

NOTES ON HUMMINGBIRDS AT CHIRIQUI, PANAMA

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HUMMINGBIRDS are among the most distinctive creatures of the tropical American avifauna, yet much remains to be learned about their specific habits. Among the many observations of Panamanian hummingbirds which I recorded in my journal during the summer of 1937 at Chiriqui, the following were of particular interest. I was much surprised to find that several species of hummingbirds have quite characteristic songs, uttered from a perch with the same regularity as the 'set' songs of passerine birds. Once I had learned the identity of the singer, I found it possible to detect its presence by ear with the same certainty that a United States ornithologist feels in identifying warblers and sparrows by their songs.

Few of the hummingbirds had songs which could be called musical. The one which came closest to consonance and harmony was that of a small species which, unfortunately, I failed to identify. Its song was something like the thin first attempt at singing of a young Song Sparrow, having a lisping and slightly disconnected quality which suggested lack of practice or skill. The song, nevertheless, was very constant in its style, and I used to hear it frequently in the late afternoon and early evening along the Rio Garaché, particularly on rainy days. The singer sat quietly near the end of a small twig, intermittently throwing its head back to sing, when its throat could be seen pulsating with the expiratory effort. Between songs it would perch quietly, perhaps preening a few feathers, again with typical passerine abandon.

Species of hummingbirds which sang thus were also possessed of the common harsh insect-like buzzes and twitterings given during pursuit of one another. In this type of vocal demonstration hummingbirds seem to resemble one another closely, while their 'set' songs are widely different and specifically characteristic.

The song of Bangs's Hermit, *Phaëthornis guy coruscus*, is very soft and can be heard for only a very short distance. It has the peculiar effect of seeming to proceed from a more remote position than the singer. Its character, besides that of ventriloquism, is remarkable for the jumble of notes of which it is composed, such as might be produced by several birds at one time. Before I had identified the song, in fact, I thought that I was hearing faintly the hunger cries of a nestful of fledgling woodpeckers, or of some other hole-nesting bird. As I searched and searched for the nest, the sounds

would shift their direction, for the hummingbird would fly to a new perch as I neared it, and I had finally decided to give up the hunt in exasperation when I was amazed to see a Bangs's Hermit producing the entire illusory chattering itself. It sat quite still, only turning its head slowly from side to side, and uttering a series of low liquid twitterings. Thereafter I frequently heard the same song, and I then became aware that Bangs's Hermit was a very common species in the forests of Chiriqui.

The most persistent singer of all was De Lattre's Saber-wing, *Campylopterus hemileucurus*, although its song was less definitely 'set.' This hummingbird would often sing for an hour at a time: *chick chick chick chick chick chick chick-ta-lil chick-t'lil chick-ta-lil chick chick chick chick chick chick chick-t'lil chick chick*—and so on endlessly it would sing loudly. The rhythm was perfectly regular, the intervals between *chicks* being one-half or two-thirds of a second. The song 'got on my nerves' after spending a morning in the forest. It would seem to become louder until it filled my ears and I could hear nothing else.

I cannot state for all the species of hummingbirds I observed whether the females ever sing, but in the case of De Lattre's Saber-wing, at least, phonation of this sort seems confined to the males.

Closely associated with the phenomenon of song is the hum of hummingbirds. Pettingill has recorded vibration frequencies of seventy-five wing-beats per second during forward flight in the Ruby-throated Hummingbird, *Archilochus colubris*, and fifty to fifty-five wing-beats per second during hovering (Bird-Lore, 39: 194, 1937). Most of the hummingbirds at Chiriqui produced a hum about three octaves below middle C, which suggests sixty-four vibrations per second. Pettingill's records are based on actual photographic analyses with a high-speed camera, while mine are purely the results of personal judgment. It happens, however, that I possess that peculiar faculty known by musicians as 'absolute pitch,' so that I am confident of the frequency stated above.

The tone of the humming was not a pure one. In the background there was a rasping note caused, I believe, by friction among the feathers, probably in the region of the wings' insertion into the body. The actual humming, moreover, was subject to variations in pitch which covered a range of approximately three half-tones (i. e., from sixty to seventy-two vibrations per second). The highest pitch was produced while the birds were feeding, particularly if they had to probe deeply into a blossom, when their heads were out of the nor-

mal relationship to their bodies and the excursion of their wings was restricted by cramped quarters. The next-highest pitch was produced at the moment of acceleration when the birds darted off. Once started, the pitch dropped another half-tone, while the lowest note of all was produced during uncomplicated hovering, that is, while the bird took its bearings preparatory to its next move. Thus:

<i>Maneuver</i>	<i>Uncomplicated Hovering</i>	<i>Normal Flight</i>	<i>Accelerated Flight</i>	<i>Feeding</i>
Pitch	B	C	C #	D
Frequency	60	64	68	72

So far as an estimate of the speed of flight of the various species is concerned, I can only say that they *all* frequently flew with extreme rapidity. On one occasion I was proceeding along a forest trail when I heard the pursuit-squeakings of a pair of hummingbirds ahead of me. They came into view at a distance of a hundred yards and then sped directly down the trail about a foot from the ground, banking heavily three times in order to get past three almost imperceptible bends in the trail. Their speed was such that unless they had banked they would have shot off into the forest. As they passed me I could see only a streak of birds, and for this reason I cannot state their identity. My estimate, which is only very casual, is that they covered the hundred yards in three seconds or less; their speed at this rate would have been at least seventy miles per hour. Whatever the speed of this particular pair of birds was, I do not regard it as exceptional for any of the hummingbirds. The Ruby-throated Hummingbird has been timed at fifty-five miles per hour during normal cruising flight (Allard, in *Auk*, 51: 84, 1934).

The high pitch produced during feeding was especially noticeable in Bangs's Hermit. With its long decurved bill, this bird has some difficulty in properly approaching a banana blossom, for it must probe within and between the parallel tiers of tubular flowers, and these are situated in a vertical position. The bird would fare better if its beak were recurved dorsally, for under existing circumstances it is necessary for it to maneuver into a position directly below its goal and then to thrust its bill straight upward into the blossoms. It seems to find this position awkward and difficult to maintain. On one occasion I watched a Bangs's Hermit probing its way systematically along the rows of blossoms when a large insect, which I believe was one of the carnivorous nocturnal crickets, suddenly appeared on

a part of the main globular banana bud just below the lowest tier. The insect may have had eggs or young concealed in one of the flower crypts, for it guarded a set area on the bud and did not allow the hummingbird to probe the blossoms in that vicinity. Unfortunately it was becoming dark, and I could not see all the details of this engagement, although I stood only a few yards away. The hummingbird seemed to acknowledge the insect's power or authority, for it did not infringe on the danger zone, though it worked systematically to its very edge. The insect occupied a strategic position to ward off the bird, for to insert its bill the hummingbird had to approach the flower until its breast touched it, with the body then vertical in position. During normal hovering the bird's body was held at about forty-five degrees from the horizontal. As long as the insect maintained a stance below certain blossoms, it could successfully hold the bird at bay. This presupposes that the bird recognized some dangerous quality, such as a sting or severe bite, in the insect. Were the flowers disposed horizontally, or were the bird's bill curved upward, the *Phaëthornis* would not have had to touch its breast to the bud, and the insect would have had less jurisdiction over the bird's feeding.

Bangs's Hermit suspends its nest at the tip of a blade of a palm leaf. Its two eggs are dull white in color and average 17.5 x 11 mm. in their dimensions. A large number of Chiriqui hummingbirds adopt a similar site for their nests, according to Señor T. B. Mönniche, my host at Boquete. I found approximately the same method in use by the Bronzy Least Hermit, *Glaucis hirsuta aenea*, except that the nests of this species were invariably suspended from a ribbon of banana leaf.

The Bronzy Least Hermit, not previously recorded from the Republic of Panama, is very common in banana groves of the Rio Garaché region in Chiriqui. I was fortunate in observing three occupied nests of this species, and all agreed in their location and structure. Banana leaves, when old, become split transversely in many places so that the blade of the leaf hangs in ribbons from the midrib. Where the midrib is nearly horizontal the ribbons depend vertically. The hummingbirds select one of these ribbons, preferably one about an inch in width. The nest is placed on the under or inner side of this ribbon, to which it is fastened by the use of downy plant fibers and spider webs which encircle the ribbon tightly. No anchorage to the midrib is used. On this foundation the nest cup is erected, rather high (that is, close to the midrib). It is large and deep, being very loosely built of rootlets, so that the eggs may be seen through the

structure from below. There is an attempt at concealment evidenced by the placing of additional material below the nest to the very tip of the leaf-ribbon. The nest is both secure and waterproof, for it is protected by the main blade of the leaf overhead. Should the mid-rib be broken, the ribbon will still hang vertically due to the weight of the nest, and rain which might then gain access to it will easily drain out through its open structure. The nests were usually placed about ten feet from the ground. I watched one during its construction. The cup was not yet finished and the adult, to affix new fibers, still had to hover at its work. It worked with its feet on the partially formed lip of the nest, its wings vibrating, and manipulated something with its head and beak at the edges of the leaf-ribbon above any point where I could see actual nesting material. I felt sure that it was working at the fiber and spider-web guy-wires which must be the critical point in such a precarious structure. The eggs, which are laid in June and July, were invariably two in number, measuring 15 x 9 and 16 x 9 mm. in one case. They were placed in the nests with their opposite poles mutually adjacent.

The young birds were quiet most of the time. They huddled deeply in the nest when I examined them; indeed it was possible to invert the entire nest without emptying out the fledglings. Their natal down harmonized well with the rootlets, fibers, and small amount of lichen adorning the rim of the cup, so that one might look into the nest but scarcely see young birds in it. In feeding the young the parent would perch on the edge of the nest and seemingly probe them with its curved bill in true hummingbird style. Then it would fly off a few feet and, hovering, run its tongue in and out several times, and then return to feed the young again. It apparently had to get clear of the nest's closely overhanging roof (the mid-rib of the banana leaf) to regurgitate a new portion of its crop's contents. Having done so, it would then return to the nest and deliver the new consignment to its young. This forcing of the bird to sally forth for free regurgitation during feeding of the young may afford an unexpected protection to this species, for it can thereby detect the approach of intruders sooner than it otherwise would.

At least twenty-five species of hummingbirds are known to occur in the Chiriqui region. In this sketch I have reported specifically on only three. I have tried, however, to point out the degree of individuality which characterizes each species.

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