

Life History of the Tropical Kingbird

ALEXANDER F. SKUTCH

No small bird of tropical America is at once so widely and uniformly distributed, so tolerant of sharply contrasting climatic conditions, so common and conspicuous, as the Tropical or Neotropical Kingbird (*Tyrannus melancholicus*). The species breeds from the southern border of the United States in Texas (where known as Couch's Kingbird), southward through Central and South America to northern Argentina, and from the Atlantic to the Pacific Oceans. In the extreme northern and southern parts of its immense range it is migratory, but between the Tropics it appears to be a permanent resident wherever it nests. It is at home no less in semi-desert areas covered by cacti and thorny scrub than in the wettest districts of tropical America, and in altitude it ranges from sea-level up to at least 5000 feet in Guatemala, 8000 feet in Costa Rica, 5000 feet in the Santa Marta region of Colombia (Todd and Carriker, 1922: 339), over 8000 feet in the interior of Colombia (Wyatt, 1871: 334; de Schauensee, 1950: 816), and 6000 feet in the equatorial Andes. A bird of open spaces, it is present wherever a few scattered trees or bushes supply lookouts whence it can dart in pursuit of flying insects, and sites for its nest. It is often a conspicuous inhabitant of savannas and extensive grassy marshlands with here and there a sickly tree. Wherever man has strung telephone or telegraph wires, the Tropical Kingbird finds them excellent perches and lookouts. It is quite absent from the midst of woodland; but a narrow clearing with a few tall, dead trees is likely to support a pair of kingbirds; and the shores of the wider waterways traversing the forest offer favorable conditions for flycatching and nesting. With the exception of the ubiquitous vultures, no other feathered inhabitant of tropical America will draw the traveller's attention at so many and such widely separated points.

This is one of the biggest as well as most common of the members of the great family of American flycatchers (Tyrannidae). Its upper plumage is predominantly light gray. When freshly acquired, the feathers of the back are bright olive-green, but they fade to gray soon after the molt; or if any are replaced at any time of the year, their greenish color contrasts with the gray of the surrounding plumage and gives the back a mottled aspect. In the center of the crown there is a concealed patch of flame-colored feathers, displayed only in the angry or otherwise excited moods of the bird. A stripe of dark gray extends from the base of the bill under the eye to the ear-coverts. The throat is pale gray, the chest yellowish clouded with olive, and the abdomen and under-tail coverts

canary yellow. The end of the folded tail is conspicuously emarginate or notched. The fairly long bill is black, the eyes dark, the feet black. The sexes are alike in appearance.

At higher latitudes, the kingbirds may flock during the months when they are not engaged in breeding. In the Guatemalan highlands, in October, I found 11 kingbirds resting together in the tree-tops in the late afternoon. But in Costa Rica, nearer the Equator, they remain mated throughout the year; and each pair stays more or less by itself. Yet I have known three individuals to keep company during the "winter" months. One January, a trio of kingbirds was to be found day after day in the tops of the tall dead trees of a forest clearing. Over a period of several weeks, these three birds associated together and seemed always on the best of terms. If at any season a kingbird loses its mate, it perches alone on some exposed bough and calls incessantly until it finds the missing partner, or wins a new one.

One night in December, I found a pair of kingbirds roosting in a small tree of *Inga spectabilis* in the pasture behind my house, in the basin of El General in Costa Rica. They rested about a yard apart on thin lower boughs, where they were wholly exposed below, but above were shielded by the entire leafage of the tree. Mated flycatchers often roost in this fashion, near each other but not in contact. I have observed similar roosting with the Boat-billed Flycatcher (*Megarhynchus pitangua*) and the Yellow-bellied Elaenia (*Elaenia flavogaster*); but the pair of Common or Black-crowned Tody-Flycatchers (*Todirostrum cinereum*) sleep in closest contact.

Food

The Tropical Kingbird subsists almost wholly upon insects which it captures in the air. In dash of movement and agility on the wing, it is surpassed by no other flycatcher. Often it rises swiftly high above the tree-tops, overtakes the insect its keen eyes have espied, then gracefully drops back to its exposed perch, whence it keeps a sharp lookout for another victim. In the evening, when after a warm day the cooling air is full of insect life, the kingbird may soar high into the air, where it rises and falls, circles and hovers, snatching up insect after insect, as it flies around and around, without ever pausing to rest. Except for its greater size and slower flight, one might almost mistake the kingbird for a swallow. As a rule, other flycatchers content themselves with the capture of a single insect on each high aerial sally. I have watched Tropical Kingbirds flycatching with the Chipsacheery or Vermilion-crowned Flycatcher (*Myiozetetes similis*) and Gray-capped Flycatchers (*M. granadensis*); and although the latter win admiration by their long, graceful, sharply

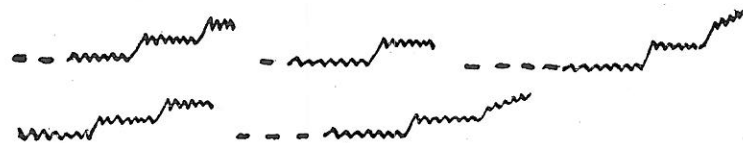
ascending darts, ending abruptly at the point where they capture the quarry which has lured them upward, their movements are simple in comparison with the intricate maneuvers of the kingbird.

At times when insects are not flying freely, the kingbird may look downward for its prey. One afternoon after a shower, a kingbird perching in a tree in front of my house darted down to the wet grass and seized a small frog, which it carried up to the tree-top and with difficulty gulped down. This is the only time that I have seen the Tropical Kingbird eat such food. Occasionally the kingbirds vary their diet with berries; and I have seen them eat the seeds of *Alchornea latifolia*, each of whose hard little seeds is enclosed in a soft, bright red aril. But kingbirds eat less fruit than many other kinds of American flycatchers.

Voice

Most naturalists who meet the Tropical Kingbird for the first time are surprised to hear notes so high and thin issue from the throat of a bird so big and bold. The kingbird's most common utterance is a rapid, high-pitched twitter, pleasant enough to hear, but seeming to belong to some far smaller bird. This twittering call becomes shrill and sharp as the kingbird angrily pursues an intruding hawk. But when the members of a pair come together on neighboring perches after a temporary separation, they often greet each other with long-drawn, high-pitched trills, uttered passionately with wings a-quiver.

At dawn, the kingbird sings tirelessly for many minutes together. He is one of the earliest of all the birds, and the very first of the flycatchers, to break silence when the eastern sky begins to brighten. Often choosing a perch only a few feet above the ground, he voices his high-pitched twitter. His clear, pleasant notes rise as though by steps, in two or three series each consisting of a few rapidly trilled syllables. Usually each ascending sequence is initiated by an indefinite number of short, distinct (not trilled), clear notes, which may be paraphrased by the syllable *pit*. Occasionally this monosyllable is omitted between two series of trills. The whole song may be represented so:



where the short dashes represent the note *pit*, the zig-zag lines the trilled notes. This sequence is continued for many minutes without a pause. At the height of the nesting season, the dawn-song goes on, with short interruptions, for about half an hour. It is one of the most characteristic

dawn sounds of the warmer parts of the American continents. The kingbird's dawn-song is rarely repeated after sunrise, and not delivered in the evening twilight. The high twitters which it utters during the day are readily distinguished from the dawn-song by those who have heard both types of utterance. When twittering in the air, the kingbird takes very short, mincing wing-strokes, quite different from the longer beats of its ordinary flight. This, I think, must be associated with its habit of fluttering its wings as it trills while perching.

In the valley of El General in southern Costa Rica, the Tropical Kingbird delivers his dawn-song over a greater part of the year than any other flycatcher, except only the little Paltry Tyrannulet or Northern Tyranniscus (*Tyranniscus vilissimus*). In 1943, the kingbirds about my house sang at dawn from March 2 until the end of July. The following year, there was sporadic singing from February 8 until the middle of March, after which the dawn-song was more regularly delivered; again the period of song lasted until the end of July. In 1945, a very dry year unfavorable for birds, I recorded the dawn-song from March 11 to June 6. In 1947, a bird in my garden sang the dawn-song on January 31, but there were a number of mornings in early February when I failed to hear him. Toward the end of February, his dawn-singing became more constant. In 1948, I heard a little dawn-singing on February 3. The period of singing continued from this date until August 14; but after early June the amount of singing at daybreak was usually slight, and on some mornings I failed to hear it. In 1949, there was a little singing as early as January 26. In this locality, then, the extreme dates of the kingbird's dawn-song are late January and mid-August, but the period of more sustained and constant singing is from early or mid-March into June. In the Caribbean lowlands of Honduras, kingbirds continued their dawn-singing into August.

Nest-Building

According to Belcher and Smooker (1937: 229) in Trinidad and Tobago the Tropical Kingbird nests from January to July, but the nesting season is at its height in May. In the Canal Zone, also, the kingbird may begin to breed early; here I found a nest with two eggs on February 24, 1935. In the valley of El General, Costa Rica, between 2000 and 3000 feet above sea-level, I have not found the birds building before mid-March, and usually not until April. Farther north, in Honduras and Guatemala, the kingbirds apparently do not begin to build before April.

The kingbird's frail, shallow nest is placed in a bush or tree standing in a pasture, by the roadside, on the gravelly floodplain of a river, or in almost any open space, but never in the midst of crowded vegetation.

Thirty-one nests found by me ranged in height from six to 40 feet above the ground, but only ten of these nests were above 15 feet. About the shores of Barro Colorado Island, Canal Zone, I found, in 1935, a number of nests built on stumps that still remained from the forest submerged twenty years earlier, when the valley of the Río Chagres was flooded to form Gatún Lake. Some of the rotting stumps that supported nests rose above the water about a hundred feet from shore. The structures were placed among the ferns, aroids, or epiphytic trees and shrubs that grew attached to the decaying stubs, and in many instances clothed them with an almost continuous mantle of vegetation. The four nests ranged in height from three to 25 feet above the water. The lowest was hardly above the reach of the waves stirred up by the larger ships that "transited" the Canal.

Hudson (1920: 189) wrote of this species, which he called the "Bellicose Tyrant": "A tall tree is usually selected for the nest, which is not infrequently placed on the very topmost twigs, exposed to the sight of every creature passing overhead, and as if in defiance of birds of prey". The Central American members of this species show the same inclination to place their nests in an exposed position which Hudson noticed in La Plata, at the other end of the bird's vast range. Often disregarding opportunities for concealment, they build in a position exposed to the open sky, at times in a dead or leafless tree, where the sun beats down hotly through most of the day, the rain strikes with force unabated by sheltering foliage, and the nest seems to invite the attention of every passing bird of prey. For any bird less valiant in the defence of its eggs and young to nest in sites so exposed would be suicidal; and its carelessness of concealment costs even the doughty kingbird many a set of eggs and many a nestling.

While hunting a site for the nest, one of the pair sits in promising crotches and utters a low, rapid twitter, which somewhat resembles the dawn-song, but is not so loud and high-pitched. This ritual may be repeated day after day in various positions, until at last the female brings a long piece of dead vine or some similar material to one of them, flying up with much twittering. Doubtless it is she who sings the low nest-song, while her mate looks on. This nest-song somewhat resembles that of the Chipsacheery or Vermilion-crowned Flycatcher; and in March I have heard kingbird and Chipsacheery sing in neighboring trees, both seeking nest-sites and doubtless stimulated by each other.

I have watched more or less the construction of four nests, and seen nothing to suggest that the male helps to build. One of these nests was made in Guatemala by a female which I had marked with vermilion paint while she incubated at an earlier nest that was despoiled by some egg-eater. The kingbird then began to tear apart her empty structure and

transfer its materials to a new site in the top of a lemon tree about 75 yards distant. From a blind, I watched this growing nest during four hours divided between two mornings. The marked female worked at an exceedingly leisurely pace, bringing material only 14 times during the four hours—yet replacement nests are as a rule built more rapidly than first nests. Usually she flew up to the nest in silence, rested on its rim while she deposited her load inside, then sat in the hollow and made vigorous movements with her feet, while she pressed down her breast until she seemed almost to stand on her head and turned around and around to mold the cup into shape. Upon leaving the nest, she generally twittered in her high, weak voice and went to a low, dead branch hard by, whence she darted out to catch a few insects before she flew away for more material. The male did not come near the new nest, except during the excitement which prevailed while I was setting up the blind.

At a second nest, the male was more attentive while his mate built, and sometimes followed her on journeys to gather material, sometimes rested, preening his feathers, while she came and went. As she neared the nest, bringing a long piece of dead vine which trailed far behind her, she often voiced her high-pitched trill; and her mate, if he happened to be perching in the nest-tree, replied with a similar trill, fluttering his wings the while. Yet another male kingbird behaved in much the same fashion while his mate built; and sometimes he would fly out from his perch to meet her as she approached the nest-tree with material in her bill, then return with her to its boughs. Most of the building kingbirds that I have tried to watch have spaced their visits to the nest so widely that it was difficult for me to maintain an interest in the procedure.

The finished nest of the Tropical Kingbird is a broad, shallow, saucer-shaped structure, containing so little material that as a rule it is possible to distinguish more or less of the eggs through the meshes in the sides and bottom. It is composed largely of lengths of dead herbaceous vines, some of which dangle untidily far below the supporting branch, rootlets, tendrils, fine woody twigs, weed stems, grasses, and similar coarse, dry vegetation, with finer material of the same nature, and sometimes horse-hair, in the lining. One nest was $4\frac{1}{2}$ inches in outside diameter by $2\frac{1}{2}$ inches high. The cavity was $2\frac{3}{4}$ inches in diameter by $1\frac{1}{4}$ inches deep.

A kingbird who built in an orange tree in Panamá would sometimes go to sit in her completed structure, although it still contained no egg. As she entered the nest she would expose the scarlet feathers of her crown and twitter softly to herself, seeming to express happiness that the nest was finished and ready to receive the spotted eggs.

The Eggs

Of 22 nests found by me in Panamá, Costa Rica, and Guatemala, 12 contained two eggs or nestlings each, ten held sets of three. There appears to be a tendency for larger sets to be found at higher latitudes. My five nests in the Canal Zone all had sets of two. Of 11 nests in Costa Rica, five held two eggs and six contained three eggs. Of the six Guatemalan nests, two had sets of two eggs and four held sets of three. But Cherrie (1916: 246) records a nest with three eggs from Venezuela, and Stone (1918: 268) a set of three from the Canal Zone. For Guatemala, sets of four have been reported by Salvin and Godman (1888: 103). Beyond the Tropics, Couch's Kingbird (*T. melancholicus couchi*) lays, according to Bent (1942: 52) "three to five eggs, oftener three or four"; and in Argentina Hudson (1920: 190) states that the "Bellicose Tyrant" lays four eggs.

In the basin of El General in Costa Rica, the dates of laying of 19 sets of eggs (as observed or computed from subsequent observations) were distributed as follows: 1 in March, 9 in April, 7 in May, and 2 in June.

In a nest with two eggs, two days separated the laying of the first and the second. In two instances when the bird laid three eggs, the interval between the deposition of the first and second was only one day, but two days intervened between the laying of the second and the third. The eggs are laid rather late in the morning: one appeared between 9:35 and 11:00 A.M., another between 11:30 A.M. and 1:00 P.M. In this late laying, the Tropical Kingbird agrees with other flycatchers (Skutch, 1952).

The eggs are whitish or pale buff, more or less heavily blotched with reddish-brown, pale brown, and pale lilac, the markings most crowded on the thicker end. At times there are a few fine, black spots. Twelve eggs measured at the nest in various parts of Central America averaged 24.7 by 18.2 millimeters. Those showing the four extremes were 26.6 by 19.1 and 22.2 by 17.5 millimeters.

Incubation

On May 18, 1932, a boy showed me a nest of the Tropical Kingbird containing two eggs, situated seven feet above the ground in a mimosa bush in a hillside pasture, at the edge of the Motagua Valley in Guatemala. It was well situated for watching, for by setting my blind up the slope I could overlook it from a higher level. I was at the time most interested in learning whether statements frequently repeated with regard to a number of North American species of Tyrannidae, that the male

takes a share in incubation, held true for the tropical members of the family. I had already satisfied myself that with the Chipsacheery and the Yellow-bellied Elaenia the male does not regularly take a part in warming the eggs, and I eagerly seized this opportunity to extend my studies to another species. In order to make quite sure that I could distinguish the male kingbird from his mate, I decided to mark one member of the pair. Wrapping some absorbent cotton about the end of a fine stick, I soaked the wad in vermilion enamel and stuck the twiglet in the nest beside the eggs, then went away. Returning twenty minutes later, I found one of the kingbirds sitting in the nest. When it flew off at my approach, it had a small but conspicuous vermilion spot on the crown (in addition to the usual concealed patch), heavy markings of the same color on the breast and belly, and a vermilion left foot. I was sorry about the foot, and hoped that its coat of paint would cause the bird no harm. But I was delighted to find it so unmistakably marked. Since during seven hours of subsequent watching I saw only this marked bird on the nest, I decided that it was the female.

This female kingbird incubated quietly and faithfully. Her seven sessions on the eggs varied from 10 to 56 minutes in length and averaged 32.4 minutes. Her eight recesses lasted from 9 to 20 minutes, the average being 12.1 minutes. She devoted 73 per cent of the seven hours to incubation. From time to time she regurgitated the indigestible parts of insects and allowed them to drop to the ground. While sitting on the nest she was nearly always silent; I heard her call only once. But she might twitter as she flew from the nest, or as she approached it flying down the hillside with mincing wing-beats. The male, if resting near the nest when she returned in this fashion, would lift and vibrate his wings as a greeting.

During much of the day, the male kingbird perched near the nest and defended it from intruders. He was dashing and fearless in pursuit of hawks, but as a rule permitted small and harmless birds, as doves and seedeaters, to rest quite near the nest without molestation. Once a trespassing Groove-billed Ani (*Crotophaga sulcirostris*) was driven away, but later two of these slender black birds were allowed to remain near the nest without being disturbed. When a Golden-fronted Woodpecker (*Centurus aurifrons*) flew into the next bush, the male kingbird drove at him, causing him to cling beneath the branch and look up defiantly at the aggressive flycatcher. But the latter made only a half-hearted attempt to drive the woodpecker away, whence I inferred that he was not looked upon as a dangerous character.

Eight years later, in Costa Rica, I began to study the mode of incubation at another nest, which unfortunately was despoiled by some unknown agent before I was able to devote much time to it. This female was a far less patient sitter than the Guatemalan kingbird. During two

hours late in the morning, she took five sessions ranging from 3 to 30 minutes in length and averaging 12 minutes. Six recesses varied from 5 to 10 minutes and averaged 7.7 minutes. She kept her eggs covered only 61 per cent of the two hours. During her absences, either she or her mate was always in sight of the nest conspicuously situated in a leafless tree in the midst of a pasture, save possibly for a period of three minutes, when neither seemed to be keeping guard. Usually the male watched over the nest during the female's recesses, either while perching in the nest-tree itself, or in a neighboring leafless tree which commanded a good view of it. Twice the female flew from the nest as he arrived in the nest-tree to keep guard; and twice he flew away as she returned to her eggs. But on other occasions, the female continued to incubate after his arrival, and he lingered in the nest-tree after her return.

If, as sometimes happened, a passing insect tempted the female from the nest while her mate was away, she caught insects from perches in view of the nest until he returned to take charge. With these Tropical Kingbirds, the alternation of female and male in incubating and guarding the eggs was far less methodical than at a neighboring nest of the Boat-billed Flycatcher (*Megarhynchus pitangua*). But since the nest was placed in an exposed position, and the kingbirds caught insects from perches commanding a wide view, one or the other of the pair had it nearly always in sight. Yet despite their vigilance, this nest so conspicuously situated caught the eye of some marauder which despoiled it.

I might add here that my own observations covering scores of nests of some 30 species of the Tyrannidae have failed to bring to light a single instance of incubation by both members of the pair. Although statements that the male of one or another species of flycatcher incubates are not lacking in print, all the accounts known to me that give evidence of careful observation agree that only the female covers the eggs.

Although I have made a number of attempts to determine the incubation period of the Tropical Kingbird, at only three nests did I meet with success. At one nest which contained three eggs when found on April 9, two nestlings hatched on April 25, giving an incubation period of at least 16 days. At the second nest, the third and last egg was laid on May 12; two of these eggs hatched on May 27 and the other on the following day, giving an incubation period of 16 days. At the third nest, the set of two eggs was completed on May 20 and the nestlings hatched on June 4, giving an incubation period of 15 days.

The Nestlings

The newly hatched Tropical Kingbird is a typical passerine nestling, with sparse gray down that fails to cover its pink skin, tightly closed

eyes, and the interior of the mouth orange. The nestlings are fed and guarded by both parents, but apparently incubated only by the female.

Near the end of a long, narrow cove that formed a deep indentation in the irregular, wooded shoreline of Barro Colorado Island in Gatún Lake, a decaying trunk, about 25 feet high, rose above the still water about a hundred feet from the nearest shore. Attached to the rotting wood grew a great variety of epiphytic plants, including aroids, orchids, ferns, and a small bush with wide-spreading branches. A small colony of Yellow-rumped Caciques (*Cacicus cela*) were using the terminal twigs of this bush for the attachment of their long, woven pouches, some of which were already completed, others just begun. At the end of April, 1935, a pair of Tropical Kingbirds were feeding feathered nestlings in a shallow cup built among the epiphytic vegetation near the top of the trunk, just below the swinging pouches of the caciques. Nearer the water a pair of Rusty-margined or Cayenne Flycatchers (*Myiozetetes cayanensis*) had built a bulky roofed nest. In addition to the nests of these three kinds of birds, the decaying trunk supported a variety of nests of wasps and of little, black, stingless melipone bees. The hives of the latter were made of black carton in furrows in the trunk; and the funnel-like entrance of one was just below the kingbirds' nest.

At first, birds, bees, and wasps all seemed to get along together fairly well. But one morning the bees, for reasons unknown, became highly excited. A great swarm of them formed a dark, troubled cloud that hung stationary in the air in front of the nests. Although the cloud itself did not change its position, it was composed of thousands of restless units all gyrating and circling about each other in the liveliest fashion. Sometimes the little biting bees attacked the caciques perching atop the trunk, but the birds merely nipped them with the tips of their sharp bills and dropped them wounded into the water.

Then the bees began to attack the two kingbird nestlings, which fortunately had a fair covering of feathers to protect them, although still unable to fly. The poor little birds frantically flapped their wings, tried to pick off the biting bees with their bills, and in their distress hopped restlessly from side to side of the narrow nest. The parents looked on without being able to protect their youngsters; they could only perch in the barrigón tree on the shore, vibrate their raised wings and twitter to each other, as is their custom when excited. Hitherto the kingbirds and the caciques had been on fairly friendly terms, although there was a certain amount of rivalry between them—as among the caciques themselves—for the coveted perch at the very top of the trunk. But now, as though to relieve their feelings, the parent kingbirds darted angrily, with clacking bills, at the caciques, especially the bigger males, and made them flee. Perhaps there was a certain amount of justice in these attacks; for the

heavy male caciques, dashing about among the epiphytic bushes, helped to keep the bees angry and aggressive, if they did not in the first place stir them up.

For my part, I was eager to help the nestling kingbirds, but as powerless to do so as their parents. To climb the decaying, epiphyte-encumbered trunk would have been difficult and dangerous, if not impossible; and the effort to do so might have angered the wasps, whose stings were far more to be dreaded than the bites of the little bees. For over an hour the latter continued their vicious attack on the nestlings, but at last they quieted down and withdrew. I could not see in what condition they left their victims, but after their departure the parent kingbirds came and fed the nestlings. Two days later I found the youngsters in good health and spirits. While sitting in the nest they often voiced low twitters much like the call of the adults, and they were eager for the insects and berries that were brought them. The parents, now in a more peaceful mood, did not attack the caciques so often.

On the first of May, it was my good fortune to witness the departure of both of these young kingbirds from the nest. Paddling through the still waters of the lake at dawn, I tied my dugout canoe to a submerged stump near the head of the cove and sat quietly watching the caciques and their neighbors. The young kingbirds kept up an almost continuous weak twittering and received many morsels from their parents. Just as the sun appeared above the tree-tops on the ridge to the east of the cove, one of the youngsters suddenly left the nest, quite spontaneously, in the absence of the parents or of any outside disturbance. It turned its course toward the nearest shore, about a hundred feet away, and flew well, high above the water. As soon as the watchful parents saw it go, they hurried after it; and while it was still many feet from the shore one of them caught up and flew directly above it, apparently in contact with it. The parent certainly did not attempt to support the little bird in the air, and if anything, forced it lower. Together parent and fledgling reached the shore, where the latter came to rest on a bush fully exposed to view. Immediately both parents dashed at it and knocked it from its conspicuous perch into the midst of the foliage, where it was well concealed. Then they flew up into the tops of the trees, vibrated their spread wings and twittered as though in mutual congratulation on the successful termination of their nesting.

The second act, that of knocking the fledgling into the bushes, was commentary upon the first. The only significance I could find in the parent's method of accompanying the fledgling on its first flight was to protect it, while still weak upon the wing, from possible attack by a bird of prey. Should a hawk attempt to strike while the parent flew above the fledgling, the adult bird would be in a position to shield it; or more

probably, it would attempt to dart aside at the critical moment, and the hawk, with its eye upon the uppermost bird, would follow, giving the youngster a chance to escape. After the young kingbird alighted in an exposed position, the parents lost not a moment in forcing it into concealment, doubtless with the same motive of protecting it from attack from the air.

Such "shielding flight" seems to be the manifestation of a behavior pattern widespread among birds whose nests are situated in high, exposed places, or facing an extensive open area without concealing vegetation. I have witnessed this close escort of the fledgling on its earliest flight by parent birds of species so various as the Montezuma Oropéndola (*Gymnostinops montezuma*), White-tipped Brown Jay (*Psilorhinus mexicanus*), Rough-winged Swallow (*Stelgidopteryx ruficollis*), White-backed Dipper (*Cinclus leucocephalus*), Black-crowned or Inquisitive Tityra (*Tityra inquisitor*), and several kinds of flycatchers. Danforth (1930: 82) saw an American Kestrel or Sparrow Hawk (*Falco sparverius*) follow closely one of its young as it flew from the flicker's hole where it was reared. Among birds more or less gregarious during the nesting season, as oropéndolas, swallows, and Brown Jays, the first flight of a fledgling may be a spectacular event; for the youngster, untried on the wing, is often followed closely not only by its parents but also by such neighbors or helpers as happen to be close by when it launches forth into the air. The value of this practice, in shielding the weakly flying fledgling from aerial attack, has already been suggested.

About two hours after the departure of the first young kingbird, the second decided to quit the nest. As it flew out over the water, three caciques followed, and one or two of them struck against it. One of the parent kingbirds hurried to the rescue, and the caciques turned back to their nests. Although doubtless this fledgling was just as capable as its nestmate of flying to the shore, the caciques' interference caused it to fall into the water a few yards short of its goal. I paddled swiftly toward the spot in order to give assistance; but before I could arrive the young kingbird had flapped its way over the surface to the land, where it crawled up on the sloping bank. Here the parents flew down to it, and tried to coax it farther inland.

I am not sure why the caciques pursued the fledgling flycatcher. They are not predatory birds, and it could not have been because of enmity toward their young neighbor—they had ample opportunity to attack it in the nest, in the absence of the parents, had they so desired. I think it may have been that the strangeness of the flying kingbird caused the caciques to rush in pursuit of it—its slow, fluttering progress was so different from the swift, direct flight of the mature kingbirds who had been visiting the nest-tree. But it may be that the caciques were actuated by

the same parental instinct to protect a fledgling on its first flight which caused the parent kingbirds themselves to rush to the first of their youngsters as it winged away from the nest, and that the unfortunate outcome to the little kingbird was a result of the disparity between its own size and that of its would-be protectors. Apparently the behavior we have called "shielding flight" can be called forth by a weakly flying fledgling of another species. In the following section of this paper, we shall refer to similar conduct of an adult kingbird with reference to an immature martin.

I do not know the exact age of the two young kingbirds reared below the caciques' nests. The lone nestling of another pair left when 18 or 19 days old. After the departure of the young from the nest, both parents and fledglings become very noisy. One pair of kingbirds, who were feeding fledglings in mid-June, called almost incessantly. The bird I took to be the male uttered from two to six high, sharp notes in a series, repeating this over and over at short intervals. His mate called in a similar fashion, but in a still higher, sharper voice. On coming together in a tree-top, they greeted each other with twitters and spread, quivering wings. They continued this demonstrative behavior through most of the day, devoting so much time to calling that I doubted whether they could be burdened with parental obligations. But soon I discovered that the pair were feeding fledglings, which were fast becoming as loquacious as their parents, although they called in weaker voices. The parents seemed to be able to satisfy the wants of their fledglings with very little effort.

I have no information on a second brood. My latest Central American nest of the Tropical Kingbird was found near Zacapa, Guatemala, on August 12, 1935, when it contained well-feathered nestlings. But nests occupied after the end of June are rare. In the upper Pastaza Valley of Ecuador, 1.5 degrees south of the Equator and 4300 feet above sea-level, I found, on October 26, 1939, a nest containing a single nestling two or three days old.

Relations with Other Birds

Like its relative the Eastern Kingbird (*Tyrannus tyrannus*), the Tropical Kingbird is generally considered to be a creature of a fiery disposition. Thus W. H. Hudson (1920: 189) writes of the "Bellicose Tyrant," the southernmost representative of our species: "In Buenos Ayres these birds arrive in September, after which their shrill, angry cries are incessantly heard, while the birds are seen pursuing each other through the air or in and out amongst the trees—perpetually driven about by the contending passions of love, jealousy, and rage. As soon as their domestic broils are over, a fresh war against the whole feathered race

begins, which does not cease until the business of propagation is finished. I have frequently spent hours watching the male, successively attacking, with scarcely an interval of rest, every bird, big or little, approaching the sacred tree where its nest was placed. Its indignation at the sight of a cowardly Carrion-Hawk (*Milvago*) skulking about in search of small birds' nests, and the boundless fury of its onset, were wonderful to witness."

As applied to the kingbirds that I have known in Central America for many years, the foregoing account would be little short of libel. Like so many other non-migratory tropical birds which remain mated through the year, Tropical Kingbirds here choose their partners and select their territories in so gradual and unobtrusive a fashion that it is difficult to learn how or when these matters are settled; and only rarely do the birds attract attention by noisy quarrels among themselves. Migratory birds, which often have only a brief period available for the winning of mates and the establishment of breeding territories, are as a rule far more quarrelsome in the spring than tropical birds which at the outset of the breeding season have long been mated—which may account for the greater pugnacity of the migratory La Plata kingbirds at this season.

As to quarreling with neighbors of other species, we have already seen, in our account of incubation, that the pair of kingbirds allowed small and harmless birds to rest in their little nest-tree, attacking only intruders which they looked upon as dangerous to their nest or at least not above suspicion. And the pair that fed nestlings in the cove of Barro Colorado Island got along remarkably well with their bigger neighbors the caciques, becoming hostile toward them only while the bees attacked their nestlings, which they were powerless to protect. They relieved their feelings by pouncing upon the innocent caciques, much as I have seen other birds peck savagely at leaves and other inanimate objects when enraged by my intrusion at their nests. In a clearing on the Island, I watched a Chipsacheery Flycatcher build her nest in a small orange tree, where a pair of Tropical Kingbirds had a newly completed nest still without eggs. The male kingbird often rested on a dead twig at the top of the tree and caused the poor Chipsacheeries a good deal of trouble. Whenever he saw the female approaching with material for her nest he darted at her and drove her away. The smaller flycatchers would usually turn tail without any show of resistance, although at times they would display their vermilion crownpatch in anger. And often the female Chipsacheery would dart past the kingbird and take her billful of material into the nest, to which he never offered the least violence. Thus for all the kingbird's bluster, the Chipsacheery was able to complete her nest close below his own. A pair of little Bananaquits (*Coereba flaveola*),

nesting in the same orange tree, went about their affairs without appearing to attract the kingbirds' notice.

Occasionally the Tropical Kingbird pursues a small, weakly-flying bird. One morning I stood in a clearing in the forest, watching a family of Gray-breasted Martins (*Progne chalybea*), admiring the deft way the parents placed food in their fledglings' mouths while one or both of the birds concerned in the transaction hovered in mid-air. Presently a kingbird alighted in the top of the dead tree with the young martins, and perched for some minutes peaceably enough a few feet from them. But when a fledgling started off on one of its slow, circling flights, the kingbird pursued, not in an angry fashion, as though it chased a hawk, but rather, so it seemed, as though trying to catch an insect. The kingbird followed the young martin through the air, touching it much of the time—much as I had earlier seen a kingbird parent follow its own youngster newly emerged from the nest—until one of the parent martins arrived, and pursuing the flycatcher in turn, caused it to change its course. Apparently a young bird in weak, unsteady flight elicits a set reaction from an adult kingbird, and this is true whether the youngster is the kingbird's own offspring or a fledgling of another species. But it is also possible that the kingbird chased the martin in a rough sort of play; somewhat as a Boat-billed Flycatcher that I once watched amused itself by alternately dropping and recovering a feather. Or could it have mistaken the young martin, with its weak flight, for a large moth?

Although the Tropical Kingbird only exceptionally molests smaller birds, and never in my experience does them actual harm, it is the relentless enemy of all birds of prey and other nest-robbers. Whether it has eggs or young to defend, or its nesting season has long been over, the kingbird can hardly ever see a hawk, kite, vulture, or toucan fly past its watch tower without darting forth in hot pursuit, twittering shrilly, sometimes striking the bigger bird on the back and causing it to cry out in alarm or pain, and never relaxing the chase until the enemy has flown afar. For its enmity to these birds, the kingbird has good cause. The Swallow-tailed Kite (*Elanoides forficatus*) preys upon eggs and nestlings from arboreal nests in exposed positions which it can reach while hovering on wing, without alighting. The kingbird's nests are often situated where they attract the kite's keen eye and are easily accessible to it. They must frequently be despoiled by the kites in the absence of the vigilant and warlike owners. Although I have not witnessed a kite plunder a kingbird's nest, I have on numerous occasions seen these graceful predators take the contents of nests belonging to other species. When a Swallow-tailed Kite swooped down and carried off nest and nestlings of a pair of Golden-masked Tanagers (*Tangara nigro-cincta*) from a tree

in front of my house, a kingbird was in close pursuit and almost succeeded in preventing the tragedy.

Although they harry toucans in the air, like other small birds the kingbirds appear to be no match for these nest-robbers while they perch and can defend themselves with their enormous bills. One afternoon at the end of May, hearing cries of distress among the birds behind my house and suspecting what was taking place, I rushed out in time to frighten a Chestnut-mandibled or Swainson's Toucan (*Ramphastos swainsonii*) from the kingbird's nest in the top of a guava tree. The marauder flew off with a single nestling in its bill, but two remained in the nest. The parents, although present and darting angrily toward the toucan, had been powerless to defend their family. Despite my having saved two of their nestlings from the toucan, after this episode I could scarcely appear behind the house without having them dart angrily close above my head. To look into their nest among the slender branches at the very top of the guava tree, I would climb a ladder and raise up a mirror attached to the end of a long pole. Darting past with angry twitters, the parent kingbirds repeatedly struck the back of the mirror, apparently with their feet. They kept vigilant guard over their nest from the dead top of an avocado tree close by. But for all their care, their other two nestlings vanished a week after the toucan ate the first, doubtless having followed it down the same capacious maw.

The Tropical Kingbird is a valuable member of the feathered community; if it sometimes mildly annoys the smaller birds, it makes ample amends by defending them and their nests from hawks and other predators.

Summary

1. The Tropical Kingbird is one of the most widespread and conspicuous of all the passerine birds of continental tropical America. It requires scattered trees and bushes, or woodland bordering open spaces; and wherever within its vast range this requirement is met it is likely to be found, whether in regions of high rainfall or in semi-desert. It ranges from sea-level up to 5000 feet in Guatemala and 8000 feet in Costa Rica.

2. At both extremes of its breeding range, as in southern United States and northern Argentina, this kingbird is migratory. At higher elevations in Guatemala, it gathers in small flocks during the "winter" months. But in Costa Rica it appears to remain paired, and in close contact with its breeding territory, throughout the year.

3. Its food consists largely of insects caught on the wing in spectacular fashion. Berries, small frogs, etc., form a subordinate part of its diet.

4. The kingbird's notes are high, shrill twitters and trills. During about half the year, the male sings an elaborate dawn-song before sunrise. On coming together after a separation, male and female greet each other with trills and twitters, uttered with the wings spread and vibrating.

5. The slight, open nest, usually placed in an exposed tree-top, is built by the female alone. She works in a leisurely fashion, while her mate may rest near by and greet her as she approaches the nest-tree.

6. The number of eggs in a set increases with latitude. In Costa Rica two or three form the set. In Guatemala nests with four eggs have been recorded. Beyond the Tropics in Argentina, four seems to be the usual number; while in southern United States sets vary from three to five eggs. The kingbird's eggs are laid rather late in the morning, on consecutive or alternate days.

7. The female alone incubates, as was proved with a marked bird, with corroborative observations at other nests. In this our kingbird agrees with other flycatchers that have been carefully studied. The eggs hatch in 15 or 16 days.

8. The nestlings are fed and guarded by both parents, but apparently brooded only by the female. In one instance the nestling period was 18 or 19 days.

9. When a fledgling flew from the nest, a parent flew just above it, forcing it downward. Similar behavior has been observed for a number of other kinds of birds whose nests are in exposed treetops, or face wide spaces devoid of sheltering vegetation, as often with streamside birds. Such "shielding flight" is apparently of importance in screening weakly flying fledglings from aerial attack. This behavior may be called forth not only by the first flight of fledglings belonging to other parents of the same species, but even, apparently, by weakly flying youngsters of distinct species.

10. The aggressiveness of these kingbirds toward harmless birds of other species has been greatly exaggerated. The parent kingbirds often permit such birds to rest and even to nest close by their own nests. Toward hawks, kites, toucans, and other nest-robbers the kingbirds are boldly aggressive; but their courageous attacks do not always shield their little ones from disaster. The kingbird's pugnacity toward predators, coupled with its tolerance of harmless small birds, make it an asset to the feathered community.

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San Isidro del General, Costa Rica

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