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NESTING BIOLOGY OF THE LONG-WATTLED UMBRELLABIRD (*CEPHALOPTERUS PENDULIGER*). PART I: INCUBATION

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Resumen. – Comportamiento de incubación del Pájaro Paraguas Longuipéndulo (*Cephalopterus penduliger*). – Un nido del Pájaro Paraguas Longuipéndulo (*Cephalopterus penduliger*) fue filmado en Buenaventura, suroeste de Ecuador. El nido se filmó durante 226 h de luz, a partir del tercero o cuarto día después de haber sido depositado el único huevo, hasta su eclosión. La apariencia del nido y el huevo fueron muy similares a otros de esta misma especie reportados anteriormente. Solamente la hembra incubó el huevo, y el periodo de incubación total fue de 27 a 28 días. El huevo fue incubado diariamente en un rango de 65 a 88% por la hembra, teniendo un promedio de incubación total del 79% durante todo el periodo. La hembra adulta invirtió 2,1% del tiempo que permaneció en el nido en actividades distintas a la vigilancia. Se observó a la hembra alimentarse de hojas caídas dentro del nido

Abstract. – A nest of Long-wattled Umbrellabird (*Cephalopterus penduliger*) was videotaped in southwestern Ecuador during 226 daylight hours from 3–4 days after laying the single egg, until hatching of the nestling. The nest and egg were similar to other reports from northwestern Ecuador. Incubation was carried out by the female only and lasted 27–28 days. Daily coverage of the egg ranged from 65–88% and averaged 79% for the entire incubation period. The female spent 2.1% of her time on the nest engaged in non-vigilant activities. The female was also observed to eat leaves fallen into the nest. *Accepted 18 February 2006*.

Key words: Egg, Ecuador, Buenaventura, nest site, incubation, Long-wattled Umbrellabird, *Cephalopterus penduliger*.

INTRODUCTION

Long-wattled Umbrellabird (*Cephalopterus penduliger*) is an inhabitant of humid forests in the Pacific lowlands, foothills, and subtropical zones from Colombia to Ecuador (Ridgely & Tudor 1994, Jahn *et al.* 1999, Berg 2000, Jahn & Mena-Valenzuela 2002). Largely due to habitat destruction, but also because of hunting (for food), the Long-wattled Umbrellabird is considered globally vulnerable and, within Ecuador, endangered (Berg 2000, BirdLife International 2004, Jahn & Mena-Valenzuela 2002, Snow 2004). In Ecuador, this species is most numerous in the northwest, but its range extends southward along the western Andean foothills to El Oro province (Ridgely & Greenfield 2001).

While various sources mention unconfirmed nests of this species (Goodfellow

1901, von Hagen 1938, Berg 2000), there remains only one confirmed nest reported in the literature (Karubian *et al.* 2003). Karubian *et al.* (2003) confirmed that only the female participated in nesting activities, described the single-egg clutch, nest, and nest site, and provided brief observations on incubation rhythms. In addition they provided detailed observations on nestling care during early stages of development. Here we provide the first detailed observations of incubation behavior for Long-wattled Umbrellabird.

MATERIALS AND METHODS

We made all observations at Buenaventura Reserve (03°39'S, 79°46'W), 20 km north of Piñas, in the El Oro province, southwestern Ecuador. We videotaped behaviors at the nest of a Long-wattled Umbrellabird nest for a total of 226 daylight hours (06:00–18:30 h EST) from 3–4 days after laying of the single egg until fledging of the young. Details of nestling care will be presented elsewhere (Greeney *et al.* in prep.). The video camera was placed 8 m from the nest, in the fork of a tree approximately level with the nest. While apparently aware of observer presence at the camera, the adult's behavior seemed largely unaffected. Videotapes were subsequently watched and transcribed. To quantify behaviors on the nest during incubation, we randomly subsampled 84.1 h of video where the female was on the nest. Results are presented, in most cases, as means ± SD. Many video tapes were saved, and are deposited in the Yanayacu Natural History Video, Sound, and Image Library.

RESULTS

Chronology. The nest was first discovered by DC on the morning of 24 January 2004, when he observed a female Long-wattled Umbrellabird carrying a single stick through the subcanopy of the forest. Upon following the bird he observed her adding the stick to a nearly complete nest, empty at this time. The following day the female was observed adding further sticks to the nest but did not lay. No observations were made on 26 January, but the following day, at 13:00 h, the female was observed sitting on the nest for 1 h. That afternoon the nest contained a single egg. Laying, therefore, occurred on 26 or 27 January. We began videotaping the nest on 30 January, 3–4 days after the egg was laid. On 23 February at 14:30 h, the egg hatched, giving an incubation period of 27–28 days. No male was ever observed in the vicinity of the nest.

Nest, nest site, and egg. The nest was a broad platform of sticks placed approximately 4.5 m above the ground in a vine tangle, supported by multiple small branches and vines. It appeared to consist entirely of dead sticks, 20–50 cm long, with no apparent lining. Based on video images of the adult sitting on the nest, and based on an adult female length of 36 cm (*sensu* Snow 2004), we estimate the nest to have measured 50 cm in diameter outside, and roughly 30 cm tall overall. The nest was well shaded by dense foliage 30–50 cm above the nest, and tangled vines and foliage obscured the nest and restricted access by the adult on one side. We estimate the egg was 5 cm long and was tan to drab olive in color, with few or no markings.

The nest was located within secondary forest, approximately 300 m from the nearest pasture. Forest in the area was heavily logged only 15 years ago (D. Cabrera pers. observ.), but canopy height was roughly 25–30 m, dominated by *Miconia* (Melastomataceae) trees. The vine tangle supporting the nest was situated in a low lying area running up and down a slight hill, which placed the nest at eye-level with the top of the depression on either side of the nest, and allowed the female to covertly approach the nest moving up or

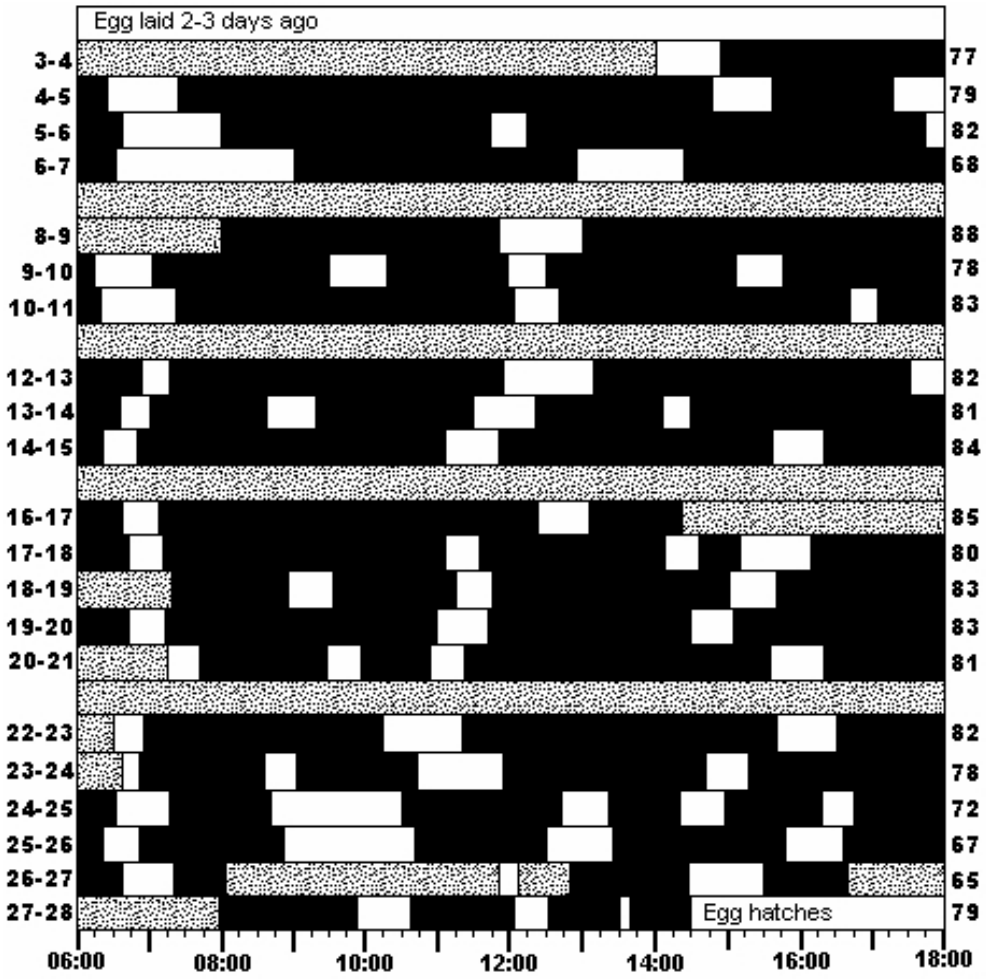

FIG. 1. Incubation rhythms of a female Long-wattled Umbrellabird (*Cephalopterus penduliger*) at Buenaventura, El Oro province, Ecuador. Time of day (EST) is given below. Numbers on the left represent estimated day of incubation (after completion of the clutch) and numbers on the right represent percent of the observation period spent covering the egg for each day. White areas represent absences, black areas presence on the nest, and stippled areas represent periods the nest was not monitored.

down the depression, without being seen until it was nearly on the nest. As described above, however, the supporting vine tangle blocked access from the downhill side of the nest, leaving access restricted to the uphill side of the depression or from the slopes on either side.

Adult approach and departure from the nest. The female showed two distinct methods of approaching the nest. During the first, she would approach the nest site while remaining high in the canopy. Upon arriving in the vicinity of the nest she would then descend from above the nest, using successively lower

perches until she could make a short (4–5 m) horizontal flight to the nest, usually from one side of the depression. During the second method, the female would approach the nest area staying low (3–6 m) in the vegetation, usually moving down the depression, uphill from the nest. After making a series of successive stops and peering about, she would make a single long gliding flight (10–20 m), curving sharply upwards at the end to arrive at the nest. After arriving at the nest, the female settled down to incubate after an average of 17 ± 8 s, often performing some or all of the behaviors described below.

When departing the nest with no observer present the female showed no particular pattern; she would sometimes leap from the nest and appear to glide away, sometimes fly up and away, and sometimes fly horizontally in one of the three directions available to her. We did not observe her natural departure from the nest except on video. When flushed from the nest by an observer, on 5 out of 7 times, we observed a distinctive flight behavior. The female stood and moved slowly to the rim of the nest as the observer approached, departing the nest when observers approached to within 4 m of the base of the vine tangle. Upon departure, the female dropped from the rim without flapping, spiraling downward until she was roughly 1 m above the ground then gliding silently down the depression away from the observer. Overall, we feel the effect was very much like the gradual descent of a falling leaf, and we suggest this behavior was intended to mimic just that. This behavior was also observed (J. Freile pers. com.) at the nest studied by Karubian *et al.* (2003). On the two other occasions when the female was flushed from the nest, she glided silently away in a directed, downward flight.

Incubation. The female generally left the nest for the first time between 06:20 and 06:40 h and returned to the nest to spend the night between 17:30 and 18:20 h. She left the nest 3–5 times a day for periods ranging from 9 to 143 min (mean = 45 ± 22, n = 57). Periods of attendance ranged from 36 to 444 min (mean = 107 ± 88, n = 44). During the observation period, we observed little or no change in overall rhythms of attendance (Fig. 1), except perhaps a slight increase in the number of off-bouts per day with a corresponding decrease in coverage of the egg. Daily coverage of the egg ranged from 65% to 88%, and averaged 79.2% for the entire incubation period.

Other behaviors. When settling down upon the egg, the female gently rocked her body back and forth as described for Scaled Antpitta (*Grallaria guatimalensis*) (Dobbs *et al.* 2003), presumably arranging breast feathers around the egg and bringing it in direct contact with her brood patch. She also occasionally performed this movement without standing, and we suspect the egg was being rolled or repositioned (either by her feet or breast) during this movement. While sitting on the nest, the female was generally still, peering about by craning her head and neck slowly in different directions. She was almost never seen to move her head in the sharp, quick manner described for other incubating birds (e.g., Dobbs *et al.* 2003, Greeney 2004, Hannelly & Greeney 2004). She occasionally (0.8 times per h) yawned (opened her bill widely without vocalizing) and occasionally (0.4 times per h) regurgitated a seed which she re-swallowed 53 % of the time, but otherwise allowed it to fall below the nest. We never observed the female dozing (closing her eyes briefly), and she appeared always alert.

During 84.1 h of carefully observed time on the nest, the female spent 2.1% of her time engaged in activities other than vigilance and which required significant movement (perhaps drawing attention to the nest). On average, 4.8 times per h the female stood and

peered down into the nest. These periods of movement lasted 1 to 281 s (mean = 16 ± 23 s, n = 406), after which she would frequently change her position and/or orientation on the nest upon settling. While standing she engaged in one or several of the following activities. Only twice, she leaned over the egg, placed her bill behind and angled underneath it, and drew her head slowly backwards, rolling the egg slightly. Occasionally (0.7 times per h; 0.2 ± 0.6 times per standing bout, during 9% of bouts), she pecked sharply at the nest, subsequently appearing to manipulate or eat something small. She also engaged in "rapid probing behavior" (Greeney 2004) during which she moved her bill in a sewing-machine-like fashion in and out of the nest. This was observed during 12% of all standing bouts (0.8 times per h, 0.2 ± 0.5 times per bout). As with sharp probing described above, she often manipulated and ate something small after such probes. Also, when her bill was positioned near the egg during such movements it resulted in rolling of the egg. We do not know, however, if this was intentional or coincidental. Only six times did we observe the female arranging sticks in the nest or otherwise repairing or maintaining it (mean duration 6 ± 3 s), and we never observed her adding material to the nest after the egg was laid. When leaves (green or yellowed, n = 6) fell into the nest, the female would pick them up and manipulate them in her bill, frequently dropping them and re-grabbing them several times before they fell from the nest or, on three occasions, were eaten. When surrounding or overhanging vegetation shifted such that it impaired the female's view or movement, she would either pluck the offending leaf or peck at it until it was sufficiently repositioned. As a whole, these nest maintenance movements (shifting material or altering surroundings) lasted 4 to 281 s (mean = 47 ± 85 s; 0.2% of total observation time). While standing, but also frequently while remaining seated, the female spent 0.7% of her time preening in short bouts (mean = 12 ± 18 s, range = 1–187 s).

DISCUSSION

The nest reported here is similar to the only other confirmed nest of this species (Karubian *et al.* 2003). While our egg description differs slightly from that of Karubian *et al.* (2003), admittedly we were unable to examine it closely. The ground-color, however, seemed to us more similar to the "khaki" color described for the egg of Amazonian Umbrellabird (*C. ornatus*) (Sick 1951). The nest was more substantial than the "frail" nest of Amazonian Umbrellabird where eggs can be seen through the nest (Sick 1954, T. Parker *in* Hilty & Brown 1986, Snow 2004), yet simpler (sticks only) than the nest of Bare-necked Umbrellabird (*C. glabricollis*) (twigs, moss, and leaves) (Fogden & Fogden 1997). While Karubian *et al.* (2003) observed some moss inside the nest, we observed no other materials besides sticks. An incubation period of 27–28 days for the Long-wattled Umbrellabird agrees with the = 24 days reported for its congener Bare-necked Umbrellabird in Central America (Fogden & Fogden 1997), and is similar to related genera (i.e., *Perissocephalus*, *Querula*) (Snow 2004).

Rapid probing behavior or "tremble-thrusting" (Haftorn 1994) has been observed in a wide variety of temperate species (see references in Haftorn 1994). Recently, it has been reported in Neotropical species, including a guan (Greeney 2005), antpittas (Dobbs *et al.* 2003, Greeney & Gelis 2005, Greeney & Sornoza 2005), and an antvireo (Greeney 2004). It was also observed at the previously studied Long-wattled Umbrellabird nest, but unreported, by Karubian *et al.* (2003) (J. Freile pers. com.). Previous reports of this behavior suggested it functions in parasite removal (Haftorn 1994, Dobbs *et al.* 2003, Greeney

2004) and/or nest cleaning and egg rolling (Haftorn 1994, Greeney & Sornoza 2005). We think it likely functioned, in conjunction with "sharp probes," as primarily parasite removal for Long-wattled Umbrellabird. While not observed directly, it is likely that the vibrations of the nest caused by this behavior also aided in dislodging debris inside the structure of the nest and thus helped in nest cleaning as suggested by Haftorn (1994). Because rapid probing also vibrated the loosely arranged sticks of the nest, we believe it may have been important in settling the sticks, tightening the construction of the nest. Also in this study the egg was occasionally rolled by this movement, and this may be an important, if incidental, function of rapid probing.

The diet of Long-wattled Umbrellabird is known to include large fruits, small vertebrates, and invertebrates (Berg 2000, Karubian *et al.* 2003, Snow 2004). Apart from the well documented folivory of the plantcutters (*Phytotoma* spp.) (Walther 2004), a few genera of cotingas, including *Xipholena*, *Conioptilon*, and *Zaratornis*, are known to eat flowers and plant "buds" (Snow 2004). While we documented Long-wattled Umbrellabird eating only a few leaves, most that it manipulated in its bill were very broad and may have been swallowed if they were smaller. While swallowing leaves at the nest appears incidental, it remains possible that they may form some portion of the birds diet, as it would have been much simpler and easier to drop the leaves over the side of the nest. Further careful observations of foraging birds are warranted to determine if leaves make up any portion of their normal diet.

The adult female umbrellabird's gradual, gliding descent from the nest, and its similarity to a falling leaf, is a potentially interesting anti-predator adaptation that has been observed in two species of hummingbirds in the genus *Heliothryx* (Cintra 1990, Schuchmann 1990). With quantified observations, Cintra (1990) even went so far as to show that the adult hummingbird fell at a nearly identical rate as similar sized falling leaves. In addition, another cotingid, Firey-throated Fruiteater (*Pipreola chlorolepidota*), also leaves the nest in a gradual leaf-like manner, similar to that described here for Long-wattled Umbrellabird (RAG pers. observ.). We encourage other field naturalists to make careful observations on nest departure methods for other tropical birds, especially trochilids and cotingids.

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