

LIFE HISTORY OF THE LONG-TAILED SILKY-FLYCATCHER,  
WITH NOTES ON RELATED SPECIES

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THREE genera of birds, confined to the more southerly portions of the North American continent, are known collectively as the silky-flycatchers, which some ornithologists classify as a distinct family, the Ptilogonatidae, and others place with the waxwings and the Asiatic *Hypocolius* in the Bombycillidae. Of the three genera of silky-flycatchers, two are monotypic: *Phainopepla nitens*, the Phainopepla, which ranges from southwestern United States to the highlands of central México; and *Phainoptila melanoxantha*, the Black-and-yellow Silky-flycatcher, which is confined to the high mountains of Costa Rica and neighboring parts of Panamá. The third genus, *Ptilogonys*, contains only two species, *P. cinereus*, the Gray Silky-flycatcher of the mountains of México and Guatemala, and *P. caudatus*, the Long-tailed Silky-flycatcher, which is confined to high altitudes in Costa Rica and western Panamá, approximately sharing the range of the Black-and-yellow Silky-flycatcher.

As is to be expected from its geographical range, the best known, as to habits, of these birds is the Phainopepla of the southwestern United States, but even it has never been studied as thoroughly as have many other birds of temperate North America. For the Gray Silky-flycatcher there are a few scattered records of the discovery of nests and incidental observations by travelers and collectors. Of the Long-tailed Silky-flycatcher, even the nest seems to have been unknown to ornithologists until the present study was begun. Although, while studying Long-tailed Silky-flycatchers, I sometimes saw Black-and-yellow Silky-flycatchers, I learned nothing to fill the absolute void in my knowledge of their breeding habits.

LONG-TAILED SILKY-FLYCATCHER

LOCALITY AND METHODS OF STUDY

My interest in this fascinating group of birds began more than 30 years ago when, during a twelve-month sojourn in the high mountains of Guatemala, from time to time I saw Gray Silky-flycatchers, although their nests eluded my search. Through most of my many years in Costa Rica, I have lived at altitudes too low for silky-flycatchers; but finally, in 1963, I was able to spend a breeding season on a highland farm where the Long-tailed Silky-flycatcher was one of the most conspicuously abundant birds, and its nests were easier to find than those of any other species. This study was made at "La Giralda," a large dairy farm which lies near the western end of the massif of the extinct Volcán Barba, in the Cordillera Central

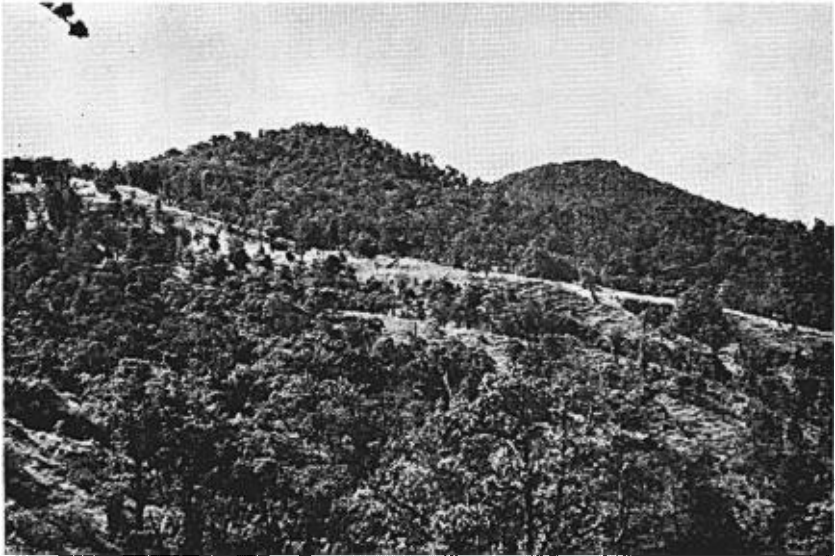


Figure 1. Pastures with scattered trees, interrupted by wooded ravines, were the habitat of the Long-tailed Silky-flycatchers at La Giralda. The foreground is about 7,500 feet above sea level.

of Costa Rica. The farmhouse is about a mile from the hamlet of Los Cartagos de Heredia, which is situated on the saddle between the volcanoes Barba and still-active Poás. The house looks over the western part of the Central Plateau toward the Pacific, which on very clear days is visible in the far distance, while at night the lights of Alajuela and several smaller towns of the plateau twinkle brightly far below.

The part of La Giralda where I studied the silky-flycatchers lies between about 6,500 and 7,500 feet above sea level. This long slope was covered largely by pastures, shaded by many trees, which in the lower reaches were chiefly alders (*Alnus acuminata*) and introduced Mexican cypress (*Cupressus Benthamii*), while in the upper reaches a variety of naturally occurring trees prevailed, conspicuous among them Winter's bark or chili (*Drimys Winteri*), a cornel (*Cornus disciflora*), and several species of myrtles (Figures 1, 2, and 3). In the numerous ravines which intersected the terrain were patches of primary and secondary forest, from less than an acre to several acres in extent, which had been left to protect the watershed. To the northwest of the pastures was a long, deep valley whose sides were covered with several hundred acres of forest that was dominated by huge, epiphyte-burdened trees, including many oaks. The steepness of these wooded slopes of the farm, and the dense undergrowth of tall, cane-



Figure 2. Shady pasture at about 7,500 feet above sea level, where Long-tailed Silky-flycatchers nested and Black-and-yellow Silky-flycatchers came from the forest at the right to eat fruits of the numerous Winter's bark trees. The tall, slender tree at the left is a cornel, *Cornus disciflora*.

like bamboos, made it extremely difficult to move around on them. Long-tailed Silky-flycatchers were never seen within the woods, although they often flew over them or rested on the tops of the trees.

My stay at La Giralda extended from 25 February 1963, when few birds of any kind, except hummingbirds and flower-piercers (*Diglossa plumbea*), had started to nest, until 6 July 1963, when the breeding season of most birds was nearly finished. The methods used in this study were simple. Eggs of accessible nests were removed briefly for description and measurement, but otherwise the nests were, as far as possible, examined by holding a mirror above them. For higher nests the mirror was attached to the end of a light pole, and for nests 20 feet or so up I often viewed the mirror with 8× binoculars, which gave a satisfactory view of the contents. From only two of the nests were the young removed for occasional examinations. Nests were watched without using a blind. When nest building and incubating, and while attending newly-hatched young, the parents seemed to ignore a watcher who sat quietly 20 or 30 feet from their nests. As the nestlings grew older, the attendants of some of the lower nests became more distrustful, and sometimes hesitated long to approach the nest in my presence, although when I increased my distance to 70 or 80 feet they



Figure 3. Habitat of the Long-tailed Silky-flycatcher at La Giralda. The pasture in the foreground is about 7,000 feet above sea level. In the background rises Volcán Poás, 8,780 feet in elevation at the peak.

generally accepted me. I refrained from setting up a blind because most of the nests were in parts of the farm frequented by the laborers and their families, and I did not wish to draw their attention to the nests.

#### APPEARANCE AND HABITAT

Nearly 30 years ago I was riding a horse down the cultivated southern slope of Volcán Irazú when a straggling flock of Starling-sized birds flew across the road and settled in the top of an oak tree ahead of me. Although these birds were new to me, I knew immediately what they were: their slender gray forms, high-peaked crests, yellow under tail coverts, black tails with white in the middle of the outer feathers and two projecting central feathers, were all so distinctive that even a novice in birdwatching could hardly confuse them with any other bird in the country.

Although the sexes of mature Long-tailed Silky-flycatchers differ in a number of features, these differences are not immediately obvious as the birds perch or fly high overhead, and it requires a little practice to distinguish them. The male's head and neck, including the crest, are largely pale yellowish, whereas these regions of the female are grayer, with little trace of yellow. Males sometimes have higher crests than their mates. In both, a narrow ring of pale yellow feathers surrounds the eye. The body

plumage of the male, including the back, rump, upper tail coverts, wing coverts, the breast, and upper abdomen, are bluish slate-color, while in the female these regions are a more olivaceous gray. In both sexes, the black remiges and primary coverts contrast with the grayish body. The yellow of the lower abdomen, thighs, and under tail coverts is often brighter in the male than in the female.

Both sexes have large areas of white on the middle portion of the inner webs of their otherwise black outer tail feathers. On both, the more or less attenuated ends of the central rectrices usually project beyond the others. In 8 out of 12 breeding pairs, the male's central rectrices projected farther than his mate's; but in four pairs I noticed little difference between the lengths of these projecting tips of the two partners. In some pairs, the projecting tips of both sexes were long, whereas in other pairs both sexes had short tips. The pronounced individual differences in the state of the tails of nesting pairs may be due to age, to molt, or to both together. In some breeding individuals, I noticed that the two central rectrices were of slightly unequal length, and the pattern of black and white on the two sides of the tail was sometimes asymmetric—conditions which suggested that the long tail feathers were still growing. The less efficient parental behavior of some of the short-tailed males suggested that they might be young birds breeding for the first time. Individuals could be recognized by their tails, within reasonable limits of time and place.

Largely because of their longer tails, males are considerably longer than females. Ridgway (1904: 119) gave the average length of museum specimens of male Long-tailed Silky-flycatchers as 240.4 mm (range 237–244); of females, 205 mm (range 200–210). The tails of males average 131.8 mm in length, whereas females' tails average only 111 mm. In living birds of both sexes the bills, legs, and feet are black and the eyes are dark.

The Long-tailed Silky-flycatcher is confined to the higher mountains of Costa Rica and western Panamá. According to Carriker (1910: 785), it is "very abundant on the high volcanoes, just below timber-line, extending downwards in lessening numbers to about 6,000 feet, which I believe to be the lowest altitude at which it is found." My own experience with this bird supports Carriker's statement. During the year when I resided below Vara Blanca (about 6 miles or 10 km in a straight line from La Giralda) at an elevation of 5,500 feet, I saw silky-flycatchers only when I climbed up to an altitude of 6,000 feet or more. Mr. C. H. Lankester, who for 40 years resided on a coffee plantation near Cartago at about 4,500 feet, recalls seeing a silky-flycatcher on his estate only once. On numerous visits to this plantation at all seasons, I never found a silky-flycatcher there, although it is in sight of the heights where the bird resides; nor have I seen the species anywhere else below 6,000 feet.

This silky-flycatcher is a far-ranging, restless bird of open spaces. It flies, in straggling flocks, well above the ground, usually above the tree-tops, whether it travels over the mountain forests or over pastures with scattered trees. In flight it flaps its wings intermittently and rises and falls in long undulations of considerably varying depth. Often it veers at the same time from side to side, as though in doubt where to go. The flight is usually accompanied by sharp calls and rattles, which we shall consider in more detail under "Voice." This silky-flycatcher alights by preference on the topmost, exposed twigs of tall trees, where it perches very upright, with its high crest and long tail making it appear elegantly tall and slender and presenting an unmistakable profile against the sky. Even in the gales which blow over the high mountains for hours or days together, the silky-flycatchers choose such exposed perches, where they rest while the strong wind ruffles their plumage and twists their tails. They remain here, too, while the chilling cloud-mist drifts through the trees, dimming their thin figures until they appear unsubstantial and ghost-like—until, seeming to dissolve in the mist, they vanish. Then only their sharp *che chip* betrays their continuing presence. The rigors of the high mountains, with their cold rains and fierce winds and frosty nights in the dry season, seem not to trouble these hardy birds, who are tolerant of most climatic extremes except the heat of the lowlands.

#### FOOD AND FORAGING

The diet of the silky-flycatchers consists of large quantities of both insects and small fruits. I have watched them plucking the black berries of the tree fuchsia (*Fuchsia arborescens*), the orange berries of a mistletoe, and the little fruits of *Eurya theoides*. They are especially fond of the pea-sized orange berries of *Citharexylum*, that are borne in long, slender, dangling racemes. They pluck these and other berries either while perching beside a cluster or clinging to it, rather than on the wing. With their small and apparently weak bills, these birds often have difficulty in detaching berries that are somewhat firmly attached. Once I watched one trying to pick berries of *C. Mocinnii* which seemed, by their color, to be ripe. Even by giving its head a sideward twist while holding a berry in its little bill, it sometimes failed to break it loose. And it dropped two berries after laboriously plucking them, apparently because they slipped from its bill.

Insects are caught in the air, often on long sallies from a high lookout. Some of the most spectacular displays of flycatching that I witnessed were given by parents collecting insects for their nestlings. As the bird, adding insect to insect in its mouth, twisted and turned high in the air with marvelous grace and skill, it often spread its tail, whose projecting central feathers, and white and black areas contrasting with the yellow of

the crissum, formed a most striking pattern. In such aerial foraging, these silky-flycatchers are no less skillful than the Tropical Kingbird (*Tyrannus melancholicus*), which also subsists on a mixed diet of insects and small fruits.

#### VOICE

Long-tailed Silky-flycatchers are noisy, loquacious birds, but to human ears they are practically songless. Their most common utterance is *che chip, che chip*, sharp and dry. This note is given while perching and also in flight. It is primarily a location note, but also, with slight modification, it is used to express apprehension or alarm. Parents whose nestlings seem to be in danger repeat it incessantly. When a flock of silky-flycatchers is perching in a high treetop, all repeatedly calling *che chip*, the effect produced is that of rattling loose pebbles in a box.

As it takes wing, and from time to time in the course of its flight, the silky-flycatcher commonly utters a long-drawn *che-e-e-e-e*—a rattling or clicking sound. Although frequently dry and harsh, this utterance sometimes becomes clear and metallic. Occasionally the flying silky-flycatcher almost achieves a brief, clear trill, which reminded me of the flight sounds of the Turquoise Cotinga (*Cotinga ridgwayi*). Bell-like or tinkling notes are sometimes given, especially by birds on the wing. One flight call sounded like *re-er-re-re*, clear and bell-like. In allusion to these sounds, the silky-flycatcher was called *Timbre* (the Spanish word for the sound of a bell) at La Giralda, but I do not know how widely this name is applied to the bird.

Rarely I heard a male silky-flycatcher, perching in the sunshine on a high, exposed twig while his mate incubated, singing with low, lisping notes that were scarcely audible at a distance of 25 yards. I might have missed them if my attention had not been drawn by the slight movements of the songster's bill and throat. The low, soft notes of this whisper song are sometimes punctuated by louder *che chip*'s. Once I heard a silky-flycatcher give a whisper song as he flew. I suspected that the silky-flycatchers, like a number of other birds with slight vocal gifts, might perform more loudly and persistently at daybreak; but if these birds have a dawn song, I failed to discover it. Early in May, a silky-flycatcher, perching before sunrise at the very top of a tall dead tree in a shady pasture, uttered a few clear, staccato notes, interspersed with dry *che chip*'s, then flew away.

As has been mentioned, parents apprehensive for the safety of their nestlings vociferate with sharp *che chip*'s, hardly to be distinguished from the ordinary call note. One pair of silky-flycatchers, whose low nest I did not find until the young were half grown, were particularly clamorous when I examined their nestlings. While I was at their nest, they complained

almost continuously while they flew around quite close to me. They varied their outcries with a few soft, peeping notes, such as I had not previously heard. The female surprised me by sparingly uttering throaty sounds that reminded me of the alarm notes of the Mountain-robin (*Turdus plebejus*), although they were much weaker. From the movements of her throat, I inferred that this distressed mother voiced still other sounds, too faint to be audible 20 feet away. Another pair of silky-flycatchers cried shrilly while I captured a nestling that had jumped from the nest and tried to escape over the ground.

It is evident that the silky-flycatchers, although vocally poorly endowed, are capable of producing a wide variety of utterances to meet the various contingencies of their lives.

#### SOCIAL HABITS

Some birds, including many that dwell in the undergrowth of tropical forests, are so solitary that they are usually seen alone, or at most with a mate; others, such as Cedar Waxwings (*Bombycilla cedrorum*) and many kinds of parrots, have achieved a high degree of social integration and fly in compact flocks. Silky-flycatchers fall into neither category; they are neither solitary nor given to performing coordinated group movements. Although they seek the company of their own kind, they retain independence of movement. Watching them one soon concludes that their life is a continual compromise between gregarious and individualistic impulses.

Early on an afternoon at the end of February, beneath a cloudy sky, I watched a number of silky-flycatchers—at one time 16 or more—resting in the top of a tall alder tree in a pasture and keeping up a constant rattle of sharp notes. Frequently they shifted their positions in the treetop, and at times one flew at another, which without resistance relinquished its perch to the aggressor. The flycatchers were continually arriving in the treetop or leaving it, coming and going in all directions, in parties of 1 to 7. Sometimes a number would start off in a loose flock, but some would turn back to the treetop while others flew onward. The latter, instead of continuing to travel together, would often diverge and follow separate courses until out of sight. It was evident, from these and numerous similar observations, that the flocking habit is poorly developed in these birds. Their flocks are even looser than those of toucans, which usually go in the same direction as their companions, although they proceed one by one, in a straggling party.

On 1 March, I found a silky-flycatcher calling on the exposed top of a tall tree in a pasture, while several others rested in a neighboring, densely leafy tree, the small green berries of which they ate from time to time.



Two rested side by side in the shade of the tree. After a while, two flew off in one direction, then another two in the opposite direction.

This observation suggested that pairs were separating from the loose flocks as the nesting season approached. But as March advanced, many of the silky-flycatchers that I saw were alone. Sometimes a solitary bird would fly down the mountainside, high above the treetops, until beyond view. At other times, I encountered a number of birds resting in neighboring trees, but detected no indication whether they belonged to pairs or flocks. Even after nesting began, silky-flycatchers continued to rest and fly in small parties. On 2 April, I found at least five perching close together in the top of a low tree. Sometimes one flew at another, making it change its perch. It was impossible from such observations to draw any conclusions about the course of pair formation. As with most tropical birds that I have studied, this took place so unobtrusively that it escaped detection. It is, certainly, not impossible that the silky-flycatchers' pair bonds are preserved between breeding seasons, although one watching the loose, erratic flocks cannot tell which birds are mates.

On the evening of 12 April, as I ended an all-day watch at a nest of an incubating silky-flycatcher, four of these birds flew close together down the mountainside through the mist, passing near the nest. As I walked down through the pastures, I noticed nine silky-flycatchers resting close together on the top of a tall dead tree. After remaining motionless for some minutes, suddenly they all flew off together in a compact flock, going eastward until lost to view. Their behavior was more suggestive of Cedar Waxwings than of silky-flycatchers. Night was falling, and apparently they were going to roost together. They seemed to be drawn closer together in the twilight than in full daylight. I could not learn where silky-flycatchers roosted. In the evening, the mates of incubating or brooding females would fly off beyond view, sometimes in company with other silky-flycatchers, leaving the females alone in the nest.

#### THE BREEDING SEASON

The mountain slopes on which I studied the silky-flycatchers were close enough to the continental divide to feel the influence of both the Pacific Ocean and the Caribbean Sea. From my arrival on 25 February until early in April, the prevailing winds came from the Caribbean, across the northern lowlands of Costa Rica and the crest of the range to our north. Sometimes these northeasterly winds blew steadily all day, occasionally attaining such force that they broke branches from trees and made bird-watching unprofitable. Since they had dropped most of their moisture while rising to the continental divide and were now blowing downward,

they did not bring much rain, but chiefly clouds and drizzle, which they drove through the trees, sometimes continuing for a day or two.

Sometimes, veering more to the southeast, the wind brought ash from erupting Irazú, 20 miles away. Early in the morning of 22 March, a strong easterly wind bore enough of the fine volcanic cinder to obscure the sun and cover all the vegetation with a thin layer of gray dust, which persisted, especially in ravines sheltered from the wind, until washed off by the hard rains which came two weeks later. Until my departure in July, there were occasional days when ash fell, although not nearly so much as on the Central Plateau southwest of the erupting volcano.

It was difficult to assess the effect of this volcanic cinder on the silky-flycatchers and other birds. A Black-cheeked Warbler (*Basileuterus melanogenys*), who had been building actively on 21 March, did not return to her work on the following morning when ash obscured the sun. Thereafter her nest was abandoned. A Flame-throated Warbler (*Vermivora gutturalis*), however, who had started her nest 10 days earlier, continued to attend it and brought forth her brood. For most of the local birds, the nesting season began later than I had expected; the ash may or may not have been responsible for this. On a visit to the Central Plateau in February of 1964, I was surprised by the number of birds of a variety of species that were living, apparently in good health, amid vegetation which for over 10 months had been almost constantly dusted with volcanic ash, which now in the dry season lay heavily on all the foliage.

Despite days of strong wind, drizzle, and falling cinders, there were many fine days at La Giralda in March of 1963. The wet season broke on the afternoon of 5 April, with a heavy rain, the first soaking downpour in a month. Westerly breezes now became common, and although they were rarely so hard as the northeasterly ones, they drove in the rain-laden clouds from the Pacific. As the rainy season advanced, sunny days became fewer. Often there were only a few hours of intermittent sunshine in the early morning, then mist and drizzle for the rest of the day, with perhaps a torrential downpour in the afternoon. Sometimes the wind shifted to the north or northeast and blew violently down the mountainside, driving the clouds.

In such inclement weather the silky-flycatchers, along with most of the other small birds, built their nests and reared their families. On 1 April I found my first pair of silky-flycatchers building, but I did not discover another building pair until 20 April, after which numerous nests were found. The last two of the 18 nests which I had under observation held half-grown nestlings on 6 July, when I left the farm. Thus, in 1963, the silky-flycatchers at La Giralda bred chiefly from late April to the end of

June, amid mist, chilling rain, and wind sometimes so strong that I expected their nests to be torn from the trees.

#### NESTING COLONIES AND TERRITORY

My earliest silky-flycatcher's nest, found under construction on 1 April and destroyed, apparently by a predator, on 21 April, was, as far as I could learn, the only nest in my study area to be completed in this interval. In late April, when nests became more numerous, I discovered that they were by no means uniformly distributed through apparently suitable habitats, but tended to be concentrated in loose colonies. The largest of these colonies occupied a fairly level tract of pasture, shaded by numerous small trees and a few large ones, at an altitude of about 7,400 feet above sea level. Here, in early May, there were four nests with eggs. Three of these nests formed the apices of a triangle whose sides were 160, 170, and 220 feet in length. The fourth nest was only 75 feet from one of these three. Six hundred feet from this group was a fifth nest which should perhaps be included in the colony, since 600 feet is a short flight for such wide-ranging birds as silky-flycatchers. Adjoining the area with the four nests was more shady pasture where a great many silky-flycatchers were commonly to be found foraging or resting in the trees, even at the height of the breeding season. Here I discovered no nest until later, after the four nests in the level area had been destroyed by one or more predators. This late nest was about 190 feet from a replacement nest in the colonial area.

About a quarter of a mile down the mountain from this colony I found a group of three nests, of which one was 150 feet and the other 225 feet from the nest which had been built first. Between these two colonies was a late nest that had no near neighbors.

After I had learned to expect silky-flycatchers' nests in groups, I was twice shown single nests by the ranger of the farm. In each case I looked for neighboring nests and found one. Once the two occupied nests were only 65 feet apart (Figure 4); in the other case the separation of the neighboring nests was 80 feet. Each of these pairs of nests was far from any other that we could discover. The second two, found in June, were among the latest nests that I saw, and they were the lowest on the mountain. They were situated in alder trees near the house, at an altitude of about 6,700 feet, where earlier in the season no nest could be found. All the earlier nests were considerably higher up the slope.

Because they live in the open, silky-flycatchers offer opportunities for the study of territorial behavior that are exceptional among the birds of the humid tropics, many of which nest amid dense, concealing vegetation. I saw no indication of territorial defense until after nest building had begun. Apparently, the silky-flycatcher does not first establish a territory and



Figure 4. Nest sites of Long-tailed Silky-flycatchers. A pair nested on the right side of the rounded leafy crown of the tree in the center, and at the same time another pair nested only 65 feet away in the nearest of the dying trees to the right. More than 3,000 feet below are the farms and coffee plantations of Costa Rica's Central Plateau.

then proceed to build, as many birds do, but first chooses a nest site and afterward defends the area around it. This area is poorly defined and extends around the nest for a distance of about 75 to 100 feet. The male, who while his mate incubates and broods spends much of his time on an exposed lookout perch near the nest, is chiefly responsible for territorial defense, but some females are hardly less active. Although in some birds each sex defends the territory only against intruding individuals of the same sex, in the silky-flycatcher this restriction is not observed: each sex drives away intruders of the opposite sex as well as of its own sex. The resident silky-flycatcher simply flies at the intruder, which retreats in much the same way as is often seen in a flock resting in a treetop before the nesting season begins. I never saw a trespasser resist expulsion, never a clash between birds, and never a prolonged chase except in one instance. This occurred when a pair with young was just beginning a second nest; one male chased another around and around in wide circles for possibly a minute, but they did not touch each other as far as I could see.

Not only does territorial defense in this silky-flycatcher seem to be a mere formality, it is a formality that is often neglected. Residents are frequently lax in warning trespassers to depart. One afternoon, while I watched a female incubate, I saw a male alight in a cornel tree close by the

nest and continue for some minutes to sing a medley of low, soft notes, punctuated by *che chip*'s. All this while, the resident male rested conspicuously on his lookout in a *Hedyosmum* tree about 70 feet away, without protesting the songster's presence. If I mistook the identity of these males, and the resident sang while an intruder occupied his lookout, the situation is still not what one expects in a territorial bird. Several other instances of lax territorial defense came to my attention.

An instance was just given of two nests with eggs only 75 feet apart. One of these nests was in a completely exposed position in the top of a small tree, whereas the other was in the lower part of the crown of a myrtaceous tree with dense foliage, where it was better concealed than any other silky-flycatcher's nest that I found. The premature destruction of these nests by predators prevented my learning in which of them the eggs were laid first, but I surmise that it was the exposed nest. The second pair perhaps chose the very secluded site to escape the vigilance of the first pair. In the case of the two nests only 65 feet apart, both were in exposed sites. They seemed to be of about the same age. Since they were not found until the young hatched, I could not learn how this situation arose.

The silky-flycatcher's nest (my no. 4) to which I devoted most attention was situated about 40 feet up in an exposed site. While watching the female incubate on 5 May, I several times saw a silky-flycatcher take material to a secluded site at the bottom of the compact crown of a small tree 90 feet from nest 4. Whenever I could distinguish the sex of the builder, it was a male. At the day's end, there was a small accumulation of nest material on this low limb. In the following days I looked for building to continue but I saw no more material added to this incipient nest, which failed to increase noticeably in size. Finally, while watching the birds of pair 4 attend their young three weeks later, I again saw a silky-flycatcher carry material to the low site, and each time that I could distinguish the carrier's sex, it was a male. This bird evidently had no mate. He sat on the scanty accumulation in the nest site and made shaping movements. The female of nest 4 was antagonistic to him, and thrice she left the nestlings she was brooding in order to chase him away. He fled promptly whenever he saw her approach. Frequently, in her absences from her nest, the female went to this tree, which was not a favorable base for flycatching, as though to assure herself that the would-be builder was absent. After being chased away several times, he did not return. As far as I saw, male 4 paid no attention to this lone male, possibly because his lookout perch was farther from the incipient nest than was the nest where his mate sat brooding and he failed to notice the intrusion.

The area mildly defended by a pair of nesting silky-flycatchers is a breeding territory but not a feeding territory. It is true that much of the

insect food for themselves and their young is gathered in or near this area, which, when the sun shines, seems a place as good as any other for catching flying insects. But for the berries which the parents need in increasing numbers as their nestlings grow, they commonly fly afar, until lost to view. If on these excursions they pass over the territories of other pairs, they are rarely chased; it is chiefly perching trespassers who are sent on their way. One pair which built in a fruiting tree of *Citharexylum Mocinnii* incidentally established a feeding as well as a breeding territory. The berries in this tree now became unavailable to other silky-flycatchers, which were chased from it. When the little gray Mountain Elaenias (*Elaenia frantzii*) that were ubiquitous in the pastures came to eat berries, sometimes these smaller birds were mildly chased but mostly they were ignored by the silky-flycatchers.

In choosing the sites of their nests, the silky-flycatchers show the same poorly integrated mixture of individualistic and social tendencies that we noticed when discussing their flocking habits. They like to build in sight of each other; but their colonies are of the loosest sort, and some pairs build far from neighbors. Aside from providing the company which silky-flycatchers appear to enjoy in moderation, the propinquity of nests permits them to warn their neighbors of the approach of enemies and to unite in chasing them (see p. 415).

#### THE NEST

*Nest site.*—On 29 April 1950, I found a pair of silky-flycatchers building in an oak at an altitude of about 9,500 feet on Volcán Irazú but, aside from watching them for a short while, I was unable to study this nest. At La Giralda in 1963, I saw 18 nests, all of which, with one possible exception, received eggs. All of these 19 nests were situated in trees or, rarely, large shrubs that stood in shady pastures. The sites were isolated from nearby trees, one or several of which were usually not far away. These nests ranged in height above ground from 6 to an estimated 60 feet. Probably no eggs were laid in the highest nest, since I never saw a bird sitting there after its completion. The second highest nest was 40 feet above ground. Ten of the nests were between 10 and 20 feet up. Only two were below 10 feet, at heights of 6 and 9 feet. The average height of the 19 nests was about 22 feet.

The nest of the species is rather bulky and becomes heavy when soaked with rain. Accordingly, it needs a fairly substantial support. Often it is placed in a fork of a more or less erect branch, or even on top of the main stem of a small tree, where it divides into ascending branches. One of the highest nests was built between the bases of four thin branches diverging from the end of a long ascending branch, where it was so well anchored



Figure 5. Long-tailed Silky-flycatcher's nest six feet up in the top of a stunted tree, draped with the beard-lichen of which the nest is made.

that it remained for over two months, despite the gales that sometimes whipped the exposed treetop. Other nests are situated on fairly stout horizontal or slightly ascending primary branches at or near the bottom of a tree's crown, at points where upright twigs provide lateral support. Usually such nests are far out from the trunk, but sometimes they are within two feet of it. None of the nests that I saw was in contact with a thick trunk.

Two of the nests were excellently concealed all around by clustering leaves. Several others, at the bottoms of the crowns of trees with abundant foliage, were well screened above but not difficult to see from the ground. Most of the nests were very poorly concealed; five were quite exposed to the sky and most inadequately screened at the sides (Figure 5; see also Figure 7). Most of the nests could be easily seen from a distance, if one knew what to look for. But they were, as a rule, made to blend so well with their surroundings, in a manner presently to be described, that one needed to train his eyes to discern them.

*Nest building.*—On 28 May I watched a pair of silky-flycatchers with dependent young begin a nest in an alder tree. The male brought material and deposited it in a crotch which seemed empty; possibly I saw him place the very first piece there. After he had brought three or four additional contributions, his mate carried something to the site. Thereafter, both sexes fetched and arranged materials, but the male more often than the female. This observation suggested that the male chooses the site—which

in this case was soon abandoned in favor of a better one—and begins the nest. An instance of an apparently unmated male starting a nest has already been given. In the related *Phainopepla*, the male starts a nest before he wins a mate, and if he finishes the structure without securing a partner, he may begin another. If a female joins him, she helps to complete the nest (Rand and Rand, 1943).

Although we lack sufficient evidence to assert that the male Long-tailed Silky-flycatcher commonly begins the nest, there is no doubt that, after it is well begun, both sexes work actively at it, taking rather equal shares in the task. I have watched six nests during construction, and at each of them both sexes were building.

All the materials used in construction were gathered from trees or high bushes; I never saw a silky-flycatcher alight on the ground for this or any other purpose. The chief component of all the nests was a beard-lichen that closely resembles the *Usnea barbata* familiar in northern woods. This pale gray, profusely and finely branched, fruticose lichen grew abundantly on nearly all the trees and stumps at La Giralda. Usually it formed compact tufts a few inches high but on shady branches sheltered from the wind it might become a pensile skein 30 inches long. The silky-flycatchers gathered this lichen either while perching or while hovering beneath the branch that bore it. Sometimes, flying up beneath a lichen, a builder seized it in his bill and, closing his wings, threw his weight upon it in order to break it off. To collect these lichens was no easy task for these weak-billed birds, who were often content to fly to the nest with a scarcely visible fragment that they had succeeded in detaching. Once I saw a female secure a prize, a strand of gray lichen as long as herself, but she lost it among the branches of an alder tree on the way to the newly begun nest. Sometimes the builder added piece to piece in its bill before it went to the nest. Usually the lichens were brought from a distance, but sometimes they were plucked from near the nest site, which was imprudent as they were needed to conceal the nest.

Cobweb or caterpillar silk was gathered from bark and foliage to bind the lichens together, and a few twigs or pieces of dry inflorescences were sometimes brought to mix with them. Foliose lichens were also collected for the nest, but they were at best a minor ingredient.

A peculiar aspect of the silky-flycatchers' building procedure was that each partner arranged in the nest the contributions it brought, even when it found its partner sitting there, shaping the structure. Many building birds would have saved time by passing the material to the partner already engaged in shaping the nest and going off for more, but not so with the silky-flycatchers. One male, finding his mate in the nest when he arrived with a lichen, seemed eager to enter it, but she remained a good while.



Twice he appeared to offer his billful to her but she would not take it; so he waited longer, until finally she left and he could arrange what he had brought. Only once in hours of watching at several nests did I see one partner receive material from the other; in this case the female, sitting in the nest, took a dry stick-like fragment from her mate and placed it in the structure.

To convert the bushy lichens into a compact, felt-like mass required some vigorous work, which seemed to be done chiefly with the feet. Sitting in the nest, the builder of either sex depressed its breast and evidently kicked or kneaded with its feet, which of course were invisible to the observer. After doing this for a short while, the bird would turn sideward and repeat the performance, until, alternately turning and depressing its breast while it seemed to kick or knead, it had in some instances made a complete turn; and once it rotated, little by little, through about 450 degrees. The builder might turn either rightward or leftward. While engaged in shaping the nest, the silky-flycatcher often lowered its crest, sometimes laying the crest feathers quite flat, so that they projected only a little at the back of the head. As the bird pressed its breast deep into the nest, one or both wings were raised slightly above its back, with the remiges somewhat spread. The bill was used chiefly to arrange materials on the outside of the nest and to spread cobweb over the rim.

When building was most active, visits to the nest followed in rapid succession, and often as soon as one partner left the other took its place. One pair made 42 visits in the hour from 0750 to 0850 hours and 22 visits in the following hour. On the following morning these two birds made 14 trips to the nest in the quarter-hour from 0825 to 0840, while the sun was shining through a thin mist and fine drizzle. Then the cloud-mist became dense, and work was suspended for half an hour. At 0910, when a little sunshine found its way through the clouds again, the birds resumed work and brought material 17 times in the next quarter-hour. The pair that built the earliest nest made 31 trips from 0658 to 0758, their first hour of work on 2 April. On the preceding day, just after I discovered them building, they had made 45 visits in the two hours from 0830 to 1030. Still another pair brought material to their nest 34 times in about 50 minutes.

Building silky-flycatchers seemed indifferent to my presence and sometimes continued their work while I stood a few yards below them. One pair started two nests, in similar sites about two feet apart on a horizontal lower limb of an alder tree, but they finished only the inner nest. Among birds, such confusion between two or more sites is not uncommon on man-made structures that offer a number of almost identical sites for nests,

such as the exposed ends of rafters or the rungs of a ladder, but it is rare in the more varied situations offered by natural environments.

I am unable to give the exact time required for building a nest, but at an inaccessible nest found at an early stage of construction on 24 April, incubation (probably only of the first egg) had begun by 30 April. A replacement nest seemed to be finished four or five days after the eggs were lost from the first nest.

*Nuptial feeding.*—Not only does the male Long-tailed Silky-flycatcher take his full share in the work of building, he also feeds his building mate. This nuptial feeding usually occurs, not while the birds are actively working, but while they perch in neighboring trees resting from their labor. The male may then fly out, catch one or more insects in the air, and pass them to his partner. A minute or two later he may repeat his gift. At one nest, however, I saw the male feed his mate twice in the course of two hours, while they were busily building. On one occasion he offered her food as she approached the nest with material for it in her bill. I did not see clearly what she did with this inedible stuff, but the vigorous swallowing movements that she made suggested that she ate it along with the food.

The nuptial feeding which is begun during the period of nest construction, if not earlier, continues during the periods of laying and incubation.

*The finished nest.*—This silky-flycatcher's nest is a beautiful structure, unlike any other bird's nest that I have seen. It is a broad, open cup, made almost wholly of a single kind of light gray beard-lichen (*Usnea*), compacted into a firm, thick, resilient fabric (Figure 6). Mixed with the lichen are often a few fine twigs, dry flower stalks, and similar pieces; but in the nests that I have examined, these are at best a minor and inconspicuous ingredient. Pieces of foliaceous lichen, gray on the upper surface and brown or blackish below, seem always to be present, and on some nests they are rather liberally attached over the outer surface, as on certain hummingbirds' nests. Tufts of cocoon silk are included in the mass and applied to the rim, but hardly in sufficient quantity to be of much help in binding the nest together: cohesion is obtained chiefly by the felting or intertangling of the innumerable fine branches of the predominant fruticose lichen. The broad rim is neatly rounded. Unlike most birds' nests, this has no special lining; the inner surface of the cup is composed wholly of the same lichens that make up its bulk. As long as a nest is in use, this surface is as hard, smooth, and firm as though it were coated with plaster; but in an abandoned nest, alternate wetting and drying loosens and roughens the inner surface. When thoroughly soaked with rain, the nest becomes very soft and tends to lose its shape.

Three nests measure  $4\frac{1}{2}$  to 5 inches (11.4–12.7 cm) in over-all diameter by 2 to  $2\frac{1}{2}$  inches (5.0–6.4 cm) high. The cavity is  $2\frac{1}{4}$  to  $2\frac{1}{2}$  inches (5.7–

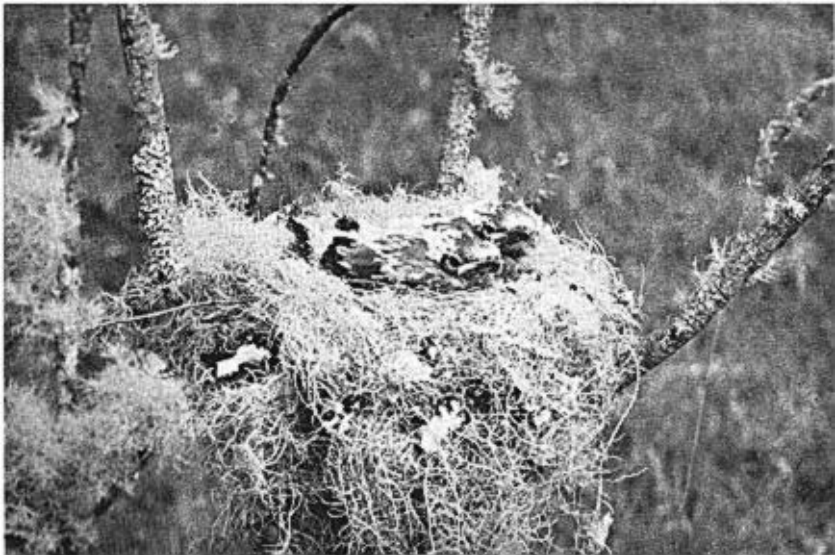


Figure 6. Nest of Long-tailed Silky-flycatcher, composed almost wholly of beard-lichen (*Usnea*). This abandoned nest was removed to a lower site for photography and the nestlings, 18 days old, placed in it temporarily.

6.4 cm) in diameter by 1 $\frac{3}{8}$  inches (4.1 cm) deep. Air-dry, these nests weigh 25, 28, and 40 grams. They were collected after predators had taken the unhatched eggs.

*Concealment.*—As has already been mentioned, silky-flycatchers' nests are only exceptionally built amid dense screening foliage; often they are fully exposed. They escape detection by being placed on branches overgrown by the same kind of lichen of which they are composed, and which grows profusely on the more exposed parts of the trees in the region where this study was made. There is much variation in the amount of beard-lichen surrounding the nests; some are placed amid sparse growths, and unless they have additional means of concealment, such as being surrounded by foliage or blending with the gray bark of the supporting branch, these nests are fairly conspicuous. Other nests are superbly camouflaged. One that was particularly hard to find was on a dying lower bough of a flourishing, umbrageous *Citharexylum* tree. The bough was richly branched, and the branches were overgrown with a profusion of the beard-lichen, in the midst of which the nest was set.

One morning the behavior of parents made me certain that their nest was nearby, but for a long time I searched fruitlessly for it. Yet this nest was all the while in plain view, nine feet up in the top of a small, sparsely



Figure 7. Dying shrub in which Long-tailed Silky-flycatchers successfully nested. The nest composed of lichens, at the very center of the photograph, can hardly be distinguished from the lichens and liverworts which heavily drape the gnarled branches.

branched, dying shrub with scanty foliage (Figure 7). What made it particularly hard to detect was the long streamers of beard-lichen that hung down all around it—a feature which most nests lacked. Although they seemed to be part of the nest itself, these long beards had doubtless been growing there before the birds started to build. Many similar beards, and large tufts of a blackish liverwort, grew lavishly over all the gnarled branches of the blighted shrub.

#### THE EGGS

In four instances, the interval between the apparent completion of the nest and the laying of the first egg was two, two, three, and four days. The longest interval was at a nest which had been built to replace one from which the eggs disappeared when they were almost ready to hatch. At the two nests where I timed the laying of the eggs most carefully, the first was laid early in the morning and the second considerably later on the following morning. At nest 3 the first egg was laid before 0723 hours, the second between 0814 and 0950 on the next day. Nest 5, which was empty at nightfall on 5 May, held one egg at 0735 on 6 May. The second egg was laid while I watched the female sit from 0928 to 1017 on 7 May. Thus in these cases the interval between the deposition of the two eggs

which constitute the set was about 26 or 27 hours. Although many small birds lay their eggs at about 24-hour intervals, other exceptions have been noticed. In two species of finches which commonly lay sets of two eggs, the Green-backed Sparrow (*Arremonops conirostris*) and the Buff-throated Saltator (*Saltator maximus*), the first egg is generally deposited early in the morning and the second considerably later on the following morning (Skutch, 1952), just as in these silky-flycatchers.

Both of the above-mentioned silky-flycatchers were fed by their mates while they sat in the nest to lay their eggs. The female of pair 5 was given insects twice in the course of the continuous 49-minute session within which she laid her second egg.

With a single exception, each of the 15 nests whose contents I could determine held two eggs or nestlings. The exceptional nest had a single egg on the point of hatching when I found it; a second egg may have been lost. The eggs are long-ovate and rather pointed, and the shells are without much gloss. The ground color is pale gray, of a shade that almost matches the bed of lichens on which the eggs lie. On this gray background, blotches and spots of shades of dark brown and pale lilac are variously distributed. Often there is a distinct belt of heavy brown pigment around the thickest part of the egg, very evident when the eggs are viewed in a mirror held far above the observer's head. In one nest, one egg was heavily blotched and speckled with brown on the thicker end but more sparingly marked toward the sharper end. The companion of this egg was thickly speckled all over. Usually the sharper end of the egg is relatively free of brown pigment. The measurements of 10 eggs average 25.8 by 17.2 mm. Those showing the four extremes measured 26.9 by 17.5, 24.3 by 17.8, and 25.0 by 16.4 mm.

#### INCUBATION

Only the female incubates. In many hours of watching at eight nests containing eggs or young that required brooding, I never saw the male sit in the nest that he had helped to build.

*The beginning of incubation.*—Incubation begins soon after the first egg is laid. At 0926 hours on 6 May, I began to watch a nest in which the first egg had been deposited earlier that same morning. In the following two hours, the female sat six times, for 3, 7, 5, 14, 15, and 8 minutes, or a total of 52 minutes. Thrice she left the nest as her mate approached with food for her. After looking in at the egg, he either ate the food or carried it away. This female had not yet learned to take food from her mate while she sat, and she incubated with far less than full constancy. When I left at 1126 hours, she had been absent for 32 minutes and was still out of sight.

On 26 April I watched a neighboring nest on the morning of the day after the first egg was laid, before the deposition of the second egg. In the 131 minutes following 0603 hours, this female sat six times, for 17, 20, 11, 8, 11, and 16 minutes, or a total of 83 minutes. She was already approaching full constancy in incubation. Her mate did not feed her in this interval.

*Posture of the incubating female.*—The Long-tailed Silky-flycatcher's nest is shallow, and much of the incubating female's body rises above its rim. Her long tail is held almost horizontally and projects far beyond the nest. She sits with her high, peaked crest more or less depressed, but she does not always keep it at the same level while in the nest. Some females tend to hold their crests rather flat while incubating, whereas others keep them more than half raised. As night approaches, however, all that I watched laid their crests quite flat, greatly changing their aspect. At the same time, they fluffed out the feathers of the breast and flanks until they extended sideward beyond their folded wings. I would find them in this posture again at dawn. Also, when rain fell, the females incubated with flattened crest.

*Patience and constancy.*—The incubating silky-flycatcher becomes active rather late in the morning, returns from her last outing early in the evening, and during the short day thence resulting, she sits with unexpected constancy (Table 1). Often she remains resting quietly on her eggs in the growing daylight for half an hour or more after other birds begin to sing and forage. For an hour after I saw other silky-flycatchers in flight, the female in nest 18 continued without any breakfast to warm her eggs. All five of the incubating females that I watched as the day ended settled down for the night long before sunset, from 1620 to 1658 hours, when there remained an hour or more of daylight in which they might have foraged. Other silky-flycatchers, including the incubating females' mates, were seen flying about more than an hour after the females had ended their active day.

In analyzing the incubation patterns of birds, it is useful to distinguish *patience* from *constancy*. *Patience* is measured by the lengths of the separate sessions or continuous intervals of sitting, *constancy* by the percentage of the day that the eggs are kept covered. A bird may incubate very impatiently, taking many short sessions, yet manifest high constancy if her absences are considerably shorter; or she may sit quite patiently, for many minutes or even hours together, yet with low constancy, if her recesses are almost as long as her sessions. The six Long-tailed Silky-flycatchers that I watched during incubation varied greatly in patience but, with one exception (nest 17), all displayed remarkably high constancy. The most impatient sitter was female 4, who left her nest 45 times in one day. A third of her sessions lasted less than 10 minutes and the average length of all her

TABLE 1  
ALL-DAY RECORDS OF INCUBATION BY FIVE FEMALE LONG-TAILED SILKY-FLYCATCHERS

Item	Nest 2	Nest 3	Nest 4	Nest 18	Nest 19
	<i>Date in 1963</i>				
	<i>12 April</i>	<i>3 May</i>	<i>5 May</i>	<i>23 June</i>	<i>19 June</i>
First departure	0608	0545	0535	0626	0550
Last return	1620	1658	1638	1626	1636
Length of active day <sup>1</sup>	10h12m	11h13m	11h3m	10h0m	10h46m
Sessions					
Number	26	36	44	14	8
Range in minutes	3-41	4-68	2-30	6-136	45-102
Total in minutes	494	545	561	523	542
Average in minutes	19.0	15.1	12.8	37.4	67.8
Recesses					
Number	27	37	45	15	9
Range in minutes	2-11	1-6	1-5	1-10	4-17
Total in minutes	118	128	102	77	104
Average in minutes	4.4	3.5	2.3	5.1	11.6
Constancy <sup>2</sup>	81%	81%	85%	87%	84%
Feedings by male	7	8	13	0	1

<sup>1</sup> In hours and minutes.

<sup>2</sup> Based on total time in nest.

sessions was only 12.8 minutes. But during the whole day, she never stayed away from her nest for more than five minutes together, and her recesses averaged only 2.3 minutes. At the other extreme was female 19, who left her nest only nine times in one day, but took much longer outings, averaging 11.6 minutes; her constancy of 84 per cent was slightly less than that of the more active female 4, who sat for 85 per cent of the day.

It will be noticed in Table 1 that the two females that I watched incubate late in June sat far more patiently than the three that I studied in April and early May. This difference may have been caused by differences in diet. When the silky-flycatchers fed on insects, they often caught them near the nest, whereas they usually flew out of sight for berries. During their infrequent recesses, females 18 and 19, whose late nests were close together, flew down the mountain until beyond view, doubtless to gather berries, which seemed to be more abundant in June than early in the wet season. Females 3 and 4 caught more insects near their nests. As a rule, frugivorous birds of various kinds sit more patiently as well as more constantly than those whose diet is largely insectivorous, as in many American flycatchers and wood warblers. Likewise, it was more economical for the silky-flycatchers who flew afar for their food to stay long enough to eat a full meal, whereas those who could dart off their nest and catch an insect could eat more frequently without loss of time and effort. For the exceptionally low constancy of female 17 on 26 June (Table 2) I can suggest no explanation other than that she was a restless individual.

TABLE 2  
INCUBATION DURING FORENOON BY SIX FEMALE LONG-TAILED SILKY-FLYCATCHERS

	<i>Nest</i> 2	<i>Nest</i> 3	<i>Nest</i> 4	<i>Nest</i> 17	<i>Nest</i> 18	<i>Nest</i> 19
	<i>Date in 1963</i>					
	<i>12 April</i>	<i>3 May</i>	<i>5 May</i>	<i>26 June</i>	<i>23 June</i>	<i>19 June</i>
Record began	0608	0545	0535	0657	0626	0550
Length of record <sup>1</sup>	6h0m	6h10m	6h 21m	4h49m	5h43m	5h33m
Sessions						
Number	16	23	28	15	11	4
Range in minutes	3-41	4-20	2-19	1-30	6-47	54-76
Average in minutes	17.9	12.2	11.3	12.6	25.7	65.3
Recesses						
Number	16	24	29	15	11	5
Range in minutes	2-11	2-6	1-5	1-16	2-10	12-17
Average in minutes	4.6	3.7	2.2	6.7	5.5	14.4
Constancy	80%	77%	84%	65%	83%	82%
Feedings by male	5	4	9	0	0	1

<sup>1</sup> In hours and minutes.

At the season when the silky-flycatchers nested, most of the rainfall came in the afternoon, when dense cloud-mist often covered the mountain even when no rain was falling. Mornings tended to be clearer, although even then mist and drizzle were frequent and sometimes showers fell. Taking advantage of the more favorable weather, the incubating silky-flycatchers did most of their foraging in the forenoon and sat more steadily in the afternoon, which in any case was, as an active period, rather short for them, because they settled so early on their nests for the night.

How did their constancy during the part of the day when they were most active compare with that of other birds? To answer this question, I made a separate analysis of the incubation behavior, during the forenoon only, of the five females that I had watched all day and of one other that I watched more briefly (Table 2). Although their constancy during the forenoon was somewhat less than that for the entire day, even then four of them achieved 80 per cent or more. As I pointed out elsewhere (Skutch, 1962), relatively few small birds incubate with a constancy in excess of 80 per cent. Whether we make the comparison on the basis of all-day records or of records for the forenoon only, we must credit the Long-tailed Silky-flycatcher with exceptionally high constancy in incubation. Of the small birds that I have studied, only the manakins (*Manacus aurantiacus* and *Pipra* spp.) showed such consistently high constancy (see Skutch, 1962, Table 2). Manakins are much smaller than silky-flycatchers, but, like them, they subsist on a mixture of insects and many berries.

*The male's role.*—While the female incubates, her mate spends much time resting on a particular exposed perch, often a dead branch, in the top



of a neighboring tree, or sometimes in the nest tree itself, if it has a widely spreading crown. From this lookout he makes sallies to chase away intruding birds of his own or other kinds and to catch insects, some of which he takes to his partner. Frequently he calls *che chip*, but he rarely sings, and then in a scarcely audible whisper. When the female flies off to gather berries, he may either accompany her or remain on his lookout. When she returns, he sometimes escorts her almost to the nest, but often he neglects this courtesy. For long intervals, he is out of sight while his mate incubates.

The high constancy of the incubating female silky-flycatcher does not appear to depend upon the food which she receives from her mate and the consequent reduction of the time that she must devote to foraging. As will appear from the last line of Tables 1 and 2, males fed their incubating partners more or less frequently early in the season but scarcely at all late in the season; yet females who received little or no food from their mates sat as constantly as those who were fed often (with the notable exception of erratic female 17). The importance of nuptial feeding in the silky-flycatcher seems to be in maintaining the pair bond, and keeping the male informed of happenings at the nest, rather than in substantially reducing the time that the incubating female devotes to foraging, as in goldfinches, siskins, jays, and some other birds. I think that the female silky-flycatchers that I watched at their nests could have collected in a few minutes as much food as their mates gave them in the course of a day.

Males fed their mates either on or off the nest. Male 4, who gave his mate food more often than any other that I watched, 13 times in a day, was seen to feed her only at the nest, either in the midst of a session or as she was about to resume sitting after an excursion. Sometimes she flew from the nest as he arrived to feed her, and then he would wait beside it until she returned a few minutes later. Male 3 fed his mate four times at the nest and four times after she had flown from it. All the seven feedings which I credited to male 2 were made at the nest. Observation at this nest was difficult because of the dense foliage amid which it was situated, and perhaps I missed some feedings. It is also possible that, in this and other pairs, I failed to record some feedings because they occurred while the birds were foraging together beyond my view. Although occasionally the male gave his mate a berry, far more often the meal consisted of insects, which he might carry in his distended throat as well as his bill and pass to her in two or three installments. Once a female quivered her wings like a fledgling while her mate fed her as they perched side by side in a tree. Usually, however, the female received the offering undemonstratively.

*Anticipating the nestlings.*—Sometimes the male followed his mate as she returned from a recess and fed her as she was about to resume incubation.

At other times, the male went to the nest while the female was absent, as possibly he was well aware, and waited beside it until her return, when he gave the food to her. While awaiting the female's return, he sometimes lowered his head into the nest, as though inspecting the eggs; or possibly he offered food to them, conceivably in an anticipatory fashion.

While female 5 was sitting in the nest to lay her second egg, her mate brought her some insects. Holding them in her bill, she rose up and seemed to offer them to her egg(s), then settled down in the nest and ate the insects. After taking several insects from her mate while she incubated, female 3 rose up with one in her bill and, bending down her head, uttered low, throaty notes, as though coaxing the eggs to take food. When female 18 returned from an excursion late in the morning of 23 June, she was preceded to her nest by her mate. She held in her bill an insect which for a moment she seemed to offer to her eggs, possibly an example of anticipatory food bringing. This occurred in the middle of the incubation period.

*Incubation in a storm.*—As noted above, even early in the rainy season when the silky-flycatchers were nesting, the wind sometimes shifted to the northeast or north and blew strongly. One of these windstorms arose while I watched nest 18 on 23 June. Throughout the forenoon, bright sunshine had alternated with intervals of cloudiness and brief flurries of fine drizzle. Soon after the female's return to her eggs at 1216, rain began and continued for about an hour, varying from a drizzle to a moderately heavy shower. The rain was driven by a northerly wind that was frequently violent, while thunder rolled heavily in the distance. I tried to keep myself dry with an umbrella, which I held pointing into the gale; but a sudden boisterous reverse gust caught its concave side and turned it inside out. After the rain stopped, the wind continued to blow violently until late in the afternoon.

Early in the rainstorm, the silky-flycatcher incubating before me had spells of shaking or trembling, especially noticeable in the movements of her tail and wings. After a while, these spells ceased. During most of the storm, she sat in her nest almost transversely to the wind's prevailing direction. Although her long, exposed tail, presented edgewise to the wind, remained almost straight, the slender projecting ends of the two central feathers were blown strongly to her right. She seemed to have a hook on the end of her tail! When the wind blew most fiercely, she was pressed against the leeward side of her nest. She seemed to be holding on with her feet and straining to maintain her position in the cup. For two hours and sixteen minutes she stuck resolutely to her post, achieving the longest diurnal session of an incubating silky-flycatcher that I timed. At 1432 she left in a lull in the gale, for a recess of only six minutes, from which she returned as the wind increased in intensity. Throughout the day, she

was absent from her eggs only 77 minutes. This was much less time than any other female had devoted to foraging in the course of a day, and I doubted whether she could incubate so constantly for several days in succession (see Table 1). The sideward bend of the tips of her central tail feathers persisted until the next day.

From the point where I sat to watch this nest, I could see neighboring nest 19 when the wind blew aside the foliage that obstructed my view. The female of this nest also sat continuously through the worst of the storm, for about as long as her neighbor in nest 18. She sat facing into the wind and was widely tossed on her long horizontal bough. When the wind abated temporarily, both females left at the same time, and they returned together when the wind's velocity increased again. By such steadfast sitting through violent storms that threaten to tear them from their nests or their nests from the trees, Long-tailed Silky-flycatchers succeed in rearing their broods in the frequently severe weather of the high mountains where they dwell.

*Length of the incubation period.*—At nest 8, the second egg was laid between 0730 and 1100 on 18 May and the second nestling hatched between 0800 and 1115 on 3 June, giving an incubation period of 16 days  $\pm$  3 hours. At nest 17, the second egg was laid before noon on 10 June, and it hatched in my presence at about 0845 on 27 June, after an incubation period of approximately 17 full days. Probably the eggs in nest 17 took longer to hatch because the female sat far less constantly than the other silky-flycatchers studied (see Table 2).

#### THE NESTLINGS

*Hatching.*—When I raised the mirror above nest 17 at 0705 hours on 27 June, it revealed a single dark-skinned nestling, so recently hatched that its short, white down was not yet dry. The shell from which it escaped had already been removed, and beside it lay an unhatched egg.

I sat on the thick pasture grass beneath a neighboring tree to watch. The female silky-flycatcher promptly returned to feed and then brood the nestling. After brooding for six minutes she left, and after an absence of seven minutes she returned to feed and brood again. Neither her sessions nor her excursions were long, and meals were frequently delivered. Once while offering food to the nestling she uttered low, clear notes. A little later she returned with empty bill and voiced more of these notes while standing on the rim of the nest looking down at the nestling. She settled down to brood, but frequently she rose up to look beneath herself and utter more of the same soft notes.

At 0731, the male followed his mate to the nest tree. At 0758, when the female was frequently rising to look down into the nest and utter low notes,

the male perched about three feet from her, remaining for about a minute. At 0830, he alighted about one foot from the nest, whereupon the brooding female left. After a minute's delay, he advanced to the nest and looked in, calling *che chip, che chip*. Finally, he bent down and seemed to give the nestling something small. He uttered more *che chip*'s. Meanwhile, the female had returned and flitted restlessly around him. When he continued to stand beside the nest, doing nothing, she pushed in front of him to feed and brood. Then he flew away.

The newly hatched nestling and the hatching egg required much warming, because the sun, which shone brightly when I arrived, had already been obscured by the gathering clouds, and a chilling wind sprang up. After feeding the nestling to the accompaniment of many soft notes, the female resumed sitting at 0847. A minute later, she picked up the cap of an empty shell and dropped it outside the nest, thereby telling me that the second egg had hatched, after 17 days of incubation. Then the female sat most restlessly, constantly rising up to look into the nest, while her mate perched in the top of the nest tree. At 0859, she picked up the main part of the empty shell and flew from the nest with it, the male following her. This was the only time I ever saw a silky-flycatcher carry waste from the nest in its bill.

*Brooding and feeding.*—The tempo of brooding and feeding the nestlings varied from nest to nest, no less than the tempo of incubating. The rate of bringing food, even by the male, was, during the nestlings' first days, so strongly influenced by the female's manner of brooding that these two aspects of parental care cannot profitably be considered apart.

As an example of a high rate of bringing food associated with frequent departures by the brooding female, we may take nest 4, where the female had incubated with slight patience but high constancy (see above), and had often been fed by her mate (Table 1). Since this nest was far above my reach, until the nestlings were some days old and I could see them above the rim of the nest, I had to infer what it contained from the behavior of its attendants. When I began to watch it at 0700 on 19 May, it held nestlings (later determined to be two) which had hatched within the last three days. The female, which had taken short sessions while incubating, was now coming and going even more frequently (Table 3). On two-thirds of her 28 returns to the nest she brought food for the nestlings. Her long-tailed mate fed them even more often, 26 times in four hours. On 12 occasions the brooding female flew from the nest as he approached with food. If she did not promptly go, he sometimes waited near the nest until she left, then proceeded to feed the nestlings. Or, sometimes, he gave her some of the insects which he carried in his mouth and throat and then, when she rose up to pass this food to the nestlings beneath her, thereby

TABLE 3  
 BROODING AND FEEDING OF NESTLING LONG-TAILED SILKY-FLYCATCHERS  
 AT SEVERAL NESTS DURING FOUR HOURS OF THE MORNING<sup>1</sup>

Number of nest and age of nestlings <sup>3</sup>	Brooding by female				Meals brought		
	No. of ses- sions	Range in minutes <sup>2</sup>	Total time in minutes	Per cent of time	Male	Female	Both
Nest 4 (1-2 days)	28	1-10+	156	65	26	18	44
Nest 8 (1 day)	8	10-30+	163	68	5	4	9
Nest 9 (1-2 days)	4	19-118+	222	93	4	4	8
Nest 17 (Few hours)	24	0.5-18	136	57	3	21	24
(2 days)	26	0.1-17+	131	55	3	27	30
(7 days)	27	0.5-9	58	24	8	29	37
Nest 19 (7 days)	6	6-39	163	68	7	6	13
Nest 4 (7-8 days)	25	1-11	110	46	25	23	48

<sup>1</sup> The watches extended from approximately 0700 to 1100 hours, except at nest 19, where the period of observation was 0800 to 1200.

<sup>2</sup> A plus sign (+) indicates that the longest session extended beyond the observation period.

<sup>3</sup> In each case two nestlings were present, except for part of the first morning at nest 17.

exposing them, he gave the remainder of the insects directly to them. This method of delivering the food, which we may for brevity designate as "shared feeding," was followed on 8 of the 26 occasions when he fed the nestlings. The male silky-flycatcher seemingly desires to feed the nestlings himself, but of course he cannot do so while his mate covers them. Intentionally or not, by surrendering part of his food to her, he causes her to rise up, thereby effecting his purpose.

These nestlings a day or two old were fed almost wholly on insects which the parents caught in the air, often near the nest, with spectacular aerial evolutions. Frequently a number of insects were brought at one time, some projecting from the parent's bill but others held inside the mouth or throat. At only one meal did I see berries passed to the nestlings, by their mother.

Another nest with rapid feeding was number 17. On the day before her eggs hatched, the female of nest 17 had incubated with slight patience and by far the lowest constancy of all the incubating silky-flycatchers that I watched (Table 2). In four hours, her mate had not once fed her. On the morning when her eggs hatched, she continued to go and come with great frequency, and on most of her returns she appeared to feed her nestlings, although I did not always detect food in her bill. This was probably because the insects were small and I was a good distance away. This female

was obliged to carry a double load, because she received little help from her mate. On several occasions he approached the nest with food in his bill and delayed there (once for four minutes), uttering low notes, while his partner continued to brood. When finally she flew off, he followed her, instead of giving the nestlings what he had brought for them. He fed them only three times in four hours, twice by "shared feeding." Both this male and his mate had equally short tails, with the central rectrices projecting but little beyond the others. Their nest was the latest but one of all that I found. These facts, coupled with the male's inefficiency, led me to believe that he was a young bird breeding for the first time. In several other species, including the Black-legged Kittiwake (*Rissa tridactyla*) and the Blackbird (*Turdus merula*) it has been found that birds nesting for the first time make less efficient parents than do experienced breeders (Coulson and White, 1958; Snow, 1958).

Two days later, this short-tailed male had not improved as a parent. He brought food to the nest only three times in four hours, during which his partner fed the nestlings 27 times and brooded them for 55 per cent of the observation period. On one occasion she fed the nestlings once, darted out from the nest to catch more insects which she again took to them, then repeated this performance, making three feedings in quick succession, after which she brooded. Of all the females that I watched attend their young, she was the most vocal, often uttering low, soft notes while she stood above her nestlings, offering food. Once while brooding she voiced low *chip*'s.

I watched this nest again on 4 July when the two nestlings were seven days old. In four hours of the morning, the short-tailed male now brought food 8 times, while his busy partner did so 29 times. During the first two hours of my watch on this day, the sun shone brightly, and the female nourished her nestlings and herself chiefly with flying insects that she caught near the nest. By mid-morning the clouds had drifted up the mountainside and enveloped the trees in their cold gray mist. Now most of the parents' foraging was done out of sight down the slope. Meals were delivered less frequently but became larger, sometimes consisting of five, six, or even seven installments. Nevertheless, the nestlings grew very hungry and stretched up their gaping orange mouths unusually high when a parent came to them.

In sharp contrast to the bustling activity at nests 4 and 17 was the slow tempo of brooding and feeding at three other nests. We shall first consider nest 9, which was situated only 13 feet up in an exposed position near the end of a long lower limb of a large dying tree standing isolated in a pasture. When this nest was shown to me, it held a newly hatched nestling and an egg near hatching. The female, almost fearless, continued to brood while two of us stood beneath her and left only when my mirror almost touched

her. Later she remained in her nest while, only a few yards away, I noisily made some adjustments on a ladder. To watch this nest I sat on a bluff, whence I could look down into it from a distance of about 60 feet.

When I arrived at 0650 on 15 May, the female silky-flycatcher was brooding her two nestlings, now about one and two days old. For the next hour and 58 minutes she continued to sit, while her mate perched much of the time on an exposed branch at the top of the nest tree or of a neighboring tree, now and again darting out to add an insect to the collection in his already laden mouth. After leaving the nest at 0848, the female took a recess of only seven minutes. As she returned, her mate at last approached the nest. Standing on opposite sides, each gave the nestlings a number of insects which they brought in their mouths and throats. Then the female resumed brooding and the male left. Her next three sessions in the nest lasted 34, 19, and 58 minutes.

This male spent half the morning perching in the nest tree with an overflowing mouthful of insects. How he managed to catch more in his already laden bill was a mystery to me. Sometimes, indeed, he dropped an insect from his mouth. Then he would dart out and try to retrieve it, at times successfully. He went to the nest only when his mate was not brooding and preferably when, after returning from one of her brief excursions, she was resting on the rim, feeding the nestlings. Although each parent fed the young only four times in as many hours, the meals, especially those delivered in five or six installments from the male's stuffed mouth and throat, were liberal, and the nestlings seemed to be satisfied by them.

When nest 8 held day-old nestlings, the behavior of the male differed from that of any of the males we have already considered. As will be seen from Table 3, the female brooded eight times in four hours, less patiently than female 9, but far more patiently than females 4 and 17. Like the male at nest 9, her mate held insects in his bill and mouth for long intervals, continuing to add to his collection, before he finally took them to the nest. While male 9 would feed the nestlings only while the female was not brooding them, the present male approached the nest only just *after* his mate resumed brooding; on this morning, he fed at no other time. On the five occasions when he fed the young in the course of four hours, he waited until the female, returning from an excursion, had delivered food and settled in the nest; then he advanced, gave part of his billful to her, and when she rose to feed the nestlings, passed the remainder directly to them.

Nest 19 was somewhat different again. Here the male preferred to stuff his mouth with insects and delay feeding until his mate returned from an excursion, but before she herself fed and then settled down to brood. Sometimes, however, he delivered a meal while she was absent.

Since, in at least most pairs of Long-tailed Silky-flycatchers, the male has long been in the habit of feeding his incubating partner, one might suppose that the transition to feeding the nestlings would be easy and natural. But in some pairs, the reverse is true: the male has considerable difficulty adjusting to the new situation. Apparently, his innate tendency to feed his offspring must be supplemented by learning before he becomes an efficient provider. One trouble seems to be that he now desires to feed the nestlings directly, but his mate, accustomed to being fed by him, remains covering them instead of flying off and leaving them exposed when she sees him approach with food. Accordingly, the male delays feeding until she finishes brooding, often catching more and more insects until his bill overflows with them, and holding his load for many minutes. Sometimes, as though afraid to approach the nest in the female's absence, he holds his insects until she returns, then goes to the nest and delivers the meal as, or just before, she returns. At other times, seemingly illogical, he waits until she has resumed brooding, then promptly goes to deliver the food, as at nest 8. As the female leaves after a brooding spell, he may even fly away with her, carrying a billful of food that he has long held for the nestlings. Possibly he gives this to his mate beyond the observer's view.

The most efficient feeding results when the male promptly learns to effect a compromise between his desire to feed the nestlings directly and his mate's desire to take food from him, by adopting the method that I have called "shared feeding" (see p. 403). Short and frequent sessions of brooding, as opposed to fewer and longer ones, facilitate feeding by the male as well as by the female, as at nest 4. But the amount of food that the nestlings receive is not directly proportional to the number of feedings, for the procrastinating male stuffs his mouth and throat with food and delivers a bigger meal in more installments than does the male who brings food to the nest more frequently. I tried to count these installments but was not satisfied with the results, for when the parent lowered its bill into a nestling's mouth, it sometimes seemed to be removing food that was not swallowed promptly, rather than delivering another item. At all the nests which I watched during the first week after hatching, the male seemed to bring a greater mass of food than the female, with the exception of inefficient male 17, who certainly did not compensate for his far fewer feedings by their occasionally larger size.

Few birds that I have watched have held food intended for nestlings for such long intervals as some male silky-flycatchers did. Parent trogons often delay for a very long while with food in their bills, because these shy birds hesitate to approach their nest in front of a blind. Male silky-flycatchers behaved in this way even when there was no reason to suppose that they were deterred from going to the nest by my presence.



TABLE 4  
CARE OF TWO NESTLING LONG-TAILED SILKY-FLYCATCHERS DURING FOUR HOURS  
OF THE MORNING (0700-1100) AT NEST 4

Age of nestlings in days <sup>1</sup>	Brooding by female				Meals brought		
	No. of ses- sions	Range in minutes	Total time in minutes	Per cent of time	Male	Female	Both
1	28	1-10+	156	65	26	18	44
7	25	1-11	110	46	25	23	48
13	6	<1-6	10	4	32	28	60
19	0	-	0	0	33	21	54
23	3 <sup>2</sup>	3-25	32	-	25	20	45

<sup>1</sup> Possibly 1 day should be added to these ages.

<sup>2</sup> Brooding started as a hard shower began at 1017 hours. In the next hour (1017-1118) the female brooded a total of 50 minutes.

Because of predation upon most nests found early in the season, my observations on the care of older nestlings were confined to one nest (no. 4). When these nestlings were seven or eight days old, their mother would sometimes, when the sun shone brightly and they began to pant, stand over them holding herself higher than usual, shading them rather than warming them. On this morning she sat in the nest 25 times in four hours (Table 4). But six days later, when the nestlings were 13 or 14 days old, her brooding was reduced to six sessions, only one of which exceeded a minute. When the nestlings were 19 days old and well covered with plumage, they were not brooded at all between 0700 and 1100, although for part of this interval they were enveloped in dense mist.

On 10 June, when the young silky-flycatchers in nest 4 were 23 or 24 days old, they were not brooded until late in the morning, when it began to rain. As soon as heavy drops fell, the female hurried to the nest and covered her young, who had already made their first excursions among the surrounding branches. Both of them pushed their foreparts under their mother and rested with their black tails sticking out in front of her breast, remaining so for 25 minutes while rain fell steadily. Then, the rain abating somewhat, the parents fed the nestlings. Soon the downpour increased again and the female resumed brooding, this time facing in the same direction as the young, whose tails projected obliquely beneath her own. This brooding lasted 22 minutes. When I left, an hour after the rain began, she had brooded a total of 50 minutes. This occurred on the day before the young finally left the nest. Because this nest was so far from my dwelling, I made no observations on nocturnal brooding; but since at this season it was often raining at nightfall, I have little doubt that the young were covered each night as long as they remained in the nest.

As we have seen, the nestlings are at first nourished almost wholly with insects caught in the air, although an occasional berry is delivered as early as their second day. As they grow, the proportion of fruit in their diet increases, yet they receive many insects as long as they remain in the nest. At nest 4, meals tended to contain more items when they consisted of berries, which were always brought from a distance, than when they consisted of insects, which were often caught around the nest. As many as seven berries might be brought in the parent's mouth and throat. At this nest, the male consistently brought food more often than the female, even after she had ceased to brood in rainless weather. In 20 hours of watching, distributed throughout the nestling period, he brought 141 meals and she only 110. Likewise, he seemed, on the average, to bring more at one time than she did. At this nest, the frequency of feeding increased until the young were about 13 days old, then declined to about the same rate as when they were 1 or 2 days old (Table 4). The decline shown by the table is probably not due to the chances of sampling, but reflects the decreasing needs of the nestlings after they had passed the period of most rapid growth. A similar decrease in the rate of feeding toward the end of the nestling period is observed in other birds which remain long in the nest, notably swallows.

*Sanitation of the nest.*—From the hatching of the young until they flew, all droppings were swallowed by the parents after feeding the nestlings. I never saw a parent carry anything from the nest, except a single shell from which a chick had just escaped. Probably droppings are not removed as in many other passerine birds, because they are not enclosed in firm gelatinous sacs which make them easy to carry. Young silky-flycatchers defecate more freely than most nestlings, as is very evident when one handles them; and their feces, after the first few days, contain many seeds. When the nestlings have grown black tails an inch or more in length, they often wag their tails from side to side after receiving a meal, a signal to the parent that droppings are about to be voided. The droppings of these older nestlings, whose posteriors often project beyond the rim of the nest, sometimes escape the parent and fall. When this occurs, the parent darts down in pursuit of the dropping, and may overtake the falling particles if branches do not interfere.

I never saw either adult or young silky-flycatchers regurgitate indigestible seeds or hard parts of insects, as American flycatchers (Tyrannidae) and many other birds do.

Although the parents' efforts to keep the nest clean seem to be handicapped by the absence of a tough sac enclosing the nestlings' droppings, they succeed remarkably well. The nest of living lichens from which the

young have just departed, after 25 days of occupancy, is as fresh and clean as when it was newly made. Few nests that I have seen show so little trace of the brood that was reared in them.

*Development of the young.*—When I raised my mirror above a silky-flycatcher's nest in which an egg had just hatched, I was immediately struck by the unique appearance of the nestling. It was not quite like any other nestling that I had ever seen. When, after bringing a ladder, I took it in my hand, the impression of its uniqueness persisted. Its natal down consisted of short, compact tufts that were nearly white, and only a few millimeters in length. These tufts were arranged in narrow rows, between which were large areas of dark, bare skin. On the top of the nestling's head the downy tufts formed a wreath or open crown, with a dark bald spot in the center. A line of tufts ran along the middle of the back and rump. On either flank was a short row of similar tufts. There was likewise a line of them on either side of the fat abdomen. There was a large patch of down on each wing and there were tiny tufts on the sides of the head and the thighs. By breaking the nestling's dark surface into irregular areas, the lines of down make it more difficult to recognize. At a distance of a few yards, one sees the nestling as a cluster of dark patches on the light gray bottom of the nest.

Most newly hatched passerine nestlings that I have seen were either quite naked or, more often, bore sparse down that was longer, looser, and darker than that of the silky-flycatcher. I have noticed similar short, compact tufts of whitish down on the tips of the contour feathers of a nearly fledged Lovely Cotinga (*Cotinga amabilis*) and on the interpterylar areas of the nestling Yellow-bellied Elaenia (*Elaenia flavogaster*).

The nestling silky-flycatcher's bill was very short and relatively broad. The surface exposed when the mouth was opened was flesh-colored centrally, with a band of orange a few millimeters wide around the edges. From a distance, the gaping mouth of somewhat older nestlings always appeared to be orange, although the flesh color of the central portion persisted. The flanges projecting from the corners of the mouth were yellow. The legs and toes were pink.

Because of the loss of these nestlings and of other nests on which I had depended for following the development of the young, I have no subsequent observations on their appearance until they reached the age of nine days. At this age, their eyes were opening and their contour feathers were beginning to expand on most parts of the body. Their upper surface was almost covered with short, compact tufts of whitish down, three to four millimeters long, which gave them a woolly aspect. In addition to the primary or pterylar down which was present when they hatched, secondary down had grown out of the formerly bare skin between the primary rows, much

as happens in the nestling Yellow-bellied Elaenia (Skutch, 1960: 303-304). Although there was little of this secondary down on the upper back where the bare skin was covered by the folded wings, it was particularly well developed on the exposed lower back and rump, between the mid-dorsal band of primary down and the line of primary down on either flank. Elsewhere on the body were scattered tufts of secondary down. On one of the four older nestlings that I examined, there was a broad band of secondary down on either side of the breast and abdomen, just within the band of yellow contour feathers that were expanding on the sides. The longest tufts of secondary down on the ventral surface of the body were only about 1.5 mm long. They were situated at the anterior end of the band; rearward the downy tufts became shorter and sparser. The other three nestlings, including the sibling of this one, lacked secondary down on the sides of the breast; but careful examination revealed in this region feather rudiments so minute that they could scarcely be distinguished without a magnifying glass.

Just as the tufts of primary or natal down were pushed out on the tips of the growing sheaths of the contour feathers, so at least some of the tufts of whitish secondary down were pushed out on the ends of longer, looser, grayer down feathers. I was unable to follow this process in detail.

When the nestlings were about two weeks old, the upper surfaces of their bodies were fairly well covered with the expanding juvenal plumage, at least when they kept their wings folded (Figure 8). The tips of the rectrices had just begun to escape from the sheaths, and the remiges were only slightly more advanced. The dorsal plumage of the nestlings was now greenish olive, more yellowish on the rump. The coloration of their upper parts was not very different from that of the adult female; but if one turned them over, an unexpected feature was revealed: on each side of the breast there was bright yellow, in a broad band which contracted and faded to whitish on the sides of the abdomen. By the time the young flew, these bright patches had all but disappeared; first they were pushed backward to the abdomen by the growth of the yellow feathers, then they seemed to be covered over by the grayer feathers around them. As the nestlings grew older, their legs and toes, at first pink, gradually darkened. Their toenails became black with whitish tips and edges.

Although one expects songbirds no larger than the silky-flycatcher to leave the nest when about two weeks old, day after day these gray nestlings lingered in their gray nest, with the tufts of white natal down, still liberally sprinkled over their upper parts, breaking the smoothness of their fresh new plumage. Their black wing plumes expanded and their black tails, becoming daily longer, stuck up prominently above the low rim of their nest. Soon a crest became evident on their heads.

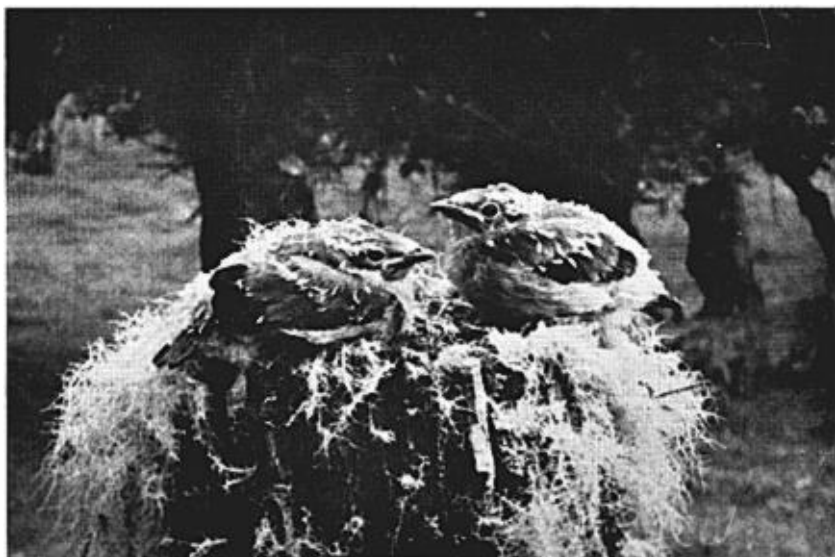


Figure 8. Eighteen-day-old silky-flycatchers posed on a stump overgrown with the beard-lichen of which the nests are made. Note the prominent tufts of whitish natal down on the juvenal plumage of these still flightless young.

They were slow to acquire the power of flight. When I was about to remove 18-day-old nestlings for photography, one jumped from the nest. Still unable to fly, it fell, clung to a twig, then fluttered to the pasture grass beneath the nest. Here it tried to escape, but it hopped weakly and was easily captured. Thereafter, it rested quietly wherever I placed it.

*Defense of the nest.*—Parent silky-flycatchers not only chased other individuals of their own kind from the vicinity of their nest, they likewise sent off visiting birds of other species. Those that I most often saw them chase were Mountain-robins, larger than themselves, and Mountain Elaenias, which were far smaller. These harmless little birds were everywhere in the pastures; they sometimes built their nests near those of the silky-flycatchers and they often foraged even closer. Although sometimes mildly chased, they were mostly ignored. Flame-throated Warblers and wintering Wilson's Warblers (*Wilsonia pusilla*) were occasionally driven from a nest tree.

One morning in early June, after the young in nest 4 were feathered, a Prong-billed Barbet (*Semnornis frantzii*) flew into their nest tree, attracted by the small orange berries of a mistletoe that parasitized it. Both parents at once vigorously attacked the brown visitor, darting at it and evidently striking it. The barbet did not receive this onslaught passively, but at-

tempted to defend itself, which, with its short thick bill that can carve into fairly sound wood, it did most effectively. It seized a silky-flycatcher by a toe and held it dangling, until the furious attack of the victim's mate effected its release. Then the barbet flew into a clump of mistletoe only a few feet from the nest, where the parents continued their onslaught. The barbet tore a big bunch of feathers from the body of one. Taking the offensive, it darted at its persecutors. Their attacks continuing, it seized one by a leg and held it until barbet and silky-flycatcher fell together toward the ground. In the course of their descent, the barbet released the leg and then it flew away. While this fight was in progress, I heard high, soft notes which were evidently from the silky-flycatchers rather than from the barbet.

The barbet's powerful, three-pronged bill can draw blood from the hand of a man who incautiously grasps the bird; and I feared that it had injured, perhaps crippled, the delicately built silky-flycatcher whose toe and leg it had seized. I was pleased to see both birds fly up and perch normally after the intruder left. They also caught flying insects without difficulty, and the male soon resumed feeding the nestlings. Several times he went to eat the orange mistletoe berries that had attracted the barbet, although for some days I had not seen him take an interest in them.

The female silky-flycatcher seemed to have come off worse than her mate. While he fed the nestlings, she perched a good deal, resting her abdomen against the branch as though to take the weight off her legs. After a while, however, she brought food to the nestlings, then brooded them briefly. Next day, she was attending her young, showing no ill effects of yesterday's encounter. A few days later, a barbet who flew into a neighboring tree fled to the forest as the parent silky-flycatchers approached.

I never saw a silky-flycatcher simulate injury, an omission to be expected in so arboreal a bird. Nor did any of them attack or make feints of attack when I touched their eggs or young, although birds no larger than they have occasionally struck or pecked me in these circumstances. While I was capturing the nestling that fell to the ground, the parents flew close around and alighted on low branches within a yard or two of me, uttering shrill cries such as I had not heard before. When I examined half-grown young in another nest, the parents flew around quite close to me, with spread tails that displayed the white areas on the outer feathers. As was earlier mentioned, while building, incubating, or attending newly hatched young, silky-flycatchers seemed nearly or quite indifferent to my presence; but as their nestlings became feathered, they grew increasingly wary and refused to approach their nest before me, even after I had sat for a long while at a good distance. An outstanding exception was the pair whose high nest (no. 4) I found soon after it was started and watched periodically

until the young flew. These parents apparently became accustomed to my presence, since they seemed never to be disturbed by it.

*Departure from the nest.*—On 3 June, when the young in nest 4 were 16 or 17 days old, I first saw one stand on the rim for a short while, preening. On the morning of 6 June, the nestlings were by spells most active, rising up, preening vigorously, stretching their wings and occasionally flapping them, sometimes while standing on the rim of the nest. Then they would become quiescent and lie for long intervals in their nest. In bright sunshine on the afternoon of 9 June, I found the nestlings very lively, preening and flapping their wings, sometimes while perching on a twig beside the nest, to which they soon returned. They were then 22 or 23 days old and had rudimentary crests.

On the following morning, the young silky-flycatchers repeatedly ventured beyond their nest, sidling out along the more horizontal of the branches that supported it, for a distance of a few inches, but always returning home after a minute or two. As the sunny morning advanced, these bold excursions grew longer, until the young were six or eight inches from their nest. At first they ventured forth singly, but by 0936 both were perching beyond the nest. Soon both were resting in it once more. A little later, one of the youngsters hopped and fluttered up an ascending branch until it was about one foot from the nest. From this point it half jumped, half flew, to a more horizontal branch, along which it promptly returned home. This was the longest excursion that I had seen. Now, with a sudden change of weather, a dense cloud rolled in to envelop the nest tree. Soon it was raining hard and the nestlings were brooded almost continuously by their mother.

At 0700 on the following day, 11 June, I found these nestlings resting quietly in their cup of lichens in the bright morning sunshine. Soon becoming active, one of them hopped and flew from branch to branch within a radius of two or three feet of its starting point, making a circuitous journey which brought it back to the nest, where the other rested. Presently one youngster, then the other, left the nest again and started to explore the crown of the nest tree, flying from twig to twig until one of them reached the very top of the tree, a yard above the nest. They preened and scratched themselves, pecked at the foliage and bark, and made flights of a yard or more through the open crown. They showed a strong tendency to keep together.

When the male parent returned and found the nestlings outside the nest, he flew from the isolated nest tree to one of the trees which stood in a row along the neighboring fence between two pastures. Then he returned to the nest tree and repeated the fifty-foot flight. He did this five times in rapid succession. He was evidently trying to lead the fledglings to a tree with

denser foliage, but they would not follow. Presently he fed one of them in the nest tree. A minute later, the female took food to the empty nest, looked in as though expecting to find the young birds there, then carried the food to the same fledgling that the male had fed. She went off for more food, again took it to the empty nest, then fed the other fledgling.

After their short flights, the young silky-flycatchers alighted with ease. They scratched their heads by raising a foot inside the relaxed wing of the same side, just as the adults did. One nestling was slightly larger than the other. The smaller one repeatedly sidled up to the larger one and pecked gently at its plumage. The young silky-flycatchers received their meals with a slight quivering of their folded wings and indeed their whole body, but without the vigorous wing-flapping of many passerine fledglings. Perhaps they were not very hungry. After feeding a fledgling, the female pecked at a dropping that had lodged on a branch below it, eating part of the dropping and throwing part of it to the ground. Her habit of removing waste persisted even after the young had left the nest.

Unlike many fledglings which have just left the nest, these young silky-flycatchers were in no hurry to seek cover. An hour after they hopped from the nest, they were resting close together in the exposed crown of the nest tree, where their parents brought them food. For another hour they perched in almost the same spot, sometimes a few inches apart, all in the cold gray mist which now covered the mountainside. Here I left them for a while. When I returned at 1100, one fledgling had vanished, but the other was still resting in almost the same place. When the parents called *che chip* from neighboring trees, the fledgling answered with a low *chip*. When a pair of harmless Golden-browed or Turquoise-naped Chlorophonias (*Chlorophonia callophrys*) foraged near the fledgling, its mother came and chased these small, brilliant tanagers away.

Shortly before noon a shower began, and I watched to see whether the fledgling would return to the nest and be brooded, as with its sibling it had been on the preceding day. For the next 20 minutes it rested in almost the same spot, while the rain grew harder and the parents perched in neighboring trees. Although the nest was only a few yards away, the young silky-flycatcher showed no inclination to return to it. At noon I left it on its exposed perch in the treetop in the downpour. In the last four hours it had moved very little.

Hard, cold rain fell most of that afternoon and far into the night, and I wondered whether the newly emerged fledglings survived it. Next morning I could not find them; but the parents were carrying food into some trees with dense foliage, where doubtless the young were hiding.

These two silky-flycatchers left the nest when they were at least 24 days



of age, and possibly one day older. From another nest, the two young departed just 25 days after the younger of them hatched.

A noteworthy feature of the young silky-flycatchers' behavior during their last days in the nest was the repeated, increasingly long excursions which finally led to its abandonment. Most fledglings that I have watched did not return to the nest after first severing contact with it. Although certain ovenbirds, cotingas, American flycatchers, and swallows that breed in holes or closed constructions remain in the nest as long or even somewhat longer, the silky-flycatcher's nestling period of 25 days is, for a small passerine, amazingly long. Among small passerine birds with open nests, I have found similarly long nestling periods only in the Boat-billed Flycatcher (*Megarhynchus pitangua*), in which the period is 24 days, and the Rufous Piha (*Lipaugus unirufus*), in which it is 28 days. Both of these birds are stouter than the silky-flycatcher. Such a long period in an exposed nest, and the fledglings' failure promptly to take cover after leaving it, might be disastrous in a region where predators, and especially hawks, were more abundant than I found them on this mountain. On the other hand, to remain in the nest, and be brooded when cold rain falls, is certainly an advantage for young birds that are reared at high altitudes in the wet season.

#### BREEDING SUCCESS AND ENEMIES

At La Giralda in 1963, I found 18 silky-flycatchers' nests, in all of which, with one possible exception, eggs were laid. In two of these nests, young were still present when I ceased observations in early July. This leaves 15 nests of known outcome. Of these, 4 were successful, producing 8 fledglings. From 11 nests, eggs, or nestlings not more than a few days old, vanished. The success of this small sample was, accordingly, 27 per cent. Since some of the nests contained eggs, or even nestlings, when found, they had already survived some of the chances of failure. Of the eight nests found before eggs were laid, two were successful and one held week-old young when observations ended.

The day before the eggs began to disappear from the colony of four nests, I first saw a Blue-throated Toucanet (*Aulacorhynchus caeruleogularis*) in this area, near one of the nests. As it flew back toward the neighboring forest, several silky-flycatchers pursued it. Since this toucan is, like other members of its family, a nest robber, my suspicion fell on it. But three weeks later, when two of the pairs in this colony had built new nests and were again incubating, my attention was drawn by a great commotion among the silky-flycatchers. They were flying excitedly from tree to tree, rapidly uttering sharp *che chip*'s. Through the mist I heard, then saw, some Brown Jays (*Psilorhinus morio*). When I chased away a jay by ap-

proaching it closely and then clapping my hands loudly, several silky-flycatchers pursued it down the mountainside. Going then to the lowest of the silky-flycatchers' nests, I found its interior, and a sound egg which remained, covered with fresh yolk from an egg which had been taken. The circumstantial evidence that a jay had plundered the nest was strong. The ranger of the farm told me that he had seen a piá-piá, as the Brown Jays are called, carrying a silky-flycatcher nestling, with adult flycatchers in pursuit.

I think Brown Jays were responsible for a large proportion of the losses of silky-flycatchers' nests at La Giralda. Some of the plundered nests were far from forest, in pastures where toucanets were never seen, although jays frequented them. Other possible predators were rare. I saw no snakes in my sojourn on the farm; and after the departure of the migratory hawks in March, the only raptor that I saw was a Red-tailed Hawk (*Buteo jamaicensis*). Squirrels occasionally pillaged the nest of a small bird, but they were not numerous. Brown Jays have been seen to rob many nests in the Costa Rican highlands. These birds, which seem to have originated in the humid Caribbean lowlands, have apparently extended their range upward in Costa Rica, in relatively recent times, with the destruction of the forests. The silky-flycatcher colony where the nests were plundered was, at 7,400 feet, the highest point where I met Brown Jays at La Giralda. Probably when Long-tailed Silky-flycatchers evolved their present nesting habits, they had no contact with Brown Jays. The concealing coloration of their nests of gray lichens seems not to avail against the sharp-eyed jays, which forage in noisy family groups.

Although I carefully wiped the yolk from the interior of the low, plundered nest and the sound egg that remained, the silky-flycatchers deserted. The same thing happened at a neighboring nest, where an intact egg was abandoned after a predator took its companion. Birds of other kinds will often continue to incubate a single egg if they lose one or more from their nest. In one instance, a silky-flycatcher did hatch a single egg; but since I found this nest only at the end of the incubation period, I cannot tell whether it ever held another.

#### A SECOND BROOD?

When on 9 May the eggs vanished from nest 3, they were within four or five days of hatching. Two days after their disappearance, I found a new nest, well begun, about 100 feet from the plundered one. The silky-flycatchers building this nest were recognized by their tails as pair 3. Their new nest was about the same distance from the male's lookout perch as their earlier nest had been, but in a different direction. The new nest

seemed finished on 13 May and the first egg was laid in it on 17 May, eight or nine days after the loss of the earlier nest.

On 28 May, silky-flycatchers were conspicuous in a level pasture with tall, spreading alder trees, where previously I had not noticed them. They were highly excited, calling much and flying from tree to tree so restlessly that it was impossible to count them. There may have been a dozen, of both sexes. Presently I saw a male pull a lichen from a high branch and deposit it in a site which seemed completely empty. After he had laid several additional pieces, his mate began to help, as already told (p. 389). While they built, other silky-flycatchers continued to fly back and forth in and around this alder tree, calling much. One male chased another around and around in wide circles, but the two did not clash.

The silky-flycatchers who started to build were accompanied by two young birds, with high crests but short tails. Sometimes these juveniles rested near the nest site, and here I saw the adult female give a berry to one of them, while it vibrated its wings.

When I revisited this pasture the following morning, scarcely any silky-flycatchers were to be seen. The silence that prevailed among the alder trees contrasted strongly with the bustling excitement that I had found there 24 hours earlier. After a while, I discovered that the pair which yesterday had started a nest were now building in a better concealed, more adequate site, about 225 feet away. By their tails I recognized them as the same birds. They must have worked very hard to have advanced their new nest so far since late on the preceding morning. While they continued to build, the two young birds sat around in neighboring trees, well concealed by the foliage, preening and stretching their wings. When one of them approached the nest, the male who was building drove it mildly away. After a spell of work by the adults, all four would fly off together to forage. Then they would return, and the adults resumed building while the youngsters rested. I did not see the parents feed them this morning, but one of the young birds darted into the air and expertly caught a flying insect. If my earliest nest, begun about 1 April, had been successful, the young reared in it would have been about as old as these two seemed to be.

The parents of these youngsters who were becoming self-supporting seemed to be preparing for a second brood, but they did not rear one. Either they failed to lay, or they abandoned their eggs, or a predator took them; for I never saw a bird incubating in this inaccessible nest. By early July, I had found no further indication of second broods. Considering how long silky-flycatchers take to raise one brood, and the shortness of the nesting season of nearly all the birds at high altitudes in Central America, I doubt whether second broods are often attempted.

During the nearly two strenuous months which the parents devoted to building a nest and rearing a family, their plumage became worn and their long tails were frayed. After one of the frequent rains, the adults appeared especially tattered. By the beginning of June, young birds in fresh plumage had begun to roam over the mountain in small flocks. In coloration, they resembled the adults, but their central tail feathers were just beginning to grow out beyond the lateral ones. They could already catch insects on long aerial darts.

#### GRAY SILKY-FLYCATCHER

The Gray Silky-flycatcher (*Ptilogonys cinereus*) resembles the Long-tailed Silky-flycatcher but is somewhat less ornate. Most notably, it lacks the projecting central tail feathers of the latter. The crest, even of the male, is gray rather than yellowish, and the feathered orbital ring is white instead of pale yellow. In each sex, the color of the body is rather similar in the two species. Both species have bright lemon-yellow under tail coverts and white areas on the outer rectrices.

The Gray Silky-flycatcher inhabits the highlands from northern México to Guatemala, from about 4,000 to 10,500 feet above sea level. In 1933, when I dwelt on the Sierra de Tecpam in the department of Chimaltenango in west-central Guatemala, I saw these birds from time to time, both amid the cypress forests from 9,000 to 10,000 feet and in the zone of pines, oaks, and other broad-leafed trees between 7,000 and 9,000 feet. Like their Costa Rican cousins, they usually perched on the exposed tops of tall trees, where they drew attention to themselves by their loud, not unmusical call, which sounded to me like *tu whip, tu whip* or *wake up, wake up*. Years later, the rather similar *che chip* of the long-tailed species brought this call from the depths of memory.

In their rather distant sociability and loosely integrated flocks, the Gray Silky-flycatchers also resembled their cousins in the south. The members of a flock, which might consist of as many as 25 birds, usually perched on neighboring treetops instead of all together in an intimate group. One of the larger companies might be scattered over several acres, with one or two birds on one treetop, two or three on another, and so forth, all keeping in touch by their reiterated calls. The members of such an assemblage would constantly shift from tree to tree, more often singly than several together. When the silky-flycatchers left the area, they would go in the same individualistic manner. The straggling flight of such a flock is well illustrated by notes which I made one day in January. A single bird led the way. Close behind it followed seven others, then after an interval five more, and after another considerable interval an additional four, well separated from each other. As they undulated across the sky, above the tree-

tops, they kept up a perpetual chatter that was pleasant to hear. Their flight was often accompanied by a rattling note, as in the Long-tailed Silky-flycatcher.

In Guatemala, the Gray Silky-flycatchers frequently associated with the flocks of wintering Cedar Waxwings, as though they recognized their relationship to the latter. Although the waxwings perched high, the silky-flycatchers chose perches above them, on the topmost twigs, and were readily distinguished by their longer tails. With their spirited admonition to *wake up, wake up*, they drowned the drowsy lisps of the more numerous waxwings. Far more active and restless, the silky-flycatchers seldom tarried in one tree as long as the phlegmatic waxwings. In the dry weather early in the year, they were very restless, wandering back and forth over the mountains all day long and doubtless covering great distances.

From their posts on the topmost twigs of tall trees, the silky-flycatchers darted out to catch flying insects, displaying such mastery of the air that I never tired of watching them. With their long tails spread to reveal contrasting areas of white and black, they looped and twisted and turned with marvelous grace. They reversed their direction in the air with such surprising suddenness that I could not discover how they managed their about-face. A number of insects were caught during an elaborate aerial evolution, after which the bird usually returned to the perch from which it started, although sometimes it alighted on a neighboring treetop. Sometimes one dropped downward for many yards, fluttering, twisting, and somersaulting, evidently catching insects as it went.

The Gray Silky-flycatchers varied their diet with berries, including those of *Monnina xalapensis* and *Eurya theoides*. One day in March when I sat on an exposed mountain slope, watching a pair of Black-eared Bush-tits (*Psaltiriparus melanotis*) build their exquisite lichen-covered pouch, a pair of silky-flycatchers plucked black berries from a shrub of *Monnina* growing near the nest. Viewed at close range below the level of my eyes (as one seldom sees them), they presented an unforgettable aspect. With their excessively slender figures, pale gray heads with black eyes and lead-colored waistcoats, they looked frail and unsubstantial, almost ghost-like. Their restless habits strengthened this illusion.

On the Sierra de Tecpam I searched in vain for a silky-flycatcher's nest. Up to the time the last Cedar Waxwings departed on 12 May, they were abundant and still flocked, but some of them seemed to have paired. Thereafter, I saw them infrequently.

From México, several nests of the Gray Silky-flycatcher have been reported. Newman (1950) found a nest 30 feet up in the dense upper foliage of an oak tree, at an altitude of 7,700 feet in the state of Veracruz. "A

work of exquisite artistry," in size and shape this nest evidently closely resembled the nests of the Long-tailed Silky-flycatcher already described, but it was composed of more varied materials. It was "based on a very loose foundation of the staminate catkins of oak, with much of this same material filling spaces between the bits of plant stems, the coarse black hairs, and the vegetable matter resembling hair that comprise the internal framework. A thick padding of fruticose lichens of the genus *Usnea* provides a relatively stiff lining, but no grasses nor long plant stems are woven into the construction anywhere. The soft materials employed seem to have been merely pressed together, rather than tightly interlaced, and as a result the entire structure lacks firmness." The exterior was completely shingled with large pieces of foliose lichen, attached by invisible strands of cobweb. This nest contained two newly hatched nestlings on 24 May.

In the state of Tamaulipas, México, Robins and Heed (1951: 267) found several nests on 27 and 28 May, when building was still in progress and laying had apparently not yet begun in the area. All these nests were lichen-covered, like that described by Newman. At an altitude of 7,000 feet in the Mexican state of Morelos, Rowley (1962: 260) found on 10 June two nests that were saddled on oak limbs, about 6 and 10 feet up. One was ready for eggs, and the other held two half-grown young. These nests are not described. It is evident that the Gray Silky-flycatcher breeds rather late in México.

The only description of the Gray Silky-flycatcher's eggs which I have found is that copied by Newman (1950) from older sources. These eggs collected in México long ago are said to be "minutely freckled and striated with brownish ash-colour on a white ground, the markings being denser and forming a ring around the large end." If these eggs are correctly ascribed to *Ptilogonys*, it is evident that those of the northern species do not closely resemble those of the southern species.

#### BLACK-AND-YELLOW SILKY-FLYCATCHER

A crestless bird of thrush-like aspect, with a broad tail of moderate length, the Black-and-yellow Silky-flycatcher (*Phainoptila melanoxantha*) differs greatly in appearance from the high-crested, long-tailed, slender, gray silky-flycatchers of the genus *Ptilogonys*. The male is largely black, with bright yellow on the rump and the sides of the body, beneath the wings. His under-parts, posterior to the chest, are yellowish olive-green, becoming gray on the center of the breast and abdomen. The top of the female's head is black, the rest of her upper parts olive-green. Her under-parts are olive-green and gray, with yellow flanks, much as in the male. Both sexes are about 8¼ inches in length. Their short, small bill and their legs are black, and their eyes are deep brown.

Carriker (1910: 786) found this bird from timber-line on the high volcanoes of Costa Rica down to about 5,000 feet on the exposed northern slope of Volcán Irazú, where a number of species of high altitudes descend lower than they do on mountainsides less exposed to the prevailing winds. On the Volcán de Chiriquí in western Panamá, the Black-and-yellow Silky-flycatcher has been reported to occur from 4,000 to 11,000 feet above sea level (Ridgway, 1904: 124). At La Giralda, I did not encounter this bird until late in April, two months after my arrival, when I glimpsed a solitary individual at about 7,500 feet. Thereafter, little by little they became more abundant at this altitude, and in June I saw them here rather frequently. As one descended the mountain, they became rarer; but I occasionally met them as low as 6,800 feet, which is as low as I have found this species anywhere. My impression was that at La Giralda they worked downward from higher altitudes as the rainy season advanced.

As suggested by its plumper form, *Phainoptila* is less active than *Ptilogonys*; it is also less sociable and voluble, less fond of open spaces. At La Giralda, I saw Black-and-yellow Silky-flycatchers most often just within the edge of the forest, especially where the canopy had been thinned by the removal of a few trees, and in the adjoining shady pasture. They remained well above the ground but far below the tops of the great oak trees. They flew out from exposed branches to catch flying insects. After capturing one, they usually continued onward to another branch ahead, instead of returning to their starting point, as many flycatching birds do. Their flycatching was far less acrobatic and spectacular than that of *Ptilogonys*, which pursues insects in wide open spaces rather than between branches. Sometimes they plucked small creatures from foliage.

Black-and-yellow Silky-flycatchers varied their diet with many small fruits, for which they often ventured forth from the woodland into neighboring pastures. I most often saw them here when dense cloud-mist shrouded the trees or when rain was falling, making them difficult to watch; more rarely they entered the pastures in clear weather. Here the chief attraction was the small, black, berry-like, ripe carpels of Winter's bark (*Drimys Winteri*). This tree is called "chili," in allusion to the peppery quality of the foliage and fruit, which severely sting the human mouth. But this did not trouble *Phainoptila*. One misty morning I watched a pair of these birds who stayed in a chili tree for nearly an hour, alternately stuffing themselves with the highly-flavored fruits and resting motionless within the shelter of the glaucous foliage, with heads drawn in and plumage puffed out, while they digested their meal. They were still present when I was called away to protect my nests of the Long-tailed Silky-flycatchers from marauding Brown Jays.

I have also seen *Phainoptila* eat the berries of *Monnina* and *Ardisia*, two common shrubs of the high mountains. On a steep bushy slope in a forested ravine, I watched a pair gathering the fruits of *Bocconia frutescens*, plucking them either on the wing or while clinging to the large inflorescences.

From late May until early July, I found Black-and-yellow Silky-flycatchers either singly or in pairs. Once I saw three together in a Winter's bark tree, but the mist and rain prevented my distinguishing their sexes. When the female of a pair that had been flycatching together in an opening in the forest went off and left the male alone, he called with a weak *chip* rather like a wood warbler's note, but slighter than the calls of some species. On another occasion, I heard low, soft notes from a pair foraging in the rain.

In May, I glimpsed a female holding what seemed to be a piece of material for a nest, in the forest near a stream. Despite much searching, I could not find her again. In late June, these birds were molting, especially their tail feathers. They scratched their heads by raising a foot inside and over the relaxed wing, as in *Ptilogonys*.

#### COMPARISON OF *PTILOGONYS* WITH RELATED BIRDS

Delacour and Amadon (1949) advocated the recognition of three subfamilies of the Bombycillidae: one for the waxwings, *Bombycilla*; one for the monotypic genus *Hypocolius* that is found in Persia and neighboring regions; and a third for the silky-flycatchers. Subsequent writers have at times followed and at times ignored this classification. In view of the uncertainty as to the proper systematic treatment of these birds, it may be helpful to survey briefly the resemblances and differences in their habits, so far as available information permits. In preparing this account, I have consulted the writings of Crouch (1936), Rand and Rand (1943), Meinertzhagen (1947), Putnam (1949), Bent (1950), Kendeigh (1952), and Marchant (1963), as well as my personal experience with the Cedar Waxwing.

*Food.*—All of these birds subsist on a mixed diet of small fruits and insects. The insects are caught on spectacular aerial sallies in *Bombycilla*, *Ptilogonys*, and *Phainopepla*, all of which prefer to perch on high, exposed twigs that facilitate their flycatching. *Phainoptila* chooses less exposed perches and catches insects on flights from branch to branch. In all four genera, berries are plucked from trees and shrubs, usually while the bird perches or clings.

*Voice.*—*Ptilogonys* and *Phainopepla* have well-developed voices and are often noisy. The voices of *Bombycilla* and *Phainoptila* are rather weak. Conspicuous, melodious song seems to have been reported only for



*Phainopepla*, and even in this bird voice apparently plays a minor role in advertising territory and winning a mate (Rand and Rand). Whisper songs have been observed in *Bombycilla*, *Phainopepla*, and *Ptilogonys*.

*Social habits*.—Sociability is most strongly developed in *Bombycilla*, which flies and forages in large, sometimes (in *B. garrula*) enormous, well-integrated flocks, and in *Hypocolius*, which is described as moving “in small compact parties in thick bush or on date palms” (Meinertzhagen). Flocks of *Ptilogonys* are loose and poorly integrated, and apparently this is also true of *Phainopepla*. *Phainoptila*, as is to be expected from its forest habitat, was nearly always found singly or in pairs.

*Territory*.—*Bombycilla*, *Phainopepla*, and *Ptilogonys* establish a nesting territory which is often poorly defined and is only incidentally a feeding territory. Territorial fighting seems not to occur in these genera; the resident bird simply flies at the intruder, who retires. Both sexes defend the territory. Aggregations of nests which may be considered small, loose colonies have been reported for *Bombycilla cedrorum*, *B. garrula*, *Ptilogonys caudatus*, and *Phainopepla*.

*Nuptial feeding*.—In *Bombycilla*, *Phainopepla*, and *Ptilogonys*, males feed their mates, often with berries, during the period of nest building and laying. Such feeding continues during incubation, at least in *Bombycilla* and *Ptilogonys*.

*Nest*.—In *Phainopepla*, *Ptilogonys*, *Bombycilla*, and *Hypocolius*, the nest is an open cup, placed in a tree or bush. In all these genera, the male helps to build; in *Phainopepla* he may take the initiative and do most of the work; in *Ptilogonys* he seems sometimes to take the initiative, but the sexes share the work rather equally. The nest of *Phainoptila* is unknown.

*Eggs*.—The eggs are gray in *Ptilogonys*, pale bluish gray to gray in *Bombycilla*, dull gray to greenish white in *Phainopepla*, and in all these genera they are variously marked with brown, black, and lilac. The eggs of *Hypocolius* are not unlike those of *Bombycilla* or *Phainopepla* (Delacour and Amadon). In *Ptilogonys*, the set consists of two eggs; in *Phainopepla*, of two, three, or rarely four; in *Hypocolius*, of three or more often four, rarely five; in *Bombycilla*, three to five or rarely six.

*Incubation*.—In *Phainopepla*, the male performs a large share of the incubation, but the female takes charge of the eggs by night (Rand and Rand). In *Ptilogonys* and *Bombycilla*, only the female incubates as a rule, although there are reports of males covering the eggs in the Cedar Waxwing. In these three genera, incubation begins with the laying of the first egg. In *Ptilogonys* and *Bombycilla*, the females incubate with extraordinarily high constancy, often 80 to 87 per cent in the Long-tailed Silky-flycatcher, 90 to 97 per cent in the Cedar Waxwing (Putnam). They are fed more or less frequently by their mates. The length of sessions on the

eggs varies greatly even in the same species. The incubation period is usually 12 to 13 days in *Bombycilla*, 14 or 15 days in *Phainopepla*, 16 or 17 days in *Ptilogonys*.

*Nestlings*.—The young hatch quite naked in *Bombycilla*, with white down in short compact tufts in *Ptilogonys*, and with long white down in *Phainopepla*. They have pinkish skin in *Bombycilla* but dusky skin in *Ptilogonys* and *Phainopepla*. In *Phainopepla*, "the edges of the mouth are bright yellow, but the lining proper is flesh-colored" (Bent). In *Ptilogonys*, the surface exposed when the mouth is opened is flesh-colored with an orange border; the flanges at the corners are yellow. I find no mention of these points for other genera. In *Ptilogonys* and *Bombycilla*, the nestlings are brooded by the female; but in *Phainopepla* they are brooded by both parents. In all three genera, they are fed by both parents. When newly hatched, they are nourished with insects, but after a few days fruit is included in their diet and rapidly increases in amount. The food is brought to the nest in the mouth, throat, and perhaps deeper regions, but it is delivered without the strenuous movements that we associate with regurgitation, as in hummingbirds and goldfinches. In these three genera, the droppings are swallowed and seem never to be carried from the nest in the bill, as in many other passerines. This is probably because they are not enclosed in a tough pellicle that makes them easy to carry. The Cedar Waxwing's nestling period has been found to vary from 13 to 18 days but is usually around 16 days. In *Phainopepla*, this period is 18 or 19 days, and in *Ptilogonys* it is 24 or 25 days. A peculiarity of both *Ptilogonys* and *Phainopepla* is that feathered nestlings make excursions through nearby branches and return to the nest, before they finally sever contact with it.

To sum up: the resemblances between these birds, so far as their habits are now known, are more numerous than their differences. If the male's participation in incubation in *Phainopepla* separates this genus from *Bombycilla*, it also sets it apart from *Ptilogonys*. In the total absence of down at hatching, *Bombycilla* differs conspicuously from *Ptilogonys* and *Phainopepla*. Downless and downy newly hatched chicks are sometimes found in the same family (e.g., Tyrannidae) or even in a single genus (e.g., *Vireo*), but in these cases the natal down, when present, is rarely so well developed as in *Ptilogonys*. Noteworthy is the slow development of *Ptilogonys*, whose nestling period is nearly as long as the combined incubation and nestling periods of *Bombycilla*, although these birds do not differ much in body size. In *Phainopepla*, both these periods are of intermediate length. In other groups, such as wood warblers, vireos, and wrens, species resident in the tropics sometimes have substantially longer incubation and nestling periods than the most closely related northern species.

It is regrettable that we know so little about *Phainoptila*. In its lack

of a crest, thrush-like aspect, slight sociability, and forest habitat, this bird contrasts with all the others that we have been considering. One who has watched this bird in the field feels the strength of Ridgway's (1904: 113) remark that "the genus *Phainoptila* is doubtfully a member of this group [the Ptilogonatidae], and so far as the adult is concerned might easily be referred to the Turdidae without materially affecting the diagnosis of the latter family; but the young have the plumage absolutely plain-colored and the acrotarsium distinctly scutellate."

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#### SUMMARY

The habits of the Long-tailed Silky-flycatcher were intensively studied in the high mountains of Costa Rica, where 18 nests were found and all stages of the breeding cycle, from the separation of pairs from the flock to the fledging of the young, were followed in detail. In the same area, observations were made on the general behavior of the Black-and-yellow Silky-flycatcher, although the nest of this bird seems to have eluded all ornithologists. Observations on the Gray Silky-flycatcher, made 30 years earlier in the Guatemalan highlands, are also given. Some of the salient results of this study are recapitulated in the concluding section of this paper, where a comparison is made between the life histories of the silky-flycatchers, the waxwings, and the Asiatic *Hypocolius*. So far as their life histories are now known, they provide no reason for classifying these birds in separate families.

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