

Short Communications

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Description of Male Vocalizations of the Turquoise Cotinga (*Cotinga ridgwayi*)

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ABSTRACT.—We describe the first recordings of a male vocalization of the Turquoise Cotinga (*Cotinga ridgwayi*) along with reviewing the sound production in the genus *Cotinga*. Vocalizations were heard in the Coto Brus region of southwestern Costa Rica from late 2003 until early 2005. The vocalization described is different from previous calls known for the species and genus. The vocalization is a pure tone, produced at a high frequency. These vocalizations were observed in a variety of contexts, although more often during alarm or advertisement situations. Received 18 September 2006. Accepted 14 December 2006.

The genus *Cotinga* is a monophyletic lineage comprising seven species (Snow 1982, Prum et al. 2000). It is part of one of the least-studied neotropical bird families in which little is known about the ecology and behavior of the majority of species. The *Cotinga* are considered almost voiceless (Snow et al. 2004) but adult males produce mechanical rattling noises during flight (Snow 1982). Until recently, vocalizations had been described only for the Spangled Cotinga (*Cotinga cayana*) (Chaves 2001). Its vocalization is described as a soft, medium-pitched “*hoo*” repeated 2–3 times at irregular intervals, produced while displaying. These displays did not include mechanical sounds emitted during male flights. The other known vocalizations have been produced by females of the genus (Snow et al. 2004). Skutch (1969) observed a female Turquoise Cotinga (*Cotinga ridgwayi*) emitting a clear, monosyllabic “*ic, ic, ic*” alarm-call after its nest was attacked by a tou-

canet and while searching for the fledgling. The only known male vocalization of the Turquoise Cotinga was heard by F. G. Stiles (pers. comm.) while manipulating a mist-netted bird. The bird emitted a surprisingly loud, mule-like raucous “*caaaoo*.” Here we describe another vocalization uttered by males of the Turquoise Cotinga while adding information on the context of the call production of a Vulnerable and endemic species (Birdlife International 2000). We also provide a general discussion on the sound production of this little known but widespread genus (*Cotinga*).

METHODS

Our observations were from late November 2003 until mid-January 2005. Most observations were made opportunistically while conducting bird-watching tours and every time a cotinga was observed (or heard), we compiled the data. Most of our observations were recorded at Las Cruces Biological Station (LCBS) in southwestern Costa Rica (8° 47' N, 82° 57' W), but included observations from Las Alturas Biological Station (8° 57' N, 82° 50' W) and other nearby sites. The area surrounding LCBS is a botanical garden that includes a mixture of secondary growth with some emerging canopy trees (Borgella et al. 2001). Turquoise Cotingas varied widely in occurrence during the observation period, ranging from zero individuals for up to 2 months to 2–4 individuals on a daily basis for as long as 30 days. These visits were consistent with high fruit abundance of *Ficus* spp., *Erythroxylum* sp., and species of wild avocados (Lauraceae). Turquoise Cotingas frequently perch on dead exposed branches of trees above canopy level (Stiles and Skutch 1989). Fourteen of 17 observed vocalizations were emitted while cotingas perched high above the ground although, on three occasions, the birds were observed vocalizing below the canopy while feeding as low as 4 m above the ground.

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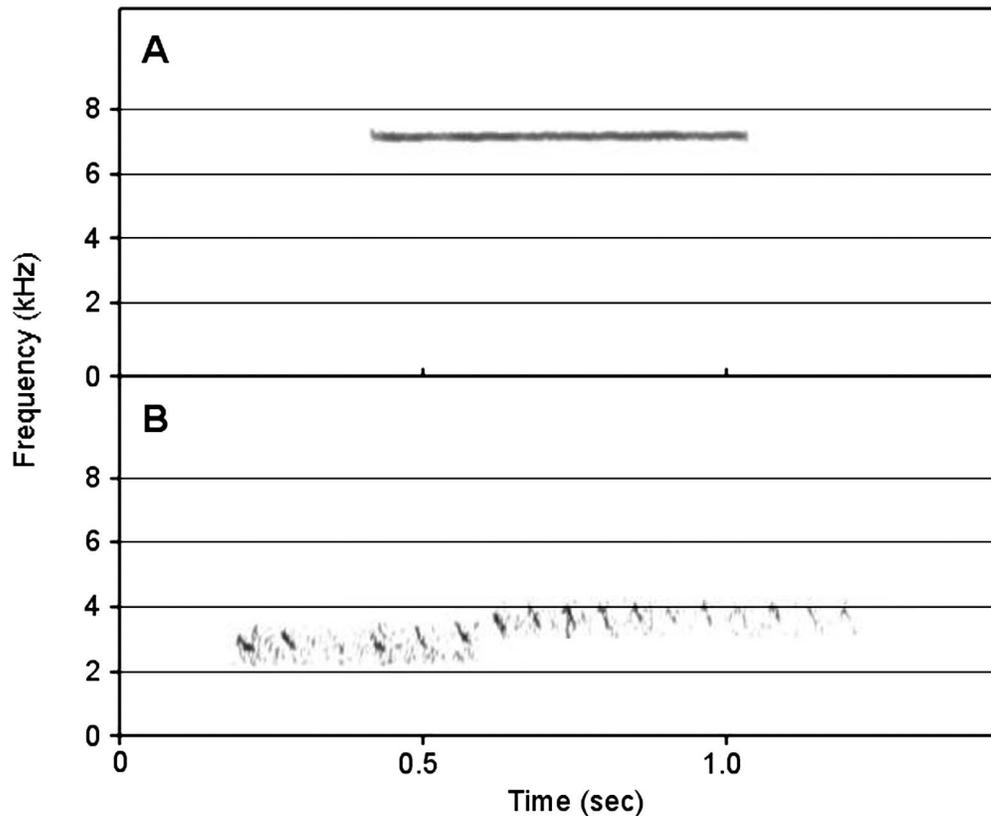


FIG. 1. Vocalization (A) and mechanical sound (B) (produced during flight) of adult male Turquoise Cotingas, Estación Biológica Las Cruces, Puntarenas, Costa Rica.

We were able to make recordings along with our observations of the Turquoise Cotingas. Vocalizations were recorded with a Marantz PMD-222 tape recorder and a Sennheizer MKH-70 microphone. Tapes were deposited at Laboratorio de Bioacústica, Universidad de Costa Rica. Sounds were digitized with Raven 1.2.1 (Charif et al. 2004) at 44100 Hz (16 bit). We used this software to measure and analyze the sonograms following these settings: transform length = 512 points, frequency resolution = 86.1 Hz, time resolution = 1.18 msec, and window = hamming.

OBSERVATIONS

We observed males uttering vocalizations during 15 occasions at LCBS and two occasions at Las Alturas. Some individuals were observed opening their bills wide while emitting the vocalization. The vocalization is a pure tone, resembling a metallic high pitch,

with almost no frequency modulation (Fig. 1A). Two songs were recorded on 21 July 2004, although we were not able to detect whether they were emitted by the same male or by two individuals. Both vocalizations are similar and the variables measured confirm their resemblance: high frequency = 7.33 and 7.30 kHz, respectively; low frequency = 7.06 and 7.02 kHz; frequency range = 0.27 and 0.28 kHz; song length = 0.59 and 0.62 sec; maximum frequency = 7.17 and 7.14 kHz; maximum power = 97 and 82.7 decibels. The different distances from the birds to the microphone (4 and 25 m) largely explains the difference in maximum power. The first vocalization occurred when a male flew directly towards another, which was perched and feeding. When the approaching male was close to the perched male, it vocalized and proceeded to move within the same tree. The second vocalization was recorded while one male was

feeding, but we were not able to see the individual at the moment it vocalized.

We also heard but did not record this same type of vocalization on 15 occasions. During two observations, adult males vocalized after interacting with individuals of the same or other species. One occurred when an immature male flew towards an adult perched male, landing within 2 m. The adult vocalized once as soon as the immature male landed. Another non-recorded vocalization was produced when a male, perched at the top of a ~25 m tall tree, was approached by two flying Brown-hooded Parrots (*Pionopsitta haematotis*), which landed within a meter. The cotinga vocalized when the parrots landed, but afterwards the bird remained in the tree for at least 10 min without vocalizing. Other observations occurred—seemingly—without interactions with other birds. On two consecutive occasions, we heard an individual emit a series of three vocalizations every 20–30 sec. Another individual produced one vocalization three times about every 2 min. Males were observed emitting the same vocalization in three other occasions, but no apparent interactions were noticed with other individuals from the same or other species. Several interactions (e.g., harassments, fly-overs) were observed between males, females, and both genders without vocalizations being emitted. All vocalizations observed were produced by adult males; we observed females or young males on eight occasions but they did not vocalize.

The other sounds known for male Turquoise Cotingas are mechanical “rattles,” produced during flight (Fig. 1B). Each time a male flies, it produces a stuttering or tittering sound, even when making short sallies (>1 m) (CS, pers. obs.). These sounds are a series of short pulses, which start at low frequencies and increase in frequency and bandwidth until leveling off at the fourth or fifth pulse. The length of each pulse is variable and the number of pulses depends on the length of the distance traveled by the bird. We speculate these sounds are produced by the modified 9th and 10th primaries. These feathers are thinner than the rest of the primaries, and slightly bent at the tip, with P 9 measuring about half the width of P 10 (P 9 = 2.3 mm, P 10 = 4.45 mm, measured at 10 mm from the tip, $n = 1$, UCR # 1481). The mechanics of sound pro-

duction with wing feathers have not been studied for Turquoise Cotinga or any other species in the genus to our knowledge.

DISCUSSION

Our observations indicate that male Turquoise Cotinga not only produce vocal sounds, but they also produce them fairly regularly. The vocalization was only seen produced by adult males, despite several months of observations, and not by females or young males. The predominance of male vocalization in the Cotingidae is a common phenomenon, a trait often considered to be sexually selected (Andersson 1994). This is consistent with the high extent of sexual dimorphism present in most members of the family, including the genus *Cotinga*. Kroodsma (2004) recently suggested that some members of the Cotingidae can learn their songs. Young Three-wattled Bellbirds (*Procnias tricarunculatus*) take 6–7 years to perfect their dialects and it can be expected that other members in the family can take several years to perform their adult vocalizations. This might explain why no young male Turquoise Cotingas were observed vocalizing.

The vocalization seems to serve as an advertisement or as an alarm, as it was produced during encounters with individuals approaching the calling male. Other vocalizations heard occurred during events where we did not record interactions between members of the same or other species. It is possible the vocalization occurs in another context rather than advertisement-alarm. Our observations span more than a year suggesting cotingas do not emit calls only during the breeding season as Turquoise Cotingas are known to breed during March (Stiles and Skutch 1989).

The function of mechanical sounds produced with the wings remains untested but probably is related to sexual displays and mate attraction (Snow 1982). We suggest this because: (1) modified feathers are only found in males of this highly dimorphic genus, (2) modifications of feathers are known to occur in species that produce mechanical sounds (which are mainly used during courtship) (Stettenheim 1976, Prum 1998), and (3) a sister clade, Pipridae (Prum and Lanyon 1989) also exhibits sexual dimorphism, and males produce mechanical sounds with modified

feathers during courtship (Snow 2004). Our observations indicate that male Turquoise Cotingas produce at least three different sounds used in different contexts. The available information shows the importance of vocalizations in a genus that until recently was considered almost voiceless (Snow et al. 2004). More detailed observations should show whether Spangled and Turquoise cotingas are the only species of *Cotinga* that vocalize.

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Nesting Behavior and Nestling Care of the Pavonine Quetzal (*Pharomachrus pavoninus*)

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ABSTRACT.—I describe the nesting behavior of the Pavonine Quetzal (*Pharomachrus pavoninus*) at Los Amigos in the southeastern Peruvian Amazon. I found a single nest cavity 4.2 m above ground in a dead snag in *terra firme* forest. The cavity contained

two pale blue eggs each with a few small brown-buff speckles, of which one hatched. I observed incubation between 18 February and 2 March 2004. Based on an average of 0.7 observation hrs/day, the male appeared to incubate during most of the day from at least 0950 hrs until sunset (near 1745 hrs) when the pair would switch before nightfall. The female appeared to incubate at night and during the early morning. Fifty-six percent of 32 food deliveries observed between 6 and 26 March were tree frogs and 44% were fruits. The

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nestling fledged on 26 March, 20 days after the first observed food provisioning. The nestling period is estimated to be 21–24 days. The plumage development of the nestling, vocalizations, and other observations are discussed and compared with the Resplendent Quetzal (*Pharomachrus mocinno*). Received 2 October 2006. Accepted 28 December 2006.

The Pavonine Quetzal (*Pharomachrus pavoninus*) is widespread in the Amazon, but little is known about its natural history. One probable nest of this species was reported 9 m above ground in a large tree during February in Brazil (Oriki and Willis 1983, in Johnsgard 2000). There is an unreferenced mention in Collar (2001) of a full grown nestling seen in a hollow 5 m above ground in a dead tree on 19 July 2000 along the Río Susucari, Loreto, Peru (Josep del Hoyo, pers. comm.). The diets of other trogons are known to include a mixture of animals and fruit, but *Pharomachrus* quetzals are thought to be almost entirely frugivorous (Remsen et al. 1993, Collar 2001), specializing on Lauraceous fruits and serving as important seed dispersers (Avila et al. 1996). Remsen et al. (1993) examined nine Pavonine Quetzal stomachs and found eight to contain only fruit and one to contain fruit and arthropods. The Resplendent Quetzal (*P. mocinno*) is known to feed its nestlings fruit, arthropods, and vertebrates (Skutch 1944, Wheelwright 1983, Avila et al. 1996).

Here I report observations of a Pavonine Quetzal nest, including descriptions of the nest cavity, eggs, incubation behavior, and food provisioning during February and March 2004 in southeast Peru. I also discuss the plumage development of the nestling, vocalizations, and other observations and compare the nesting behavior and food-provisioning to that of the better known Resplendent Quetzal.

METHODS

I discovered the Pavonine Quetzal nest near the Centro de Investigación y Capacitación Río Los Amigos (CICRA), Depto. Madre de Dios, Peru. CICRA is at an elevation of 250 m above sea level, along the north bank of the Río Madre de Dios near the mouth of the Río Los Amigos (12° 34' S, 70° 05' W). The lowland tropical forests and climate of CICRA are similar to that of other, better known field stations

in the region within Manu and Tambopata National parks. More information on climate, geology, vegetation, and trails at CICRA is available at www.amazonconservation.org/home and in Pitman (2006).

I monitored the quetzal nest most days during the rainy season between discovery on 18 February and fledging of the single nestling on 26 March 2004. I spent ≥ 6.3 hrs observing the nest during incubation over 9 days between 18 February and 2 March (mean = 0.7 hrs/day) and ≥ 40.3 hrs when adults provisioned food to the nest over 14 days between 6 and 26 March (mean = 2.9 hrs/day). I constructed a blind 12 m uphill from the nest tree using a small tent to observe adults switch incubation duties at the nest at sunset (1413–1800 hrs on 21 Feb, 1655–1750 hrs on 23 Feb, 1711–1756 hrs on 24 Feb) and, to minimize disturbance. I examined the nest and eggs directly on 22 February using a ladder to access, photograph, and measure the nest and eggs, spending less than 20 min near the nest to minimize disturbance.

I sat quietly in the open to observe food provisioning because of limited visibility inside the tent. Adults arrived with food and approached to within 2 m of the nest cavity, but appeared wary of entering while I was nearby. I identified delivered food items as fruit or animal, described them in my notes, and left the nest site for 20–40 min to allow the adult to feed the young. I accessed the nest again on 15 March by ladder to count nestlings and to collect regurgitated seeds. I also collected regurgitated seeds from the nest cavity on 27 March after the nestling fledged. Seeds were identified by Fernando Cornejo Valverde (Botanical Research Institute of Texas). I identified frogs using photographs accompanying Cocroft et al. (2001).

RESULTS

The nest cavity was in a large dead tree trunk on a hillside in *terra firme* forest at an elevation of 205 m above sea level (12° 33' S, 70° 07' W). The tree snag was 7–8 m tall, rotting with multiple cavities, small buttresses at the base, and a circumference at breast height of 0.85 m. The nest was in a cavity on the western and uphill side of the snag 4.2 m above ground. The nest entrance was circular with a large wedge-shaped opening descend-