

THE BREEDING OF THE HENNA-HOODED FOLIAGE-GLEANER (*HYLOCRYPTUS ERYTHROCEPHALUS*), WITH NOTES ON CONSERVATION CONCERNS

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Resumen. – La nidificación del Rascahojas Capuchirrufa (*Hylocryptus erythrocephalus*), con notas sobre su conservación. – Estudiamos aspectos de la biología reproductiva del casi desconocido y vulnerable Rascahojas Capuchirrufa (*Hylocryptus erythrocephalus*) en el suroeste de Ecuador. Los nidos fueron copas de fibras flexibles gruesas y planas (n = 3) dentro de una cámara al final de un túnel excavado por los adultos (n = 17). Todos los nidos excepto uno fueron encontrados en el talud de un camino, ribera de una quebrada seca, o lindero de un sendero. Los que examinamos contuvieron tres huevos (n = 5), que fueron desovados a intervalos de c. 48 h separados (n = 2). Nidadas duraron c. 5 días para ser completadas (n = 2), y la incubación duró 16–19 días (n = 3). Pudimos observar los pichones de dos nidos; todos los pichones observados estaban infestados por larvas de Diptera. Aunque el sitio de estudio fue dentro de una reserva privada, varios viandantes pasan caminando y manejando carros sobre el camino donde estuvieron situados la mayoría de nidos que estudiamos. De videos que tomamos durante la época de incubación en un nido, 12 de 22 salidas del nido fueron causados por los viandantes, y sugerimos la posibilidad de que el camino puede atraer *H. erythrocephalus*, pero también funciona como un sumidero, es una amenaza que merece ser investigada mas a fondo.

Abstract. – We studied aspects of the breeding biology of the poorly known and vulnerable Henna-hooded Foliage-gleaner (*Hylocryptus erythrocephalus*) in southwest Ecuador. The nests were thick, flattened cups of flexible fibers (n = 3) in a chamber at the end of a tunnel excavated by the adults (n = 17). All but one of the nests was in a nearly vertical muddy road cut, stream bank, or trail edge, and those that we examined contained three eggs (n = 5). Eggs were laid c. 48 h apart (n = 2). Clutches took c. 5 days to complete (n = 2), and incubation lasted 16–19 days (n = 3). We were able to observe the nestlings in two nests. All nestlings were infested by dipteran larvae. Though our study site was in a private reserve, local passersby both walk and drive the road along which most of our study nests were located. From videos we took during the incubation period at one nest, 12 of 22 observed off-bouts were caused by these passersby, and we suggest the possibility that road cuts can attract nesting *H. erythrocephalus*, but act as sink habitats, is a potential threat worth further investigation. *Accepted 12 December 2012.*

Key words: Henna-hooded Foliage-gleaner, *Hylocryptus erythrocephalus*, Tumbesian, breeding biology, Furnariidae.

INTRODUCTION

The reproductive biology of the Henna-hooded Foliage-gleaner (*Hylocryptus erythrocephalus*) is poorly studied. It is reported to nest at the end of a 1-m long tunnel in a dirt bank (Best *et al.* 1993, Remsen 2003), but further information is lacking. The species is endemic to the threatened Tumbesian Region, a severely deforested area of seasonal rainfall stretching from western Ecuador to northwestern Peru (Dodson & Gentry 1991, Best & Kessler 1995). Due to this deforestation, and because its population is thought to be declining rapidly, *H. erythrocephalus* is considered ‘Vulnerable’ to extinction (BirdLife International 2011), making a thorough understanding of its breeding biology of conservation relevance.

The genus *Hylocryptus* contains only two species, both restricted to seasonal forests in geographically disparate areas (Remsen 2003, Faria *et al.* 2008). Though recent studies on the natural history of the congeneric Henna-capped Foliage-gleaner (*H. rectirostris*) (Faria *et al.* 2007a, Faria *et al.* 2007b, Faria *et al.* 2008) have improved our understanding of the reproductive biology of the Philydorini tribe as a whole, recent evidence suggests that *Hylocryptus* as currently circumscribed is actually polyphyletic (Derryberry *et al.* 2011). Current evidence suggests that *H. erythrocephalus* is closely related to Ruddy (*Automolus rubiginosus*) and Santa Marta Foliage-gleaner (*A. rufipectus*), respectively (Derryberry *et al.* 2011, Krabbe 2008), both poorly studied species.

During work in the Tumbesian region of southwest Ecuador, we opportunistically studied the breeding biology of *H. erythrocephalus*. Here we report details of nest placement, construction, and composition; the appearance, size, and rate of water loss of the eggs; laying and hatching events; incubation period and rhythm; clutch size; descriptions

of the nestlings; and adult behavior in and around the nest.

METHODS

From March–May 2006, February–March 2007, and February–March 2010, we studied nests of *H. erythrocephalus* in the Jorupe Reserve of the Jocotoco Foundation (4°22′42.32″S, 79°54′3.67″W, 600–750 m a.s.l.), a *Ceiba*-dominated dry forest near Macará, Loja province, southwest Ecuador (Fig. 1). For further site details, see Miller *et al.* (2007).

By walking the reserve’s trails, noting behavioral cues and scanning for desirable nesting locations, we found 17 active *H. erythrocephalus* nest burrows, most of which we were unable to access due to the length of the entrance tunnel. For this reason, we could not comprehensively determine nesting biology characteristics for all nests.

We were, however, able to either see into or reach the contents of four nest burrows. One of these nest burrows we studied in both 2006 and 2007, and so we therefore observed five complete clutches. We were able to access the contents of three of these nest burrows, and measured the size of the eggs from two of these using calipers accurate to 0.1 mm. On four separate occasions, spanning 11 days (and beginning near the date of clutch completion, based on incubation period and the appearance of the eggs upon discovery), we weighed the eggs of one of these nests using a digital scale accurate to 0.001 g. At the same nest, 3 and 6 days after the eggs hatched, we removed the nestlings and took photographs to document their development. We weighed two additional well-developed eggs from a single nest – the third egg was partially consumed by a presumed predator. The three nests that we could access were removed from the burrow after the nesting period; two were air-dried for several months before



FIG. 1. A map showing the location of Jorupe Reserve in southwest Ecuador. The reserve is outside the city of Macará, Loja.

we dismantled them to quantify use of materials.

At one nest burrow we monitored activity during incubation using a video camera hidden approximately 10 m away. The camera was positioned on the opposite side of a muddy road used mostly for foot and horse traffic, though a few trucks also passed on most days. Thus, we were easily able to determine when humans were in the vicinity, as they passed between the camera and the nest. The majority of these passersby were local residents traveling to and from an inholding that is not part of the reserve. The birds almost always flushed from the burrow when humans walked past, especially if they were not actively taking care to walk quietly (e.g., bird watchers were often able to pass the bur-

row without flushing the adults, but the average group of chatting local residents was not). The camera itself did not appear to bother the adults, and we were able to change cassettes (by approaching from the road edge) without flushing the birds from the burrow. When doing so, if the adults were nearby, we observed them at this time. We subsequently watched videos at the Yanayacu Biological Station, all of which have now been archived at the Cornell Lab of Ornithology, Ithaca, New York, USA.

RESULTS

Burrow placement and dimensions. The nests of *H. erythrocephalus* were thick, saucer-like cups of flexible fibers placed in an expanded chamber



FIG. 2. A Henna-hooded Foliage-gleaner (*Hylocryptus erythrocephalus*) brings rootlets to a nest in construction at Jorupe Reserve in southwest Ecuador. The shady, root-filled bank habitat that seems to be preferred for nesting is also visible. Photo by Murray Cooper.

at the end of an earthen tunnel excavated by both adults. All but one of the 17 nest burrows that we located was in a nearly vertical muddy road cut, stream bank, or trail edge (14 were along the road). A single burrow was in the middle of a small trail inclined roughly 20° above horizontal. From our observations at a single nest during walks on the reserve's trails, we saw that two adults excavated burrows and brought material for nest construction. We have no reason to suspect that helpers assist and assume these adults were breeding pairs.

Burrows were generally excavated in shaded sections of the bank, such as under overhanging vegetation, between roots or, most commonly, under overhangs formed by erosion from the bank, as seen in Figs 2–3 ($n = 17$). We located several nest burrows ($n = 4$) by flushing adults while they were engaged in active excavation. From these

observations, it seemed that most nest building occurs before midday, though some visits were also made in the afternoon.

Burrow entrances were generally wider than tall, measuring 8.9 ± 0.5 cm wide by 7.2 ± 0.6 cm tall (mean \pm SD, $n = 11$). Mean tunnel length to the front of the nest chamber was 43.8 ± 16.6 cm (mean \pm SD, $n = 6$), with most tunnels inclined slightly upwards and with a slight bend just before the terminal chamber. We were able to measure only one nesting chamber, which was 15 cm in diameter and 7 cm tall at its tallest point. The average height of banks chosen for nesting was 2.3 ± 1.6 m (mean \pm SD, $n = 13$), the average height of the burrow entrances was 2.2 ± 1.6 m (mean \pm SD, $n = 14$), and the burrows were placed on average above the ground $79 \pm 15\%$ (mean \pm SD, $n = 13$) of the total height of the bank.

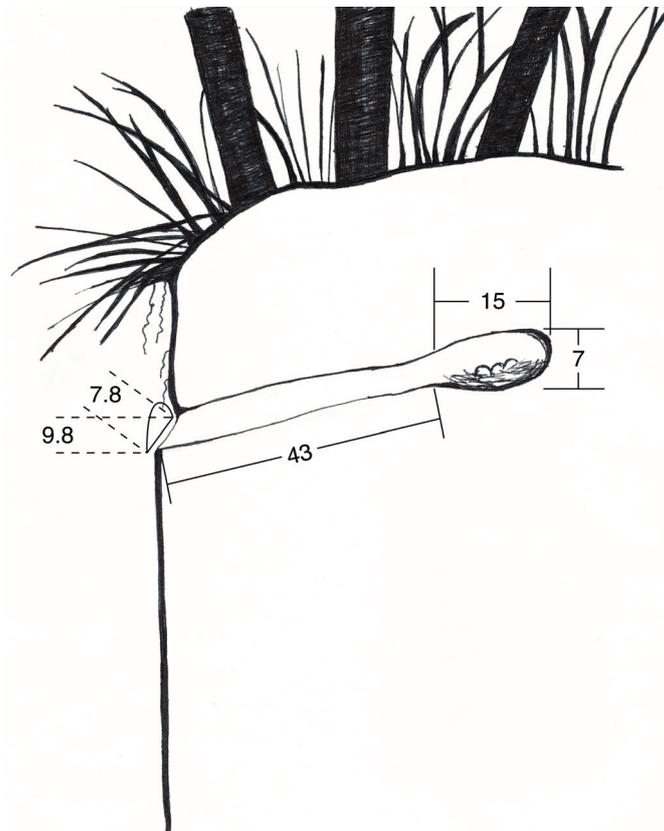


FIG. 3. The burrow and nest of *Hylocryptus erythrocephalus*, with measurements given in centimeters. The semi-circle-shaped burrow entrance is shown schematically. Illustration by S. K. Wagner.

Nest size and materials. One of the nests we removed was 10.9 x 13.1 cm in outside diameter across the shortest and longest axes, respectively, whereas the other two were visually estimated to be 12 cm in outside diameter. The outside height of one nest was 3.1 cm, and the other two were visually estimated to be 4 cm. All three nests had shallow, poorly defined depressions 1–2 cm deep. Two of these nests were composed almost entirely of thin, flexible materials with no differentiated lining (Fig. 4), whereas the third could be divided into two layers, which seemed to represent a new nest built on top of an older construction, rather than a distinct lining.

Materials were crisscrossed and interwoven (rather than coiled), and formed a thick, tangled mat. The nests that we dried and took apart were composed primarily of thin, dark, branched rootlets. These dark rootlets were generally c. 20 cm long, but a few were c. 60 cm. Distinct from these were thicker, lighter brown, kinked but unbranched roots. These were more abundant in the base of the cup and were longer, often > 40 cm. Sparsely included throughout the nest were pieces of dried grass, small sticks, liana tendrils, leaf skeletons, fungal rhizomorphs (Fig. 4, inset), and one long mammalian hair. Quantified compositional data for one nest are presented

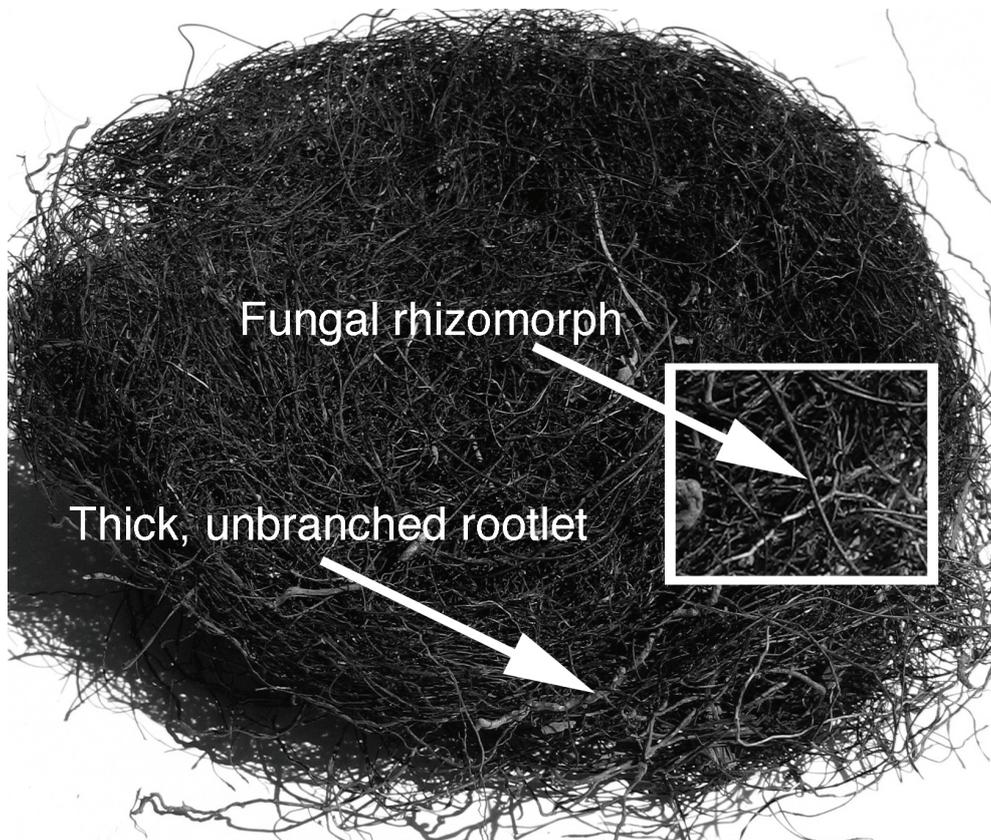


FIG. 4. The air-dried *Hylocryptus erythrocephalus* nest before it was dismantled into its component parts. The progression towards thicker, lighter brown, unbranched rootlets concentrated in the base of the cup can be seen in the figure. The inset presents a closer view of a smooth, shiny fungal rhizomorph. Photo by Eliot Miller.

in Table 1. The other nest we dismantled was similar.

Clutch size and egg description. Clutch size was three eggs at each of five nests. All 15 examined eggs were between oval and suboval and immaculate white (like those of almost all other Furnariidae), usually appearing off-white due to staining by surrounding soil (photos available upon request). Mean dimensions of six eggs from two nests were $28.4 \pm 0.4 \times 21.7 \pm 0.6$ mm (mean \pm SD). The mean mass of the eggs from a single clutch was 6.91

± 0.24 g (mean \pm SD, $n = 3$) when first weighed. These eggs lost mass at rates of 0.23, 0.46, and 0.33 % of their original (day of clutch completion) mass per day during the first 11 days of the incubation period. The two partially-developed eggs that remained in the depredated nest weighed 6.64 and 7.15 g.

Laying, incubation and hatching rhythms. Eggs at two nests were laid c. 48 h apart. The incubation period at three nests was: > 17 days, c. 16 days, and > 18 days. Thus, clutches were completed within 5 days, and incubation lasted

TABLE 1. Dry weight component data of a *Hylodyptes erythrocephalus* nest, disassembled after air-drying for several months. Only one layer was clearly discernible, but the thick, brown rootlets were concentrated near the base of the shallow cup.

Nest material	Dry weight (g)
Dark rootlets	9.47
Thick, brown, kinked rootlets	2.20
Dried grass, stick pieces, and leaf skeletons	0.62
Fungal rhizomorphs	0.45
Hair	< 0.001

16–19 days. We observed hatching at two nests. In both, this occurred asynchronously, with two eggs hatching a day ahead in one, and one egg hatching a day ahead of the others in the second. Thus, incubation may begin before clutch completion.

We filmed for a total of 25.19 h at *H. erythrocephalus* nest burrows. Of these, 17.03 h were of incubation at a single nest, and we present data on incubation rhythms in Fig. 5. Often, a second individual entered while the first was incubating. We assume this second individual replaced the first, and therefore that two adults incubated. At least one adult was inside the burrow (presumably covering the eggs) for 72.8% of our observations during daylight hours. We considered any on-bout that was terminated by human activity, and the resulting off-bout, to not be natural. Thus, the average on- and off-bouts, including those altered by human presence, were 31.3 ± 33.1 min (mean \pm SD, $n = 20$) and 50.3 ± 32.8 min (mean \pm SD, $n = 22$), respectively. When only natural on- and off-bouts are included, the values are 42.0 ± 39.0 min (mean \pm SD, $n = 12$) and 54.1 ± 38.2 min (mean \pm SD, $n = 10$), respectively. The longest observed on-bout lasted 135.2 min. On another occasion, an individual that incubated for 85.7 min exited the nest just before dusk, stretched and preened while perched on over-

hanging roots for 1.2 min, then returned to continue incubating for at least 50.4 min, at which point twilight ended and our video could no longer detect activity at the nest.

Nestling description. Three days after hatching, we removed and photographed the nestlings from one nest. At least two of the three nestlings were infested with large, subcutaneous dipteran larvae, tentatively identified as *Philonis* sp. (Muscidae, Diptera). The nestlings' eyes were closed, their skin was pink, and they bore sparse but long wisps of dark grey down, primarily in the orbital (including between the eyes) and occipital portions of the capital tract, the scapular and upper portions of the spinal tract, the femoral tract, and a few wisps along the alar tract (Wetherbee 1957). All three were still alive 6 days after hatching, and appeared to be developing normally, though large, obvious dipteran larvae now infested all. Their eyes remained mostly closed, most of their down feathers were gone, and feather development was clearly visible along the ventral, caudal and alar feather tracts. Some feather development was also visible along the scapular and upper portions of the spinal tract and along the femoral tract. These nestlings remained in the nest at least five more days before we ceased monitoring. Nestlings were also infested with dipteran larvae at the only other nest we observed during this stage.

Adult behavior in and around nest. Both adults appear to participate in incubation. We base this on the fact that a second adult routinely entered the nest burrow while a first was incubating and, though the second adult occasionally arrived with fresh nesting material (for at least 3–4 days after clutch completion), we never observed food brought to the nest during incubation. In general, the adults showed little aggressive behavior around the nest. When flushed, they usually flew directly to

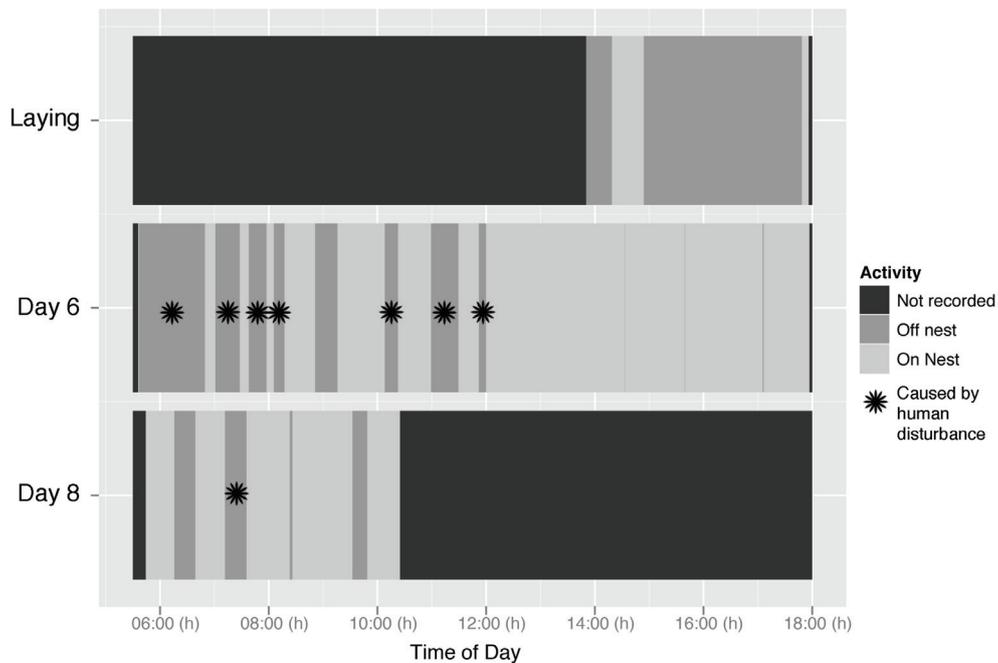


FIG. 5. Incubation rhythms at a *Hylocryptus erythrocephalus* nest. This provides a graphical representation of the large number of off-bouts caused by humans passing on the road. The first row represents data collected during the laying period, 3 days before the start of incubation. The second row represents day 6 of incubation, and the final row is day 8 of incubation. Time of day is represented along the x-axis.

nearly tangled underbrush and quickly moved out of sight, scolding little or not at all. On a few occasions they gave more persistent alarm calls if they returned from being flushed and found us still in the vicinity, but even then they remained well hidden in dense vegetation. Occasionally, when a second adult entered the burrow while the other was still inside, our camera (c. 10 m away) was able to record quiet vocalizations.

DISCUSSION

Our description of nest architecture and placement for *H. erythrocephalus* is broadly concordant with that of *H. rectirostris* (Faria *et al.* 2008) – an open cup of thin and uniform branches, lined with bark strips, placed in a

spherical chamber at the end of an 82 cm long tunnel – but shows some notable differences. Namely, the nests we studied were constructed largely of rootlets, not branches, and our entrance tunnels were shorter. Moreover, *H. rectirostris* entrance burrows seemed to be built at steeper angles into the bank, and were generally rounder than were those of *H. erythrocephalus* we studied. The nests that Faria *et al.* (2008) studied contained 1–3 eggs, with a mean of 2.5. The five nests for which we have data all contained three eggs. Differences among related burrow-nesting Furnariidae have been shown to be phylogenetically informative (Zyskowski & Greeney 2010), and given these disparities, we concur with recent evidence (Krabbe 2008, Derryberry *et al.* 2011) that the two recognized members of

Hylocryptus do not appear to be particularly closely related.

A more phylogenetically relevant comparison may be between *Automolus rubiginosus* and *H. erythrocephalus* (Krabbe 2008, Derryberry *et al.* 2011). The former nests in burrows excavated in shaded earth banks (Rowley 1966, Marin A. & Carrion B. 1991, Gómez de Silva G. *et al.* 1999). From the scant literature available, these species' burrows are similar in height, placement in the bank, and length; in the size and shape of the chamber; and in nest materials (Rowley 1966, Marin A. & Carrion B. 1991). These authors also discuss the seemingly large relative size of the eggs of *A. rubiginosus* – data from both of these studies provide an average of 13.8% of the female's body mass. If we take the midpoint of the range in observed adult masses (Remsen 2003) to be the mass of a female *H. erythrocephalus*, then a *H. erythrocephalus* egg, at 14.8% of the mass of a female, is likewise large relative to the size of the bird.

We have little comparative data on incubation rhythms in Furnariidae, or even other Passerines for that matter. What little we know suggests that the rhythms we observed in *H. erythrocephalus* were abnormal (Greeney & Zyskowski 2008), though some other Furnariidae have been observed to take extended (but regular, i.e. not arrhythmic) off-bouts (Greeney 2009), and reduced parental attentiveness can also simply extend the incubation period, without necessarily leading to nest failure (Martin *et al.* 2007). We draw attention to row two of Fig. 5. Regular human disturbance may hinder proper embryonic development (McGowan & Simons 2006), and may have contributed to the ultimate failure of this nest. We spent a few hundred observer hours at Jorupe Reserve, much of it walking on trails and in dry stream beds in the woods. Yet, the vast majority of nests that we found were located along the road. Though empirical evidence is lacking, the prospect that road banks

could simultaneously attract vulnerable nesting *H. erythrocephalus*, and act as sink habitat, warrants further investigation.

The Tumbesian Region is characterized by a pronounced wet-dry cycle (Best & Kessler 1995). The rains stopped the day after we arrived in March 2006. At that time the soil of potential nesting banks was loose and, we speculate, too soft for construction of a stable burrow. Within a week of being there in 2006, both Whooping Motmot (*Momotus subrufescens*) and *H. erythrocephalus* began excavating burrows. By the time we left in April that year, the mud had baked to a rocky consistency. Presumably, there is a narrow window in which to excavate these burrows. El Niño severely affects the timing and quantity of the rains in this region (Best & Kessler 1995), and may be another important factor for this species' conservation. Additionally, *H. erythrocephalus*, like *A. rubiginosus* (Gómez de Silva *et al.* 1999), has been speculated to undergo altitudinal migration (BirdLife International 2011, R. Ridgely pers. comm.). If indeed this is true, the few remaining intact altitudinal transects like those at Jorupe may be extremely important to maintaining viable populations of this species.

The Tumbesian Region is an area of tremendous bird diversity, much of it threatened by human encroachment; almost 20 years ago less than 5% of the area remained forested (Best & Kessler 1995, Parker *et al.* 1995). With few recently created protected areas, the situation is unlikely to have improved. Best & Kessler (1995) also state, “very few details are known about the habitat requirements, feeding preferences and life-histories of” Tumbesian threatened and near-threatened species. Six species, including *H. erythrocephalus*, were highlighted as showing particularly worrisome signs of sensitivity to understory degradation (Best & Kessler 1995). Though this contribution makes only modest gains with respect to a call for “quantitative ecological studies last-

ing several months at least, in both the wet and dry seasons” (Best & Kessler 1995), we hope it helps to draw attention to the dearth of information, and the relative ease with which it may be obtained during even sporadic visits.

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