ISSN 1794-0915

# Ornitología Colombiana

ACO
ASOCIACION
COLOMBIANA
DE ORNITOLOGIA

Mayo 2022 | Número 21
http://asociacioncolombianadeornitologia.org/revista-ornitologia-colombiana/

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Imagen de la portada: *Touit stictopterus, Heliangelus mavors, Hapalopsittaca fuertesi, Cardinalis cardinalis*

Fotografías: Fernando Parra-Hernández *et al*., Alberto Peña, John Alexis Franco-Padilla, Santiago Castro.

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## Reseña

# Nota editorial número 21 - Ornitología Colombiana

Con mucha alegría hacemos entrega de un nuevo número de Ornitología Colombiana. Después de varios cambios en nuestro equipo editorial esperamos haber llegado a un equilibrio en el que hemos consolidado una cadena ágil y continua de flujo de manuscritos gracias a la cual entregamos el cierre del primer número de 2022, un año muy significativo para OC pues la revista ¡cumple veinte! Oscar Humberto Marín-Gómez quien nos acompañó durante unos meses, desafortunadamente tuvo que abandonar el equipo por otros compromisos y fue reemplazado por Ronald A. Fernández-Gómez. Ronald es Biólogo de la U. de Nariño, M.Sc. y Ph.D. del Instituto de Neuroetología, de la Universidad Veracruzana (Xalapa, Veracruz, México), y ahora se encuentra vinculado como investigador posdoctoral en la Universidad Nacional Autónoma de México (UNAM). Con sus intereses y experiencia en bioacústica, comunicación animal, ecología sensorial y neuroetología Ronald es un excelente complemento en el equipo al cual se ha acoplado de manera sinérgica y efectiva desde el inicio aportando gran conocimiento, profesionalismo y dedicación. Mil gracias a Oscar Humberto por sus grandes aportes mientras estuvo con nosotros y a Ronald por haber respondido tan rápido a esta emergencia con tanta eficiencia y camaradería.

En este número retomamos dos secciones de interés como son la de las reseñas de libros y los resúmenes de tesis. En la primera F. G. Stiles nos comenta sobre un texto en el que de manera juiciosa se argumenta sobre como el asunto del origen de las aves aún no está resuelto. En la segunda se revive esta idea original de OC en la que recién egresados y sus tutores pueden dar a conocer sus trabajos de investigación para conocimiento de la comunidad científica y como antesala de sus publicaciones. El grueso de este número está dedicado a novedades de registros muy interesantes en zonas poco exploradas y de especies con interés de conservación. Incluimos también un caso de un fenómeno inusual y poco estudiado en aves.

## Agradecimientos

Agradecemos muy especialmente a los editores asociados y evaluadores de los manuscritos publicados en este número por su tiempo y esfuerzo que contribuyen a la rigurosidad de OC y la calidad de sus contribuciones. Contribuyeron con este número: Fernando Ayerbe Quiñones (Col), Diego Carantón (Col), Daniela Gómez Giraldo (Col), Víctor Pulido (Col), Yanira Cifuentes (Col), Jhonathan Miranda (Ven), Glenn Seeholzer (EEUU), Jorge Velásquez Tibatá (Col), Gedio Marín -Espinoza (Ven), Mauricio Linares Porto (Col), Araceli Janette Rodríguez Casanova (Mex) y Gary Stiles (Col). Agradecemos de manera especial a Tatian Celeita por su trabajo esmerado en la diagramación de la revista y por la coordinación eficiente e inteligente de las comunicaciones entre autores, evaluadores y editores. Tatian es pieza clave en el funcionamiento de la revista.

Loreta Rosselli
Revista Ornitología Colombiana

Nuestra portada: *Touit stictopterus* (Fernando Parra-Hernández *et al.*), *Heliangelus mavors* (Alberto Peña), *Hapalopsittaca fuertesi* (John Alexis Franco-Padilla), *Cardinalis cardinalis* (Santiago Castro).

Se incluye el país de residencia actual de los evaluadores que colaboraron en este número.

# Noteworthy bird records from the Araracuara area, Amazonas and Caquetá, Colombia

## Registros notables de aves de los alrededores de Araracuara, Amazonas y Caquetá, Colombia

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## Abstract

We surveyed birds near Araracuara (Caquetá Department) and Puerto Santander (Amazonas Department), Colombia in August 2019 and January/February 2021. Our records included substantial range extensions for *Nyctibius leucopterus*, *Crypturellus brevirostris*, *Polioptila facilis* and *Geothlypis aequinoctialis*. We also encountered numerous species characteristic of poor-soil and rock-outcrop habitats that were previously documented further north on the Chiribiquete massif but never so far south, and we report that many of these species reach the south bank of the Caquetá River. Additionally, we encountered several savanna-associated species on cattle pastures near Puerto Santander, of which two are shared with nearby rock-scrub habitats and three are apparently colonists from elsewhere. We discuss the distribution of the Guianan avifauna in the western Amazon, and we suggest areas where further observations could help to resolve outstanding questions.

Key words: white sands, poor soil, *Crypturellus brevirostris*, *Nyctibius leucopterus*, *Chlorostilbon olivaresi*

## Resumen

Observamos aves por los alrededores de Araracuara (Departamento Caquetá) y Puerto Santander (Departamento Amazonas), Colombia, en agosto 2019 y enero/febrero 2021. Nuestros registros incluyen extensiones de distribución para *Nyctibius leucopterus*, *Crypturellus brevirostris*, *Polioptila facilis* y *Geothlypis aequinoctialis*. También encontramos varias especies características de bosques de suelo pobre y tepuyes rocosos que habían sido documentadas previamente más hacia el norte en el macizo Chiribiquete, pero nunca tan hacia el sur, y reportamos que muchas de estas especies llegan hasta la orilla sur del río Caquetá. Encontramos algunas especies asociadas con sabanas en potreros cerca de Puerto Santander; entre ellas dos se comparten con los tepuyes cercanos y al parecer tres han colonizado desde más lejos. Discutimos la distribución de la avifauna con afiliación guianense en la Amazonía occidental, y sugerimos áreas donde observaciones adicionales podrían ayudar a resolver preguntas pendientes.

Palabras clave: arena blanca, varillal, suelo pobre, *Crypturellus brevirostris*, *Nyctibius leucopterus*, *Chlorostilbon olivaresi*

## Introduction

In the central Colombian Amazon, a series of rock outcrops and mesas extends from southern Guaviare department southwards to Araracuara (Caquetá department) and barely across the rio Caquetá into Amazonas department (Galvis Vergara 1994, Figure 1). Here, we use the term "Araracuara formation" to encompass the entire region of rock outcrops and nearby forests, including the Sierra de Chiribiquete, which comprises the northernmost and tallest rock outcrops as well as the lower mesas further south. Beginning in the 1990s, a series of biological expeditions documented three salient features of the avifauna of the Sierra de Chiribiquete and adjacent areas (Stiles *et al.* 1995, Stiles 1996, Álvarez *et al.* 2003, Stiles and Naranjo

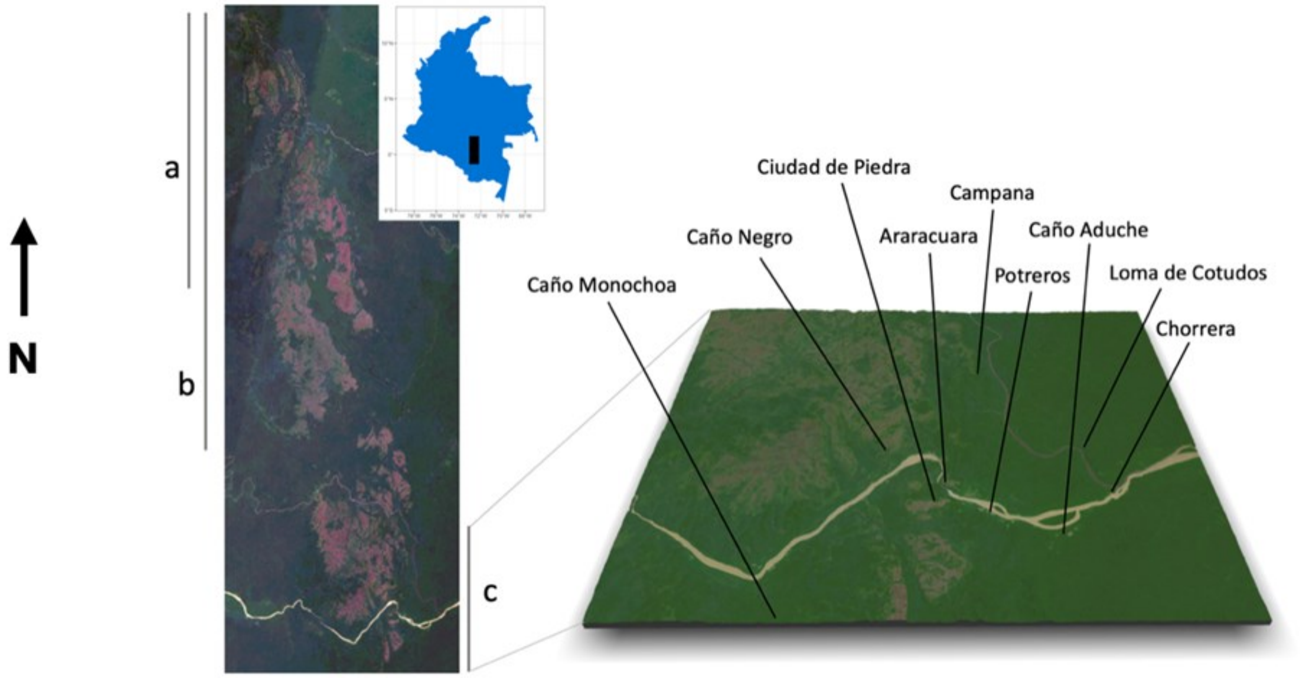

Figure 1. The rock outcrops of the Araracuara formation. Forest habitats are greenish; rock-scrub habitats are pinkish. **(A) (B)** The study regions of Stiles 1996 and Alvarez *et al.* 2003 **(C)** The study region of the current study, with key localities labeled at right. On the right-hand image, the rio Caquetá is the bright pale river crossing the panel from east to west, while the rio Yarí is the darker river that meets the Caquetá near the point labeled "Chorrera".

2017). First, open scrubby habitats atop the outcrops share ornithological affinities with non-forest habitats of the llanos, Magdalena valley, and white-sand savannas of far eastern Colombia. Second, adjacent forests, growing on localized sandy podzols derived from in situ weathering of outcropping sandstone or on more widespread nutrient-poor ultisols (Duivenvoorden 1994), support an avifauna typical of Amazonian white-sand forests. And third, the physical rock outcrops support species that nest and forage at cliff faces or river rapids.

Previous expeditions have focused primarily on the northern and central parts of the Araracuara formation (*i.e.* the Sierra de Chiribiquete). The southernmost part of the formation reaches the Caquetá River at Araracuara and extends barely south into Amazonas department at Puerto Santander. At Araracuara, the Caquetá River is only *ca.* 100 meters wide as it flows through a spectacular canyon flanked on both sides by low-stature forest. Thus, the river is unlikely to pose a biogeographic barrier for the poor-soil and scrub-associated birds of the Chiribiquete. Although Araracuara is accessible by regular airplane flights and has served as a point of entry for expeditions to the central Araracuara formation, the outcrops and forests immediately around Araracuara and Puerto Santander have received almost no ornithological attention since the collections of H. Romero in 1977 (Stiles 1996). We surveyed birds near Araracuara and Puerto Santander during three expeditions in August 2019, January 2021, and February 2021.

**Localities visited.-** We obtained noteworthy records at 9 localities (Figure 1, Table 1) as follows: 1) Ciudad de Piedra is one of several rock outcrops south of the Caquetá River at Puerto

Table 1. Localities visited

| Site name | Coordinates |
|---|---|
| Ciudad de Piedra | -0.63°, -72.41° |
| Caño Negro | -0.55°, -72.46° |
| Campana | -0.44°, -74.34° |
| Loma de Cotudos | -0.56°, -72.27° |
| Caño Monochoa | -0.77°, -72.54° |
| Caño Aduche | -0.66°, -72.31° |
| Araracuara | -0.60°, -72.40° |
| Potreros | -0.63°, -72.37° |
| Chorrera | -0.61°, -72.25° |

Santander and reaches a maximum elevation of *c.* 330 m. The approach to the outcrop features stunted white-sands forest that gives way to patchy scrub growing between areas of exposed bedrock, with abundant flowering *Decagonocarpus cornutus*. 2) Caño Negro is an indigenous community on the north bank of the Caquetá River that includes a rock outcrop similar to Ciudad de Piedra. Unlike Ciudad de Piedra, the outcrop at Caño Negro is connected to a large complex of near-contiguous outcrops stretching north to the Mesay River. 3) Campana, on the right bank of the lower Yarí River, supports tall forest on gently sloping terrain that gradually ascends from the bank of the Yarí at *c.* 100 m to the flank of a mesa at *c.* 280 m. At the highest elevations, the tall forest gives way to progressively more stunted forest and eventually to scrub growing on peat at least 70 cm (one machete length) deep, with trees 2-5 meters tall interspersed with sedges. Compared to Ciudad de Piedra, the scrub at Campana is floristically poor, with just 1-2 dominant woody species and no flowering *Decagonocarpus cornutus*. 4) Loma de Cotudos, on the left bank of the lower Yarí River, supports extensive medium-stature poor-soil forest on flat terraces dissected by small forest streams. Based on Duivenvoorden (1994) we believe the soils here to be weathered ultisols. 5) Caño Monochoa is a south-bank tributary of the Caquetá River upstream from Puerto Arturo, featuring poor-soil forest. We visited several additional south-bank sites upstream from Puerto Arturo, but did not obtain any noteworthy records for inclusion here. 5) Caño Aduche is a small blackwater tributary on the south bank of the Caquetá River downstream from Puerto Santander, home to an Andoke community of the same name. 7) Araracuara is a military base and airstrip with access to disturbed areas, stunted white-sands forest, and an overlook over the spectacular canyon of the Caquetá River as it flows through a water gap in the Araracuara formation. 8) Potreros is a series of pastures carved out of hilly forest on the right bank of the Caquetá River, downstream from Puerto Santander. 9) Chorrera (not to be confused with the town of La Chorrera, Amazonas), is a set of navigable rapids on the Caquetá River near the mouth of the rio Yarí.

Our survey effort was uneven across these sites. We visited Ciudad de Piedra on four separate days, but never during the early morning. We spent three days at Caño Negro, with one day focused on the rock outcrop. We conducted standardized point-count surveys for four days at Loma de Cotudos, four days at Campana, and three days at Potreros. We spent one morning birding at Caño Monochoa. We visited Araracuara on five days, but often during the heat of the day and without a strong focus on bird surveys. We observed birds incidentally at Caño Aduche during a visit to meet with the indigenous Andoke community there. We passed through Chorrera repeatedly as we traveled between Puerto Santander and the Yarí River, but we observed birds only from the moving boat.

**Documentation.-** Most of the records mentioned here are supported by photographs (archived at the Macaulay Library) or audio recordings (archived at Xeno-Canto). In the following accounts, numbers preceded by the letters XC are Xeno Canto catalog numbers. All audio documentation, including documentation mentioned in Tables 2 and 3, is collated in a curated collection at https://www.xeno-canto.org/article/260.

**Range extensions.-** *Crypturellus brevirostris* (Rusty Tinamou) We voice-recorded multiple individuals of a *Crypturellus* tinamou at Campana on 15 and 16 August 2019 (XC585282). By voice, these recordings clearly involve either *C. brevirostris* or *C. bartletti*, neither of which is known from the vicinity. Bret Whitney identified the recordings as *Crypturellus brevirostris* based on subtle vocal characters. In addition, the habitat (poor-soil terra firme forest) is more typical for *C. brevirostris* than for *C. bartletti*. The nearest previous localities for *C. brevirostris* are in Brazil along the rio Uaupes (Hilty & Brown 1986). The only previous Colombian record is a sight-record from the Serranía de Naquen roughly 540 km to the northeast (Newman 2008). Thus, this record is the first for Caquetá department and is the first documented record for Colombia.

*Chlorostilbon olivaresi* (Chiribiquete Emerald) We voice-recorded and photographed this species on rock outcrops on both sides of the Caquetá River. These records will be detailed in a forthcoming manuscript.

*Nyctibius leucopterus* (White-winged Potoo) We voice-recorded one individual at Campana that sang spontaneously at 1755h on 15 August 2019 and then vocalized twice more in response to whistled imitation (Fig. 2, XC585020, XC585021). The habitat was tall forest less than 1 km from extremely stunted forest. This species went unrecorded between its description in 1821 and its rediscovery in 1985 (Cohn Haft 1993), but subsequent discoveries have clarified that it is widespread in poor-soil habitats across Amazonia (Alvarez Alonso & Whitney 2003, Socolar *et al.* 2018). The nearest known locality is the Algodoncillo River in Peru, roughly 260 km to the south (Socolar *et al.* 2018). The song, if not the bird itself, is apparently familiar to members of nearby Andoke communities, and so our claim to the first documented record in Colombia must be viewed narrowly.

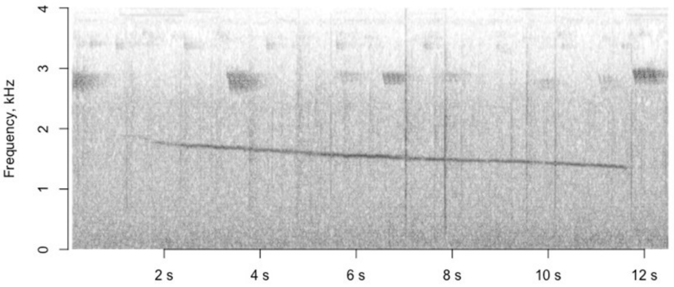

Figure 2. Spectrogram of a vocalization of White-winged Potoo (clear descending tone between 2 and 1 kHz), recorded after whistled imitation at 1755h on 15 August 2019 at Campana. Prepared using the soundgen package in R (Anikin 2019).

*Polioptila facilis* (Río Negro Gnatcatcher) We observed 1-2 *Polioptila* with a large canopy mixed flock in the interior of tall forest at Campana on 13 and 16 August 2019. The birds remained high in the canopy where they were backlit against an overcast sky, but they appeared to lack the extensively white breast and throat of *P. plumbea*. Moreover, *P. plumbea* would not be expected to occur with canopy flocks in tall primary forest interior. Still, confirmation via physical documentation would be desirable. To our knowledge, the nearest records are at Mitú, roughly 300 km to the northeast (Janni *et al.* 2013), and physical documentation does not yet exist for this species in Colombia.

*Geothlypis aequinoctialis* (Masked Yellowthroat) We observed two individuals, one of which was singing, at Ciudad de Piedra on 23 January 2021. This species is not known from elsewhere on the Araracuara formation (Alvarez *et al.* 2003) and few records exist from the western Amazon away

Table 2. Species of poor-soil forest

| Species | Site | | | |
|---|---|---|---|---|
| | Loma de Cotudos | Caño Negro | Campana | South-bank[1] |
| *Crypturellus brevirostris* | | | A | |
| *Crypturellus duidae* | A | | | |
| *Topaza pyra* | | | | X |
| *Nyctiprogne leucopyga*[2] | | | | X |
| *Nyctibius leucoptera* | | | A | |
| *Trogon rufus* | A | | A | |
| *Galbula leucogastra* | A | | | |
| *Selenidera nattereri* | X | | | |
| *Notharchus ordii* | | | X | X |
| *Sclerurus rufigularis* | X | | A | |
| *Megastictus margaritatus* | A | | A | |
| *Myrmotherula ambigua* | A | | A | |
| *Herpsilochmus dorsimaculatus* | A | | A | A |
| *Hypocnemis flavescens* | A | X | A | |
| *Hypocnemis hypoxantha* | | | | X |
| *Rhegmatorhina cristata* | A | | | |
| *Percnostola rufifrons* | A | | A | |
| *Lophotriccus galeatus* | | | A | |
| *Conopias parvus* | A | | A | |
| *Platyrinchus platyrhynchos* | A | | X | |
| *Rhytipterna immunda* | | | X | |
| *Neopelma chrysocephalum* | A | X | X | |
| *Heterocercus flavivertex* | | | | X |
| *Xipholena punicea* | A | | X | |
| *Dixiphia pipra* | A | | | |
| *Polioptila facilis* | | | X | |
| *Caryothraustes canadensis* | A | | | |

P: Photo documentation, archived at Macaulay Library.
A: Audio documentation, archived at Xeno Canto; curated at https://www.xeno-canto.org/article/260
X: Sight or sound record without documentation.
1: Although *Rupicola* is a forest bird, we group it with the non-forest species because its presence is related to the physical rock outcrops, which it requires for nesting, rather than the poor soils.

from extensive savannas, large rivers and lakes, or large-scale deforestation.

**Birds of poor-soil forests.-** The forests at Loma de Cotudos, Campana, and Caño Negro supported numerous additional poor-soil specialists that were previously reported further north on the Chiribiquete massif (Table 2). Despite spending little time in forest habitats south of the Caquetá River, we also encountered several poor-soil specialist birds at Ciudad de Piedra, Potreros, Caño Monochoa, and Caño Aduche, and we suspect that most or all of the poor-soil avifauna of the Araracuara formation and adjacent areas will eventually be found to occur to the south bank of the Caquetá in Amazonas Department.

Birds of non-forest habitats.- The rock-scrub habitats at Ciudad de Piedra and Caño Negro and the low scrub at Campana supported numerous regionally noteworthy species that were previously reported further north on the Chiribiquete massif (Table 3). Of these, the pastures at Potreros harbored only *Amazilia versicolor* and *Schistochlamys melanopis* even though these pastures are separated from the rock-scrub of Ciudad de Piedra by just 3 km of heavily degraded forest. On the other hand, the pastures at Potreros support at least three open-country species (*Vanellus chilensis*, *Columbina minuta*, and *Leistes militaris*) that are not known from natural scrub on the Araracuara formation and probably reflect the ongoing colonization of western Amazonia by open-country birds in response to deforestation (Socolar *et al.* 2018, Acevedo-Charry *et al.* 2021). One further species, *Cercomacroides tyrannina*, was found in a very small forest fragment surrounded by pasture; Alvarez *et al.* (2003) report it from forest habitats further north near the Chiribiquete massif, but the species is often associated with nonforest habitats (*e.g.* savanna edges) and is absent from dense forests further south. Finally, two additional species occurred in habitats related directly to the rock outcrops: *Hirundinea ferruginea* on the cliffs at Araracuara, and *Pygochelidon melanoleuca* around the rapids at Chorrera.

Additional noteworthy species.- In addition to birds with known poor-soil affinities, we encountered a handful of species that we consider to be locally or regionally noteworthy. These include *Buteo nitidus* at Potreros, *Neomorphus* sp. at Campana (detected by bill clapping; the species might have been any of *geoffroyi*, *pucheranii*, or *rufipennis*), *Geotrygon saphirina* at Loma de Cotudos, and *Dromococcyx phasianellus* at Loma de Cotudos and Potreros.

## Discussion

The distribution of white-sand and other poor-soil specialist birds remains poorly understood across much of the western Amazon. In the 1990s two series of spectacular finds extended the known range of white-sand species south and west from previous records in the rio Negro drainage: a nearly full complement of these species was recorded from Chiribiquete (Álvarez *et al.* 2003), and a subset was discovered in isolated white-sands masses near Iquitos, Peru (Alvarez Alonso & Whitney 2003). Many of these species ultimately proved to be relatively widespread across weathered poor-soil terraces even far from known white-sand masses (Díaz-Alván *et al.* 2017, Socolar *et al.* 2018). We show that an important group of core Guianan species penetrate further southwest into the Colombian Amazon than was previously known, and we suggest that many or all of them cross the Caquetá River. As their distributions come into sharper focus, a set of key questions remains.

First, where is the limit for the core Guianan species that are as-yet unknown from Ecuador and Peru? Recent discoveries have extended a few of these species, such as *Hypocnemis flavescens* and *Myrmotherula ambigua* to the north bank of the Putumayo River (Janni *et al.* 2018, Acevedo-Charry *et al.* 2021). Perhaps many of the remaining species drop out of the avifauna somewhere in the Caquetá/Putumayo interfluve. This is particularly likely to be the case for the rock-scrub associated avifauna, because the rock-

**Table 3.** Species of non-forest habitats

| Species | Site | | | | | |
|---|---|---|---|---|---|---|
| | Ciudad de Piedra | Caño Negro | Campana (scrub) | Potreros | Araracuara | Rapids |
| *Chlorostilbon olivaresi* | A, P | P | | | P | |
| *Amazilia versicolor* | A | | A | X | X | |
| *Polytmus theresiae* | X | | | | | |
| *Nyctipolus nigrescens* | X | | X | | | |
| *Vanellus chilensis* | | | | A | | |
| *Columbina minuta* | | | | A | | |
| *Galbula leucogastra* | A, P | | | | | |
| *Picumnus pumilus* | A | | | | | |
| *Formicivora grisea* | A | | | | | |
| *Cercomacroides tyrannina* | | | | A | | |
| *Elaenia cristata* | A, P | | | | | |
| *Elaenia ruficeps* | X | | X | | | |
| *Hemitriccus margaritaceiventer* | A | | | | | |
| *Hirundinea ferruginea* | | | | | X | |
| *Rupicola rupicola*[1] | P | | | | | |
| *Pygochelidon melanoleuca* | X | | | | | X |
| *Hylophilus brunneiceps* | A | | | | | |
| *Turdus arthuri* | A | X | A | | | |
| *Schistochlamys melanopis* | X | | | X | X | |
| *Zonotrichia capensis* | A | X | | | | |
| *Geothlypis aequinoctialis* | X | | | | | |
| *Stilpnia cayana* | X | | | | | |
| *Tachyphonus phoeniceus* | X | X | | | | |
| *Leistes militaris* | | | | A | | |
| *Euphonia plumbea* | | X | | | | |

scrub habitat is clearly visible on satellite imagery and extends only a short distance south of the rio Caquetá. The range-limits of the forest-associated Guianan species are much less clear. While they too might drop out somewhere in the Caquetá/ Putumayo interfluve, it is also possible that they are limited by the Putumayo itself. If so, the Putumayo plays a much larger role than is currently recognized as a biogeographic barrier for the poor-soil avifauna of upper Amazonia. Finally, it is possible that some of these species will ultimately be found in poor-soil enclaves of northern Peru.

A particular conundrum is the status of *Herpsilochmus dorsimaculatus* vis-à-vis a vocally similar undescribed *Herpsilochmus* taxon that occurs in northern Peru (Pomara 2009). We tentatively identified the birds of the southern Araracuara formation, including south of the Caquetá River, as *H. dorsimaculatus* based primarily on the clear Guianan affinities of the regional avifauna, which contains numerous species that are not known to reach Peru (Alvarez Alonso & Whitney 2003, Álvarez *et al.* 2003). It remains to be seen whether *H. dorsimaculatus* and the Peruvian taxon replace one another across the Putumayo River or whether they are in contact somewhere in northern Peru, southern Colombia, and/or western Brazil. Peruvian observers have reported the undescribed taxon northwards to the Putumayo River whereas Colombian and Brazilian observers have reported *H. dorsimaculatus* south to the Amazon River (eBird 2021), but in our view none of these records sufficiently excludes the other taxon.

Second, to what extent are populations of forest-based poor-soil specialists on the Araracuara formation and in northern Perú disjunct from large populations on the Guiana shield? One view holds that nutrient-rich sediments of the Pebas formation, which have been re-exposed over much of northern Peru, isolate populations of poor-soil specialists from one another (Higgins *et al.* 2011, Socolar *et al.* 2018). However, recent discoveries of poor-soil specialists on weathered terraces and in peatland formations across northern Peru suggest that populations of Amazonian white-sand birds are more widespread and interconnected than has previously been appreciated (Lähteenoja *et al.* 2009, Díaz-Alván *et al.* 2017, Socolar *et al.* 2018, Vásquez-Arévalo *et al.* 2020). Our observations of a classically Guianan avifauna on weathered ultisols east of the lower Yarí River suggests that populations on the Araracuara formation might be contiguous with populations further east.

Third, to what extent will ongoing forest loss in upper Amazonia rearrange these biogeographic patterns? Forest clearing might provide opportunities for range expansion to the specialists of white-sand savanna and rock-scrub habitats, but our records suggest that these species may be unable to utilize cleared habitats, even when those habitats are directly adjacent to occupied rock-scrub landscapes. Even *Zonotrichia capensis*, which is commensal with humans elsewhere in its range, is absent from the town of Puerto Santander, a mere 1.5 km from Ciudad de Piedra. Forest-based poor-soil specialists are known to be uniquely sensitive to forest clearing (Socolar *et al.* 2019, Socolar & Wilcove 2019), and if previously unappreciated connectivity is important to the maintenance of their sparse populations then large-scale clearing and fragmentation in upper Amazonia could spell severe trouble for this component of the avifauna.

Ultimately, answers to these questions will require more fieldwork. We suggest that Colombian observers might prioritize searches for poor-soil assemblages in central and southern Amazonas Department, including near the town of La Chorrera. Peruvian observers would do well to arm themselves with knowledge of the vocalizations of several species not yet known to reach Peru, such as *Selenidera nattereri*, *Myrmotherula ambigua*, *Hypocnemis flavescens*, *Rhytipterna immunda*, and *Caryothraustes canadensis*, and to search for them in the hinterlands of the Putumayo drainage as well as in peatlands on the Putumayo floodplain.

## Acknowledgements

We thank Arturo Andoke, Leandro Andoke, Antony Paki, Solín Paki, Jonas Rodríguez, Alci Rodríguez, the indigenous community of Aduche (resguardo Aduche), and the indigenous community of Amename (resguardo Monochoa) for their knowledge, permissions, and field support; Claudia Medina Uribe, Diego Martínez Revelo, Jørgen Sand Sæbø, Daniela García Cobos, Catherine Noll, Daniel Davison, and Viviana Tapasco for field companionship and support; Dan Lane and Bret Whitney for comments on bird recordings; and Claudia Medina Uribe, Torbjørn Haugaasen, David Edwards, and Iván Macías for help with planning, logistics, and support. We thank Xeno Canto and the Macaulay Library for providing platforms to archive documentation. The February 2021 expedition was made possible by Peter Hobbs. Funding for the 2019 expedition was provided by Research Council of Norway (project no. 262378) awarded to Torbjørn Haugaasen and David Edwards, and funding for the January 2021 expedition was provided by Catherine Noll and Daniel Davison. This is article no. 30 of the Biodiversity, Agriculture and Conservation in Colombia/Biodiversidad, Agricultura, y Conservación en Colombia (BACC) project.

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*Recibido:* 1 de julio de 2021 *Aceptado:* 5 de septiembre de 2022

**Citación:** Socolar, J.B., J.F. Castaño & J. Arango. 2022. Ampliación Noteworthy bird records from the Araracuara area, Amazonas and Caquetá, Colombia. Ornitología Colombiana 21: 2-10.

# Ampliación de la distribución de *Touit stictopterus* (Psittacidae) para la cordillera Central, Colombia

## Distribution extension of *Touit stictopterus* (Psittacidae) in the colombian Central Andes

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## Resumen

*Touit stictopterus* es una especie vulnerable y poco conocida que durante décadas fue considerada como extinta en Colombia. Presentamos un nuevo registro de la especie para el país en una localidad del departamento de Tolima, ampliando su distribución geográfica en 197,75 km hacia el norte, sobre la cordillera Central. Este registro confirma la presencia de este loro en el Tolima, región que no había sido considerada como área potencial de distribución. Nuestro registro aporta una nueva localidad en donde se puede estudiar la especie, lo que permitirá evaluar el estado actual de sus poblaciones.

**Palabras clave:** cordillera Central, extensión de ámbito, Tolima, *Touit stictopterus*, vulnerable

## Abstract

*Touit stictopterus* is a vulnerable and little-known species that for decades was considered extinct in Colombia. We report a new record of the species for Colombia, in a locality in the Tolima department, which broadens its geographical distribution by 197.75 km to the north, on the cordillera Central. This record confirms the presence of the parrotlet in Tolima, a region that had not been considered as a potential area for its distribution. Our record adds a new locality where the species can be studied, allowing to assess the current status of its populations.

**Key words:** Central Andes, range extension, Tolima, *Touit stictopterus*, vulnerable

El periquito alipunteado, *Touit stictopterus*, es una especie poco conocida y considerada como rara a lo largo de su distribución (Brightsmith 2018, Botero-Delgadillo & Páez 2011, Ridgely 1980), con grandes vacíos de información básica sobre su historia natural, distribución y tamaño poblacional. Por lo tanto, la documentación de nuevos registros es importante para evaluar el estado actual de sus poblaciones (Snyder *et al.* 2000, Brightsmith 2018). A nivel global y nacional este periquito ha sido categorizado en riesgo de extinción vulnerable (VU) C2a, en razón a la falta de estimaciones de la densidad poblacional y a una disminución paulatina observada e inferida de su número de individuos, así como subpoblaciones estimadas menores a 1000 individuos; además se encuentra en el Apéndice II del convenio CITES (Renjifo *et al.* 2014, Bird Life International 2021), debido a la pérdida de ~42,5% de su hábitat, especialmente en la cuenca alta del río Magdalena (Linero 2014). El periquito alipunteado habita en selvas húmedas nubladas, semihúmedas y de manera estacional áreas de cultivo, en franjas de Bosque Húmedo Tropical Amazónico, Bosque Montano Oriental y Bosque Piemontano Oriental (Borrero & Hernández-Camacho 1958, Blake 1962, Hilty & Brown 1986, Freile & Poveda 2019) desde los 600 hasta 2400 m, aunque es más común entre 1050 y 1700 m (Linero 2012, Freile & Poveda 2019).

Su distribución conocida comprende el norte de Suramérica, en el sur de Colombia, oriente de Ecuador y norte de Perú (Ridgely 1980, Hilty & Brown 1986, Brooks *et al*. 2009, Schulenberg *et al*. 2010, Brightsmith 2018, Freile & Poveda 2019). En Colombia, durante casi 50 años se consideró como extinta (Juniper & Parr 1998, Rodríguez-Mahecha & Hernández-Camacho 2002, Renjifo *et al*. 2002, Brightsmith 2018), sin embargo, en años recientes ha sido registrada en diferentes localidades. Los registros históricos de la especie comprenden la vertiente occidental de la cordillera Oriental, en Cundinamarca, cerca de Fusagasugá a 1750 m y de manera ocasional entre 2200 a 2300 m (Dugand 1945a; Hilty & Brown 1986), la Serranía de la Macarena, Meta a 1070 m (Blake 1962) y la vertiente oeste de la cordillera Central en el departamento de Cauca y San Andrés de Pisimbalá a 1600 m (Borrero & Hernández-Camacho 1958).

Más recientemente se ha reportado sobre la vertiente oriental de la cordillera Oriental en el Cerro La Mica, Parque Nacional Natural (PNN) Los Picachos, en Caquetá, a 1600 m (Salaman *et al*. 2002), Santa María, Boyacá (Laverde- R. & Gómez 2016, Rodríguez-Villamil 2018) y en Mámbita, Cundinamarca (Chaparro- Herrera *et al*. 2020). También en la vertiente occidental de la misma cordillera en Pandi, Cundinamarca (Chaparro- Herrera *et al*. 2020, Linero 2012) y al sur del Huila, de este último se han subido varios registros a la plataforma eBird para los municipios de Palestina, (Reserva de Eduardo y Reserva Ecoturística El Encanto) y Garzón (Finca de Nidia Calderón, vereda las Mercedes); adicionalmente se ha observado en la vertiente oriental de la cordillera Central en La Argentina (Huila) y el corregimiento de Itaibe (Páez, Cauca) (Figura 1). Algunos autores han reseñado que posiblemente la especie se distribuye en Nariño (Hilty & Brown 1986, Rodríguez-Mahecha & Hernández-Camacho 2002). Estos registros sugieren que posiblemente *Touit stictopterus* sea más una especie poco conocida que una especie amenazada (Linero 2014).

Según lo observado por Dugand (1945b) y señalado por Rodríguez-Mahecha y Hernández-Camacho (2002), el periquito alipunteado parece realizar migraciones altitudinales condicionadas por la fructificación de algunas especies silvestres o del cultivo de maíz, y señalan que su alimentación se basa en frutos de *Ficus* spp., *Clusia* spp. y Loranthaceae; además suele alimentarse e invadir los maizales cuando el grano está madurando.

En cuanto a su población, es conocida como una especie local y que presenta bajas densidades. En Perú se considera que ha presentado declinación poblacional y que su distribución está fragmentada a través de los Andes, donde suele ubicarse en algunos cerros aislados (Schulenberg *et al*. 2010, Juniper & Parr 1998). De acuerdo con Linero (2014) las poblaciones colombianas desafortunadamente se encuentran en áreas sujetas a una alta deforestación y consecuentemente a una severa fragmentación del hábitat. Se sospecha que existe una lenta y constante disminución de la población debido a la destrucción y fragmentación del hábitat (Brightsmith 2018). Se estima que a nivel general su población oscila entre 1.000-2.499 individuos con base en una evaluación de registros conocidos, descripciones de abundancia y extensión de distribución. Esta estimación es equivalente a 600-1700 individuos maduros (BirdLife International 2021).

En la presente nota reportamos el primer registro del periquito alipunteado *Touit stictopterus* para el Tolima (Fig. 1), departamento donde se reconoce la presencia de más de 820 especies de aves, de las cuales 22 son loros (Vélez *et al*. 2021, Parra & Molina 2021 datos no publ.). El registro

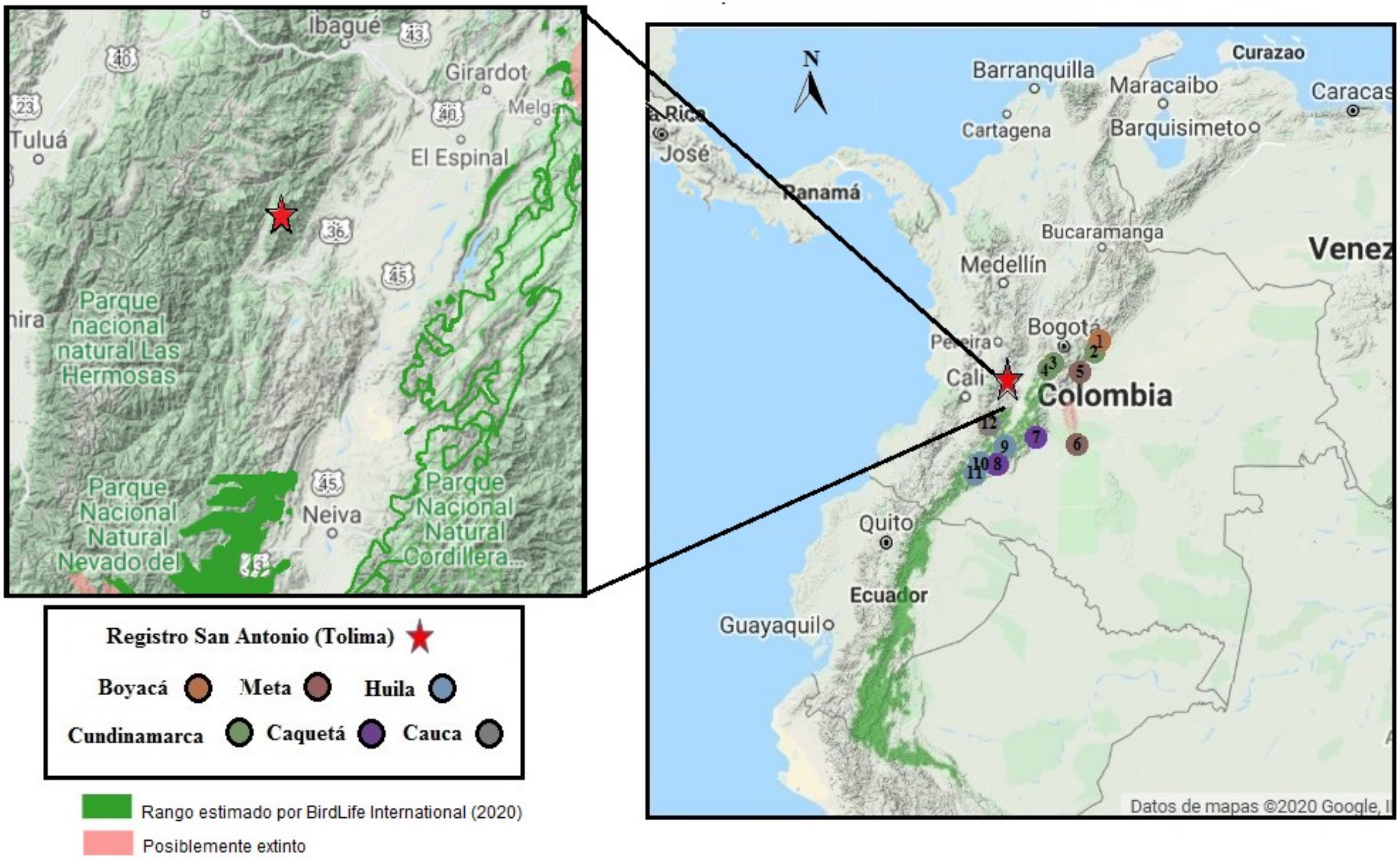

Figura 1. Distribución geográfica de *Touit stictopterus* en Colombia. Registro en San Antonio, Tolima (estrella roja). Boyacá (café): 1. Santa María; Cundinamarca (verde): 2. Mámbita, 3. Fusagasugá, 4. Pandi; Meta (lila): 5. Cubarral, 6. Serranía Macarena; Caquetá (morado): 7. Cerro La Mica PNN Los Picachos, 8. Belén de los Andaquies: Huila (azul): 9. Argentina, 10. Garzón y 11. Palestina; Registros de Cauca (gris): 12. San Andrés de Pisimbalá. Distribución geográfica tomada de BirdLife International (2020). *Touit stictopterus*. Downloaded from http://www.birdlife.org on 23/07/2020

se realizó el 20 Julio de 2020, y correspondió a un grupo de cuatro individuos observados entre las 09:30 y 10:30, los cuales fueron escuchados y vistos sobrevolando en la copa de los árboles, y luego fueron localizados perchados sobre las ramas de árboles, estos individuos se desplazaban de una zona de bosque maduro a otra con abundantes palmas, en el bosque de la Reserva Natural Finca El Manantial (municipio de San Antonio) (Fig. 2) (3°55'37.8"N; 75°26'39.9"W) sobre 2700 m en esta mismo lugar, la especie había sido observada sobrevolando el dosel de los árboles por J. Vargas en febrero de 2019. Aunque la especie es conocida como lora boba en Fusagasugá y en Cauca como pericos (Dugand 1945b, Borrero & Hernández-Camacho 1958), en el área de estudio son conocidos como periquitos alinegros.

Estos individuos fueron reconocidos en primera medida por presentar cola cuadrada y corta, en comparación con otras especies de loros registrados en la localidad como *Ognorhynchus icterotis* y *Psittacara wagleri*, y por su tamaño mediano en comparación con *Amazona mercenaria* y *Forpus conspicillatus*. Así mismo, se diferenció de otras especies de loros de tamaño similar como *Pionus mentruus* y *Pionus seniloides* por su patrón de coloración verde predominante en el cuerpo, en especial en la cabeza. Adicionalmente, a una corta distancia, se observó la coloración naranja sobre las coberteras de las alas, algunos individuos (hembras) así como la coloración negra de las mismas con puntos

Figura 2. Hábitat y registro de *Touit stictopterus* dentro del bosque de la Reserva Natural Finca El Manantial, en el municipio de San Antonio, departamento del Tolima, Colombia.

blancos, caracteres diagnósticos de la especie, lo cual fue corroborado con el registro fotográfico (Fig. 2).

El registro de la especie se realizó en un bosque de bajo porte, en el cual se evidenció un buen estado de conservación donde abundan diversas palmas, entre estas la palma de cera (*Ceroxylon wettinia*) y chontas del género *Aiphanes* sp. (Fig. 2). Este bosque se ubica sobre la llamada cordillera de Calarma, una saliente aislada de la cordillera Central de la cual descienden diferentes afluentes del río Tetuán. El área de observación comprende un bosque aislado ubicado sobre el cañón, lo cual concuerda con lo referenciando por algunos autores para la especie en Perú y otras localidades de Colombia (Schulenberg *et al.* 2010, Juniper & Parr 1998, Linero 2014). La Reserva Natural Finca El Manantial comprende 40 hectáreas de bosque contiguas a otras áreas conservadas que en su totalidad suman unas 100 hectáreas, conformadas por ocho predios particulares y una reserva natural municipal (Nueva Zelandia). El PNN más cercano es Chili Barragán, el cual se ubica a unos 194 km del punto de observación, el cual comprende una zona de páramo, con una superficie de 32.770,62 ha (Moreno-Palacios & Losada-Prado 2016), sin embargo es de resaltar que este parque no tiene conexión con la zona de estudio, principalmente por la presencia de potreros y gran cantidad de fincas intermedias con poca cobertura boscosa. De manera que es apremiante generar corredores biológicos que permitan una conexión directa entre ambas zonas.

Este nuevo registro de *T. stictopterus*, amplía en 197,75 km la distribución de la especie hacia el norte, en línea recta sobre la cordillera Central, partiendo del registro más al norte conocido hasta la fecha en la vertiente oriental de la cordillera Central realizado en el municipio de La Argentina (Huila). De manera que complementa la distribución de la especie, la cual se extiende desde el sur del Huila y el flanco occidental de la cordillera Oriental, validando su hipótesis de la presencia en el Tolima, pues Rodríguez-Mahecha & Hernández-Camacho (2002) y Borrero & Hernández (1958) advirtieron sobre la posibilidad de encontrar la especie en el departamento. Según los análisis de los registros hasta entonces conocidos por estos autores se consideró que la distribución podría extenderse sobre la vertiente oriental de la cordillera Central hasta el sur del Tolima, en el punto de encuentro con los departamentos de Cauca y Huila.

Este registro de *T. stictopterus* complementa la distribución conocida de la especie, ajustando su distribución sobre las vertientes interandinas del valle alto del río Magdalena desde el sur del Huila hacia el norte hasta Cundinamarca en la cordillera Oriental y el centro del Tolima en la cordillera Central, generando además la inquietud de si la especie puede estar presente en hábitats idóneos más al norte en los departamentos de Caldas y Boyacá en sus respectivas cordilleras. Consideramos de importancia este registro en términos de la necesidad de realizar un seguimiento exhaustivo de la especie en esta nueva localidad en pro de contribuir a generar estrategias para la conservación, en razón de su declive y poca información existente de la especie en el departamento.

## Agradecimientos

Los autores agradecen a la Asociación Tolimense de Ornitología, a la Asociación Fincas Verdes y a los propietarios de la Reserva Natural Finca el Manantial de San Antonio, Tolima por su apoyo en el desarrollo de esta nota y por las actividades que desarrollan en favor de la conservación de las aves y sus hábitats en el departamento.

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*Recibido:* 1 de abril de 2021 *Aceptado:* 3 de marzo de 2022

**Citación:** Parra-Hernández, R.M., J. Vargas-Oviedo & K. Certuche-Cubillos. 2022. Ampliación de la distribución de *Touit stictopterus* (Psittacidae) para la cordillera Central, Colombia. Ornitología Colombiana 21: 11-16.

Ornitología Colombiana Año 2022 I Número 21

Nota breve

# Noteworthy bird records from the Tamá massif and adjacent areas, Norte de Santander, Colombia

## Registros notables de aves del macizo Tamá y alrededores, Norte de Santander, Colombia

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### Abstract

The Tamá massif straddles the Colombia-Venezuela border on the east slope of the East Andes. Rugged topography and recent political unrest have limited ornithological work in the area, particularly at lower elevations. We made multiple excursions to Tamá in 2017–2020, visiting elevations of 900–3400 m. We recorded several species that are unknown or poorly known on the east slope of the northeastern Andes in Colombia, including *Heliangelus mavors*, *Coeligena bonapartei*, *Sternoclyta cyanopectus*, *Aulacorhynchus sulcatus*, *Thamnophilus unicolor*, *Formicarius rufipectus*, *Grallaricula ferrugineipectus*, and *Thripadectes virgaticeps*. Additional noteworthy observations included records of *Pauxi pauxi* and *Tephrophilus wetmorei*.

Key words: Andes, biogeography, cloud forest, paramo

### Resumen

El macizo de Tamá se extiende a ambos lados de la frontera entre Colombia y Venezuela, en la vertiente oriental de los Andes orientales. La topografía escabrosa y la inestabilidad política han limitado trabajos de campo en la zona, especialmente en elevaciones bajas. Hicimos múltiples excursiones a Tamá entre 2017–2020, visitando elevaciones de 900–3400 m. Registramos varias especies que se conocen muy poco en la vertiente oriental de los Andes nororientales en Colombia, como *Heliangelus mavors*, *Coeligena bonapartei*, *Sternoclyta cyanopectus*, *Aulacorhynchus sulcatus*, *Thamnophilus unicolor*, *Formicarius rufipectus*, *Grallaricula ferrugineipectus*, y *Thripadectes virgaticeps*. Otras observaciones notables incluyeron registros de *Pauxi pauxi* y *Tephrophilus wetmorei*.

Palabras clave: Andes, biogeografía, bosque nublado, páramo

## Introduction

The Tamá massif (hereafter Tamá) is a large mountain on the Colombia-Venezuela border in the states of Norte de Santander, Colombia and Apure and Táchira, Venezuela. National parks in both countries harbor forest and paramo habitats spanning the full elevational gradient from roughly 300-3600 m. To the northeast, the low-lying Táchira depression isolates Tamá from Venezuela's Sierra Nevada de Mérida. To the west, high ridges above 2600 m connect Tamá to Colombia's northeastern Andes. To the south, the low-elevation forests of Tamá are contiguous with those of Colombia's northeastern Andes on the Cocuy massif. Thus, Tamá is biogeographically a part of the east slope of Colombia's East Andes (Cuervo 2013).

Nevertheless, Tamá harbors populations of multiple bird species that are undetected on adjacent portions of the East Andes, including apparently isolated populations of *Grallaria chthonia*, *Grallaricula cucullata*, *Thripadectes virgaticeps*, *Tephrophilus wetmorei*, and possibly *Odontophorus columbianus* (Leal *et al.* 2011, Greeney 2018, Carroll *et al*. 2020, Remsen Jr. & de Juana 2020). A few additional species such as *Aulacorhynchus sulcatus* and *Orochelidon flavipes* reach Tamá from the Venezuelan side but remain unknown from adjacent Colombia.

Ornithological fieldwork on Tamá began at least as early as 1911 with the collections of Wilfred Osgood and Stanley Jewett (Cory 1913, 1916) and continued in the 1940s and 1950s with the collecting expeditions of Enrique Riera, Ramón Urbano, and Ventura Barnés (Phelps & Gilliard 1941, Phelps & Phelps, Jr. 1954, 1956a, 1956b, 1957, 1958, 1960, Wetmore & Phelps 1956, Zimmer & Phelps 1944). In 1959, Kjell von Sneidern collected in lowlands and foothills immediately adjacent to Tamá (Blake 1961). More recent fieldwork included expeditions by Mauricio Álvarez-Rebolledo in 1999 and by Andrés M. Cuervo in 2008 and 2009 (Cuervo 2013), observations by Tamá National Park staff (Leal *et al*. 2011), and multiple recent visits by Jhonathan Miranda to the Venezuelan side (Miranda & Kvarnbäck 2017, Miranda *et al*. 2019). Nearby, Setina *et al*. (2012) studied *Pauxi pauxi* at 800-1200 m at a site south of the Margua river and therefore just off of the main Tamá massif.

We visited multiple locations on and near the Tamá massif between 2017 and 2020 (Fig. 1). In April 2019, one of us (JBS) surveyed birds on Tamá at elevations ranging from 900-3300 m as part of a collaboration between the Humboldt Institute, the Norwegian University of Life Sciences, and Tamá National Park. We conducted point counts and opportunistic observations for ten days at San Alberto (900-2100 m; 7.22°N, 72.32°W), four days at Asiria-Belén (2650-3200 m; 7.30°N, 72.37°W), and four days at Orocué (2400-3400 m; 7.40°N, 72.45°W). At San Alberto, we visited four habitats: tall primary forest in the extremely steep ravine of the Talco river at 900-1000 m, with shorter, epiphyte-laden forest and forest edge at 1350-1400 m, tall primary and mature secondary forest on mountain ridges and steep slopes at 1650-2100 m, and cattle pastures interspersed with forest fragments and coffee and banana cultivations at 1100-1800 m. At Asiria-Belén, we visited primary forest with extensive *Chusquea* bamboo at 2850-2950 m, sub-paramo at 3000-3200 m, and cattle pastures at 2700-2900 m.  At Orocué we visited primary forest at 2500-2650 m, cattle pastures at 2450-2550 m, and high-elevation forest and paramo in a brief excursion up to 3300 m.

From 2017 to 2020, AP made four visits to Tamá and nearby portions of the Colombian Andes to observe, photograph, and record birds.  In May 2017, we spent four days at Cubugón (7.05°N, 72.18°W) at elevations of 400-900 m on the flank of the East Andes just south of Tamá. This locality corresponds to the "Río Cobugón" collecting localities of Kjell von Sneidern as described by Blake (1961).  This site was dominated by pastures and cultivations (banana and cacao) with some remnant native forest. In May 2019, we spent two days at Orocué (see above). In October 2019 and January 2020, we visited elevations of 2600-3300 m at Páramo de Tierra Negra, located adjacent to Tamá near the town of Pamplona (7.35°N, 72.62°W). This is the site of the bifurcation between the high spine of the East Andes and the highest ridge that branches towards Tamá. We visited secondary forest, elfin forest, and sub-paramo that supports a "frailejón" of the genus *Libanothamnus* (Sánchez Montaño & Gelviz Gelvez 2004).

**Noteworthy species.-** We provide accounts for 12 species that are noteworthy for the paucity of additional records in adjacent Colombia. All documentation is archived in Xeno Canto ("XC" followed by a catalog number) or the Macaulay Library ("ML" followed by a catalog number), and some of this documentation is reproduced here

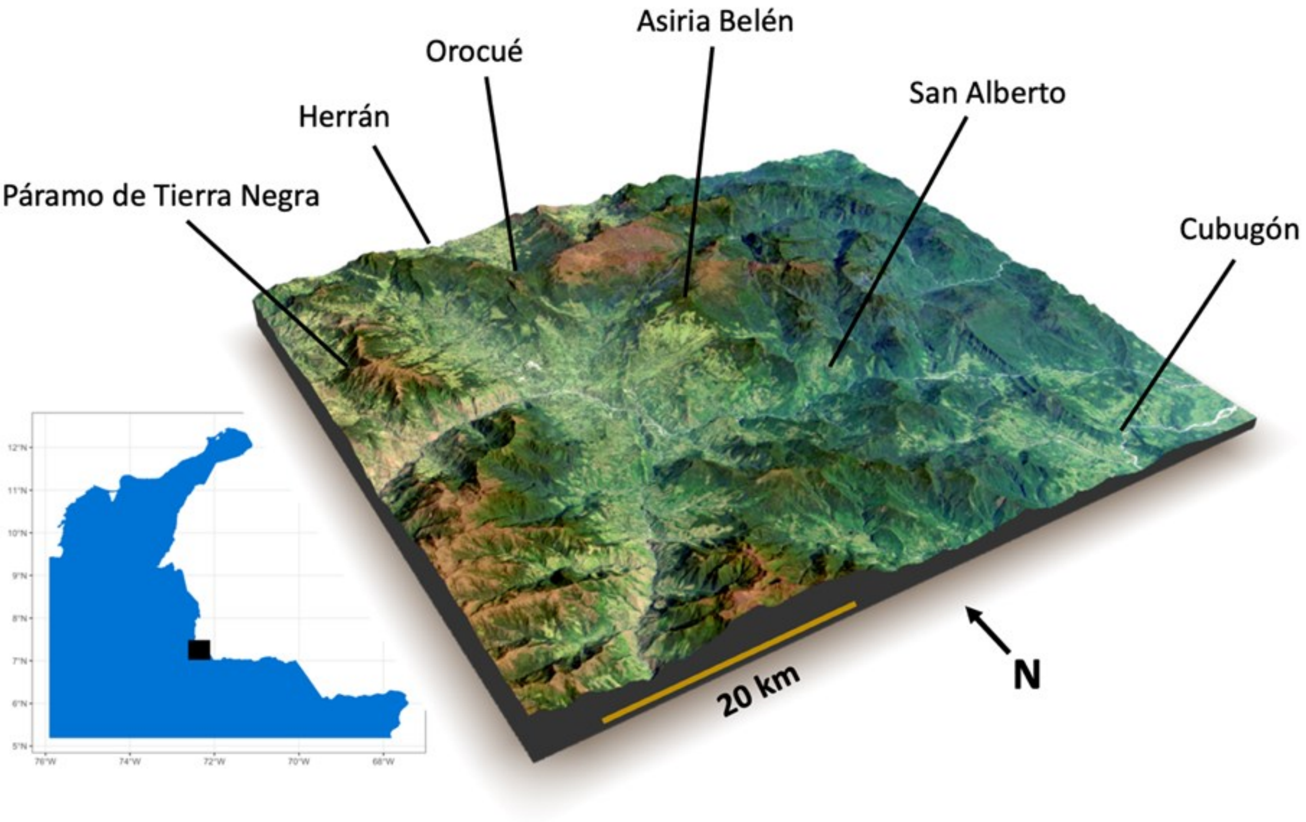

Figure 1. Map of study region with localities of noteworthy records. The map is oriented to view the Tamá massif from the southwestern (Colombian) side, looking towards the northeast and into Venezuela.

(Fig. 2). In discussing related records, we sometimes mention eBird submissions ("S" followed by a catalog number; eBird 2021) or additional material from the Macaulay Library, for which we provide the last name of the observer followed by the catalog number.

*Pauxi pauxi* (Helmeted Curassow).- JBS recorded the booming song of this species on 12 April 2019 (XC482373) and heard additional individuals on 10 and 14 April 2019 in the ravine forest at 900-1000 m at San Alberto. The audio recordings are entirely consistent with this species, which is the only booming curassow that occurs in the vicinity of Tamá. This population is well known and occasionally hunted by the residents of San Alberto. Although we visited this area during the pre-dawn, we detected booming only from mid-morning through mid-afternoon, generally shortly before or after rain showers. Residents of San Alberto indicated that this curassow is more vocal in December. The noisy rapids of the Talco river made it difficult to detect and count distant birds, but we unambiguously heard at least two individuals (possibly as many as four). In the same vicinity, we found a pile of feathers from a dead individual. The resident of the house nearest the ravine expressed confidence that nobody had recently hunted this species, and the cause of death could not be determined. To our knowledge recent Colombian records for this species exist only from Tamá, the buffer zone of Tamá National Park at 800-1200 m (Setina *et al*. 2012), foothills of Catatumbo Barí National Park (Avendaño 2012), and the eastern flank of the Cocuy massif at 960 m (Acevedo-Charry 2017). At San Alberto, only a narrow tongue of primary forest remains on the steep slopes above the Talco river, protected by the extreme topography, but connected to more extensive

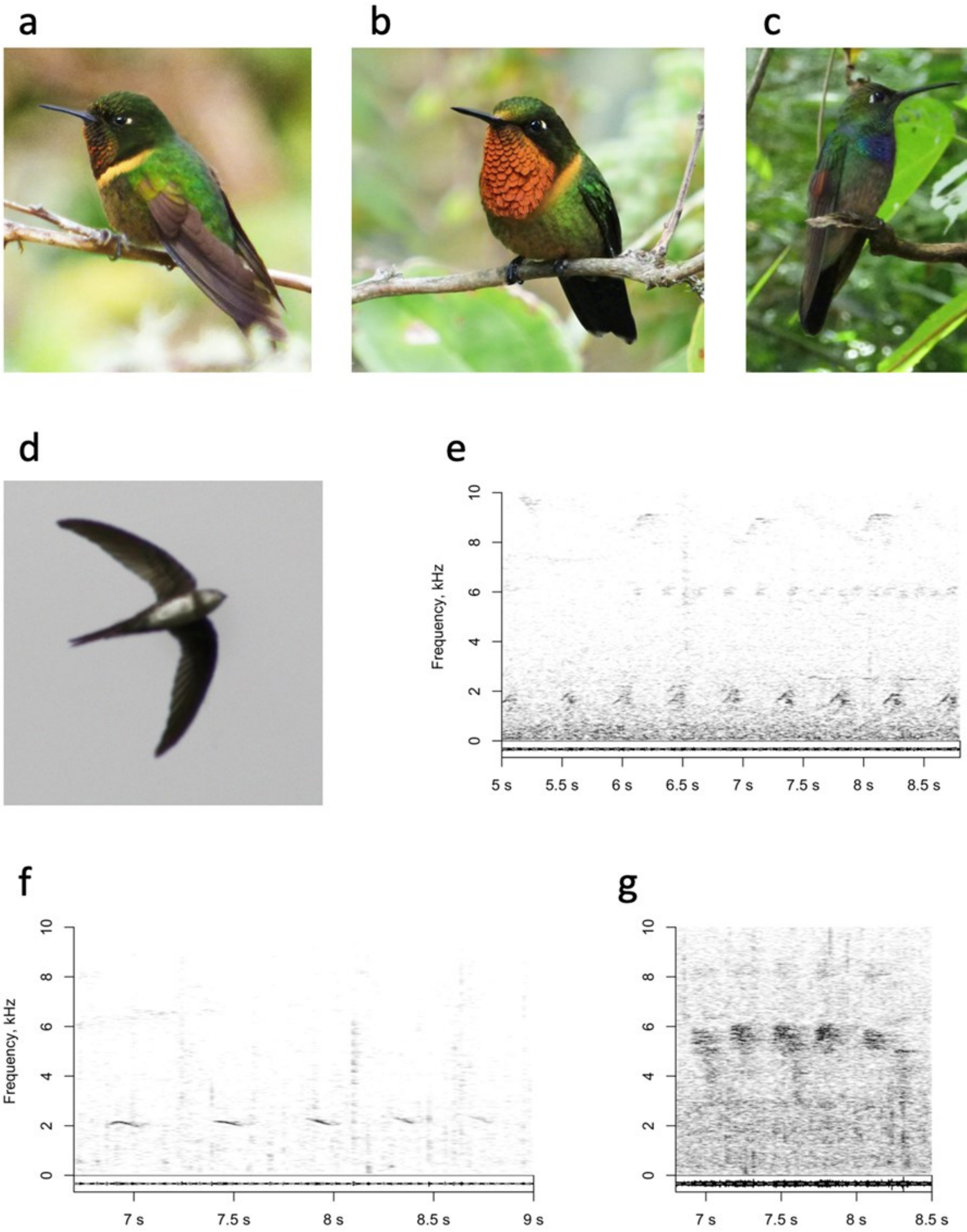

Figure 2. Documentation for selected records **a.** *Heliangelus mavors* at Orocué **b.** *Heliangelus mavors* at Páramo de Tierra Negra **c.** *Sternoclyta cyanopectus* at Cubugón **d.** *Tachornis* sp. at Herrán **e.** *Aulacorhynchus sulcatus* (continuous series near 2 kilohertz; part of a much longer series) at San Alberto **f.** *Thamnophilus unicolor* at San Alberto **g.** *Thripadectes virgaticeps* at San Alberto. All photographs taken by AP, all audio by JBS. Spectrograms were prepared using the Soundgen package in R (Anikin 2019). The the x-axes of the spectrograms give the timings relative to the associated full recordings archived at Xeno Canto (see main text).

forest downstream along the Margua river. The topography affords these birds some protection not only from deforestation, but also from ongoing hunting pressure (Lizcano & Setina 2007).

***Dromococcyx pavoninus*** **(Pavonine Cuckoo).-** JBS voice-recorded this species on 10 April 2019 at San Alberto (XC512610) and heard additional individuals on 11 and 13 April 2019. The voice-recording was obtained in primary ravine forest with old landslides at 1100 m. The other records were of distant birds heard downslope from the rim of the ravine, and the extreme topography precludes ascribing accurate elevations to these additional records. This species is an expected component of the avifauna at Tamá, but there are few records from this region of Colombia, and it was unrecorded during recent fieldwork at appropriate elevations on the adjacent Cocuy massif (Acevedo-Charry 2017).

***Heliangelus mavors*** **(Orange-throated Sunangel).-** AP photographed this species on 04 May 2019 at Orocué (Fig. 2a, ML197151141) and on 02 January 2020 at Páramo de Tierra Negra (Fig. 2b, ML363553421), and additionally observed the species at Páramo de Tierra Negra on 19 October 2019. Although Hilty & Brown (1986) state that this species is present in Colombia, only three locations are given, two of which appear to actually be located in Venezuela. The third involves a 1977 sight record at Lago de Tota which we view as unconfirmed. We are unaware of additional recent records in Colombia. The Natural History Museum in London holds several old specimens of *H. mavors* with imprecise or unknown collecting dates and localities given as "Colombia" or in one case "North Colombia."

***Sternoclyta cyanopectus*** **(Violet-chested Hummingbird).-** AP photographed this species on 23 May 2017 at Cubugon near a small forest strip among banana cultivations (Fig. 2c, ML198032811). The only previous Colombian records of this Venezuelan near-endemic are specimens collected in 1999 at 1100 m, near the southern part of Tamá National Park at Vereda El Diamante (Córdoba-Córdoba & Echeverry-Galvis 2006). JBS fleetingly observed a hummingbird that was possibly this species in similar habitat at San Alberto.

***Tachornis*** **sp.-** AP photographed a swift with a long, forked tail and a clear breastband at Herrán (1950 m), adjacent to the Orocué sector of Tamá National Park, on 05 May 2019 (Fig. 2d, ML275148921). The bird was observed in flight near the edge of downtown Herrán over cultivated areas. Some references (*e.g*, Hilty & Brown 1986) suggest that the clear breast-band is consistent with *T. furcata* (Pygmy Swift). However, consultation with experts yielded contrasting opinions about the bird's identity. Experts in reviewing photos of flying birds agree that the dark breast-band is not a photographic artifact and is best explained by a bird that genuinely showed a clear and contrasting dark breast band (*pers. comm.* M. Iliff). Observers familiar primarily with *T. squamata* (Fork-tailed Palm-Swift), including JBS, felt that this bird is obviously atypical for that species (*pers. comm.* FG Stiles, O Acevedo-Charry). However, observers familiar with *T. furcata* in life reported that contrary to many field guides, *T. furcata* does not show a clear contrasting breast band, and that this image is therefore atypical for that species as well, and perhaps unidentifiable (*pers. comm.* T. Ryan, D. Ascanio, J. Avendaño). The very limited specimen material available for *T. furcata* appears to bear out this position (Fig. 3). Of particular interest is the fact that a similar breast-banded appearance was apparently a feature noted in support of the identification of two 2011 sight records ascribed to *T. furcata* from the Araucan foothills of Colombia (Acevedo-Charry 2017). Thus, it seems

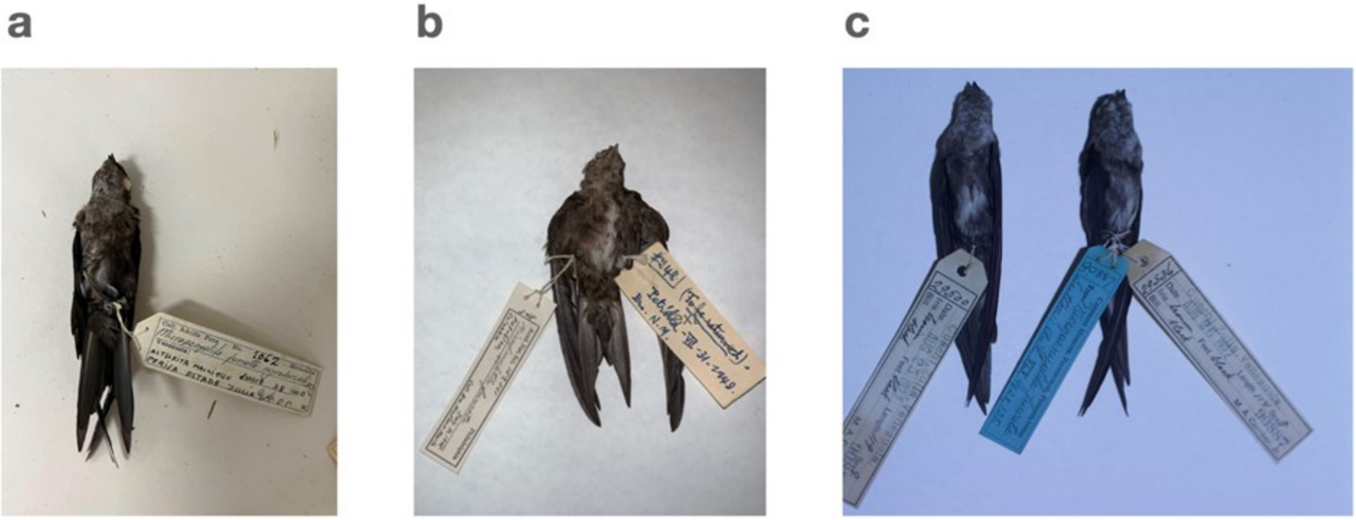

Figure 3. Images of all specimens of adult *T. furcata* listed in VertNet **(A)** AMNH specimen #781689 (subspecies *nigrodorsalis*) from Zulia, Venezuela, credit Augie Kramer **(B)** ANSP ORN specimen #157551 (subspecies *furcata*) from Petrolea, Colombia, credit Nate Rice **(C)** CM Birds specimen #P90851 and #P90887 (subspecies presumably *nigrodorsalis*) both from Guachi, Zulia, Venezuela, credit Steve Rogers/Carnegie Museum of Natural History.

possible that a poorly documented population of breast-banded *Tachornis* inhabits the area around the Tamá and Cocuy massifs. We are aware of only a handful previous Colombian records of *T. furcata*: a nesting individual collected in 1948 at Petrólea in the Catatumbo lowlands (Bond 1956), three sight records in 2005 near downtown Tibú, also in the Catatumbo lowlands (Avendaño 2012), a nearby sight record in 2015 (Romero S28576373), and the aforementioned sight records in 2011 from 810 m in the Araucan foothills (Acevedo-Charry 2017). To our knowledge there are no previous photographs of the species in Colombia. We note that Venezuelan records include a 1987 sight record from Las Delicias, only a few km from Herrán (Fazio S27766190).

*Coeligena bonapartei* (Golden-bellied Starfrontlet).- JBS clearly saw one male individual on 21 and 22 April 2019 at 2900 m at Asiria-Belén but was unable to obtain documentation. Ayerbe -Quiñones (2018) does not map this species from the east slope of the East Andes, but the species was previously reported from Tamá without details (Florez, S71499935). Unfortunately, our observations were insufficient to determine the subspecies. Some authorities split the nominate *bonapartei* of the Colombian East Andes and *eos* of the Sierra Nevada de Mérida (Palacios 2020). The former is unknown from Venezuela; the latter unknown from Colombia.

*Aulacorhynchus sulcatus* (Groove-billed Toucanet).- JBS voice-recorded one individual (Fig. 2e, XC629476) on 12 and 14 April 2019 at 10:00 from the ravine forest at San Alberto. Although the bird was not observed visually, the fast and high-pitched yelping quality of the vocalization eliminates *A. albivitta*. Multiple reports of this species exist from the Venezuelan side of the Tamá massif (*e.g*, Miranda S31042919), but this is apparently the first Colombian record away from the Serranía del Perijá and Sierra Nevada de Santa Marta.

*Thamnophilus unicolor* (Uniform Antshrike).- JBS voice-recorded two individuals on 15 and 17 April 2019 from primary forest at 1850 and 2050 m above San Alberto (Fig. 2f, XC511592). This species occurs on nearby portions of the west slope of the Eastern Andes (Donegan *et al.* 2007) but we are unaware of previous east-slope records north of the vicinity of Yopal (240 km to the south), and the species remains unrecorded in Venezuela. It is unclear whether the population on Tamá is geographically isolated or whether additional populations exist at appropriate elevations on the poorly surveyed east slope of the northeastern Andes in Colombia.

***Formicarius rufipectus* (Rufous-breasted Antthrush).-** JBS voice-recorded 1-2 individuals on 15-17 April 2019 from forest at 1850 m above San Alberto (XC511844). While this species is regularly recorded on the Venezuelan side of Tamá, and although both MacMullan (2018) and Ayerbe Quiñones (2018) map this species from the vicinity of Tamá, we have been unable to locate details of additional Colombian records from this vicinity. The expected subspecies here is apparently *lasallei*, but we have been unable to ascertain the basis for this expectation (Krabbe & Schulenberg 2020).

***Grallaricula ferrugineipectus* (Rusty-breasted Antpitta).-** JBS voice-recorded one individual on 12 and 14 April (XC654954) from disturbed forest at 1400 m near San Alberto. This species is rarely reported and apparently local in Colombia's East Andes but has been previously recorded on the east slope of the Andes in Norte de Santander (Greeney 2018).

***Thripadectes virgaticeps* (Streak-capped Treehunter).-** JBS voice-recorded one individual on 18 April 2019 from primary forest at 1650 m above San Alberto (figure 2g, XC512609). This record is presumably referable to the subspecies *tachirensis*, whose type locality is on the Venezuelan side of the Tamá massif (Phelps & Phelps Jr. 1958), and which was previously unrecorded in Colombia. In Colombia, the nearest known populations belong to the subspecies *magdalenae* on the west slope of the East Andes.

***Ochthoeca frontalis* (Crowned Chat-Tyrant).-** JBS clearly heard one individual on 21 April 2019 from primary forest near 2800 m at Asiria-Belén. This record came shortly after the first Venezuelan record, also from the Tamá massif (Miranda *et al.* 2019).

***Tephrophilus wetmorei* (Masked Mountain-Tanager).-** JBS and H.S. Meneses saw and voice-recorded two individuals traveling together with one *Iridosornis rufivertex* on 29 April 2019 from sub-paramo at 3150 m above Orocué (XC482372). This species was previously reported from similar habitat at Asiria-Belén (Leal *et al.* 2011), but this is the first record from the Orocué sector of the park. Five months later, the first Venezuelan record was obtained approximately 2 km to the northeast (Miranda *et al.* 2019). The population on Tamá occupies a bioclimatic space that differs from this species' core range in the central and southern Andes (Acevedo-Charry & Coral Jaramillo 2017).

## Discussion

Of the records presented here, *Thamnophilus unicolor* is seemingly a first for the Tamá massif. *Aulacorhynchus sulcatus* and *Thripadectes virgaticeps* are new for the Colombian side of Tamá and are not known from adjacent portions of the East Andes. At least two species reported from the Venezuelan side, *Odontophorus columbianus* and *Grallaria chthonia*, have yet to be reported anywhere in Colombia. The sustained string of recent detections of regionally unknown species (Miranda & Kvarnbäck 2017, Miranda *et al.* 2019, present manuscript) highlights the potential for novel ornithological discovery on both sides of the Tamá massif. Of interest, our records of

*Thamnophilus unicolor* and *Thripadectes virgaticeps* highlight the incomplete knowledge of bird distributions in precisely the elevational band where *O. columbianus* and *G. chthonia* might be expected to occur. Likewise, *T. unicolor* and *C. bonapartei bonapartei* (assuming that our records involve the nominate form) are currently undocumented in Venezuela but very likely occur there.

Of the roughly ten species on Tamá that are not known from adjacent portions of the northeastern Andes, all but *Tephrophilus wetmorei* typically have lower elevational limits below 2600 m, the elevation at which Tamá connects to the main Andean massif. The east slope of the northeastern Andes remains poorly surveyed, and it is not yet clear whether Tamá populations are true geographic isolates or whether undetected adjacent populations exist, particularly on the eastern slopes of the Cocuy massif. Recent fieldwork documented multiple range extensions from the Araucan foothills below Cocuy, and more surprises will doubtless be found there with further fieldwork, especially at montane elevations that have not been visited recently (Acevedo-Charry 2017). One mystery that is especially ripe for further exploration is the status and identity of *Tachornis* swifts showing clear breast bands in the vicinity of Tamá and Cocuy.

## Acknowledgements

We thank the staff and directorship of PNN Tamá for research permission and extensive logistical support, and we thank Francisco and Heliodoro Cote Mogollón of finca Tierra Negra, Zaida Cadena of Cubugón, and the residents of San Alberto for hospitality and permission to work locally. We thank Henry Saul Meneses, Marcela Ramírez Gutierrez, and Alejandro Lopera for companionship and support in the field, and Claudia Medina Uribe, Diego Martínez Revelo, Torbjørn Haugaasen, and David Edwards for support with planning and logistics. Funding for the April 2019 expeditions was provided by Research Council of Norway (project no. 262378) awarded to Torbjørn Haugaasen and David Edwards. This is article no. 29 of the Biodiversity, Agriculture and Conservation in Colombia/ Biodiversidad, Agricultura, y Conservación en Colombia (BACC) project.

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*Recibido:* 9 de junio de 2021 *Aceptado:* 2 de septiembre de 2022

**Citación:** Socolar, J.B. & A. Peña. 2022. Noteworthy bird records from the Tamá massif and adjacent areas, Norte de Santander, Colombia. Ornitología Colombiana 21: 17-25.

# Range extension of *Hapalopsittaca fuertesi* (Psitaccidae): a new record in Las Hermosas-GVC National Natural Park, Colombia

## Ampliación de la distribución de *Hapalopsittaca fuertesi* (Psittacidae): un nuevo registro en el Parque Nacional Natural Las Hermosas-GVC, Colombia

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### Abstract

We report a new record of 17 individuals of the Indigo-winged Parrot (*Hapalopsittaca fuertesi*), one of the most threatened psittacine species in Colombia, on the border of the Las Hermosas-Gloria Valencia de Castaño National Park, in the municipality of Palmira, Valle del Cauca department at an elevation of 3188 m, in a mosaic of natural vegetation and artificial grasslands. This parrot was previously considered to be restricted to four sub-populations located in the limit zone of the Caldas, Quindío, Risaralda, and Tolima departments. This record extends the known distribution of *H. fuertesi* approximately 122 km southward on the Central Andes of Colombia, to the limit of its previously hypothesized distribution. Las Hermosas-Gloria Valencia de Castaño National Natural Park could well be the most important conservation area to protect this species.

Key words: Indigo-winged Parrot, protected areas, range extension, threatened species

### Resumen

Obtuvimos un nuevo registro de 17 individuos de la Cotorra coroniazul (*Hapalopsittaca fuertesi*), una de las especies de psitácidos más amenazados de Colombia, sobre el límite oeste del Parque Nacional Natural Las Hermosas–Gloria Valencia de Castaño en el municipio de Palmira, departamento del Valle del Cauca, a una elevación de 3188 m en un mosaico de vegetación natural y pastos. Previamente se consideraba que esta especie estaba restringida a cuatro subpoblaciones en área limítrofe de los departamentos de Caldas, Quindío, Risaralda y Tolima. Este registro extiende la distribución conocida de *H. fuertesi* aproximadamente 122 km hacia el sur sobre la Cordillera Central de los Andes colombianos, hasta el límite sur de su distribución hipotética. El Parque Nacional Natural Las Hermosas–GVC bien podría ser el área de conservación más importante para esta especie.

Palabras clave: áreas protegidas, aves amenazadas, cotorra coroniazul, extensión de distribución

As a result of the socio-political changes that the country has gone through in recent years and the improvement of the public-private partnerships, it has become possible to access zones, including part of the protected areas, not previously possible. This context has made it possible to scientifically explore areas that were banned, to plan and carry out research on the ecology and conservation status of various species (Bota-Sierra 2017, Paya *et al.* 2019, Atuesta-Dimian *et al.* 2020, Castaño *et al.* 2020) in order to review conservation priorities and environmental management of these areas (Pullin & Knight 2005, Nichols & Williams 2006). This has permitted the Las Hermosas-GVC National Natural Park surveillance patrols to extend sampling efforts into the park to implement monitoring plans for this protected area. On 7 Nov 2020, at 08:20, we observed 17 individuals of Indigo-winged Parrot (*Hapalopsittaca fuertesi*) foraging fruits in a *Chrysochlamys* cf. *colombiana* (Cuatrec.) tree close to the west boundary of the park, in the

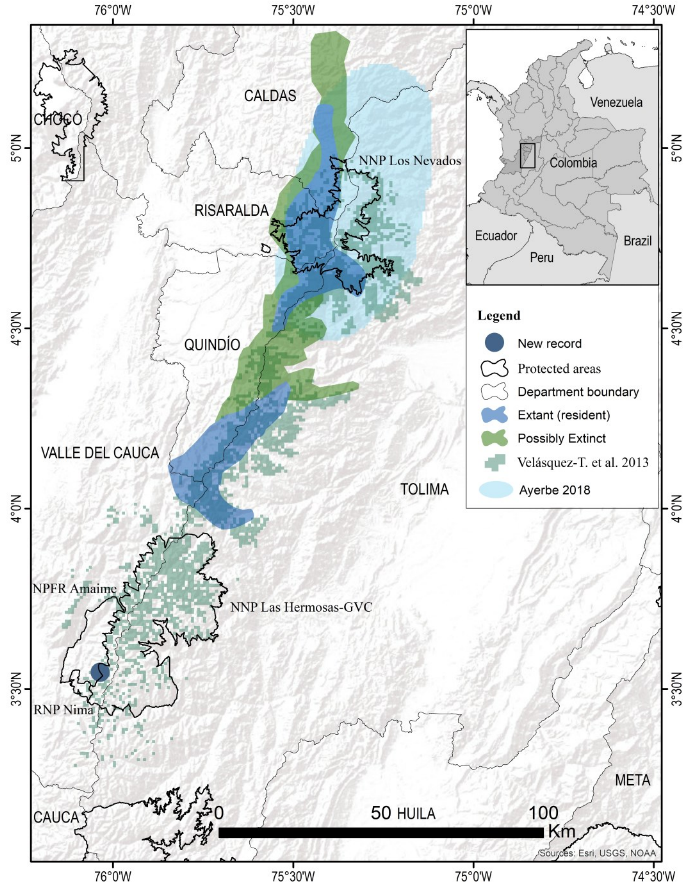

Figure 1. New record and documented distribution (Ayerbe-Quiñones 2018), probable distribution (Velásquez-Tibatá *et al.* 2013) and IUCN distribution, extant and possibly extinct (BirdLife International 2021).

municipality of Palmira, Valle del Cauca department at an elevation of 3188 m (Figs. 1 and 2).

*Hapalopsittaca fuertesi* is categorized as an Endangered (EN) B1ab(iii); D (BirdLife International 2021) or CR C2a(i), EN B2ab(iii); D1, VU B1ab(iii); D2 (Renjifo *et al.* 2014) species and its population, estimated between 230 and 300 individuals, appears to be increasing (BirdLife International 2021). *H. fuertesi* was considered to be restricted to an area of around 3,000 km$^2$ in the border zone of Caldas, Quindío, Risaralda, and Tolima departments (Ayerbe-Quiñones 2018), with a theoretical extent of occurrence estimated 7,869 km$^2$ and a remaining area weighted by suitable habitat of around 972 km$^2$. Its habitat may have been reduced by around 46.7 % (Renjifo *et al.* 2014). Its total extent was apparently around 1300 km$^2$ up to 60 km to the north of our record (BirdLife International 2021) (Fig. 1).

With this record, the distribution of *H. fuertesi* is extended to the southward from 60 km (BirdLife International 2021) to more than 120 km (Ayerbe-Quiñones 2018) from the previously documented southern limit of its distribution. This extension also is in accordance with its theoretical distribution model (Velásquez-Tibatá *et al.* 2013). The group size could be the usual size for this species, which has a mean of 5.6 individuals but with an apparent fission-fusion system (Silk *et al.* 2014) with a temporal group size of up to 42 individuals . The population of the Las Hermosas-GVC National Natural Park could be one of the most abundant and protected. This park includes the total southernmost suitable habitat for *H. fuertesi*, as defined by Velásquez-Tibatá *et al.* (2013). More than 97 % of the park´s original land cover of Andean forest and paramo remains, and the land previously used for agricultural activities is recovering (Instituto de Hidrología Meteorología y Estudios Ambientales [IDEAM], 2021). However, even though the area adjacent to the park also includes the nominally protected areas of the Río Amaime National Protective Forest Reserve (24,212 ha) and Nima Regional Natural Park (3,037 ha), with more than 50 % within the elevation range of *H. fuertesi*, only 32 % (8952 ha) is forest, its preferred habitat (Tovar-Martínez 2009a, 2009b, 2014), plus 20 % (5,478 ha) of grasslands and shrublands with different levels of intervention. The rest of their more than 27,000 ha are pastures, crops and forest plantations (IDEAM 2021). These results may be reflecting a continuous reduction or degradation of the habitat as a result of the lack of effective management of the established conservation strategies. Thus, it is necessary to increase surveillance efforts to determine the presence of

Figure 2. Indigo-Winged Parrot (*Hapalopsittaca fuertesi*) recorded in Las Hermosas National Natural Park-GVC, Franco-P®

*H. fuertesi* in other areas of the Las Hermosas-GVC National Natural Park, as well as in adjacent conservation areas to better estimate its population size and structure.

## Acknowledgements

This record was obtained as a part of the consultant agreement CQ52 with World Wildlife Fund, Inc. The resources were donated by ISAGEN (CO0867.31 – 9887) in the framework of the donation contract 34/3067 and the agreement between National Natural Parks of Colombia and WWF. The authors thank the team of the Las Hermosas-GVC National Natural Park for the technical and operative support. Plant determination was done by Shalom Natalia Sanchez Quintero and Javier Mauricio Varón López. We thank two anonymous reviewers and the editors for their comments which greatly helped the improvement of the manuscript.

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*Recibido:* 19 de mayo de 2022 *Aceptado:* 22 de septiembre de 2022

**Citación:** Roncancio-Duque, N.J., J.A. Franco-Padilla & G. Rodríguez Penagos. 2022. Range extension of *Hapalopsittaca fuertesi* (Psitaccidae): a new record in Las Hermosas-GVC National Natural Park, Colombia. Ornitología Colombiana 21: 26-29.

# Un caso de ginandromorfía en el Cardenal Norteño (*Cardinalis cardinalis*) en México, con una revisión de otros casos en Norteamérica

## A case of gynandromorphy in Northern Cardinal (*Cardinalis cardinalis*) in Mexico, with a review of other cases in North America

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### Resumen

El ginandromorfismo es fenómeno de un organismo que presenta tejidos y rasgos tanto masculinos como femeninos, es inusual o poco común en la naturaleza y se manifiesta de forma rara en las aves. Durante el mes de abril de 2020 observamos un Cardenal norteño (*Cardinalis cardinalis*) con ginandromorfismo bilateral, en la costa oeste de México, lo que representa el primer reporte de este tipo para el país. En comparación con los reportes históricos de ginandromorfismo en *C. cardinalis*, notamos que la coloración del plumaje en su distribución bilateral excluye sus patrones corporales y en algunos casos llega a ser incompleto. La causalidad del ginandromorfismo es un tema genético-fenotípico aún no bien entendido que todavía falta aclarar a través de investigaciones dentro de esta línea especialmente interesante; por esta razón los reportes de incidencia como el presente contribuyen a entender el comportamiento de los individuos y sus áreas de ocurrencia, mientras que los estudios futuros a niveles genómicos serán capaces de resolver y aclarar esta anormalidad.

Palabras clave: Cardinalidae, ginandromorfismo bilateral, ginandromorfismo en aves, hermafroditismo, intersexual, leucismo, plumaje, quimerismo

### Abstract

Gynandromorphism is a phenomenon of an organism that possesses both male and female tissues and features that are unusual in nature, and rarely occurs in birds. During April 2020, we observed a possible bilateral Northern Cardinal (*Cardinalis cardinalis*) gynandromorph, in Mexico's west coast, representing the first report of this kind for the whole country. Comparing to the historic reports of gynandromorphism in *C. cardinalis*, we noted that the plumage coloration on bilateral distribution excludes a bodily pattern and in some cases is incomplete. The causality of gynandromorphism is a genetic-phenotypic issue not yet well understood that still needs to be clarified through research in this especially interesting line; incidence records contribute to understanding behavior and areas of incidence, while future studies at the genomic level will be able to resolve and clarify this abnormality.

Key words: Cardinalidae, bilateral gynandromorphis, birds gynandromorphis, hermaphrodite, intersex, leucism, plumage, chimerism

El ginandromorfismo también conocido como quimerismo, es un fenómeno que ocurre de forma extremadamente rara en la naturaleza (Major & Smith 2016), y puede ser causado por varias razones, entre ellas, factores hormonales (Graves *et al.* 1996), trastornos genéticos (Zhao *et al.* 2010) o fertilización de ovocitos binucleados (Blanchard & Descimon 1988). Cuando la diferenciación sexual es equitativa, se conoce como ginandromorfismo bilateral. Esto ocurre con mayor frecuencia en los vertebrados porque la división celular es bilateralmente simétrica (Zhao *et al.* 2010, Jones & Bartlett 2017) y por la fertilización de un ovocito doble. Sin embargo, cuando este trastorno se presenta en estadios avanzados de la división celular puede existir simetría bilateral incompleta y de forma compleja donde puede resultar de causas completamente diferentes, en tales casos se puede observar un patrón, de forma axial o en mosaico (Blanchard & Descimon 1988, Clinton *et al.* 2012).

El ginandromorfismo se ha manifestado en una variedad de animales incluidos insectos, aves y mamíferos; en estos últimos, su frecuencia es extremadamente baja (Kumerloeve 1987). En aves, el ginandromorfismo se ha reportado con mayor frecuencia en los Passeriformes (Kumerloeve 1954), especialmente en individuos de la familia Fringillidae (Patten 1993) posiblemente porque las aves de esta familia se reproducen en cautiverio frecuentemente, por su uso como aves canoras y de ornato, lo que facilita su detección. No obstante, en especies monomórficas no es posible detectarla visualmente y requiere de estudios específicos bajo condiciones de laboratorio, lo cual podría indicar que este fenómeno puede ser más común de lo que se reporta actualmente (Clinton *et al.* 2012).

La causa del ginandromorfismo puede determinarse mediante estudios morfo-anatómicos o genéticos (Zhao *et al.* 2010), mediante muestras de sangre a través de la detección de hormonas sexuales o mediante la disección durante la necropsia, para determinar la existencia de genitales femeninos (ovarios) y masculinos (testículos) en el mismo organismo, mientras que la evidencia visual de la división bilateral del dimorfismo sexual (es decir, al menos parte del plumaje del ave) es la característica diagnóstica más evidente del ginandromorfismo en este tipo de organismos (Zhao *et al.* 2010).

Reportamos el primer un caso de un ginandromorfismo con simetría bilateral incompleta en un individuo de Cardenal norteño (*Cardinalis cardinalis*) en México y discutimos algunos casos de ginandromorfismo en esta especie, que muestran patrones irregulares de comportamiento y de distribución en el color del plumaje. Bajo este sentido, el presente caso puede ser excepcionalmente interesante y amplia en panorama del conocimiento de este fenómeno poco común, facilitando la identificación de individuos con ginandromorfismo.

## Observaciones

El 4 de abril de 2020 durante el monitoreo de aves del Programa de Aves Urbanas (PAU) en una zona periurbana con caminos de terracería que conecta la población “Los Achotes” y la comunidad turística y pesquera “Barra de Potosí”, municipio de Zihuatanejo de Azueta en la Costa del estado de Guerrero, México observamos un individuo de *C. cardinalis* que exhibió ginandromorfismo (17°34'40.56"N, 101° 26'16.98"O, elevación 17 m).

El individuo presentó un plumaje parecido al de una hembra en el lado izquierdo del cuerpo, desde el frente del cuello y la parte posterior de la nuca hasta la cola y mostró plumaje masculino rojo en la parte del lado derecho del cuerpo. La cabeza fue casi totalmente masculina con el plumaje color rojo, incluyendo una máscara negra del área loreal y alrededor del pico, que de vuelta a la región occipital de la cabeza, y una máscara facial negra que se encuentra con el gris pálido del cuello anterior izquierdo, al mismo nivel que se encuentra con el rojo de la derecha); mostró pocas plumas pálidas parecidas a las de una hembra en el lado izquierdo de la cabeza y hacia las plumas auriculares (Fig. 1).

El individuo ginandromorfo se alimentaba de los frutos de árboles de Ciruela de Huesito (*Spondias purpurea*) y Guanacaste (*Enterolobium cyclocarpum*). Usando llamados de reproducción, pudimos atraerlo a las ramas de un árbol de Cacahuananche (*Gliricidia sepium*) adyacentes a nuestra ubicación. El ave vocalizaba constantemente mientras una hembra de plumaje con coloración normal, aparentemente su pareja, seguía al individuo con ginandromorfismo durante el tiempo de observación, que fue alrededor de 15 min.

El 7 de abril volvimos al lugar de la primera observación para continuar el avistamiento y dar seguimiento al individuo ginandromorfo, el cual se observó comiendo en compañía de una hembra. Una vez más, usamos llamados de reproducción y la pareja respondió a las simulaciones vocales con vocalizaciones recíprocas.

En ambas visitas se observaron individuos coespecíficos en las inmediaciones del individuo ginandromorfo. El ave en cuestión permaneció posada y alimentándose sin interacciones agonísticas aparentes de sus coespecíficos. Durante las observaciones pudimos verificar la presencia de al menos cuatro parejas de *C. cardinalis*, así como de dos machos aparentemente sin pareja en un radio no mayor a 600 m, todos los cuales se encontraban activos y vocalizando con llamados cortos simplemente para mantener el contacto con otros miembros de una bandada. Durante los días 21 y 22 de abril regresamos al área de avistamiento y sus alrededores, pero no hicimos avistamientos adicionales del ginandromorfo de *C. cardinalis*.

## Discusión

Actualmente existe un aumento en el número de

Figura 1. Vista frontal, lateral izquierda y dorsal izquierda del individuo de *Cardinalis cardinalis*, con ginandromorfismo bilateral incompleto. El plumaje rojo del macho es incompleto en el lado izquierdo como un macho de coloración norma, sin embargo no es absolutamente simétrico bilateralmente, en la cabeza aún conserva el patrón común del macho. Fotografiado en Zihuatanejo de Azueta, Guerrero, México el 04 de abril de 2020 (Fotos de Santiago Castro).

observadores de aves que ayudan a documentar individuos con aparente ginandromorfismo a través del uso de cámaras o celulares digitales, además, se presenta una mejor capacidad para comunicar y compartir estos avistamientos a través del internet. No obstante, entre algunos casos de individuos de *C. cardinalis* con anormalidad pigmentaria en sitios y plataformas web, existe confusión al momento de identificar el ginandromorfismo con algún otro tipo de anomalía pigmentaria, por ejemplo: el leucismo, albinismo o despigmentación progresiva (Tabla 1, No. 10 y 11).

El tipo de aberración que más ha sido confundido con ginandromorfismo es el leucismo parcial, que podría parecer similar. En el presente reporte, el leucismo parcial fue excluido, porque el leucismo indica la ausencia congénita y hereditaria de células productoras de melanina, en un individuo con leucismo parcial la apariencia es comúnmente bilateral o simétrica, es decir con plumas blancas en ambos lados del cuerpo del ave (Mahabal *et al*. 2016, Rodríguez-Ruiz *et al*. 2017, van Grouw  2021). En las formas más comunes de leucismo parcial en las aves, las partes del cuerpo más alejadas de la cresta neural, como la cara y las puntas de las alas, son las más propensas a quedar sin células de melanina (van Grouw 2014), lo cual no corresponde con el presente caso. Una recomendación para la consulta de anormalidades pigmentarias en el *C. cardinalis* es "The Sibley Guide to Birds, 2nd Edition" (Sibley 2014), donde se ilustran y describen diferentes tipos de anormalidades pigmentarias.

En las aves en que se ha documentado que muestran ginandromorfismo bilateral, el plumaje masculino se distribuye con mayor frecuencia hacia el lado derecho del cuerpo (Bohlen 2006, Jones & Bartlett 2017), debido a que algunas células tienen cromosomas sexuales ZW que son típicos de las hembras y otras células tienen cromosomas sexuales ZZ típicos de los machos. La mayoría de las  células del lado con plumaje masculino eran ZZ, y la mayoría de las células del lado con plumaje femenino eran ZW. Como resultado de la clasificación incompleta de células masculinas y femeninas entre los dos lados, con plumas intercaladas en cada lado que correspondían al sexo opuesto, probablemente resulten de un error en la ovogénesis en la madre del ginandromorfo, resultando en dos núcleos en el ovario fertilizado (Zhao *et al*. 2010). En las aves, las hembras suelen sólo desarrollar un ovario en el lado izquierdo (Kumerloeve 1954, Peer & Motz 2014). Sin embargo, algunos ginandromorfos tienen un ovario a la izquierda y un testículo a la derecha, pero los lados del plumaje están invertidos (Patten 1993) con respecto a las gónadas (DaCosta *et al*. 2007). La información recopilada en el presente estudio arrojó que en un 70% de los casos (Tabla 1), los rasgos femeninos aparecen al lado izquierdo del individuo, lo cual podría reflejar que las hembras presentan sólo un ovario al lado izquierdo, no obstante el número apreciable de excepciones enumeradas indica que ésta en sí no representa una causa fundamental. Por otro lado, en todos los casos presentados, toda el área submandibular es negra y la cresta roja (como en los machos); posiblemente indica que la genética de esta área es diferente y así representa una excepción a la asimetría bilateral en otras partes del plumaje. Este mecanismo probablemente explica por qué en los casos que se ha reportado el Cardenal norteño tienden a tener una simetría de plumaje imperfecta (Jones & Bartlett 2017). Sugerimos recopilar más información referente a individuos de vida libre y domésticos con esta condición, además de resguardar y preservar material biológico de tejido y genético en congelación (*ej.* nitrógeno líquido),

**Tabla 1.** Comparativo de algunos casos de reportes históricos (desde 1969 a 2020) provenientes de literatura científica e informes en plataformas digitales y redes sociales de internet que están relacionados con el ginandromorfismo bilateral en individuos del Cardenal norteño (*Cardinalis cardinalis*) en América.

| No. | Fecha de registro | Localidad | Patrón de coloración en el ave | Comportamiento | Fuente |
|---|---|---|---|---|---|
| 1 | 10 de enero de 1969 | Nashville, Tennessee, EE. UU. | -Der. ♂, izq. ♀; cresta de la cabeza ♀; alrededor de la región mandibular negra como ♂ | -No menciona datos de comportamiento | Laskey (1969) |
| 2 | 06 de diciembre de 2002 | Springfield, Illinois, EE. UU. | - Der. ♂, izq. ♀; cresta de la cabeza ♂; coloración de cabeza mayormente ♂; alrededor de la región mandibular negra como ♂ | -Vocalizó | Bohlen (2006) |
| 3 | 15 de marzo, 30 de mayo de 2006 | Sangchris Lake State Park, Rochester, Illinois, EE. UU. | - Der. ♂, izq. ♀; cresta de la cabeza ♂; coloración de cabeza mayormente ♂; alrededor de la región mandibular negra como ♂ | -Vocalizó; con pareja,<br>-Construcción de nido | Bohlen (2006) |
| 4 | 20 de marzo de 2009 | Virginia, EE. UU. | - Der. ♂, izq. ♀; cresta de la cabeza ♂; coloración de cabeza mayormente ♂; alrededor de la región mandibular negra como ♂ | -No menciona datos de comportamiento | Mitchell A. Byrd, https://www.flickr.com/photos/birdsofvirginia/3370349942/ |
| 5 | Diciembre 2008 a marzo 2010 | Rock Island, Illinois, EE.UU. | -Der. ♀, izq. ♂; cresta de la cabeza ♂; alrededor de la región mandibular negra como ♂ | -Solitario, no vocalizó, no se asoció con conespecíficos | Peer & Motz (2014) |
| 6 | 01 de mayo de 2011 | South Bass Isla, Lake Erie, Ohio, EE. UU. | -Der. ♂, izq. ♀; alrededor de la región mandibular negra como ♂ | -Sin protuberancia cloacal o parche de cría, sin pareja, no en condiciones reproductivas. | Jones & Bartlett (2017) |
| 7 | 30 de enero de 2014 | Carolina del Norte, EE. UU. | -Der. ♂, izq. ♀; cresta de la cabeza ♂; alrededor de la región mandibular negra como ♂ | -Posando sobre una rama de árbol | Charlotte-Mecklenburg Schools (2014) https://twitter.com/charmeckschools/status/428929447660498945 |
| 8 | 2014 a 2016 | Centro de Texas, EE. UU. | -Der. ♀, izq. ♂ | -Forrajeo en comederos artificiales. | IBBA (Inland Bird Banding Association) https://www.facebook.com/InlandBirdBandingAssociation/posts/1308047839378707 |
| 9 | 11 de febrero de 2018 | Roland, Pulaski Co. Arkanssas, EE. UU. | - Der. ♂, izq. ♀ | -Forrajeo en grupo con individuos de la misma especie. | Tumlison *et al.* (2018) |
| 10 | 12 de marzo de 2018 | Charlestown, Indiana, EE. UU. | -Refiere a leucismo parcial pero se trata de ginandromorfismo bilateralmente incompleto.; Der. ♂, izq. ♀; cresta de la cabeza ♀; alrededor de la región mandibular negra como ♂ | -Alimentándose en un comedero artificial | Andrew Clark (2018); https://www.indystar.com/story/news/2018/03/12/bird-spotted-southern-indiana-last-week-extremely-rare/417594002/ |

Tabla 1 cont. Comparativo de algunos casos de reportes históricos (desde 1969 a 2020) provenientes de literatura científica e informes en plataformas digitales y redes sociales de internet que están relacionados con el ginandromorfismo bilateral en individuos del Cardenal norteño (*Cardinalis cardinalis*) en América.

| No. | Fecha de registro | Localidad | Patrón de coloración en el ave | Comportamiento | Fuente |
|---|---|---|---|---|---|
| 11 | 12 de enero de 2018 | Missouri, EE. UU. | -Refiere a leucismo parcial pero se trata de ginandromorfismo bilateralmente incompleto. Der. ♀, izq. ♂; cresta de la cabeza ♀; alrededor de la región mandibular negra como ♂ | -Alimentándose en un comedero artificial | Missouri Dept. of Conservation - Weird Wildlife. Tom Schultheis () |
| 12 | 28 de enero de 2019 | Erie, Pensilvania, EE. UU. | -Der. ♂, izq. ♀ | -Vocalizó, con pareja, y con individuos de la misma especie. | Shirley & Jeffrey Caldwell https://www.nationalgeographic.com/animals/2019/01/half-male-half-female-cardinal-pennsylvania/?utm_source=reddit.com |
| 13 | 04 y 07 de abril 2020 | Zihuatanejo, Guerrero, México | - Der. ♀, izq. ♂; alrededor de la región mandibular como coloración negra como de ♂ | -Vocalizó, con pareja, en grupo con individuos de la misma especie. | Erick Rubén Rodríguez-Ruíz & Santiago Baltazar Castro-Gutiérrez (Reporte actual) |

principalmente de gónadas para determinar su funcionalidad (Jones & Bartlett 2017).

Para nuestro caso de *C. cardinalis* la dirección del sexo se ha documentado como inconsistente, porque su plumaje incluye plumas rojas dispersas en el lado femenino y plumas marrones a grises en el lado masculino, de tal forma que la diferencia de plumaje entre los dos lados no es completa, un patrón de simetría bilateral no bien definido (Bohen 2006, Tabla 1). Esta condición de ginandromorfismo aparentemente imperfecto (Jones & Bartlett 2017) o incompleto, con algunas variaciones principalmente a nivel de cabeza y rectrices, ha sido reportado en un amplio número de casos con una frecuencia de por lo menos el 69% (Laskey 1969, Peer & Motz 2014, Tumilson *et al*. 2018, Tabla 1) y puede estar relacionado al mecanismo causal del ginandromorfismo (Jones & Bartlett 2017).

El mecanismo que provoca el ginandromorfismo aún no es comprendido en su totalidad, lo que se ha asociado a múltiples vías de afectación (Graves 1996, Jones & Bartlett 2017) y aunque en la actualidad se conoce más sobre este fenómeno, aún existe falta de información sobre los efectos que tiene en los individuos que desarrollan esta (Peer & Motz 2014), incluso al abordar las implicaciones que el ginandromorfismo tiene a nivel conductual con las interacciones de los individuos de la población (Laskey 1969). Por ejemplo, en los casos documentados para *C. cardinalis* (Tabla 1), los individuos con ginandromorfismo han demostrado aparentemente pocas modificaciones en su comportamiento, manteniendo las interacciones habituales con otros individuos, por ejemplo alimentándose juntos, vocalizando entre otros machos, formando pareja y hasta en la construcción de nido de un macho ginandromórfico apareado con una hembra aparentemente de coloración normal (Bohlen 2006) como el presente registró en el cual se observó al individuo con una hembra que estuvo constantemente siguiéndolo.

Sin embargo, en un caso de Peer & Motz (2014) también con *C. cardinalis*, con ginandromorfismo el individuo mostró un comportamiento solitario y no se registraron vocalizaciones durante las observaciones. Los registros previos documentados y el presente nos permiten concluir que *C. cardinalis*, al menos en la gran mayoría, muestra un patrón bilateral incompleto en la sección de la cabeza y en algunos casos inusuales donde sigue un orden opuesto dando como resultado el lado derecho del individuo con plumaje aparentemente femenino.

Finalmente, esperamos que este documento ayude en el diseño de futuras investigaciones sobre la genética de *C. cardinalis* con ginandromorfismo y cuestione el mecanismo que influye en este fenómeno inusual en la naturaleza.

## Agradecimientos

Nuestro agradecimiento H. van Grouw (especialista mundial en anormalidades pigmentarias en aves) por confirmar la identificación del individuo de Cardenal norteño con ginandromorfismo. De igual manera a F. Gary Stiles Editor asociado y a T. L. Celeita R. Coordinadora de Comunicaciones de la Revista Ornitología Colombiana por el constante seguimiento de la nota y a los revisores por sus atinadas sugerencias para la mejora del contenido.

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*Recibido:* 16 de noviembre de 2021 *Aceptado:* 27 de octubre de 2022

Citación: Rodríguez-Ruíz, E. R. & S. B. Castro-Gutiérrez. 2022. Un caso de ginandromorfía en el Cardenal Norteño (*Cardinalis cardinalis*) en México, con una revisión de otros casos en Norteamérica. Ornitología Colombiana 21: 30-37.

Juan Carlos Martínez-Benavides, 2019

# Transmisión del canto de *Zonotrichia capensis* en escenarios con distinta intensidad de ruido

## Song transmission of *Zonotrichia capensis* in scenarios with different noise intensity

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Los cantos en las aves tienen una vital importancia, pues poseen varias funciones como lo son la protección del territorio y la atracción de la pareja, este medio posee ciertos inconvenientes que lo dificultan de especial manera en las ciudades por el ruido que se genera en las actividades cotidianas humanas. Para entender este problema se grabaron cantos de *Zonotrichia capensis* en diez puntos del municipio de Pasto, cinco dentro del casco urbano y cinco fuera de este. Se midieron distintas variables espectro-temporales de los cantos y se clasificaron teniendo como base esas medidas. Se eligieron siete cantos que fueron reproducidos y regrabados en 3 grabadoras a distancias de 4, 8 y 16 m, con intensidades de señal de 70, 80 y 90 dB e intensidades de ruido de 0, 60, 70 y 80 dB. Se generaron modelos lineales mixtos de los datos obtenidos del experimento. Se evaluó el efecto del ruido en la transmisión de variables espectro-temporales del canto, encontrando efectos significativos de las variables a excepción de la frecuencia pico. Los modelos generados teniendo en cuenta variables como la distancia, el nivel de emisión de la señal y el ruido, tuvieron una baja explicación al presentarse juntos sobre el poder máximo, la tasa señal-ruido y el exceso de atenuación. Aunque las variables evaluadas afectaron la transmisión del canto según lo previsto, no se encontró una tendencia en el comportamiento de las variables de los cantos provenientes de ambientes urbanos durante los experimentos de trasmisión, aunque presentan el incremento en la frecuencia mínima como se registra en otros trabajos para aves en ambientes urbanos. Estos resultados sugieren que los atributos espectro-temporales de los cantos no reflejan una ventaja en términos de distancia de transmisión; sino que sus variaciones son, o bien una consecuencia a las variables físico-ambientales del espacio donde se transmiten, o que son producto de un proceso de evolución cultural en las poblaciones.

Palabras clave: transmisión, canto, sonido, urbano, gorrión

# Review of: Feduccia, A. 2020.

# Romancing the Birds and Dinosaurs: Forays in Postmodern Paleontology. BrownWalker Press/ Universal Publishers, Inc. Boca Raton, FLA and Irvine, CA.

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## The evolution of birds and flight: a controversy definitively resolved?

For over half a century, a heated controversy has existed in paleontology regarding the origin of birds and their feathers and flight. The ‘classical’ theory, championed by Alan Feduccia in his book “Romancing the birds and Dinosaurs”, considers that the bird and dinosaur lineages diverged in the Triassic from early archosaurs, that flight evolved in small, trunk-climbing animals via selection favoring specialization for gliding, with feathers having evolved concurrently to produce aerodynamic airfoils and smooth body outlines to reduce drag by air resistance. The newer, ‘postmodern’ theory posits that birds evolved more recently from highly specialized cursorial theropod dinosaurs, with flight evolving via fast running to attain takeoff and wing-assisted climbing to reach higher elevations from which to glide, while feathers evolved to reduce heat loss in cursorial, endothermic dinosaurs and only later were adapted for flight. The two theories rely upon very different methodologies to reach their conclusions. The classical theory traces the evolution of different bones and functional complexes through time as well as ontogenetic processes including embryology to determine homology, with consideration of the chronology of the fossils derived from stratigraphy. The postmodern theory is based upon the methodology of cladistic phylogenetics that produces cladograms to express the relatedness of any two specified groups, deducing the characteristics of their common ancestors quantitatively via measurements of numerous characters through computer algorithms and identifying homologies from the cladograms; the temporal component of stratigraphy to date fossils is deemed of only secondary importance.

This review is timely, because the postmodern “birds are dinosaurs” theory is the *only* one presented in all modern ornithology texts, as well as in nearly all of the popular and semipopular literature. Proponents of this theory have proclaimed that the controversy is resolved, affirming that the only valid way to deduce phylogeny is through the cladistic method, thus conclusions reached by any other method are “non-scientific”. The arguments presented by Feduccia appear too solid and logical to be so arrogantly dismissed, and the evidence he presents suggests clearly that the controversy is far indeed from having been resolved.

In his preface, Feduccia describes the current controversy and why he considers cladistic phylogenetics to be a “restrictive, monolithic methodology blended with hard-line ideology”: all knowledge must flow from the cladogram, and all cladograms can *only* be tested by competing cladograms. He then presents three of his own basic arguments: a) any creature with avian feathers and flight hand is of the avian lineage; feathers are too aerodynamically complex to have evolved in any context other than flight; b) nonflying feathered "dinosaurs" exhibit flighted ancestry (the "neoflightless hypothesis") – loss of flight is a derived rather than a primitive character; and c) he points out three fundamental sources of error in cladistic reconstructions of phylogeny: massive parallelism and convergence in disparate lineages, fossil deterioration and decay which distort ancestry, and ontogeny, especially paedomorphosis or arrested development.

**Chapter 1. Burning Dim:** The New Theory-Laden Study of Fossils. Feduccia considers two events that changed the field of paleontology: John Ostrom's discovery of the lower Cretaceous bird-like "dinosaur" *Deinonychus* and its striking overall resemblance to modern flightless birds, which led him to propose that the origin of birds was to be sought in terrestrial, bipedal theropods; and the discovery of the exceptionally well-preserved and diverse fossils of the Jehol biota of early Cretaceous deposits in China, which included many birdlike forms. Each of these events produced floods of subsequent publications describing these finds – but their interpretations were principally directed toward reinforcing the new view of the earthbound theropod origin of birds, with the presence of feathers and aerodynamic wings being explained as having been evolved for other functions and preadapted for subsequent utility for flight, as now supported by cladistic phylogenetics.

**Chapter 2. The Road to Paleontological Postmodernism.** The term "postmodernism" represents rejection and replacement of "modern" (latter 20th century) methodologies and ideas: for paleontology, the advent of phylogenetics via cladograms. Also fueling the mix was the recreation of dinosaurs as warm-blooded, colorful, highly active and intelligent animals by Robert Bakker. This was most convenient for the cladogram because it permitted feathers, as essential for endothermy by retarding heat loss, to be viewed as having evolved in this context rather than for flight.

**Chapter 3. Make it new! The Dinosaur Renaissance.** This chapter actually deals with how much the "new look" at dinosaurs (as triggered by the Bakkerian "renovation") can tell us about their behavior in life. For the bipedal, predatory theropods, some of Bakker's speculations on their locomotion have held up, but for the gigantic, long-necked sauropods, this is not the case. Here, the computer-generated digital reconstructions of dinosaur skeletons, based upon careful measurements taken directly from the fossil bones, have greatly clarified their postures and resultant limits to behavior, effectively consigning Bakker's visions of dancing behemoths with swan-like necks browsing on Mesozoic treetops to the realm of science fiction.

**Chapter 4. New and Improved Dinosaur.** Here, Feduccia presents a relatively brief but incisive critique of Bakker's and Ostrom's conception of endothermic dinosaurs (for Ostrom, necessary for his hypothesis that birds inherited their warm-bloodedness from theropod ancestors: (in fact, Bakker had depicted *Archaeopteryx* as an earthbound theropod that could not fly). Considering surface/volumen relationships, it had been calculated that large dinosaurs could maintain high body temperatures without necessity of feathers for insulation, obviating the need to consume far higher quantities of food to support heat production: they were in effect, "inertial homeotherms". To attain such large sizes, it had been calculated that such dinosaurs required growth rates far higher than present-day reptiles (or birds), but this study was criticized for serious errors in these calculations; among living organisms, no correlation exists between basal metabolic rate and growth rate. Feduccia concludes that in the uniformly tropical climate of the Mesozoic, endothermy was unnecessary and perhaps even maladaptive.

**Chapter 5. The Hot-Blood Dinosaurs.** Feduccia continues here developing the arguments for and against endothermy in dinosaurs with a detailed consideration of the physiological and behavioral correlates of endothermy and ectothermy. He describes the variety of behavioral mechanisms involved, with particular reference to the physiology of energy production in muscles and the muscular mass required for flight. He shows that short anaerobic energy bursts produced by a relatively small amount of muscle permit ectothermic animals to move quickly enough to capture food and avoid being captured as food, and considers the capacity of ectotherms to use behavior to acquire daily and maintain high body temperatures, again with a fraction of the energy required for permanent endothermy. Also, he reviews the many variations in thermoregulation by modern birds, including use of environmental heat gradients (*e.g.*, sun-shade) in different contexts to supplement or offset energy requirements of endothermy. With respect to early birds like *Archaeopteryx* as well as small theropods, Feduccia concludes that they simply were ectothermic! Moreover, the supposedly high intelligence of large predatory theropods (deduced from their supposed endothermy) is contradicted by their minute brain casts.

**Chapter 6. Methodology: The Endless Search for a Panacea.** This chapter presents a detailed critique of phylogenetic systematics, tracing its origins through the phenetic era of the 1960s and 1970s and on to Hennig's cladistic method, and its modified version as currently practiced. This involves moving away from Hennig's careful analyses to identify homologies and separate derived from primitive characters, to deducing homologies from cladograms constructed by computer algorithms incapable of recognizing massive convergence, parallelism and paedomorphosis, all of which have been important in avian evolution. Homologies are discerned by "reciprocal illumination", in effect majority-rule consensus in the cladogram, which in turn is evaluated by the criterion of parsimony. Therefore, the selection of characters to enter into the construction of the cladogram is of paramount importance. Redundant, highly co-correlated characters can exert a disproportionate influence compared to highly unique and diagnostic characters; weighting of such diagnostic key characters is not allowed as this would constitute "special pleading" and bias the cladogram. Feduccia presents a detailed list of cladistic phylogenetic studies that produced results incompatible with whole-genome analyses. In effect, the biological significance of characters and *how* natural selection favored their evolution are ignored, as is stratigraphy, the most conclusive indicator of *when* they evolved.

**Chapter 7. Dinosaur: What's That?** This turns out to be a difficult question. Feduccia details the supposed defining characters of dinosaurs and theropods, in which evolution of bipedality and associated features of the pelvic girdle, legs and feet figure most prominently. However, looking back to the Triassic, various groups of pre-dinosaurian "protoarchosaurs" are found, and the classification of these is fraught with uncertainty due to frequent and varying degrees of convergence in different lineages toward dinosaurlike posture and locomotion, and the once clear definitions of dinosaurs and theropods (among others) have become increasingly blurred: rather than a neat, straight-line evolutionary sequence, the phylogenetic tree becomes increasingly bushy and tangled. Which group or groups are potential avian ancestors, and when the avian lineage diverged from that of advanced archosaurs, are questions with no clear answers (yet?). Even the question of what currently constitutes a "dinosaur" may depend upon how far back among the various possible nodes one wishes to go – and as sometimes suggested, this "is essentially arbitrary".

**Chapter 8. The Rise and Fall of Vicariance Biogeography.** Here, the question involves the origins of the ratites, and of the origins of the modern avifauna: were these the gradual consequences of continental drift, or the result of an explosive radiation of modern birds following the meteor strike that abruptly terminated the Cretaceous, producing the extinction of not only the dinosaurs, but also of the dominant lineage of birds of the Mesozoic avifauna, as first proposed by Feduccia's "big bang" hypothesis? Evidence that modern orders existed in the Cretaceous, as favored by the cladists, rested in part on the identification of the Cretaceous *Vegavis* as a modern duck, although subsequent studies showed that it represented an archaic form not clearly ascribed to any modern order. Finally multiple genetic studies including whole-genome analyses of modern orders conclusively support the origin of nearly all modern orders including the ratites as following the extinctions at the end of the Cretaceous, and that modern ratites were descendants of volant ancestors.

**Chapter 9. Peter Pan Evolution: Fast Track to Macroevolution.** This chapter highlights the work of Gavin deBeer, who developed the ideas of mosaic evolution, applicable to many forms exhibiting combinations of primitive and derived characters (including *Archaeopteryx*), and the importance of paedomorphosis or arrested development: the retention of juvenile characters into the adult stage, with retarding or eliminating the expression of adult flight-related structures. This has been an important feature of many lineages, including secondarily flightless birds, as in the ratites as well as flightless Mesozoic forms. The highly developed aerodynamic wing morphology has been progressively reduced in cases where the selective advantages for its maintenance were relaxed, in order to increase in size beyond that necessary for aerial locomotion, especially in predator-free isolated ecosystems such as oceanic islands. Paedeomorphosis can result in secondarily flightless forms rapidly acquiring the appearance of ancestral stages in the evolution of flight, and such changes may be all but impossible to detect in cladistic analyses: specifically, the resultant bipedal, cursorial animals come to resemble theropods that never flew.

**Chapter 10. You Can't Go Home Again: Dollo's Law.** This "law" essentially states that once lost over long periods, complex adult characters cannot be reacquired: the statistical improbability of following the previous evolutionary trajectory backwards. Flightless ratites cannot reacquire the ability to fly, just as blind cave organisms cannot reacquire eyes. In the case of birds, flight requires long forelimbs that support wings. In many dinosaurs including theropods, the evolution of shorter forelimbs was part of specialization for fast bipedal, cursorial locomotion. The hypothesis of the "ground-up" origin of flight from a theropod origin requires the re-elongation of the forelimbs (to serve as insect nets or for displays), but no actual evidence supports such a process, which is also aerodynamically highly unlikely.

**Chapter 11. Rambo and Clementine: Thanks for the Thumb.** The homology of the three digits of the avian hand has long been disputed, because the hand of advanced dinosaurs like theropods also has three digits, clearly identified as 1,2 and 3 in the fossil record, which documents reduction and loss of digits 4 and 5. Working from the eggs of a pair of captive ostriches (named Rambo and

Clementine), a careful embryological study by Feduccia and Nowicki definitively identified the digits of birds as 2,3 and 4, clearly showing the rudiments of digits 1 (the "thumb") and 5 in an early stage of embryology, with the subsequent resorption of these elements at a later stage. The non-homology of avian and theropod hands was conclusively demonstrated. In effect, this affirmed digital homology as a key character distinguishing avian and theropod lineages. However, cladistic algorithms deal with *numbers* of characters and the weighting of *key* characters is denied as "special pleading" by cladists. To resolve the difference in digital homology, a *homeotic frame shift*, whereby the identity of the digits shifted during embryology was proposed. However, what may occur in a genetic laboratory experiment may not occur in the real world, without any demonstrable advantage from natural selection. Further experimentation led its proponents to propose digits in addition to the original five, which would effectively remove embryology from the phylogenetic toolkit. As noted by Feduccia, the question never asked is, "if birds are direct descendants of dinosaurs, why would they not have possessed a dinosaur hand at their origin?"

**Chapter 12. Topsy-Turvy Phylogeny.** Here, Feduccia discusses a popular figure purporting to show the progression from theropod to bird, taken by many to represent a phylogenetic timeline. It begins with *Sinosaurapteryx*, an early Cretaceous theropod sporting a mane of supposed downy "protofeathers" and continues with Velociraptor of the late Cretaceous, a terrestrial cursor with a birdlike wrist bespeaking avian affinities (much like *Deinonychus*), *Protoarchaeopteryx*, an apparently close relative of *Archaeopteryx* but appearing in the fossil record *after* the latter, on to the late Cretaceous *Caudipteryx*, with many birdlike features including the remnants of a feathered flight wing (considered by Feduccia to represent a secondarily flightless bird), followed by the Jurassic *Archaeopteryx*, definitely capable of at least short-distance flight, then *Eoalulavis*, an enantiornithine bird of the early Cretaceous and definitely off of the main branch leading to the final crow (*Corvus*) exemplifying the modern avifauna. As a chronological progression, the figure is totally meaningless (avian ancestors are placed millions of years later than the earliest birds while the earliest known bird appears almost at the end of the sequence), but it typifies the disregard for stratigraphy by much of cladistic analysis.

**Chapter 13. Dino-Fuzz in the Jehol.** The mane of supposedly downy protofeathers of *Sinosaurapteryx* was quickly taken by cladists as perhaps the final evidence of a dinosaur-bird link. However, the status as true feathers of this theropod has been severely questioned, and their location as a midback mane obviates any thermodynamic function, especially as no evidence exists for such "feathers" being the insulatory pelt required by Ostrom to support endothermy. Feduccia notes that such a downy covering would be maladaptive in a wet climate, and that downy young of modern birds are often sheltered from wetting by the wing or back feathers of the adults, as well as being vulnerable to predators. Skin impressions of Cretaceous theropods and other dinosaurs, never show external featherlike coverings. Moreover, such fibrous structures are present widely as collagen fiber meshworks that give structural support to the integument in a wide variety of vertebrates, and in *Sinosaurapteryx* probably supported a dorsal frill as seen in some modern lizards. However, their existence prompted Prum and Brush to develop a model for feather evolution starting with such "protofeathers" and progressing through several stages to the aerodynamic airfoils first definitely seen in

*Archaeopteryx* 30-40 million years earlier. Presence of other stages of feather evolution in the fossil record according to this model have been virtually duplicated by experiments on decay of collagen fibers of scales in vertebrates including dolphins and to decaying collagenous tendons or scales in some fossils including icthyosaurs by Lingham-Solier, the world expert on collagen. Preservational alteration of the integument shown in primitive chordates also produces similar "stemward slipping" and resemblance to earlier, more primitive states, easily misguiding cladistic reconstructions of phylogeny.

**Chapter 14. Collagen, Collagen Everywhere!** Here, Feduccia reviews the resistant structure and ubiquitous nature of collagen, which is the main structural protein in everything from skin and scales to bone and cartilage, as well as the cornea of the eye, blood vessels and the heart itself. These conclusions derive from the decades of intensive study of collagen by Lingham-Solier, who also collaborated with Feduccia in a number of studies. Feathers are hollow, keratinaceous structures, but there is no clear evidence that "protofeathers" were hollow, and this also calls into question the assertion that the external, hairlike integumentary structures seen in some pterosaurs "must be" feathers, with the alternative explanation being that they are the residue of a mesh of collagen fibers exposed by decay of a wing membrane.

**Chapter 15. Iconic Urvogel: Bird to Dinosaur to Bird.** Although often considered to be a "Rosetta Stone" of evolution, *Archaeopteryx* is actually rather far removed from the true origin of birds. Its current status is reviewed by Feduccia in this chapter. Until the 1970s, it was generally agreed that *Archaeopteryx* was an arboreal trunk climber, but the discovery of *Deinonychus*, presumably close to avian ancestry, shifted its image to that of a terrestrial predator unable to fly. However, its anatomically avian anatomy has been confirmed in many studies, including the discovery that one specimen had hindwing feathers, symmetrical rectrices and pennaceous feathers on its body, which probably served to produce a smooth outline to reduce air resistance (drag) once airborne. A study of its shoulder girdle indicated that it was probably incapable of sustained flight, but could flap its wings periodically. Other features of *Archaeopteryx* recently documented are the presence of pre-and postpatagia, membranes important for flight function as well as indicating that it could fold its wings as does a modern bird; being embedded in the propatagium restricts digital movement to the extent that use of the digits in predation is untenable. However, its hand digits were well suited for trunk climbing. Its feet, with the reversed hallux, were apt for perching on branches. A cast of the *Archaeopteryx* brain revealed it to be very similar to that of modern birds, albeit slightly smaller. The insistence by cladists that it was a terrestrial predator, required of the cladogram because of its placement in the Jurassic, in turn required that its flight characteristics had evolved as exaptations in the contexts of endothermy or displays, an unnecessarily complicated and tortuous explanation.

**Chapter 16. Confuciusornis: Earliest Known Beaked Bird.** Like *Archaeopteryx*, the earliest descriptions of *Confuciusornis* portrayed it as a terrestrial runner and insect trapper, but numerous studies have confirmed that it was a fully volant bird, in many ways more advanced than *Archaeopteryx* but like other enantiornithines, lacking certain more advanced features of modern birds of the ornithurine lineage that gave rise to modern birds. Suffice it to say that with literally thousands of well-preserved specimens, its external and internal anatomy is known in detail, as revealed by laser fluorescence and scanning electron microscopy. Feduccia speculated that its extreme abundance and with no identifiable stomach contents such as insect chitinous parts having been found in any specimen, therefore it might well have been a colonial leaf eater, with stomachs full of digesting leaves.

**Chapter 17. WAIR WAC-ked!** One of the hypotheses advanced to rescue the idea of the ground-up origin of flight is "wing-assisted climbing" or WAIR, first proposed to explain how baby theropods could use their wings to surmount fallen trunks, thereby selecting for re-elongation of their wings. A revival of this hypothesis was based on observations on the chukar, a gallinaceous bird known for its ability for flapping its wings to aid in climbing hills or logs, from which it could glide or fly down. However, there is no evidence that the requisite forelimb musculature existed in any theropod. Finally, Feduccia reviews the evidence that flight only evolved in the "gravity-assisted", trees-down mode (termed wing-assisted climbing or WAC), via parachuting and gliding stages, beginning with a small, trunk-climbing, leaping vertebrate. Any increase in surface area of a small animal could decrease the vertical angle of descent and increase the distance achieved by the leap. Many intermediate stages of parachuting to gliding with increasing surface area are exhibited among modern small vertebrates, and the transition toward active flight could be easily selected via increased development of an airfoil on the forewing permitting flapping to increase the distance reached in the glide; further increase of the wing musculature would permit active flight. By contrast, no modern flying animals appear to have evolved via the ground-up, "gravity-resisting" method embraced by Ostrom and the cladists, via the improbable and aerodynamically inefficient re-elongation of greatly shortened forelimbs as in even the smallest theropods.

**Chapter 18. The Mismeasure of Claws.** Claws can provide valuable information regarding locomotion, especially when attention is directed toward the extremes of the range of variation in curvature and sharpness. Feduccia shows that strong curvature with a laterally compressed, extremely sharp tip is characteristic of a variety of trunk-climbing vertebrates from lizards to squirrels to woodpeckers and serves to separate these from more terrestrial animals with broader, flatter claws. The forelimb claws of early birds, both gliders and active fliers clearly show them to be arboreal climbers whose claws can function for climbing within the narrow range of movements permitted by the incorporation of the digits into the propatagia. Claws of terrestrial, cursorial theropods are quite different, and their forelimbs are too short and slender to be useful for climbing in any case. Feduccia notes that the horny sheath is the pertinent feature for measuring claws; the underlying bones often fail to reveal claw structure.

**Chapter 19. Climbing Wings: The Arboreal Scansoriopterids.** When described, these tiny mid-Jurassic animals were originally considered to be the smallest, arboreal coelurosaurs and the closest to the origin of birds. However, these animals lack any salient dinosaur features but show many avian characters, including evidence of elongated, rachis-dominant feathers on both fore and hindlimbs, claws fit for tree-climbing and a reversed hallux for perching. The pelvis is more like those of pre-dinosaurian archosaurs of the Triassic than that of theropods: they have been classed as pre-manoraptorian archosaurs, perhaps ancestral to oviraptorids and most likely represent early departures of the avian lineage from that of theropods and "dinosaurs" generally. They definitely support the "trees-down" evolution of gliding and flight.

**Chapter 20. *Caudipteryx*: Feathered Dinosaurs Unveiled.** The discovery of the early Cretaceous *Caudipteryx*, with reduced wings supporting avian flight feathers, an avian hand and propatagium and pennaceous body feathers was hailed as the definitive proof that flight evolved among dinosaurs and feathers had evolved for some other function (display?). However, these conclusions were derived from phylogenetic analyses incapable of dealing with secondary loss of flight. A close relative, *Protoarchaeopteryx*, had somewhat larger wings and perhaps was capable of limited flight; both were classified as dinosaurs in the Oviraptoridae. Far from considering these as dinosaurs, Feduccia and others saw them as remnants of a previously unrecognized radiation of flightless Cretaceous birds, distinct from that of theropods and "dinosaurs". Other studies, including a detailed cladistic analysis by Maryanska and Omólska clearly placed these oviraptorids as secondarily flightless birds. Feduccia noted that the complex structure of pennaceous feathers on the body becomes simplified in modern flightless birds, suggesting that such complexity is unnecessary for thermoregulation and could only have evolved in a flight context.

**Chapter 21. Pennaraptorans ("Feathered Raptors"): Dinosaurs or Birds?** The Penniraptora is a recently described group including the most avian members of the Maniraptora: the Oviraptosauria, Dromaeosauria and Troodontidae, defined phylogenetically by their "most recent common ancestor of *Oviraptor*, *Deinonychus* and *Passer domesticus*", thus it is presumed to be an early derivative of the line leading to modern birds. Including the most avian members of the Maniraptora (and possibly also the scansoriopterids), its characters include avian features like pennaceous feathers and a semilunate carpal that permits the wrist movement essential for flight, an element lacking in classic theropods. This would effectively eliminate theropods from the entire avian lineage, thus placing the nature of the penniraptorans at the heart of the dinosaur-bird debate: are they dinosaurs or birds? Feduccia extends his argument that *Caudipteryx* is a secondarily flightless bird to the penniraptorans, which as a group includes all stages of gliding, flight and secondary loss of flight: they represent descendants rather than ancestors of birds. The earliest known definitive penniraptoran is *Anchiornis* of the mid-to-late Jurassic. Its skeleton suggests that it was a tetrapteryx glider like *Archaeopteryx* and *Microraptor* and recent studies have shown it to have multiple avian characters; it likely was an ancestor of the still more birdlike troodontids.

**Chapter 22. The Day the Dinos Died.** Here the Cretaceous-Tertiary (KT) extinction is taken up in more detail, including evidence that at least some dinosaurs were still extant when the meteorite collided, as revealed by the "Tanis" fossil site, and evidence in favor of the "big bang" evolution of modern avian orders. Feduccia follows this up with the prospects for the already progressing next major extinction of biodiversity resulting from the human impact of exploding population growth and its consequences, including climate change, dramatic reduction of natural areas and atmospheric contamination.

While reading "Romancing the Birds and Dinosaurs", I made frequent comparisons with parallel conclusions expressed in Luis Chiappe's book "Glorified Dinosaurs: the origin and early evolution of birds", wherein the cladistic method of phylogenetic systematics is explained as the only truly scientific method for deciphering the past. It was interesting to note the different interpretations of the nature and significance of the certain fossils between the two books. However, I was struck by its nearly total absence of presentation and evaluation of alternate hypotheses or contrary evidence: paedomorphosis is nowhere mentioned and secondary flightlessness only briefly (but not explained); collagen is only mentioned in passing in two places; Feduccia's listing of failed examples of phylogenetic methodology is not mentioned, nor is the existence of a competing cladogram of the phylogeny and relationships of *Caudipteryx*.

**Epilogue: A Search for Consilience, Not Consensus.** Consilience might be defined as the unification of different areas of knowledge reached through agreement among those favoring different approaches and conclusions. In science, this implies open debate and mutual respect between different sides of a controversy and not by simply ignoring the existence of such differences. Consensus rather implies an effort to convince a majority of those interested in a controversy by vehement advocacy through methods sometimes akin to populist proposals to win a political election: winner takes all, alternative proposals are discredited. The consensus view that "birds are dinosaurs" has been reached in much this manner. Ignoring the existence of a controversy when a great deal of contrary evidence has been presented is not the way science is best served. Presenting the cladistic phylogenetic method as the *only* hypothesis in ornithology texts effectively deprives students of the opportunity to compare both sides of this controversy, evaluating both with respect to how well they explain the phenomenon under discussion and withstand falsification: in sum, to reach a more informed decision as to whether the controversy has in reality been definitively resolved. I note that Chiappe's book contains a detailed index (lacking in Feduccia´s book - which also includes numerous citations of the phylogenetic hypothesis). Both books are well-written. I also note that Chiappe also has published a second book I have not seen, and which also should be consulted. In short, I highly recommend Feduccia's book to ornithologists in general, and especially those teaching (or receiving) courses in ornithology, where the "neoflightless" hypothesis is ignored. Comparing the treatments of avian origins by Chiappe and Feduccia would make a superb seminar topic!

Recommended for consultation (in addition to the reference lists of both books):

Chiappe, L. M. 2007. Glorified Dinosaurs: The Origin and Early Evolution of Birds. John Wiley & Sons, Inc., Hoboken, NJ

Chiappe, L. M. 2019. Birds of Stone. Johns Hopkins Publishers, Baltimore, MD.

Feduccia, A. 1996. The Origin and Evolution of Birds. Yale University Press, New Haven and London.

James, F. C. & J. Pourtless IV. 2009. Cladistics and the origin of birds: A review and two new analyses. Ornithological Monographs no. 66:1-78.

# Ornitología Colombiana

http://asociacioncolombianadeornitologia.org/revista-ornitologia-colombiana/

La Asociación Colombiana de Ornitología (ACO) inició actividades en 2002 con el fin de incentivar el estudio científico y la conservación de las aves de Colombia mediante la publicación de una revista, *Ornitología Colombiana*. La membresía en la Asociación está abierta a cualquier persona con interés por las aves colombianas y su conservación. Las cuotas para el 2022 son (dentro de Colombia, en pesos colombianos): $130.000 (profesionales), $65.000 (estudiantes con carné vigente), $1.875.000 (miembro benefactor o vitalicio). Encuentre el proceso para afiliarse en:
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