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New extra-Amazonian records of the Black-billed Cuckoo *Coccyzus erythropthalmus* (Cuculidae) for Brazil

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Short title: New records of the Black-billed Cuckoo for Brazil

Abstract —The breeding grounds of the Black-billed Cuckoo *Coccyzus erythropthalmus* encompass a wide area in northern North America. During the austral winter individuals migrate to non-breeding areas in South America. There had been only three known locations for the species in Brazil, two in the Amazon Forest and one in the Atlantic Forest. Here, we aim to present new records in Brazil and to organize the available literature recovering historical data. The new records are in the Southeast and South regions and thus represent the first documented records outside the Brazilian Amazon. These findings indicate an expansion of the area considered nomadic for the species. All extra-Amazonian records were made in strong *El Niño* years, a climate phenomenon that may be changing bird migration patterns in South America, which requires further investigation.

Keywords: Animal movement, Atlantic Forest, Conservation, El Niño, Migration, Natural history, Serra do Mar, Vagrant bird

INTRODUCTION

The breeding region of the Black-billed Cuckoo *Coccyzus erythropthalmus*, encompasses a broad area of southern Canada and the north-central, northeastern, and eastern US. Breeding occurs during the spring and summer of the Northern Hemisphere, after which the species migrates south through south-central and southeastern US and Central America to western South America. Non-breeding regions consist of a wide area located between northern Colombia and southern Bolivia, including Ecuador, Peru, and western Brazil. The species also has a nomadic area extending from northern Paraguay to western Brazil, as well as Argentina, where it winters during autumn and winter, until returning north again to breed (Erritzøe et al. 2012, Hughes 2020).

There are only four published records of the Black-billed Cuckoo in Brazil. The first was made in February 1992 in the Amazon Forest domain, state of Acre, in the extreme west of the country (Sick 1997, Whittaker & Oren 1999). The second was made in the Atlantic Forest domain, state of Paraná, the most meridional record to date, but with no important details available (*e.g.*, date, bird characteristic; Scherer-Neto et al. 2001, 2008). The third and fourth records were made in November 2005 and 2006 also in the Amazon Forest domain, state of Amapá, far northern Brazil (Xavier & Boss 2011). All four records were made during the expected wintering period of the species, which occurs between spring and summer of the Southern Hemisphere (Erritzøe et al. 2012, Hughes 2020). Therefore, the species is considered a northern visitor (Sick 1997), wintering or incidental occurrence (Somenzari et al. 2018), and a northern vagrant, statuses assumed but not confirmed by the Brazilian Committee of Ornithological Records (Pacheco et al. 2021). Here we present three new extra-Amazonian records for Brazil, as well as a review of records in the country, with the recovery of important information from the first record in the Atlantic Forest domain partially published by Scherer-Neto et al. (2001, 2008).

MATERIALS AND METHODS

Regarding secondary data, digital databases, such as Web of Science, Scopus, and Google Scholar, were searched by using combinations of the following keywords: *Coccyzus erythropthalmus*, papa-lagarta-de-bico-preto/Black-billed Cuckoo. Ornithological collections were checked through the platform Global Biodiversity Information Facility (GBIF; https://www.gbif.org/). Citizen science platforms, such as WikiAves (https://www.wikiaves.com.br), e-Bird (https://ebird.org), Xeno-canto (https://xeno-canto.org), and iNaturalist (https://www.inaturalist.org/), were also consulted up to 25 November 2023. Data from the platforms were cross-referenced regarding date, location, and author to avoid duplicated data.

Regarding field data, the present study did not perform field sampling specific to detecting the Black-billed Cuckoo in Brazil, but some of the field information comes from collateral data of research and/or birdwatching projects by some of the authors.

RESULTS

The bibliographical research did not obtain any new information for the records of the Black-billed Cuckoo for Brazil, including the individual collected in Acre (Figs. 1 and 2; Table 1). The record cited by Sick (1997) for Cruzeiro do Sul, state of Acre, in 1992, is the same as that of Whittaker & Oren (1999) for Porangaba, on the Juruá river (Fig. 1). We present four field records of the Black-billed Cuckoo for Brazil, organized by state. Three of these records are new and one has been revised to recover important information.

Paraná

Authors P.S.N. and E.C. retrieved the details of the historical record of the Black-billed Cuckoo, partially published by them (Scherer-Neto et al. 2001, 2008 - on the same record) for the Atlantic Forest of Brazil. This is the first extra-Amazonian record of this species and was made on 16 October 1999, at Estação Ecológica Caiuá, located in the northwest region of the state of Paraná, South Brazil (22°41' S, 52°55' W; 315 m a.s.l.). This reserve is on the border with the state of São Paulo, approximately 50 km from Parque Estadual Morro do Diabo (Fig. 1), and within the Atlantic Forest domain (Seasonal Semideciduous Forest). An adult individual was observed at around 08:00 am, perched 3 m high on the edge of a forest (capoeira), located 500 m from Ribeirão Diamante. The observed bird had a red periophthalmic ring and some well-worn remiges and rectrices, but photographic documentation was not possible.

São Paulo

The second extra-Amazonian record of the Black-billed Cuckoo for Brazil was made by the authors L.K.Y and M.Y on 8 January 2023. On this date, an individual was found after colliding with the windowpane of the main house of the property “Cantos da Mata”, located in the rural area of the municipality of Mogi das Cruzes (23°36’43.66” S, 46°11’32.92” W; 760 m a.s.l.), in eastern São Paulo State, Southeast Brazil. This location is about *c.* 5 km from the urban area of Mogi das Cruzes, part of the Metropolitan Region of São Paulo, in the Atlantic Forest domain (Fig. 1).

The individual was found recently dead by author M.Y. at around 08:00 am, about 50 m from a 5,000 m^2 lake in a forest fragment of about 3 ha. The juvenile female (50% cranial ossification) had molted remiges of a slight rust tone and light spots on the coverts of the primaries and rectrices, presenting the following measurements: total length 377 mm, wing length 137 mm, wingspan 384 mm, tail length 144 mm, culmen 24 mm, tarsus 25 mm, and total weight 50 g. Coloration soon after the collision included an intense yellow periophthalmic ring, a greenish yellow mandible base and a light brown iris, which changed color after freezing (Fig. 3A-H).

A caterpillar larva of the family Saturniidae (Insecta: Lepidoptera) was found in the stomach of the specimen and deposited in the entomological collection of Instituto Butantan, São Paulo, Brazil (IBSP - Ent 14118). The specimen was taxidermized by author G.B. and deposited in the Museu de Zoologia da Universidade de São Paulo (MZUSP). Extra tissue samples (pectoral muscle) were deposited in the collections of Laboratório de Genética e Evolução Molecular de Aves of Universidade de São Paulo and the bird collection of Universidade Federal do Mato Grosso.

Rio de Janeiro

The third extra-Amazonian record of the Black-billed Cuckoo for Brazil was made by author G.A.S. on 4 November 2023, in the Campo Grande neighborhood (22°53'16.25” S, 43°32'43.06” W; 53 m a.s.l.). This is an urban area bordering Floresta da Posse, an Área de Relevante Interesse Ecológico (ARIE; Area of Relevant Ecological Interest), in the west zone of the municipality of Rio de Janeiro, approximately 17 km from the coast (Fig. 1).

At around 09:30 am, an adult individual, with a yellow periophthalmic ring and slightly worn plumage, was observed flying across a street and landing approximately 2.5 m above the ground at the edge of a forest fragment, where it remained for less than one minute, before entering the forest (Fig. 4). The record was made during “Passarinhar Carioca”, a bird watching activity involving 15 people.

Santa Catarina

The fourth extra-Amazonian record of the Black-billed Cuckoo in Brazil was carried out by authors M.R.R. and G.R.R.B. on 25 November 2023, in Parque Natural Municipal das Dunas da Lagoa da Conceição, a Conservation Unit in the municipality of Florianópolis (27°36'51.0" S 48°27'15.0" W; sea level) and represents the southernmost record of the species to date (Fig. 1).

The park consists of vast dune fields covered by an extensive sandbank area, with natural perennial and seasonal lagoons. At around 09:00 am, the juvenile individual, with a yellow periophthalmic ring and very worn plumage, was captured in a mist net installed as part of a project evaluating the impact of anthropogenic actions on the microbiota of birds in different areas close to Lagoa da Conceição. The age of the individual was identified by the less patterned rectrices as described in Hughes (2020). The individual was ringed (CEMAVE ring - G131497), subjected to cloacal and oropharyngeal swabbing to evaluate bacteria resistant to antimicrobials, and released at the capture site (Fig. 5).

DISCUSSION

The extra-Amazonian records made in the Southeast and South regions of Brazil in 1997 and 2023 are all within the Atlantic Forest domain, including the records available for Paraguay, located in a broad forest swath that was originally connected but is currently very fragmented (Dean 2004).

Individuals detected in the eastern region of the states of São Paulo, Rio de Janeiro, and Santa Catarina may have originated from the nomadic region. Despite being a fragmented strip of Atlantic Forest, numerous forest fragments could provide suitable conditions for displacement for a forest-dwelling migratory species such as the Black-billed Cuckoo. A similar movement pattern, from west to east, was observed with the Ash-colored Cuckoo *Micrococcyx cinereus*, in São Paulo state, with some individuals reaching the coast (Schunck et al. 2022). The bird from Santa Catarina was captured on the coast in a sand dune environment streaked with thick shrubby restinga vegetation and temporary lagoons, a habitat resembling some of the breeding grounds in North America (Hughes 2020).

A displacement between the Amazon region and the Atlantic Forest of Southeast and South Brazil, spanning approximately 1,500 km in a straight-line distance, would be a less likely hypothesis. This is not so much due to the distance itself, as the Black-billed Cuckoo has been recorded in different locations in Europe and is known to wander over long distances (Erritzøe et al. 2012, Lees & Gilroy 2021), but mainly because such a movement would require crossing the Cerrado biome, a Neotropical savannah where this species has not yet been recorded (Silva & Santos 2005). The Cerrado vegetation is more open and with much drier climate than the Atlantic Forest biome, and sightings of other species of the genus *Coccyzus* are relatively common, such as the Dark-billed Cuckoo *Coccyzus melacoryphus* and Yellow-billed Cuckoo *C. americanus*, which are morphologically similar to the Black-billed Cuckoo and Pearly-breasted Cuckoo *C. euleri* (Sick 1997, Silva & Santos 2005, WikiAves 2024).

The records made in the eastern portions of the states of São Paulo, Rio de Janeiro and Santa Catarina, were in the Metropolitan Regions of São Paulo (which has about 20 million inhabitants), Rio de Janeiro (13 million) and Florianópolis (540 thousand) (IBGE 2022). These observations might show some possible capacity of the species to use urban natural environments during wintering periods in South America, a fact that needs to be better understood with future investigation.

During the hottest period of the year (collected on the IBSP website - Ent 14117), there is an annual phenomenon in Mogi das Cruzes (SP), involving the proliferation of butterfly caterpillars of the genus *Apistosia* sp. (Erebidae). Although thousands of caterpillars occupy trees, no trace of *Apistosia* sp. was found in the stomach contents of the analyzed specimen, only a caterpillar larva of the family Saturniidae. The lack of traces of *Apistosia* sp. in the stomach contents may indicate that the individual had just arrived at the respective location, perhaps attracted by the large supply of food.

Furthermore, it is worth noting that all the easternmost records in the Atlantic Forest domain (PR in 1997; SP, RJ, and SC in 2023) coincided with strong El Niño years (L'Heureux et al. 2013). During El Niño events, above-normal ocean surface temperatures in the Tropical Pacific Ocean can reach very high intensities, leading to significant changes in climate and rainfall patterns in the northern portion of the South American Continent (Builes-Jaramillo et al. 2023). These extreme oscillations may influence the distribution and migratory routes of birds in South America, like changes observed in the Northern Hemisphere (Knudsen et al. 2011; Lehikoinen & Virkkala 2016, Koleček et al. 2020, Yu 2023). It is possible that this climatic phenomenon forces Black-billed Cuckoos to disperse further east of their known wintering range, in search of food or more favorable environmental conditions. This highlights the importance of further research on the effects of climate change on migratory birds in South America.

The seven existing records of the Black-billed Cuckoo for Brazil indicate its occurrence during the hottest period of the year (spring and summer), being birds that are wintering. These records facilitate carrying out new searches based on the time of year and location, as well as in nearby locations. The environments of the extra-Amazonian records are very similar to those described in the literature for the other Brazilian records of the species, namely edges of secondary forests and near water bodies, indicating the habitat used by the species and the potential for new searches in its wintering grounds in South America.

The current number of records available for the Black-billed Cuckoo in the Atlantic Forest of Southeast and South Brazil (4) indicates that this region may represent an expansion of the area considered by Erritzøe et al. (2012) as nomadic for the species, with the presence of wandering individuals.

However, it may also represent a yet to be documented wintering grounds, as recently suggested for the Blackpoll Warbler *Setophaga striata* by Schunck & Cavarzere (2022). The discreet forest-dwelling behavior of the Black-billed Cuckoo during the wintering period, when it almost does not vocalize, together with its morphological similarity to other species of the genus *Coccyzus*, with individuals presenting well-worn plumage during migration, are factors that make identification difficult. This may have contributed to the limited availability of data until 2023, which could change with increased data production through both scientific research and citizen science initiatives in Brazil.

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Cuckoos of the world. Leonardo Lopes for helping with the bibliography. Marcelo Felix for determining the percentage of cranial ossification; Erik Johnson and Bret Whitney for help in determining the age of the São Paulo and Santa Catarina birds, respectively; Paulo Masuti Levy for supporting the field work. To the students of the Laboratório de Ornitologia e Bioacústica Catarinense da Universidade Federal de Santa Catarina (Lucas F. Irion, Leticia Codova, Debora M. Marquato and Leonardo Wolff Oliveira) for their assistance in the field in capturing the birds. Two anonymous reviewers provided useful comments and suggestions.

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Figures

Figure 1. Occurrence area of the Black-billed Cuckoo: A. Breeding area in North America (orange), migration area in southern North and Central America (yellow), wintering area in South America (blue), nomadic area in southern South America (double hatched blue) and region of extra-Amazonian records (black area); B. Location of records made in Brazil (Table 1), stars are extralimital records, black dots are records by Erritzøe et al. (2012), blue squares are Brazilian records from the literature and green dots are novel Brazilian records made in 2023; C. Location of records made in states of Southeast and South Brazil in 2023 (Maps © Cuckoos of the World - Erritzøe *et al*. 2012 © Google Earth, Landsat / Copernicus 2015).

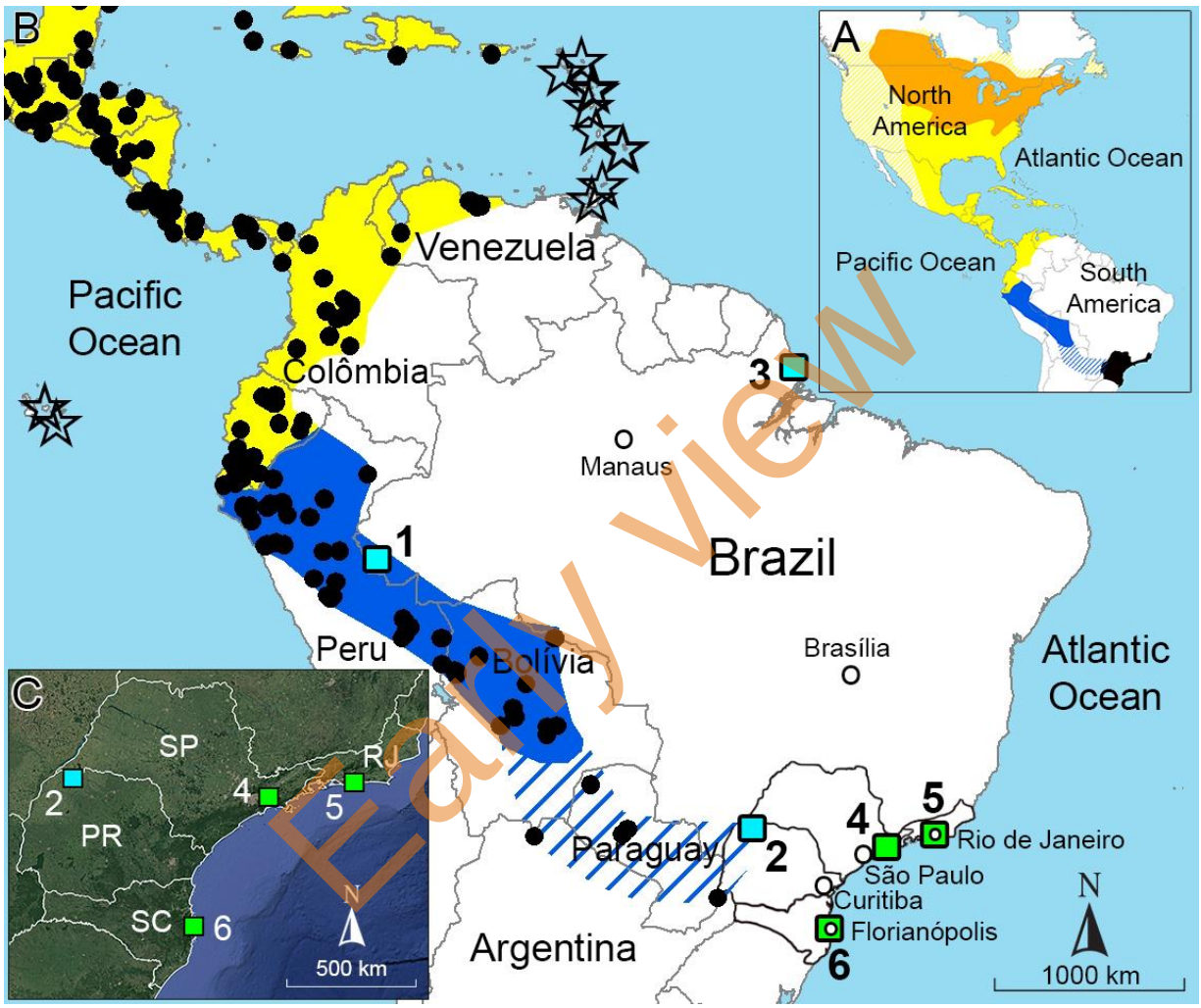

Figure 2. Male Black-billed Cuckoo deposited in the ornithological collection of the Museu Paraense Emílio Goeldi, MPEG4807. (Photos by Lincoln Silva Carneiro).

Figure 3. Black-billed Cuckoo collected in São Paulo State. A and B - Dorsal and ventral views of the fresh specimen. C and D - Details of the head and periophthalmic ring (after death, dark yellow; after freezing, light yellow). E and F - Tail, dorsal and ventral views. G and H - Wing, dorsal and ventral views. (Photos by Tomas Sigrist, except image C by Luis Yabase).

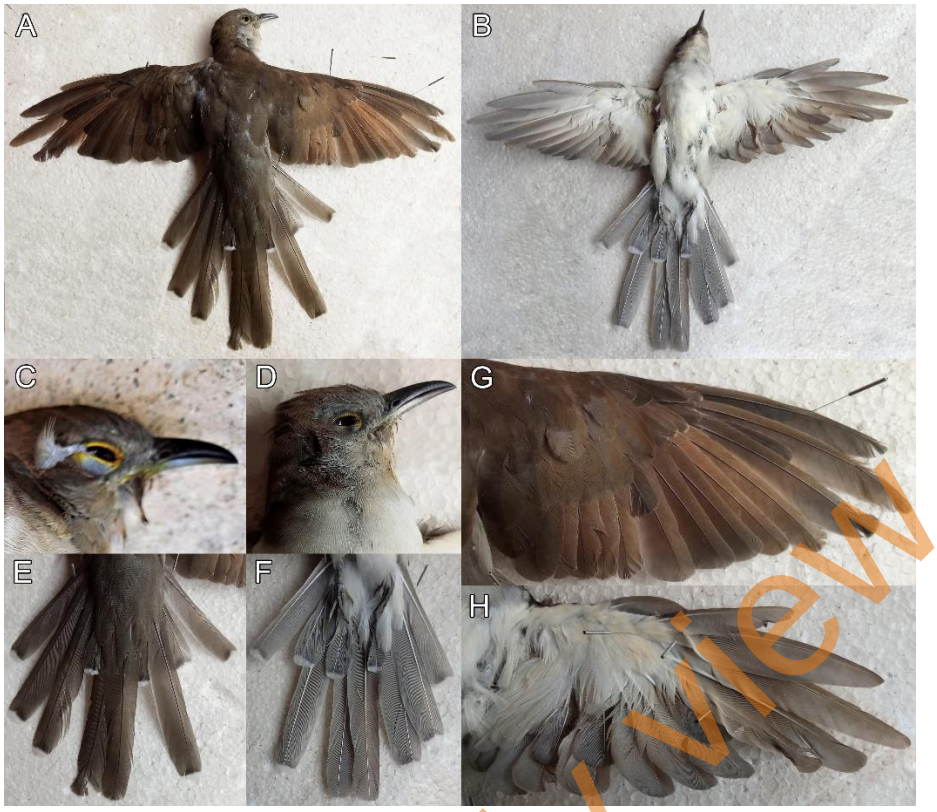

Figure 4. Black-billed Cuckoo recorded in Rio de Janeiro State. (Photos by Guilherme Alves Serpa).

Figure 5. Black-billed Cuckoo captured in Santa Catarina State. (Photos by Debora Malu Marquato).

TABLES

Table 1. Brazilian records of the Black-billed Cuckoo.

N°	Locality	Geographic Coordinates	Date	Collector Author	Record type	N° Birds	Number	Source
01	AC, Porto Walter, Porangaba, right bank of Juruá river	08°45'S 72°49'W 250 m	18/02/1992	Andrew Whittaker	Observation	1		Whittaker & Oren 1999
			28/02/1992		Scientific collection	1	MPEG 48047	
02	PR, Diamante do Norte, Estação Ecológica do Caiuá	22°41'S 52°55'W 315 m	16/10/1999	Pedro Scherer Neto, Eduardo Carrano	Observation	1		Scherer-Neto et al. 2001, 2008
03	AP, Amapá, Estação Ecológica Maracá-Jipioca (EEMJip)	02°01'11.33"N 50°25'37.43"W 10 m	November 2005		Observation	4		Xavier & Boss 2011
			November2006		Observation	2		
04	SP, Mogi das Cruzes, Cantos da Mata	23°36'43.66"S 46°11'32.92"W 760 m	08/01/2023	Luis K. Yabase and Marta Yabase	Accidental death	1	MZUSP 115348	Present study
05	RJ, Rio de Janeiro, Campo Grande	22°53'16.25"S, 43°32'43.06"W 53 m	04/11/2023	Guilherme A. Serpa	Observation	1	WA 5717727	Present study
06	SC, Florianópolis, Parque Natural Municipal das Dunas da Lagoa da Conceição	27°36'51.0"S 48°27'15.0"W 8m	25/11/2023	Mateus R. Ribas & Guilherme R. R. Brito	Capture (mist net)	1	CEMAVEG131497	Present study