



**Spring stopover of Yellow-billed Cuckoo and other Neotropical migrants
in lowland tropical dry forests in NW Colombia**



Project Funded by

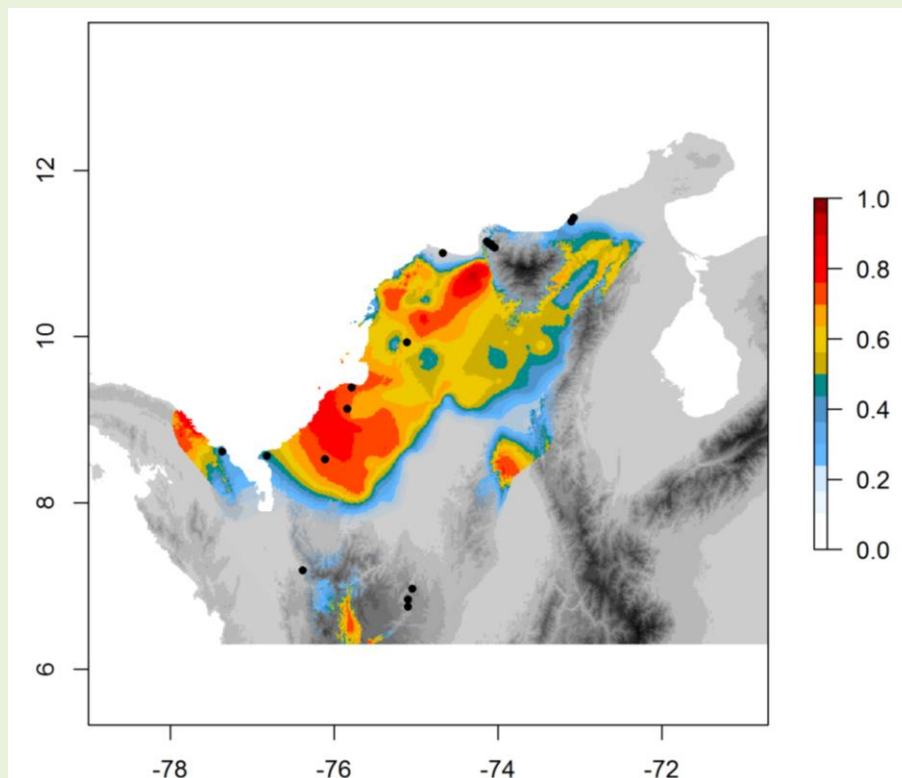
**Paso Pacifico Rapid Action Small Grants Fund (on behalf of American Bird Conservancy)
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Background

The Yellow-billed Cuckoo is a steeply declining Nearctic-Neotropical migratory bird of conservation concern. In particular, western populations of cuckoos have declined faster than any other and are in urgent need of conservation actions that protect their populations throughout their complex annual cycle. The Yellow-billed Cuckoo migrates further than the majority of migratory birds in the Americas and recent evidence supports the conclusion that both eastern and western populations traverse over 8000 km between their breeding grounds and wintering grounds south of the Amazon basin in South America. Cuckoos are not alone among long-distance migrants with regards to the trajectory of their populations, a pattern that has led various authors to conclude that factors acting during migration may be driving declines. Only recently have begun to understand the route by which cuckoos migrate and information on where they stop along the way is still lacking. We know even less about where birds acquire the energy reserves to cover 1000s of kilometers, making this an urgent research topic.

In 2016, as part of the [Neotropical Flyways Project](#), occupancy surveys were carried out across the Caribbean region of Colombia. These surveys revealed a high abundance of Yellow-billed Cuckoo during a period of approximately one month in lowland tropical dry forests across a narrow band of the central Caribbean region (Fig. 1). This previously un-described concentration of cuckoos concurs with recent evidence from six GPS tags, which revealed Western Yellow-billed Cuckoo using this region on their northward migration. The timing of records across northern Colombia is similar to the initiation of the rainy season, which follows a three-month dry season and likely produces a “flush” of resources that cuckoos use to fuel their migration. The same occupancy surveys identified other species that appear to utilize tropical dry forests to fuel their spring migration, including Willow Flycatcher, Alder Flycatcher and Mourning Warbler, all of which are experiencing sharp population declines.

Figure 1. Occupancy model for Yellow-billed Cuckoo during spring migration in the Caribbean region of Colombia. Regions with occupancy rates >0.5 (orange/red) sustained high occupancy rates during approximately three weeks in late April and early May. Black dots represent study sites.



Tropical dry forests in Colombia have been devastated through clearance to make way for cattle pastures and today just 8% of the original dry forest remains. There is therefore an acute need to understand the role of tropical dry forests in Colombia within the context of the annual cycles of migratory birds before it is too late.

In the study described below, we highlight results from activities undertaken during the spring migration of 2018 (April-May) in combination with data collected during 2017. We provide a synthesis of research carried out between 2016 and 2018 by SELVA, to provide recommendations for how the restoration of dry forests and the adoption of biodiversity friendly farming practices, like silvopastures, may facilitate the recovery of species dependent on these forest during their spring migration.

Objective

Overall: Describe the spring stopover and habitat needs of Yellow-billed Cuckoo and other migratory landbirds in tropical dry forests in northwestern Colombia.

Focal Species: Yellow-billed Cuckoo, Willow Flycatcher, Alder Flycatcher, Mourning Warbler.



The tropical dry forest ecosystem undergoes rapid greening with the advent of the rains – here a silvopasture is transformed following rains at the study site in Finca Las Palmeras, Córdoba.

METHODOLOGY

Study Site: Finca Las Palmeras, Córdoba, Colombia

Dates: 08 April – 18 May 2018

Constant Effort Mist-Netting: 12 mist-nets including three canopy nets were run between the 10 April and 17 May 2018. All birds were banded and for each cuckoo a series of measurements were taken to differentiate between eastern and western birds, as well as feather for possible future genetic analysis.

Radio telemetry: 20 Yellow-billed Cuckoo were fitted with radiotransmitters (nano-tags) compatible with the Motus automated telemetry array. Individuals were tracked within the study site via an automated Motus telemetry tower fitted with two antennas.

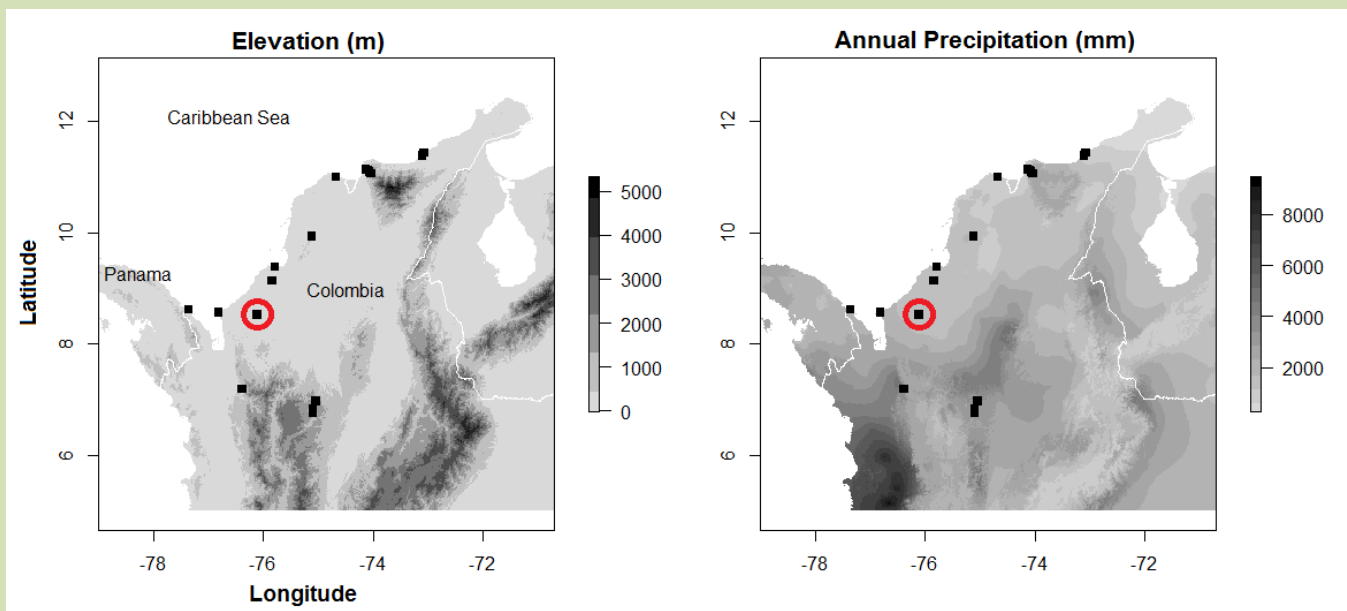
Foraging Observations: Foraging sequences were collected for 26 Yellow-billed Cuckoo, giving rise to a dataset of 73 observations since 2016. Each sequence includes prey items and tree species.

Caterpillar Phenology: To monitor changes in the abundance of caterpillars (primary prey item for Yellow-billed Cuckoo), 30 trees of 9 tree species were surveyed for caterpillars on eight occasions.



Yellow-billed Cuckoo fitted with nano-tag.

Location of study site (red circle) in relation to elevation, annual precipitation and sites surveyed as part of the Neotropical Flyways Project during 2016.



Results

Mist-netting totals

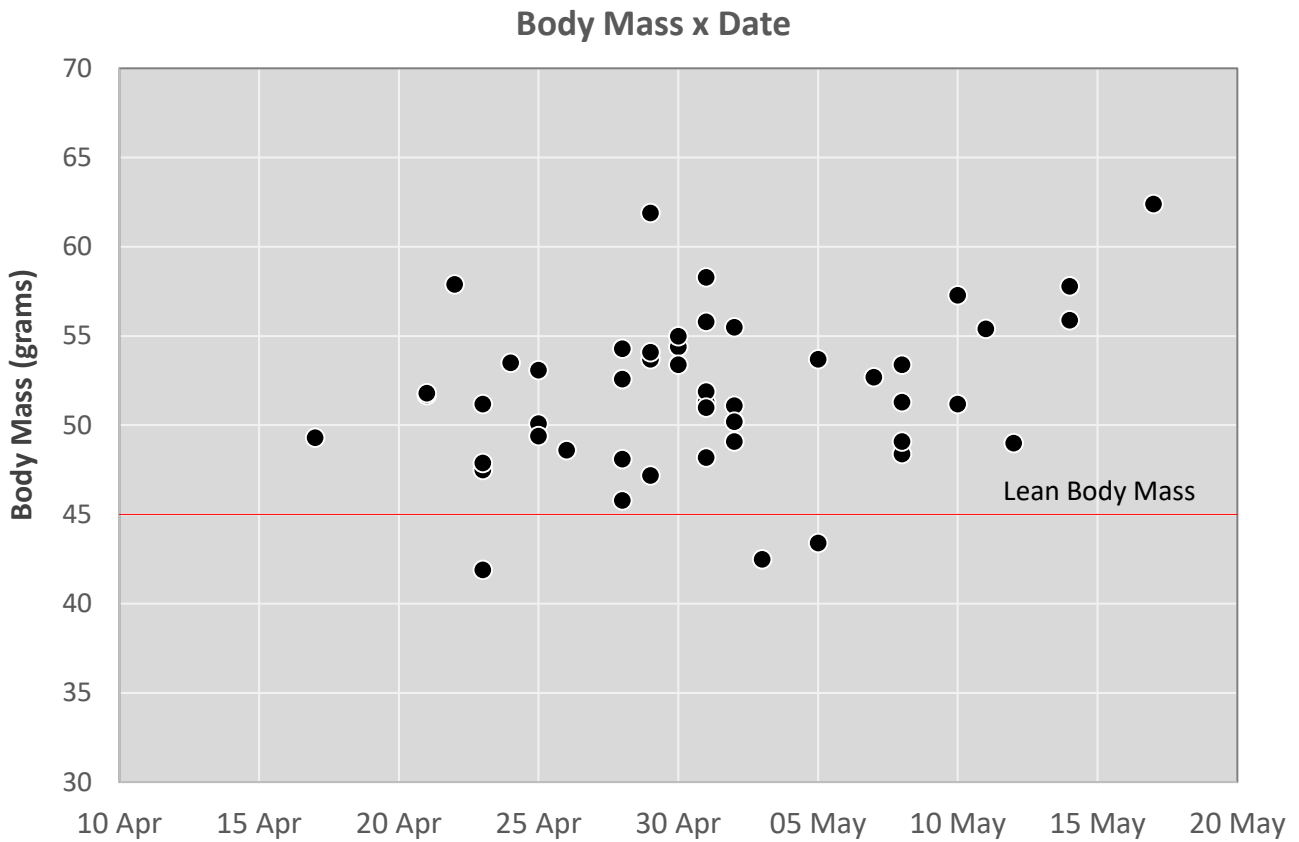
Relative to 2017, we captured more Yellow-billed Cuckoo in 2018. Despite a similar mist-netting effort, totals for Willow Flycatcher, Swainson's Thrush and Blackburnian Warbler also increased, while Red-eyed Vireo, Tennessee Warbler, Yellow Warbler and Cerulean Warbler all decreased, probably due to the later start date in 2018. Based on the discriminant function analysis of Franzreb & Laymon (1993), and bearing in mind that Yellow-billed Cuckoo could not be sexed, 27.1% of birds could be assigned as eastern YBCU and 8.5% as western YBCU, regardless of whether they were males or females. The majority of birds (64.4%) could not be assigned to either population without knowing their sex.

Common Name	Row Labels	2017 (Recaptures)	2018 (Recaptures)
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>		1
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	33 (1)	51
Eastern Wood-Pewee	<i>Contopus virens</i>	7	10
Acadian Flycatcher	<i>Empidonax virens</i>		2
Willow Flycatcher	<i>Empidonax traillii</i>	117 (5)	195 (16)
Trail's Flycatcher	<i>Empidonax traillii/alnorum</i>	72 (1)	41 (1)
Alder Flycatcher	<i>Empidonax alnorum</i>	26 (1)	17
Great-crested Flycatcher	<i>Myiarchus crinitus</i>	10	10
Sulphur-bellied Flycatcher	<i>Myiodynastes luteiventris</i>	1	1
Barn Swallow	<i>Hirundo rustica</i>		10
Veery	<i>Catharus fuscescens</i>	1	
Gray-cheeked Thrush	<i>Catharus minimus</i>	8	5
Swainson's Thrush	<i>Catharus ustulatus</i>	8	20
Red-eyed Vireo	<i>Vireo olivaceus</i>	76 (5)	49 (2)
Yellow-green Vireo	<i>Vireo flavoviridis</i>	14	44 (3)
Baltimore Oriole	<i>Icterus galbula</i>	2	
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	1	
Tennessee Warbler	<i>Leiothlypis peregrina</i>	41 (3)	2 (1)
Yellow Warbler	<i>Setophaga petechia</i>	111 (15)	45 (6)
Cerulean Warbler	<i>Setophaga cerulea</i>	8	
Blackburnian Warbler	<i>Setophaga fusca</i>	7	15
Blackpoll Warbler	<i>Setophaga striata</i>		1
Bay-breasted Warbler	<i>Setophaga castanea</i>		2
American Redstart	<i>Setophaga ruticilla</i>	5	2
Northern Waterthrush	<i>Parkesia noveboracensis</i>	10 (7)	6 (4)
Prothonotary Warbler	<i>Protonotaria citrea</i>	5	
Mourning Warbler	<i>Geothlypis philadelphia</i>	43 (6)	44 (2)
Canada Warbler	<i>Cardellina canadensis</i>	1	2
Summer Tanager	<i>Piranga rubra</i>	8	1
Scarlet Tanager	<i>Piranga olivacea</i>	1	
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	1	

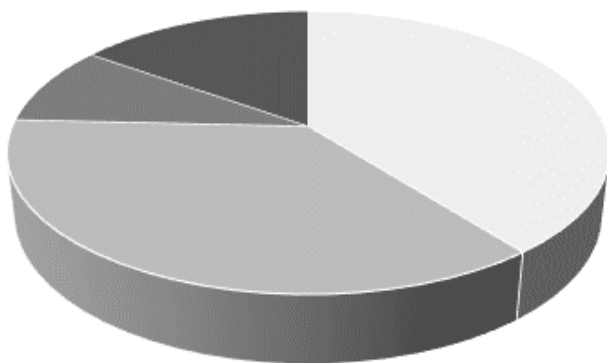
The number of new individuals captured during spring migration in 2017 and 2018 in Finca Las Palmeras, with the number of within season recaptures given in brackets.

Body mass dynamics of Yellow-billed Cuckoo

The body mass of captured cuckoos during spring 2018 showed a slight increase with date but the relationship was weak and in combination with maximum increases of 30% above lean body mass (mass of birds carrying no energy reserves), suggests that birds were not undergoing extensive fueling/fattening at the study site. This conclusion is supported by the lack of evidence for the accumulation of fat stores in 2018 relative to 2017.

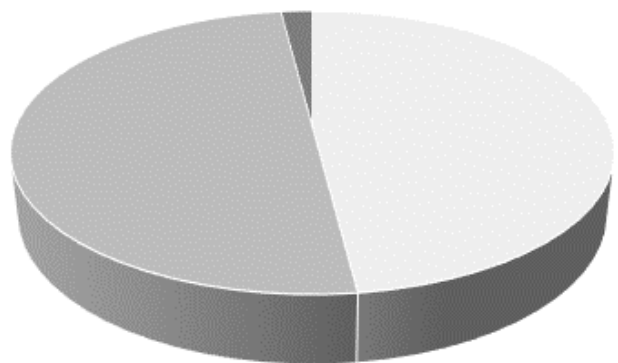


2017 - FAT SCORE



■ 0 ■ 1 ■ 2 ■ 3

2018 - FAT SCORE

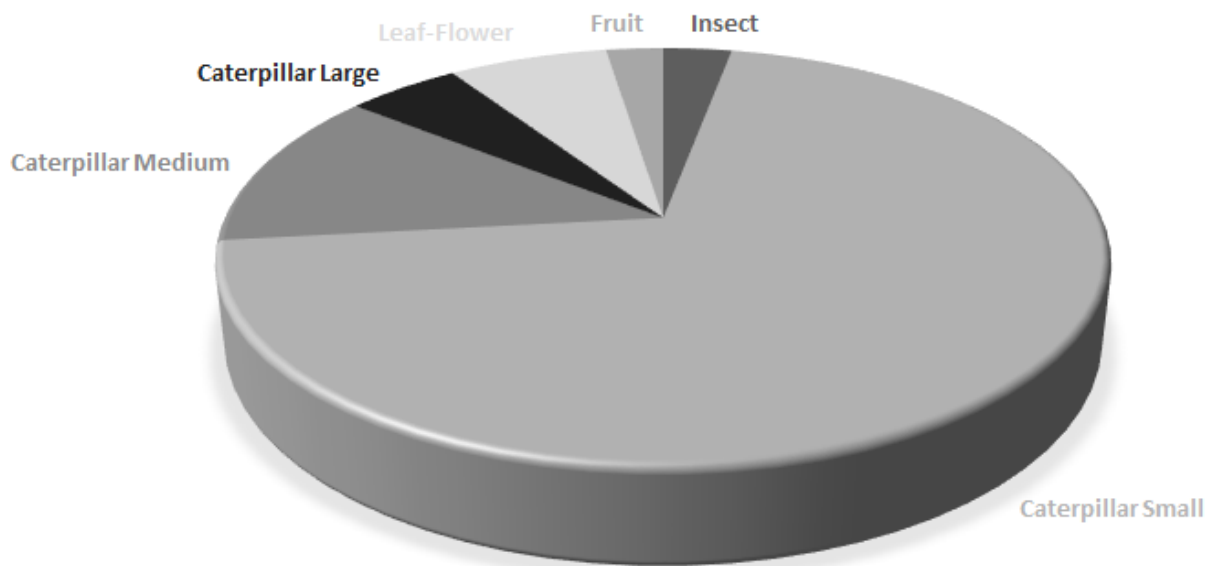


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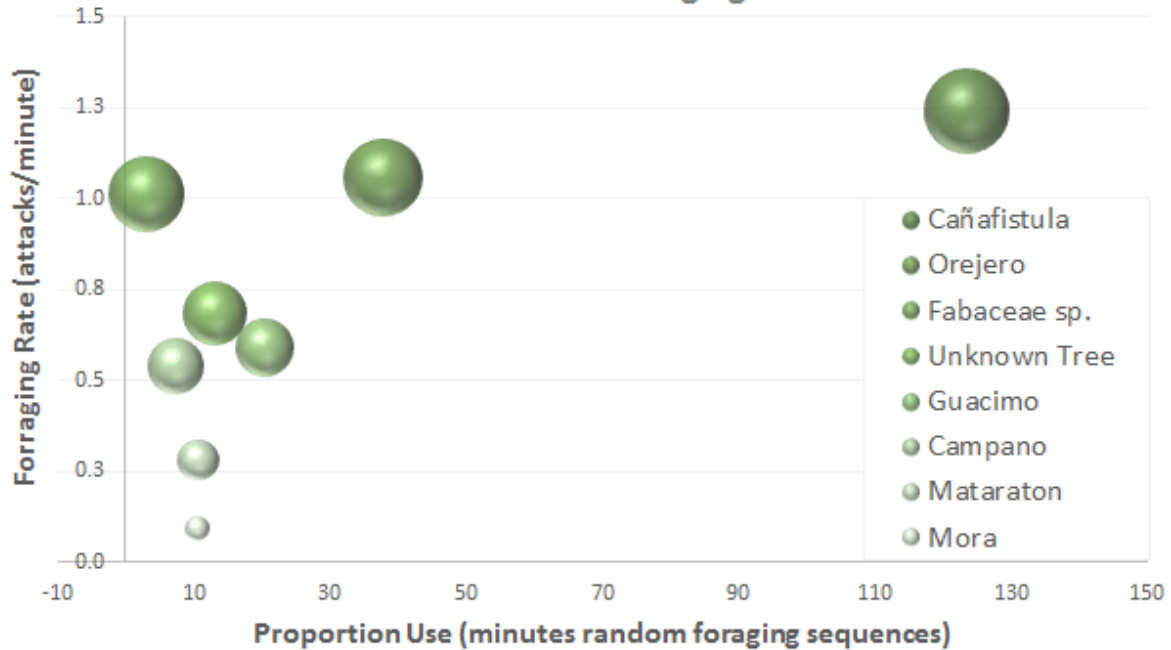
Diet and tree use during stopover

The majority of attacks made by cuckoos were directed towards caterpillars (based on 202 attacks recorded during 198 minutes of foraging sequences in 2017 and 2018). The interactions with leaves and flowers are likely associated with the extraction of caterpillars from inside rolled leaves. Most foraging sequences were in Cañafistula trees (*Cassia grandis*), where cuckoos also had a higher foraging rate. Other trees from the Fabaceae family were also well used, particularly the species known locally as Orejero (*Enterolobium cyclocarpum*).

PREY ITEMS OBSERVED IN 202 ATTACKS



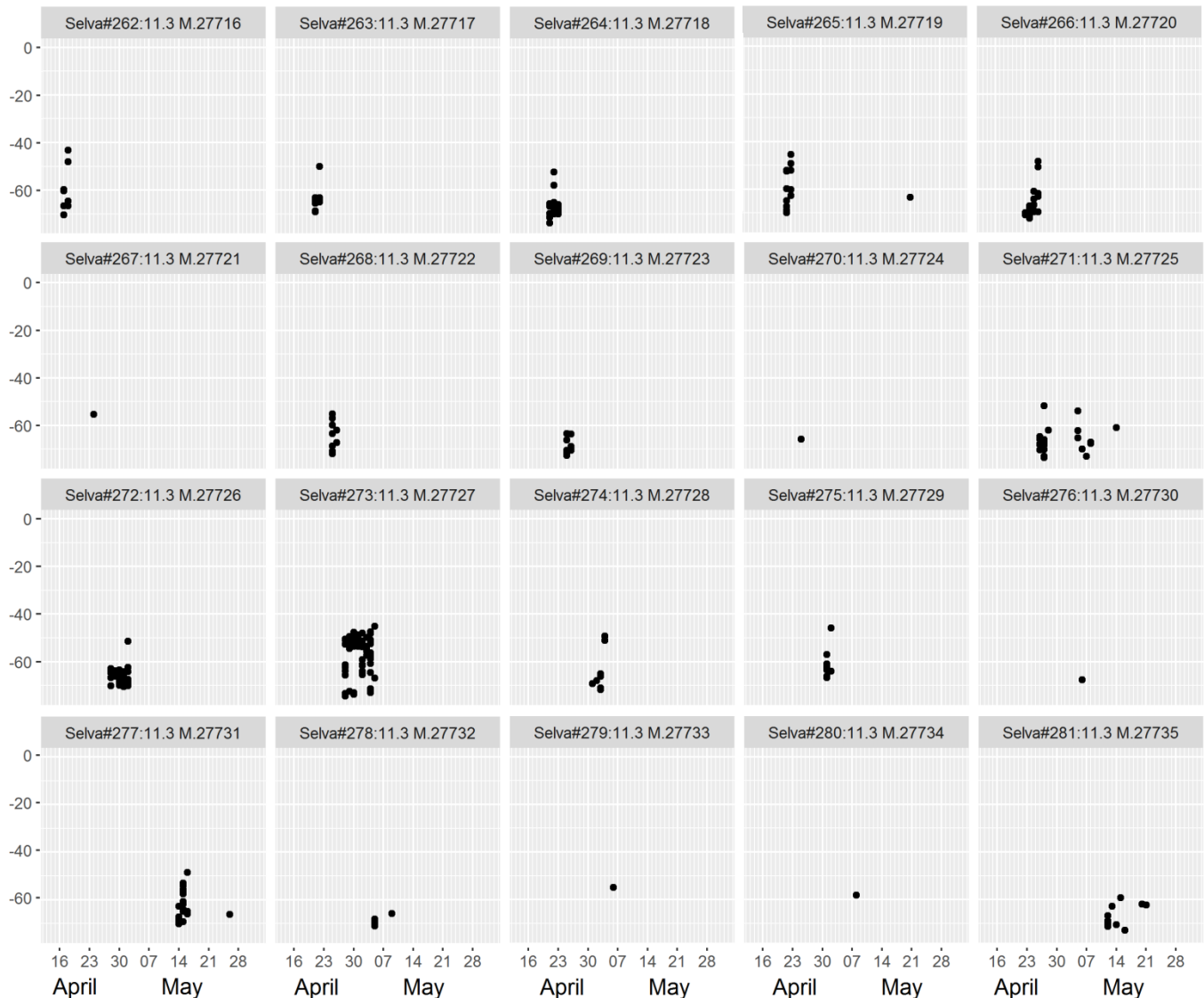
Tree Use x Foraging Rate



Stopover duration based on radiotransmitters

In 2018, 20 cuckoos were fitted with Motus tags, with apparent failure in two tags. Stopover duration varied from 1 to 12 days in the remaining 18 birds, at an average of 3.7 days. Compared to 2018, durations were longer in 2017 (mean = 6.4 days in 7 birds). Mean duration across the two years was 4.5 days. Based on interruptions in detections of >2 days, 32% of birds likely made local landscape movements within the range of the antenna (10-15 km).

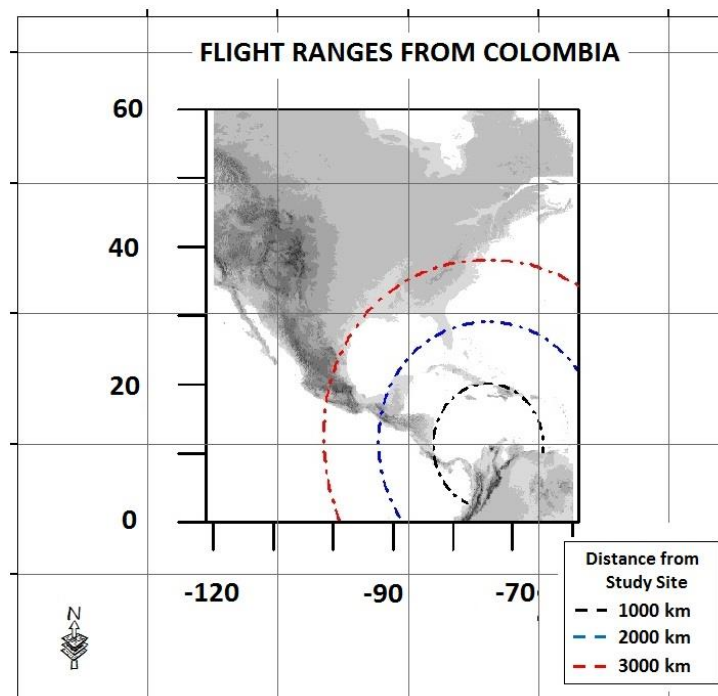
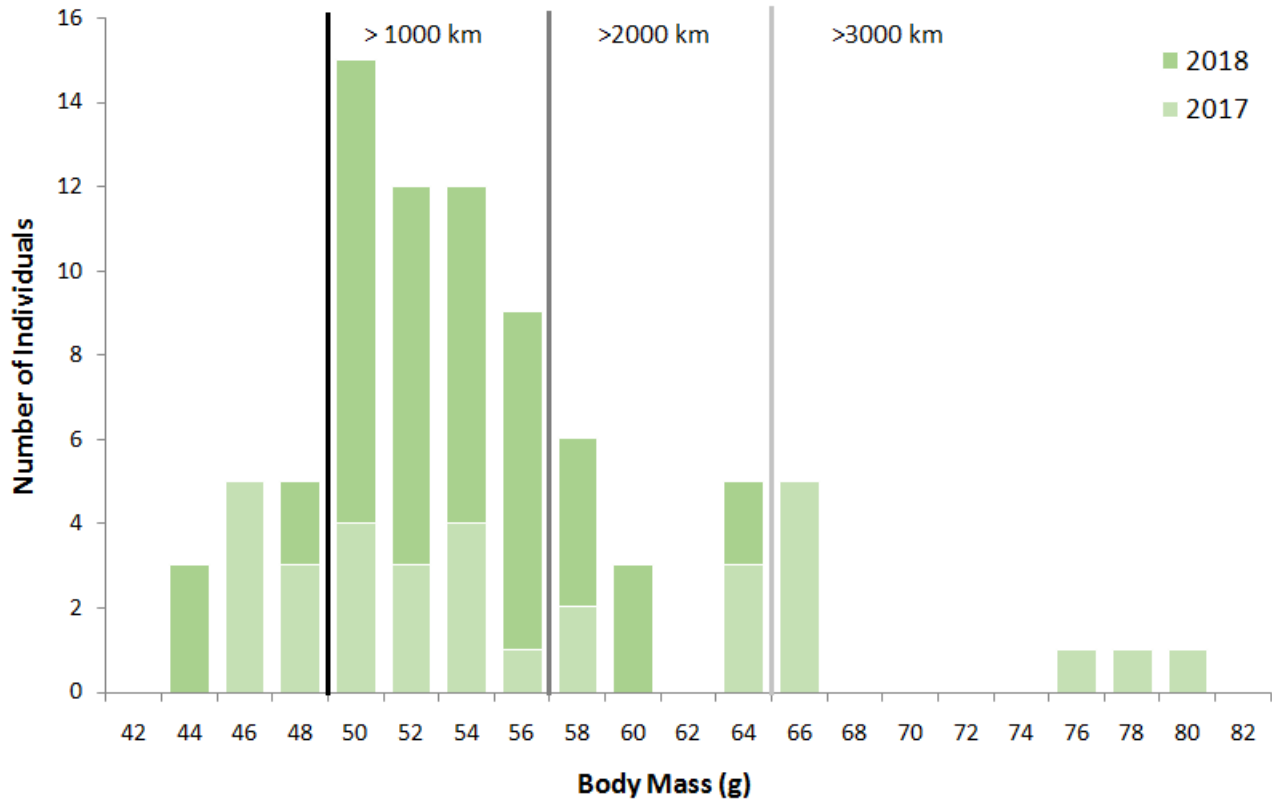
Yellow-billed Cuckoo had variable stopover durations based on detections from two antennas installed at the study site in 2018. Signal strength (y-axis) is plotted against date (x-axis) for each individual fitted with a radiotransmitter (individual plots). The tag ID of each bird is given at the top of plots e.g. Selva#262.



Flight range estimates

Compared to the majority of migratory birds, cuckoos have extremely long and pointed wings, making them one of the most efficient flyers in the Americas. Consequently, they need relatively little fuel to cover large distances. In both 2017 and 2018, the heavier cuckoos, which are probably those that are nearly ready to migrate, were capable of flights >2000 km. Longer, direct trans-Caribbean flights between South and North America were only possible for a handful of birds in 2017.

Distribution of body mass in captured cuckoos in relation to potential flight ranges



Conclusions & Management recommendations

- Yellow-billed Cuckoo consistently stopped over at the study site during three years
- The energy reserves obtained during stopovers varied between years, being greater in 2017
- Stopover duration varied between 1 and 15 days, with an average of 4.5 days over two years
- Cuckoos primarily foraged for caterpillars during stopover
- Heavily used trees, *Cassia grandis* & *Enterolobium cyclocarpum*, also supported high attack rates
- On leaving the stopover site, estimated flight ranges suggest birds could fly >2000 km
- Higher body mass, longer stopovers and flight ranges imply better fueling conditions in 2017
- This stopover site is used by other migrants to gain energy reserves including: Willow Flycatcher, Yellow Warbler, and Mourning Warbler.

Based on the evidence gathered over the course of three years, the region surrounding our study site in Cordoba is a regular stopover site for cuckoos, supporting one of the highest occupancy rates in the Colombian Caribbean. How birds used our study site varied between years and was likely related to fueling conditions, which in turn are likely determined by the abundance of caterpillars. In a “good” year (2017), birds stayed longer at the site, had higher body masses and were capable of long-haul flights >3000 km. The latter finding indicates that the conditions at the site are in some way optimal and that the resources therein can make a significant contribution to the migration of individual birds.

Most observations came from silvopastures at the study site, which were dominated by two species of Fabaceae, *Cassia grandis* and *Enterolobium cyclocarpum*. These two trees also supported the highest attack rates recorded in foraging birds. The adoption of these two species in silvopastures might therefore improve habitat quality in the wider region but given the apparent reduction in food availability in 2018, including a greater diversity of trees may help to buffer against year to year variation. Increasing the diversity of nitrogen fixing Fabaceae species in productive systems could increase quality for migrants, while simultaneously improving soil nutrients and stimulating grass growth. Given that 92% of tropical dry forest in Colombia has already been cleared, we recommend stimulating silvopastures, even with a reduced diversity of trees, as a means of increasing the habitat available for Yellow-billed Cuckoo and other migratory landbirds.

Cassia grandis or the Cañafistula was used by cuckoos more than any other tree and also supported abundant caterpillars. Promoting its use in silvopastures has additional benefits in terms of nitrogen fixation, while its seeds contain a nutritious pulp enjoyed by cattle



About SELVA

SELVA is a Colombian NGO dedicated to undertaking rigorous scientific research with applications to conservation issues. Formed in 2009, SELVA has spearheaded research on migratory birds in Colombia, resulting in multiple scientific publications (<http://selva.org.co/publications/>) and a growing reputation for excellence in migratory bird research. In 2016, SELVA in partnership with the Cornell Lab of Ornithology and Environment and Climate Change Canada initiated the Neotropical Flyways Project that aims to map and prioritize stopover regions for migratory landbirds across six countries in northern South America and Central America.

Report Author:

Dr. Nicholas Bayly
nick.bayly@selva.org.co

Researchers:

Yuly Caicedo
Carlos González
Angela Caguazango
Marta Rubio
Pilar Caicedo

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