ISSN (impresso/printed) 0103-5657
ISSN (on-line) 2178-7875

Revista Brasileira de Ornitologia

Volume 22 / Issue 22
Número 3 / Number 3
Setembro 2014 / September 2014

www.museu-goeldi.br/rbo

Publicada pela / Published by the
Sociedade Brasileira de Ornitologia / Brazilian Ornithological Society
Belém - PA

Revista Brasileira de Ornitologia

EDITOR / EDITOR IN CHIEF	Alexandre Aleixo, *Museu Paraense Emílio Goeldi / Ministério da Ciência, Tecnologia e Inovação,* Belém, PA. E-mail: aleixo@museu-goeldi.br
SECRETARIA DE APOIO À EDITORAÇÃO / MANAGING OFFICE	M. Regina de S. Bueno Bruno, São Paulo, SP.

EDITORES DE ÁREA / ASSOCIATE EDITORS

Biologia Evolutiva / Evolutionary Biology:	Gustavo Sebastián Cabanne, *Museo Argentino de Ciencias Naturales "Bernadino Rivadavia"*, Buenos Aires, Argentina Jason D. Weckstein, *Field Museum of Natural History,* Chicago, USA
Comportamento / Behavior:	Carlos A. Bianchi, *Universidade Federal de Goiás,* Goiânia, GO Carla Suertegaray Fontana, Pontifícia *Universidade Católica do Rio Grande do Sul*, Porto Alegre, RS Cristiano Schetini de Azevedo, *Universidade Federal de Ouro Preto,* Ouro Preto, MG
Conservação / Conservation:	Alexander C. Lees, *Museu Paraense Emílio Goeldi*, Belém, PA James J. Roper, *Universidade de Vila Velha*, Vila Velha, ES
Ecologia / Ecology:	Leandro Bugoni, *Universidade Federal do Rio Grande*, Rio Grande, RS Caio Graco Machado, *Universidade Estadual de Feira de Santana*, Feira de Santana, BA Marco Aurélio Pizo Ferreira, *Universidade Estadual Paulista*, Rio Claro, SP
Sistemática, Taxonomia e Distribuição / Systematics, Taxonomy, and Distribution:	Luciano N. Naka, *Universidade Federal de Pernambuco*, PE Luís Fábio Silveira, *Universidade de São Paulo,* São Paulo, SP Marcos Pérsio Dantas Santos, *Universidade Federal do Pará*, Belém, PA
CONSELHO EDITORIAL /EDITORIAL COUNCIL	Edwin O. Willis, *Universidade Estadual Paulista,* Rio Claro, SP Enrique Bucher, *Universidad Nacional de Córdoba,* Argentina. Richard O. Bierregaard Jr., *University of North Carolina,* Estados Unidos José Maria Cardoso da Silva, *Conservation International,* Estados Unidos Miguel Ângelo Marini, *Universidade de Brasília,* Brasília, DF Luiz Antônio Pedreira Gonzaga, *Universidade Federal do Rio de Janeiro,* Rio de Janeiro, RJ

***** O trabalho do Editor, Secretaria de Apoio à Editoração, Editores de Área e Conselho Editorial da Revista Brasileira de Ornitologia é estritamente voluntário e não implica no uso de quaisquer recursos e infraestrutura que não sejam pessoais*****
***** The work of the Editor in Chief, Managing Office, Associate Editors, and the Editorial Council of Revista Brasileira de Ornitologia is strictly voluntary, and does not involve the use of any resources and infrastructure other than the personal ones*****

SOCIEDADE BRASILEIRA DE ORNITOLOGIA

(Fundada em 1987 / Established in 1987)
www.ararajuba.org.br

DIRETORIA / ELECTED BOARD (2014-2016)	Presidente / president: Miguel Ângelo Marini, *Universidade de Brasília,* Brasília, DF 1° Secretário / 1st Secretary: Caio Graco Machado, *Universidade Estadual de Feira de Santana*, Feira de Santana, BA 2° Secretário / 2nd Secretary: Wesley Rodrigues Silva, *Universidade Estadual de Campinas*, Campinas, SP 1° Tesoureira / 1st Treasurer: Carla Suertegaray Fontana, *Pontifícia Universidade Católica do Rio Grande do Sul*, Porto-Alegre, RS 2° Tesoureiro / 2nd Treasurer: Ricardo Belmonte-Lopes – *Mater Natura – Instituto de Pesquisas Ambientais*, PR
CONSELHO DELIBERATIVO / ELECTED COUNCILORS 2011-2015	Nêmora Pauletti Prestes, *Universidade de Passo Fundo*, Passo Fundo, RS (**2014-2017**) Márcio Amorim Efe, *Universidade Federal de Alagoas*, Maceió, AL James J. Roper, *Universidade de Vila Velha*, Vila Velha, ES Claiton Martins Ferreira, *Universidade Federal do Rio Grande do Sul*, Porto Alegre, RS Márcia Cristina Pascotto, *Universidade Federal de Mato Grosso*, Barra do Garças, MT
CONSELHO FISCAL / FINNANCIAL COUNCIL 2014-2016	Marilise Mendonça Krügel*, Universidade Federal de Santa Maria*, RS Patrícia Pereira Serafini, CEMAVE/ICMBIo, SC Paulo de Tarso Zuquim Antas, *PTZA Consultoria e Meio Ambiente*, Brasília, DF

A ***Revista Brasileira de Ornitologia*** (ISSN 0103-5657 e ISSN 2178) é um periódico de acesso livre editado sob a responsabilidade da Diretoria e do Conselho Deliberativo da Sociedade Brasileira de Ornitologia, com periodicidade trimestral, e tem por finalidade a publicação de artigos, notas curtas, resenhas, comentários, revisões bibliográficas, notícias e editoriais versando sobre o estudo das aves em geral, com ênfase nas aves neotropicais. Todos os volumes ***Revista Brasileira de Ornitologia*** podem ser acessados gratuitamente através do site http://www.museu-goeldi.br/rbo

The ***Revista Brasileira de Ornitologia*** (ISSN 01035657 e ISSN 2178-7875) is an open access journal edited by the Elected Board and Councilors of the Brazilian Ornithological Society and published four times a year. It aims to publish papers, short communications, reviews, news, and editorials on ornithology in general, with an emphasis on Neotropical birds. All volumes of ***Revista Brasileira de Ornitologia*** can be downloaded for free at http://www.museu-goeldi.br/rbo

Projeto Gráfico e Editoração Eletrônica / Graphics and electronic publishing: M. Regina de S. Bueno Bruno (e-mail: mrsbueno@gmail.com).

Capa: Casal de chororó do pantanal (*Cercomacra melanaria*; macho à esquerda e fêmea à direita), espécie cuja biologia reprodutiva é documentada em detalhes pela primeira vez por Bernardom *et al.* Montagem com base nas fotos de Aldo Ortiz.

Cover: Pair of the Mato Grosso Antbird (*Cercomacra melanaria*; male to the left and female to the right), whose breeding biology is documented in detail for the first time herein by Bernardom *et al.* Photomontage based on Aldo Ortiz pictures.

ISSN (impresso/printed) 0103-5657
ISSN (on-line) 2178-7875

Revista Brasileira de Ornitologia

Volume 22 / Issue 22
Número 3 / Number 3
Setembro 2014 / September 2014

www.museu-goeldi.br/rbo

Publicada pela / Published by the
Sociedade Brasileira de Ornitologia / Brazilian Ornithological Society
Belém - PA

Revista Brasileira de Ornitologia

Impact Factor: 0.358
This is a Qualis CAPES B2 journal.

A Revista Brasileira de Ornitologia é publicada com recursos de:

CNPq
Conselho Nacional de Desenvolvimento
Científico e Tecnológico

CAPES

Artigos publicados na *Revista Brasileira de Ornitologia* são indexados por:
Biological Abstract, Scopus (Biobase, Geobase e EMBiology), Zoological Record e Web of Science®.

Manuscripts published by Revista Brasileira de Ornitologia are covered by the following indexing databases:
Biological Abstracts, Scopus (Biobase, Geobase, and EMBiology), Zoological Records and Web of Science®.

Registro no ZooBank
urn:lsid:zoobank.org:pub:6F023490-1FF1-41FD-A720-84F548E5D65C

ZooBank Register
urn:lsid:zoobank.org:pub:6F023490-1FF1-41FD-A720-84F548E5D65C

FICHA CATALOGRÁFICA

Revista Brasileira de Ornitologia / Sociedade Brasileira de
Ornitologia. Vol. 20, n.1 (2012) -
Belém, A Sociedade, 2005 -
v. : il. ; 30 cm.

Continuação de:. Ararajuba: Vol.1 (1990) - 13(1) (2005).

ISSN: 0103-5657 (impresso)
ISSN: 2178-7875 (on-line)

1. Ornitologia. I. Sociedade Brasileira de Ornitologia.

Revista Brasileira de Ornitologia

Issue 22 – Number 3 – September 2014

CONTENTS

ARTICLES

Comparative population densities of three species of doves (Columbidae) in disturbed landscapes in Northern Paraná State, Brazil

Priscila Montes Fontoura and Mário Luis Orsi *245*

Age and gender related plumage variation of psittacofulvine pigments: the case of the Yellow-faced Parrot *Alipiopsitta xanthops*

Carlos Barros de Araújo and Luiz Octavio Marcondes-Machado *251*

Occurrence of the Eastern Slaty Thrush (Turdidae) in southern Brazil during the non-breeding season

Huilquer Francisco Vogel *260*

Uniformity of diet composition of Brown Skua chicks at different ages and between siblings

Maricel Graña Grilli, Lucas J. Marti and Diego Montalti *265*

Reproductive biology and nest-site selection of the Mato Grosso Antbird *Cercomacra melanaria* in the Brazilian Pantanal

Bianca Bernardon, Paula Fernanda Albonette de Nóbrega1 and João Batista de Pinho *270*

SHORT-COMMUNICATIONS

New Record of the Rufous–Vented Ground–Cuckoo (*Neomorphus geoffroyi dulcis*) in the Atlantic Forest, Brazil

Fagner Daniel Teixeira, André Aroeira Pacheco and Fernando Cesar Cascelli de Azevedo *278*

New records and distribution extension of *Buteogallus solitarius* (Aves: Accipitridae) in Venezuela

Adrián Naveda-Rodríguez and Gabriela Lugo *281*

First record of the Andean Flamingo in the Brazilian Amazon

Bianca Bernardon and João Valsecchi *285*

Feeding of nestlings of the Amazonian Motmot (*Momotus momota*) in southern Goiás, Brazil

Marcos Antônio Pesquero, André Grassi Corrêa, Marcos Filipe Pesquero and Henrique Marques de Paula *288*

Tap patiently, hit safely: a preying tactic of the White Woodpecker on social wasp nests

Ivan Sazima *292*

Hunting the unexpected: Harris's Hawks (*Parabuteo unicinctus*) preying on bats in a Neotropical megacity

Rubén Ortega-Álvarez and Rafael Calderón-Parra *297*

Black-throated Antshrike preys on nests of social paper wasps in central French Guiana

Sean Mccann, Onour Moeri, Tanya Jones and Gerhard Gries *300*

The Grey-bellied Shrike Tyrant (*Agriornis micropterus*), a new tyrant flycatcher for Brazil

Gina Bellagamba, Danielle Bellagamba-Oliveira and Rafael Antunes Dias *303*

Predation of Green Iguana (*Iguana iguana*) by Guira cuckoo (*Guira guira*) in Northeastern Brazil
Alysson Guedes Coutinho, Kalyl Sivino Serra, Luís Gonzaga Sales Junior and Daniel Cassiano Lima *305*

A case of partial leucism in the American Barn Owl (*Tyto furcata*) (Temminck, 1827), from Buenos Aires province, Argentina
María Cecilia Chiale and Luis Pagano *307*

Instructions to Authors *311*

Revista Brasileira de Ornitologia, 22(3), 245-250
September 2014

ARTICLE

Comparative population densities of three species of doves (Columbidae) in disturbed landscapes in Northern Paraná State, Brazil

Priscila Montes Fontoura[1,3] and Mário Luis Orsi[2]

[1] Programa de Pós-graduação em Ciências Biológicas, Universidade Estadual de Londrina - UEL, CP 10011, CEP 86057-970, Londrina, PR, Brazil.
[2] Departamento de Biologia Animal e Vegetal, Universidade Estadual de Londrina - UEL, CP 10011, CEP 86057-970, Londrina, PR, Brazil.
[3] Corresponding author: primontes@yahoo.com.br

Received on 11 September 2013. Accepted on 29 June 2014.

ABSTRACT: Assessments of population density and contact number of individuals of the Eared Dove *Zenaida auriculata* were conducted in areas of the city of Londrina and were compared with those of two other species of the family Columbidae (*Columbina talpacoti* and *C. picui*). Data were collected from distance sampling in linear transects of 2,000 m. Analyses of density were calculated using the program DISTANCE. The results show that *C. talpacoti* and *C. picui* were recorded in all months in urban areas, and less frequently in rural and pasture areas. *Zenaida auriculata* was the most frequently recorded species in all areas, showing high rates of population density with seasonal variations; density peaks were observed during September and January in the urban area (coinciding with the arrival of warmer days in the region), while in rural areas, density peaks were also recorded during November/December, March and April/May — periods in which planting of soybean and maize, and the soybean harvest, and wheat planting in the region, occurred, respectively. The density of *Z. auriculata* during these months showed a value that was 93 times greater in November/December and 75 times greater in April/May, compared to the density in the other months of the year. Although *Z. auriculata* was considered uncommon a few decades ago, we suggest that the removal of the original forest and the expansion of agriculture in the region have provided a large amount of seeds in the environment, which might favor the increased density of *Z. auriculata* in the region. The high rate of population density achieved by the Eared Dove suggests that the species has found a favorable environment in the region. This includes the ease of obtaining resources, suitable sites for nesting, reproductive success and possible adaptive factors, such as the opportunist movement in search of distant food sources.

KEY-WORDS: *Columbina picui*, *Columbina talpacoti*, distance sampling, urbanization, *Zenaida auriculata.*

INTRODUCTION

Most Brazilian species of doves (Columbidae) inhabit the countryside and benefit from deforestation and the expansion of agricultural crops. This is true for the Ruddy Ground Dove, *Columbina talpacoti* (Temminck, 1811) and the Picui Ground Dove, *C. picui* (Temminck, 1813) (Sick 1997). *Columbina talpacoti* is also adapted to habitats altered by man and is generally found in all places where land is cultivated, roads, fields, parks and backyards (Carvalho 1957). *Columbina picui* inhabits natural open areas, and also occurs in rural areas and its distribution might be expanding, due to the alteration of natural areas and the creation of pastures (Andrade 1997, Sick 1997, Blamires 2002). Another species that is favored by the expansion of crops is the Eared Dove, *Zenaida auriculata* (Des Murs, 1847), which inhabits fields, cultured areas, pasture, and urban areas, with a naturally wide distribution in Brazil (Sick 1997, Souza *et al*. 2007).

These three species have similar ecological characteristics, such as diet composed primarily of seeds (Baptista *et al.* 1997) and the type of habitat they occupy. However, large quantities of seeds available in the environment have favored the population growth of *Z. auriculata* in regions of Argentina, Colombia, Uruguay, Bolivia and Brazil (Bucher & Ranvaud 2006). In the Brazilian states of São Paulo and Paraná, this species is considered a serious pest of germinating soybeans (Brannstrom 2003).

Columbina talpacoti, C. picui, and Z. auriculata are well adapted to anthropogenic environments and were considered common all year round in studies performed in the city of Londrina (Paraná State) by Westcott *et al.* (2002) and Lopes & Anjos (2006). Although it was uncommon for several decades, *Z. auriculata* is currently considered as possibly the most abundant species in rural and urban areas of Londrina (Lopes & Anjos 2006). Agricultural areas, combined with the mosaic formed in the fragmented landscape, provide a favorable environment for *Z. auriculata* individuals, including suitable sites for foraging, shelter and nesting. *Zenaida auriculata* has found possible sites of refuge and nesting in the urban area of Londrina (Lopes 2006).

Estimates of the number of individuals of *Z. auriculata* in the Londrina region are important to determine its abundance in different areas of the city. This could indicate the types of landscape where the species is more frequent in the region. Therefore, we assessed the population density of this species in three distinct areas located in Londrina, and compared it with that of the two other sympatric dove species with similar habits: *C. talpacoti* and *C. picui*. Additionally, we tried to document temporal changes in the number of contacts of these three dove species.

MATERIALS AND METHODS

Study area

The region of Londrina is located in the northern state of Paraná and currently is covered by only 7% of its original vegetation (Fundação SOS Mata Atlântica & INPE 2009), consisting of several Atlantic Forest fragments relatively isolated from each other. The main causes of deforestation in the region have been the commercial exploitation of wood and the implementation of agriculture (Santos-Filho 1980), particularly grain production. The cultivation of maize, wheat, and soybean during the year contributes to the ranking of Paraná state as one of the largest producers of these grains in Brazil (IBGE 2010).

Londrina has a mean annual temperature of 21ºC and mean rainfall of about 1,600 mm per year. December is considered the rainiest month, with a mean rainfall of 233 mm and August is the driest month with 52 mm (Soares-Silva & Barroso 1992). For this study, we selected three distinct areas (Figure 1) located within the municipality of Londrina. Area 1 is an urban area located in the southern part of the city (periphery), containing houses, empty lots, paved roads, afforestation and gardens; area 2 is characterized as a rural area formed by plantations, the edge of secondary forest, and built-up areas; and finally, area 3 is a pasture area with grasses, regenerating forest, secondary forest edge, and built areas (Figure 1).

Field procedures

Censuses were conducted between August 2011 and July 2012. We established a transect of 2,000 m at each sampling area and adopted the method of transect census proposed by Bibby *et al.* (1992), in which the observer walks the transect with low and constant speed to record all visual and aural contacts with species. When a species was detected, its perpendicular distance to the transect was estimated. Marks were established in these areas to facilitate distance calculations.

Samplings started at sun-rise and each transect was walked twice-monthly to obtain a replicate sample each month. Each sampling area was censused 24 times over the 12-months long study.

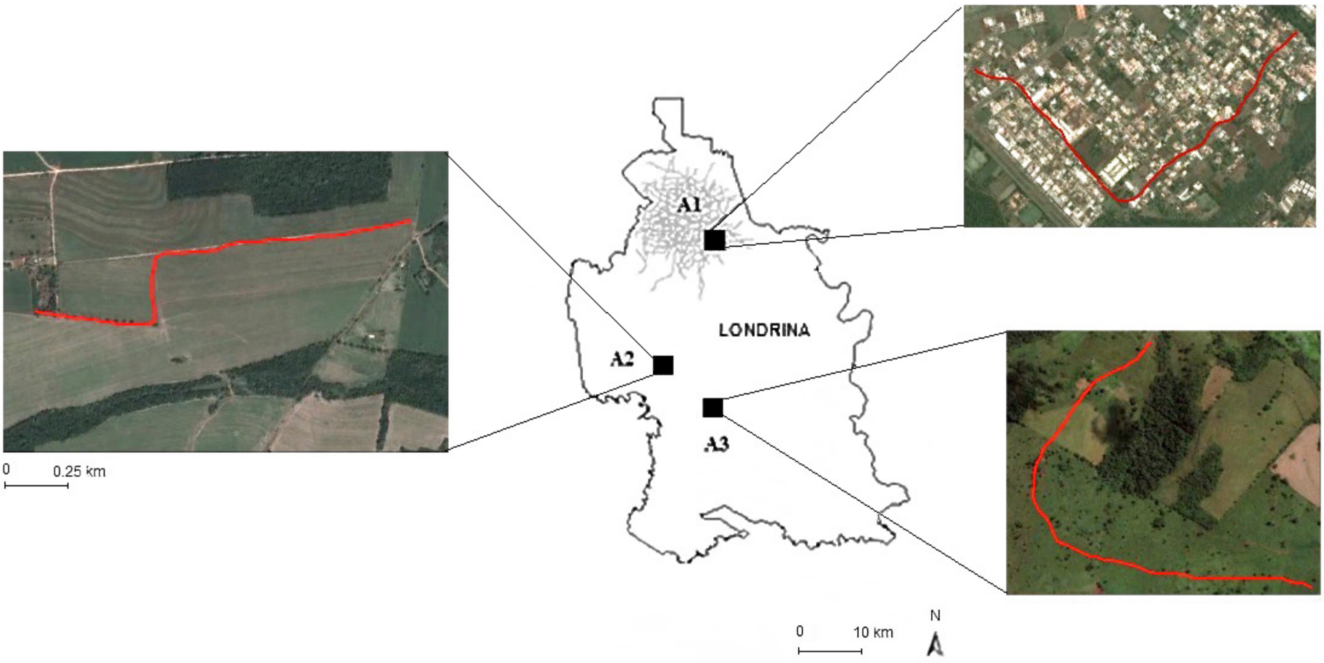

FIGURE 1. Map of the city of Londrina with the location and satellite images of transects in the three study areas. A1 – urban area (23º20’51.44”S and 51º10’01.63”W; 23º20’41.10’S and 51º09’12.90”W); A2 – rural area (23º25’40.25”S and 51º14’52.49”W; 23º25’20.15”S and 51º13’56.31”W); and A3 – pasture area (23°28’59.38”S and 51°14’38.03”W; 23°29’12.53”S and 51°14’00.10”W).

Data Analysis

Distance samplings were analyzed with the software DISTANCE version 6.0 (Thomas *et al.* 2009), based on the detection function g(x) for obtaining density values (D). The analyses used a detection model that allowed the extrapolation of the collected data for the region of study (Thomas *et al.* 2010). To ensure the validity of these analyses, three premises were assumed, following Buckland *et al.* (1993): 1) all individuals present along the transects were detected; 2) detections were made before evasive movements of individuals; and 3) the distances were estimated accurately. The data were modeled by "key function half-normal" followed by the "cosine" adjustments. The model that best represented the data analyzed was selected by the program from the minimum value of AIC (Akaike's Information Criterion). At least 5% of the data was truncated to eliminate "outliers", because these provide little information for estimating densities (Buckland *et al.* 1993). DISTANCE estimates used only contacts from transects where at least 40 contacts with a given species were obtained in each transect (Burnham *et al.* 1980). A two-way analysis of variance (ANOVA) ($P < 0.05$) was used to test for differences in the number of contacts obtained with each species among areas and months sampled.

RESULTS

Columbina talpacoti showed a density of 76.9 ind/km^2 in the urban area during the 12 months of study (Coefficient of variation, CV = 0.06); *C. picui* had a density of 28.0 ind/km^2 (CV = 0.10); and *Z. auriculata* a density of 1,501 ind/km^2 (CV = 0.03) for the same areas and period.

Due to the minimum number of contacts established for the analysis in DISTANCE, it was not possible to calculate the density for *C. talpacoti* and *C. picui* in rural and pasture areas, because the total number of contacts in each area for these species was fewer than 40. For *Z. auriculata*, the density value was 25.6 ind/km^2 in the pasture area (CV = 0.08) and 1,178 ind/km^2 in the rural area (CV = 0.03).

Monthly density estimates were only possible for *Z. auriculata* in the urban area (Table 1); the variation observed ranged from 626 ind/km^2 in July to 2,645 ind/km^2 in January (Figure 2). In the rural area, we obtained the following data for *Z. auriculata*: density of 3,161 ind/km^2 (CV = 0.04) for the months of November and December combined, 323 ind/km^2 (CV = 0.12) for March, 2,564 ind/km^2 (CV = 0.03) for the months of April and May combined, and 34 ind/km^2 (CV = 0.11) for the other seven months (August, September, October, January, February, June and July) combined (Figure 3).

Zenaida auriculata had the highest number of contacts in all three areas (Figure 4). In the urban area ($F_{2.69}$ =13.97; $P < 0.001$) and rural area ($F_{2.69}$ = 13.87; $P < 0.001$), significant differences were observed in the number of contacts obtained throughout the year. In these areas, the two *Columbina* species had a similar number of contacts, but *Z. auriculata* had a significantly higher number of contacts than the other two species (Tukey's pairwise comparisons, $P < 0.001$). All three species studied showed no significant differences in the number of contacts throughout the year in the pasture area ($F_{2.69}$=1.027; P=0.459).

Columbina talpacoti and *Z. auriculata* showed significant differences in the number of contacts throughout the whole study period in the different areas ($F_{2.69}$ = 1.989; P = 0.03 and $F_{2.69}$ = 13.25; $P < 0.01$, respectively). *Columbina talpacoti* had a significantly higher number of contacts in the urban area (Tukey's pairwise comparisons, $P < 0.001$), while *Zenaida auriculata* had significantly fewer contacts in the pasture area (Tukey's pairwise comparisons, $P < 0.001$). *Columbina picui* had a statistically similar number of contacts in all three areas ($F_{2.69}$ = 0.725; P = 0.785).

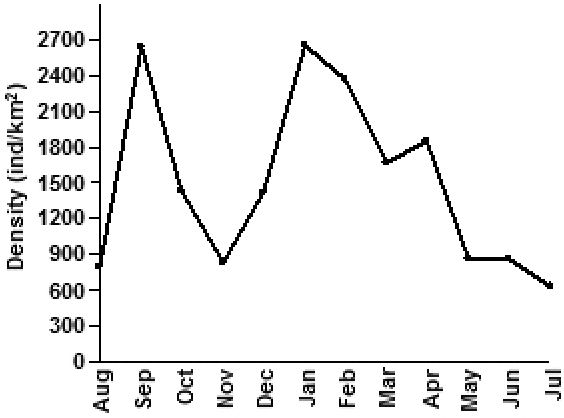

FIGURE 2. Density of *Zenaida auriculata* during the months of August 2011 to July 2012 in the urban area of Londrina, Southern Brazil.

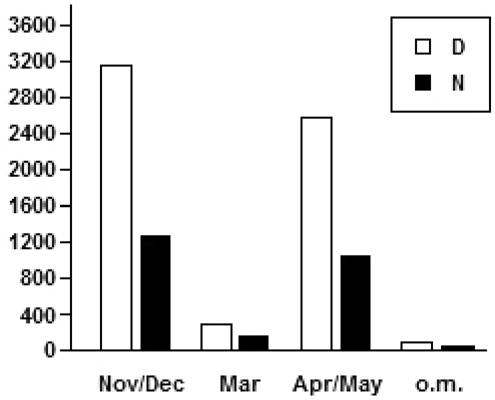

FIGURE 3. Density of ind/km^2 (D) and number of individuals (N) of *Zenaida auriculata* in the rural area in Londrina, Southern Brazil for November and December, March, April and May and the other months combined. Coefficient of variation (CV): Nov/Dec = 0.04; March = 0.03; Apr/May = 0.03; other months = 0.11.

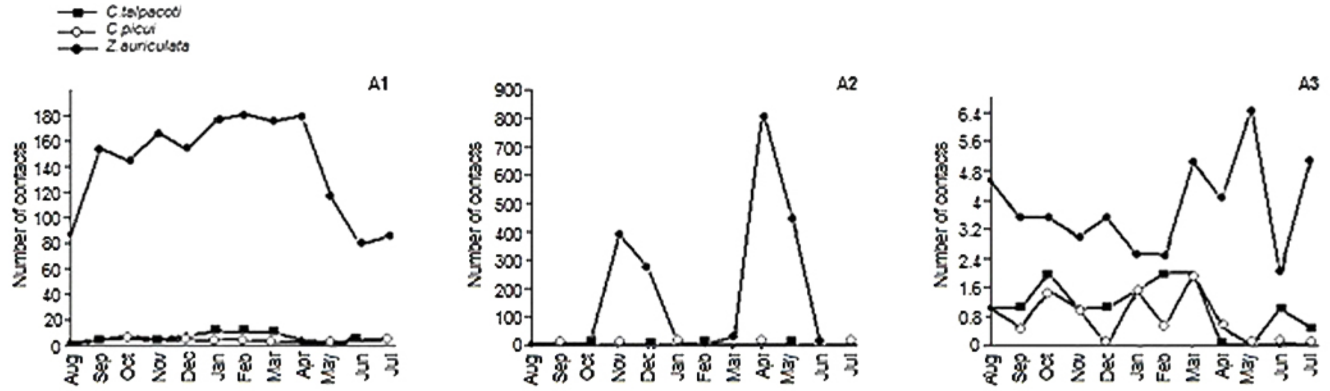

FIGURE 4. Mean number of contacts obtained for each of the three species of Columbidae in the urban area (A1), rural area (A2) and pasture area (A3) in Londrina, Southern Brazil, in the period of August 2011 to July 2012.

Months	D (ind/km^2)	N	CV
August	803	321	0.07
September	2634	1053	0.07
October	1437	575	0.1
November	840	336	0.09
December	1415	566	0.05
January	2645	1058	0.06
February	2375	950	0.05
March	1660	664	0.06
April	1842	737	0.06
May	867	347	0.08
June	864	346	0.1
July	626	251	0.09

TABLE 1. Density (D), number of individuals (N) and coefficient of variation (CV) of *Zenaida auriculata* during the months of August 2011 to July 2012 in the urban area in Londrina, Southern Brazil.

DISCUSSION

Although they share some similarities, *Z. auriculata* excelled compared to the other two *Columbina* species sampled, due to its high population density recorded in all months of the year in the urban area and for a few months in the rural area. The population peaks of the species in the rural area can be characterized by their opportunistic displacement during a period of large seed availability in the region.

The density of *Z. auriculata* was relatively high in all months in the urban area. The species had a high number of contacts even in months with a lower density. The low population density of *Z. auriculata* occurred in the same period as winter in the region (from June to August), characterized by low temperatures and low precipitation (Bianchini *et al.* 2006). The density peaks (months of September and January) of this species in the urban area (Figure 2) can be related to the appearance of warmer temperatures in the region and as a result of their reproductive success.

During the sampling, the collection of material for nesting by individuals of *Z. auriculata* was observed throughout the whole year, but more intensely in November. This observation suggests an increased reproductive activity of the species in this season, which coincides with the increased density rate of the species in January, a month in which many immature individuals were observed. According to Murton *et al.* (1974), *Z. auriculata* reproduces between October and April, which coincides with the rainy season and an abundance of seeds in Córdoba, Argentina. However, Bucher & Orueta (1977) reported active nests for the species during all months of the year in the same region. In southeastern Brazil, breeding peaks were observed in February to May, and August to November, and the breeding season of *Z. auriculata* might be influenced by the availability of grains cultivated in the environment (Menezes *et al.* 1998, Ranvaud *et al.* 2001). In Córdoba, Argentina, the availability of food, especially grain sorghum, appears to be the main factor that controls the reproduction of *Z. auriculata* in the region (Bucher & Orueta 1977).

The three dove species sampled had similar numbers of contacts over the sampling period in the pasture area. This area is characterized by an open area dominated by exotic grasses (e.g., *Brachiaria* sp. and *Panicum maximum*), the presence of some trees in the landscape, and isolated fragments in the surroundings. The pasture area is probably the most similar area to the natural environment selected by these species compared to the other areas studied. Nonetheless, the number of contacts of the three species was higher in the urban area. Therefore, the habitat selected by these species is highly influenced by the presence of anthropogenic environments (Fontoura & Orsi 2013).

Columbina picui was the species most commonly found in soybean fields in the region of Entre Rios in

Argentina, with a 40% frequency of occurrence (Goijman & Zaccagnini 2008). A different pattern was observed in this study, in which few *C. picui* and *C. talpacoti* individuals were recorded in rural areas. This agrees with data of Cintra *et al.* (1990), where an analysis of the composition of the diet of *C. talpacoti* found only 8.2% of cultivated grain, while 74% were seeds of other species. This suggests that this species is possibly not related to cultivated fields.

A considerable increase in the density of *Z. auriculata* was observed in the rural area during the period of the soybean harvest (March), which was about 10-fold higher than the density in other months of the year. However, this increase does not compare to the population peaks of *Z. auriculata* observed for the months of November/December (approximately 93-fold higher than in other months, coinciding with the planting of soybean and maize) and April/May (75-fold higher than in other months, during the planting of wheat). In the other periods of the year, we found the permanent residence of a few individuals of *Z. auriculata* in the rural area. However, during the periods where cultivated seeds were available in the region, it was possible to observe the arrival of many individuals in the early morning. This suggests that individuals of the Eared Dove arrived in rural areas in search of grain wasted by agricultural practices and that they did not sleep in the area. Individuals of *Z. auriculata* also visit crop fields during different periods over the year in southeastern Brazil and widely explore different food sources according to the seasonal availability of resources (Ranvaud *et al.*2001). Nomadism in search of seeds was also recorded for this species in the Chaco of both Argentina and Paraguay (Murton *et al.* 1974), and in Córdoba, Argentina (Bucher & Ranvaud 2006). In northeastern Brazil, periodic migrations of *Z. auriculata* in search of food were recorded, in which the species moved great distances, following the rains that favor the fruiting seed of *Croton* sp. (Antas 1987).

The population explosion of *Z. auriculata* generates some concerns because it is unknown whether the maintenance of its current population density can threaten other species and even the local biodiversity as a whole. Broad control programs using toxic baits and other methods were not successful in Argentina (Bucher 1974, Murton *et al.* 1974) or Uruguay (Bucher 1985, Bucher & Ranvaud 2006); although the these programs caused high mortality and affected the reproductive potential of the species, the arrival of new individuals from other areas determined the recovery of these populations (Bruggers *et al.* 1998).

Besides the high density of *Z. auriculata*, our results also documented the predominance of *Z. auriculata* with respect to two species of *Columbina* in the study areas in Londrina. The high population density achieved by *Z. auriculata* every month in the urban area and in those in the rural area coinciding with the planting of soybean, wheat and maize, and the harvest of soybean, indicate that the species has found a favorable environment in the region. This includes the ease of obtaining resources, suitable sites for nesting, high reproductive success, possible adaptive factors, and its opportunistic displacement in search of distant food sources.

The replacement of forests by agricultural land and the consequent abundance of grain in the environment might contribute to the increased density of *Z. auriculata* in the region. We showed that the Eared Dove is the species most favored by deforestation and the expansion of agriculture in the region studied, although there is a lack of information that quantitatively compares all bird species in the Londrina region. Restriction measures on the food sources, to minimize the loss of grain in agricultural practices and during grain transport, the recovery of the forests and consequently the reestablishment of those elements of biodiversity that were part of the original landscape in the region, might result in interactions between competition and predation involving *Z. auriculata*. These could represent the most promising strategies to assist in controlling the population of the species.

ACKNOWLEDGMENTS

We thank Luiz dos Anjos for advice and several contributions during this research. Edson Lopes helped to improve a version of the manuscript. We are grateful to Leonardo, Lídia and the technicians of the Museum of Zoology at UEL Aparecido and Edson for contributing to the sampling. We thank local families Mrs. Luiza, Sir Otacílio, Mrs. Maria Helena, Sir Guilon and the graduate program in Biology at UEL for academic and financial support.

REFERENCES

Andrade, M. A. 1997. *Aves silvestres – Minas Gerais*. Belo Horizonte: Conselho internacional para a conservação das aves.

Antas, P. T. Z. 1987. A nidificação da avoante, *Zenaida auriculata*, no Nordeste do Brasil, relacionada com o substrato fornecido pela vegetação. *Revista Brasileira de Zoologia*, 3: 467-470.

Baptista, L. F., Trail, P. W. & Horblit, H. M. 1997. Family Columbidae (pigeons and doves), p. 60-243. In: del Hoyo, J. ; Elliott, A. & Sargatal, J. (eds.). *Handbook of the Birds of the World. Volume 4: Sandgrouse to Cuckoos.* Barcelona: Lynx Edicions.

Bianchini, E., Pimenta, J. A. & Santos F. A. M. 2006. Fenologia de Chrysophyllum gonocarpum (Mart. & Eichler) Engl.(Sapotaceae) em floresta semidecÌdua do Sul do Brasil. *Revista Brasileira de Botânica*, 29 (4): 595-602.

Bibby, C. J., Burgess, N. D. & Hill, D. A. 1992. *Bird Census Techniques*. San Diego: Academic Press.

Blamires, D., Lemes, M. J., Carvalho, C. C, Souza, C. R. P. & Mendonça, C. V. 2002. Ocorrência de *Columbina picui sptrepitans*

Spix, 1825 na região de Mambaí, nordeste do Estado de Goiás, Brasil (Columbiformes, Columbidae). *Ararajuba*, 10(1): 99-100.

Brannstrom, C. 2003. Post-1940 occurrence of the Eared Dove (*Zenaida auriculata*) in the Middle Paranapanema River Valley, São Paulo State, Brazil. *Ararajuba*, 11(1): 93-94.

Bruggers, R. L., Rodriguez, E. & Zaccagnini, M. E. 1998. Planning for bird pest problem resolution: A case study. *International Biodeterioration & Biodegradation*, 42: 173-184.

Bucher, E. H., 1974. *Bases Ecológicas para el Control de la Paloma Torcaza.* Córdoba: Centro de Zoologia Aplicada.

Bucher, E. H, 1985. *Ecología de aves plaga en el Uruguay*. Montevideo: FAO.

Bucher, E. H. & Orueta, A. 1977. Ecologia de la reproduccion de la paloma *Zenaida auriculata*. *Ecosur,* 4: 157-185.

Bucher, E. H. &. Ranvaud, R. D . 2006. Eared dove outbreaks in South America: patterns and Characteristics. *Acta Zoologica Sinica,* 52: 564-567.

Buckland, S. T., Anderson, D. R., Burnham, K. P. & Laake, J. L. 1993. *Distance Sampling: Estimating Abundance of Biological Populations*. London: Chapman and Hall.

Burnham, K. P., Anderson, D. R. & Laake, J. L. 1980. Estimating density from line transect sampling of biological populations. *Wildlife Monographs*, 72: 3-202.

Carvalho, C. T. 1957. Relações biológicas entre *Columbigallina passerina* e *C. talpacoti* (Aves, Columbidae). *Boletim do Museu Paraense Emilio Goeldi,* 7: 1-15.

Cintra, R., Alves, M. A. S. & Cavalcanti, R. B. 1990. Dieta da Rolinha *Columbina talpacoti* (Aves, Columbidae) no Brasil Central – Comparação entre sexos e idades. *Revista Brasileira de Biologia*, 50: 469-473.

Fontoura, P. M. & Orsi, M.L. 2013. Ecological partitioning of three Columbidae species in Northern Paraná, Southern Brazil. *Biota Neotropica*, 13(3):1-6.

Fundação SOS Mata Atlântica & Inpe. 2009. Atlas dos remanescentes florestais da Mata Atlântica Período 2005-2008. www.inpe.br/ (access on 15 May 2011).

Goijman, A. P. & Zaccagnini, M. E. 2008. The effects of habitat heterogeneity on avian density and richness in soybean fields in Entre Ríos, Argentina. *Hornero*, 23: 67-76.

IBGE. 2010. Área plantada, área colhida, quantidade produzida e valor da produção da lavoura temporária. Produção agrícola Municipal. www.sidra.ibge.gov.br (access on 13 September 2012).

Lopes, E. V. 2006. Distribuição e abundância de duas espécies de pombos (Aves; Columbidae) na área central de Londrina, norte do Paraná. *Congresso Brasileiro de Zoologia*, 26.

Lopes, E. V. & Anjos, L. 2006. A composição da avifauna do campus da Universidade Estadual de Londrina, norte do Paraná, Brasil. *Revista Brasileira de Zoologia*, 23: 145-156.

Menezes, L. N., Ranvaud, R.D. & Bucher, E.H. 1998. Breeding synchronization in Eared Dove *Zenaida auriculata* colonies in South-eastern Brazil. *Proc. 22 Int. Ornithological Congress*, 69: 227.

Murton, R. K., Bucher, E. H., Nores, M., Gomez, E. & Reartes, L. 1974. The ecology of the eared dove (*Zenaida auriculata*) in Argentina. *Condor*, 76: 80-81.

Ranvaud, R., Freitas, K. C., Bucher, E. H., Dias, H. S., Avanzo, V. C. & Alberts, C. C. 2001. Diet of eared doves (*Zenaida auriculata*, Aves, Columbidae) in a sugar-cane colony in Southeastern Brazil. *Brazilian Journal of Biology*, 61: 651-660.

Santos-Filho, A. 1980. As principais consequências do desmatamento e uso do solo no estado do Paraná. *Revista Floresta*, 11: 12-16.

Sick, H. 1997. *Ornitologia Brasileira*. Edição revista e ampliada por J.F. Pacheco. Rio de Janeiro: Nova Fronteira.

Soares-Silva L. H. & Barroso, G. M. 1992. Fitossociologia do estrato arbóreo da floresta na porcão norte do Parque Estadual Mata dos Godoy, Londrina – PR, Brasil. Anais do Congresso da Sociedade Botânica de São Paulo, 8: 101-112.

Souza, E. A., Telino-Júnior, W. R., Nascimento, J. L. X., Lyra-Neves, R. M., Júnior, S. M. A., Filho, C. L. & Neto, A. S. 2007. Estimativas populacionais de avoantes *Zenaida auriculata* (Aves Columbidae, DesMurs, 1847) em colônias reprodutivas no Nordeste do Brasil. *Ornithologia*, 2(1): 28-33.

Thomas, L., Buckland, S. T., Rexstad, E. A., Laake, J. L., Strindberg, S., Hedley, S. L., Bishop, J. R. B., Marques, T. A. & Burnham, K. P. 2010. Distance software: design and analysis of distance sampling surveys for estimating population size. *Journal of Applied Ecology,* 47: 5-14.

Thomas, L., Laake, J. L., Rexstad, E.A., Strindberg, S., Marques, F. F. C., Buckland, S. T., Borchers, D. L., Anderson, D. R., Burnham, K. P., Burt, M. L., Hedley, S. L, Pollard, J. H., Bishop, J. R. B. & Marques, T. A. 2009. *Distance 6.0. Release 2. Research Unit for Wildlife Population Assessment.* UK: University of St.Andrews.

Westcott, P. W., Mariño, H. F. & Anjos, L. 2002. *Observando aves em Londrina: norte do Paraná – Brasil*. Londrina: Eduel.

Associate editor: Caio Graco Machado

Revista Brasileira de Ornitologia, 22(3), 251-259
September 2014

ARTICLE

Age and gender related plumage variation of psittacofulvine pigments: the case of the Yellow-faced Parrot *Alipiopsitta xanthops*

Carlos Barros de Araújo[1, 2, 4] and Luiz Octavio Marcondes-Machado[3]

[1] Programa de Pós-graduação em Ecologia, Instituto de Biologia, Unicamp.
[2] Current address: Universidade Federal da Paraíba, Centro de Ciências Exatas e da Natureza - Campus I. Departamento de Sistemática e Ecologia, CEP 58059-900, João Pessoa, PB, Brazil.
[3] Departamento de Biologia Animal, Instituto de Biologia, Unicamp, CP 6109, CEP 13083-970, Campinas, SP, Brazil.
[4] Corresponding author: cabarau@gmail.com

Received on 22 October 2013. Accepted on 24 September 2014.

ABSTRACT: The Yellow-faced Parrot *Alipiopsitta xanthops* presents considerable phenotypic variation with a belly coloration that may vary from green to yellow-red. Though it has been hypothesized that this variation could be related to sex or age, these possibilities remain untested. We therefore tested these hypotheses by verifying geographical, sexual, and age-related trends in coloration based on museum specimens, wild populations, and captive developing juvenile birds. We found colored belly parrots (CBP) throughout the species distribution of *A. xanthops*. We found no differences in the proportion of CBP individuals between the two wild populations sampled (overall mean of 8.7%), but the proportion of CBP in museums was higher (32%) indicating that specimens were probably not randomly collected. We also found a skewed sex ratio in museums, as females represented only 25% of the specimens. We found that 37% of museum males had colored bellies, in contrast with only 18% of females; furthermore, colored bellied males presented a greater area of yellow-red patch on their bodies. None of the 16 observed fledglings presented colored bellies. The yellow head coloration slowly grew over the 14 days of observation of 16 nestlings. Together, our results suggest that color variation in the Yellow-faced Parrot seems to be related to both age and gender.

KEY-WORDS: Arinii, dichromatism, feather coloration, morphology, Psittacidae, sexual dimorphism.

INTRODUCTION

Among the myriad explanations for bird plumage variation, sexual selection is the most studied (Savalli 1995). Plumage may convey information that could be used by females to choose a high quality partner (Fitzpatrick 1998; Perrier *et al.* 2002; Siitari & Huhta 2002; Saks *et al.* 2003; Masello *et al.* 2004). However, there are alternative hypotheses to explain the remarkable plumage variation found in birds. For instance, feather coloration may be used for individual recognition (Whitfield 1986, 1987; Rohwer & Røskaft 1989), flock cohesion (Røskaft & Rohwer 1987; Selander & Hunter 1960), species recognition (Sibley 1957; Pierotti 1987), or dominance relationships (Rohwer 1977, 1985; Parsons & Baptista 1980; Fugle *et al.* 1984; Ryan *et al.* 1987; Holberton 1990).

Unlike most birds that sediment carotenoid-based compounds on their feathers, most Psittacidae derive their yellow-red coloration from psittacofulvins, a family of lipochromes pigments found exclusively within the family (McGraw & Nogare 2005). Unlike carotenoids (the pigments responsible for similar colors in most avian species), which are obtained through the diet, psittacofulvins seem to be endogenously produced. Parrots are very unlikely to absorb the pigments directly from diet, especially if we consider that no pigment was found in blood samples of 44 Psittacidae species (McGraw & Nogare 2005), or that most species maintain their color in captivity despite diet restrictions (Nemesio 2001).

Sexual plumage dimorphism or dichromatism is not common in Psittacidae, but it may be observed in some parrot species. For instance, males of the Blue-winged Parrotlet (*Forpus xanthopterygius*) exhibit primary and secondary violet-blue wing-coverts (Forshaw 1989); males of the Burrowing-parrots (*Cyanoliseus patagonus*) are slightly larger and exhibit larger red patches on their chest (Masello & Quillfeldt 2003); males of the Blue-bellied Parrot *Triclaria malachitacea* exhibit a bluish-violet bely (that may turn red as they age), and males of the Red-capped Parrot *Pionopsitta pileata* exhibit a conspicuous red crown (Sick 1997). But what would be the roles of such a conspicuous plumage among parrots?

It has been shown that plumage may vary according to body-condition in *Cyanoliseus patagonus*, as feathers reflect body-condition during feather development (Masello *et al.* 2004). Furthermore, the size of the red patch exhibited by males is positively correlated to body condition, and males with large red patches will produce higher quality offspring. Hence, plumage coloration seems to be a reliable signal of body condition that indicates higher male fitness accurately (Masello & Quillfeldt 2003). Biogeography may also lead to plumage differences, as isolated populations could be under distinct selection pressures ultimately leading to distinct plumage patterns. In fact, the Cuban Amazon (*Amazona leucocephala*) exhibits plumage variation among different island populations (Reynolds & Hayes 2009). However, plumage dichromatism has not been properly addressed among parrot species, leading to many competing hypotheses related to age, gender, genetic, or ecological explanations (Sick 1997, Masello *et al.* 2004).

The Yellow-faced Parrot (*Alipiopsitta xanthops*) is a comparatively small species (27 cm) (Sick 1997) that presents remarkable plumage variation. It has orange ear-coverts and a variable amount of yellow on the head (Miranda-Ribeiro 1920). The belly coloration varies from green to conspicuous yellow/orange/red (Forshaw 1989; Sick 1997). The species has a wide distribution throughout the *Cerrado* in central Brazil, from southern Maranhão and Piauí States, throughout Goiás, Tocantins, Mato Grosso, Mato Grosso do Sul, western Bahia, and northern São Paulo as well as Bolivia (Sick 1997). Despite its wide distribution and high local abundance, the biology of *A. xanthops* began to be studied only recently (Bianchi 2009; de Araújo & Marcondes-Machado 2011; de Araújo *et al.* 2011, 2014; Dias 2011). However, none of these previously published studies describes the species' plumage variation, in spite of the role it may have on the species' biology (e.g. Masello & Quillfeldt 2003; Masello *et al.* 2004; Heinsohn *et al.* 2005; Hill 2006).

Authors disagree on the cause and form of the Yellow-faced Parrot's color variation. Some authors simply inform of the variation (Perlo 2009, Antas *et al* 2009, Sigrist 2009), while others relate it to age (Collar 1997, Erize *et al.* 2006, Mata *et al.* 2006, Juniper & Parr 1998, Forshaw 1989, Sick 1997) or sex (Sick 1997, Collar 1997). Still, all these studies have in common an anecdotal approach, without a formal or systematic approach to elucidate or differentiate between competing hypotheses. As a consequence, contradictory information may be found in the literature (i.e. Alderton 1991, which states that sexes actually exhibit similar plumage and no dichromatism at all).

We aim to test whether Yellow-faced Parrot's plumage variation is 1) age-related, that is, if juveniles present distinct plumage when compared to adults; 2) gender related; or 3) geographically-related, varying among distinct localities. This was accomplished through a comprehensive analysis of specimens found in museums worldwide, field observations, as well as the study of captive juveniles.

METHODS

We obtained a total of 109 ventral photographs of parrot specimens from worldwide museum collections. However, here we used only the ones that presented gender classification, so that our analysis was restricted to 65 pictures / specimens. Additionally, we used pictures of 16 chicks from the Mato Grosso do Sul rehabilitation center ("Centro de Reabilitação de Animais Silvestres" - CRAS/MS). All specimens measured in this study (n = 81) are listed in Table 1.

We used pictures to classify adult parrots (n = 65) according to the amount of yellow/reddish coloration in their bellies. If the yellow patch covered the belly completely the specimens were classified as color-bellied parrots (CBP); if they were green or presented incomplete yellow/reddish patches on their bellies, the specimens were classified as non color-bellied parrots (non-CBP). Additionally, we created a plumage index (I) that is given by the relative ratio of the longitudinal length of the colored patch on the center of the ventral region divided by the total body length (Figure 1; Index (I) = Color patch length/ body length). All measurements were made through the pictures with the help of software ImageJ. To test for index differences between sexes, we used a unilateral Fischer exact test, as it is expected that males should exhibit higher indexes as dichromatism (when present) as verified in other parrot species such as *Forpus xanthopterygius*, *Cyanoliseus patagonus*, *Triclaria malachitacea*, and *Pionopsitta pileata* (Forshaw 1989, Sick 1997, Masello & Quillfeldt 2003). We used the Ornithological Gazetteer (Paynter & Traylor 1991) to geo-reference specimens and build a map of colored belly occurrences along the Yellow-faced Parrot's distribution.

Weekly pictures from the CRAS/MS allowed for observations of nestling development (n = 16 individuals) for a period of 21 days. Pictures were taken ventrally (in order to observe the presence of yellow coloration on the belly), and laterally (in order to allow for observations of the size of the mask, and the presence of the orange patch over the ears). Nestlings were classified following the categories described above (CBP or non-CBP).

During 2005, we studied wild populations of the Yellow-faced Parrot in *Cerrado* fragments of the "Cana do Reino" stream (Vicente Pires – DF, Central Brazil; 146 parrots in 9 flocks). In September of the same year we took a 20-day field trip to the Emas National Park (southern state of Goiás, Brazil), where we observed the color bellies of 61 parrots from 7 distinct flocks. Overall, we observed 207 parrots in 16 flocks in the wild at both localities. We classified the plumage of the individuals observed in the field as CBP or non-CBP, following the criteria above described. We were thus able to determine the proportion of colored bellied individuals in both wild populations. Even though some individuals could be recounted, we expect that our final estimation represents a value very close to what may be found in these areas. Additionally, we made the observations on distinct days and (as much as possible) in distinct areas, further reducing the possibility of overlapping parrot counts.

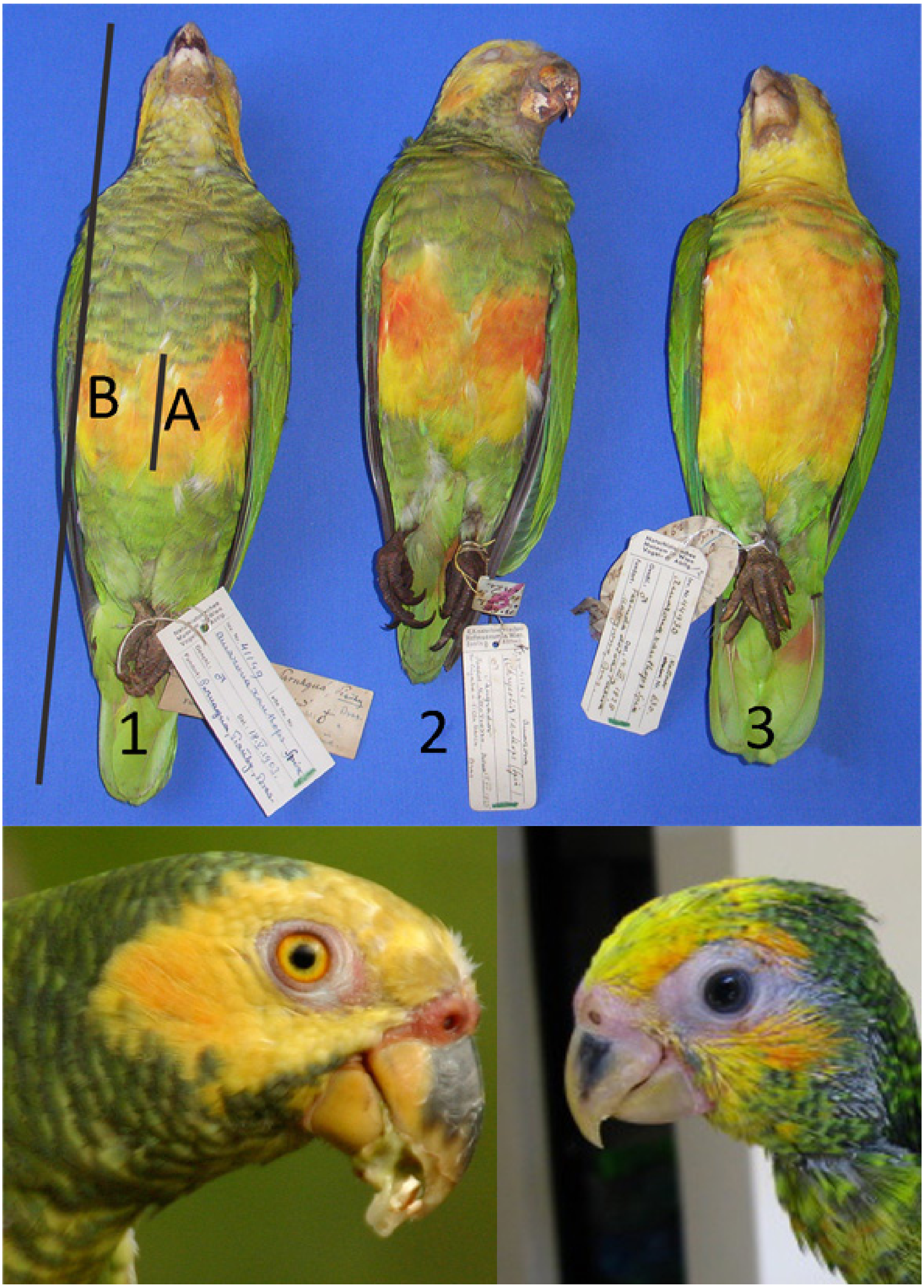

FIGURE 1. Top: some of the variation found in colored bellied parrots. A and B represent the measurements needed to calculate the plumage index (I) given by I = A/B. Parrot 3 is an example of a yellow neck parrot. (Picture by Dr. Ernst Bauernfeind, Naturhistorisches Museum Wien). Bottom left: an adult *Alipiopsitta xanthops* showing the orange ear-covert. Bottom right: an *A. xanthops* nestling with a small yellow mask, and no orange ear-covert.

TABLE 1. Specimens of *Alipiopsitta xanthops* examined in this study.

Institution	Voucher number	Sex	Index [1]
Academy of Natural Sciences, Philadelphia, USA (ANSP)	170759	F	0.23
American Museum of Natural History, New York, USA (AMNH)	174597	F	-
AMNH	241824	M	-
AMNH	241825	F	-
AMNH	241826	M	0.24
AMNH	475312	M	0.27
Coleção Ornitológica Marcelo Bagno, Brasília-DF (COB)	404	M	-
COB	285	M	-
COB	281	M	-
COB	282	M	-
Field Museum of Natural History, Chicago, USA (FMNH)	46971	M	-
FMNH	46972	M	-
FMNH	350841	M	0.24
Forschungsinstitut Senckenberg, Frankfurt, Germany (SMF)	26282	M	0.26
Louisiana Museum of Natural History, Baton Rouge, USA (LSUMNS)	64937	F	-
LSUMNS	166429	M	-
Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP)	4330	M	0.27
MZUSP	5078	F	-
MZUSP	5079	M	-
MZUSP	13107	M	-
MZUSP	17098	M	-
MZUSP	17100	M	0.35
MZUSP	30161	M	0.31
MZUSP	30162	M	0.22
MZUSP	30163	M	-
MZUSP	30164	M	-
MZUSP	30165	M	0.24
MZUSP	30166	M	0.29
MZUSP	30167	F	-
MZUSP	35030	M	-
MZUSP	35031	M	-
MZUSP	5081	M	-
Naturhistorisches Museum Wien, Vienna, Austria (NHMW)	44930	M	0.54
NHMW	41146	F	-
NHMW	41141	M	0.31
NHMW	41142	M	-
NHMW	41144	M	-
NHMW	41145	F	-
NHMW	41146	M	-
NHMW	41147	M (Immature)	-
NHMW	41148	F	0.12
NHMW	41149	M	0.20

Institution	**Voucher number**	**Sex**	**Index** [1]
Museu Paraense Emílio Goeldi, Belém (MPEG)	14810	M	-
MPEG	15589	M	0.27
Museu Nacional da Universidade Federal do Rio de Janeiro, Rio de Janeiro (MN)	3992	M	-
MN	3997	M	0.26
MN	4007	F	0.17
MN	9447	M	-
MN	9448	M	-
MN	31573	F	-
MN	31575	M	-
MN	42780	F	-
MN	43617	F	-
MN	Without accession number	M	-
Museum of Comparative Zoology, Cambridge, USA (MCZ)	160970	M	-
MCZ	198332	F	-
MCZ	198333	M	0.21
Natural History Museum of Los Angeles County, Los Angeles, USA (LACM)	32371	F	-
LACM	32372	M	-
LACM	32373	M	0.10
LACM	32374	M	-
LACM	32375	M	-
The Natural History Museum, Tring, UK (NHM)	1929.3.10.1	F	-
Museu de Zoologia da Universidade Estadual de Campinas, Campinas (ZUEC)	1015	M	-
ZUEC	0408	M	0.23
Centro de Reabilitação de Animais Silvestres, Campo Grande (CRAS-MS)	A4_2066	? (Immature)	-
CRAS-MS	A4_2067	? (Immature)	-
CRAS-MS	A4_2068	? (Immature)	-
CRAS-MS	A4_2069	? (Immature)	-
CRAS-MS	A4_2070	? (Immature)	-
CRAS-MS	A4_2071	? (Immature)	-
CRAS-MS	A4_2072	? (Immature)	-
CRAS-MS	A4_2073	? (Immature)	-
CRAS-MS	A4_2074	? (Immature)	-
CRAS-MS	A4_2075	? (Immature)	-
CRAS-MS	A4_2076	? (Immature)	-
CRAS-MS	A4_2077	? (Immature)	-
CRAS-MS	A4_2078	? (Immature)	-
CRAS-MS	A4_2079	? (Immature)	-
CRAS-MS	A4_2080	? (Immature)	-
CRAS-MS	A4_2081	? (Immature)	-

[1] For Index calculation see methods.

RESULTS

The belly color in *A. xanthops* varied from a complete green to a yellow, orange or red coloration (Figure 1), and color belied parrots (CBP) were found throughout its entire distribution (Figure 2). The amount of color on the belly was also quite variable. Museum specimens could be completely green or present belies with yellow/red/orange patches that in some cases extended to its upper chest (Figure 1, parrot 3) reaching up to 54% of the total body length (n = 21, median = 24%). The yellow mask also presents a great deal of variation, as adults have a yellow mask that completely covers the top of the head, while younger parrots generally display smaller masks without the orange ear-coverts (Figure 1). Some individuals have much broader yellow masks, contiguous towards the breast and belly (Figure 1, parrot 3). We observed 3 individuals with this particular coloration phenotype (hereafter yellow necked parrots, YNP), and they were restricted to the southwestern distribution of the species (Figure 2).

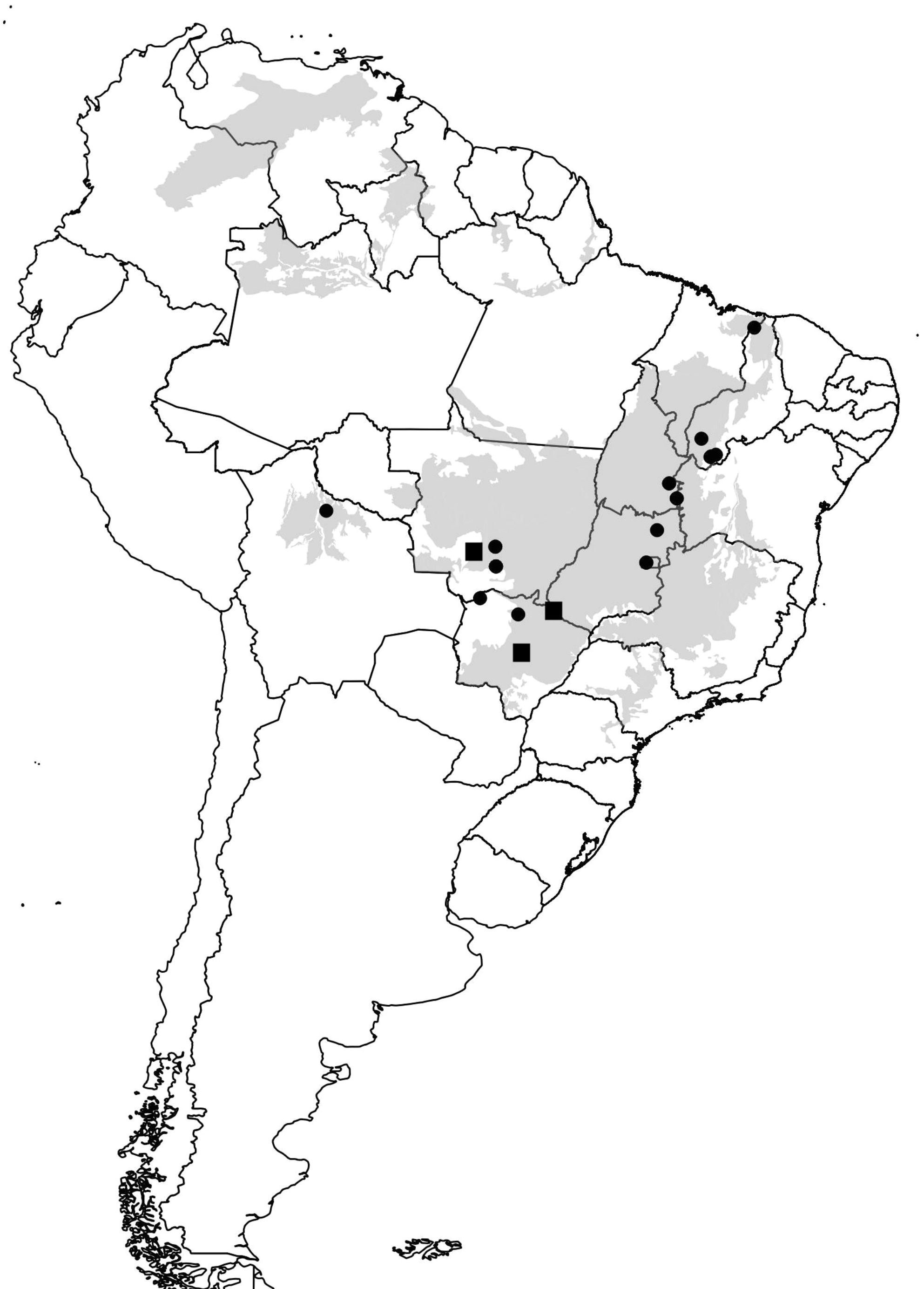

FIGURE 2. Black dots represent the occurrences of the studied colored bellied *Alipiopsitta xanthops* individuals, whereas the squares represent the locations of yellow neck individuals.

The proportion of CBP individuals in flocks was similar in the two wild populations – 8.9% in Emas and 8.2% in Brasília (χ^2 = 0.001; d.f.=1; p = 0.98). However, museum specimens presented approximately three times more CBP individuals than the two wild populations studied (32%; $\chi 2$ =25.6; d.f.=1; p<0.01; Figure 3). We also found a skewed sex (male:female) ratio of 3:1 in museums, as 75% of the specimens were males. When we compared the proportion of CBP between sexes, we found no differences (Fischer exact test; p = 0.12; Figure 3), despite the proportion of CBP among males (37%) being more than twice that among females (17%). The comparison of the plumage indexes (I) between sexes of museum specimens revealed that males exhibit a significantly wider colored patch (t = 1.81, unilateral p = 0.04), presenting a mean index of 27%, while females presented a lower value of 16%.

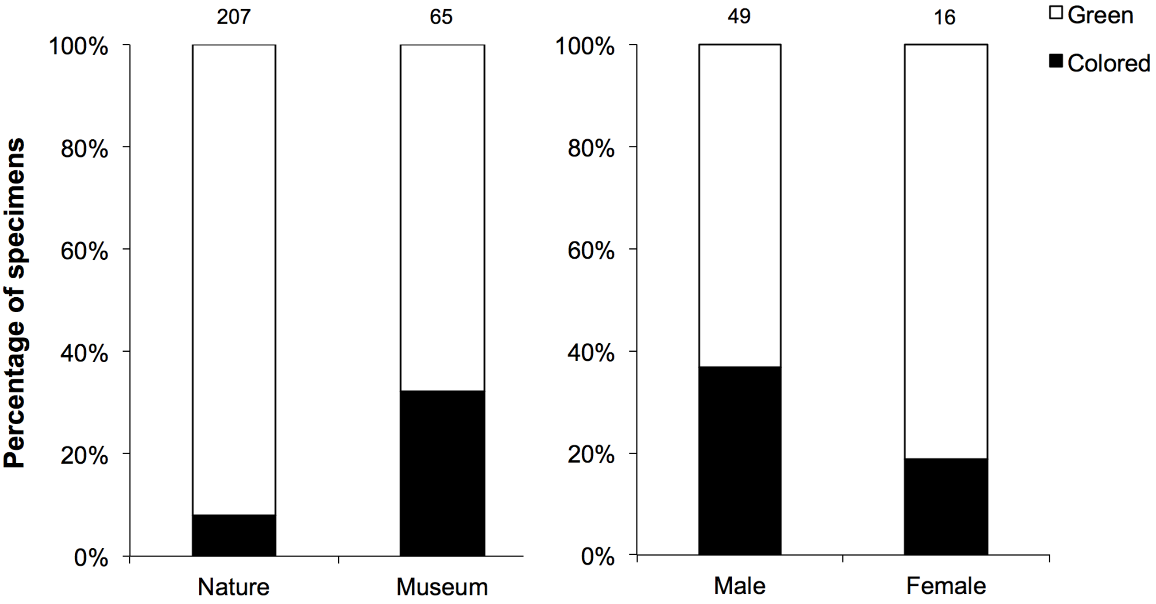

FIGURE 3. Left: proportions of adult color belied parrots in nature (Brasília and Emas National Park) and museums. Right: proportions of museum colored belied parrots specimens for each sex. Numbers over each bar represents the sample size.

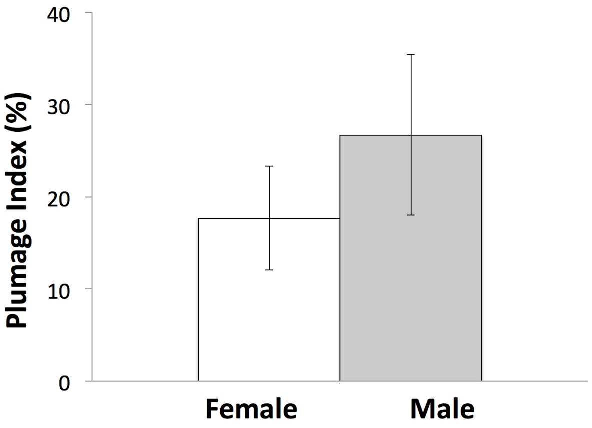

FIGURE 4. Mean and standard deviation of the plumage index (I) of color belied parrots (adults) of *Alipiopsitta xanthops* calculated from pictures for females (n = 3) and males (n = 18).

DISCUSSION

Overall, the Yellow-faced parrot presents great plumage variation throughout its distribution range. Plumage variation observed includes different colors, but also morphological differences on colored patches. We found no significant differences in the proportion of CBP between males and females, but that males have larger colored patches on the belly. Chicks did not present colored bellies and orange ear-coverts, whereas yellow masks were smaller than in adults.

Yellow coloration seems to increase in area during aging, since none of the 16 nestlings observed presented colored bellies. Also, the yellow mask, a trait observed in all adults, grew during nestling development, whereas the presence of orange ear-coverts was never observed in sub-adults. Despite these findings, our data does not allow for any further discussion on the ontogeny of the plumage patterns found. Orange ear-coverts have been reported by Miranda-Ribeiro (1920) to be absent in some individuals. As this character seems to be always present in adults and absent in young parrots, we believe that Miranda-Ribeiro (1920) probably observed young parrots to draw his conclusions.

The differences in the proportion of CBP individuals between wild and museum specimens indicate that museum sampling may be biased. This is likely to occur in species that present such conspicuous plumage variation, as naturalists may focus their sampling efforts towards rare morphs in order to obtain specimens encompassing the full color variation for the species.

Male-skewed sex ratios seem to be the norm within Psittacidae (Taylor & Parkin 2008). Still, the skewed sex ratio of 3.0 male:female found in this study is larger than what has been reported for other species in nature (maximum of 2.42 in *Pyrrhura egregia*; review in Taylor & Parkin 2008). The presence of such highly skewed sex ratio elicit three distinct possibilities: 1) the sex ratio is an actual trend in Yellow-faced Parrot's wild populations; 2) males are easier to catch (for instance, females spend more time inside the nest), or; 3) males are more colorful and thus attract additional attention from collectors. A combination of these three possibilities could also be an explanation. In spite of the fact that the difference in the proportion of CBP specimens between males and females was not significant, we cannot exclude the possibility that the observed higher proportion of CBP in males is a real biological trend, given our small sample size of females. Moreover, we have shown that colored bellies are broader in males, corroborating our hypothesis that the belly is likely to be more colorful in males.

Parrot sexual dichromatism has been described for *Cyanoliseus patagonus* , *Forpus xanthopterygius*, *Triclaria malachitacea, Pionopsitta pileata*, (Masello & Quillfeldt 2003, Sick 1997) and now for *Alipiopsitta xanthops*. Additionally, slight plumage variations may be found in species such as *Aratinga leucophthalma* (that present variable red spots) or is *Amazona pretrei*, which shows slight differences on the amount of red in their forewings (CBA pers. obs.). Thus, its necessary to further investigate the presence and function of this kind of plumage variation found within Neotropical Parrots. For instance, it has been shown that plumage color may vary according to body-condition in Burrowing-parrots as feathers reflect body-condition during feather development (Masello *et al.* 2004). Hence, future studies should incorporate well-designed experiments to elucidate the ecological role of the plumage variation described here.

It is unlikely that a single factor or hypothesis accounts for all plumage variation found in the Yellow-faced Parrot. Age seems to have a role, as chicks did not show colored bellies, neither orange ear-coverts. Sex also seems to be related, as colored belied males have wider orange-yellow patches on their bellies. Also, population genetics factors cannot be excluded, as demonstrated by the presence of yellow-necked individuals only in the southwestern part of the range of *A. xanthops*. Finally, it appears that plumage variation could have multiple functional roles in the Yellow-faced Parrot, since it seems correlated with age and sex.

ACKNOWLEDGMENTS

We thank Renato Caparroz and Iubatã Faria for field help; Rafael Maia and Juan Masello for comments that helped improving this manuscript; Emas National Park for logistic support; CRAS/MS, Ana Paula Felício, Vinicius Andrade Lopes, Raphael Dias and Gláucia Seixas for the pictures of chicks sent. We would like to thank worldwide museums curators for gently sending the material, especially Luis Fábio Silveira for his comments and encouragement. We would also like to thank Dr. Alexandre Aleixo and two anonymous referees for the many comments that helped to improve the quality of this manuscript. We also thank the collections mentioned in Table 1 for providing us with pictures and data on the specimens under their care. Faepex – Unicamp and Mclennan Brown Charitable Foundation provided funding.

REFERENCES

Alderton D. 1991. *The atlas of parrots*. Neptune City, USA: T. F. H. Publications Inc.

Antas, P. T. Z., Cavalcanti R. B. & Cruz, M. C. V. 2009. *Aves comuns do Planalto Central*. Brasília, Brazil: Editora da Universidade de Brasília.

Bianchi, C. A. 2009. Notes on the ecology of the Yellow-faced Parrot (*Alipiopsitta xanthops*) in Central Brazil. *Ornitología Neotropical* 20:479-489.

Caparroz, R. & Duarte, J. M. B. 2004. Chromosomal similarity between the Scaly-headed parrot (*Pionus maximiliani*), the Short-tailed parrot (*Graydidascalus brachyurus*) and the Yellow-faced parrot (*Salvatoria xanthops*) (Psittaciformes: Aves): A cytotaxonomic analysis. *Genetics and Molecular Biology* 27:522-528.

Collar, N. J. 1997. Family Psittacidae, p. 280-477. In: del Hoyo, J.; Elliott, A. & Sargatal, J. (eds.). Handbook of the birds of the world, v. 4. Barcelona, Spain: Lynx Edicions.

de Araújo C. B., Marcondes-Machado, L. O. & Costa, G. C. 2014. Importance of biotic interactions in species distribution models: a test of the Eltonian Noise Hypothesis using parrots. *Journal of Biogeography* 41: 513-523.

de Araújo C. B. & Marcondes-Machado, L. O. 2011. Diet and feeding behavior of the Yellow-faced Parrot (*Alipiopsitta xanthops*) in Brasilia, Brazil. *Ornitología Neotropical* 22:79-88.

de Araújo, C. B., Marcondes-Machado, L. O. & Vielliard, J. M. E. 2011. Vocal Repertoire of the Yellow-Faced Parrot (*Alipiopsitta xanthops*). *The Wilson Journal of Ornithology* 123: 603-608.

Dias, R. I. 2011. Nesting biology of the Yellow-faced Parrot (*Alipiopsitta xanthops*), a species without nest-site fidelity: an indication of high cavity availability? *Emu* 111:217-221.

Erize F., Mata J. R. & Rumboll M. 2006. *Birds of South America. Non-Passerines: Rheas to Woodpeckers.* Princeton, USA: Princeton University Press.

Fitzpatrick S. 1998. Colour schemes for birds: structural coloration and signals of quality in feathers. Annales Zoologici Fennici 35:67-77.

Forshaw, J. M. 1989. *Parrots of the world*. Sidney, Australia: Lansdowne editions.

Fugle, G. N., Rothstein S.I., Osenberg, C. W. & McGinley M. A. 1984. Signals of status in wintering White-crowned Sparrows, *Zonotrichia leucophrys gambelii*. *Animal Behaviour* 32:86-93.

Heinsohn, R., Legge, S. & Endler J. A. 2005. Extreme reversed sexual dichromatism in a bird without sex role reversal. *Science* 309:617-619.

Hill, G. E. 2006. Female Mate Choice for Ornamental Coloration, p. 137-200. In: Hill, G. E. & McGraw, K. J. (eds.). Bird Coloration Vol. II. Cambridge, USA: Harvard University Press.

Holberton, R. L., Hanano, R. & Able K. P. 1990. Age-related dominance in male Dark-eyed Juncos: effects of plumage and prior residence. *Animal Behaviour* 40:573-579.

Juniper, T. & Parr, M. 1998. Parrots: *A guide to parrots of the world*. New Haven, USA: Yale University Press.

McGraw, K. J. & Nogare, M. C. 2005. Distribution of unique red feather pigments in parrots. *Biology Letters* 1:39-43.

Masello, J. F. & Quillfeldt, P. 2003. Body size, body condition and ornamental feathers of burrowing parrots: Variation between years and sexes, assortative mating and influences on breeding success. *Emu* 103:149-161.

Masello, J. F., Pagnossin, M. L., Lubjuhn, T. & Quillfeldt P. 2004. Ornamental non-carotenoid red feathers of wild burrowing parrots. *Ecological Research* 19:421-432.

Mata, J. R., Erize, F., Rumbol, M. 2006. *Aves de Sudamerica*. Buenos Aires, Argentina: HarperCollins Publishers.

Miranda-Ribeiro A. 1920. *Revisão dos psitacídeos brasileiros*. *Revista do Museu Paulista* 12:3-83.

Nemesio, A. 2001. Color production and evolution in parrots. *International Journal of Ornithology* 475-102.

Parsons, J. & Baptista L. F. 1980. Crown color and dominance in the white-crowned Sparrow. *Auk* 97:807-815.

Paynter, R. A., Traylor, M. A. 1991. *Ornithological Gazetteer of Brazil*. Cambridge, USA: Museum of Comparative Zoology, Harvard University.

Perlo, B. V. 2009. *A field guide to the birds of Brazil*. New York, USA: Oxford University Press.

Perrier, C., de Lope, F., Møller, A. & Ninni, P. 2002. Structural coloration and sexual selection in the barn swallow *Hirundo rustica*. Behavioural Ecology 13:728-736.

Pierotti, R. 1987. Isolating mechanisms in seabirds. Evolution 41:559-570.

Reynolds, M. B. J. & Hayes, W. K. 2009. Conservation taxonomy of the Cuban parrot (*Amazona leucocephala*): variation in morphology and plumage. *Journal of Caribbean Ornithology* 22:1-18.

Rohwer, S. 1977. Status signaling in Harris Sparrows: some experiments in deception. *Behaviour* 61:107-129.

Rohwer, S. 1985. Dyer birds achieve higher social status than controls in Harris' Sparrows. *Animal Behaviour* 33: 1325-1331.

Rohwer, S. & Røskaft, E. 1989. Results of dyeing male Yellow-headed Blackbirds solid black: implications for the arbitrary identity badge hypothesis. *Behavioral Ecology and Sociobiology* 25: 39-49.

Røskaft, E. & Rohwer, S. 1987. An experimental study of the function of the epaullete and the black body colour of the male Red-winged blackbirds. *Animal Behaviour* 35:1070-1077.

Ryan, P. G., Wilson, R. P. & Cooper J. 1987. Intraspecific mimicry and status signals in juvenile Africans penguins. *Behavioral Ecology and Sociobiology* 20:69-76.

Saks, L., Ots, I. & Hõrak, P. 2003. Carotenoid-based plumage coloration of male greenfinches reflects health and immunocompetence. *Oecologia* 134:301-307.

Savalli, U. M. 1995. Evolution of bird coloration and plumage elaboration: a review of hypotheses. *Current Ornithology* 12:141-190.

Selander, R. K. & Hunter, D. K. 1960. On the function of wing-flashing in Mockingbirds. *The Wilson Bulletin* 72:341-345.

Sibley, C. J. 1957. The evolutionary and taxonomic significance of sexual dimorphism and hybridization in birds. *Condor* 59:166-191.

Sick, H. 1997. *Ornitologia Brasileira*. Rio de Janeiro, Brazil: Editora Nova Fronteira.

Sigrist, T. 2009. *Avifauna brasileira*. São Paulo, Brazil: Aves Brasilis.

Siitari, H. & Huhta E. 2002. Individual color variation and male quality in pied flycatchers (*Ficedula hypoleuca*): a role of ultraviolet reflectance. *Behavioural Ecology* 13:737-741.

Taylor, T. D. & Parkin D. T. 2008. Sex ratios observed in 80 species of parrots. *Journal of Zoology* 276:89-94.

Whitfield, D. P. 1986. Plumage variability and territoriality in breeding turnstone *Arenaria interpress*: status signaling or individual recognition? Animal *Behaviour* 34:1471-1482.

Whitfield, D. P. 1987. Plumage variability, status signaling and individual recognition in avian flocks. *Trends in Ecology & Evolution* 2:13-18.

Associate Editor: Luis Fábio Silveira

Revista Brasileira de Ornitologia, 22(3), 260-264
September 2014

ARTICLE

Occurrence of the Eastern Slaty Thrush (Turdidae) in southern Brazil during the non-breeding season

Huilquer Francisco Vogel[1,2]

[1] UNESPAR - Universidade Estadual do Paraná, Departamento de Ciências Biológicas, Praça Coronel Amazonas, s/nº, Caixa Postal 57, CEP 84600-000, União da Vitória, PR, Brazil.
[2] Corresponding author: huilquer@hotmail.com

Received on 21 January 2013. Accepted on 18 May 2014.

ABSTRACT: There are many gaps in the knowledge about Neotropical bird migration patterns. Among these gaps is the presence of some non-migrating individuals at their breeding sites, outside their wintering grounds. There is evidence that *Turdus subalaris* can occur in southern Brazil during the non-reproductive period. The objective of this work was: (1) to verify possible occurrences of *T. subalaris* in southern Brazil during its non-breeding season and; (2) to relate these occurrences to years of harsh winters (caused in southern Brazil mainly by the influence of the climatic phenomenon La Niña). After synthesizing specific literature data and ornithological collection records, the occurrence data were compared with the climatic events of the preceding years. Thirteen *T. subalaris* individuals were recorded in southern Brazil during the breeding season between 1973 and 2013. Eight of these records (61.53%) occurred in years preceded by harsh winters. These new data indicate that migration dynamics in *T. subalaris* is more complex than previously thought, indicating that forest formations in southern Brazil may act as habitats for this species during the post-reproductive resting period.

KEY-WORDS: Breeding sites, *Turdus subalaris*, migration, wintering grounds

INTRODUCTION

Birds of the Turdidae family are well-distributed over the different Brazilian ecosystems, but the ecology of some species is still poorly understood (Vogel *et al.* 2013), including *Turdus subalaris* (Seebohm, 1887), commonly called the Eastern Slaty Thrush. According to Sibley & Monroe (1993), the taxonomic status of this species is controversial, with *T. subalaris* considered a subspecies of *Turdus nigriceps* (subsp. *subalaris*), in accordance with Collar (2005). Aspects of the migration of the species *T. n. nigriceps* with Andean populations have been well documented (Capllonch *et al.* 2008a). However, this study considered them distinct species, in agreement with the Brazilian Ornithological Committee Records (CBRO 2014).

Studies on the migratory patterns of *T. subalaris* have so far been carried out on a local scale, and have focused on the *Cerrado* biome, more specifically in Brasília-Federal district (Antas & Valle 1987; Ferreira & Bagno 2000). It has been suggested that in winter (the non-breeding period), *T. subalaris* occurs in southern Mato Grosso state, the states of Rio de Janeiro, Minas Gerais and the Distrito Federal (Sick 1997; Ridgely & Tudor 2001; Sigrist 2006). Ferreira & Bagno (2000) recorded *T. subalaris* in September and October in Brasília. This shows that the wintering grounds of this species are probably more northerly, in ecotone areas between the Amazonia and *Cerrado* biomes, in the states of Pará and Mato Grosso. This is also supported by the more recent records of Mestre *et al.* (2011) and Somenzari *et al.* (2011).

In southern Brazil, *T. subalaris* has been reported from early September to late January (rarely until April), during its breeding season (Belton 1985; Collar 2005). Most of the information on the species is still based on general literature sources such as Belton (1985), Sick (1997), Clement (2000), Ridgely & Tudor (2001), Collar (2005) and Sigrist (2006). In general, these authors report that the species occurs in southern Brazil during the breeding season.

In March (autumn) of 2009 one juvenile *T. subalaris* was captured in Guarapuava (Paraná state; more details can be found in Vogel *et al.* 2012a). Ghizoni-Jr *et al.* (2013) have also disclosed an older record of *T. subalaris* from Santa Catarina state during the winter of 1984. The presence of individuals in later periods (autumn occurrences) can also be interpreted as variations in inter-annual migratory patterns (Antas & Valle 1987). According to Belton (1985), during more rigorous and dry winters, the arrival of *T. subalaris* in southern Brazil occurs later than in years of milder winters. Rigorous and dry winters in southern Brazil occur mainly during La Niña years (Grimm *et al.* 2000; Marengo 2007).

Therefore, if La Niña can really influence migration patterns in *T. subalaris*, records of this species in southern Brazil during the non-breeding season are predicted to be preceded by winters under the influence of La Niña. The aim of this work was to: (a) search for evidence to support the hypothesis that individuals of *T. subalaris* can also occur in southern Brazil in their non-breeding period and (b) investigate if there is any relationship between such occurrences and years under the influence of rigorous winters.

MATERIALS AND METHODS

Southern Brazil [states of Paraná, Santa Catarina and Rio Grande do Sul; ca. 576.5 km^2 according to IBGE (2013)] has a subtropical or temperate climate, with annual mean temperatures between 12 and 22°C. In Paraná, a tropical climate predominates in the north, while a humid subtropical climate prevails in the south. Santa Catarina and Rio Grande do Sul are more influenced by cold air masses from the South Pole; thus, a humid subtropical climate is predominant in these states, with annual mean precipitation between from 1250 and 2000 mm, except along the coast of Paraná and western Santa Catarina, where rainfall is excessive (up to 2000 mm), with vegetation composed of rainforests along the coast and prairie-like vegetation in the south (Grimm *et al.* 2000; Maack 2002; Ab'Saber 2003).

Turdus subalaris records in southern Brazil were sought, with May through August defined as the non-breeding season, as records up to April are considered late migrants to southern Brazil (Belton 1985). Records of *T. subalaris* in southern Brazil were sought in: (a) Web databases (Xeno canto Foundation$^{\copyright}$ – XC [http://www.xeno-canto.org], WikiAves$^{\copyright}$– WA [http://www.wikiaves.com.br] and Ebird$^{\copyright}$– EB [http://www.ebird.org]); (b) Voucher specimens deposited in scientific collections in Paraná (Natural History Museum Capão da Imbuia – MHNCI), Santa Catarina (Zoological Collection of the University of Blumenau – CZFURB and Bird Collection of the Zoology Laboratory of the University of Western Santa Catarina – CLZU), and Rio Grande do Sul (Science and Technology Museum of the Pontifical Catholic University – MCTPUCRS and Natural Sciences Museum of Zoobotany Foundation – MCNFZ) states; and (c) Literature records retrieved through the Scirus web data base (http://www.scirus.com) until September 2013. Furthermore, a personal record obtained in 2013 was included in the analyses.

Records were summarized and the occurrence and intensity of climatic phenomena such as La Niña and El Niño were checked for the winter preceding each record. Climate data was provided by the National Oceanic and Atmospheric Administration (NOAA 2013). Lastly, a chi-square test with the Yates' correction ($\alpha = 0.05$) was performed to compare the proportion of records of *T. subalaris* obtained during years followed by La Niña, El Niño as well as those without the presence of these atmospheric phenomena.

TABLE 1. Records of *Turdus subalaris* in southern Brazil during the non-breeding period. PCP = presence of climatic phenomenon in the winter preceding the record. (+) corresponds to the number of winter months under the influence of La Niña (La) or El Niño (El). (♂, ♀, Y, A) represent male, female, young and adult, respectively.

Author	Source	Date	City	PCP
1. Czaban, R. E.	WA - 79584♂A	July/22/2001	Curitiba, PR	La ++++
2. Linkowski, A.	EB - S9093688	August/15/2009	Morretes, PR	La++
3. Lorin, D.	WA - 373726♀Y	June/17/2011	Apucarana, PR	La ++++
4. Vogel, H. F.	pers. obs. ♂A	May/05/2013	Guarapuava, PR	---
5. Rosário, L. A.	CZFURB -1529♀A	July/14/1984	Florianópolis, SC	---
6. Straube, F. C.; Urben-Filho, A.	MHNCI - 5196♂A	May/08/1999	Itajaí, SC	La +++
7. Olmos, F.	WA - 148649♂Y	May/29/2010	Lajes, SC	El ++++
8. Amorim-Neto,A.	WA - 401091♂A	May/24/2011	São Joaquim, SC	La+++
9. Volkmann, K. M.	WA - 401702♂A	June/24/2011	Pomerode, SC	La+++
10. Miguel, V. S.	WA - 358625	June/25/2011	Itajaí, SC	La+++
11. Freitas, P. A.	WA - 348398♂A	August/12/2011	Santo Amaro da Imperatriz, SC	La+++
12. Belton, W.	in litt. (1985) c.f. ♂	August/24/1973	São Leopoldo, RS	El ++++
13. Godinho, D.	WA - 1017153♂A	July/11/2013	Canela, RS	---

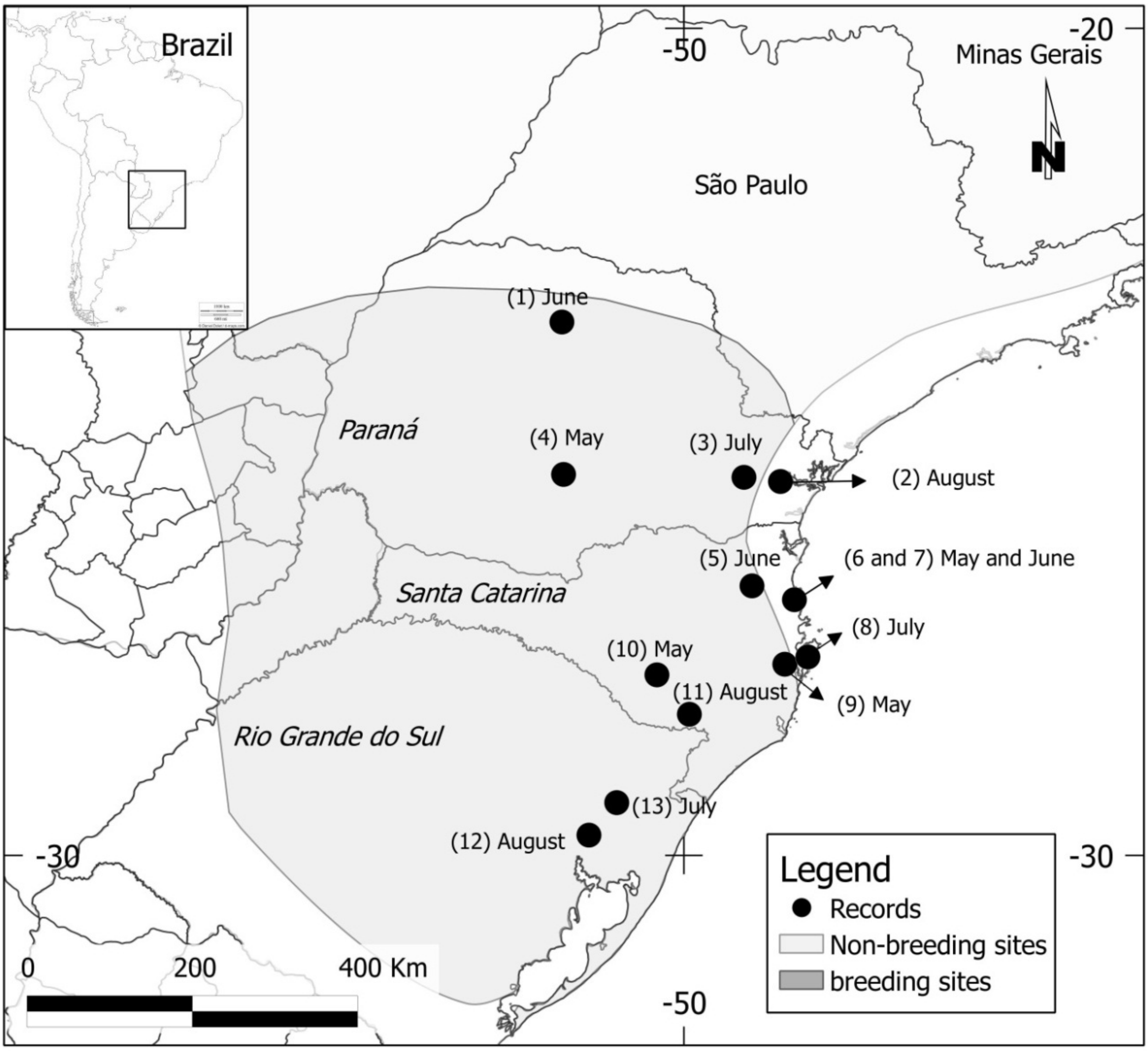

FIGURE 1. Records of *Turdus subalaris* in southern Brazil during the non-breeding season. The geographic range of the species was based on Ridgely *et al.* & BirdLife International (2012). The numbers represent the records in Table 1.

RESULTS

There were 13 records of *T. subalaris* in southern Brazil between 1973 and 2013, covering the non-breeding season (May 5th to August 15th; Table 1, Figure 1). Eight of these records (61.53%) occurred during years followed by harsh winters under the influence of La Niña (Table 1). In contrast, two records were preceded by El Niño years, and three were without the presence of these atmospheric phenomena. However, the higher frequency of records following La Niña winters was not statistically significant ($\chi^2_{\text{Yates}} = 3.25$, df = 2, P = 0.19).

DISCUSSION

There are important gaps in the knowledge concerning the migratory behavior of bird species (Alves 2007). Here, it is demonstrated that *Turdus subalaris* occurs in southern Brazil during the non-reproductive period; however, the possibility of reaction to the La Niña phenomenon is weakly supported by the chi-square test, as a non-significant association was recovered.

The recorded observations in this region during the winter might be of young individuals that remained in their birth area until becoming adults and later migrating the following year, similar to the pattern observed for birds of the families Charadriidae and Scolopacidae (Campos *et al.* 2008, p. 41). This hypothesis is based on the records of a young male in late autumn and a young female in winter (Table 1).

The migration of *T. subalaris* is possibly very similar to that of *Turdus amaurochalinus* (Capllonch *et al.* 2008b). Populations of migrating individuals might overlap with those of non-migrating populations. In this case, a portion of the population might cease migrating due to the seasonal availability of resources or to favorable conditions at the resting or breeding sites (Sick 1997;

Alves 2007). It is worth noting that *T. subalaris* and *T. amaurochalinus* are morphologically very similar (Vogel *et al.* 2012b) and juveniles of the former species can be confused with females of the latter (Belton 1985). Accordingly, *T. subalaris* can only be identified from spring onwards, when its breeding activities start and allow identification through its distinctive vocalization (Ridgely & Tudor 2001; Collar 2005). Evidence of this is that some skins deposited at the MCNFZ had not been identified yet with certainty as either *T. subalaris* or *T. amaurochalinus*.

Intense winters on preceding years do not conclusively explain *T. subalaris* occurrences in southern Brazil between late autumn and winter. More records are needed to establish a more reliable pattern. Necessary for long migration needs, such as weight gain and molting, food resources probably become scarce in colder and drier winters (Sillett *et al.* 2000; Capllonch *et al.* 2008a). The effect of atmospheric phenomena such as El Niño and La Niña in the winter resting areas of the species is still little known. These phenomena can certainly influence migration patterns, due to rainfall dynamics affecting the availability of resources (Joseph 1996; Marengo 2007). Although such inferences are speculative, the family Turdidae can change its reproductive strategies in atypical climate years (Richmond *et al.* 2007).

The records from Paraná state confirm the observations of Sick (1997) and Sigrist (2006), that the species is capable of occupying moist araucaria and seasonal forests during the non-breeding season. However, the records from Morretes, Santo Amaro da Imperatriz, and especially Itajaí, show that the species can also occur in transitional forests on the Santa Catarina state coast. This is corroborated by data recently published by Ghizoni-Jr *et al.* (2013), who present an older record of a female *T. subalaris* collected on the island of Santa Catarina.

The range of this species should be better studied, because the growing number of records of *T. subularis*, mainly in Rio Grande do Sul state, has intensified from the mid-twentieth century onward (Belton 1985, p. 110). Perhaps this process partially explains the occurrences recorded outside the breeding area proposed by Ridgely & Tudor (2001); however, only extensive banding records and new monitoring endeavors will help elucidate the complex migratory patterns of this species.

In summary, there are records of *Turdus subalaris* (males, females, juveniles and adults) in southern Brazil throughout the non-reproductive period; however, it is plausible that these winter records are sporadic. There is also evidence that the presence of climatic phenomena such as El Niño and La Niña may be related to the presence of *T. subalaris* in southern Brazil during the non-breeding season, but due to the lack of a greater number of records, a strong cause - effect relationship cannot be established yet.

ACKNOWLEDGEMENTS

Thanks are due to the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for providing a doctoral scholarship, the Programa de Pós-graduação em Ecologia de Ambientes Aquáticos Continentais for logistical support, Fernando Costa Straube (Hori Environmental Consulting) and Antenor Silva Junior (collection curator of the MHNCI) for providing necessary information; Dr^{a}. Carla Suertegaray Fontana and Biologist Alessandra Daniele da Silva Boos for providing information on the specimens deposited at MCTPUCRS; Biologist Glayson Ariel Bencke for providing information on the birds deposited at MCNFZ; and Dr. Cláudio Henrique Zawadzki for his valuable comments on the manuscript. I appreciate the important contributions of anonymous reviewers to this manuscript.

REFERENCES

Ab'Saber, A. N. 2003. *Os domínios de natureza no Brasil: potencialidades paisagísticas.* São Paulo: Ateliê Editorial, 159 p.

Alves, M. A. S. 2007. Sistemas de migrações de aves em ambientes terrestres no Brasil: exemplos, lacunas e propostas para o avanço do conhecimento. *Revista Brasileira de Ornitologia*, 15(2): 231-238.

Antas, P. T. Z. & Valle, M. P. 1987. Dados preliminares sobre *Turdus nigriceps* no Distrito Federal. *In*: II Encontro Nacional de Anilhadores de Aves, n. 2, Rio de Janeiro, 1987. *Anais...* Editora UFRJ. 1987, 213-220.

Belton, W. 1985. Birds of Rio Grande do Sul, Brazil, part 2. Formicariidae through Corvidae. *Bulletin of the American Museum of Natural History*, 180: 01-242.

Campos, C. E. C., Naiff, R. H. & Araújo, A. S. 2008. Censo de aves migratórias (Charadriidae e Scolopacidae) da Porção Norte da Bacia Amazônica, Macapá, Amapá, Brasil. *Ornithologia*, 3(1): 38-46.

Capllonch, P.; Soria, K.; & Ortiz, D. 2008a. Comportamiento migratorio del Zorzal Plomizo (*Turdus nigriceps nigriceps*) en Argentina. *Ornitologia Neotropical*, 19(2): 161-174.

Capllonch, P., Ortiz, D. & Soria, K. 2008b. Migración del Zorzal común *Turdus amaurochalinus* (Aves, Turdidae) en Argentina. *Revista Brasileira de Ornitologia*, 16(1): 12-22.

Clement, P. 2000. *Thrushes.* Princeton, NJ: Princeton, 424 p.

Collar, N. J. 2005. Family Turdidae (Thrushes). In: J. Del Hoyo; A. Elliot; D. A. Christie (ed.), *Handbook of the Birds of the World*. Barcelona: Lynx Edicions, 514-811.

CBRO - Comitê Brasileiro de Registros Ornitológicos. 2014. Lista das aves do Brasil, 11ª edição. http://www.cbro.org.br/CBRO/pdf/AvesBrasil2014.pdf (access on 06 January 2014).

Ferreira, A. A. & Bagno, M. A. 2000. Período de permanência de *Turdus nigriceps* Seebohn,1887 (Aves, Passeriformes,Turdinae) no Distrito Federal. *Revista Brasileira de Ornitologia*, 8(1): 45-47.

Ghizoni-JR, I. R., Farias, F. B., Vieira, B. P. Willrich, G., Silva, E. S., Mendonça, E. N., Albuquerque, J. B. L., Ass, D. A.; Ternes, M. H., Nascimento, C. E. Roos, A. L., Couto, C. C. M., Serrão, M., Serafini, P. P., Dias, D., Fantacini, F. M., Santi, S., Souza, M. C. R., Silva, M. S., Barcellos, A. Albuquerque, C. & Espínola, C. R. R. 2013. *Checklist* da avifauna da Ilha de Santa Catarina, Sul do Brasil. *Atualidades Ornitológicas*, 171: 50-75.

Grimm, A. M., Barros, V. R. & Doyle, M. E. 2000. Climate variability in Southern South America associated with El Niño and La Niña events. *Journal of Climate*, 13(1): 35-58.

IBGE - Instituto Brasileiro de Geografia e Estatística. 2012. *Estados.* hwww.ibge.gov.br/estadosat (access on 09 July 2012).

Joseph, L. 1996. Preliminary climatic overview of migration patterns in South America austral migrant passerines. *Ecotropica*, 2: 185-193.

Maack, R. 2002. *Geografia física do Estado do Paraná.* 3 ed. Curitiba: Imprensa Oficial, 440p.

Marengo, J. A. 2007. *Mudanças climáticas globais e seus efeitos sobre a biodiversidade - Caracterização do clima atual e definição das alterações climáticas para o território brasileiro ao longo do Século XXI*. 2 ed. Brasilia: Ministerio do Meio Ambiente, 214p.

Mestre, L. A. M., Rechetelo, J., Cochrane, M. A. & Barlow, J. 2011. Avifaunal inventory of a Southern Amazonian transitional forest site: the São Luiz farm, Mato Grosso, Brazil. *Boletim do Museu Paraense Emílio Goeldi. Ciências Naturais*, 6(2):147-161.

NOAA - National Oceanic and Atmospheric Administration. 2013. Changes to the Oceanic Niño Index. www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.shtml (access on 01 January 2013).

Richmond, S., Nol, E.; Campbell, M. & Burke, M. D. 2007. Conspecific and Interspecific Nest Reuse by Wood Thrush (*Hylocichla mustelina*). *Northeastern Naturalist*, 14(4): 629-636.

Ridgely, R. S. & Tudor, G. 2001. *The Birds of South America.Vol II.The Oscine Passerines.* Austin, University of TexasPress, 940p.

Ridgely et al. & BirdLife International. 2012. Digital Distribution Maps of the Birds of the Western Hemisphere, version 5.0. In BirdLife International and NatureServe. *Bird species distribution maps of the world*. www.biodiversityinfo.org (access on 01 January 2012).

Sibley, C. G. & Monroe, B. L. 1993. *Supplement to Distribution and Taxonomy of Birds of the World.* New Haven and London: Yale University Press,108p.

Sick, H. 1997. *OrnitologiaBrasileira.* Rio de Janeiro: Nova Fronteira, 862p.

Sigrist, T. 2006. *Aves do Brasil: Uma Visão Artística*. São Paulo: Fosfértil, 672p.

Sillett, T. S., R. T. Holmes. & Sherry, T. W. 2000. Impacts of a global climate cycle on population dynamics of a migratory songbird. *Science,* 288: 2040-2042.

Vogel, F., Zawadzki, C. H. & Metri, R. 2012a. Occurrence of thrushes in an urban fragment of Araucaria forest in southern Brazil. *Biota Neotropica,* 12(4): 243-247.

Vogel, H. F., Miranda, J. M. D., Zawadzki, C. H. & Metri, R. 2012b. Similaridade morfológica entre turdídeos sintópicos em um parque urbano na Região Sul do Brasil. *Sitientibus. Série Ciências Biológicas*, 12(2): 333-338.

Vogel, H. F., Silva, J. C. B., Zawadzki, C. H. & Campos, J. B. 2013. Research Into Brazilian Thrushes: Bibliographies, Species and Next Steps. *Bioscience Journal*, 29(2): 468-477.

Associate Editor: Luciano N. Naka

Revista Brasileira de Ornitologia, 22(3), 265-269
September 2014

ARTICLE

Uniformity of diet composition of Brown Skua chicks at different ages and between siblings

Maricel Graña Grilli[1,4], Lucas J. Marti[2] and Diego Montalti[1,3]

[1] Instituto Antártico Argentino, Balcarce 290, C1064AAF, Ciudad Autónoma de Buenos Aires, Argentina – Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET).
[2] Universidad CAECE, Av. de Mayo 866, C1084AAQ-Ciudad Autónoma de Buenos Aires, Argentina.
[3] División Zoología Vertebrados, Museo de La Plata, Paseo del Bosque, B1900FWA-La Plata, Argentina.
[4] Corresponding author: ggmaricel@gmail.com

Received on 14 May 2014. Accepted on 17 September 2014.

ABSTRACT: The diet of chicks may change according to their growth and also vary between siblings due to their competitive relationship. Diet composition of 81 Brown Skua (*Stercorarius antarcticus lonnbergi*) chicks was analysed from regurgitated stomach contents in order to determine changes in diet composition related to chick age and differences between siblings. Fifty-nine of the samples belonged to chicks whose age was estimated by applying culmen measurement to a regression function. The remaining 22 samples belonged to 11 sibling pairs whose stomach contents were simultaneously sampled. The diet was constituted mostly by soft tissues of penguins. Marine resources were a minor part of the diet of chicks, appearing in the third week of their life. The qualitative composition of the stomach content of siblings was similar in most cases, but mass of regurgitates differed between siblings (1.3–90.0% = 0.5–9 g), which suggests the potential existence of aggressive food monopolization by one sibling, an issue to be elucidated with further research.

KEY-WORDS: Chick growth, sibling competition, *Stercorarius antarcticus lonnbergi*, stomach regurgitate.

INTRODUCTION

The food delivered to chicks by their parents may be influenced by many factors, such as changes in food availability, the status of dominance of parents or changes on their ability or opportunity to get different kinds of resources. Changes in the nutritional requirements due to chick growth, as well as their acquisition of the ability to feed on new kinds of food and larger meals can also lead to variations in the food delivered to chicks (Shealer 1998, Smiseth & Amundsen 2002), not only in quantity, but also to its qualitative characteristics (Moorer 1986, Hill & Hamer 1994, Robinson & Hamer 2000, Mitrus *et al.* 2010).

Hatching asynchrony gives the older chick a higher ability to compete for food delivered by parents (Braun & Hunt 1983, Smiseth & Amundsen 2002, Smiseth *et al.* 2003). This higher competitiveness added to the initial difference in size at the time the second chick hatches, may determine a progressive increase in the difference in size between siblings (Pugesek 1993). In turn, this reduces the probability of survival of the younger chick either during its rearing, leading to brood reduction (Seddon & van Heezik 1991, Royle & Hamer 1998, Maddox & Weatherhead 2008), or after fledging (Ploger & Mock 1986, Stenning 1996).

The Brown Skua (*Stercorarius antarcticus lonnbergi*) breeds on the Antarctic Peninsula and in Antarctic and Sub-Antarctic islands (Ritz *et al.* 2008). It has opportunistic feeding habits taking advantage of a broad variety of available resources. Its main food resources during the breeding period are penguins from nearby colonies, and flying seabirds (Trivelpiece *et al.* 1980, Graña-Grilli & Montalti 2012). During the rearing period, lasting around 60 days, both parents feed chicks (Young 1994) and the hatching asynchrony between siblings, of between 1 and 4 days, is reflected in a bigger body size of the older one (Montalti 2005, Ritz *et al.* 2005).

The aim of this study was to describe the diet of Brown Skua chicks while looking for differences in its composition at different ages and between siblings.

METHODS

Study area

Sampling was carried out at Harmony Point (62º17'60''S, 59º15'0''W), Nelson Island, South Shetland Islands, Antarctica, where Brown Skuas breed in sympatry with South Polar Skuas (*S. maccormicki*). Breeding colonies of

Chinstrap Penguins (*Pygoscelis antarcticus*) and Gentoo Penguins (*P. papua*) are located at this site, which in 1995 had 89,700 and 3,347 pairs, respectively (Silva *et al.* 1998). During the 2002–2003 season, 79 pairs of Brown Skua bred at Harmony Point (Author's ump. data).

Sampling and sample analysis

Between 19 January and 11 February 2003, samples of stomach content were obtained from 81 Brown Skua chicks by stimulating their regurgitation reflex through abdominal massage. Samples were analyzed to identify food items and classify them by comparison with reference material.

Diet according to chick age

Fifty-nine samples were obtained from chicks for which their culmen was also measured (precision 0.01 mm). That measurement was later used for age estimation by means of a regression model developed from culmen measurements taken from 15 known-age Brown Skua chicks, between 1 and 57 days old, from Laurie Island (South Orkney Islands), whose growth was monitored every three days during the 1993–1994 breeding season (Montalti 2005). From a total of 206 measurements, the regression function obtained was:
$\text{Age} = 2.240170 – 0.420258 * \text{Culmen} + 0.026932 * \text{Culmen}^2$
and showed good fit to the data ($R^2 = 0.97$). The application of the function on the same data that generated it gave a correct age assignation to 15.3% of the measurements and a difference between the calculated and actual age of 1 and 2 days to 32.6% and 23.7% of measurements, respectively (difference mean = 2 d, SD = 1.74 d). The largest differences between calculated and actual ages were 8 and 9 days for 2 and 1 measurements, respectively, the three cases belonging to chicks over 50 days old. This model allowed determining that ages of chicks sampled at Harmony Point were between 4 and 43 days old.

Samples were grouped according to the age of chicks, defined in weeks, covering a total of six weeks. The frequency of occurrence of resources in stomach contents was calculated for the following categories: penguin colonies – soft tissue, indigestible remains of penguin chicks, feathers, bone and egg; eggs of flying seabirds; and marine resources – including krill (*Euphausia superba*), fish, and cephalopods.

Data analysis was carried out by contingency tables, grouping data for two consecutive weeks, obtaining three age categories defined by fortnights: first ($n = 14$), second ($n = 25$), and third fortnight ($n = 20$). Fortnight blocks were used because the condition of 20% of the expected frequencies higher than 5 at every class was not fulfilled for chi-squared test (Quinn & Keough 2002), precluding analysis in weekly blocks. For the same reason, eggs of penguins and flying seabirds were pooled for analysis, despite being possible to identify them as belonging to each category. Similarly, krill, fish and cephalopods remains were combined in a single category named "marine resources".

Diet of sibling chicks

Regurgitated stomach contents were sampled from 11 pairs of sibling chicks, in both chicks simultaneously. Culmen measurements were not recorded for these chicks precluding us from estimating their ages. Samples obtained were weighed and their qualitative composition was examined and both mass and composition were compared between siblings.

Temporal change in diet

In order to test for changes in diet throughout the study period, regardless of chick age, all 59 samples took from chicks of different ages were classified in three groups, covering eight consecutive calendar days each (19/01–26/01, $n = 24$; 27/01–03/02, $n = 15$; 04/02–11/02, $n = 20$) and an analysis of contingency was performed.

RESULTS

Diet according to chick age

Penguin remains found belonged to soft tissue (muscle and viscera), bone of chicks, complete body parts, and down feathers (all them grouped as indigestible chick remains); adult bones and skin with feathers, and egg. In the case of other seabird species, remains of egg and of a Greater Sheathbill, *Chionis alba*, were found. The latter was found in a single sample and therefore, it was not included in the contingency table.

Soft tissue of penguins predominated in all age classes (Figure 1). There was an exclusive presence of penguin remains during the first week, with a progressive appearance of other items in the following weeks, and the incorporation of marine resources in the third week of life of chicks (Figure 1). Those marine resources were found in the stomach content of 6 chicks sampled in dates that covered all the sampling period (between 20 January and 4 February). In 4 of those samples the marine remains belonged to krill in advanced digestion condition.

There were no significant differences in the composition of the diet in the three chicks' stages ($\chi^2 = 6.74$, $df = 10$, $P = 0.75$).

Diet of sibling chicks

Regurgitated wet mass obtained was variable between sibling chicks. In five of the pairs of siblings, the difference was between 60.9% (9–23 g) and 90.0% (1–10 g), while in the other four pairs it was between 1.3% (38–38.5 g) and 13.3% (26–30 g).

Penguin remains were almost the only food item found in stomach contents of siblings and in 8 out of 11 pairs, the items found were coincident in both siblings (Table 1).

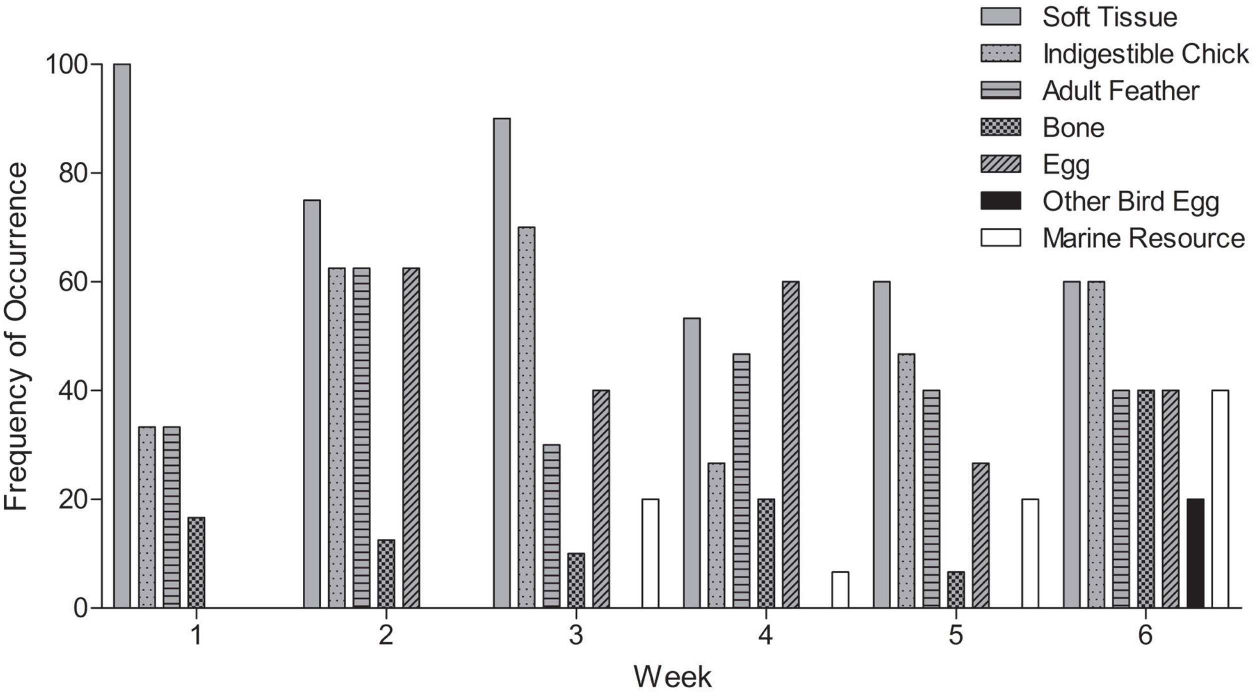

FIGURE 1. Frequency of occurrence of food items found in stomach contents (n = 59) of Brown Skua chicks (*Stercorarius antarcticus lonnbergi*) of different weeks of age.

TABLE 1. Food items found in the stomach contents of sibling Brown Skua chicks (*Stercorarius antarcticus lonnbergi*) from Nelson Island, South Shetland Islands during the 2002-2003 breeding season. A and B denote different chicks in the same brood.

Nest	**Chick**	**Food items**						
		Soft Tissue	**Chick Feather**	**Chick Bone**	**Adult Feather**	**Bone**	**Egg**	**Algae**
1	A	x						x
	B	x						x
2	A			x				
	B	x		x				
3	A	x	x		x			
	B	x	x		x			
4	A	x	x			x	x	
	B	x	x			x	x	
5	A	x	x			x	x	
	B	x	x			x	x	
6	A	x			x	x		
	B	x			x	x		
7	A			x			x	
	B	x		x			x	
8	A	x			x			
	B	x			x			
9	A	x	x					
	B	x	x					
10	A	x			x			
	B	x			x			
11	A	x	x	x				
	B		x	x				

Temporal change in diet

The comparison of items found when samples were classified according to calendar date did not show significant differences between the three periods sampled ($\chi^2 = 8.60$, $df = 10$, $P = 0.57$).

DISCUSSION

We addressed in the current study only one aspect among several ones that can determine changes in diet of chicks, such as changes in food availability or feeding status of parents. The lack of differences among the three compared periods sampled would suggest that the kind of food that skuas offer to their chicks would be determined by the availability more than by changes in the specific needs of chicks related to their age.

In agreement with previous, studies, remains of soft tissue of penguins predominated in the diet of Brown Skua chicks throughout their nesting period (Reinhardt 1997, Graña-Grilli *et al.* 2011). Sampling covered a period of 24 days in which penguin chicks would be at the crèche stage (chicks are big and get grouped under the care of a few adults while other parents forage at sea) and at the onset of the fledging stage (Williams 1995). At those stages, penguin chicks have low vulnerability to the attack of skuas due to their big size and self-defense ability (Burton 1968). However, the occurrence of viscera and muscle in stomach contents would indicate that parent skuas were able to get high quality food from nearby penguin colonies. Viscera and muscle are the first parts ingested by skuas (Young 1994) and may be selected as high quality food to be given to chicks.

The appearance of marine resources in stomach contents of older chicks only would suggest that there is a need for supplementation of the diet that may lead parents to look for other kinds of food, apart from the ones obtained at the penguin colonies, or that availability of marine foods changed through the season. However, the high degree of digestion of krill remains suggests that its occurrence may be due to secondary ingestion, i.e. from digestive tracts of penguins on which the skuas fed.

The lack of information about feeding status of parents, as owners of feeding territories or not, which can be a determinant of breeding success (Ens et al. 1992), precludes us from making inferences about the possibility that no territorial pairs may need to look for food sources other than penguins. In the same way, the age of parents, which also has an influence on breeding success (Pugesek 1993), is not known in this work.

Aggression of the older sib towards younger ones has been reported for other skua species, especially when the food availability is reduced (Procter 1975, Wang & Norman 1993, Young & Millar 2003). Aggressive behaviour consists of older chick throwing out the younger sib from the territory, causing its death by predation or starvation (Young & Millar 2003). However, parents can control food delivered to chicks, either by reducing the effects of competition between siblings (Ricklefs 1982), or enhancing differences in food acquisition by selecting the older one during feeding (Braun & Hunt 1983). Sampling of siblings was carried out on both chicks at a nest, therefore ejection from the nest is not an option in our study, and the similarity in the kind of items found between siblings would suggest that there is no parent discrimination between them when delivering food. This rose the possibility of parents intervening to reduce the effect of competition between chicks, thus increasing fledging rates and consequently their own fitness

On the other hand, the stomach contents obtained from many sibling pairs had important differences in mass. Unfortunately, our work does not allow us to determine the amount of food delivered to each chick after each foraging trip and whether the feeding frequency is similar for both chicks or not. Those differences in mass found in the stomach contents could be the result of aggressive food monopolization by one of the siblings, or differences in the period elapsed since the last time each chick was fed. Alternatively it could result from sampling biases, such as obtaining an incomplete sample of the total stomach content (Barrett *et al.* 2007). Dietary differences between chicks would be most likely reflected in its quantity rather than quality, but the impossibility to distinguish among those possible causes for mass differences leaves the question open about food monopolization by older siblings in skuas. Further research on the feeding of chicks could clarify the characteristics of the relationship between siblings and the role of parental provisioning on them.

ACKNOWLEDGEMENTS

The sampling for this study was done thanks to the financial support of the Instituto Antártico Argentino and under the permits given by the Program of Environmental Management and Tourism, observing the guidelines of the Madrid Protocol. We thank to J. Harada for improving the English.

REFERENCES

Barrett, R. T., Camphuysen, C. J., Anker-Nilssen, T., Chardine, J. W., Furness, R. W., Garthe, S., Hüppop, O., Leopold, M. F., Montevecchi, W. A. & Veit, R. R. 2007. Diet studies of seabirds: A review and recommendations. *ICES Journal of Marine Science,* 64: 1675-1691.

Braun, B. M. & Hunt, G. L. 1983. Brood reduction in Black-legged Kittiwakes. *Auk,* 100: 469-476.

Burton, R. W. 1968. Breeding biology of the Brown Skua, *Catharacta skua lönnbergi* (Mathews), at Signy Island, South Orkney Islands. *British Antarctic Survey Bulletin,* 15: 9-28.

Ens, B. J., Kersten, M., Brenninkmeijer, A. & Hulscher, J. B. 1992. Territory quality, parental effort and reproductive success of Oystercatchers (*Haematopus ostralegus*). *Journal of Animal Ecology*, 61: 703-715.

Graña-Grilli, M., Libertelli, M. & Montalti, D. 2011. Diet of South Polar Skua chicks in two areas of sympatry with Brown Skua. *Waterbirds,* 34: 495-498.

Graña-Grilli, M. & Montalti, D. 2012. Trophic relationships between Brown and South Polar Skuas at Deception Island, Antarctica. *Polar Biology,* 35: 299-304.

Hill, J. K. & Hamer, K. C. 1994. Do Great Skuas *Catharacta skua* respond to changes in the nutritional needs of their chicks? *Seabird,* 16: 3-7.

Maddox, J. D. & Weatherhead, P. J. 2008. Egg size variation in birds with asynchronous hatching: Is bigger really better? *American Naturalist,* 171: 358-365.

Mitrus, C., Mitrus, J. & Sikora, M. 2010. Changes in nestling diet composition of the Red-breasted Flycatcher *Ficedula parva* in relation to chick age and parental sex. *Animal Biology,* 60: 319-328.

Montalti, D. 2005. *Morfología y biología reproductiva de las especies del género* Catharacta *(Aves, Stercorariidae) de la Antártida*. PhD Dissertation. La Plata: Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata.

Moorer, J. 1986. Dietary variation among nestling starlings. *Condor*, 88: 181-189.

Ploger, B. J. & Mock, D. W. 1986. Role of sibling aggression in food distribution to nestling Cattle Egrets (*Bubulcus ibis*). *Auk,* 103: 768-776.

Procter, D. L. C. 1975. The problem of chick loss in the South Polar Skua *Catharacta maccormicki*. *Ibis,* 117: 452-459.

Pugesek, B. H. 1993. Chick growth in the California Gull: relationships with hatching asynchrony and parental age. *Colonial Waterbirds,* 16: 183-189.

Quinn, G. & Keough, M. 2002. *Experimental design and data analysis for biologists*. Cambridge: Cambridge University Press.

Reinhardt, K. 1997. Nahrung und Fütterung der Küken antarktischer Raubmöwen *Catharacta antarctica lonnbergi* und *C. maccormicki*. *Journal of Ornithology,* 138: 199-213.

Ricklefs, R. E. 1982. Some considerations on sibling competition and avian growth rates. *Auk,* 99: 141-149.

Ritz, M. S., Hahn, S. & Peter, H.-U. 2005. Factors affecting chick growth in the South Polar Skua (*Catharacta maccormicki*): Food supply, weather and hatching date. *Polar Biology,* 29: 53-60.

Ritz, M. S., Millar, C., Miller, G. D., Phillips, R. A., Ryan, P., Sternkopf, V., Liebers-Helbig, D. & Peter, H.-U. 2008. Phylogeography of the southern skua complex-rapid colonization of the Southern Hemisphere during a glacial period and reticulate evolution. *Molecular Phylogenetics and Evolution,* 49: 292-303.

Robinson, J. A. & Hamer, K.C. 2000. Brood size and food provisioning in Common Terns *Sterna hirundo* and Arctic Terns S. *paradisaea:* consequences for chick growth. *Ardea,* 88: 51-60.

Royle, N. J. & Hamer, K. C. 1998. Hatching asynchrony and sibling size hierarchies in gulls: Effects on parental investment decisions, brood reduction and reproductive success. *Journal of Avian Biology,* 29: 266-272.

Seddon, P. J. & van Heezik, Y. 1991. Effects of hatching order, sibling asymmetries, and nest site on survival analysis of Jackass Penguin chicks. *Auk,* 108: 548-455.

Shealer, D. A. 1998. Differences in diet and chick provisioning between adult Roseate and Sandwich Terns in Puerto Rico. *Condor,* 100: 131-140.

Silva, M. P., Favero, M., Casaux, R. & Baroni, A. 1998. The status of breeding birds at Harmony Point, Nelson Island, Antarctica in summer 1995/96. *Marine Ornithology,* 26: 75-78.

Smiseth, P. T. & Amundsen, T. 2002. Senior and junior nestlings in asynchronous Bluethroat broods differ in their effectiveness of begging. *Evolutionary Ecology Research,* 4: 1177-1189.

Smiseth, P. T., Bu, R. J., Eikenæs, A. K. & Amundsen, T. 2003. Food limitation in asynchronous Bluethroat broods: effects on food distribution, nestling begging, and parental provisioning rules. *Behavioural Ecology,* 14: 793-801.

Stenning, M. J. 1996. Hatching asynchrony, brood reduction and other rapidly reproducing hypotheses. *Trends in Ecology and Evolution,* 11: 243-246.

Trivelpiece, W., Butler, R. G. & Volkman, N. J. 1980. Feeding territories of Brown Skuas (*Catharacta lonnbergi*). *Auk,* 97: 669-676.

Wang, Z. & Norman, F. I. 1993. Timing of breeding, breeding success and chick growth in South Polar Skuas (*Catharacta maccormicki*) in the Eastern Lasermann Hills, Princess Elizabeth Land, East Antarctica. *Notornis,* 40: 189-203.

Williams, T. D. 1995. *The penguins: Spheniscidae*. New York: Oxford University Press.

Young, E. 1994. *Skua and penguin: predator and prey*. Cambridge: Cambridge University Press.

Young, E. C. & Millar, C. D. 2003. Siblicidal brood reduction in South Polar Skuas. *New Zealand Journal of Zoology,* 30: 79-93.

Associate Editor: Leandro Bugoni

Revista Brasileira de Ornitologia, 22(3), 270-277
September 2014

Reproductive biology and nest-site selection of the Mato Grosso Antbird *Cercomacra melanaria* in the Brazilian Pantanal

Bianca Bernardon[1, 2, 3], Paula Fernanda Albonette de Nóbrega[1] and João Batista de Pinho[1]

[1] Laboratório de Ornitologia, Núcleo de Estudos Ecológicos do Pantanal, Instituto de Biociências, Universidade Federal de Mato Grosso – UFMT, Avenida Fernando Corrêa, s/nº, Coxipó, CEP 78060-900, Cuiabá, MT, Brazil

[2] Current Address: Grupo de Pesquisa em Ecologia de Vertebrados Terrestres, Instituto de Desenvolvimento Sustentável Mamirauá – IDSM, Estrada do Bexiga, 2584, CEP 69553-225, Tefé, AM, Brazil

[3] Corresponding author: biabernardon@yahoo.com.br

Received on 27 December 2013. Accepted on 26 June 2014.

ABSTRACT: Economic activities, such as extensive cattle ranching, may seriously threaten the types of forest most important to the Mato Grosso Antbird *Cercomacra melanaria*, and information on reproductive biology is essential for defining sound conservation and management strategies for the species. Here, we report on the reproductive biology of this species in the Brazilian Pantanal, focusing on attributes such as incubation and nestling periods, as well as characteristics of parental care. The hypothesis that nest occurrence is associated with canopy opening was also tested. Average nest height was 0.98 m; mean nest construction and egg incubation periods were 12.2 and 14 days, respectively; average nestling period was 9.4 days. Both males and females participated in nest construction, egg incubation, and feeding of nestlings. The canopy was consistently more open away from the nests (18.74%) than at nest sites (10.10%; $P < 0.0001$), indicating that *C. melanaria* selects nest sites with dense vegetation.

KEY-WORDS: Canopy opening, nesting biology, reproductive attributes, Thamnophilidae.

INTRODUCTION

Through study of the reproductive biology of a species, a better understanding of its life history is gained (Bartholomew 1986). Nests characteristics are among the key attributes of the life history of birds, and are strictly tied to their reproductive success (Ricklefs 1969, Mason 1985, Ricketts & Ritchison 2000, Mezquida & Marone 2001).

Reproductive parameters such as the size of eggs and brood, extent of incubation period, and care for nestlings are subject to selection and are therefore important to individual fitness (Ricklefs 2003). However, these parameters are poorly studied and, for most species, remain unknown (Robinson *et al.* 2000, Ricklefs 2003).

Nest site selection occurs early in the breeding season and is made within the pair's territory. In some cases, the male and female choose the nest-building location together (Burger 1985), and this choice is described in terms of general habitat characteristics, vegetation and environmental factors (Clark *et al.* 1983, Jones 2001).

The Mato Grosso Antbird *Cercomacra melanaria* (Passeriformes, Thamnophilidae) inhabits the sub canopy in semi deciduous and gallery forests of the Brazilian Pantanal, as well as the Guaporé Pantanal, and the Bolivian Chaco (Zimmer & Isler 2003). This species relies heavily on two forest types for survival in the region and might become locally threatened because of economic activities such as hydroelectric power plants of the Paraguay-Paraná waterway and extensive cattle ranching (Pinho *et al.* 2006, Pinho & Marini 2012). Thus, information on reproductive biology is essential to set safe strategies for the conservation and management of the species. Pinho *et al.* (2006) presented the first description of the nest and eggs of *Cercomacra melanaria,* as well as some aspects of natural history and reproductive biology; nevertheless, important information on the species' breeding biology remains unknown.

The aim of this study was to understand the reproductive attributes of the Mato Grosso Antbird. As such, incubation period and the amount of time nestlings remained in the nest were determined. Furthermore, parental care and morphological characteristics of nests and eggs were described, and the hypothesis that nest occurrence is associated with canopy opening was tested.

METHODS

Study area

This study was conducted from August to December 2005, July to August 2006, and October to December 2006, at the Retiro Novo Farm (16º 22' 0.4''S, 56° 17' 56.6'' W, 130 m alt.) in the Pirizal region, municipality of Poconé, state of Mato Grosso (MT), Brazil.

The predominant vegetation in the study area is associated with forest habitats, such as *Cambarazal*, *Landi*, *Carvoeiro* and *Cordilheira* forests. Our study was conducted in *Cambarazal*, a seasonally flooded semi-evergreen forest dominated by *Vochysia divergens* Pohl. Nascimento & Nunes da Cunha (1989), Nunes da Cunha & Junk (2001) and Arieira & Nunes da Cunha (2006) have presented details on vegetation structure and composition in the Poconé Pantanal. The climate in this region is characterized by two seasons: dry from April to September, and wet from October to March (Nunes da Cunha & Junk 2004). The average annual temperature is 25.8º C, with October being the warmest month and July the coldest. Average rainfall is 1,250 mm/year, of which 80% occurs between November and March (Allem & Valls 1987).

Field methods

Nest search and monitoring

With the intention of locating nests, understory vegetation was thoroughly inspected throughout 29 ha of *Cambarazal* forest from September to December 2005, in August 2006, and from October to December 2006. Spotting and following birds carrying nest material or food was also a way of locating nests. While searching for and monitoring nests, precautions were taken to minimize impact to the surroundings, avoid damage to vegetation, and minimize time at the site. To avoid attracting predators, the position of each nest was marked with a colored ribbon at least three meters away from it.

Nests were monitored through visits at intervals of three to four days, at which time their status was recorded (eggs, nestlings, or predated). However, a subset of nests was monitored more regularly during critical periods, such as egg laying, hatching, and nestling (every day or every other day) in order to improve the confidence level of our estimates. When the status of a nest (*e.g.* egg laying, hatching, predated) changed between two consecutive visits, it was assumed that the change occurred mid-period. Our methodology was adapted from Martin & Geupel (1993) and Robinson *et al.* (2000).

Morphometric variables of each nest were measured (internal and external diameter of the opening, internal depth, and external length), as well as its height above the ground. These measurements were taken after the nests became inactive in order to avoid interference with nest activities; nests were considered active while still with eggs or nestlings, and inactive after the nestlings had left or when the nest had been predated.

The following information on each egg was recorded: measurement of length and width, mass, incubation period, and amount of time nestlings remained in the nest. Egg period was defined as the interval between oviposition of the first and last egg (Mayfield 1975). Incubation period was defined as the interval between oviposition of the last egg until hatching of the first nestling (Mayfield 1975). The last period, occurring from hatching of the first egg until the last nestling fledged, was considered the nestling period (Mayfield 1975). When chicks were about seven days old they received a metal band provided by CEMAVE/ICMBio (Brazilian banding agency; banding permit number 1281/1), and two plastic color bands for subsequent studies on territoriality.

Canopy openness

Hemispherical photographs provide estimates of canopy openness and leaf area index (Frazer *et al.* 1997) that are used in ecological and forestry studies (Frazer *et al.* 2000, 2001, Beaudet & Messier 2002, Melloh *et al.* 2003, Rubio & Pinho 2008). In order to investigate whether nest occurrence was associated with canopy density, two photographs were taken: one from just above the nest and another five meters to the north of it, taken at the same height as the nest. The second photograph (control site) was captured as a way of sampling a site not selected by the species for nesting. The Pantanal flooded forests present mosaics of understory and open areas dominated by grasslands (Nascimento & Nunes da Cunha 1989, Nunes da Cunha & Junk 2001, Arieira & Nunes da Cunha 2006). Due to these characteristics of the environment and the characteristics of the nest site, which are always well hidden between dense tangles of vegetation (Pinho *et al.* 2006), we considered the selection of five meters from the nest a sufficient distance to serve as the control site.

A hemispheric photograph was captured using a Nikkor 8 mm fisheye lens, which provided a 180º angle view of the canopy opening similar to that of the sky hemisphere (Frazer *et al.* 1997, Melloh *et al.* 2003). The lens was attached to a Nikon Coolpix E4300 digital camera, 4.1 megapixels, and the top of the camera was oriented northward with the aid of a compass (Frazer *et al.* 2001). No flash was used while taking photographs to avoid changes in image brightness. All images were taken in December 2006 at dawn or dusk, or on days when the cloud cover was uniform, to avoid reflections and sun rays passing through the canopy, as these could be confused with portions of the sky. Photographs were taken when the wind was not blowing in order to avoid blurred images of moving vegetation (Frazer *et al.* 2001).

Data analysis

Hemispheric photographs were analyzed in the program Gap Light Analyzer 2.0 (GLA) (Frazer *et al.* 1999), which determined the percentage of open sky seen from underneath the vegetation, each analyzed image having 128 pixels. The opening in the canopy, over the nest and away from it, was subjected to a logistic regression to examine whether the probability of finding a nest was associated with opening in the canopy. Statistical analyses were performed using the Systat® 10 software package (Wilkinson 2000) following Zar (1984). The significance level of 5% was adopted.

RESULTS

Nest searching effort in 2005 was 153 h (September to December) and 157 h in 2006 (August - December), resulting in a total sampling effort of 310 hours. Fifty-one nests of the Mato Grosso Antbird were found, of which 47 were monitored until they became inactive. Among those 47 nests, seven (14.89%) were abandoned and one was damaged during construction; the remaining 39 nests being active, 12 (30.78%) of them successful. Regarding the 51 nests, 41.18% were located during the building phase, 49.02% during the incubation period, and 9.8% inhabited by fledglings.

Adult behavior near the nests facilitated locating them, and males capturing insects and giving them to females was a common observation (n = 8). Other behaviors that were often observed were: adults growing very agitated while carrying nest-building material, releasing items from their beaks when surprised by an observer; pairs in active nests displaying persistent vocalization and aggressive behavior when approached by an observer; during the incubation period, adults approaching nests quietly, being more tolerant of the presence of an observer; adult birds surprised by an observer while delivering food to their chicks, becoming very agitated and vocalizing, but retaining the food in their beaks; adults not feeding nestlings in the presence of an observer.

The first nest in construction was found on September 30, 2005, and the highest number of consecutive active nests (n = 10) was recorded in the second half of October (Figure 1 a). The first egg was observed on October 8th, and the first eggs hatched on October 25th.

In 2006, the first active nest was found on August 5th and the first eggs hatched on October 14th. The highest number of consecutive active nests (n = 11) was recorded in October, and the last nest was found on November 27th, which remained active until December 10th (Figure 1 b).

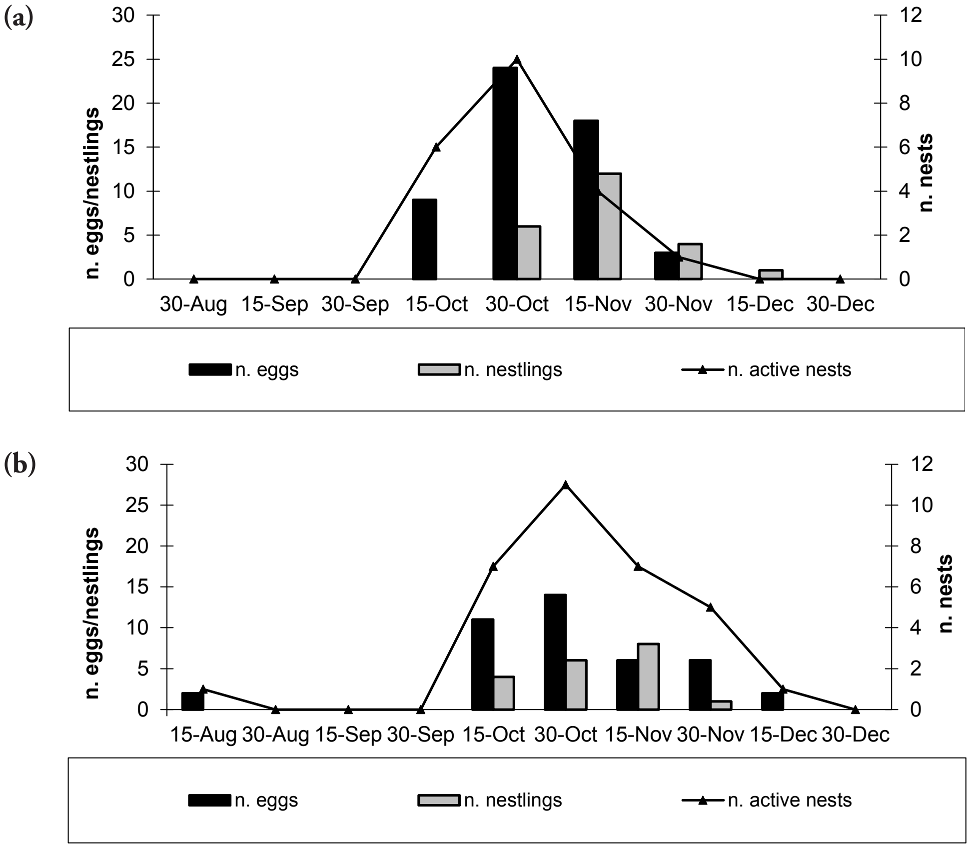

FIGURE 1. Number of active nests and number of eggs and offspring of the Mato Grosso Antbird recorded in the Pantanal, Brazil, during (a) 2005 and (b) 2006 breeding seasons.

Nests of Mato Grosso Antbirds are *low cup/lateral*, according to the classification of Simon & Pacheco (2005), constructed with fine fibers derived mainly from aerial roots of *Cissus spinosa* Camb. and *C. sicyoides* L., as well as dried leaves mostly from *Licania parvifolia* Huber (Chrysobalanaceae). These items are placed on the outside along with some grass (not identified) and other unidentified leaves, and all materials are secured with spider webs (Figure 2).

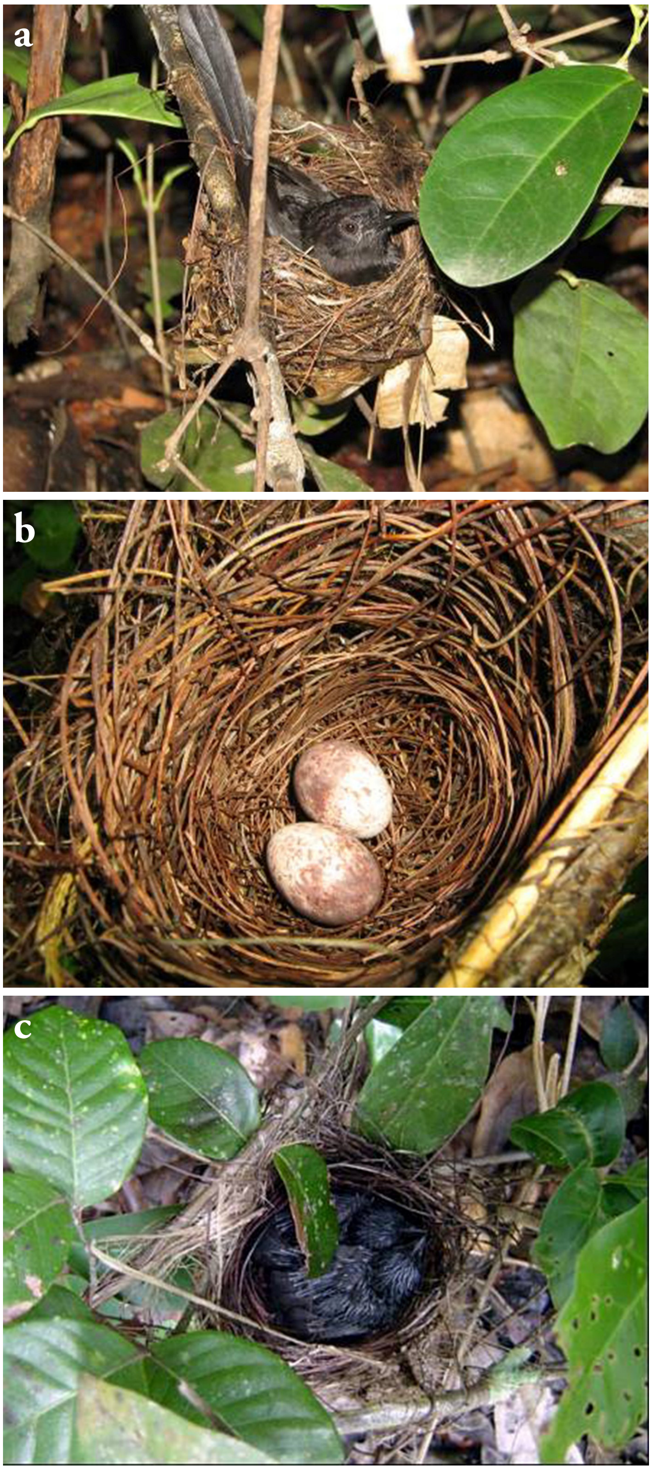

FIGURE 2. (a) Lateral view of a nest of the Mato Grosso Antbird, with a male incubating the eggs; (b) detail of the interior of the nest with eggs; (c) overview of the nest with nestlings.

Plant species used as support for the construction of the nests were *Licania parvifolia*, both young shrubs (n = 13) and branches of mature trees (n = 11), *Bactris glaucescens* Drude ("tucum") (n = 1), *Vochysia divergens* Pohl ("cambará") (n = 2), and several vines such as *Rhynchospora* sp. (razor grass) (n = 5). Construction also occurs inside bushes or trees with entangled vines (n = 6), on *Cissus spinosa* and *C. sicyoides* (n = 4), and on other herbaceous plants (n = 9).

The mean nest construction time observed was 12.20 ± 2.39 days (n = 5), and the range was 10-16 days. Males and females participated in nest building, and nests were not repaired after eggs were laid.

Nest height was 0.98 m ± 0.89 (n = 51), ranging between 0.23-4.50 m. External height of nests was 76 mm ± 5 (n = 18), ranging between 63-84 mm; internal height was 62 mm ± 8 (n = 18), ranging between 50-75 mm. External diameter was 86 mm ± 6 (n = 18), ranging from 74 to 98 mm; internal diameter was 59 mm ± 6 (n = 18), ranging between 44 to 70 mm.

Mean values of eggs were as follows: mass 2.5 g ± 0.2, length 20.9 mm ± 0.6, and width 15.1 mm ± 0.4 (n = 30). Maximum number of eggs per nest was two (n = 32) and in two cases only one egg was found, the average number being 1.9 (n = 34).

Average incubation period was 14 ± 0.71 days (n = 4), ranging from 13 to 14.5 days. Assuming that the period of egg-laying by this species is two days (Pinho *et al.* 2006), the egg period in this study was 16 days. Among 27 visits to the nest in which one parent was incubating, a female was observed 10 times and a male 17 times.

The nestling period ranged from eight to eleven days, averaging 9.4 ± 1.1 days (n = 10). Both males and females fed nestlings and uttered alarm calls at the approach of potential predators.

Two adult females were preyed upon in the nest, evidenced by the presence of feathers and bones on the ground near the destroyed nest. On November 3, 2005 one male whose female had been preyed upon paired with another female on the same day.

Three couples were observed feeding their fledglings outside the nest. On one occasion we observed a male being followed by a fledgling, while the mother was followed by and fed the other. At this stage, however, fledglings do not have sexual dimorphism and their plumage resembles that of the females.

Predated nests were not re-used, even by other bird species. Multiple attempts at reproducing were observed, and the same pair was witnessed trying to build a nest three times. After reproductive success, however, pairs no longer mated (n = 12).

The canopy was significantly more open away from the nests than on nest sites ($P < 0.0001$; Rho = 0323, Gal = 1) (Figure 3), suggesting that the species selected nest sites with dense vegetation. The mean (n = 26) percentage of open sky seen from underneath the vegetation among selected sites (nest) was 10.10%, SD = 2.5, and for control sites (5 m from the nest) 18.74%, SD = 10.5 (Table 1).

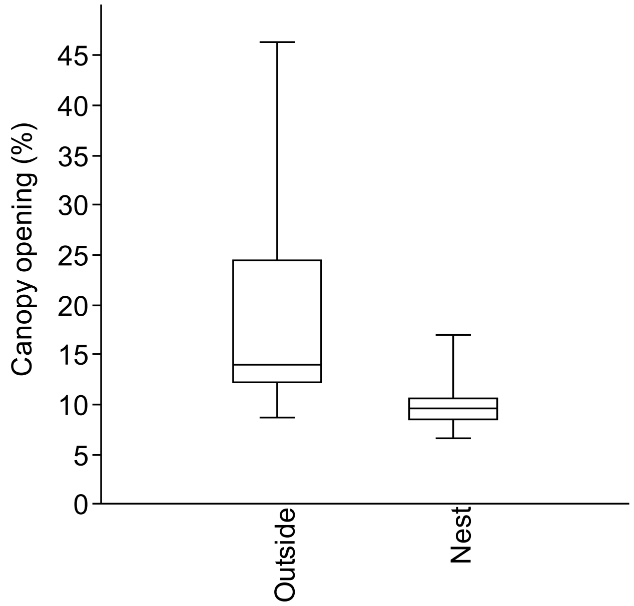

FIGURE 3. Percent of canopy opening (measured as the percentage of open sky seen from underneath the vegetation) at and 5 m away from nests of the Mato Grosso Antbird in the Pantanal, Brazil.

TABLE 1. Opening of the canopy (measured as the percentage of open sky seen from underneath the vegetation) above the nest sites of the Mato Grosso Antbird and away from nests (n = 26) in the Brazilian Pantanal.

	At nest sites	**Away from nest sites**
Min. (%)	6.56	8.64
Max. (%)	16.92	46.25
Mean ± SD (%)	10.10 ± 2.53	18.74 ± 10.50

DISCUSSION

Active nests of *C. melanaria* reach their peak in October, coinciding with the beginning of the wet season at Poconé Pantanal. In 2005 and 2006, the first active nest was found on October 8th and August 5th, respectively, the difference in the nesting period possibly being related to the rainy season and food availability in the Pantanal (Poulin *et al.* 1992, Rubio & Pinho 2008). In 2005 there was a period of marked drought without rain in July (0 mm), followed by a dry period in August (1 mm), and rain beginning in September (43.3 mm) (INMET 2008). In 2006, a complete drought did not occur, with rain in July (17.1 mm), August (24.3 mm) and September (112 mm) (INMET 2008). However, even with this difference in the onset of nest construction, both breeding seasons followed the pattern of reproduction common to most Neotropical passerines at this time of year (Aguilar *et al.* 1999, 2000, Aguilar 2001, Hau 2001, Duca & Marini 2004, Lopes & Marini 2005, Pinho 2005, Pinho *et al.* 2006, Marini *et al.* 2012). Aside from precipitation, food abundance also has been shown to affect breeding cycles in other tropical regions (Poulin *et al.* 1992, Stutchbury & Morton 2001, Hau *et al.* 2008), as insects migrate to more favorable environments among seasons (Adis *et al.* 2001, Battirola *et al.* 2007). Rainfall is probably a stronger determinant of food abundance in many tropical areas (Ahumada 2001), and food abundance for insectivorous antbirds increases dramatically during early rainy season, marking the beginning of their breeding periods (Willis 1972b).

The breeding period of the Mato Grosso Antbird, (approximately 90 days), is shorter than the entire wet season (150 days), with the first half of December experiencing a remarkable decrease in nest activity. During this period with abundant rainfall and flooding of primary areas, environmental conditions mainly in the sub canopy grow adverse for bird reproduction as nests are low; during the wet season, floodwater levels in Cambarazal forests can reach 1.4 m (Arieira & Nunes da Cunha 2006). The minimum and maximum nest heights found in this study for *C. melanaria* were 0.23 m and 4.5 m respectively, whereas those found in 2001 and 2002 for the same species varied from 0.3 to 2.0 m (Pinho *et al.* 2006), with average heights being similar in both studies (0.98 m in the present study versus 0.83 m in Pinho *et al.* 2006).

As previously stated, individuals of the Mato Grosso Antbird, as well as those of the Band-tailed Antbird *Hypocnemoides maculicauda*, use fibers of *Cissus spinosa* Camb. to build their nests (Pinho *et al.* 2006, 2009). Plant species (*Licania parvifolia*, *Bactris glaucescens* Drude, *Vochysia divergens* Pohl, *Rhynchospora* sp.) used by the Mato Grosso Antbirds to build nests and as nest support are abundant in the Poconé Pantanal, as demonstrated by floristic studies carried out at a local *Cambarazal* (Nascimento & Nunes da Cunha 1989, Arieira & Nunes da Cunha 2006). Many factors may be involved in the choice of plants used as support, such as density of shrubs in the nest area, height of shrub, and degree to which a plant can conceal the nest (Martin 1995, Howlett & Stutchbury 1996). As observed at the study area, nest sites had a higher concentration of shrubs, providing camouflage for the nests.

The *low cup/lateral* nests of Mato Grosso Antbirds are consistent with nests of other Thamnophilidae species (Johnson 1953, Greeney & Gelis 2007, Lebbin *et al.* 2007) and can be deep or shallow. Descriptions including dimensions are not common (Lebbin *et al.* 2007, Crozariol 2011), but are needed to ascertain whether there is any constant or significant variation in the construction of these nests (Zimmer & Isler 2003). Pinho *et al.* (2006) obtained measurements of only one nest of *C. melanaria* (external height = 92 mm, diameter = 65 mm, depth = 74 mm), which differed from those in our study (n = 18) where the external height ranged between 63-84 mm (mean = 76 mm ± 5); the external diameter from 74 to 98 mm (mean = 86 mm ± 6), and the depth between 44 to 70 mm (mean = 59 mm ± 6). According to the classification of Simon & Pacheco (2005), the total height of *a low cup* nest must be less than or equal to its external diameter. Thus, the results found by Pinho *et al.* (2006), based on the measurements of just one nest, fit the *high cup/lateral* classification better than the *low cup/lateral* one reported herein. From a total of 18 nests measured in our study, two nests were found with total heights slightly greater than their diameters, being 78 x 74 mm and 84 x 81 mm, respectively. Regarding these exceptions, it may be concluded that most nests are *low/cup lateral*, yet a few can be *high cup/lateral*.

The time spent on nest building varies greatly among species and even among couples of the same species (Zimmer & Isler 2003). The Mato Grosso Antbird presents a long nest-building period (10 – 16 days) compared to other species of the same family. For example, a nesting pair of the Plain Antvireo *Dysithamnus mentalis* (Thamnophilidae) was observed building a nest in less than two days (Skutch 1996). Nest building time for *Thamnophilus* species is five to six days, and more than eight days for the Checker-throated Antwren *Epinecrophylla fulviventris*. Usually, there is a pause of about two days between nest completion and the first egg laid (Zimmer & Isler 2003).

Throughout the breeding season, we observed males offering food items to females (n = 8), demonstrating an initial investment that contributes greatly to the formation of eggs (Greenberg & Gradwhol 1983). In Thamnophilidae, it is common, if not universal, for a male to nurture the female (Skutch 1996); the duration and extent of such behavior varies considerably among species and among couples of the same species (Zimmer & Isler 2003).

On average, in the present study egg incubation in Mato Grosso antbirds lasted 14 days, and the nestling phase 9.4 days. In a study conducted in 2001 and 2002, incubation and nestling periods were estimated to last 13.5 and 10.9 days, respectively (Pinho *et al.* 2006). In the Thamnophilidae family, duration of nestling period is more variable than the duration of incubation period, which is 14-16 days (Zimmer & Isler 2003). Nestling period was estimated at eight to nine days in the White-flanked Antwren *Myrmotherula axillaris*, Dot-winged Antwren *Microrhopias quixensis*, and Rusty-backed Antwren *Formicivora rufa* (Willis & Oniki 1988). Robinson *et al.* (2000) reported 16.9 days of incubation and 9.8 days of nestling for the Dusky Antbird *Cercomacra tyrannina*; in another study on the same species, a nestling period of 11 days was recorded (Skutch 1945). In Thamnophilidae nestling periods are shorter than incubation periods (Skutch 1945, Zimmer & Isler 2003). Dusky antbirds have nests in the shape of a deep pocket, which may allow a longer incubation period with less risk of predation (Zimmer & Isler 2003). It is noteworthy that nest predation rates during incubation and nestling periods are lower in closed nests than in open nests (Mason 1985) such as the *low cup/lateral* nest of the Mato Grosso Antbird.

The predation of two females in their nests possibly occurred during the night, as evidence of both events was found in early morning, and traces of predation appeared to be recent. No records of predation on adult males were found. In this study, no nocturnal visits to nests were made, yet it is known that only females of Mato Grosso antbirds incubate at night (Pinho *et al.* 2006). A similar result was found for several species of *Cercomacra* and for the Thamnophilidae in general (Skutch 1969, 1996, Kratter 1998, Morton & Stutchbury 2000, Zimmer & Isler 2003), suggesting that males participate in egg incubation especially during the day. This is consistent with information on other species of the same family, in which males replace females in early morning and incubate for prolonged periods (Skutch 1945).

Mato Grosso antbirds lay two eggs, the usual number for the *Cercomacra* genus and Thamnophilidae in general (Skutch 1969, Wetmore 1972, Robinson *et al.* 2000, Zimmer & Isler 2003, Pinho *et al.* 2006). In this family, nests with one egg are regarded as rare (Skutch 1996, Robinson *et al.* 2000, Zimmer & Isler 2003).

With respect to a fledgling's attachment to a particular parent, according to Willis (1972a), when a nestling leaves a nest it is called by one parent, resulting in the young one staying close to that parent, while the other parent assumes responsibility for the nestling remaining in the nest. This behavior probably reduces the risk of predation for both nestlings. It is unclear whether the division in offspring care after leaving the nest is a general rule for all Thamnophilidae species (Zimmer & Isler 2003).

Data on the time required for a *C. melanaria* chick to reach adulthood and reproduce has been obtained in this study for the first time. A nestling banded in 2005 was found in 2006 at the age of about thirteen months as a paired female. For most Thamnophilidae, although the exact age at first reproduction is unknown, it occurs approximately at one year of life. The White-cheeked Antbird *Gymnopithys leucaspis* forms pairs at four to six months of life, and a female of this species already mates and produces eggs by only 6.5 months (Zimmer & Isler 2003).

Information documenting the number of breeding attempts made per pair, per year, is available for only a few species (Robinson *et al*. 2000). However, in this study we did not observe any pairs making further attempts at breeding after they had achieved reproductive success; this fact had been recorded for Band-tailed antbirds in the same study area (Evangelista 2008).

During this study, the canopy was observed to be consistently more open away from nests, suggesting that the species selected nest sites with dense vegetation. In confirmation, nesting sites of this species have been described as being well hidden among dense vegetation (Pinho *et al*. 2006). Quality of habitat in which nests are built is an important factor in reproductive success, fecundity, and survivorship (Martin 1995). Some sites offer safer habitats for nest building and provide defense against predators, or offer better protection against climatic variations (Wittenberger 1980).

This study was the first to describe several characteristics of the reproductive biology of the Mato Grosso Antbird *Cercomacra melanaria*, such as nest site selection, species of plants used to build nests, and parental behavior around the nest while interacting with nestlings and fledglings. Such basic natural history information is essential to support future studies on population dynamics and ecology of the range restricted *C. melanaria* in the Brazilian Pantanal.

ACKNOWLEDGMENTS

We thank Núcleo de Estudos Ecológicos do Pantanal (NEPA), Centro de Pesquisa do Pantanal (CPP), Instituto de Áreas Úmidas (INAU), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Ministério de Ciência, Tecnologia e Inovação (MCTI) and Programa de Pós Graduação em Ecologia e Conservação da Biodiversidade – UFMT for financial assistance. The authors were supported by the following grants: B. Bernardon by Fundação de Amparo à Pesquisa do Estado de Mato Grosso (FAPEMAT) during her Masters degree, and also by CNPq while writing this article, P.F.A. Nóbrega by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES). We thank T. C. Rubio, M. E. Gaebler, T. M. Aguilar, C. Strüsmann, M. A. Carvalho, L. E. Lopes, M. Aragona , J.M. Penha and D. Plumpton, for constructive criticism to earlier versions of this manuscript. We also thank the anonymous reviewers and Instituto de Desenvolvimento Sustentável Mamirauá (IDSM) for support during manuscript writing.

REFERENCES

Adis, J., Marques, M. I. & Wantzen, K. M. 2001. First observations on the survival strategies of terricolous arthropods in the northern Pantanal Wetland of Brazil. *Andrias*, 15: 127-128.

Aguilar, T. M., Leite, L. O. & Marini, M. Â. 1999. Biologia de nidificação de *Lathrotricus euleri* (Cabanis 1968) (Tyrannidae) em fragmento de mata em Minas Gerais. *Ararajuba*, 7: 125-133.

Aguilar, T. M., Maldonado-Coelho, M. & Marini, M. Â. 2000. Nesting biology of the Gray-hooded Flycatcher (*Mionectes rufiventris*). *Ornitologia Neotropical*, 11: 223-230.

Aguilar, T. M. 2001. Biologia reprodutiva e seleção de habitat por *Leptopogon amaurocephalus* (Aves, Tyrannidae), e fragmentos de Mata Atlântica em Minas Gerais. Master thesis. Belo Horizonte: Universidade Federal de Minas Gerais.

Ahumada, J. A. 2001. Comparison of the reproductive biology of two Neotropical Wrens in an unpredictable environment in Northeastern Colombia. *Auk*, 118: 191-210.

Allem, A. C. & Valls, J. F. M. 1987. Recursos forrageiros nativos do Pantanal matogrossense. 1st ed. Brasília: EMBRAPA.

Arieira, J. & Nunes da Cunha, C. 2006. Fitossociologia de uma floresta inundável monodominante de *Vochysia divergens* Pohl (Vochysiaceae), no Pantanal Norte, MT, Brasil. *Acta Botanica Brasileira*, 20: 569-580.

Battirola, L. D., Adis, J., Marques, M. I. & Silva, F. H. O. 2007. Comunidade de artrópodes associada à copa de *Attalea phalerata* Mart. (Arecaceae), durante o período de cheia no Pantanal de Poconé, Mato Grosso, Brasil. *Neotroical Entomology*, 36: 640-651.

Bartholomew, G. A. 1986. The role of natural history in contemporary Biology. Bioscience 36: 324-329.

Beaudet, M., & Messier, C. 2002. Variation in canopy openness and light transmission following selection cutting in northern hardwood stands: an assessment based on hemispherical photographs. *Agricultural and Forest Meteorology*, 110: 217-228.

Burger, J. 1985. Habitat selection in temperate marsh-nesting birds, p. 253-281. In: CODY, M. L. (ed.) Habitat selection in birds. Toronto, Canada: Academic Press.

Clark, L., Ricklefs, R. E. & Schreiber, R. W. 1983. Nest-site selection by the Red-tailed Tropicbird. *Auk*, 100: 953-959.

Crozariol, M. A. 2011. Territorialidade e Reprodução do Chororó do Araguaia *Cercomacra ferdinandi* Snethlage, 1928 (Passeriformes:Thamnophilidae) em uma área ecotonal no estado de Tocantins. Master thesis. Palmas: Universidade Federal do Tocantins.

Duca, C. & Marini, M. Â. 2004. Aspectos da nidificação de *Cacicus haemorrhous* (Passeriformes, Icterinae) no sudeste do Brasil. *Ararajuba*, 12: 23-30.

Evangelista, M. M. 2008. Biologia Reprodutiva e Territorialidade de *Hypocnemoides maculicauda* (Pelzeln, 1868) (Passeriforme, Thamnophilidae) na região de Pirizal - Pantanal de Poconé - MT. Master thesis. Cuiabá: Universidade Federal de Mato Grosso.

Frazer, G. W., Trofymow, J. A. & Lertzman, K. P. 1997. A method for estimating canopy openness, effective leaf area index, and photosynthetically active photon flux density using hemispherical photography and computerized image analysis techniques. Pacific Forestry Centre, v. 373. Victoria, B.C.

Frazer, G. W., Canham, C. D., & Lertzman, K. P. 1999. Gap light analyzer (GLA), Version 2.0: Imaging software to extract canopy structure and gap light transmission indices from true-color fisheye photographs, users manual and program documentation New York. Copyright © 1999: Simon Frazer University, Burnaby, British Columbia, and the Institute of Ecosystem Studies, Millbrook, New York. http://www.rem.sfu.ca/forestry/downloads/gaplightanalyzer.htm (access on 19 November 2006).

Frazer, G., Trofymow, J. A. & Lertzman, K. P. 2000. Canopy openness and leaf area in chronosequences of coastal temperate rainforests. *Canadian Journal of Forest Research*, 30: 239-256.

Frazer, G. W., Fournier, R. A., Trofymow, J. A. & Hall, R. J. 2001. A comparison of digital and film fisheye photography for analysis of forest canopy structure and gap light transmission. *Agricultural and Forest Meteorology*, 109: 249-263.

Greenberg, R. & Gradwohl, J. 1983. Sexual roles in the Dot-winged Antwren (*Microrhopias quixensis*), a Tropical Forest Passerine. *Auk*, 100: 920-925.

Greeney, H. F. & Gelis, R. A. 2007. Breeding records from the north-east Andean foothills of Ecuador. *Bulletin of the British Ornithologists Club*, 127: 236-241.

Hau, M. 2001. Timing of Breeding in Variable Environments: Tropical birds as model systems. *Hormones and Behavior*, 40: 281-290.

Hau, M., Perfito, N. & Moore, I. T. 2008. Timing of breeding in tropical birds: mechanisms and evolutionary implications. *Ornitologia Neotropical*, 19: 39-59.

Howlett, J. S. & Stutchbury, B. J. 1996. Nest concealment and predation in Hooded Warblers: Experimental removal of nest cover. *Auk*, 113: 1-9.

INMET. Instituto Nacional de Meteorologia. 2008. Parâmetros Meteorológicos do 9º Distrito de Meteorologia. Cuiabá.

Jones, J. 2001. Habitat Selection Studies in Avian Ecology: A Critical Review. *Auk*, 118: 557-562.

Johnson, R. A. 1953. Breeding notes on two Panamanian Antbirds. *Auk,* 70: 494-496.

Kratter, A. W. 1998. The nest of two bamboo specialists: *Celeus spectabilis* and *Cercomacra manu*. *Journal of Field Ornithology*, 69: 37-44.

Lebbin, D. L., Hosner, P. A., Andersen, M. J., Valdez, U. & Tori, W. P. 2007. First description of nest and eggs of the White-lined Antbird (*Percnostola lophotes*), and breeding observations of poorly known birds inhabiting *Guadua* bamboo in southeastern Peru. *Boletin SAO*, 17: 119-132.

Lopes, L. E. & Marini, M. Â. 2005. Biologia reprodutiva de *Suiriri affinis* e *S. islerorum* (Aves: Tyrannidae) no Cerrado do Brasil Central. *Papéis Avulsos de Zoologia*, 45: 127-141.

Marini, M. Â., Borges, F. J. A., Lopes, L. E., Sousa, N. O. M., Gressler, D. T., Santos, L. R., Paiva, L. V., Duca, C. G., Manica, L. T., Rodrigues, S. S., França, L. F., Costa, P. M., França, L. C., Heming, N. M., Silveira, M. B., Pereira, Z. P., Lobo, Y. P., Medeiros, R. C. S. & Roper, J. 2012. Breeding biology of birds in the cerrado of central Brazil. *Ornitologia Neotropical*, 23: 385-405.

Martin, T. E & Geupel, R. G. 1993. Nest-monitoring plots: methods for locating nests and monitoring success. *Journal of Field Ornithology*, 64: 507-519.

Martin, T. E. 1995. Avian life history evolution in relation to nest sites, nest predation and Food. *Ecological Monographs,* 65: 101-127.

Mason, P. 1985. The nesting biology of some passerines of Buenos Aires, Argentina. *Ornithological Monographs*, 36: 96-104.

Mayfield, H. 1975. Suggestions for calculating nest success. *Wilson Bulletin*, 87: 456-466.

Melloh, R., Ballard, J., Hardy, J., Woodcock, C., Liu, J., Smith, J., Koenig, G. & Davis, R. 2003. Spatial Distribution of Canopy Gaps in Lodgepole Pine Forest. In: *60th Eastern Snow Conference*, Sherbrooke, Québec, Canada, p. 11-123.

Mezquida, E. T. & Marone, L. 2001. Factors affecting nesting success of a bird assembly in the central Monte Desert, Argentina. *Journal of Avian Biology*, 32: 287-296.

Morton, E. S. & Stutchbury, B. J. M. 2000. Demography and reproductive success in the Dusky Antbird, a sedentary tropical passerine. *Journal of Field Ornithology*, 71: 493-500.

Nascimento, M. T. & Nunes da Cunha, C. 1989. Estrutura e composição florística de um Cambarazal no Pantanal de Poconé-MT. *Acta Botânica Brasilicca*, 3: 3-23.

Nunes da Cunha, C. & Junk, W. J. 2001. Distribution of wood plant communities along the flood gradient in the Pantanal of Poconé, Mato Grosso, Brazil. *International Journal of Ecology and Environmental Science*, 27: 63-70.

Nunes da Cunha, C. & Junk, W. J. 2004. Year-to-year changes in water level drive the invasion of *Vochysia divergens* in Pantanal grasslands. *Applied Vegetation Science*, 7: 103-110.

Pinho, J. B. 2005. Riqueza de espécies, padrões de migração e biologia reprodutiva de aves em quatro ambientes florestais do Pantanal de Poconé, MT. Ph.D dissertation. Belo Horizonte: Universidade Federal de Minas Gerais.

Pinho, J. B., Lopes, L. E., Morais, D. H. & Fernandes. A. M. 2006. Life history of the Mato Grosso Antbird *Cercomacra melanaria* in the Brazilian Pantanal. *Ibis*, 148: 321-329.

Pinho, J. B., Lopes, L. E., Maldonado-Coelho, M., Rubio, T. C. & Bernardon, B. 2009. Habitat associations and nests of Band-Tailed Antbirds (*Hypocnemoides maculicauda*) in the Brazilian Pantanal. *Wilson Journal of Ornithology*, 121: 153-159.

Pinho, J. B. & Marini, M. A. 2012. Using birds to set conservation priorities for Pantanal wetland forests, Brazil. *Bird Conservation International*, 22: 155-169.

Poulin, B., Lefebvre, G. & MCeil, R. 1992. Tropical avian phenology in relation to abundance and exploitation of food resources. *Ecology*, 73: 2295-2309.

Ricketts, M. S. & Ritchison, G. 2000. Nesting success of Yellow-breasted Chats: effects of nest site and territory vegetation structure. *Wilson Bulletin*, 112: 510-516.

Ricklefs, R. E. 1969. An analysis of nesting mortality in birds. *Smithsonian Contrib. Zool.* 9: 1-48.

Ricklefs, R. E. 2003. *A Economia da Natureza*. 5ª ed. Rio de Janeiro: Guanabara Koogan.

Robinson, W. D., Robinson, T. R., Robinson, S. K. & Brawn, J. D. 2000. Nesting success of understory forest birds in central Panama. *Journal of Avian Biology*, 31: 151-164.

Rubio, T. C. & Pinho, J. B. 2008. Biologia reprodutiva de *Synallaxis albilora* (aves: Furnariidae) no Pantanal de Poconé, Mato Grosso. *Papéis Avulsos de Zoologia*, 48: 181-197.

Simon, J. E., & Pacheco, S. 2005. On the standardization of nest descriptions of neotropical birds. *Revista Brasileira de Ornitologia*, 13: 143-154.

Skutch, A. F. 1945. Incubation and nestling periods of Central American birds. *Auk*, 6: 8-37.

Skutch, A. F. 1969. *Life histories of Central American birds III - Families Cotingidae, Pipridae, Formicariidae, Furnariidae, Dendrocolaptidae, and Picidae*. Berkeley, USA: Cooper Ornithological Society.

Skutch, A. F. 1996. *Antbirds and Ovenbirds: their lives and homes*. USA: University of Texas Press.

Stutchbury, B. J. M. & Morton, E. S. 2001. *Behavioral ecology of tropical birds*. San Diego, USA: Academic Press.

Wetmore, A. 1972. The Birds of the Republic of Panama - Part 3. Passeriformes: Dendrocolaptidae (Woodcreepers) to Oxyruncidae (Sharpbills). *Smithson Miscellaneous Collections*, 150: 1-631.

Wilkinson, L. 2000. Systat 10: Statistics I. Spss Inc.” Chicago, Illinois.

Willis, E. O. 1972a. Breeding of the With-plumed Antbird (*Pithys albifrons*). *Auk*, 89: 192-193.

Willis, E. O. 1972b. The behaviour of Spotted Antbirds. *Ornithological Monographs*. 10: 1-157.

Willis, E. O. & Oniki, Y. 1988. Nesting of the Rusty-backed Antwren, *Formicivora rufa* (Wied, 1831) (Aves, Foemicariidae). *Brazilian Journal of Biology*, 48: 635-637.

Wittenberger, J. F. 1980. Vegetation structure, food supply, and polygyny in bobolinks (*Dolichonyx oryzivorus*). *Ecology*, 61: 140-150.

Zar, J. H. 1984. *Biostatistical Analysis*. 2nd ed. EUA: Prentice-Hall International, Inc., Englewood Cliffs.

Zimmer, K. J. & Isler, M. L. 2003. Family Thamnophilidae (Typical antbirds), p. 448-681. In: Del Hoyo, J., Elliot, A. & Christie, D. A. (eds.). Handbook of the birds of the world: Broadbills to Tapaculos, v. 8. Spain, Barcelona: Lynx Edicions.

Associate Editor: Carla Fontana

Revista Brasileira de Ornitologia, 22(3), 278-280
September 2014

SHORT-COMMUNICATION

New Record of the Rufous–Vented Ground–Cuckoo (*Neomorphus geoffroyi dulcis*) in the Atlantic Forest, Brazil

Fagner Daniel Teixeira[1], André Aroeira Pacheco[1] and Fernando Cesar Cascelli de Azevedo[2,3]

[1] Universidade Federal de Minas Gerais – UFMG, Programa de Pós-Graduação em Ecologia, Conservação e Manejo da Vida Silvestre, Instituto de Ciências Biológicas, Avenida Presidente Antônio Carlos, 6627, Pampulha, CEP 31270-910, Belo Horizonte, MG, Brazil.
[2] Universidade Federal de São João Del Rei – UFSJ, Departamento de Ciências Naturais, Campus Dom Bosco, Praça Dom Helvécio 74, Fábricas, CEP 36301-160, São João Del Rei, MG, Brazil.
[3] Corresponding author: fazevedo@ufsj.edu.br

Received on 9 August 2014. Accepted on 27 September 2014.

ABSTRACT: Birds from the Neomorphinae subfamily are little known and rarely recorded in Brazil. We present a new record of the threatened taxon *Neomorphus geoffroyi dulcis* at Rio Doce State Park (RDSP) in Minas Gerais State, Brazil. This subspecies is thought to be rare in the Atlantic Forest with very few records over the last years. The present record may serve as background information to boost more research on this critically endangered subspecies and its habitat and for future management programs in conservation areas of the Atlantic Forest in Brazil

KEY-WORDS: Atlantic Forest, Rufous–vented Ground–Cuckoo, Rio Doce State Park, Minas Gerais, Brazil.

The avian order Cuculiformes is comprised by one family divided into four subfamilies with a total of 19 species in Brazil (CBRO 2014). The subfamily Neomorphinae includes four inconspicuous species belonging to the genus *Neomorphus* and are characterized by a very shy behavior, which may contribute to the lack of records in the country. *Neomorphus* are forest-dwelling birds with high demands regarding the quality of forests they inhabit (Sick 1997). As terrestrial birds they follow army ants (Hymenoptera: Formicidae) and herds of peccaries (Mammalia: Tayassuidae) that forage the layer of leaf litter dislodging invertebrates, small lizards, snakes and amphibians, which may also serve as prey to the ground cuckoo (Sick 1997, Silveira 2008). The vocalization of these birds consists of a low monosyllabic decreasing peep at intervals of 3 to 4 seconds during several minutes. When distressed, they utter a loud snap by beating the upper maxilla towards the lower mandible (Sick 1997).

The Rufous-vented ground-cuckoo *Neomorphus geoffroyi* is one of the largest species of the order Cuculiformes (up to 51 cm), with a broad distribution throughout South and Central America. In Brazil, there are three recognized subspecies of *N. geoffroyi* occurring in the Amazon, *Caatinga*, and Atlantic forest biomes (Payne 1997, Sick 1997, Raposo *et al.* 2009, Roos *et al.* 2012), as follows: *N. geoffroyi geoffroyi*, *N. geoffroyi amazonicus*, and *N. geoffroyi dulcis*. The latter subspecies has been recorded in remnant forests of southeastern Brazil, mostly from the Minas Gerais State to the north of Espírito Santo State (Pinto 1962, 1964) but is probably extinct from the Rio de Janeiro State (Silveira 2008).

Very few records of *N. geoffroyi* have been reported lately and most of them are anecdotal (Roos *et al.* 2012). The most recent records reported were from the *Caatinga* biome, extending the known species´ distribution to the northwest (Roos *et al.* 2012). Likewise, for the Atlantic Forest, recent records are also anecdotal, particularly for the mid Rio Doce region in Minas Gerais State (Machado *et al.* 2008, Roos *et al.* 2012). Until recently, the occurrence of *N. g. dulcis* at the Rio Doce State Park (RDSP) was considered uncertain and improbable (Knox & Walters 1994). However, in 2005 three birds were observed following army ants within a patch of regenerating forest (A. L. Ribeiro *pers. comm.*). In 2006, one record was obtained through a camera trap set to record mammals at RDSP (L. M. Scoss *pers. comm.*).

Although not considered globally threatened of extinction because of its wide distribution (BirdLife International 2014), several subspecies of *N. geoffroyi* have distinct characteristics that may warrant a species level status in the near future (Raposo *et al.* 2009). In this context, the taxon *N. g. dulcis* has been classified as critically endangered at a national level in Brazil (MMA 2003, Machado *et al.* 2008), after even being previously classified as extinct due to the absence of confirmed records (Knox & Walters 1994). Therefore, new records are vital to confirm the continued presence of *N. g. dulcis* in its former distribution and for helping develop effective conservation strategies for this taxon.

We report here one opportunistic observation of *N. geoffroyi dulcis* at RDSP. The observation occurred on the 26 March 2014, along the Porto Capim trail (19°46'20''S, 42°37'40.30''W). The site of the record is located at 270 m and is characterized by a regrowth forest with a dense understory mostly composed of bamboos (*Chusquea* sp., Poaceae), being previously burnt during the 1960s. The canopy was approximately 20 m high and partially opened. The vegetation at the RDSP consists of submontane semideciduous forest (Veloso *et al.* 1991). The relief comprises smooth hills and lowlands with elevations varying between 230 and 515m, with a local semi-humid tropical climate (Aw, Köppen classification). Annual average rainfall is approximately 1480 mm and annual average temperature 21.9° C with a dry period between May and September (Queiroz *et al.* 1980).

At around 3:00 pm one individual was sighted and photographed while perched on a branch close to the trail at approximately 1 m high. As soon as the bird realized the presence of the observers, it changed branches several times without getting away from the original position, allowing a very good sight by the observers (Figure 1). During the entire time of observation, the bird performed repeated vertical movements with its head and tail. In some of these movements, the bird intensively lowered its body, touching the chest to the branch and quickly raising itself, stretching the legs and getting away from the branch at the same time the tail and head were up in a 45^0 angle. At each 13 seconds interval, the bird snapped the mandibles several times when the head and tail were up. Although the sound made by this bird is described as very high and distinct, reminding a snap of mandibles of wild pigs (Sick 1997), only weak snaps were heard, often confounded with the sound of dry branches breaking because of the movements of the bird and the observers. The bird kept its position for 3 min when it jumped to the layer of leaf litter and disappeared into the interior of the forest. Few minutes after, many army ants (*Eciton* sp.) were recorded moving towards the same direction

FIGURE 1. *Neomorphus geoffroyi dulcis* at the Rio Doce State Park (RDSP) photographed on 26 March 2014 along the Porto Capim trail (19°46'20''S, 42°37'40.30''W), Rio Doce valley, state of Minas Gerais. Photos by FDT.

that the bird followed. However, we did not verify any interaction between the bird and the ants. Despite of that, we speculate the bird may have been foraging on the ants due to the presence of both at the same location.

Our record confirms the continuing presence of this threatened taxon at the RDSP and the Rio Doce valley. Moreover this record reassures the importance of RDSP as a priority area for the conservation of avifauna in Brazil (Drummond *et al.* 2005). Due to its extensive area composed by large tracts of more preserved vegetation than the site of our record, we speculate it is probable that a resident population with several individuals of *N. g. dulcis* may exist at RDSP.

The present record of *Neomorphus geoffroyi dulcis* may serve as background information to boost more research on this critically endangered subspecies and its habitat and for future management programs in conservation areas of the Atlantic Forest in Brazil.

ACKNOWLEDGEMENTS

We are grateful to the Instituto Estadual de Florestas de Minas Gerais (IEF) for logistic support at Rio Doce State Park. We thank Alan Loures Ribeiro and Leandro Scoss for valuable information on previous records of *Neomorphus geoffroyi* for the RDSP. The manuscript was greatly improved by comments from Vitor Torga Lombardi and Larissa Souza Arantes. We are grateful to Reuber Lana Antoniazzi Junior and Alice Carvalho Leite for identifying the species of ants. The first two authors are supported by a master's degree fellowship from CAPES.

REFERENCES

BirdLife International. 2014. Species factsheet: *Neomorphus geoffroyi*. http://www.birdlife.org. (access on 07 April 2014).

Comitê Brasileiro de Registros Ornitológicos (CBRO). 2014. *Listas das aves do Brasil.* 11ª Edição, 1/1/2014. http://www.cbro.org.br. (access on 01 April 2014).

Drummond, G. M., Martins, C. S., Machado, A. B. M., Sebaio, F. A. & Antonini, Y. 2005. *Biodiversidade em Minas Gerais: um atlas para sua conservação*. Belo Horizonte: Fundação Biodiversitas. 222 p.

Knox, A. G. & Walters, M. P. 1994. Extinct and Endangered Birds in the Collections of The Natural History Museum. British Ornithologists' Club Occasional Publication. No. 1, London.

Machado, A. B. M., Drummond, G. M. & Paglia, A. P. 2008. *Livro Vermelho da fauna brasileira ameaçada de extinção,* v. 2. Brasília: MMA, Belo Horizonte: Fundação Biodiversitas.

MMA - Ministério do Meio Ambiente. 2003. Lista de Animais Ameaçados de Extinção do Brasil. Instrução normativa nº 3, de 27 de maio de 2003. *Diário Oficial da União,* Seção1, 101:88-97.

Payne, R. B. 1997. Family Cuculidae. Pp. 508-607. In: Hoyo, J.del, A. Elliott & J. Sargatal., (eds.). Handbook of the birds of the world. Vol. 4. Sandgrouse to Cuckoos Lynx Edicions, Barcelona, Spain.

Pinto, O. M. O. 1962. Miscelânea ornitológica: notas sobre a variação geográfica nas populações de *Neomorphus geoffroyi,* com a descrição de uma subespécie nova. *Papéis Avulsos de Zoologia,* 15: 299-301.

Pinto, O. M. O. 1964. *Ornitologia Brasiliense,* v. 1. São Paulo: Departamento de Zoologia da Secretaria de Agricultura do Estado de São Paulo, Brasil.

Queiroz, R., Souza, A. G., Santana, P., Antunes, F. Z. & Fontes, M. 1980. *Zoneamento agroclimático do Estado de Minas Gerais*. Secretaria do Estado da Agricultura. Belo Horizonte.

Raposo, M. A., Simon, J. E. & Teixeira, D. M. 2009. Correction of the type locality of Neomorphus geoffroyi (Temminck, 1820), with lectotype designation. *Zootaxa*, 2176: 65-68

Roos, A. L., Souza, E. A., Campos, C. B., Paula, R. C. & Morato, R. G. 2012. Primeiro registro documentado do jacu-estalo Neomorphus geoffroyi Temminck, 1820 para o bioma Caatinga. *Revista Brasileira de Ornitologia*, 20: 81-85.

Sick, H. 1997. *Ornitologia brasileira.* Rio de Janeiro: Nova Fronteira.

Silveira, L. F. 2008. *Neomorphus geoffroyi dulcis* Snethlage, 1927, p. 486-487.In: Machado, A. B. M., Drummond, G. M. & Paglia, A. P. (eds.). Livro vermelho da fauna brasileira ameaçada de extinção, v. 2. Belo Horizonte: Fundação Biodiversitas.

Veloso, H. P., Rangel Filho, A. L. R. & Lima, J. C. A. 1991. *Classificação da vegetação brasileira, adaptada a um sistema universal.* Rio de Janeiro: IBGE, 123 p.

Associate Editor: Alexandre Aleixo

Revista Brasileira de Ornitologia, 22(3), 281-284
September 2014

New records and distribution extension of *Buteogallus solitarius* (Aves: Accipitridae) in Venezuela

Adrián Naveda-Rodríguez[1,2,3] **and Gabriela Lugo**[1]

[1] Entropía A.C. Apartado Postal 4845, Maracay 2101, Aragua, Venezuela.
[2] Fundación BioRaptor, Av. Las Ciencias, Edif 1, Los Chaguaramos, Caracas, Venezuela.
[3] Corresponding author: adrian.naveda@gmail.com

Received on 22 May 2013. Accepted on 19 March 2014.

ABSTRACT: The Solitary Eagle (*Buteogallus solitarius*) is a poorly known Neotropical raptor and many aspects of its natural history remain unknown. The species is often misidentified and confused with other congeners. In Venezuela, its occurrence, based on voucher specimen and photographic records, is restricted to the Cordillera de la Costa Central. Here we report on four new confirmed records of the Solitary Eagle in Venezuela. These records represent a distribution extension (>160 km) from its previously known geographic range within the country.

KEY-WORDS: Coastal mountain range, Sierra de Portuguesa, Sierra de Perijá, Solitary Eagle.

The Solitary Eagle (*Buteogallus solitarius*) is a large size raptor with a discontinuous distribution from northwest Mexico to northern Argentina (Ferguson-Lees & Christie 2001; Seminario *et al.* 2011). In South America, it has a localized distribution through the Andes (Marquez *et al.* 2005) where its altitudinal distribution has been described between 700 to 2000 m above sea level (Brown & Amadon 1968). In Venezuela, it is distributed in the Guayana Region (Willard *et al.* 1991) and Cordillera de la Costa (Hilty 2003). Nonetheless, the record from Guayana is not reliable because of the lack of information on identifiable field marks. It is considered a rare, local and very uncommon raptor across its distribution and is often misidentified and confused with the similarly plumaged Common Black-Hawk (*Buteogallus anthracinus*) and Great Black-Hawk (*Buteogallus urubitinga*) (Clark *et al.* 2006).

Valid records (museums specimens and/or photographs) of the Solitary Eagle in Venezuela are scarce; only two specimens collected from Aragua State are found in ornithological collections of Venezuelan museums: EBRG (Museo de la Estación Biologica de Rancho Grande) 12.069 from Valle Verde, El Limon; and COP (Colección Ornitológica Phelps) 43.921 obtained at Rancho Grande, Pico Guacamayo. Observational records from the scientific literature have also reported the species for the states of Aragua, Amazonas, Carabobo, and Miranda (Willard *et al.* 1991, Bisbal 1993, Sharpe *et al.* 2001, Hilty 2003). However, these reports do not provide diagnostic characteristics or photographs to validate the observations. Considering the scarce knowledge on the occurrence of the Solitary Eagle in Venezuela, the four new confirmed records presented here contribute to the knowledge on presence of the species in the country (Figure 1). These records correspond to field observations and, to our knowledge, represent the first photographic records for Venezuela. These location records were documented on the Guiana Shield and in the Cordillera de Los Andes, which is divided in two branches in Venezuela: Sierra de Perijá and Cordillera de Merida (PDVSA 1992). To avoid misidentification, specific determinations were based on Clark *et al.* (2006).

In July 2001, an immature Solitary Eagle (Figure 2A) poached in Santa Rosalia, Bolivar State, Guayana Region (07°28'46'' N, -65°39'34'' W; 270 m elevation) was confiscated and transported to Zoologico de Las Delicias (Aragua, Venezuela). The eagle had been shot while chasing piglets on a farm in Santa Rosalia. Santa Rosalia is located in the bioregion denominated Piedmont Hill Systems of the Guiana shield and the habitat at this locality is characterized as semideciduous foothill tropophilic forest (see Huber & Alarcón 1988). The wing tips beyond the tail tip, the absence of white barring on the leg feathers, and the occipital cowl diagnosed this bird as a Solitary Eagle. This record from Bolivar State is the southernmost location for the Solitary Eagle in Venezuela, and was found approximately 390 km SE of the previous known area for this species in the Cordillera de la Costa in Venezuela.

A second valid record from Bolivar State was recorded by ornithologist John Kvarnbäck, on 23 December 2007. He observed two adult Solitary Eagles in La Escalera, Sierra de Lema (05°57'00'' N, -61°25'59'' W, 1,100 m elevation), with one of these birds being photographed in-flight (Figure 2B). This record occurred in the Guiana Massif bioregion in an Ombrophile sub-montane evergreen forest (Huber & Alarcón 1988) approximately 495 km WNW from Santa Rosalia and 205 km to the NW from the only known record in Guyana (O'Shea *et al.* 2007). These were properly identified as Solitary Eagles by the wide wings forming a triangular shape with the bulging secondaries, and the short tail barely protruding past the secondaries; these characteristic can be observed in figure 2B.

On 26 January 2009, a perched adult individual was photographed by ANR (Figure 2C) in Sierra de Perijá, Lajas River Basin, 27 km WNW from Villa del Rosario, Zulia State, Venezuela (10°21'57'' N, -72°33'59'' W, 1,100 m elevation). This site is located in an ombrophile montane semideciduous seasonal forest (Huber & Alarcón 1988). This bird was identified by the wingtips beyond the tail tip and the absence of narrow white barring on its leg feathers, which is a characteristic of the Great Black-Hawk. This record is approximately 475 km W from the previous known locality in Venezuela, Campamento Palmichal, Carabobo (Bisbal 1993). However, a Solitary Eagle was collected in the Colombian slope of Sierra de Perijá in 1942 (ORNIS) (Marquez *et al.* 2005) with at least one known record from Serrania de Eroca (BioMap Alliance Partners 2006), approximately 62 km SW from our record in Lajas River.

The fourth record occurred on 4 June 2012 in the Sierra de Portuguesa in the Venezuelan Andes, 4 km SSE from Sanare, Lara State, Venezuela (09°42'43'' N, -69°39'02'', 1,745 m elevation) where we observed and photographed an adult Solitary Eagle soaring (Figure 2D). The habitat at this locality is characterized as ombrophile

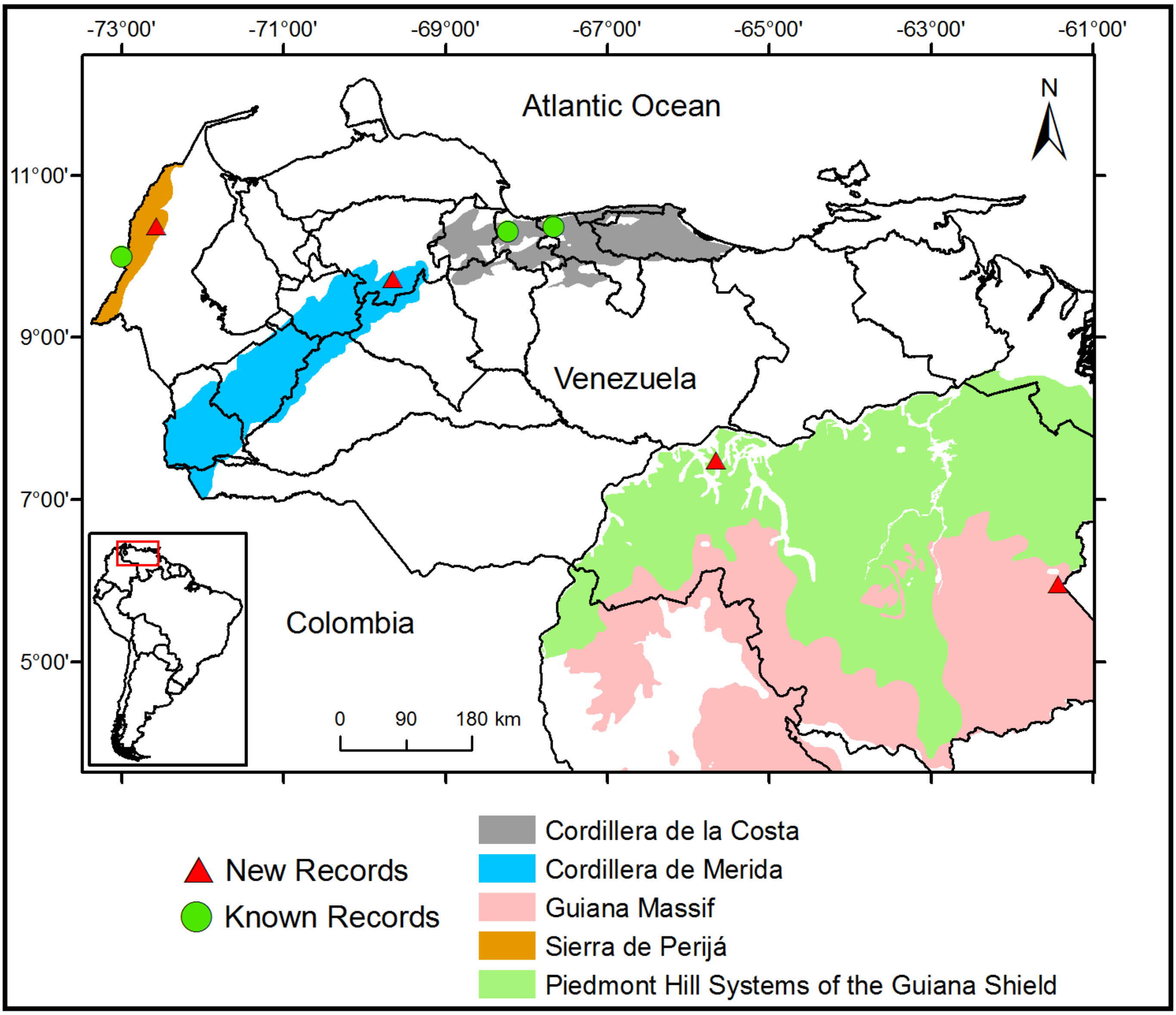

FIGURE 1. New and known records of the Solitary Eagle (*Buteogallus solitarius*) in Venezuela

sub-montante/montane evergreen forest (Huber & Alarcón 1988). Field marks used to identify this eagle were the short squared tail when not fanned and the wide and triangular shaped wings. The nearest known report of this species from this site is approximately 170 km ENE at Campamento Palmichal in Carabobo State, Cordillera de la Costa.

Forest habitats in the Andes where two of these new records occurred are undergoing serious threats of habitat conversion for cattle ranching and agriculture with established pesticide use. The conservation status of the montane forest in Venezuela is critical. Madi *et al.* (2011) reported between 26% and 75% of the original vegetation has been altered through reduction, fragmentation or alteration. The forests of the Lajas River Basin have been classified as critically endangered; approximately 35% of the area has undergone habitat conversion over the last 15 years (Hernández-Montilla & Portillo-Quintero 2010). This loss and fragmentation of habitat may pose threats to the Solitary Eagle. Protection of habitat where the Solitary Eagle is known to occur is critical for viable populations in Venezuela, where this species is not listed or legally protected.

Given the lack of information on the Solitary Eagle in Venezuela, we recommend careful attention to diagnostic characteristics in the field and proper documentation on locality (i.e., geographic coordinates), elevation, habitat, and behavior in order to distinguish it from other congeners and better understand the species in Venezuela.

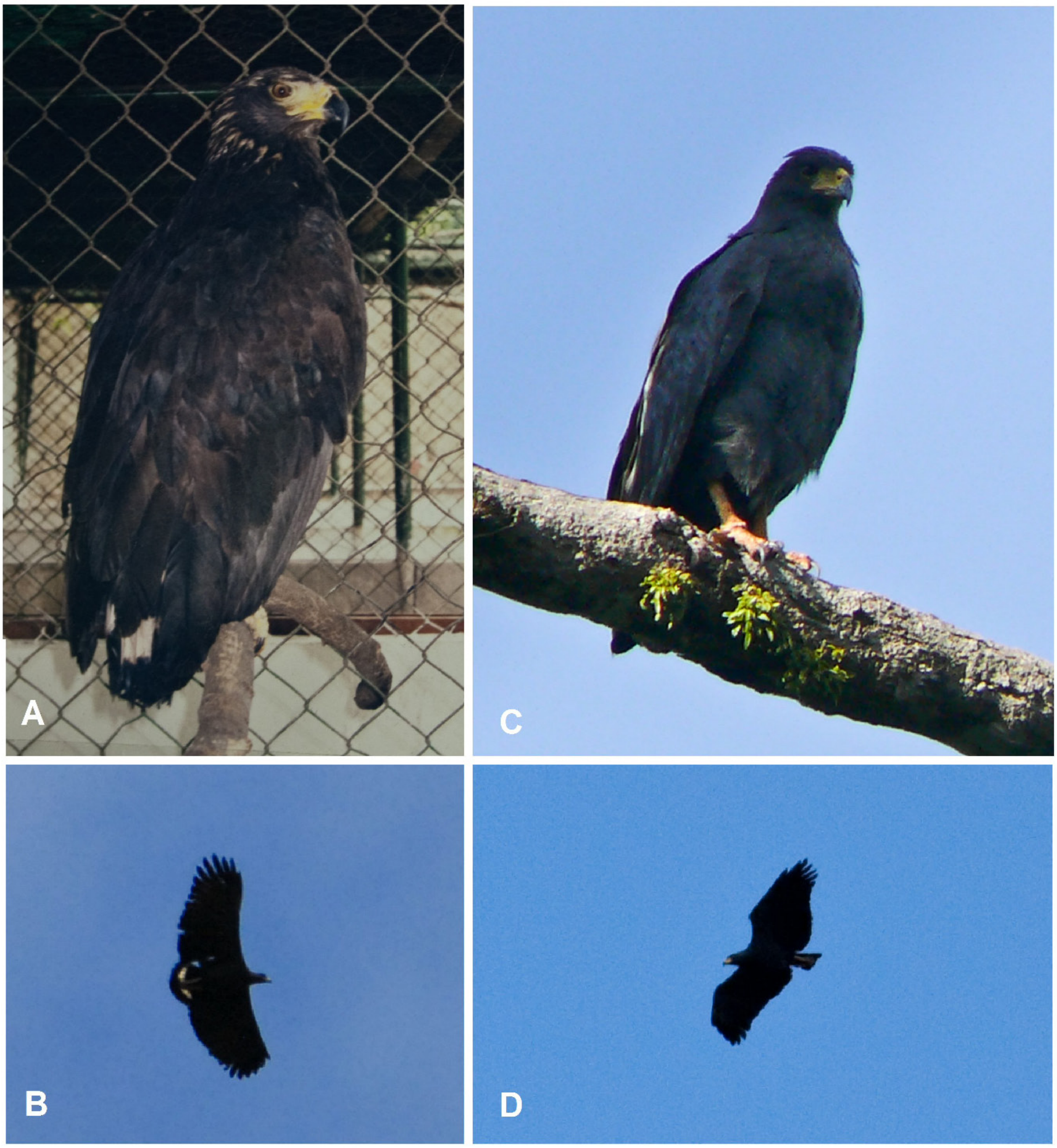

FIGURE 2. Photographic records of the Solitary Eagle (*Buteogallus solitarius*) in Venezuela. (A) eagle poached and rescued in Santa Rosalia, Bolivar; (B) adult sighted at La Escalera, Bolivar by ornithologist John Kvarnbäck; (C) adult Solitary Eagle perched in the Sierra de Perijá, Zulia; (D) adult soaring in the Cordillera de Merida, Lara. Photos: A and C: Adrian Naveda-Rodriguez; B: Muse Björklund; D: Gabriela Lugo.

ACKNOWLEDGMENTS

We would like to thank Francisco Bisbal (Museo de la Estación Biologica de Rancho Grande – EBRG) and Miguel Lentino (Coleccion Ornitologica Phelps -COP), Alexis Araujo, Carlos Rengifo, Marco Salcedo, Rosana Calchi and Jurahimar Gamboa for kindly providing information on their collections. Sergio Seipke, Jose Gustavo Leon, John Kvarnbäck, and Muse Björklund provided information and/or help in the identification of our records.

REFERENCES

BioMap Alliance Partners. 2006. Darwin Database: Project BioMap distribution database of Colombian avifauna. http://www.biomap.net (access on 26 June 2012).

Bisbal, F. 1993. Inventario Preliminar de la Fauna de la Cuenca del Rio Moron, Estado Carabobo, Venezuela. *Acta Cientifica Venezolana* 44: 365-482.

Brown, L.H. & Amadon, D. 1968. *Eagles, Hawks, and Falcons of the World, Vol. 1*. New York: McGraw-Hill. 945 p.

Clark, W.; Jones, H.L.; Benesh, C. & Schmitt, N.J. 2006. Field Identification of the Solitary Eagle. *Birding* 38: 66-74.

Ferguson-Lees, J. & Christie, D.A.. 2001. *Raptors of the World*. London: Christopher Helm. 992 p.

Hernández-Montilla, M. & Portillo-Quintero, C. 2010. Conversion de los Bosques del Norte de la Sierra de Perijá, Estado Zulia. Pp: 124-129. In: Rodríguez, J.P.; Rojas-Suárez, F. & Giraldo, D. (eds.). Libro Rojo de los Ecosistemas Terrestres de Venezuela. Caracas: Provita, Shell Venezuela, Lenovo (Venezuela).

Hilty, S.L. 2003. *Birds of Venezuela*. Princeton: Princeton University Press. 878 p.

Huber, O. & Alarcón, C. 1988. *Mapa de vegetación de Venezuela*. Caracas: MARNR-BIOMA.

Madi, Y.; Vazquez, J.; Leon, A. & Rodriguez, J.J. 2011. Estado de Conservación de los Bosques y Otras Formaciones Vegetales en Venezuela. *Biollania Edicion Especial* 10: 302-324.

Marquez, C.; Gast, F.; Venegas, V. & Bechard, M. 2005. *Aves Rapaces Diurnas de Colombia*. Bogota: Instituto de Investigacion de Recursos Biologicos "Alexander von Humboldt". 394 p.

O'Shea, B.J.; Milensky, C.M.; Claramunt, S.; Schmidt, B. K.; Gebhard, C.A.; Schmitt, C.G. & Erskine, K. T. 2007. New records for Guyana, with description of the voice of Roraiman Nightjar *Caprimulgus whitelyi*. *Bulletin of the British Ornithologists' Club* 127: 118-128.

PDVSA.1992. *Imagen de Venezuela, una visión espacial*. Caracas: Petróleos de Venezuela (PDVSA). 271 pp.

Seminario, Y.; Phillips, R. & Curti, M. 2011. Observations of the post-fledging behavior and prey of the Solitary Eagle (*Harpyhaliaetus solitarius*). *Journal of Raptor Research* 45: 261-264.

Sharpe, C.; Ascanio, D. & Rodriguez, G. 2001. Further Range Extensions and Noteworthy Records for Venezuelan Birds. *Bulletin British Ornithologist' Club* 121: 50-62

Willard, D.E.; Foster, M.S.; Barrowclough, G.F.; Dickerman, R.W.; Cannell, P.F.; Coats, S.L.; Cracraft, J.L. & O'Neill, J.P.. 1991. The Birds of Cerro de la Neblina, Territorio Federal Amazonas, Venezuela. *Fieldiana, Zoology New Series,* No 65: 1-80.

Associate Editor: Leandro Bugoni

Revista Brasileira de Ornitologia, 22(3), 285-287
September 2014

SHORT-COMMUNICATION

First record of the Andean Flamingo in the Brazilian Amazon

Bianca Bernardon[1, 2] and João Valsecchi[1]

[1] Grupo de Pesquisa em Ecologia de Vertebrados Terrestres - Instituto de Desenvolvimento Sustentável Mamirauá IDSM-OS/MCTI, Estrada do Bexiga, 2584, Bairro Fonte Boa, CEP 69553-225, Tefé, AM, Brazil.
[2] Corresponding author: biabernardon@yahoo.com.br

Received on 10 March 2014. Accepted on 19 March 2014.

ABSTRACT: On May 29th 2007, three fishermen observed an "unknown" bird, "swimming" on the Igarapé do Baré, a stream inside the Amanã Sustainable Development Reserve. Since they had never spotted that bird species before, they shot and donated it to the Mamirauá Sustainable Development Institute (IDSM). The specimen is an Andean Flamingo *Phoenicoparrus andinus* and is housed at the Ornithological Collection of IDSM. This is the first record of the Andean Flamingo for the state of Amazonas and the Brazilian Amazon.

KEY-WORDS: Amanã Reserve, Amazonas, *Phoenicoparrus andinus.*

There are four flamingo species recorded for Brazil: *Phoenicopterus ruber* (American Flamingo), is the only species resident in Brazil, with reproductive colonies on the shores of the Amapá state (Sick 1997); *Phoenicopterus chilensis* (Chilean Flamingo) has been recorded in the states of São Paulo and Rio de Janeiro; *Phoenicoparrus jamesi* (James's Flamingo) had its first and only occurrence in Brazil in 2005, in the state of Acre (Guilherme *et al.* 2005); and *Phoenicoparrus andinus* (Andean Flamingo), with records so far in the states of Rio Grande do Sul and Santa Catarina (Bege & Pauli 1990, Antas 1992, Bornschein & Reinert 1996). Here, we report on the first occurrence of the Andean Flamingo for the state of Amazonas and Brazilian Amazonia.

On May 29th 2007, three fishermen observed an "unknown" bird, "swimming" alone on the stream known as "Igarapé do Baré" at approximately 2º21'09''S 64º43'00''W, inside the Amanã Sustainable Development Reserve (ASDR), in the municipality of Maraã, state of Amazonas. Since they had never spotted such a bird before, they hunted and later donated it to the Mamirauá Sustainable Development Institute (IDSM), where it was incorporated into the ornithological collection as IDSM 00001.

The collected specimen is a young individual (Figure 1), with beige and brown feathers, with a small pink area under the wings, and flanks covered with dark striated feathers. As the bird was kept in formaldehyde, the color of the feathers, legs and bill have been altered. The specimen belongs to the genus *Phoenicoparrus* for showing only three toes (Figure 2a), one of the main diagnosable characteristics of this genus.

The specimen was compared directly with two other flamingo specimens: a young *P. jamesi* deposited at the Museu Paraense Emilio Goeldi (MPEG 58950), and an adult *P. andinus* from the Museu de Zoologia da Universidade de São Paulo (MZUSP 84351). However, due to extreme similarities in juvenile plumage of both *Phoenicoparrus* species, it was not possible to determine the species to which IDSM 00001 belonged based on plumage alone. Nevertheless, the bill of IDSM 00001 presented 9 lamellas (comb-like or hair-like structure present on the mandible, serving for filtering food) per cm, as verified for the Andean flamingo, whereas the James's Flamingo has about 20 lamellas per cm (Mascitti & Kravetz 2002). This Identification was confirmed with the assistance of the researchers Omar Rocha, Biologist from the Centro de Estudios de Biologia Teórica y Aplicada (BIOTA), Bolivia, and Johnson K. Vizcarra, from the Grupo Aves del Perú (GAP).

The bill dimensions of IDSM 00001 are as follows: exposed culmen and mandible with 104.63 mm and 67.07 mm, respectively (Figure 2b). It is a young specimen appearing between 4 and 6 months old (J. Vizcarra *pers. comm.*).

The Andean Flamingo occurs mainly in the high Andean plateaus of Peru, Chile, Bolivia, and Argentina, with a population estimated in 38,000 individuals (Marconi *et al.* 2011). It is listed as 'vulnerable' by the IUCN because its population has been decreasing quickly due to exploitation and loss in habitat quality (Rocha & Quiroga 1997, BirdLife International 2014).

Andean Flamingos reproduce during the austral summer, from December to February, on the highest Andean regions, with altitudes between 3,500 to 4,500 m (del Hoyo 1992), and which are located at least 1,500 km on a straight line from where IDSM 00001 was found. Valqui *et al.* (2000) carried out a census of the species during the winter and only found half of the Andean Flamingos recorded that summer, which means that about half of its population is going to places still unknown. Caziani *et al.* (2007) recorded the increase in the abundance of *P. andinus* in low altitude flooded areas of Peru and Argentina during the austral winter.

Caziani & Derlindati (1999) concluded that drastic changes in the environment, such as severe droughts, may induce the flamingos to seasonal altitude relocation. If feeding areas next to the nesting areas are not enough in terms of quality or quantity, long distance movements in search of food sources may influence nest abandonment (Marconi *et al.* 2011). However, the factor that contributes the most for the erratic movements of *P. andinus* and *P. jamesi* seems to be the occurrence of great storms and cold fronts. These storms end up "dragging" flamingos to more distant regions since these birds usually cannot fly against strong air currents (Guilherme *et al.* 2005).

These birds generally live in groups. However, the fishermen only found one flamingo and did not see any

FIGURE 1. Dorsal view of the young *Phoenicoparrus andinus* (IDSM 00001), collected on May 29th 2007, at the Amanã Sustainable Development Reserve, municipality of Maraã, Amazonas state.

FIGURE 2. a) Detail of the three toes of the *Phoenicoparrus andinus* collected, main characteristic of the genus *Phoenicoparrus*. b) Head of the young specimen *P. andinus*.

other individual during the following three days of fishing in the area. This fact probably indicated that IDSM 00001 may have gotten lost from the group and been brought by an air current, until near where it was found. According to weather reports (CPTEC/INPE 2007), on the last week of May 2007, a new cold air mass advanced over the South American continent, causing strong temperature drops and historical records of minimum temperatures. Guilherme *et al.* (2005) also suggested that the arrival of the James's Flamingo in the state of Acre was caused by a cold front.

This is the first record of the Andean Flamingo for the state of Amazonas and the Brazilian Amazon.

ACKNOWLEDGMENTS

We thank the following institutions for support: Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Ministério de Ciências, Tecnologia e Inovação (MCTI), and Instituto de Desenvolvimento Sustentável Mamirauá (IDSM).

We thank Moisés do Carmo for donating the flamingo specimen to the IDSM and the anonymous reviewers. We also thank Omar Rocha, biologist from Centro de Estudios de Biología Teórica y Aplicada (BIOTA), Bolívia, and Jhonson K. Vizcarra, from Grupo Aves del Perú (GAP), for helping with the identification the collected flamingo.

REFERENCES

Antas, P. T. Z. 1992. Novos registros para a avifauna do Rio Grande do Sul, p. 80-81. In: Anais do VI Encontro Nacional de Anilhadores de Aves. Pelotas: Universidade Católica de Pelotas, EDUCAT.

Bege, L. A. R. & Pauli, B. T. 1990. Two birds new to Brazilian avifauna. *Bulletin of the British Ornithologists' Club*, 110: 93-94.

BirdLife International. 2014. Species factsheet: *Phoenicoparrus andinus*. http://www. birdlife.org (access on 02 January 2014).

Bornschein, M. R. & Reinert, B. L. 1996. The Andean Flamingo in Brazil. *Wilson Bulletin*, 108: 807-808.

Caziani, S. M., & Derlindati, E. J. 1999. Humedales altoandinos del Noroeste de Argentina: su contribución a la biodiversidad regional. *Tópicos sobre humedales subtropicales y templados de Sudamérica. Oficina Regional de Ciencia y Tecnología de la UNESCO para América Latina y el Caribe-ORCYT-Montevideo. Uruguay.* http://www.unesco.org.uy/phi/aguaycultura/fileadmin/ciencias%20naturales/ mab/1.pdf (access on 03 January 2014).

Caziani, S. M.; Rocha, O.; Ramirez, E. R.; Romano, M.; Derlindati, E. J.; Talamo, A.; Ricalde, D.; Quiroga, C.; Contreras, J. P.; Valqui, M.; & Sosa, H. 2007. Seasonal distribution, abundance, and nesting of Puna, Andean, and Chilean Flamingos. *The Condor*, 109: 276-287.

CPTEC/INPE [Centro de Previsão de Tempo e Estudos Climáticos, Instituto Nacional de Pesquisas Espaciais]. 2007. http://www. climanalise.cptec.inpe.br/~rclimanl/boletim/index0507.shtml (access on 30 July 2013).

del Hoyo, J. 1992. Phoenicopteridae (Flamingos), p. 508-526. In: del Hoyo, J.; Elliott, A.; Sargatal, J. (eds.). Handbook of the birds of the world. Barcelona: Lynx Edicions.

Guilherme, E.; Aleixo, A.; Guimarães, J. O.; Dias, P. R. F.; Amaral, P. P.; Zamora, L. M. & Souza, M. S. 2005. Primeiro registro de *Phoenicoparrus jamesi* (Aves, Phoenicopteriformes) para o Brasil. *Revista Brasileira de Ornitologia*, 13: 212-214.

Marconi, P.; Sureda, A. L.; Arengo, F.; Aguilar, M. S.; Amado, N.; Alza, L.; Rocha, O.; Torres, R.; Moschione, F.; Romano, M.; Sosa, H. & Derlindati, E. 2011. Fourth simultaneous flamingo census in South America: preliminary results. *Flamingo*, 18: 48-53.

Mascitti, V. & Kravetz, F. O. 2002. Bill morphology of South American Flamingos. *The Condor*, 104:73-83.

Rocha, O. & Quiroga, C. 1997. Primer censo simultáneo internacional de los flamencos *Phoenicoparrus jamesi* y *Phoenicoparrus andinus* en Argentina, Bolivia, Chile y Perú, con especial referencia y análisis al caso boliviano. *Ecología en Bolivia*, 30: 33-42.

Sick, H. 1997. *Ornitologia Brasileira.* Rio de Janeiro: Editora Nova fronteira.

Valqui, M.; Caziani, S. M.; Rocha, O. & Rodriguez, E. 2000. Abundance and distribution of the South American altiplano flamingos. *Waterbirds*, 23: 110-113.

Associate Editor: Alexandre Aleixo

Revista Brasileira de Ornitologia, 22(3), 288-291
September 2014

SHORT-COMMUNICATION

Feeding of nestlings of the Amazonian Motmot (*Momotus momota*) in southern Goiás, Brazil

Marcos Antônio Pesquero[1,4], André Grassi Corrêa[2], Marcos Filipe Pesquero[2] and Henrique Marques de Paula[3]

[1] Universidade Estadual de Goiás - UEG, Rua 14, 625 - Jardim América, CEP 75650-000, Morrinhos, GO, Brazil.
[2] Universidade Federal do Tocantins. Ecologia de Ecótonos.
[3] Instituto Federal Goiano - Campus Rio Verde.
[4] Corresponding author: mapesq@ueg.br

Received on 18 April 2013. Accepted on 12 April 2014.

ABSTRACT: In this study, the provisioning of nestlings by a monogamous pair of *Momotus momota*, living in the urban area of Morrinhos, Goiás, Brazil, was studied. The male and female fed the nestlings throughout the day, but with greater intensity during sunrise. One of them devoted twice as much effort than his mate to this activity. Food items offered to the nestlings were usually insects, small vertebrates, fruits, and other invertebrates.

KEY-WORDS: Parental care, daily activity, nestlings, diet, urban environment.

Reproductive effort is defined as part of the energy spent during a period of time in the life of an organism that is devoted to reproduction (Hirshfield & Tinklee 1975). In birds, this energy can be allocated to sex-specific activities such as egg-laying in females, mating rituals in males, and activities that can be shared by both sexes, such as nest building, incubation, and feeding and defending young. The degree of parental investment in performing these tasks depends on the mating system, with greater dedication expected of males in parental care in social and/or genetic monogamous reproductive systems of tropical birds (Stutchbury & Morton 2001). Momotidae comprises a monophyletic group of six genera and ten species of Neotropical birds recognized by simple song, bright plumage, lack of sexual dimorphism (Snow 2001), and monogamy (Murphy *et al.* 2010). These birds dig tunnels through earth banks to incubate between two to six white eggs (Snow 2001), feeding mainly on insects, small vertebrates and fruits (Orejuela 1980, Remsen *et al.* 1993). *Momotus momota* is a large motmot with a wide distribution in South America, inhabiting forests near watercourses for nesting (Melo & Piratelli 1999). Few studies have been conducted on reproduction and provisioning of nestling motmots in Brazil (Alves *et al.* 1999, Piratelli *et al.* 2000).

This study was conducted in an urban area of Morrinhos (17°73'42''S, 49°09'94''W), southern Goiás, Brazil. More than half of the municipal area was occupied by pastures, leaving only 17% native vegetation, mainly of the Cerrado biome (Martins *et al.* 2009). The local climate is characterized by a cool period from May to August (20.85 ± 1.10°C, mean ± SD), and a hot period from September to April (24.33 ± 0.81°C). Rainfall is high from November to March (241.07 ± 32.50 mm), low from May to August (9.57 ± 1.44 mm), and intermediate in April, September and October (77.34 ± 13.46 mm) (Pesquero *et al.* 2012).

We estimated the dedication of a *M. momota* pair during the feeding of three nestlings for six alternate days between October 19 and November 8, 2008, from 6:15 am to 7:15 pm (DST), totaling 84 h of observation. The birds dug a 2.46 m long nest on the bank of a cistern in the backyard of a residence. The number of nestlings and the length of the nest were measured using a 3 m probe attached to a netbook (Figure 1). Observations began after the incubation period, when parents entered the nest only to deliver food to the nestlings. Binoculars (7 × 25 mm) were used to recognize parents and food types when parents perched on a wall before entering the nest at a maximum distance of 5 m from the observer. Timepoints in which parents entered the nest to feed the nestlings were recorded for parental dedication analysis.

Several times a day, parents entered the nest to feed the nestlings, preferably during the first three hours after sunrise, corresponding to a 4.14 ± 0.71 / hour (mean ± SE) encounter rate of food compared with 3.02 ± 0.23 / h during other periods of the day ($t = 1.95$, $df = 69$, $P = 0.054$) (Figure 2). The reason for the non-significant outcome should be the delayed onset of observations (6:15 am) in relation to sunrise (5:44 am to 5:34 am), underestimating foraging activity in the early morning.

Although sexes were not recognized, parents were morphologically distinguished from each other by the presence or absence of a spot on the chest. The spotted bird fed the nestlings twice as much as the mate (Figure 2). It was present for 67 of the 84 h of observation, compared to 46 h of the mate's activity ($\chi^2 = 11.92$, $P < 0.001$); entered the nest to feed the nestlings 150 times, while his mate entered only 80 times ($\chi^2 = 21.30$, $P < 0.00001$); and its rate of food delivery per hour was twice as much as the mate's (2.10 ± 0.17 and 1.01 ± 0.15, respectively. $t = -4.78$, $df = 140$, $P < 0.00001$).

The nestlings' diet was mainly composed of insects, including slugs, snails, worms, millipedes, woodlice, spiders, dragonflies, cockroaches, grasshoppers, mantes, frogs, lizards, and small fruits (Figure 3A). The most common insects were Lepidoptera (40% young and 60% adults), Coleoptera, and Orthoptera (Figure 3B).

The dedication of parents to feeding activity decreased as the lifetime of nestlings progressed (Figure 4), but this relationship was not significant ($r_s = -0.77$, $t = -2.42$, $P = 0.07$). On November 9 and 10, 2008 three nestlings left the nest. They had a single pectoral spot, 24.6 ± 0.6 cm mean length, and 95.37 ± 6.59 g mean weight (mean ± SE).

The occurrence of *M. momota* is expected for the central region of Brazil, but the pair observed during this study had distinctive specific stains (Stiles 2009), such as a greenish breast, ocher abdomen, violet posterior region of the crown, and the absence of an ocher stain close to the neck. Interestingly, there are no records regarding adult motmots without a pectoral spot, or records on the relationship of this trait with sexual dimorphism.

FIGURE 1. Probe attached to a netbook used to visualize the *Momotus momota* nestlings.

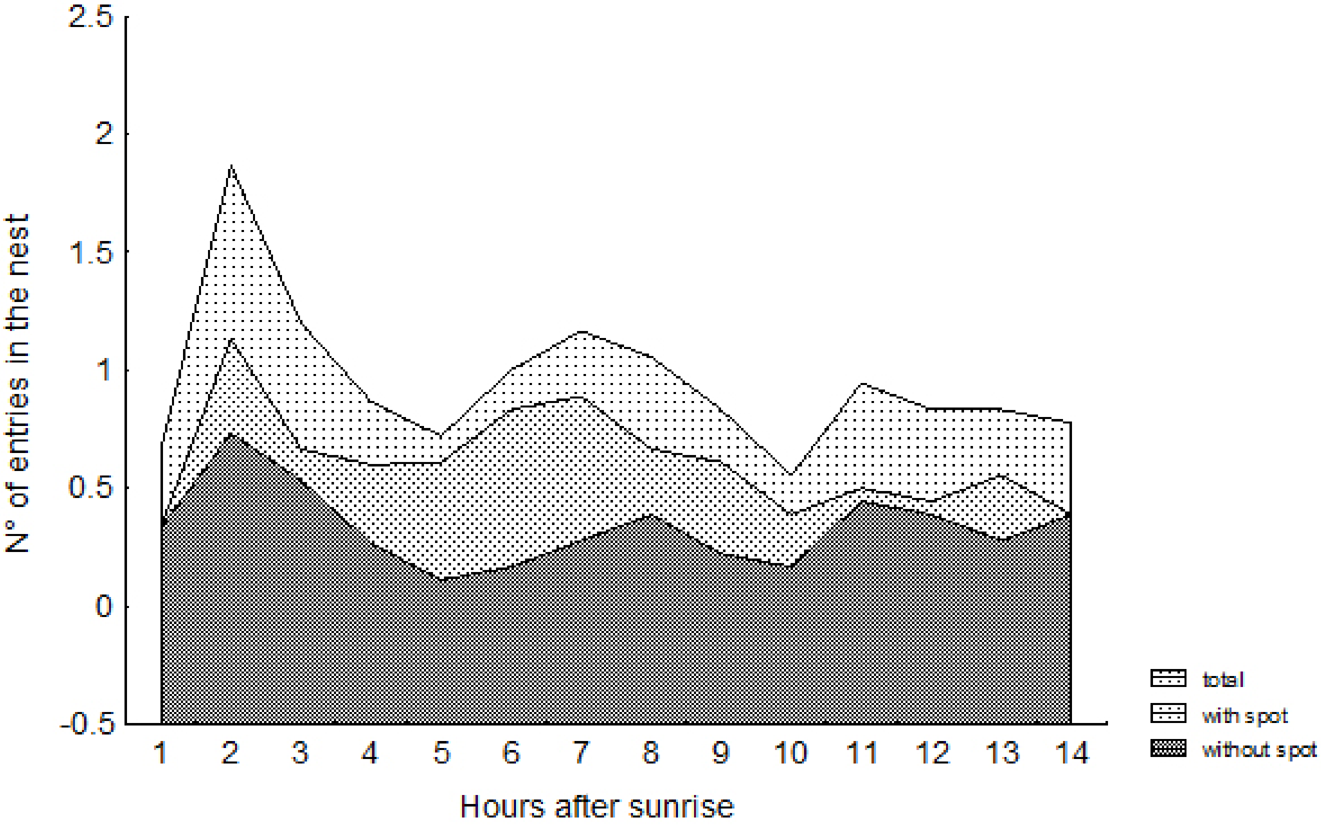

FIGURE 2. Average number of feeding visits to the nest carried out by a pair of *Momotus momota* throughout the day.

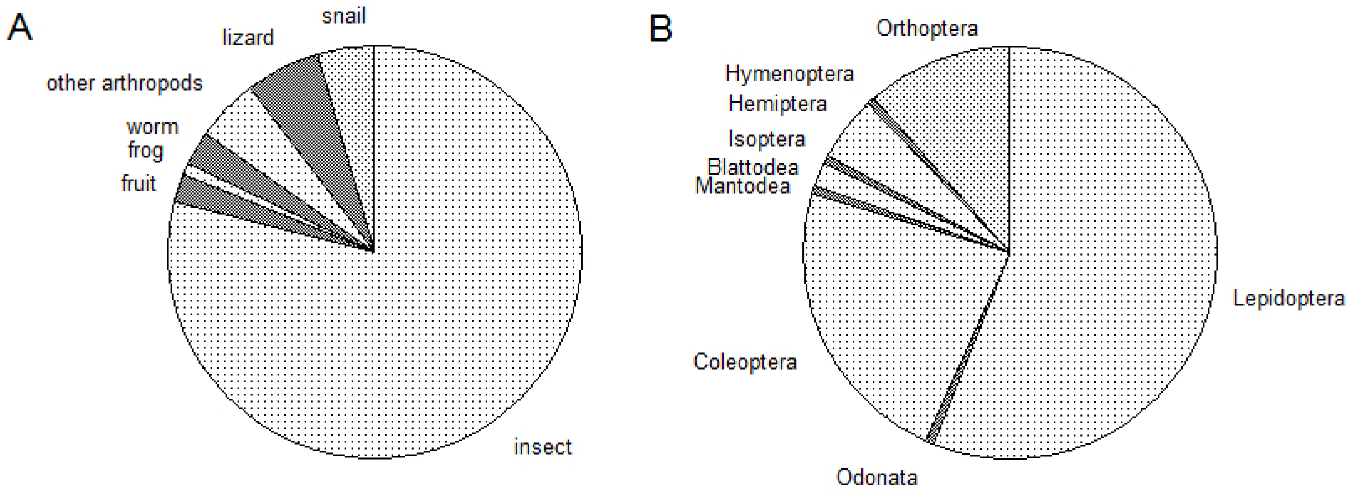

FIGURE 3. Kinds of food brought into the nest by the couple of *Momotus momota*. A) All foods. B) Insects.

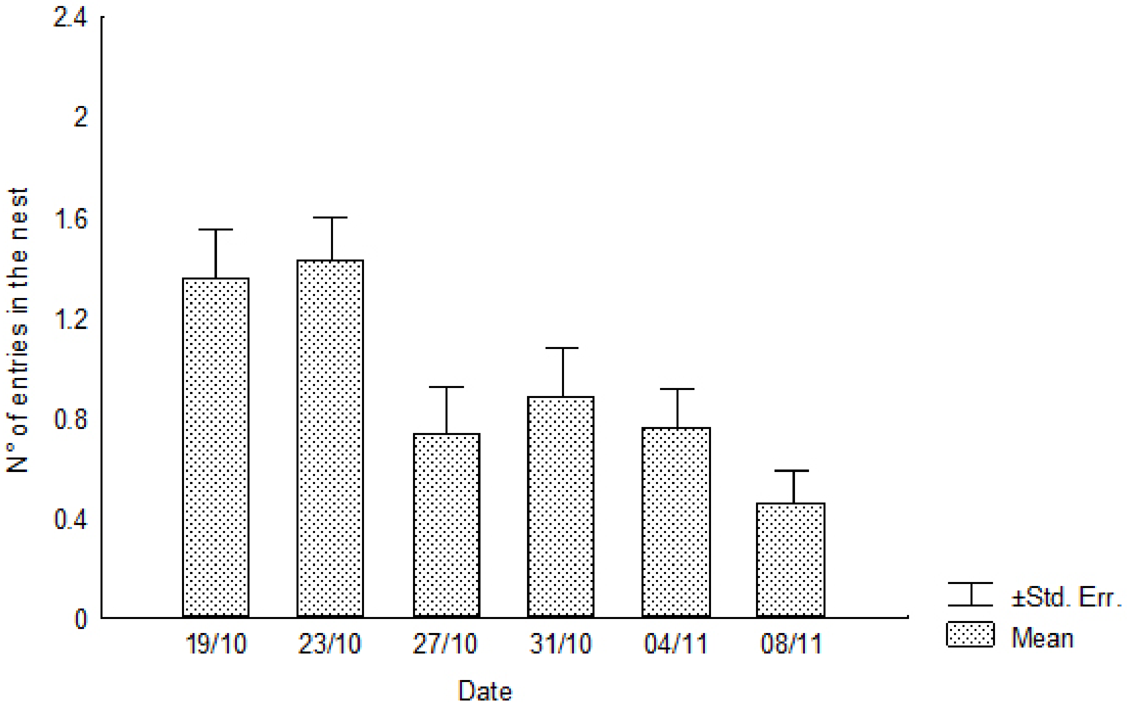

FIGURE 4. Average number of feeding visits to the nest carried out by a pair of *Momotus momota* throughout the days.

The breeding observed here occurred in the rainy season, similar to other studies on motmot birds (Skutch 1971, Alves *et al.* 1999, Piratelli *et al.* 2000). In seasonal climates, the rainy season favors the growth and reproduction of arthropods, which is very common in the diet of motmots (Alves *et al.* 1999, Melo & Piratelli 1999). The nestlings' diet was composed predominantly of insects, small vertebrates and fruits, similar to the omnivorous diet of adult birds (Orejuela 1980, Remsem *et al.* 1993, Piratelli & Pereira 2002). Unlike forest environments where the insects most commonly offered to the nestlings of *Electron platyrhynchum* (Skutch 1971) are cicadas, Lepidoptera was the most offered insect to nestlings during the six days of observation in an urban area. However, the rate of food delivery to nestlings was not constant over time. This can indicate paternal encouragement for nestlings to leave the nest.

The prevalence of adult activity during the first hours of the day was described for *M. momota* and *Eumomota superciliosa* (Sandbach 1837) (Orejuela 1980, Melo & Piratelli 1999), and the authors attribute them to satiety and physiological limitation. Both sexes fed the nestlings as expected for monogamous birds of tropical climate (Stutchbury & Morton 2001), yet one individual devoted more time than the mate to this activity. Although Skutch (1947) did not recognize the sex of the parents, he reported that *E. superciliosa* presented unequal division of labor in digging nest tunnels. Males and females of *Baryphtengus ruficapillus* (Vieillot 1818) have also presented unequal dedication during the provisioning of nestlings (Alves *et al.* 1999); and observations of the species made by Orejuela (1977) suggest that motmot females are more devoted to parental care.

ACKNOWLEDGMENTS

Fernanda Santos Tomazella and Mercia A. O. Pesquero assisted during field collections. Suzana Macedo Oliveira and two anonymous reviewers of the manuscript provided a number of helpful suggestions.

REFERENCES

Alves, M.A.S.; Ritter, P.D.; Vecchi, M.B.; Storni, A. & Bernardes, A. 1999. Feeding rates of Rufous-capped Motmot *Baryphtengus ruficapillus* nestlings in Atlantic Forest of Ilha Grande, RJ, Brasil. *Ararajuba*, 7: 31-34.

Hirshfield, M.F. & Tinkle, D.W. 1975. Natural selection and the evolution of reproductive effort. *Proceedings of the National Academy of Sciences USA*, 72: 2227-2231.

Martins, R.A.; Santos, E.V. & Ferreira, I.M. 2009. Atualização do mapa de remanescente florestal do município de Morrinhos - GO: Utilizando imagem landsat-TM. *Anais do XI Simpósio Regional de Geografia*. 04-07 de setembro, Jataí-GO.

Melo, F.P. & Piratelli, A.J. 1999. Biologia e ecologia do udu-de-coroa-azul (*Momotus momota*: Aves, Momotidae). *Ararajuba*, 7: 57-61.

Murphy, T.G.; Rohwer, V.G. & Scholes, E. 2010. Breeding biology and longevity of Russet-crowned Motmots in central Mexico. *Journal of Field Ornithology*, 81: 13-16.

Orejuela, J.E. 1977. Comparative biology of Turquoise-browed and Blue-crowned Motmots in the Yucatan Peninsula, Mexico. *The Living Bird*, 16: 193-208.

Orejuela, J.E. 1980. Niche relationships between Turquoise-browed and Blue-crowned momots in the Yucatán Peninsula, Mexico. *The Wilson Bulletin*, 92: 229-244.

Pesquero, M.A.; Teixeira Filho, J.C. & Junqueira, D.I. 2012. Desafios da sociedade na produção de alimento, p. 85-102. In: Silva, M.V. & Pesquero, M.A. (eds.). *Caminhos interdisciplinares pelo ambiente, história e ensino*: o sul goiano no contexto. Uberlândia: Editora Assis.

Piratelli, A.J. & Pereira, M.R. 2002. Dieta de aves da região leste de Mato Grosso do Sul, Brasil. *Ararajuba*, 10: 131-139.

Piratelli, A.J.; Siqueira, M.A.C. & Marcondes-Machado, L.O. 2000. Reprodução e muda de penas em aves de sub-bosque na região leste de Mato Grosso do Sul. *Ararajuba*, 8: 99-107.

Remsen Jr., J.V.; Hyde, M.A. & Chapman, A. 1993. The diets of neotropical trogons, motmot, barbets and toucans. *The Condor*, 95: 178-192.

Skutch, A.F. 1947. Life history of the turquoise-browed motmot. *The Auk*, 64: 201-217.

Skutch, A.F. 1971. Life history of the Broad-billed motmot, with notes on the Rufous motmot. *The Wilson Bulletin*, 83: 74-94.

Snow, D.W. 2001. Family Momotidae (Motmots), p. 264-284. In: del Hoyo, J.; Elliott, A. & Sargatal, J. (eds.) Handbook of the birds of the world. v. 6. Barcelona: Lynx Edicions.

Stiles, F.G. 2009. A review of the genus *Momotus* (Coraciiformes: Momotidae) in northern South America and adjacent areas. *Ornitología Colombiana*, 8: 29-75.

Stutchbury, B.J.M. & Morton, E.S. 2001. Behavioral ecology of tropical birds. London: Academic Press.

Associate editor: Caio Graco Machado

Revista Brasileira de Ornitologia, 22(3), 292-296
September 2014

SHORT-COMMUNICATION

Tap patiently, hit safely: a preying tactic of the White Woodpecker on social wasp nests

Ivan Sazima[1]

[1] Museu de Zoologia - Universidade Estadual de Campinas, CP 6109, CEP 13083-970, Campinas, SP, Brazil. isazima@gmail.com

Received on 9 April 2014. Accepted on 26 June 2014.

ABSTRACT: The Neotropical woodpecker *Melanerpes candidus* is one of the few bird species known to attack wasp or bee colonies to feed on the brood and honey of these colonial stinging insects. I describe herein a foraging tactic that lessen the risk posed by the nest-defending Paulistinha wasps (*Polybia paulista*) and allows this woodpecker to feed on the brood with no or little disturbance by the wasps. The bird taps repeatedly on the branch that supports the paper wasp nest, about 2-3 m below the nest. During this process, the nest-defending wasps attack the woodpecker. When the attack is intense, the bird retreats from the nest vicinity only to return instants later. After a while, the woodpecker climbs slowly but steadily towards the nest while tapping continuously, the wasps retreating to the nest top and fleeing away. With the nest largely wasp-free, the bird perches on the nest and preys on the brood. This subtle foraging tactic of *M. candidus* and its driving the wasps away from their nest contrasts with the sudden, rash, and nest-damaging attacks described for other bird species that prey on wasp and bee broods, such the Neotropical falcon *Ibycter americanus* and the Old World buzzards of the genus *Pernis*.

KEY-WORDS: *Melanerpes candidus*, specialized predation, social Hymenoptera.

Very few bird species attack bee and wasp colonies to feed on the brood and honey of these stinging, nest-defending insects. The most iconic plunderers of wasp and bee nests are the Honey Buzzards, species of the Old World accipitrid genus *Pernis* (Thiollay 1994). These birds boldly attack wasp or bee colonies, break a comb piece and fly away to feed on the brood (Figure 1a). Alternatively, they consume the brood on the spot or carry comb pieces to feed their nestlings (Thiollay 1994, Bhardwaj 2008).

A less known wasp nest marauder is the Red-throated Caracara (*Ibycter americanus*), a New World falcon (White *et al.* 1994). This raptor makes bold and quick nest-damaging attacks to drive the wasps away (McCann *et al.* 2013), and once the nest defenders are gone the bird feeds on the brood (Figure 1b). Conversely, this falcon breaks pieces of the nest and feeds on the brood and adults on the pieces fallen to the ground (Sick 1997).

Besides these two raptor genera, there is another pillager on wasp and bee nests: the White Woodpecker (*Melanerpes candidus*), a species confined to South America (Winkler & Christie 2002). This bird is long known as a wasp nest marauder feeding on the brood and honey (Kerr 1892, Chubb 1910, Hempel 1949, Sick 1997), but to the best of my knowledge its foraging tactics are mentioned en passant or are poorly described in the available records that mention attack on wasp nests (see references above).

Herein I provide a documented record of a foraging tactic of the White Woodpecker while preying on the paper nests of a small polistine wasp in Southeastern Brazil. I comment on this tactic and compare it briefly to the foraging tactics of the Red-throated Caracara and the Honey Buzzards, besides providing a few insights on this woodpecker pillager and its prey.

I observed the foraging behaviour of the White Woodpecker on paper wasp nests on three occasions at the Parque Ecológico Prof. Hermógenes de Freitas Leitão Fº (22°48'42''S, 47°04'21''W), Campinas, São Paulo, South-eastern Brazil. This park has a total area of 13.4 ha, of which about 75 % are occupied by a pond surrounded by trees, bushes and grass patches (see Corbo *et al.* 2013 for a sketchy map). The foraging birds were observed with the naked eye and recorded with a 70-300 telephoto zoom lens mounted on a SLR camera from a distance of about 10 m. Throughout the observational sessions I used the "*ad libitum*" and "sequence" samplings (Altmann 1965), both of which are adequate for opportunistic records. The description of the foraging tactic is based on the best-documented episode. Seven wasp individuals and small papery comb pieces containing a few cells are housed as vouchers at the hymenopteran collection of the Museu de Zoologia da Universidade Estadual de Campinas (access number ZUEC-HYM 134).

FIGURE 1. Two bird species renowned for raiding wasp or bee colonies. The Oriental Honey Buzzard (*Pernis ptilorhyncus*: Accipitridae) flies away from a beehive with a comb piece in its talons (a); the Red-throated Caracara (*Ibycter americanus*: Falconidae) uses its bill to dismantle a paper wasp nest fixed to a tree trunk (b). Photo credits: Chongyew Tan (a); Christian Pachaud (b).

The best-substantiated episode of the White Woodpecker (*Melanerpes candidus*) preying on a colony of the Paulistinha paper wasp (*Polybia paulista*) was recorded on 22 February 2014 at noon. When I arrived at the scene (1224 h), the foraging behaviour was already in course and, thus, I am unable to tell how long the whole episode lasted.

A small woodpecker group (three individuals) was calling and flying from one branch to another of an ant tree (*Triplaris americana*) about 12 m tall. Upon a close inspection, I observed a male that was repeatedly and almost continuously tapping at a section of a particular branch (Figure 2a). Looking higher at this branch, I noticed a wasp nest (Figure 2b) whose surface and the lower section of the supporting branch were covered with highly alert wasps, most of them moving actively with open wings and some flying nearby. The wasp colony was at about 8 m from the ground and the bird was tapping at a distance of about 2-3 m below the nest.

While the woodpecker was tapping on the branch that supported the nest, it was approached and attacked by the nest-defending wasps several times mostly on the head and face. The woodpecker snatched and ate some of the attacking wasps, but when their number increased the bird scratched its head, retreated along the branch and finally fled away only to return instants later and resume its branch tapping. When it was about 1 m from the nest the bird began to climb slowly but steadily upwards while tapping continuously (Figure 2c), a behaviour that likely caused the wasps to retreat to the nest top or flee away deserting the nest (Figure 2c-d). Only when the nest surface was essentially wasp-free, the woodpecker approached the nest from behind and quickly perched on its surface (Figure 2e), opened the outer layer and began to feed on the wasp brood within the comb cells. The process from when I first noticed the tapping to the attack to the nest lasted 23 min (1224-1247 h). However, it probably lasted longer as its outset was not recorded. While perched on the nest the woodpecker pulled its head within the nest to reach the brood, and from time to time it tore out pieces of the outer envelope (Figure 2f), thus enlarging its feeding surface and reaching deeper into the nest. The bird worked on the wasp nest for 18 min (1247-1305 h) before it left. At 1304 h it was joined by another male, which attempted to balance itself on the nest together with the first bird. The second bird left at 1307 h, joining the small group perched on another tree about 5 m away. The three birds vocalised and climbed on the branches, but no one came back to the partially destroyed nest for the ensuing 15 min that I remained near the tree. The next day I inspected the further damaged nest, which indicates that the woodpeckers returned later to feed on the remaining brood.

I tested the reaction of the Paulistinha wasp towards a potential predator on an intact nest at the study area, tapping gently the branch about 2 m below the nest, an action that caused the wasps to cover the nest surface and fly nearby. After 10 min, I cautiously advanced about 30 cm towards the nest, still tapping gently, and was almost instantly attacked by a swarm of 20-30 wasps that aimed at, and successfully stung, my head and face. The wasps followed me as far as about 5 m away from their colony.

When attacking paper wasp colonies, the White Woodpecker employs a subtle tactic to reach, and feed on, the brood of the aggressively defended nest of polistine wasps. As far as I am aware, the attacks of this bird on paper wasps' and stingless bees' colonies remain poorly described, if at all. Most authors simply state that groups of this woodpecker attack and break into wasp or bee nests and do not elaborate further (Hempel 1949, Sick 1997, Patterer *et al.* 2003, Winkler & Christie 2002).

Although a small group of the White Woodpecker was actually recorded near the wasp colony, only one individual worked actively towards a situation to minimise the wasp attacks and consequent stings. The continuous, long-lasting and repeated tapping was plausibly the most important feature that caused the wasps to desert the nest. Thus, this woodpecker probably relies on this prolonged tapping to exploit the nest-deserting behaviour that is characteristic of swarm-founding polistine wasps in presence of an external stress on the colony (Jeanne 1991). This mass desertion (termed absconding swarm) comprise all members of the colony (Hunt 2007) and is regarded as an adaptive response to great stress or nest destruction, such as that imposed by numerous or persistent predators (West-Eberhard 1982, McCann *et al*., 2013). The White Woodpecker's tapping behaviour may certainly be regarded as persistent, and as soon as the colony is deserted, the bird safely tears the nest and preys on the brood, as the attack risk from the few wasps remaining nearby is minimal.

The paper wasp *Polybia paulista* is regarded as a highly aggressive species by some authors (Henrique-Simões *et al*. 2011), and hardly aggressive by others (Souza *et al*. 2008). However, given the head scratching and fleeing responses by the tapping White Woodpecker and my own painful experience, I would classify this wasp species as highly aggressive. Alarm recruitment is recorded for the swarm-

FIGURE 2. A foraging tactic employed by the White Woodpecker (*Melanerpes candidus*) to prey on the paper nest of the Paulistinha wasp *Polybia paulista* (Vespidae). The woodpecker taps continuously near the base of the branch that supports the wasp colony (a); the bird approaches the colony from below (**w**), while the alert wasps spread over the nest surface and a section of the supporting branch (b), the woodpecker proceeds to tap and climb upwards while the wasps retreat to the nest top or flee away (c-d); with no active wasps on the colony, the bird climbs to the nest and begins to peck and feed on the wasp brood within the comb cells (e); tearing the outer envelope, the woodpecker enlarges the feeding surface (f).

founding paper wasp *Polybia occidentalis*, and probably occurs in other polistine species (Jeanne 1991). Alarm recruitment seems to occur in *P. paulista* as well, given the quick appearance of numerous individuals on the nest surface when their colony is disturbed even if slightly but persistently, as exemplified by the tapping woodpecker or myself (present paper). Thus, preying on the brood of this and other polistine colonies that are aggressively defended would require specialised tactics, and the persistent tapping by the White Woodpecker qualifies as such.

The brood and possibly honey of colonial stinging and stingless hymenopterans are important in the diet of the White Woodpecker (Kerr 1892, Hempel 1949, Sick 1997, Winkler & Christie 2002, Patterer *et al.* 2003) and this bird probably displays more than one tactic to obtain this food type. Besides the tap-and-attack tactic reported herein, group attacks in which several individuals take turns or made massive attacks on the nests plausibly occur as well, but these still wait to be substantiated. Additional, natural history-oriented observations on this common and widespread woodpecker may shed light on this issue.

The subtle foraging tactic of the White Woodpecker and its driving the wasps away by determinedly tapping on the nest-supporting branch contrasts with the rushing and nest-damaging attacks described for other bird species that prey on wasp and bee broods. For instance, the Red-throated Caracara (*Ibycter americanus*) of the Neotropics relies on "hit-and-run" attacks that damage the nest structure and cause the wasps to desert the nest (McCann *et al.* 2103). Similarly, the Old World buzzards of the genus *Pernis* also employ the hit-and-run tactic, tearing off a comb piece and fly away or consume the brood *in situ* (Thiollay 1994, present paper). Moreover, these raptors deliver comb pieces to feed their nestlings (Huang *et al.* 2004, Bhardwaj 2008).

The foraging behaviour of the White Woodpecker reported herein results from so-called anecdotic, natural history-oriented observations, often disregarded by theory-trained biologists. Nevertheless, this kind of observation draws attention to phenomena that latter may prove more widespread or commoner that previously thought (Maddock *et al.* 2011, Woehler *et al.* 2013, Jaafar & Dexiang 2014). Additionally, natural history-oriented studies may offer new insights (Costa-Pereira 2012, D'Angelo & Sazima 2014, Dinets *et al.* 2014), and bear the potential to address evolutionary and conservation issues (Gerlach 2006, Zuanon *et al.* 2006, Campos e Silva 2012).

ACKNOWLEDGEMENTS

I thank to the staff of the Parque Ecológico Prof. Hermógenes de Freitas Leitão Fº for allowing my field studies at the park; Sidnei Mateus for friendly support and the confirmation of my preliminary identification of the wasps; my family for loving support in the field and at home; the CNPq for an earlier financial support.

REFERENCES

Altmann, J. (1965). Observational study of behavior: sampling methods. *Behaviour*, 49: 227-267.

Bhardwaj, G.S. (2008). Photo essay: a brief glimpse into the private world of the Oriental Honey-Buzzard *Pernis ptilorhynchus*. *Indian Birds*, 4: 154-156.

Campos e Silva, J. V. (2012). Roost of leaftossers (genus *Sclerurus*) in the Brazilian Amazon: hints of the low density in fragmented environments. *Revista Brasileira de Ornitologia*, 21: 129-132.

Chubb, C. (1910). X.-On the birds of Paragway. *Ibis*, 52: 263-285.

Corbo M.; Macarrão A.; D'Angelo G. B.; Almeida C. H.; Silva W. R. & Sazima I. (2013). *Aves do campus da Unicamp e arredores*. Vinhedo: Avisbrasilis Editora.

Costa-Pereira, R. (2012). Small fishes follow large mammals suspending sediment. *Revista Chilena de Historia Natural*, 85: 361-364.

D'Angelo, G. B. & Sazima, I. (2014). Commensal association of piscivorous birds with foraging otters in South-eastern Brazil, and a comparison of such relationship of piscivorous birds with cormorants. *Journal of Natural History*, 48: 241-249.

Gerlach, J.; Muir, C. & Richmond, M. D. (2006). The first substantiated case of trans-oceanic tortoise dispersal. *Journal of Natural History*, 40: 2403-2408.

Hempel, A. (1949). Estudo da alimentação natural das aves silvestres do Brasil. *Arquivos do Instituto Biológico de São Paulo*, 19: 237-268.

Henrique-Simões, M.; Cuozzo, M. D. & Frieiro-Costa, F. A. (2011). Social wasps of Unilavras/Boqueirão Biological Reserve, Ingaí, state of Minas Gerais, Brazil. *Check List*, 7: 656-667.

Huang, K-Y.; Lin, Y-S. & Severinghaus, L. L. (2004). Nest provisioning of the Oriental Honey Buzzard (*Pernis ptilorhynchus*) in Northern Taiwan. *Journal of Raptor Research*, 38: 367-371.

Hunt, J. H. (2007). *The evolution of social wasps*. Oxford: Oxford University Press.

Jaafar, Z. & Dexiang, C. (2014). Goby and shrimp associations: more than meets the eye. *Reef Sites*, doi: 10.1007/s00338-014-1143-4.

Jeanne, R.L. (1991). The swarm-founding Polistinae, p.191-231. *In*: Ross, K. G. & Mathews, R. W. (eds.). The social biology of wasps. Ithaca: Cornell University Press.

Kerr, J. G. (1892). On the avifauna of the lower Pilcomayo. *Ibis*, 1: 120-152.

Maddock, S.; Tolhurst, B.; Brown, M.; Peck, M.; Pérez, E. V. & Morales, J. N. (2011). Body bending behaviour: more widespread than previously thought? New reports from two snake species of Northwest Ecuador. *Herpetology Notes,* 4: 079-081.

McCann, S.; Moeri, O.; Jones, T.; Scott, C.; Khaskin, G.; Gries, R.; O'Donnell, S. & Gries, G. (2013). Strike fast, strike hard: the Red-Throated Caracara exploits absconding behaviour of social wasps during nest predation. *PLoS ONE*, 8: e84114. doi:10.1371/journal.pone.0084114.

Patterer, A. N.; Beltzer, A. H. & Rossetti, M. A. (2003). Dieta de *Melanerpes candidus* carpintero blanco (Aves: Picidae) en el valle de inundación del Río Paraná, Argentina. *Revista FAVE – Ciencias Veterinarias*, 2: 132-139.

Sick, H. (1997). *Ornitologia brasileira, uma introdução*. Rio de Janeiro: Editora Nova Fronteira.

Souza, M. M.; Silva, M. J.; Silva, M. A. & Assis, N. R. G. (2008). A capital dos marimbondos: vespas sociais Hymenoptera, Vespidae do município de Barroso, Minas Gerais. *MG.Biota*, 1: 24-38.

Thiollay, J. M. (1994). Family Accipitridae (hawks and eagles), p.216-277. In: J. del Hoyo, A. Elliot & J. Sargatal (eds.). Handbook of the birds of the world. Vol.2. New World vultures to guineafowl. Barcelona: Lynx Edicions.

West-Eberhard, M. (1982). The nature and evolution of swarming in tropical social wasps (Vespidae, Polistinae, Polybiini). *Social insects in the tropics*. Ciudad Universitaria: Smithsonian Tropical Research Institute.

White, C. M.; Olsen, P. D. and Kiff, L. F. (1994). Family Falconidae (falcons and caracaras), p.52-205. In: J. del Hoyo, A. Elliot & J. Sargatal (eds.). Handbook of the birds of the world. Vol.2. New World vultures to guineafowl. Barcelona: Lynx Edicions.

Winkler, H. and Christie, D. A. (2002). Family Picidae (woodpeckers), p.296-558. In: J. del Hoyo, A. Elliot & J. Sargatal (eds.). Handbook of the birds of the world. Vol.7. New Jacamars to woodpeckers. Barcelona: Lynx Edicions.

Woehler, E .J.; Saviolli, J. Y.; Francini, C. L. B.; Neves, T. and Francini, R. B. (2013). Insect prey of breeding South American Terns. *Marine Ornithology*, 41: 199-200.

Zuanon, J., Bockmann, F. A. and Sazima, I. (2006). A remarkable sand-dwelling fish assemblage from central Amazonia, with comments on the evolution of psammophily in South American freshwater fishes. *Neotropical Ichthyology*, 4: 107-118.

Associate Editor: Carlos Bianchi

Revista Brasileira de Ornitologia, 22(3), 297-299
September 2014

SHORT-COMMUNICATION

Hunting the unexpected: Harris's Hawks (*Parabuteo unicinctus*) preying on bats in a Neotropical megacity

Rubén Ortega-Álvarez[1,2] and Rafael Calderón-Parra[1]

[1] Iniciativa para la Conservación de las Aves de América del Norte-México (NABCI-México), Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO). Liga Periférico-Insurgentes Sur, No. 4903, Col. Parques del Pedregal, Delegación Tlalpan, 14010, Distrito Federal, México.

[2] Corresponding author: rubenortega.al@gmail.com

Received on 6 June 2013. Accepted on 29 June 2014.

ABSTRACT: Many wildlife species have modified their behaviors in order to thrive within cities. Since the 1980's, Harris's Hawk has become a regular resident species in Mexico City, Mexico. Here, we report on what may be an urban adaptation – two Harris's Hawks hunting bats in urban, southern Mexico City. This represents the first formal record of Harris's Hawk preying on bats, either within anthropogenic or natural ecosystems. Cities might facilitate access to novel food resources for particular sorts of species, including urban adaptable ones such as the Harris's Hawk.

KEY-WORDS: Accipitridae, diet, falconry, hunting, Mexico City, raptor, urbanization.

Urban development affects original ecosystems worldwide by altering all levels of biological organization, from ecosystemic to individual ones (Blair 2004, Grimm *et al.* 2008). As a result of the stress and hazards imposed by urbanization, many animals have modified their behavior in order to thrive within urban ecosystems (Ditchkoff *et al.* 2006). Birds are often the focus of urban ecology studies (McKinney 2008), and raptors are a particularly well-studied group (Chace & Walsh 2006). Most raptor studies analyzed the variation of their abundances across urban gradients (Palomino & Carrascal 2007). Other studies determined urban habitat use (*e.g.*, breeding, foraging), the effects of urban development on the size of their home ranges (Chace & Walsh 2006), and the impacts of urban hazards on raptor populations (Dwyer & Mannan 2007). However, little research has been devoted to evaluate the influence of urbanization on raptor behavior.

The Harris's Hawk (*Parabuteo unicinctus*) is a charismatic raptor, mainly because of its unique social hunting strategy and its habitual use in falconry (Bednarz 1988, Dwyer & Bednarz 2011). The response of this hawk to urban development is widely variable throughout its distribution in the Americas (Dwyer & Bednarz 2011). For example, in the U.S., Harris's Hawks initially experienced declines in some areas due to habitat degradation/loss from urbanization, but later some individuals adapted to the altered, urban habitat and are thriving in some urban areas (*e.g.*, Phoenix and Tucson, Arizona; Dawson 1998). In other areas of the continent, urbanization has created new conditions that offer novel resources to the species, resulting in the colonization of urban areas by this hawk (Dwyer & Bednarz 2011). Since the 1980's, Harris's Hawk has become a regular resident species in Mexico City (Gómez de Silva *et al.* 2005), one of the largest metropolitan areas in the world. Originally, this species was not present in the region, however, it is now established in the city as a result of escapes from captivity (Gómez de Silva *et al.* 2005), as it is a common species used in falconry throughout the country. Today, this raptor can be observed in urban parks of Mexico City, where it breeds and hunts mainly for Rock Pigeons (*Columba livia*), rats (*Rattus norvegicus*) and squirrels (*Sciurus aureogaster*; Gómez de Silva *et al.* 2005). A similar, urban phenomenon has been reported for Lima, Peru, where Harris's Hawks are now established (including escaped captives) and are preying primarily on Pacific Doves (*Zenaida meloda*; Beingolea 2010).

The natural history of the Harris's Hawk, including its food habits, is relatively well known. This raptor has a quite flexible diet. It hunts mainly for medium-sized mammals (*i.e.*, hares, rabbits); to a lesser extent, it also preys on small mammals (*i.e.*, rodents), birds (*e.g.*, herons, egrets, ducks, roadrunners, chachalacas, tinnamous, gallinules, doves, quail, small passerines), snakes, frogs, and occasionally on insects, arthropods, and arachnids (Bednarz 1988, Jiménez & Jaksic 1993, Figueroa & González-Acuña 2006, Pache 1974, Pavez *et al.* 2010, Dwyer & Bednarz 2011, Salvador 2012). Nevertheless, there are no published reports about this raptor preying on bats, neither in natural ecosystems nor in anthropogenic ones (reviewed in Coulson & Coulson 2012).

From December 2012 to March 2013, we recorded, on four evenings, a pair of Harris's Hawks hunting bats outside a supermarket located in urban, southern Mexico City, Mexico. This region of the city is highly residential-commercial and it is close (~3km) to major green areas, such as Xochimilco. We observed hawks from a distance of 90m with the aid of 10x42mm binoculars. Our observations were occasional and varied in relation to their duration, ranging from 10 to 25 minutes, between 18:30 and 19:40 hrs. We could not identify hawks' age classes or sexes. For three evenings, hawks arrived together to the site; however, only one of them appeared for the last day of observation. The hawks always showed up at the scene during early sunset (~18:45 hrs) and perched on antennas located on the roof of the supermarket, above (~1m) the bats' roost. From this strategic site, the hawks waited until dusk (~19:10-19:25 hrs), when a few number of bats (~18 individuals/minute) appeared from their roost in a scattered pattern. By using alternatively their both feet, the two hawks stroke bats through a series of short flights, making more than one attempt after a particular bat. If bats flew off, the hawk returned back to the antenna to perch and waited for another bat. Hunting behavior of each hawk was completely independent of the other. As a consequence of the bats' erratic movements, the hawks repeatedly missed in their attempts to catch these mammals, thus, we only witnessed two captures that occurred on different evenings. Immediately after capturing a bat, a hawk flew out of sight with the prey clutched in one foot, followed by the other hawk. We did not determine if both captures were performed by the same hawk. Because of the casual nature of our observations, we did not estimate a capture rate for the recorded individuals. Moreover, we were not able to identify the bats to species. Bat species recorded for this area include *Eptesicus fuscus*, *Myotis sp.*, *Eumops perotis*, *Nyctinomops macrotis*, and *Tadarida brasiliensis* (Ávila-Flores & Fenton 2005).

Although preying on nocturnal bats is not uncommon among certain species of diurnal raptors (*e.g.*, accipiters, hawk-eagles, falcons; Baker 1962, Fenton & Fleming 1976, Speakman 1991), this represents the first formal record of Harris's Hawk hunting and capturing bats. Moreover, the hunting hour is remarkable, as this diurnal raptor usually forages under suitable light conditions. We find the behavior intriguing, as hawks might be expected to hunt for their usual, abundant urban prey (*i.e.*, Rock Pigeon).

Three main factors related to characteristics of the species, energetic costs, and urban habitat properties, could have facilitated the unusual behavior. First, although it prefers medium-sized mammals, this hawk's diet is flexible, enabling it to forage for unusual/novel food resources (Dwyer & Bednarz 2011, Coulson & Coulson 2012). It is also capable of exhibiting considerable flight maneuverability when necessary (*e.g.*, catching small birds; Dwyer & Bednarz 2011), which may also be useful when preying on bats (Baker 1962, Fenton & Fleming 1976). Second, short flights needed for catching bats could be energetically more efficient than capturing fast-flying doves. Finally, artificial, urban light might compensate for low-light conditions at sunset, enhancing this diurnal hawk's vision and facilitating the hunting process on crepuscular and nocturnal prey (*i.e.*, bats). Further studies might elucidate on the role of each of these factors on the reported behavior.

Cities might facilitate the access to novel food resources for particular sorts of species, including urban adaptable ones such as the Harris's Hawk. We believe that urban ethology might benefit from increasing the study of urban wildlife, as the complex effects that urbanization has on ecosystems might detonate unique behaviors, even in well-known species.

ACKNOWLEDGMENTS

We are grateful to Yolanda Barrios for her kind help in editing the English grammar for this manuscript. We acknowledge three anonymous reviewers for their comments, as they highly contributed to enhance the quality of our paper.

REFERENCES

Ávila-Flores, R. & Fenton, M. B. 2005. Use of spatial features by foraging insectivorous bats in a large urban landscape. *Journal of Mammalogy*, 86: 1193-1204.

Baker, K. J. 1962. The manner and efficiency of raptor depredations on bats. *The Condor*, 64: 500-504.

Bednarz, J. C. 1988. Cooperative hunting in Harris' Hawks (*Parabuteo unicinctus*). *Science*, 239: 1525-1527.

Beingolea, O. 2010. Harris' Hawks in Lima, Peru. *American Falconry*, 54: 28-48.

Blair, R. 2004. The effects of urban sprawl on birds at multiple levels of biological organization. Ecology and Society, 9: 2.

Chace, J. F. & Walsh, J. J. 2006. Urban effects on native avifauna: a review. *Landscape and Urban Planning*, 74: 46-69.

Coulson, J. & Coulson, T. 2012. Natural history of the Harris's Hawk, pp. 11-64. In: Coulson, J. & Coulson, T. The Harris's Hawk revolution. Pearl River, LA: Parabuteo Publishing.

Dawson, J. W. 1998. Harris' Hawk, pp. 77-81. In: Glinski, R. L. (ed.). The raptors of Arizona. Phoenix, AZ: University of Arizona Press, Tucson, AZ, and Arizona Game and Fish Department.

Ditchkoff, S. S.; Saalfeld, S. T. & Gibson, C. J. 2006. Animal behavior in urban ecosystems: Modifications due to human-induced stress. *Urban Ecosystems*, 9: 5-12.

Dwyer, J. F. & Bednarz, J. C. 2011. Harris's Hawk (*Parabuteo* *unicinctus*). In: Poole, A. (ed.). The birds of North America online. Ithaca: Cornell Lab of Ornithology. http://bna.birds.cornell.edu/bna/species/146 (access on 23 April 2013).

Dwyer, J. F. & Mannan, W. 2007. Preventing raptor electrocutions in an urban environment. *Journal of Raptor Research*, 41: 259-267.

Fenton, M. B. & Fleming, T. H. 1976. Ecological interactions between bats and nocturnal birds. *Biotropica*, 8: 104-110.

Figueroa, R. A. R. & González-Acuña, D. 2006. Prey of the Harris's Hawk (*Parabuteo unicinctus*) in a suburban area of southern Chile. *Journal of Raptor Research*, 40: 164-168.

Gómez de Silva, H.; Oliveras de Ita, A. & Medellín, R. A. 2005. *Vertebrados superiores exóticos en México: Diversidad, distribución y efectos potenciales*. *Parabuteo unicinctus*. México, D.F.: Instituto de Ecología, Universidad Nacional Autónoma de México, bases de datos SNIB-CONABIO (Proyecto U020).

Grimm, N. B.; Faeth, S. H.; Golubiewski, N. E.; Redman, C. L.; Wu, J.; Bai, X. & Briggs, J. M. 2008. Global change and the ecology of cities. *Science*, 319: 756.

Jiménez, J. E. & Jaksic, F. M. 1993. Observations on the comparative behavioral ecology of Harris' Hawk in central Chile. *Journal of Raptor Research*, 27: 143-148.

McKinney, M. L. 2008. Effects of urbanization on species richness: A review of plants and animals. *Urban Ecosystems*, 11: 161-176.

Pache, P. H. 1974. Notes on prey and reproductive biology of Harris' Hawk in southeastern New Mexico. *Wilson Bulletin* 86: 72-74.

Palomino, D. & Carrascal, L. M. 2007. Habitat associations of a raptor community in a mosaic landscape of Central Spain under urban development. *Landscape and Urban Planning*, 83: 268-274.

Pavez, E. F.; Lobos, G. A. & Jaksic, F. M. 2010. Long-term changes in landscape and in small mammal and raptor assemblages in central Chile. *Revista Chilena de Historia Natural*, 83: 99-111.

Salvador, S. A. 2012. Dieta del Gavilán mixto (*Parabuteo u. unicinctus*) en Villa María, Córdoba, Argentina. *Nuestras Aves*, 57: 21-23.

Speakman, J. R. 1991. The impact of predation by birds on bat populations in the British Isles. *Mammal Review*, 21: 123-142.

Associate Editor: Leandro Bugoni

Revista Brasileira de Ornitologia, 22(3), 300-302
September 2014

SHORT-COMMUNICATION

Black-throated Antshrike preys on nests of social paper wasps in central French Guiana

Sean Mccann[1,2], Onour Moeri[1], Tanya Jones[1] and Gerhard Gries[1]

[1] Department of Biological Sciences - Simon Fraser University, Burnaby, BC, Canada V5A 1S6
[2] Corresponding author: smmccann@sfu.ca

Received on 7 April 2014. Accepted on 21 July 2014.

ABSTRACT: We studied predation by birds on nests of neotropical social paper wasps at the Inselberg camp of the Nouragues Reserve in Central French Guiana, an minimally-disturbed lowland rainforest habitat. Seven meters above ground, we built recording arenas and fitted them with motion-detecting video cameras. We transferred active wasp nests from surrounding forest to the arenas to film bird predators of wasps. In a video recording taken on 13 April 2010, we documented predation by a male Black-throated Antshrike, *Frederickena viridis,* on nests of *Polybia scrobalis* and *P. bistriata*. In rapid fly-bys, the antshrike repeatedly struck the wasp nests with his beak and in the process knocked parts of the nest to the ground. After the wasps absconded, he perched next to the nest of *P. bistriata* and fed on the wasp larvae and pupae. This predation tactic and type of prey was previously not known for *F. viridis.* Also, *F. viridis* apparently forages in higher strata of the forest than previously recorded.

KEY-WORDS: Black-throated Antshrike, predation, social wasps, *Polybia*, *Frederickena viridis.*

Social wasps have evolved nest defenses, such as stinging, biting and venom spraying that largely deter most vertebrate predators. Some Neotropical bird species have even evolved a tendency to nest near these fearsome insects in order to gain protection from other vertebrate predators, such as capuchin monkeys (Joyce 1993). Nonetheless, social wasp nests offer a valuable source of nutrition to animals capable of withstanding the defensive behaviors of the worker wasps. *Polybia* is a speciose genus of swarm-founding social wasp that builds enveloped nests attached to branches and leaves (Richards 1978, Jeanne 1991). They primarily use stinging as a means of defense against vertebrate predators.

We studied predation by birds on nests of several species of *Polybia* wasps around the Inselberg Camp within the Nouragues Reserve in French Guiana (4°05' N - 52°41' W) (McCann *et al.* 2010), a low-altitude rainforest habitat far from human settlement (Charles-Dominique 2001). In the rainy season (January-April) of 2010, we recorded bird predation on wasp nests at recording arenas (McCann *et al.* 2013) that we had constructed about 7 m above ground in three trees 100 m northeast of the camp. Each arena consisted of four crosspieces, the two upper ones of which each bearing a spring clip for the attachment of a transplanted wasp nest. We transplanted nests from surrounding forest at night to avoid losing worker wasps from the nests. We equipped the arena with four 540 TV line resolution security video cameras (Aartech Canada, Oshawa ON, Canada) and recorded video with a 4-channel security digital video recorder (ChannelVision DVR 4C, ChannelVision Technology Costa Mesa, CA, USA) housed in a shelter within the camp. The DVR recorded video at 15 frames per second at 640 × 480 pixel resolution, with a 5-s recording buffer to record events prior to motion detection. We mounted a nest of *Polybia scrobalis* and one of *P. bistriata* (Figure 1) in the arena for recording sessions in April 2010.

The *P. scrobalis* nest (8 cm in diameter, 5 cm high) was still attached to a large *Philodendron* leaf, and the *P. bistriata* nest (8 cm in diameter, 7 cm high) was attached to an *Astrocaryum* palm leaf.

On the morning of 13 April 2010, a male Black-throated Antshrike, *Frederickena viridis,* attacked both wasp nests in rapid fly-by strikes (McCann 2010, online video), hitting the nests with his beak. In the attack on the *P. scrobalis* nest, which commenced at 06:38, the antshrike struck the nest from below and repeated the same type of attack 24 s later. In total, he struck the nest 5 times in this manner. These strikes correspond to the "sally-strike" sensu Remsen and Robinson (1990). Several times between strikes, he perched nearby looking at the nest. He also killed and dropped two adult wasps which appeared to be attacking him. During the last strike on the *P. scrobalis* nest at 6:40:24, a large portion of the nest fell to the ground.

At 6:49:04, the antshrike struck the *P. bistriata*

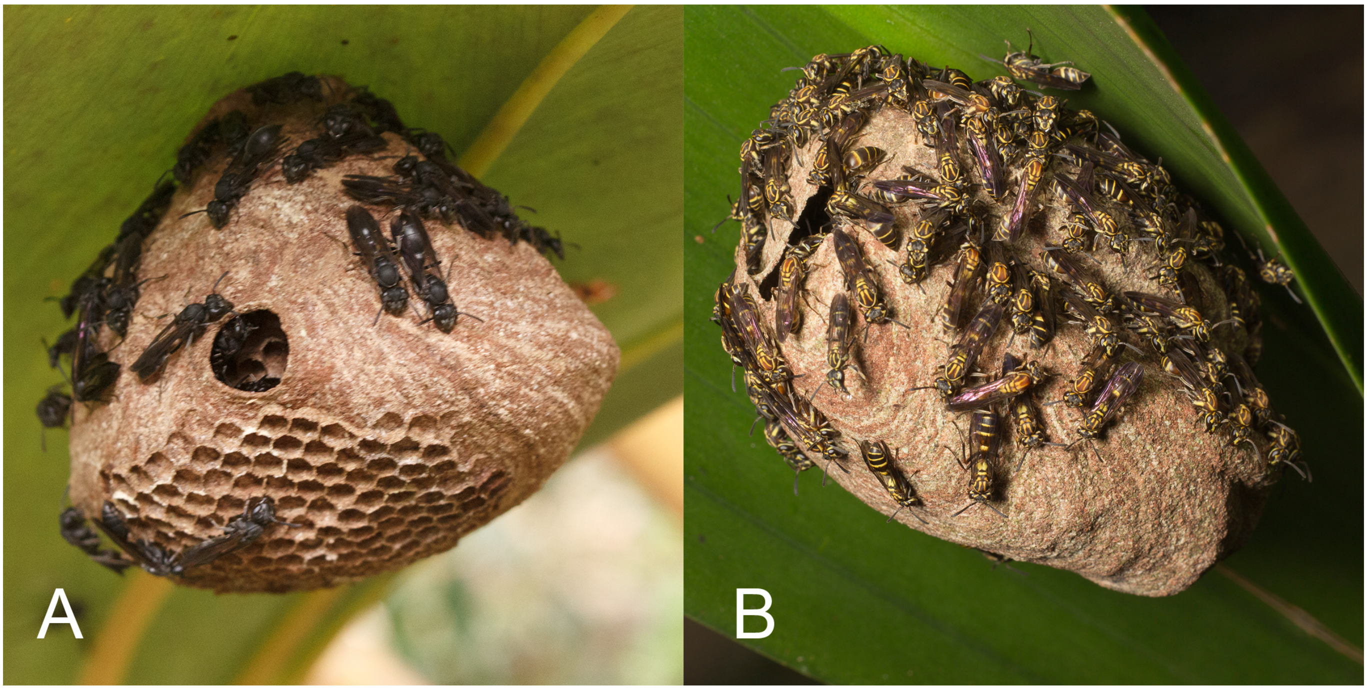

FIGURE 1. Representative photographs of nests of *Polybia scrobalis* (A) and *Polybia bistriata* (B). Nests of these species were attacked and fed upon by a male Black-chinned Antshrike *Frederickena viridis* at the Nouragues Station, French Guiana 13 April, 2010.

nest with his beak from below, and repeated the same type of attack six times between 6:49:40 and 7:19. At 7:19:14, he perched immediately adjacent to the nest, and at 7:19:25 he began to eat larvae and pupae from the remains of the nest. No adult wasps molested the antshrike at this time. The bird fed for 76 s and departed at 7:21:03. It is noteworthy that this Black-chinned Antshrike was thus foraging 7-m above the ground, which is higher than typically reported for this species (Zimmer & Isler 2003).

One hour following the antshrike's attacks, we examined the fragments of both nests that were still attached to substrate and found no remaining brood. Similarly, all the brood cells of the nest fragments on the forest floor that the antshrike had dislodged were empty, likely because the antshrike had eaten the brood after knocking the nest to the ground. Swarms of adult wasps from both nests clustered on leaves near their former nest site. These swarms of reproductive females and workers will disperse, seek new nest sites, and found new colonies, a phenomenon known as absconding (Jeanne 1991, West-Eberhard 1982). The antshrike appeared to induce the absconding response of these swarm-founding polistine wasps when it knocked their nests to the ground. Absconding behaviour of swarm-founding polistine wasps was also evident during attacks on *Polybia* nests by the Red-throated Caracara, *Ibycter americanus,* a falconid specialist predator of social wasps (McCann *et al.* 2010, 2013). Unlike the antshrike, caracaras were not attacked by *P. scrobalis* although they were attacked by *Polybia jurinei* and *Polybia affinis*.

Other Neotropical birds have also been reported to forage on wasp nests, such as American Kestrels (*Falco sparverius*), Lineated Woodpeckers (*Dryocopus lineatus*; Raw 1997), Gray-headed Kites (*Leptodon cayanensis*; Windsor 1976; and Summer Tanagers (*Piranga rubra*; Alvarez del Toro 1950). Tanagers appear to slaughter the adults before consuming the nest. The American Kestrel and Lineated Woodpeckers perch on the nest and are not attacked by their prey. Gray headed Kites appear to knock nests to the ground, or tear into nests from a nearby perch.

In conclusion, we present the first record of a Black-throated Antshrike attacking nests, and eating the brood of social wasps. Whether wasp larvae and pupae constitute regular or occasional prey items for the Black-throated Antshrike is yet to be investigated. It is possible that many other bird species may similarly exploit social wasps as prey.

ACKNOWLEDGEMENTS

We thank P. Gaucher and P. Chatelet for technical assistance in the rainforest, and J. Carpenter of AMNH for identifying wasp specimens. Funding was provided by three Project Amazonie research grants from the Centre National de la Recherche Scientifique to S.M. for travel and accommodation at the Nouragues Station in French Guiana, and by a Natural Sciences and Engineering Research Council of Canada (NSERC) – Industrial Research Chair to G.G.

REFERENCES

Alvarez del Toro, M. 1950. A Summer Tanager, *Piranga rubra*, annihilates a wasp nest. *The Auk*, 67(3), 397.

Charles-Dominique, P. 2001. The Field Station. *In* Nouragues: Dynamics and Plant-Animal Interactions in a Neotropical Rainforest. (F. Bongers, P. Charles-Dominique, P.-M. Forget & M. Théry, eds.). Dordrecht: Kluwer Academic Publishers

Jeanne, R. L. 1991. The swarm-founding Polistinae. In K. G. Ross & R. W. Matthews (Eds.), The Social Biology of Wasps (pp. 191-231). Ithaca, NY: Cornell University Press.

Joyce, F. J. 1993. Nesting success of rufous-naped wrens is greater near wasp nests. *Behavioral Ecology and Sociobiology*, 32(2), 71-77. doi:10.1007/BF00164038

McCann, S. 2010. Black-throated Antshrike attacking nests of *Polybia* wasps. (video online). Retrieved 17:36, Aug 08, 2014 (GMT) DOI: http://dx.doi.org/10.6084/m9.figshare.1132643

McCann, S., Moeri, O., Jones, T., O'Donnell, S. & Gries, G. 2010. Nesting and nest-provisioning of the Red-throated Caracara (*Ibycter americanus*) in Central French Guiana. *Journal of Raptor Research*, 44(3), 236-240. doi:10.3356/JRR-09-75.1

Mccann, S., Moeri, O., Jones, T., Scott, C., Khaskin, G., Gries, R., O'Donnell, S. & Gries, G. 2013. Strike fast, strike hard: the Red-Throated Caracara exploits absconding behavior of social wasps during nest predation. *PLOS ONE*, 8(12), e84114. doi:10.1371/journal.pone.0084114

Raw, A. 1997. Avian predation on individual neotropical social wasps (Hymenoptera, Vespidae) outside their nests. *Ornitologia Neotropical*, 8, 89-92.

Remsen Jr, J. V, & Robinson, S. K. 1990. A classification scheme for foraging behavior of birds in terrestrial habitats. *Studies in Avian Biology*, 13, 144-160.

Richards, O. W. 1978. The social wasps of the Americas excluding the Vespinae. London: British Museum (Natural History).

West-Eberhard, M. J. 1982. The nature and evolution of swarming in tropical social wasps (Vespidae, Polistinae, Polybiini. In S. Turillazzi & M. J. West-Eberhard (Eds.), Social Insects in the Tropics (pp. 97-128). Paris: Universite de Paris-Nord.

Windsor, D. D. M. 1976. Birds as predators on the brood of *Polybia* wasps (Hymenoptera: Vespidae: Polistinae) in a Costa Rican deciduous forest. *Biotropica*, 8(2), 111-116.

Zimmer, K. J., & Isler, M. L. 2003. Black-throated Antshrike. In J. del Hoyo, A. Elliot, & D. Christie (Eds.), Handbook of the Birds of the World Volume 8 (p. 537). Barcelona: Lynx Editions.

Associate Editor: Carla Fontana

Revista Brasileira de Ornitologia, 22(3), 303-304
September 2014

SHORT-COMMUNICATION

The Grey-bellied Shrike Tyrant (*Agriornis micropterus*), a new tyrant flycatcher for Brazil

Gina Bellagamba[1], Danielle Bellagamba-Oliveira[2] and Rafael Antunes Dias[3, 4]

[1] Rua Domingos de Almeida, 1580, CEP 97500-002, Uruguaiana, RS, Brazil.
[2] Programa de Pós-Graduação de Zootecnia, Laboratório de Ecologia Vegetal Campestre, Universidade Federal de Pelotas, Campus Universitário Capão do Leão, CP 354, CEP 96010-610, Pelotas, RS, Brazil.
[3] Departamento de Ecologia, Zoologia e Genética, Instituto de Biologia, Universidade Federal de Pelotas, Campus Universitário Capão do Leão, CP 354, CEP 96010-900, Pelotas, RS, Brazil.
[4] Corresponding author: rafael.dias@ufpel.edu.br

Received on 21 August 2013. Accepted on 9 May 2014.

ABSTRACT: Here we report on the first record of the Grey-bellied Shrike Tyrant (*Agriornis micropterus*) for Brazil. An individual of this species was observed and photographed on 8 September 2012 at “Estância Tarumã”, Uruguaiana, state of Rio Grande do Sul. The individual observed probably belonged to populations nesting in central-southern Argentina and migrating to northern Argentina, Bolivia, and Paraguay during the austral winter. More records are necessary to determine the status of occurrence of this species in Brazil.

KEY-WORDS: Extralimital record, geographical distribution, migration, pseudo-vagrancy, Rio Grande do Sul, vagrancy.

The Grey-bellied Shrike Tyrant (*Agriornis micropterus*) breeds in open shrubby steppes and grasslands from southern Peru to the Argentinean province of Santa Cruz (Fitzpatrick 2004). Southernmost populations are migratory, leaving their breeding grounds in late summer and spending the austral autumn and winter in southern Bolivia, Paraguay, Uruguay, and most of northern Argentina (Fitzpatrick 2004). The species is rare in Paraguay and Uruguay, while in Brazil it has not yet been detected (Fitzpatrick 2004).

On 8 September 2012 at 08:15 h, GB and R. Oliveira de Oliveira observed and photographed an unidentified bird (Figure 1) at Estância Tarumã (30°00'16.40''S, 56°28'13.71''W), Uruguaiana, in extreme western of Rio Grande do Sul, Brazil. The bird was atop a fencepost in a pasture near small patches of the bush *Aloysia virgata* (Ruiz & Pav.) Pers. along the BR 290 highway. Vegetation in the region comprises mainly of natural grasslands used for livestock raising.

The bird was later identified as a Grey-bellied Shrike Tyrant based on its strong and hooked bill, dark eye, prominent whitish supraloral, and dark tail with a narrow white tip and white outer web of the outer rectrix (Fjeldså & Krabbe 1990, Ridgely & Tudor 1994). The overall brownish plumage, pale cinnamon-brown underparts and weak throat markings suggest a young individual (Fjeldså & Krabbe 1990). C. E Agne, A. Rocchi and A. Azpiroz examined the photographs and confirmed the identity of the bird.

The Grey-bellied Shrike Tyrant can only be confused with three other large members of genus *Agriornis*. However, a series of field marks – all visible in Figure 1 – allow for a safe diagnosis. The dark tail readily separates it from both the Black-billed Shrike Tyrant (*A. montanus*) and the White-tailed Shrike Tyrant (*A. albicauda*), while the prominent supraloral and the more sharply and contrastingly white outer web of the outermost tail feather distinguish it from the larger Great Shrike Tyrant (*A. lividus*). Furthermore, all these three species are sedentary and largely restricted to the Andean and Patagonian regions (Fitzpatrick 2004), which makes their occurrence in Brazil unlikely.

This was the first time the species was recorded at Estância Tarumã in nearly three years of observations. The Grey-bellied Shrike Tyrant is also rare in adjacent northern Uruguay and northeastern Argentina (Fitzpatrick 2004, Narosky & Di Giacomo 1993). Distribution maps in Fjeldså & Krabbe (1990), Ridgely & Tudor (1994) and Fitzpatrick (2004) indicate that populations breeding in southern Argentina migrate north to the Monte, Espinal and Chaco Zones, mostly west of the Paraná River. However, since the Espinal also fringes the Uruguay River in extreme western Rio Grande do Sul (Waechter 2002), the possibility that the

FIGURE 1. Grey-bellied Shrike Tyrant (*Agriornis micropterus*) photographed at Estância Tarumã, Uruguaiana, Rio Grande do Sul state, Brazil, on 8 September 2012. Note the diagnostic hooked bill, prominent supraloral, and the dark, white tipped tail with white outer web of the outer rectrix.

species is a regular, low-density migrant in Brazil cannot be ruled out. Western Rio Grande do Sul is one of the least explored areas of the state in ornithological terms. Not surprisingly, surveys conducted in this region in the past few years have produced a series of new state and country records (Bencke *et al.* 2010; Bellagamba & Oliveira 2012). Additional observations are therefore needed to elucidate if the occurrence of *A. micropterus* in southern Brazil is related to vagrancy or pseudo-vagrancy (see Gilroy & Lees 2003).

Considering that some southern migratory tyrannids have been named *gaúcho* in Brazil, including the congeneric Lesser Shrike-Tyrant (*Agriornis murinus*) (Dias *et al.* 2010), we propose the portuguese name of *gaúcho-de-barriga-cinza* (Grey-bellied Gaucho) for the species.

ACKNOWLEDGMENTS

Glayson A. Bencke provided valuable contributions to the manuscript. We thank Carlos Eduardo Agne, Adrián Azpiroz and Alfredo Rocchi for confirming the identification of the species. We are also indebted to Ricardo Oliveira de Oliveira for his constant support and company in the field.

REFERENCES

Bellagamba, G. & Oliveira, D. B. 2012. Primeiro registro do tio-tio-pequeno, *Phacellodomus sibilatrix* (Passeriformes: Furnariidae) no Brasil. *Revista Brasileira de Ornitologia*, 20:158-160.

Bencke, G. A., Dias, R. A., Bugoni, L., Agne, C. E., Fontana, C. S., Maurício, G. N. & Machado, D. B. 2010. Revisão e atualização da lista das aves do Rio Grande do Sul, Brasil. *Iheringia. Série Zoologia*, 100:519-556.

Dias, R. A., Gianuca, A., Vizentin-Bugoni, J. & Coimbra, M. A. A. 2010. New documented records for two bird species in southernmost Brazil, including the first mention of *Agriornis murinus* for the country and comments on vagrancy. *Revista Brasileira de Ornitologia*, 18:124-129.

Fitzpatrick, J. W. 2004. Family Tyrannidae, p. 170-462. In: del Hoyo, J.; Elliot, A. & Christie, D. (eds). *Handbook of the birds of the world*, v. 9. Barcelona: Lynx Edicions.

Fjeldså, J. & Krabbe, N. 1990. *Birds of the high Andes*. Copenhagen: Apollo Books.

Gilroy, J. J. & Lees, A. C. 2003. Vagrancy theories: are autumn vagrants really reverse migrants? *British Birds*, 96:427-438.

Narosky, T. & Di Giacomo, A. G. 1993. *Las aves de la Provincia de Buenos Aires: distribución y status.* Buenos Aires: Asociación Ornitológica del Plata, Vázquez Mazzini & L.O.L.A.

Ridgely, R. S. & Tudor, G. 1994. *The birds of South America*, v. 2. The suboscine passerines. Austin: University of Texas Press.

Waechter, J. L. 2002. Padrões geográficos na flora atual do Rio Grande do Sul. *Ciência & Ambiente*, 24:93-108.

Associate Editor: Alexandre Aleixo

Revista Brasileira de Ornitologia, 22(3), 305-306
September 2014

SHORT-COMMUNICATION

Predation of Green Iguana (*Iguana iguana*) by Guira cuckoo (*Guira guira*) in Northeastern Brazil

Alysson Guedes Coutinho[1,4], Kalyl Sivino Serra[2], Luís Gonzaga Sales Junior[2] and Daniel Cassiano Lima[3]

[1] Universidade Federal da Paraíba, Programa de Pós-Graduação em Ciências Biológicas, Departamento de Sistemática e Ecologia, Cidade Universitária, Campus I, CEP 58.051-900, João Pessoa, PB, Brazil.
[2] Universidade Estadual do Ceará, Curso de Ciências Biológicas, Av. Paranjana, 1700, CEP 60.714.903, Fortaleza, CE, Brazil.
[3] Universidade Estadual do Ceará, Faculdade de Educação de Itapipoca (FACEDI), Av. Monsenhor Tabosa, CEP 62.500-000, Itapipoca, CE, Brazil.
[4] Corresponding Author: guedescoutinho@gmail.com

Received on 9 October 2013. Accepted on 26 June 2014.

ABSTRACT: The Guira Cuckoo is an opportunistic species, with a carnivorous preference, preying mainly on arthropods. Here we make the first report on the consumption of Green Iguana (*Iguana iguana*) by the Guira Cuckoo.

KEY-WORDS: Cuculidae, diet, lizard.

Guira Cuckoo is an opportunistic species with a carnivorous preference that feeds mainly on arthropods (Schubart *et al.* 1965; Kokubum and Zacca, 2003; Mesquita, 2009). Food items included in the Guira Cuckoo's diet have been reported by several authors (Marelli, 1919; Alvarez, 1933; Zotta, 1940; Hudson, 1974; De La Peña, 1977; Beltzer, 1995; Soave *et al.* 2008; Mesquita, 2009; Repenning *et al.* 2009; and Morais *et al.* 2013). However, none of these sources report the reptile *Iguana iguana* serving as prey to the Guira Cuckoo. Here we report the first record of a Guira Cuckoo preying on a Green Iguana in Brazil.

We observed the event on January 13th 2013, around 14h in a non-urbanized *Caatinga* area with predominance of few large trees and some shrubs, near the city of Nova Jaguaribara, Ceará, Brazil (05°30'15'' S and 38º26'34'' W).

While observing a group of eight individuals of *G. guira* foraging on the floor near the base of a cashew tree (*Anacardium occidentale*), we noticed that one of the individuals caught a prey and flew up to the tree. The prey was identified as a juvenile individual of Green Iguana *Iguana iguana*, characterized by its approximate size of 30 cm, with vivid green colour and the absence of a dorsal row of spines (Figure 1).

For a few moments, the bird deposited the felled prey on the branch of a tree, deferring several pecks on the head and body of the prey. Sometimes the bird held the prey on its beak, apparently mindful to the approach of any other bird that could compete for the prey. At a given moment three other individuals of *G. guira* landed on the same branch, and then the bird took off with the prey on its beak for a given location that could not be monitored, making it impossible to observe the intake of the prey.

Reviewing the main studies involving *G. guira*, none reports *I. iguana* as part of its diet, although other lizards such as *Ophioides vertebralis* and *Anguidae* sp. have been reported, along with various species of amphibians and even unidentified reptiles (Beltzer, 1995; Soave *et al*, 2008; Repenning *et al*, 2009). Therefore, we can consider that our record is the first of a *G. guira* preying on a reptile with the size of an *Iguana iguana*, the only species of the genus to occur in Brazil.

FIGURE 1. *Guira guira* preying an individual of *Iguana iguana* on a tree in a non-urbanized area of *Caatinga*, near the city of Nova Jaguaribara, Brazil.

ACKNOWLEDGEMENT

We thank the Departamento Nacional de Obras Contra as Secas (DNOCS), for the accommodation and support provided during our stay in place; The Mayor of Nova Jaguaribara, for logistical support, the Conselho Nacional para o Desenvolvimento Científico e Tecnológico (CNPq), for financial support, Dr. Arnóbio de Mendonça Cavalcante from Instituto Nacional do Semiárido (INSA) and the Anonymous reviewers.

REFERENCES

Alvarez, T. 1933. Observaciones biológicas sobre las aves Del Uruguay. *An. Museo de Historia Natural*. Montevideo, 4: 1-50.

Beltzer, A. H. 1995. Biología alimentaria del Pirincho *Guira guira* (Aves: Cuculidae) en el valle aluvial del río Paraná medio, Argentina. *Revista Ecologica de Latina Am*erica. 2: 13-18.

De La Peña, M. R. 1977. *Aves de La provincia de Santa Fe*. Castellví. Santa Fe. 45: 93-123.

Hudson, G. E. 1974. *Aves del Plata. Libros de Hispanoamérica*, Buenos Aires.

Kokubum, M. N. C. & Zacca, W. 2003. Physalaemus cf. fuscomaculatus (NCN). Predation. *Herpetological Review*. 34:232-233.

Marelli, C. A. 1919. Sobre el contenido del estómago de algunas aves. *Hornero* 1: 221-228.

Mesquita, P. C. M. D. de. 2009. A record of predation on a poisonous toad *Rhinella granulosa* (Anura, Bufonidae) by Guira Cuckoo *Guira guira* (Cuculidae, Crotophaginae) in the state of Ceará, Brazil. *Revista Brasileira de Ornitologia*, 17: 84-85.

Morais, A. R., Siqueira, M. N. & Bastos, R. P. 2013. Predation on a Neotropical treefrog (*Scinax* aff. *fuscovarius*) by *Guira guira* (Aves, Cuculidae) in the state of Goiás, Central Brazil. *Herpetological Notes*. 6: 567-568

Repenning, M., Basso, H. C. de P., Rossoni, J. R., Krügel, M. M. & Fontana, C. S. 2009. Análise comparativa da dieta de quatro espécies de cucos (Aves: Cuculidae), no sul do Brasil. *Zoologia* 26: 443-453.

Schubart, O., Aguirre, A. C. & Sick, H. 1965. Contribuição para o conhecimento da alimentação das aves brasileiras. *Arquivos de Zoologia*, 12:95-249.

Soave, G. E., Darrieu, C. A., Aribalzaga, M. E., Camperi, A. R., Lucía, M., Williams, J. & Juarez, M. 2008. Dieta del Pirincho (*Guira guira*) em el nordeste de la província de Buenos Aires, Argentina (Cuculiformes: Cuculidae). *Revista de Biologia Tropical*. Vol. 56: 1883-1892.

Zotta, A. 1940. Lista sobre el contenido estomacal de aves argentinas. *Hornero* 7: 402-411.

Associate Editor: Cristiano Schetini

Revista Brasileira de Ornitologia, 22(3), 307-310
September 2014

SHORT-COMMUNICATION

A case of partial leucism in the American Barn Owl (*Tyto furcata*) (Temminck, 1827), from Buenos Aires province, Argentina

María Cecilia Chiale[1,2,4] and Luis Pagano[1,3]

[1] División Zoología Vertebrados, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, Paseo del Bosque s/n (1900), La Plata, Buenos Aires, Argentina.
[2] Consejo Nacional de Investigaciones Científicas y Técnicas.
[3] GRUPO FALCO. www.grupofalco.com.ar
[4] Corresponding author: ceciliachiale@fcnym.unlp.edu.ar

Received on 6 May 2014. Accepted on 9 September 2014.

ABSTRACT: The diverse colorations of a birds' plumage are due to either structural colors or pigments that are synthesized in specialized cells or incorporated through the diet. However, plumage color aberrations can occur; several cases of albinism and leucism have been reported for different bird species and some examples are found in Strigiformes. A specimen of the American Barn Owl (*Tyto furcata*) with partial leucism was found in Carhué, Buenos Aires province. The plumage of its facial disc, tail and the ventral region was completely white; furthermore, the neck, primaries, and secondaries were pigmented although in a significantly lighter fashion than in normal-phenotype specimens. The rest of the body presented a normal pattern for the species.

KEY-WORDS: Birds, melanins, pigmentation, plumage, Strigiformes.

Bird plumages present diverse colorations, some of which are due to structural colors and/or to several pigments. In turn, pigments may be divided into three categories, namely:

1) Melanins, being derived from the aminoacid tyrosin and synthesized in melanoblasts; there are two types of melanins: eumelanins (*i.e.* big and regular granules that produce dark browns, greys and black colors), and pheomelanins (*i.e.* irregular granules which originate different types of reddish brown and yellow pigmentation);

2) Carotenoids, which must be incorporated through the diet and then modified by enzimatic reactions into diverse compounds that give the plumage bright red, orange, yellow and some violet and ultraviolet coloration; and

3) Porfirins, chemically related to hemoglobin, the better known of which are turacin (magenta) and turacoverdin (bright green) (these elements are very unstable and they can be easily destroyed by the sun; Gill 2007).

Plumage aberrations are common in birds. In the case of leucism, there is a total absence of a particular pigment (*e.g.* melanin or pheomelanin) either in the entire plumage or in some feathers. As a result, the whole plumage or distinct feather-groups are white (Nemésio 1999). However, leucistic birds have normal pigmentation in other regions such as the bill, eyes and legs, unlike the case of albinism (Van Grouw 2006). Leucism can be the result of a genetic disorder in the melanin biosynthesis pathway (Van Grouw 2006). Other cases of leucism are related to disorders in the deposition of carotenoid pigments, as it was observed in a population of barn swallows (*Hirundo rustica*), which had been temporarily affected by radioactive contamination at Chernobyl, Russia. These birds presented partial leucism (wrongly called "partial albinism") in the head feathers (Møller & Mousseau 2001).

The occurrence of leucistic birds does not exceed 1% in the wild (Sage 1963, Bensch *et al.* 2000), with a few cases recorded in different bird families of non-Passeriformes and Passeriformes (Zapata & Novatti 1979, 1995), such as Anatidae (Wilson *et al.* 2006), Spheniscidae (*Pygoscelis sp*., Forrest & Naveen 2000; and *Aptenodytes patagonicus*, Voisin *et al.* 2002), Procellariidae (Mancini *et al.* 2010), Sulidae (Van Grouw *et al.* 2011), Cathartidae (Hosner & Lebbin 2006, Figueroa *et al.* 2011), Accipitridae (Van Grouw 2011, Robb & Pop 2012), Charadriidae (Cestari & Vernaschi Vieria Da Costa 2007), Columbidae (Contreras Balderas & Ruiz Campos 2011, Costa Correa *et al.* 2013), Emberizidae (Acosta Broche 2005, Grilli *et al.* 2006), Turdidae (Campos Gonçales Junior *et al.* 2008, Azzarri *et al.* 2011), and Corvidae (Van Grouw 2014), among others.

During periodic field-work sampling at Carhué (37º10', 62º45'W), SW Buenos Aires province, a pair of American Barn Owls (*Tyto furcata*) was found in an old abandoned barn. One of them caught our attention because the plumage of its facial disc, tail and the ventral region was entirely white; furthermore, the neck, secondaries, and primaries were pigmented, albeit in a significantly lighter fashion than in specimens with a normal pigmentation. On the other hand, the tertiaries, covert feathers, and alula had a normal pigmentation. This combination of white and colored feathers denoted a characteristic pattern (Figure 1). This leucistic individual was observed and photographed in the same place during April 2013 and a year later, in March 2014, along with another individual with normal plumage (Figure 2). No breeding records are available for these birds, thus, it is not known whether the leucistic condition could affect the breeding success of the specimen in question.

Previous studies have found no differences in life expectancy and reproductive success of leucistic- and normal-phenotypes of several bird species, such as Great Reed warblers (*Acrocephalus arundinaceus*, Bensch *et al.* 2000) and other Strigiformes (Ajala & Mikkola 1997). However, McCardle (2012) reported the death at two months of age of a leucistic specimen of the great horned owl (*Bubo virginianus*). If any, the adverse consequences

Figure 1. An American Barn Owl *Tyto furcata* with partial leucism from Carhué, Buenos Aires province, Argentina. Photograph taken on March 22, 2014 by M.C. Chiale.

Figure 2. Leucistic and normal-phenotype American Barn owls (*Tyto furcata*) specimens from Carhué, Buenos Aires province, Argentina. Photograph taken on April 30, 2013 by L.G. Pagano.

of leucism in birds might compromise aspects such as camouflage and prey capture, but not their vision. Leucistic birds have normal eye pigmentation and this fact relates directly to a normal visual system; therefore, they should not have vision problems that might interfere with prey search (Van Grouw 2006).

According to several authors, albinism and leucism are rare among Strigiformes (Gross 1965, Ajala & Mikkola 1997). However, few species have been reported with such chromatic aberrations (Ajala & Mikkola 1997). Leucism was reported in burrowing owls (*Athene cunicularia*) by Sutton (1912), Ajala & Mikkola (1997), and most recently by Motta-Junior *et al*. (2010). A recent reference (Nogueira & Alves 2011) reports a specimen with its entire plumage being white but its eyes, legs and beak having a normal pigmentation. Likewise, a leucistic Austral pigmy owl (*Glaucidium nana*) was reported from Parque Nacional Los Alerces, Chubut province, Argentina (Comisso 2012). Previous reports for leucistic barn owls (*T. alba*) are from a male belonging to a private collection in Norfolk, England, a specimen which was completely white but with normal coloration eyes (Alaja & Mikkola 1997). As far as we know, this contribution represents the first report of partial leucism in the American barn owl (*T. furcata*).

ACKNOWLEDGMENTS

We thank Dr. Pablo A. Chiale for his useful comments and revision of this note and Jerónimo Pan for improving the English of the final version.

REFERENCES

Acosta Broche, L. 2005. Primer caso conocido de leucismo parcial en *Tiaris olivacea* en Cuba. *Huitzil*, Vol. 6 (2): 14-15.

Ajala, P. & Mikkola, H. 1997. Albinism in the Great Grey Owl (*Srix nebulosa*) and other owls. In: J. R. Duncan, D. H. Johnson and T. H. Nicholls (eds.) Biology and conservation of owls of the Northern hemisphere. Washington, D.C.: USDA Forest Service (General Technical Report NC-190), p. 33-37.

Azzarri, D. E., Ferro, L. & Grilli, P. G. 2011. Leucismo en dos especies de zorzales en la Argentina. *Nótulas Faunísticas*, 74 (2): 1-3.

Bensch, S., Hansson, B., Hasselquist, D. & Nielsen, B. 2000. Partial albinism in a semi-isolated population of Great Reed Warblers. *Hereditas*, 133: 167-170.

Campos Gonçales Junior, C., da Silva, N. A., Cordeiro De Luca, A., Pongiluppi, T. & de Barros Molina, F. 2008. Record of a leucistic Rufuos-bellied Thrush *Turdus rufiventris* (Passeriformes, Turdidae) in Sao Paolo City, Southeastern Brazil. *Revista Brasileira de Ornitología*, 16 (1): 72-75.

Cestari, C. & Vernaschi Viera Da Costa, T. 2007. A case of leucism in Southern Lapwing (*Vanellus chilensis*) in the Pantanal, Brazil. *Boletín SAO*, Vol. XVII (2): 145-147.

Comisso, E. 2012. Caso de leucismo en Caburé Grande *Glaucidium nana*. *Ecoregistros*, 2: 1-3.

Contreras Balderas, A. J. & Ruiz Campos, G. 2011. Primer informe de leucismo en la Paloma de Collar *Streptopelia decaocto* (Columbiformes), especie exótica en México. *Cuadernos de Investigación UNED*, Vol. 3 (1): 85-88.

Costa Correa, L. L., Silva, D. E. & Vilges de Oliveira, S. 2013. A partial leucism case in *Columbina picui* (Temminck 1813) (Birds: Columbiformes), in South of Brazil. *Caderno de Pesquisa*, Serie Biologia, Vol. 25 (2): 41-46.

Figueroa, J., Stucchi, M. & Mori, G. 2011. Cases of leucism in the Turkey Vulture (*Cathartes aura*) in Lobos de Tierra island, Perú. *Boletín informativo* INOP, Vol. 6 (2): 14-18.

Forrest, S. C. & Naveen, R. 2000. Prevalence of leucism in Pygocelids Penguins of the Antarctic Peninsula. *Waterbirds*, 23 (2): 283-285.

Gill, F. B. 2007. Ornithology, Third Edition. Freeman, W.H. and Company (Eds.), New York.

Grilli, P. G., Moschione, F.N. & Burgos, F.G. 2006. Leucismo parcial en Pepitero de collar *Saltator aurantiirostris* en Santa Bárbara, Jujuy, Argentina. *Cotinga*, 25: 89-90.

Gross, A. O. 1965. The incidence of albinism in North American birds. *Bird Banding*, 36 (2): 67-71.

Hosner, P. A. & Lebbin, D. J. 2006. Observations of plumage pigment aberrations of birds in Ecuador, including Ramphastidae. *Boletín SAO*, Vol. XVI (1): 30-43.

Mancini, P. L., Jiménez, S., Neves, T. & Bugoni, L. 2010. Records of leucism in albatrosses and petrels (Procellariiformes) in the South Atlantic Ocean. *Revista Brasileira de Ornitología*, 18 (3): 245-248.

McCardle, H. 2012. *Albinism in wild vertebrates*. Master of Science dissertation. San Marcos, Texas: Texas State University.

Møller, A. P. & Mousseau, T. A. 2001. Albinism and phenotype of Barn Swallows (*Hirundo rustica*) from Chernobyl. *Evolution*, 55(10): 2097-2104.

Motta-Junior, J. C., Monteiro Granzinolli, M. A. & Resende Monteiro, A. 2010. Miscellaneous ecological notes on Brasilian birds of prey and owls. *Biota Neotropical*, 10 (4): 355-359.

Nemésio, A. 1999. Plumagens aberrantes em Psittacidae neotropicais – uma revisão. *Melopsittacus*, 2(2/4): 51-58.

Nogueira, D. M. & Alves, M. A. S. 2011. A case of leucism in the Burrowing Owl *Athene cunicularia* (Aves: Strigiformes) with confirmation of species identity using citogenetic analysis. *Zoologia*, 28 (1): 53-57.

Robb, M. & Pop, R. 2012. An aberrantly coloured buzzard *Buteo bannermani* on Santo Antão, Cape Verde Islands, in November 2012, with notes on the past and present status of the species. *Zoologia Caboverdiana*, 3 (2): 87-90.

Sage, B. L. 1963. The incidence of albinism and melanism in British birds. *British Birds*, 56: 409 416.

Sutton, G. M. 1912. An Albinistic Burrowing Owl. *Bird Lore*, 14: 184

Van Grouw, H. 2006. Not every white bird is an albino: sense and nonsense about colour aberrations in birds. *Dutch Birding*, 28: 79-89.

Van Grouw, H. J., Russel, S. & Merne, O. J. 2011. Notes on colour aberrations in Common Guillemot *Uria aalge* and Northern Gannet *Morus bassanus*. *Seabird*, 24: 33-41.

Van Grouw, H. 2011. Lappet-faced Vultures with white feathers. *Vulture News*, 60: 13-14.

Van Grouw, H. 2014. Some black and white facts about the Faeroese white-speckled Common Raven *Corvus corax varius*. *Bulletin of the British Ornithologists´ Club*, 134 (1): 4-13.

Voisin, J. F., Mougin, J. L., Segonzac, M. & Ropert-Coudert, Y. 2002. Colour aberrations and physical deformities in the King Penguin *Aptenodytes patagonicus* at Crozet Islands. *Marine Biology*, 30 (1): 1-4.

Wilson, R. E.; Valqui, T.H. & McCracken, K.G. 2006. Aberrant plumage in the Yellow- billed Pintail *Anas georgica*. *Wildfowl*, 56: 192-196.

Zapata, A. R. P & Novatti, R. 1979. Aves albinas en la colección del Museo de La Plata. *Hornero*, 12 (01): 1-10.

Zapata, A. R. P. & Novatti, R. 1995. Passeriformes albinos en la colección del Museo de La Plata. *Revista de la Asociacion de Ciencias Naturales del Litoral*, 26: 69-71.

Associate Editor: Cristiano Schetini

Instructions to Authors

The ***Revista Brasileira de Ornitologia*** will accept original contributions related to any aspect of the biology of birds, with emphasis on the documentation, analysis, and interpretation of field and laboratory studies, presentation of new methodologies, theories or reviews of ideas or previously known information. The ***Revista Brasileira de Ornitologia*** is interested in publishing ornithological studies on behavior, behavioral ecology, biogeography, breeding biology, community ecology, conservation biology, distribution, evolution and genetics, landscape ecology, methods and statistics, migration, nomenclature, paleontology, parasites and disease, phylogeography, physiology, population biology, systematics, and taxonomy. Noteworthy range extensions and novel geopolitical (country/state/province) records are also welcome, but not mere lists of the avifauna of a specific locality. Monographs may be considered for publication upon consultation with the editor.

Manuscripts submitted to The ***Revista Brasileira de Ornitologia*** must not have been published previously or be under consideration for publication, in whole or in part, in another journal or book. **Manuscripts may be written only in English** and must be typed in Microsoft Word, using Times New Roman 12, double spaced and left justified. Scientific names must be shown in *italic,* and authors are encouraged to follow the latest systematic sequence of the Brazilian (www.cbro.org.br/CBRO/index.htm) or South American (www.museum.lsu.edu/~Remsen/SACCBaseline.html) bird lists, when pertinent and at their discretion. When using one of each of those sources, please be explicit about which one is being used, following it consistently throughout the manuscript. Common names should follow those recommended by the South American Checklist Committee (www.museum.lsu.edu/~Remsen/SACCBaseline.html).

Authors for whom English is not their native language are strongly recommended to have their manuscript professionally edited before submission to improve the English. Two of these independent suppliers of editing services in Brazil can be found through maryandriani@yahoo.com or the web site www.idstudio.art.br. All services are paid for and arranged by the author, and use of one of these services does not guarantee acceptance or preference for publication.

SUBMISSION

Originals must be submitted by email only (editoriarbo@gmail.com) and as a single Microsoft Word file (figures and table must me imbedded into the manuscript). Upon manuscript acceptance, high quality image files (extensions JPG, TIF, PSD, CDR, AI, EPS, WMF or XLS; minimum resolution of 300 DPI) of the original figures will be requested. The *title* must be concise and clearly define the topic of the manuscript. Generic expressions such as "contribution to the knowledge..." or "notes on..." must be avoided. The name of each author must be written fully, followed by the full mailing address, and author for communication in the case of multiple authors.

The parts of the manuscript must be organized as follows:

- **Title** (of the manuscript, in lowercase – not capitals - with names and addresses of all the authors)
- **Abstract/Key-Words** (with title and up to 300 words; five key-words related to the main topics of the manuscript and *not already mentioned in the title* must be provided in alphabetical order and separated by semicolons)
- **Introduction** (starting on a new page)
- **Methods** (this and subsequent parts continue without page breaks)
- **Results** (only the results, succinctly)
- **Discussion**
- **Acknowledgments**
- **References**
- **Tables**
- **Figure Legends**
- **Figures**

For short notes, the same *Abstract* and *Key-Words* structure outlined above must be included. The *text* must provide a brief introduction, description of methods and of the study area, presentation and discussion of the results, acknowledgments and references. Conclusions may be provided after the discussion or within it.

Each Table should be on a separate page, numbered in Arabic numerals, with its own legend. The legend should be part of the table, and occupy the space made by inserting an extra line at the beginning of the table, in which the cells are merged. Figure legends, occupying one or more pages following the tables, should be numbered successively, also in Arabic numerals. Figures will follow, one to each page, and clearly numbered in agreement with the legends.

As necessary, subsections may be identified and labeled as such. All pages should be numbered in the upper, right hand corner.

The following *abbreviations* should be used: h (hour), min (minute), s (second), km (kilometer), m (meter), cm (centimeter), mm (millimeter), ha (hectare), kg (kilogram), g (gram), mg (miligram), all of them in lowercase (not capitals) and with no "periods" ("."). Use the following *statistical notations:* P, n, t, r, F, G, U, $\chi2$, df (degrees of freedom), ns (non significant), CV (coefficient of variation), SD (standard deviation), SE (standard error). With the exception of temperature and percentage symbols (e.g., 15°C, 45%), leave a space between the number and the unit or symbol (e.g., n = 12, P < 0.05, 25 min). Latin words or expressions should be written in italics (e.g., *et al., in vitro, in vivo, sensu).* Numbers one to nine should be written out unless a measurement (e.g., four birds, 6 mm, 2 min); from 10 onwards use numbers.

Author *citations* in the text must follow the pattern: (Pinto 1964) or Pinto (1964); two publications of the same author must be cited as (Sick 1985, 1993) or (Ribeiro 1920a, b); several authors must be presented in chronological order: (Pinto 1938, Aguirre 1976b); for two-author publications both authors must be cited: (Ihering & Ihering 1907), but for more than two authors, only the first one should be cited: (Schubart *et al.* 1965); authors' names cited together are linked by "&". Unpublished information by third parties must be credited to the source by citing the initials and the last name of the informer followed by the appropriate abbreviation of the form of communication: (H. Sick *pers. comm.)* or V. Loskot (*in litt.);* unpublished observations by the authors can be indicated by the abbreviation: (*pers. obs.);* when only one of the authors deserves credit for the unpublished observation or another aspect cited or pointed out in the text, this must be indicated by the name initials: "... in 1989 A. S. returned to the area...". *Unpublished manuscripts* (e.g., technical reports, undergraduate monographs) and *meeting abstracts* should be cited only exceptionally in cases they are absolutely essential and no alternative sources exist. The *reference* list must include all and only the cited publications (titles written in full, not abbreviated), in alphabetical order by the authors' last name:

Articles

Fargione, J.; Hill, J.; Tilman, D.; Polasky, S. & Hawthornez, P. 2008. Land clearing and the biofuel carbon debt. *Science,* 319: 1235-1238.
Santos, M. P. D. & Vasconcelos, M. F. 2007. Range extension for Kaempfer's Woodpecker *Celeus obrieni* in Brazil, with the first male specimen. *Bulletin of the British Ornithologists' Club,* 127: 249-252.
Worthington, A. H. 1989. Adaptations for avian frugivory: assimilation efficiency and gut transit time of *Manacus vitellinus* and *Pipra mentalis. Oecologia,* 80: 381-389.

Books and Monographs

Sick, H. 1985. *Ornitologia brasileira, uma introdução,* v. 1. Brasília: Editora Universidade de Brasília.

Book Chapters

Remsen, J. V. & Robinson, S. K. 1990. A classification scheme for foraging behavior of birds in terrestrial habitats, p. 144-160. In: Morrison, M. L.; Ralph, C. J.; Verner, J. & Jehl Jr., J. R. (eds.). Avian foraging: theory, methodology, and applications. Lawrence: Cooper Ornithological Society (Studies in Avian Biology 13).

Theses and Dissertations

Novaes, F. C. 1970. *Estudo ecológico das aves em uma área de vegetação secundária no Baixo Amazonas, Estado do Pará.* Ph.D. dissertation. Rio Claro: Faculdade de Filosofia, Ciências e Letras de Rio Claro.

Web-based References

CBRO - Comitê Brasileiro de Registros Ornitológicos. 2011. Listas das aves do Brasil, 10th Edition. http://www.cbro.org.br/CBRO/pdf/AvesBrasil2011.pdf (access on 20 January 2013).
IUCN. 1987. A posição da IUCN sobre a migração de organismos vivos: introduções, reintroduções e reforços. http://iucn.org/themes/ssc/pubs/policy/index.htm (access on 25 August 2005).
Dornas, T. 2009a. [XC95575, *Celeus obrieni].* www.xeno-canto.org/95575 (access on 25 February 2012).
Dornas, T. 2009b. [XC95576, *Celeus obrieni].* www.xeno-canto.org/95576 (access on 25 February 2012).
Pinheiro, R. T. 2009. [WA589090, *Celeus obrieni* Short, 1973]. www.wikiaves.com/589090 (access on 05 March 2012).

Footnotes will not be accepted.

Illustrations and *tables.* The illustrations (photographs, drawings, graphics and maps), which will be called figures, must be numbered with Arabic numerals in the order in which they are cited and will be inserted into the text. Upon manuscript acceptance, high quality image files (extensions JPG, TIF, PSD, CDR, AI, EPS, WMF or XLS; minimum resolution of 300 DPI) of the original figures will be requested. Tables and figures will receive independent numbering and must appear at the end of the text, as well as all legends to the figures that must be presented on separate sheets. In the text, mentioning figures and tables must follow the pattern: "(Figure 2)" or "... in figure 2." Table headings must provide a complete title, and be self-explanatory, without needing to refer to the text. All figure legends must be grouped in numerical order on a separate sheet from the figures.

All materials must be submitted through the *Revista Brasileira de Ornitologia* web site: www.museu-goeldi.br/rbo

Only submissions through the web site will be considered. A letter of submission must accompany the manuscript. Notification of receipt of the submission will be sent to the corresponding author. Once the manuscript is finally accepted and a final version consolidated, PDF proofs will be sent by email to the corresponding author for revision. The correction of the final version sent for publication is entirely the authors' responsibility. The first author of each published paper will receive via e-mail, free of charge, a PDF file of the published paper. In the case of doubts as to the rules of format, please contact the editor prior to submission:

Alexandre Aleixo

Coordenação de Zoologia / MCTI / Museu Paraense Emílio Goeldi
Caixa Postal 399 / CEP 66040-170 / Belém / PA / Brazil
Phone: (55-91) 3075-6102 / 3075-6282.
E-mail: editoriarbo@gmail.com

Black-throated Antshrike preys on nests of social paper wasps in central French Guiana
Sean Mccann, Onour Moeri, Tanya Jones and Gerhard Gries *300*

The Grey-bellied Shrike Tyrant (*Agriornis micropterus*), a new tyrant flycatcher for Brazil
Gina Bellagamba, Danielle Bellagamba-Oliveira and Rafael Antunes Dias *303*

Predation of Green Iguana (*Iguana iguana*) by Guira cuckoo (*Guira guira*) in Northeastern Brazil
Alysson Guedes Coutinho, Kalyl Sivino Serra, Luís Gonzaga Sales Junior and Daniel Cassiano Lima *305*

A case of partial leucism in the American Barn Owl (*Tyto furcata*) (Temminck, 1827), from Buenos Aires province, Argentina
María Cecilia Chiale and Luis Pagano *307*

Instructions to Authors *311*

Revista Brasileira de Ornitologia

Issue 22 – Number 3 – September 2014

CONTENTS

ARTICLES

Comparative population densities of three species of doves (Columbidae) in disturbed landscapes in Northern Paraná State, Brazil
Priscila Montes Fontoura and Mário Luis Orsi 245

Age and gender related plumage variation of psittacofulvine pigments: the case of the Yellow-faced Parrot *Alipiopsitta xanthops*
Carlos Barros de Araújo and Luiz Octavio Marcondes-Machado 251

Occurrence of the Eastern Slaty Thrush (Turdidae) in southern Brazil during the non-breeding season
Huilquer Francisco Vogel 260

Uniformity of diet composition of Brown Skua chicks at different ages and between siblings
Maricel Graña Grilli, Lucas J. Marti and Diego Montalti 265

Reproductive biology and nest-site selection of the Mato Grosso Antbird *Cercomacra melanaria* in the Brazilian Pantanal
Bianca Bernardon, Paula Fernanda Albonette de Nóbrega1 and João Batista de Pinho 270

SHORT-COMMUNICATIONS

New Record of the Rufous–Vented Ground–Cuckoo (*Neomorphus geoffroyi dulcis*) in the Atlantic Forest, Brazil
Fagner Daniel Teixeira, André Aroeira Pacheco and Fernando Cesar Cascelli de Azevedo 278

New records and distribution extension of *Buteogallus solitarius* (Aves: Accipitridae) in Venezuela
Adrián Naveda-Rodríguez and Gabriela Lugo 281

First record of the Andean Flamingo in the Brazilian Amazon
Bianca Bernardon and João Valsecchi 285

Feeding of nestlings of the Amazonian Motmot (*Momotus momota*) in southern Goiás, Brazil
Marcos Antônio Pesquero, André Grassi Corrêa, Marcos Filipe Pesquero and Henrique Marques de Paula 288

Tap patiently, hit safely: a preying tactic of the White Woodpecker on social wasp nests
Ivan Sazima 292

Hunting the unexpected: Harris's Hawks (*Parabuteo unicinctus*) preying on bats in a Neotropical megacity
Rubén Ortega-Álvarez and Rafael Calderón-Parra 297

Continue inside back cover...

ISSN 0103-5657
9 770103 565003