

LIFE HISTORY NOTES ON TWO TROPICAL AMERICAN KITES

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In the more heavily wooded parts of tropical America, nests of the diurnal birds of prey (Accipitridae and Falconidae) are so difficult to find that I can count on my fingers all that I have noticed in over 30 years. This is due in part to the low population density of many of the resident species and in part to the excellent concealment that the great, epiphyte-burdened trees provide for their nests. In eastern Ecuador I found a single nest of the Plumbeous Kite (*Ictinia plumbea*), and in Costa Rica I discovered one of the Laughing Falcon (*Herpetotheres cachinnans*). My observations on these nests have already been reported (Skutch, 1947, 1960). Over the years, I have found four nests of the Swallow-tailed Kite (*Elanoides forficatus*), the only member of these families for which I have seen more than a single nest. Recently I discovered my first nest of the Double-toothed Kite (*Harpagus bidentatus*) and watched the parents attend feathered nestlings. The present paper records what I have learned about the breeding and other habits of these two kites. The only other species of bird of prey whose nest I have seen is the Large-billed Hawk (*Buteo magnirostris*), but I could not learn what the single nest of this common hawk contained. All of these nests of hawks, kites, and falcons were too high for me to reach, although some might have been accessible to a very strong and expert climber.

SWALLOW-TAILED KITE

MIGRATION

As Friedmann (1950:90) has recorded, the South American Swallow-tailed Kite (*Elanoides forficatus yetapa*) is "known so far in Central America only as a summer visitor, probably absent in winter." The nominate race, which breeds in México and the United States and migrates through Central America, appears to pass onward to South America, rarely, if ever, lingering to spend the winter months north of Panamá. Here in the Térraba Valley of southern Costa Rica, soaring kites are a familiar sight through the first half of the year, but they are absent after July or August. My earliest date for their reappearance in El General, the mountain-rimmed basin at the head of the Río Térraba, is January 8, 1962. In 1960 I first noticed them on January 11, and in 1961 and 1963 I first saw them on January 12. Each year from 1952 to 1959 (with the exception of 1954, for which I have no record) the kites were first seen in the second half of January. Before 1952, my few records note their first appearance in February or even March, but possibly this was because I did not then pay so much attention to them, and I might have missed them for some time after their arrival. The kites which arrive first in El General are evidently summer residents of the South American race rather than transients on their way north. After their first appearance, they may be seen circling through the sky almost daily, and some of them promptly start their nests. Thus, in 1964, when I first saw kites on January 14, in the lowlands near the mouth of the Río Térraba, I found a nest under construction in El General on January 23.

Farther north, the kites seem usually to arrive later. At an altitude of around 5500 feet near Vara Blanca in northern Costa Rica, I first saw them on March 5, 1938, and in the Motagua Valley of Guatemala they made their appearance on March 27, 1932. I do not know whether these kites belonged to the southern or to the northern race. Griscom (1932:161) states that in Guatemala the species had not been recorded

between December and the middle of March. Land (1963:51), however, saw a single kite at Panzós, in northeastern Guatemala, as early as January 26. Even as far north as Gainesville, Florida, the bird may arrive by February 6, but this record is exceptionally early for that state (Hicks, 1955).

After returning in January to nest in El General, the Swallow-tailed Kites remain for six months and then disappear unobtrusively, in most years, in the second half of July. My only record of their presence here as late as August was made in 1947, when I saw three kites on the fifteenth. I have never noticed a mass movement of Swallow-tailed Kites in El General, and my only observation of a migrating flock was made near Vara Blanca, Costa Rica, on August 15, 1938. Early in the afternoon on this date, a flock of about 20 kites soared high above the mountain pasture near the cottage I then occupied. Keeping together, they drifted southward, then turned eastward, to vanish amid the clouds near the continental divide, which in this part of Costa Rica stretches transversely from east to west. The flocks of "15 or even 30 individuals" which Howell (1957:76) saw almost daily in eastern Nicaragua in August of 1953 were probably migrants. In Panamá, Eisenmann (1963:75) "repeatedly noted migrating flocks of up to 40 Plumbeous Kites between 13 August and 6 September, often with migrating groups of Swallow-tailed Kites." August is evidently the month when the southward movement of the Swallow-tailed Kite is at its height.

FEEDING HABITS

Early in the morning, late in the afternoon, and in cloudy weather, Swallow-tailed Kites are most often seen resting, a few together, on high exposed branches at the forest's edge or in trees left standing in a neighboring clearing. When the sun shines brightly, they catch the eye by soaring above the treetops, their snow-white bodies upheld by widely spreading, pointed, black wings, their twists and turns regulated by movements of their deeply forked black tails. Figures of surpassing grace and beauty, they trace wide, irregular circles against the bright blue sky. Riding the ascending currents of warm air and rarely flapping their wings, they dip close to the treetops or soar high up into the blue; they vanish behind the crest of a forested ridge, soon to reappear at another point.

One wonders what the kites are searching for as they course so tirelessly through the air. If you watch closely through good field glasses, you may from time to time see a small foot shoot out beneath the snowy body, with a movement almost too swift and slight for your eyes to follow. Sometimes both feet seem to dart out together, but it is difficult to make sure of this. The soaring bird seems to be striking at an unseen adversary, boxing with a phantom. Rarely, if it flies low enough, you can see it seize an insect in a quickly darting foot. You are puzzled why the kite should capture small volitant creatures in this seemingly difficult and inefficient fashion, instead of catching them directly in its bill as the swallows and swifts may be doing at the same time—until you reflect that this graceful bird is, after all, a hawk, and to seize prey with the talons is the method almost invariably followed by this group of birds. When it has caught an insect, the kite, without ceasing to circle on widespread wings, lifts its foot, lowers its head, and transfers its victim to its mouth. If the insect is large, it may perform this movement several times, tearing pieces from the prey rather than swallowing it whole. Sometimes a wing of the prey may be seen floating slowly earthward.

Insects caught high in the air appear to be the mainstay of the Swallow-tailed

Kites here in Costa Rica, but, when possible, they vary their diet with more substantial items. In the breeding season, as they circle over the treetops they look sharply for nests of small birds. Only nests accessible while they soar or hover seem to tempt them; at least, I have never seen a kite alight, or work its way into the crown of a tree, in order to plunder a nest. High, exposed nests most often attract them, but they will pillage a low one which they can reach while they fly.

At the end of April, 1937, I watched three kites circling low over a pasture in a valley between forested ridges. One after another, they clung to the tips of the branches of a laurel (*Cordia*) tree that was shedding its foliage, exposing a high nest in which a pair of Gray's Thrushes (*Turdus grayi*) were feeding unfeathered nestlings. Since the kites did not alight on the tree, nor attempt to push in among its branches, but only clung to the exposed twigs while continuing to flap their wings to keep themselves in the air, I doubted whether they could by this procedure reach the nest, which was well within the outermost twigs. But after several unsuccessful attempts of momentary duration, one of the kites clung over the nest longer than before, and, fearing that it would harm the nestlings, I hurried up to drive it away. The kite flew up with a nestling dangling in its bill but dropped its victim when it saw me. The nestling fell into the weeds where I could not find it. The three kites then retreated down the valley, leaving the thrushes with the remainder of their brood. But the next morning, while I was too far off to interfere, they returned to carry off the surviving nestlings.

Although in this instance the kites removed the nestlings from the thrush's bulky nest, which they left in the tree, in other cases they find it more convenient to carry off a small nest along with its occupants, which they extract after rising again into the air. Early one afternoon in April of 1945, I sat on my front porch talking to two visitors, while a pair of Golden-masked Tanagers (*Tangara larvata*) fed eight-day-old nestlings in a calabash tree 50 feet in front of us. The tanagers' little nest was only six feet above the ground in an exposed fork of the main trunk. Suddenly a Swallow-tailed Kite swooped out of the sky and, before we were aware of what was happening, rose again into the air with the nest and two nestlings clutched in its talons. At the moment when the kite seized the nest, a Tropical Kingbird (*Tyrannus melancholicus*) darted angrily at the robber but could not save the tanagers. After rising to a good height, the kite soared around holding the nest in its feet, and lowered its head to remove a small object that was doubtless a nestling. Then it dropped the nest, which fell slowly earthward.

On another occasion, I was walking through a coffee plantation when I noticed a Swallow-tailed Kite circling low above the tall *Inga* shade trees with a Tropical Kingbird following it closely. Presently the kite flew up with a nest—apparently that of a kingbird—in its talons. Three kingbirds now pursued the predator hotly, rising above the kite and apparently striking its back. The kite dropped the nest, which fell into a thicket where I could not find it. Kingbirds, which often build their open nests in exposed situations, have as strong an antipathy for Swallow-tailed Kites as Boat-billed Flycatchers (*Megarhynchus pitangua*) have for toucans. I have watched some most spectacular pursuits, in which the kingbird, beating its wings steadily, chased the far larger soaring kite around and around high in the air, usually managing to keep above it. Again and again the kingbird, with an extra burst of speed, would dart down upon the kite, which would swoop earthward in an effort to escape that was not always successful; if the angry flycatcher did not actually strike its enemy's back, it certainly came more than once within an inch

of doing so. After continuing for some minutes to harry and buffet the kite, the kingbird would fly, twittering shrilly, back to its mate and nest, while the fugitive soared silently off over the treetops.

In addition to insects and nestlings, I have seen Swallow-tailed Kites take an occasional lizard. In Surinam, these kites also appear to subsist largely on insects, including members of the Pentatomidae, Fulgoridae, and Membracidae, together with female leaf-cutting ants, *Atta sexdens* (Haverschmidt, 1962:154). Others, however, have watched Swallow-tailed Kites of the northern race feed their young with tree frogs, green tree snakes, and larvae from wasps' nests, in addition to numerous lizards and nestlings of smaller birds (Sutton, 1955; W. B. Robertson, Jr., *in litt.*).

Often several kites soar together, catching insects. When one has captured an insect and holds it in its feet or bill, another kite may pursue the fortunate one, as though to take the coveted morsel from it. This gives rise to some very spectacular flying, as the fugitive dives or veers aside to avoid its tormentor, much as it does to escape an angry kingbird. I have never known the would-be pirate to wrest food from another kite.

DATES AND SITES OF NESTS

In the last quarter of a century, I have seen four nests of the Swallow-tailed Kite in Costa Rica, and in addition I noticed one pair of kites gathering nest material while I was riding over a long forest trail and could not delay to find the nest. The localities and dates are as follows:

1. Below Vara Blanca, northern or Caribbean slope of Cordillera Central, at 5400 feet: a pair built from May 6 to 12, 1938, but apparently never used their nest.
2. Coastal range between El General and the Pacific Ocean, at about 2000 feet: a pair gathering twigs on March 14, 1939.
3. Above Río Pejivalle, Caribbean slope, at 2300 feet: a pair building on April 13, 1941, apparently incubating by April 25.
4. Between Quizarrá and Santa Elena, El General, Pacific slope, at 2500 feet: a pair feeding nestlings, April 11, 1961.
5. A few hundred yards from the site of the preceding nest: a pair building on January 23, 1964, apparently incubating on February 18, feeding nestlings on March 7.

From the foregoing records, it appears that in Costa Rica the kites nest, at least occasionally, as high as 5400 feet above sea level, and their breeding season extends from late January to May or June. Probably only a single brood is reared. The four nests that I found were at the very top of tall, slender, living trees standing at the edge of the forest or in a neighboring clearing; I estimated their heights at from 100 to 125 feet. When the nest tree was at the forest's edge, its crown rose free of the surrounding trees. The foliage clustering around the nests made them difficult to see from the ground, but they had little or no shade above them. Evidently to be able to reach and leave their nest through the air, without passing through the branches, is more important for the kites than having the nest screened from above. These nests were unfavorably situated for observation, even apart from the eyestrain involved in looking for a long while at a dark object against a brilliant sky.

NEST BUILDING

I have watched three pairs of Swallow-tailed Kites engage in the spectacular activity of building their nests. All the twigs which they needed for the foundation were broken from the dead ends of high, exposed branches while the kites remained

in the air. Soaring slowly over the treetop, or dipping to the side of a lofty exposed crown, they grasped a twig in their feet and broke it off by the momentum of their flight, without ever coming to rest. This was a feat not without peril to the birds, and they needed great skill and judgment to avoid disaster. Had they clutched too firmly a twig that failed to break, they might have dislocated a leg or have been pulled from the air and overturned, becoming entangled among the branches with possible injury to their long wings. Often I saw a kite clutch a twig which did not break, only to release its hold before it lost the forward momentum of its soaring flight. These birds must have a delicate and discriminating sense of touch in their feet, which seem rather weak for this work of breaking off twigs.

Often the twiglet which the kite secured proved to be too small and was promptly dropped. When the bird had broken off a suitable twig, which was often branched, the next step was to transfer it to the bill. This was done while the kite soared slowly and gracefully around above the treetops. The transfer was not always easy to effect, for sometimes the branchlet was heavy and hung below the bird's feet, where it was difficult to reach with the bill. Moreover, the kite's weak bill could hardly sustain one of the larger twigs unless it was grasped near its center of gravity, so that it would balance. This center was found by trial and error, the bird, soaring around on outspread wings, passing the stick back and forth between its feet and its bill until it balanced in the latter. Even after the kite had satisfactorily adjusted the burden in its bill, it often continued to fly in wide circles before, with its feet free for alighting, it glided to the treetop where the nest was being built. Sometimes it found its mate on the nest, arranging the materials there, in which case it alighted beside the other, who soon slipped off into the air, so that its partner could deposit the latest contribution. Both sexes shared the work of construction rather equally, as far as I could tell.

At one nest, while the building kite was trying to transfer from feet to bill the biggest stick that I saw it secure, this prize slipped from its grasp. The bird shot downward in spectacular pursuit of the falling stick and caught it in its feet. But then the twig dropped again, this time so near the treetops that it fell among the branches before the kite could retrieve it.

The foundation of sticks receives a lining of softer material, which on the Caribbean slope of Costa Rica may be long, gray strands of "Spanish moss" (*Tillandsia usneoides*), but in El General, where this bromeliad has not been found, a beardlichen (probably *Usnea* sp.) of similar appearance may be used. In a fallen nest, I found a great mass of this richly branched, gray lichen, pieces of which were as much as two feet in length. The lichen had evidently been brought from a considerable distance, for I could find no long pieces of it growing anywhere near the nest, although I discovered such growths on trees about 1000 feet higher in the mountains and several miles away. The pair which I watched build in this locality three years later brought all their lichens from a point beyond view. Once a kite arrived with a fairly large ball of lichen; but I could not tell whether the bird had found it in this form or, as seemed more probable, had rolled up a long strand into a compact mass. This gray ball was shifted back and forth between the kite's bill and feet while the bird soared around the nest tree, before going to the nest. Apparently the kites soon tire of carrying anything a trifle heavy in their bills. In the most concentrated effort which I witnessed, this pair took five sticks and four billfuls of lichen to their nest between 8:00 and 9:00 in the morning of January 25.

After adding a piece of material to the nest, the builder may sit there for some

time, and if its partner delays too long in bringing something else, it calls with high, thin notes, rapidly repeated and ascending in pitch. After working for a while in the aerial fashion that I have tried to describe, both builders may soar around catching insects in their talons and from time to time repeating their slight, high-pitched cry, which always suggests excitement and is surprisingly weak for so large a bird. None of these building kites seemed to pay the slightest attention to the watcher in plain sight so far below them.

INCUBATION AND CARE OF YOUNG

I could never tell how many eggs were laid or when incubation began in these lofty eyries. I am certain, however, that both sexes share this task and both brood the nestlings. At the nest above the Pejivalle River, I had watched one partner incubate for over three hours before its mate came to replace it. The newcomer brought a piece of *Tillandsia*, which it added to the nest as it settled down to warm the eggs. Ten minutes later, the one that had gone off returned with a small piece of the same gray "moss" and gave it to the sitting partner. Thus material may be added to the nest during incubation, both at a change-over and also while the same bird continues to sit.

As far as I have seen the nestlings are fed by both parents, with a long interval between feedings. One morning, when the sky was lightly clouded, food was brought to a nest only twice in two hours. On a sunny morning, food was brought only once in an hour and a half. The parent that brought this article passed it to the other parent, who all this while had been guarding the nestling(s). Except for a single lizard, I have seen only insects brought to the nest. There seemed to be no point in making long-continued records of feeding at nests where I could learn neither the number nor the age of the young. A Swallow-tailed Kite watched by Sutton (1955) in Florida left the nest when it was 38 or 39 days old.

MISCELLANEOUS OBSERVATIONS

Swallow-tailed Kites are sociable at all seasons. Often several of them, in addition to the parents, spend much time resting or soaring around near an occupied nest without being chased away or seriously threatened by the breeding pair. At one nest there were four additional birds, at another five, and at yet another six of them. Long ago, it occurred to me that these extra kites, apparently without nests of their own, might help the breeding pair to build or to take care of their nestlings; but I could never gather any evidence that they did so. I thought that this failure might have been due to the great difficulty of watching nests so high above my head that were more or less screened by foliage; but at a Swallow-tailed Kite's nest in Florida, more favorably situated for observation, Dr. William B. Robertson, Jr. (*in litt.*) failed during many hours of watching to find helpers, although a number of kites (once as many as ten) frequented the vicinity without arousing the antagonism of the parents.

Nesting kites drive away trespassing birds of prey of other kinds. While I watched the nest above the Pejivalle River, a wide-winged hawk (probably *Leucopternis princeps*) soared above it. Uttering its high-pitched cry, the incubating kite slipped from its nest, rose above the intruder, and repeatedly darted down at it, making it veer suddenly to avoid being struck. The big hawk soared off over the treetops, while the kite continued to wheel about in the air. Before it returned to its nest, a White Hawk (*Leucopternis albicollis*) drifted down toward it, to be harried by the parent

kite just as the first hawk had been. The kite treated the trespassing hawks much as a Tropical Kingbird treats a trespassing kite, and the hawks avoided the kite much as kites try to avoid being struck by an angry kingbird. When the air was at least clear of raptorial intruders, the kite returned to its eggs.

Once I watched a pair of Swallow-tailed Kites worry a Red-tailed Hawk (*Buteo jamaicensis*) that rested atop a tall charred trunk in the highlands. They soared in circles above the hawk, swooping repeatedly to pass a few inches above its head. As a kite swept by so close above it, the hawk would thrust its bill suddenly upward, without succeeding in touching its tormentor. This occurred in late July, when the kites seemed no longer to be nesting. On other occasions, I have watched kites treat hawks of various kinds in this fashion.

The kites' nest that I watched in 1961 was situated at the top of a milk tree (*Brosimum utile*) which was about 125 feet high and stood in a recently made pasture near the forest. The massive columnar trunk, which rose about 80 feet to the lowest branches, had been scarred by fire and weakened by decay which resulted from a wound. Revisiting this nest at the end of April, I found that the trunk had snapped off well above the ground, apparently in a storm a few days earlier. Amid the shattered boughs and withering leaves of the crown, I discovered the corpse of a parent, swarming with fire ants. Evidently the kite had been whipped down by the falling branches before it could fly clear of them. A few yards away were the remains of a nestling, whose expanding feathers were still ensheathed at their bases. These were the only kites that I have known to meet disaster. Mostly they seem to soar well out of harm's way.

DOUBLE-TOOTHED KITE

The small Double-toothed Kite is rare in Central America, and I did not become acquainted with it until 1952. On February 4 of that year, a solitary kite, evidently an immature individual of this species, rested in a tree in front of our house, where I had already dwelt for over a decade without meeting this bird. On August 15 of the same year, a Double-toothed Kite again perched in this tree, and in view of the rarity of the species, it may have been the same individual. If this supposition is correct, it had undergone some interesting color changes in the interval of six months. When I first saw it, the top and sides of its head were dark slate-gray and the remaining upper parts were sooty brown. The sooty brown tail was crossed on the upper surface with several narrow, widely distant, whitish bars and was tipped with a narrow light band. The white throat was marked by a prominent, narrow, dark, medial stripe; on either side of the white area was an area of russet. All the remaining underparts were evenly barred with dark gray and whitish (the dark and light bars were about equal in width), except the long under tail-coverts, which were white with only a few dark bars at their base. The kite's eyes were bright orange-yellow; the bill was dark with a yellowish cere; the bare legs and toes were bright yellow; the nails were black. In August, the prominent transverse bars on the underparts were russet instead of gray, and the almost solid russet areas at the sides of the throat and chest had become more extensive.

At a nest which I found some years later, one of the parents gave me far better opportunities to examine its plumage through my binoculars than did the other. This parent, evidently the female, had plain light gray upper plumage, with a dark tail crossed by a few widely spaced light bars. Her chest was bright cinnamon-rufous with some white spots, especially in the center; and the remaining underparts,

including the flanks, were irregularly barred with cinnamon-rufous and white. This bird's throat had the same narrow, dark, medial stripe, bordered with white, that I had noticed on the first Double-toothed Kite that I saw. This mark seems to provide a good means of recognition for the species in its various attires. The breeding kite's eyes, bill, and feet were colored as in the young bird.

Both times that the kite appeared on the tree in front of our house, in February and again in August, it caught and ate a large grasshopper with coral wings. The Double-toothed Kites watched in Panamá by Laughlin (1952) ate large green insects and lizards; the latter they pursued up slanting branches by hopping, with wings spread to maintain their balance. Haverschmidt (1962:154) records that in Surinam this species devoured small lizards and insects of the families Cicadidae and Phyllidae. One breeding pair I observed nourished their nestlings chiefly on insects, with an occasional lizard (see beyond).

DATES AND SITES OF NESTS

The only published record of a Double-toothed Kite's nest that has come to my attention is that of Laughlin (1952). This nest was discovered, at the end of June, about 75 feet up in a tall spiny cedar (*Bombacopsis fendleri*) in the forest beside the laboratory clearing on Barro Colorado Island, Panamá Canal Zone. The structure was a shallow saucer of twigs, placed in a fork of one of the main branches. Incubation began on July 3, but on the following day a Chestnut-mandibled Toucan (*Ramphastos swainsonii*) ate the egg, after driving the female from the nest, apparently simply by intimidating her with its huge bill. While the female incubated, her mate brought food to her.

The only nest of the Double-toothed Kite that I have seen was found on May 1, 1964, at an altitude of about 3800 feet above sea level, at Las Cruces, a few miles south of San Vito de Java on the Pacific slope of Costa Rica near the Panamanian border. This nest was about 70 feet up in the crown of a tall, slender tree at the edge of the forest, beside a coffee plantation. The flat structure, composed of coarse sticks, rested on a stout, mossy, horizontal, lower branch, about four feet out from the trunk. It was readily visible from the ground but was sheltered from above by almost the whole height of the tree's leafy crown. Its site contrasted strongly with that of nests of the Swallow-tailed Kite, which are exposed above but often screened below. The difference in the situations chosen for nesting by these two kites seems to be correlated with the fact that Swallow-tailed Kites prefer to approach their nest by soaring, while Double-toothed Kites more often fly onto their nests.

THE NESTLINGS AND THEIR CARE

When I first saw the Double-toothed Kite's nest on May 1, it held two nestlings already well feathered. Both had whitish downy heads. The one that appeared to be older had lost practically all the natal down from the rest of its plumage, but the younger one still bore conspicuous light tufts on its dark wings. Both nestlings had dusky dorsal plumage. In both, the breast was pale cinnamon-rufous, which became lighter posteriorly, fading to whitish on the middle of the lower abdomen and the under tail-coverts. The breast was marked with prominent dark streaks; the sides of the abdomen were marked with dark bars and spots. The stubby tail feathers were blackish with narrow light tips. The bill and eyes were dark, but the legs and toes were bright yellow as in the adults.

The parent kites seemed to ignore my presence as I sat unconcealed in a clear

area between the nest tree and the coffee plantation. On May 3 and 4 I spent the first six hours of the day with them, or a total of 12 hours in all. I made no long watches after midday, because of the hard rain which fell almost every afternoon at this season. When I arrived as it grew light at 5:25 a.m. on May 3, a parent was brooding one nestling on the nest, but the other nestling was perched about a foot away. After about ten minutes, the first nestling emerged in front of its parent and flapped its wings. At 5:45 the brooding parent flew away as the other parent came with food, which it tore into small pieces, while standing on the nest, and passed to the young. I could see little of the preceding action because of the dense cloud which covered the mountain and enveloped the nest tree. At 5:51 a parent returned to brood both nestlings, continuing until 6:23, when it flew off through the cloud-mist. Thereafter, the young were not brooded until I left at 11:25.

Around eight o'clock, sunshine began to penetrate the dense cloud that had rested on the mountaintop since dawn. After their meager breakfast at 5:45, the nestlings received nothing more until 8:24, when an interval of concentrated feeding began. In the next 93 minutes, the parents brought food 10 times. After 9:57 the meals were far more widely spaced, one at 10:30 and one at 10:58, then nothing more until I left at 11:25. In the first six hours of the day, the two nestlings had been fed 13 times by both parents. I could not distinguish the male from the female and so could not learn whether the male or the female was the more diligent attendant.

On May 4 the course of events was much the same. When I arrived at 5:25, a parent was on the nest, while the older nestling rested exposed on a neighboring branch. After about five minutes, the younger nestling appeared beside the parent on the nest, apparently having emerged from beneath it. At 5:54 the parent flew away. At 6:03 a parent brought a large green insect to the nestlings. Around 7:08 each parent brought food once. Then they remained beyond sight for another hour, while the younger nestling slept on a limb near the nest, its head turned back and buried in its feathers, and the older nestling rested farther off. On this morning the interval of concentrated feeding began at 8:10, a little earlier than on the preceding day. In the next 110 minutes, food was brought eight times. Then, after an hour of neglect, three more meals were brought between 11:05 and 11:20. In the six hours from 5:25 to 11:25, the parents came with food 14 times. Taking the two mornings together, 27 meals were brought in 12 hours, which was slightly more than one meal per nestling per hour.

Each morning one lizard was taken to the nest; all the other items appeared to be insects, some of which seemed to be cicadas and beetles. As far as I could see, only one insect was brought at a time. Although I could not clearly distinguish everything that was given to the young kites, I am fairly certain that neither adult birds nor nestlings were included in their diet on these two mornings. The young were fed either on or, more often, beside the nest. The older nestling spent much time perching at a distance from the nest, but when a parent arrived it usually returned for its meal, if it were hungry. Occasionally a parent alighted beside the older nestling where it rested and fed it there, while the younger one remained at the nest, calling. Nearly always, however, the meal was delivered while the parent stood between the two nestlings, feeding them alternately with small bits of the insect, which it held beneath a foot on a branch and tore apart with its bill. The young kites never clamored for their food nor tried to push each other aside; they took their meals most decorously, even daintily, so that the feeding was pleasant to watch. When the nestlings' demands were not urgent, the parent seemed to swallow a few morsels while

feeding them. Although a feathered nestling of the Plumbeous Kite was sometimes given whole insects which it tore apart for itself (Skutch, 1947), these Double-toothed Kites, nearly ready to fly away, always had prepared food placed in their mouths by their parents.

Some of the insects which the parent kites tore apart for their nestlings would have been gulped down whole by one of the larger flycatchers, which were considerably smaller than these young kites. One such insect was broken into about 33 tiny fragments, each of which was eaten separately by a nestling or its parent. Yet, strangely enough, the two lizards, which were by far the largest articles brought to the nest tree on these two mornings, were swallowed whole, probably because they would have been too difficult for the parents to dismember. I watched a nestling as, with great effort, it gulped down the smaller lizard, headfirst. The larger lizard seemed to cause some embarrassment to the parent who brought it: the kite flew from branch to branch, instead of taking the meal directly to the nestlings, as it did when the meal consisted of an insect. The lizard finally vanished while the parent and young were hidden from me by the nest. I suspect that the older nestling ate it. For the next hour and a half, this nestling rested on its favorite perch at the outside of the crown, digesting its substantial meal and taking no interest in the next three insects that the parents brought and gave to the downier nestling.

I could not watch the parents hunt, as nearly all the meals were brought from the forest, into which they disappeared, rather than from the coffee plantation on the other side of the nest tree, where I enjoyed a better view. Sometimes the kites approached and left the nest in silence, but at other times they voiced a high, thin *peee weeet* as they arrived at the nest or flew off. This utterance, weaker than the somewhat similar call of the Wood Pewee (*Contopus virens*), might be repeated a number of times in succession. Given as a parent approached the nest tree, it alerted the young for their meal. The young birds uttered a similar call, but their voices were weaker.

The parents always approached their nest by flapping their wings rather than soaring, as do Swallow-tailed and Plumbeous kites. But on the second morning, while the sun shone brightly nearly overhead, one of the parents circled around on set wings a few times, at no great height.

DEPARTURE OF THE NESTLINGS

As early as May 3, the older nestling was venturesome, hopping or even flying short distances from branch to branch, but never ascending much above the level of the nest at the bottom of the tree's crown. It spent much time on an exposed branch at the outside of the crown, whence it could look into the neighboring forest, and from this point it returned to the nest to be fed. The younger, downier kite also sallied from the nest but did not wander so far. Both preened much and flapped their wings vigorously, usually while clinging to the nest or a branch with their legs stretched up high, but sometimes rising slightly into the air.

On the evening of May 9, I could find only one fledgling in the tree, where it rested quietly beside the nest. Soon it went on the nest, then left it to flit from branch to branch. Presently a parent arrived and settled on the side of the nest with outfluffed feathers, to remain in this posture until I left in the failing light. I was not sure where the fledgling had gone, but at daybreak I found it perching near the nest, behind a thick branch that made it difficult to detect. Evidently the parent had slept alone on the nest with one of the young birds roosting nearby. At six o'clock

the parent flew away, leaving the young bird resting where the growing light had revealed it.

When I returned to the nest tree late in the afternoon of May 10, no kite was in sight. Around five o'clock, a young kite flew into the tree from the neighboring forest, rested a while near the nest, then vanished. The parent had not appeared by nightfall, and as far as I could see, no kite slept in the nest tree.

Four days later, on May 14, I saw a fledgling kite fly out of the forest to alight in the nest tree. It had lost practically all the nestling down from its body but still bore much on its head. After a while, a parent arrived and fed the young bird on a branch near the nest, tearing bits from the insect and placing them in the fledgling's mouth, just as it had done before the young birds could fly. The parent itself ate part of the insect, then flew away, and after a few minutes the fledgling also left. It was interesting to find the nest serving as a place of meeting for the parents and young some days after the latter had begun to fly widely and to find the parent feeding a fledgling as though it were still a helpless nestling. Many birds of prey would, I believe, have passed the food entire to a fledgling at this stage.

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SUMMARY

Swallow-tailed Kites arrive in southern Costa Rica in January, and some of them promptly begin to nest. All disappear from the region during the second half of July or more rarely in the first half of August.

In Costa Rica, these kites subsist largely on insects, which they catch in their feet as they soar above the treetops on ascending air currents. They plunder birds' nests which they can reach without alighting, pulling the nestlings from larger nests but carrying off smaller nests bodily, to remove the contents while they soar in the air. Lizards are also eaten.

The breeding season extends from late January to May or June. One nest was found as high as 5400 feet above sea level. Nests are placed at the very top of tall, more or less isolated trees, 100 or more feet above the ground. Both sexes build. Dead twigs are broken from the treetops by being seized in the feet as the kite swoops past. The twigs are then transferred to the bill, often with considerable difficulty, before they are taken to the nest. The structure is lined with *Tillandsia usneoides* or long beard-lichens, which may be found at a considerable distance. Additional lining is brought during incubation.

Both parents incubate the eggs, brood, and feed the young. The food consists largely of insects and lizards.

Several kites may loiter near an occupied nest, without arousing the antagonism of the parents. They are not known to help with the care of the nest.

Swallow-tailed Kites drive other birds of prey from the vicinity of their nests and worry them even when no nest is in sight.

At an altitude of about 3800 feet in southern Costa Rica, a nest of the Double-

toothed Kite was found on May 1. The shallow saucer of sticks was situated on a thick lower bough of a tall tree at the forest edge, and it contained two feathered nestlings.

In 12 hours of watching on two mornings, the nestlings were fed 27 times by both parents. In the middle of each morning, there was a period of concentrated feeding, lasting from one and a half to two hours, when most of the meals were brought. The nestlings were fed on insects, with an occasional lizard. The parent tore each insect into many tiny pieces which it placed one by one in the nestlings' mouths; yet lizards, far larger than any of the insects, were swallowed whole with difficulty by the young kites, apparently because the parents found these reptiles too difficult to dismember.

The young did not compete for food and showed no antagonism toward each other.

The young were brooded by night until they left the nest. Thereafter, as long as one of them remained in the nest tree, a parent slept on the nest with the young bird perching nearby.

Even after they began to fly widely, the young kites returned occasionally to be fed at the nest. The parent still tore the food into tiny bits which it placed in the fledgling's mouth.

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