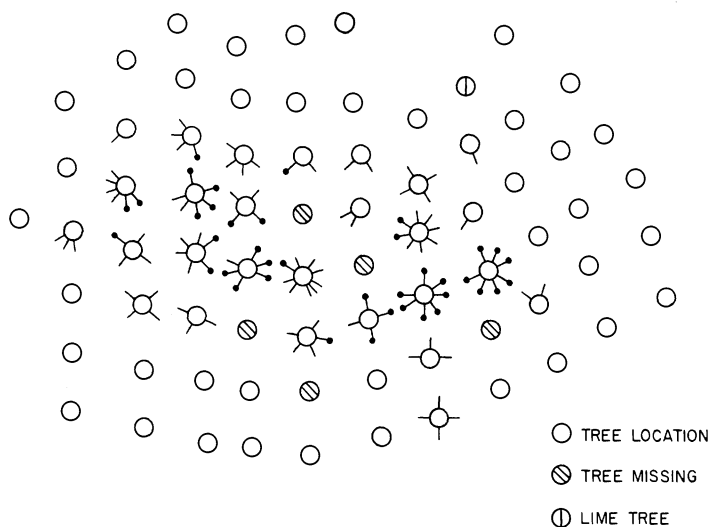


Fig. 1. Schematic diagram of an avacado orchard at Vista, California, used as a roost by White-tailed Kites. Lines extending from trees indicate perches used. Solid dots on lines show locations of 39 kites roosting on the night of March 3, 1954.

Table 1

Skeletal Remains in Kite Pellets from Roost near Vista, California

Date	Number of pellets	Meadow mice	House mice	Harvest mice	Other contents*
March 1-4, 1954	32	33	4	2	4
April 1	20	31	12	2	0
May 7	14	14	1	0	2
June 10	19	18	9	1	0
July 6	31	22	10	6	1
Aug. 5	14	15	2	1	0
Jan, 4, 1955	4	1	4	1	0
Totals	144	134	48	13	7
Percentages		66	24	6½	3½

Average number of items per pellet—1.4.

* 1 deer mouse (*Peromyscus maniculatus*), 1 shrew (*Sorex* ?), 1 gopher (*Thomomys* ?), 1 wood rat (*Neotoma* ?), 1 unidentified small mouse, two small birds. There were no insect remains.

In one valencia orange orchard where an unusually heavy cover crop had been plowed under and which had been mulched with 80 tons of race track straw, there occurred a heavy infestation of meadow mice. This orchard was a favorite feeding ground for kites in the fall of 1953 and the spring of 1954 and three pairs nested in nearby orchards. Two of these pairs had nests in orange trees and the third pair nested in a large avocado tree. All three pairs reared their young successfully and were seen in the area until the latter part of July. In the spring of 1955 this orchard was again visited by kites. However, the trees had suffered such heavy rodent damage that the orchardist had adopted a method of "clean cultivation" to get rid of the mice and as a result the kites soon left for other feeding areas.

In late May of 1940, we observed kites gathering in large numbers in a river bottom area. Here we noted 34 kites roosting in a dense growth of willows and cottonwoods only a few miles from the ocean. The kites remained in this area several weeks and hunted along a sewer drain where the heavily nitrogenized water had stimulated a luxuriant growth of water cress. A high population of meadow mice was present in this lush vegetation, providing an excellent feeding ground for the kites.

In this group of birds we noted a large percentage of young and also some indication of family groups. We feel reasonably sure that this flock contained offspring of kites which had nested nearby. There were three occupied kite nests in one grove of trees within a radius of 500 feet and in adjoining groves we saw two more breeding pairs.

The abundance of both kites and owls in the study area rises and falls with the increase or decrease in numbers of rodents. The sizes of the small rodent population in coastal San Diego County suggest a seven-year cycle. In the years of high populations (1943 and 1950) more breeding kites were found and we think they were prone then to lay more eggs per clutch. In periods of plentiful food supply, pairs often attempted two broods in one season. Our observations suggest that if ample food is present, an area of about 20 acres of mouse pasture is large enough to support a pair of nesting kites and their brood.

In partial support of the hypothesis that an abundant rodent population is the governing factor in the breeding of the White-tailed Kite we offer the following: three different localities, where one might expect to find a high population of mice, were picked at random from our field note records and searched for kites. In each place we found a breeding pair.

The Red-shouldered Hawk (*Buteo lineatus*) is able to maintain itself in areas abandoned by kites. Perhaps this is possible because the hawk is not as restricted as the kite in its diet; it feeds not only on mice, but also on snakes, frogs, lizards, small rabbits, and squirrels. Both the kite and this hawk have increased in numbers in the study area although there has been a large increase in human population. We think that these raptors will continue to increase as long as the prey upon which they depend is available. Both species seem able to adapt themselves to changing conditions as long as their food supply is not eliminated.

NESTING

The first indication of the onset of the breeding season is the presence of a single kite sitting on a desirable perch in the top of a tree or bush. Thereafter the bird may be seen in that place at certain hours of the day with surprising regularity. The earliest date we have noted this has been November 10 and the latest date March 10. Soon after the first bird has been sighted a second kite makes its appearance and the two birds hunt together.

Breeding starts with attempts of the male to copulate. These first attempts are in-

variably repulsed by the female (Hawbecker, 1942). The male then, in many instances, endeavors to select a nesting location and even makes a haphazard effort at nest building. The site he chooses is apparently not acceptable to the female, for we have never seen a female use such a nest site when she started building.



Fig. 2. Typical kite feeding area. Note overgrazing in foreground and dense grass beyond fence. Dead willows behind were used as perches.

Nesting sites.—Kites nest in any suitable tree of moderate height. We have found them using the following introduced trees: pepper (*Schinus molle*), avocado (*Persea gratissima*), orange (*Citrus sinensis*), eucalyptus (*Eucalyptus masculata*), and olive (*Olea europaea*). We have also found kites nesting in the following native trees: cottonwood (*Populus fremontii*), black willow (*Salix nigra*), live oak (*Quercus agrifolia*), sycamore (*Platanus racemosa*), and toyon (*Photinia arbutifolia*). Pickwell (1930) lists a number of kinds of nesting trees compiled from records in the literature, and Hawbecker (1942) states that any suitable tree may be used for nesting that is near the required food source.

The earliest nesting date (two eggs in nest) we have recorded is February 6 and the latest is July 10 (4 eggs in nest). Twice we have found young kites at least 10 days old on February 22 which would indicate laying earlier than February 6.

Nest building.—With the beginning of actual copulation the female selects a nesting site and starts to build. Some authors (Hawbecker, 1942; Watson, 1940) state that both sexes work on the nest, but our observations indicate that nest building is done almost entirely by the female.

Hawbecker (*op. cit.*) records a nest completed in seven days, but we found that

construction of the nest takes from 14 to 28 days. The male sometimes accompanies the female on her nest-building flights and upon rare occasions brings back nest material. If this occurs, the material is taken by the female and arranged to her satisfaction. In securing the hard, dry twigs for the outer part of the nest the female does not pick them off the ground but breaks them from standing trees or bushes with her bill. She then carries them to the nest in her bill. Sometimes these twigs are difficult to obtain and the female may perform odd maneuvers in acquiring them.

When viewed from the outside, the nest appears flimsy, but a closer inspection of the structure indicates that it is strong and well designed. Pickwell (1930:224) calls the nest a "loose pile of dry sticks," but Bent (1937), Hawbecker (1942), and Watson (1940) report that the nest is well built. The nest may be lined with straw, grass, or root-lets (Pickwell, *op. cit.*). In our study area the hard, dry roots of salt grass (*Distichlis spicata*) or Bermuda grass (*Cynodon dactylon*) are preferred, but if these are not available, the dry, hard stems of last year's wild oats are used.

The measurements of a typical nest are as follows: outside diameter 21 inches, depth 8 inches; inside diameter 7 inches, depth $3\frac{1}{2}$ inches.

Kites do not use the same nest over and over; they always seem to build new ones. Only two nests observed were built on top of old nests of other birds. A nest of a Cooper Hawk (*Accipiter cooperii*) was used as a foundation in one instance and a crow nest in another. All other nests seen were constructed entirely by the kites.

"Flutterflight" of male.—In the nest-building period and quite often after the female kite is incubating the eggs, we have observed the male kite flying in a peculiar manner. We have called this the "flutterflight." Watson (1940) calls it the "quiverflight." In this flight the male leaves his customary perch and proceeds to fly around and around over the nesting grove. He holds his wings in a V-shape directly overhead and rapidly vibrates them at the same time making a chittering sound. After circling the grove several times the kite returns to its perch and rests there for a considerable period before going forth to hunt again. This very odd flight can be seen from some distance and it has been the means of our locating many nests we might otherwise have overlooked in the dense growth of river bottoms.

Territoriality.—We noted no territorial fighting among the kites. They seem to be more sociable than other raptorial birds, although Watson (1940) reports definite territoriality among the kites he studied.

Protection of nest.—In the course of nest building the female stands constant guard over the nesting area. She will attack savagely any of the large raptorial birds that come near her perch. The male sometimes joins in these attacks and we have seen the pair haze Golden Eagles (*Aquila chrysaetos*), Red-tailed Hawks (*Buteo jamaicensis*), and Red-shouldered Hawks. Such protective action has been reported by Moore and Barr (1941) and by Hawbecker (1940). Kites seem able to stay above the larger birds and can inflict enough damage to cause the intruders to leave the area hurriedly. However, Turkey Vultures (*Cathartes aura*), Marsh Hawks (*Circus cyaneus*), and Cooper Hawks were never attacked.

Relations with Crows.—We witnessed only two instances where Crows (*Corvus brachyrhynchos*) destroyed the eggs of the kite and only one instance of crows mobbing to death a young kite just out of the nest.

Crows scavenge from the kites at every opportunity and use every means to get food away from them. We have seen a crow alight on the same limb with a feeding kite and proceed to crowd sideways into the kite to make it drop its food. The other kite of the pair was perched within a few feet and while it watched with interest it made no effort to intercede.

Table 2
Eggs and Young of White-tailed Kite at Twenty-three Nests

Date	Number of eggs laid	Number of young leaving nest	Number of young banded
June 13, 1937	5	3	3*
April 14, 1940	4	4	2
April 5, 1942	4	4	4
May 16, 1942	4	2	2
May 17, 1942	3	2	1
April 18, 1943	4	2	2
May 2, 1943	4	3	2
May 4, 1944	4	2	2
May 4, 1944	4	4	4
May 4, 1944	4	4	1
May 8, 1944	4	4	4
May 22, 1944	4	3	3
May 27, 1944	4	4	4
May 27, 1944	4	3	1
April 28, 1946	4	3	3
April 28, 1946	4	4	4
June 23, 1946	4	4	4*
April 27, 1947	4	4	4
April 27, 1947	4	3	3
April 27, 1947	4	3	3
March 16, 1950	6	4	4
April 18, 1950	4	2	2
April 28, 1950	4	3	3
Totals	94	74**	65

* Second nesting for season. ** Nine young escaped without bands.

EGG-LAYING AND INCUBATION

Hawbecker (1942) estimates the incubation period as 30 to 32 days, but we have never established an accurate incubation period because the egg-laying period is rather prolonged. In addition, most of the nests are inaccessible. We regularly checked nest contents with the aid of a mirror mounted on a long pole, but only 23 nests were so situated as to allow banding of the young kites (table 2). Of the 124 nests checked, one contained six eggs, 15 had five eggs, 106 had four eggs, and two had three eggs. Eight of the 15 nests containing five eggs were found in one season of high mouse population (1950).

Eggs vary in coloration even within a single clutch. One cannot follow the nesting of a female season after season by the appearance of her eggs as is possible in many other raptorial birds. Eggs vary from pure white to a heavily marked condition in which there are light purple and rust-red spots and blotches. These vivid colors fade during the incubation period. Hawbecker (1942) states that the eggs he observed were chocolate brown when first laid but that they soon faded to mottled brown and tan.

Differing from most raptorial birds, the female kite does all the incubating of the eggs. She leaves the nest at this time only for short periods to stretch and to preen her feathers. Hawbecker (1942) and Watson (1940) have likewise observed that the female alone incubates the eggs.

YOUNG

Young kites when newly hatched are covered with a grayish down quite different in color from that of other raptorial birds which nest in this area (fig. 3). Hawbecker

(1940) agrees with our observation that at first there is a variation in the size of the young. However, by proper feeding the female closes this "gap," for there is never over two days' time between the dates of leaving the nest by the oldest and youngest birds.

The female appears to do all the feeding of the young and she is very careful to give each bird its proper quantity of food. When the young grow older and show some signs of hoggishness, she wards off an aggressive bird by striking it between the eyes with the elbow of her wing. This treatment seems to be very effective.

Moore and Barr (1941) have described the plumage of the young kite. We have observed that when the young birds leave the nest (fig. 4) they are quite different in



Fig. 3. Nest and eggs of White-tailed Kite.

appearance from their parents, having a number of reddish feathers on the breast and in shoulder patches. This reddish plumage and their ungainly flight enabled us to distinguish young from the parents as long as they were in a family group.

We agree with Hawbecker (1942) that after the young leave the nest they return there at night to roost, and they often return in the daytime to eat. The nest is a sanctuary from various birds of prey. We have noted that the percentage of young leaving the nest is large and this coupled with the habit of raising two broods may account for the rapid increase of kites in the study area.

The parents "wean" the young by flying into them roughly and driving them from the nesting area. The young are not permitted to return. From a nest that held a complete clutch of eggs on March 10, weaning took place on July 15. In this area the following season weaning took place on July 17.

Banding.—The time when the young can be secured for banding is very short. From four to six weeks of age is the best time. If older than six weeks, the young swarm out of the nest, even when it is approached on the ground. They cannot fly far at this

age, but they are difficult to catch. Sometimes when the young are being banded the parent birds try to defend them by diving down and lightly striking the climber and scolding with a rasping note which is more like that of a falcon than that of a hawk.

Of the broods banded, 15 were located in cottonwood trees, five in live oak, two in orange trees, and one in a black willow. To date we have received only three returns of bands. They are as follows: one young kite, banded on May 16, 1943, was found dead on January 26, 1944, about 12 miles east of the point of banding; one banded on May 4, 1944, was found dead under the nest tree on May 30, 1944; and one banded on April 28, 1946, was killed on November 11, 1948, about 100 miles north of the point of banding.



Fig. 4. White-tailed Kite at nest with small young in cottonwood tree.

Second nestings.—The male tries to stimulate the female to undertake a second nesting for the season. This is done by nest location search, by repeated copulations, and by abortive nest constructing attempts. There are several instances on record where the female started a second nest before the young had left the first nest.

HUNTING

From the time the female chooses the nest site until the young leave the nest the male does all the hunting (Watson, 1940). The female sits on her perch, occasionally nest building and awaiting the arrival of the male with food. When the male arrives with food, she flies to meet him if she is hungry and she will take the food from his claws in midair. If the female refuses food brought in by the male, he eats it himself or stores it in a nearby tree. These food storage places are usually in a shallow hollow in a large limb of a tree or in a split limb where food can be wedged in until needed.

The male kite is a very good hunter. We once timed a hunting male and found that he caught three mice and delivered them in eight minutes. The first mouse went to a young bird, the second was taken by his mate, and the third he ate. These three mice were caught in a two-acre tract of land that was tightly fenced and heavily covered with

needle grass (*Bromus rigidus*). Here the grass had accumulated over the seasons until a mulch several inches deep had covered the area. In this place we also noted a female coyote (*Canis latrans*) lying flat on her stomach with one paw raised. Soon there was a wriggling in the dry grass in front of her and she brought her paw down quickly but firmly and reached under it with her nose and withdrew a meadow mouse. This locality contained the greatest concentration of meadow mice we observed. The surrounding area was somewhat overgrazed and this no doubt had forced the mice into this area.



Fig. 5. Young White-tailed Kite just out of nest.

When hunting, the kite flies rather low and usually not more than 200 feet above the ground. Flying into the prevailing wind, it hunts until it sees something of interest whereupon it stops and takes a stationary stance by slowly flapping its wings. Usually a kite will follow its prey for some time, dropping down nearer to the ground and again taking up the stationary stance. When it is finally satisfied that the prey is in a catchable situation, it folds its wings in a steep "V" overhead and drops vertically on the prey. Being equipped with needle-like talons the kite seems very successful in striking the prey through dry cover.

ROOST ACTIVITIES

We have already described a roosting concentration that may involve as many as 39 individuals in the non-breeding period. On the evening of March 6, 1954, we made the following observations in this roosting area (fig. 1) at Vista, California. At 5:35 p.m.

the first kite appeared and, after hunting unsuccessfully in the vicinity, it went to roost. From 5:35 to 6:12 p.m. we watched 22 kites arrive and go to roost. At 6:30 p.m. we took up an observation point within 300 feet of the roosting birds in a place where we would not disturb them. Here we noted a few stragglers still coming in to roost; they seemed to come from all directions and they did not fly around before going to roost as the earlier arrivals had. Alighting on the highest points on the trees, they faced into the prevailing wind and apparently settled for the night.

The owner of the ranch immediately west of the roosting area reported that there had been a gradual building up of the number of roosting birds for three seasons. He also said that they were early risers, as most of them were gone by 6 a.m. Few of the individuals here showed any indications of the reddish breast plumage or ungainly flight patterns of young birds. Apparently many of these birds drifted away to breeding areas in the spring and summer of 1954.

Morgan (1948) reported a kite roost near Camp Pendleton, Oceanside, California, where as many as 25 kites were seen at one time.

SUMMARY

The White-tailed Kite is now a common breeding bird in the northern half of coastal San Diego County, California. Nesting of kites has been observed in 35 localities in this county and 130 occupied nests have been recorded.

A study of 144 kite pellets reveals that meadow mice (*Microtus californicus*) are the principal prey. The maximum number of kites are to be found in areas where there are large concentrations of meadow mice.

Nesting dates extend from early February to July 10. The female does most of the nest building and all the incubating of the eggs. The majority of nests examined contained four eggs, but eight nests noted with five eggs were found in one season of high mouse population (1950).

In 23 nests closely watched 94 eggs were laid and 74 young survived to leave the nest.

The male kite obtains all the food for the incubating female and the young. Food may be stored in small caches in trees. Crows repeatedly scavenge food from kites and may destroy eggs and young.

Roosting concentrations of non-breeding birds may occur in which as many as 39 kites assemble in a small area.

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Escondido, California, September 1, 1956.