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BLUE-TAILED EMERALD HUMMINGBIRD (*CHLOROSTILBON MELLISUGUS*) NESTING AND NESTLING DEVELOPMENT

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Abstract: A nest of the Blue-tailed Emerald Hummingbird (*Chlorostilbon mellisugus*) was studied from the early finding of two eggs through to the loss of the single surviving nestling on day 19. Nestling growth and development, as well as female attendance during incubation and brooding are reported. The body mass K-value was 0.2777, and the inverse measurement of growth rate, the t_{10-90} value, was 15.81 days. *Accepted 25 October 1993.*

Key words: Blue-tailed Emerald Hummingbird, Chlorostilbon mellisugus, *nestling development, parental care, Venezuela.*

INTRODUCTION

The Blue-tailed Emerald Hummingbird *Chlorostilbon mellisugus* is wide spread in tropical and subtropical zones of Venezuela (Meyer de Schauensee & Phelps 1978). It ranges from Costa Rica to Bolivia and is present on islands close to Venezuela including Aruba, Curacao, and Trinidad. There has been uncertainty concerning the taxonomic status of various *Chlorostilbon* populations (Meyer de Schauensee 1966, Wetmore 1968). Field studies of free living birds is one way to help clarify the relationships of such a common species that is a permanent resident over such a vast range. In spite of its abundance no studies have been published of Blue-tailed Emerald nesting. However, Fraga (1984) studied the congeneric Glittering-bellied Emerald *Chlorostilbon aureoventris* in Argentina. This report documents aspects of the reproductive biology of *C. mellisugus* in north-central Venezuela.

SITE AND METHODS

The Blue-tailed Emerald nest that I studied was in Estado Miranda at Los Anaucos, about 30 km south of Caracas, Venezuela. A description of this site and its bird fauna is in Thomas 1993. The nest was located in regenerating secondary-scrub which had been entirely destroyed by fire five years before my observations. I spent 51 h observing the nest, much of the time sitting about 8 m distant, without a blind. This distance was determined by locating the nearest point to the nest that I could remain without disturbance to the female bird. Eventually she became so accustomed to my presence, that she left the area, presumably to forage, when I handled the chick. The nestling was weighed with a 10 g pesola spring balance, calibrated daily, and measured with a vernier scale at about 08:30 each morning.

Air temperature in December and January ranged from 16° to 33 °C. Although this nesting occurred at the beginning of a particularly harsh dry season, unseasonably prolonged light rains continued during incubation and until the nestling was three days old; a total of 4 cm of rain fell on 7 days.

Colors were compared with the Smithe (1975, 1981) guide in hand. A single day of observation, from dawn to dark was not practical, thus in order to record nest attendance I worked on two consecutive days, the first from before dawn to noon, the second from noon until nightfall.

RESULTS

Nest and Site. On 23 December 1982 at 09:05 I discovered the nest with two fresh eggs. The eggs were white and they measured 11.4 x 7.5 mm and 12.0 x 7.4 mm, and each weighed 0.4 g. The nest was a tiny cup with exterior dimensions of 3 cm in diameter and 2.5 cm deep, agreeing with a nest from Curacao (Voous 1957). It was fastened to the 1 cm thick stalk of a common weed *Fleischmannia microstemon* (Asteraceae), that was just beginning to flower. The nest was 89 cm from the nearly bare ground, about half way up the total height of the plant but under its lower leaves. Overhead was a thin canopy of mesquite

trees *Prosopis juliflora* at 4—5 m. The nest was made of rufous-colored plant downs, fastened with spider webs, and lined with white plant downs that also covered the rim. It was not yet finished, because it had a hole in one side of the cup which was gradually closed by the incubating female, who brought additional billsfull of plant down nearly every time she returned to the nest. She vigorously tucked the material into the nest on her return, and stamped and pressed the nest material, frequently adjusting it with her bill during incubation. Skutch (1964, 1967, 1972) and Snow & Snow (1973) report nest building during incubation. When she was incubating, her nearly white breast merged cryptically with the white nest rim. Small fragments of fine bark, not lichens, were applied to the exterior of the nest, and they turned black as they dried. On the sixth day after finding the nest, one egg was missing. It may have been cracked by the female's energetic work on the nest, and that she had removed it.

When it was found the nest rim was at a right angle to the plant support, however, gradually the outer edge of the nest rim became slanted downward to a 45° angle because the female used that side as a perch. During incubation she sat in the nest in all compass directions, but more frequently faced the nest support. After the nestling hatched it consistently oriented up, toward the plant stem, and the female regularly brooded in that direction with her tail cocked upward. Skutch (1964), Snow & Snow (1973), and Théry (1987) describe this same orientation of hummingbird females toward the nest support of pendant nests.

During 9 h on the 4th and 5th day after I found the nest, the Blue-tailed Emerald incubated her eggs 62% of the time. Skutch (1964, 1967, 1972) recorded incubation for 58—79% of the time for other Neotropical hummingbirds. But Schuchmann & Jakob (1981) found that a captive female *Trochilus scitulus* incubated 86% and 85% of the time during 12 h sessions. The greater incubation time might be because the bird had a close and secure source of food, as compared with free living birds.

Nestling growth and behavior. The single nestling hatched on the early morning of 9 January. This was an incubation period of a minimum of 19 days, because even if the nest was found on the day of the laying of the second egg, I do not know which egg was lost. I weighed and measured the chick daily (Table 1). The calculated growth rate constant K was 0.2777, and the inverse measurement of growth rate, the t_{10-90} value, was 15.81 days. This appears normal when compared with other Neotropical hummingbirds (Ricklefs 1976).

At hatching the nestling skin was Dusky brown above, and Cinnamon-rufous below, colors #19 and #40 respectively (Smithe 1975, 1981). It had rufous colored dorsal downs about 5—6 mm long. An egg tooth was on its upper mandible, but had disappeared by day 8. The next morning, day 2, the chick moved around and clung to the nest lining when I removed it for weighing. By day 3 the head and dorsum were still color #19, the mandible was Salmon #6, and the ventral skin a deeper Salmon #106, legs and feet Buff #124, and the downs True Cinnamon #139. On day 4 paired downs, nine on the left side and 10 on the right, were 6—8 mm long. This natal down pattern was similar to those of other hummingbirds as reported by Collins (1978).

On day 10 the nestling could turn itself over when laid on its back. The following day emerging ventral feathers, in brush, were white in contrast to all other feathers that were rufous, indicating that the chick was probably a female. More certain evidence of sex was obtained, when on day 19 the outer rectrices were white and the next outer ones white tipped. On day 14 the nestling's wing coverts were in brush while the primaries were still in sheaths. On day 17 the primaries and secondaries emerged from their sheaths, and primary (P) 6 was the longest, P 5—1 were decreasingly smaller, while P 7—10 were the smallest and about the same size as the emerging secondaries. This pattern was the same for both wings.

On day 15 a metallic green sheen was noted on the secondary covert emerging brushes and on the following day distinctive facial stripes were clearly buffy, not white as in the adult female. On the nestling's 19th day the dorsum was well feathered, although much of the ventral area was still bare, and it was not yet ready to fly. Sometime between this examination and the following morning at 08:30 the chick suffered

TABLE 1. *Chlorostilbon mellisugus* nestling growth. A. body mass (g); B. length of manus (mm).

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	0.2	0.4	0.5	0.6	0.8	0.9	1.2			1.9	2.0	2.2	2.8*	2.6	2.8	2.7	2.8	2.8	2.7
	—	—	—	—	—	—	—			5	8	9	11	12	14	15	16	17	19

* Body mass of adult female = 2.8 g.

predation. The nest and the nestling were entirely gone with no evidence of either in the vicinity. A few < 1 cm fragments of nest material were still attached to the nest support. This suggests an avian predator, rather than a snake or mammal.

Parasites. On day 4 the first larva of a species of Muscidae was noted as a dark lump on the chick's neck, eventually four other subcutaneous larvae were found in the nestling's dorsal surface. I extracted them as soon as possible. Several authors have reported fly larva infesting hummingbird nestlings, even causing their death (Skutch 1964, Schuchmann 1978, Oniki 1983).

The first of many ectoparasitic mites were observed, beginning on day 6, in the nest and on the nestling. Each morning when I handled the chick the mites crawled off on to my hands until day 8, when the chick was quite warm to my touch, and from then on stayed on the nestling. This might be a crude way of assessing that the young bird was now thermoregulating. Schuchmann (1985, 1986) reported that thermoregulation began on day 10 for *Lampornis clemenciae*, and day 8 day (counting hatch day as 1) for *Phaethornis ruber* respectively.

Parental care. The female Blue-tailed Emerald was a restless incubator and brooder. During approximately 12.5 daylight hours on the chick's 6th and 7th day I timed her behavior. She brooded in 18 sessions (mean = 8.3 min; range 5—13 min; SD ± 2.3). She was absent 19 times (mean = 27.8 min; range 12—71 min; SD ± 13.8). There were 15 feedings all of brief duration. She covered the nest 21% of the time. This compares with a brooding time of 20% for two *Colibri thalassinus* 5—7 days old (Skutch 1967), but generally greater coverage of younger nestlings are noted in Skutch (1972).

On the 17th day the female brooded only three times (6, 9, and 1 min) leaving at 08:11. Starting with her return at 08:55 the chick was fed 14 times before dark on day 18. These feedings were much longer often lasting 20—22 s. Her 15 absences were similar to her behavior 11 days earlier (mean = 36.0 min; range 10—72 min; SD ± 17.3). The nestling was no longer brooded at night starting on day 18.

The female fed the nestling by regurgitation but was often seen to gather tiny rufous spiders from abundant small webs on the overhead and nearby mesquite trees. The angle between the long thorns of this tree and its branches, supplied both web for the nest structure and food for the nestling. I examined several of these webs and found > 100 tiny spiders in each.

DISCUSSION

Although Meyer de Schauensee & Phelps (1978) reported that the Blue-tailed Emerald "perches low" this needs to be qualified. In this study area I mistnetted a number of hummingbirds, nine *Glaucis hirsuta* at c. 1—2 m above the ground; 10 *Phaethornis augusti* at c. 2—3 m; nine *Amazilia fimbriata* at c. 2—2.5 m; and five *A. tobaci*, all but the latter were common or fairly common permanent residents (Thomas 1982, 1990, 1993). Even though the Blue-tailed Emerald was also a common resident I caught only two, because both males and females spent their time in the canopy at 4—5 m, well above the top of my 3-m high mistnets.

Voous (1957) reported an unusually short incubation period of 13 days and fledging at 18 days on Aruba for this species. The incubation period of the bird I studied was a minimum of 19 days, and it was not yet ready to fledge on the last day that I examined it. Thus, in the Venezuelan subspecies, if indeed it is different, both the incubation and nestling period are longer. In Argentina Fraga (1984) found the congeneric Glittering-bellied Emerald, had a 15 day incubation, and a nestling period of 21—23 days.

Belcher & Smooker (1936) reported breeding of *C. caribbeanus nanus* (syn. *C. mellisugus cari-*

baeus Meyer de Schauensee & Phelps 1978), on Trinidad in May, which is just before the onset of heavy rains there in late May (ffrench 1973). In a long-term study of the Los Anaucos habitat I have records of Blue-tailed Emeralds breeding from August to January, but lack a November record, and flight feather molt in January and February (Thomas 1993). Thus, I consider it a late wet season to early dry season breeder in northern Venezuela.

In pendant hummingbird nests, including this one, it has often been noted that the parent incubates and broods facing the nest support. Over time the outer edge of nests begin to tip down from horizontal, rather than an incipient danger to the nest contents, as it may appear, this nest angle may be adaptive. The nestlings cling to the nest head up, toward the nest support, an orientation that facilitates gaping behavior when stimulated either tactily or by air movement of the wings of the feeding female, as shown by Schuchmann (1983, 1989). In the case of the nest I studied the female would not have been able to hover at the nest to induce gaping because of obstructing foliage until the outer rim of the nest was bent down at a 45° angle.

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