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First documented record of *Amazilia tzacatl* (de la Llave, 1893) (Aves, Trochilidae) in the Colombian Orinoco region and comments of its distribution at the eastern Andes

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Abstract
Land use change and anthropic colonization influence forest degradation and biodiversity turnover. We present the first documented record of the Rufous-tailed Hummingbird, *Amazilia tzacatl*, for the eastern slope of the Andes-Orinoco region of Colombia. This hummingbird is widely known as a "non-forest" species in lowlands in the west of the Andes. We discuss recent observations in the eastern Andes. These records could be associated with land use change and deforestation fronts through the Andes.

Key words
Andean passes; Arauca; colonization of generalist species; deforestation; hummingbird distribution; piedmont.

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Introduction

Land use and land cover change have important impacts on the biodiversity sustainability, and even it can be one of the drivers for tropical speciation (Smith et al. 2014). Between 2001 and 2010, Latin America and the Caribbean region has experienced both deforestation and reforestation trends, with a net balance of 179,405 km^2 of woody vegetation loss (Aide et al. 2013). Studies have shown that the dynamic of changes in land use can drive either local extinction process or colonization by generalist species (Renjifo 1999, Stiles et al. 1999). For example, Renjifo (1999) documented the loss of biodiversity (i.e. extinction of large body size birds) in the Central Andes of Colombia after long-term fragmentation process. In contrast, Stiles et al. (1999) showed the colonization of open areas by generalist bird species (e.g. *Sicalis flaveola* (Linnaeus 1766), *Sporophila crassirostris* (J.F. Gmelin 1789), *Icterus nigrogularis* (Hahn 1819)) in the deforested Middle Magdalena Valley in Colombia. Although the above examples evidence some of the general patterns in these demographic processes, such as local extinction or colonization, many poorly known sites could be experiencing those dynamics without any documentation. Here, we present the first documented record of a generalist hummingbird for a region that has experienced

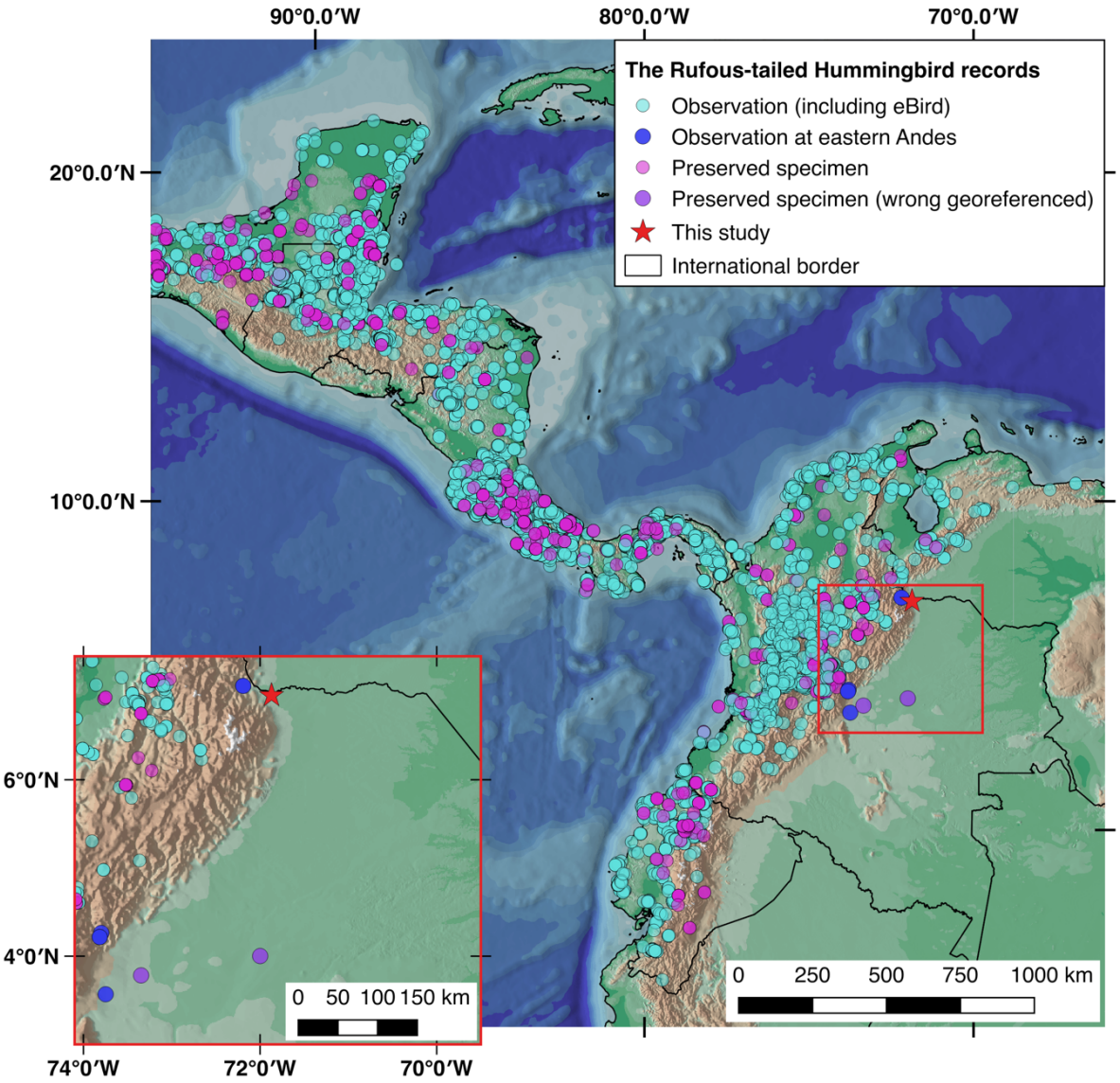

Figure 1. Occurrence data of *Amazilia tzacatl* based on 58,033 records accessed from the Global Information Biodiversity Facility - GBIF (2017). Records included 2 specimens wrong georeferenced in GBIF. Inset image is a zoom to the east slope of the Eastern Andes of Colombia and western Colombian Orinoco region.

great deforestation and land use cover change since the middle 1950s but has been understudied: the foothills of the Orinoco region lowlands of Colombia.

The Rufous-tailed Hummingbird *Amazilia tzacatl* (De la Llave 1833) is one of the most common and generalist hummingbirds in degraded areas at the northern parts of South and Central America. It is widely distributed in the north and west of the Andes, from Mexico to Ecuador and Venezuela. This hummingbird is more common in non-forest lowlands, but it occurs from 1700 to 1800 m in Colombia (Hilty and Brown 1986), and up to 2500 m in some places of Ecuador, possibly related to local altitudinal migration (Ridgely and Greenfield 2001). At the northern of South America, *A. tzacatl* occurs in the Pacific lowland forests, inter-Andean valleys, and the Maracaibo basin, including the Cordillera de Mérida in Venezuela, but excluding the open lowlands of the Orinoco region as well as the dry Caribbean coast (Fig. 1; Acevedo-Charry et al. 2014, Hilty and Brown 1986, Sullivan et al. 2009).

At the east slope of the Colombian Andes, there are few presumed sight records without documentation or further analysis in Putumayo foothills (Salaman and Mazariegos 1998), as well as recent observations in Meta, Cundinamarca, and Norte de Santander (Fig. 1; Sullivan et al. 2009). In addition, there is a misidentified skin specimen from the Meta foothills held in the Universidad de los Andes ornithological collection in Bogotá (ANDES-O-57; Acevedo-Charry et al. 2014, BioMap 2006), and 2 wrong georeferenced specimens in the Royal Belgian Institute of Natural Science (RBINS-A-391953) and in the Moore Laboratory of Zoology (MLZ-B-520). Although the evidence seems unconfirmed in the Orinoco region of Colombia, and there are no Casanare nor Arauca records well documented, Zamudio et al. (2010) included this hummingbird species in a review about the birds present in Casanare without any confirmed documentation. Our record is thus the first documented confirmation of the presence of *A. tzacatl* in the Orinoco

Figure 2. First documented record of *Amazilia tzacatl* in the lower foothills of the Colombian Orinoco region.

region, specifically in the Arauca lower foothills (Fig. 1). We present below details of our observation followed by a discussion of the geographical distribution of *A. tzacatl* in the region and the significance of our record and other recent observations.

Methods

Our record was made in the town of Saravena, in the western Arauca department (06°57′13″ N, 071°52′13″ W). Saravena is located in a region that has been historically known as the Sarare, only 90 km southward from the Cordillera de Mérida in Venezuela, and less than 70 km from the Táchira Depression. The Sarare region has received very little attention for research over the past 40 years, due in part of the socio-political instability of the region. Since its foundation in 1972 Saravena has functioned as a front for deforestation, causing the region to experience intense land use cover change. Recently, it was identified as a hotspot of deforestation in Colombia (Sánchez-Cuervo and Aide 2013).

We observed 1 individual of *A. tzacatl* between 13:04 h and 14:00 on 20 December 2012 in a garden house at the northeast of Saravena. The hummingbird visited the flowers of a *Etilingera elatior* (Jack) R.M. Smith (Zingiberaceae) inflorescence, an ornamental plant known locally as "bastón de emperador" and widely used in house gardens through the region (Fig. 2). After 15 mins of the first sight, the hummingbird was back to visit the same inflorescence. After 10 mins of foraging, it was perched just a few meters from the inflorescence to groom itself. Then, the hummingbird was absenting for over 5 mins, but it went back to the first perch revisiting the same inflorescence.

Although this species is very common at the west slope of Eastern Andes, we did not expect its presence at its east slope. To confirm our novelty, we assessed the Global Biodiversity Information Facility (GBIF 2017) distributional data for *A. tzacatl* (Supplemental Data). GBIF (2017) comprised almost 60,000 records, combining literature records from Central America, observations (mainly from eBird), and preserved specimens. Literature records were confined to Mexico; thus, we did not use them given our regional interest (the east slope of Eastern Andes). We use only observations and preserved specimens to create the Figure 1 (Supplemental Data).

Results

New records. Colombia, Arauca, Saravena, (06°57′13″ N, 071°52′13″ W), Orlando Acevedo-Charry, Orlando E. Acevedo-S. and Sonia I. Charry-B., 20 December 2012, Photographed only (Fig. 2), 1 individual.

Identification. The individual was identified based on the combination of their characteristic red bill, including

upper and lower mandible; rufous tail, with dingy lower underparts; and green head (Fig. 2, Hilty and Brown 1986). Such morphological combination is absenting in the Golden-tailed Sapphire, *Chrysuronia oenone* (Lesson, 1832), in which the adults have a blue head, their mandibles are bicolor, lower mandible is pink, and upper mandible is black. The other congeners in the Orinoco region (see Acevedo-Charry et al. 2014), Versicolored Emerald, *A. versicolor* (Vieillot, 1818), Glittering-throated Emerald, *A. fimbriata* (Gmelin, 1788), or Green-bellied Hummingbird, *A. viridigaster* (Bourcier, 1843), have a greenish or purplish tail.

Discussion

Only 8 of 58,033 records of *A. tzacatl* in GBIF (2017) correspond to the east slope of the Colombian Eastern Andes (Fig. 1, Supplemental Data). As we mentioned, 2 of those 8 records are wrongly georeferenced specimens (RBINS-A-391953, MLZ-B-520). The remaining 6 records correspond to observations between 2009 and 2015 from the Rio Ariari in San Martin (Meta), the road between Toledo and Gibraltar (Norte de Santander), the Vereda Monterredondo in Guayabetal (Cundinamarca), and the town of Pipiral (Meta). None of the above records present documentation in eBird (Sullivan et al. 2009). The records from Meta and Cundinamarca are more than 300 km south-southwest of Saravena. Although the road between Toledo and Gibraltar (Norte de Santander) is less than 200 km northwest from Saravena, our record is the first confirmed record in Arauca and serves to validate the current presence of *A. tzacatl* in the Colombian Orinoco region, at the east slope of the Eastern Andes.

The Eastern Andes and the Orinoco region of Colombia showed significant change in land use cover within Colombia and Latin America analysis (Aide et al. 2013, Sanchez-Cuervo et al. 2012). Indeed, the foothills municipalities had a significant loss in woody cover between 2001 to 2010 (Sánchez-Cuervo and Aide 2013), but this trend is perhaps followed by historical change without documentation given the lack of information to this region in Colombia (Arbeláez-Cortés 2013, Acevedo-Charry 2017). For example, between 1956 and 1970 the Colombian government promoted colonization fronts to transform pristine forest to cattle and agricultural lands, as a post-conflict initiative after "La Violencia" (Baquero 2009, Stiles et al. 1999). Huge extensions of forest with a canopy of 35 m (IGAC 1986) were cleared during this period in Colombia, making the Sarare region in Arauca the most important deforestation front during this period at the east slope of the Eastern Andes, extending from Pamplona and Toledo (Santander and Norte de Santander, respectively) to the Orinoco basin (Baquero 2009).

Few biodiversity surveys have documented the biota in Saravena or in the Sarare region; indeed, specimens collected by K. von Sneidern in 1959 are the main documented reference from the birds around this part of Colombia (Blake 1961). Nevertheless, the information available has allow to postulate biogeographic hypotheses of historic connectivity between the Amazonian region and the Catatumbo region, at south and north of Saravena, respectively (Blake 1961, Hernández-Camacho et al. 1992). For instance, Blake (1961) reported Amazonian biota, such as *Lanio fulvus peruvianus* Carriker 1934, far north of its known distribution. In the same account of species, Blake (1961) also reported for the very first time *Thraupis episcopus cana* (Swainson 1835) at the east slope of the Colombian Andes, a subspecies known for that time only at the west of Eastern Andes. The account of the western *T. episcopus cana* could be influenced by relatively recent colonization in the 1950s, followed by the deforestation front in the Sarare. As both *T. episcopus cana* and *A. tzacatl* are generalists, "non-forest" and relatively common species, their records at the east slope of the Eastern Andes, rather than demonstrating a historical evolutionary prevalence in the region (i.e., ancient presence), probably indicate instead recent movements through geographic discontinuities influenced by the response of the change in land use; these movements may be colonization of open and degraded areas after the forest barriers are removed (Stiles et al. 1999). This hypothesis could be supported by the altitudinal migratory behavior of *A. tzacatl*. However, further phylogeographic analysis of these species is needed to support or reject our hypothesis (see Acevedo-Charry 2017).

In conclusion, our records of *A. tzacatl* in Saravena, and the recent records at the east slope of the Eastern Andes could be associated with the expansion of generalist species by following the change in land use after deforestation. Similar patterns of cis-Andean (Orinoco-Amazon) species recorded at the west slope of the Eastern Andes and Middle Magdalena Valley (trans-Andes) have been recently documented in Colombia (Avendaño et al. 2013, Freeman et al. 2012). As generalist species are colonizing recent open/degraded areas, forest specialist and sensitive species could be extirpated without any documentation. Only continuous and long-term monitoring of the biota could allow identifying lacunas in the response of different biota to the change of land use. This concern is even more importantly during the next postwar context years in Colombia (Baptiste et al. 2017).

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Authors' Contributions

OAC, OEAS, and SICB collected the data, OAC wrote the text, and OEAS edited the text.

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Supplemental Data

R Code used to download the GBIF records of *Amazilia tzacatl* and a table with 58,034 records (including this study) can be downloaded from the journal's web site.