

## Birds of Cahuita National Park, Costa Rica

### Avifauna del Parque Nacional Cahuita, Costa Rica

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#### Abstract

Biological inventories are essential for planning management and conservation actions. In Cahuita National Park, there are still information gaps regarding its biodiversity, which is why it is necessary to conduct species inventories. **Objective:** Generate and update the available information about birds in Cahuita National Park. **Methodology:** Information about the area was collected through other sources, such as previous studies and photographs taken at the Park. In addition, a sampling was carried out from April 11<sup>th</sup> to 21<sup>st</sup>, 2015, where visual and auditory records were obtained through systematic and unsystematic searches, mainly in 10 randomly selected parcels. Mist-nets were also used. Species ID was based on field guides and vocalizations audios, additionally, species accumulation curves were completed. **Results:** 209 species were registered, which correspond to 21 orders and 49 families, representing 22.7% of species present in Costa Rica. Of the registered birds, three are endemic to the region and six are in the “Near Threatened” category according to IUCN. Also, 38 migratory species were registered, along with 19 species with mixed populations (migratory and resident). **Conclusions:** The high specific richness of birds in this protected area could be due to the great diversity of ecosystems present, which constitute potential habitats for species from open areas, forest interior, marine and freshwater. The variety of species registered is evidence of the importance of this park for the conservation of regional avifauna.

**Keywords:** Biodiversity, Endemism, Inventory, Migratory species.

#### Resumen

Los inventarios biológicos son esenciales para realizar acciones de manejo y conservación. En el Parque Nacional Cahuita, aun existen vacíos de información sobre su biodiversidad, por lo que es necesario realizar inventarios de especies. **Objetivo:** Generar y actualizar la información sobre la avifauna del Parque Nacional Cahuita. **Metodología:** Se recopiló información del área a través de otras fuentes, como estudios previos realizados en la zona y fotografías tomadas en el Parque. Además, se realizó un muestreo del 11 al 21 de abril del 2015, donde se obtuvieron registros visuales y auditivos a través de recorridos sistemáticos y no sistemáticos, y capturas con redes de niebla, en diez parcelas seleccionadas aleatoriamente. La identificación de las aves se basó en guías de campo y audios de cantos, además, se realizaron curvas de acumulación de especies. **Resultados:** Se registraron 209 especies pertenecientes a 21 órdenes y 49 familias, que representan 22,7% de las especies de Costa Rica. De las aves registradas tres son endémicas de la región y seis están en la categoría de “Casi Amenazada” según UICN. Además, se registraron 38 especies migratorias y 19 con poblaciones tanto residentes como migratorias. **Conclusiones:** La alta riqueza específica de aves de esta área protegida puede deberse a la gran variedad de ecosistemas presentes, los cuales constituyen hábitats potenciales para especies de zonas abiertas, de interior de bosque, marinas y dulceacuícolas. La variedad de especies registradas evidencia la importancia del parque para la conservación de la avifauna de la región.

**Palabras clave:** Biodiversidad, Endemismo, Especies migratorias, Inventario.

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## Introduction

Costa Rica is dominated by two coasts and by mountains that cover more than half of its terrestrial area and which influence greatly on the climate. The variations in temperature and rainfall, and a wide range of elevations, are combined to produce the rich and diverse vegetation which is the basis for the richness of bird species of the country (Stiles and Skutch 2007). By 2019, 924 species were known for Costa Rica (Sandoval and Sánchez 2019). Besides the resident birds of the country, long distance migratory birds from the temperate and boreal zones of North America, arrive in large quantities around September and October (Stiles and Skutch 2007), and a few migratory birds from South America can be found at the start of the year (Stiles and Skutch 2007). In general, Costa Rican avifauna shows close affinity with that of Northeast Colombia and the Pacific Slope of South America, down to Ecuador (Stiles and Skutch 2007).

Costa Rica is home to around 5% of all species of flora and fauna known in the world (SINAC 2007), this biodiversity is concentrated in its over 190 natural protected areas, which cover 26% of the national territory (González-Maya *et al.* 2015). However, habitat loss is the greatest threat to biodiversity, especially to the avifauna of the country (Stiles and Skutch 2007). The rate of deforestation in Costa Rica is one of the highest in the world: more than half of the forest cover has disappeared since 1940 and the remaining forest is being lost at an annual rate of 3% of the country's area (Stiles and Skutch 2007). Within a few years, almost all of Costa Rica's forests will only prevail within the protected area system and equivalent reserves and parks (Stiles and Skutch 2007). Therefore, it is necessary to know the avifauna present in the protected area systems to ensure the survival of these species by providing them with adequate protection.

Likewise, birds are necessary for the long-term viability of protected areas. In the Cahuita National Park (CNP), which contains a representative sample of the different terrestrial and marine ecological systems of the southern Caribbean side of the country (SINAC 2009), birds pollinate flowers and disperse seeds, playing an important part, being essential in all tropical forests. In this area, one of the humid regions of Costa Rica, more than half of the tree species, especially from the understory, bear fruits adapted

to being dispersed by birds (Stiles and Skutch 2007).

CNP was created as a National Monument on September 7<sup>th</sup> 1970 and elevated to the category of National Park on April 27<sup>th</sup> 1978 (Cifuentes and Masterson 1991, MINAET 2012). The park has a large variety of ecosystems such as tropical rainforest, flooded forests, mangroves and lagoons, apart from the beach and marine area, which allows to find a great diversity of flora and fauna and is considered as a temporary habitat for many migratory species, especially birds (Cifuentes and Masterson 1991).

In addition to its biological representativeness, the CNP has national importance because it is a part of the Talamanca-Caribbean Biological Corridor (TCBC), in the basin of La Estrella river. To maintain the viability of wildlife populations in the region, connectivity is crucial among the different protected areas that are part of the TCBC, specially for the species that require vast extensions of habitat, like birds, which could be vulnerable to genetic and demographic deterioration if this connectivity is lost (SINAC 2012).

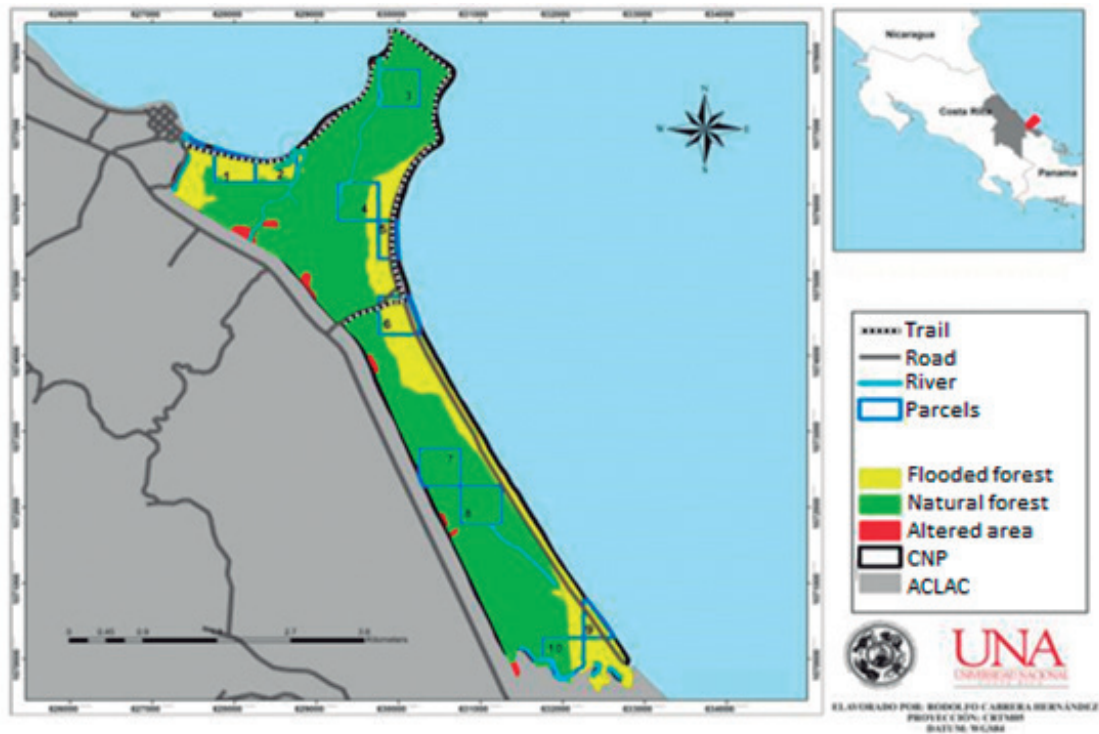
Despite its natural wealth and regional and national importance, there are information gaps about the biological communities that are present in the CNP. Therefore, this study aimed to generate and update the available information regarding the avifauna of CNP to April 2015.

## Methodology

CNP is found on the Caribbean coast of Costa Rica, 42 km south of the port of Limón. It is part of the La Amistad Caribbean Conservation Area (ACLAC) (Figure 1). Its extension is 1068 ha of land area and 2400 ha of sea. According to the classification of Holdridge (1967), it is considered within the humid tropical forest life zone.

The park has an average temperature of 27°C, with precipitation between 4.700-5.500 mm a year and a relative humidity of 92%. This area has no marked dry months, it has two precipitation peaks during June and from December to January, during which heavy floods can occur in the area (Bermúdez *et al.* 2009).

Vegetation is primarily perennial; it is composed of three or more strata with a height between 30 and 40 m. This protected area conserves a sample of swampy forest with pure stands of "sangrillo" (*Pre-*



**Figure 1.** Map of the terrestrial area of Cahuita National Park (CNP), southern Caribbean of Costa Rica. It includes the type of vegetation cover present in the park and the quadrants used for the bird sampling study.

*rocarpus officinalis*), apart from a great variety of epiphytic plants and remnants of very humid tropical forest (Cortés *et al.* 2010). In regards to wildlife, previous studies developed before April 2015 in the park, had reported 33 bird species, 31 terrestrial mammals, 17 marine mammals, 17 amphibians and 25 reptiles, including four species of sea turtles (Sánchez 2012).

To make the CNP avifauna inventory, four researchers followed the method recommended by Villarreal *et al.* (2004) was followed, with modifications:

**Gathering of previous information:** We reviewed three previous bird studies conducted in the southern Caribbean of Costa Rica and in the park (Sánchez 2012, Villegas and Villalobos 2014, Calvo *et al.* 2015). Additionally, we gathered photographs taken by park staff prior to our sampling. For each species, distribution was corroborated with Garrigues and Dean (2014). Through this activity, we sought to complete the records of birds that were previously reported in the park, paying special attention to those that were not recorded during the field phase of the study. Only studies carried out or published before April 2015 and that were carried out specifically in the park or in nearby areas, were taken into account,

this information does not represent an exhaustive review of the area.

**Visual and audio records (systematic surveys):** From the 11<sup>th</sup> to the 20<sup>th</sup> of April 2015, daily surveys were conducted by two people during the peak hours of bird activity (0530-1030 h and 1530-1730 h) in trails within the 10 randomly selected parcels (500 x 500 m in size) of the CNP (Figure 1). A different parcel was sampled each day. For parcels 7, 8 and 9, the surveys were conducted outside the parcels, but from a near distance (no more than 300 m away), because of the logistical difficulties of working in areas where the forest was flooded. The other parcels were not flooded at the time of sampling. Whenever possible, the birds were photographed.

**Mist-net captures:** Four mist-nets of 12 m long, and two of 6 m long, were used between the 11<sup>th</sup> and the 21<sup>st</sup> of April 2015 (except on the 19<sup>th</sup>), from 0530-1730 h. They were set in three different sites (parcels 4, 5 and 6), and remained in use approximately three days in each site. The birds that were captured were also identified, measured, photographed and released.

**Non-systematic searches:** This technique is intended to encompass as many habitats and micro-

habitats as possible (Bibby *et al.* 1998), to register species in habitats that were not represented in the parcels during the systematic surveys. Additionally, two nocturnal surveys (variable duration) were conducted between 1930-0000 h.

During these non-systematic searches, between one and four people participated, mainly taking opportunistic records of birds not registered through the other methods, while traveling at different times in different areas of the park, mainly using the trails in the area.

The bird species were identified using field guides (Stiles and Skutch 2007, Garrigues and Dean 2007, 2014) and audio guides (David 2001). A list of the species including the records taken in the field and another list with the records from previous information, were developed. Endemic species, migratory species and species considered threatened were reported. The scientific name, English name and status (resident, endemic, migratory), of each species was based the List of Birds from Costa Rica (Sandoval and Sánchez 2019), which is based on the taxonomy of the American Ornithologists' Union. Common names were taken from the Official List of Birds from Costa Rica (Obando-Calderón *et al.* 2014). The threatened category of each species was taken from International Union for Conservation of Nature, IUCN (BirdLife International 2019).

**Data analysis:** Species accumulation curves and Clench's Equation adjusted to the curve, were made to evaluate the quality of the sampling, and to estimate species richness the Chao 1 estimator was used, for each sampling method (systematic surveys and mist-net captures). For these, the computer programs used were EstimateS 9 (Colwell 2015) and Statistica 8.0 (StatSoft Inc 2015).

## Results

Through the visual and audio records, the mist-net captures and the non-systematic searches conducted in the CNP, 160 bird species were listed. These species belong to 20 orders and 46 families (Table 1, Figure 2). The family with the most species registered was Tyrannidae (19 species), followed by Thraupidae (14) and Parulidae (11). Out of the 160 species, 112 are resident, 31 are migratory, 15 have mixed populations (both resident and migratory)

and two species were regionally endemic from the Caribbean slope of Central America (*Psittacara finschi* and *Sporophila nuttingi*). To complement our findings, we registered 49 bird species of the CNP and its surroundings, from other information sources (Table 2). These included the registry of seven new migratory species, four new with mixed populations (both resident and migratory) and one new endemic species (*Pheugopedius atrogularis*).

By unifying the list of observed species with the complementary species, in the CNP a total of 209 bird species, correspondent to 21 orders and 49 families were registered. This value represents 22.7% of the 924 bird species reported for all of Costa Rica. Regarding the conservation status of this total, six species (*Tinamus major*, *Calidris pusilla*, *Contopus cooperi*, *Eupsittula nana*, *Amazona farinosa* and *Ramphastos ambiguus*) are under the category on Near Threatened (NT) on the Red List of Threatened Species.

**Visual and audio records during surveys.** We registered 125 bird species. The total sampling effort was 55.33 hours/researcher. The species accumulation curve of  $R^2=0.999$ , indicates a good adjustment of the model to the data (Figure 3). The slope calculated with Clench's Equation (6.28), has a value higher than 0.1, which suggests that the inventory is incomplete, that the proportion of registered avifauna was of approximately 50%. To be able to register 95% of all bird species present in CNP, a total of 19 parcels would need to be analyzed with the method of visual and audio surveys described here.

The Chao 1 estimator predicted that the number of expected species on average is 156 (CI 95%=139-191 species). According to Chao 1, 31 species should still need to be registered. This means that 80% of expected species were registered in this inventory.

**Mist-net captures.** Using this method, 105 individuals belonging to 41 species were captured and recorded, with a sampling effort of 447 hours/net. The species accumulation curve of  $R^2=0.999$ , indicates a good adjustment of the model to the data (Figure 4). The slope calculated with Clench's Equation (2.10) suggests that the inventory is incomplete. The Chao 1 estimator predicted that the number of expected species on average is 60 (CI 95%=47-100 species). According to the estimator, 19 species were not registered, which means that only 68% of species were recorded.



**Figure 2.** Photographs of some of the bird species recorded at Cahuita National Park (CNP). *Sporophila nuttingi* female (top left), *Gymnocichla nudiceps* male (top right), *Psittacara finschi* (center left), *Manacus candei* male (center right), *Leucopternis semiplumbeus* (bottom left), *Xiphorhynchus susurrans* (bottom right).

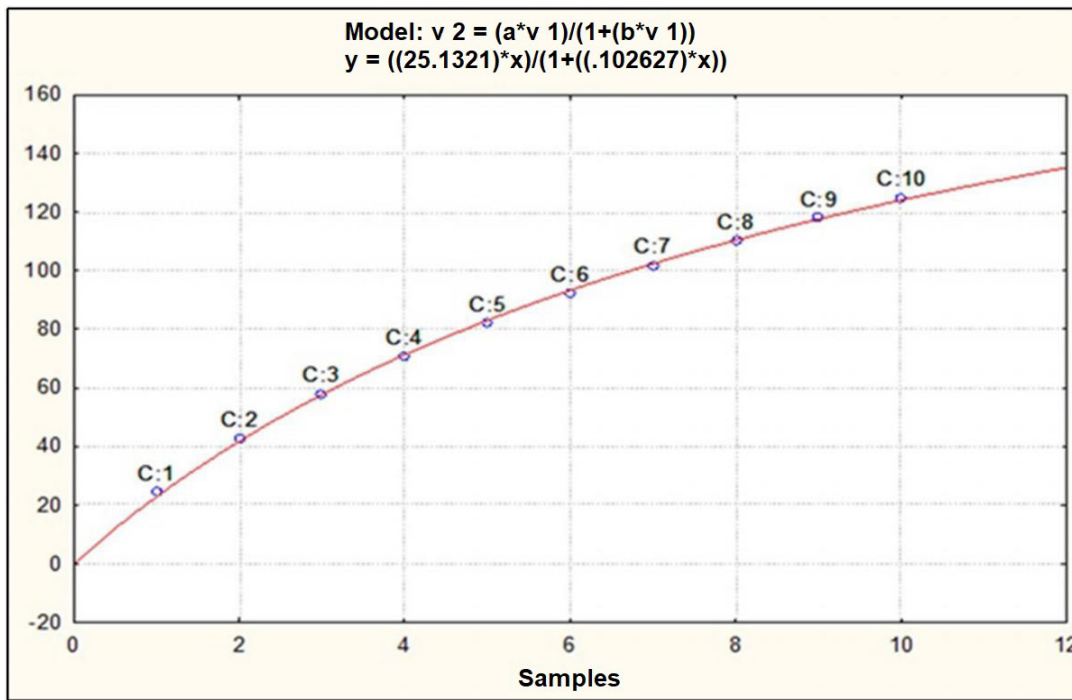


Figure 3. Species accumulation curve for sampling bird using visual and audio records during daytime surveys in Cahuita National Park, Costa Rica, 2015.

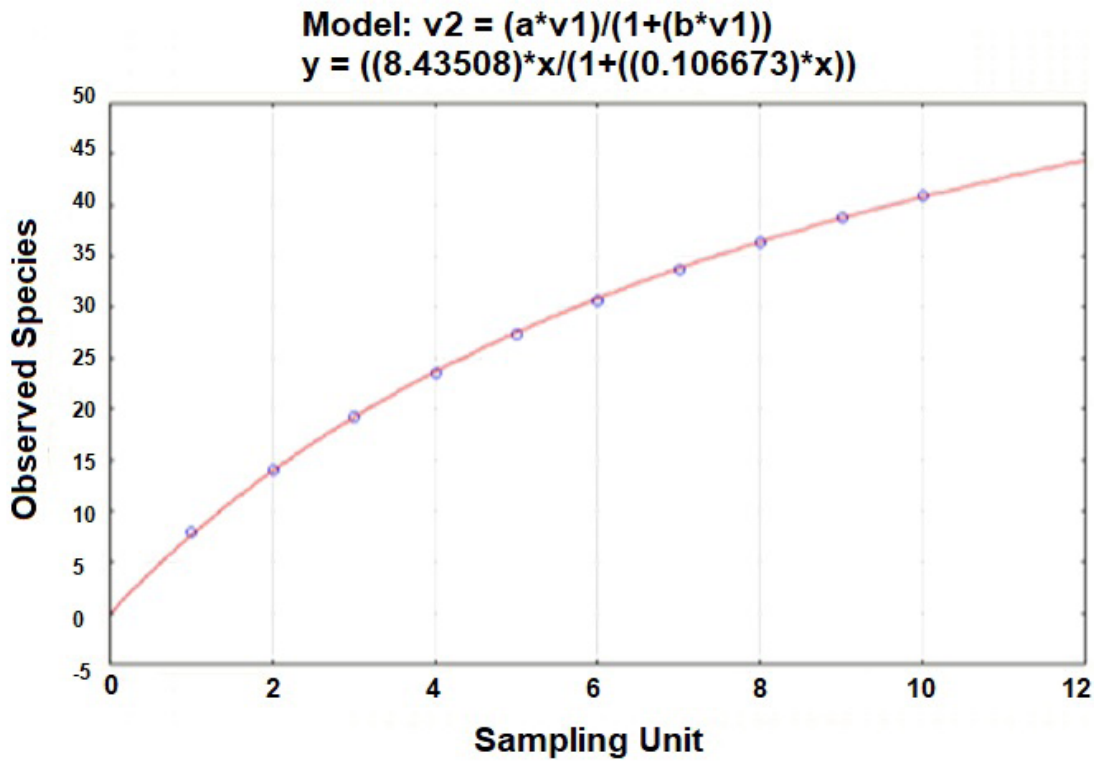


Figure 4. Species accumulation curve for sampling birds using mist-net captures in Cahuita National Park, Costa Rica, 2015.

**Table 1.** List of observed bird species in Cahuita National Park

Taxa	Common name (local name)	Name in English	Status <sup>1</sup>
Tinamiformes			
Tinamidae (1)			
<i>Crypturellus soui</i>	Tinamú Chico (Gallina de Monte Chica, Gongolona, Yerre, Ponchita)	Little Tinamou	R
Anseriformes			
Anatidae (1)			
<i>Cairina moschata</i>	Pato Real (Pato perulero)	Muscovy Duck	R
Galliformes			
Cracidae (1)			
<i>Ortalis cinereiceps</i>	Chachalaca Cabecigrís (Chachalaca, Pavita)	Gray-headed Chachalaca	R
Suliformes			
Fregatidae (1)			
<i>Fregata magnificens</i>	Rabihorcado Magno (Tijereta, Fragata, Zopilote de Mar)	Magnificent Frigatebird	R
Pelecaniformes			
Pelecanidae (1)			
<i>Pelecanus occidentalis</i>	Pelícano Pardo (Buchón, Pelicano, Alca-traz)	Brown Pelican	R
Ardeidae (8)			
<i>Tigrisoma mexicanum</i>	Garza-Tigre Cuellinuda (Garzón, Martín Peña, Pájaro Vaco)	Bare-throated Tiger-Heron	R
<i>Ardea herodias</i>	Garzón Azulado (Garza Ceniza, Garzón)	Great Blue Heron	MN(RN)
<i>Egretta thula</i>	Garceta Nivosa	Snowy Egret	R (MN)
<i>Egretta caerulea</i>	Garceta Azul (Garza Negra)	Little Blue Heron	R (MN)
<i>Egretta tricolor</i>	Garceta Tricolor	Tricolored Heron	R (MN)
<i>Butorides virescens</i>	Garcilla Verde (Martín Peña)	Green Heron	R
<i>Nyctanassa violacea</i>	Martinete Cabecipinto	Yellow-crowned Night-Heron	R (MN)
<i>Cochlearius cochlearius</i>	Pico Cuchara (Chocuaco, Cuaca)	Boat-billed Heron	R
Threskiornithidae (1)			
<i>Mesembrinibis cayennensis</i>	Ibis Verde (Coco Negro)	Green Ibis	R
Cathartiformes			
Cathartidae (2)			
<i>Coragyps atratus</i>	Zopilote Negro (Zoncho, Gallinazo)	Black Vulture	R
<i>Cathartes aura</i>	Zopilote Cabecirrojo (Zonchite, Noneca)	Turkey Vulture	R, MN
Accipitriformes			
Accipitridae (6)			
<i>Ictinia mississippiensis</i>	Elanio Colinegro	Mississippi Kite	MN
<i>Accipiter superciliosus</i>	Gavilán Enano (Camaleón)	Tiny Hawk	R

**Table 1.** List of observed bird species in Cahuita National Park (continuation)

<b>Taxa</b>	<b>Common name (local name)</b>	<b>Name in English</b>	<b>Status<sup>1</sup></b>
<i>Buteogallus anthracinus</i>	Gavilán Cangrejero	Common Black Hawk	R
<i>Buteogallus urubitinga</i>	Gavilán Negro Mayor (Aguilucho, Gavilán Silbero, Cangrejero)	Great Black Hawk	R
<i>Leucopternis semiplumbeus</i>	Gavilán Dorsiplomizo	Semiplumbeous Hawk	R
<i>Buteo platypterus</i>	Gavilán Aludo (Gavilán Pollero)	Broad-winged Hawk	MN
Gruiformes			
Rallidae (1)			
<i>Aramides cajaneus</i>	Rascón Cuelligris (Chirincoco, Pomponé, Pone-pone)	Gray-cowled Wood-Rail	R
Charadriiformes			
Charadriidae (3)			
<i>Pluvialis squatarola</i>	Chorlito Gris (Avefría)	Black-bellied Plover	MN(RN)
<i>Charadrius wilsonia</i>	Chorlitejo Picudo (Chorlito Gritón, Turillo)	Wilson's Plover	R, MN
<i>Charadrius semipalmatus</i>	Chorlitejo Semipalmado (Chorlito, Turillo)	Semipalmated Plover	MN(RN)
Jacanidae (1)			
<i>Jacana spinosa</i>	Jacana Centroamericana (Cirujano, Gallito de Agua, Mulita, Yegüita)	Northern Jacana	R
Scolopacidae (5)			
<i>Actitis macularius</i>	Andarríos Maculado (Alzacolita, Piririza, Tigüiza)	Spotted Sandpiper	MN(RN)
<i>Arenaria interpres</i>	Vuelvepiedras Rojizo	Ruddy Turnstone	MN(RN)
<i>Numenius phaeopus</i>	Zarapito Trinador (Cherelá, Zarceta)	Whimbrel	MN(RN)
<i>Calidris minutilla</i>	Correlimos Menudo (Patudo, Becacina)	Least Sandpiper	MN(RN)
<i>Calidris mauri</i>	Correlimos Occidental (Patudo, Becacina)	Western Sandpiper	MN(RN)
Laridae (1)			
<i>Thalasseus maximus</i>	Pagaza Real	Royal Tern	MN
Columbiformes			
Columbidae (5)			
<i>Patagioenas cayennensis</i>	Paloma Colorada (Paloma Morada)	Pale-vented Pigeon	R
<i>Patagioenas flavirostris</i>	Paloma Piquirroja (Paloma Morada Común)	Red-billed Pigeon	R
<i>Patagioenas nigrirostris</i>	Paloma Piquicorta (Paloma Morada, Dos-tontos-son)	Short-billed Pigeon	R
<i>Columbina talpacoti</i>	Tortolita Rojiza (Tortolita, Palomita Colorada)	Ruddy Ground Dove	R
<i>Leptotila cassinii</i>	Paloma Pechigrís (Yuré)	Gray-chested Dove	R
Cuculiformes			
Cuculidae (2)			
<i>Piaya cayana</i>	Cuco Ardilla (Bobo Chiso, Cacao, San Miguel)	Squirrel Cuckoo	R



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Taxa	Common name (local name)	Name in English	Status <sup>1</sup>
<i>Crotophaga sulcirostris</i>	Garrapatero Piquiestriado (Tijo, Tinco, Zopilotillo)	Groove-billed Ani	R
Caprimulgiformes			
Caprimulgidae (1)			
<i>Chordeiles minor</i>	Añapero Zumbón	Common Nighthawk	MN
Nyctibiiformes			
Nyctibiidae (1)			
<i>Nyctibius grandis</i>	Nictibio Grande (Pájaro Estaca, Leona, Bruja)	Great Potoo	R
Apodiformes			
Trochilidae (8)			
<i>Florisuga mellivora</i>	Jacobino Nuquiblanco	White-necked Jacobin	R
<i>Glaucis aeneus</i>	Ermitaño Bronceado	Bronzy Hermit	R
<i>Threnetes ruckeri</i>	Ermitaño Barbudo	Band-tailed Barbthroat	R
<i>Phaethornis longirostris</i>	Ermitaño Colilargo	Long-billed Hermit	R
<i>Phaethornis striigularis</i>	Ermitaño Enano	Stripe-throated Hermit	R
<i>Thalurania colombica</i>	Colibrí Ninfa Verde-Violeta	Crowned Woodnymph	R
<i>Polyerata amabilis</i>	Amazilia Pechiazul (Gorrión)	Blue-chested Hummingbird	R
<i>Amazilia tzacatl</i>	Amazilia Rabirrufa (Gorrión)	Rufous-tailed Hummingbird	R
Trogoniformes			
Trogonidae (2)			
<i>Trogon massena</i>	Trogón Coliplomizo (Caicota)	Slaty-tailed Trogon	R
<i>Trogon caligatus</i>	Trogón Violáceo	Gartered Trogon	R
Coraciiformes			
Momotidae (1)			
<i>Electron platyrhynchum</i>	Momoto Piquiancho (Pájaro Bobo)	Broad-billed Motmot	R
Alcedinidae (3)			
<i>Megaceryle torquatus</i>	Martín Pescador Collarejo	Ringed Kingfisher	R
<i>Chloroceryle americana</i>	Martín Pescador Verde	Green Kingfisher	R
<i>Chloroceryle aenea</i>	Martín Pescador Enano	American Pygmy Kingfisher	R
Piciformes			
Buconidae (2)			
<i>Notharchus hyperrhynchus</i>	Buco Collarejo	White-necked Puffbird	R
<i>Malacoptila panamensis</i>	Buco Barbón	White-whiskered Puffbird	R
Ramphastidae (3)			
<i>Pteroglossus torquatus</i>	Tucancillo Collarejo (Cusingo, Tití, Félix)	Collared Aracari	R
<i>Ramphastos sulfuratus</i>	Tucán Pico Iris (Tucán Pico Arcoiris, Curré Negro)	Keel-billed Toucan	R
<i>Ramphastos ambiguus</i>	Tucán Pico Negro (Quioro, Dios te dé, Gran Curré Negro)	Yellow-throated Toucan	R

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Taxa	Common name (local name)	Name in English	Status <sup>1</sup>
Picidae (3)			
<i>Melanerpes pucherani</i>	Carpintero Carinegro	Black-cheeked Woodpecker	R
<i>Celexus castaneus</i>	Carpintero Castaño	Chestnut-colored Woodpecker	R
<i>Dryocopus lineatus</i>	Carpintero Lineado	Lineated Woodpecker	R
Falconiformes			
Falconidae (4)			
<i>Herpethotes cachinnans</i>	Guaco	Laughing Falcon	R
<i>Falco sparverius</i>	Cernícalo Americano (Klis-Klis, Camaleón)	American Kestrel	MN
<i>Falco columbarius</i>	Esmerejón	Merlin	MN
<i>Falco peregrinus</i>	Halcón Peregrino	Peregrine Falcon	MN
Psittaciformes			
Psittacidae (6)			
<i>Eupsittula nana</i>	Perico Azteco	Olive-throated Parakeet	R
<i>Brotogeris jugularis</i>	Periquito Barbinaranja (Perico, Zapoyolito, Chimbolito, Catano)	Orange-chinned Parakeet	R
<i>Pionus menstruus</i>	Loro Cabeciazul (Chucuyo)	Blue-headed Parrot	R
<i>Pionus senilis</i>	Loro Coroniblanco (Cotorra, Chucuyo)	White-crowned Parrot	R
<i>Psittacara finschi</i>	Perico Frentirrojo (Cotorra, Chucuyo, Perico Colilarga o de Palmera)	Crimson-fronted Parakeet	R(e)
<i>Amazona autumnalis</i>	Loro Frentirrojo (Lora Jupa Roja)	Red-lored Parrot	R
Passeriformes			
Thamnophilidae (6)			
<i>Taraba major</i>	Batará Grande	Great Antshrike	R
<i>Thamnophilus atrinucha</i>	Batará Plomizo	Black-crowned Antshrike	R
<i>Myrmotherula axillaris</i>	Hormiguerito Flanquiblanco	White-flanked Antwren	R
<i>Microrhopias quixensis</i>	Hormiguerito Alipunteado	Dot-winged Antwren	R
<i>Gymnocichla nudiceps</i>	Hormiguero Calvo	Bare-crowned Antbird	R
<i>Poliocrania exsul</i>	Hormiguero Dorsicastaño	Chestnut-backed Antbird	R
Formicariidae (1)			
<i>Formicarius analis</i>	Gallito Hormiguero Carinegro	Black-faced Antthrush	R
Furnariidae (3)			
<i>Dendrocincla fuliginosa</i>	Trepador Pardo	Plain-brown Woodcreeper	R
<i>Dendrocolaptes sanctithomae</i>	Trepador Barreteado	Northern-barred Woodcreeper	R
<i>Xiphorhynchus susurrans</i>	Trepador Gorgianteado	Cocoa Woodcreeper	R
Tyrannidae (19)			
<i>Elaenia flavogaster</i>	Elainia Copetona (Tontillo, Bobillo, Copetoncillo)	Yellow-bellied Elaenia	R
<i>Mionectes oleagineus</i>	Mosquerito Aceitunado (Tontillo)	Ochre-bellied Flycatcher	R

**Table 1.** List of observed bird species in Cahuita National Park (continuation)

Taxa	Common name (local name)	Name in English	Status <sup>1</sup>
<i>Todirostrum cinereum</i>	Mosquerito Aceitunado (Tontillo)	Common Tody-Flycatcher	R
<i>Contopus cooperi</i>	Pibí Boreal (Tontillo)	Olive-sided Flycatcher	MN
<i>Contopus virens</i>	Pibí Oriental (Tontillo, Piguí)	Eastern Wood-Pewee	MN
<i>Contopus cinereus</i>	Pibí Tropical (Tontillo, Piguí)	Tropical Pewee	R
<i>Empidonax flaviventris</i>	Mosquerito Vientriamarillo	Yellow-bellied Flycatcher	MN
<i>Empidonax alnorum</i>	Mosquerito de Charral	Alder Flycatcher	MN
<i>Colonia colonus</i>	Mosquero Coludo	Long-tailed Tyrant	R
<i>Attila spadiceus</i>	Atila Lomiamarilla	Bright-rumped Attila	R
<i>Rhytipterna holerythra</i>	Plañidera Rojiza	Rufous Mourner	R
<i>Myiarchus tuberculifer</i>	Copetón Crestioscuro (Tontillo)	Dusky-capped Flycatcher	R
<i>Myiarchus crinitus</i>	Copetón Viajero (Tontillo)	Great Crested Flycatcher	MN
<i>Pitangus sulphuratus</i>	Bienteveo Grande (Cristo Fue, Pecho Amarillo)	Great Kiskadee	R
<i>Myiozetetes similis</i>	Mosquero Cejiblanco (Pecho Amarillo)	Social Flycatcher	R
<i>Myiozetetes granadensis</i>	Mosquero Cabecigrís (Pecho Amarillo)	Gray-capped Flycatcher	R
<i>Conopias albovittatus</i>	Mosquero Cabecianillado (Pecho Amarillo)	White-ringed Flycatcher	R
<i>Tyrannus melancholicus</i>	Tirano Tropical (Pecho Amarillo)	Tropical Kingbird	R
<i>Tyrannus tyrannus</i>	Tirano Norteño (Viuda Negra)	Eastern Kingbird	MN
Tityridae (2)			
<i>Tityra semifasciata</i>	Tityra Carirroja (Pájaro Chancho, Calandria)	Masked Tityra	R
<i>Tityra inquisitor</i>	Tityra Coroninegra (Pájaro Chancho)	Black-crowned Tityra	R
Cotingidae (1)			
<i>Querula purpurata</i>	Querula Gorgimorada	Purple-throated Fruitcrow	R
Pipridae (1)			
<i>Manacus candei</i>	Saltarín Cuelliblanco (Quiebrapalos, Quiebraramas, Bailarín)	White-collared Manakin	R
Vireonidae (2)			
<i>Vireo olivaceus</i>	Vireo Ojirrojo (Chiguisa)	Red-eyed Vireo	MN
<i>Pachysylvia decurtata</i>	Verdillo Menudo	Lesser Greenlet	R
Corvidae (2)			
<i>Psilorhinus morio</i>	Urraca Parda (Piapia)	Brown Jay	R
<i>Cyanocorax affinis</i>	Urraca Pechinegra	Black-chested Jay	R
Hirundinidae (4)			
<i>Tachycineta albilinea</i>	Golondrina Lomiblanca	Mangrove Swallow	R
<i>Stelgidopteryx ruficollis</i>	Golondrina Alirrasposa Sureña	Southern Rough-winged Swallow	R
<i>Riparia riparia</i>	Golondrina Ribereña	Bank Swallow	MN
<i>Hirundo rustica</i>	Golondrina Tijereta	Barn Swallow	MN

**Table 1.** List of observed bird species in Cahuita National Park (continuation)

Taxa	Common name (local name)	Name in English	Status <sup>1</sup>
Troglodytidae (2)			
<i>Troglodytes aedon</i>	Soterrey Cucarachero (Soterrey, Soterré)	House Wren	R
<i>Cantorchilus nigricapillus</i>	Soterrey Castaño	Bay Wren	R
Poliophtilidae (2)			
<i>Ramphocaenus melanurus</i>	Soterillo Picudo	Long-billed Gnatwren	R
<i>Poliophtila plumbea</i>	Perlita Tropical (Espatulilla, Cazadora)	Tropical Gnatcatcher	R
Turdidae (2)			
<i>Catharus ustulatus</i>	Zorzal de Swainson (Conchita)	Swainson's Thrush	MN
<i>Turdus grayi</i>	Mirlo Pardo (Yigüirro)	Clay-colored Thrush	R
Parulidae (11)			
<i>Parkesia noveboracensis</i>	Reinita Acuática Norteña (Menea Cola, Tordo de Agua)	Northern Waterthrush	MN
<i>Mniotilta varia</i>	Reinita Trepadora (Zebritita)	Black-and-white Warbler	MN
<i>Leiothlypis peregrina</i>	Reinita Verdilla (Cazadorcita)	Tennessee Warbler	MN
<i>Geothlypis philadelphia</i>	Reinita Enlutada	Mourning Warbler	MN
<i>Geothlypis trichas</i>	Antifacito Norteño	Common Yellowthroat	MN
<i>Setophaga ruticilla</i>	Candelita Norteña (Raya Roja)	American Redstart	MN
<i>Setophaga magnolia</i>	Reinita Colifajeada	Magnolia Warbler	MN
<i>Setophaga fusca</i>	Reinita Gorginaranja	Blackburnian Warbler	MN
<i>Setophaga petechia</i>	Reinita Amarilla (Canarita)	Yellow Warbler	R, MN
<i>Setophaga pensylvanica</i>	Reinita de Costillas Castañas	Chestnut-sided Warbler	MN
<i>Cardellina canadensis</i>	Reinita Pechirrayada	Canada Warbler	MN
Thraupidae (14)			
<i>Tachyphonus rufus</i>	Tangara Forriblanca (Fraile)	White-lined Tanager	R
<i>Ramphocelus passerinii</i>	Tangara de Passerini (Sargento, Rabadilla Tinta, Terciopelo, Sangre de Toro)	Scarlet-rumped Tanager	R
<i>Thraupis episcopus</i>	Tangara Azuleja (Viudita, Viuda)	Blue-gray Tanager	R
<i>Thraupis palmarum</i>	Tangara Palmera (Viudita de la Costa)	Palm Tanager	R
<i>Stelpnia larvata</i>	Tangara Capuchidorada (Juana, Mariposa, Siete Colores)	Golden-hooded Tanager	R
<i>Dacnis cayana</i>	Mielero Azulejo (Rey de Viuda)	Blue Dacnis	R
<i>Coereba flaveola</i> <i>Chlorophanes spiza</i>	Reinita Mielera (Pincha Flor, Santa Marta) Mielero Verde (Rey de Mar, Verde Mar, Rey de Trepadores)	Bananaquit Green Honeycreeper	R R
<i>Cyanerpes lucidus</i>	Mielero Luciente (Picudo Patiamarillo)	Shining Honeycreeper	R
<i>Cyanerpes cyaneus</i>	Mielero Patirrojo (Picudo, Mielero, Tucuso, Trepador)	Red-legged Honeycreeper	R
<i>Volatinia jacarina</i>	Semillerito Negro Azulado (Brea, Pius, Piusillo Negro, Saltapalito)	Blue-black Grassquit	R
<i>Sporophila funerea</i>	Semillero Picogrueso	Thick-billed Seed-Finch	R

**Table 1.** List of observed bird species in Cahuita National Park (continuation)

Taxa	Common name (local name)	Name in English	Status <sup>1</sup>
<i>Sporophila nuttingi</i>	Semillero Piquirrosado	Nicaraguan Seed-Finch	R(e)
<i>Sporophila corvina</i>	Espiguero Variable (Setillero Collarejo, Monjito, Arrocerito)	Variable Seedeater	R
Passerellidae (2)			
<i>Arremon aurantirostris</i>	Pinzón Piquinaranja (Pico Chile, Pico Rojo, Pico de Oro)	Orange-billed Sparrow	R
<i>Arremonops conirostris</i>	Pinzón Cabecillado (Purisquero, Pájaro Suzuki)	Black-striped Sparrow	R
Cardinalidae (5)			
<i>Piranga rubra</i>	Tangara Veranera (Cardenal Veranero, Pan de Achote, Sangre Toro)	Summer Tanager	MN
<i>Piranga olivacea</i>	Tangara Escarlata (Cardenal Alas Negras)	Scarlet Tanager	MN
<i>Habia fuscicauda</i>	Tangara Hormiguera Gorgirroja	Red-throated Ant-Tanager	R
<i>Pheucticus ludovicianus</i>	Picogrueso Pechirrosado (Calandria)	Rose-breasted Grosbeak	MN
<i>Cyanoloxia cyanoides</i>	Picogrueso Negro Azulado	Blue-black Grosbeak	R
Icteridae (6)			
<i>Quiscalus mexicanus</i>	Clarinero, Zanate Grande (Sanate, Zanate)	Great-tailed Grackle	R
<i>Molothrus bonariensis</i>	Vaquero Mirlo	Shiny Cowbird	R
<i>Icterus mesomelas</i>	Bolsero Coliamarillo (Chorcha, Chiltote, Chiltotel)	Yellow-tailed Oriole	R
<i>Icterus galbula</i>	Bolsero Norteño (Cacique Veranero, Cacicón, Naranjero)	Baltimore Oriole	MN
<i>Cacicus uropygialis</i>	Cacique Lomiescarlata (Sargento, Plío)	Scarlet-rumped Cacique	R
<i>Psarocolius montezuma</i>	Oropéndola de Moctezuma (Oropéndola)	Montezuma Oropendola	R
Fringillidae (1)			
<i>Euphonia gouldi</i>	Eufonia Olivácea (Agüño, Barranquillo, Culo Rojo, Güere)	Olive-backed Euphonia	R

<sup>1</sup> MN= North American Migrant; RN= Non reproductive resident; R= Resident; e = Endemic

The scientific name, English name and status, of each species was based the List of Birds from Costa Rica (Sandoval and Sánchez 2019), which is based on the taxonomy of the American Ornithologists' Union. Common names were taken from the Official List of Birds from Costa Rica (Obando-Calderón *et al.* 2014). In parenthesis, the number of species found from each family.

**Table 2.** Complementary list of birds registered in the Cahuita National Park and surrounding areas in the Southern Caribbean of Costa Rica by other authors

Taxa	Common name (local name)	Name in English	St. <sup>1</sup>	Ref. <sup>2</sup>
Tinamiformes				
Tinamidae (1)				
<i>Tinamus major</i>	Tinamú Grande (Gallina de monte, Perdiz, Gongolona, Yerre)	Great Tinamou	R	3
Suliformes				
Phalacrocoracidae (1)				
<i>Phalacrocorax brasilianus</i>	Cormorán Neotropical (Pato Chancho, Pato de Agua, Bigua)	Neotropic Cormorant	R	1, 4
Pelecaniformes				
Ardeidae (1)				
<i>Bubulcus ibis</i>	Garcilla Bueyera (Garcilla Ganadera, Garza Vaquera, Garza de Ganado)	Cattle Egret	R	3, 4
Threskiornithidae (1)				
<i>Eudocimus albus</i>	Ibis Blanco (Coco)	White Ibis	R	2
Accipitriformes				
Accipitridae (2)				
<i>Chondrohierax uncinatus</i>	Gavilán Piquiganchudo	Hook-billed Kite	R	3
<i>Harpagus bidentatus</i>	Gavilán Gorgirrayado	Double-toothed Kite	R	4
Charadriiformes				
Charadriidae (1)				
<i>Charadrius collaris</i>	Chorlitejo Collarejo (Turillo)	Collared Plover	R	1
Scolopacidae (6)				
<i>Tringa semipalmata</i>	Pigüilo	Willet	MN (RN)	1
<i>Tringa flavipes</i>	Patiamarillo Menor (Pijije, Zarceta)	Lesser Yellowlegs	MN (RN)	1
<i>Calidris alba</i>	Playero Arenero	Sanderling	MN	1
<i>Calidris melanotos</i>	Correlimos Pechirrayado (Patudo, Becacina)	Pectoral Sandpiper	MN	4
<i>Calidris pusilla</i>	Correlimos Semipalmado	Semipalmated Sandpiper	MN (RN)	1
<i>Limnodromus griseus</i>	Agujeta Común	Short-billed Dowitcher	MN (RN)	1
Columbiformes				
Columbidae (1)				
<i>Leptotila verreauxi</i>	Paloma Coliblanca (Coliblanca, Yuré)	White-tipped Dove	R	3
Cuculiformes				
Cuculidae (1)				
<i>Tapera naevia</i>	Cucuillo Listado (Rondero, Tres Pesos, Ave de las Ánimas)	Striped Cuckoo	R	3

**Table 2.** Complementary list of birds registered in the Cahuita National Park and surrounding areas in the Southern Caribbean of Costa Rica by other authors (continuation)

Taxa	Common name (local name)	Name in English	St. <sup>1</sup>	Ref. <sup>2</sup>
Strigiformes				
Strigidae (1)				
<i>Ciccaba nigrolineata</i>	Lechuza Blanco y Negro	Black-and-white Owl	R	2, 4
Caprimulgiformes				
Nyctibiidae (1)				
<i>Nyctibius griseus</i>	Nictibio Común (Pájaro Estaca, Pájaro Palo)	Common Potoo	R	2
Trogoniformes				
Trogonidae (1)				
<i>Trogon rufus</i>	Trogón Cabeciverde	Black-throated Trogon	R	2, 3
Coraciiformes				
Momotidae (1)				
<i>Baryphthengus martii</i>	Momoto Canelo Mayor (Pájaro Bobo)	Rufous Motmot	R	3
Alcedinidae (2)				
<i>Chloroceryle amazona</i>	Martín Pescador Amazónico	Amazon Kingfisher	R	4
<i>Chloroceryle inda</i>	Martín Pescador Vientrirufo	Green-and-rufous Kingfisher	R	3
Piciformes				
Bucconidae (1)				
<i>Notharchus tectus</i>	Buco Pinto	Pied Puffbird	R	3
Falconiformes				
Falconidae (1)				
<i>Micrastur ruficollis</i>	Halcón de Monte Barreteado	Barred Forest-Falcon	R	3
Psittaciformes				
Psittacidae (1)				
<i>Amazona farinosa</i>	Loro Verde (Lora Cabeza Negra, Lora Jupa Gris)	Mealy Parrot	R	2
Passeriformes				
Thamnophilidae (1)				
<i>Cercomacroides tyrannina</i>	Hormiguero Negruzco	Dusky Antbird	R	3
Furnariidae (1)				
<i>Synallaxis brachyura</i>	Arquitecto Plomizo	Slaty Spinetail	R	3
Tyrannidae (3)				
<i>Poecilotriccus sylvia</i>	Espatulilla Cabecigrís	Slate-headed Tody-Flycatcher	R	3
<i>Contopus sordidulus</i>	Pibí Occidental (Tontillo, Piguí)	Western Wood-Pewee	MN	3
<i>Megarynchus pitangua</i>	Mosquerón Picudo (Pecho Amarillo)	Boat-billed Flycatcher	R	3

**Table 2.** Complementary list of birds registered in the Cahuita National Park and surrounding areas in the Southern Caribbean of Costa Rica by other authors (continuation)

Taxa	Common name (local name)	Name in English	St. <sup>1</sup>	Ref. <sup>2</sup>
Onychorhynchidae (2)				
<i>Onychorhynchus coronatus</i>	Mosquero Real	Royal Flycatcher	R	3
<i>Terenotriccus erythrurus</i>	Mosquerito Colirrufo	Ruddy-tailed Flycatcher	R	3
Tityridae (2)				
<i>Pachyramphus cinnamomeus</i>	Cabezón Canelo	Cinnamon Becard	R	3
<i>Pachyramphus aglaiae</i>	Cabezón Plomizo	Rose-throated Becard	R	3
Cotingidae (1)				
<i>Carpodectes nitidus</i>	Cotinga Blanca	Snowy Cotinga	R	3
Troglodytidae (3)				
<i>Campylorhynchus zonatus</i>	Soterrey Matraquero	Band-backed Wren	R	3
<i>Pheugopedius atrogularis</i>	Soterrey Gorginegro	Black-throated Wren	R(e)	3
<i>Cantorchilus modestus</i>	Soterrey Chinchirigüí (Huevos Blancos)	Cabanis's Wren	R	3
Turdidae (1)				
<i>Catharus fuscescens</i>	Zorzal Dorsirrojo (Conchita)	Veery	MN	3
Parulidae (3)				
<i>Geothlypis formosa</i>	Reinita Cachetinegra	Kentucky Warbler	MN	3
<i>Setophaga castanea</i>	Reinita Castaña	Bay-breasted Warbler	MN	4
<i>Setophaga coronata</i>	Reinita Lomiamarilla	Yellow-rumped Warbler	MN	3
Thraupidae (3)				
<i>Tachyphonus delatrix</i>	Tangara Coronadorada	Tawny-crested Tanager	R	3
<i>Saltator maximus</i>	Saltator Gorgianteado (Chayotero, Chojui, Comepuntas, Sinsonte Verde)	Buff-throated Saltator	R	3
<i>Sporophila moreletii</i>	Espiguero Collarejo (Setillero Collarejo)	Morelet's Seedeater	R	3
Cardinalidae (2)				
<i>Chlorothraupis carmioli</i>	Tangara Aceitunada o de Carmiol	Carmiol's Tanager	R	3
<i>Caryothraustes poliogaster</i>	Picogrueso Carinegro (Sarapiqueña)	Black-faced Grosbeak	R	3
Icteridae (2)				
<i>Dives dives</i>	Tordo Cantor	Melodious Blackbird	R	3
<i>Molothrus aeneus</i>	Vaquero Ojirrojo (Pius)	Bronzed Cowbird	R	3
Fringillidae (1)				
<i>Euphonia luteicapilla</i>	Eufonia Coroniamarilla (Monjita, Agúío)	Yellow-crowned Euphonia	R	3

<sup>1</sup> Status: R= Resident; MN= North American Migrant; e= Endemic; RN= Non reproductive resident

<sup>2</sup> References: 1 = Calvo et al. 2015; 2 = Sánchez 2012; 3 = Villegas and Villalobos 2014; 4 = Photographical record of birds in CNP

The scientific name, English name and status, of each species was based the List of Birds from Costa Rica (Sandoval and Sánchez 2019), which is based on the taxonomy of the American Ornithologists' Union. Common names were taken from the Official List of Birds from Costa Rica (Obando-Calderón et al. 2014). In parenthesis, the number of species found from each family



## Discussion

Of the species recorded during this study, three were endemic to the region and six are found under the category of “Near Threatened” from the IUCN Red List of Threatened Species. The main threats faced by the birds of Costa Rica are habitat destruction, pollution by pesticide residues and waste and illegal poaching (Stiles and Skutch 2007). Endemic and threatened species are the most vulnerable to extinction, an evaluation is needed to determine what threats affect the populations of these species in the area to implement effective conservation actions in the CNP.

Due to its geographical location, Costa Rica constitutes a strategic spot for migratory bird species coming from North and South America (Stiles and Skutch 2007). Both coasts of the country constitute biological corridors for birds and are important ecological sites for feeding, resting, reproduction and for the permanence of juveniles (Canevari *et al.* 2001).

The Sothern Caribbean wetlands of Costa Rica (including those in CNP), represent some of the most important sites for resident and migratory aquatic birds (Alvarado 2006). This is evidenced by the presence of the 38 migratory species and the 19 species with both migratory and resident populations recorded during this study. Also, worth noting, the Keköldi Indigenous Reserve is located near CNP. In this reserve, they have counted 10 million individuals of different species of raptors (birds of prey), during each migratory season. This reserve constitutes one of the monitoring sites for raptor migration in the world (Bildstein 2004). CNP could be as important for the observation of raptor migration, but more studies are needed.

Given the high specific richness of birds in CNP, it was necessary to implement different sampling methods to detect the highest number of species possible (Whitman *et al.* 1997, Bojorges *et al.* 2006). The techniques applied in this study allowed the possibility to register cryptic species like the Great Potoo (*Nyctibius grandis*), hummingbirds and other species that, due to their dwelling in the undergrowth, are hard to detect by direct observation.

However, the species richness analysis conducted for each sampling method shows that there are more bird species yet to be recorded. This could be

explained, among other reasons, by the fact that part of the protected area was flooded when this study took place, so the sampling effort in some parcels was lower due to the difficulties of accessing these sites. In addition, sampling was concentrated in a short period and during a specific season, which could affect the observation of several species.

## Conclusions

Cahuita National Park (CNP) is home to at least 209 bird species which represents 22.7% of all species found in Costa Rica. This specific bird richness could be the result of the wide variety of ecosystems present in the area, which constitute potential habitats for bird found in open areas, forest interior, along with marine and freshwater species. Even though CNP is relatively small, the variety of observed species demonstrates the importance of this protected area for the conservation of the avifauna of the country.

Due to the presence of species of interest, such as endemic, threatened and migratory species in the park, monitoring and conservation programs should be established in the area, focusing on species of national and international importance. However, to carry out a monitoring program that serves to compare the abundance and richness of this taxonomic group, it is necessary to resort to experts, so that they design an adequate sampling method for the CNP.

The species richness analyzes show that there are still species to be registered, so other biodiversity inventories must be carried out, it is necessary to increase the sampling effort, both spatially and temporally (other months), to register more bird species.

Within CNP there is a Sustainable Tourism Program which determined that it is feasible to concession the Guided Tours Specialized Service. Due to the avifauna found in this study, CNP is suitable to offer specialized tours for bird watching. To implement these tours, CNP should ensure that all guidelines for Public Use Regulations are met. Specially by respecting the load capacity of the park and carry out activities as permitted by zonation. This would allow to bring in more revenue for the park and the community. It would also be a great opportunity to sensitize visitors about the importance of natural resources conservation.

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