

NOTES ON THE DISTRIBUTION, NATURAL HISTORY, AND CONSERVATION OF THE YELLOW-BILLED COTINGA (*CARPODECTES ANTONIAE*)

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Resumen. – **Notas sobre la distribución, historia natural, y conservación de la Cotinga de Piquiamarillo (*Carpodectes antoniae*).** – Hicimos un estudio a lo largo de la costa sur del Pacífico de Costa Rica y el oeste de Panamá para evaluar la distribución actual de la Cotinga Piquiamarillo (*Carpodectes antoniae*), una especie de ave poco conocida, en peligro de extinción, y de rango restringido. Confirmamos la presencia de la Cotinga Piquiamarillo dentro de los siguientes estuarios de manglar: Río Tárcoles y cerca de la Reserva Biológica Carara, el Humedal Nacional Terraba-Sierpe, Río Rincón, Río Esquinas y Río Coto en Costa Rica, así como el área de Cerro Batipa al sureste de David, Panamá. También observamos las aves por bosques interiores como el bosque primario en el Bosque del Río Tigre Lodge e Lapa Ríos Lodge en la Península de Osa, Costa Rica. Descubrimos el primer nido conocido de esta especie, c. 10 m en un árbol de mangle, y reportamos otros comportamientos reproductivos.

Abstract. – We initiated surveys from December 2007 to July 2009 along the south Pacific coast of Costa Rica and western Panama to assess the current distribution of the Yellow-billed Cotinga (*Carpodectes antoniae*), a little-known, endangered, and range-restricted bird species. We confirmed Yellow-billed Cotinga presence within the following mangrove estuaries: Río Tárcoles and nearby Reserva Biológica Carara, Humedal Nacional Terraba-Sierpe, Río Rincón, Río Esquinas, and Río Coto in Costa Rica, as well as Cerro Batipa and surrounding estuaries southeast of David, Panama. We also observed birds away from the coast in primary forest at Bosque del Río Tigre Lodge and at Lapa Ríos Lodge in the Osa Peninsula, Costa Rica. We discovered the first known nest of this species, c. 10 m up in a mangrove tree, and report other reproductive behaviors. *Accepted 15 July 2014.*

Key words: Yellow-billed Cotinga, *Carpodectes antoniae*, breeding, conservation, Costa Rica, distribution, Golfo Dulce, mangrove, nest, Osa Peninsula, Panama.

INTRODUCTION

The Yellow-billed Cotinga (*Carpodectes antoniae*) is an endangered and range-restricted species, with a population estimated to be between 250–999 and decreasing (BirdLife International 2013, Stattersfield et al. 1998). It occurs in mangroves and forests along the Pacific coast of Costa Rica and adjacent western Panama (Fig. 1). During the last fifty years prior to this study, this species has been observed at the following sites listed from northeast to southwest: Río Tárcoles and nearby Reserva Biológica Carara, Hacienda Jaco (just south of Carara), Parrita (Río Pirrís, along with the nearby Río Palo Seco estuary, Quepos, and Manuel Antonio National Park), Boca Coronado in the Río Terraba estuary, Río Sierpe estuary, Río Rincón, Parque Nacional Corcovado, Puerto Jimenez, Golfito, and Río Coto estuary in Costa Rica; in Panama on the Burica Peninsula (at Río Corotú, El Chorrogo, and Mellicita), Cerro Batipa and nearby estuaries south of David (e.g., Chorchá Abajo, Pedregal), and near Punaga on the eastern side of the Gulf of Montijo (Wege & Long 1995, Angehr 2000, Snow 2004, Angehr et al. 2008, Kirwan & Green 2011, eBird 2013). It may occur at the Playa de la Barquete Agrícola Wildlife Refuge in Panama. During the 1920s, a specimen was collected near Aguadulce, Panama, 200 km east of the current range. Much appropriate habitat has been cleared in Panama and Costa Rica, and the largest populations are now suspected to be centered on the mangrove estuaries of the Humedal Nacional Terraba-Sierpe and the Golfo Dulce in Costa Rica (Angehr 2000).

Little is known about the natural history of the Yellow-billed Cotinga. Prior to this study, males were observed to make prominent swooping display flights during March through June over forests and mangroves (Skutch 1970, Stiles & Skutch 1989, Angehr 2000). Nesting was suspected to occur within

mangroves between March–June (Angehr 2000, Snow 2004), though no nests were documented prior to this study. It is possible this species may also breed inland in foothill areas (Ridgely & Gwynne 1989), though this has yet to be documented. Although Stiles & Skutch (1989) mention a “dove-like or trogon-like *cab* or *cow* ending in a throaty scrape (Slud)” vocalization, the Yellow-billed Cotinga is generally silent, but males are visually conspicuous where present.

More information on the species’ distribution, habitat requirements, and movements, as well as other non-scientific information on land tenure are needed to help guide conservation efforts for this species (Angehr 2000, BirdLife International 2013, Lebbin et al. 2013). In this study, we sought to confirm presence-absence of the Yellow-billed Cotinga across its historic range, find new locations, and record habitat types associated with foraging, courtship, and nesting activities.

METHODS

We surveyed for Yellow-billed Cotingas at three types of sites: 1) historic locations of the species, 2) new sites along the forest-mangrove ecotone where the habitat appeared suitable based on the literature, and 3) inland forest sites that we targeted for other species of conservation concern (e.g., Black-cheeked Ant-Tanager *Habia atrimaxillaris*, Fig. 1). Between December 2007 and July 2009, EJ and AG recorded bird observations during surveys as checklists following stationary (at fixed points), traveling (by foot, boat, or car; recording distance traversed), and incidental protocols under eBird (eBird.org; Table 1) in the historic range of the Yellow-billed Cotinga. EJ uploaded observations to eBird, where data are available under the checklists attributed to Liz Jones. In Costa Rica, EJ and AG visited sites from the Zona Protectora Tivives, southeast to Río Tárcoles and

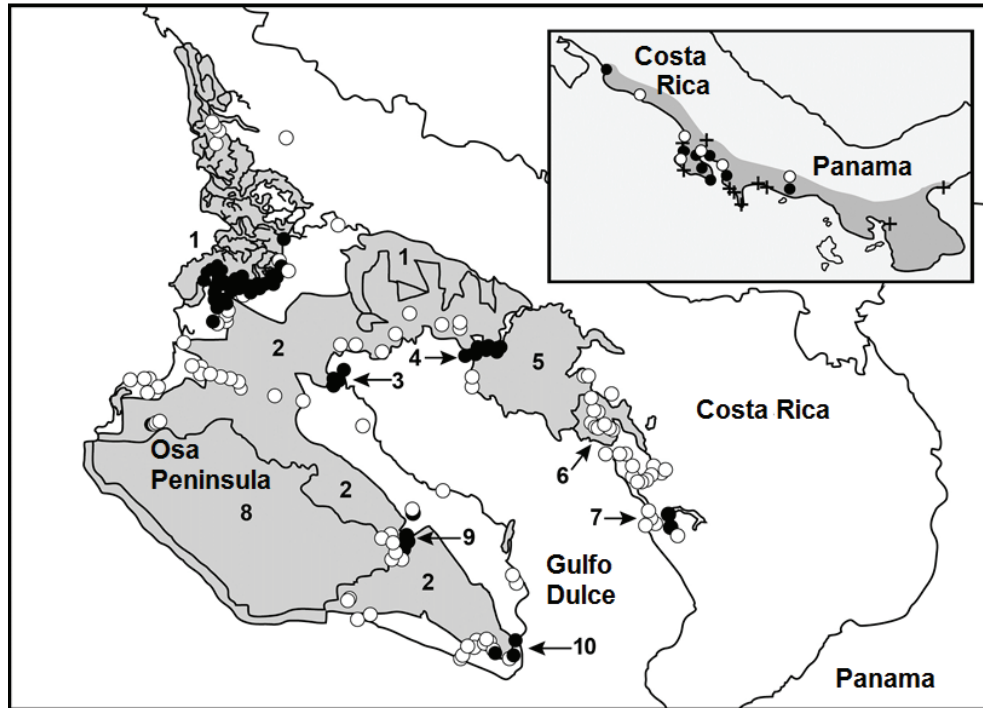


FIG. 1. Inset shows potential historic range (darker gray) of the Yellow-billed Cotinga. Main map details protected areas in core of range (gray). Crosses represent historic locations unsearched in this study, open circles represent search areas where Yellow-billed Cotingas were not detected, and closed circles represent sites where Yellow-billed Cotingas were observed. Key sites and protected areas include Humedal Nacional Térraba-Sierpe (1), Reserva Forestal Golfo Dulce (2), Río Rincón (3), Río Esquinas (4), Parque Nacional Piedras Blancas (5), Golfito (6), Río Coto (7), Parque Nacional Corcovado (8), Bosque del Río Tigre (9), Lapa Ríos (10).

Reserva Biológica Carara east through the Humedal Nacional Térraba-Sierpe, along the coast and interior of the Osa Peninsula and Golfo Dulce. In Panama, EJ and AG visited the Cerro Batipa area south of David. Additional behavioral observations by EJ and AG while bird-watching after July 2009 are also included in this paper. BDRT and Río Rincón were the most accessible sites and therefore, EJ and AG spent more effort at these sites than elsewhere. We standardized the ease of observing the Yellow-billed Cotinga by dividing total detections by EJ and AG across all surveys at select sites by the total number of

surveys, observation time, and travel distance at each site (Table 2). EJ and AG also noted any breeding behavior observed opportunistically (Table 3). KL and LP collected supplementary observations while radio-tracking three Yellow-billed Cotingas near the Río Rincón between February and October 2011 (Leavelle & Powell *et al.* in prep.).

RESULTS

Distribution. We detected Yellow-billed Cotingas quickly, with multiple detections per hr of observation (Table 2), in locations where the

TABLE 1. Summary of observations by eBird protocol type, where n = checklists.

eBird protocol	n	Total h	Total distance (km)
Incidental	305	24.52	22.66
Stationary	336	71.27	NA
Traveling	345	622.88	921.55
Total	986	718.67	943.81

mangrove-forest ecotone was intact or recently intact, including Río Sierpe (at several locations, including Isla Violín), Río Rincón, Río Coto, and Río Esquinas in Costa Rica; and Cerro Batipa and surrounding estuaries in Panama where recent forest clearing was evident along the mangrove-forest ecotone. Presence was also confirmed at Río Tarcoles and Reserva Biológica Carara (Table 2) where we observed smaller numbers of cotingas and the mangrove-forest ecotone is no longer intact with mangroves separated by a 2.1 km gap of deforested land from the closest forest fragment and by 2.5 km from intact forests of the nearby Reserva Biológica Carara. Yellow-billed Cotinga detections were much less frequent per survey, hour of observation, and km travelled at Bosque del Río Tigre Lodge (BDRT) and at Lapa Ríos (Table 2), both forested sites without mangroves nearby with observers present almost daily. We recorded Yellow-billed Cotingas at BDRT once monthly between 14 December 2007 and 1 March 2008, on 5 August 2008, regularly from 12 December 2008 through 4 April 2009, as well as in July 2009. A single male was present at BDRT during December 2010 through March 2011, and during January–February 2013. At Lapa Ríos, Yellow-billed Cotingas were also recorded 24–27 January 2008, 18 February 2008, 26 June 2008, and regularly between 5 November 2008 and 12 January 2009.

Additional localities, from sightings by others, are now available via eBird, which

were not so at the beginning of our study. There is a Yellow-billed Cotinga observation by Jeff Skevington from San Pedrillo on the western coast of Corcovado National Park from 13 August 2001 in eBird (eBird Checklist S4907774). Since conducting our field work, Celeste Paiva also observed the Yellow-billed Cotinga on 11 May 2011 (eBird Checklist S11170310) at La Gamba inland between the Río Esquinas and Golfito.

In Costa Rica, we did not observe the Yellow-billed Cotinga at Parrita (during one visit on 27 April 2009 with four 10 min stationary counts and 10 traveling counts all totaling 4.6 h of observation time and 22.8 km), Puerto Jimenez (visited frequently), nor Golfito (during five visit days in December 2007, March 2008, and March–April 2009 including 24 stationary counts and 13 travel counts totaling 7.0 h of recorded observation time and 9.1 km; Table 2).

Foraging. We observed male and female Yellow-billed Cotingas feeding at fruit trees within forests. Fruits consumed included *Gnatteria luscens* (Annonaceae), *Schefflera morotoni* (Araliaceae), *Cecropia* sp. (Cecropiaceae), *Hyeronima alchorneoides* (Euphorbiaceae), *Ocotea rivularis* (Lauraceae), *Nectandra hibua* (Lauraceae), various *Ficus* spp. (Moraceae), *Virola* sp. (Myristicaceae), and an unidentified tree locally known in Tarcoles as “papatura” (Luis Campos pers. comm.). We observed Yellow-billed Cotingas moving within, and we suspected them to be foraging within, *Ocotea insularis* (Lauraceae), *Brosimum utile* (Moraceae), and *Trichospermum grevifolium* (Tiliaceae).

We did not observe Yellow-billed Cotingas taking any fruit within mangroves, although KL did observe two different males gleaning unidentified lepidopteron larvae within mangroves (Leavelle 2011). On 26 March 2010, AG also observed a female Yellow-billed Cotinga thrashing an unidentified insect larva on a branch near BDRT.

TABLE 2. Yellow-billed Cotinga detections (CD), search effort, and frequency of detections per unit of search effort varied between sites. N refers to the number of checklists, h is the total observation time, km is the total distance covered by traveling counts, CD is the number of Yellow-billed Cotinga detections per site, CD/hrs is the cumulative number of Yellow-billed Cotinga detections per hours of observation, and CD/N is the cumulative detections per checklist. Sites BDRT and OBC refer to Bosque del Río Tigre Lodge and Osa Biodiversity Center respectively. Total cotinga detections and km are not the same as absolute numbers, as we repeatedly counted individual birds and travelled the same km at some sites.

Location	Habitat	N	h	km	CD	CD/N	CH/h	CD/km
Río Rincón	Mangroves with forest	94	77.58	53.27	427	4.54	5.50	8.02
Río Esquinas	Mangroves with forest	40	5.13	6.94	24	0.60	4.68	3.46
Río Coto	Mangroves, short distance to forest	20	2.8	14.64	17	0.85	6.07	1.16
Río Sierpe	Mangroves with forest	190	45.75	206.45	224	1.18	4.90	1.09
Carara	Mangroves, 2.1 km to nearest forest	63	17.78	14.85	16	0.25	0.90	1.08
Cerro Batipa	Mangroves, with recently cut forest	11	3.82	17.27	8	0.73	2.09	0.46
Lapa Ríos	Forest, no mangroves nearby	83	136.58	128	33	0.40	0.24	0.26
BDRT	Forest, no mangroves nearby	265	347.12	227.15	42	0.16	0.12	0.18
Golfito	Short mangroves, with forest	37	6.97	9.13	0	0	0	0
OBC	Forest, no mangroves nearby	27	9.47	6.84	0	0	0	0
Parrita	Mangroves, no forest nearby	14	4.62	22.74	0	0	0	0
Drakes Bay	Forest	11	2.67	0.88	0	0	0	0

Display flights. We observed display flights over both rivers and mangroves at Río Sierpe, Río Rincón, Río Esquinas, Río Coto in Costa Rica, and estuaries adjoining Cerro Batipa, Panama, as well as interior primary forest at BDRT, ca. 6 km inland from the Golfo Dulce coast. We observed flight displays during all months of the year during fieldwork, except November, which may be a result of low search effort during this month (Table 3). AG and EJ observed multiple displaying males simultaneously at Río Sierpe and Cerro Batipa where hilltops allowed views of large areas. We observed males performing flight displays at Río Sierpe (10 March 2008, 16–17 July 2008, 16 December 2008, and 22 March 2009), Río Rincón (8 December 2007 through 26 July 2008, regularly between 31 January–22 March 2009, and during February–October 2011), BDRT (a single male on 28 February 2008; and a single male on the same tree from December or January to late March or mid-April, each year, between 24 December

2008 and 8 February 2013; as well as a single display 25 July 2009 and two flight displays on 22 August 2010), Río Esquinas (3 February 2009), Río Coto (4 March 2009), and Cerro Batipa (6 February 2009).

Nesting. On ten occasions, AG (often with EJ) observed a female carrying short (~ 6 cm) pieces of grass or sticks presumed to be nesting material into mangroves (8 and 25 February 2008, 10 and 31 January 2009, 15 January 2010, 28 July 2011, 24 March 2012, 7 July 2012, 8 July 2013 at Río Rincón; 21 March 2009 at Río Sabalo in the Río Sierpe estuary). Once, in Río Rincón, a female flew from a forest perch towards a pasture and returned with presumed nesting material before flying into mangroves. Capper *et al.* (1998) also mention a female carrying small twigs, presumed to be nesting material, in tall forest adjacent to mangroves along the Río Sierpe in mid-May 1998. Kirwan & Green (2011) also note an observation of dead stick-carrying in late

TABLE 3. Reproductive behavior observed during the calendar year across survey sites: months are listed in order along the top row. Observations by month and year are indicated with abbreviations, with observations of males performing flight displays (D), observations of females carrying potential nesting materials (M), observation of an active nest (N), and observations of young birds (dependent young) with adult females (Y). The lack of observed displays in November may be a result of insufficient search effort during this month.

Location	Year	J	F	M	A	M	J	J	A	S	O	N	D
Río Rincón	'06					Y							
	'07												D
	'08	D	DM	DYN	D	D	D	DY					
	'09	DM	D	D					Y				
	'10	M											
	'11		D	D	D	D	D	DM	D	D	D		
	'12			M				M					
Río Sierpe	'13						M						
	'98					M							
	'08			DY				DY					D
BDRT	'09			DM									
	'08		D	Y									D
	'09	D	D				D						
	'10	D	D	D	D				D				D
	'11	D	D	D									
	'12	D	D	D	D								
Río Esquinas	'13	D	D	D									
Río Coto	'09			D									
Cerro Batipa	'09		D										

March and fruit transport as if to feed nestlings in the second week of April near Rincón. On 30 March 2008 at Río Rincón, AG observed a female visit a nest site where she fed two nestlings. The nestlings were small, covered with downy white feathers, and located ~ 10 m up in a vertical fork of a mangrove (*Rhizophora racemosa*, Rhizophoraceae) tree. The structure of the nest within the fork was not visible. The female fed the nestlings fruit from *Ocotea rivularis*. On 2 April 2008, AG and EJ observed the female visiting the nest tree very close to the nest, but no nestlings were observed. A group of Fiery-billed Aracaris (*Pteroglossus frantzii*) were present in the nest tree and White-fronted Capuchin monkeys (*Cebus albifrons*) were also present

nearby. The female stayed in the tree for the next half hour without attempting to feed nestlings and then did not return over the next two hours. We presumed, but did not observe, that the nest had been depredated.

Fledglings and dependent young. On 30 March 2006, from the bridge at Río Rincón, Bart Brown (pers. comm.) photographed a female Yellow-billed Cotinga accompanied by a partially grown fledgling in a mangrove tree (photos viewable at Lebbin *et al.* 2013). EJ and AG observed young birds with adult females on ten separate occasions between 10 March and 26 July 2008 (Río Rincón), and between 21 March (Río Sierpe) and 2 August 2009 (Río Rincón). AG, EJ, Clay Taylor, and

three other birders observed a female Yellow-billed Cotinga delivering food items to a fledgling in mangroves at Río Rincón on 26 July 2008 (photos by C. Taylor viewable at Lebbin *et al.* 2013). The food items included what appeared to be a small fruit and an item that looked much like a leaf, but was more likely a leaf-mimicking katydid (Orthoptera) or other insect.

DISCUSSION

Yellow-billed Cotingas clearly use both forest and mangrove habitats, each to fulfill different ecological needs, such as for foraging and nesting, respectively. We consistently observed Yellow-billed Cotingas at several sites located outside protected areas where mangroves and forest met (Fig. 1). These sites, especially those lying between the Humedal Nacional Terraba-Sierpe and the Reserva Forestal Golfo Dulce, along the Río Esquinas adjacent to Parque Nacional Piedras Blancas, and the forest north of Río Coto should be high priorities for additional conservation efforts. These and additional recommendations are found in the Yellow-billed Cotinga Species Conservation Action Plan (Leavelle 2011).

Both Isla Violín (within the Río Sierpe estuary) and Río Esquinas represent important new localities for this species, but were expected based on the mangrove-forest ecotone habitat. Although we mostly observed the Yellow-billed Cotinga around estuaries where mangroves and forest meet, EJ and AG also observed Yellow-billed Cotingas perching, displaying, and foraging well inland away from coasts. We did not search Corcovado National Park, but the forest habitat there is permanently protected and EJ and AG observed Yellow-billed Cotingas near Corcovado at BDRT and Lapa Rios.

In Costa Rica, Yellow-billed Cotingas now appear to be absent at Parrita, Puerto Jimenez, and Golfito. Each of these three historic locations in Costa Rica has suffered extensive loss of forest and/or mangroves. No records appear at Parrita or the surrounding estuaries in eBird. No records unambiguously located in Puerto Jimenez appear in eBird, although one traveling checklist (S11407393) from 22 April 2011 by Tom Allin recorded a single female somewhere within 15 miles of Puerto Jimenez. The only record in eBird of the Yellow-billed Cotinga from Golfito is from James Holmes on 9 July 1993 (eBird Checklist S13670178). Although we did not observe the Yellow-billed Cotinga near Golfito, we did record Yellow-billed Cotingas in the nearby Río Coto mangrove system to the south.

We observed the Yellow-billed Cotinga foraging for fruit exclusively in forest habitat, occasionally and infrequently foraging for insects in both mangrove and forest habitats, displaying in both mangrove and forest habitats, and nesting (one observation) within mangrove habitat. Additional fruit of forest trees consumed by the Yellow-billed Cotinga are summarized in Lebbin *et al.* 2013 (which includes observations from this study) and total at least 26 forest species representing 16 families (Anacardiaceae, Annonaceae, Araliaceae, Ce-cropiaceae, Clusiaceae, Euphorbiaceae, Lauraceae, Loranthaceae, Melastomataceae, Me-liaceae, Moraceae, Myristicaceae, Rutaceae, Sapindaceae, Sapotaceae, Tiliaceae). It is un-likely that the species is able to survive solely within mangrove habitat, as most of our foraging observations are of birds consuming fruit from forest tree species. Conversely, the species may not be able to survive in forested habitat alone, as the species nests, displays, and regularly roosts (Leavelle and Powell *et al.* in prep) in mangroves.

We presumed the Yellow-billed Cotinga's breeding behavior would be similar to that of the closely related Snowy Cotinga (*Carpodectes nitidus*), which is known to breed between

March and April, to build tiny platform nests placed 7–12 m high in vertical tree forks, to lay a single egg clutch, and to incubate 27 days (Sánchez-M. 2002). Although the Yellow-billed Cotinga nest structure in our study was not visible, its placement was consistent with that of its congener the Snowy Cotinga. Several Cotinga species make remarkably tiny and cryptic nests (Snow 2004), therefore it is not surprising that our nest was difficult to see. Records of males displaying inland, both from this study and from 1940 (Skutch 1970) have failed to confirm whether this species also nests in forest habitat as does the closely-related Snowy Cotinga (Sánchez-M. 2002). Our observation of two nestlings is interesting as many medium-large cotingas have been observed with single egg clutches, though clutch size does seem to vary between one and two eggs among members of the genus *Cotinga* (Snow 2004). The observation (Table 3) of females with nesting material in January, and nestlings and fledglings as early as March suggests that the breeding season begins earlier than proposed by Angehr (2000), at least in Costa Rica. The observation (Table 3) of females with nesting materials and provisioning with fledglings from January into August suggests, however, that the breeding season is protracted, possibly through August. At Río Rincón the frequency of displays seemed to increase beginning in January and decrease in April, possibly corresponding to the peak of nest initiation.

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