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FIRST DESCRIPTION OF THE NEST AND EGGS OF THE GREEN-CROWNED BRILLIANT (*HELIODOXA JACULA*), WITH SOME BEHAVIORAL NOTES

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Abstract. A nest of the Green-crowned Brilliant (*Heliodoxa jacula*), previously undescribed, was found on 20 January 1999 along a tributary of Río Grande de Orosí on the Caribbean side of the northern Cordillera de Talamanca of Costa Rica. The bulky, cup-shaped nest was constructed from fibers and scales of tree ferns and covered outside with liverworts and a few mosses and lichens. It was saddled on a thin, slightly downsloping branch and had two "tails" of hanging liverworts, longer than the height of the nest cup, draped beneath the nest on each side of the supporting branch. It eventually contained two whitish eggs that were long elliptical in shape, measuring roughly 16.5 mm by 11 mm. Two other nests of the species discovered subsequently were very similar in construction and/or placement to the first. Brief observations of nest-building and incubation behavior at the first nest were generally consistent with descriptions for various other hummingbird species. *Accepted 25 February 2000.*

Resumen. Un nido del colibrí Brillante Frentiverde (*Heliodoxa jacula*) fue encontrado el 20 de Enero de 1999 cerca de un tributario del Río Grande de Orosi, vertiente Caribe, extremo norte de la Cordillera de Talamanca, Costa Rica. El nido de esta especie no había sido descrito anteriormente. Este nido es compacto, en forma de taza, construido con fibras y escamas de helecho arborescente y cubierto externamente con hepáticas, pocos musgos y líquenes. Estaba sostenido en una ramita ligeramente inclinada hacia abajo y tenía dos "colas" de hepáticas colgando, más largas que la altura del nido. Este contenía eventualmente dos huevos de forma elíptica alargada, midiendo aproximadamente 16.5 x 11 mm. Otros dos nidos de la misma especie descubiertos posteriormente fueron muy similares en su construcción y/o localización respecto al primero. Las breves observaciones del comportamiento de construcción e incubación del primer nido fueron coincidentes con las de otras especies de colibríes.

Key words: Green-crowned Brilliant, Brillante Frentiverde, Heliodoxa jacula, *hummingbird, nest, nest building, incubation, Costa Rica.*

INTRODUCTION

The Green-crowned Brilliant (*Heliodoxa jacula*) has the most northerly range of the nine hummingbird species in its genus (del Hoyo *et al.* 1999). Its distribution in Costa Rica, where it is represented by the subspecies *H. j. henryi*, is from Cordillera de Guanacaste southward, mainly on the Caribbean slope but locally on the Pacific slope of the northern ridges, and especially on Cordillera de Talamanca (Stiles & Skutch 1989). The species is "fairly common" in the subtropical forest between 700–2000 m (Slud 1964, Stiles & Skutch 1989). Around Tapantí National Park, where the senior author often has worked with mist nets, it is one of the most frequently caught birds between 800–1000 m (J. Sánchez, unpubl.).

Although nests of *H. jacula* apparently have been found before (K.-L. Schuchmann, pers. com.), none has been found in Costa Rica (F. G. Stiles, pers. com.), and no nest description has been published previously; in fact, nesting information is unavailable for most species in this genus (del Hoyo *et al.* 1999).

STUDY AREA AND METHODS

The study area consisted of secondary riparian growth bordering Río Quirí at an elevation of 1200 m on the Caribbean slope (9°46'45"N, 83°42'30"W). Río Quirí is a small tributary of Río Grande de Orosí, which traverses Tapantí National Park on the Caribbean side of the northern Cordillera de Talamanca.

At 07:15 h (CST) on 20 January 1999, while making observations for a study of wintering Louisiana Waterthrushes (*Seiurus motacilla*) and other obligate riparian birds at Río Quirí, Mulvihill observed a hummingbird fly from downstream directly into a small bush on the opposite bank of the stream, at a distance of about 25 m. Training binoculars where the bird appeared to land, he observed it sitting on a nest and adding nesting material to it. Mulvihill watched the hummingbird for about 15–20 min, during which time it visited the nest six times. Because the bird was on the nest for very short periods of time, was largely concealed by the nest cup and surrounding leaves during these brief nest visits, never perched prior or subsequent to a nest visit, and flew out of sight between nest visits, its identity could not be positively determined at first; nonetheless, based on what could be seen, *H. jacula* was considered to be one of only a few possibilities.

At 07:30 h on the following morning, Mulvihill and Master returned to the nest site. Master moved to a position within 4 m of the nest and was quickly able to confirm that the bird building the nest was a female *H. jacula* (Fig. 1). They watched the female building the nest for about 30 min, during which time she made six visits. They returned later in the morning, at 10:15 h, to obtain photographs of the nest. The female was not seen during this 15-min visit. Because the junior authors were scheduled to leave Rio Quirí on 21 January and Costa Rica on 23 January, they were unable to follow up on their nest discovery. Therefore, upon returning to the United States, Mulvihill contacted Sánchez and informed him of the nest's location so that a full description could be made for the ornithological record. Sánchez and Robert Fisher relocated the nest on 28 January 1999, observed the female's behavior at the nest for about 30 min, then collected the nest and eggs in order to make a full description.

RESULTS AND DISCUSSION

Nest building. During the course of the early morning observation on 20 January, when the nest was first found, the female averaged about one trip to the nest every 3 min, typi-

FIG. 1. Female Green-crowned Brilliant (*Heliodoxa jacula*) sitting on a completed nest first found under construction on 20 January 1999 along Rio Quirí near Tapantí National Park, Costa Rica. Photo by Julio Sánchez.

cally remaining at the nest for < 30 s. Her building rate early on the following morning, when the nest was obviously nearing completion, was a little slower on average, about one trip every 4 min, however, she made two trips within one minute during this observation. Also, she sometimes remained at the nest for a minute or more during this observation. Although she was being watched from much closer range, we do not think this affected her building rate–she showed no signs of nervousness and continued to fly directly onto the nest at each visit.

Oniki & Willis (1998) observed a much more rapid building rate of about one trip per minute and shorter nest visits (7 s on average) for the much smaller Frilled Coquette (*Lophornis magnifica*) (body mass c. 2 g compared to c. 8 g for *H. jacula*; del Hoyo *et al.* 1999). They (1998) reported that the female *L. magnifica* gathered nesting material from within 10 m of the nest, whereas the female *H. jacula* reported on here flew out of sight, for a distance of at least 25 m, between nest visits.

During her brief nest visits on the morning of the first observation, the female *H. jacula* sat in the nest cup, bent her head down over the side of the cup, made rapid tamping motions with her bill all around the outside of the nest cup, and then quickly left. During observations made on the following morning, her nest-building included slower, more deliberate tamping motions, as well as broad sweeping, or smoothing, motions with her bill along the outside of the nest cup. In addi-

FIG. 2. *Heliodoxa jacula* nest and eggs photographed along Rio Quirí near Tapanti National Park, Costa Rica on 28 January 1999. Photo by Julio Sánchez

tion, she sometimes spent a short time during nest-building visits on 21 January sitting motionless in the nest cup in an incubation-like posture.

When it was first found on 20 January, the nest appeared to be nearly completed; however, the nest cup was perceptibly taller, by about 1 cm, on the following morning. In addition, the color of the outside of the nest had changed from reddish-brown to grayish-brown, presumably through the addition of spider webbing, lichens, or other materials, but perhaps also due to the drying out of nest materials incorporated previously. As mentioned above, the female was not seen at the nest during the late morning visit on 21 January. Oniki & Willis (1998) observed late morning reduction or cessation of nest-building activity by *L. magnifica*.

Incubation. At 09:35 h on 28 January 1999, when Sánchez first checked the nest, the female was not present and the nest contained two eggs (Fig. 2). The female arrived one minute later, perching 3 m from the nest and carrying material for the nest (tree fern fibers). At 09:36:30 she entered the nest to incubate and to place the nesting material on the upper interior wall of the nest, pushing repeatedly with her beak. Continuation of nest building behavior during incubation is characteristic of many species of hummingbirds (Skutch 1958, 1961, 1964, 1973; Sick 1993, Oniki & Antunes 1998, Oniki & Willis 1998).

At 09:50 h she left the nest, returning at 09:55 h, this time stopping right within the nest on her return. At 09:58 h she began to move, turning the eggs, raising her body and

FIG. 3. Illustration showing details of the construction of the *Heliodoxa jacula* nest collected along Rio Quirí near Tapantí National Park, Costa Rica on 28 January 1999. Asymmetrical nest cup height at the two ends of the supporting, downsloping *Saurauia* sp. branch kept the top of the nest cup level with respect to the ground. Drawing by Jose Alberto Pérez.

neck slightly and moving her head from side to side. At 10:03 h she once again left the nest. During a half hour of observation, she incubated twice, for 13.5 min and 8 min (ave. 10.75 min), and was absent from the nest once for 5 min, or < 20% of the observation

period. Although these data are very limited, the absolute and/or relative lengths of the attentive and inattentive periods during this observation are fairly consistent with incubation data for other tropical hummingbirds (Skutch 1958, 1961, 1964, 1973; Oniki & Antunes 1998, Oniki & Willis 1998). The female made no vocalizations whatsoever during this observation, and none was noted during the earlier visits by Mulvihill and Master.

Nest description. The bulky, cup-shaped nest was built in a leaning *Saurauia* sp. bush growing on a high stream bank in an area of young second growth near the headwaters of Río Quirí, about 35 m downstream of a 15 m high waterfall. It was saddled on a lower, slightly downward sloping branch 1.95 m from the top of the stream bank and another 2 m from the stream. The horizontal supporting branch was 13.2 mm thick; a smaller (6.3 mm thick) vertical branch, imbedded within the nest wall, provided additional support on the lower side of the nest (Figs 1 and 3). Two "tails" of nesting material hung beneath the supporting branch.

The height of the outer nest cup was 65.8 mm on the lower end of the branch and 55.4 mm on the upper end. The depth of the cup was 33 mm and 28 mm on the two ends, respectively. This asymmetry allowed the upper edge of the nest to be more or less horizontal with respect to the ground (Figs 1 and 3). The outside diameter of the nest cup was 57 mm; the inside diameter was 31 mm.

The nest cup was constructed in two layers. The outer layer of the nest was composed of scales from tree ferns *Cyathea onusta* and *Sphaeropteris brunei*, while the somewhat thicker inner layer was composed of fibers of *C. onusta*. The outside of the nest was decorated mainly with the liverworts *Taxilojeuna* sp. and *Frullania* sp., and less so with the moss *Meteorium illecebrum* and a few pieces of greenish-white lichen, all stuck on with spider webs. The two "tails" draped beneath the nest, one on each side of the supporting branch, measured 80 mm and 90 mm in length; they were composed of the hanging liverworts, *Taxilojeuna* sp. and *Frullania* sp. The nest contained two whitish eggs that were long-elliptical in shape (terminology of Harrison 1978), measuring 16.4 mm by 11.2 mm and 16.45 mm by 10.75 mm (Fig. 2). The nest and eggs were deposited in the Ornithological Collection of the National Museum of Costa Rica.

Comparative nest information for other *Heliodoxa* sp. is scarce. del Hoyo *et al.* (1999) give some nest information for just two *Heliodoxa* species: the nest of the Violet-browed Brilliant (*H. xanthogonys*) is described simply as "saddle-shaped;" one nest of the Empress Brilliant (*H. imperatrix*) was a "downy cup…plastered on top of a palm frond 10 m up at forest edge." The Magnificent, or Rivoli's, Hummingbird (*Eugenes fulgens*), placed by some authors in the genus *Heliodoxa* (see Johnsgard 1983), has a bulky cup-shaped nest without hanging "tails," which typically is saddled on a thin horizontal branch, often at the edge of a stream or other forest gap (Johnsgard 1983, Stiles & Skutch 1989).

On 20 July 1999, Suzanne Palminteri showed Sánchez and G. Powell another nest of *H. jacula*, similar to that just described. It was found about 6 m off the ground at the end of the lower branches of a tree in primary forest in the Monteverde Biological Reserve, at an elevation of 1600 m. At 17:00 h the female was observed sitting on the nest, but due to the height and position of the nest, no observation of its contents could be made. In addition, On 8 January 2000, Mulvihill, along with Master and Ernesto Carman, found another *H. jacula* nest on Río Quirí just 50 m upstream of the nest found in 1999 and, therefore, possibly built by the same female. This second nest on Quirí, in a much earlier stage of construction than the one found pre-

viously (i.e., with "tails" and base but minimal nest wall or cup formation), was situated very similarly to the first: 4.5 m above the stream, 50 cm from the tip (and proximal to a horizontal fork) on a thin, lower, slightly downsloping, moss- and lichen-covered branch in a leaning *Saurauia* sp. bush growing on a high stream bank. A week later this nest was found destroyed, possibly by a falling branch and probably before it had been completed (Carman, pers. com.). The three nests described in this paper, active in January and late July, are near the reported seasonal limits of breeding for this species in Costa Rica (Stiles 1985, Stiles & Skutch 1989).

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