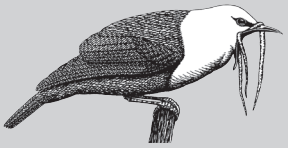
25 YEARS 1994-2019 Neotropical Bird Club

COTINGA

Journal of the Neotropical Bird Club

Number 41 **June 2019**



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- mobilise the increasing number of enthusiastic birdwatchers active in the region to contribute to the conservation of Neotropical birds
- provide a forum for the publication of articles and notes about Neotropical birds, their identification and conservation and thus enhance information exchange in this subject area
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NBC publishes one issue of *Cotinga* and two issues of *Neotropical Birding* each year.

ISSN 1353-985X

Website:
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Cotinga

Journal of the Neotropical Bird Club

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Estado del Piquero de Pico Naranja *Sula granti* en Perú (1980–2017)

Judith Figueroa, Lorenzo Timaná, Simón García, Jelber Ordoñez, Víctor Chávez y Ciprián Gutiérrez

Received 6 October 2015; resubmitted 18 May 2018; final revision accepted 1 May 2019
Cotinga 41 (2019): 2–11
published online 21 June 2019

Breeding by a pair of Nazca Boobies *Sula granti* was observed for the first time in Peru, on Lobos de Tierra Island in 1980. By 1989 numbers had increased to nine individuals. This population remained stable in 1996–2005, with 16–20 breeding individuals, but subsequently decreased to 8–14 birds in 2016. In 2000, a new colony was found 54 km further south, on the Lobos de Afuera Islands, numbering nine individuals. This population has fluctuated between six and 19 breeding birds. Given the presence of individuals originally ringed on Española Island, Galápagos, it is believed that the Peruvian populations emanates from the latter archipelago. Variation in the number of *S. granti* breeding in Peru is apparently related to food availability and anthropogenic disturbance. The southernmost record of the species is at 11º19'S on Huampanú Island, dpto. Lima. Given increasing anthropogenic activity on the islands (fishing and tourism), as well as the presence of exotic fauna and the lack of surveillance by the authorities, the conservation of *S. granti* on Lobos de Tierra and Lobos de Afuera is uncertain. There is an urgent need for government policy that does not prioritise economic activities over the preservation of the islands' biodiversity.

El Piquero de Nazca *Sula granti* se distribuye mayormente en el océano Pacífico oriental, desde las islas de Baja California, México[25,38,39] hasta las islas Lobos de Afuera, Perú[14], con algunos registros extralimitales recientes[5,23,42,50]. *S. granti* fue separado como especie distinta al Piquero Enmascarado *S. dactylatra* sobre la base de criterios morfológicos, ecológicos[39] y genéticos[21].

Las áreas reproductivas más grandes de *S. granti* se encuentran en las islas Malpelo, Colombia, con 24.000–52.000 individuos[31]; Galápagos, Ecuador, con no más de 25.000 parejas[37] e Isla La Plata, Ecuador, con 2.175 individuos[34]. Además, existen otras áreas reproductivas más pequeñas en las islas San Benedicto, México (100 individuos[38]), Clipperton, México (150 individuos[39]), Lobos de Tierra, Perú (20 individuos[28]) y Lobos de Afuera, Perú (nueve individuos[14]).

En las evaluaciones realizadas en Lobos de Tierra y Lobos de Afuera desde inicios del siglo XX[9–11,35,36,47] se reportó la presencia de *S. dactylatra* debido a que las observaciones se realizaron antes de la separación de *S. granti* como especie. Los primeros registros de reproducción de *S. granti* en Lobos de Tierra se realizaron en mayo y noviembre de 1996[28]. En marzo de 2000 se encontró una pequeña colonia en Lobos de Afuera, 54 km al sur de Lobos de Tierra[14]. Actualmente, *S. granti* está considerada En Peligro por la ley peruana[32], debido al reducido número de individuos reproductivos en estas dos islas. Ambas islas están protegidas dentro la Reserva Nacional Sistema de Islas, Islotes y Puntas Guaneras (RNSIIPG)[33] y se consideran Áreas Importantes para la Conservación de Aves[20].

El presente estudio tuvo como objetivo brindar nueva información sobre el asentamiento de la colonia reproductiva de *S. granti* en Lobos de Tierra, y sobre su estado en esta isla y en Lobos de Afuera hasta 2016. Además, procuramos determinar cómo influyen las condiciones ambientales y las actividades antrópicas en ambas colonias, y reportamos la dispersión de *S. granti* hacia zonas más australes en Perú hasta 2017.

*Área*s de estudio

Isla Lobos de Tierra (06°26'S 80°51'O; Fig. 1a).—Tiene una superficie de 14,26 km^2 y una altitud máxima de 92 m, con una distancia mínima a la costa peruana de 11,42 km. Presenta una geografía accidentada, cuyo suelo es de roca granítica sin vegetación. Se han registrado 43 especies de aves, 11 de ellas reproductivas[15]. Las más abundantes son Piquero de Patas Azules *Sula nebouxii*, Pelícano Peruano *Pelecanus thagus* y Piquero Peruano *S. variegata*, con un promedio de 78.130, 15.130 y 4.721 individuos, respectivamente[17].

Islas Lobos de Afuera (06°55'S 80°42'O; Fig. 1b).—Están conformadas por dos islas de similar superficie (Independencia y Cachimbo), separadas entre sí por un pasaje de 36 m de ancho. Ambas están rodeadas por grupos de islotes y arrecifes. Tienen una altitud máxima de 61 m y un área total de 2,35 km^2. La distancia mínima a la costa es de 61,12 km. Tienen una geografía accidentada, con bordes de acantilados y algunas playas de canto rodado, arena y conchal. Están compuestas principalmente de substrato rocoso, sin vegetación. Se han registrado 43 especies de aves, diez de ellas reproductivas. Las más abundantes son *Sula variegata*, *S. nebouxii* y *Pelecanus thagus*, con un promedio de 8.787, 3.750 y 1.852 individuos, respectivamente[17].

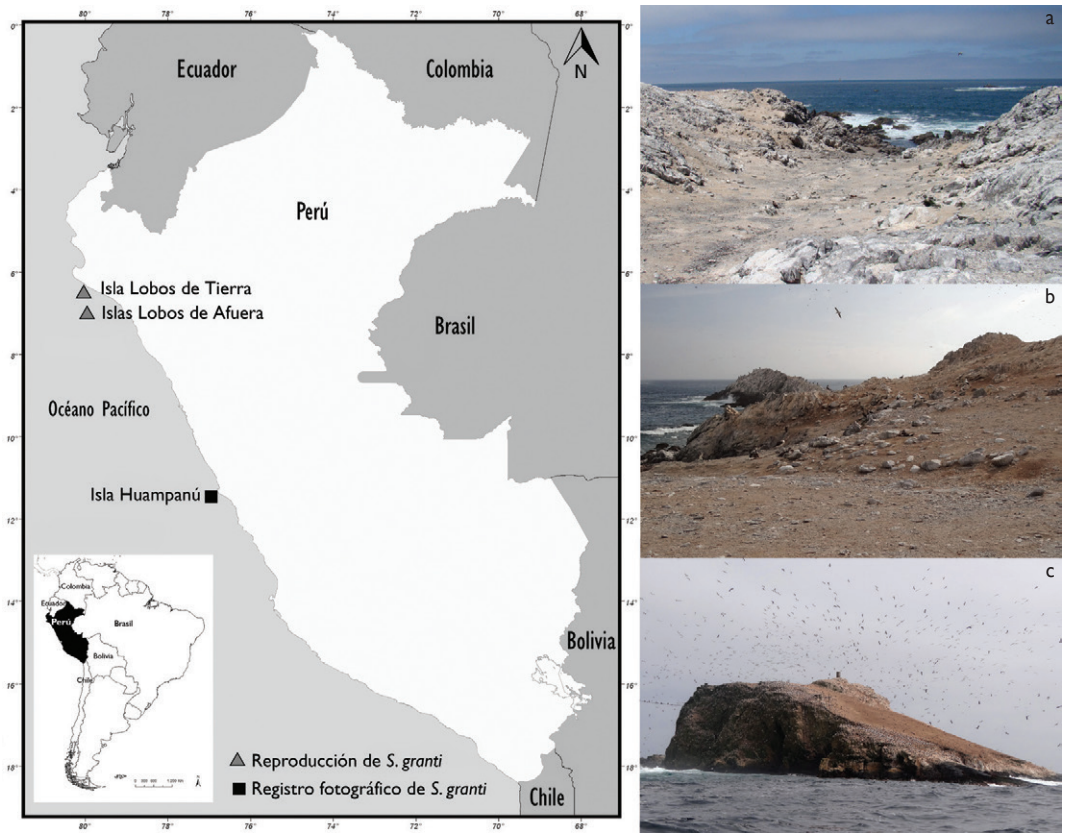

Figura 1. Islas guaneras en Perú con registros fotográficos de *Sula granti*. (a) Lobos de Tierra, (b) Lobos de Afuera y (c) Huampanú (Judith Figueroa / AICB)

Métodos

Se obtuvo información sobre el número de individuos de cinco fuentes. (1) Observaciones de campo realizadas por VC en 1980, 1981 y 1989, cuando participó de la recolección de guano en Lobos de Tierra. (2) Observaciones de campo realizadas por SG en 2010 y 2011 en Lobos de Tierra. (3) Observaciones de campo realizadas por JF entre marzo de 1999 y agosto de 2016. En algunas visitas se determinó el número de machos y hembras sobre la base de las diferencias del color del pico y patas[39]. Lobos de Tierra fue visitada en 27–28 de marzo de 1999, 24–25 de febrero de 2000, 6–8 de diciembre de 2004 y 28 de febrero–3 de marzo de 2011. Lobos de Afuera fue visitada en 18 de septiembre–1 de octubre de 2003, 10 de noviembre–5 de diciembre de 2004, 20–29 de agosto de 2005, 18–27 de febrero de 2011, 8–10 de diciembre de 2012 y 16–29 de agosto de 2016. (4) Conteos mensuales de *S. granti* en Lobos de Tierra y Lobos de Afuera entre 2011 y 2016 realizados por LT, SG, JO y CG, guardaislas del Programa de Desarrollo Productivo Agrario Rural (Agro Rural), quienes se encargan del monitoreo de las aves. (5) Una revisión de publicaciones y búsqueda de registros en internet.

Se utilizó el software SPSS 23 para evaluar la correlación de Pearson (r; $\alpha \leq 0{,}05$) entre el número de individuos de Lobos de Tierra y Lobos de Afuera con el Índice Costero El Niño (ICEN), el cual señala la anomalía de la temperatura del mar en la región 'Niño 1+2' (90°O–80°O, 10°S–00°), que refleja las condiciones del mar en la costa peruana[27].

Resultados

Población reproductiva

Isla Lobos de Tierra.—Durante la campaña de recolección de guano en febrero de 1980 se observó una pareja asentada en las inmediaciones de El Ñopo. En 1981 y 1989 se observaron seis y nueve individuos, respectivamente. Entre mayo de 1996 y julio de 2005 la población de *S. granti* se mantuvo estable en el lado sureste de la isla (zona A; Fig. 2a), con 16–20 individuos reproductivos. No se obtuvieron datos poblacionales entre agosto de 2005 y diciembre de 2010. En mayo de 2010 las parejas asentadas abandonaron los nidos y, a su

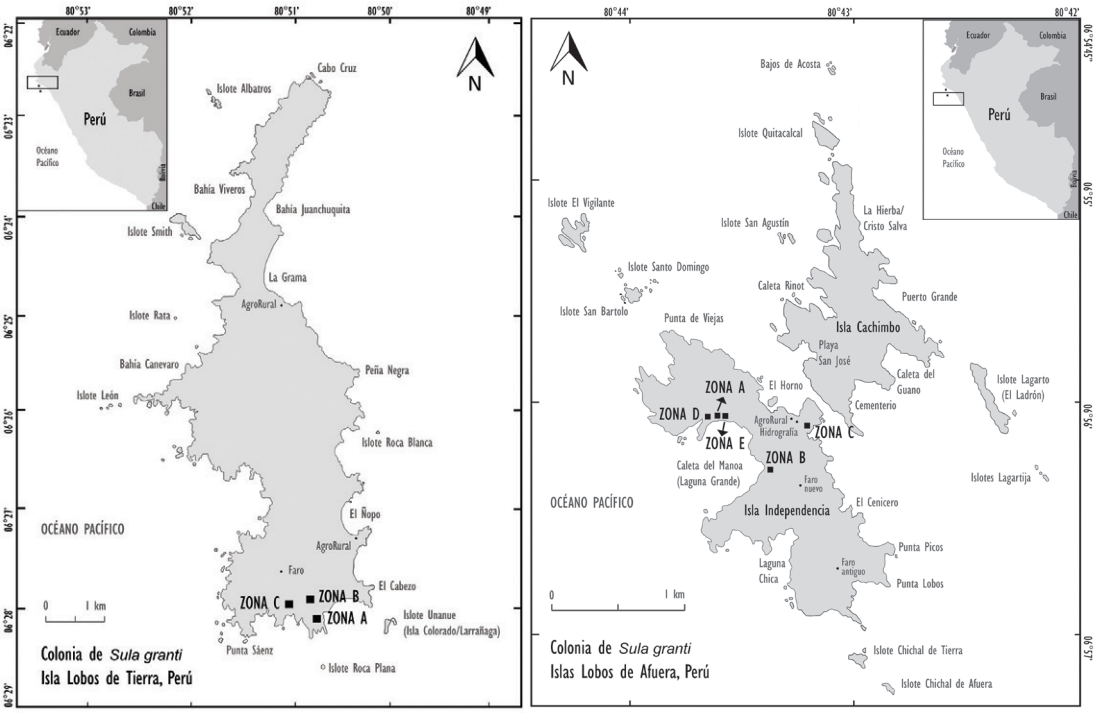

Figura 2. Zonas de reproducción de *Sula granti* en las islas Lobos de Tierra (a) y Lobos de Afuera (b), Perú.

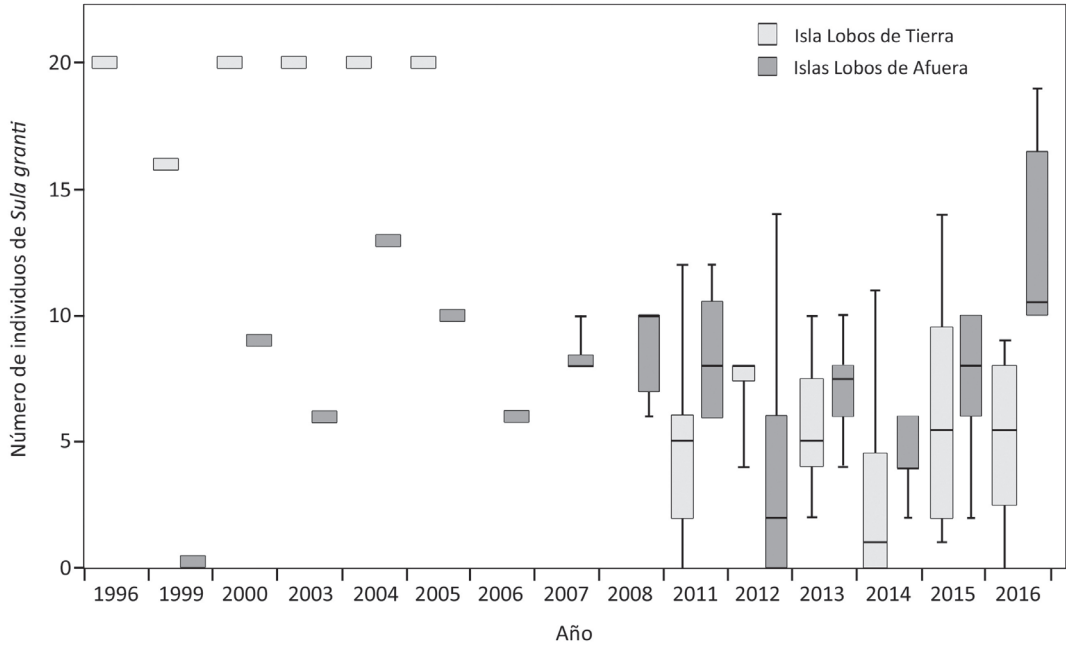

Figura 3. Tendencia de la población reproductiva de *Sula granti* en las islas Lobos de Tierra y Lobos de Afuera, entre mayo de 1996 y diciembre de 2016.

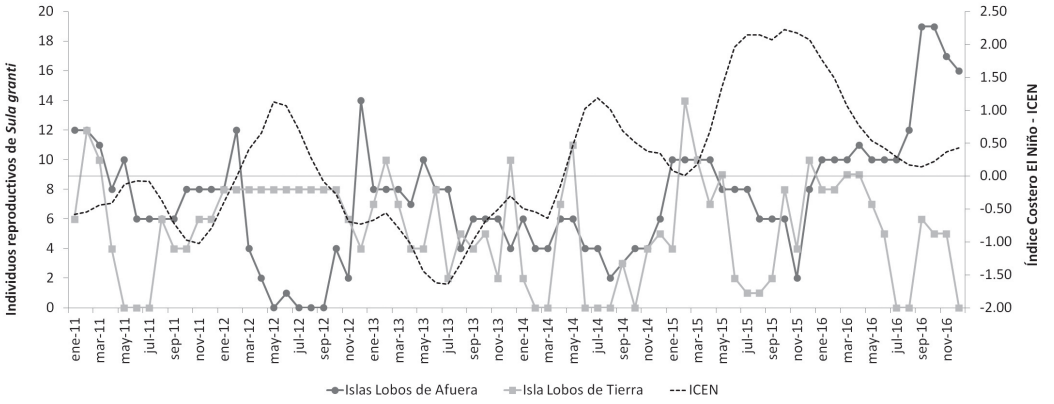

Figura 4. Variación de la población de *Sula granti* en Lobos de Tierra y Lobos de Afuera y el Índice Costero El Niño (ICEN).

regreso, en enero de 2011, se establecieron zonas de reproducción más dispersas: el área inicial y dos áreas adicionales en el lado suroeste de la isla (zonas B y C; Fig. 2a). En 2011 se tuvo un promedio de 4,83 ± 3,76 individuos (mínimo mensual [minM] = 0, máximo mensual [maxM] = 12) dispersos en las tres áreas de reproducción; su ausencia se dio entre mayo y julio. En 2012, 2013 y 2015 la especie estuvo presente durante todo el año, con un promedio de 7,50 ± 1,24 individuos (minM = 4, maxM = 8), 5,67 ± 2,74 (minM = 2, maxM = 10) y 6,0 ± 4,26 (minM = 1, maxM = 14), respectivamente. En 2014 se registró el menor número de individuos (2,67 ± 3,55; minM = 0, maxM =11), ausentándose en febrero, marzo, junio–agosto y octubre. Finalmente, en 2016 el promedio fue de 5,17 ± 3,43 (minM = 0, maxM = 9) individuos, abandonando la isla en julio, agosto y diciembre (Fig. 3). En los cuatro censos realizados por JF (marzo 1999, febrero 2000, diciembre 2004 y marzo 2011), la colonia estuvo compuesta por 57,08% de machos y 42,92% de hembras (1,33 machos / una hembra).

Islas Lobos de Afuera.—En marzo de 1999 JF no observó a la especie en la isla Independencia, donde se registró por primera vez un año después reproduciéndose en el lado noroeste (zona A; Fig. 2b)[14]. Entre 2000 y 2010, se encontró una población reproductiva variable de 6–13 individuos. En 2011 se tuvo un promedio de 8,42 ± 2,31 (minM = 6, maxM = 12) individuos, pero en 2012 se redujo a 3,92 ± 4,87 (minM = 0, maxM = 14) individuos, ausentándose en mayo y julio–septiembre. En 2013, el número de individuos se incrementó a 6,92 ± 1,78 (minM = 4, maxM = 10), pero en 2014 disminuyó a 4,42 ± 1,31 (minM = 2, maxM = 6). En 2015, la población creció 7,67 ± 2,39 (minM = 2, maxM = 10) individuos. En 2016 se presentó el mayor número en la isla Independencia, con 12,83 ± 3,76 (minM = 10, maxM = 19) individuos (Fig. 3).

Respecto a las áreas de descanso y reproducción, entre 2003 y 2005 se observó un macho adulto en la playa Caleta de Guano, en el lado sureste de la isla Cachimbo. En 2011 se encontró en esa misma playa un individuo muerto cuyo sexo no pudo ser determinado. En noviembre de 2004, se encontraron por primera vez dos zonas reproductivas en la isla Independencia (zonas A y B; Fig. 2b). La zona B se ubicó entre el faro activo y la playa Caleta del Manoa. Estas se mantuvieron activas hasta 2005. Entre enero de 2007 y julio de 2008, se observaron individuos distribuidos en las zonas A y C, esta última ubicada atrás de la estación de hidrografía (Fig. 2b). En febrero de 2011, se encontró una nueva zona de anidamiento (zona D; Fig. 2b), próxima a la zona A, pero separada por un promontorio de rocas. En diciembre de 2012, se encontraron parejas distribuidas en las zonas A, B y D. En agosto de 2016 se observó una nueva zona de anidamiento (zona E; Fig. 2b) y el mantenimiento de las zonas A y D. En los seis censos (2003–05, 2011, 2012 y 2016), la población estuvo compuesta por 56,81% machos y 43,19% hembras (1,32 machos / una hembra).

Variación poblacional en Lobos de Tierra y Lobos de Afuera 2011–16

Se determinó el coeficiente de correlación de Pearson entre el número de individuos de Lobos de Tierra y Lobos de Afuera con el ICEN. En el primer caso, fue r = 0,01 y en el segundo r = 0,1, lo que significa que existe una muy baja asociación entre ambas variables. Por otro lado, se encontró una tendencia de incremento poblacional durante los meses del verano austral (diciembre–febrero) y una disminución en el invierno (junio–agosto) (Fig. 4). A diferencia de Lobos de Tierra, en Lobos de Afuera *S. granti* se observó durante casi todo el año, ausentándose solo en mayo y julio–septiembre de 2012. En 2012 se observó en Lobos de Tierra una inusual presencia continua de ocho individuos

Figura 5. *Sula granti* macho en la isla Huampanú, Lima (Jelber Ordoñez / Agro Rural)

entre enero y octubre, mientras que en Lobos de Afuera la población estuvo ausente entre mayo y septiembre. En 2016 el número de individuos en Lobos de Afuera llegó a su máximo en septiembre y octubre.

Individuos anillados

En ambas islas se observaron individuos que fueron anillados en Perú y Ecuador. La primera campaña de anillamiento en Lobos de Tierra se desarrolló en mayo de 1996, con 14 individuos adultos reproductivos anillados[28]. Los códigos de los anillos solo pudieron observarse con claridad hasta el año 2000; posteriormente se cubrieron con óxido. Mientras tanto se han anillado 4.948 polluelos y 1.928 individuos adultos en Punta Cevallos, isla Española, Galápagos (01°20'S 89°40'O), entre 1984 y 1999[26], manteniendo este esfuerzo de anillamiento hasta la actualidad (F. Estela com. pers.).

En noviembre de 1996 se recapturaron en Lobos de Tierra siete individuos anillados allí en mayo del mismo año[28]. Entre marzo de 1999 y marzo de 2011 se observó un individuo joven anillado en la isla Española y cuatro individuos reproductivos anillados en Lobos de Tierra (tres machos y una hembra). El macho con anillo de Lobos de Tierra observado en 2011 tenía al menos 15 años reproduciéndose en esa isla hasta la fecha del registro.

En Lobos de Afuera, entre marzo de 2000 y diciembre de 2012, se observaron nueve individuos reproductivos anillados (seis machos y tres hembras): seis provenientes de la isla Española y tres de Lobos de Tierra. Un individuo macho anillado en la isla Española fue observado desde el inicio del establecimiento de la colonia en marzo de 2000 hasta diciembre de 2012. Este lleva c.13 años reproduciéndose en Lobos de Afuera. Una hembra anillada en la isla Española fue observada reproduciéndose en Lobos de Afuera por 5,5 años, entre marzo de 2000 y agosto de 2005. Individuos anillados en Lobos de Tierra solo fueron observados hasta noviembre de 2004.

Otros registros en Perú

Desde 1925 se cuenta con registros que evidencian la presencia de *S. granti* en el norte de Perú, entre las regiones de Tumbes y Lambayeque (03–06°S)[13,36]. Recientemente, se reportó su observación en al menos seis ocasiones en la región de Lima (11–12°S)[13,18]; sin embargo, estos registros no cuentan con sustento fotográfico. Debido a la dificultad de identificación entre *S. granti* y *S. dactylatra* en el campo, estos registros no han podido ser corroborados. Solo se obtuvo un registro fotográfico en la isla Huampanú (11°19'S 77°42'O; Fig. 1c), ubicada a 1,11 km de la costa de la región Lima. Se trata de un macho adulto observado el 9 de marzo de 2017 sobre el techo de la casa de Agro Rural, descansando cerca de un grupo de *S. variegata* (Fig. 5).

Discusión

Se propone utilizar como nombre común en castellano Piquero de Pico Naranja en lugar de Piquero de Nazca, debido a la confusión que se origina por la palabra Nazca. Se tiende a relacionar el origen o presencia de la especie con la provincia de Nasca y la cultura Nazca (ubicados al centro-sur de Perú) y no con la placa, por la cual fue nominada por Pitman & Jehl[39].

Asentamiento en Perú

A inicios del siglo XX, R. C. Murphy sugirió que *S. granti* indicaba el avance de las aguas cálidas de la

Contracorriente Ecuatorial bajo la influencia de El Niño, observándose en Perú hasta Punta Pariñas, Piura (04°40'S 81°19'O), posiblemente relacionado además con la distribución de peces voladores (Exocoetidae), que forman parte importante de su dieta[36]. A fines del siglo XX, la especie se asentó en Lobos de Tierra y Lobos de Afuera, ubicadas en áreas con predominancia de aguas costeras frías con activos afloramientos costeros[6], cohabitando durante todo el año con especies típicas de la corriente de Humboldt como Guanay *Phalacrocorax bougainvillii*, *Sula variegata* y *Pelecanus thagus*. No es de extrañar su presencia en ambientes fríos, ya que esta corriente también influye durante la época seca (junio–noviembre) en la colonia de *S. granti* en la isla La Plata[8,34], a 23,8 km de la costa de Manabí, Ecuador.

Jahncke & Goya[28] plantearon que la colonia reproductiva de *S. granti* en Lobos de Tierra se habría formado durante el periodo de aumento de la biomasa de sardina *Sardinops sagax* (Clupeidae) en el Sistema de Afloramiento Peruano, que tuvo uno de los picos de mayor abundancia en el verano de 1995[24]. Este pez fue la especie más importante en la dieta de *S. granti* en las islas Galápagos hasta 1997, pero posteriormente los peces voladores integraron la base de su dieta[46]. Considerando los nuevos datos sobre el inicio de la reproducción de *S. granti* en Lobos de Tierra en el verano austral de 1980, la colonia se habría formado a consecuencia del primer crecimiento de la biomasa de sardina, la cual se inició en 1978[7].

S. granti se asentó en Lobos de Tierra y aprovechó otros recursos alimenticios que presenta el Sistema de Afloramiento Peruano. En 1996 se registró que se alimentó de anchoveta *Engraulis ringens* (Engraulidae) (64,09%), agujilla *Scomberesox saurus scombroides* (Scomberesocidae) (25,19%) y caballa *Scomber japonicus* (Scombridae) (10,71%)[29]. Durante El Niño 1997–98, su dieta fue más variada. En 1997 consistió en anchoveta (27,27%), pez volador (25,55%), lorna *Mugil cephalus* (Mugilidae) (21,45%), caballa (9,09%), barrilete *Katsuwonus pelamis* (Scombridae) (7,54%) y merluza *Merluccius gayi peruanus* (Merluccidae) (2,71%)[29]. En 1998, se alimentó de caballa (50,27%), Exocoetidae (21,49%), anchoa *Anchoa nasus* (Engraulidae) (10,72%), agujilla (8,33%), barrilete (8,12%), calamar (Loliginidae) (0,86%) y sardina (0,22%)[29]. En otros sistemas marinos también se ha registrado una dieta variable que incluye, además de seis especies de peces voladores, otras 17 especies de peces (Hemiramphidae, Carangidae, Coriphaenidae, Kyphosidae, Monacanthidae, Balistidae, Scombridae) y en menor cantidad calamares (Ommastrephidae)[22].

El asentamiento de colonias reproductivas en Lobos de Tierra y Lobos de Afuera pudo deberse también a la disminución de los disturbios por actividades antrópicas como la extracción de guano[14]. Tampoco se han reportado eventos de depredación a individuos adultos de *S. granti* por parte de otras aves, como parece ocurrir en la isla Malpelo con el Halcón Peregrino *Falco peregrinus*[1], ni lesiones como las ocasionadas por el Sinsonte de Española *Mimus macdonaldi* y el Pinzón de Darwin Conirrostro *Geospiza conirostris* en la isla Española, Galápagos[3]. En Lobos de Tierra y Lobos de Afuera los polluelos y huevos de *S. granti* tendrían como depredadores potenciales a las Gaviotas Peruana *Larus belcheri* y Dominicana *L. dominicanus* (JF obs. pers.). Adicionalmente, el asentamiento en Lobos de Tierra y Lobos de Afuera podría relacionarse con la elevada población (c.50.000) en las islas Galápagos[37], donde se ha reproducido con éxito antes y después de 1997[1], así como con el aumento poblacional en las islas Malpelo (de 24.034 individuos entre 1985 y 1992[40] a 52.000 ± 20.000 individuos entre 2003 y 2006[31]) y La Plata (de 800 individuos en 1993[8] a 2.175 individuos en 2011[34]). Si bien, el 50–80% de jóvenes y adultos de *S. granti* abandonan sus colonias reproductivas durante la temporada no reproductiva[49] para alimentarse en zonas pelágicas, generalmente a cientos de kilómetros de tierra firme[2,26], se conoce que presentan filopatría extrema, siendo más evidente en los machos[26]. Es posible que los primeros colonizadores en Lobos de Tierra y Lobos de Afuera se hayan visto obligados a buscar nuevos territorios reproductivos, debido a la fuerte competencia espacial con otros individuos en sus islas de origen.

Los datos analizados entre 2011 y 2016 sugieren que la variación del número de individuos de *S. granti* en Lobos de Tierra y Lobos de Afuera no está directamente relacionada con el ICEN (Fig. 4). Esta variación podría ser el resultado de factores como el pico de anidamiento y cuidado de crías entre finales e inicios de año, las condiciones oceanográficas locales y las actividades antrópicas. Respecto al primero, el incremento poblacional durante los meses del verano austral (diciembre–febrero) y una disminución en el invierno (junio–agosto) es congruente con la dinámica poblacional de la colonia de Punta Cevallos[2].

Población en Perú

Entre 1996 y 1999, la población reproductiva de *S. granti* en Perú solo se había registrado en Lobos de Tierra, con un máximo de 20 individuos. Entre 2000 y 2005, debido a la reproducción en Lobos de Afuera, la población aumentó hasta 33 individuos. Durante este periodo, el 68,29% de la población se mantuvo en Lobos de Tierra y el 31,71% en Lobos de Afuera. Posteriormente, la población reproductiva decreció hasta un máximo de 17 individuos en 2014, debido a la disminución de la colonia en Lobos de Tierra. En 2015 y 2016

la población total creció a un máximo de 24 y 25 individuos por la recuperación de la colonia en Lobos de Afuera. Entre 2011 y 2016 el 39,96% de la población se encontró en Lobos de Tierra y el 60,04% en Lobos de Afuera (Fig. 3). La población total estuvo compuesta por 57,43% machos y 42,57% hembras (1,35 machos / una hembra), siendo la proporción de sexos similar a la de Galápagos (1,43 macho / una hembra)[48].

Dispersión de Sula granti

Recientemente se ha registrado el desplazamiento de *S. granti* hacia las islas Tern, Eastern[42] y Moku Manu[50], en el archipiélago de Hawái, entre 4.880 y 6.765 km de San Benedicto y entre 5.311 y 7.324 km de Clipperton, las islas reproductivas más cercanas a Hawái. También hay un registro reciente de varios individuos en la isla del Coco, Costa Rica[30]. La dispersión de *S. granti* desde la isla Española ha sido registrada anteriormente, en especial subadultos, hacia las costas de México, Guatemala, Nicaragua, Costa Rica, Panamá, Colombia (2.000–3.000 km)[26] e isla La Plata (858 km)[8,26,34]. En Lobos de Tierra y Lobos de Afuera también se observaron individuos, en su mayoría adultos, provenientes de la isla Española, 1.122 y 1.155 km hacia el noroeste, respectivamente. En el caso de Lobos de Afuera, algunos individuos asentados allí se reprodujeron inicialmente 54 km al norte, en Lobos de Tierra. Por otro lado, el registro casual de *S. granti* en la isla Huampanú (11°S) significa una dispersión de entre 588 y 1.715 km al sur de las islas reproductivas más cercanas, siendo la localidad más austral donde se ha observado a la especie. Este registro podría estar relacionado con las anomalías positivas de la temperatura superficial del mar de El Niño Costero de 2017. Por otro lado, tomando en cuenta el ancho de la corriente de Humboldt (hasta 185,2 km en el invierno)[52] y la distancia recorrida por *S. granti* en un día en busca de alimento en el periodo reproductivo (máximo de 329 km)[54], no se puede descartar la posibilidad de que algunos individuos se desplacen por las aguas relativamente cálidas ubicadas al oeste de la corriente de Humboldt, pudiendo llegar a mayores latitudes.

Impactos antrópicos a las poblaciones de Sula granti en Perú

La colonia de *S. granti* en Lobos de Tierra se mantuvo estable por varios años, pero a partir de 2010 se ha reportado la desaparición de polluelos sin motivo aparente. Se conoce que en algunas áreas las poblaciones de piqueros han disminuido alarmantemente debido a la introducción de fauna exótica[4,41,43]. Si bien se registró la presencia de gatos en Lobos de Tierra, no se encontraron heces, huellas o individuos en las inmediaciones de la colonia de *S. granti*[15], aunque sí hay reportes de depredación de huevos y polluelos de *Pelecanus thagus*[10] e individuos jóvenes de *S. variegata* y *S. nebouxii*[12,53]. Por otra parte, en los últimos diez años se ha incrementado la pesca en los alrededores de Lobos de Tierra, debido principalmente al cultivo de la concha de abanico *Argopecten purpuratus*. Esto ha provocado que muchos pescadores recorran y descansen en la isla. Desde las primeras investigaciones en Lobos de Tierra, se ha señalado a los pescadores como saqueadores de huevos y polluelos de aves marinas, principalmente de *Phalacrocorax bougainvillii*, para negociarlos en tierra[19]. Esta extracción también ha sido reportada con otras especies de Sulidae en otras regiones[45]. No se podría descartar este hecho, dada la creciente curiosidad de los pescadores por el 'piquero blanco'. Asimismo, en 2011 se realizó la manipulación de ocho individuos de *S. granti* para pesarlos y medirlos en el desarrollo de una investigación[51]. En ese año, la colonia en Lobos de Tierra tuvo un máximo de 12 individuos. Tomando en cuenta su reducción poblacional, consideramos que la manipulación de individuos de *S. granti* es arriesgada, ya que podría influir en su permanencia en la isla.

Recientemente, el Servicio Nacional de Áreas Naturales Protegidas por el Estado (Sernanp) aprobó el Plan Maestro 2016–20 de la RNSIIPG. En la zonificación de Lobos de Tierra se ha identificado como áreas de reproducción de *S. granti* las 'zonas silvestres 2 y 3'; sin embargo, esto es errado. Las colonias se ubican en el lado sur y suroeste de Lobos de Tierra, que están incluidas en la zonificación como 'zona de aprovechamiento directo', lo que significa que está permitida la recolección de guano[44]. Es importante corregir la ubicación de las zonas reproductivas para que las actividades extractivas no perturben a *S. granti*.

Pese a que el número de *S. granti* en Lobos de Afuera se incrementó desde su primer registro en 2000, se han truncado al menos cinco intentos de ampliación de las áreas de reproducción hacia las zonas B (2004, 2005, 2012) y C (2007 y 2008) debido a su perturbación por buzos pescadores de pulpo, que se trasladan de un sitio de pesca a otro por tierra. Además, algunos pescadores comentaron tener curiosidad por observar más de cerca al 'piquero blanco' e incluso probar su carne. El aumento en el número de ratas *Rattus rattus* y su desplazamiento por toda la isla Independencia[17], así como el registro del ataque de ratas al Zarcillo *Larosterna inca*[16], sugieren que estas representan un peligro potencial para la colonia de *S. granti*. Sumado a esto, en los últimos años el Sernanp ha permitido el ingreso de grupos turísticos a Lobos de Afuera para observar a la colonia de *S. granti*. Esto representa un riesgo considerando el pequeño tamaño poblacional, los intentos de ampliación de áreas reproductivas, la falta de estudios de impacto, carga turística e infraestructura.

Tanto en Lobos de Tierra como en Lobos de Afuera, la vigilancia del personal del Sernanp es nula y la de Agro Rural es limitada por restricciones logísticas para el patrullaje (escaso personal, falta de un medio de transporte marítimo para entrar y salir de las islas, y para recorrerlas). Es evidente que después del primer registro reproductivo de *S. granti* en Perú, en 1980, su estado en Lobos de Tierra y Lobos de Afuera sigue siendo incierto. Es importante determinar qué medidas ayudarán a la protección y éxito reproductivo de esta especie, por lo que es necesario continuar con el monitoreo a largo plazo. Urge una política de Estado que no priorice el desarrollo de actividades económicas por sobre la preservación de la biodiversidad de las islas.

Agradecimientos

A Marcelo Stucchi, Gina Mori, Edith Suazo, Bruno Ghersi, Esmeralda Flores, Mirtha Soplopuco y Ernesto Flores por su ayuda en el campo. A Agro Rural por el apoyo logístico de sus guardaislas Pedro Sotelo, Osmar Navarro, José Ninfa, Walter Cano, Felipe Flores y Armando Nieto. A la Dirección de Hidrografía de la Marina de Guerra del Perú por el uso de sus instalaciones, hospitalidad y traslado hacia la isla Independencia, especialmente a los técnicos Wanner Puicón, Eduardo Mendoza, Oscar Marcoz, José Cholán, Dennis Huanca, Jaime Gamboa, Felipe Portugal, Abel Martínez, Pedro Yepén y César Guerra. A Luis Fiestas, Ismael Ignacio 'chuchales', Jhonny Ignacio 'chuchalín', Esteban Ezequiel 'chape', José Yarlequé 'piurita' y Gregorio García 'chocolín', y sus tripulaciones, por sus atenciones, amistad y su apoyo en el traslado a las islas Independencia, Cachimbo (Lobos de Afuera) y Lobos de Tierra desde el 2000. A Juan Freile, Carlos Zavalaga, Felipe Estela y Ana Agreda por sus valiosos comentarios al manuscrito.

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Threats to, and conservation of, birds in Mata de Aldeia, north-east Atlantic Forest, Brazil

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Received 1 September 2017; final revision accepted 27 April 2019
Cotinga 41 (2019): 12–21
published online 21 June 2019

O Centro de Endemismo Pernambuco compreende as florestas úmidas localizadas nos estados de Alagoas, Pernambuco, Paraíba e Rio Grande do Norte. Nessa região há uma grande quantidade de aves endêmicas e ameaçadas de extinção. Um dos maiores blocos florestais, com cerca de 10.000 ha, é a Mata de Aldeia (07°54'S 35°03'W; 145 m), situada no Estado de Pernambuco. De 2004 a 2017 foram assinaladas 220 espécies de aves, dos quais 40,4% dependem de ambientes florestais. Destes, 12 são endemicos e 16 táxons são ameaçados de extinção. Foram registrados insetívoros de sub-bosque indicadores de qualidade ambiental, além de grandes e médios frugívoros e aves de rapina. No entanto, importantes espécies de bandos mistos e grandes escaladores de troncos não foram registradas. Apesar da importância da Mata de Aldeia para a manutenção da avifauna, parte desse bloco florestal está ameaçado devido à proximidade de habitações humanas e por ser cortada por rodovias e estradas vicinais, entre outros fatores. Dessa forma, são necessárias medidas urgentes para a proteção e conservação da área.

The Brazilian Atlantic Forest domain runs along much of the eastern coast of Brazil but is currently largely deforested and fragmented, with only 12.41% remaining of its original vegetation cover[8]. The northernmost portion, in the states of Alagoas, Pernambuco, Paraíba and Rio Grande do Norte, is the most deforested of the entire domain[41], with only 6.35% of its original vegetation surviving[8]. This sector of the Atlantic Forest is known as the Pernambuco Endemism Centre (PEC) and supports a large number of threatened and endemic flora and fauna species[41,42]. Among birds, 27 taxa are endemic to the PEC and 49 are globally threatened[21].

Although Pernambuco has lost much of its Atlantic Forest, the state still harbours most of the endemic and threatened birds of PEC in a few fragments, including some in the metropolitan region of Recife[24]. However, most forest is secondary, including the largest remaining patch in the region, Mata de Aldeia[10]. This locality hosts 75 forest-dependent species, ten PEC endemics and 13 threatened birds[24]. Furthermore, the entire Mata de Aldeia lies within a protected area, the Área de Proteção Ambiental (APA) Aldeia Beberibe, created in 2010[10].

The present study aimed to list the bird species of Mata de Aldeia, to identify the taxonomic groups most sensitive to forest fragmentation, and to highlight threats and conservation strategies. We provide information that could promote conservation actions for the region.

Methods

Field work was carried out at Mata de Aldeia (07°54'S 35°03'W; 145 m). Mata de Aldeia covers c.10,000 ha and is divided into two blocks: a northern part covering 7,176 ha and a southern part of 2,898 ha. Mata de Aldeia is located in the municipalities of Camaragibe, Abreu e Lima, Araçoiaba, Paudalho, Igarassu and Tracunhaém (Fig. 1).

The dominant vegetation is Open Ombrophilous Forest[24], mostly secondary or younger growth (Fig. 2a). Fragments are surrounded by numerous villages, condominiums, country clubs, settlements and sugarcane plantations (Fig. 2b). Several trails, roads and three paved highways (PE-18, PE-27 and PE-41) cross or border the forest, and there are some streams, rivers and weirs inside the fragments[10] (Fig. 2c). Mata de Aldeia lies entirely within the APA Aldeia Beberibe, which covers 31,634 ha. In the northern part, there is the 273.4-ha Reserva da Vida Selvagem (RVS) Mata de Miritiba, which lies inside a military area.

We performed a qualitative survey based on opportunistic observations by several researchers and birdwatchers. Field work took place between May 2004 and June 2017. Birds were observed with binoculars and their voices sound-recorded. We also used cameras to document some records. Taxonomic sequence and nomenclature follow the Brazilian Ornithological Records Committee (CBRO)[25].

Species were classified by habitat following Stotz *et al.*[37] and Roda[31]: (1) forest-dependent (birds associated with the forest interior, but occasionally found at edges); (2) forest semi-dependents (found in forests, at edges, and in the surrounding matrix); and (3) forest independents (in open areas or those with scarce arboreal vegetation). Classification of endemics follows Pereira *et al.*[24], and threat status IUCN[11], while threat status at national level follows the Brazilian Ministry of Environment (MMA)[16]. Important bird groups (indicators of

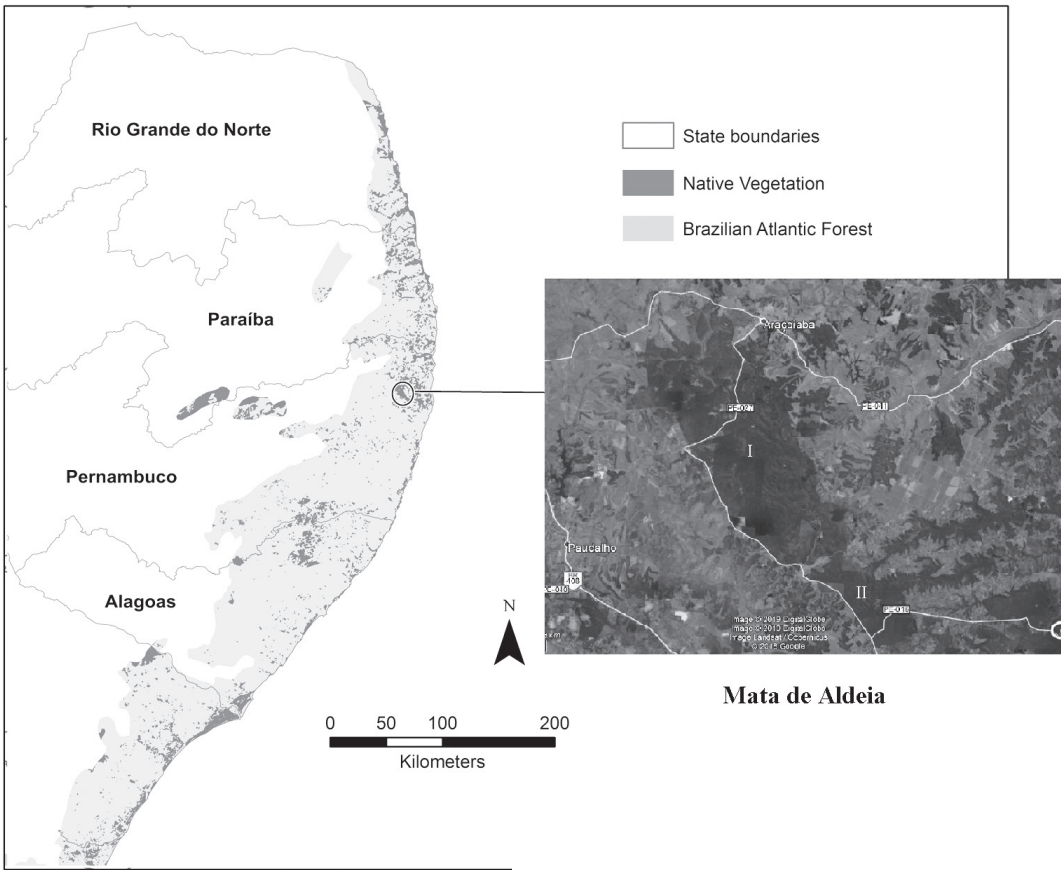

Figure 1. Mata de Aldeia, Pernambuco, highlighting the northern (I) and southern (II) blocks and the three state highways PE 18, PE 27 and PE 41 (yellow lines). (© Google Earth)

habitat quality and threat status in the region) are identified after Silveira *et al.*[34].

Results and Discussion

Composition of the avifauna

A total of 220 species was recorded in Mata de Aldeia (see Appendix), or c.50% of the species known in the PEC[31] (n = 434). Most are forest-dependent (40.4%), while semi-dependents and independents represented 29.5% and 30% of the avifauna, respectively. We recorded 12 species endemic to the PEC, six globally threatened and 16 listed as threatened in Brazil (Table 1). Although forest in the PEC is fragmented and most patches are small, they are very important in maintaining local bird populations[23,24,34]. Secondary forests are crucial in fragmented landscapes, especially when they reach advanced successional stages[1].

Avian guilds

Understorey insectivores.—These are among the most sensitive species to forest fragmentation and

Table 1. Endemic species of the Pernambuco Endemism Centre (PEC) and threatened birds recorded at Mata de Aldeia, Pernambuco, Brazil. VU = Vulnerable; EN = Endangered; CR = Critically Endangered.

Taxa	Brazilian list	IUCN list	PEC endemic
Penelope superciliaris alagoensis	CR		x
Leptodon forbesi	EN	CR	
Touit surdus	VU	VU	
Momotus momota marcgravianus	EN		x
Picumnus pernambucensis			x
Thamnophilus caerulescens pernambucensis	VU		x
Pyriglena pernambucensis	VU		x
Cercomacroides laeta sabinoi			x
Myrmoderus ruficauda soror	EN	EN	x
Conopophaga cearae	EN		
Conopophaga melanops nigrifrons	VU		x
Xiphorhynchus atlanticus	VU		
Xenops minutus alagoanus	VU		x
Automolus lammi	EN	VU	
Schiffornis turdina intermedia	VU		x
Hemitriccus griseipectus naumburgae	VU		x
Tangara fastuosa	VU	VU	x
Spinus yarrellii	VU	VU	

Figure 2a. Secondary forest in the Mata de Aldeia (Roberto Harrop); b. Sugarcane crop near Mata de Aldeia (Roberto Harrop); c. weir inside Mata de Aldeia (Roberto Harrop)

Figure 3a. Northern Lesser Woodcreeper *Xiphorhynchus atlanticus* (Roberto Harrop); 3b. Seven-coloured Tanager *Tangara fastuosa* (Yuri Raia); 3c. Black Hawk-Eagle *Spizaetus tyrannus* (Roberto Harrop); 3d. White-collared Kite *Leptodon forbesi* (Yuri Raia)

changes in landscape structure[3,38], their populations being reduced or becoming locally extinct in fragmented areas[7,39]. They are often considered strong indicators of habitat quality[26]. In Mata de Aldeia, forest-dependent understorey insectivores included Willis's Antbird *Cercomacroides laeta sabinoi*, Scalloped Antbird *Myrmoderus ruficauda soror*, Ceará *Conopophaga cearae* and Black-cheeked Gnateaters *C. melanops nigrifrons*, Rufous-capped Antthrush *Formicarius colma* and Pernambuco Foliage-gleaner *Automolus lammi*. Most of these species occur only in the southern part of Mata de Aldeia, probably due to the forest's more mature state there, and its more complex and heterogeneous vegetation.

Trunk-climbers (scansorial birds).—Some species in this group are very sensitive to forest fragmentation and degradation in structure[28,36]. Most occur in well-preserved habitats with large trees for foraging and nesting. In our study area, sensitive species include Red-stained Woodpecker *Veniliornis affinis* and Northern Lesser

Woodcreeper *Xiphorhynchus atlanticus* (Fig. 3a). On the other hand, some resilient species such as Olivaceous Woodcreeper *Sittasomus griseicapillus*, Straight-billed Woodcreeper *Dendroplex picus* and Little Woodpecker *Veniliornis passerinus* occur in disturbed areas or in fragments at an early stage of succession, as elsewhere in the PEC[34]. Other sensitive species like Yellow-throated Woodpecker *Piculus flavigula* and Pernambuco Woodcreeper *Dendrocincla taunay* were not recorded at Mata de Aldeia, which suggests that the local avifauna is to some extent depauperate.

Mixed canopy and understorey flocks.—Mixed-species flocks are multi-specific associations that maximise foraging opportunities and reduce predation risk[17,18,29]. Canopy flocks are unstable and composed of frugivorous and insectivorous species, while understorey flocks are more stable and mostly comprised of insectivores[13,18,29]. Mixed-species canopy flocks were observed several times at Mata de Aldeia. The commonest species were Black-capped *Herpsilochmus atricapillus* and Rufous-winged Antwrens *H. rufimarginatus*, Plain *Xenops minutus alagoanus* and Streaked Xenops *X. rutilans*, Grey-crowned Flycatcher *Tolmomyias poliocephalus*, Long-billed Gnatwren *Ramphocaenus melanurus*, Chivi Vireo *Vireo chivi*, Bananaquit *Coereba flaveola*, Flame-crested Tanager *Lanio cristatus*, Blue Dacnis *Dacnis cayana*, Red-legged Honeycreeper *Cyanerpes cyaneus*, Palm *Tangara palmarum*, Seven-coloured *T. fastuosa* (Fig. 3b), Silver-breasted *T. cyanomelas* and Guira Tanagers *Hemithraupis guira*, and Violaceous Euphonia *Euphonia violacea*.

Mixed-species understorey flocks were less common, a situation similar to localities in neighbouring Alagoas[34]. Most understorey mixed flocks comprised insectivores[20], and the commonest species in Mata de Aldeia included Variable Antshrike *Thamnophilus caerulescens pernambucensis*, White-flanked Antwren *Myrmotherula axillaris*, Plain Antvireo *Dysithamnus mentalis*, *Myrmoderus ruficauda soror*, Pernambuco Fire-eye *Pyriglena pernambucensis*, *Sittasomus griseicapillus* and *Dendroplex picus*. Mixed-species flocks occur more frequently in fragments with a more complex and mature vegetation structure, whereas in small fragments these associations are precluded by a scarcity of resources and the absence of flocking bird species[30,38].

Medium and large frugivores.—Frugivorous birds are important elements in tropical bird communities[27]. Forest fragmentation strongly affects many frugivores[2,45] and in the Brazilian Atlantic Forest several of these species are threatened[9]. The largest frugivores recorded at Mata de Aldeia were Brazilian Tinamou *Crypturellus strigulosus*, East Brazilian Chachalaca *Ortalis araucuan* and Rusty-margined Guan *Penelope superciliaris alagoensis*. Some, such as *O. araucuan*, are more resilient to deforestation, being found in small fragments. *P. superciliaris alagoensis* is also somewhat resilient but is considered Critically Endangered in Brazil due to hunting and forest fragmentation[16]. In Mata de Aldeia, the species was recorded just once. Even in neighbouring forest fragments, the species was recorded at only one of five sites[5]. In Alagoas, it was recorded at five forest fragments ranging from well-preserved to degraded[34]. All frugivorous species are important for seed dispersal of native trees[20]. Many woody plants in the north-eastern Atlantic Forest may become regionally extinct due to altered seed dispersal processes (i.e., a direct result of forest fragmentation, habitat loss and hunting)[40].

Raptors.—Many species require large forested areas and have specialised diets[4,14]. Large forest species are often absent from fragments due to habitat loss[2], and in the PEC most remaining raptor species are small to medium-sized[32,34]. The largest raptor recorded at Mata de Aldeia was Black Hawk-Eagle *Spizaetus tyrannus* (Fig. 3c), for which there are few published records in the PEC[24,32]. It feeds on large prey such as arboreal mammals, birds, snakes and large lizards[6,43]. White-collared Kite *Leptodon forbesi* (Fig. 3d), a globally threatened raptor, was also recorded at Mata de Aldeia, as well as at several other localities in the PEC[21,23].

Threats and conservation of the birds of Mata de Aldeia

Roads, highways and power transmission towers can pose serious threats to the birds of Mata de Aldeia. As Mata de Aldeia lies within an urban area, the many other threats include water pollution, deforestation, waste pollution, timber extraction, hunting and illegal capture of birds. Moreover, pets (e.g., cats) and feral domestic animals that live in these areas can seriously impact bird populations[12,15,19,44].

We found evidence of hunting activity and people trapping birds either for trade or to keep in cages[22]. The species caught included *Tangara fastuosa*, *Dacnis cayana*, *Cyanerpes cyaneus*, Brazilian Tanager *Ramphocelus bresilius*, White-lined Tanager *Tachyphonus rufus*, Chestnut-bellied Seed Finch *Sporophila angolensis*, White-bellied *S. leucoptera* and Yellow-bellied Seedeaters *S. nigricollis*. Illegal trade is one of the main threats to Brazilian birds, considerably impacting populations of species like Yellow-faced Siskin *Spinus yarrellii*, which is rare in Mata de Aldeia. Wildlife trade has been witnessed in all states within the PEC[35].

The northernmost part of Mata de Aldeia is mostly owned by the Brazilian army, and part of the region is used for military training. We visited this area twice. The forest is still young, without tall trees and with an open understorey. Furthermore, this area is highly fragmented by

roads, potentially preventing the movement of some species typical of forest interior. Nevertheless, the single protected area in the northern part of Mata de Aldeia, RVS Mata de Miritiba, which is currently protected by the Brazilian army, is under permanent surveillance, and hunting, fishing, trapping and logging is prevented.

The southern part of Mata de Aldeia is smaller but has more mature forest. However, it is more susceptible to degradation due to its proximity to urban areas, villas, condominiums, country clubs and mills. There are also two paved highways crisscrossing much of the forest. Despite being included within the APA Aldeia Beberibe, some areas within this southern portion could be rapidly degraded.

Conclusions

Numbers of forest-dependent, endemic and threatened birds highlight the conservation importance of Mata de Aldeia. Conservation efforts are urgently needed to prevent local extinctions in the short term[40]. For effective conservation, natural resources should be properly managed, restoration and habitat expansion projects implemented, and ecological corridors created[33,41,42]. All of these actions were already proposed by the APA Aldeia Beberibe management plan[10]. Environmental awareness among local inhabitants needs to be promoted, by highlighting the importance of the forest and its biota. Finally, more control is necessary to prevent further forest loss and the hunting and trapping of birds in the area.

Acknowledgements

We thank Weber Girão for sharing with us some of his important bird records.

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Appendix

Bird species recorded in Mata de Aldeia, Pernambuco, Brazil, between May 2004 and June 2017. Habitat: DEP = forest dependent, SEM = semi-dependent, IND = forest independent. Nomenclature and taxonomic order follow CBRO[25]. Evidence: P = photo, S = sound-recording, V = sight only.

Family/Species	English name	Evidence	Habitat
TINAMIDAE			
Crypturellus soui	Little Tinamou	S	DEP
Crypturellus strigulosus	Brazilian Tinamou	S	DEP
Crypturellus parvirostris	Small-billed Tinamou	S,V	IND
CRACIDAE			
Penelope superciliaris	Rusty-margined Guan	S	DEP
Ortalis araucuan	East Brazilian Chachalaca	P,S	DEP
PHALACROCORACIDAE			
Nannopterum brasilianum	Neotropic Cormorant	V	IND
ARDEIDAE			
Tigrisoma lineatum	Rufescent Tiger Heron	P	IND
Nycticorax nycticorax	Black-crowned Night Heron	P	IND
Butorides striata	Striated Heron	P	IND
Bubulcus ibis	Cattle Egret	P	IND
Ardea alba	Great Egret	P	IND
Egretta thula	Snowy Egret	P	IND
CATHARTIDAE			
Cathartes aura	Turkey Vulture	P	IND
Cathartes burrovianus	Lesser Yellow-headed Vulture	P	IND
Coragyps atratus	Black Vulture	P	IND
ACCIPITRIDAE			
Leptodon forbesi	White-collared Kite	P,S	DEP
Chondrohierax uncinatus	Hook-billed Kite	P	SEM
Elanus leucurus	White-tailed Kite	P	IND
Rupornis magnirostris	Roadside Hawk	P,S	IND
Buteo nitidus	Grey-lined Hawk	S,V	SEM
Buteo brachyurus	Short-tailed Hawk	P,S	SEM
Buteo albonotatus	Zone-tailed Hawk	V	DEP
Spizaetus tyrannus	Black Hawk-Eagle	P,S	DEP
ARAMIDAE			
Aramus guarauna	Limpkin	P	IND
RALLIDAE			
Aramides cajaneus	Grey-necked Wood Rail	P,S	SEM
Amaurolimnas concolor	Uniform Crake	S	SEM
Laterallus viridis	Russet-crowned Crake	S	SEM
Laterallus melanophaius	Rufous-sided Crake	S	IND
Mustelirallus albicollis	Ash-throated Crake	S	IND
Porphyrio martinicus	Purple Gallinule	P,S	IND
CHARADRIIDAE			
Vanellus chilensis	Southern Lapwing	P,S	IND
JACANIDAE			
Jacana jacana	Wattled Jacana	P	IND
COLUMBIDAE			
Columbina passerina	Common Ground Dove	P	IND
Columbina minuta	Plain-breasted Ground Dove	P	IND
Columbina talpacoti	Ruddy Ground Dove	P	IND
Columbina picui	Picui Ground Dove	P	IND
Columba livia	Rock Pigeon	P	IND
Patagioenas speciosa	Scaled Pigeon	S,V	DEP
Leptotila verreauxi	White-tipped Dove	S,V	SEM
Leptotila rufaxilla	Grey-fronted Dove	P,S	DEP
Geotrygon montana	Ruddy Quail-Dove	S	DEP
CUCULIDAE			
Piaya cayana	Squirrel Cuckoo	P,S	SEM
Coccyzus americanus	Yellow-billed Cuckoo	V	SEM
Crotophaga ani	Smooth-billed Ani	P	IND
Guira guira	Guira Cuckoo	P	IND
Tapera naevia	Striped Cuckoo	S	IND
TYTONIDAE			
Tyto furcata	American Barn Owl	P,S	IND
STRIGIDAE			
Megascops choliba	Tropical Screech Owl	P,S	SEM
Pulsatrix perspicillata	Spectacled Owl	S,V	DEP
Strix virgata	Mottled Owl	S	DEP
Athene cunicularia	Burrowing Owl	P	IND

Family/Species	English name	Evidence	Habitat
NYCTIBIIDAE			
Nyctibius griseus	Common Potoo	S	IND
CAPRIMULGIDAE			
Antrostomus rufus	Rufous Nightjar	S	SEM
Lurocalis semitorquatus	Short-tailed Nighthawk	S,V	DEP
Nyctidromus albicollis	Pauraque	P,S	SEM
APODIDAE			
Chaetura meridionalis	Sick's Swift	V	SEM
Tachornis squamata	Fork-tailed Palm Swift	P	IND
Panyptila cayennensis	Lesser Swallow-tailed Swift	P	SEM
TROCHILIDAE			
Glaucis hirsutus	Rufous-breasted Hermit	P	DEP
Phaethornis ruber	Reddish Hermit	P	DEP
Phaethornis pretrei	Planalto Hermit	P	SEM
Eupetomena macroura	Swallow-tailed Hummingbird	P	IND
Florisuga fusca	Black Jacobin	P	DEP
Anthracothorax nigricollis	Black-throated Mango	P	SEM
Chrysolampis mosquitus	Ruby-topaz Hummingbird	V	SEM
Chlorestes notata	Blue-chinned Sapphire	P,S	DEP
Chlorostilbon lucidus	Glittering-bellied Emerald	P	SEM
Hylocharis cyanus	White-chinned Sapphire	V	DEP
Amazilia leucogaster	Plain-bellied Emerald	P	SEM
Amazilia versicolor	Versicoloured Emerald	P	SEM
Amazilia fimbriata	Glittering-throated Emerald	P,S	SEM
Heliothryx auritus	Black-eared Fairy	P	DEP
TROGONIDAE			
Trogon viridis	Green-backed Trogon	V	DEP
Trogon curucui	Blue-crowned Trogon	P	DEP
ALCEDINIDAE			
Megaceryle torquata	Ringed Kingfisher	P,S	IND
Chloroceryle amazona	Amazon Kingfisher	P	SEM
Chloroceryle americana	Green Kingfisher	P	SEM
MOMOTIDAE			
Momotus momota	Amazonian Motmot	S,V	DEP
GALBULIDAE			
Galbula ruficauda	Rufous-tailed Jacamar	P,S	DEP
BUCCONIDAE			
Nystalus maculatus	Spot-backed Puffbird	P,S	IND
RAMPHASTIDAE			
Pteroglossus inscriptus	Lettered Araçari	P	DEP
Pteroglossus aracari	Black-necked Araçari	P	DEP
PICIDAE			
Picumnus pernambucensis	Pernambuco Piculet	P,S	SEM
Veniliornis affinis	Red-stained Woodpecker	S,V	DEP
Veniliornis passerinus	Little Woodpecker	P,S	SEM
Colaptes melanochloros	Green-barred Woodpecker	P,S	SEM
Dryocopus lineatus	Lineated Woodpecker	S,V	SEM
FALCONIDAE			
Caracara plancus	Southern Caracara	P,S	IND
Milvago chimachima	Yellow-headed Caracara	P,S	IND
Herpetotheres cachinnans	Laughing Falcon	P,S	SEM
Micrastur ruficollis	Barred Forest Falcon	S	DEP
Micrastur semitorquatus	Collared Forest Falcon	S	DEP
PSITTACIDAE			
Diopsittaca nobilis	Red-shouldered Macaw	P,S	SEM
Aratinga jandaya	Jandaya Parakeet	P	SEM
Forpus xanthopterygius	Blue-winged Parrotlet	P,S	IND
Brotogeris chiriri	Yellow-chevroned Parakeet	P,S	SEM
Touit surdus	Golden-tailed Parrotlet	P,S	DEP
THAMNOPHILIDAE			
Myrmotherula axillaris	White-flanked Antwren	S,V	DEP
Formicivora grisea	White-fringed Antwren	S,V	SEM
Dysithamnus mentalis	Plain Antvireo	S,V	DEP
Herpsilochmus atricapillus	Black-capped Antwren	P,S	DEP
Herpsilochmus rufimarginatus	Rufous-winged Antwren	S,V	DEP
Thamnophilus palliatus	Chestnut-backed Antshrike	P,S	SEM
Thamnophilus pelzelni	Planalto Slaty Antshrike	S,V	DEP
Thamnophilus caerulescens	Variable Antshrike	S	DEP
Taraba major	Great Antshrike	P,S	SEM
Myrmoderus ruficauda	Scalloped Antbird	P,S	DEP
Pyriglena pernambucensis	Pernambuco Fire-eye	S,V	DEP
Cercomacroides laeta	Willis's Antbird	S,V	DEP
CONOPOPHAGIDAE			
Conopophaga cearae	Ceara Gnateater	P,S	DEP
Conopophaga melanops	Black-cheeked Gnateater	S,V	DEP
FORMICARIIDAE			
Formicarius colma	Rufous-capped Antthrush	P,S	DEP
DENDROCOLAPTIDAE			
Sittasomus griseicapillus	Olivaceous Woodcreeper	P,S	DEP
Xiphorhynchus atlanticus	Northern Lesser Woodcreeper	P,S	DEP
Dendroplex picus	Straight-billed Woodcreeper	P,S	SEM
XENOPIDAE			
Xenops minutus	Plain Xenops	P,S	DEP
Xenops rutilans	Streaked Xenops	S,V	DEP
FURNARIIDAE			
Furnarius figulus	Wing-banded Hornero	P,S	SEM
Automolus lammi	Pernambuco Foliage-gleaner	S,V	DEP
Phacellodomus rufifrons	Rufous-fronted Thornbird	S,V	IND
Certhiaxis cinnamomeus	Yellow-chinned Spinetail	P,S	IND
Synallaxis frontalis	Sooty-fronted Spinetail	S,V	SEM
PIPRIDAE			
Neopelma pallescens	Pale-bellied Tyrant-Manakin	S,V	DEP
Ceratopipra rubrocapilla	Red-headed Manakin	P,S	DEP
Manacus manacus	White-bearded Manakin	P,S	DEP
Chiroxiphia pareola	Blue-backed Manakin	P,S	DEP
ONYCHORHYNCHIDAE			
Myiobius barbatus	Whiskered Flycatcher	P	DEP
TITYRIDAE			
Schiffornis turdina	Thrush-like Schiffornis	S,V	DEP
Tityra cayana	Black-tailed Tityra	S,V	DEP
Pachyramphus polychopterus	White-winged Becard	P,S	DEP
RHYNCHOCYCLIDAE			
Mionectes oleagineus	Ochre-bellied Flycatcher	P,S	SEM
Leptopogon amaurocephalus	Sepia-capped Flycatcher	S,V	DEP

Family/Species	English name	Evidence	Habitat
Tolmomyias poliocephalus	Grey-crowned Flycatcher	S,V	DEP
Tolmomyias flaviventris	Yellow-breasted Flycatcher	P,S	DEP
Todirostrum cinereum	Common Tody-Flycatcher	P,S	SEM
Poecilotriccus fumifrons	Smoky-fronted Tody-Flycatcher	P,S	SEM
Hemitriccus griseipectus	White-bellied Tody-Tyrant	S,V	DEP
TYRANNIDAE			
Zimmerius acer	Guianan Tyrannulet	P,S	DEP
Ornithion inerme	White-lored Tyrannulet	P,S	DEP
Camptostoma obsoletum	Southern Beardless Tyrannulet	P,S	IND
Elaenia flavogaster	Yellow-bellied Elaenia	P,S	SEM
Elaenia spectabilis	Large Elaenia	S	SEM
Myiopagis gaimardii	Forest Elaenia	S,V	DEP
Myiopagis caniceps	Grey Elaenia	S,V	DEP
Myiopagis viridicata	Greenish Elaenia	S,V	DEP
Capsiempis flaveola	Yellow Tyrannulet	P,S	SEM
Phaeomyias murina	Mouse-coloured Tyrannulet	S,V	SEM
Phyllomyias fasciatus	Planalto Tyrannulet	P,S	DEP
Legatus leucophaius	Piratic Flycatcher	P,S	DEP
Myiarchus tuberculifer	Dusky-capped Flycatcher	P,S	DEP
Myiarchus ferox	Short-crested Flycatcher	P,S	SEM
Myiarchus tyrannulus	Brown-crested Flycatcher	P,S	SEM
Rhytipterna simplex	Greyish Mourner	P,S	DEP
Pitangus sulphuratus	Great Kiskadee	P,S	IND
Machetornis rixosa	Cattle Tyrant	P,S	IND
Megarynchus pitangua	Boat-billed Flycatcher	P,S	DEP
Myiozetetes similis	Social Flycatcher	P,S	SEM
Tyrannus melancholicus	Tropical Kingbird	P,S	IND
Empidonomus varius	Variegated Flycatcher	P,S	SEM
Myiophobus fasciatus	Bran-coloured Flycatcher	P,S	IND
Fluvicola nengeta	Masked Water Tyrant	P	IND
Arundinicola leucocephala	White-headed Marsh Tyrant	P	IND
Lathrotriccus euleri	Euler's Flycatcher	S,V	DEP
VIREONIDAE			
Cyclarhis gujanensis	Rufous-browed Peppershrike	P,S	DEP
Hylophilus amaurocephalus	Grey-eyed Greenlet	S,V	SEM
Vireo chivi	Chivi Vireo	P,S	DEP
HIRUNDINIDAE			
Stelgidopteryx ruficollis	Southern Rough-winged Swallow	P	IND
Progne tapera	Brown-chested Martin	V	IND
Progne chalybea	Grey-breasted Martin	P	IND
Tachycineta albiventer	White-winged Swallow	P	IND
TROGLODYTIDAE			
Troglodytes musculus	Southern House Wren	P,S	IND
Pheugopedius genibarbis	Moustached Wren	P,S	DEP
DONACOBIIDAE			
Donacobius atricapilla	Black-capped Donacobius	P,S	IND
POLIOPTILIDAE			
Ramphocaenus melanurus	Long-billed Gnatwren	S,V	DEP
Polioptila plumbea	Tropical Gnatcatcher	P,S	SEM
TURDIDAE			
Turdus flavipes	Yellow-legged Thrush	P	SEM
Turdus leucomelas	Pale-breasted Thrush	P,S	SEM
Turdus rufiventris	Rufous-bellied Thrush	P,S	SEM
MIMIDAE			
Mimus saturninus	Chalk-browed Mockingbird	P,S	IND
MOTACILLIDAE			
Anthus lutescens	Yellowish Pipit	P	IND
PASSERELLIDAE			
Arremon taciturnus	Pectoral Sparrow	S,V	DEP
PARULIDAE			
Basileuterus culicivorus	Golden-crowned Warbler	S,V	DEP
Myiothlypis flaveola	Flavescent Warbler	P,S	DEP
ICTERIDAE			
Procacicus solitarius	Solitary Black Cacique	P,S	SEM
Icterus pyrrhopterus	Variable Oriole	P,S	SEM
Icterus jamacaii	Campo Troupial	S,V	SEM
Agelaioides fringillarius	Pale Baywing	P,S	IND
Molothrus bonariensis	Shiny Cowbird	P	IND
Sturnella superciliaris	White-browed Blackbird	V	IND
THRAUPIDAE			
Paroaria dominicana	Red-cowled Cardinal	V	IND
Tangara cyanomelas	Silver-breasted Tanager	P,S	DEP
Tangara fastuosa	Seven-coloured Tanager	P,S	DEP
Tangara cyanocephala	Red-necked Tanager	P	DEP
Tangara sayaca	Sayaca Tanager	P,S	SEM
Tangara palmarum	Palm Tanager	P,S	SEM
Tangara cayana	Burnished-buff Tanager	P,S	SEM
Nemosia pileata	Hooded Tanager	P	SEM
Conirostrum speciosum	Chestnut-vented Conebill	V	DEP
Sicalis flaveola	Saffron Finch	P,S	IND
Chlorophanes spiza	Green Honeycreeper	V	DEP
Hemithraupis guira	Guira Tanager	P,S	DEP
Volatinia jacarina	Blue-black Grassquit	P,S	IND
Lanio cristatus	Flame-crested Tanager	P,S	DEP
Tachyphonus rufus	White-lined Tanager	P,S	SEM
Ramphocelus bresilius	Brazilian Tanager	P,S	DEP
Tersina viridis	Swallow Tanager	V	DEP
Cyanerpes cyaneus	Red-legged Honeycreeper	P,S	DEP
Dacnis cayana	Blue Dacnis	P,S	DEP
Coereba flaveola	Bananaquit	P,S	SEM
Sporophila nigricollis	Yellow-bellied Seedeater	P,S	IND
Sporophila leucoptera	White-bellied Seedeater	S,V	IND
Sporophila angolensis	Chestnut-bellied Seed Finch	S,V	IND
Emberizoides herbicola	Wedge-tailed Grass Finch	P,S	IND
Saltator maximus	Buff-throated Saltator	P,S	DEP
Thlypopsis sordida	Orange-headed Tanager	P,S	SEM
FRINGILLIDAE			
Spinus yarrellii	Yellow-faced Siskin	V	SEM
Euphonia chlorotica	Purple-throated Euphonia	P,S	SEM
Euphonia violacea	Violaceous Euphonia	P,S	DEP
ESTRILDIDAE			
Estrilda astrild	Common Waxbill	P	IND
PASSERIDAE			
Passer domesticus	House Sparrow	P	IND

Primer registro del Pato Overo *Mareca sibilatrix* en Bolivia

Dennis Camacho Rojas

Received 30 November 2017; final revision accepted 13 March 2019
Cotinga 41 (2019): 22–23
published online 21 June 2019

I present the first record of Chiloe Wigeon *Mareca sibilatrix* in Bolivia, a pair at Larati Lagoon, Tunari National Park, dpto. Cochabamba, on 29 October 2017. The nearest record of the species is 600 km to the south-west of this locality. Chiloe Wigeon is presumably only a vagrant to Bolivia.

El Pato Overo *Mareca sibilatrix* es un anátido que se distribuye en el sur de Sudamérica, desde el norte de Argentina, Uruguay, sur de Brasil, centro de Chile, Tierra de Fuego y las islas Malvinas[3,4] (Fig. 1). Las poblaciones de *M. sibilatrix* del sur de Sudamérica migran hacia Uruguay, Paraguay y Brasil, mientras que la población de las islas Malvinas es sedentaria[4]. La especie está relacionada a humedales como charcos temporales, praderas de pastos cortos, lagos poco profundos, pozas, campos inundados y secciones protegidas de lagos grandes y profundos[6]. Dichos humedales pueden contener algas filamentosas y también algunas plantas acuáticas como *Myriophyllum* sp. y *Juncus* sp.[4]. La presente nota describe el primer registro de esta especie en Bolivia[7].

El 29 de octubre de 2017 observé dos individuos de *M. sibilatrix* (Fig. 1) en la laguna Larati, parte sureste del Parque Nacional Tunari (PNT), municipio de Sacaba, Cochabamba (17°20'39"S 66°01'21"W; 3.500 m de altitud). La observación duró diez minutos aproximadamente. Los dos individuos se mostraban nerviosos ante mi presencia y volaron con rumbo incierto poco tiempo después de ser fotografiados. Las siguientes características diagnósticas permitieron identificarlos como *M. sibilatrix*: cabeza parda con reflejos verdes, máscara blanca y parche blanco en las alas, notorio durante el vuelo[4,6]. Al momento de la observación, en la laguna se encontraban además Pato Puna *Spatula puna*, Pato Colorado *S. cyanoptera*, Pato Jerga *Anas georgica*, Gallareta Andina *Fulica ardesiaca*, Polla de Agua *Gallinula galeata*, Playero Pata Amarilla Mayor *Tringa melanoleuca*, Playero Pata Amarilla Menor *T. flavipes*, Chorlo Dorado *Pluvialis dominica* y Playerito Unicolor *Calidris bairdii*.

El PNT tiene un área de 3.091 km^2 aproximadamente[1], con hábitats de pajonales, arbustales y bofedales. En este parque existen numerosas lagunas donde predominan plantas acuáticas emergentes como totoras *Schoenoplectus californicus* y *Typha domingensis*, y sumergidas como *Myriophyllum quitense* y *Potamogeton ferrugineus*. Los humedales del PNT son áreas habituales de congregación de aves acuáticas.

Figura 1. Pareja de Patos Overos *Mareca sibilatrix* en la laguna Larati, Parque Nacional Tunari, Cochabamba, Bolivia, 29 de octubre de 2017 (Dennis Camacho)

Figura 2. Registro más cercano del Pato Overo *Mareca sibilatrix* correspondiente al río Loa en Chile y el registro en la laguna Larati. (© Google Earth)

Por ello, y por la presencia de cuatro especies endémicas de Bolivia y ocho especies con algún grado de amenaza[1], el PNT se considera un área de importancia para la conservación de las aves (AICA).

El presente registro de *M. sibilatrix* en Bolivia, según todo indica, es accidental. La especie realiza desplazamientos desde el sur de Argentina y Chile hacia el norte durante el otoño e invierno australes[4]. El registro más cercano de esta especie a Larati está a 600 km en las cercanías del río Loa en Chile[5] (Fig. 2). Existen muy pocos registros de *M. sibilatrix* sobre 3.000 m de altitud en toda su área de distribución, incluyendo un registro accidental a 3.363 m en Catamarca, Argentina[2].

Agradecimientos

Gracias a Sebastián K. Herzog y un revisor anónimo porque mejoraron la calidad de esta nota, también a la Unidad de Limnología y Recursos Acuáticos de la Universidad Mayor de San Simón, sin cuyo apoyo no habría sido posible llegar a esta laguna y realizar el registro.

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El nido de Metalura Tiria *Metallura tyrianthina* en Venezuela y Perú

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Received 3 February 2018; final revision accepted 20 March 2019
Cotinga 41 (2019): 24–28
published online 21 June 2019

The breeding biology of Tyrian Metaltail *Metallura tyrianthina* is poorly known, with only incomplete published data about nest architecture. Here we present new information about the nest of *M. tyrianthina*. We describe a nest of the race *M. t. chloropogon* from the Cordillera de la Costa, Venezuela, found during the rainy season in August, and two nests of the race *M. t. smaragdinicollis* on the east slope of the Andes in Peru, discovered during the dry season in June. All nests were pensile cups constructed of moss, grasses, spider webs and rhizomorphic fungi, and sited under vegetation cover or in small caves. Finally, we compare all available data concerning nest materials, location and placement from the available literature on the genus *Metallura*.

El género *Metallura* incluye nueve especies de colibríes de alta montaña con distribución restringida a los Andes desde Venezuela hasta Bolivia[2,4,5]. Este género de colibríes utiliza comúnmente hábitats de ecotono entre los bosques húmedos montanos y su transición al páramo andino[1,5]. Las especies de este género son comúnmente observadas entre 2.000–4.500 m de altitud[4], aunque algunas especies pueden llegar hasta 1.500 m[14]. En Venezuela residen dos especies[6]: Metalura de Perijá *Metallura iracunda*, restringido a la sierra de Perijá, y Metalura Tiria *M. tyrianthina*, con cuatro subespecies separadas geográficamente: *M. t. districta* en la sierra de Perijá, *M. t. tyrianthina* al suroeste del estado Táchira, *M. t. oreopola* en la cordillera de Mérida, y *M. t. chloropogon* en el tramo central la cordillera de la Costa. En Perú residen seis especies: Metalura Negra *M. phoebe*, Metalura Escamada *M. aeneocauda*, Metalura Cobriza *M. theresiae*, Metalura Golifuego *M. eupogon*, Metalura Neblina *M. odomae* y Metalura Tiria *M. tyrianthina*, esta última con tres subespecies: *M. t. tyrianthina* al extremo norte del país, *M. t. septentrionalis* en la vertiente occidental de los Andes y *M. t. smaragdinicollis* en la vertiente oriental de la cordillera andina[2,14].

La información sobre la biología reproductiva de *Metallura* es escasa, como en otros géneros de colibríes neotropicales[14]. En la actualidad, solo se conoce el nido de *M. tyrianthina*[9,16], *M. odomae* (B. M. Whitney en Collar *et al.*[3]), Metalura Gorgivioleta *M. baroni*[8], Metalura Verde *M. williami*[11] y *M. phoebe*[7,10], aunque las descripciones son en general poco detalladas, sin documentación ilustrada o fotográfica. Para *M. tyrianthina*, la especie de mayor distribución en el género, solo se ha descrito un nido en construcción en Colombia[16] (subespecie *M. t. tyrianthina*) y un reporte fotográfico del nido y huevos de *M. t. smaragdinicollis* en Perú[9].

En este trabajo se presenta una descripción detallada de un nido de *M. t. chloropogon* al norte de Venezuela, y se aportan nuevas observaciones de dos nidos de *M. t. smaragdinicollis* en Huánuco, Perú. Finalmente, se comparan las observaciones con la información de nidos disponible para los colibríes del género *Metallura* y se discute su identificación.

Observaciones

En Venezuela, el nido fue hallado en un camino de montaña usado comúnmente por senderistas hacia el sector de Lagunazo (10°32'84"N 66°52'157"O; 1.930 m de altitud) dentro del Parque Nacional El Ávila (PNA), Distrito Capital, el 30 de agosto de 2015. Esta zona se caracteriza por un mosaico de transición que parte del bosque sub-montano, nublado y siempreverde, a pequeños arbustales asociados a la vegetación de pre-páramo[17]. El nido estaba situado a 1,40 m sobre el suelo, en una pequeña cavidad de 0,77 m de profundidad, 1,20 m de ancho y 1,60 m de altura. El nido estaba colgado en la parte superior de la cavidad, y medía 15 cm de largo (longitud total vertical), 13 cm de ancho (a nivel de la cama de incubación) y 6 cm de profundidad (desde la base de la cama de incubación al borde de la cama).

El nido estaba unido a raíces de la parte superior de la cavidad, adosado al terraplén mediante musgo entrelazado con fibras filiformes de gramíneas y reforzadas con tela de araña (Fig. 1A); tenía forma de canasta alta / colgada[15]. La parte posterior a la cama de incubación presentó una extensión parcial de musgo más alta. La cama se encontraba revestida por una fina capa de fibra vegetal suave de color blanco sucio (Fig. 1B). Se observó una hembra de *M. t. chloropogon* sobre el nido entre 09h00–10h00, efectuando repetidas salidas hacia una percha en un arbusto al otro lado del sendero. Ningún macho se avistó

en las inmediaciones del nido mientras duraron las observaciones. No se colectó el nido el día de la observación y no fue posible regresar hasta 15 días después, cuando estaba abandonado y deteriorado.

En Perú se observaron dos nidos independientes de *M. t. smaragdinicollis* en la cuenca del río Huallaga, cordillera de Carpish (09°43'38"S 75°57'6"O; 3.110 m de altitud), departamento de Huánuco, uno en junio de 2015 y otro en junio de 2018. El nido del año 2018 estaba a aproximadamente 3 m de la ubicación del nido de 2015. La vegetación en la localidad es mixta de alta montaña, principalmente dominada por bosques montanos y achaparrados[13]. Las temperaturas durante la noche llegaron a valores ligeramente bajo cero (–0,4°C) en 2018. El nido encontrado en 2015 tenía dos pichones, mientras que el nido de 2018 estaba en fase de pre-puesta. La hembra utilizó el nido como dormidero entre 12–15 de junio de 2018, pero el nido no contenía huevos o crías. El 18 de junio se observaron dos huevos en el nido.

Los nidos de Perú fueron construidos en raíces expuestas bajo una rama gruesa, adosado a la vegetación o sustrato usando musgo entrelazado con fibras filiformes y algunos rizomorfos obscuros (Figs. 2, 3B). Ambos presentaron una forma de canasta alta / colgada[15] reforzada con tela de arañas y pocos líquenes. En los dos casos, posterior a la cama de incubación se presentó una extensión parcial de musgo (Fig. 2A, 3B). El interior fue revestido por una fina capa de fibra vegetal suave en los dos nidos. No se realizaron registros de las dimensiones ni fueron colectados los nidos ni huevos.

Discusión

El conocimiento sobre la arquitectura del nido de *M. tyrianthina* permanecía incompleto, debido a que su primera descripción se realizó sobre un nido en construcción no culminado[16]. En Perú no se cuenta con una descripción detallada del nido de esta especie[12], y la escasa información disponible proviene de la región de Manu[9] y de nuestros nidos en el departamento de Huánuco, ambos de la subespecie *M. t. smaragdinicollis*.

En términos generales, los nidos descritos en este trabajo son similares a aquellos reportados en *Metallura*[3,6–11,16], mismos que se construyen en terraplenes, cavidades, pequeñas cuevas o rocas expuestas, cerca o no de corrientes de agua. Los nidos son fabricados principalmente con abundante musgo, helechos y material vegetal filiforme, comúnmente gramíneas. La estructura es reforzada con tela de araña, puede o no presentar líquenes adosados, están colgados, unidos a raíces salientes, debajo de una rama gruesa o sobre el sustrato rocoso, entre 1–3 m sobre el suelo. La forma del nido es una copa densa de musgo, que puede presentar una extensión de musgo parcial en la parte posterior a la cama de incubación. La cama es revestida en su interior de un material suave, con presencia de pocas plumas como relleno.

La pequeña cavidad donde fue encontrado el nido en Venezuela presentó características similares a lo señalado previamente en Colombia[16], donde el nido se encontraba en una cavidad a 1,3 m sobre el suelo, y de dimensiones comparables al nuestro[16]. El nido fotografiado en Manu[9] y nuestro nido en Huánuco también compartieron características de micro-hábitat. La presencia de una extensión parcial de musgo en la parte trasera de la cama de incubación de los tres nidos documentados en este trabajo (Figs. 2–3) fue una característica compartida con la primera descripción de nido de *M. tyrianthina*[16]; sin embargo, no se encontró en el nido de *M. t. smaragdinicollis* de Manu[9]. Por su parte, Snow[16] no describió el revestimiento de la cama de incubación, presente en los nidos estudiados en Venezuela y Perú, posiblemente debido a que su nido no estaba completamente terminado.

Observamos dos huevos de color blanco y forma ovalada (Fig. 3A), como es común en la familia Trochilidae[9,14]. Nuestras observaciones en Huánuco de nidos en junio de 2015 y 2018 sugieren que la nidificación ocurre durante el período de sequía. En Venezuela no se observaron huevos, lo que puede sugerir que la hembra estaba preparándose para la puesta o que la construcción del nido estaba recién concluida, pero a diferencia de los nidos en Perú, la nidificación al parecer ocurrió hacia el fin del periodo de lluvias.

Según Snow[16], las características del micro-hábitat de anidación de las especies de *Metallura* podrían ser aspectos claves de su éxito reproductivo, ya que las cuevas proveen resguardo ante condiciones climáticas desfavorables y ante depredadores. Nuestras observaciones en Venezuela sugieren que, pese a este reguardo, el nido fue destruido por inclemencia climática o por depredación. No obstante, los micro-hábitats de anidación que encontramos comparten rasgos documentados en otras especies de *Metallura*, por lo que al parecer estos colibríes seleccionan activamente estos lugares para anidación.

Agradecimientos

A Roberto Sánchez Cabello y David Koster por su ayuda en campo. A Andreina López, Cristina Sainz y Susan Bonfield por comentarios y correcciones al manuscrito. A Manuel Plenge por su orientación en la bibliografía ornitológica del Perú. A Gustavo Londoño por la información facilitada. Agradecemos el

Figura 1. Nido de Metalura Tiria *Metallura tyrianthina chloropogon* en Venezuela. A: Extensión parcial de musgo posterior a la cama de incubación y hembra ocupando el nido; B: vista interna al material que reviste la cama de incubación (Miguel E. Matta Pereira)

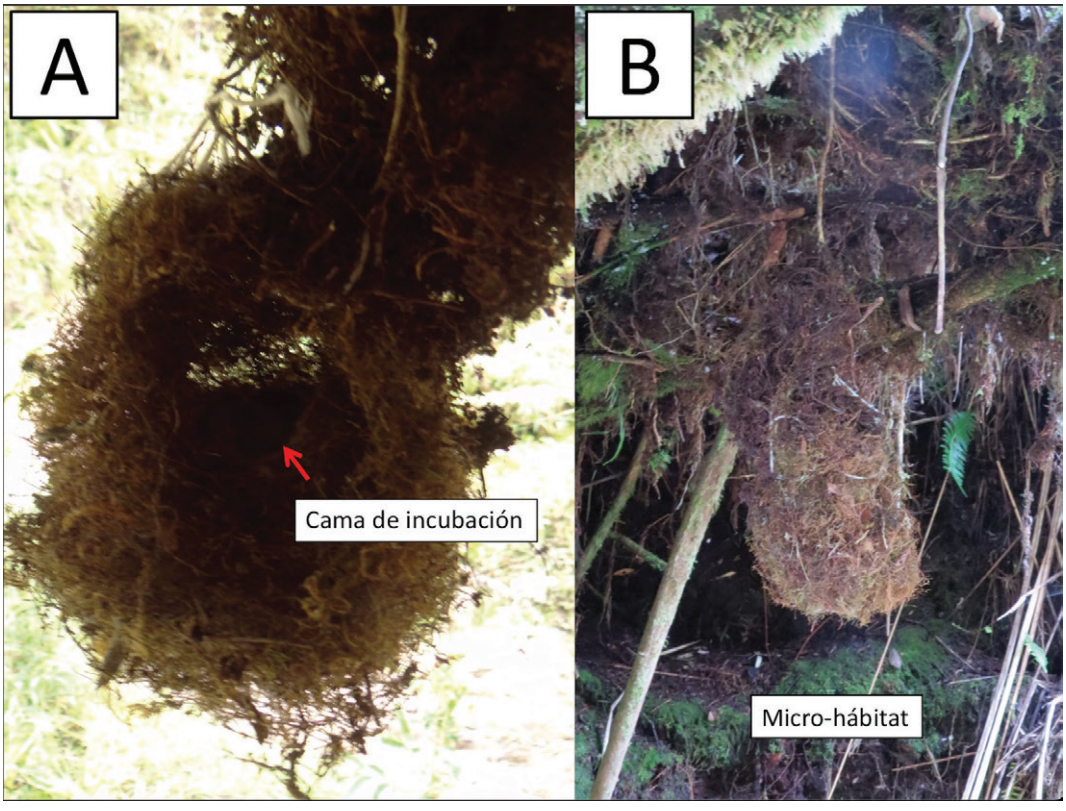

Figura 2. Nido de Metalura Tiria *Metallura tyrianthina smaragdinicollis* en Perú (junio de 2015). A: Presencia de la extensión de musgo y entrada a la cama de incubación; B: micro-hábitat de anidación, nido colgando sujeto a raíces expuestas (Daniel Muñoz)

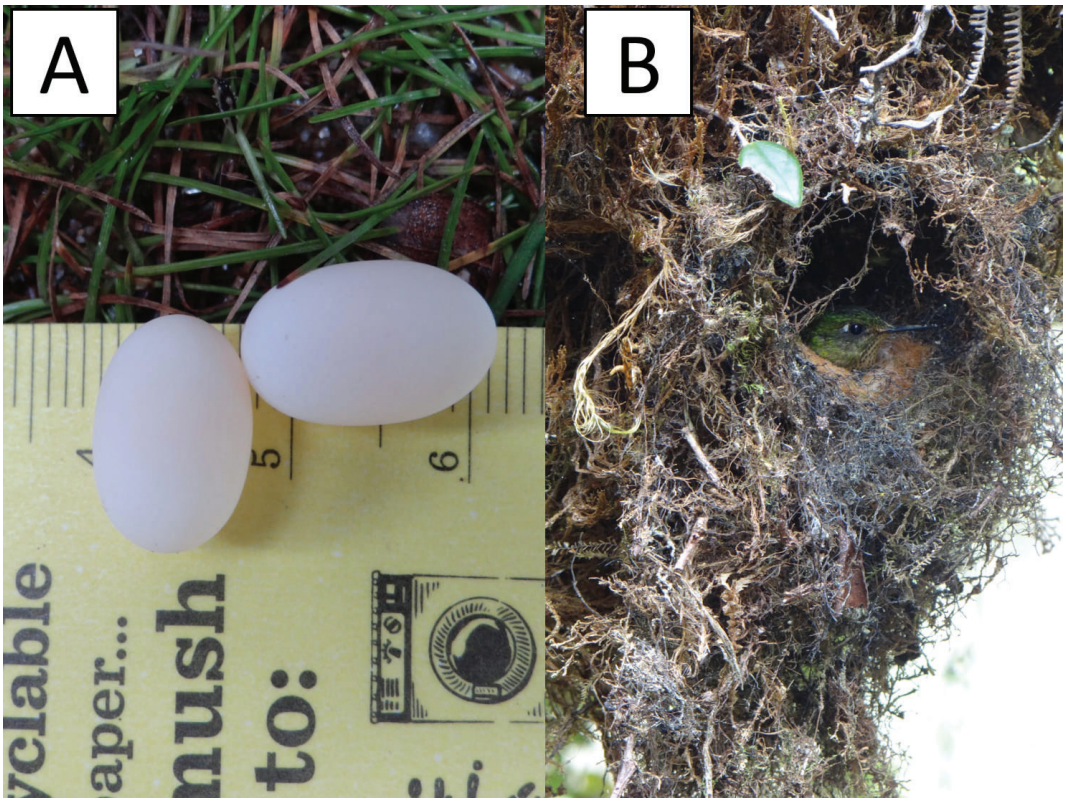

Figura 3. Huevos (A) y nido de Metalura Tiria *Metallura tyrianthina smaragdinicollis* en Perú (junio de 2018). B: micro-hábitat de anidación, nido colgando sujeto a raíces expuestas y hembra ocupando el nido (Daniel Muñoz)

esfuerzo editorial de Juan Freile, y los comentarios de Gary Stiles y un revisor anónimo, que contribuyeron constructivamente al manuscrito final.

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Avifauna del Parque Internacional La Amistad (sector Isla) y los territorios indígenas Bribri y Cabécar, Costa Rica

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Received 13 March 2018; final revision accepted 5 September 2018
Cotinga 41 (2019): 29–40
published online 21 June 2019

Costa Rica possesses relatively high avian diversity considering its small territory. This high diversity represents a challenge for documenting temporal and spatial distribution of species. La Amistad International Park (PILA) is one of the least-known areas in the country despite its considerable biological importance. PILA is a bi-national reserve (Costa Rica / Panama) covering 200,000 ha and a UNESCO World Heritage site. The goal of this study was to document the avifauna of PILA by studying bird communities in three areas: Sector Isla, and two indigenous reserves in the buffer zone, Talamanca Bribri Indigenous Reserve and Cabécar Indigenous Reserve. Bird species were surveyed using point counts and mist-netting over four days at each site in April 2016. Overall 128 species were detected, or 14% of the avifauna of Costa Rica. Fifteen species are migrants, five have restricted geographical ranges, and six are of global conservation concern (five Near Threatened and one Vulnerable). More species were detected at Isla (86) than in Bribri (71) and Cabécar (53). Differences in the elevational range or heterogeneity in vegetation composition sampled at each site could account for variation in species richness, but insufficient sampling effort might also have affected our results. PILA and its buffer zones are important for preserving high avian diversity and could also provide income sources for the local human populations.

Costa Rica alberga una considerable biodiversidad al ser un puente de intercambio de especies entre Sur y Norteamérica[2,21,23]. Costa Rica posee una de las mayores riquezas de avifauna en América[17,22,23]. La última actualización de la lista de aves reportadas en el país incluye un total de 924 especies[19]. La gran diversidad de aves en Costa Rica supone un reto para documentar su presencia y distribución geográfica y espacial.

Una zona poco muestreada en Costa Rica, pero de gran importancia biológica, es el Parque Internacional La Amistad (PILA). Esta importancia biológica se debe, principalmente, a sus amplios rangos altitudinales, variaciones en la precipitación y temperatura y a los diversos tipos de suelos existentes, que resultan en ecosistemas heterogéneos[20]. El PILA es una reserva binacional (Panamá / Costa Rica) de casi 200.000 ha. Este parque fue declarado por la UNESCO como patrimonio mundial de la humanidad[20] (Fig. 1). EL PILA cubre 4% del territorio nacional; está cubierto en su mayoría por bosques primarios (93% de su extensión), fundamentalmente en la vertiente Caribe. Además, está adyacente a territorios indígenas incluidos dentro de la categoría de reservas indígenas de las culturas Bribi y Cabécar[20].

Está documentado que los pueblos indígenas ocupan más de la mitad de los bosques de Centroamérica, lo cual los convierte en actores clave para la conservación de los ecosistemas más importantes de la región[25]. Estos pueblos indígenas mantienen algunas prácticas productivas tradicionales compatibles con la conservación de los recursos naturales[6,24]. Sin embargo, se sabe que los cambios culturales asociados a la globalización pueden alterar la utilización de los recursos naturales, con impactos negativos para la conservación de la biodiversidad[24]. Por ello, el objetivo de este estudio fue documentar las especies de aves presentes en el sector Isla del PILA y en dos reservas indígenas (Cabécar y Bribri), ubicadas en los márgenes del área núcleo del parque, como un aporte para documentar la riqueza de aves presentes en el PILA y su zona de influencia.

Área de estudio

El PILA se ubica en el centro de la cordillera de Talamanca, macizo montañoso que se extiende por casi 1.000 km desde el cerro de la Muerte, Costa Rica, hasta el oriente de Chiriquí, Panamá. El PILA es muy diverso en clima y topografía; aproximadamente 88% del área se encuentra hacia la vertiente del Caribe[20] (Fig. 1). La asociación vegetal presente en el área de estudio fue el bosque tropical húmedo, que en Costa Rica abarca la mayoría de las tierras bajas del Caribe[22,23]. Algunas especies de árboles típicos de este bosque son: *Anacardium excelsum*, *Brosimum* sp., *Cordia alliodora*, *Cedrela mexicana*, *Cecropia* spp., *Virola* spp., *Guarea* spp., *Vitex* spp., *Calophyllum brasiliense*, *Terminalia amazonia*, *Tabebuia pentaphylla*, *Manilkara* spp., entre otras[21].

El trabajo de campo se realizó en tres localidades, entre c.110–480 m de altitud:

1. Sector Isla, también conocido como bloque C o sector Tsókë-Namöwöki: es uno de los cuatro bloques administrativos del PILA. Se ubica

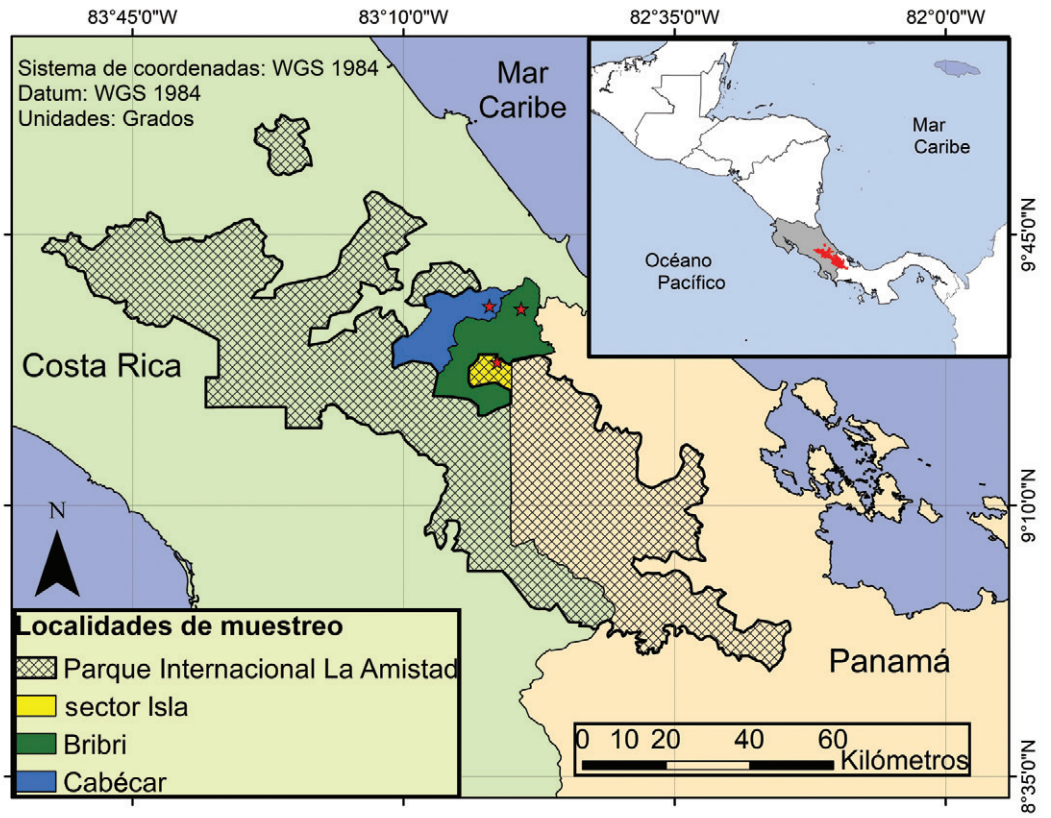

Figura 1. Ubicación del Parque Internacional La Amistad (PILA), el sector Isla y las reservas indígenas Bribri y Cabécar en el sur de Costa Rica. Las estrellas rojas indican las localidades de estudio. El recuadro indica la ubicación de Costa Rica (en gris) con respecto a América Central y del Parque Internacional La Amistad (en rojo) con respecto a Costa Rica y Panamá.

en la reserva indígena de Talamanca Bribri, considerada como zona de uso restringido debido a la presencia de indígenas y a su importancia ecológica. En este sector se permiten prácticas de uso tradicional indígena y la conservación de la biodiversidad[20] (Fig. 2).

2. Reserva Indígena Talamanca Bribri: la reserva indígena más poblada de Costa Rica y la segunda en extensión. Además de bosques, cuenta con cultivos de banano, plátano, cacao, tubérculos, maíz y frutales en complejos sistemas agroforestales[20]. Los sitios de muestreo se ubicaron entre c.155–295 m de altitud (Fig. 3).
3. Reserva Indígena Cabécar, donde también hay cultivos de banano, plátano, cacao, frijol, maíz, café y ganadería bovina[20]. Los sitios de muestreo se ubicaron entre c.110–310 m (Fig. 4).

Métodos

Durante cuatro días consecutivos en cada localidad se muestreó la avifauna en 12–24 de abril 2016, entre 06h00–10h00 y 15h00–18h00. En cada localidad se establecieron tantos puntos de conteo como fue posible, dependiendo del área y la topografía: 20 puntos de conteo en el sector Isla, 18 puntos en Bribri y 13 puntos en Cabécar (Figs. 2–4). Cada punto estuvo separado del siguiente por una distancia de 150 m. En cada punto, dos observadores permanecieron durante diez minutos y registraron todas las especies detectadas visual y acústicamente. El desplazamiento entre puntos fue de cinco minutos, y se esperó dos minutos antes de iniciar el conteo en cada punto nuevo. Adicionalmente, se utilizaron tres redes de niebla en cada localidad de muestreo, colocadas de manera continua: dos redes de 12,0 m × 2,5 m, tamaño de malla 0,5 mm, y una tercera red de 6,0 m × 2,5 m, tamaño de malla 0,5 mm (Figs. 2–4). Las redes fueron operadas por dos personas distintas a las que muestrearon en los puntos de conteo, y los individuos capturados fueron identificados, fotografiados y liberados.

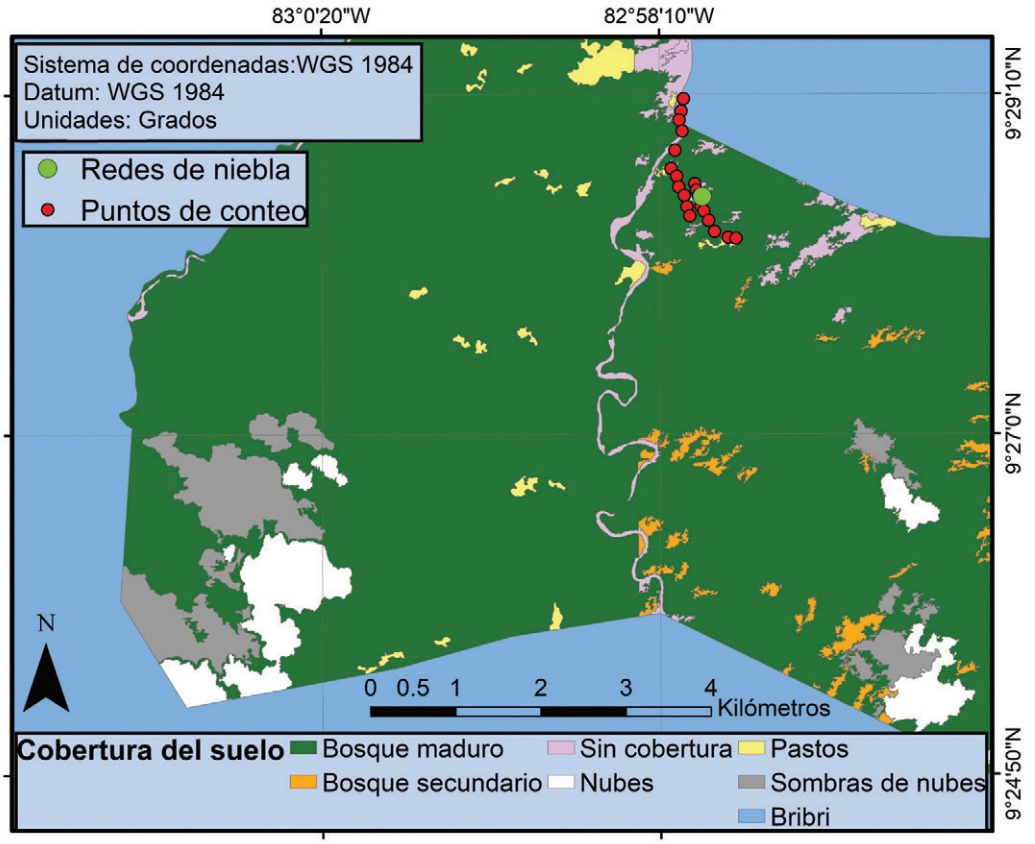

Figura 2. Ubicación de los sitios de muestreo de aves con redes de niebla y puntos de conteo en el sector Isla, Parque Internacional La Amistad, Costa Rica, abril de 2016. Mapa de cobertura del suelo según FONAFIFO[9].

La identificación de especies se realizó con base en Garrigues y Dean[10]. Se empleó la clasificación taxonómica de la AOU[1] incluyendo los suplementos publicados posteriormente. Los nombres comunes de las especies fueron basados en la lista oficial de aves de Costa Rica 2017–2018 de la Asociación Ornitológica de Costa Rica[11]. Se realizaron curvas de acumulación de especies para cada técnica de muestreo y para cada localidad, para observar la tendencia de la riqueza de especies según el esfuerzo de muestreo. También se realizó un análisis de agrupamiento de las localidades según la similitud de riqueza de especies y se utilizó el índice de distancia euclideana. Las especies detectadas se categorizaron como residentes o migratorias según Garrigues y Dean[10]. También se clasificaron por categoría de amenaza global[4].

Resultados

En las tres localidades muestreadas se registraron en total 128 especies, pertenecientes a 39 familias (Tabla 1, Fig. 5); esto representa aproximadamente el 14% de las especies reportadas en Costa Rica[19]. Se registraron 11 especies migratorias no reproductivas boreales. De estas, siete son consideradas residentes de invierno: Martín Pescador Norteño *Megaceryle alcyon*, Mosquerito Chebec *Empidonax minimus*, Copetón Viajero *Myiarchus crinitus*, Zorzal de Swainson *Catharus ustulatus*, Vireo Pechiamarillo *Vireo flavifrons*, Reinita de Costillas Castañas *Setophaga pensylvanica* y Reinita Acuática Norteña *Parkesia noveboracensis*; y cuatro son consideradas migratorias boreales de paso: Elanio Colinegro *Ictinia mississippiensis*, Pibí Boreal *Contopus cooperi*, Tirano Norteño *Tyrannus tyrannus* y Reinita Pechirrayada *Cardellina canadensis*. Además, se observaron dos especies consideradas migratorias reproductivas (se reproducen en Costa Rica y migran a Sudamérica): Gavilán Tijereta *Elanoides forficatus* y Vireo Cabecigrís *Vireo flavoviridis*. De todas las especies migratorias registradas, *Elanoides forficatus*, *Contopus cooperi* y *Cardellina canadensis* son consideradas de especial importancia para la conservación en Costa Rica[14]. Se registraron dos especies con distribución restringida a Centroamérica[4,10]: Gallinita *Odontophorus melanotis* y Soterrey Pechirrayado *Cantorchilus thoracicus*. Además,

se registró a Loro Cabeciazul *Pionus menstruus*, Batarito Cabecipunteado *Dysithamnus puncticeps* y Tangara Cenicienta *Tangara inornata*, tres especies con distribución restringida en Costa Rica[4,10]. En cuanto al estado de conservación, se reportaron cinco especies Casi Amenazadas: Gallina de Monte *Tinamus major*, Quioro *Ramphastos ambiguus*, Loro Verde *Amazona farinosa*, Perico Azteco *Eupsittula nana* y *Contopus cooperi*, y una especie Vulnerable: Pavón *Crax rubra*.

En el sector Isla se detectó el mayor número de especies (86 especies; 33 familias), seguido de Bribri (71 especies; 31 familias) y Cabécar (53 especies; 26 familias). Sin embargo, las curvas de acumulación de especies mostraron que en ninguno de los tres sitios el esfuerzo de muestreo fue suficiente para detectar la totalidad de especies presentes (Fig. 6). Bribri y Cabécar presentaron mayor similitud en composición de especies (Fig. 7), mientras que Isla fue el más disímil.

Discusión

El alto número de especies encontradas en este estudio, pese al esfuerzo de muestreo relativamente bajo, el corto periodo de tiempo y el estrecho rango altitudinal abarcado, es un indicio de la importancia del PILA para la conservación de las aves en Costa Rica. El registro de cinco especies en categorías de amenaza de extinción global, de 52 amenazadas globales reportadas en Costa Rica[5], resalta la importancia del PILA y su zona de influencia para las aves amenazadas, ya que podría albergar poblaciones estables de estas especies. Nuestros resultados refuerzan la identificación previa del PILA como un área de importancia para la conservación de aves (IBA) en Costa Rica[18].

La presencia de especies migratorias indica que el parque y sus zonas de influencia brindan recursos para el paso, reabastecimiento y refugio de estas especies. A la vez, algunas de estas especies migratorias contribuyen a la regeneración natural al dispersar semillas en los bosques que visitan[16]. Por otro lado, es conocido que la región Caribe sur de Costa Rica es importante para la migración de aves, ya que el cuello de botella que se forma en esta zona provoca que millones de aves transiten por la región durante su migración anual[3,14]. Además de varias áreas protegidas, existen en la región diferentes reservas indígenas que conservan fragmentos de bosque que pueden brindar recursos a las poblaciones de aves migrantes[7,14]. Por otra parte, el sur de Costa Rica representa el límite

Tabla 1. Especies registradas en el sector Isla, Parque Internacional La Amistad, y en las reservas indígenas Bribri y Cabécar, en la zona de influencia del parque, Costa Rica, 12–24 de abril 2016. Identificación: A = Auditiva en el campo, V = Visual en el campo, F = posterior con fotografía.

Nombre común	**Familia /** *Nombre científico*	**Pila**	**Bribri**	**Cabécar**	**Identificación**
	TINAMIDAE				
Gallina de Monte, Gongolona	*Tinamus major*	x	x	x	A
	CRACIDAE				
Chachalaca	*Ortalis cinereiceps*	x	x		V
Pava Granadera	*Penelope purpurascens*	x	x	x	V
Pavón	*Crax rubra*		x	x	V
	ODONTOPHORIDAE				
Chirrascuá, Gallinita	*Odontophorus melanotis*	x			A, V
	COLUMBIDAE				
Paloma Morada Común	*Patagioenas flavirostris*	x		x	V
Paloma Morada	*Patagioenas nigrirostris*	x	x		V
Tortolita Azulada	*Claravis pretiosa*			x	V
Paloma-Perdiz Rojiza	*Geotrygon montana*		x		V, F
	CUCULIDAE				
Bobo Chiso, Cacao	*Piaya cayana*	x	x	x	V
Tijo	*Crotophaga sulcirostris*	x			A, V
	NYCTIBIIDAE				
Pájaro Estaca, Bruja	*Nyctibius grandis*			x	A
Pájaro Estaca	*Nyctibius griseus*			x	A
	APODIDAE				
Golondrón	*Streptoprocne zonaris*	x			V
Vencejo Lomigrís	*Chaetura cinereiventris*		x		V

Nombre común	**Familia /** *Nombre científico*	**Pila**	**Bribri**	**Cabécar**	**Identificación**
	TROCHILIDAE				
Pico de Hoz	*Eutoxeres aquila*	x			V, F
Ermitaño Bronceado	*Glaucis aeneus*		x		V
Ermitaño Barbudo	*Threnetes ruckeri*	x	x	x	V, F
Ermitaño Colilargo	*Phaethornis longirostris*	x	x	x	V, F
Ermitaño Enano	*Phaethornis striigularis*	x	x	x	V
Colibrí Patirrojo	*Chalybura urochrysia*	x	x	x	V, F
Colibrí Ninfa Verde-Violeta	*Thalurania colombica*	x			V, F
Gorrión	*Amazilia amabilis*	x			V
Gorrión	*Amazilia tzacatl*	x	x	x	V
	ARDEIDAE				
Garzón, Martín Peña	*Tigrisoma mexicanum*	x			V
Garza Real	*Ardea alba*	x			V
	CATHARTIDAE				
Zopilote Negro, Zoncho	*Coragyps atratus*	x			V
Zopilote Cabecirrojo, Zonchite	*Cathartes aura*	x	x		V
	ACCIPITRIDAE				
Gavilán Tijereta	*Elanoides forficatus*	x			V
Elanio Colinegro	*Ictinia mississippiensis*		x		V, F
Gavilán Chapulinero	*Rupornis magnirostris*		x		A, V
Gavilán Blanco	*Pseudastur albicollis*	x			V
Aguilillo Negro, Aguilucho	*Spizaetus tyrannus*	x			V, F
	STRIGIDAE				
Oropopo	*Pulsatrix perspicillata*		x		A, V
Mochuelo Enano	*Glaucidium griseiceps*			x	V
Lechuza Café, Ju de León	*Ciccaba virgata*			x	A
	TROGONIDAE				
Trogón Coliplomizo, Caicota	*Trogon massena*		x		V
Trogón Cabeciverde	*Trogon rufus*			x	V
	MOMOTIDAE				
Pájaro Bobo	*Baryphthengus martii*		x		V, F
	ALCEDINIDAE				
Martín Pescador Collarejo	*Megaceryle torquata*	x			V
Martín Pescador Norteño	*Megaceryle alcyon*	x			V
Martín Pescador Amazónico	*Chloroceryle amazona*	x			V
Martín Pescador Verde	*Chloroceryle americana*	x			V
	BUCCONIDAE				
Buco Barbón	*Malacoptila panamensis*	x			V
Monja Frentiblanca, Julio	*Monasa morphoeus*	x			V
	RAMPHASTIDAE				
Tucancillo Collarejo, Cusingo	*Pteroglossus torquatus*	x	x	x	V
Tucan Pico Arcoíris	*Ramphastos sulfuratus*	x	x	x	A, V
Quioro	*Ramphastos ambiguus*	x	x	x	A, V
	PICIDAE				
Carpintero Carinegro	*Melanerpes pucherani*	x	x		V
Carpintero Lineado	*Dryocopus lineatus*		x		V
Carpintero Picoplata	*Campephilus guatemalensis*	x	x	x	V
	FALCONIDAE				
Guaco	*Herpetotheres cachinnans*	x	x	x	A, V

Nombre común	**Familia /** *Nombre científico*	**Pila**	**Bribri**	**Cabécar**	**Identificación**
Halcón de Monte Barreteado	*Micrastur ruficollis*	x			V
Halcón Cuelliblanco	*Falco rufigularis*	x			V
	PSITTACIDAE				
Perico Azteco	*Eupsittula nana*		x	x	V
Loro Cabecipardo, Lora	*Pyrilia haematotis*	x		x	V
Loro Cabeciazul, Chucuyo	*Pionus menstruus*	x	x		V
Loro Coroniblanco, Cotorra	*Pionus senilis*	x	x		V
Loro Verde, Lora Cabeza Negra	*Amazona farinosa*		x	x	V
	THAMNOPHILIDAE				
Batará Plomizo	*Thamnophilus atrinucha*	x	x	x	V
Batarito Cabecipunteado	*Dysithamnus puncticeps*		x	x	V, F
Hormiguerito Alipunteado	*Microrhopias quixensis*	x		x	V
Hormiguero Negruzco	*Cercomacroides tyrannina*		x		V
Hormiguero Dorsicastaño	*Myrmeciza exsul*	x	x	x	V
Hormiguero Moteado	*Hylophylax naevioides*	x	x		V, F
Hormiguero Bicolor	*Gymnopithys bicolor*	x			V, F
	FORMICARIIDAE				
Gallito Hormiguero Carinegro	*Formicarius analis*	x	x	x	V
	FURNARIIDAE				
Trepadorcito Pico de Cuña	*Glyphorynchus spirurus*	x	x	x	V, F
Trepador Gigante	*Xiphocolaptes promeropirhynchus*	x			V
Trepador Gorgianteado	*Xiphorhynchus susurrans*	x	x	x	V
	TYRANNIDAE				
Mosquerito Aceitunado	*Mionectes oleagineus*	x	x	x	V, F
Espatulilla Común	*Todirostrum cinereum*	x	x		V
Mosquero Real	*Onychorhynchus coronatus*	x			V
Mosquerito Colirrufo	*Terenotriccus erythrurus*	x	x	x	V, F
Mosquerito Lomiamarillo	*Myiobius sulphureipygius*	x			V
Pibí Boreal, Tontillo	*Contopus cooperi*		x		V
Pibí Tropical	*Contopus cinereus*	x	x	x	V
Mosquerito Chebec	*Empidonax minimus*	x			A, V
Mosquero Coludo	*Colonia colonus*	x	x	x	V, F
Copetón Viajero	*Myiarchus crinitus*			x	V
Bienteveo Grande, Cristo Fue	*Pitangus sulphuratus*	x			V
Mosquero Cejiblanco	*Myiozetetes similis*	x	x	x	A, V
Tirano Norteño, Viuda Negra	*Tyrannus tyrannus*		x		V
	TITYRIDAE				
Pájaro Chancho, Calandria	*Tityra semifasciata*	x	x		V
	COTINGIDAE				
Querula Gorgimorada	*Querula purpurata*		x		V
	PIPRIDAE				
Quiebrapalos	*Manacus candei*	x	x		A, V
Saltarín Cabecirrojo	*Ceratopipra mentalis*		x	x	V, F
	VIREONIDAE				
Verdillo Menudo	*Pachysylvia decurtata*			x	V
Vireo Pechiamarillo	*Vireo flavifrons*	x			V
Vireo Ojirrojo, Chiguisa	*Vireo olivaceus*	x	x	x	V
Vireo Cabecigris, Chiguisa	*Vireo flavoviridis*			x	V

Nombre común	**Familia /** *Nombre científico*	**Pila**	**Bribri**	**Cabécar**	**Identificación**
	HIRUNDINIDAE				
Martin Pechigrís	*Progne chalybea*			x	V
	TROGLODYTIDAE				
Soterrey Cucarachero	*Troglodytes aedon*		x		V
Soterrey Pechirrayado	*Cantorchilus thoracicus*		x		V
Soterrey Castaño	*Cantorchilus nigricapillus*	x			V
Soterrey de Selva Pechiblanco	*Henicorhina leucosticta*		x		V
Soterrey Canoro	*Cyphorhinus phaeocephalus*		x		V
	POLIOPTILIDAE				
Soterillo Caricafé	*Microbates cinereiventris*	x			V, F
Soterillo Picudo	*Ramphocaenus melanurus*	x	x	x	V
Perlita Tropical, Espatulilla	*Polioptila plumbea*	x	x		V
	TURDIDAE				
Zorzal de Swainson, Conchita	*Catharus ustulatus*	x	x		V
Mirlo Pardo, Yigüirro	*Turdus grayi*	x		x	A, V
	FRINGILLIDAE				
Eufonia Olivácea, Agüío	*Euphonia gouldi*	x	x	x	V, F
	PASSERELLIDAE				
Pinzón Cabecilistado	*Arremonops conirostris*		x		V
	ICTERIDAE				
Oropéndola Cabecicastaña	*Psarocolius wagleri*			x	A, V
Oropéndola de Moctezuma	*Psarocolius montezuma*	x	x	x	A, V
Cacique Lomiescarlata	*Cacicus uropygialis*	x			V
Bolsero Capuchinegro	*Icterus prosthemelas*	x			V
Zanate Grande	*Quiscalus mexicanus*	x			A, V
	PARULIDAE				
Reinita Acuática Norteña	*Parkesia noveboracensis*		x	x	V
Reinita de Costillas Castañas	*Setophaga pensylvanica*	x	x		V
Reintita Guardaribera	*Myiothlypis fulvicauda*	x	x		V
Reinita Pechirrayada	*Cardellina canadensis*			x	V
	MITROSPINGIDAE				
Tangara Carinegruzca	*Mitrospingus cassinii*	x			V
	CARDINALIDAE				
Tangara Hormiguera Gorgirroja	*Habia fuscicauda*	x		x	V
Picogrueso Carinegro	*Caryothraustes poliogaster*	x			V
Picogrueso Negro Azulado	*Cyanocompsa cyanoides*	x		x	V
	THRAUPIDAE				
Tangara Azuleja, Viudita	*Thraupis episcopus*	x	x		V
Tangara Palmera	*Thraupis palmarum*	x			V
Tangara Capuchidorada, Juana	*Tangara larvata*	x	x	x	V
Tangara Cenicienta	*Tangara inornata*		x		V
Semillerito Negro Azulado	*Volatinia jacarina*	x			V
Tangara Caponiblanca	*Tachyphonus luctuosus*	x		x	V
Tangara Coronidorada	*Tachyphonus delatrii*	x	x		F
Tangara de Passerini, Sargento	*Ramphocelus passerinii*	x	x		V
Mielero Luciente	*Cyanerpes lucidus*	x			V
Reinita Mielera, Pincha Flor	*Coereba flaveola*	x			V
Espiguero Variable, Setillero	*Sporophila corvina*	x	x		V

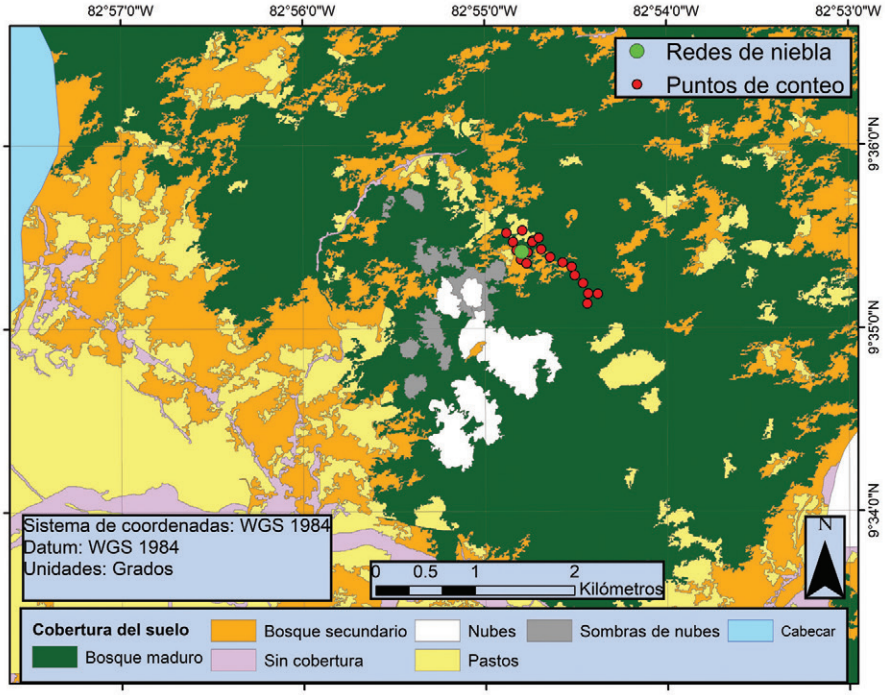

Figura 3. Ubicación de los sitios de muestreo de aves con redes de niebla y puntos de conteo en la Reserva Indígena Bribri, Costa Rica, abril de 2016. Mapa de cobertura del suelo según FONAFIFO[9].

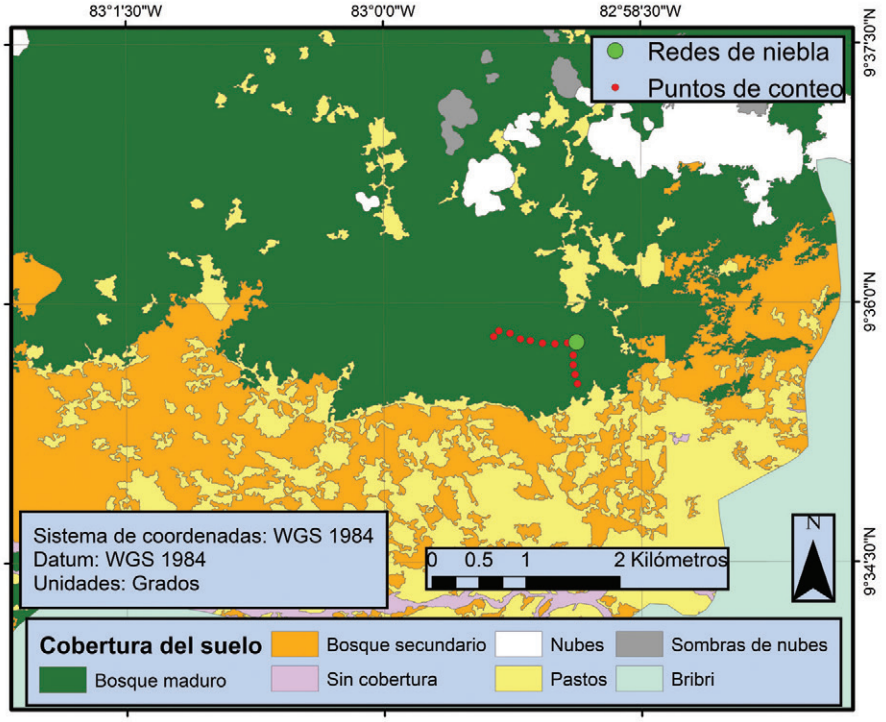

Figura 4. Ubicación de los sitios de muestreo de aves con redes de niebla y puntos de conteo en la Reserva Indígena Cabécar, Costa Rica, abril de 2016. Mapa de cobertura del suelo según FONAFIFO[9].

Figura 5. Algunas especies de aves registradas en el sector Isla, Parque Internacional La Amistad, y reservas indígenas Bribri y Cabécar, Costa Rica, abril de 2016. A: *Geotrygon montana* (Diana Sagastume); B: *Threnetes ruckeri* (Hersson Ramírez); C: *Phaethornis longirostris* (Hersson Ramírez); D: *Baryphthengus martii* (Diana Sagastume); E: *Dysithamnus puncticeps* hembra (Diana Sagastume); F: *Hylophylax naevioides* (Diana Sagastume); G: *Terenotriccus erythrurus* (Diana Sagastume); H: *Ceratopipra mentalis* macho (Diana Sagastume); I: *Microbates cinereiventris* (Diana Sagastume); J: *Euphonia gouldi* hembra (Diana Sagastume)

norte de la distribución de dos especies registradas en este trabajo: *Pionus menstruus* y *Dysithamnus puncticeps*. Esto puede ser importante para estas especies, ya que está documentado que poblaciones cercanas al margen de la distribución pueden tener algunas características particulares como menores densidades y menor diversidad genética, haciéndolas más susceptibles de extinción[8,12,15].

Es posible que las diferencias de riqueza de especies entre los sitios muestreados se deban a la cercanía del sector Isla al bloque continuo de bosque que alberga el PILA (Fig. 1), a su rango altitudinal más amplio y a la mayor heterogeneidad de hábitats[13] en comparación con Bribri y Cabécar, lo cual podría brindar mayores posibilidades de movimiento de especies a lo largo del gradiente

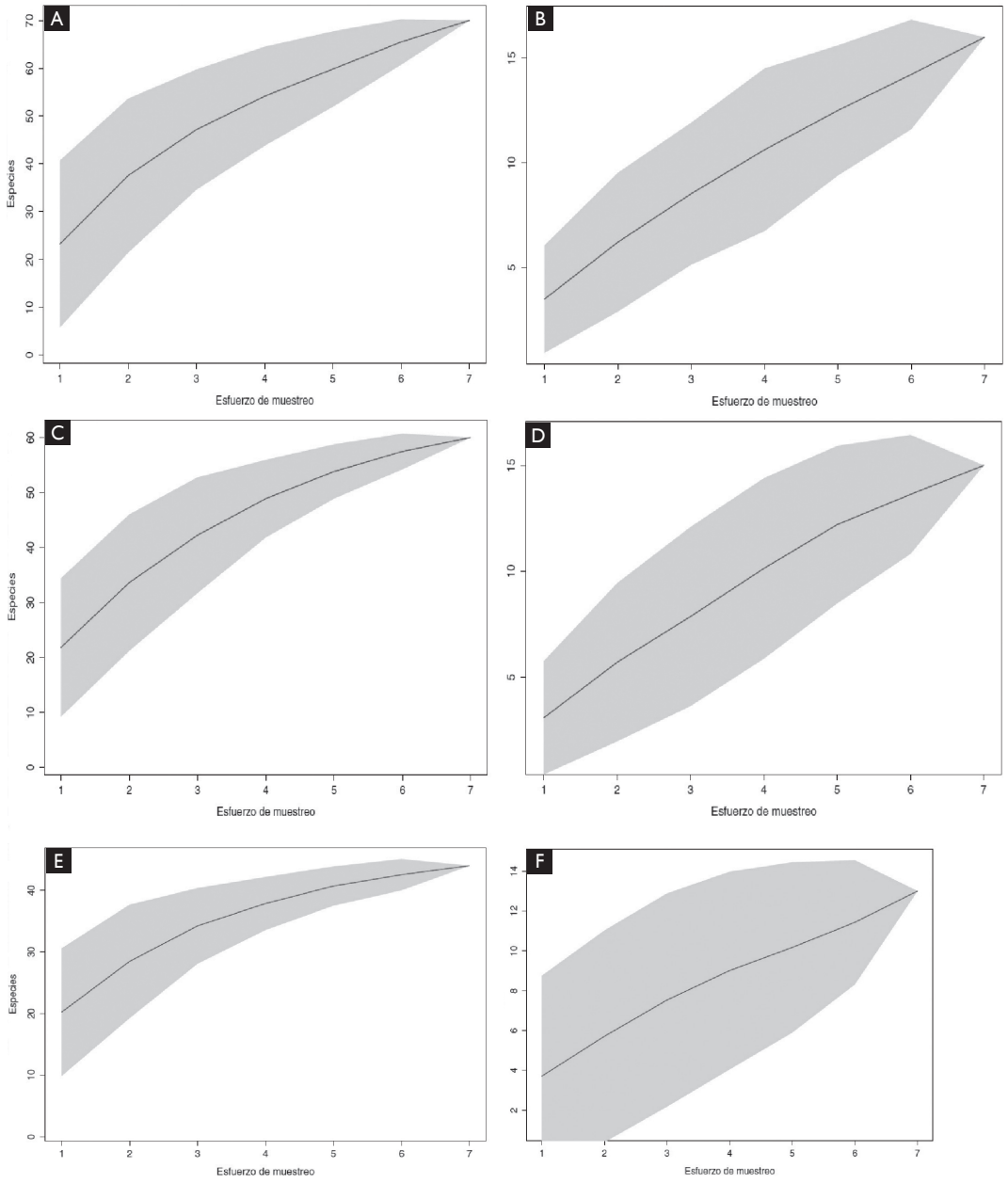

Figura 6. Curvas de acumulación de especies con un intervalo de confianza de 95% (color celeste). A: puntos de conteo Isla; B: redes de niebla Isla; C: puntos de conteo Bribri; D: redes de niebla Bribri; E: puntos de conteo Cabécar; F: redes de niebla Cabécar.

altitudinal. La similitud entre Bribri y Cabécar podría deberse a que ambas reservas tuvieron una composición vegetal más similar (Figs. 3–4), con predominancia de bosque secundario, cultivos y pastizales, y con menor rango altitudinal que Isla. Sin embargo, el muestreo fue insuficiente para obtener una muestra completa de la avifauna de cada sitio de estudio, por lo cual las diferencias detectadas entre Bribri, Cabécar y el sector Isla podrían ser un efecto del esfuerzo de muestreo. La presencia de especies como *Crax rubra*, considerada vulnerable de extinción a nivel mundial, así como la presencia de especies con distribución geográfica restringida y especies migratorias, sugieren

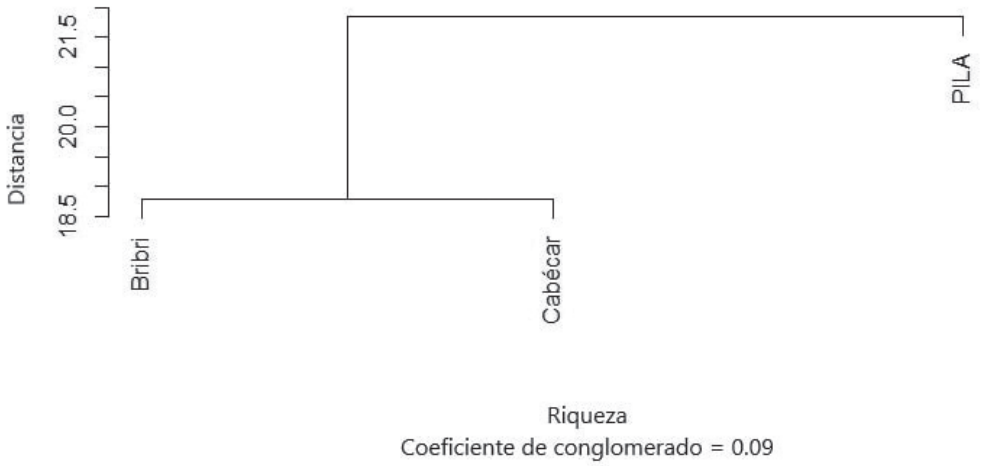

Figura 7. Análisis de similitud de especies registradas mediante puntos de conteo y redes de niebla en el sector Isla, Parque Internacional La Amistad, y reservas indígenas Bribri y Cabécar, Costa Rica, 12–24 de abril 2016. El análisis se realizó mediante conglomerados, utilizando la distancia euclidiana para las tres localidades de muestreo.

que tanto el PILA como las reservas indígenas adyacentes juegan un papel importante en la conservación de la biodiversidad.

Agradecimientos

A los miembros del Área de Conservación La Amistad-Caribe del SINAC (Sistema Nacional de Áreas de Conservación) y al Instituto Internacional de Conservación y Manejo de Vida Silvestre (ICOMVIS) de la Universidad Nacional de Costa Rica (UNA) por apoyar con la logística y el financiamiento para la realización de esta investigación. A los pueblos indígenas Bribri y Cabécar por permitirnos estudiar la biodiversidad en sus territorios. A Roldán Ellis por guiarnos en el Parque Nacional La Amistad-Caribe sector Isla. A Joel por guiarnos en el territorio indígena Bribri, sector Meluk-La Pera. A Joel Saénz y Grace Wong del ICOMVIS por sus comentarios durante todo el proceso de investigación. A la promoción XXVI del ICOMVIS (maldición 26) por su apoyo durante la fase de campo y por su amistad: B. Antúnez, J. Barrantes, E. Brenes, C. Cano, M. Farrera, M. Monge, N. Ortiz, R. Seisdedos y D. Villanueva. A Juan Freile y dos revisores anónimos por sus valiosas observaciones al manuscrito. Al servicio alemán de intercambio académico (DAAD siglas en alemán) por financiar por completo la estancia de JMQG, DJMQ y DS en el ICOMVIS-UNA. Dedicado a la memoria de Roldán Ellis.

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Eurasian Curlew *Numenius arquata* in Argentina: first record for South America

David Vander Pluym and John Sterling

Received 22 March 2018; final revision accepted 10 May 2018
Cotinga 41 (2019): 41–43
published online 21 June 2019

Presentamos el primer registro de Zarapito Real *Numenius arquata* en Sudamérica, a partir de una observación y fotografías de un individuo en Punta Rasa, Argentina. Este es un registro adicional de una especie eurasiática en América del Sur proveniente de Punta Rasa, un sitio 'trampa' para especies erráticas.

At 13h00 on 27 January 2010, C. Ogan and the authors found a Eurasian Curlew *Numenius arquata* on the western shore of Punta Rasa, near the town of San Clemente del Tuyú, Buenos Aires province, Argentina. We had spent several hours checking the mudflats between the lighthouse and the Anexo Naútico Tapera de López when, as we headed to our car, JS heard a *cur-lew* call. As DVP was getting onto the bird as it flew past us from behind, JS identified it as Eurasian Curlew. DVP quickly agreed with the identification, and JS & DVP acquired several identifiable photographs (Fig. 1) before the bird disappeared behind marshy vegetation on the other side of a slough. Over the next 30 minutes we were unable to refind the bird, although we photographed a Willet *Tringa semipalmata*, a species considered rare but possibly regular at the site[6,8]. Knowing the significance of the record and not being able to relocate the curlew, we suspended our search, alerted other birders and tried again next morning. At 07h45, on 28 January, we saw the bird on the mudflats c.300 m north of where we observed it flyby the previous day. We took distant photographs of the bird on the ground (Fig. 2) and in flight (Figs. 3–4), but it never permitted us to approach within less than 200 m. After 30 minutes, the bird flew across open water into a marsh and we were unable to relocate it. During this observation, the bird also gave the *cur-lew* call in flight. Various Argentine and visiting British birders saw the bird during the weekend of 30–31 January 2010.

It was identified by its large size for a curlew, with a long downcurved bill, white rump extending as a wedge onto the back, white underwings and belly to undertail-coverts with

Figure 1. Distant Eurasian Curlew *Numenius arquata*, Punta Rasa, Argentina, 27 January 2010; note the white underwings and wedge on back (David Vander Pluym)

Figure 2. Eurasian Curlew *Numenius arquata*, Punta Rasa, Argentina, 28 January 2010; note the large size and long evenly curved bill (David Vander Pluym)

Figures 3–4. Eurasian Curlew *Numenius arquata*, Punta Rasa, Argentina, 28 January 2010; note the white underwings and wedge on back, as well as the worn outer primaries contrasting with fresher inner primaries (John Sterling)

some dusky streaking on the breast and flanks. Distance precluded a detailed analysis of the plumage. However, additional characters were noted as follows. Legs very long and grey. Bill long and strongly decurved, roughly intermediate in size between Whimbrel *Numenius phaeopus* and Long-billed *N. americanus* / Far Eastern Curlews *N. madagascariensis*, and dark with a pinkish base. In flight, the toes extended past the tail tip. Head rounded, with a gently sloping forehead, and apparently plain brown. Primaries short and did not appear to project beyond the tail. Back brown with dark streaks and a white wedge, which extended up almost in line (in flight) with the forewing. Rump white with a few brown streaks, and tail white with many brown bars. Secondary-coverts appeared to be checkered brown and white, and primary-coverts a more uniform dark brown. Primaries and secondaries appeared to be barred brown and white; the outer three primaries (pp8–10) were worn and appeared brown, contrasting with new inner pp1–6, while p7 was seemingly growing. Wing-coverts appeared to be a mix of older and newer feathers, but not juvenile ones, indicating that the bird was an after second year (ASY) or in at least its third calendar year or definitive plumage (P. Pyle & S. N. G. Howell pers. comm.).

Although identification of scolopacids is often difficult, identification of this species is relatively straightforward. Among other species in the subfamily Numeniinae, only Whimbrel has been recorded on mudflats of Argentina[10,12]. The combination of white underwings, long decurved bill and white 'wedge' extending from rump to back eliminate this species and other Numeniinae that have been reported in Argentina, including Upland Sandpiper *Bartramia longicauda* and the presumed extinct Eskimo Curlew *N. borealis*, as well as with Far Eastern and Long-billed Curlews, which have not been observed in the country[3,9]. Of these, Whimbrel is the most likely species at this site[10,12], but the expected subspecies *N. p. hudsonicus* has a brown rump, underwing and tail[13]. Similar potential vagrants include the Eurasian subspecies of Whimbrel *N. p. phaeopus*, *N. p. alboaxillaris* (the range of which, and its rarity, make vagrancy to South America very unlikely[4]) and *N. p. variegatus*, all of them eliminated by the lack of head-stripes, larger overall size, different call, and very long, evenly downcurved bill. Lastly, the probably extinct Slender-billed Curlew *N. tenuirostris* was ruled out by the Argentine bird's longer bill, darker marked tail and secondaries[3,9,10]. Variation within the two races of Eurasian Curlew (nominate and *orientalis*) makes positive field identification to subspecies difficult[4,9].

Punta Rasa is a well-known vagrant trap[6] and has hosted other first continental records[6,7,11]. Eurasian Curlew is a widespread Eurasian species with a history of vagrancy in North America[1,3,5], making occurrence in South America not wholly unexpected. Eurasian Curlew breeds widely across Eurasia, from the British Isles east across central Europe, north to the Arctic Circle in Scandinavia, and east across Central Asia to north-east China[4]. It winters on coasts of southern Eurasia and Africa[4,14]. In the New World, it is a casual visitor to the eastern seaboard of North America in autumn to spring, with fewer than ten records, some of them perhaps involving the same individual[1,3,5]. There are also single records from Bermuda and the Bahamas[1]. The species is increasing in Iceland, but there has not been a corresponding increase in records in North America[5]. The latitude at Punta Rasa is slightly further south than South Africa, where the species winters. Eurasian Curlew is also a vagrant to northern Australia[2], but Punta Rasa appears to represent the southernmost record in the world. If accepted by the South American Checklist Committee, it will represent the first record for South America[12].

Acknowledgements

Chet Ogan shared our observations. We thank Peter Pyle and Steve Howell for providing useful comments on the age of the bird. We are grateful to Adrián Azpiroz and Daniel Blanco for their comments and providing additional papers that helped improve our paper.

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Presencia y reproducción del Cardenal Crestado *Paroaria coronata* en Lima, Perú

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Received 27 April 2018; final revision accepted 20 September 2018
Cotinga 41 (2019): 44–47
published online 21 June 2019

We discuss the timing and circumstances surrounding the establishment of Red-crested Cardinal *Paroaria coronata*, a non-native species, in the city of Lima, Peru. We also present some breeding data. Finally, we discuss its inclusion on the Peru bird list as an introduced species.

El Cardenal Crestado *Paroaria coronata* se distribuye de forma natural en el noreste de Argentina, Uruguay, Paraguay, extremo suroeste de Brasil y este de Bolivia[6]. También se ha registrado como introducida en Perú, pero no se sabe a ciencia cierta la fecha y circunstancias de su llegada. Los primeros avistamientos de Cardenal Crestado datan de mediados de 1990, en la Universidad Nacional Agraria La Molina (Lima), donde se observaron parejas o tríos en repetidas ocasiones (A. Tovar com. pers.). En esta localidad, un solo individuo fue observado y fotografiado el 30 de noviembre 2006, alimentándose de restos de maíz[13] (F. Takano com. pers.). En la actualidad, la especie es común en la ciudad de Lima, donde la mayoría de registros se concentran en los jardines y áreas aledañas a los acantilados frente al mar, en los distritos de San Isidro, Miraflores y Barranco; también hay registros aislados en lugares alejados de estos acantilados, como Chaclacayo, Cieneguilla, La Molina, Surco, San Borja y Cercado de Lima[4]. El Cardenal Crestado es una especie que aún no está oficialmente incluida en la lista de aves del Perú[8].

Es posible que esta especie haya llegado a Perú por el comercio de aves silvestres como mascotas. Esta actividad se da de forma ilegal en Perú[3]; incluso se ha publicado recientemente una estrategia nacional para reducir el tráfico ilegal de fauna silvestre[12]. Un estudio sobre la comercialización de animales silvestres vivos en Perú, realizado entre febrero 1987 y agosto 1988, lista al 'Cardenal Crestado (*Paroaria cristata*)[1] (*sic*)' (aunque se refiere a *P. coronata*; A. Begazo com. pers.) como una especie comercializada en el mercado central en Lima. El autor asigna a esta especie la categoría de 'raro'; es decir, que se encontraron entre 5 y 30 especímenes (*sic*) en promedio. Ortiz[7] registró 166 individuos de *P. coronata* comercializados en el Mercado 'El Palomar', en Arequipa, entre septiembre 2006 y agosto 2007. Otro estudio sobre el comercio de aves silvestres en mercados del Perú entre abril

Figura 1. Adulto de *Paroaria coronata* alimentando a juvenil, Miraflores, Lima, Perú, 27 de enero 2016 (Miguel Morán)

Figura 2. Juvenil de *Paroaria coronata*, Miraflores, Lima, Perú, 27 de enero 2016 (Miguel Morán)
Figura 3. Nido de *Paroaria coronata* en un *Schinus terebinthifolius*, Miraflores, Lima, Perú, 27 de enero 2016 (Miguel Morán)
Figura 4. Juvenil de *Paroaria coronata* forrajeando, Miraflores, Lima, Perú, 27 de abril 2015 (María Isabel Guerra)

2007 y septiembre 2012, reportó a *P. coronata* en mercados de Tumbes (ocho individuos), La Libertad (15 individuos), Lima (75 individuos) e Ica (dos individuos)[14]. Este último estudio también reportó a la especie en el Mercado Central en Lima en abril 2007. Asimismo, existen registros en otros mercados de Perú, como Puente Piedra y Unión (Lima), Aguas Verdes (Tumbes, julio 2009), Mercado Mayorista (La Libertad, noviembre 2010) y Mercado de Ica (Ica, agosto 2009) (M. Villena com. pers.).

En el presente manuscrito se presenta el registro de un evento reproductivo de *P. coronata* en Lima en enero 2016, y se enlistan otros eventos reproductivos previos en esta misma ciudad. Además, se discute sobre la posible fecha y circunstancias de su arribo al Perú, así como su posible inclusión en la lista oficial de aves peruanas como especie exótica establecida.

Registro

El 27 de enero 2016, MM observó y fotografió dos individuos adultos y dos juveniles de *P. coronata* en el parque del Faro de Miraflores (12°07'29.66"S 77°02'16.11"O; 63 m de altitud). Los cuatro individuos estaban posados sobre molles costeños *Schinus terebinthifolius* y los adultos alimentaban a los juveniles (Figs. 1–2). Los adultos se comunicaban con silbidos y los juveniles con chillidos más cortos y fácilmente diferenciables. El nido se encontraba dentro del follaje de un molle costeño a unos 4 m del suelo. Estaba construido con pequeños trozos de ramas delgadas y fibras vegetales de palmeras (Fig. 3). El 16 de octubre 2017, MM observó un adulto en el mismo árbol, pero no ubicó el nido nuevamente. Individuos del Cardenal Crestado han sido observados en este mismo lugar, alimentándose de frutos de plantas exóticas sembradas en el parque, insectos y restos de alimentos que son provistos por gente que vive en las casas cercanas específicamente para alimentar a las aves (arroz y fruta, en especial plátanos).

Discusión

La causa más probable del establecimiento de *P. coronata* en Perú es la comercialización como mascota. Existen al menos otros tres casos documentados de especies de aves establecidas en Perú[2] (Paloma de Castilla *Columba livia*, Gorrión Europeo *Passer domesticus* y Garza Bueyera *Bubulcus ibis*), aunque ninguna por comercio como mascota. Existen registros de comercialización de *P. coronata* en mercados de varias ciudades de Perú: Lima (entre agosto 1988 y abril 2007), Arequipa (agosto 2007), Tumbes (julio 2009), Ica (agosto 2009) y La Libertad (noviembre 2010). También hay un registro de individuos en cautiverio de 1974 en Arequipa (A. Begazo com. pers.). Es probable que se hayan dado varios episodios de escape o liberación deliberada, al menos en la ciudad de Lima.

Si bien el presente trabajo documenta por primera vez la reproducción de esta especie en Perú, existen varios registros previos. El más antiguo corresponde a un juvenil fotografiado en abril 2015 en el Malecón de Miraflores, por M. I. Guerra (Fig. 4), muy cerca del sitio de nuestro registro. Este juvenil muestra las primeras plumas rojas en la cabeza. Además, según datos publicados en Facebook Aves del Perú, en 2018, y en eBird[4], existen más datos reproductivos: un nido en enero 2016; juveniles en mayo 2016; juveniles en enero–mayo, julio y noviembre 2017; y juveniles en marzo 2018. La mayor parte de estos registros corresponden al distrito de Miraflores[4].

En Lima, la época de reproducción y la estructura del nido son similares a los reportados para la especie en estado silvestre[10,11]. La época de reproducción en su rango natural de distribución va desde octubre a mediados de febrero, y los nidos son construidos en árboles de *Celtis tala*, *Scutia buxifolia* y *Schinus longifolius*[10]. Los nidos son copas abiertas construidas con ramas finas y pequeños tallos de hierba, mientras que la cámara está llena de raicillas delgadas, fibras de vegetación y pelo de ganado[11]. Cabe resaltar que *Schinus terebinthifolius* también se distribuye en Argentina, Brasil y Paraguay, justo donde ocurre *P. coronata*[5].

La especie no está incluida en la lista de aves de Perú[8]. Para estarlo, debe cumplir ciertos criterios. De acuerdo al *South American Classification Committee* (SACC), el criterio para definir si una especie introducida se ha establecido en un país es la existencia de registros persistentes, durante al menos diez años y con evidencia satisfactoria de que mantienen una población razonablemente estable o en aumento mediante una reproducción exitosa[9]. En Perú, *P. coronata* tiene registros de reproducción confirmados de al menos 12 años y hay evidencia de que mantienen una población estable en Lima. Por ello, de confirmarse la estabilidad o crecimiento de su población, podría considerarse como especie introducida en Perú.

Agradecimientos

A Antonio Tovar, César Ortiz, Alfredo Begazo, Mirella Villena y Fernando Takano por compartir su información no publicada y bibliografía. A María Isabel Guerra por la información y foto. A dos revisores anónimos que ayudaron grandemente a mejorar el artículo, y a Juan Freile por los comentarios constructivos.

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Three new bird species for Cocos Island, Costa Rica, and additional observations of other vagrants

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Received 27 April 2018; final revision accepted 22 September 2018
Cotinga 41 (2019): 48–51
published online 21 June 2019

En esta nota presentamos tres nuevos registros de especies en la isla del Coco, Costa Rica: Aguja Lomiblanca *Limosa haemastica*, Mosquerito de Traill *Empidonax traillii* / Mosquerito de Charral *E. alnorum* y Reinita de Costados Castaños *Setophaga pensylvanica*. Además, presentamos nuevos registros de nueve especies accidentales en la isla. Toda la información proviene de encuentros fortuitos con las especies entre 2015 y 2016. Los tres nuevos registros aumentan la lista de las islas a 152 especies, la mayoría son registros accidentales (menos de cinco observaciones para cada especie).

The avifauna of Cocos Island and surrounding seas is a combination of resident (n = 13), migratory (n = 80) and accidental species (n = 56), both terrestrial and aquatic[9,19]. This oceanic island is in the eastern Pacific (05°32'N 87°03'W) 495 km south-west of Cabo Blanco, Costa Rica[2,7,10]. Its location makes it a 'sink hole' for migratory bird species, especially terrestrial (e.g., warblers, tyrant-flycatchers, swallows or sparrows), which become lost during migration (September–November and March–May) to and from boreal latitudes. The majority of new bird records on the island probably occurs during migration periods[3,5,10,11]. Here we report three new species for Cocos Island, and present further records for nine accidental species.

Methods

Observations were conducted opportunistically in 2015–16 on Cocos Island by GB, and photographs were taken of all new island records. We corroborated species identifications by comparing photographs of the birds in the field with specimens at the Museo de Zoología, Universidad de Costa Rica, San José, and with the text and illustrations in Stiles & Skutch[23], Garrigues & Dean[8] and / or specialised monographs[6,17,18,22].

Species accounts

Purple Gallinule *Porphyrio martinica*

A juvenile in a grassy field on 6 July 2016 (Fig. 1). Distinguished from Azure Gallinule *P. flavirostris* in juvenile plumage by its reddish bill with yellow-green tip, vs. yellowish bill with green culmen[24,25]. The third record on the island[14].

American Coot *Fulica americana*

An adult on 6 December 2016 in a grassland (Fig. 2). Separated from Common Gallinule *Gallinula galeata* by its white frontal shield (red in the gallinule)[24,25]. This is the second observation on the island and the first dated record[13].

Killdeer *Charadrius vociferus*

One at a grassland on 18 November 2016 (Fig. 3) was identified by its double breast-band[1,17,18]. The second observation on the island, after a record in 2011[16].

Hudsonian Godwit *Limosa haemastica*

One on a sandy beach on 5 May 2016, together with a Willet *Tringa semipalmata* (Fig. 4). It was an adult male in breeding plumage, with reddish breast and belly, dark wings and grey neck with black marks (Fig. 4). Nearly unmistakable among shorebirds by plumage alone, even from its congener, Marbled Godwit *L. fedoa*, with which it shares a long, bicoloured and upturned bill. Rare in Costa Rica, with only two previous records: one in 1975 and one on 26 April 2014 (P. O'Donnell pers. comm.), both at the Golfo de Nicoya[18,23]. This is the first record for the island[9].

Willet *Tringa semipalmata*

One on 5–22 May 2016 on a sandy beach at the Genio estuary, Wafer Bay (Fig. 5). Showed a grey bill with black tip, bluish-grey legs, and a black-and-white upperwing pattern. Accidental on the island, with very few reports[13].

Wilson's Phalarope *Phalaropus tricolor*

An adult in winter plumage in a grassy field on 22 May 2016 (Fig. 6). Separated from other phalaropes by its long pointed black bill, white supercilium, and plain grey cap and back. This is the second record on the island, after one in 2004[15].

Willow / Alder Flycatcher *Empidonax traillii / E. alnorum*

One perched on a Melastomataceae bush in a grassy area at Wafer Bay on 16 October 2015 (Fig. 7). Identification of Alder *E. alnorum* and Willow Flycatchers *E. traillii* is impossible by plumage alone, even if photographed[6,8,20,23]. For a reliable identification, it is necessary to examine the bird

in the hand or hear the song, although this is rarely heard outside the breeding season[8,23]. The photographed individual had a brownish to olive back, white throat, brownish breast, yellowish belly and white wingbars (Fig. 7). Similar species include Acadian *E. virescens* (greenish back and buff wingbars), Least *E. minimus* (conspicuous eye-ring and short bill) and Yellow-bellied Flycatchers *E. flaviventris* (yellowish throat, breast and belly)[8,20,23]. Willow and Alder Flycatchers are abundant migrants throughout continental Costa Rica between August and November[8,23]; however, on Cocos Island neither had been recorded to date[9].

Great Crested Flycatcher *Myiarchus crinitus*

A single perched in a *Cecropia pittieri* (Cecropiaceae) tree on 23 October 2015 (Fig. 8). Distinguished from other *Myiarchus* by sharp contrast between the brighter yellow belly and grey breast, and a broad and large bill[6,8,23]. This is the second observation on the island after one in 1963[21].

Chestnut-sided Warbler *Setophaga pensylvanica*

An adult female foraging in a vine tangle on 23 March 2016 (Fig. 9) was in breeding plumage[22]. Diagnostic characters included the chestnut flanks stripe and yellow crown. Similar Bay-breasted Warbler *S. castanea* has a dark face and buffy collar, and breeding male Blackpoll Warbler *S. striata* a black cap, white cheeks and yellow legs[22]. One of the commonest migrant warblers in continental Costa Rica, from sea level to 2500 m[8,23], but this is the first record for the island[9].

Palm Warbler *Setophaga palmarum*

A winter-plumaged male foraging in bushes and trees on 17 May 2016 (Fig. 10). Separated from resident Yellow Warbler *S. petechia aureola* by its long supercilium, long tail with yellow undertail-coverts, buffy wingbars, and reddish-speckled crown[4,22]. This is the third record on the island, after singles observed in 1963[21] and 2010[10].

Blue Grosbeak *Passerina caerulea*

A male on 17 October 2015 (Fig. 11). Distinguished from other blue grosbeaks or buntings by its cinnamon wingbars. This is the second observation after a male observed in 2010[10].

Indigo Bunting *Passerina cyanea*

A female on 24 October 2015 and two males, one on 4 May 2015 and one on 9 March 2016, at different grasslands near settlements (Fig. 12). Female recognised by faint streaks on breast, and wingbars; male by its indigo plumage and silvery bill. These observations are the third to fifth records for the island, where previously recorded in 1992[12] and 2008[11].

Acknowledgements

We thank César Sánchez and two anonymous reviewers for comments on the submitted version of this manuscript, and Jorge Cortés and Luciano Capelli who enabled contact between the authors.

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Figure 1. Juvenile Purple Gallinule *Porphyrio martinica*, Cocos Island, Costa Rica, 6 July 2016 (Guillermo Blanco)
Figure 2. American Coot *Fulica americana*, Cocos Island, Costa Rica, 6 December 2016 (Guillermo Blanco)
Figure 3. Killdeer *Charadrius vociferus*, Cocos Island, Costa Rica, 18 November 2016 (Guillermo Blanco)
Figure 4. Adult male Hudsonian Godwit *Limosa haemastica* in breeding plumage, Cocos Island, Costa Rica, 5 May 2016 (Guillermo Blanco)
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Figure 11. Male Blue Grosbeak *Passerina caerulea*, Cocos Island, Costa Rica, 17 October 2015 (Guillermo Blanco)
Figure 12. Female Indigo Bunting *Passerina cyanea*, Cocos Island, Costa Rica, 24 October 2015 (Guillermo Blanco)

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Distribution of Wedge-tailed Grass Finch *Emberizoides herbicola* in Peru, with three new localities

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Received 27 April 2018; final revision accepted 26 April 2019
Cotinga 41 (2019): 52–56
published online 21 June 2019

El Sabanero Cola de Cuña *Emberizoides herbicola*, residente de pastizales y campos de cultivo, presenta una amplia distribución en Sudamérica, pero con escasos y esparcidos registros en Perú. En esta nota se documentan tres nuevas localidades al sureste y centro del Perú, los cuales actualizan nuestro conocimiento sobre la extensión y rango altitudinal de distribución de esta especie. Además, presentamos un mapa del área potencial de su distribución en base a localidades con registros previos y datos ambientales.

Wedge-tailed Grass Finch *Emberizoides herbicola* is widely distributed in the Neotropics, being found in grasslands across two main areas separated by lowland Amazonian forests. The northern population occurs from south-west Costa Rica to the Guianas and northern Brazil, and the southern population is found mostly from eastern Bolivia through south-eastern South America (northern Argentina, Paraguay, Uruguay and south-east Brazil)[5]. Records from intervening areas (Ecuador and Peru) are isolated and the species' distribution there poorly understood.

In Peru, *E. herbicola* has a fragmented distribution, with sparse records in inter-montane valleys[1,9]. It occurs in humid to well-drained grasslands and meadows usually with isolated shrubs, either natural or invasive as a result of anthropogenic activities such as deforestation combined with regular burning[5]. Furthermore, the species occupies isolated savannas in the Andes below 1,500 m[5]. There are published records from the valleys of the Marañón and Mayo in northern Peru, the upper Ucayali Valley in central Peru[5], and the Pampas del Heath in south-east Peru[9], spanning elevations of 800–1,450 m[9]. Here, we present three new localities for the species in Peru and evaluate those environmental factors determining its distribution in country.

Methods

Records.—New records were made at several different locations in Peru during various non-systematic surveys. Identification was based on the species' olive upperparts, black-streaked mantle and long pointed tail[10]. Individuals were photographed to confirm their identification. Four specimens were collected at one locality and deposited in the Louisiana State University Museum of Natural Science, Baton Rouge (LSUMNS) and Centro de Ornitología y Biodiversidad (CORBIDI), Lima collections.

Species distribution model.—To evaluate environmental factors that may determine *E. herbicola* distribution in Peru we compiled eBird records and generated a geographic distribution model using Maxent. The number of records (n = 8) in Peru precluded a strong model, so records from throughout the species' range were included. From an original dataset of 5,677 records, we selected 1,096 records that corresponded to unique GPS points, with survey efforts spanning a max. 20 km (mean ± SD = 5.09 ± 4.5 km) and 480 minutes of survey time (mean ± SD = 196.8 ± 116.89 minutes). These records were assessed against a suite of 14 environmental variables generally used in Maxent modelling[8]: elevation; ecoregion; annual cloud cover; annual diurnal temperature range; annual frost frequency; annual and monthly precipitation in January, April, July and October; annual vapour pressure; and annual mean, max. and min. temperature. We used a bootstrap of 500 replications with 25% of data as training samples (615 presence records used for training, 204 for testing) to create a map of the probability of occurrence of *E. herbicola* on a logistic scale (where 0 indicates non-suitable habitat and 1 high habitat suitability). The model's efficiency was estimated by the Area Under the Curve for the training (AUC training) and test (AUC test) data. As a threshold, we used the equal training sensitivity and specificity index, which was 0.354.

Results

New records

Alto Sangobatea, prov. La Convención, dpto. Cusco (12°33'59"S 72°51'34"W; 1,580 m).—One trapped by FH on 15 July 2015 after extensive mist-netting; the bird was photographed and released (Fig. 1). Habitat was characterised by tall grassland of anthropogenic origin, with scattered shrubs. The commonest grass species were *Melinis minutiflora*, *Paspalum plicatulum*, *Axonopus*

capillaris and *Aristida* sp. (Poaceae), and *Scleria* sp. (Cyperaceae). Scrub patches were dominated by *Miconia rubiginosa* (Melastomataceae).

Yanacocha, prov. Sandia, dpto. Puno (14º02'24.4"S 69º19'41.2"W; 1,825 m).—On 10 December 2016, GFS observed 12 individuals and collected three males and a female at an isolated humid grassland. Specimens were deposited at LSUMNS (Tissue B-93846, B-93847; Fig. 2) and CORBIDI (AV-012384, AV-012385). GFS observed a pair or a family group every c. 100 m and considered the species to be common in the area. Birds were mostly observed on hillsides with shrubs up to 1 m tall, near marshy pastures. Sound-recordings were made of the pair collected and deposited at LSUMNS (Macaulay Library, Cornell Lab of Ornithology, Ithaca, NY; ML43868121).

El Boquerón del Padre Abad, prov. Padre Abad, dpto. Ucayali (09°03'47.7"S 75°40'21.6"W; 575 m).—On 23 September 2017, GC photographed one in a rocky pasture (Fig. 3). It was feeding in grasses near a chicken farm.

Modelling.—The model predicted the central-south Andes of Peru as suitable habitat for *E. herbicola* (Fig. 4). The efficiency of the model was high (AUC training = 0.866; AUC test = 0.851) (Fig. 5). Overall, the most important environmental variables were annual vapour pressure (AUC = 0.74), mean annual temperature (AUC = 0.735), min. temperature (AUC = 0.73) and ecoregion type (AUC = 0.67). The model predicted that dry and warm areas are more suitable for the species than wetter areas.

Discussion

Our new records of *E. herbicola* in Peru increase the number of known localities and expand its upper altitudinal limit to 1,825 m (Table 1). They suggest a patchy but more widespread distribution on the east Andean slope and adjacent lowlands in Peru than heretofore perceived. We believe that records in the lowlands of Ucayali and Madre de Dios probably represent entirely natural colonisation facilitated by the naturally dry and warm conditions, but those from inter-montane grasslands are probably facilitated by deforestation and subsequent expansion of pastures[7,11–13].

Currently, *E. herbicola* is known from eight localities in Peru (Table 1). The first record was in 1977 during an expedition to the Pampas del Heath[3]. Between 1978 and 2003, *E. herbicola* was recorded in the valleys of the Marañón and Mayo[4,9]. At present, there are more records from the Mayo Valley near Moyabamba than from the middle Marañón, but this may simply reflect greater observer coverage of the Mayo Valley[2]. The small number of records in Peru precludes a better assessment of the factors influencing its distribution there.

According to our model, the areas between Abancay / Cusco and Pampas del Heath / Puno possess the greatest probability of occurrence (high habitat suitability) (Fig. 4). However, the areas in northern Peru, where the species is known from several sites, are not predicted to be suitable for the species. One possible explanation is that the areas between Abancay / Cusco and Pampas del Heath provide more natural conditions and habitat suitable for the species[7], as predicted by the niche modelling. These areas probably form a continuum with predicted suitable habitats in Bolivia and southern Brazil. Conversely, northern Peru might possess different bioclimatic characteristics, but current conversion of forest into pastures and agricultural areas is probably facilitating *E. herbicola* colonisation due to its preference for pasture-like habitats[6,12,13]. Yet, the scale of our modelling is seemingly too broad to capture fine-scale changes in landcover, preventing our model from fully predicting more precise drivers of the current distribution of *E. herbicola* in northern Peru. A similar pattern can be observed in Amazonian Bolivia and Brazil (Fig. 4) where forest is being converted into pastures or other more open environments[11]. While further studies of the species' ecology will be necessary to establish these fine-scale relationships, our results provide evidence of a wider distribution of *E. herbicola*

Table 1. Records of Wedge-tailed Grass Finch *Emberizoides herbicola* in Peru (1977–2017).

Code	Locality	Date	Habitat	Elev. (m)	Reference
P1	Pampas de Heath, Madre de Dios	Jun–Jul 1977	Seasonally flooded grassland	160	3
P2	La Peca, Amazonas	Jul 1978	Grassy hillside	885	4
P3	Laguna Azul, Cajamarca	May 2002	Tall grass in agricultural land	1,100	4
P4	Rioja, San Martín	Jul–Aug 2003	Weedy pasture and grassy slopes	800	4
P5	Monte Tabor and Oventeni, Ucayali	Sep–Nov 2008	Short grass and herbaceous savanna	1,400	4
N1	Alto Sangobatea, Cusco	Jul 2015	Tall grass with scattered shrubs	1,580	FH (2015); this paper
N2	Yanacocha, Puno	Dec 2016	Marshy grassland	1,825	GFS, eBird (2016), checklist S33110561
N3	El Boquerón de Pedro de Abad, Ucayali	Sep 2017	Pasture	575	GC (2017); this paper

Figure 1. Wedge-tailed Grass Finch *Emberizoides herbicola*, Alto Sangobatea, prov. La Convención, dpto. Cusco, Peru, July 2015 (Caroll Landauro)

Figure 2. Female and male Wedge-tailed Grass Finch *Emberizoides herbicola* collected in Yanacocha, prov. Sandia, dpto. Puno, Peru, December 2016 (LSUMNS Tissue B-93846, B-93847) (Flor Hernández)

Figure 3. Wedge-tailed Grass Finch *Emberizoides herbicola*, El Boquerón del Padre Abad, prov. Padre Abad, dpto. Ucayali, Peru, September 2017 (Gustavo Carrasco)

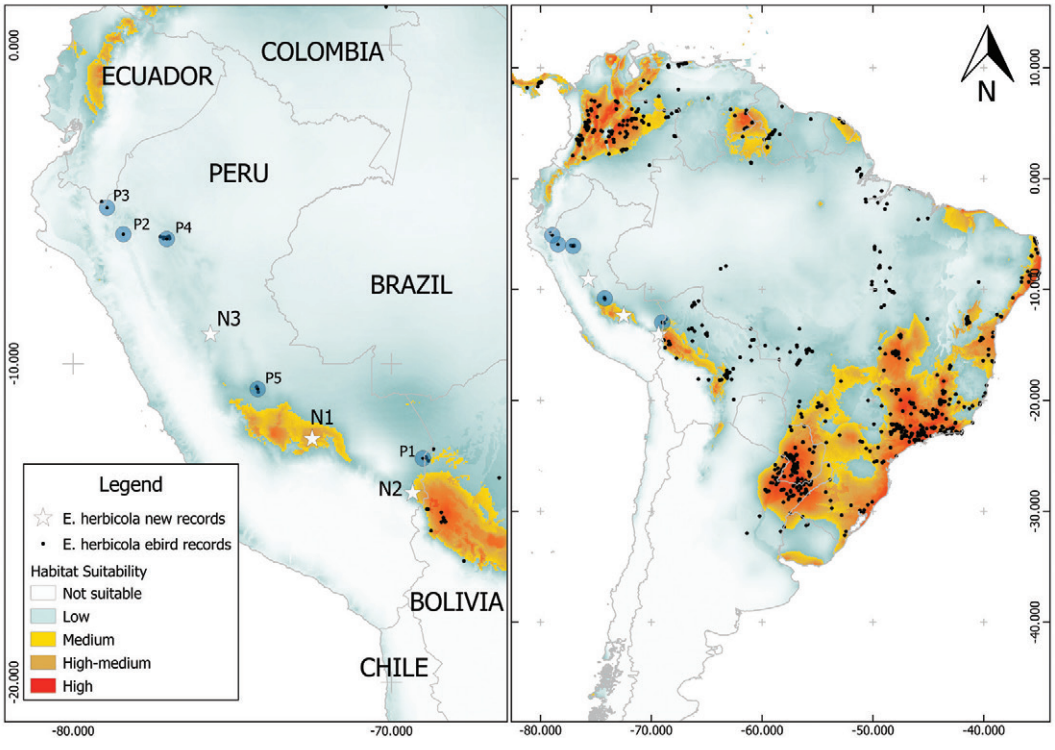

Figure 4. Distribution map of Wedge-tailed Grass Finch *Emberizoides herbicola* in Peru (left) and South America (right). Blue dots = published records[9,10]; white stars = new records (this paper); black dots = eBird records[2].

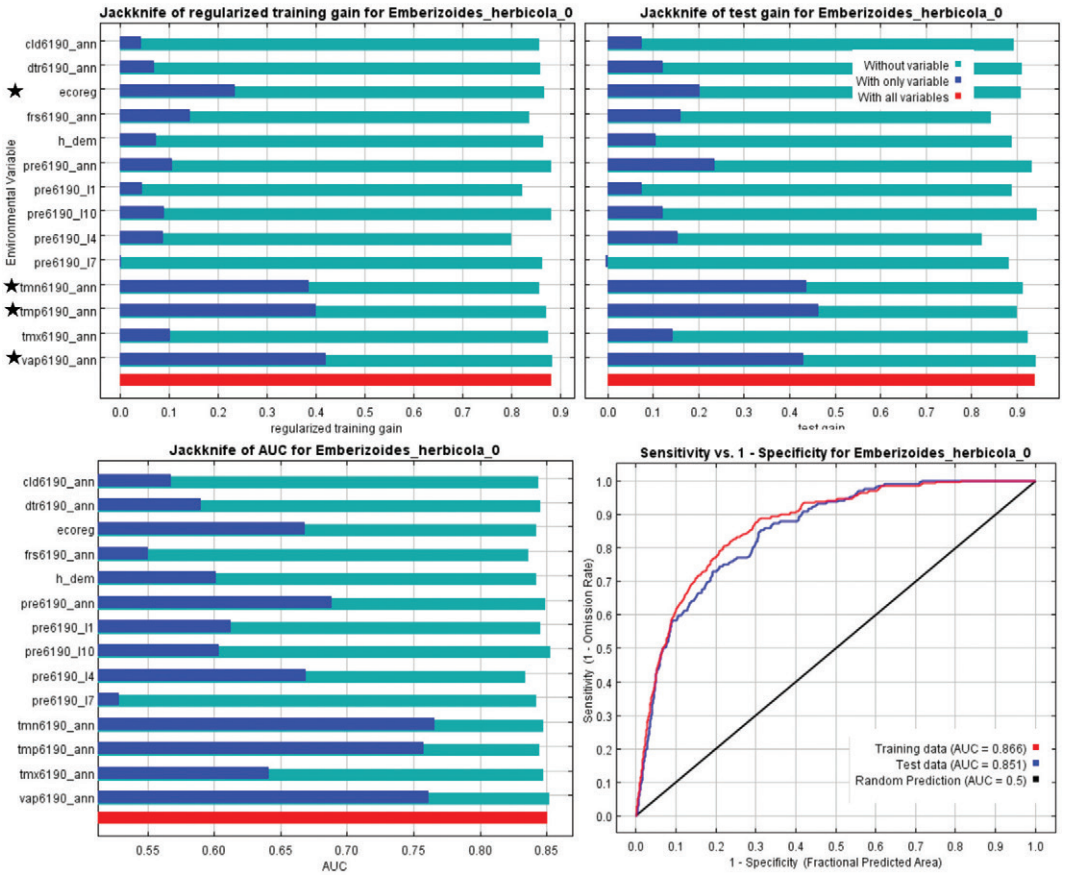

Figure 5. Environmental contributions and the Area Under the Curve (AUC) to test the efficiency of the Maxent 3.3 modeling. The stars indicate the environmental variables that contributed most to the model.

across Peru and suggest that both natural and human factors could be influencing the species' range.

Acknowledgments

This study formed part of the project 'Improvements in the country's energy security and development of the south Peruvian gas pipeline, variant of KP 104 + 460 to KP 123 + 000 and variant of KP 162 + 500 to KP 196 + 685 auxiliary and components', authorised by General Management Resolution No. 152-2015-SERFOR-DGGSPFFS. Special thanks to Thomas Valqui, Van Remsen, Robb Brumfield and Steven Cardiff for access to specimens housed at the Centro de Ornitología y Biodiversidad and Louisiana State University Museum of Natural Science. We thank Tom Schulenberg, Daniel Lane, Todd Mark and Caroll Landauro for sharing their records and photographs; Philip Lavretsky, Alexis Díaz, André Moncrieff and Oscar Johnson for their comments on the manuscript; and Gisela Pecho for the maps. Finally, we thank Nadia Sánchez and Ing. Oscar Cuya, from Walsh Peru S.A. Consulting, for their support.

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An avifaunal survey and conservation assessment of Serranía Sadiri, Madidi National Park, Bolivia

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Received 16 May 2018; final revision accepted 28 April 2019
Cotinga 41 (2019): 57–71
published online 21 June 2019

Durante tres meses de trabajo de campo entre noviembre de 2010 y febrero de 2011, se examinó la avifauna de la serranía Sadiri, departamento La Paz, noroeste de Bolivia. El área alberga bosque seco enano, bosque primario perenne de piedemonte y bosque de llanura tropical, en los yungas bajos del área de endemismo de aves entre Bolivia y Perú. Salvo algunos bosques secos alterados en la parte este de la cresta, el área está en gran parte sin explotar y se encuentra dentro del Parque Nacional Madidi. El estudio cubrió un área de 30 km^2, con un rango de elevación de 400–1.200 m, pero destacó la zona piedemonte por encima de los 800 m. Presentamos una lista de 274 especies de aves registradas en el área, incluyendo notas de abundancia relativa, rango de altitud, migración y evidencia. Se proporcionan recuentos para especies con registros significativos, incluyendo el primer registro del Vencejo Barbiblanco *Cypseloides cryptus* y el tercer registro del Vencejo Pechiblanco *C. lemosi* o Vencejo Negro *C. niger* en Bolivia. El área protege poblaciones de dos especies vulnerables y tres especies casi amenazadas globalmente, como también cuatro especies de rango restringido. Biogeográficamente, la avifauna de la zona piedemonte incluye un número de especies de crestas periféricas del norte de Bolivia y del sur de Perú, mientras que la zona más baja de la cresta alberga una mezcla de especies características del bosque de llanura tropical. La combinación de alta biodiversidad de aves en un área pequeña y la presencia de poblaciones aparentemente sanas de algunas especies de rango restringido, amenazadas y casi amenazadas le dan a la serranía Sadiri una alta prioridad para la conservación y la idoneidad de nombrarla como un área de importancia para las aves.

Madidi National Park was established in 1995 and protects 18,957 km^2 of pristine Amazonian and Andean ecosystems at 180–5,760 m above sea level[29,30]. With an estimate of more than 1,000 bird species, Madidi is suspected to be one of the most species-rich protected areas on Earth, holding c.10% of the world's bird species[11,30]. The exceptional biodiversity and large number of endemic, threatened and range-restricted species of plants and vertebrates make the area a biodiversity hotspot of high conservation priority[23,24]. Together with Manu Biosphere Reserve and adjacent Bahuaja-Sonene National Park, in southern Peru, and Pilón Lajas Biosphere Reserve in Bolivia, Madidi protects a unique Andean–Amazonian system, and an important biological corridor on the east slope of the Andes[29,37].

Madidi National Park is experiencing a slow but increasing rate of deforestation caused by rapid colonisation of border areas and increased access to the park[11,14,17]. Evaluating the ecological consequences of deforestation is crucial to efficient conservation management and to counteract the future reduction of biodiversity in the national park (e.g. shifting baseline syndrome)[20,21,27]. This requires monitoring of biodiversity and population trends, as well as mapping patterns of land-use change in and around Madidi[22,23].

This study aimed to determine the current conservation value and potential threats to Serranía Sadiri, in the Andean foothills adjacent to the Yucumo–Ixiamas road, in and along the main access road to San José de Uchupiamonas community in Madidi National Park (Fig. 1). The area lies within the Yungas ecoregion, which is Bolivia's highest priority for bird conservation[18], and is an Endemic Bird Area (Bolivian and Peruvian Lower and Upper Yungas EBA)[6]. Although several avifaunal studies have been conducted in Madidi[29] and distribution data are available for the lowlands, the avifauna of many outlying ridges is poorly studied. Previous ornithological surveys in Serranía Sadiri were limited to three visits over 15 days[20], which produced the first bird list for the area. The present study is the first survey of the area conducted over an extended period, with estimations of abundance, movements and altitudinal distribution. The primary objectives were to: (1) survey avifaunal composition; (2) collect data on the presence of species of conservation concern; and (3) review the need for conservation management and opportunities for sustainable development. Here, we present the results of a three-month bird survey in Serranía Sadiri, and highlight the importance of conservation management to influence decision-makers[16].

Study area and Methods

Study area.—Serranía Sadiri forms part of an outlying ridge that runs nearly 360 km from

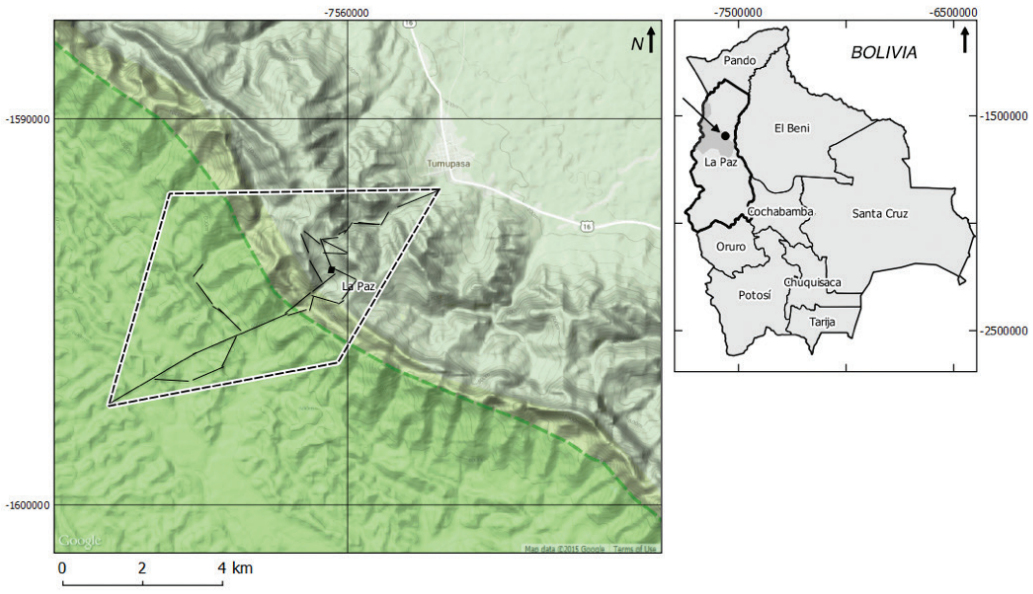

Figure 1. Map of Serranía Sadiri showing the border of Madidi National Park (green) in dpto. La Paz, © Google Earth version 7.1.5 (2015). The survey was undertaken within the dashed area and was focused on the forest trails (black lines). The camp (black square) is at 950 m above sea level.

south-east Peru to north-west Bolivia. It is the first such outermost ridge of the Andes south of an area of plains-level lowland dry forest, with the Beni pampas to the north-east. Being the first Andean ridge, it receives prevailing winds from the northern lowlands, resulting in increased precipitation compared to ridges further west. In contrast to other ridges in the region, Serranía Sadiri is isolated from the central Andes by lowland forest below 450 m (Fig. 1). The nearest ridge with similar topography is c.20 km south-west of Serranía Sadiri and the closest peak above 1,800 m is 53 km south-west. From the village of Tumupasa (14°8'46"S 67°53'18"W; 450 m) a dirt road leads over the ridge of Serranía Sadiri (14°10'10"S 67°55'01"W; 950 m) and down to the lowlands in the west (Fig. 1–3). The highest peaks of Serranía Sadiri reach c.1,200 m. Geologically, much of the ridge consists of limestone, schist, and unstable soils, resulting in frequent landslides on steeper slopes. Numerous streams and moist ravines traverse the foothill zone, and these flow into a larger river in the lowland forest west of the ridge. The exposed ridgetops and dry east side of Serranía Sadiri are characterised by a stunted species-poor forest just 2–5 m tall (Fig. 2). The west side of the ridge consists of 25–40 m-tall primary tropical forest. The forest in the foothill zone possesses a rich cover of epiphytic mosses, ferns and bromeliads, the result of higher precipitation. Most areas of this forest are characterised by dense undergrowth, although some areas have a remarkably open understorey. Frequent natural treefall gaps occur throughout. Although some selective logging occurred in the past (<10 years ago), the forest is predominantly undisturbed. There is also a 5-ha spiny bamboo (*Guadua* sp.) stand 2 km south-west of the ridge. The lowland forest east of the ridge mostly consists of 30–40 m-tall semi-humid primary forest that has undergone more selective logging pressure near the village of Tumupasa (Fig. 1).

Avifaunal sampling.—Bird surveys were conducted between 22 November 2010 and 22 February 2011, which period includes the transition from the late dry season to rainy season, and corresponds to the breeding season of several species in the foothills and lowlands. Surveys were conducted at 450–1,200 m, with an emphasis on the foothill zone (800–1,200 m) and covered c.20 km^2 (Fig. 1). The principal survey method was non-systematic visual and auditory observations. On a daily basis, MB walked from the camp, at 950 m, along the road, on trails and in dense forest. Regular hikes were made to the level-ground lower region south-west of the ridge (Fig. 3). Field work was carried out every day from sunrise to c.11h00 and between 17h00 and sunset. Nocturnal inventories were conducted 1–2 times per week. Playback was used to verify identifications, as well as to locate several shy or rare species. Observed numbers of each species were later summarised and classified following the relative abundance classification of Parker *et al.*[28]: common (several individuals encountered daily in appropriate habitat); fairly

Figure 2. The peaks of Serranía Sadiri are covered with dry stunted forest. View towards the level-ground semi-dry *cerrado* forest to the east (Martin Berg)

Figure 3. Humid west slope of Serranía Sadiri (foreground) covered in primary evergreen foothill forest; tropical lowland forest in the background (Martin Berg)

common (small numbers almost daily); uncommon (recorded in small numbers most weeks); and rare (recorded just once or a few times during the entire survey). Species identification follows Schulenberg *et al.*[36] and taxonomy Remsen *et al.*[31].

Results

Avifaunal sampling.—Some 274 species were recorded (see Appendix), of which 77 were restricted to the foothill zone (28%), 70 to the lowlands (26%) and 127 were recorded throughout (46%). Given that 'new' species were recorded during most visits

Table 1. Summary of Nearctic migratory birds in the Serranía Sadiri, dpto. La Paz, Bolivia in November 2010–February 2011; elevation, relative abundance (C: common, F: fairly common, U: uncommon, R: rare), and period during which the species were observed. *Might also involve resident *V. o. chivi*.

Species	Elevational range (m)	Relative abundance	Period
Broad-winged Hawk *Buteo platypterus*	-	F	Nov–Feb
Swallow-tailed Kite *Elanoides forficatus*	-	F	Nov–Feb
Spotted Sandpiper *Actitis macularius*	400–800	F	Nov–Feb
Swainson's Thrush *Catharus ustulatus*	500–1,200	C	Nov–Feb
Red-eyed Vireo* *Vireo olivaceus*	700–1,100	C	Nov–Feb
Sulphur-bellied Flycatcher *Myiodynastes luteiventris*	500–1,200	C	Nov–Feb
Olive-sided Flycatcher *Contopus cooperi*	500–850	U	Nov–Feb
Eastern Wood Pewee *Contopus virens*	400–1,100	C	Nov–Feb
Western Wood Pewee *Contopus sordidulus*	750	R	Dec
Scarlet Tanager *Piranga olivacea*	600–1,200	F	Nov–Feb
Summer Tanager *Piranga rubra*	600–1,200	F	Nov–Feb

to the lowlands immediately south-west of the ridge, even at the end of the survey, the bird list of the Serranía Sadiri is certainly incomplete. This total represents c.35% of the total number of bird species in Madidi National Park[30].

The lowland tropical forest south-west of the ridge harbours a rich community of widespread Amazonian species. In November–December, this area was relatively dry and bird activity low, with some species observed in small numbers compared to nearby similar habitats[17]. In contrast, activity in the foothill zone peaked in November–December when most birds increased territorial song and display activity (e.g., Sharpbill *Oxyruncus cristatus* and White-browed Hermit *Phaethornis stuarti*). Following heavy rainfall in January–February, the lowland forest became increasingly moist, which resulted in high water level in streams, and an abundance of forest bogs and marshes throughout the area. While bird activity in the upper foothill zone declined in January–February, due to often prolonged periods of heavy rain, abundance and diversity of bird species in the lowlands increased, possibly due to a shift in food resources[32]. Species recorded in appropriate habitat only during the wet season were Green Heron *Butorides virescens*, Fasciated Tiger Heron *Tigrisoma fasciatum* and Hoatzin *Opisthocomus hoazin*, indicating local movements between the wet and dry seasons. Nocturnal birds (six owl species, two potoos and four nightjars) were mostly recorded in the foothill zone and almost exclusively in November–December.

Raptor migration.—In early–mid December, a large number of Swallow-tailed Kites *Elanoides forficatus* passed over Serranía Sadiri. It is unclear if these birds were of the migratory race *E. f. forficatus*, which relatively commonly over-winters over large parts of Central and South America[4], or resident *E. f. yetapa*. Flocks typically involved 4–20 birds and flew south-east to north-northwest following the Andean ridge. Numbers increased to more than 50 per day in mid December, with the max. 120 on 18 December, in flocks of 10, 20 and 80, plus singles. Given that most time was spent in forest below the canopy each day, many more birds might have passed over the ridge. It is unclear if the large number of *E. forficatus* was a result of a cold front further south or movements between local feeding areas[26]. The species was seen in 'good' numbers until 22 December. Thereafter, numbers declined to a few birds in January–early February. Three flocks consisting of 20, 11 and 14 birds were seen again in mid February. These flocks were moving in the same direction as those in November–December. Other raptors observed with the flocks of *E. forficatus* were Plumbeous Kite *Ictinia plumbea* and Broad-winged Hawk *Buteo platypterus*, which was seen in numbers on migration in February, but rarely in November–January.

Nearctic migrants.—A total of 11 Nearctic migrants was observed in the area during the survey (Table 1). The most abundant were: Swainson's Thrush *Catharus ustulatus*, Red-eyed Vireo *Vireo olivaceus*, Eastern Wood Pewee *Contopus virens* and Scarlet Tanager *Piranga olivacea*. Numbers of Nearctic migrants were greater in the foothill zone than in the lowlands, where only *C. ustulatus* was observed.

Species accounts

Harpy Eagle *Harpia harpyja* NT

Globally rare and declining, and appears rare but regular in the Serranía Sadiri. Although never observed during this survey, local people are familiar with the species and indicate that they have seen it on several occasions in the lowlands.

It is, however, unclear whether some of these observations might have involved the similar-looking Crested Eagle *Morphnus guianensis*, which potentially occurs in the area. During the survey, knowledgeable local people saw an immature *H. harpyja* beside the road on the lower part of the ridge, south-west of Serranía Sadiri, in February 2011. The eagle was perched in a large tree 10–15 m above ground, and was identified from *M. guianensis* by the grey breast-band and prominent dark, bifurcated crest.

Solitary Eagle *Buteogallus solitarius* **NT**
Two adults were regularly observed over the ridge of Serranía Sadiri and nearby peaks throughout the survey period. They were often seen soaring together. *B. solitarius* appears to be rare throughout its range, but its population status and threats are poorly understood[8].

Military Macaw *Ara militaris* **VU**
This rare and globally threatened macaw was observed 1–4 times per week during the entire period, but was more frequent in January–February. They were most frequently located by their loud calls in flight, in groups of 2–4 over the canopy in the foothill zone. They were rarely seen perched, and there are currently no signs of breeding in the area. Hosner *et al.*[20] reported it as common in Serranía Sadiri in 2009, with flocks of 2–20, and a max. count of 36 individuals in one flock. As known for many other macaws in Bolivia, it is possible that *A. militaris* is only present seasonally in the area and that its abundance varies according to local movements in response to food availability[10]. Hosner *et al.*[20] suggested that the *A. militaris* seen possibly were the same as those observed in the upper río Tuichi Valley, where it occurs only during the dry season[29]. Further evidence consistent with this hypothesis is that numbers of *A. militaris* in Serranía Sadiri increase during the wet season (January–February) compared to the late dry season (November).

Rufous-vented Ground Cuckoo *Neomorphus geoffroyi* **VU**
This rare and secretive species was seen once on a steep forest slope 300 m north of the camp, in the foothill zone at 950 m, in February 2011. It was observed for several minutes in low undergrowth and on a forest trail. *N. geoffroyi* has been reported from humid forest in dpto. Pando, Noel Kempff National Park and the central Río Tuichi dry forest, deeper into Madidi National Park[19], but is possibly overlooked due to its secretive behaviour.

Subtropical Pygmy Owl *Glaucidium parkeri*
This globally rare and patchily distributed owl was described as recently as 1995[33], but was documented in Bolivia for the first time based on recordings made by T. A. Parker in 1979 during an expedition to Serranía Bellavista, dpto. La Paz (Macaulay Library ML13885). In Bolivia, it has since been frequently reported at Serranía Eslabón, Madidi National Park (ABH pers. obs.) and Pilón Lajas[17]. In Serranía Sadiri it was frequently recorded in 2007[20]. During the present survey, *G. parkeri* was heard on most calm evenings and early mornings in November–December from camp, at 950 m, and on the lower west slope of Serranía Sadiri at 700 m. Two were simultaneously heard at dusk on 10 December 2010, which suggests that there is more than one territory in the area. Considered a restricted-range species[7], but its abundance and status are poorly known[19,36].

White-chinned Swift *Cypseloides cryptus* **/ American Black Swift** *Cypseloides niger*
On 3 January 2011, MB observed three juvenile *Cypseloides* swifts foraging within a large flock comprising White-collared *Streptoprocne zonaris*, White-tipped *Aeronautes montivagus*, Short-tailed *Chaetura brachyura* and White-chested Swifts *Cypseloides lemosi*. The flock was feeding over humid forest immediately south-west of the peak of Serranía Sadiri. The *Cypseloides* were observed on several occasions that day, sometimes at close range and for several minutes. They had dark plumage and diffuse but clearly visible white fringes on the lower belly, which are not shown by the otherwise similar juvenile Chestnut-collared Swift *Streptoprocne rutila*. The proportions of the *Cypseloides* were larger than *A. montivagus* in the same flock, but all were considerably smaller than the *S. zonaris*. Based on their relatively stocky proportions, uniformly dark plumage, and diffuse white fringes on the lower belly, the three swifts were initially identified as *C. cryptus*. The Bolivian distribution of *C. cryptus* is poorly known[19], with no recent records. There are, however, two records from dpto. Puno, southern Peru, immediately adjacent to dpto. La Paz, Bolivia, suggesting that it might have been overlooked[34,36]. Although there are no records of *C. niger* in Bolivia or Peru, a study using light-logger data suggests that the species forages over north-west Bolivia and southern Peru in the non-breeding season[3], making occurrence at Serranía Sadiri plausible. Nevertheless, identification of these species is difficult or, in many cases, almost impossible in the field.

White-chested Swift *Cypseloides lemosi*
MB observed an adult *C. lemosi* on 3 January 2011 foraging in the same large flock of swifts described above. It was seen from an outlook under good conditions several times during the day. Identification was confirmed by the triangular white breast patch, uniformly dark plumage, and

smaller size than *S. zonaris* but larger size than *A. montivagus*. Additionally, MB observed two adults in a large group of *S. zonaris* and *A. montivagus* near the village of San José de Uchupiamonas, a few km south-west of the survey area, on 28 December 2010. These observations suggest more regular occurrence of *C. lemosi* in the region at this season than previously believed. Status in Bolivia is poorly known[19]; the above-mentioned observations are the third and fourth records in the country. Previous observations are from Caranavi, dpto. La Paz, on 28 December 2005, and Rurrenabaque, dpto. La Paz, on 29 December 2005[34]. The species has recently also been reported on eBird[12] as follows: three seen at Campamento base, near Atén, on 29 October 2011; two at Camino via Crusis, on 4 November 2011; and ten at Tolopampa, on 12 December 2016, all of them near the Apolo area in north-west Bolivia[12].

Red-billed Tyrannulet *Zimmerius cinereicapilla* **VU**
Frequently seen and heard in the upper foothill zone at 900–1,200 m in November–December. It was usually found foraging in the canopy with mixed-species flocks. It was previously recorded in Serranía Sadiri in November 2009[20], at Chalalan Ecolodge in 1998 (ABH pers. obs.) and Serranía Eslabón[7]. *Z. cinereicapilla* is a restricted-range species patchily distributed in the east Andean foothills of Peru and Ecuador[1]. Its population is declining due to deforestation, road construction and mining[5].

Cinnamon-faced Tyrannulet *Phylloscartes parkeri*
Described as recently as 1997[13], this species was fairly common in the foothill zone, frequently associated with mixed-species flocks, and most often detected by voice. It is known from just four sites in dpto. La Paz[19], including a previous record from Serranía Sadiri by ABH in 1999[20].

Scaled Fruiteater *Ampelioides tschudii*
Common in the foothill zone at 800–1,100 m, where 5–15 birds were heard daily, with a peak in November–December. *A. tschudii* was hard to locate, even using playback, and always remained high in the canopy. In Bolivia, this species is known from Serranía Cuchilla, dpto. Beni[17], the río Tuichi Valley[29], and Pilón Lajas Biosphere Reserve[17,18].

Sharpbill *Oxyruncus cristatus*
Relatively common in the foothill zone at 700–1,100 m. Often heard in November–December, but not in January–February. When not singing, it was usually detected 1–2 times per day as singles or pairs with mixed-species flocks, mostly close to the camp at the ridge. Rare in Bolivia, the species is known from just seven sites in dpto. La Paz[19].

Scarlet Tanager *Piranga olivacea*
Observed in pairs or small flocks on most days in the upper foothill zone at 600–1,200 m. Numbers increased until late November and declined significantly in late January, when many males were moulting to summer plumage. The species has suffered a population decline due to habitat loss on the wintering grounds, and habitat fragmentation in North America[35]. It was common to fairly common during the previous ornithological survey in Serranía Sadiri[20] and has also been observed regularly at Pilón Lajas Biosphere Reserve[17].

Discussion

We recorded a total of 274 species during our three-month survey. An additional 32 species have previously been observed in the area[20]. The abundance and diversity of birds in Serranía Sadiri appear similar to the ridges of Serranía Pilón, where 332 species have been observed[17]. Serranía Pilón covers an elevational range of 400–1,200 m, and is 180 km south-southeast of Serranía Sadiri.

Serranía Sadiri is located within the Bolivian and Peruvian Lower Yungas EBA[6], with four species restricted to this EBA[6,19,36]. With large numbers of the globally Vulnerable *Ara militaris* regularly seen in the foothill zone, confirmed territories of the Vulnerable *Zimmerius cinereicapilla*, three globally Near Threatened species, four restricted-range species, as well as many biome-restricted species, Serranía Sadiri area fulfils three of four the criteria to be proposed as an Important Bird Area (IBA)[6,38]. Among conservation priority species, seven have their centre of abundance in lower tropical forest (<500 m), and ten in foothill-upper tropical forest (500–1,100 m)[28]. Eleven of the 22 species of high and medium conservation priority occur at relative higher abundance on Serranía Sadiri than globally (Table 2)[28].

Although habitat is apparently suitable, we did not record two species near-endemic to Bolivia, Bolivian Recurvebill *Simoxenops striatus* and Yungas Antwren *Myrmotherula grisea*. Overall, Serranía Sadiri covers just 400–500 m of the altitudinal ranges of these species (640–1,500 m for *Simoxenops striatus*; 600–1,400 m for *Myrmotherula grisea*), which might be too narrow to sustain viable populations[18]. *Simoxenops striatus* shows a preference for *Guadua* bamboo, so it is possible that Serranía Sadiri does not support sufficient bamboo to meet the species' requirements[18]. The closest known site to Serranía Sadiri for *Simoxenops striatus* and *Myrmotherula grisea* is Serranía Eslabón (B. M. Whitney & A. Perry pers. comm.).

Serranía Sadiri is mainly located in the Integrated Management Natural Areas (IMNA) of Madidi National Park, which is under a sustainable resource management regime by the local population[14]. However, there are several threats.

Table 2. Species of conservation concern recorded at Serranía Sadiri, dpto. La Paz, Bolivia, in November 2010–February 2011. High (H) and medium (M) conservation priority following Parker *et al.*[28]. Species marked ** = globally Vulnerable, * = globally Near Threatened. Conservation priority and research priority: High (H), Medium (M) and Low (L) following Parker *et al.*[28]. Centre of abundance: Lower tropical (LT), Upper tropical (UT), Foothill (FH). Relative abundance: rare (R), uncommon (U), fairly common (F), common (C); patchily distributed (P).

Species	Conservation priority	Research priority	Centre of abundance	Relative Abundance	Serranía Sadiri abundance
Tataupa Tinamou *Crypturellus tataupa*	H	M	LT	F	U
Rufous-vented Ground Cuckoo *Neomorphus geoffroyi***	M	M	LT	R	R
Silky-tailed Nightjar *Antrostomus sericocaudatus*	M	M	LT	R/P	F
White-chinned Swift *Cypseloides cryptus*	M	M	UT	U/P	U
White-chested Swift *Cypseloides lemosi*	H	H	UT	R/P	U
White-browed Hermit *Phaethornis stuarti*	M	M	UT	F/P	F
Rufous-crested Coquette *Lophornis delattrei*	M	M	UT	R/P	U
Pale-winged Trumpeter *Psophia leucoptera*	H	L	LT	U	U
Fasciated Tiger Heron *Tigrisoma fasciatum*	M	H	FH	U/P	R
Solitary Eagle *Buteogallus solitarius**	M	H	UT	R	F
Harpy Eagle *Harpia harpyja**	M	H	LT	R	R
Band-bellied Owl *Pulsatrix melanota*	M	M	FH	F	F
Subtropical Pygmy Owl *Glaucidium parkeri*	M	M	FH	U	U
Scarlet Macaw *Ara macao*	M	M	LT	F	R
Red-and-green Macaw *Ara chloropterus*	M	L	LT	F	C
Military Macaw *Ara militaris***	H	M	UT	U/P	F
Rough-legged Tyrannulet *Phyllomyias burmeisteri*	M	M	UT	U	U
Spectacled Bristle Tyrant *Phylloscartes orbitalis*	M	M	FH	F	F
Cinnamon-faced Tyrannulet *Phylloscartes parkeri*	H	H	FH	F	F
White-bellied Pygmy Tyrant *Myiornis albiventris*	M	M	UT	U	U
Red-billed Tyrannulet *Zimmerius cinereicapilla***	H	H	FH	R	U
Buff-throated Tody-Tyrant *Hemitriccus rufigularis**	M	M	FH	U/P	R
Scaled Fruiteater *Ampelioides tschudii*	M	M	UT	U	C
Bronze-green Euphonia *Euphonia mesochrysa*	M	L	UT	U	C

First, a major road from San Buena Ventura (14°26'S 68°31'W) to Tumupasa (14°08'S 67°53'W), over the ridge of Serranía Sadiri, to the community of San José de Uchupiamonas (14°12'S 68°03'W) enables future settlement in areas adjacent to the Serranía, and increased access to the reserve. The park is trying to counteract this by installing a guard station at the crest of Serranía Sadiri. However, during our survey, the station was largely unoccupied. Secondly, hunting within Serranía Sadiri appears regular, with gunshots heard during the survey. Hunting pressure in the lowlands, especially adjacent to San José de Uchupiamonas, seems high. Studies have shown that dispersal between source and sink habitats is evident and that unsustainable hunting pressure in adjacent areas may also affect Serranía Sadiri[15,25], possibly explaining our relatively few encounters with large gamebirds such as piping guans and curassows, which are common in more remote areas[2].

Madidi National Park is suffering a slow but increasing rate of deforestation[14]. The primary concern is unregulated land and resource management caused by rapid colonisation of border areas and increased access to the park[11,14,17]. These threats are especially severe in the Madidi Integrated Natural Management Area (IMNA), which represents 33% of the park. The most significant cause of deforestation is agriculture and infrastructure development along the Yucumo–Ixiamas road. This road was opened by a logging company to serve its mill in Alto Madidi and follows the park's north-east border. Consequently, increasing numbers of people have settled the roadsides in search of inexpensive land for agriculture and logging[14,22]. Slash-and-burn agriculture includes forest clearance, burning of debris, and cropping, and will probably increase in the future[22]. The increased edge effect disrupts biotic processes such as seed dispersal, whereas control of insect herbivores leads to reduced biodiversity and a less resilient ecosystem[9]. Increased accessibility to the park may also elevate the risk of pollution and serve as a corridor for invasive species, e.g. cogon grass *Imperata cylindrica*)[39].

Our study confirms that Serranía Sadiri harbours several species restricted to the outlying ridges of northern Bolivia and southern Peru. The combination of populations of several restricted-range, globally Near Threatened and threatened species, as well as high species diversity within a relatively small area, makes Serranía Sadiri a major conservation priority. The area also lies within Madidi National Park, which was designated to preserve one of the world's most important biodiversity hotspots. With the increasing development of areas adjacent to Serranía Sadiri, stronger protection is clearly required.

Acknowledgements

We thank Fundación Pueblo Nuevo for sponsoring the project; we are especially grateful to its director Ruth Alipaz for her support and logistic assistance to MB. Thanks are due to Sandro Valdez and Ricardo Cuqui for their companionship in the field and for sharing their extensive knowledge of the forest. The friendly people of Uchupiamonas permitted MB to stay in the region and shared their knowledge of the environs. We are also grateful to J. V. Remsen, P. A. Hosner and J. F. Freile for helpful comments on the submitted version of this paper.

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Appendix. Bird species recorded at Serranía Sadiri, Madidi National Park, dpto. La Paz, Bolivia, 22 November 2010–22 February 2011. Species sequence and scientific nomenclature follow Remsen *et al.*[31].

Abundance

C = common, several individuals encountered daily in appropriate habitat.
F = fairly common, encountered almost daily in small numbers.
U = uncommon, encountered infrequently.
R = rare, only one or a few records.

Elevation (m)

L = lowlands below 450 m

Seasonality

AM = austral migrant
BM = boreal migrant

Evidence

L = local information
S = sight
V = voice

Sites

E = dry east slope
F = foothill zone
L = lowland
T = village of Tumupasa
B = bamboo

Scientific name	English name	Abundance	Sites	Elevation	Seasonality	Evidence
TINAMIDAE						
Tinamus tao	Grey Tinamou	C	F	700–1,100		S, V
Tinamus major	Great Tinamou	C–R	L, F	L–1,100		V
Crypturellus soui	Little Tinamou	C	F	700–1,200		S, V

Scientific name	English name	Abundance	Sites	Elevation	Seasonality	Evidence
Crypturellus obsoletus	Brown Tinamou	C	F	600–1,200		S, V
Crypturellus undulatus	Undulated Tinamou	U	L	400		V
Crypturellus tataupa	Tataupa Tinamou	R	E, F	L–1,100		V
CRACIDAE						
Penelope jacquacu	Spix's Guan	U	L, F	400–1,100		S, V
Pipile cumanensis	Blue-throated Piping Guan	R	L F	400–1,100		S, V
Mitu tuberosum	Razor-billed Curassow	R	L, F	400–1,100		S, V
ODONTOPHORIDAE						
Odontophorus stellatus	Starred Wood Quail	F	F	800–1,100		S, V
COLUMBIDAE						
Patagioenas speciosa	Scaled Pigeon	C	L, F	400–1,100		S, V
Patagioenas plumbea	Plumbeous Pigeon	C	F, L	400–1,100		S, V
Patagioenas subvinacea	Ruddy Pigeon	C	F	700–900		S, V
Geotrygon violacea	Violaceous Quail-Dove	U	F	900–1,100		S
Leptotila rufaxilla	Grey-fronted Dove	C	L, F	L–1,100		S, V
CUCULIDAE						
Dromococcyx phasianellus	Pheasant Cuckoo	R	L	L		V
Neomorphus geoffroyi	Rufous-vented Ground Cuckoo	R	F	1,100		S
Piaya cayana	Squirrel Cuckoo	C	L, F	L–1,100		S, V
NYCTIBIIDAE						
Nyctibius aethereus	Long-tailed Potoo	R	F	700–900		S, V
Nyctibius griseus	Common Potoo	U	L	L		V
CAPRIMULGIDAE						
Chordeiles minor	Common Nighthawk	R	L	L	BM	S
Lurocalis semitorquatus	Short-tailed Nighthawk	U	F	950		S, V
Nyctipolus nigrescens	Blackish Nightjar	U	F	700–900		S
Antrostomus sericocaudatus	Silky-tailed Nightjar	F	L	L		S, V
APODIDAE						
Cypseloides lemosi	White-chested Swift	R	F	900		S
Cypseloides cryptus	White-chinned Swift	R	F	900		S
Streptoprocne zonaris	White-collared Swift	C	L, F	L–1,200		S
Chaetura cinereiventris	Grey-rumped Swift	F	L, F	L–1,200		S
Chaetura egregia	Pale-rumped Swift	F	L, F	L–1,200		S
Chaetura brachyura	Short-tailed Swift	F	L, F	L–1,200		S
Aeronautes montivagus	White-tipped Swift	C	L, F	L–1,200		S
Panyptila cayennensis	Lesser Swallow-tailed Swift	U	L	L		S
TROCHILIDAE						
Florisuga mellivora	White-necked Jacobin	U	F, L	L–1,000		S
Threnetes leucurus	Pale-tailed Barbthroat	R	L	L		S
Phaethornis ruber	Reddish Hermit	F	F, L	L–900		S
Phaethornis stuarti	White-browed Hermit	F	F	600–950		S, V
Phaethornis hispidus	White-bearded Hermit	R	L	L		S
Heliothryx auritus	Black-eared Fairy	F	F, L	L–1,100		S
Lophornis chalybeus	Festive Coquette	U	L	L		S
Lophornis delattrei	Rufous-crested Coquette	R	F	600–900		S
Klais guimeti	Violet-headed Hummingbird	R	F	600–1,100		S
Calliphlox amethystina	Amethyst Woodstar	U	F	600–1,000		S
Chaetocercus mulsant	White-bellied Woodstar	R		500–1,000		S
Campylopterus largipennis	Grey-breasted Sabrewing	F	F, L	L–1,000		S, V
Thalurania furcata	Fork-tailed Woodnymph	F	F	600–1,100		S, V
Chlorostilbon mellisugus	Blue-tailed Emerald	C	F, L	L–1,150		S, V

Scientific name	English name	Abundance	Sites	Elevation	Seasonality	Evidence
Chrysuronia oenone	Golden-tailed Sapphire	F	F, L	L–1,000		S
OPISTHOCOMIDAE						
Opisthocomus hoazin	Hoatzin	R	L	L		S, V
PSOPHIIDAE						
Psophia leucoptera	Pale-winged Trumpeter	U	L	400		L
SCOLOPACIDAE						
Actitis macularius	Spotted Sandpiper	C	L, F	400–900	BM	S
Tringa solitaria	Solitary Sandpiper	R	L	400	BM	S
EURYPYGIDAE						
Eurypyga helias	Sunbittern	F	L	400		S
ARDEIDAE						
Ardea cocoi	Cocoi Heron	U	L	400		S
Tigrisoma fasciatum	Fasciated Tiger Heron	R	F	700		S
CATHARTIDAE						
Sarcoramphus papa	King Vulture	U	L, F	400–1,200		S
Coragyps atratus	Black Vulture	C	F, L	400–1,200		S
Cathartes aura	Turkey Vulture	C	F, L	400–1,200		S
Cathartes melambrotus	Greater Yellow-headed Vulture	F	L, F	400–1,200		S
ACCIPITRIDAE						
Elanoides forficatus	Swallow-tailed Kite	C–U	L, F	400–1,200	BM	S
Ictinia plumbea	Plumbeous Kite	C–U	L, F	400–1,200		S
Harpagus bidentatus	Double-toothed Kite	C	L, F	400–1,200		S
Accipiter striatus	Sharp-shinned Hawk	R	F	900		S, V
Pseudastur albicollis	White Hawk	C	F	700–1,200		S, V
Buteo platypterus	Broad-winged Hawk	F-U	L, F	400–1,200	BM	S
Buteo brachyurus	Short-tailed Hawk	R	T	400		S
Spizaetus ornatus	Ornate Hawk-Eagle	R	F	1,100		S
Spizaetus tyrannus	Black Hawk-Eagle	R	F	1,200		S
Buteogallus solitarius	Solitary Eagle	F	F	800–1,200		S
Harpia harpyja	Harpy Eagle	R	L	400		L
Buteogallus urubitinga	Great Black Hawk	U	L, F	400–1,100		S
STRIGIDAE						
Megascops guatemalae	Vermiculated Screech Owl	C	F	700–1,200		V
Lophostrix cristata	Crested Owl	F	F	600–1,100		V
Ciccaba huhula	Black-banded Owl	F	F	600–1,100		V
Pulsatrix melanota	Band-bellied Owl	C	F	600–1,100		V
Glaucidium parkeri	Subtropical Pygmy Owl	U	F	800–1,200		V
Glaucidium hardyi	Amazonian Pygmy Owl	F	L, F	L–1,100		V
TROGONIDAE						
Trogon melanurus	Black-tailed Trogon	C	F, L	L–1,100		S, V
Trogon viridis	Green-backed Trogon	R	L	L		S, V
Trogon curucui	Blue-crowned Trogon	F	F, L	L–1,100		S, V
Trogon collaris	Collared Trogon	C	F, L	L–1,100		S, V
MOMOTIDAE						
Electron platyrhynchum	Broad-billed Motmot	F	L	L		S, V
Baryphthengus martii	Rufous Motmot	F	F	700–1,000		S, V
Momotus momota	Amazonian Motmot	C	F, L	L–700		S, V
ALCEDINIDAE						
Megaceryle torquata	Ringed Kingfisher	F	L	L		S
Chloroceryle amazona	Amazon Kingfisher	F	L	L		S
Chloroceryle aenea	American Pygmy Kingfisher	R	L	L		S

Scientific name	English name	Abundance	Sites	Elevation	Seasonality	Evidence
Chloroceryle americana	Green Kingfisher	U	L	L		S
BUCCONIDAE						
Nystalus obamai	Western Striolated Puffbird	U	F, L	L–1,000		S
Malacoptila fulvogularis	Black-streaked Puffbird	U	F	950–1,000		V
Monasa morphoeus	White-fronted Nunbird	F	L	L		S
Chelidoptera tenebrosa	Swallow-winged Puffbird	U	L	L		S
CAPITONIDAE						
Capito auratus	Gilded Barbet	C	F, L	L–1,100		S, V
Eubucco richardsoni	Lemon-throated Barbet	F	F, L	L–1,100		S, V
RAMPHASTIDAE						
Ramphastos tucanus	White-throated Toucan	F	F, L	L–1,100		S, V
Ramphastos vitellinus	Channel-billed Toucan	U	F, L	L–1,100		S, V
Aulacorhynchus prasinus	Emerald Toucanet	F	F	600–1,100		S, V
Selenidera reinwardtii	Golden-collared Toucanet	U	F, L	L–1,200		S, V
Pteroglossus inscriptus	Lettered Araçari	R	L	L		S
Pteroglossus beauharnaesii	Curl-crested Araçari	U	E, F, L	L–1,000		S
PICIDAE						
Picumnus aurifrons	Bar-breasted Piculet	F	F	600–1,000		S
Melanerpes cruentatus	Yellow-tufted Woodpecker	F	L	L		S
Veniliornis passerinus	Little Woodpecker	R	F	1,000		S
Veniliornis affinis	Red-stained Woodpecker	U	F	600–1,100		S
Campephilus rubricollis	Red-necked Woodpecker	F	F, L	L–1,100		S
Piculus leucolaemus	White-throated Woodpecker	F	F, L	L–1,100		S
FALCONIDAE						
Micrastur ruficollis	Barred Forest Falcon	C	L, F	400–800		S, V
Micrastur semitorquatus	Collared Forest Falcon	F	L, F	400–1,100		S, V
Falco rufigularis	Bat Falcon	R	L	400		S
Falco peregrinus	Peregrine Falcon	R	F	1,200		S
PSITTACIDAE						
Pionus menstruus	Blue-headed Parrot	C	L	L		S, V
Amazona farinosa	Mealy Parrot	F	L, F	L–900		S, V
Pyrrhura roseifrons	Rose-fronted Parakeet	F-C	F	700–1,100		S, V
Ara chloropterus	Red-and-green Macaw	C	L, F	L–1,200		S, V
Ara militaris	Military Macaw	F	F	700–1,200		S, V
Ara macao	Scarlet Macaw	R	L	500		S, V
Pionites leucogaster	White-bellied Parrot	F	L	L		S, V
Psittacara leucophthalmus	White-eyed Parakeet	U	L, F	400–1,200		S, V
THAMNOPHILIDAE						
Cymbilaimus lineatus	Fasciated Antshrike	U	F, L	L–1,100		S, V
Thamnophilus schistaceus	Plain-winged Antshrike	R	L	L		S
Thamnomanes ardesiacus	Dusky-throated Antshrike	R	L	L		S, V
Myrmotherula axillaris	White-flanked Antwren	F	L	L		S, V
Herpsilochmus rufimarginatus	Rufous-winged Antwren	F	F	700–1,200		S, V
Epinecrophylla ornata	Ornate Antwren	R	L	L		S, V
Dysithamnus mentalis	Plain Antvireo	C	L	L		S, V
Cercomacra cinerascens	Grey Antbird	R	L	L		S, V
Dichrozona cincta	Banded Antbird	R	L	L		S, V
Myrmoborus myotherinus	Black-faced Antbird	F	F, L	L–1,200		S, V
Pyriglena leuconota	White-backed Fire-eye	U	F	700–1,100		S, V
Myrmelastes brunneiceps	Brownish-headed Antbird	F	F	500–900		S, V
Sciaphylax hemimelaena	Chestnut-tailed Antbird	C	F, L	L–1,100		S, V

Scientific name	English name	Abundance	Sites	Elevation	Seasonality	Evidence
Rhegmatorhina melanosticta	Hairy-crested Antbird	U	L, F	L–800		S
Drymophila devillei	Striated Antbird	R	B	1,000		S, V
Gymnopithys salvini	White-throated Antbird	R	F	900		S, V
Willisornis poecilinotus	Common Scale-backed Antbird	U	F, L	L–900		S, V
Hylophylax punctulatus	Dot-backed Antbird	R	L	L		S
GRALLARIIDAE						
Hylopezus berlepschi	Amazonian Antpitta	U	L	L		V
FORMICARIIDAE						
Formicarius colma	Rufous-capped Antthrush	U	L	L		S, V
Formicarius analis	Black-faced Antthrush	C	L, F	L–1,100		S, V
FURNARIIDAE						
Sclerurus mexicanus	Tawny-throated Leaftosser	U	F	600–900		S, V
Sclerurus caudacutus	Black-tailed Leaftosser	F	L	L		S, V
Sclerurus albigularis	Grey-throated Leaftosser	F	F	600–900		S, V
Sittasomus griseicapillus	Olivaceous Woodcreeper	U	F, L	500–950		S, V
Deconychura longicauda	Long-tailed Woodcreeper	F	F	700–950		S, V
Xiphocolaptes promeropirhynchus	Strong-billed Woodcreeper	F	F, L	L–950		S, V
Xiphorhynchus ocellatus	Ocellated Woodcreeper	R	F	950		S, V
Xiphorhynchus elegans	Elegant Woodcreeper	C	F, L	L–1,200		S, V
Xiphorhynchus guttatus	Buff-throated Woodcreeper	F	L	L		S, V
Lepidocolaptes fuscicapillus	Rondônia Woodcreeper	F	F, L	500–1,000		S, V
Xenops minutus	Plain Xenops	C	F	600–1,100		S
Philydor erythrocercum	Rufous-rumped Foliage-gleaner	U	F	700–1,100		S
Philydor erythropterum	Chestnut-winged Foliage-gleaner	F	F	800–1,150		S
Philydor ruficaudatum	Rufous-tailed Foliage-gleaner	U	F	700–1,200		S
Anabacerthia striaticollis	Montane Foliage-gleaner	U	F	900–1,100		S
Ancistrops strigilatus	Chestnut-winged Hookbill	U	L, F	L–800		S
Automolus ochrolaemus	Buff-throated Foliage-gleaner	C	L	L		S, V
Automolus subulatus	Striped Woodhaunter	F	L	L		S
TYRANNIDAE						
Phyllomyias burmeisteri	Rough-legged Tyrannulet	U	F	600–1,000		S, V
Myiopagis gaimardii	Forest Elaenia	U	F, L	L–950		S, V
Myiopagis caniceps	Grey Elaenia	U	F, L	L–950		S, V
Tyrannulus elatus	Yellow-crowned Tyrannulet	R	F, L	L–950		S
Ornithion inerme	White-lored Tyrannulet	U	F, L	L–950		S, V
Mecocerculus hellmayri	Buff-banded Tyrannulet	U	F	700–950		S, V
Zimmerius cinereicapilla	Red-billed Tyrannulet	U	F	600–950		S, V
Zimmerius gracilipes	Slender-footed Tyrannulet	F	F, L	L–900		S, V
Phylloscartes orbitalis	Spectacled Bristle Tyrant	F	F	600–1,200		S, V
Phylloscartes parkeri	Cinnamon-faced Tyrannulet	F	F	500–800		S, V
Mionectes oleagineus	Ochre-bellied Flycatcher	C	F, L	L–950		S, V
Leptopogon amaurocephalus	Sepia-capped Flycatcher	F	F, L	L–700		S, V
Leptopogon superciliaris	Slaty-capped Flycatcher	U	F	500–700		S, V
Myiornis albiventris	White-bellied Pygmy Tyrant	U	F	700–1,200		S, V
Myiornis ecaudatus	Short-tailed Pygmy Tyrant	F	F, L	L–700		S, V
Hemitriccus rufigularis	Buff-throated Tody-Tyrant	R	F	950		S, V
Hemitriccus griseipectus	White-bellied Tody-Tyrant	F	F, L	L–1,200		S, V
Todirostrum chrysocrotaphum	Golden-browed Tody-Flycatcher	U	F	500–1,100		S, V
Ochthornis littoralis	Drab Water Tyrant	U	L	L		S
Tolmomyias assimilis	Yellow-margined Flycatcher	U	F, L	L–1,100		S
Tolmomyias poliocephalus	Grey-crowned Flycatcher	R	L	L		S, V

Scientific name	English name	Abundance	Sites	Elevation	Seasonality	Evidence
Tolmomyias flaviventris	Yellow-breasted Flycatcher	F	F, L	L		S, V
Platyrinchus coronatus	Golden-crowned Spadebill	U	L	L		S
Terenotriccus erythrurus	Ruddy-tailed Flycatcher	U	F, L	L–700		S
Onychorhynchus coronatus	Royal Flycatcher	U	F, L	L–1,000		S
Lathrotriccus euleri	Euler's Flycatcher	C	F	600–950		S, V
Contopus cooperi	Olive-sided Flycatcher	U	F	700	BM	S
Contopus sordidulus	Western Wood Pewee	R	F	700	BM	S, V
Contopus virescens	Eastern Wood Pewee	F	F, L	L–1,200	BM	S, V
Sayornis nigricans	Black Phoebe	U	L	L		S
Myiozetetes similis	Social Flycatcher	R	L	L		S
Myiozetetes luteiventris	Dusky-chested Flycatcher	F	L	L		S
Myiozetetes cayanensis	Rusty-margined Flycatcher	U	F	500–1,200		S
Myiodynastes maculatus	Streaked Flycatcher	R	F	700		S
Myiodynastes luteiventris	Sulphur-bellied Flycatcher	C	F, L	L–1,200	BM	S
Megarynchus pitangua	Boat-billed Flycatcher	F	L	L		S
Tyrannus tyrannus	Eastern Kingbird	U	L	L		S
Rhytipterna simplex	Greyish Mourner	U	L	L		S, V
Attila spadiceus	Bright-rumped Attila	U	L	L		S, V
OXYRUNCIDAE						
Oxyruncus cristatus	Sharpbill	F	F	700–1,100		S, V
COTINGIDAE						
Ampelioides tschudii	Scaled Fruiteater	C	F	800–1,100		S, V
Querula purpurata	Purple-throated Fruitcrow	F	F, L	L–800		S, V
Lipaugus vociferans	Screaming Piha	C	F, L	L–1,200		S, V
PIPRIDAE						
Lepidothrix coronata	Blue-crowned Manakin	U	F	700–1,100		S, V
Machaeropterus pyrocephalus	Fiery-capped Manakin	U	F	L		S, V
Ceratopipra chloromeros	Round-tailed Manakin	C	F, L	L–1,100		S, V
TITYRIDAE						
Tityra semifasciata	Masked Tityra	U	F, L	L–1,000		S, V
Laniocera hypopyrra	Cinereous Mourner	U	F, L	L–800		S, V
Pachyramphus minor	Pink-throated Becard	U	F, L	L–1,200		S, V
Schiffornis turdina	Brown-winged Schiffornis	F	F, L	L–1,200		S, V
INCERTAE SEDIS						
Piprites chloris	Wing-barred Piprites	F	F, L	L–1,000		S, V
VIREONIDAE						
Vireolanius leucotis	Slaty-capped Shrike-Vireo	C	F, L	L–1,200		S, V
Pachysylvia hypoxantha	Dusky-capped Greenlet	C	F, L	L–1,100		S
Tunchiornis ochraceiceps	Tawny-crowned Greenlet	C	F	800–1,100		S
Vireo olivaceus	Red-eyed Vireo	C	F, L	L–1,200	BM	S
Vireo flavoviridis	Yellow-green Vireo	F	F	700–1,000		S
CORVIDAE						
Cyanocorax violaceus	Violaceus Jay	F	L	L		S
TROGLODYTIDAE						
Cyphorhinus arada	Musician Wren	F	L	L		V
Pheugopedius genibarbis	Moustached Wren	F	F, L	L–1,100		S, V
POLIOPTILIDAE						
Microbates cinereiventris	Half-collared Gnatwren	R	F	950		S, V
Ramphocaenus melanurus	Long-billed Gnatwren	R	L	L		S
TURDIDAE						
Catharus ustulatus	Swainson's Thrush	C	F, L	L–1,200	BM	S
Turdus hauxwelli	Hauxwell's Thrush	C	L	L		S

Scientific name	English name	Abundance	Sites	Elevation	Seasonality	Evidence
Turdus lawrencii	Lawrence's Thrush	U	L	L		S
Turdus ignobilis	Black-billed Thrush	F	L	L		S
ICTERIDAE						
Cacicus cela	Yellow-rumped Cacique	F	L	L		S
Psarocolius decumanus	Crested Oropendola	U	L	L		S
Icterus cayanensis	Epaulet Oriole	C	F, L	L–1,000		S
FRINGILLIDAE						
Euphonia laniirostris	Thick-billed Euphonia	R	F	950		S
Euphonia mesochrysa	Bronze-green Euphonia	F	F	600–950		S
Euphonia xanthogaster	Orange-bellied Euphonia	U	F	800–1,100		S
Euphonia minuta	White-vented Euphonia	U	F, L	L–1,000		S
Euphonia rufiventris	Rufous-bellied Euphonia	F	F, L	L–1,200		S
PARULIDAE						
Setophaga pitiayumi	Tropical Parula	F	F	700–950		S
Myiothlypis bivittata	Two-banded Warbler	C	F	600 –950		S
Myiothlypis chrysogaster	Golden-bellied Warbler	U	F	600–900		S
Myiothlypis fulvicauda	Buff-rumped Warbler	F	F, L	L–850		S
Myioborus miniatus	Slate-throated Redstart	U	F	700–1,100		S
CARDINALIDAE						
Piranga flava	Hepatic Tanager	U	F	600–950		S
Piranga rubra	Summer Tanager	F	F	600–1,200	BM	S
Piranga olivacea	Scarlet Tanager	F	F	600–1,200	BM	S
Habia rubica	Red-crowned Ant Tanager	F	F, L	L–1,200		S, V
Cyanoloxia brissonii	Ultramarine Grosbeak	F	F	500–950		S
THRAUPIDAE						
Parkerthraustes humeralis	Yellow-shouldered Grosbeak	F	F	500–950		S
Hemithraupis guira	Guira Tanager	F	F, L	L–1,000		S
Hemithraupis flavicollis	Yellow-backed Tanager	F	F, L	L–1,000		S
Dacnis lineata	Black-faced Dacnis	F	F, L	L–1,000		S
Dacnis flaviventer	Yellow-bellied Dacnis	R	L	L		S
Dacnis cayana	Blue Dacnis	F	F, L	L–1,000		S
Tersina viridis	Swallow Tanager	R	F	700		S
Cyanerpes caeruleus	Purple Honeycreeper	U	F, L	L–1,000		S
Chlorophanes spiza	Green Honeycreeper	U	F, L	L–1,100		S
Saltator maximus	Buff-throated Saltator	F	F, L	L–1,000		S
Sporophila caerulescens	Double-collared Seedeater	R	T	L	AM	S
Volatinia jacarina	Blue-black Grassquit	C	T	L		S
Ramphocelus carbo	Silver-beaked Tanager	C	L	L		S
Stilpnia nigrocincta	Masked Tanager	F	F, L	L–1,000		S
Tangara chilensis	Paradise Tanager	C	F, L	L–1,000		S
Tangara schrankii	Green-and-gold Tanager	C	F, L	L–950		S
Tangara gyrola	Bay-headed Tanager	C	F, L	L–1,200		S
Tangara mexicana	Turquoise Tanager	C	F, L	L–1,000		S
Tangara velia	Opal-rumped Tanager	U	L	L		S
Thraupis palmarum	Palm Tanager	R	F, L	L–950		S
Ixothraupis xanthogastra	Yellow-bellied Tanager	U	F, L	L–950		S
Chlorothraupis carmioli	Carmiol's Tanager	C	F	500–1,000		S, V
Tachyphonus rufiventer	Yellow-crowned Tanager	U	F	600–1,100		S
Lamprospiza melanoleuca	Red-billed Pied Tanager	R	L	L		S

Novos registros documentados de aves para o município de Teodoro Sampaio, oeste de São Paulo, sudeste do Brasil

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Received 30 May 2018; final revision accepted 9 November 2018
Cotinga 41 (2019): 72–74
published online 21 June 2019

We conducted a rapid bird census within the urban area of Teodoro Sampaio, São Paulo state, south-eastern Brazil. The largest (30,000 ha) semi-deciduous Atlantic Forest remnant in the state lies entirely within the municipality. We recorded 87 bird species during transects conducted over 34 hours during September and October 2017. During this period we recorded four species previously unknown in the municipality.

Teodoro Sampaio é um dos municípios com maior representatividade de estudos em relação à composição e estrutura da comunidade de aves do Pontal do Paranapanema (São Paulo, Brasil) comparado com outros municípios de referência, como Presidente Prudente e Euclides da Cunha Paulista. Embora o município de Teodoro Sampaio seja o mais bem estudado ornitologicamente[10,15,17] o conhecimento sobre a avifauna ainda é incipiente e necessita de mais informações. Na região, os primeiros registros de aves ocorreram em 1979, por E. O. Willis & Y. Oniki, em estudos preliminares publicados dois anos mais tarde[16]. Dez anos após as primeiras observações, Straube e colaboradores[13,14], ao estudar a avifauna da região noroeste do Estado do Paraná, expandiram sua área de estudo para o oeste paulista e gradativamente foram compondo a lista de espécies da região. Através de revisão bibliográfica feita por Uezu, a região do Pontal do Paranapanema acumulou 323 espécies de aves. Contudo, esta lista sofreu atualizações com estudos recentes[10,15] e com análise de compilações de dados de Willis & Oniki[17], demonstrando que ainda são necessários

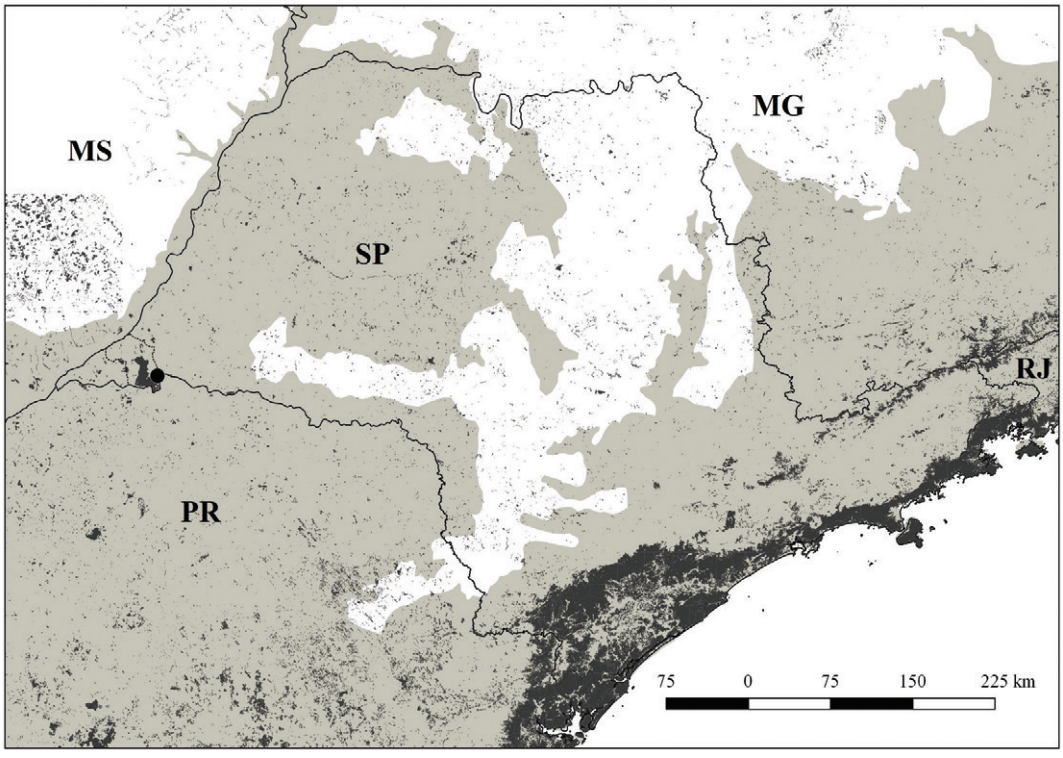

Figura 1. Localização do município de Teodoro Sampaio, São Paulo, Brasil (ponto preto).

mais censos para o conhecimento mais adequado da avifauna deste município.

Localizado no oeste do Estado de São Paulo, sudeste do Brasil (Fig. 1), Teodoro Sampaio é o oitavo maior município do Estado em extensão territorial (c.1.555 km^2)[6], com variação altitudinal de 255 m a aproximadamente 600 m, sendo os vales dos rios Paranapanema e Paraná os pontos menos elevados[8]. O município abriga fragmentos florestais da Mata Atlântica Estacional Semidecídua[9], tendo como exemplo o Parque Estadual do Morro do Diabo e os fragmentos da Estação Ecológica Mico-Leão-Preto. A região apresenta também espécies da flora característica de cerradão por se encontrar em área de ecótono entre a Mata Atlântica de Interior e o Cerrado. Atualmente Teodoro Sampaio conta com 25% de sua área coberta por vegetação nativa[1]. O clima da região é considerado do tipo Cwa, ou seja, inverno de clima seco e verão quente e úmido com intensas chuvas, sendo a temperatura média anual de 21°C[3].

Neste trabalho apresentamos novos registros documentados de aves de um levantamento inédito na área urbana de Teodoro Sampaio (22°53'25"S 52°16'75"W) realizado nos meses de setembro e outubro de 2017, totalizando 34 horas de amostragens. Foram conduzidas por transecções lineares iniciadas cerca de 20 minutos antes do nascer do sol, estendendo-se em média até às 11h00, aproveitando o período de maior atividade das aves, sendo o retorno geralmente entre 16h00–18h00, de acordo com as condições climáticas. Por meio de registros fotográficos, gravações, observações visuais e sonoras, foram registradas 87 espécies de aves, sendo quatro ineditamente documentadas para o município. Os e-vouchers de nossos registros estão disponibilizados na plataforma online Wiki Aves (www.wikiaves.com.br) com suas respectivas numerações, estando abreviado no texto pela sigla WA.

Guaracava-grande *Elaenia spectabilis*
Realizou-se um registro fotográfico (W. F. Teixeira; WA 2733184) de um indivíduo pousado no estrato alto de um bosque urbano em 12 de outubro de 2017 no bairro Vila São Paulo (22º31'36.383"S 52º10'51.636"W), e depois a espécie não foi mais avistada, ao menos até 24 de outubro de 2018. A identificação da espécie foi realizada por reconhecimento da vocalização. A espécie ocorre em quase todo o Brasil, distribuindo-se ainda na Argentina, Uruguai, Paraguai, Bolívia, Peru, Colômbia e Equador[7]. É considerada migrante austral, porque após a reprodução ao sul da América do Sul, migra para o norte, atravessando a região amazônica[4].

Piolhinho *Phyllomyias fasciatus*
No entardecer de 15–16 de outubro de 2017 um indivíduo adulto foi registrado e teve sua vocalização gravada (W. F. Teixeira; WA 2945318) após uso de *playback* no bairro Centro (22º31'31.552"S 52º10'25.572"W). Distribui-se na Argentina, Uruguai, Paraguai, Bolívia e Brasil[7]. Em território brasileiro a espécie concentra-se mais na região litorânea do sudeste e sul do país, frequentando principalmente Floresta Tropical Úmida e menos frequente em Floresta Estacional Semidecídua[5]. Estudos sugerem que a espécie é migratória[2], registrada no sudeste do Brasil durante o verão austral[5].

Primavera *Xolmis cinereus*
Em 1 de outubro de 2017 foi registrado um indivíduo (W. F. Teixeira; WA 2727028) no bairro Vila Minas Gerais (22º31'38.917"S 52º9'43.351"W). Além de a espécie ter sido registrada em Teodoro Sampaio, também foi observada no município de Euclides da Cunha Paulista (49,3 km distante sul-oeste Teodoro Sampaio). Ocorre na Argentina, Uruguai, Paraguai, Bolívia, Suriname e do norte ao sul do Brasil, em quase todos os estados; durante o inverno austral a espécie migra, mas seu registro é constante durante todo o ano, ao menos no Rio Grande do Sul[11].

Sanhaçu-papa-laranja *Pipraeidea bonariensis*
Um macho foi observado em um bosque urbano em 13 de outubro de 2017 (W. F. Teixeira; WA 2986213). O registro ocorreu no bairro Vila São Paulo (22º31'52.33"S 52º10'36.16"W) e, é o primeiro para o oeste do Estado de São Paulo. Consequentemente, amplia sua distribuição geográfica em aproximadamente 150 km para o oeste de sua atual distribuição no estado (comparar em: T. Ricardo; WA 1567338). Na base de dados do Wiki Aves há um registro anterior para Teodoro Sampaio (F. Branquinho; WA 2986004) feito por um observador de aves, colaborador de nossas pesquisas, e dois registros próximos, em Mandaguaçu, Paraná (M. F. Agostinho; WA 1943748) e Nova Andradina, Mato Grosso do Sul (A. Polatto; WA 1082219), sendo suas distâncias em linha reta, de 90 km e 125 km, respectivamente. Em trabalhos de campo de Willis & Oniki[17], realizados no município de Teodoro Sampaio e em outros municípios do Pontal do Paranapanema, a espécie não foi registrada. Está distribuída vastamente nos Andes e sul da América do Sul; em Brasil pode ser encontrada do sul de São Paulo ao Rio Grande do Sul[12].

Nosso trabalho sugere que é possível registrar outras espécies inéditas no município de Teodoro Sampaio com aumento do esforço amostral. Portanto, recomendamos novos projetos com enfoque na avifauna na região, que contém o maior

remanescente de mata estacional semidecídua do interior paulista. Com esta atualização, em Teodoro Sampaio constam 381 espécies de aves. No entanto, outros municípios do Pontal do Paranapanema continuam sem informações recentes sobre suas avifaunas, o que os tornam alvos prioritários para futuros levantamentos no oeste paulista.

Agradecimentos

Ao Carlos Eduardo Oliveira Viana (Oriximiná, PA) pelo incentivo no desenvolvimento do projeto e apoio na identificação das espécies. Ao Eriqui Marqueti Inazaki, gestor do Parque Estadual do Morro do Diabo. Ao Museu de Zoologia da Universidade de São Paulo (MZUSP), IdeaWild, The Rufford Foudation (18269-1), CNPq (503496/2014-6) e Milton C. Ribeiro.

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Coincident high-elevation sightings of two rare Neotropical herons and their possible significance

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Received 31 May 2018; final revision accepted 14 February 2019
Cotinga 41 (2019): 75–80
published online 21 June 2019

Reportes aislados de garzas de tierras bajas a altas elevaciones a lo largo de la ladera oriental de los Andes sugieren que estos hábitats atípicos pueden ser recursos temporalmente importantes. Aquí reportamos un registro inusual obtenido en febrero de 2017 de dos garzas típicas de elevaciones bajas, encontradas sintópicamente a 2.700 m cerca de Guango Lodge, provincia de Napo, a lo largo del río Papallacta, en la vertiente oriental de los Andes ecuatorianos. Una Garza Tigre Barreteada *Tigrisoma fasciatum* inmadura, identificada como un ave de primer año por la presencia de plumas vellosas en la parte inferior de la corona, se detectó por primera vez el 20 de febrero e intermitentemente durante al menos un mes más. Un probable inmaduro de Garza Agamí *Agamia agami* también se registró en el mismo tramo del río en una ocasión durante ese intervalo. La sintopía de las dos garzas, junto con la evidencia de la progresión de la muda y la residencia prolongada de la garza tigre, sugieren que las garzas no reproductoras pueden satisfacer requisitos de energía importantes en hábitats de alta elevación. Informes anteriores de jóvenes de garza tigre en la misma localidad implican el uso regular de la zona, lo que puede ayudarles a evitar la competencia con adultos en hábitats a elevaciones más bajas. Una racha seca regional prolongada a principios de 2017 probablemente mejoró las condiciones de cacería para estas especies de garzas que pescan en orillas, quizás facilitando sus movimientos altitudinales. El cambio climático podría promover movimientos ascendentes en el futuro, lo que puede ser problemático para los esfuerzos de piscicultura realizados por encima de las distribuciones altitudinales de muchos piscívoros aviares (<3.000 m).

As with many tropical sites globally, the Neotropical lowlands harbour an ecologically diverse heron fauna[7,9,11]. However, some Neotropical lowland ecosystems lie adjacent to extensive upland and alpine areas, especially along the Andes. Use of Andean regions by herons[2,6,13], including species typically found in and around the Amazon basin, is poorly understood, although many Neotropical herons and other waterbirds undertake dramatic seasonal movements[1,3,4,6,14,15].

Both Fasciated Tiger Heron *Tigrisoma fasciatum* and Agami Heron *Agamia agami* are local and poorly known species mainly found at lower elevations in Central and South America[5–8]. Fasciated Tiger Heron prefers turbulent rivers in the foothills and subtropics, whereas Agami Heron favours sluggish forest streams in the lowlands. However, both species are rarely reported high in the Andes[6], and undertake strong post-breeding movements (up to 1,250 km in Agami Heron[14]). Therefore, it was of considerable interest that within just two days in early 2017, both species were observed at c.2,700 m along a single stretch of the río Papallacta near Guango Lodge, Napo province, on the east slope of the Ecuadorian Andes. Field work over the next month attempted to gather more information on the local status of each species, and appeared to reinforce evidence for an apparent influx of certain herons in recent years that may reflect local and more global environmental changes.

Observations were made intermittently between 14 February and 1 April 2017 at Guango Lodge (0º22'46.56"S 78º04'36.12"W), a private nature reserve in the valley of the río Papallacta between Cayambe Coca National Park and Antisana Ecological Reserve, approximately c.10 km by road (and 300 m in elevation) below the town of Papallacta. Observations were conducted via a 242.5 m-transect along a pre-established trail running east–west on the north bank of the river (the lodge's 'Torrent Duck Trail'). Both ends of the transect provide broad views up and down river. The intervening section lies within closed riparian forest, providing cover to observe shorter sections of river. Censusing was conducted at varying intervals within the study period, which was unusually dry and sunny for the season[13]. All observations were made in daylight, including near dawn and dusk.

Results

Fasciated Tiger Heron *Tigrisoma fasciatum*

Identification and age.—A tiger heron in immature plumage was initially encountered on a small boulder at the edge of a turbulent stretch of the river on 20 February. The robust bill and legs, paler

Table 1. Heron sightings along the río Papallacta, below Guango Lodge, February–March 2017.

Date	Species	First sighting	Site[1]	Duration[2]	Weather
20 February	Fasciated[3]	15h31	closed	29 minutes	sunny
21	Agami	13h15	open	15 seconds	sunny
22	Fasciated	12h31	closed	80 minutes	sunny
23	Fasciated	11h47	open	108 minutes	sunny
24	none			110 minutes	sunny
25	none			670 minutes	sunny
26	none			399 minutes	sunny
28	none			173 minutes	sunny
17 March	none			397 minutes	sunny
20	Fasciated	13h05	closed	76 minutes	sunny to stormy
31[4]	none			176 minutes	sunny

[1]Closed = forested riverbank; open = broader, more open stretch of river at or away from forest edge, not enclosed by forest.

[2]Except in the case of the Agami Heron, sightings were terminated by the observer.

[3]Immature, possibly the same bird, observed independently on 9 February by BirdEcuador tour.

[4]A prolonged dry spell at Guango began in late January and ameliorated around 20 March. However, water levels in the río Papallacta remained low until heavy rains occurred at higher elevations during the night of 30 March. No herons were seen subsequently, but surveys ended on 1 April.

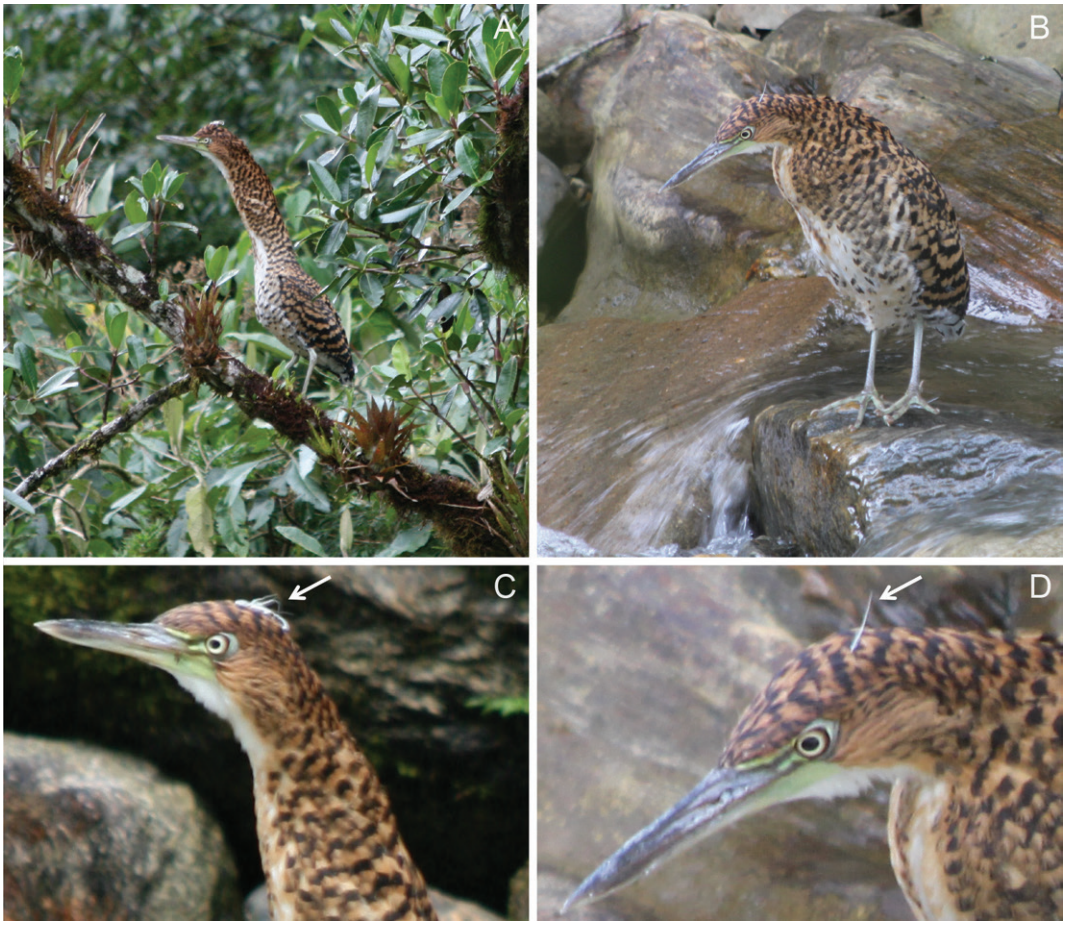

Figure 1. Fasciated Tiger Heron *Tigrisoma fasciatum*, along the río Papallacta at Guango Lodge on 22 February (A, C) and 20 March (B, D) 2017. Note the downy plumes on 22 February (C) and 20 March (D) are just posterior to the second dark band behind the eye, supporting the interpretation that the same moulting individual was involved. Rain has matted the down in C, but dry feathers had the typical texture of natal down (R. Bleiweiss)

Figure 2. Río Papallacta in early 2017, during a dry period when herons were observed (A, 23 February) and following a night of heavy rains (B, 31 March) at higher elevations, taken from a bridge upstream of where both herons were sighted, at the more open, west end of the transect (R. Bleiweiss)

rufous plumage with black barring and extensive white underparts, and habitat, all identified it as a Fasciated Tiger Heron, rather than Rufescent Tiger Heron *T. lineatum* (Fig. 1A, 1C). Fasciated Tiger Herons gradually acquire darker and more finely barred adult plumage over four years[11]. Thus, the bird's coarse rufous and black barring suggested it was a young immature, and the distinctive downy topknot (Fig. 1) pointed to a hatch-year individual, as extensive down is present on the crowns of heron fledglings[7], including this species (http://www.wikiaves.com.br/wiki/soco-boi-escuro).

The similar plumage pattern and location of the down in images intermittently taken of the species along the same stretch of river until 20 March (Fig. 1B, 1D) indicated that the same individual was seen each time (Table 1, Fig. 1). Furthermore, the more extensive down observed in late February (Fig. 1C) compared to late March (Fig. 1D) suggested moult progression.

Ecological range.—In western South America, Fasciated Tiger Heron generally occurs in the Andean foothills at c.600–2,200 m, although locally it has been recorded lower in Ecuador (e.g., at 100 m along the río Santiago, Playa de Oro, north Esmeraldas)[13,16] and elsewhere[5,8]. However, especially immatures have been observed at higher elevations (to 3,300 m) in arid Andean valleys[6]. The Guango bird was usually seen beside the river in riparian forest, similar to typical habitat at lower elevations. However, one sighting was made in the broader, more open stretch of the river at the west end of the transect, downstream from but near where the Agami Heron was seen (see below; Table 1). Thus, the new records provide additional evidence that young range up to 2,700 m, and add upper montane cloud forest (typical of the Guango environs) to the species' ecological range.

Behaviour.—All encounters were in white-water areas (Fig. 2A), either at the water's edge or amid the river's braided course. The bird typically perched on boulders, when its postures suggested that it was hunting (Fig. 1B). Other interpretations (prospecting, resting) could apply, however, especially when it perched on boulders that were too tall to permit the bird to reach aquatic prey.

The bird was wary, and on different occasions retreated into one of the several dark, cave-like recesses on the riverbank created by overhanging

bamboo and other vegetation (Fig. 2A). Once, when an observer pressed closer for a photograph, the bird flew directly from the river's boulder field to a tree (Fig. 1A). During these encounters, the bird repeatedly raised its crown feathers, stretched and contracted its neck (Fig. 1A), and depressed its tail. The bird returned to the boulder field when the observer was still, supporting earlier evidence that the species can habituate to an observer's presence[7].

Agami Heron *Agamia agami*

Identification and age.—While searching the river in fine weather in the early afternoon of 21 February, another dark heron was flushed from a boulder field in a broader, more open stretch at the west end of the transect. It landed on a horizontal branch c.1 m up along the edge of a dense tangle of high watermark debris comprising logs and branches at the river's edge. Here it remained motionless in a more horizontal posture for c.15 seconds, before disappearing into the forest.

The encounter was too brief to document with a photograph. However, the unobstructed view with binoculars of the perched bird revealed a remarkably long bill and neck, disproportionately short legs, prominent white line on the sides of the throat and brown neck, and a shining bluish-green dorsum. Adult features[10,11] such as the silvery, filigreed plumes of the head, iridescent blue hackles on the neck, and chestnut belly were not noted. Immature *A. agami* is extensively brown above, so the bird was probably acquiring adult plumage (which takes three years[10,11]). Immature or non-breeding adult status would be consistent with the time of the sighting, as in the west of the range the species breeds from approximately May (or as early as March; J. Freile pers. comm.) to September[10,11].

Ecological range.—This is the first record of *A. agami* anywhere in the highlands of Ecuador. Given the species' known habits, the elevation and habitat of our sighting were even more remarkable than for the *T. fasciatum*. Nevertheless, the banks and canyon of the río Papallacta around Guango are extensively forested, providing the dense cover favoured by the species at lower elevations. Moreover, the bird was flushed from a broader stretch of river where the water was shallower and less turbulent, in keeping with its preference at lower elevations for slower-moving streams. Despite the novelty of the Guango sighting, *A. agami* has been recorded at similar elevations (2,600 m) on the savannas of Bogotá and Ubaté, on the eastern slope of the Colombian East Andes[6]. The available data suggest that young or non-breeding *A. agami* are capable of upslope movements into habitats at higher elevations.

Behaviour.—Agami Herons are harder to locate away from their breeding colonies due to their secretive habits, motionless foraging strategy, and preference for dense cover[9–12]. Encountering the species along a montane white-water river was remarkable given the species' preference for sluggish forest streams. However, the apparent ease with which it flushed, and its quick getaway, conformed to the species' generally retiring habits (cf. Fasciated Tiger Heron; Table 1). Moreover, the bird was never seen again despite additional searches over the next month (see above). This is consistent with the species' general reluctance to return to sites where it has been disturbed[10] (cf. Fasciated Tiger Heron).

Occurrence patterns at Guango

Observations made by the large number of ecotourists that visit Guango annually provide important supplementary evidence that immature *T. fasciatum* frequented the area mostly during the same period (January–May) in other years (Table 2; not all sightings indicated age). The finer barring on the plumage of at least one of these other birds, the seven-year span encompassed by the observations, and the likely age of the 2017 individual (Table 2) suggest that multiple individuals and age classes were involved. The single record of *A. agami* does not permit similar comparisons for that species. Both herons were sighted during midday hours on sunny days (Table 1), suggesting that in montane habitats their favoured activity periods overlap.

Full details regarding the daily whereabouts of either heron (continuously present or sometimes absent?) during the study period are unknown. However, failure to record either species on 24–28 February despite relatively intensive searches (Table 2) suggests that one or both were absent from the area during this period, following which specific efforts to locate them were not resumed until 17 March. The moult progression of the *T. fasciatum* when it was re-sighted on 20 March (Fig. 1C–D) implies that this individual had been meeting its energy requirements during the intervening period.

Discussion

Additional high-elevation records for *T. fasciatum* and *A. agami* suggest that upper Andean riparian forests can be important, if suboptimal, habitats for immature or non-breeding herons[1]. Based on the data presented here, use of such sites is deliberate, not casual, and can sustain a heron for some time (at least four weeks in the case of the *Tigrisoma* in 2017). Possibly, higher elevations provide younger birds with suitable foraging areas free of adult competitors, as we recorded only an adult during our survey for *T. fasciatum* in more typical foothill haunts at 1,100 m, along the río Hollín at Narupa Reserve, Napo province, on 17 April 2017.

Table 2. Recent heron sightings at Guango Lodge, based on web reports or photographs, and the current study.

Date	Species	Age class	Criterion[1]	Behaviour	Habitat
8 November 2010[2]	Fasciated	unknown		flushed	along river
27 January 2015[3]	Fasciated	immature	c. first-year	foraging	along river
28 February 2015[4]	Fasciated	immature	> first-year	in flight	over river
April 2015[5]	Fasciated	immature	c. first-year	perched	vegetation
20 February 2017[6]	Fasciated	immature	c. first-year	foraging	along river
21 February 2017[6]	Agami	immature	> first-year	foraging	along river
5 May 2018[7]	Fasciated	unknown		no data	no data
29 August 2018[7]	Fasciated	unknown		no data	no data

[1]Younger (c. first-year) birds are more finely barred than older (> first-year) individuals, but precise ageing is very difficult.

[2]R. Cannings: first known sighting for Guango. No photograph. https://dickcannings.com/2010/11/08/ecuador-2010-the-east-slope-of-the-andes/.

[3]R. Fairbanks: bird appeared to lack natal down so might have been a more advanced first-year or older immature. http://birdingneversleeps.blogspot.com/2015_01_01_archive.html.

[4]BirdForum Gallery. Distant view of possibly >first-year, based on more finely barred plumage. No natal down visible. https://www.birdforum.net/opus/Fasciated_Tiger-Heron.

[5]B. Porter: blog post. Heron facing observer, so any natal down on crown invisible. http://benporterphotography.blogspot.com/2015/02/.

[6]Fasciated Tiger Heron was recorded in the area until at least 20 March 2017 (minimum), the Agami Heron on just one day.

[7]eBird hotspots for Guango Lodge, 2018. https://ebird.org/view/checklist/S45355217 (5 May); https://ebird.org/camerica/hotspot/L489428?yr=all&m=&rank=mrec (29 August).

Guango Lodge was opened in 2000, but herons were not reported there until 2010, suggesting a recent and perhaps growing influx (Table 2). This trend requires further study, as it is difficult to disentangle from the growing number of ecotourists (I. Bustamante pers. comm.) visiting Guango. Notably, prior records (Tables 1–2) of *T. fasciatum* around Guango occurred more frequently during relatively drier months of the year, when lower water levels might provide fishing herons with suitable and increased foraging habitat. Herons were not recorded after heavy rains resumed and the river became a raging torrent (Table 2; Fig. 2), although our field work was suspended shortly thereafter. Upslope movements by herons may continue as a result of warming and drying due to local and global climate change (e.g., a strong El Niño in 2016–17). Incidental enrichment of local food stocks by fish farms (above Guango at Papallacta, as well as downstream) may further promote such movements.

The ecology of herons in montane environments deserves much greater attention from conservationists. For example, an ongoing upslope trend could lead to detrimental interactions between herons and nearby fish farm operations at Papallacta. Hopefully, this brief account will inspire more intensive searches for herons in upper montane riparian forest, or at least an increased awareness that sightings are possible. Given the retiring habits of both heron species in this study, camera traps and telemetry studies[4,14] may provide the best means to assess movement patterns over time and space.

Acknowledgements

Special thanks to Irene Bustamante, proprietor of Guango Lodge, for her permission to conduct this work, generous support, and insights into local conservation issues. She and her fabulous staff worked tirelessly to make our stay comfortable and successful. We also thank Fundación Jocotoco and Mario Pilataxi for permitting access to Narupa Reserve. Juan Freile, Charles Vogt, Mitch Lysinger and an anonymous reviewer made many helpful comments on the manuscript, and Freile and Guy Kirwan provided additional data and editorial assistance. We thank Sarah Friedrich for her meticulous work on the figures. This research did not receive any specific grant from agencies in the public, commercial or not-for-profit sectors.

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Expansão de distribuição geográfica para região do Jalapão de três espécies de Passeriformes encontradas no Cerrado brasileiro

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Received 12 August 2018; final revision accepted 17 March 2019
Cotinga 41 (2019): 81–86
published online 21 June 2019

The Jalapão region in eastern Tocantins, central Brazil, is one of the most important areas for bird conservation in the Cerrado biome. We present new records of Tropical Gnatcatcher *Polioptila plumbea*, Black-masked Finch *Coryphaspiza melanotis* and Sharp-tailed Tyrant *Culicivora caudacuta* from the region. Records of *Polioptila plumbea* and *Coryphaspiza melanotis* extend the known distributions of these species and confirm their occurrence in the state of Tocantins, while those of *Culicivora caudacuta* extend the species' known range in the Jalapão region. The Jalapão region has biogeographic affinities to both the Caatinga biome and the southern part of the Cerrado biome. The presence of *Coryphaspiza melanotis* and *Culicivora caudacuta* in the region underlines the importance of Jalapão for bird conservation, harbouring as it does several species currently considered to be threatened.

O Cerrado é considerado o segundo maior bioma da América do Sul, localizado na região central do Brasil, alcançando os limites da Bolívia e Paraguai[1]. Embora sejam listadas 856 espécies de aves para o Cerrado[28], a riqueza de espécies dentro dos limites do bioma já supera essa marca e possivelmente já tenha atingindo as 900 espécies, visto que espécies desconhecidas para o bioma têm sido registradas sistematicamente nos últimos anos[8,12,18,22,24].

Uma das áreas mais relevantes para conservação das aves do bioma Cerrado é a região do Jalapão, localizada predominantemente no leste do Estado do Tocantins, mas também presente nos estados da Bahia, Piauí e Maranhão. A região conta com uma marcante heterogeneidade ambiental, devido ao mosaico de fitofisionomias, e com um complexo de unidades de conservação de proteção integral com mais de um milhão de hectares. A avifauna local tem sido alvo de inventários ornitológicos sistematizados, sobretudo nos últimos 15 anos, revelando uma riqueza superior a 300 espécies[6,16,22,24].

Destaca-se no Jalapão a ocorrência de umas das últimas populações do pato-mergulhão *Mergus octocetaceus*[2,4], espécie considerada criticamente ameaçada de extinção[9,13]. Além disso, é verificada a presença de inúmeras espécies global e nacionalmente ameaçadas de extinção, como a arara-azul-grande *Anodorynchus hyacintinus*[7] e espécies endêmicas do Cerrado, em especial aquelas de hábitos campestres como inhambu-carapé *Taoniscus nanus*, cigarra-do-campo *Neothraupis fasciata*, mineirinho *Charitospiza eucosma* e papa-mosca-do-campo *Culicivora caudacuta*[10,16,22]. Cabe destacar que registros inéditos na região têm promovido à expansão considerável da distribuição geográfica de várias espécies, conforme constado para maria-preta-de-garganta-vermelha *Knipolegus nigerrimus*[3], bacurau-de-rabo-branco *Eleothreptus anomalus*[16], mocho-dos-banhados *Asio flammeus*[22] ou mesmo *Culicivora caudacuta*[6].

Desta forma, trabalho apresenta registros de *Culicivora caudacuta*, balança-rabo-de-chapéu-preto *Polioptila plumbea* e tico-tico-de-máscara-negra *Coryphaspiza melanotis* em localidades tanto marginais quanto nucleares do Jalapão, no Estado do Tocantins, bem como na porção baiana, já na divisa entre os estados da Bahia e Tocantins. Embora sejam espécies conhecidas nos limites do bioma Cerrado, são escassamente registradas no Jalapão e suas ocorrências confirmadas na região expandem consideravelmente suas distribuições geográficas, consolidando principalmente suas ocorrências no Estado do Tocantins.

Papa-moscas-do-campo *Culicovora caudacuta*

Considerada globalmente vulnerável de extinção[9], habita cerrados com vegetação herbácea-arbustiva com presença de gramíneas, assim como campos sujos, preferencialmente com solo menos exposto e formado por arbustos baixos[10,26,27,29]. A distribuição da espécie é apontada para centro-norte da Bolívia, sudeste do Paraguai e norte da Argentina[23,26]. No Brasil a espécie era reconhecida apenas para região centro-sul do país, contudo novos registros em regiões setentrionais do bioma Cerrado e enclaves campestres amazônicos ampliaram substancialmente a sua distribuição geográfica para o Tocantins, Bahia, Maranhão e Amazonas[6].

No Jalapão sua presença é confirmada para região da Reserva Particular do Patrimônio Natural Minnehaha (V. Braz com. pess.), Parque Estadual do Jalapão[17], buritizais na região de Lizarda[16]

Figura 1. À esquerda indivíduo de papa-moscas-do-campo *Culicivora caudacuta*, Rio Sono, Tocantins, 27 de agosto de 2016 (Tulio Dornas); à direita macho de balança-rabo-de-chapéu-preto *Polioptila plumblea*, município de Mateiro, Tocantins, 28 de março de 2018 (Wanieulli Pascoal)

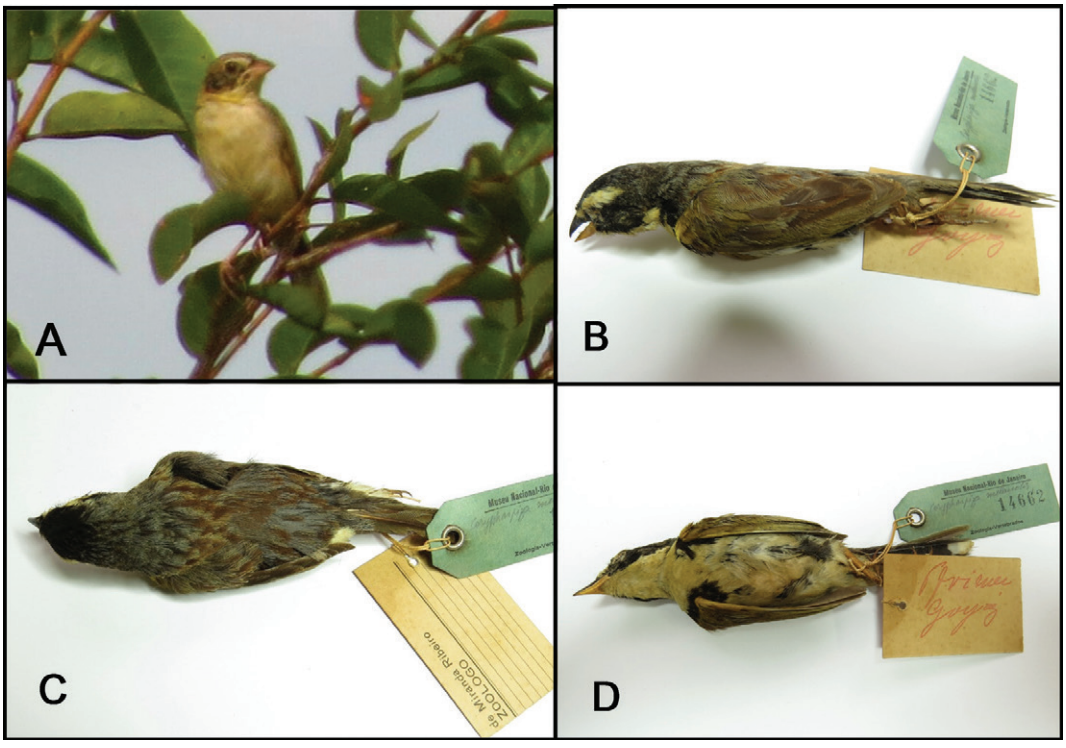

Figura 2A. Jovem de tico-tico-de-máscara-negra *Coryphaspiza melanotis*, Mateiros, Tocantins, 24 de março de 2018 (Wanieulli Pascoal); B–D: macho de *C. melanotis* depositado no Museu Nacional (MN14662) coletado pelo Rudolph Pfrimer entre o sudeste de Tocantins e nordeste de Goiás, na década de 1920; na etiqueta, Pfrimer faz alusão na determinação da localidade de coleta apenas à 'Goyaz' (Marco A. Crozariol).

e para uma série de sete veredas na Estação Ecológica Serra Geral do Tocantins (EESGT)[6]. Apresentamos, portanto, um conjunto de sete novas localidades de ocorrência da espécie na região do Jalapão, cujos registros foram efetuados entre agosto de 2016 e março de 2018, nos municípios de Rio Sono e Mateiros.

Em 27 de agosto de 2016, às 17h30 TD registrou um casal de *C. caudacuta* em área de cerrado campo sujo no município de Rio Sono (09°44'58"S 47°29'56"W; 300 m) equidistante de 1,5 km de duas veredas. O casal foi visualizado após uso de playback, um dos indivíduos foi fotografado (Fig. 1; www.wikiaves.com; WA2623828) e teve

sua vocalização gravada (www.xenocanto.org; XC417347). Na localidade deste registro foram também identificadas outras espécies típicas de formações campestres do Cerrado: *Charitospiza eucosma*, *Neothraupis fasciata*, bandoleta *Cypsnagra hirundinacea*, suiriri-da-chapada *Suiriri affinis*, batuqueiro *Saltatricola atricollis* e maria-corruíra *Euscarthmus rufomarginatus*.

Também para o município de Rio Sono, WP obteve mais três registros da espécie. Em 31 de agosto de 2016, às 08h30 foi observado um bando com quatro indivíduos em área de vereda (09°25'27"S 47°15'50"W; 330 m), sendo estes avistados após o uso de playback e também fotografados (WA2730205). Em 5 de março de 2017, às 07h40 foi detectado um bando com três indivíduos, próximo à cabeceira do ribeirão Areias (09°48'15"S 47°34'48"W; 345 m) em área de campo úmido. Em 9 de março de 2017, às 10h30 no povoado Mansinha, em área de vereda (09°20'19"S 47°16'36"W; 275 m) foi observado um bando com três indivíduos no final da tarde.

Para o município de Mateiros, foram realizados três registros. Em 24 de março de 2018, às 08h30 WP registrou um bando com quatro indivíduos em área campestre (10°23'34"S 46°03'39"W; 780 m), onde um dos indivíduos foi fotografado (WA3057568). No dia seguinte, às 09h30 foi observado um bando com cinco indivíduos em área de cerrado campo sujo adjacente a uma plantação de soja (10°27'56"S 46°08'34"W; 770 m). Um dos indivíduos tratava-se de um filhote recém-saído do ninho. Os indivíduos do bando revezavam na proteção do mesmo e vocalizavam constantemente. No dia 26, às 07h45 um bando com três indivíduos foi registrado em área de vereda (10°22'49"S 46°08'51"W; 665 m), onde os mesmos estavam pousados em capim do gênero *Lagenocarpus*.

Os referidos registros, juntamente com aqueles descritos por Dornas & Crozariol[6], ampliam a ocorrência da espécie ao longo de grande parcela do Jalapão tocantinense. O número expressivo de indivíduos visualizados reflete a existência de uma população significativa e numerosa da espécie na região, acompanhando as indicações populacionais inferidas para a espécie na EESGT[6]. Contudo, apesar de se presumir uma elevada representatividade da população legalmente protegida da espécie em níveis nacionais no Jalapão, os registros aqui apresentados ocorreram em áreas destinadas às atividades de silvicultura, onde presumisse ocorrerá em breve a substituição da vegetação nativa por eucaliptais.

Balança-rabo-de-chapéu-preto *Polioptila plumbea*

Espécie com ampla distribuição geográfica, se estendendo desde a América Central à América do Sul passando pela Amazônia e nordeste do Brasil[23]. No Brasil são reconhecidas pelo menos quatros subespécies: *P. p. plumbea*, *P. p. atricapilla*, *P. p. innotata* e *P. p. parvirostris*. Entretanto, análises filogeográficas apontam forte estruturação populacional dentro da espécie, separando as populações da Caatinga (*P. p. atricapilla*), e baixo rio Amazonas (*P. p. plumbea*), por exemplo, em duas populações distintas passíveis de validação a nível específico[14].

No Tocantins a ocorrência da espécie é controversa, não havendo até o momento disponível documentação que ateste a sua presença incontestavelmente. Pacheco & Olmos[16] avistaram alguns indivíduos da espécie, presume-se fêmeas e machos, mas não há nenhum detalhamento no texto (os machos oferecem diagnose segura para distinguir a espécie do balança-rabo-de-máscara *P. dumicola*), no extremo leste do Tocantins, na região de Lizarda, quase divisa com Estado do Maranhão. Outro registro, este documentado, trata de uma fêmea da espécie para região de Mateiros (R. Biancalana; WA22559), no entanto, as fêmeas de *P. dumicola* são bastante similares, não permitindo uma identificação segura do indivíduo documentado. Portanto, apresentamos dois novos registros de *P. plumbea*, devidamente documentados, referentes à indivíduos machos, sendo um no Tocantins e outro na Bahia, ambos próximos a divisa entre os dois estados.

Em 23 de março de 2016, às 16h30, TD registrou um casal de *P. plumbea* nas margens da Rodovia Estadual BA-458, no município de Formoso do Rio Preto, no limite sul da porção baiana da EESGT (10°47'57"S 46°12'20"W; 725 m). O casal foi avistado e ouvido, sendo o macho fotografado (WA3057496). Os indivíduos encontravam-se em uma área que mesclava cerrado *sensu stricto* e cerradão, onde a vegetação é relativamente bem adensada, com árvores com altura entre 6–9 m. O registro foi efetuado no declive entre o patamar mais alto da Serra Geral e o intermediário, há pouco mais de 2,5 km da divisa entre Bahia e Tocantins, cujo limite é a encosta da Serra Geral. Trata-se do primeiro registro da espécie na EESGT, uma vez que os inventários anteriores não a detectaram[6,22].

Em 28 de março de 2018, às 07h20, WP registrou um indivíduo macho de *P. plumbea*, sendo este fotografado (Fig. 1; WA3057579) em área de cerrado *sensu stricto* (10°29'47"S 46°10'39"W; 760 m) no município de Mateiros. O indivíduo foi detectado em um bando misto formado em comportamento de tumulto (*mobbing*) após a reprodução da vocalização de caburé *Glaucidium brasilianum*.

Os registros de *P. plumbea* apresentados juntamente com o registro de Pacheco & Olmos[16] foram todos efetuados nas porções mais altas do espigão norte-sul da chapada da Serra Geral, em altitudes entre 500–800 m. Os inventários

realizados ao longo da EESGT predominantemente ocorreram nos patamares intermediário e inferior da região da Serra Geral, em altitudes abaixo de 500 m, onde não foi detectado *P. plumbea*[6,22].

Pacheco & Olmos[16] argumentam que em regiões de altitudes inferiores, a poucos km a oeste dos pontos de registros de *P. plumbea* no município de Lizarda, na divisa entre Maranhão e Tocantins, já se observa uma substituição marcante da espécie pelo seu congênere de *P. dumicola*, a qual é bastante comum nas demais porções tocantinenses do Jalapão (TD obs. pess.). Pacheco & Olmos[16] sugerem a existência de uma faixa de simpatria entre as duas espécies, nessa região do Jalapão.

Os registros apresentados reforçam a existência dessa zona de simpatria a qual deve ocorrer ao longo do patamar superior da Serra Geral, onde as altitudes são mais elevadas (acima de 600 m). Sua extensão será mais proeminentemente para leste, adentrando aos estados da Bahia e Maranhão, devido à presença já confirmada de *P. dumicola* nestes estados (A. C. Lees; WA1342427, J. R. Matos; WA1974081) e em detrimento da ausência de registros de *P. plumbea* em áreas mais centrais do Tocantins. Os registros de simpatria detectados no Refúgio da Vida Silvestre Veredas do Oeste Baiano[16] suportam essa condição, uma vez que *P. plumbea* não foi encontrada em localidades a oeste do espigão mestre da Serra Geral, em território tocantinense[6,17,22].

Do ponto de vista taxonômico os registros de *P. plumbea* efetuados na região do Jalapão devem ser relacionados à população de *P. p. atricapilla*. O uso de habitat savânicos na região, onde há influência de elementos florísticos e faunísticos da Caatinga, a proximidade geográfica com este bioma do nordeste brasileiro e os resultados de análises moleculares recentes[14] ratificam essa condição. Espera-se, portanto, que populações de *P. p. plumbea*, presentes no baixo Amazonas, ocorram no Tocantins, eventualmente, nas florestas ombrófilas da margem tocantinense do baixo rio Araguaia.

Tico-tico-de-máscara-negra *Coryphaspiza melanotis*

Considerada globalmente vulnerável de extinção[9] e nacionalmente em perigo de extinção[13], trata-se de uma espécie campestre, sobretudo em cerrados do tipo campo limpo e campo sujo[26–28]. Ocorre no Cerrado brasileiro, alcançando savanas da Bolívia, Paraguai e Argentina[23,26]. No Brasil apresenta população isolada na ilha de Marajó (*C. m. marajoara*[23], A. C. Lees' WA518891) e também em enclaves de Cerrado no litoral do nordeste, no Rio Grande do Norte[19]. A descoberta desta espécie no Tocantins, e em especial no Jalapão, passou despercebida por vários importantes inventários ornitológicos nestes últimos dez anos[6,16,22]. O primeiro registro da espécie no Jalapão, por conseguinte no Tocantins, foi efetuado recentemente em trabalho fotográfico-documentativo publicado sobre a flora e fauna do Jalapão[25] (L. Scalon; WA2518334). O encontro ocorreu em área de campo limpo marginal a vereda, nas margens do rio Sono, junto ao ribeirão Frito Gordo (L. Scalon com. pess.).

Apresentamos mais dois registros da espécie para a região do Jalapão. Em 24 de março de 2018, às 09h00, WP registrou um indivíduo macho jovem (Fig. 2A; WA3057581) (10°23'24"S 46°04'24"W; 785 m) em cerrado em regeneração e em 26 de março de 2018, às 17h25, um bando com três indivíduos, sendo dois jovens e um macho adulto (10°27'39"S 46°08'42"W; 775 m) em área de cerrado campo sujo.

No entanto, ambos os registros ocorreram muito próximos à plantação de soja ativas, em altitudes superiores à 700 m. A maior parte do cerrado campestre, à leste dos locais dos registros, foram quase todos suprimidos, totalizando uma perda de mais de 100,000 ha de vegetação savânica nativa. Assumimos o estabelecimento pretérito da espécie ao longo dessa área suprimida, no momento destinado à monoculturas de soja e milho. Investidas ornitológicas na área podem confirmar o desaparecimento total da espécie ou a possível presença de algum indivíduo.

A supressão dos cerrados campestres da região do Jalapão, externos aos limites das áreas protegidas da região, tem ocorrido em altíssima velocidade e a inexistência (ainda que momentânea) de registros da espécie no interior do Parque Estadual do Jalapão e na EESGT, unidades de conservação locais de proteção integral, não permitem até o momento inferir nada de concreto sobre uma proteção legal eficiente da espécie na região. A expectativa, sobretudo baseado nos registros apresentados, é que as unidades de conservação do Jalapão tenham registros da espécie confirmados nos próximos anos, o que elevará a proteção legal da espécie em sua plenitude ao longo do bioma Cerrado.

Entretanto, vale ainda uma interessante ressalva histórica de registro pretérito da espécie no Estado do Tocantins. O naturalista austríaco Rudolph Pfrimer coletou um exemplar de *C. melanotis*, atualmente depositado no Museu Nacional do Rio de Janeiro (MN 14662), em suas expedições na porção nordeste de Goiás e sudeste de Tocantins durante a década de 1920 (Fig. 2B–D). No entanto, a etiqueta associada a este espécime apenas traz como localização de coleta o enunciado 'Goyaz', fazendo referência a então província de Goyaz, que abrangia os atuais estados de Goiás e Tocantins.

Conforme constatado junto aos espécimes coligidos por este naturalista, depositada no MN, localidades como Cavalcante e Alto Paraíso de Goiás, na região da Chapada dos Veadeiros, no Estado de Goiás, foram alvos de coletas de R. Pfrimer, onde a

espécie é satisfatoriamente conhecida, remetendo-se a origem deste espécime, MN14662, a esta região de Goiás. É sabido junto a outros espécimes coligidos por R. Pfrimer da sua passagem pelas regiões de Taguatinga (na época Santa Maria de Taguatinga—série de espécimes que compõem o holótipo e parátipos de tiriba-de-pfrimer *Pyrrhura pfrimeri*) e Dianópolis (na época São João do Duro), localidades do sudeste do Tocantins. Além disso, há coletas de algumas espécies cujas atribuições nas respectivas etiquetas de campo remetem apenas à localidade 'Serra Geral'.

A Serra Geral se inicia na tríplice divisa entre Minas Gerais, Bahia e Goiás, e se estende até a região da tríplice divisa entre Tocantins, Maranhão e Piauí, com mais de 600 km de extensão, na porção central do Brasil. Em função das prospecções realizadas por R. Pfrimer em toda essa região na década de 1920, a localidade 'Serra Geral' anotada em suas etiquetas, devem ser compreendidas desde o município de Posse, em Goiás, até Dianópolis, no Tocantins, sempre adjacentes as atuais divisas destes dois estados ao oeste do Estado da Bahia. Portanto, em função dos registros apresentados neste trabalho para o Jalapão, não há razão para se descartar uma possível origem tocantinense do espécime MN14662, embora menos provável, e igualmente, a autoria do suposto primeiro registro da espécie para o Tocantins a este notável naturalista europeu do início do século XX.

Considerações finais

Os registros apresentados podem ser interpretados sob diferentes óticas, das quais são destacadas, minimamente duas: biogeográfica e conservacionista. Do ponto de vista biogeográfico, os registros apresentados demonstram que o Jalapão tem se mostrado uma região com destacada influência da presença de espécies típicas das porções meridionais do Cerrado e / ou associadas às regiões tipicamente campestres da Mata Atlântica, bem como também de espécies associadas e presentes na Caatinga. Os registros de *Culicovora caudacuta*, e principalmente *Coryphaspiza melanotis*, demostram uma ligação histórica evolutiva entre o Jalapão e as porções meridionais do Brasil, ao invés das regiões savânicas do centro-oeste do Tocantins, onde essas espécies tem se demonstrado ausentes[5,11,15,20,21]. Concomitantemente, *Polioptila plumbea* demonstra uma relação histórica evolutiva da região do Jalapão com a região nordeste, sobretudo com avifauna da Caatinga, quando assumimos que os registros da espécie para o Jalapão são de *P. p. atricapilla*.

Do ponto de vista conservacionista, os registros no Jalapão de *Culicovora caudacuta* e principalmente *Coryphaspiza melanotis*, se apresentam alentadores, uma vez que ampliam consideravelmente a ocorrência dessas duas espécies ameaçadas de extinção na porção norte de suas distribuições geográficas, as inserindo em uma porção relevante, significativa e estratégica do bioma Cerrado. Embora os registros apresentados tenham sido feitos de forma marginal aos limites das unidades de conservação de proteção integral do Jalapão, eles dão fortes mostras que essas espécies possuem populações, pelo menos, no interior do Parque Estadual do Jalapão e da Estação Ecológica Serra Geral do Tocantins. Este cenário certamente incrementará o *status* de conservação dessas espécies quando considerado toda sua distribuição geográfica e ameaças associadas.

Agradecimentos

TD agradece à Unitins, ICMBio e NeoFauna Ambiental por oportunizarem as visitas à campo. WP agradece à NeoFauna Ambiental e OGS-Engenharia de Meio Ambiente e Topografia pelo apoio e oportunidade. Agradecemos a Marco A. Crozariol pelo envio das fotos do espécime mencionado depositado no Museu Nacional, e também, a Martjan Lammertink, pela gentileza de revisar o *abstract* do artigo.

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New and noteworthy distributional records for birds in Manu Biosphere Reserve

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Received 17 September 2018; final revision accepted 1 May 2019
Cotinga 41 (2019): 87–90
published online 21 June 2019

La Reserva de Biosfera Manu alberga una de las avifaunas más diversas del mundo. Pese a que la exploración ornitológica del Manu lleva más de cuatro décadas, en esta nota reportamos nuevos registros en la reserva del Gavilán Carinegro *Leucopternis melanops*, y registros adicionales de dos especies poco conocidas: Picolanza Frentiazul *Doryfera johannae* y una subespecie de Picoancho Azufrado *Tolmomyias sulphurescens peruvianus*. Nuestras observaciones sugieren que el monitoreo continuo es esencial para definir la distribución de aves tropicales con precisión, incluso en las regiones más estudiadas de Sudamérica.

The east slope of the tropical Andes and adjacent Amazonian lowlands are home to more than 2,000 species of birds, c.25% of them found nowhere else on Earth[12]. This astounding diversity is the result, in part, of the region's complex topography and the abrupt changes in habitat and species composition that occur along steep altitudinal gradients stretching from above the treeline to Amazonia[16]. Despite a rich history of ornithological exploration, the status and distribution of many species in tropical forests of South America remain poorly known[10,11,14,17].

Accurate accounts of species distributions are important as they inform systematic conservation planning and permit robust analysis of questions related to biogeographic patterns, such as understanding how species respond to a changing climate[8] and the underlying evolutionary processes that drive speciation[13]. Correctly identifying a species' distribution depends on the availability of reliable occurrence data. This is a particular challenge in remote regions of the Neotropics where incomplete sampling can lead to perceived distributional gaps in species ranges[15]. For example, a relatively sparse network of roads and rivers limiting access to vast areas of wilderness prevents researchers from visiting large portions

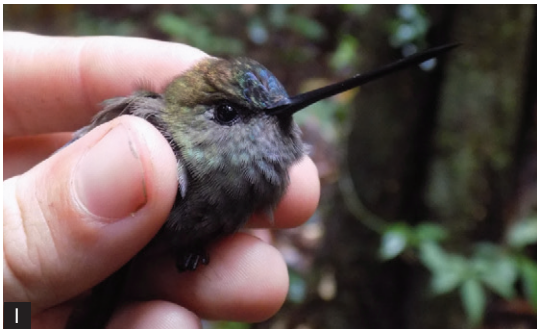
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Figure 1. Blue-fronted Lancebill *Doryfera johannae*, Pantiacolla, Manu Biosphere Reserve, dpto. Madre de Dios, Peru, 28 September 2015 (Micah Noel Scholer)


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Figure 2. Black-faced Hawk *Leucopternis melanops*, Pantiacolla, Manu Biosphere Reserve, dpto. Madre de Dios, Peru, 18 October 2012 (Paul Preston)

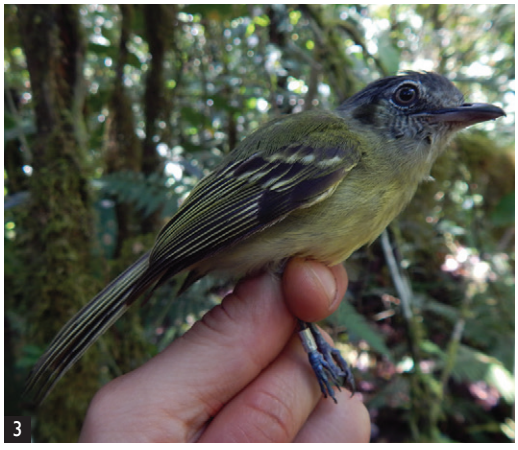
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Figure 3. Yellow-olive Flycatcher *Tolmomyias sulphurescens peruvianus*, San Pedro, Manu Biosphere Reserve, dpto. Madre de Dios, Peru, 29 September 2014 (Barbara Reguera Alonso)

of a species' potential distribution. Even in areas that are well studied, the cryptic habits and / or rarity of some species can impede their detection[3,9], resulting in 'false absences' and under-estimates of species range limits.

We report observations of three Neotropical birds with poorly understood distributions in south-east Peru: Blue-fronted Lancebill *Doryfera johannae*, Black-faced Hawk *Leucopternis melanops* and Yellow-olive Flycatcher *Tolmomyias sulphurescens*. We compare our occurrence records from six years of mist-netting in the Manu Biosphere Reserve (MBR) to data collected during important ornithological expeditions to the region[21], the primary literature, and sightings reported on eBird (http://www.ebird.org). We briefly discuss our records for each species in the context of its currently understood distribution in Peru[17].

Methods

Data reported herein were collected during 2011–16 as part of a larger study within the MBR to describe diversity and distribution patterns of the regional avifauna and to estimate apparent annual survival of tropical birds (JEJ & MNS unpubl.). We conducted bird surveys in 20 plots at two research stations: ten at Pantiacolla (12°38'S 71°14'W; 385–575 m), in humid lowland rainforest at the base of the Andean foothills, and ten in humid montane forest at San Pedro (13°03'S 71°32'W; 1,250–1,720 m). Each plot was visited annually for 2–3 consecutive days and an array of 10–15 mist-nets (12 × 3 m, 36 mm mesh) was opened from dawn to dusk. We timed data collection to overlap with the end of the dry season, in late August–November, and coinciding with the peak onset of breeding for most species at our study sites[19].

We fitted all trapped birds with an aluminum leg band to identify individuals. In the case of some species for which we lacked appropriate band sizes, such as hummingbirds and larger raptors, we clipped the tip of one of the outer rectrices to ensure that individuals were not counted more than once p.a. We measured wing chord and tail length (in mm) and mass (± 0.05 g, FlipScale F2, www.myweigh.com/pcoket/) of each individual, and determined sex where possible by plumage or the presence of a brood patch or cloacal protuberance.

Results and Discussion

Over the course of the study we recorded >11,000 captures, of 400 species from 42 families. Of these, the following species represent interesting distributional records.

Blue-fronted Lancebill *Doryfera johannae*

At Pantiacolla several individuals trapped (Fig. 1) at 420–575 m represent the southernmost occurrence of this poorly known hummingbird in Peru, where it was previously recorded in Madre de Dios[21]. We obtained 11 mist-net captures. Although we were unable to distinguish between birds captured in different years, our captures represent at least six different individuals (Table 1). *D. johannae* was first recorded in MBR at c.1,000 m along the Cerro de Pantiacolla during a 1985 expedition led by J. W. Fitzpatrick and colleagues from the Field Museum of Natural History, Chicago, and, more recently, at 685–1,400 m during a re-survey of the same terrain[8]. It has also been recorded as far south as the upper Urubamba Valley in the neighbouring dpto. Cusco[14]. Yet, most sources still treat Junín as the southern limit of its range[17]. Our records, along with those by other researchers[8,14,21] and numerous eBird sightings reported in dptos. Ayacucho, Cusco and Madre de Dios[6] suggest *D. johannae* has a continuous distribution in appropriate foothill and adjacent lowland habitat from Madre de Dios north to Junín.

Black-faced Hawk *Leucopternis melanops*

An adult trapped (Fig 2; Table 1) at Pantiacolla in 2012 is the first documented record of *L. melanops* for MBR[21]. The species is typically described as occurring in northern Amazonia, where it is thought to replace its sister species, White-browed Hawk *L. kulhi*[7]. However, evidence of their sympatry south of the Amazon River dates from the 1930s, when a specimen of *L. melanops* was collected on the lower Tapajós River, Brazil[1]. Subsequent mist-net captures of both species from the same area have since corroborated their co-occurrence[4], and records of *L. melanops* are now available from several localities throughout south-west Amazonia[2,11]. In Peru, *L. melanops* is currently considered uncommon to rare in lowland forest north of the Marañón River[17], but also occurs locally in dptos. Ucayali[10] and Madre de Dios[18]. Our record was obtained in *terra firme* forest near the town of Itahuania, beside the Alto Madre de Dios River, c.125 km west of where Shrum *et al.*[18] captured three individuals. Scattered sightings of *L. melanops* in southern Amazonia have also been reported on eBird, with the two southernmost at Puerto Maldonado, Madre de Dios[6]. All records in Madre de Dios are well outside the known range of *L. melanops* and c.1,000 km from the nearest reports of the species in Peru[10] or Brazil[6]. These observations suggest that the species probably occurs patchily throughout the Madre de Dios drainage and across a larger area of central and southern Amazonia, where it remains rare and under-reported.

Table 1. Capture records and morphometric measurements for three species of birds in Manu Biosphere Reserve, Peru (2011–16).

Species	Capture date	Station[a]	Sex[b]	Wing chord (mm)	Tail length (mm)	Body mass (g)
Doryfera johannae	18 Aug 2011	PA	F	52	30	3.83
Doryfera johannae	19 Aug 2011	PA	U	57	31	4.35
Doryfera johannae	1 Oct 2014	PA	F	51	26	4.12
Doryfera johannae	8 Oct 2014	PA	M	56	30	4.22
Doryfera johannae	26 Sep 2015	PA	U	53	29	3.93
Doryfera johannae	26 Sep 2015	PA	M	53	30	4.23
Doryfera johannae	28 Sep 2015	PA	M	57	31	4.85
Doryfera johannae	28 Sep 2015	PA	U	53	30	3.93
Doryfera johannae	29 Sep 2015	PA	M	57	30	4.00
Doryfera johannae	12 Oct 2015	PA	F	52	29	4.13
Doryfera johannae	9 Oct 2016	PA	F	53	28	4.27
Leucopternis melanops	18 Oct 2012	PA	U	240	162	310
Tolmomyias sulphurescens	27 Sep 2012	SP	U	65	52	16.50
Tolmomyias sulphurescens	27 Sep 2012	SP	U	66	57	17.75
Tolmomyias sulphurescens	29 Sep 2012	SP	U	70	54	15.85
Tolmomyias sulphurescens	29 Sep 2014	SP	F	63	55	16.20

[a] PA = Pantiacolla, SP = San Pedro
[b] U = unknown, F = female, M = male

Yellow-olive Flycatcher *Tolmomyias sulphurescens* Four individuals trapped at San Pedro (Fig. 3; Table 1) appear to represent *T. s. peruvianus*, the second observation of this race for MBR. In Peru, the range limits usually accepted for *T. s. peruvianus* are dptos. Amazonas and western Loreto, south over the east slope of the Andes in San Martín, Pasco, Huánuco and Junín[5]. More recently, it was recognised to be resident in dpto. Cusco[14,20]. In Madre de Dios, occurrence of *T. s. peruvianus* was first documented at San Pedro in 2009 from photographs and sound-recordings by D. F. Lane. We trapped it at the same location (Table 1) in riparian areas of humid montane forest at 1,200–1,500 m, including a female with an active brood patch in late September 2014, indicating that it breeds in the study area. However, we acknowledge that our captures could represent *T. s. inornatus*, which occurs in similar montane habitat from southern Peru as far north as Puno, or even the lowland subspecies *T. s. pallescens*, typical of floodplain forests along the Madre de Dios[5,6].

Nevertheless, trapped birds had a dark iris, rather dark-grey crown, and relatively distinct ear-coverts patch (Fig. 3), all features indicative of *T. s. peruvianus*. Given that our captures were also obtained at a locality where *T. s. peruvianus* had been previously documented[6], we suggest that foothill birds in MBR are probably *T. s. peruvianus*, whereas those along the Madre de Dios River are *T. s. pallescens*. Similar replacement patterns between closely related species associated with changes from lowland to foothill habitat are observed among other taxa in MBR[17], including Reddish *Phaethornis ruber* and White-browed Hermits *P. stuarti*, Strong-billed Woodcreeper *Xiphocolaptes promeropirhynchus* (Andean *promeropirhynchus* and Amazonian *orenocensis* subspecies groups), White-eyed *Epinecrophylla leucophthalma* and Foothill Antwrens *E. spodioptila*, Blue-crowned *Lepidothrix coronata* and Cerulean-capped Manakins *L. coeruleocapilla*, and Blue-backed *Chiroxiphia pareola* and Yungas Manakins *C. boliviana*. Although eBird sightings for *T. sulphurescens* exist along the Manu Road and the Madre de Dios River[6], the species was not recorded in the MBR during the Walker *et al.*[21] expedition, and details concerning subspecies occurrence from eBird are generally lacking for dpto. Madre de Dios. *T. sulphurescens* almost certainly represents multiple species[5] and more refined reporting of each taxon's occurrence will aid in delineating range limits for subspecies, some of which might merit upgrading to species-level status.

Collectively, these records highlight that continued observations and reliable reporting are essential to better delineate the distributions of tropical species in these diverse and heterogeneous landscapes.

Acknowledgements

We are grateful to the many volunteers from the Manu Bird Project who helped make field work

possible, in particular Paul Preston and Barbara Reguera Alonso, who provided photos of *L. melanops* and *T. s. peruvianus*, respectively. We thank Barry Walker and Doug Stotz for reviewing and improving our manuscript, and Dan Lane, who offered helpful feedback concerning the distribution of *T. sulphurescens*. Our work would have been impossible without the staff at Pantiacolla and Cock-of-the-Rock Lodge who provided us accommodation, cooperation and friendship over the years. The Servicio Nacional Forestal y de Fauna Silvestre permitted our work in MBR. Grants from the National Science Foundation DEB-1120682 (to Scott Robinson, Mark Chappell and JEJ) and the North American Bird Banding Association and Werner & Hildegard Hesse Research Award in Ornithology (to MNS) helped fund this study.

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Preliminary assessment of the diet of Grey-bellied Comet *Taphrolesbia griseiventris* in Cajamarca, Peru

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Received 6 November 2018; final revision accepted 29 April 2019
Cotinga 41 (2019): 91–93
published online 21 June 2019

El Cometa de Vientre Gris *Taphrolesbia griseiventris* es un colibrí endémico de los Andes del norte de Perú, considerado como En Peligro en escala global y En Peligro Crítico en Perú. El presente estudio preliminar tiene como objetivo evaluar las especies de flores usadas por *T. griseiventris* como parte de su dieta en la región de Cajamarca, donde ocurre la mayor frecuencia de avistamientos. Se realizaron censos a lo largo del valle de Chonta entre 2017 y 2018, y las flores utilizadas por *T. griseiventris* fueron registradas. Los resultados sugieren que *T. griseiventris* muestra una preferencia por *Delostoma integrifolium* en esta región, y muestra alta fidelidad de sitio, indicando un comportamiento territorial. Se requiere realizar más evaluaciones en otras regiones donde la especie se encuentre para documentar su dieta completa y mejorar la comprensión de su ecología.

Grey-bellied Comet *Taphrolesbia griseiventris* is a monotypic hummingbird endemic to the north-central Andes of Peru[11]. It is one of the most threatened hummingbirds in South America[3], being listed as Endangered by BirdLife International[3] and Critically Endangered in Peru[13] due to its small population, estimated at 250–999 individuals, and currently declining due to habitat loss and fragmentation. Despite its conservation status, few attempts have been made to improve our understanding of the species' ecology, including its dietary preferences.

Given that hummingbirds are highly dependent on flowers to obtain energy[1,4,15], lack of floral resources can negatively impact their populations. This dependence facilitates study of their diets and habitat requirements without invasive techniques, providing an interesting approach to the study of endangered species such as *T. griseiventris*. While this species has been observed feeding on different ornithophilous flowers, a complete assessment of its diet is relevant to improve future conservation plans.

This preliminary study aims to provide a first assessment of the flowers used by *T. griseiventris* in known territories at different points in the Chonta Valley, where the highest density of records exists, to contribute to our knowledge of the species.

Methods

Study site.—The study area is located in dpto. Cajamarca, northern Andes of Peru (04°30'–07°45'S 78°31'W; 400–3,590 m). Annual temperatures in Cajamarca range from 0–23°C, with a marked rainy season in December–March[12]. The site is located in the Chonta Valley, which encompasses montane forests of the north-west Andes[6], including seasonal woodland. The Chonta Valley includes steep hills dominated by Andean scrub and bromeliads, at altitudes of 2,700–3,200 m. The landscape is influenced by agriculture and cattle grazing.

Data collection.—The study was undertaken between July 2017 and September 2018. Five visits to the area were made during the wet and dry seasons: in July 2017, February 2018, May 2018, July 2018 and September 2018. In total, 15 days of field work were conducted (120 hours). Searches along the valley focused on sites reported on eBird. Six territories were identified and surveyed. Observations at these sites lasted between 30–60 minutes, recording and photographing all flowers used by the species. Relative frequency of use of each flower species was recorded, and is expressed as the number of territories where a species was used of the total number of territories where the species was present. Within each territory, an additional inventory of ornithophilous flowers was made inside a 2,500 m^2 plot. Plant identification was based on the online database of the herbarium of Universidad Nacional de Cajamarca.

Results

A total of six flowering plants was recorded in the six territories surveyed. These plants belonged to four families: *Delostoma integrifolium* (Bignoniaceae), *Bomarea* sp. (Alstroemeriaceae), *Tillandsia* sp. (Bromeliaceae), *Eucalyptus globulus* (Myrtaceae), *Clematis haenkeana* (Ranunculaceae) and *Tecoma stans* (Bignoniaceae). Flower species used most frequently were *D. integrifolium* (f = 1.00) and *Tillandsia* sp. (f = 0.33). The remaining four species were used in a single territory each (f = 0.17).

Discussion

In the study area, *T. griseiventris* shows a high preference for *Delostoma integrifolium*, the most frequently used species irrespective of season. This is consistent with other reports of *Delostoma*

Table 1. Ornithophilous species in the habitat of Grey-bellied Comet *Taphrolesbia griseiventris* in the Chonta Valley, Cajamarca, Peru. Species used by *T. griseiventris* are marked with an asterisk.

Family	Scientific name
Myrtaceae	*Eucalyptus globulus**
Bignoniaceae	*Delostoma integrifolium**
Bignoniaceae	*Tecoma stans**
Bromeliaceae	*Tillandsia* sp.*
Alstroemeriaceae	*Bomarea* sp.*
Ranunculaceae	*Clematis haenkeana**
Lamiaceae	*Salvia* sp.
Adoxaceae	*Sambucus* sp.
Passifloraceae	*Passiflora tripartita*
Orchidaceae	*Epidendrum* sp.

integrifolium in its diet[2,5]. Although other plant species were used by *T. griseiventris*, they were not defended from other nectarivorous birds, unlike *D. integrifolium*. Overall, 60% of ornithophilous plants was used in each territory (Table 1). Flowering *Tillandsia* sp. were abundant in all territories at both seasons, but *T. griseiventris* was seen visiting them only twice (May 2018 and September 2018). These plants require further investigation because the location of flowers on steep hillsides prevented field observations. Although *Eucalyptus globulus* was numerous in the valley, not all flowering *Eucalyptus* were visited by *T. griseiventris*, suggesting opportunistic use.

In all surveyed territories, flowering *Delostoma integrifolium* was also used by Black-throated Flowerpiercer *Diglossa brunneiventris*, Giant Hummingbird *Patagona gigas* and Tyrian Metaltail *Metallura tyrianthina*. *T. griseiventris* displayed site fidelity across seasons; at each territory, 3–4 trees of *Delostoma integrifolium* were periodically used and the floral patch was actively defended against other hummingbirds, but not from *Diglossa brunneiventris*. Use of *Delostoma integrifolium* by *T. griseiventris* appears to be facilitated by previous piercing by *Diglossa brunneiventris*, given that the corolla is probably too long for *T. griseiventris*; all *T. griseiventris* that visited *Delostoma integrifolium* used pierced holes. This suggests that there is an opportunistic relationship between these two nectar feeders, *T. griseiventris* acting as a secondary nectar robber[7–9]. This behaviour has been observed in other nectarivorous birds like Cinereous Conebill *Conirostrum cinereum*[14].

Additionally, all observed individuals of *T. griseiventris* in the field were males. This suggests a potential niche partitioning between males and females, with the latter probably using 'less ornithophilous' flowers, as reported in other hummingbirds[10,16]. Further research is needed to address this question.

While this study provides initial information as to the diet of *T. griseiventris*, research should encompass a wider region. For example, *Delostoma integrifolium*, the most used flower in the Chonta Valley, does not occur in Huascarán National Park, where *T. griseiventris* is present[5]. Further investigation should account for variation in the species' diet across the wet, dry and transitional seasons, and in several study sites across its range. Also, the relationship between *T. griseiventris* and co-occurring flowerpiercers needs additional study to better understand the ecological requirements of this endangered hummingbird.

Acknowledgements

I thank the Association of Field Ornithologists of the Ornithological Societies of North America (AFO-OSNA) and the Rufford Foundation for funding a study in progress, which made this preliminary assessment possible. I also thank Fernando Angulo for his revisions and suggestions during the preparation of this note, Richard Garrigues for sharing information on nest sites, and Angie Montenegro for guidance in identifying flower species. Finally, I thank the reviewers for their constructive comments.

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Observations of Rufous-vented Ground Cuckoo *Neomorphus geoffroyi* associating with mixed-species flocks

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Received 19 November 2018; final revision accepted 5 April 2019
Cotinga 41 (2019): 94–97
published online 21 June 2019

Neomorphus geoffroyi es una especie Vulnerable, y la ecología de forrajeo y los detalles de su historia natural son poco conocidos. Estudios previos indican que *Neomorphus* se asocia con varios tipos de grupos interespecíficos de forrajeo, incluyendo a los primates, pecaríes y hormigas soldado. En nuestra primera observación, documentamos un comportamiento de ataque-golpe (<1 segundo) de *N. geoffroyi* acompañando una bandada mixta de sotobosque y una tropa de hormigas. En nuestras observaciones segunda y tercera, *N. geoffroyi* estaba asociado a bandadas mixtas lejos de tropas de hormigas. Sugerimos que *N. geoffroyi* puede ser un seguidor generalista de grupos interespecíficos que hacen perturbaciones de presa.

The Neotropical ground cuckoos (subfamily Neomorphinae) comprise four or five species that are patchily distributed throughout Central and South American tropical forests[10]. Ground cuckoo species appear to replace each other geographically and share similar ecological traits. Although they occur in many Neotropical forests, their shyness, use of large territories, low population densities and terrestrial foraging behaviour contribute to a relative paucity of detailed observations. The foraging ecology of ground cuckoos is known to include following large groups of animals, such as peccaries, primates and ant swarms, while also foraging apart from other animal groups[2,4,13].

Here, we expand upon the known foraging associations of Rufous-vented Ground Cuckoo *Neomorphus geoffroyi*. The species is considered Vulnerable due to a combination of large territory size and low population density[3], yet its specific habitat requirements are poorly understood. We documented three observations of the species in Madre de Dios, Peru. A pair was recorded following a large ant swarm with an associated mixed-species flock, and two individuals were found in company with mixed-species understorey flocks but no ants.

Observations

The first observation was made at Pantiacolla Lodge on 29 September 2015. Pantiacolla is on the west bank of the río Alto Madre de Dios (12°39'2.0"S 71°13'4"W), dpto. Madre de Dios, Peru. The dominant habitat at Pantiacolla is characterised as moist, tropical forest. A pair of *N. geoffroyi* was found attending an ant swarm beside a trail, which skirts a tract of bamboo and low-lying transitional forest. Video was made using a Canon point-and-shoot style camera with 300-mm optical zoom.

The other two observations occurred on 8 September and 2 November 2018 at Cocha Cashu Biological Station, Manu National Park, dpto. Madre de Dios, Peru (11°51'S 71°19'W). This site is an ornithologically well-studied plot in south-west Amazonia, which includes a grid network of trails with distinct trail markers. The second observation occurred on trail 5, at the 250 m marker, c.400 m east of the station. Video was recorded using a Canon Rebel XT 8 mega-pixel DSLR camera with a Tamron 70–300 mm lens. The third observation occurred on trail 33, at the 775 m marker. A recording was made using a Tascam DR-05 digital audio-recorder and a Sennheiser ME 66 shotgun-style microphone. All observations included a census of bird species present, and all understorey or ant-following flock members identified are listed in Table 1. Sonograms were made using Raven Pro 1.5 Beta. All videos are available at http://www.neotropicalscience.com/neomorphus-and-mixed-flocks.html.

Results

At 08h30, on 29 September 2015, we began following a large group of foraging army ants *Eciton burchelli*. Shortly afterwards, a pair of *N. geoffroyi* was noted. They were filmed foraging and preening for 45 minutes (Fig. 1A). Twice, one individual gleaned a food item from the dead leaf litter on the ground. On a separate occasion, the same individual gleaned a prey from the underside of a live leaf, displaying the rapid run-and-attack behaviour described in previous literature[3]. The attack behaviour was accomplished in c.0.9 seconds, and involved taking several steps followed by a reach to pick the prey from the leaf (Fig. 2A–C). All food items observed being taken were insects escaping the ant swarm. One of the two individuals was filmed preening and repeatedly raising and lowering its crest. Both individuals were silent while attending the ant swarm.

On 8 September 2018, at 09h45–10h30, while following a mixed-species understorey flock, we heard and recorded video of a *N. geoffroyi* calling

Table 1. List of mixed-flock species present during each observation. Species are listed in taxonomic order. Observation 1 was made at Pantiacolla Lodge in September 2015 and was the only observation during which army ants (*Eciton burchelli*) were detected. Observations 2 and 3 were made in September and November 2018, respectively, at Cocha Cashu Research Station, Peru.

English name	Latin name	Obs 1	Obs 2	Obs 3
Buff-throated Woodcreeper	*Xiphorhynchus guttatus*			X
Elegant Woodcreeper	*Xiphorhynchus elegans*		X	X
Striped Woodhaunter	*Automolus subulatus*			X
Plain-winged Antshrike	*Thamnophilus schistaceus*		X	
Dusky-throated Antshrike	*Thamnomanes ardesiacus*			X
Bluish-slate Antshrike	*Thamnomanes schistogynus*	X	X	
White-eyed Antwren	*Epinecrophylla leucophthalma*	X	X	X
Pygmy Antwren	*Myrmotherula brachyura*		X	
Sclater's Antwren	*Myrmotherula sclateri*			X
Grey Antwren	*Myrmotherula menetresii*	X		
White-flanked Antwren	*Myrmotherula axillaris*		X	
Black-faced Antbird	*Myrmoborus myotherinus*	X	X	X
Chestnut-tailed Antbird	*Sciaphylax hemimelaena*	X	X	X
Plumbeous Antbird	*Myrmelastes hyperythrus*		X	
Plain-throated Antwren	*Isleria hauxwelli*		X	X
Sepia-capped Flycatcher	*Leptopogon amaurocephalus*	X		X
Greyish Mourner	*Rhytipterna simplex*		X	X
Red-crowned Ant Tanager	*Habia rubica*			X

(Fig. 1B). This individual was 20 m south of the trail, and was observed foraging directly below and following the mobile mixed-species flock. At 10h00, we imitated the call and it approached to within 8 m. It then jumped onto a perch 1 m above ground and began vocalising at higher volume. We recorded this using a DSLR camera. After c.2 minutes vocalising (Fig. 3A), the bird hopped off the perch and continued foraging with the flock. We heard it snapping its bill at irregular intervals, giving single snaps. It was not detected after 10h30, although the mixed-species flock remained in the vicinity for several more hours.

Finally, on 2 November 2018, at 07h45–08h10, while performing point counts, we found a mixed-species understorey flock (Table 1) and heard the calls of *N. geoffroyi* from below the flock. This individual was seen following the flock, crossing the trail twice and then moving around a treefall gap. No ant swarms were found and no obligate ant-following species detected. Three recordings were made of the calling *N. geoffroyi* at 10 m range (Fig. 3B–C). After 25 minutes, we moved to another point where the flock and the *N. geoffroyi* were no longer detectable.

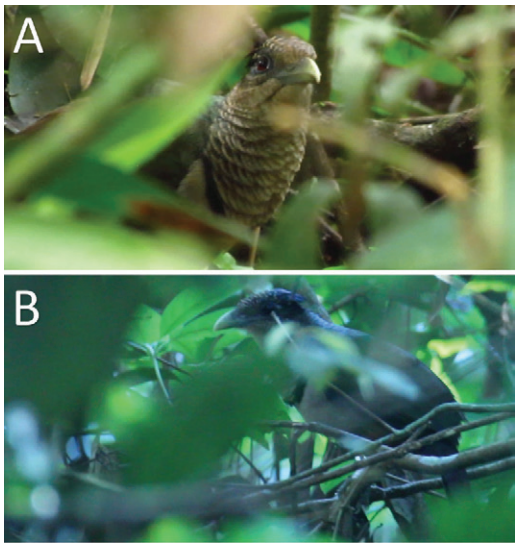

Figure 1. Individuals of Rufous-vented Ground Cuckoo *Neomorphus geoffroyi* described in observations 1 and 2. (A) Video frame of observation 1 showing the head and neck of the ground cuckoo, filmed at Pantiacolla Lodge, Cusco, Peru (E. Parra). (B) Video frame from observation 2 showing the upperparts of the ground cuckoo, Cocha Cashu Biological Station, Madre de Dios, Peru (E. Parra)

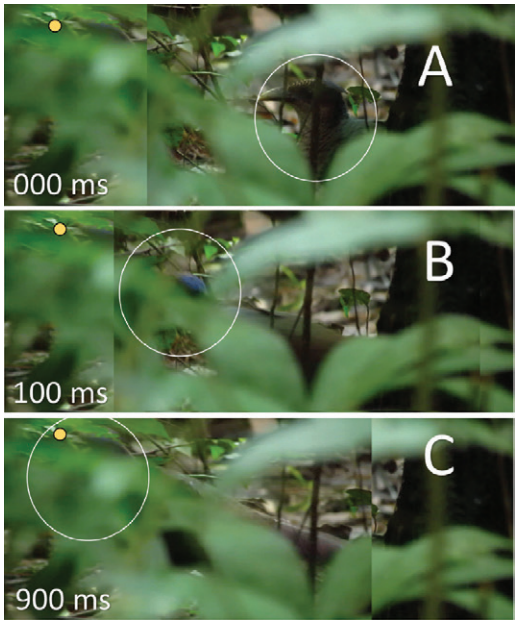

Figure 2. Frames (A–C) illustrating the attack behaviour of Rufous-vented Ground Cuckoo *Neomorphus geoffroyi*, including the time (beginning at 000 ms), target leaf location (yellow dot) and a circle tracking the cuckoo's head location in each frame.

These are the first accounts of *N. geoffroyi* foraging with understorey flocks. While mixed-flock species were present in all cases, when attending the army ants *N. geoffroyi* was observed foraging directly over the swarm. No obligate ant-following bird species were detected when *N. geoffroyi* was observed in the presence of ants.

Discussion

N. geoffroyi has been reported to follow peccaries and attend army ant swarms, consuming escaping insects and small vertebrates[4,5,12]. However, radio telemetry studies of Banded Ground Cuckoo *N. radiolosus* in the Chocó of north-west Ecuador revealed that individuals spent <10% of their time at ant swarms and did not associate with peccaries[4]. Peccaries move over large distances, and large groups of peccaries are absent from or rare at many sites[5]. Published reports of *N. geoffroyi* and Red-billed Ground Cuckoo *N. pucheranii* show that both species may follow troops of primates foraging in low forest strata[11,13]. Such heterospecific associations may be explained by the increase in foraging opportunities afforded by the insects flushed by peccaries, primates or ants[1]. Our observations evidenced the benefits gained when associating with 'beaters'[14], as we recorded an individual gleaning several insects escaping an ant swarm (Fig. 2; see also supplementary video).

Mixed-species flocks probably offer similar benefits to groups of large mammals, as escaping insects or falling food items may be captured on the forest floor. Further, these mixed-species flocks include species that serve as sentinels, providing information regarding potential predators. Mixed-species flocks represent a stable, predictable and common feature of Amazonian forests, with territory sizes of <10 ha[6,7]. Such flocks form throughout Amazonia, wherever *Thamnomanes* antshrikes are present. Our observations occurred at sites with two species of *Thamnomanes*, which segregate by habitat type: Dusky-throated Antshrike *T. ardesiacus* in *terra firme* forest and Bluish-slate Antshrike *T. schistogynus* in successional forest, river edge forest or bamboo patches[7,9]. Our observations include examples of associations between *Neomorphus* and both species of *Thamnomanes* (Table 1).

Neomorphus territories have been estimated to cover 25–50 ha[3,4], while mixed-species flocks occupy home ranges of 8–10 ha[8,9]. Kernel density estimates reveal that mixed flocks spend much of their time foraging in less than half of their home range[8]. This suggests that *Neomorphus* territories probably contain several mixed-species flocks that spend large amounts of their time in relatively small (>5 ha) areas[8]. *Neomorphus* should be searched for in association with mixed-species understorey flocks in other regions. Ground cuckoos likely have multiple foraging associates to act as beaters, adding to the complexity of their ecological requirements and the uncertainty of their population in heavily disturbed areas. Our observations suggest that *Neomorphus* ground cuckoos may be more general in their associations than previously suggested. The foraging ecology of mixed-species flock-followers like *N. geoffroyi* warrants more thorough investigation.

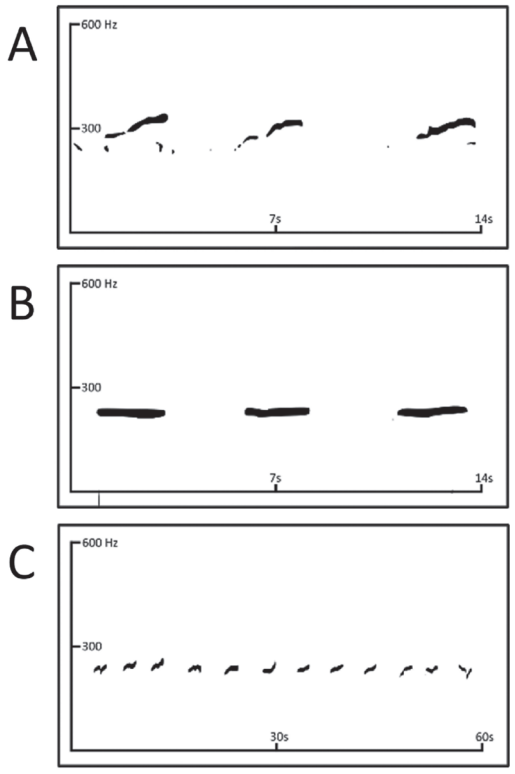

Figure 3. Sonograms of calls of Rufous-vented Ground Cuckoo *Neomorphus geoffroyi* recorded during observations 2 and 3, at Cocha Cashu Biological Station, Madre de Dios, Peru. Sonogram A was prepared from a recording made during observation 2 on 8 September 2018 by E. Parra. Sonograms B–C were prepared from recordings made during observation 3 on 2 November 2018 by J. Novoa. Sonograms prepared by E. Parra.

Acknowledgements

We thank National Geographic for funding research at Cocha Cashu through an Explorer's grant to AEM (WW-150R-17). Research conducted at Pantiacolla Lodge was funded via a National Science Foundation Postdoctoral Fellowship (PRFB1309320), also to AEM. We further thank CORBIDI, Centro de Ornitología de Perú, for their collaboration and guidance, and the Ministry of Agriculture, Department of Forestry and Wildlife of the government of Peru. We owe a debt of gratitude to all those who work to maintain

the Cocha Cashu Biological Station. Special thanks to Blaine Carne for correcting several versions of this manuscript and Thomas Valqui for assistance in translating the summary. Research within Manu Biological Reserve was conducted under permit no. 19-2018-SERNANP-JPNM/INV.

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First Bolivian record of Laughing Gull *Leucophaeus atricilla*, and two noteworthy records of *Fulica* coots from Laguna Guapilo, dpto. Santa Cruz

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Received 30 November 2018; final revision accepted 29 April 2019
Cotinga 41 (2019): 98–100
published online 21 June 2019

El 28 de enero de 2018, durante una visita a laguna Guapilo, al este de Santa Cruz de la Sierra, depto. Santa Cruz, Bolivia, observamos una Gaviota Reidora *Leucophaeus atricilla*, el primer registro en Bolivia. Adicionalmente, observamos comportamiento indicativo de anidación de la Gallareta Chica *Fulica leucoptera*, una especie que se consideraba como visitante no reproductiva en Bolivia, así como una Gallareta Andina *Fulica ardesiaca*, el primer registro para el depto. Santa Cruz. La reproducción de *F. leucoptera* en la laguna Guapilo fue confirmada el 5 de mayo de 2018 mediante la fotografía de un polluelo.

On 28 January 2018, MLB, AEH, NLH-H and SKH observed several notable birds at Laguna Guapilo (17°46'50"S 63°05'48"W), a semi-urban park 8.9 km east of Santa Cruz city centre, dpto. Santa Cruz, Bolivia. The habitat is dominated by a c.35-ha lagoon, with dense mats of reeds and water hyacinth *Eichhornia crassipes* at the edges, and short trees characteristic of the Chiquitano biome.

Laughing Gull *Leucophaeus atricilla*

We first observed an immature gull resting on the shoreline at the north edge of the lagoon around 09h00 (Fig. 1A). Only two gull species have been reported in Bolivia[5]: the resident Andean Gull *Chroicocephalus serranus* and vagrant Franklin's Gull *Leucophaeus pipixcan* for which only a handful of records exist. We identified the individual as a Laughing Gull *L. atricilla*, differing from a similarly aged *L. pipixcan* by its relatively longer, thinner bill, less contrasting dark hood, more uniform ash-grey body plumage, and less distinct eye crescents. *Chroicocephalus serranus* is smaller with a thin, almost tern-like bill, and much white in the primaries in flight; thus, we also eliminated this species.

We aged the bird during the observation based on the following combination of characters: uniformly dark primaries, without the white apical spots typical of older birds; a dark tail-band; extensive ash-grey neck and breast; and worn, brownish wing-coverts. These features are typical of an advanced first-year *L. atricilla* in formative plumage[6,14]. Moult was evident in the wing-coverts, with the replaced, darker grey median secondary-coverts contrasting with the browner, unreplaced juvenile greater, lesser and primary-coverts (Figs. 1B–C). The bird appeared to be healthy, being alert and able to fly strongly (Fig. 1B–C).

L. atricilla has not previously been reported in Bolivia[5]. However, there are a number of records from interior South America, including one from southern Paraguay[2] and several inland occurrences in Ecuador (e.g., ML100965921, ML102697931), dptos. Cusco (ML100964311), Madre de Dios[13] and Loreto[10], Peru, as well as records from Brazil, in Amazonas, Ceará, Rio de Janeiro, Pará and São Paulo states[1,3,11]. Additionally, the species is known to wander widely, with c.300 records from Western Europe (the overwhelming majority in Britain, Ireland and Spain), a few from north-west

Figure 1. Laughing Gull *Leucophaeus atricilla*, Laguna Guapilo, dpto. Santa Cruz, Bolivia, January 2018 (A: Matthew L. Brady), (B–C: Anna E. Hiller)

Figure 2A. White-winged Coot *Fulica leucoptera*, Laguna Guapilo, dpto. Santa Cruz, Bolivia, January 2018 (Anna E. Hiller). B. White-winged Coot *Fulica leucoptera* with chick, May 2018 (Damián I. Rumiz). C. Slate-coloured Coot *Fulica ardesiaca*, January 2018 (Matthew L. Brady)

and West Africa (Morocco, Mauritania, Senegal and Gambia) and many Pacific islands, including Japan, Fiji, Samoa, Hawaii, the Pitcairn Islands, and the Philippines[1,12]. Other medium-sized gulls that could potentially occur in Bolivia include Grey-hooded *C. cirrocephalus* and Brown-hooded Gulls *C. maculipennis*. Both differ in immature plumage from *L. atricilla* in being smaller and paler in coloration, with dramatically different wing patterns in flight, and by having reddish-orange bare parts. These species have been reported in northern Argentina (e.g., ML21353531, ML93434461) and Paraguay[2], and should be looked for on shallow lakes in southern Bolivia.

White-winged Coot *Fulica leucoptera*

Around 10h30, from a boardwalk over the wetland in the centre of the park, we used a 30× telescope to scan the edge of the cattails and floating mats of vegetation. We immediately noticed c.30 White-winged Coots *Fulica leucoptera* (Fig. 2A). The species is currently considered an austral migrant in Bolivia[5], and we did not anticipate seeing it in January (the austral summer), when this coot would be expected to be in the breeding range in Argentina and Chile[16]. We noticed one individual carrying a small stick in its bill for c.3 minutes before it disappeared into the reeds in the characteristic manner of a bird carrying nesting material. Subsequently, breeding was confirmed by DIR, who visited Laguna Guapilo on 5 May 2018, and photographed a *F. leucoptera* chick on the same pond (Fig. 2B). *F. leucoptera* was first documented at Laguna Guapilo in the breeding season on 4 February 2017 by DIR (ML47603361); however, our observations represent the first confirmed breeding record in Bolivia. Other seasonally unusual records of *F. leucoptera* north of its typical breeding range are from the northern Bolivian Andes (ML47780761), northernmost Chile (e.g. ML34236961) and southern Peru (e.g. ML83874121), where a few individuals have been noted at coastal lagoons. *F. leucoptera* might be expanding the northern edge of its breeding range, and additional unseasonal records from Peru, Bolivia and northern Chile can be expected.

Slate-coloured Coot *Fulica ardesiaca*

At c.11h00 on 28 January 2018, amongst the *F. leucoptera*, we noticed an unusual coot with a dark red frontal shield and yellow bill, quite unlike the yellow frontal shield and white bill of *F. leucoptera*. Using a telescope, we determined that it was a Slate-coloured Coot *F. ardesiaca*, the first record for dpto. Santa Cruz. Additional identification criteria (Fig. 2C) included the all-dark body plumage lacking any white in the wings or tail, and larger size than *F. leucoptera* and Common Gallinules *Gallinula galeata*, which were common at the lake. In Bolivia, *F. ardesiaca* was previously known only from the high Andes in dptos. La Paz, Cochabamba, Oruro, Potosí and Tarija[5]. Our observation at 400 m also represents a significant extension to the lower limit of the species' elevational range in the country; it has previously been reported at 2,550–4,700 m in Bolivia[4,5]. The species is regular at sea level elsewhere in its range[15]. This bird was probably a vagrant; Laguna Guapilo is c.260 km from the nearest record in Cochabamba[5], and we observed just one individual.

Importance of Neotropical wetland surveys

Our observations, based on relatively little effort (four observers over <3 hours), demonstrate the high potential for ornithological discovery in Bolivia. In particular, we recommend future surveys of wetland ecosystems because these communities simultaneously represent a particularly poorly understood Neotropical avifauna[7], ripe for discovery of notable distributional records[8,9] due to the 'oasis' factor in drier habitats like Chiquitano forest, Chaco woodland and agricultural landscapes of eastern Santa Cruz, and a habitat type that is especially vulnerable to anthropogenic pressures such as land conversion and water extraction[7].

Lastly, our observations highlight the importance of urban wetland parks for conservation, especially of migratory waterbirds.

Acknowledgements

We thank J. V. Remsen, Dan Lane and Oscar Johnson for providing feedback on early drafts of this manuscript. Funds for M. L. Brady and A. E. Hiller's work were provided by the Ted Parker Memorial Fund, Louisiana State University Museum of Natural Science. We also thank Ryan Terrill, Miguel Aponte Justiniano, Kathia Rivero, and the Museo de Historia Natural Noel Kempff Mercado for facilitating our work in Bolivia. The following photographs from the Macaulay Library at the Cornell Lab of Ornithology were referenced: ML100965921, ML102697931, ML100964311, ML21353531, ML93434461, ML47603361, ML47780761, ML34236961, ML83874121.

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Redescubrimiento del Gorrión-Montés Paisa *Atlapetes blancae*

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Received 8 December 2018; final revision accepted 20 February 2019
Cotinga 41 (2019): 101–108
published online 21 June 2019

We report the rediscovery of Antioquia Brush Finch *Atlapetes blancae* in the municipality of San Pedro de Los Milagros, dpto. Antioquia, Colombia. This recently described species is considered globally Critically Endangered, and was previously known from just three specimens collected 47 years ago. During 2018 and early 2019, we observed several individuals at 2,500–2,830 m in remnant patches of native shrub. We made the first observations of its natural history and ecology, and provide the first description of its vocalisations. We observed singles or pairs, occasionally with Yellow-breasted Brush Finch *Atlapetes latinuchus elaeoprorus* and White-naped Brush Finch *A. albinucha*. They foraged on the ground, in low to mid strata, taking seeds and fruits, and gleaning insect larvae and possibly adult insects from foliage. We also mist-netted four *A. blancae*, two of which were possibly immatures due to their duller plumage and moult state. One was considered adult and the other possibly subadult. We analysed six song phrases and 22 call notes, which probably represent a small fraction of the species' repertoire. We emphasise the importance of undertaking conservation efforts and recommend further searches for the species, to collect additional ecological data, and to determine the species' current status and any threats, in order to decide conservation priorities for the species and its habitat.

El Gorrión-Montés Paisa *Atlapetes blancae* es una especie endémica de Colombia[5], categorizada a nivel nacional y global como en Peligro Crítico-Probablemente Extinta (CR-PE) debido al presumible reducido tamaño poblacional, posiblemente menor a 50 individuos maduros y en disminución[3,4,20], y a la pérdida de hábitat nativo[3,10]. Esta especie fue descrita en 2007 a partir de tres especímenes colectados, el más reciente en 1971. Inicialmente, las pieles fueron determinadas como Atlapetes Pizarra *A. schistaceus*. Sin embargo, tras ser revisados por T. Donegan durante estudios relacionados con la descripción de una subespecie de Atlapetes Pechiamarillo *A. latinuchus*[9], se concluyó que serían la base para la descripción de esta nueva especie.

Luego de su descripción, *A. blancae* fue buscada en la localidad denominada La Lana, municipio de San Pedro de los Milagros, dpto. Antioquia, de donde presuntamente provenían los especímenes, aunque la información de localidad es escueta. Varias expediciones para la búsqueda de *A. blancae* fueron lideradas por ornitólogos en 2007 y años posteriores, sin éxito, aunque se detectaron otras especies como *A. s. schistaceus* y *A. latinuchus elaoprorus*[9,10]. Durante los últimos diez años, varias organizaciones locales y numerosos grupos de observadores de aves han buscado activamente la especie en el norte de Antioquia, incluyendo el municipio de San Pedro de los Milagros, sin lograr encontrarla (T. M. Donegan com. pers.). Al no registrarse individuos de *A. blancae*, se plantearon tres hipótesis relacionadas con su estado y distribución. (1) La especie continúa en La Lana, pero es rara o se encuentra únicamente en microhábitats poco explorados. (2) La especie no se encuentra en La Lana, pero sí en otra localidad cercana. (3) *A. blancae* está localmente extinta debido a las altas tasas de deforestación en la región[4,8,20]. Otro punto importante es la discusión que se ha dado acerca de la validez taxonómica de *A. blancae* como especie, argumentada por algunos investigadores, a pesar de que todas las autoridades taxonómicas mundiales han aceptado su estatus de especie[6,7,12,19].

Hasta la fecha, el debate en torno a *A. blancae* era su aparente extinción o su validez taxonómica. Sin embargo, en 2018 observamos varios individuos de esta especie entre 2.500–2.830 m de altitud en el municipio de San Pedro de los Milagros. La presente nota describe el redescubrimiento de *A. blancae* después de 47 años de ser colectada, con la primera información sobre su ecología, historia natural, descripción de los individuos capturados y las primeras descripciones de sus vocalizaciones. No se mencionan las coordenadas de los registros por consideraciones de conservación de esta especie críticamente amenazada.

Observaciones

La primera observación se llevó a cabo el 7 de enero de 2018 (RC). Se observó y fotografió un individuo que se desplazaba entre matorrales; aunque esta fotografía no evidenciaba los detalles suficientes para corroborar la identificación de la especie, se pudieron observar patrones de coloración que sugerían que el ave registrada podía ser *A. blancae*. El 15 de enero, en un huerto

adyacente a una casa de campo, RC logró una mejor fotografía que confirmaba la identificación de la especie al presentar corona rufa, dorso gris con tinte parduzco, lista malar negra muy angosta (casi imperceptible), pecho y vientre gris blancuzco y alas sin espéculo visible[8]. Entre 28 de enero y 30 de noviembre de 2018, obtuvimos 38 eventos de observación de *A. blancae* (posiblemente 3–4 parejas) en dos puntos en la misma localidad, separados por 500 m lineales. Obtuvimos 29 registros entre 5h40–10h30 y nueve registros entre 13h25–16h00.

Los individuos se han observado principalmente en matorrales nativos remanentes, en una huerta casera cercana a dichos matorrales y en cultivos de tomate de árbol (*Solanum betaceum*), papa (*Solanum tuberosum*) y fríjol (*Phaseolus vulgaris*) que limitan con áreas naturales. Estas áreas cultivadas serían utilizadas como áreas de paso entre relictos de vegetación nativa (Fig. 1). Doce registros correspondieron a individuos solitarios, 25 registros a parejas y un registro fue de un posible grupo familiar de cuatro individuos. En seis eventos se registró a la especie forrajeando y desplazándose en compañía de *A. latinuchus elaeoprorus*, y en uno también con *A. albinucha*. En tres ocasiones se observaron interacciones agresivas, dos de ellas con Cucarachero Común *Troglodytes aedon* y una con *A. l. elaeoprorus*.

Figura 1. Hábitat de *Atlapetes blancae* en el municipio de San Pedro de los Milagros, dpto. Antioquia, Colombia (Sergio Chaparro-Herrera)

En 19 ocasiones se los observó forrajeando en estratos medios y bajos, incluyendo el suelo, consumiendo semillas y frutos de varias especies como corazón herido (*Persicaria nepalensis* Polygonaceae), encenillo (*Weinmannia pubescens* Cunoniaceae), nigüito (*Miconia resima* Melastomataceae), mortiño (*Vaccinium meridionale* Ericaceae), sauco de monte (*Viburnum undulatum* Adoxaceae) y guayabo de monte (*Myrcianthes* sp. Myrtaceae). Además, se observó picoteando las

Tabla 1. Datos morfométricos de cuatro individuos de *Atlapetes blancae* capturados en el municipio de San Pedro de los Milagros, Antioquia, y datos de tres especímenes depositados en colecciones de historia natural. Todas las medidas están en milímetros (mm) excepto el peso en gramos; ICN: Instituto de Ciencias Naturales; MCSJ: Museo del Colegio San José de La Salle; ML: Museo de La Salle.

Edad	Alto pico	Ancho pico	Comisura	Culmen expuesto	Longitud ala	Distancia primarias-secundarias	Hálux	Tarso	Cola total	Graduación cola	Peso
Inmaduro?	6,9	5,6	10,4	13,5	69	6,9	15,5	27,7	76	Muda	27,8
Inmaduro?	6,9	5,8	9,5	12,5	71	Muda	15,1	27,9	71	Muda	28,2
Adulto	7	5,5	8,5	13,5	76	7,4	12,4	27,2	85	14,8	27,89
Adulto	7	5,6	8,9	13,6	71	8	15,4	27,1	79	10	27,77
Media	6,95	5,52	9,32	13,27	71,75	7,43	14,6	27,47	77,75	12,4	27,91
Desviación	0,05	0,12	0,82	0,51	2,98	0,55	1,47	0,38	5,85	3,39	0,19
Especímenes											
ICN 19015	6,9	6,6	9,9	12,5	75	7	15	23,6	77	5,4	Sin datos
MCSJ 0242	7,54	5,64	8,69	11,73	82	10,21	16,4	22,75	85	4,14	Sin datos
ML 7553	6,6	5,5	10,3	13,5	76,7	10,6	16,2	26,4	81,5	10,4	Sin datos
Media	7,01	5,91	9,63	12,57	77,9	9,27	15,86	24,25	81,16	6,64	
Desviación	0,48	0,59	0,83	0,88	3,65	1,97	0,75	1,9	4,01	3,31	

Figura 2. Individuos capturados de *Atlapetes blancae* en el municipio de San Pedro de los Milagros, dpto. Antioquia, Colombia, posibles inmaduros (Sergio Chaparro-Herrera)

Figura 3. Individuos capturados de *Atlapetes blancae* en el municipio de San Pedro de los Milagros, dpto. Antioquia, Colombia. Superior: macho en condición reproductiva. Inferior: posible subadulto (Sergio Chaparro-Herrera)

hojas de estos arbustos para recolectar larvas y posiblemente buscar insectos adultos. También observamos (SC-H, AL-S) dos individuos el 27 de enero de 2018 en otras dos localidades a 4,2 y 5,0 km lineales de la primer localidad, separadas 2,6 km lineales entre ellas. En una de estas localidades se encontró un individuo brincando en la parte media de matorrales nativos en los límites con pastizales limpios, y en la otra un individuo estaba desplazándose en el estrato medio de un borde de bosque contiguo a pastizales arbolados. La observación más reciente, el 20 de enero de 2019, realizada durante la exploración de nuevas áreas de posible presencia de la especie, detectamos dos parejas en un parche de 77 ha de matorral nativo a una distancia de 5 km lineales de la primera localidad, a 3 km lineales de la segunda localidad y a 3,5 km lineales de la tercera localidad.

Capturas

Instalamos 4–6 redes de niebla entre 23 y 25 de febrero de 2018 en sitios donde la especie fue observada previamente. Capturamos 16 especies, incluyendo cuatro individuos de *A. blancae*, los cuales fueron pesados y medidos (Tabla 1), y se les tomó una muestra de sangre de la vena

Tabla 2. Características del plumaje y coloración general de los cuatro individuos de *Atlapetes blancae* capturados en el municipio de San Pedro de los Milagros departamento de Antioquia.

	Individuo 1	**Individuo 2**	**Individuo 3**	**Individuo 4**
Iris	Marrón rojizo	Marrón rojizo	Marrón rojizo	Marrón rojizo
Párpados	Negro	Negro	Negro	Negro
Comisura	Clara	Clara	Oscura	Oscura
Pico	Negro	Negro	Negro	Negro
Área loreal	Canela blanquecino	Canela blanquecino	Canela blanquecino	Canela blanquecino
Corona	Rufo	Rufo canela	Rufo encendido, más intenso (saturado) que todos los individuos	Rufo, similar a 1
Máscara	Negro azabache	Negro tiznado	Negro azabache	Negra tiznado, similar a 2
Auriculares	Negro grisáceo	Negro grisáceo, más claro que 1	Negro grisáceo	Negro grisáceo, similar a 2
Garganta	Crema	Crema	Blanco cremoso	Blanco cremoso
Lista malar	Negra (muy angosta), casi imperceptible	Negra (muy angosta)	Negra (muy angosta); contraste entre la parte superior de la lista malar, más blanca, y la inferior	Negra (muy angosta), más marcada que el resto de los individuos
Dorso	Gris con tinte parduzco	Gris con tinte parduzco	Gris con tinte parduzco	Gris con tinte parduzco
Pecho y vientre	Gris blancuzco con tintes crema, un poco más oscuro hacia los flancos	Gris blancuzco con tintes crema, un poco más oscuro hacia los flancos	Gris blancuzco, un poco más oscuro hacia los flancos; el individuo más blanco	Gris blancuzco, un poco más oscuro hacia los flancos; más grisáceo que 3.
Alas	Gris negruzco con bordes más claros, algunas plumas con tintes marrones (muda); algunas coberteras de las secundarias con borde rufo	Gris negruzco con bordes más claros, algunas plumas con tintes marrones (muda)	Gris negruzco	Gris negruzco con bordes más claros
Espéculo	No presenta	No presenta	Blanco, poco visible	No presenta
Cola	Gris negruzco	Gris negruzco	Gris negruzco	Gris negruzco
Patas	Negro	Negro	Negro	Negro

braquial para posterior análisis. Las muestras fueron depositadas en el laboratorio del Grupo de Ecología y Evolución de Vertebrados, Universidad de Antioquia. El 23 de febrero capturamos dos individuos que determinamos como inmaduros por su coloración de plumaje, color de comisuras y características de muda completa (Fig. 2; Tabla 2). El 25 de febrero capturamos dos individuos con coloración de plumaje en tonalidades más saturadas a los capturados anteriormente; además, uno de ellos presentó una protuberancia cloacal (macho en condición reproductiva). Consideramos que estos individuos eran adultos, posiblemente uno de ellos un subadulto (Fig. 3, Tabla 2). Adicionalmente, realizamos mediciones morfológicas de los tres especímenes depositados en colecciones de Colombia (Tabla 1).

Los resultados de estas mediciones muestran una superposición entre todas las medidas de los individuos en nuestro estudio y de los especímenes utilizados en la descripción, apoyando la identificación de nuestros individuos como *A. blancae*. Las mediciones morfológicas de *A. blancae* son similares a las reportadas para *A. latinuchus* y *A. schistaceus* en Colombia (Fig. 4), por lo que hasta ahora no se conocen diferencias marcadas en morfología entre estos tres congéneres. Se sugiere recopilar múltiples líneas de evidencia (morfometría, coloración, cantos, dieta) en búsqueda de rasgos que permitan una mejor caracterización de estos linajes.

Vocalizaciones

Analizamos seis estrofas de canto y 22 notas de llamados a partir de grabaciones de las cuales tuvimos plena certeza de la identidad del emisor. Se diferenciaron dos tipos de llamados. El primero (llamado A), más suave y corto (*tz … tz*), tuvo una duración promedio de 0,05 ± 0,1 segundos y se tuvo una frecuencia de 7.388–9.648 Hz. El llamado B fue más estridente y más largo (*tzzzz … tzzzz*), con una duración promedio de 0,19 ± 0,18 segundos y una frecuencia entre 7.931–9.872 Hz (Fig. 5). El canto tuvo una duración promedio de 3,7 ± 0,7 segundos y estaba compuesto por entre 10 y 18 sílabas. Las primeras sílabas, que correspondieron a las notas

introductorias, fueron variables en número (2–5) (Fig. 6) y tuvieron la misma estructura que los llamados, iniciando con los suaves (llamado A) y luego los más estridentes (llamado B). La siguiente sílaba fue un trino veloz con entre 4–9 notas (*trzz…*) y a continuación tuvo una serie de sílabas con notas ascendentes y descendentes, también variable en número (*…zcheui zcheui zcheui…*). En nuestras grabaciones observamos que cuando hay más llamados en las notas introductorias hay menos notas ascendentes y descendentes al final (Fig. 6). Este canto presentó frecuencias entre 5.165–8.189 Hz. Se observaron dos variaciones del canto. La primera (canto D) constó en llamados suaves seguidos por llamados más largos y con un trino final (Fig. 7). Esta variación tuvo una duración de 1,673 segundos y una frecuencia de 6.009–9.952 Hz. La otra variación detectada (canto E) tuvo una duración de dos segundos y se compuso de cinco sílabas en las que se combinaron notas largas similares al llamado B, trinos y pocas notas ascendentes y descendentes. El canto E tuvo valores de frecuencia de 4.105–10.433 Hz (Fig. 8). Es probable que el canto y los llamados descritos sean una pequeña parte del repertorio total de *A. blancae*.

Discusión

Son varias las hipótesis alrededor de la identidad y relaciones taxonómicas de *A. blancae* desde su descripción en 2007[8]. Se ha considerado que está cercanamente emparentada con *A. schistaceus*, e incluso que podía tratarse solo de una variación de coloración[19]. Nuestras observaciones y aquellas de Donegan[8] muestran que las diferencias en color y patrón de coloración son marcadas. Además, los hábitats donde hemos observado a estas dos especies presentan condiciones diferentes: *A. schistaceus* en bosques y *A. blancae* en matorrales. En las salidas de observación que hemos realizado en el municipio, a la fecha, no hemos encontrado a las dos especies en una misma localidad. Sumado a esto, análisis moleculares preliminares proponen una relación más estrecha con *A. latinuchus* que con *A. schistaceus* (A. Lopera-Salazar *et al*. no publ.). Una segunda hipótesis sugiere que *A. blancae* es una posible variación de *A. l. elaeoprorus*[19]. Sin embargo, encontramos que las vocalizaciones de *A. blancae* se diferencian de forma visual (espectrogramas) y auditiva (en el campo y en grabaciones), principalmente en las notas finales del canto, de todas las variaciones conocidas de *A. l. elaeoprorus* y archivadas en bibliotecas acústicas de acceso público (https://www.xeno-canto.org/, https://www.macaulaylibrary.org/). Las vocalizaciones se han considerado como caracteres de diagnóstico en este género[11,21]. Finalmente, se menciona que *A. blancae* podría ser un híbrido[19], pero el número de individuos observados en este trabajo, junto con el número de localidades de presencia de la especie, hace que esta hipótesis pierda validez.

Las observaciones descritas representan los primeros datos ecológicos de la especie, y sustentan la hipótesis de que hay preferencia por matorrales nativos, que forrajea en parejas o grupos en estratos medios y bajos, incluyendo el suelo, y que consume varias plantas (frutos y semillas) e insectos[8]. Estos datos son similares a otras especies del género *Atlapetes*, como *A. latinuchus* que forrajea en parejas o grupos pequeños y en estratos bajos[13] y *A. schistaceus* que forrajea a menudo en solitario o en parejas e incluye en su dieta insectos y frutas que recolecta desde el suelo hasta los 5 m; además, puede asociarse a otros *Atlapetes*[14]. Este es además el primer reporte de las vocalizaciones de esta especie, importante para comprender las diferencias vocales y las relaciones de *A. blancae* dentro de su género. Con el fin de complementar esta información, se recomienda un monitoreo acústico de la especie que permita describir ampliamente su repertorio vocal.

Una situación similar a la de *A. blancae* fue documentada para *A. pallidiceps*, especie que se creyó extinta durante varias décadas hasta su redescubrimiento al sur de Ecuador en 1998[2]. Su redescubrimiento y pronta protección[15,16] han permitido identificar las principales amenazas que enfrenta, entre las que se incluye el parasitismo por el Chamón *Molothrus bonariensis*, el cual disminuyó inicialmente la tasa de reproducción de *A. pallidiceps* en un 38,5%[17]. Las medidas de control tomadas fueron efectivas para aumentar el número de territorios ocupados[18]. Con este antecedente, es importante realizar un seguimiento de los aspectos reproductivos de *A. blancae*, incluyendo el posible parasitismo de *M. bonariensis*—especie presente en el municipio de San Pedro de los Milagros y en las áreas de registro de *A. blancae*—con el fin de implementar acciones de control para prevenir la posible disminución de sus poblaciones.

El municipio de San Pedro de Los Milagros tiene una extensión de 244,5 km^2, de los cuales el 73% ha sido transformado en pastizales para la producción principalmente de leche[1]. Las coberturas naturales de este municipio han sido en gran parte transformadas, generando un alto grado de fragmentación de áreas con rastrojo o bosque, además de una escasa o nula conectividad entre los parches de vegetación nativa. Por ello, es urgente la protección de los pocos relictos de vegetación nativa que quedan en el municipio, como matorrales emergentes en la zona de hábitat principal de *A. blancae*. Según la información recopilada hasta la fecha, *A. blancae* presenta una población muy pequeña, posiblemente menor de 50 individuos maduros, y en un área muy restringida[4,10,20].

Dada la urgencia de conocer y conservar esta especie, a lo largo de este año de redescubriemiento

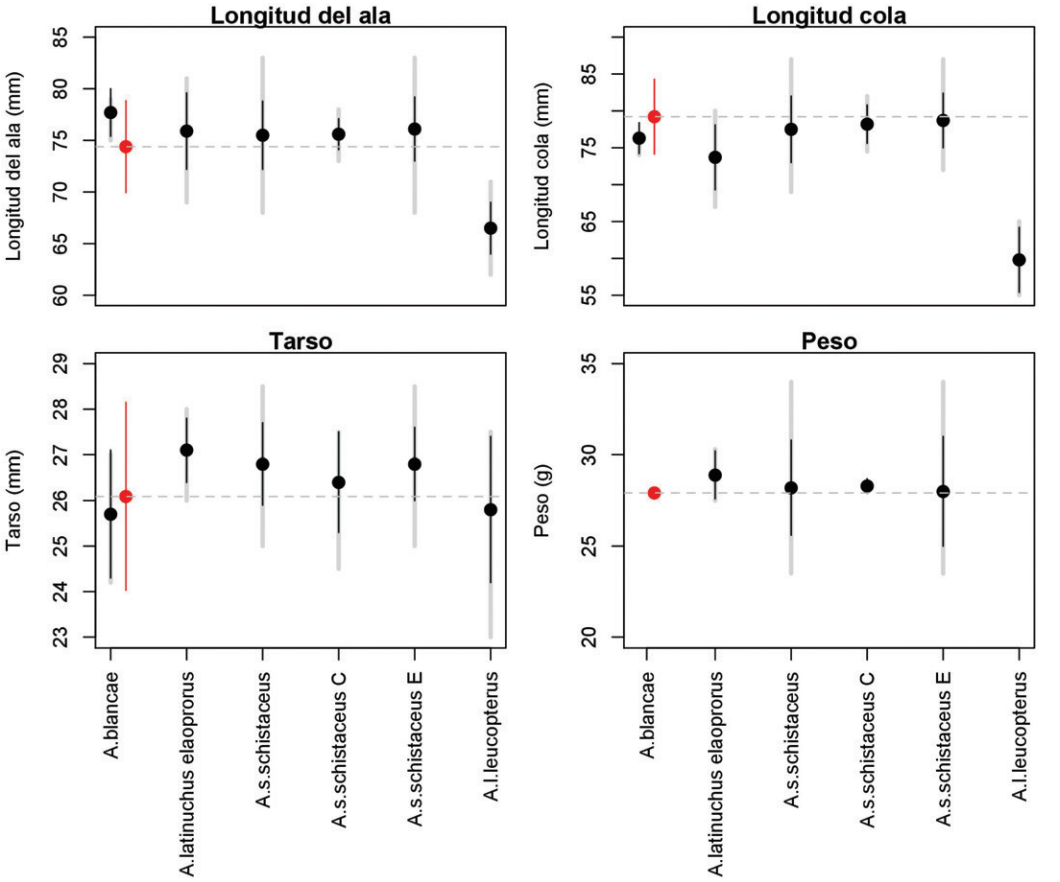

Figura 4. Datos morfológicos de las especies de *Atlapetes* reportadas en la descripción de la especie (rango en gris, promedio y desviación estándar en negro), junto con los datos presentados para *A. blancae* en este estudio (promedio y desviación estándar en rojo).

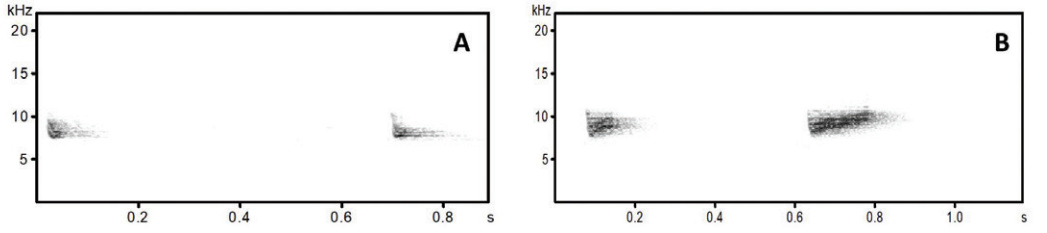

Figura 5. Llamados de *Atlapetes blancae* con notas de menor (A) y mayor (B) duración.

hemos adelantado trabajos de investigación enfocados en comprender la distribución, hábitat y taxonomía de *A. blancae*. Para ello, estamos buscando activamente nuevas localidades, aplicando modelos ecológicos para caracterizar sus preferencias ambientales y acumulando información molecular, vocal y morfológica. Adicionalmente, estamos procurando un acercamiento con la comunidad local para lograr su participación en las medidas de conservación de *A. blancae*. Reiteramos la importancia de unificar esfuerzos de conservación y recomendamos intensificar la búsqueda de la especie en áreas con condiciones de hábitat similares a las descritas en esta nota, así como la búsqueda de datos ecológicos, monitoreos para comprender el estado de la población, y seguimiento de aspectos reproductivos y factores que los afectan. Esta información permitirá

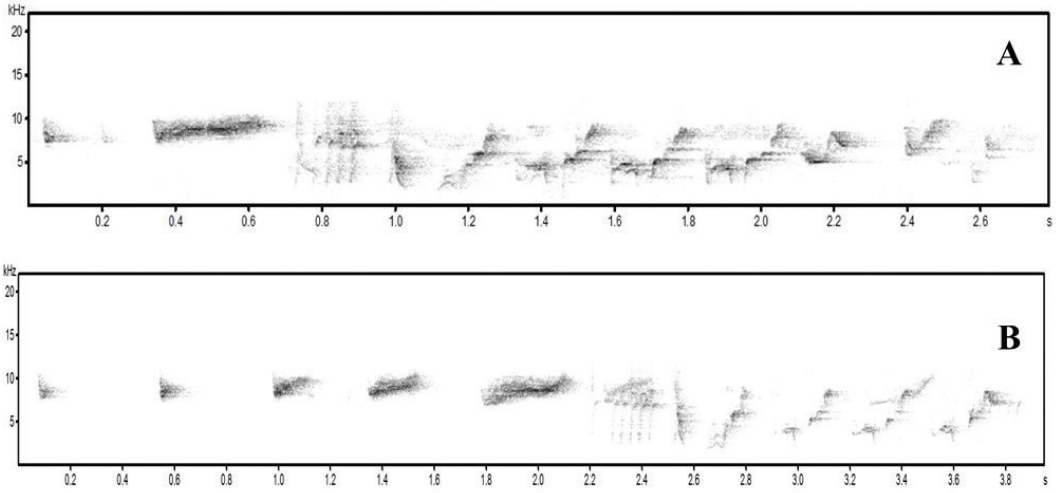

Figura 6. Canto C de *Atlapetes blancae*. (A) Pocas notas introductorias y más notas ascendentes y descendentes hacia el final; (B) más notas introductorias y menos notas ascendentes y descendentes hacia el final.

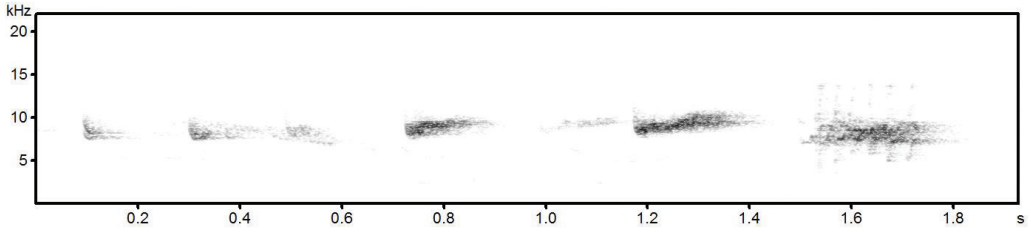

Figura 7. Canto D de *Atlapetes blancae* sin notas ascendentes y descendentes anteriormente observadas.

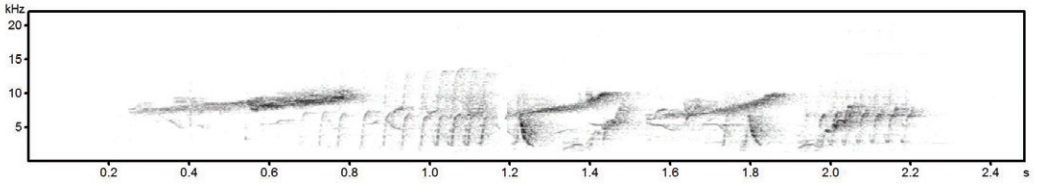

Figura 8. Variación en el canto E de *Atlapetes blancae*.

tomar decisiones locales de conservación de áreas naturales y procesos de restauración. Por último, es importante consolidar estrategias inmediatas de conservación de la especie y su hábitat con base en planes manejo y ordenamiento territorial a través de la apreciación de la biodiversidad local, sus funciones ecosistémicas y prácticas de manejo y uso sustentables.

Agradecimientos

A T. Donegan, L. M. Renjifo y J. F. Freile por sus valiosos aportes, comentarios y sugerencias al manuscrito. A Association of Field Ornithologists (Skutch Fund), American Bird Conservancy (William Belton Conservation Grant) y a Neotropical Bird Club por la financiación. Estos datos fueron tomados bajo el permiso marco otorgado a la Universidad de Antioquia mediante resolución 0524 del 27 de mayo de 2014.

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Short Communications

First breeding records of Southern Lapwing *Vanellus chilensis* for Honduras

Southern Lapwing *Vanellus chilensis* is a widespread shorebird that occurs in open areas, often near water, throughout South America[21]. During recent decades, it has become established in southern Central America[2,9,16], but is still uncommon to rare in northern Central America[1,7] (Fig. 1). We present the first breeding records of *V. chilensis* for Honduras.

On 12 July 2018, we observed a pair of Southern Lapwings tending a juvenile c. 3–4 weeks old in a cattle pasture near Villanueva, dpto. Choluteca, southern Honduras (13°02'56.40"N 87°05'36.60"W), providing the first evidence of breeding in Honduras. All three birds were feeding in a cattle pasture with a nearby waterhole, surrounded by 59% open woodland (*Crescentia* spp.), 25% pasture, 12% cultivation and 4% water within a 1 km radius. A few days later, on 15 July 2018, we found a pair with an active nest in El Jicarito Reserve, dpto. Choluteca (13°08'35.88"N 87°12'25.92"W). This nest contained three eggs being incubated, and was in an area of bare ground at the edge of a canal in a seasonal wetland (Fig. 2), surrounded by 56% pasture, 39% marsh and 5% water within a 1 km radius. Eight metres from the lapwing nest, we observed a Black-necked Stilt *Himantopus mexicanus* incubating four eggs.

First reported in Honduras in 2008[8] and still considered a vagrant to northern Central America as recently as 2016[7], observations of Southern Lapwing have increased steadily in Honduras in recent years, with records to date from seven of its 18 departments, in Gracias a Dios (since 2008), Choluteca and Francisco Morazán (2014), Olancho (2015), Santa Bárbara (2016), Yoro and Valle (2018)[6].

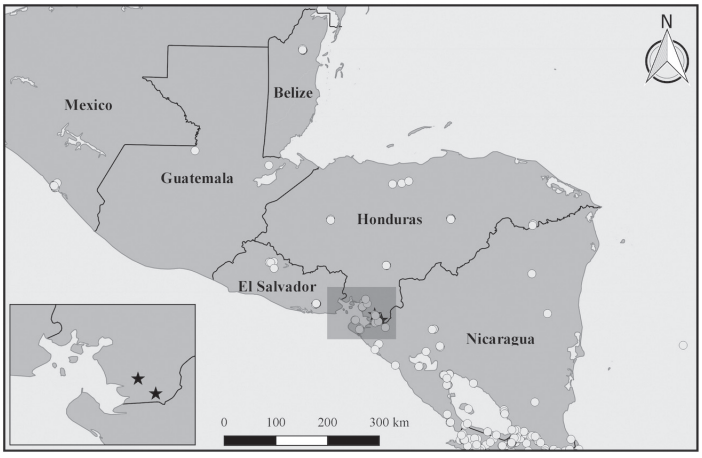

Figure 1. Southern Lapwing *Vanellus chilensis* records in northern Central America on eBird[6] up to July 2018. Inset: two nesting localities in southern Honduras reported here.

The spread north through Central America has been underway for many years. The first Panamanian record dates from 1936, when an adult was collected near Pacora[10]. By 1965 the species was considered a casual visitor to Panama[20] and by the late 1980s breeding had been suspected[16]. In 2010, the species was considered common on the Pacific slope from Coclé east, but uncommon and local elsewhere on the Pacific and Caribbean slopes of Panama[2]. The first record for Costa Rica dates from 1993[17], while breeding was documented in 2005[15]. In 2009, the first Southern Lapwings were found in Nicaragua[3], although breeding has not yet been reported there (L. Chavarría & O. Jarquín pers. comm.). Southern Lapwings were first reported in Mexico in 1996[14], Belize in 2004[11], El Salvador in 2012[1] and Guatemala in 2014[12], but breeding has not been reported from any of these countries. Our breeding records—like all of the Central American and Mexican observations identified to subspecies[1,6,14]—pertain to northernmost *V. c. cayennensis*. The northward range expansion through Central America, probably as a result of ongoing deforestation and the expansion of agricultural land, might represent the frontline of other open-country species from South America that are increasing in Central America, such as Pearl Kite *Gampsonyx swainsonii*[19], Savanna Hawk *Buteogallus meridionalis*[4,18] and Red-breasted Meadowlark *Leistes militaris*[5,13].

Acknowledgements

We are grateful to Knut Eisermann, Oliver Komar and Andrew Vallely for helpful comments that allowed us to improve this note.

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Figure 2. Nest, habitat of nest location and mobbing behaviour of Southern Lapwing *Vanellus chilensis*, El Jicarito Reserve, Choluteca, Honduras, 15 July 2018 (John van Dort)

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Received 6 August 2018; final revision accepted 20 September 2018; published online 21 June 2019

First record of Scarlet Ibis *Eudocimus ruber* in Puerto Rico

Scarlet Ibis *Eudocimus ruber* occurs mainly in northern South America, from Colombia to northern Brazil, with an apparently isolated population in south-east Brazil[1]. It is mainly coastal, inhabiting mangroves and estuaries, but also occurs inland at flooded grasslands and rice fields.

Flamenco Lagoon on Culebra Island, Puerto Rico (18º19'29.5"N, 65º19'02.2"W) is a saltwater wetland fringed by mangrove and adjacent dry shrubland[3].

Figure 1. Scarlet Ibis *Eudocimus ruber*, Flamenco Lagoon, Culebra Island, Puerto Rico, July 2018 (Julio Salgado)

At c.07h20 on 14 July 2018, I observed a Scarlet Ibis 100–200 m away, flying east. In flight, the vibrant red colour, curved bill, black wingtips and generally similar size, shape and proportions to White Ibis *E. albus* confirmed the identification. The bird landed at the edge of the lagoon, where it foraged with Black-necked Stilts *Himantopus mexicanus* and White-cheeked Pintails *Anas bahamensis*. If accepted, this would be the first record of Scarlet Ibis in Puerto Rico[2].

I was unable to photograph the bird, but I reported the observation on www.ebird.org and the bird was relocated on 17 July 2018, when photographed by J. Salgado (Fig. 1). The bird's origin is not definitely known, but it is presumably a product of the breeding programme on Necker Island, British Virgin Islands, where the birds are free-flying and unringed. Hurricane Irma passed through the area in September 2017 and might have prompted wandering by some individuals. Furthermore, the remnants of Hurricane Beryl, which passed Puerto Rico on 8 July 2018, also could have facilitated the bird's arrival. Vagrants have been recorded elsewhere in the West Indies, including Cuba, Dominica, Grenada and Jamaica[1]. The continued success of the breeding programme on Necker Island will probably complicate validation of this and any future records of the species in the region.

Acknowledgements

Wayne Arendt kindly commented on an earlier version of the manuscript. Special thanks to Sergio A. Colón López and Gabriel Lugo for feedback on the initial sighting. Julio Salgado graciously provided the photograph.

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Received 28 August 2018; final revision accepted 4 March 2019; published online 21 June 2019

Northernmost mainland South American record of Crowned Slaty Flycatcher *Empidonomus aurantioatrocristatus* at Tayrona National Natural Park, Colombia

In the morning of 24 July 2015, a Colombian Birdwatch tour co-led by C. Calonje and G. Utría spotted a lone bird perched on a dead branch atop one of the tallest trees near the main

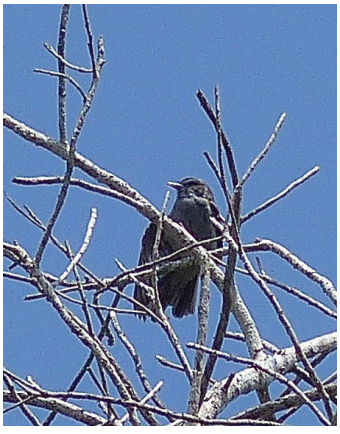

Figure 1. Crowned Slaty Flycatcher *Empidonomus aurantioatrocristatus*, Tayrona National Park, dpto. Magdalena, northern Colombia, 24 July 2015 (Christopher T. Burris)

parking area at Tayrona National Natural Park, dpto. Magdalena, northern Colombia (11°16'31.49"N 74°07'6.088"W). The immediate impression was of a medium-sized tyrant flycatcher with a vertical posture, approximately the size of a Social Flycatcher *Myiozetetes similis*. The bird appeared uniformly pale grey below and darker above. The bill was dark, straight, fairly broad-based and proportionate (in length) to the head. The eyes appeared dark. Telescope views revealed a grey-black eyestripe, a dark crown and, most notably, a patch of golden-yellow feathers in the central crown when the bird looked down. The group was initially puzzled by the bird's identity. Based on previous observations in Ecuador and Peru, however, I realised that its size, plumage and chosen perch (a treetop snag) were all consistent with Crowned Slaty Flycatcher *Empidonomus aurantioatrocristatus*, rather than any expected local species. Because McMullan & Donegan[3] suggested that the bird was hundreds of km north of its usual austral winter range, I photographed it (Fig. 1).

At c.2º north of the December 2007 Panama record[4], the Tayrona record appears to be the third northernmost overall of the species, surpassed only by a June 2008 specimen from Louisiana in the southern USA[1], and a September 2018 report from Bonaire[5] off the coast of Venezuela. There are reports from two localities in northern Venezuela[2], but the Tayrona record is the northernmost for mainland South America and, as such, expands the area of South American vagrancy for *E. aurantioatrocristatus*.

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Received 8 August 2018; final revision accepted 10 February 2019; published online 21 June 2019

New locations for Rose-breasted Chat *Granatellus pelzelni* in Colombia

Rose-breasted Chat *Granatellus pelzelni* occurs in south and south-east Venezuela and the Guianas through central and eastern Amazonian Brazil to northernmost Bolivia, and at a single locality in Colombia—Matraca, in the municipality of Inírida, dpto Guainía, near the frontier with Venezuela[2–4,6,9] (Fig. 1). The species inhabits *terra firme* forest, *várzea*, edges and mature second growth[3,9].

We present three new records from Colombia, all in the municipality of San José del Guaviare, dpto. Guaviare: a male observed by all authors foraging in the canopy and understorey beside Laguna María (02°33'N 72°39'W; 180 m) on 3 January 2016; two males and a female observed by all authors in the understorey beside Kioscos Lagoon, near Laguna María, on 16 January 2016 (Fig. 2); and a pair seen by CA in the canopy of *terra firme* forest with rocky outcrops at Bocas del Guayabero (02°34'N 72°53'W; 250 m), 400 m from the Guayabero River, on 8 March 2018. The pair formed part of a mixed-species flock that also included Ornate Antwren *Epinecrophylla ornata*, Golden-headed Manakin *Ceratopipra erythrocephala*, Long-billed Gnatwren *Ramphocaenus melanurus*, Tropical Gnatcatcher *Polioptila plumbea* and Paradise Tanager *Tangara chilensis*.

These records extend the species' range in Colombia c.540 km west, and are the only published localities away from Matraca (Fig. 1). However, there is a record in March 2017 from Solano municipality, dpto. Caquetá (https://www.xeno-canto.org/365715, D. Calderón-Franco *et al*. in prep.[5]). This record lies 330 km south-west of ours, suggesting that the species might be widespread across eastern Colombia, as recently demonstrated for several other Amazonian birds (e.g., Yellow-crowned Elaenia *Myiopagis flavivertex*, Dugand's Antwren *Herpsilochmus dugandi* and Spotted Antpitta *Hylopezus macularius*[7,8]). These records highlight the need of further field work in under-explored areas of the Colombian Amazon, where there have been only seven mid- to long-term inventories during recent decades[1].

Acknowledgements

P. Pulgarín and an anonymous referee commented on the submitted manuscript.

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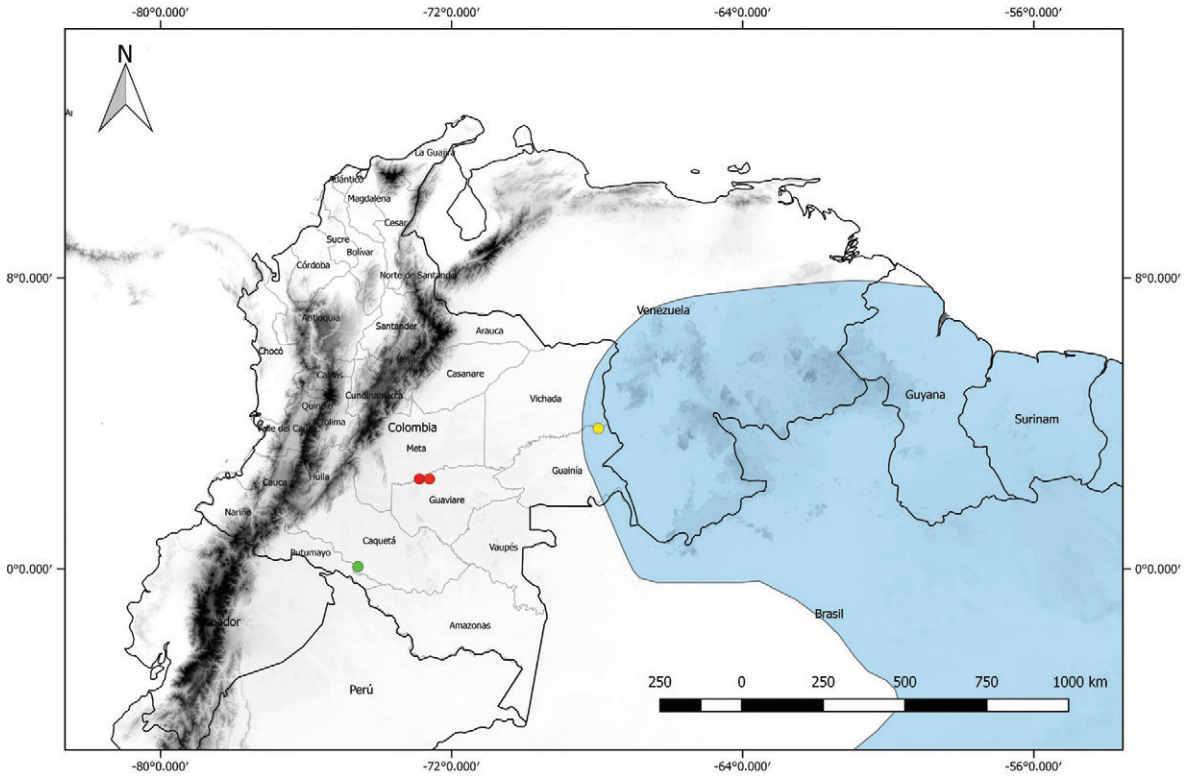

Figure 1. Distribution of Rose-breasted Chat *Granatellus pelzelni* in northern South America[3] (blue). Yellow: first confirmed record in Colombia at Matraca, municipality of Inírida, dpto. Guainía[9]. Red: new records in dpto. Guaviare (reported here). Green: record in dpto. Caquetá (https://www.xeno-canto.org/365715; D. Calderón-Franco *et al.* in prep.[5]).

Figure 2. Male Rose-breasted Chat *Granatellus pelzelni*, municipality of San José del Guaviare, dpto. Guaviare, Colombia, January 2016 (Wilmer A. Ramírez)

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Received 24 September 2018; final revision accepted 16 April 2019; published online 21 June 2019

Streptognathism displays in two *Phaethornis* hermits

Streptognathism (twisted jaw, in Latin) is defined as a voluntary medio-lateral bowing of the mandibular rami by action of the jaw muscles[1,13]. Gape expansion results from two flexion zones along the mandible, one near the mandibular symphysis (distal) and the other along the posterior third of the bill, approximately below the distal edge of the orbit[18,22]. Bowing occurs when the bill is open and the rami are twisted and rotated outward[18], causing the distal portion of the mandible to bend downward[21] and lateral gape size (intra-ramal space) to enlarge (e.g. Fig. 1). This expansion is different in hermits (subfamily Phaethorninae) vs. non-hermits (Trochilinae)[19].

White-whiskered Hermit *Phaethornis yaruqui* occurs in forest undergrowth, dense shrubbery and adjacent plantations at low to mid-elevations (median 1,500 m)[6] on the west slope of the Darién, Panama, south to western Ecuador[6,17]. Like many hermits, it forages by trap-lining at an array of flowers (e.g., Heliconiaceae, Ericaceae, Rubiaceae and Bromeliaceae) and does not defend territories at floral resources[16]; instead, males form leks where they exhibit a complex repertoire of displays, including sustained bouts of singing accompanied by repeated shaking of their tails[6,17].

On 13 November 2013, in Bajo Calima, Buenaventura municipality, dpto. Valle del Cauca, Colombia (03°54'N 76°43'W; 70 m), we observed a male *P. yaruqui* perched 50 cm above ground in dense undergrowth. It gave 13 calling bouts over c.1 minute. Calls averaged 0.61 ± 0.19 seconds (mean ± SD) in duration, and were given every 2.35 ± 0.59 seconds. The min., max. and peak frequency were 3.73 ± 0.56 kHz, 16.17 ± 0.19 kHz and 7.32 ± 2.08 kHz, respectively (www.xeno-canto.org/165378). This vocalisation is probably typical of those given at leks (www.xeno-canto.org/241485), but we did not observe or hear other individuals nearby. While calling, this and other *Phaethornis* exhibit lateral bowing of their lower jaw (streptognathism), thereby coupling acoustic and visual signals (AR-G pers. obs.). On ceasing to vocalise, it performed a prolonged lateral bowing of the lower jaw, expanding the gape and exposing the bright red colour inside (apparently the visible basal portion of the mandibular rhamphotheca). This individual did not return to the same perch and was not heard again.

Green Hermit *Phaethornis guy* inhabits rainforest undergrowth and borders, small clearings, secondary forest and adjacent plantations with dense understorey[7]. It occurs from Costa Rica to eastern Peru; in Colombia it is found in the inter-Andean foothills and all three main Andean cordilleras at 300–2,220 m[6,7]. It feeds by trap-lining on genera such as *Heliconia* (Heliconiaceae), *Costus* (Costaceae), *Razisea*, *Mirandea* (Acanthaceae), *Columnea* (Gesneriaceae) and *Lobelia* (Campanulaceae)[7].

On 17 October 2015, at Mámbita, Ubalá municipality, dpto. Cundinamarca, Colombia (04°44'N 73°21'W; 1,200 m), a male *P. guy* was trapped in a secondary forest surrounded by grassland with scattered trees. It exhibited streptognathism (Fig. 1) intermittently for c.1 minute while being handled for ageing and sexing. During mandibular bending, the intra-ramal space enlarged 42–48% (45.75 ± 2.87, n = 4; calculated by extrapolating

the bill width measurement at the nostrils).

Streptognathism has been observed in other species of *Phaethornis* including Reddish *P. ruber*[16], Long-billed *P. longirostris*[18], Grey-chinned *P. griseogularis*[13] and Margaretta's Hermits *P. margarettae* (C. Albano pers. comm.). It was also previously reported for *P. guy* by Snow[17]. Furthermore, it has been observed in other hummingbirds, namely Band-tailed Barbthroat *Threnetes ruckeri*, Bronze-tailed Plumeleteer *Chalybura urochrysia*, Crowned Woodnymph *Thalurania colombica*, Violet Sabrewing *Campylopterus hemileucurus*, Magnificent Hummingbird *Eugenes fulgens*, Blue-throated Hummingbird *Lampornis clemenciae*, Ruby-throated Hummingbird *Archilochus colubris*[15,19,20,22], and Sparkling *Colibri coruscans* and Brown Violetears *C. delphinae* (AR-G pers. obs.), as well as in other birds including most piscivores (like pelicans) and some insectivores like nightjars, swifts and puffbirds[2,5,9].

There are two different contexts in which mandibular bowing behaviours have been reported. (1) Displays in territory defence (Fig. 2) and / or pre-copulatory events in hummingbirds[11,17], which highlight bill use in aggressive contexts, even as weapons[11,12]. It has been hypothesised that streptognathism is more frequent and intense in species with a colourful inner bill, like *P. guy*[17] and *P. longirostris*[18]; *P. yaruqui* also has a colourful bill base and a lek-based mating system[18]. Some leks may be active year-round[6,14]. The use of streptognathism as a 'social display' tool could contain elements of agonistic behaviour / threat, providing information as to the individual's condition and, according to context, intent (G. Yanega pers. comm.). For example, hermits use jaw spreading while being handled (probably in fear) as a threat or a startle display (G. Yanega pers. comm.), as was probably true for the *P. guy* here. (2) Associated with foraging behaviour in hummingbirds (Fig. 3), and several other clades of birds. Open jaws are used by aerial insectivores of the Cypselomorphae to expand the gape and fly towards the prey as if using a 'butterfly net'[2,4,20,22]. Similarly, many birds are able to spread their jaws when consuming large prey like fish[3,8,21]. Comparative studies on mechanics of streptognathism use for hunting in birds are needed. Mandibular bowing has also been suggested to be associated with nectar-feeding in hummingbirds. It has been hypothesised that basal expansion of the mandible, while keeping the bill closed, is used by *Archilochus colubris* to drink nectar[22]. Such expansion could create a vacuum that may facilitate the intra-oral transport of nectar, or function as a cohesive pulling mechanism[10]. However, this has not been reported in recent studies of hummingbird drinking[10,12]. Additional studies of streptognathism in each of the above-mentioned scenarios are necessary. Each context will place different selective pressures on the evolution of jaw bending. Thus, behavioral and biomechanical differences are expected in the different contexts, which deserve further research.

Acknowledgments

We are deeply grateful to G. Yanega and D. Field for comments and suggestions on previous versions of the manuscript. We thank F. G. Stiles for his guidance on studying hummingbird biology, and K. Hurme for sharing her photographs and videos. SC-H thanks Fundación Humedales. AR-G was supported by the Miller Institute for Basic Research in Science.

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Figure 1. Streptognathism in Green Hermit *Phaethornis guy*, Mámbita, Ubalá municipality, dpto. Cundinamarca, Colombia, October 2015; stills from a video of a bird in the hand (S. Chaparro-Herrera)

Figure 2. Territory defence display by Brown Violetear *Colibri delphinae*, Finca Colibrí Gorriazul, dpto. Cundinamarca, Colombia, August 2016; opening the jaws and expanding the gape (K. Hurme)

Figure 3. Aerial hunting by Sparkling Violetear *Colibri coruscans*, Finca Colibrí Gorriazul, dpto. Cundinamarca, Colombia, July 2017; still from a video showing the open jaws prior to trapping (K. Hurme)

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Received 27 August 2018; final revision accepted 5 April 2019; published online 21 June 2019

Natural history notes of a ghost: the Alagoas Foliage-gleaner *Philydor novaesi*

Alagoas Foliage-gleaner *Philydor novaesi* is a Critically Endangered species and one of the rarest birds in the world. It is endemic to the Pernambuco Centre of Endemism[11], which comprises Atlantic Forest areas north of the São Francisco River, in north-east Brazil, and is one of the most threatened regions in the Neotropics. The species' last documented record was made by C. Albano at Frei Caneca Reserve (Jaqueira, Pernambuco; 08°42'41"S 35°50'30"W) on 13 September 2011[2].

Because of the species' extreme rarity, the NGO SAVE Brasil (the BirdLife International partner) purchased 360 ha of forest in the area in 2004. This area is adjacent to Frei Caneca Reserve and totals 1,000 ha of protected forest in the region locally known as Serra do Urubu. The reserves protect 14

Figure 1. Adult Alagoas Foliage-gleaner *Philydor novaesi* reaching-up to a bromeliad leaf (A) and with a cockroach (Blattaria) in the bill (B), Frei Caneca Reserve, Pernambuco, north-east Brazil, 5 November 2010 (A) and 5 February 2010 (B) (Carlos O. A. Gussoni)

globally threatened birds that have been monitored annually since 2006.

Between 2008 and 2010 I encountered Alagoas Foliage-Gleaner five times (on 11 November 2008, 15 November 2008, 28 November 2009, 5 February 2010 and 5 November 2010) at Frei Caneca Reserve, and collected qualitative information regarding its foraging behaviour. Here I present some new foraging manoeuvres and a new prey item for the species, and make comparisons with congenerics based on the literature and personal field observations.

I registered seven foraging manoeuvres (*sensu* Remsen & Robinson[9]) utilised by the species: hang-down, hang-sideways, hang-up, hang-upside-down, reach-down, reach-out and reach-up (Fig. 1A). The birds foraged mainly on dead leaves of bromeliads, Araceae and other woody plant groups, but also on green leaves of bromeliads and pendant mosses. Once, it was possible to identify the bromeliad species: *Canistrum aurantiacum*, Bromeliaceae (11 November 2008). The birds foraged 2–15 m above ground and food-handling included beat, engulf and gulp. I identified two prey items: a cockroach (Blattaria, 5 February 2010; Fig. 1B) and an orthopteran (5 November 2010).

According to Mazar Barnett *et al.*[4], Mazar Barnett & Buzzetti[5], Roda[10] and Teixeira & Gonzaga[13], Alagoas Foliage-gleaner forages in the canopy and understorey, capturing arthropods, principally insects. Prey are usually seized on trunks (on the surface and below bark), dry leaves (including bromeliads and other epiphytes, curled-up dry leaves and leaf clusters), green leaves, balls of detritus, and rotten and thick branches. Foraging manoeuvres previously noted included hammer, hang-down and hang-upside-down[2,4,5,13]. Dietary items previously registered included Coleoptera, Orthoptera (Acrididae) and Hymenoptera (Formicidae)[13].

Several congenerics are dead-leaf-searching specialists, e.g. Rufous-rumped Foliage-gleaner *P. erythrocercum* and Black-capped Foliage-gleaner *P. atricapillus*[7,8]. Comparing the foraging behaviour of Alagoas Foliage-gleaner with the latter, it is evident that their manoeuvres and foraging substrates are similar[3,7]. Nevertheless, Black-capped Foliage-gleaner explore mainly isolated or clusters of dead leaves and dead palm fronds[7]. Both forage mainly on dead leaves, but also in epiphytes and green leaves. All of the foraging manoeuvres I recorded for Alagoas Foliage-gleaner have been observed for Black-capped Foliage-gleaner[3,7]. On the other hand, foraging substrate appears to be different to that utilised by Buff-fronted Foliage-gleaner *P. rufum*, a species that searches for prey mainly in green leaves[6]. Foraging stratum utilised by Alagoas Foliage-gleaner is similar to those used by Black-capped Foliage-gleaner (0.4–12.0 m above ground)[7] and Buff-fronted Foliage-gleaner (mainly above 6 m)[6]. Orthopteran species were previously noted in the diet of Rufous-rumped Foliage-gleaner[12], Black-capped Foliage-gleaner[1,3] and Buff-fronted Foliage-gleaner[6,12], but Blattaria were registered only for the second-named species[3].

Acknowledgments

I thank Pedro Dias for confirming the identification of the orthopteran, Rogério Machado for helping with the figure, José Almir Jacomelli and José Fernando Pacheco for assisting with literature, Alice Reisfeld for English review, and Thiago Vernaschi Costa and Pedro Develey for refereeing the manuscript. I also thank Ciro Albano, Jociel Barbosa Vicente, José Antonio Vicente Filho, Pedro Ferreira Develey, Tatiana Pongiluppi, Thiago Vernaschi Costa and SAVE Brasil staff for field assistance and support. The Aage V. Jensen Charity Foundation, Marshall-Reynolds Foundation, Mohamed Bin Zayed Species Conservation Fund, Conservation Leadership Programme, Ricoh Co. Ltd., American Bird Conservancy (ABC), BirdLife International, Fundação Grupo Boticário de Proteção à Natureza, Albert and Nancy Boggess provided financial support.

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Received 19 January 2018; final revision accepted 27 June 2018; published online 21 June 2019

A Nocturnal Curassow *Nothocrax urumutum* with chicks in eastern Ecuador

Nocturnal Curassow *Nothocrax urumutum* inhabits wet forests of upper and middle Amazonia. Captive studies and field records suggest that *N. urumutum* often forages in daylight, but the species is rarely seen in the field. Few nests have been found[9] and very little is known about the species' breeding biology in the wild.

At 16h50 on 22 May 2018, in hilly *terra firme* forest at Tiputini Biodiversity Station, Orellana province, north-east Ecuador, under a clear sky, together with two companions, I turned a sharp corner in the trail as it crested a hill (c.00˚37'55"S 76˚09'23"W; 240 m). On the trail c.2 m in front of me I had a clear view of an adult *N. urumutum*. I identified the bird by its uniform rusty head (except a black crest), neck, breast and wings, slaty tail with buff terminal band, distinct crescent of bare yellow skin above the eye, and orange-red bill[4]. It had apparently just emerged from dense herbaceous cover along the trail which, coupled with the slope, may have obscured my approach. The adult ran a few steps, then stopped in the trail, gave a single-note squawk, raised its crest, and crouched while fanning its wings and tail. I then noted three chicks running with the adult. They were dark and dusky overall; I did not see any markings. I estimated them to be 16–18 cm tall. Initially, they ran under the cover of the adult's fanned wings and tail. The chicks emitted high-pitched peeps and ran away from me along the trail and off into the vegetation, while the adult remained with wings and tail fanned. It then resumed its normal posture and ran after the chicks. At this point, a fourth chick ran from the cover from where the adult had originally appeared, and fled after the latter. We scanned the area for c.10 m from the initial encounter without seeing or hearing additional birds, nor did we relocate the birds I had seen. There was no fallen fruit evident on the ground in the area we searched.

Although *N. urumutum* vocalises from elevated perches at night, it is increasingly recognised to be not strictly nocturnal[7]. There are reports of birds feeding on fallen fruit in the morning and before dusk[9]. The network of camera traps on trails and at salt licks (*saladeros*) at Tiputini Biodiversity Station has recorded *N. urumutum* primarily in the afternoon (15h30–17h30), with a few records in early morning (06h30–06h45; D. Mosquera pers. comm.[2]). Transects of vocalising birds at Tiputini have detected *N. urumutum* in pre-dawn / early morning hours[1]. The birds I observed did not appear to be foraging, as no fruit was found in the vicinity, but they may have been in transit to a food source. Surveys of forested areas subject to low hunting pressure using vocalising birds to estimate densities have revealed that *N. urumutum* is broadly as abundant as other large-bodied cracids with which it co-occurs[3,6,9]. One explanation for the low frequency of *N. urumutum* sightings is its propensity to freeze or to flee by running into cover, rather than the more typical curassow response of flying to perches when disturbed[9]. The species' chicks are unusual among cracids in having primary and secondary flight feathers on hatching[4]; nevertheless, the chicks I observed escaped by running.

The group of chicks accompanying the adult was larger than expected based on the clutch size of two eggs (occasionally three) reported for *N. urumutum*[4]. The four chicks I observed were of approximately equal size. Either the clutch was unusually large, or the adult was accompanying chicks from more than one nest (behaviour otherwise unknown in Cracidae). I did not see or hear other adults in the area; however, as adult *N. urumutum* sometimes travel in small groups[7] it is possible that two or more adults were present. Based on their size and plumage, the chicks I observed were probably c.4 weeks old (D. Brooks pers. comm.). I estimate they hatched in late April, with eggs laid in late March (assuming incubation period of 28 days[4]). At Tiputini, rainfall generally increases in March following a relatively dry period in November–February[2]. The timing of *N. urumutum* breeding at Tiputini might therefore track the seasonal availability of food resources.

Following a peak in tree and liana flowering that ends in December[8], ripe fruit availability on trees is highest in March[5], presumably followed by peak abundance of fallen fruit available to ground-feeding curassows.

Acknowledgements
José Macanilla and Siobhan O'Donnell assisted in the field. Thanks to Daniel Brooks, Harold Greeney, Diego Mosquera, Kelly Swing and Jason Weckstein for commenting on the paper and / or sharing information on cracid biology. My research was supported by the Drexel University Office of International Programs, Tiputini Biodiversity Station, and the Universidad San Francisco de Quito.

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Received 9 October 2018, final revision accepted 23 January 2019; published online 21 June 2019

New records of Puna Ibis *Plegadis ridgwayi* in the Bolivian lowlands

Puna Ibis *Plegadis ridgwayi* occurs in the highlands of central Peru, Bolivia, northern Chile and north-west Argentina, and is a non-breeding visitor to, and a local breeder, on the Peruvian coast[1,2,5]. In Bolivia, it has been recorded in every department except Pando, Beni and Santa Cruz, at 1,500–4,600 m (exceptionally to 700 m), and in four ecoregions:

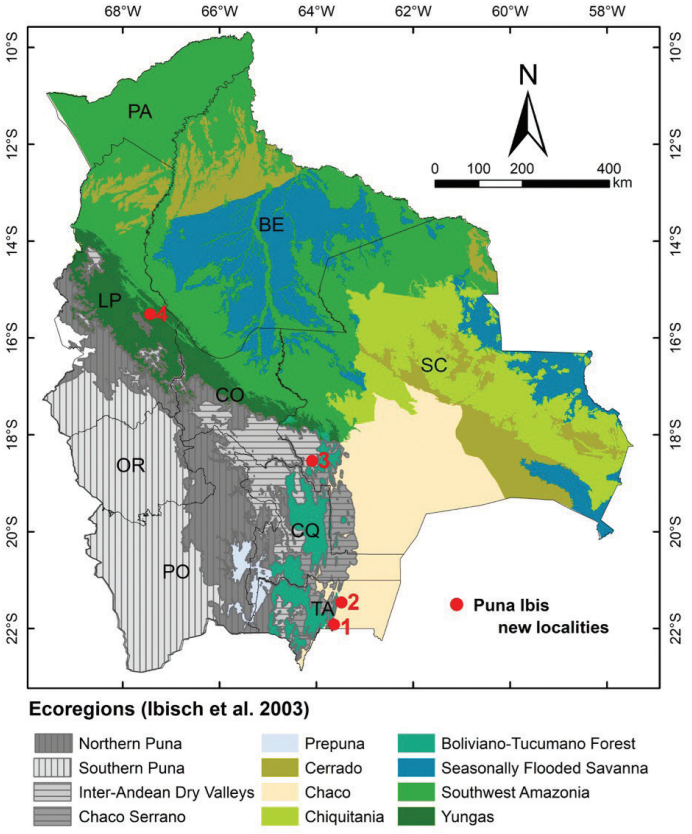

Figure 1. New localities for Puna Ibis *Plegadis ridgwayi* in Bolivia reported in this paper. Ecoregions follow Ibisch *et al.*[4].

Humid and Dry Puna, Inter-Andean Dry Valleys and, occasionally, Chaco Serrano[3]. The species inhabits large marshes, pastures, mudflats, ponds and streams, and coarse bunch grass on hillsides, sometimes far from water, but feeds mainly in flooded areas and around freshwater lakes[1,5]. Here, we report four records from parts of Bolivia where the species had not previously been recorded (Fig. 1).

On 6 August 2017, seven *P. ridgwayi* were foraging on the shore of Lago Santa Martha, 11 km north of Yacuiba, dpto. Tarija (21°55'11.0"S 63°37'44.5"W; 600 m; Figs. 1–2). They were observed together with other waterfowl, including Brazilian Teal *Amazonetta brasiliensis*, Southern Lapwing *Vanellus chilensis*, Black-necked Stilt *Himantopus mexicanus* and Wattled Jacana *Jacana jacana*. On 25 August 2017, five Puna Ibis were foraging in a swamp dominated by Caranday Wax Palm *Copernicia alba*, 24 km south of Villamontes, dpto. Tarija (21°27'50.4"S 63°28'31.9"W; 490 m; Figs. 1 and 3). This record extends the species' range c.140 km east of the locality reported in Tarija by Herzog *et al.*[3], which is in the Chaco Serrano ecoregion. Our records in dpto. Tarija are both in the Chaco ecoregion, where the species had not been recorded previously.

On 10 July 2018, eight were foraging at Laguna Rayuela, 6 km south of Vallegrande, dpto. Santa Cruz (18º32'14.8"S 64º05'01.3"W; 2,025 m; Figs. 1 and 4). Next day, the lagoon was revisited in the morning, and 315 Puna Ibis were seen, together with Comb Duck *Sarkidiornis melanotos*, White-cheeked Pintail *Anas bahamensis*, *Amazonetta brasiliensis*, Snowy Egret *Egretta thula*, Great Egret *Ardea alba* and Common Gallinule *Gallinula galeata*. These probably arrived during the previous night. This is the first record of Puna Ibis for dpto. Santa Cruz.

On 27 July 2018, two (one of them in breeding plumage) were seen feeding on the banks of the upper río Beni at Santa Ana, 13.5

Figure 2. Puna Ibis *Plegadis ridgwayi*, Lago Santa Martha, dpto. Tarija, Bolivia, August 2017 (Miguel Ángel Montenegro)

Figure 3. Two Puna Ibis *Plegadis ridgwayi*, south of Villamontes, dpto. Tarija, Bolivia, August 2017 (Miguel Ángel Montenegro)

Figure 4. Group of Puna Ibis *Plegadis ridgwayi*, Laguna Rayuela, dpto. Santa Cruz, Bolivia, July 2018 (Miguel Ángel Aponte)

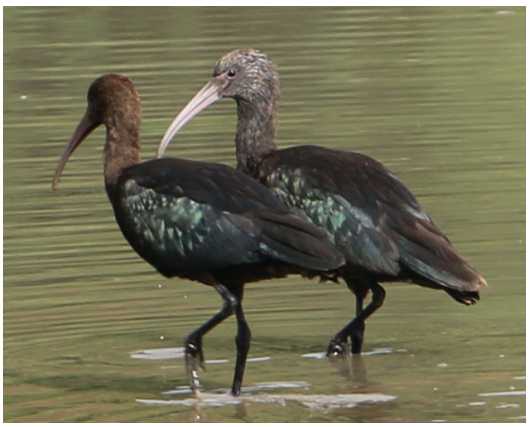

Figure 5. Puna Ibis *Plegadis ridgwayi*, upper río Beni, Santa Ana, dpto. La Paz, Bolivia, July 2018 (Kazuya Naoki)

km north-west of Sapecho, dpto. La Paz (15°30'29.4"S 67°25'58.0"W; 370 m; Figs. 1 and 5). This site is in south-west Amazonia. This is the lowest altitudinal record for Puna Ibis on the east slope of the Andes and the first for Amazonia.

The records reported here suggest that the Puna Ibis occurs at lower elevations in Bolivia than previously documented. The species appears to move altitudinally, with records on the Peruvian coast[1], but little is known concerning elevational movements on the east slope of the Andes.

Acknowledgements
We thank Lilian Acuña, of the Dirección de Medio Ambiente del Municipio de Vallegrande, and two anonymous reviewers for their helpful suggestions.

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Received 6 November 2018; final revision accepted 19 January 2019; published online 21 June 2019.

Registros documentados de joão-de-barro *Furnarius rufus* em Pernambuco, Brasil

O genero *Furnarius* é composto por oito especies com distribuição na América do Sul. Dentre os representantes desta família, o mais popular é o joão-de-barro *F. rufus* por apresentar um ninho de barro abaulado, em forma de forno[6]. Segundo Sick[6], o *F. rufus* se distribui da Argentina à Bolívia e Paraguai. No Brasil a literatura apresenta informações de ocorrência dessa espécie no Estado de Rio Grande do Sul[2,5], São Paulo[1], indo até a região Nordeste do país[6]. Para a região Nordeste não há registros documentados no Estado de Pernambuco, no entato há registros para Bahia[4], Paraíba[a] e Sergipe, Alagoas, Piauí e Maranhão (www.wikiaves.com.br/mapaRegistros_joao-de-barro). O registro foi realizado no município de Floresta, Pernambuco, Brasil (08º36'04"S 38º34'07"W), no dia 13 de janeiro de 2016, sendo a fotografia depositada na plataforma Wikiaves (www.wikiaves.com.br; WA2437430). A ave encontrava-se solitária na ocasião. *F. rufus* é encontrado na lista segundaria para o Estado de Pernambuco, com esse registro, sugerimos a inclusão da espécie na lista primaria.

Agradecimentos
A Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) pela bolsa de pós-graduação concedida a dois dos autores, bem como ao editor e ao revisor pelas sugestões na correção do manuscrito.

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Received 25 August 2017; final revision accepted 25 October 2017; published online 21 June 2019

Bran-coloured Flycatcher *Myiophobus fasciatus* in Amazonas state, Brazil, and notes on other open-country species in Amazonia

Bran-coloured Flycatcher *Myiophobus fasciatus* is a small tyrannid that perhaps has two morphs (greyish and rufous) and a small reddish or yellowish concealed coronal stripe; its boldly striped chest is distinctive among related species. It occurs mainly in open areas, including Brazilian *cerrado*, *caatinga* and regenerating forests (*capoeira*), being absent from dense or flooded forests[10], but it has also been suggested that *M. fasciatus* is an austral migrant to Amazonia[6]. Although there are records in almost all Brazilian states[9–11], its presence in Amazonas is undocumented. Here, we present the first record for Amazonas, at Parintins, and discuss its probable explanation.

Parintins is a rural city in Amazonas state, northern Brazil, on an island near the border with Pará state[8]. The natural vegetation is a mosaic of *terra firme* and *várzea* forests, with small areas of *campina* and *campinarana*[7]. In the centre of the municipality, original forest cover has been almost completely transformed into cattle pastures.

On 6 May 2013, at 11h40, while conducting an avian inventory for an airport management plan, we observed a single *M. fasciatus* foraging in bushes of *Borreria* sp. (Rubiaceae) and *Mimosa* sp. (Fabaceae), in an open area near the municipal rubbish dump (02°38'39.59"S 56°45'8.37"W; c.50 m). After ten minutes the bird was lost, but only after it had been photographed (Fig. 1).

There are previously unpublished records of *M. fasciatus* in Amazonas. One was observed in the canopy of *terra firme* forest, at Iracema Falls, Presidente Figueiredo, in January 2002, with another in second growth at Tupana Lodge, in the municipality of Borba, in July 2007 (A. Whittaker pers. comm.). Even more recently, the species has been recorded three more times at Presidente Figueiredo: on 20 September 2013 (MHMB), 10 September 2014 (FBRG) and 21 January 2018 (H. A. Perreira; http://www.wikiaves.com/2879139). Remaining forest at Presidente Figueiredo is better preserved, with many small cattle pastures and orchards where *M. fasciatus* was observed. Additionally, there is a 2013 record from Guajará, near the border with Acre (E. T. Rodrigues; http://www.wikiaves.com/1115239).

The dates and number of records might suggest that *M. fasciatus* is in fact an austral migrant, except for those in January (A. Whittaker pers. comm.). However, we believe that the presence of *M. fasciatus* in Parintins might result from recent expansion following dramatic habitat changes, it being a species typical of open, drier and degraded habitats.

Other species typical of open areas recorded in Parintins included Toco Toucan *Ramphastos toco*, Hyacinth Macaw *Anodorhynchus hyacinthinus* and White Woodpecker *Melanerpes candidus*. *R. toco* is very common in the Brazilian *cerrado*. We observed a small population (probably recently established; M. Cohn-Haft pers. comm.) at Parintins in 2009 (MHMB) and 2013[5]. Furthermore, three *A. hyacinthinus* were recorded by MHMB in 2009[1] in open habitats near the village of Vila Amazônia, and in April 2013 two *A. hyacinthinus* (J. Valsko; http://www.wikiaves.com/943079), possibly the same as in 2009, indicates that the region continues to be used by the species. In June 2012, five *M. candidus* were recorded by R. Czaban (http://www.wikiaves.com/2879139) in the centre of the municipality, in pastures; the species was recorded again in the same area in May 2013 and August 2014 (FBRG).

Neighbouring regions of Pará and Mato Grosso have witnessed the highest levels of deforestation in all of Amazonia due to legal and illegal logging, commercial cattle ranching and agro-business[3]. Parintins lies immediately adjacent to Pará, suggesting that the region serves as a starting point for expanding deforestation into Amazonas, permitting open-country birds to colonise central Brazilian Amazonia. Newly arrived species can use patches of naturally open habitat, such as savanna and *campina*, but also anthropogenic areas like pastures and agricultural fields. This mechanism has been proposed to explain the colonisation of Amazonas by other open-country species like Black-faced Tanager *Schistochlamys melanopis* and Burrowing Owl *Athene cunicularia*[4,5]. In a study of natural savannas in central Amazonia, without pastures and deforested habitats, Borges[2] did not find *M. fasciatus*, supporting our suggestion that the species colonises deforested areas more

Figure 1. Bran-coloured Flycatcher *Myiophobus fasciatus*, Parintins, Amazonas, Brazil, May 2013 (Felipe Bittioli R. Gomes)

readily than naturally open areas. Records of *M. fasciatus* from other Amazonian states (Roraima, Pará, Mato Grosso, Acre) further indicate that the species might benefit from a broad front of deforestation and human colonisation of open habitats further south.

Acknowledgements

We thank Robson Czaban and Andrew Whittaker for permission to cite their records, also uploaded at www.wikiaves.com.br, Fernando Straube for identifying the vegetation, and Adrian Barnett for suggestions and his review of the English version of this note. FBRG thanks CNPq for Ph.D. (#145304/2009-4), and post-doctoral PNPD/UFPA fellowship support, and Atend Ltda. for research support.

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Received 3 December 2015; final revision accepted 3 September 2018; published online 21 June 2019

New description of the nest, eggs and nestling of Greenish Schiffornis *Schiffornis virescens*

Greenish Schiffornis *Schiffornis virescens* is endemic to the Atlantic Forest biome[10]. It occurs from Bahia south to Rio Grande do Sul, Brazil, and in eastern Paraguay and northern Argentina[7,10]. Despite being common, information on its breeding biology is scarce[2]. The first nest was described by Snow[10] as a large cup made of leaves, sited 3 m above ground, in the fork

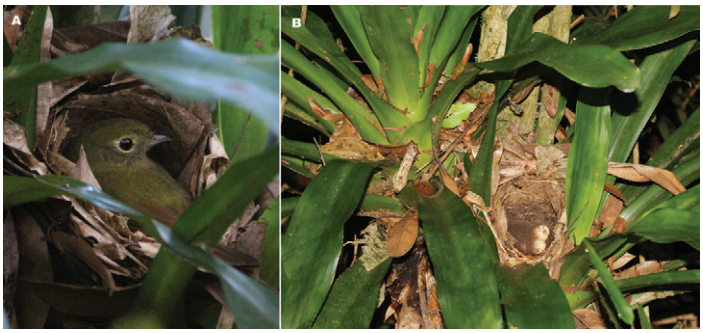

Figure 1. Nest of Greenish Schiffornis *Schiffornis virescens*, municipality of Grão Pará, Santa Catarina, southern Brazil, December 2017 (Guilherme Willrich): (A) adult incubating; (B) nest located between two live bromeliads on a small tree (Guilherme Willrich)

Figure 2. Nest and eggs of Greenish Schiffornis *Schiffornis virescens*, municipality of Grão Pará, Santa Catarina, southern Brazil, December 2017: (A) nest on 6 December 2017 containing three creamy-white eggs with a ring of reddish-brown spots (Larissa Zanette da Silva; (B) nest on 10 December 2017 with two eggs and a nestling covered in dense brown down (Guilherme Willrich)

of an understorey plant. However, this was questioned because it differs from other nest descriptions for members of the genus *Schiffornis*[3]. The first documented nest observations were made by A. Bianco and archived in Wikiaves (www.wikiaves.com.br; WA36059 and WA143347)[3]. This nest was a cup of leaves constructed within a cavity in a tree-fern trunk, and contained three white / creamy eggs with brown spots[3].

Additional breeding data were published recently by Marini & Heming[4] who reviewed online databases and museum collections to establish a reproductive period for *S. virescens* between October and February, and also reported two clutches of two eggs each. Further, Bodrati & Cockle[1] described three nests from Argentina. All these nests were cups constructed of leaves, attached to fern stems, and all contained three creamy-white eggs speckled reddish chestnut[1]. Unfortunately, all three nests were predated and no additional information was obtained[1]. Given the paucity of breeding data, we present another description of the species' nest and eggs, and the first data concerning the nestling of *S. virescens*.

The nest was found on 6 December 2017 in an old-growth forest fragment surrounded by *Eucalyptus* sp. plantations, on a private property in the municipality of Grão Pará, Santa Catarina, southern Brazil (28°05'32.5"S 49°18'50.8"W; 400 m). The fragment is crossed by two streams and the nest was located atop a hill between them. The forest understory was open, with many ground bromeliads.

The nest was c.1 m above ground, concealed between two epiphytic bromeliads attached to a small tree stem (Fig. 1). It was a cup constructed of dead leaves and some 'leaf skeletons' in the innermost portion of the cup. The rim of the cup facing the tree was higher than the other rim, giving a slightly angled shape. The base of the cup was lined with dark rhizomorphs and thin rootlets, and held three eggs (Fig. 2). Eggs were creamy white with a ring of reddish-brown spots near the larger end. One of the eggs was cracked. Unfortunately, as the discovery was opportunistic, no measurements of the eggs and nest could be made. Initially, no adult was seen on the nest and the species concerned could not be identified. On 10 December, we revisited the site and identified the species by observing an adult at the nest (Fig. 1A). By now, one nestling had hatched (Fig. 2). It was estimated to be 1–4 days old, and was covered in dense brown down with elongated barbs, which provided good camouflage within the nest. Skin was pinkish.

The nest was very similar to the photographs taken by A. Bianco and to the nests described from Argentina[1], except that our nest was attached to a small tree and concealed within two live bromeliads. *Sensu* Simon & Pacheco[8], the nest of *S. virescens* described here can be classified as a low cup (total height similar to diameter) supported at its base (by the bromeliads). Clutch size and egg colour were similar to those reported by Bodrati & Cockle[1], but differ slightly from Marini & Hering[4] and the eggs described by Schönwetter[6]. The latter author

described unmarked white eggs, but questioned the species identity due to similarities with eggs of a Furnariidae[6] and this description must be regarded as dubious. The eggs reported by Marini & Hering[4] were covered in small spots throughout, while those described by Bodrati & Cockle[1] and observed by us had a ring of large spots at the large end. Differences in clutch size were attributed by Marini & Hering[4] to this character being influenced by latitude.

We provide the first description of the nestling, which was similar to nestlings of two other *Schiffornis* species for which descriptions are available, namely Northern Schiffornis *S. veraepacis*[9] and Russet-winged Schiffornis *S. stenorhyncha*[5]. Sandoval *et al*.[5] suggested that dense down provides temperature stability for nestlings during the early stages of development. We suggest that this dense down might be also important for nestling camouflage, as it strongly resembled the lining of the nest's inner cup.

Acknowledgements
We thank Prosul for logistical and financial support. We also thank the *Cotinga* editorial team and an anonymous reviewer for their valuable contributions.

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Received 1 August 2018; final revision accepted 19 October 2018; published online 21 June 2019

The display flight of Yellow-shouldered Grosbeak *Parkerthraustes humeralis*

Yellow-shouldered Grosbeak *Parkerthraustes humeralis* is a little-known passerine of lowland *terra firme* forest in southern Colombia, eastern Ecuador, eastern and central Peru, northern Bolivia and a significant part of southern Amazonian Brazil[1]. It is either genuinely rare or partially overlooked because of its canopy-dwelling habits and apparently easily missed vocalisations[3]. Consequently, very little is known of its ecology and behaviour. Here, I report a display flight of this species in Bolivia.

On 9 November 2017, between 17h00 and 18h00, I observed two *P. humeralis* near Sadiri Lodge, in north-west Bolivia (14°10'48"S 67°55'12"W; 700 m). The lodge is a few km uphill from the village of Tumupasa, and within Madidi Integrated Management Natural Area and National Park. Following their calls, the birds were spotted under adverse light conditions atop a tree, and readily identified by their head pattern and remarkable bill shape, visible using a telescope. After playback, one bird flew in and landed on top of a tree, on a dead branch, c.20–40 m away, and was studied under much better light conditions at eye level given the hilly nature of the site. It was silent for c.5–10 minutes perched quietly but very visibly. Thereafter, the bird, presumably a male given its strong head pattern and near-white underparts[2,4], uttered high-pitched *b'dee* calls (XC395392; www.xeno-canto.org), quite different from the species' better-known *tsee-weet* call (e.g. XC 3123). Subsequently, it gave a high-pitched song, a mix of quite nasal calls and rapid trills (XC395390). While singing, the bird swung its head from left to right, much like certain hummingbirds, e.g. Violet-headed Hummingbirds *Klais guimeti* (pers. obs.), which were also very vocal in the same area.

More remarkable were the song or display flights. On several occasions, the bird took flight and

immediately started to sing, flying in a straight line but rolling its body left to right along the axis of the body, and landed on a bare branch in another treetop, where it perched for c.1 minute before launching into another song flight, before returning to the original perch. The distance covered during one song flight was c.100 m. The yellow shoulders were much more evident during the display flight than when perched. It appeared as if the feathers were ruffled to stand out from the other wing feathers, or as if the carpal joint was pushed forwards to highlight the yellow shoulders. It is tempting to speculate that the yellow patches serve as an advertisement during song flights, either aimed at a potential mate or a rival male. A second individual, of unidentified sex, was heard giving the *tsee-weet* call distantly. To my knowledge, song flights have not previously been reported for this species, nor has the habit of displaying the yellow shoulders.

Acknowledgements

Raoul Beunen, Klaas Bouwmeester and Merijn Salverda helped find the birds.

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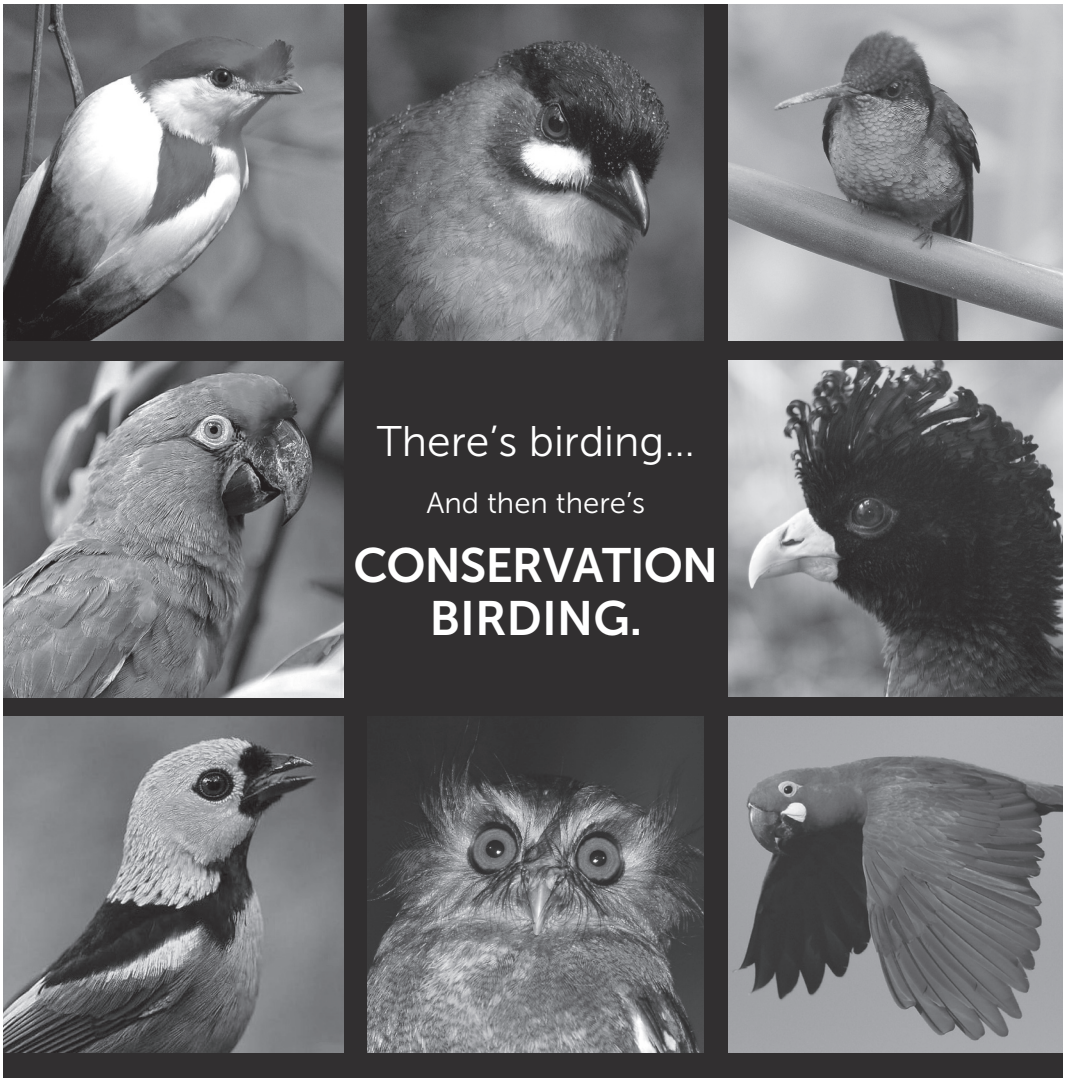
Received 8 December 2017; final revision accepted 3 September 2018; published online 21 June 2019

Corrigendum

S. N. G. Howell (*in litt*. 2018) has brought to our attention that Fig. 1 in the note concerning the first record of Tropical Parula *Setophaga pitiayumi* on Cozumel Island and the Yucatán Peninsula, Mexico (*Cotinga* 40: 91) 'shows a bird with features inconsistent for Tropical and suggests instead an odd Northern Parula (or perhaps a hybrid): the yellow throat is narrow (dark on head extends to malar tract, one of the best diagnostic features for Northern) and there is a hint of white eye arcs, especially below the eye. The extent of yellow below is difficult to evaluate in the single photo, but does not look bad for Northern, and appears to be not extensive enough for Tropical.'



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