Birds of Río Tame of the Andes-Orinoco transitional region: species check-list, biogeographic relationship and conservation

Aves del Río Tame de la región de transicional Andes-Orinoco: lista de especies, relación biogeográfica y conservación

Orlando Acevedo-Charry[1]

Grupo de Ornitología de la Universidad Nacional de Colombia – GOUN, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá D.C., Colombia.
YOLUKA ONG, Fundación de Investigación en Biodiversidad y Conservación, Bogotá D.C., Colombia.
[1] Present address: Department of Biology. College of Natural Science. University of Puerto Rico – Río Piedras, San Juan, Puerto Rico.
✉ acevedocharry@gmail.com

Abstract

The foothills of the Eastern Andes of Colombia represent one of the least explored and poorly known ornithological regions in the northern Neotropics. This area includes the transition between the Andean premontane forests and the tropical savanna of the Orinoco lowland region (the Llanos). Land covers are a mixture of grassland, semi-deciduous and premontane forests within a relatively short geographical distance. Here, I present an inventory of the birds of the lower foothills of the Río Tame Forest Reserve (Río Tame) in Arauca, Colombia. I conducted a biogeographic relationship analysis at the subspecies level, based on the birds collected in Río Tame. Field work took place in 2011 and 2013, at elevations between 630 and 1,023 m. The surveys were based on visual and auditory surveys, complemented with sound recording, mist netting and, when possible, the collection of specimens to document records of particular interest. I recorded 215 bird species belonging to 43 families. Extensions of geographical or altitudinal ranges were documented for 20 species. I recorded 15 species of conservation concern and 19 species with few historical, unsubstantiated records or special interest at the level of subspecies in the Araucan foothills. The biogeographic analysis documents that the Araucan foothill region, at Rio Tame, represents a zone of avifaunal turnover between those of northern vs. southern affinities; with more similarities with the northern Andes avifauna. My results differ from others that found greater similarities between the Eastern Andes slopes and the Sierra de la Macarena, and dissimilarities with the Serranía de Perijá. More phylogeographic studies are needed to elucidate the dynamics of avian turnover at both geographic and taxonomic scales. I highlight the importance of this region to the conservation of birds in Colombia and suggest that it be included as part of the El Cocuy Important Bird Area (IBA), or as a new IBA.

Key words: Apure-Villavicencio ecoregion, biogeography, Colombia, lower piedmont, range extensions, threatened species.

Resumen

Las estribaciones del sector norte de la cordillera Oriental de Colombia representan uno de los ecosistemas menos explorados y con menor información ornitológica disponible al norte del Neotrópico. Esta área incluye la transición entre el bosque premontano de los Andes y las sabanas tropicales de la región Orinoquia (los Llanos) con una mezcla de sabanas, bosques semicaducifolios y premontanos dentro de una distancia geográfica relativamente corta. Presento un inventario de aves de la zona baja del piedemonte en la Reserva Forestal Protectora Río Tame (Río Tame) en Arauca, Colombia. Adicionalmente, presento un análisis de relaciones biogeográficas al nivel de subespecie, en base a las aves colectadas. Hice exploraciones ornitológicas en 2011 y 2013 a elevaciones entre 630 y 1.023 m, mediante registros visuales y acústicos, captura con redes de niebla y, donde era posible, recolecta de especímenes para documentar registros de interés particular. Logré registrar un total de 215 especies de aves de 43 familias. Registré extensiones de las distribuciones geográficas o altitudinales para 20 especies. Quince especies con interés de conservación fueron registradas, además de 19 especies con pocos registros históricos, sin confirmación en el piedemonte araucano o especies de interés particular al nivel de subespecie. Mi análisis biogeográfico documenta la región de piedemonte de Arauca, en Río Tame, como una zona de recambio de avifauna entre las afinidades norte y sur; con una mayor similitud con el norte. Mis resultados difieren de otros

que han encontrado mayor similitud entre la vertiente este de los Andes y la Sierra de la Macarena, y disimilitudes con la Serranía de Perijá. Se requieren más estudios filogeográficos para elucidar la dinámica del recambio de especies en ambas escalas, geográfica y taxonómica. Comento sobre la importancia de esta región para la conservación de las aves en Colombia, y sugiero que sea incluida como parte del Área de Importancia para la Conservación de las Aves (AICA) El Cocuy, o que sea propuesta una nueva AICA.

Palabras clave: ampliación de distribución, biogeografía, Colombia, ecorregión Apure-Villavicencio, especies amenazadas, piedemonte bajo.

Introduction

The Andes are recognized as a global biodiversity hotspot due to its high levels of endemism and beta diversity (Myers *et al.* 2000, Graham *et al.* 2010, Jenkins *et al.* 2013), harboring more than 2,000 bird species, 600 of which are endemic to the region (Herzog & Kattan 2012). Near its northern end, the Andes split into three large ranges, the Western, Central, and Eastern Cordilleras of Colombia. Each range has unique bird communities, reflecting different historical processes of geographical isolation and dispersal in the context of topographical and ecological complexity (Chapman 1917, Hilty & Brown 1986, Kattan *et al.* 2004, Graham *et al.* 2010). The Eastern Andes of Colombia is recognized as an important center of avian endemism, with many endangered species (Stattersfield 1998, Boyla & Estrada 2005). Of particular biogeographic interest is the northernmost end of this range (López-O. *et al.* 2014). At around 7ºN a spur extends eastward as the Páramo de Tamá; between 7º and 8º N, the main range takes a 90º turn (from NE to NW), and at 8º N, approaches close to the Cordillera de Mérida of Venezuela across the narrow Táchira depression (Graham *et al.* 2010). Although significant avifaunal turnover is known to exist in this area (Hilty & Brown 1986), Graham *et al.* (2010) found no evidence of major ecological changes in the Andes-Orinoco transition region (Hernández-Camacho *et al.* 1992, Olson *et al.* 2001). This environmental gradient provides an interesting opportunity to further elucidate the relationship between evolutionary and ecological processes (Graham *et al.* 2014).

The lower Andean foothills are regions of high species diversity and rapid turnover because of the mixing of lowland and montane communities (Terborgh 1977, Jankowski *et al.* 2013). The east slope of the Eastern Andes harbors the highest diversity of bird species in the Colombian Andes and has more species per elevational belt than other Andean slopes (Kattan & Franco 2004, Kattan *et al.* 2004, but see Ocampo-Peñuela & Pimm 2014 for an analysis of endemic species). Nevertheless, the northern portion (*e.g.,* Arauca) is one of the least explored and documented, with few and sparse inventories (Chapman 1917, Olivares 1963, 1971, IAvH 1998, Bohórquez 2002, Salaman *et al.* 2002, Chaparro & Laverde 2014). In the adjacent Araucan Orinoco region, the few published studies have been mainly in the lowlands of the Arauca river and some of its southern tributaries (Blake 1961, Rojas *et al.* 1997, Rojas & Piragua 2000, Acevedo-Charry *et al.* 2013). The first study of the avifauna in this region was based on an expedition by K. von Sneidern, in 1959 to Arauca and eastern Boyacá (Blake 1961). However, this account mentioned only those of von Sneidern's specimens that included additions to the Colombian avifauna and did not include a complete list of his collection for each locality (Blake 1961). Only at Hacienda La Primavera (*ca.* 7ºN), now in the southernmost Norte de Santander, he reached elevations of *ca.* 2,000 m, from which Blake (1961) mentioned some montane birds, including White-browed

Spinetail *(Hellmayrea gularis),* Streaked Tuftedcheek *(Pseudocolaptes boissoneautii),* and Barred Becard *(Pachyramphus versicolorus).*

Recent research reviewing the avifauna in the Orinoco region (Umaña *et al.* 2009) recorded only 60 species around the town of Tame, the largest municipality in Arauca. The lack of data for the entire Arauca-Casanare foothills in recent years has been partly due to a continuous sociopolitical conflict (O'Dea *et al.* 2004, Sánchez-Cuervo & Aide 2013), as well as difficult access to remnants of natural vegetation. Extensive deforestation exists along most of this slope below 1,000-2,000 m, especially for cattle pastures and agriculture. Due to the combination of least deforestation rate and least-studied effort, the Araucan foothills were recently recognized as a high priority for basic research (Restrepo-Calle *et al.* 2010, Arbeláez-Cortés 2013). Furthermore, that lack of knowledge could be an obstacle to understanding the ecology and biogeography of the Andes mountain biota (Graham *et al.* 2014).

The only named protected area in the Orinoco-Andes foothill region is the Río Tame Forest Reserve (hereafter Río Tame), declared in 1985 (Vásquez & Serrano 2009) yet lacking studies of the flora or fauna. The protected area has been experiencing timber harvesting and selective logging. In 2011, a restoration project of previously logged or deforested areas was initiated (García & Moreno 2011), which included a preliminary inventory of the birds that yielded 175 species (Acevedo-Charry 2013). The present article includes results of an additional rapid inventory to identify focal conservation species in the reserve (T. Angarita-Sierra *et al.,* unpublished data). In addition, I reviewed the potential biogeographic relationship of the birds collected in Río Tame at the level of subspecies, and comment on the conservation of birds in Río Tame. I hope to hereby provide preliminary baseline data for future biodiversity research and potential conservation action in the Araucan foothill region, as well as including the most important additions to knowledge of the birds of this area.

Materials and methods

Study site.- Río Tame is located in the eastern foothills Andes of Arauca (6°22'N; 71°55'W), along with the Tame river watershed, which forms part of the buffer zone along the eastern border of the El Cocuy National Park (Fig. 1A). I carried out field work in three land covers, mainly between 680 and 1,023 m, but including walking the Tame-Bogotá highway between 630 and 680 m at the beginning and end of each field trip (see below). I visited two timber harvesting trails within the reserve: El Oso and Santa Librada. El Oso trail is south of the Tame river watershed and extends from 630 m, on the Bogotá-Tame highway, until an Andean stream at 1,023 m. The Santa Librada trail is north of the Tame river watershed and extends from 620 m throughout open and secondary forested areas until a plateau between 820 and 900 m, where there is a mixture of savannas used as cattle pastures, secondary forest and premontane forests (Fig. 1A). In this part of the foothills, the landscape changes from tropical savanna with grassland and semi-deciduous forest patches in the lower zone, typical of the Orinoco region, to a second-growth deciduous forest and premontane moist forest in the upper zone (Fig. 2; Vásquez & Serrano 2009). The most abundant plant families in the lower zone include Poaceae, Fabaceae, Cyperaceae, Rubiaceae, Asteraceae, Euphorbiaceae, and Melastomataceae, with scrub, grassland, and anthropic pastures abandoned since 2011 (Fig 2A; Huber 2007, García & Moreno 2011). Most abundant plant families in the second growth semideciduous forests include trees and shrubs in the families Fabaceae, Rubiaceae, Asteraceae,

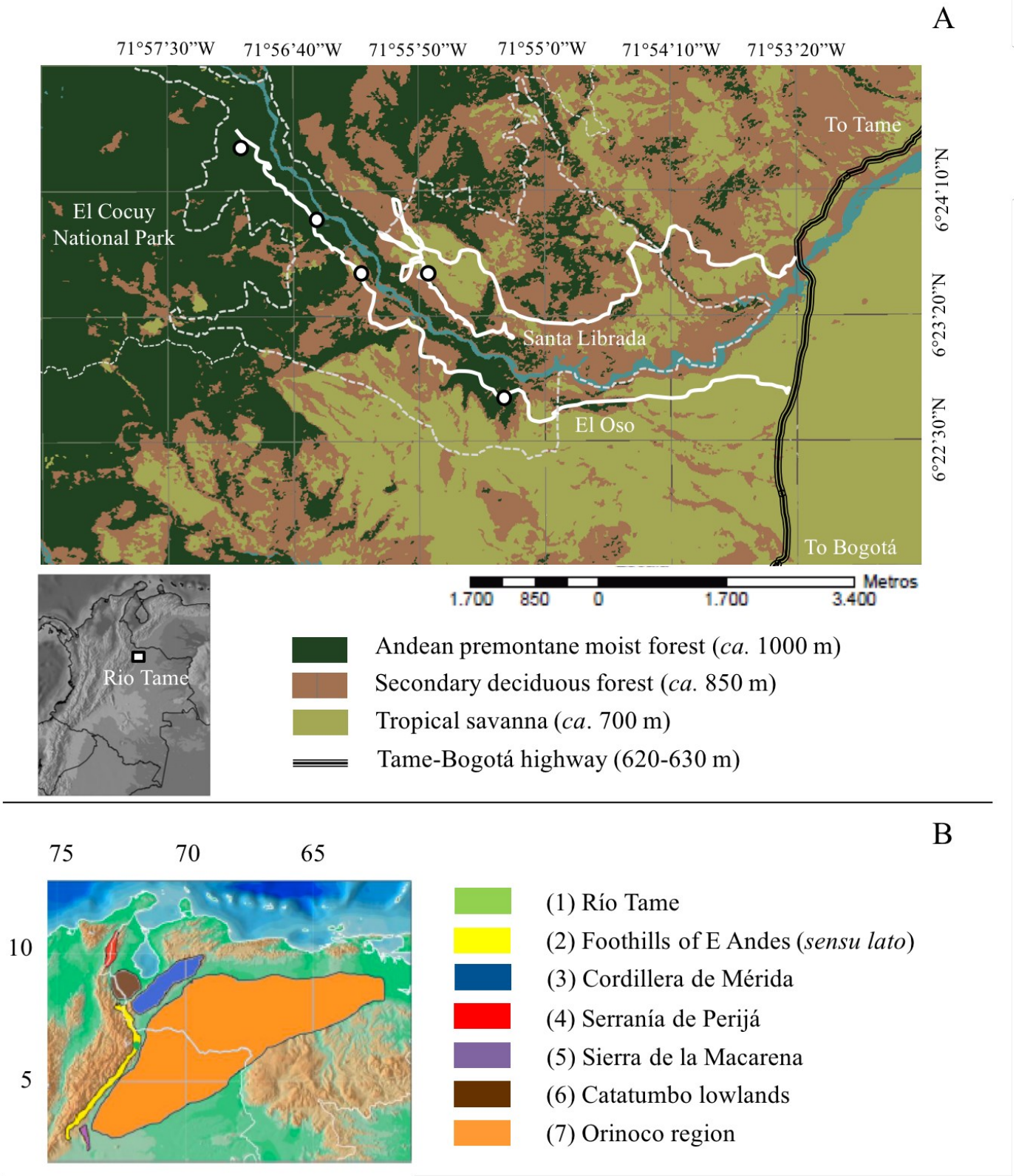

Figure 1. (A) Study site, the Río Tame Forest Reserve (Río Tame) in Arauca, Eastern Andes (see inset map for location in Colombia). White lines show timber harvesting trails where ornithological sampling was conducted (see text for details), each dot indicates areas sampled (camp) during each visit. White-dashed lines show the limit of Protected Areas: Río Tame and El Cocuy National Park (northeastern limits of Río Tame). The different colors indicate the different land covers. (B) Seven geographic regions at north South America, used in the biogeographic analysis (see text for details).

Orchidaceae, Euphorbiaceae and Melastomataceae, and emergent trees in genera *Cecropia, Erythrina,* and *Shefflera*, with abundant ferns in the understory (Fig. 2B; García & Moreno 2011). Finally, the premontane moist forest includes Arecaceae and Piperaceae in the understory; whereas the middle strata and canopy (*ca.* 25 m) include large trees of the families Lauraceae, Moraceae, Myrtaceae, and Myristicaceae, which support arboreal epiphytes such as mosses, bromeliads and orchids, similar to the Meta foothills (Fig. 2C; Carvajal-Rojas *et al.* 2008). The rainy season extends from April to November, with a maximum monthly rainfall of 2,877 mm and a decrease through June and August. The dry season extends from December to March, with less than 1,000 mm of monthly rainfall. The average temperature is *ca.* 26ºC (Anonymous 2008, Vásquez & Serrano 2009).

Bird sampling.- I surveyed the avifauna in the middle of the rainy season of 2011, and the end of the dry season of 2013 during five field trips. The first four expeditions (a total of 15 days) were conducted on 29-31 July, 17-19 and 24-26 August and 30 August-2 September 2011. The final 6-day expedition was on 18-23 March 2013. In order to obtain a complete species list I used combination of different traditional methods (see Borges *et al.* 2001): (1) Binocular observation and/ or voice recognition: Visual and auditory surveys were made in open areas, scrub, forest edge, and interior forests along the El Oso and Santa Librada timber harvesting trails which were established before the declaration of the Reserve (Fig. 1). (2) Sound recording: I complimented the surveys along each trail with sound recordings ad libitum using a Marantz PMD 620 recorder and sometimes an external Sennheiser ME 66 microphone. Recordings were stored and are available through xeno-canto (www.xeno-canto.com). (3) Mist netting: I captured birds using mist-nets during two days in each visit between 05:30 and 17:00 (Five 12 m, 36 mm mesh mist nets) for a total of 42 net-hours. (4) Specimen collection: Specimens collected were deposited in the ornithological collection of the Instituto de Ciencias Naturales of the Universidad Nacional de Colombia in Bogotá (ICN), and in the Instituto Alexander von Humboldt collection in

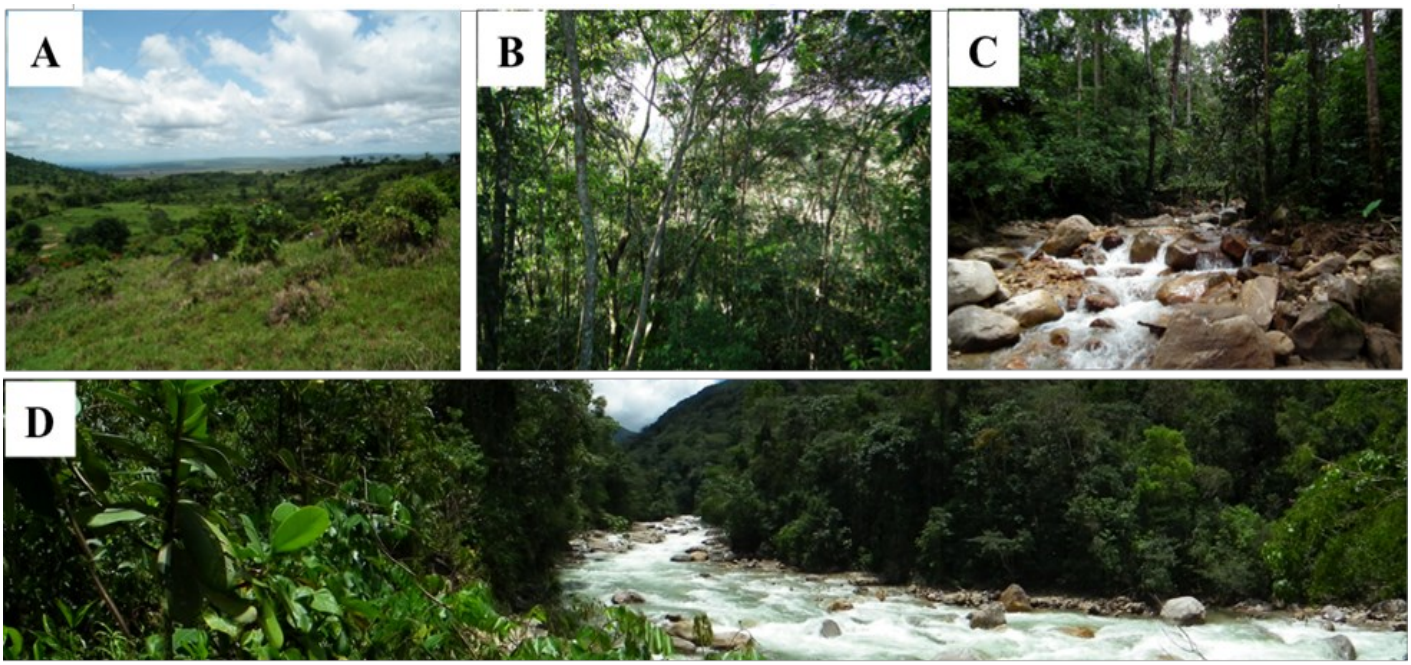

Figure 2. Habitat photos at the Río Tame Forest Reserve. **(A):** Tropical savanna at 750 m; **(B):** Secondary deciduous forest at 860 m; **(C):** Andean premontane moist forest at 1,010 m; **(D):** the Tame river with the relict premontane forest at 900 m.

Villa de Leyva, Colombia (Appendix 1). As some of the survey methods I used were not quantitative (nor point counts neither transects), the check-list indicates all methods used to record the presence of each bird species in Río Tame. Nomenclature and taxonomy follow Remsen *et al.* (2017).

Biogeographic analysis.- I conducted a Jaccard similarity analysis in order to understand the biogeographic affinities of a subset of the Río Tame avifauna (*i.e.,* the species collected) and adjacent regions based on different bird populations occurring in each area. The Jaccard clustering analysis was made using 90 subspecies (Appendix 2) distributed among seven geographic regions (Fig. 1B): (1) Río Tame (present study), (2) Northeastern Andean foothills (eastern foothills sensu lato in the northern Colombian Eastern Andes, including the Táchira Andes), (3) the Cordillera de Mérida (from the Táchira depression northeast through the Venezuelan Andes), (4) the Serranía de Perijá (the northernmost Andes site between Colombia and Venezuela), (5) the Sierra de la Macarena (an isolated mountain on the transition between the Orinoco and Amazon regions), (6) the Catatumbo lowlands (including the Maracaibo lake basin), and (7) the Orinoco region (of eastern Colombia and southwestern Venezuela). To make this clustering, I based subspecies identifications mainly on comparisons of the specimens from Río Tame to those at the ornithological collection of the ICN, and to lists from other studies (Blake 1962, Meyer de Schauensee 1964, Aveledo & Pérez 1989, 1994, Rojas & Piragua 2000, Hilty 2003, Avendaño 2012, Clements *et al.* 2013, López-O. *et al.* 2014, J. Pérez-Emán pers. com.).

The 90 subspecies were selected based on the 45 subspecies collected in Río Tame, and those other subspecies within the same species for the other regions (Appendix 2). I acknowledge that this subset representing only a small part of the birds within the seven geographic regions, but I assumed the 90 selected subspecies are sufficiently representative to allow preliminary comparisons of population relationships and biogeographic affinities of these regions (*cf.* Kattan *et al.* 2004, Acevedo-Charry *et al.* 2014).

Results

I recorded 215 bird species in 43 families and 18 orders at Río Tame (Appendix 1). These include 15 bird species of global (IUCN 2015) and national (Renjifo *et al.* 2002, 2014) conservation concern, in the categories: data deficient (DD), near threatened (NT), vulnerable (VU), endangered (EN), or critically endangered (CR; Fig. 3, Appendix 1). Significant range extensions (>100 km from previous records) were detected for 15 bird species, and the reported elevational ranges by Hilty & Brown (1986) were extended (>300 m higher or lower) for five species. I also confirmed the presence of 19 bird species in the Araucan foothills (7 of conservation concern), which had few historical or unsubstantiated records, and were not included in recent distribution maps for Arauca (*e.g.,* Hilty & Brown 1986, McMullan *et al.* 2010, IUCN 2015), as well as species with biogeographic interest at the subspecies level. In the following species accounts, I present details for the most significant geographical and elevational range extensions and confirmation of various historical or unsubstantiated records. I also specify whether permanent documentation from either specimen (in which case the ICN collection number is given) or sound recordings (when the xeno-canto number is given) in Appendix 1.

Tinamus tao **(Gray Tinamou):** Several solitary individuals were heard and seen inside the understory of Andean premontane moist forest (hereafter simply "premontane forest"), between

850 and 950 m on 27-28 July 2011, and 18, 20, 21 (2 ind) and 22 (2 ind) March 2013. A recording of this tinamou is stored in xeno-canto (XC133287). Hilty & Brown (1986) menioned this species for all east Andes foothills, but others (McMullan *et al.* 2010, IUCN 2015) did not report it for the Araucan foothills. This species still experiences hunting pressure from local people and is currently classified as vulnerable (VU; IUCN 2015).

Aburria aburri (Wattled Guan): A pair was seen inside the premontane forest at 780 m on 30 August 2011, and the second pair at 850 m on 2 September 2011. There are records of this species throughout the Andes of Colombia (Hilty & Brown 1986, McMullan *et al.* 2010), but recent maps by IUCN (2015) did not report it in the Eastern Andes between Santander and Huila Departments (more than 460 km). This record confirms the presence in the Araucan foothills. This species is also hunted locally and is near threatened (NT; Renjifo *et al.* 2002, IUCN 2015).

Pauxi pauxi (Helmeted Curassow): Two individuals were seen inside the premontane forest at 960 m on 22 March 2013 (Fig. 3A). Although this species is reported in the Arauca and Casanare foothills (Hilty & Brown 1986), some recent maps show it just for Arauca (McMullan *et al.* 2010), but others list this curassow as probably extinct there (IUCN 2015).This record confirms its presence in Arauca, where it still experiences hunting pressure by local people and is classified as endangered (EN; IUCN 2015, Renjifo *et al.* 2014).

Hydropsalis maculicaudus (Spot-tailed Nightjar): A pair was seen in open areas between secondary forest patches at 700 m on 18 March 2013 (Fig. 4A). I observed the distinctively white tail tip when the male flushed. My sighting in Río Tame was over 300 m higher than previous records, up to 200 m in Colombia (Hilty & Brown 1986) and 400 m in Venezuela (Hilty 2003).

Tachornis furcata (Pygmy Swift): Two groups of 5 and 3 individuals were seen over the canopy of premontane forest and crossing open areas among secondary growth forest, at 810 m on 30 and 31 August 2011. Also, a pair was observed flying over open grasslands on 23 March 2013. This is a smaller and faster swift, with a blackish band on the breast setting off the white throat and belly, showing a whiter appearance than its congener *T. squamata*, and with faster wing beats. Moreover, *T. squamata* is distinguished by its blotchy sides and spotty white breast and belly. The closest records are from the Catatumbo lowlands (200 km NW; Avendaño 2012) and the Maracaibo Basin (200 km N; Hilty & Brown 1986). This swift is considered data deficient for Colombia (DD; Renjifo *et al.* 2002).

Lophornis delattrei (Rufous-crested Coquette): Four individuals were seen (one caught and collected) in the premontane forest canopy and flying between patches of second-growth forest between 880 and 960 m, on 19, 26, 31 August 2011, and 22 March 2013 (Fig. 4B, ICN-38351). This species has records from south of Cúcuta, southwestern Norte de Santander (170 km N-NW), and along the eastern base of the Andes from the Casanare river (50 km SW) to western Meta (Hilty & Brown 1986).

Klais guimeti (Violet-headed Hummingbird): Two individuals were seen and heard inside the premontane forest at 850 m on 17, and 19 August 2011, another individual was mist-netted and collected on 25 August 2011 (Fig. 4C, ICN-38347). Hilty & Brown (1986) mentioned this species in the east slope of the Eastern Andes from extreme eastern Cundinamarca to southeastern Nariño, and probably to northern

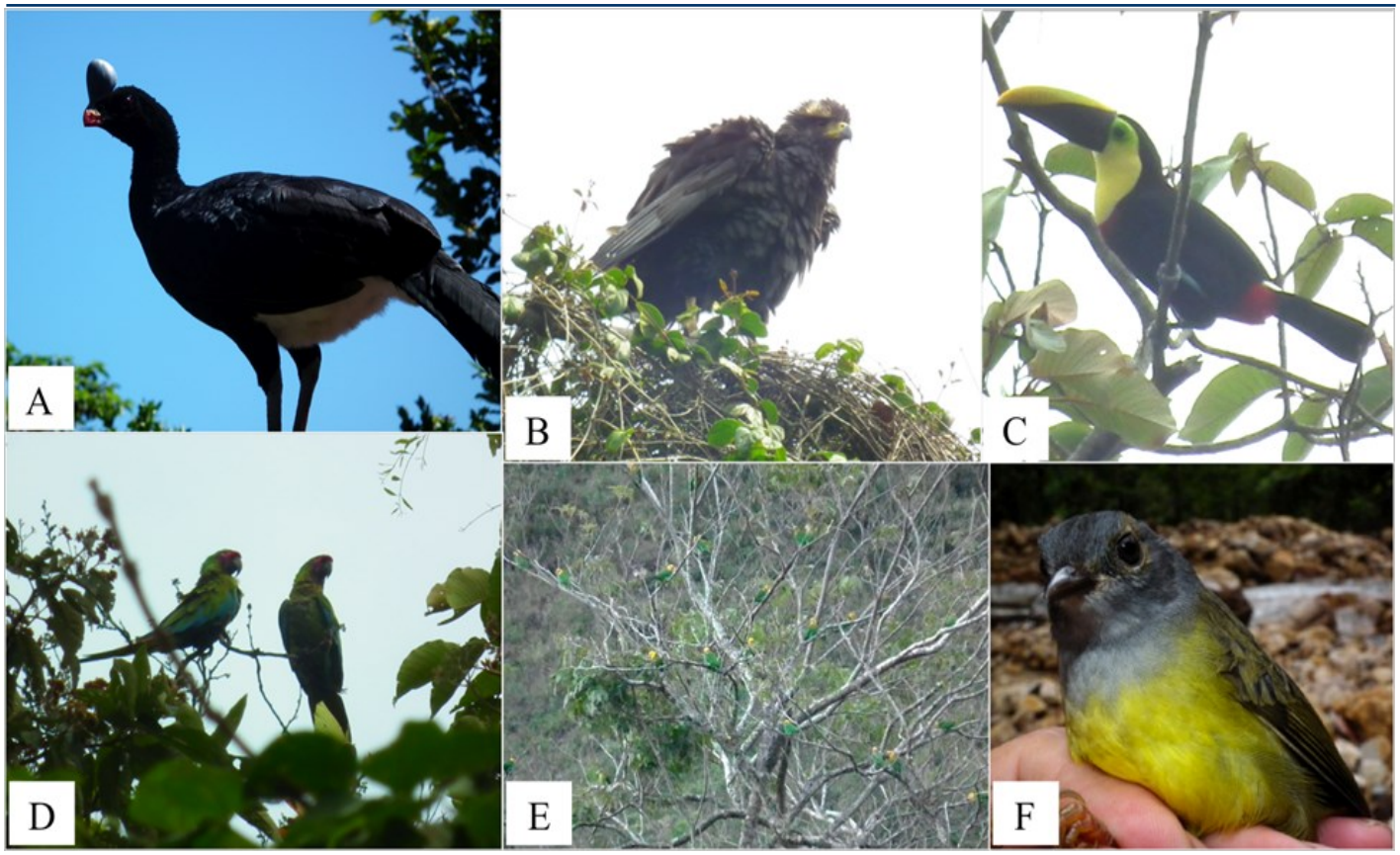

Figure 3. Photographs of some conservation interest birds of Río Tame Forest Reserve. **(A)** *Pauxi pauxi;* **(B)** *Buteogallus solitarius;* **(C)** *Ramphastos ambiguus;* **(D)** *Ara militaris;* **(E)** A large group of *Pyrilia pyrilia* spend the night on a tree (see the distinctive yellow head); **(F)** *Myothlypis cinereicollis.*

Arauca but with no records there until now (Bohórquez 2002, Salaman *et al.* 2002). My records confirm the presence of this species in Arauca.

Hylocharis cyanus (White-chinned Sapphire): A single female was caught inside the premontane forest at 850 m on 25 August 2011 (Fig. 4D). This species is locally common, but has infrequent records on the Eastern Andes of Colombia; the closest records are from the Zulia valley in Eastern Andes of Norte de Santander towards the northern end of Serranía de Perijá (over 200 km NW; Hilty & Brown 1986).

Buteogallus solitarius (Solitary Eagle): One individual was seen in the canopy of the premontane forest at 820 m on 20 March 2013 (Fig. 3B). The individual was perched quietly in a tree for 5-8 minutes, after which it flew off over the canopy. This powerful eagle is distinctive by the combination of a large size but less black (dark slate gray) than other *Buteogallus,* as well the shorter tail with a median white band and narrow white tip (Hilty & Brown 1986). My sighting is the second published report of this eagle for the foothills of the Eastern Andes and fills a large gap in its known distribution between Santa María, Boyacá (over 200 km SW; Chaparro-Herrera & Laverde 2014, Laverde & Gómez 2016) and the Serranía de Perijá (Guajira-Cesar; 400 km NNW). This eagle is critically endangered nationally (CR; Renjifo *et al.* 2014), and near threatened globally (NT; IUCN 2015).

Ciccaba nigrolineata (Black-and-white Owl): Nocturnal and pre-dawn sounds were heard inside premontane forest between 790 and 840 m on 27 July, 30-31August 2011, and 20 March (2 ind) 2013. An individual with white underparts finely barred with black, and contrasting black face was seen and recorded after playback with sounds of *C. nigrolineata* (Boesman 2012) on 20 March 2013; the recording is stored in xeno-canto (XC148753). Hilty & Brown (1986) did not record *C. nigrolineata* in the Eastern Andes. However, Salaman *et al.* (2002) reported this owl in Mámbita (Boyacá) as the first record of the east slope of the Andes, yet not included in IUCN (2015) distribution maps. This record represents a significant range extension for *C. nigrolineata, ca.* 240 km NE from Mámbita, and confirms its presence along the east slope of the Eastern Andes of Colombia (Salaman *et al.* 2002).

Trogon violaceus sensu lato ("Violaceous" Trogon): This trogon was seen and caught inside the premontane forest at 910 m on 18 August and 1 September 2011 (ICN-38228). Recently, the "Violaceous" Trogon group was split into *T. violaceus* (the Guianan Trogon of the Guiana Shield), *T. caligatus* (the Gartered Trogon of Middle and northern South America, extending locally to the east slope of the Andes), and *T. ramonianus* (the Amazonian Trogon of the Amazon region; Remsen *et al.* 2011). This record is a range extension of more than 200 km for any of these species (Hilty & Brown 1986, IUCN 2015). The nearest records of *T. caligatus* are at the Catatumbo lowlands (200 km NW; Hilty 2003, Avendaño 2012), while *T. ramonianus crissalis* is known from the foothills of Meta department south to the Sierra de la Macarena (over 200 km S; Blake 1962, Hilty & Brown 1986, Restall *et al.* 2007). The specimen has a mainly white tail like *T. caligatus*, but a burnt-yellow belly more like that of *T. ramonianus crissalis*. I did not hear it call, therefore the specimen requires confirmation by genetic analysis and sound recordings in this region, where *T. caligatus* and *T. ramonianus* may come into contact, and further study might clarify their taxonomic status.

Malacoptila mystacalis (Moustached Puffbird): Two individuals were heard, seen and captured inside the premontane forest at 800 m on 31 August 2013 (ICN-38357, ICN-38358). Previously this species was reported north only to the foothills of Boyacá in the Cusiana river watershed (150 km SW; Bohórquez 2002, Salaman *et al.* 2002) and recently in Santa María (Laverde & Gómez 2016).

Eubucco bourcierii (Red-headed Barbet): Two individuals were seen inside the premontane forest, at 870 m on 19 August 2011. Salaman *et al.* (2002) reported this barbet to Pajarito (150 km SW, in Boyacá), and suggested that it is continuously distributed along most or all of Andean east slope. Hilty (2003) reported it on the east slope of the Cordillera de Mérida. Previous reports were mainly between 1,200 and 1,400 m (Hilty & Brown 1986, McMullan *et al.* 2010), but recently it has been recorded as lower as *ca.* 850-1100 m at Santa María, Boyacá (Laverde & Gómez 2016).

Ramphastos ambiguus (Yellow-throated Toucan): Family groups of 2 to 9 individuals were heard and seen in the canopy of premontane and secondary forests (Fig. 3C), between 750 and 950 m on virtually all field work days. A recording was obtained and is stored at xeno-canto (XC148755). A female was collected in the premontane forest on 1 September 2011. Interestingly, the bill of the specimen was dark reddish chestnut, not black, and the facial skin color was yellowish green except for a bright blue area around the eye; apparently, a mix between the colors of the two subspecies at east slope of Eastern Andes (yellowish-green in *abbreviatus* and bright blue in

Figure 4. Photographs of selected birds from río Tame Forest Reserve. (A) *Hydropsalis maculicaudus;* (B) *Lophornis delattrei;* (C) *Klais guimeti;* (D) *Hylocharis cyanus* (female); (E) *Pteroglossus castanotis;* (F) *Cymbilaimus lineatus;* (G) *Cyanocompsa cyanoides;* (H) *Habia rubica.*

ambiguus). The race *abbreviatus* occurs at northern east slope of the Eastern Andes and the Andes slopes of the Catatumbo lowlands, as well as formerly to the headwaters of the Magdalena Valley in Huila, while race *ambiguus* is present at east slope of the Eastern Andes from the Casanare river and the Sierra de la Macarena southward (Hilty & Brown 1986). The specimen, therefore, may represent an intergrade between them; hence this region may be a contact zone between both subspecies. Hilty & Brown (1986) noted this species along the Andean foothills, but neither McMullan *et al.* (2010) nor the IUCN (2015), recorded it to Arauca. This toucan is considered near threatened (NT; IUCN 2015).

Pteroglossus castanotis (Chestnut-eared Aracari): Several individuals were heard and seen in secondary growth forest, and at the edge of premontane forest between 750 and 850 m on 1 September 2011, 18, and 19 March 2013 (Fig. 4E). My records were up to 350 m higher in elevation than previous records in Colombia (Hilty & Brown 1986), although this species is often recorder up to 1,000 m in places along the Andes (Short 2017).

Falco deiroleucus (Orange-breasted Falcon): A presumed pair was seen in flight. They were crossing over open areas between patches of secondary forest on 18 March 2013. The throats of these birds were white, and their breasts orange-rufous, heavily barred black on the lower breast and belly; the similar but smaller Bat Falcon *(F. rufigularis)* has at most a narrow rufous band between the white throat and the black-and-white barring of the posterior underparts. This falcon has a spotty distribution in the Eastern Andes. The closest records are in the foothills of Casanare (Upía river, 230 km SW from Río Tame; Hilty & Brown 1986), and the Catatumbo lowlands (200 km NW; Avendaño 2012). This species is categorized as data deficient in Colombia (DD; Renjifo *et al.* 2002), and as near threatened globally (NT; IUCN 2015).

Pyrilia pyrilia (Saffron-headed Parrot): On several days throughout my field work I heard and saw single individuals and small groups of 2-5 individuals inside the premontane forest and crossing open areas between patches of secondary forest, and on 30 August I recorded a flock of 30. Interestingly, small groups apparently gather to roost. I observed over 25 individuals in numerous small clusters that spent the night in a single tree (Fig. 3E). A sound recording is stored at xeno-canto (XC149742). This parrot had not been previously reported on the east slope of the Eastern Andes (Hilty & Brown 1986). However, specimens of this species have been documented from Cubará, Boyacá (Cuervo & Toro 2002). My records confirm the presence of this species in the Araucan foothills. This parrot is considered vulnerable in Colombia (VU; Renjifo *et al.* 2002), and near threatened globally (NT; IUCN 2015).

Pionus sordidus (Red-billed Parrot): Small flocks of this species were heard and seen over the canopy of premontane forest over 860 m on 17, 19, 24, and 30 August 2011. The individuals seen in flight had conspicuous red on their bills and were duller than Blue-headed Parrot *(P. menstruus),* also their voice differed from that of the Bronze-winged Parrot *(P. chalcopterus)*. This is the first record of this parrot in the Eastern Andes between the Serranía de los Churumbelos and the Serranía de Perijá, a gap of over 950 km (Hilty & Brown 1986, Salaman *et al.* 2002, IUCN 2015).

Pionus chalcopterus (Bronze-winged Parrot): I heard and saw groups of 3-11 individuals in premontane and secondary forests and crossing open areas at 700-800 m on several days during July, August and September 2011. Previously, this parrot was recorded in the Serranía de Perijá (400 km N-NW; López-O. *et al.* 2014) and on the

northeastern slope of the Eastern Andes in Cundinamarca (290 km SW) near the foothills of Meta (Salaman *et al.* 2002). Recently recorded in Santa María (220 km SW; Laverde & Gómez 2016).

Orthopsittaca manilata (Red-bellied Macaw): Three individuals were seen flying across open areas between secondary growth forests over grasslands at 630 m on 18 March 2013. This macaw has been recorded in numerous localities in the Orinoco region associated with *Mauritia flexuosa* palm swamps but had not been reported in Arauca (Hilty & Brown 1986, Rodríguez-Mahecha & Hernández-Camacho 2002, IUCN 2015). This parrot follows the *M. flexuosa* distribution, even in Casanare and Arauca (Acevedo-Charry *et al.* 2014), but ranges more widely when seeking fruiting trees.

Ara militaris (Military Macaw): Several groups of 10-32 individuals were heard and seen over the premontane forest and crossing open areas between 550 and 980 m on several days in both wet and dry seasons (Fig. 3D). I obtained a sound recording that is stored at xeno-canto (XC148754). There are records of this macaw from Villavicencio in Meta (over 300 km SW), and Orocué in Casanare (*ca.* 200 km S-SE; Umaña *et al.* 2009, Zamudio *et al.* 2011). Other nearby records are in localities such as the Sierra de la Macarena (over 400 km SW from Río Tame; Hilty & Brown 1986), the Catatumbo lowlands (200 km NW; Avendaño 2012), and the foothills of the Maracaibo Basin in Venezuela (200 km N; Hilty 2003). This is the first record of this species for Arauca. This macaw is considered vulnerable (VU; Renjifo *et al.* 2002, IUCN 2015).

Cymbilaimus lineatus (Fasciated Antshrike): A pair (female and male) was heard inside the premontane forest at 840 m on 20 March 2013 (Fig. 4F); they were attracted by playback and recorded (XC149791). This antshrike had northern records in the Serranía de Perijá (400 km N-NW; López-O. *et al.* 2014), historically in the Catatumbo lowlands (200 km NW; Avendaño 2012) and in the foothills of the Cordillera de Mérida (in Táchira – Venezuela over 200 km NE; Hilty & Brown 1986, Hilty 2003), as well as at Tauramena, in the Casanare foothills (175 km SW; Zamudio *et al.* 2011); the latter record is not included in recent distribution maps (McMullan *et al.* 2010, IUCN 2015). This range extension complements the distribution along the east slope of the Eastern Andes.

Myrmotherula schisticolor (Slaty Antwren): A call-sound of this species was heard inside the premontane forest at 950 m on 19 August 2011. I used playback to attract two individuals to the mist-nets and collected the specimens to confirm identification (ICN-38339, 38340). The subspecies in the east slope of the Eastern Andes and head of Magdalena Valley is *interior;* but the subspecies recorded in Río Tame is the same that in the Serranía de Perijá and the Santa Marta Mountains (*sanctamartae;* Hilty & Brown 1986, Zimmer & Isler 2003).

Thamnophilus tenuepunctatus (Lined Antshrike): Four individuals were seen inside the premontane forest at 820 m on 27 (1 ind) and 31 (3 ind) July 2011. This antshrike had been previously recorded in the Eastern Andes in northern Meta foothills (*ca.* 280 km SW of Río Tame; Hilty & Brown 1986, IUCN 2015), and in Santa María (Laverde & Gómez 2016). This species is considered vulnerable (VU; IUCN 2015).

Sclerurus albigularis (Gray-throated Leaftosser): Two individuals were recorded inside the understory of the premontane forest at 900 m on 18 August 2011. This species has been recorded throughout the Eastern Andes foothills (Hilty & Brown 1986), for instance at Santa María, Boyacá

(over 200 km SW; F. G. Stiles pers. comm.). Despite its wide distribution, it has recently been classified as near threatened (NT; IUCN 2015).

Synallaxis albescens (Pale-breasted Spinetail): Several individuals were heard and seen crossing scrub patches and secondary semi-deciduous forest between 550 and 800 m on several days in both wet and dry seasons; one was caught and collected (ICN-38363). The specimen was identified as the subspecies *insignis,* present in the Andes of Colombia (Clements *et al.* 2013). Specimens from Caño Limón Arauca, a locality within the Orinoco region, were identified as the subspecies *trinitatis* (Rojas & Piragua 2000), present in the east of Venezuela and Trinidad (Clements *et al.* 2013). Although this species is common in open grassy habitats, there are few records east of the Andes (Hilty & Brown 1986). There are tentatively ten subspecies recognized in *S. albescens;* the characters of the subspecies *trinitatis* (darker crown and wing-coverts, as well as more buff-brown back than the subspecies *nesiotis* from northern Colombia and Venezuela) were not corroborated by some authors, hence *trinitatis* was not recognized by Remsen (2003), and included in the subspecies *nesiotis.*

Lophotriccus pileatus (Scale-crested Pygmy-Tyrant): A pair was seen in a secondary growth forest at 750 m on 31 August and 1 September 2011. This species is reported in the east slope of the Cordillera de Mérida in Venezuela (over 120 km N-NE; Hilty 2003, IUCN 2015). This species was not recorded at the Cusiana river in Boyacá (150 km SW) but was present at the Serranía de los Picachos in Caquetá (500 km SW; Bohórquez 2002), and has been seen and captured at Santa María, Boyacá, at *ca.* 1,100 m (F. G. Stiles pers. comm., Laverde & Gómez 2016); hence this species is probably overlooked in foothill sites.

Machaeropterus regulus (Striped Manakin): Several individuals were seen inside secondary growth semi-deciduous forest and premontane forest, more common during the dry season of 2013 than the rainy season of 2011. I collected a specimen on 19 March 2013. The specimen collected was identified as *M. regulus zulianus*, the subspecies from northwestern Venezuela (Snow 2004b). Previous specimens from Arauca were catalogued as *M. regulus striolatus*, the subspecies from Amazonia (Blake 1961, Snow 2004b). The western subspecies group *(zulianus, obscurostriatus, antioquiae, striolatus,* and *aureopectus)* may constitute a separate species *(M. striolatus)* from *M. regulus*, the population of southeastern Brazil (Snow 2004a, 2004b, Remsen *et al.* 2017). It seems that the southern Araucan foothills may be a transition zone between the subspecies *striolatus,* from more southern foothills and Amazonia, and the subspecies *zulianus* from northwestern Venezuela (Zulia, Barinas, and Táchira; Snow 2004b).

Pachyramphus rufus (Cinereous Becard): One individual was observed in the canopy of premontane forest on 19 August 2011, and 1 September 2011, another was observed at the edge of secondary growth forest at 780 m on 18 March 2013. Although the map in Hilty & Brown (1986) shows no records from east of the Andes, García & Botero-Delgadillo (2013) reported this becard in Meta, Casanare, and Vichada, and proposed its distribution throughout the Orinoco region. My records support and include Arauca within that assumption.

Pachysylvia aurantiifrons (Golden-fronted Greenlet): Four birds were seen and one was caught and collected (ICN-38329) at 820-900 m, inside the premontane forest and secondary growth forest on 17, 18 August 2011, and 18 March 2013. Previous records of this species were up to 700 m (100 m lower than Río Tame; Hilty & Brown 1986). The subspecies reported by Hilty & Brown (1986) from western Arauca and Casanare, and followed by other authors is *saturatus*, but

the specimen appears rather represent *helvinus,* recorded from northwestern Venezuela, in the Cordillera de Mérida (Brewer 2010).

Cyanocorax yncas (Green Jay): Small flocks were seen inside the premontane forest and in secondary growth semi-deciduous forest between 800 and 1,100 m. I collected an individual at 800 m, more than 300 m lower than previous elevational records for the Eastern Andes of Colombia (*ie.,* 1,200-2,800 m; Hilty & Brown 1986).

Hemithraupis guira (Guira Tanager): This species was seen several days at 740-850 m in the premontane forest canopy and the shrubs near to second-growth forest in mixed flocks of passerines (*e.g., Chlorophanes spiza, Dacnis cayana, Tangara gyrola).* This species has historic records in the Eastern Andes from Guamalito and the Cobugón river, Norte de Santander near Boyacá boundary (50 km N from Río Tame; Blake 1961, Hilty & Brown 1986), as well as scattered records from Pajarito, Boyacá (150 km SW), and Gazaunta river in Medina, Cundinamarca (260 km SW; Salaman *et al.* 2002).

Lanio fulvus (Fulvous Shrike-Tanager): A pair was heard and seen inside the premontane forest on 17 August 2011, and on 19 August a male was collected at 900 m (ICN-38326). The altitudinal range of this species for Colombia was considered up to 500 m (Hilty & Brown 1986). Historical specimens were taken from the Cobaría river in Arauca, as well as the Cabugón river and La Argentina in Boyacá (50-80 km N; all in lowlands but elevation not included in Blake 1961).

Cyanerpes cyaneus (Red-legged Honeycreeper): Several individuals were seen within mixed flocks of passerine frugivores and nectarivores (*e.g., C. caeruleus, Dacnis cayana, Chlorophanes spiza),* in canopy of premontane and secondary forest edges between 810 and 960 m on 30 August 2011 (1 male) and 22 March 2013 (1 male, 1 female). The nearest reports in the Eastern Andes are from Santa María, Boyacá (over 200 km SW; Laverde & Gómez 2016), in the Catatumbo lowlands (200 km NW; Avendaño 2012), and the east slope of the Cordillera de Mérida, Venezuela (over 100 km N-NE; Hilty & Brown 1986, Hilty 2003, IUCN 2015).

Chlorospingus flavopectus (Common Bush-Tanager): A single bird was observed in the canopy of the premontane forest at 900 m on 31 August 2011. The bird observed had the crown and sides of head gray to blackish, but appeared to lack the prominent white spot behind the eye of the subspecies *eminens*. Ecological niche modeling (ENM) by Avendaño *et al.* (2013) suggests that the region of the foothills of the Sierra Nevada del Cocuy, including the Río Tame, may represent a gap between *olsoni* and *eminens.* There are five specimens of *C. flavopectus* (previously *ophthalmicus) eminens* in the Field Museum of Chicago from Hacienda La Primavera in Cubará, Boyacá (now in Norte de Santander), and the Bojabá river, Arauca (both over 50 km N of the Río Tame; Blake 1961) that were used in a study of geographic variation of the species (Olson 1983), in addition the locality "Hacienda La Primavera" was used in the ENM by Avendaño *et al.* (2013). Specimens from Boyacá and Arauca have white post-ocular spots as in *eminens*, but with a buffier throat (Blake 1961), perhaps more similar to *olsoni* (Avendaño *et al.* 2013). Rather than a gap in the distribution of *C. flavopectus* at foothills of the Sierra Nevada del Cocuy, the Río Tame region may be a transition zone between *eminens* and *olsoni*, such as occurs in other taxa (*e.g., R. ambiguus ambiguus* x *abbreviatus* or *M. regulus striolatus* x *zulianus,* see above). Interestingly, the ENM, as well as the habitat and ecology for *olsoni* suggested that this

subspecies occurs along a narrow elevation belt of cloud forest between *ca.* 2,000 and 2,600 m; the bird in Río Tame was recorded in the premontane forest, over 1,000 m lower. Elsewhere, my sighting is within the altitudinal scope of the species (Hilty & Brown 1986).

Habia rubica (Red-crowned Ant-Tanager): This species was seen and heard inside premontane forest within flocks of insectivore species (*e.g., Herpsilochmus rufimarginatus, Myrmotherula schisticolor, Dendrocincla fuliginosa, Myiothlypis cinereicollis)* between 800-1,000 m and I collected several specimens (Fig. 4G, ICN-38313, 38314, 38330, 38780, 38781). My records were at least 300 m higher in elevation than previous records of this species (Hilty & Brown 1986). Specimens from Río Tame were identified as *H. rubica coccinea,* the subspecies that is found at the base of the Andes in western Venezuela and adjacent north-central Colombia. Other subspecies *(rhodinolaema)* occurs east of the Eastern Andes from southern Meta southward (Hilty 2011). Subspecies *coccinea* was not previously represented in Colombian ornithological collections.

Cyanoloxia cyanoides (Blue-black Grosbeak): Two birds were heard and attracted to mist nets inside the understory of the premontane forest at 850 m on 29 March 2013 and another was heard in the same habitat at 920 m on 22 March 2013. A male specimen (Fig 4H, ICN-38773) pertains to the nominate subspecies *cyanoides.* Interestingly, the only subspecies previously reported east of the Andes was *rothschildi,* which is widely distributed from at least southern Meta southward. The subspecies *cyanoides* is widespread west of the Andes, but also in foothills north of the Santa Marta Mountains as well as in the Serranía de Perijá (Brewer 2011).

Myiothlypis cinereicollis (Gray-throated Warbler): Three individuals were seen and one caught inside the understory of premontane forest between 890 m and 910 m on 17 August 2011 (Fig. 3F, ICN-38333). Those individuals were with mixed flocks of understory insectivores (*e.g., Terenotriccus erythrurus, Basileuterus culicivorus, Habia rubica).* This warbler is reported rather widely in the Eastern Andes foothills, the Serranía de Perijá, and the Cordillera de Merida (Hilty & Brown 1986, Hilty 2003), but is considered a near threatened species (NT; Renjifo *et al.* 2014, IUCN 2015).

Other minor altitudinal scope extensions for Colombia (<300 m higher or lower than Hilty & Brown 1986) were detected during my field work, such as *Burhinus bistriatus* at 750 m (previously records to 500 m), *Tangara cayana* at 710 m (previous records to 500m), and *Ixothraupis guttata* at 800 m (ICN-38311, previous records between 1,000 and 1,800 m).

Biogeographic relationship.- There were three main clusters for the 90 subspecies among the seven regions selected in and near the northern Eastern Andes (Fig. 5). The northern cluster grouped the Río Tame collected birds most closely with the Cordillera de Mérida (*ca.* 60% similarity), next with the Serranía de Perijá (over 50%), and finally with the Catatumbo lowlands (40 -50%). There was another group that included the Sierra de la Macarena and the entire foothills at Eastern Andes (40-50% similarity). As the most of the information from the foothills at Eastern Andes are based on inventories southern Araucan foothills, I assume the cluster Sierra de la Macarena – Foothills of E Andes *(sensu lato)* as the southern cluster (Fig 5). Interestingly, the Orinoco region has lower subspecies relationship (less than 15% similarity) with the other six regions, despite its proximity to the Andes. This analysis clearly documents that the Río Tame foothill region has more similarity with the northern regions, and perhaps represents a zone of avifaunal turnover at the subspecies level

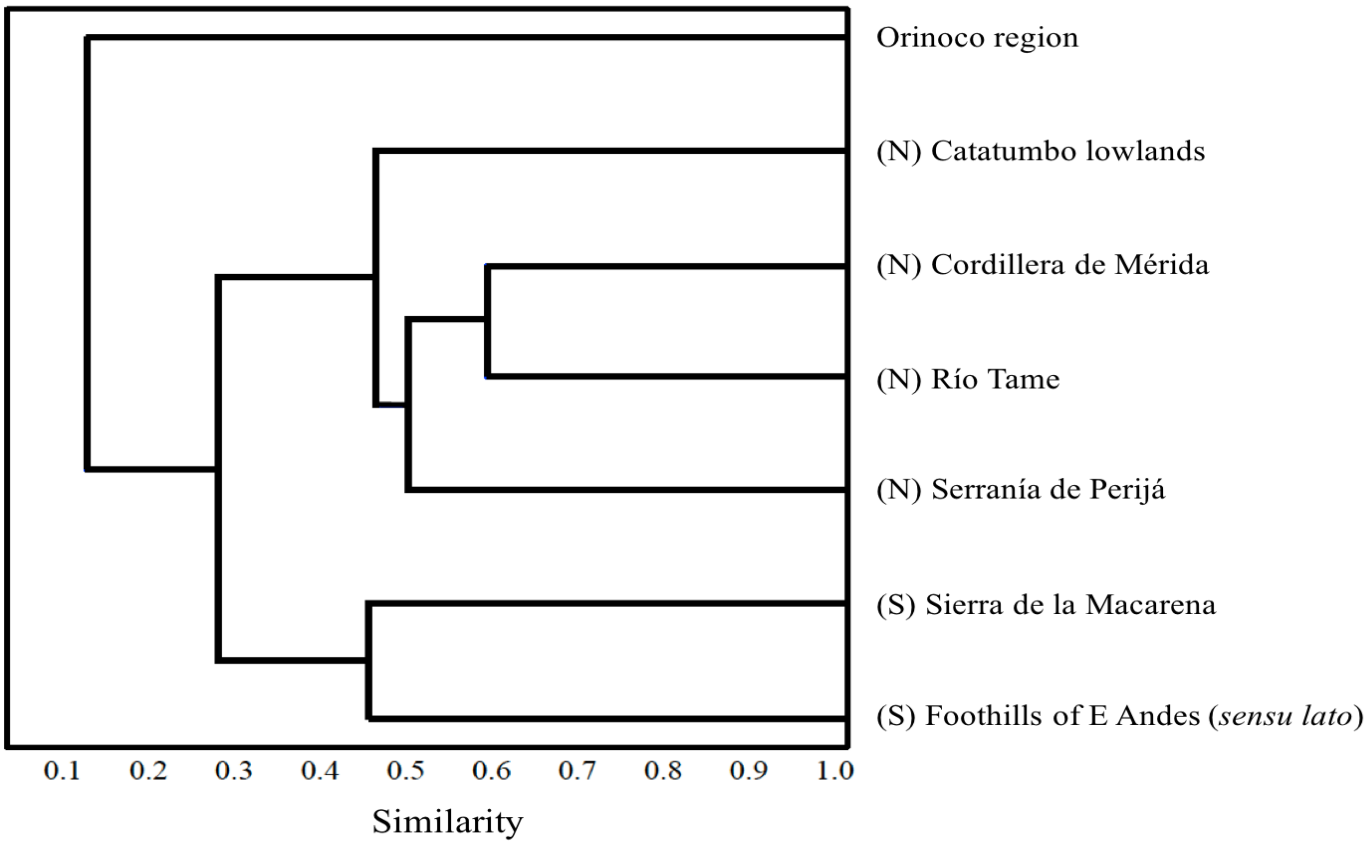

Figure 5. Jaccard clustering analysis for 90 subspecies of seven geographic sites northern of South America (see text and Fig. 1B for details). In parenthesis is given the assumed affinity of the region, to the north (N) or to the south (S).

between those of northern vs. southern affinities. Distributions of those of the northern group extend around the northern end of the main Eastern Andes from the west, as well as north to the Serranía de Perijá and eastward into the Venezuelan Andes. In contrast, those of the southern group extend southward along the east slope of the Eastern Andes, in some cases into Amazonia. A more detailed analysis of the climate and vegetation along this transition might further elucidate the ecological conditions underlying this species turnover.

Discussion

Bird diversity.- Many of the geographic and altitudinal range extensions recorded in this study may reflect the lack of studies in this part of the transition region between the Andes and the Orinoco region, rather than the absence of the birds. My records often tend to fill gaps of varying lengths in the mapped or published distributions of several species rather than being range extensions in the strict sense. Few studies have documented bird species in the Araucan Andes region (Blake 1961, Restrepo-Calle *et al.* 2010). Consequently, my species list in Río Tame added 155 bird species to those previously reported by Umaña *et al.* (2009) in Tame municipality. The presence of some threatened, near threatened, and data deficient bird species (Renjifo *et al.* 2002, IUCN 2015) was confirmed for the Araucan foothills. Additionally, several species had altitudinal range extensions which might be a result of altitudinal movements, which are poorly still studied in Colombia (Bohórquez 2002), or

could reflect the effect of lowland deforestation in the tropical mountain birds (Ocampo- Peñuela & Pimm 2015). Río Tame is at the lower elevational belt of the east slope of the Eastern Andes, a region with a high local immigration rate of birds from the lowland forests (Kattan & Franco 2004). Thus, the species reported here may offer opportunities for further research and conservation efforts in the Eastern Andes region.

The Río Tame region has a relatively high avian diversity compared to other foothill localities on the east slope of the Eastern Andes at similar elevations. For example, 210 bird species were reported in a fragmented landscape in the Cordillera del Condor, east of the Peruvian Andes (900 m; Schulenberg *et al.* 1997). Elsewhere, 172 bird species were reported throughout an altitudinal range of 300-1,200 m in three locations at Serranía de los Churumbelos, east of the Colombian Andes (Salaman *et al.* 1999). Another location in the Eastern Andes, the Rumiyaco river in Nariño between 700 and 1,600 m, yielded 120 bird species (Bohórquez 2002). These localities are in the ecotone between the Andes and the Amazon region, while Río Tame is in the ecotone between the Andes and the Orinoco region. The higher species richness of the lower Araucan foothills compared with that of the lower amazonian foothills might reflect a greater ecological contrast between lowland and montane zones. The Orinoco region has mostly open savanna with patches of scrub and riparian forest, while to the south the forest is continuous from the lowlands to the adjacent Andean slopes. Hernández-Camacho *et al.* (1992) suggested a historical relationship throughout the eastern foothills as a connection of Amazonian forests with those of the Catatumbo and Araucan regions at the level of species. The present analysis indicates a zone of transition between northern and southern avifauna at the level of subspecies. I did not consider the Catatumbo lowlands separately to compare species richness, because the only locality at a foothill elevation (Bellavista at 650 m) yielded just 43 bird species based on Carriker's collections in the 1940's (Avendaño 2012), but the present analysis supports a greater similarity of the Catatumbo lowlands to the Río Tame foothill region than with the adjacent Orinoco region.

Biogeographic relationship.- The relationship between Río Tame, the Serranía de Perijá, the Catatumbo lowlands, and the Cordillera de Mérida (both slopes) could indicate the existence of historical corridors connecting these distinct geographic subregions. One of those historical corridors perhaps traverses the Andean discontinuity of the Táchira depression along the connection between Perijá-Catatumbo and Mérida-Río Tame, through the Uribante river watershed in Venezuela (Graham *et al.* 2010). The relationship between the Catatumbo lowlands and the Serranía de Perijá has been previously noted, and these areas were suggested to pertain to the same endemic bird area (Cracraft 1985). Additionally, Gutiérrez *et al.* (2015) found that suitable climatic conditions, both at the Last Glacial Maximum and at present, exist for an Andean brocket deer *(Mazama rufina)* in the Táchira depression. Such climatic condition thus, in combination with the analysis on the suspected endemic mammals of the Cordillera de Mérida, support the argument that the Táchira depression is not a complete geographic barrier for dispersal of High-Andean biota between the Eastern Andes of Colombia and the Cordillera de Mérida (Gutiérrez *et al.* 2015). Instead of a geographic barrier, the Táchira depression could support environmental conditions as a corridor among the Serranía de Perijá, the Catatumbo lowlands and the west slope of the Cordillera de Mérida from north to south. This assumed corridor could be extending toward lower foothills of the Eastern Andes into the Río Tame area. A phylogeographic

analysis of the avifauna of Río Tame would be needed to evaluate the relationship between geographic regions involved in the Táchira depression and the hypothesized existence of the suggested historical corridor across this depression. Nevertheless, it is especially interesting that some species apparently show a continuity at the level of subspecies with trans-Andean populations along the northern end of the Eastern Andes and south to the foothills of the Río Tame area. Conditions along this potential corridor may have been more humid and forest more extensive at certain times during the Pleistocene. Again, phylogeographic studies are needed, as such studies would demonstrate the existence of dynamic histories of divergence and colonization among mountain systems as drivers of speciation and structure of the neotropical avifauna (Smith *et al.* 2014, López-O. *et al.* 2014).

Results from my biogeographic analysis differ in part from those of Kattan *et al.* (2004), who found greater similarities between the Eastern Andes slopes and the Sierra de la Macarena, and dissimilarities with the Serranía de Perijá. This may reflect the fact that they included the southern slopes of the Andes but had limited data from the northern Andes, especially the Andes-Orinoco foothills región. Although species turnover is recognized along the Eastern Andes (Hilty & Brown 1986, Kattan *et al.* 2004, Graham *et al.* 2010), it may further differ between elevational belts and might be better understood by analyses at the subspecies level, rather than at species levels including the Andes as a whole. Further and more detailed phylogeographic analyses are needed to better understand the dynamics of avian turnover at both the geographic and taxonomic scales. Finally, my analysis would not have been possible without the collection of specimens that are now available in the two most important ornithological collections in Colombia for future comparisons between DNA-based studies that complement the phenotypic comparisons inherent to subspecies taxonomy. This highlights the importance of scientific collections for future research on Colombian birds (Cuervo *et al.* 2006, López-O. *et al.* 2014, Rocha *et al.* 2014).

Conservation comments.- The remnant forests of Río Tame are important buffer areas to the El Cocuy National Park because these provide elevational continuity to the Orinoco region lowlands. Conserving this elevational transition, birds would benefit in the face of current habitat loss and future climate change (Ocampo-Peñuela & Pimm 2015). In addition, the presence of species like Gray Tinamou *(T. tao),* Wattled Guan *(A. aburri),* Helmeted Curassow *(P. pauxi),* and Marbled Wood-quail *(O. gujanensis),* recognized as focal for conservation efforts, indicate the good quality of the reserve's forests despite continued hunting pressure (Robbins *et al.* 2011). Other focal species for conservation projects reported here from the reserve include the Solitary Eagle *(B. solitarius),* Yellow-throated Toucan *(R. ambiguus),* Military Macaw *(A. militaris),* Saffron-headed Parrot *(P. pyrilia),* Lined Antshrike *(T. tenuepunctatus),* Gray-throated Warbler *(M. cinereicollis),* and mammals such as the Colombian Woolly Monkey *(Lagothrix lugens),* Red Howler Monkey *(Alouatta seniculus),* White-tailed Deer *(Odocoileus virginianus),* Black Agouti *(Dasyprocta fuliginosa),* Spotted Paca *(Cuniculus paca),* Ocelot *(Leopardus pardalis),* and Tayra *(Eyra barbara).* Some of these taxa could be considered charismatic, umbrella, flagship, or economically important species that could provide ecosystem services for the local community (Anonymous 2003, 2005), but more detailed conservation plans to the Araucan foothills are needed. For instance, Setina *et al.* (2012) estimated the population density of Helmeted Curassow *(P. pauxi)* in Tamá National Park; similar studies could be made in Río Tame in the future. Furthermore, the species reported above should be included in the threatened

species list of the Important Bird Area (IBA) El Cocuy, extending its influence to a wider elevational transect. Nevertheless, given the new knowledge of the birds of the Araucan and Casanare foothills, a new IBA could be proposed for this region. Strategies to include the local community in the process would be fundamental to achieve consensus, as well as agreements on hunting practices. Currently, new research is already updating the information on the foothills of Arauca and Casanare (D. Carantón *et al.*, unpublished data). For example, two large eagles (*Harpia harpyja* and *Spizaetus tyrannus,* not observed during my field work in Río Tame) were recently shot by local farmers in the Tame municipality, indicating the need for environmental education and community outreach (Acevedo-Charry e*t al.* 2015).

In conclusion, much remains to be learned about the lowland-to-montane transition zones along the Eastern Andes, where lowland deforestation and dynamic land use changes may have obscured the nature of this transition in many areas (Sánchez-Cuervo *et al.* 2012, Ocampo-Peñuela & Pimm 2015). Another complicating factor has been socio-political conflicts preventing further exploration in many areas (Murillo 2005, Sanchez-Cuervo & Aide 2013). If the current conversations between the Colombian government and the important guerrilla groups reach a successful conclusion, this would help open the way for much-needed ecological and biogeographic studies that would in turn help to prioritize conservation efforts.

Acknowledgments

I am especially grateful to the late Sonia I. Charry Bastidas, my mom, and first teacher; she knew, enjoyed and loved the Araucan lower foothills, including Tame. I also thank all my family for their support and encouragement. This study was the result of my undergraduate thesis in Biology, and I thank all help and advice of the staff in the Universidad Nacional and the Pontificia Universidad Javeriana at Bogotá, especially my advisor F. G. Stiles for his advice, encouragement and his many constructive comments and corrections on the manuscript. This study was funded by Patrimonio Natural, the Gobernación de Arauca, Parques Nacionales Naturales de Colombia, Universidad Nacional de Colombia (Vicerrectoría de Investigación and Sede Orinoquía), Yoluka ONG and the Instituto Alexander von Humboldt partnership agreement 13-12-067-036CE. The students group "Grupo de Ornitología de la Universidad Nacional" (GOUN), IdeaWild Foundation, and Yoluka ONG provided some equipment for the study, which would have been impossible without the field and office help of the Patrimonio Natural team (especially J. F. García, V. Moreno, E. Matiz, and D. Rojas), the El Cocuy National Park team (F. Muñoz, H. Pinzón, R. Ariano "Paiton", D. Mulato, D. Acevedo, C. J. Valencia, R. Valderrama and others) and the Yoluka-Humboldt team (C. Mora-Fernández, T. Angarita-Sierra, J. Barriga, A. Diaz, F. Forero). I also thank J. P. López for his advice, great company and hard work in the field. J. Pérez-Emán confirmed the identification of subspecies in the Cordillera de Mérida. I also thank the pre-review and extended comments on the manuscript by J. E. Avendaño, as well the bibliographic information given by J. O. Cortés. Comments on the manuscript were made as well by P. Furumo, B. Branoff, C. Amorocho, M. Campos, and J. Roper. I thank O. Laverde and N. Ocampo-Peñuela for the revision of the manuscript and rewarding comments in. I thank A. Hernández-Serna for help with the similarity analysis, N. Álvarez for help with the map in Figure 1, as well as the faculty and other graduate students in the Tropical Community Ecology Lab – ARBIMON, at the University of Puerto Rico-Río Piedras campus, whose suggestions improved a

preliminary manuscript version; especially T. M. Aide who motivated intensity toward the writing of this manuscript.

Literature cited

ANONYMOUS (INSTITUTO ALEXANDER VON HUMBOLDT). 1998. Caracterización ecológica del transecto río Cusiana, vertiente oriental de los Andes, Boyacá, Colombia. BIOSINTESIS Boletín del Instituto de Investigación de Recursos Biológicos Alexander von Humboldt 4: 1-4.

ANONYMOUS (MILLENIUM ECOSYSTEM ASSESSMENT). 2003. Ecosystems and their services. Chapter 2 in Ecosystem and human well-being. Island press, Washington.

ANONYMOUS (MILLENIUM ECOSYSTEM ASSESSMENT). 2005. Ecosystems and human well-being: current state and trends. Island Press, Washington, D. C.

ANONYMOUS (CORPORINOQUIA). 2008. Plan de ordenación y manejo ambiental de la cuenca hidrográfica del río Tame con otras determinaciones. CORPORINOQUIA. Resolución Nro. 200.41.08.1433 del 10 de diciembre de 2008. El Yopal, Casanare, Colombia.

ACEVEDO-CHARRY, O. A. 2013. Caracterización ornitológica del río Tame, zona de amortiguación del Parque Nacional Natural El Cocuy (Tame, Arauca, Colombia). Ornitología Colombiana 12 (Resumen de Tesis): 69.

ACEVEDO-CHARRY, O. A., N. F. PÉREZ-BUITRAGO, & C. A. MUR-ESCOBAR. 2013. Avifauna de la Orinoquía: Diversidad Local del Campus de la Universidad Nacional de Colombia – Sede Orinoquía (Arauca, Arauca). Miniguías de Campo del Instituto de Ciencias Naturales No. 18. Bogotá, Colombia.

ACEVEDO-CHARRY, O. A., A. PINTO-GÓMEZ, & J. O. RANGEL-CH. 2014. Las Aves de la Orinoquia colombiana: una revisión de sus registros. Pp: 691-750 in: J.O. Rangel-Ch (Ed). Colombia Diversidad Biótica XIV. La región de la Orinoquia de Colombia. Universidad Nacional de Colombia - Instituto de Ciencias Naturales, Bogotá D.C., Colombia.

ACEVEDO-CHARRY, O. A., E. MATIZ-GONZÁLEZ, K. E. PÉREZ-ALBARRACÍN, S. RODRÍGUEZ-GONZÁLEZ & C. J. VALENCIA-VERA. 2015. El águila arpía *(Harpia harpija)* y el águila iguanera *(Spizaetus tyrannus)* en el ecotono entre los Andes y los Llanos de la Orinoquia, Arauca, Colombia. Spizaetus: Boletín de la Red de Rapace Neotropicales 19:2-11.

ARBELÁEZ-CORTÉS, E. 2013. Knowledge of Colombian biodiversity: published and index. Biodiversity and Conservation 22(12):2875-2906.

AVELEDO, R. & L. PÉREZ. 1989. Tres nuevas subespecies de aves (Picidae, Parulidae, Thraupidae) de la Sierra de Perijá, Venezuela y lista hipotética para la Avifauna Colombiana de Perijá. Boletín de la Sociedad Venezolana de Ciencias Naturales 43 (146):7-24.

AVELEDO, R. & L. PÉREZ. 1994. Descripción de nueve subespecies nuevas y comentarios sobre dos especies de aves de Venezuela. Boletín de la Sociedad Venezolana de Ciencias Naturales 44 (148):229-257.

AVENDAÑO, J. E. 2012. La avifauna de las tierras bajas del Catatumbo, Colombia: inventario preliminar y ampliaciones de rango. Boletín de la Sociedad Antioqueña de Ornitología 21 (1): evAP3_2012 1-14.

AVENDAÑO, J. E., F. G. STILES, & C. D. CADENA. 2013. A new subspecies of Common Bush-Tanager *(Chlorospingus flavopectus,* Emberizidae) from the east slope of the Andes of Colombia. Ornitología Colombiana 13:44-58.

BLAKE, E. R. 1961. Notes on a Collection of Birds From Northeastern Colombia. Fieldiana 44 (4):25-44.

BLAKE, E. R. 1962. Birds of the Sierra Macarena, Eastern Colombia. Fieldiana 44:69-112.

BOESMAN, P. 2012. Birds of Colombia: MP3 Collection (Version 1.0). Landmark Production (DVD media)

BOHÓRQUEZ, C. I. 2002. La avifauna de la vertiente oriental de los Andes de Colombia. Tres evaluaciones en elevación subtropical. Revista de la Academia Colombiana de Ciencias Naturales y Exactas. 26 (100):419-442.

BORGES. S. H., M. COHN-HAFT, A. M. PEREIRA, L. M. HENRIQUES, J. F. PACHECO, & A. WHITTAKER. 2001. Birds of Jaú National Park, Brazilian Amazon: species check-list, biogeography and conservation. Ornitologia Neotropical 12:109-140.

BOYLA, K., & A. ESTRADA (eds). 2005. Áreas importantes para la conservación de las aves en los Andes tropicales: sitios prioritarios para la conservación de la biodiversidad. BirdLife International & Conservation International, Quito, Ecuador.

BREWER, D. 2010. Golden-fronted Greenlet *(Hylophilus aurantiifrons).* In: del Hoyo, J. Elliott, A., Sargatal, J., Christie, D. A. & de Juana (eds.). 2014. Handbook of the Birds of the World Alive. Lynx Edicions, Barcelona. (retrieved from http://www.hbw.com/node/61279 on 15 October 2015).

BREWER, D. 2011. Blue-black Grosbeak *(Cyanocompsa cyanoides).* In: del Hoyo, J. Elliott, A., Sargatal, J., Christie, D. A. & de Juana (eds.). 2014. Handbook of the Birds of the World Alive. Lynx Edicions, Barcelona. (retrieved from http://www.hbw.com/node/62211 on 15 October 2015).

CADENA, C. D., M. ÁLVAREZ, J. L. PARRA, I. JIMÉNEZ, C. A. MEJÍA, M. SANTAMARÍA, A. M. FRANCO, C. A. BOTERO, G. D. MEJÍA, A. M. UMAÑA, A. CALIXTO, J. ALDANA, & G. A. LONDOÑO. 2000. The birds of CIEM, Tinigua National Park,

Colombia: an overview of 13 years of ornithological research. Cotinga 13:46-54.

CARVAJAL-ROJAS, L., D. PUENTES-CAMACHO, & J. VALERO-GARAY. 2008. Catálogo ilustrado de especies del piedemonte llanero en el Departamento del Meta. Universidad Distrital "Francisco José de Caldas" y CORMACARENA, Bogotá.

CHAPARRO-HERRERA, S., & O. LAVERDE. 2014. Una nueva localidad para el águila solitaria *(Buteogallus solitarius)* en Colombia. Boletín SAO 23:15-17.

CHAPMAN, F. M. 1917. The distribution of bird-life in Colombia. Bulletin of the American Museum of Natural History 36:1-729.

CLEMENTS, J. F., T. S. SCHULENBERG, M. J. ILIFF, B. L. SULLIVAN, C. L. WOOD, & D. ROBERSON. 2013. The eBird/Clements checklist of birds of the world: Version 6.8. Downloaded from <http://www.birds.cornell.edu/clementschecklist/download/> Consulted October 2 2013.

CRACRAFT, J. 1985. Historical biogeography and patterns of differentiation within the South America avifauna: Areas of endemism. Ornithological Monographs 36:49-84.

CUERVO, A. M., C. D. CADENA, & J. L. PARRA. 2006. Seguir colectando aves en Colombia es imprescindible: un llamado a fortalecer las colecciones ornitológicas. Ornitología Colombiana 4:51-58.

CUERVO, A., & J. L. TORO. 2012. *Pionopsitta pyrilia*. Pp. 221-225 in: Renjifo, L. M., A. M. Franco-Maya, J. D. Amaya-Espinel, G. Kattan & B. López-Lanús (eds). 2002. Libro rojo de aves de Colombia. Serie Libros Rojos de Especies Amenazadas de Colombia. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt y Ministerio del Medio Ambiente. Bogotá, Colombia.

GARCÍA, J. M. & E. BOTERO-DELGADILLO. 2013. Nuevos registros de distribución del Cabezón Cinéreo *(Pachyramphus rufus)* en Colombia. Ornitología Colombiana 13:69-73.

GARCÍA, J. F. & V. MORENO. 2011. Restauración ecológica participativa en el Parque Nacional El Cocuy (Costado Oriental) Departamento de Arauca; Memorias Técnicas del Proyecto. Ministerio de Ambiente y Desarrollo Sostenible, Republica de Colombia – Parques Nacionales de Colombia – Gobernación de Arauca – Patrimonio Natural.

GRAHAM, C. H., N. SILVA, & J. VELÁSQUEZ-TIBATÁ. 2010. Evaluating the potential causes of range limits of birds of the Colombian Andes. Journal of Biogeography 37:1863-1875.

GRAHAM, C. H., A. C., CARNAVAL, C. D. CADENA, K. R. ZAMUDIO, T. E. ROBERTS, J. L. PARRA, C. M. MCCAIN, R. C. K. BOWIE, C. MORITZ, S. B. BAINES, C. J. SCHNEIDER, J. VANDERWAL, C. RAHBEK, K. H. KOZAK, & N. J. SANDERS. 2014. The origin and maintenance of montane diversity: integrating evolutionary and ecological processes. Ecogeography 37:EV001-009.

GUTIERREZ, E. E., J. E. MALDONADO, A. RADOSAVLJEVIC, J. MOLINARI, B. D. PATTERSON, J. M. MARTÍNEZ-C., AMY R. RUTTER, M. T. R. HAWKINS, F. J. GARCIA, & K. M. HELGEN. 2015. The taxonomic status of *Mazama bricenii* and the significance of the Táchira depression for Mammalian endemism in the Cordillera de Mérida, Venezuela. PloS ONE 10(6): e0129113. doi: 10.1371/journal.pone.0129113

HERNÁNDEZ-CAMACHO, J., T. WALSCHBURGER-B, R. ORTÍZ-QUIJANO, & A. HURTADO-GUERRA. 1992. Origen y distribución de la Biota Suramericana y Colombiana. Acta zoológica Mexicana (edición especial):55-104.

HERZOG, S. K., & G. H. KATTAN. 2012. Patrones de diversidad y endemismo en las Aves de los Andes tropicales. Pp: 287-305 in: S. K. Herzog, R. Martínez, P. M. Jorgensen, & H. Tiessen (eds). Cambio climático y Biodiversidad en los Andes tropicales. Instituto interamericano para la Investigación del cambio global (IAI), Sao José dos Campos, y Comité Científico sobre Problemas del Medio Ambiente (SCOPE), París, France.

HILTY S. L. & W. L. BROWN. 1986. A Guide of the birds of Colombia. Princeton University Press, Princeton, New Jersey, 836 pp.

HILTY, S. L. 2003. Birds of Venezuela. Princeton University Press, Princeton, New Yersey.

HILTY, S. L. 2011. Red-crowned Ant-tanager *(Habia rubica)*. In: del Hoyo, J. Elliott, A., Sargatal, J., Christie, D. A. & de Juana (eds.). 2014. Handbook of the Birds of the World Alive. Lynx Edicions, Barcelona. (retrieved from http://www.hbw.com/node/61836 on 15 October 2015).

HUBER, O. 2007. Sabanas de los llanos venezolanos. Pp: 73-86 in: R. D. de Stefano, G. Aymard, O. Huber (eds). Catálogo anotado e ilustrado de la flora vascular de los llanos de Venezuela. Fundación para la Defensa de la Naturaleza (FUDENA), Fundación Empresas Polar, Fundación Instituto Botánico de Venezuela "Dr. Tobías Lasser" (FIBV), Caracas, Venezuela.

IUCN. 2015. International Union for Conservation of Nature and Natural Resource Red List of Threatened Species. Version 2015-3. <www.iucnredlist.org> Consulted October 10 2015.

JANKOWSKI, J. E., C. L. MERKORD, W. FARFAN RÍOS, K. GARCÍA CABRERA, N. SALINAS REVILLA, & M. R. SILMAN. 2013. The relationship of tropical bird communities to tree species composition and vegetation structure along an Andean elevation gradient. Journal of Biogeography 40 (5):950-962.

JENKINS, C. N., S. L. PIMM, & L. N. JOPPA. 2013. Global patterns of terrestrial vertebrate diversity and

conservation. Proceedings of the National Academy of Science of the U.S.A. doi:10.1073/pnas. 1302251110.

KATTAN, G. H., P. FRANCO, V. ROJAS, & G. MORALES. 2004. Biological diversification in a complex region: a spatial analysis of faunistic diversity and biogeography of the Andes of Colombia. Journal of Biogeography 31:1829-1839.

KATTAN, G. H., & P. FRANCO. 2004. Bird diversity along elevational gradients in the Andes of Colombia: area and mass effects. Global Ecology and Biogeography 13:451-458.

LAVERDE, O., & F. GÓMEZ. 2016. Las aves de Santa María (Boyacá, Colombia). Serie de Guías de Campo del Instituto de Ciencias Naturales, Universidad Nacional de Colombia No. 16. Instituto de Ciencias Naturales. Universidad Nacional de Colombia. Bogotá D.C. 182 p.

LÓPEZ-O, J. P., A. M. CUERVO, J. AVENDAÑO, & N. GUTIÉRREZ-PINTO. 2014. The birds of Serranía de Perijá: The northernmost avifauna of the Andes. Ornitología Colombiana 14:62-93.

MÁRQUEZ, C. 2002. *Harpyhaliaetus solitarius*. Pp. 109-111 in: Renjifo, L. M., A. M. Franco-Maya, J. D. Amaya-Espinel, G. Kattan & B. López-Lanús (eds). 2002. Libro rojo de aves de Colombia. Serie Libros Rojos de Especies Amenazadas de Colombia. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt y Ministerio del Medio Ambiente. Bogotá, Colombia.

MCMULLAN, M., T. M. DONEGAN, & A. QUEVEDO. 2010. Field Guide to the Birds of Colombia. ProAves Publications. 225 p.

MEYER DE SCHAUENSEE, R. 1964. The Birds of Colombia and adjacent areas of South and Central America.Academy of Natural Sciences of Philadelphia, Narberth, Pennsylvania, U.S. 427 p.

MURILLO, J. I. 2005. Evaluación de la distribución y estado actual de los registros ornitológicos de los llanos orientales de Colombia. Bachelor thesis. Universidad de Nariño.

MYERS, N., R. A. MITTERMEIER, C. G. MITTERMEIER, G. A. B. DA FONSECA, & J. KENT. 2000. Biodiversity hotspots for conservation priorities. Nature 403:853-858.

OCAMPO-PEÑUELA, N. & S. L. PIMM. 2014. Setting practical conservation priorities for birds in the western Andes of Colombia. Conservation Biology 28 (5):1260-1270.

OCAMPO-PEÑUELA, N. & S. L. PIMM. 2015. Elevational ranges of montane birds and deforestation in the Western Andes of Colombia. PLoS ONE 10 (12): e0143311. doi:10.1371/journal.pone.0143311

O'DEA, N., E. M. J. WATSON & R. J. WHITTAKER. 2004. Rapid assessment in conservation research: a critique of avifaunal assessment techniques illustrated by Ecuadorian and Madagascan case study data. Diversity and Distributions 10:55-63.

OLSON, S. L. 1983. Geographic variation in *Chlorospingus ophthalmicus* in Colombia and Venezuela (Aves: Thraupidae). Proceedings of the Biological Society of Washington 96:103-109.

OLSON, D. M., E. DINERSTEIN, E. D. WIKRAMANAYAKE, N. D. BURGESS, G. V. N. POWELL, E. C. UNDERWOOD, J. A. D'AMICO, I. ITOUA, H. E. STRAND, J. C. MORRISON, C. J. LOUCKS, T. F. ALLNUTT, T. H. RICKETTS, Y. KURA, J. F. LAMOREUX, W. W. WETTENGEL, P. HEDAO, & K. R. KASSEM. 2001. Terrestrial ecoregions of the world: A new map of life on Earth. BioScience 51 (11):933-938.

OLIVARES, A. 1963. Notas sobre aves de los Andes orientales en Boyacá. Boletín de la Sociedad Venezolana de Ciencias Naturales 25 (106):91-125.

OLIVARES, A. 1971. Aves de la ladera oriental de los Andes orientales, alto río Cusiana, Boyacá, Colombia. Caldasia 11(51): 203-226.

REMSEN, J. V. JR. 2003. Pale-breasted Spinetail *(Synallaxis albescens)*. In: del Hoyo, J. Elliott, A., Sargatal, J., Christie, D. A. & de Juana (eds.). 2014. Handbook of the Birds of the World Alive. Lynx Edicions, Barcelona. (retrieved from http://www.hbw.com/node/56433 on 15 October 2015).

REMSEN, J. V. JR., J. I. ARETA, C. D. CADENA, S. CLARAMUNT, A. JARAMILLO, J. F. PACHECO, J. PÉREZ-EMÁN, M. B. ROBBINS, F. G. STILES, D. F. STOTZ, & K. J. ZIMMER. Version 28 April 2017. A classification of the bird species of South America. American Ornithologists' Union.<http://www.museum.lsu.edu/~Remsen/SACCBaseline.html> Final consult on September 19 2017.

RENJIFO, L. M., A. M. FRANCO-MAYA, J. D. AMAYA-ESPINEL, G. KATTAN & B. LÓPEZ-LANÚS (eds). 2002. Libro rojo de aves de Colombia. Serie Libros Rojos de Especies Amenazadas de Colombia. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt y Ministerio del Medio Ambiente. Bogotá, Colombia.

RENJIFO, L. M., M. F. GÓMEZ, J. VELÁSQUEZ-TIBATÁ, A. M. AMAYA-VILLAREAL, G. H. KATTAN, J. D. AMAYA-ESPINEL, & J. BURBANO-GIRÓN. 2014. Libro rojo de aves de Colombia, Volumen I: bosques húmedos de los Andes y la costa Pacífica. Editorial Pontificia Universidad Javeriana e Instituto Alexander von Humboldt. Bogotá D.C., Colombia.

RESTALL, R. C. RODNER, & M. LENTINO. 2007. Birds of Northern South Amercia, An Identification Guide. Volume I y II. Yale University Press, New Haven and London, 656 p.

RESTREPO-CALLE, S., M. LENTINO, & L. G. NARANJO. 2010. Aves. Capitulo 9. Pp. 290-309 in: Lasso, C.A., J. S. Usma, F. Trujillo & A. Rial (eds). 2010. Biodiversidad de la Cuenca del Orinoco: bases científicas para la identificación de áreas prioritarias para la conservación y uso sostenible

de la biodiversidad. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, WWF Colombia, Fundación Omacha, Fundación La Salle e Institutos de Estudios de la Orinoquía (Universidad Nacional de Colombia). Bogotá, D.C., Colombia.

ROBINS, M. B., D. GEALE, B. WALKER, T. J. DAVIS, M. COMBE, M. D. EATON & K. P. KENNEDY. 2011. Foothill avifauna of the upper Urubamba Valley, dpto. Cusco, Peru. Cotinga 33: 41-52.

ROCHA, L. A., A. ALEIXO, G. ALLEN, F. ALMEDA, C. C. BALDWIN, M. V. L. BARCLAY, J. M. BATES, A. M. BAUER, F. BENZONI, C. M. BERNS, M. L. BERUMEN, D. C. BLACKBURN, S. BLUM, F. BOLAÑOS, R. C. K. BOWIE, R. BRITZ, R. M. BROWN, C. D. CADENA, K. CARPENTER, L. M. CERÍACO, P. CHAKRABARTY, G. CHAVES, J. H. CHOAT, K. D. CLEMENTS, B. B. COLLETTE, A. COLLINS, J. COYNE, J. CRACRAFT, T. DANIEL, M. R. DE CARVALHO, K. DE QUEIROZ, F. DI DARIO, R. DREWES, J. P. DUMBACHER, A. ENGILIS JR., M. V. ERDMANN, W. ESCHMEYER, C. R. FELDMAN, B. L. FISHER, J. FJELDSÅ, P. W. FRITSCH, J. FUCHS, A. GETAHUN, A. GILL, M. GOMON, T. GOSLINER, G. R. GRAVES, C. E. GRISWOLD, R. GURALNICK, K. HARTEL, K. M. HELGEN, H. HO, D. T. ISKANDAR, T. IWAMOTO, Z. JAAFAR, H. F. JAMES, D. JOHNSON, D. KAVANAUGH, N. KNOWLTON, E. LACEY, H. K. LARSON, P. LAST, J. M. LEIS, H. LESSIOS, J. LIEBHERR, M. LOWMAN, D. L. MAHLER, V. MAMONEKENE, K. MATSUURA, G. C. MAYER, H. MAYS JR., J. MCCOSKER, R. W. MCDIARMID, J. MCGUIRE, M. J. MILLER, R. MOOI, R. D. MOOI, C. MORITZ, P. MYERS, M. W. NACHMAN, R. A. NUSSBAUM, D. Ó FOIGHIL, L. R. PARENTI, J. F. PARHAM, E. PAUL, G. PAULAY, J. PÉREZ-EMÁN, A. PÉREZ-MATUS, S. POE, J. POGONOSKI, D. L. RABOSKY, J. E. RANDALL, J. D. REIMER, D. R. ROBERTSON, M.-O. RÖDEL, M. T. RODRIGUES, P. ROOPNARINE, L. RÜBER, M. J. RYAN, F. SHELDON, G. SHINOHARA, A. SHORT, W. B. SIMISON, W. F. SMITH-VANIZ, V. G. SPRINGER, M. STIASSNY, J. G. TELLO, C.W. THOMPSON, T. TRNSKI, P. TUCKER, T. VALQUI, M. VECCHIONE, E. VERHEYEN, P. C. WAINWRIGHT, T. A. WHEELER, W. T. WHITE, K. WILL, J. T. WILLIAMS, G.,WILLIAMS, E. O. WILSON, K. WINKER, R.WINTERBOTTOM, C. C. WITT. 2014. Specimen collection: An essential tool. Science 344 (6186):814-815

RODRÍGUEZ-MAHECHA, J. V., & J. I. HERNÁNDEZ-CAMACHO. 2002. Loros de Colombia. Conservación Internacional. Bogotá, Colombia.

ROJAS, R., W. PIRAGUA, F. G. STILES, & T. MCNISH. 1997. Primeros registros para Colombia de cuatro taxones de la familia Tyrannidae (Aves: Passeriformes). Caldasia 19 (3): 523-525.

ROJAS, R. & W. PIRAGUA. 2000. Afinidades biogeográficas y aspectos ecológicos de la avifauna de Caño Limón, Arauca, Colombia. Crónica Forestal y del Medio Ambiente 15 (1):1-26.

SALAMAN, P. G. W., T. M. DONEGAN, & A. M. CUERVO. 1999. Ornithological surveys in Serranía de los Churumbelos, southern Colombia. Cotinga 12:29-39.

SALAMAN, P. G. W., F. G. STILES, C. I. BOHÓRQUEZ, M. ÁLVAREZ-R., A. M. UMAÑA, T. M. DONEGAN, & A. M. CUERVO. 2002. New and noteworthy bird records from the east slope of the Andes of Colombia. Caldasia 24 (1):157-189

SANCHEZ-CUERVO, A. M., T. M. AIDE, M. L. CLARK, & A. ETTER. 2012. Land Cover Change in Colombia: Surprising Forest Recovery Trends between 2001 and 2010. PloS ONE 7 (8): e43943. doi:10.1371/journal.pone.0043943.

SANCHEZ-CUERVO, A. M., & T. M. AIDE. 2013. Consequences of the armed conflict, forced human displacement, and land abandonment on forest cover change in Colombia: A multy-scaled analysis. Ecosystems 16(6):1052-1070.

SCHULENBERG, T. S., T. A. PARKER, & W. WUST. 1997. Birds of the Cordillera del Cóndor. Pp: 63-70 in: T. S. Schulenberg & K. Awbrey (Eds). The Cordillera del Cóndor Region of Ecuador and Peru: A Biological Assessment. RAP Working Papers by Conservation International, Washington. 231 p.

SETINA, V., D. J. LIZCANO, D. M. BROOKS, & L. F. SILVEIRA. 2012. Population density of the Helmeted Curassow *(Pauxi pauxi)* in Tamá National Park, Colombia. The Wilson Journal of Ornithology 124(2):316-320.

SHORT, L. L. 2017. Chestnut-eared Araçari *(Pteroglossus castanotis)*. In: del Hoyo, J. Elliott, A., Sargatal, J., Christie, D. A. & de Juana (eds.). 2014. Handbook of the Birds of the World Alive. Lynx Edicions, Barcelona. (retrieved from http://www.hbw.com/node/56092 on 4 January 2017).

SMITH, B. T., J. E. MCCORMACK, A. M. CUERVO, M. J. HICKERSON, A. ALEIXO, C. D. CADENA, J. PÉREZ-EMÁN, C. W. BURNEY, X. XIE, M. G. HARVEY, B. C. FAIRCLOTH, T. C. GLENN, E. P. DERRYBERRY, J. PREJEAN, S. FIELDS, & R. T. BRUMFIELD. 2014. The drivers of tropical speciation. Nature 515:406-409.

SNOW, D. 2004a. Eastern Striped *Manakin (Machaeropterus regulus)*. In: del Hoyo, J. Elliott, A., Sargatal, J., Christie, D. A. & de Juana (eds.). 2014. Handbook of the Birds of the World Alive. Lynx Edicions, Barcelona. (retrieved from http://www.hbw.com/node/57096 on 15 October 2015).

SNOW, D. 2004b. Western Striped Manakin *(Machaeropterus striolatus)*. In: del Hoyo, J. Elliott, A., Sargatal, J., Christie, D. A. & de Juana (eds.). 2014. Handbook of the Birds of the World Alive. Lynx Edicions, Barcelona. (retrieved from http://www.hbw.com/node/57095 on 15 October 2015).

STATTERSFIELD, A. J., M. J. CROSBY, A. J. LONG, & D. C. WEGE. 1998. Endemic bird areas of the world: priorities for biodiversity conservation. BirdLife International, Cambridge.

TERBORG, J. 1977. Bird species diversity on an Andean

elevation gradient. Ecology 58:1007-1019.

UMAÑA, A. M., J. I. MURILLO, S. RESTREPO & M. ÁLVAREZ. 2009. Aves. Pp: 51-83 in: M. H. Romero, J. A. Maldonado, J. D. Bogotá-Gregory, A. M. Usma, M. Álvarez, M. T. Palacio-Lozano, M. Saralux-Valvuena, S. L. Mejía, J. Aldana-Rodríguez, & E. Payán (Eds). Informe sobre el estado de la biodiversidad en Colombia 2007-2008: piedemonte orinoquense, sabanas y bosques asociados al norte del río Guaviare. IAvH. Bogotá, D. C., Colombia. 151 p.

VÁSQUEZ, V. H. & M. A. SERRANO. 2009. Las áreas naturales protegidas de Colombia. Bogotá, Colombia: Conservación Internacional – Colombia y Fundación Biocolombia.

XENO-CANTO FOUNDATION. 2005-2014. Xeno-canto America. Bird sounds for the Americas. Xeno-canto Foundation, Amsterdam. Available in: <http://xeno-canto.org>

ZAMUDIO, J. A., L. F. ORTEGA, & L. F. CASTILLO. 2011. Aves del Casanare. Pp: 168-179 in: J. S. Usma & F. Trujillo (eds.). 2011. Biodiversidad del Casanare: Ecosistemas Estratégicos del Departamento. Gobernación de Casanare – WWF Colombia. Bogotá D.C. 286 p.

ZIMMER, K., & M. L. ISLER. 2003. Slaty Antwren *(Myrmotherula schisticolor).* In: del Hoyo, J. Elliott, A., Sargatal, J., Christie, D. A. & de Juana (eds.). 2014. Handbook of the Birds of the World Alive. Lynx Edicions, Barcelona. (retrieved from http://www.hbw.com/node/56730 on 15 October 2015).

Recibido: 6 de octubre de 2015 *Aceptado:* 19 de septiembre de 2017

Editor asociado
Andrés M. Cuervo
Evaluadores
Natalia Ocampo-Peñuela / Oscar Laverde

Citación: ACEVEDO-CHARRY. O. A. 2017. Birds of Río Tame, Andes-Orinoco transition region: species check-list, biogeographic relationship and conservation. Ornitología Colombiana 16:eA03.

Appendix 1. Species list of birds encountered at Río Tame Forest Reserve, Araucan lower foothills, east Andes of Colombia. # indicates species with range extension (>100 km); % altitude scope extension (>300 m higher or lower as Hilty & Brown 1986); ^ indicates latitudinal bird migrants; * indicates species which at least one specimen was collected. Species collected, except *Trogon violaceus sensu lato,* were used in the biogeographic analysis (see Appendix 2). Type of record was by hearing (A), visual (V) or mist net capture (C). The evidence was by sound recording (XC: xeno-canto catalog number), photograph in the field (Figs. 3 and 4), or with specimen collected (ICN specimen catalog number at Instituto de Ciencias Naturales - Ornithological collection, or OAC: Orlando A. Acevedo-Charry catalogue, specimens housed at Instituto Alexander von Humboldt - Ornithological Collection, but not yet catalogued). The global threat category follows IUCN (2015); the Colombian threatened category follows Renjifo *et al.* (2002) and Renjifo *et al.* (2014). DD: data deficient, LC: least concern, NT: near threatened, VU: vulnerable, EN: endangered, CR: critically endangered. Avian taxonomy follows the classification of the South American Checklist Committee (Remsen *et al.* 2017).

No.	Taxa	Type of record	Evidence	Threat category	
				Global	Colombia
I.	TINAMIFORMES				
i.	Tinamidae				
1.	*Tinamus tao*	A, V	XC133287	VU	LC
2.	*Crypturellus soui*	A	-	LC	LC
II.	GALLIFORMES				
ii.	Cracidae				
3.	*Penelope argyrotis argyrotis* *	A, V	ICN-38336	LC	LC
4.	*Penelope purpurascens*	A, V	XC86578	LC	LC
5.	*Aburria aburri*	V	-	NT	NT
6.	*Ortalis ruficauda*	A, V	-	LC	LC
7.	*Pauxi pauxi*	V	Fig. 2A	EN	EN
iii.	Odontophoridae				
8.	*Colinus cristatus*	A	-	LC	LC
9.	*Odontophorus gujanensis*	A	-	NT	LC
III.	COLUMBIFORMES				
iv.	Columbidae				
10.	*Patagioenas speciosa*	V	-	LC	LC
11.	*Patagioenas cayennensis*	A, V	-	LC	LC
12.	*Patagioenas subvinacea*	A, V	XC149243	VU	LC
13.	*Leptotila verreauxi*	A, V	-	LC	LC
14.	*Leptotila rufaxilla pallidipectus* *	V, A, C	ICN-38309	LC	LC
15.	*Zenaida auriculata*	V	-	LC	LC
16.	*Columbina talpacoti*	V	-	LC	LC
17.	*Claravis pretiosa* *	V, A, C	ICN-38342	LC	LC
IV.	CUCULIFORMES				
v.	Cuculidae				
18.	*Crotophaga ani*	A, V	-	LC	LC
19.	*Tapera naevia*	A, V	-	LC	LC
20.	*Piaya cayana*	A, V	-	LC	LC
V.	CAPRIMULGIFORMES				
vi.	Caprimulgidae				
21.	*Nyctidromus albicollis*	A, V	-	LC	LC
22.	*Hydropsalis maculicaudus* %	A, V	Fig. 3A	LC	LC

No.	Taxa	Type of record	Evidence	Threat category	
				Global	Colombia
VI.	APODIFORMES				
vii.	Apodidae				
23.	*Streptoprocne rutila*	V	-	LC	LC
24.	*Streptoprocne zonaris*	V	-	LC	LC
25.	*Chaetura cinereiventris*	V	-	LC	LC
26.	*Tachornis furcata #*	V	-	LC	DD
viii.	Trochilidae				
27.	*Florisuga mellivora mellivora **	C, V	ICN-38364	LC	LC
28.	*Phaethornis griseogularis griseogularis **	C, V	ICN-38310	LC	LC
29.	*Phaethornis augusti augusti **	C, V	ICN-38366	LC	LC
30.	*Phaethornis hispidus*	C, V	-	LC	LC
31.	*Phaethornis guy apicalis **	C, V	ICN-38776	LC	LC
32.	*Anthracothorax nigricollis*	V	-	LC	LC
33.	*Lophornis delattrei lessoni **	C, V	Fig. 3B, ICN-38351	LC	LC
34.	*Chlorostilbon mellisugus*	V	-	LC	LC
35.	*Klais guimeti guimeti **	C, V	ICN-38347	LC	LC
36.	*Chalybura buffonii*	V	-	LC	LC
37.	*Thalurania colombica colombica **	C, V	ICN-38779	LC	LC
38.	*Amazilia viridigaster viridigaster **	C, V	ICN-38349	LC	LC
39.	*Chrysuronia oenone oenone **	C, V	ICN-38778	LC	LC
40.	*Hylocharis cyanus #*	C	Fig. 3C	LC	LC
VII.	GRUIFORMES				
ix.	Rallidae				
41.	*Aramides cajaneus*	A	-	LC	LC
VIII.	CHARADRIIFORMES				
x.	Charadriidae				
42.	*Vanellus chilensis*	A, V	-	LC	LC
xi.	Burhinidae				
43.	*Burhinus bistriatus*	A, V	-	LC	LC
IX.	PELECANIFORMES				
xii.	Ardeideae				
44.	*Tigrisoma fasciatum*	V	-	LC	LC
45.	*Bubulcus ibis*	V	-	LC	LC
46.	*Syrigma sibilatrix*	A, V	-	LC	LC
47.	*Egretta caerulea*	V	-	LC	LC
X.	CATHARTIFORMES				
xiii.	Cathartidae				
48.	*Cathartes aura*	V	-	LC	LC
49.	*Coragyps atratus*	V	-	LC	LC
50.	*Sarcorhamphus papa*	V	-	LC	LC
XI.	ACCIPITRIFORMES				
xiv.	Accipitridae				
51.	*Elanoides forficatus ^*	V	-	LC	LC
52.	*Harpagus bidentatus*	V	-	LC	LC
53.	*Accipiter bicolor*	V	-	LC	LC

No.	Taxa	Type of record	Evidence	Threat category	
				Global	Colombia
54.	*Buteogallus solitarius #*	V	Fig. 2B	NT	CR
55.	*Rupornis magnirostris*	A, V	-	LC	LC
56.	*Geranoaetus albicaudatus*	V	-	LC	LC
57.	*Pseudastur albicollis*	V	-	LC	LC
58.	*Buteo nitidus*	V	-	LC	LC
59.	*Buteo platypterus ^*	V	-	LC	LC
60.	*Buteo albonotatus*	V	-	LC	LC
XII.	STRIGIFORMES				
xv.	Tytonidae				
61.	*Tyto alba*	A, V	-	LC	LC
xvi.	Strigidae				
62.	*Megascops choliba*	A	-	LC	LC
63.	*Ciccaba nigrolineata #*	A, V	XC148753	LC	LC
XIII.	TROGONIFORMES				
xvii.	Trogonidae				
64.	*Trogon viridis*	A, V	-	LC	LC
65.	*Trogon violaceus sensu lato (cf. ramonianus / caligatus) # **	V, C	ICN-38228	LC	LC
XIV.	GALBULIFORMES				
xviii.	Galbulidae				
66.	*Galbula ruficauda*	A, V	-	LC	LC
xix.	Bucconidae				
67.	*Malacoptila mytacalis mystacalis # **	V, A, C	ICN-38357, 38358	LC	LC
XV.	PICIFORMES				
xx.	Capitonidae				
68.	*Eubucco bourcierii #*	V	-	LC	LC
xxi.	Ramphastidae				
69.	*Ramphastos ambiguus ambiguus x abbreviatus **	V, A, C	Fig. 2C, ICN-38361, XC148755	NT	LC
70.	*Ramphastos tucanus (aff. tucanus)*	A	-	VU	LC
71.	*Pteroglossus castanotis %*	A, V	Fig. 3C	LC	LC
xxii.	Picidae				
72.	*Picumnus squamulatus*	V	-	LC	LC
73.	*Melanerpes cruentatus*	V	-	LC	LC
74.	*Melanerpes rubricapillus*	A, V	-	LC	LC
75.	*Colaptes rubiginosus*	V	-	LC	LC
76.	*Dryocopus lineatus lineatus **	V, A, C	ICN-38360	LC	LC
77.	*Campephilus melanoleucos*	V	-	LC	LC
XVI.	FALCONIFORMES				
xxiii.	Falconidae				
78.	*Herpetotheres cachinnans*	A, V	-	LC	LC
79.	*Milvago chimachima*	A, V	-	LC	LC
80.	*Falco sparverius*	V	-	LC	LC
81.	*Falco deiroleucus #*	V	-	NT	DD
82.	*Falco femoralis*	V	-	LC	LC
XVII.	PSITTACIFORMES				
xxiv.	Psittacidae				

No.	Taxa	Type of record	Evidence	Threat category	
				Global	Colombia
83.	*Pyrilia pyrilia*	A, V	Fig. 2E, XC149742	NT	VU
84.	*Pionus sordidus #*	A, V	-	LC	LC
85.	*Pionus menstruus*	V	-	LC	LC
86.	*Pionus chalcopterus #*	A, V	-	LC	LC
87.	*Amazona ochrocephala*	V	-	LC	LC
88.	*Amazona amazonica*	V	-	LC	LC
89.	*Forpus conspicillatus*	V	-	LC	LC
90.	*Eupsittula pertinax*	A, V	-	LC	LC
91.	*Orthopsittaca manilatus #*	A, V	-	LC	LC
92.	*Ara militaris #*	A, V	Fig. 2D, XC148754	VU	VU
XVIII.	PASSERIFORMES				
xxv.	Thamnophilidae				
93.	*Cymbilaimus lineatus #*	A, V	Fig. 3D, XC149791	LC	LC
94.	*Thamnophilus tenuepunctatus #*	A, V	-	VU	LC
95.	*Dysithamnus mentalis*	V	-	LC	LC
96.	*Myrmotherula schisticolor sanctamartae **	A, C	ICN-38339, 38340	LC	LC
97.	*Herpsilochmus rufimarginatus*	A, V	-	LC	LC
98.	*Cercomacroides tyrannina*	A, V	-	LC	LC
99.	*Pithys albifrons peruvianus **	V, A, C	ICN-38774, OAC-238	LC	LC
xxvi.	Formicariidae				
100.	*Formicarius analis*	A, V	-	LC	LC
xxvii.	Furnariidae				
101.	*Sclerurus albigularis*	A, V	-	NT	LC
102.	*Dendrocincla fuliginosa*	C, V	-	LC	LC
103.	*Glyphorynchus spirurus integratus**	C, V	ICN-38772	LC	LC
104.	*Xiphorhynchus guttatus*	A, V	-	LC	LC
105.	*Dendroplex picus*	A, V	-	LC	LC
106.	*Lepidocolaptes souleyetii lineaticeps **	C, V	ICN-38337	LC	LC
107.	*Xenops minutus neglectus **	C, V	OAC-230	LC	LC
108.	*Synallaxis albescens insignis **	C, V	ICN-38363	LC	LC
xxviii.	Tyrannidae				
109.	*Elaenia flavogaster*	A, V		LC	LC
110.	*Elaenia parvirostris ^ **	C	ICN-38348	LC	LC
111.	*Camptostoma obsoletum pussillum (venezuelae) **	V, A, C	ICN-38308	LC	LC
112.	*Mionectes olivaceus*	C	-	LC	LC
113.	*Mionectes oleagineus*	C, V	-	LC	LC
114.	*Leptopogon amaurocephalus*	V	-	LC	LC
115.	*Leptopogon superciliaris*	V	-	LC	LC
116.	*Lophotriccus pileatus*	V	-	LC	LC
117.	*Atalotriccus pilaris*	A, V	-	LC	LC
118.	*Poecilotriccus sylvia*	A	-	LC	LC
119.	*Todirostrum cinereum*	A, V	-	LC	LC
120.	*Tolmomyias sulphurescens*	V	-	LC	LC
121.	*Platyrinchus mystaceus neglectus **	C	OAC-236	LC	LC
122.	*Myiobius villosus villosus **	C	ICN-38312	LC	LC

No.	Taxa	Type of record	Evidence	Threat category	
				Global	Colombia
123.	*Terenotriccus erythrurus fulvigularis**	C, V	ICN-38323	LC	LC
124.	*Lathrotriccus euleri*	V	-	LC	LC
125.	*Sayornis nigricans*	V	-	LC	LC
126.	*Legatus leucophaius*	A, V	-	LC	LC
127.	*Myiozetetes cayanensis*	A, V	-	LC	LC
128.	*Myiozetetes similis*	A, V	-	LC	LC
129.	*Pitangus sulphuratus*	A, V	-	LC	LC
130.	*Myiodynastes maculatus*	V	-	LC	LC
131.	*Megarhynchus pitangua*	A, V	-	LC	LC
132.	*Tyrannus melancholicus*	A, V	-	LC	LC
133.	*Tyrannus savana*	V	-	LC	LC
134.	*Sirystes albocinereus*	V	-	LC	LC
135.	*Myiarchus tuberculifer*	A, V	-	LC	LC
136.	*Myiarchus tyrannulus*	C, V	-	LC	LC
xxix.	Cotingidae				
137.	*Rupicola peruvianus aequatorialis **	C, V	ICN-38335	LC	LC
xxx.	Pipridae				
138.	*Masius chrysopterus ssp. **	C, V	ICN-38341	LC	LC
139.	*Manacus manacus*	A, V	-	LC	LC
140.	*Machaeropterus regulus zulianus**	V, A, C	OAC-227	LC	LC
141.	*Ceratopipra erythrocephala erythrocephala **	V, A, C	ICN-38775	LC	LC
xxxi.	Tityridae				
142.	*Tityra cayana*	A, V	-	LC	LC
143.	*Pachyramphus rufus*	A, V	-	LC	LC
144.	*Pachyramphus cinnamomeus*	V	-	LC	LC
145.	*Pachyramphus polychopterus*	C, V	-	LC	LC
xxxii.	Vireonidae				
146.	*Hylophilus flavipes*	A, V	-	LC	LC
147.	*Vireolanius eximius*	A, V	XC86576	LC	LC
148.	*Pachysylvia aurantiifrons helvinus **	C, V	ICN-38329	LC	LC
149.	*Vireo olivaceus*	V	-	LC	LC
xxxiii.	Corvidae				
150.	*Cyanocorax violaceus violaceus **	V, A, C	ICN-38356	LC	LC
151.	*Cyanocorax yncas cyanodorsalis % **	V, A, C	ICN-38359	LC	LC
xxxiv.	Troglodytidae				
152.	*Microcerculus marginatus marginatus**	V, A, C	ICN-38777	LC	LC
153.	*Troglodytes aedon*	A, V	-	LC	LC
154.	*Pheugopedius rutilus*	V, A, C	-	LC	LC
155.	*Thryophylus rufalbus*	A, V	-	LC	LC
156.	*Cantorchilus leucotis*	A	-	LC	LC
157.	*Henicorhina leucophrys*	A	-	LC	LC
xxxv.	Polioptilidae				
158.	*Ramphocaenus melanurus*	A, V	-	LC	LC
xxxvi.	Turdidae				
159.	*Myadestes ralloides venezualensis*	V, A, C	ICN-38350	LC	LC

No.	Taxa	Type of record	Evidence	Threat category	
				Global	Colombia
160.	*Catharus dryas*	A	XC86577	LC	LC
161.	*Turdus leucomelas*	A, V	-	LC	LC
162.	*Turdus nudigenis*	A, V	-	LC	LC
163.	*Turdus albicollis phaeopygoides* *	V, A, C	ICN-38331, OAC-237	LC	LC
xxxvii.	Mimidae				
164.	*Mimus gilvus*	A, V	-	LC	LC
xxxviii.	Thraupidae				
165.	*Chlorophanes spiza*	V	-	LC	LC
166.	*Hemithraupis guira*	V	-	LC	LC
167.	*Sicalis flaveola*	V	-	LC	LC
168.	*Volatinia jacarina*	V	-	LC	LC
169.	*Tachyphonus luctuosus*	V	ICN-38367	LC	LC
170.	*Tachyphonus rufus*	C, V	-	LC	LC
171.	*Ramphocelus carbo*	V, A, C	-	LC	LC
172.	*Lanio fulvus peruvianus %**	V, A, C	ICN-38326	LC	LC
173.	*Cyanerpes caeruleus*	V	-	LC	LC
174.	*Cyanerpes cyaneus #*	V	-	LC	LC
175.	*Tersina viridis*	V	-	LC	LC
176.	*Dacnis cayana*	V	-	LC	LC
177.	*Sporophila minuta*	V	-	LC	LC
178.	*Sporophila crassirostris*	V	-	LC	LC
179.	*Sporophila nigricollis*	V	-	LC	LC
180.	*Saltator maximus*	A, V	-	LC	LC
181.	*Saltator coerulescens*	A, V	-	LC	LC
182.	*Coereba flaveola*	A, V	-	LC	LC
183.	*Schistochlamys melanopis*	V	-	LC	LC
184.	*Cissopis leverianus*	V	-	LC	LC
185.	*Tangara cayana*	V	Fig. 3E	LC	LC
186.	*Tangara cyanicollis*	V	-	LC	LC
187.	*Tangara gyrola toddi* *	C, V	ICN-38344, 38345	LC	LC
188.	*Tangara arthus*	V	-	LC	LC
189.	*Thraupis episcopus*	A, V	-	LC	LC
190.	*Thraupis palmarum*	A, V	-	LC	LC
191.	*Ixothraupis guttata bogotensis* *	C, V	Fig. 3F, ICN-38311	LC	LC
xxxix.	Emberizidae				
192.	*Chlorospingus flavopectus*	V	-	LC	LC
193.	*Ammodramus humeralis*	A, V	-	LC	LC
194.	*Arremonops conirostris*	A, V	-	LC	LC
195.	*Arremon taciturnus*	C, V	-	LC	LC
xl.	Cardinalidae				
196.	*Piranga rubra*	V	-	LC	LC
197.	*Piranga leucoptera*	V	-	LC	LC
198.	*Habia rubica coccinea % **	V, A, C	Fig. 3G, ICN-38313, 38314, 38330, 38780, 38781	LC	LC

No.	Taxa	Type of record	Evidence	Threat category	
				Global	Colombia
199.	*Cyanoloxia cyanoides cyaniodes* *	A, C	Fig. 3H, ICN-38773	LC	LC
xli.	Parulidae				
200.	*Setophaga ruticilla*	V	-	LC	LC
201.	*Setophaga pitiayumi*	V	-	LC	LC
202.	*Setophaga striata*	V	-	LC	LC
203.	*Myiothlypis cinereicollis pallidulus* *	C, V	Fig. 2F, ICN-38333	NT	NT
204.	*Basileuterus culicivorus austerus* *	C, V	ICN-38338	LC	LC
xlii.	Icteridae				
205.	*Psarocolius angustifrons*	A, V	-	LC	LC
206.	*Psarocolius decumanus*	A, V	-	LC	LC
207.	*Icterus auricapillus*	V	-	LC	LC
208.	*Gymnomystax mexicanus*	V	-	LC	LC
209.	*Molothrus oryziborus*	V	-	LC	LC
210.	*Sturnella magna*	A, V	-	LC	LC
211.	*Sturnella militaris*	A, V	-	LC	LC
xliii.	Fringillidae				
212.	*Euphonia chlorotica*	V	-	LC	LC
213.	*Euphonia laniirostris crassirostris* *	C, V	ICN-38343	LC	LC
214.	*Euphonia xanthogaster lecroyana (badissima)* *	C, V	ICN-38327, 38355	LC	LC
215.	*Chlorophonia cyanea*	V	-	LC	LC

Appendix 2. Subspecies used for a biogeographic approach analysis (see Figs. 1B & 5). There were seven sites to compare: (1) Río Tame (present study), (2) Northeastern Andean foothills (all eastern foothills of the northern Colombian Eastern Andes, including the Táchira Andes), (3) the Cordillera de Mérida (from the Táchira depression northeast through the Venezuelan Andes), (4) the Serranía de Perijá (the northernmost Andes site between Colombia and Venezuela), (5) the Sierra de la Macarena (an isolated mountain on the transition between the Orinoquian and Amazon regions), (6) the Catatumbo lowlands (including the Maracaibo lake basin), and (7) the Orinoquian Llanos (of eastern Colombia and southwestern Venezuela). Identification of subspecies was based on Instituto de Ciencias Naturales Ornithology Collection, at Bogotá, and also in lists of species collected on the seven geographic sites (Blake 1962, Meyer de Schauensee 1964, Aveledo & Pérez 1989, 1994, Rojas & Piragua 2000, Hilty 2003, Avendaño 2012, Clements *et al.* 2013, López-O *et al.* 2014, J. Pérez-Emán pers. comm.). Taxonomy follows the classification of the South American Checklist Committee (Remsen *et al.* 2017). * denotes that geographic ranges were taken from Clements *et al.* (2013), whereas ** that nomenclature and geographic range follows Meyer de Schauensee (1964).

Taxa	Site (s)	Geographic range *
Penelope argyrotis argyrotis	1, 2, 3	Montane forests of N Colombia and N Venezuela
P. argyrotis albicauda	4	Sierra de Perijá (Colombia – Venezuela border)
Claravis pretiosa	1, 2, 3, 4, 5, 6, 7	(Monotypic species) SE Mexico (San Luis Potosí) to N Argentina and s Brazil
Leptotila rufaxilla pallidipectus	1, 3, 5, 7	Tropical E Colombia and adjacent W Venezuela
L. rufaxilla dubusi	5, 7	SE Colombia and E Ecuador to Tepuis of Venezuela and Brazil
Florisuga mellivora mellivora	1, 2, 3, 4, 5, 6	Tropical S Mexico to N Bolivia and Amazonian Brazil; Trinidad
Phaethornis griseogularis griseogularis	1, 2, 3, 4, 5, 6	Andes of Colombia to N Peru, S Venezuela and adjacent Brazil
P. augusti augusti	1, 2, 3, 4, 5, 6	Colombia (E Andes and Macarena Mts.) to mts. of N Venezuela
P. guy apicalis	1, 2, 3, 4, 5, 6	E slope of Andes (N Colombia to NW Venezuela and E Peru)
Lophornis delattrei lessoni	1, 2, 4	Locally from SW Costa Rica to Andes of central Colombia
Klais guimeti guimeti	1, 2, 3, 4, 5	E Colombia to Venezuela, Brazil, E Ecuador and N Peru
Thalurania colombica colombica	1, 2, 3, 4, 6	N Colombia and NW Venezuela
T. colombica rostrifera	2	NW Venezuela (SW Táchira)
Amazilia viridigaster viridigaster	1, 2, 5	E slope of Eastern Andes of Colombia
A. viridigaster iodura	2, 6	Andes of W Venezuela (Táchira)
Chrysuronia oenone oenone	1, 2, 3, 4, 5, 6	E Colombia to E Venezuela, E Ecuador, NE Peru and W Brazil
Malacoptila mystacalis mystacalis	1, 2, 3, 4, 6	Andes of Colombia and N Venezuela
Ramphastos ambiguus abbreviatus	1, 2, 3, 4, 6	E slope of Andes of Colombia to W Venezuela and E Peru
R. ambibuus ambiguus	2, 5	Northern section of upper Amazon basin
Dryocopus lineatus lineatus	1, 2, 3, 4, 5, 6, 7	E Costa Rica to W Colombia, E Peru, N Paraguay and E Brazil
Myrmotherula schisticolor sanctamartae	1, 2, 3	NE Colombia (Santa Marta Mts.) and mts. of N Venezuela
M. schisticolor interior	2	Andean slopes from e Colombia to s Peru (Puno)
Pithys albifrons peruvianus	1, 2, 5	E Colombia to W Venezuela, N-C Peru and NW Amazonian Brazil
Glyphorynchus spirurus integratus	1, 3, 4, 6	N Colombia and W Venezuela
*G. spirurus sublestus***	2	Eastward to the lower Cauca and east to the Andes in Boyacá and Arauca
G. spirurus rufigularis	5	Tropical E Colombia to S Venezuela, NE Ecuador and NW Brazil
Lepidocolaptes souleyetii lineaticeps	1, 2, 3, 4, 6	Cent. and E Panama to N Colombia and W Venezuela
Xenops minutus neglectus	1, 3, 6	N Colombia and N Venezuela
X. minutus remoratus	2, 5	Tropical E Colombia to S Venezuela and N Brazil
X. minutus olivaceus	4	Lowlands of NE Colombia
X. minutus ruficaudus	7	Extreme E Colombia to Venezuela, the Guianas and N Brazil
Synallaxis albescens insignis	1, 2, 5, 7	Andes of Colombia
S. albescens perpallida	4, 6	NE Colombia (Guajira Peninsula) and NW Venezuela
S. albescens occipitalis	3, 4	E Colombia and NW Venezuela (montane areas)
S. albescens josephinae	5	S Venezuela, Guyana, Suriname and adjacent N Brazil
S. albescens trinitatis	7	E Venezuela and Trinidad. (Not recognized by Remsen 2003; included in *nesiotis)*
Elaenia parvirostris	1, 2, 3, 4, 5, 6, 7	(Monotypic species=) S Brazil to Bolivia and C Argentina; winters N to Colombia
*Camptostoma obsoletum bogotensis***	2, 5	Eastern base of the Andes in Meta
C. obsoletum pusillum (venezuelae)	1, 3, 4, 6, 7	Caribbean coast of N Colombia and N Venezuela, Trinidad

Taxa	Site (s)	Geographic range *
*C. obsoletum napaeum***	2	Extreme S-central Venezuela to the Guianas and N Brazil; East of the Andes
C. obsoletum olivaceum	2, 5	SE Colombia to E Ecuador, NE Peru and W Brazil (W Amazonas)
Platyrinchus mystaceus neglectus	1, 2, 5, 6	E Costa Rica to E Colombia and extreme NW Venezuela
P. mystaceus perijanus	4	Subtropical Sierra de Perijá (Colombia – Venezuela border)
P. mystaceus insularis	3	N Venezuela, Trinidad and Tobago
Myiobius villosus villosus	1, 2	E Panama (Cerro Tacarcuna) to W Colombia and W Ecuador
M. villosus schaeferi	2, 3, 4	E Andes of N Colombia and extreme W Venezuela (Táchira)
Terenotriccus erythrurus fulvigularis	1, 3, 4, 6	Tropical SE Mexico to Colombia, W Ecuador and Venezuela
T. erythrurus signatus	2, 5	E Colombia to NE Peru (north of Río Marañón)
T. erythrurus venezuelensis	7	Extreme E Colombia to S Venezuela and NW Brazil
Rupicola peruvianus aequatorialis	1, 2, 3	Andes of E Colombia to W Venezuela, E Ecuador and E Peru
Masius chrysopterus ssp.	1	(Eastern Andes of Colombia: Santanderes)
M. chrysopterus chrysopterus	2, 3	Central and Eastern Andes of Colombia and NW Venezuela
M. chrysopterus pax	2	Subtropical SE Colombia (E Nariño) and E Ecuador
Machaeropterus regulus zulianus	1, 2, 3, 4, 6	Tropical W Venezuela (W Zulia, Táchira and N Barinas)
*M. regulus striolatus***	2, 5	Tropical E Colombia to E Ecuador, NE Peru and W Amazonas Brazil; E of
M. regulus obscurostriatus	3	Tropical NW Venezuela (Mérida)
Ceratopipra erythrocephala erythrocephala	1, 2, 3, 4, 6, 7	E Panama to the Guianas and Brazil north of R. Amazon, Trinidad
C. erythrocephala berlepschii	2, 5, 6	Tropical SE Colombia to NE Peru and W Amazonian Brazil
Hylophilus aurantiifrons helvinus	1, 2, 3	Tropical NW Venezuela (Zulia to N Mérida and S Táchira)
H. aurantiifrons saturatus	4, 7	Tropical E Colombia to N Venezuela, Trinidad
Cyanocorax violaceus violaceus	1, 2, 5, 7	E Colombia to Venezuela, Guianas, Brazil, Peru and N Bolivia
C. yncas cyanodorsalis	1, 2, 4	E Andes of Colombia and NW Venezuela
C. yncas andicolus	3, 4	Mountains of N Venezuela
Microcerculus marginatus marginatus	1, 2, 5	E Colombia to N Bolivia and W Amazonian Brazil
M. marginatus squamulatus	2, 3, 4, 6	NE Colombia and NW Venezuela
Myadestes ralloides venezuelensis	1, 2, 3, 4	E Andes of Colombia to N Venezuela, E Ecuador and N Peru
Turdus albicollis phaeopygoides	1, 3, 4, 6	NE Colombia to N Venezuela, Trinidad and Tobago
T. albicollis spodiolaemus	2, 5	E Ecuador to E Peru, N Bolivia and W Brazil
*T. albicollis berlepshi***	2	E Andes from Meta southward to Putumayo
Lanio fulvus peruvianus	1, 2, 5	S Colombia (E of the Andes) to E Ecuador and NE Peru
T. gyrola toddi	1, 3, 4, 6	Mountains of N Colombia and NW Venezuela
T. gyrola catharinae	2, 5	E base of Eastern Andes of Colombia to central Bolivia
Ixothraupis guttata bogotensis	1, 2, 3, 4, 5	Colombia (E of the Andes) and adjacent W Venezuela
Habia rubica coccinea	1, 2, 3	E base of E Andes of N-central Colombia and W Venezuela
H. rubica rhodinolaema	2, 5	SE Colombia E of the Andes to NE Peru and extreme NW Brazil
H. rubica perijana	4, 6	Sierra de Perijá (Colombia – Venezuela border)
Cyanocompsa cyanoides cyanoides	1, 3, 4	Cent. and E Panama to Colombia, NW Venezuela and W Ecuador
C. cyanoides rothschildii	2, 5, 6	E Colombia to Venezuela, the Guianas, Amaz. Brazil and Bolivia
Myiothlypis cinereicollis pallidulus	1	Andes of NE Colombia and W Venezuela
M. cinereicollis cinereicollis	2, 3	Eastern Andes of Colombia (Santander del Norte to W Meta)
M. cinereicollis zuliensis	4	Sierra de Perijá (Colombia – Venezuela border)
Basileuterus culicivorus austerus	1, 2	E slope of E Andes of Colombia (Boyacá, Cundinamarca and Meta)
B. culicivorus cabanisi	3, 4	Extreme NE Colombia (Santander del Norte) and NW Venezuela
B. culicivorus indiguus	4	Santa Marta Mountains (NE Colombia)
B. culicivorus olivascens	6	E slope of E Andes of Colombia, N Venezuela and Trinidad
Euphonia laniirostris crassirostris	1, 3, 4, 6	Costa Rica to N Colombia and N Venezuela
E. laniirostris melanura	5, 7	E Colombia to E Ecuador, N Peru and W Amazonian Brazil
E. xanthogaster lecroyana (badissima)	1, 2, 3, 6	W Venezuela (Táchira, Mérida, Lara, Barinas and Zulia)
E. xanthogaster brevirostris	2, 5, 7	E Colombia to Venezuela, Guianas, nw Brazil and e Peru
E. xanthogaster exsul	4	Mountains of NE Colombia and N Venezuela