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Capa: Da esquerda para a direita (fotos de Edson Guilherme): rabo-de-espinho (*Discosura langsdorffi*) e bandeirinha (*Discosura longicaudus*), duas espécies raras e de distribuição pontual registradas na Floresta Nacional do Amana, estado do Pará, Brasil e cujo primeiro inventário de avifauna é publicado neste volume por Guilherme.

Cover: From left to right (photos by Edson Guilherme): Black-bellied Thorntail (*Discosura langsdorffi*) and Racket-tailed Coquette (*Discosura longicaudus*), two rare and patchily distributed species recorded at Amana National Forest, state of Pará, Brazil, whose first avifaunal survey is reported herein by Guilherme.

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ARTICLE

# A preliminary survey and rapid ecological assessment of the avifauna of Amana National Forest (Itaituba and Jacareacanga, Pará, Brazil)

**Edson Guilherme**[1]

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**ABSTRACT:** Amana National Forest (FLONA Amana) is located on the left bank of the middle Tapajós River, in the interfluve of the Tapajós and Madeira Rivers, state of Pará, Brazil. I performed a "Rapid Ecological Assessment" (REA) on the bird communities of the park to identify important areas for avian conservation and areas where activities could impact bird communities. Field surveys were carried out at the end of the rainy season and at the beginning of the dry season. Nine points distributed among five sites were sampled within Amana or very close to its borders. Three approaches were used to survey the avifauna of each point: (a) a quantitative approach using mist nets, (b) a qualitative approach using field observations with binoculars, and (c) interviews with local residents. With a sampling effort of 3,320 net hours, interviews with local residents, and approximately 60 additional hours of visual observations, 247 species of birds were recorded belonging to 51 families. Eight taxa are considered endemic to the interfluve of the Tapajós/Madeira Rivers. Two species are on IUCN's Red List of endangered birds (*Penelope pileata* and *Guaruba guarouba*), and the known distribution of two species (*Topaza pella* and *Discosura longicaudus*) is extended by our surveys. Two activities within Amana were detected to have possible negative impacts on avifauna, specifically hunting and gold and cassiterite mining.

**KEYWORDS:** birds, Amana National Forest, Amazon, conservation.

## INTRODUCTION

Although the Brazilian Amazon has been subject to scientific study for many decades, due to its large expanse, it is still considered under studied by ornithologists (Oren & Albuquerque 1991). For example, the region between the lower and middle Tapajós River in Pará State has been visited and studied for over 100 years by Brazilian and foreign ornithologists (Snethlage 1908; Oren & Parker 1997; Pacheco & Olmos 2005; Santos *et al*. 2011; Lees *et al*. 2013a). It is estimated that more than 2,000 specimens have been collected from the lower and middle Tapajós River, the area that contains Amazonia National Park (Parque Nacional da Amazônia) and Amana National Forest (Floresta Nacional do Amana). The study of birds in this region over the past 100 years has resulted in the description of 16 new species and records for over 400 bird species in the area between the city of Itaituba and the southern boundary of Amazonia National Park (Oren & Parker 1997). Even recently, new bird species have been described to the interfluve of the Madeira and Tapajós Rivers, the most recent ones being the Bald Parrot (*Pyrilia aurantiocephala*); Roosevelt Stipple-throated Antwren (*Epinecrophylla dentei*); Alta Floresta Antpitta (*Hylopezus whittakeri*); Chico's Tyrannulet (*Zimmerius chicomendesi*); and Sucunduri Yellow-margined Flycatcher (*Tolmomyias sucunduri)* (Gaban-Lima *et al*. 2002; Whitney *et al.* 2013a; Carneiro *et al.* 2012; Whitney *et al.* 2013b; Whitney *et al.* 2013c).

Amana National Forest was created by the Brazilian Government by an unnumbered decree on 13 February 2006, and has an area of 540,417.17 ha (DOU 2009). Amana was created to promote sustainable multiple-use management of forest resources; maintain and protect water resources and biodiversity; and support development of methods for the sustainable use of natural resources (DOU 2009).

The goal of this study was to conduct a preliminary survey of the local avifauna to identify potential anthropogenic impacts on and important areas for conservation of bird communities within Amana. I performed a "Rapid Ecological Assessment" (REA; Sayre *et al*. 2003) of Amana. The REA is an integrated methodology used to direct the efforts of conservation planning sites and contributes to the inventories of biodiversity (Sayre *et al*. 2003). Together with information

from other taxa, this survey will enable the creation of a management plan for Amana National Forest.

## METHODS

### Location of Sites and Sampling Period

Field surveys were performed at the end of the rainy season, from 24 April to 6 May 2008 and at the beginning of the dry season from 21 July to 8 August 2008. Nine points distributed among five sites were sampled within Amana (Table 1, Figure 1). Four sampled sites were visited during both sampling periods, and one (Site 5 - Igarapé Preto) during only the second sampling period (Table 1). Two additional locations along the Transamazonian Highway were also partially sampled during the sampling period (Sites 6 and 7; Table 1, Figure 1). General information is shown in Table 1, including habitat present at every studied point.

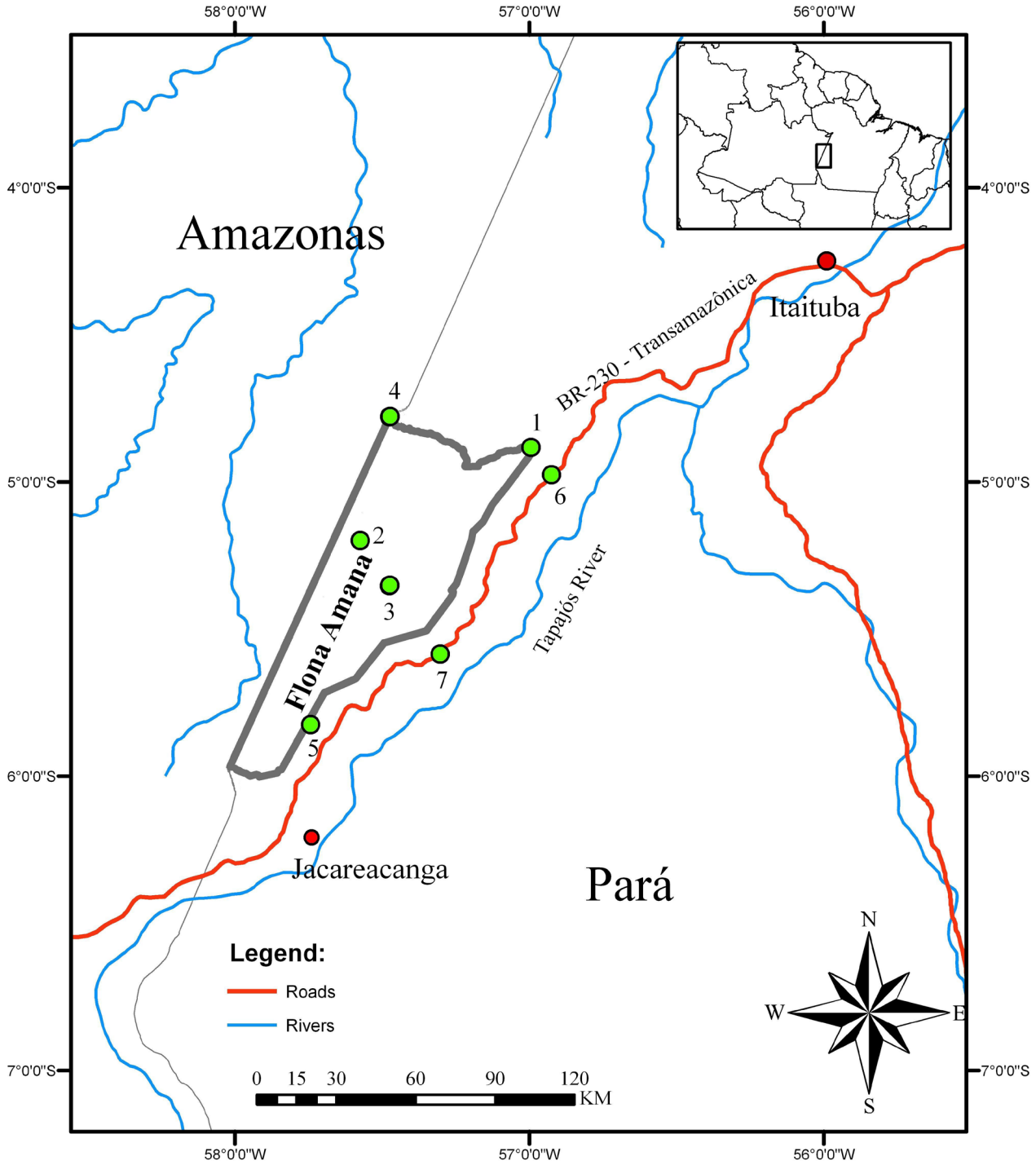


**FIGURE 1.** Location of the Amana National Forest and sampling sites. 1 - Igarapé Montanha (Montanha stream); 2 - JML Gold Mining; 3 – Maranhense Landing Strip; 4 - São Pedro Landing Strip; 5 – Igarapé Preto (Preto stream); 6 - Amana surrounding area (Km 180); 7 - Amana surrounding area (Km 275, Rabelo).

**TABLE 1.** Sites and points of observation and collection of birds during the two campaigns of Rapid Ecological Assessment in Amana National Forest, Pará, Brazil.

| Site | Point | Coordinates | | Sampling Days | Habitat |
|---|---|---|---|---|---|
| | | W | S | | |
| 1 - Montanha Stream | 01 | 56°58'10.1"W | 04°52'58,7"S | 25-27 April 2008 | Plateau of *terra-firme* forest |
| | 02 | 56°58'07.0"W | 04°52'55.9"S | 22-24 July 2008 | Lowland alluvial forest |
| 2 - JML Gold Mining | 03 | 57°32'14.9"W | 05°06'35.7"S | 29-30 April 2008 | *Terra-firme* forest with palm trees |
| | 04 | 57°32'07.8"W | 05°06'28.3"S | 30 July to 01 August 2008 | Secondary forest with bamboo |
| 3 - Maranhense | 05 | 57°28'32.0"W | 05°21'10.7S | 01-03 May 2008 | *Terra-firme* forest with palm trees |
| | 06 | 57°28'27.0"W | 05°21'04.7S | 02-04 August 2008 | Submontane forest with palm trees |
| 4 - São Pedro | 07 | 57°28'24.7"W | 04°46'41.1"S | 05-06 May 2008 | Vegetation on white sand soil (*campina*) |
| | 08 | 57°28'28.4"W | 04°46'43.4"S | 26-29 April 2008 | Edge of floodplain forest, sandy beaches, and *campina* |
| 5 - Southern Portion of FLONA (Igarapé Preto) | 09 | 57°42'29,1"W | 05°54'31,9"S | 06-08 August 2008 | Edge of *terra-firme* forest |
| 6 - FLONA Surrounding | | 56°55'29.0" | 04°58'32.7 | 24 April 2008 and 21 July 2008 | Km 180 - anthropogenically influenced area (open area) |
| 7 - FLONA Surrounding | | 57°18'10.8" | 05°35'07.1" | 05 August 2008 | Km 275 – Rabelo - anthropogenically influenced area (open area) |

## Species Survey

Three approaches were used to survey the avifauna of each point: (a) quantitative, with mist nets, (b) qualitative, through field observations with binoculars, and (c) interviews with local residents. Scientific nomenclature is in accordance with the Comitê Brasileiro de Registros Ornitológicos (CBRO 2014).

(a) **Mist-net surveys**: Eighteen mist nets were used, 12 x 2 m in length with 36-mm mesh (Rosaminas®). The nets were placed in pre-existing transects at each point where they remained on average for two days. The opening of nets took place soon after sunrise, from 0530 to approximately 1600 h in order to maximize catches. Individuals were identified, photographed, and released. To monitor recaptures during each campaign,

individuals released were marked by cutting the tip of two rectrices. Some individuals were collected and prepared as specimens to document occurrence at the study area. Voucher specimens were taken with the permission of Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis-IBAMA (Brazilian Institute of Environment and Renewable Natural Resources). All collected specimens are currently deposited for further studies at the Museu Paraense Emílio Goeldi, Belém, Pará.

(b) **Observations:** Observations were performed daily with binoculars (Eagle Optics, 8 x 42) from 0600-0900 h. Trails inside the forest, roads, and open areas around the main localities were censused. Occasionally, I made boat trips along rivers and streams near the sites to maximize the observation of riverside species. Since I did not use recording devices, I was unable to identify all vocalizations heard during censuses. I report our observations of the portion of the avain community I was able to positively identify.

(c) **Interviews**: Some local residents, mostly miners, were interviewed about which bird species are best known in the region. In order to minimize the confusion generated by common bird names (which vary from one region to another), books containing photos of Amazonian birds with their species names were shown. This methodology allowed us to check *in loco* whether the species mentioned in the interviews were expected to occur in this region of study.

### Data Analysis

Aiming to understand the degree of similarity among bird communities at different sites surveyed in this study, similarity analysis was performed. A Jaccard index was calculated based on the presence and absence of species at each site (Magurran 1988). Cluster analysis was performed using the MVSP 3.1 software package (Kovach 2003).

## RESULTS

Two hundred forty-seven species of birds belonging to 51 families were recorded (Appendix). The capture effort consisted of 3,320 hours/net and approximately 60 additional hours of visual observation. The most representative families were Thraupidae, Thamnophilidae, Tyrannidae and Psittacidae, with 21, 20, 18, and 14 species, respectively (Appendix). More than 300 individuals were captured by mist net and 130 specimens were collected for further study.

### Similarity Analysis among Sampling Sites

All sites located within the FLONA had an average similarity above 0.3 (30%), making them more similar to each other when compared to sites located outside the National Forest (Table 2, Figure 2). The dendrogram (Figure 2) resulting from hierarchical cluster analysis showed the formation of two distinct groups: the first group was formed by sites 6 and 7, and the second one by the other sites.

### Endemic Species

We recorded eight interfluve endemics taxa (Cracraft 1985) in Amana, including Red-throated Piping-Guan (*Aburria cujubi nattereri*), Bar-breasted Piculet (*Picumnus aurifrons borbae*), Hoffmanns's Woodcreeper

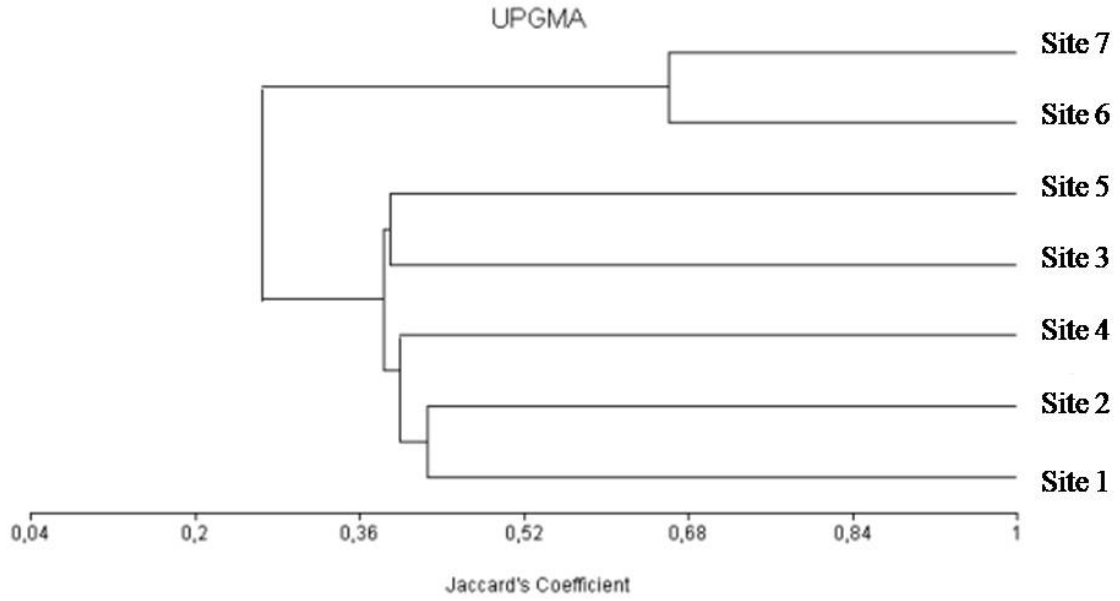


**FIGURE 2.** Hierarchical clustering analysis for avian survey sites in Amana National Forest using Jaccard similarity distances.

**TABLE 2.** Similarity matrix of Jaccard coefficients among sites surveyed in Amana National Forest.

| | Site 1 | Site 2 | Site 3 | Site 4 | Site 5 | Site 6 | Site 7 |
|---|---|---|---|---|---|---|---|
| Site 1 | 1 | | | | | | |
| Site 2 | 0.427 | 1 | | | | | |
| Site 3 | 0.373 | 0.427 | 1 | | | | |
| Site 4 | 0.391 | 0.408 | 0.356 | 1 | | | |
| Site 5 | 0.357 | 0.415 | 0.39 | 0.374 | 1 | | |
| Site 6 | 0.184 | 0.279 | 0.252 | 0.262 | 0.351 | 1 | |
| Site 7 | 0.193 | 0.254 | 0.237 | 0.25 | 0.388 | 0.66 | 1 |

(*Dendrocolaptes hoffmannsi*), Ferruginous-backed Antbird (*Myrmoderus ferrugineus elatus*), Long-winged Antwren (*Myrmotherula longipennis ochrogyna*), White-eyed Antwren (*Epinecrophylla leucophthalma phaeonota*), Harlequin Antbird (*Rhegmatorhina berlepschi*), and Pale-faced Antbird (*Phlegopsis borbae*).

## Threatened Species

Among the species observed within the FLONA, at least two deserve special attention because they are on red lists of threatened birds.

White-crested Guan (*Penelope pileata*): Although this species is not included by IBAMA on the list of threatened birds in Brazil, White-crested Guan is on the IUCN's Red List in the Vulnerable category (Birdlife International 2014a). Due to the prospects of future deforestation in the Amazon region, where this species occurs, and its sensitivity to hunting and fragmentation, the conservation status of this species has received considerable attention. This species, as well as other cracids, is used as a source of protein by traditional residents (Brooks *et al*. 2006). During the survey, a single individual of *P. pileata* (Appendix) was observed and photographed on 31 July 2008 (Guilherme 2008).

Golden Parakeet (*Guaruba guarouba*): This psittacid has been recently reclassified as Vulnerable by Birdlife International (2014b). The threat to this species lies mainly in its habitat loss and offspring capture by illegal bird traders (Oren & Novaes 1986; Laranjeiras & Cohn-Haft 2009). In Amana, I observed several flocks of 18 to 22 individuals, flying daily over the camps of sites 3, 4, 5, 6, and 7. Fortunately, residents raising individuals of this species as pets were not detected in Amana or its surroundings. Therefore, in a preliminary assessment, it seems that populations of this species are in good condition within Amana.

## Species of Regional Relevance

During this Rapid Ecological Assessment of Amana National Forest, three important records were made: Bald Parrot (*Pyrilia aurantiocephala*), Crimson Topaz (*Topaza pella*), and Racket-tailed Coquette (*Discosura longicaudus*). Crimson Topaz and Racket-tailed records represent an extension of their known geographic ranges; Bald Parrot was only recently described and is poorly known.

Bald Parrot (*Pyrilia aurantiocephala*): These parrots with a bare and orange head were for many years considered to be the young of the Vulturine Parrot (*Pyrilia vulturina*; Sick 1997). Now recognized as its own species (Gaban-Lima *et al*. 2002), it is endemic to the Brazilian Amazon, with its entire geographical distribution restricted to a narrow band of the southeastern Amazon within interfluves of the Madeira, Tapajós, and Xingu Rivers (InfoNatura 2007; del Hoyo *et al*. 2013). Because it was only described a few years ago, virtually nothing is known about its biology. It is highly recommended that a study be made on its populations including preferential habitat, feeding, and reproductive biology. Gaban-Lima *et al*. (2002) suggest that the preferential habitat of this species is "*campinarana*." Based on our observations in Amana National Forest, the species seems to occur in the canopy of the floodplain forests, where an individual was collected at site 2 (Figure 4; Appendix). This habitat has been one of the most impacted by mining in Amana National Forest. As this species occurs only in a very restricted area that has been suffering intense anthropogenic pressure, the Bald Parrot was recently included on the IUCN's Red List in the Near Threatened category (Birdlife International 2014c).

Crimson Topaz (*Topaza pella*): This magnificent hummingbird is well known from the northeastern Amazon (from Guyana to the region around Belém, Brazil; Schuchmann 1999). Until recently, only two

records of Crimson Topaz had been made in the southern basin of the middle and lower Amazon River, between the cities of Parintins in Amazonas and Santarém in Pará (Hu *et al*. 2000). Davis & Olmstead (2010) reported a compilation of scattered records of this species made in the southern basin of the Amazon River, including the states of Pará, Amazonas, Mato Grosso, and Rondônia. The few records of this species from the southern bank of the Amazon River indicate that it appears to be rare at least in this region. The female specimen of Crimson Topaz collected during this study in Site 3 (Appendix) extends this species' distribution a few kilometers west of the "Trairão" locality, the previous southernmost record of this species from state of Pará (Pacheco & Olmos 2005).

Racket-tailed Coquette (*Discosura longicaudus*): In Amazonia, the occurrence of this species is restricted to a portion of the northeastern basin and the mouth of the Amazon River (Venezuela, Guyana, states of Amazonas, Amapá, and Pará, in Brazil; Schuchmann 1999; Daffonseca 2010). There are also a few records of this species in the Brazilian Atlantic Forest (Schuchmann 1999, InfoNatura 2007, Albano 2012). During the first field campaign at Site 3, one individual of this species was photographed at the forest edge (Figure 5). We observed the species and collected one individual in the same place three months later (Appendix). These records considerably extend the geographical distribution of this species, so that it reaches the southern Brazilian Amazon. Surely, this species must be quite rare in the region, which would explain the fact that no record of it has been made until now.

Black-bellied Thorntail (*Discosura langsdorffi*): This little hummingbird was known only from the western Amazon (Colombia, Ecuador, Peru, Bolivia, and Brazil) and the Brazilian Atlantic Forest (Schuchmann 1999). The first records of this species in the southern portion of the eastern Amazon were made in Alta Floresta, Mato Grosso (Zimmer *et al.* 1997). More recently the Black-bellied Thorntail was recorded in the Carajás region (Pacheco *et al*. 2007) and Parauapebas, southeastern Pará (Endrigo 2011). It seems to be a rare species whose populations in the Atlantic Forest (states of Bahia, Espírito Santo, and Rio de Janeiro) are endangered, mainly due to deforestation (IBAMA 2003; Olmos 2005). There is no information on the conservation status of this species in the eastern portion of the Amazon, a region that has suffered enormous anthropogenic pressures (Capobianco *et al*. 2001). There is urgent need to carry out a study on the distribution and abundance of this taxon within Amana National Forest. During the two field campaigns, this species was only seen and photographed (Figure 3) at forest edge in Site 3 (Maranhese; Appendix, Figure 3). Further study of this species should work to identify its preferred habitats in the region, so that they can be protected within Amana.

**FIGURE 3.** Black-bellied Thorntail (*Discosura langsdorffi*). Species recorded in secondary forest edge within Amana National Forest. Besides being a species of interest for conservation, this record extends its known geographical distribution in the Brazilian Amazon.

**FIGURE 4.** Bald Parrot (*Pyrilia aurantiocephala*). Species present in Amana National Forest; still little known regarding its geographical distribution and ecological requirements. This record adds important information for this species.

**FIGURE 5.** Racket-tailed Coquette (*Discosura longicaudus*). The record of this species in Amana National Forest extends its distribution in the Brazilian Amazon.

## Species Associated with Specific Habitats

Besides *terra-firme* and floodplain forests, in Amana National Forest there is a vegetation type known as *campina*, which is found on white sand soil. *Campina* vegetation has a low height, with a high density of small and thin trees, and scarcity of emergent trees. *Campina* shelters a number of species that are closely associated with this habitat (Oren 1981; Borges 2004; Guilherme & Borges 2011). Even after obtaining information by local residents regarding the presence of several spots of *campina* and *campinarana* in Amana National Forest, it was only possible to inventory a small portion of this habitat at site 4.

Below are comments on some recorded species associated with this vegetation type:

Red-shouldered Tanager (*Tachyphonus phoenicius*): This species is associated with *campina* and *campinarana* throughout the Amazon (Oren 1981; Borges 2004). One individual was collected in April 2008 (Appendix) during the first field campaign.

Flame-crowned Manakin (*Heterocercus linteatus*): This is an uncommon species associated with sandy soil vegetation, mostly near black water rivers and streams (Polleto & Aleixo 2005). It was observed on the banks of Igarapé Porquinho at Site 3 and Igarapé Preto at Site 5. One individual was collected in a *campina* spot at Site 4 (Appendix).

White-bearded Manakin (*Manacus manacus*): Although this species is found in many types of environments within the Amazon, including *terra-firme* forest and secondary vegetation, referred to as *capoeira*, (Sick 1997), its abundance seems to increase significantly in *campina* (pers. obs.). Throughout the field campaign, 12 individuals of White-bearded Manakin were captured. All observed and captured individuals were along the stretch of *campina* at Site 4.

## Environmental Impacts

Two types of impacts on the environment of Amana were identified: one that affects the ecosystem as a whole (mining), and another that directly affects the populations of game birds (hunting).

**Mining** - Environmental changes caused by mining, either gold or cassiterite, were detected at all sites (Figure 6) except for Site 1.

**FIGURE 6.** Washing soil to extract gold within Amana National Forest. Note the crater formed in the woods due to soil leaching.

**Evidence of Hunting** - Bird hunting activity, especially for food, was detected at all surveyed points within Amana, except Site 1, which had no homes nearby. The bird families most affected appear to be Cracidae (Curassows and Guans) and Anatidae (Table 3; Figure 7).

**TABLE 3.** Evidence of hunting at surveyed sites.

| Location | Hunted Species | Evidence |
|---|---|---|
| **Site 2 (JML Gold Mining)** | Crestless Curassow (*Pauxi tuberosa*) | feathers |
| | Scarlet Macaw (*Ara macao*) | feathers |
| **Site 3 (Maranhense)** | Crestless Curassow (*Pauxi tuberosa*) | feathers |
| | Red-throated Piping-Guan (*Aburria cujubi*) | carcass |
| **Site 4 (São Pedro)** | Ornate Hawk-Eagle (*Spizaetus ornatus*) | carcass |
| | Black-bellied Whistling-Duck (*Dendrocygna autumnalis*) | carcass (Figure 7) |
| **Site 5 (Igarapé Preto)** | Gray Tinamou (*Tinamus tao*) | Witnessed eggs collected for consumption |

**FIGURE 7.** Black-bellied Whistling-duck (*Dendrocygna autumnalis*) hunted by a local resident.

## DISCUSSION

The number of species reported during this study is about 45% less than the number of expected species for the total area of Amana National Forest. Oren & Parker (1997) recorded 448 bird species in Amazonia National Park. As Amazonia National Park is limited to the south by Amana National Forest, it is plausible that many species found in this park are also present within Amana. Because the sampling effort of this Rapid Ecological Assessment was much smaller than the effort used in Amazonia National Park (Oren & Parker 1997), many species will be added to this preliminary list (Appendix) as more surveys are accomplished in Amana.

### Similarity Analysis among Sampling Sites

The two distinct groups shown in the dendrogram (Figure 2) were expected. The separation of Sites 6 (Km 180) and 7 (Km 275; Figure 2) were expected since these sites were located in an open area and quite anthropogenically influenced. At these sites, most bird species are associated with open environments and/or forest edges, differentiating these communities from ones located in sites within Amana. The second group formed by sites 1, 2, 3, 4, and 5 have in common the fact that they are located in a predominantly forest-based habitat of Amana. Three subdivisions within this group can be noted. The first subdivision includes Sites 5 (southern portion of Amana) and 3 (Maranhense), in which the relative proximity and likeness among explored habitats explain similarities among their avian communities. The second subdivision groups Sites 1 (Montanha stream) and 2 (JML Gold Mining), which are highly similar to each other (Table 2). This resemblance can be explained due to the presence of *terra-firme* forest with plateaus and well-marked shallows. The third subdivision is formed only by Site 4 (São Pedro), located at an intermediate position between the first and second groups of sites (Figure 2). The most plausible explanation for this separation seems to be the presence of two types of environments within

the site, which were not sampled at other points. The first habitat type refers to the floodplain forest and sandy beaches along the Amana River passing through this site. The presence of this medium-sized river with a range of micro-aquatic habitats allowed observation of some species that were not detected at other sites (Appendix). However, the largest contributor to the separation of this site from the others was the presence of the white-sand "*campina*" forest (*sensu*, Anderson 1981; Guilherme & Borges 2011). I dedicated special attention to the *campina* spot in Site 4, and recorded some species typical of *campina* that were not found at other sampled sites (Appendix).

## Endemic Species

According to Cracraft (1985), 21 taxa are considered endemic to the interfluve of the Tapajós and Madeira Rivers. Eight (38.0%) of these taxa were recorded in Amana. White-crested Guan (*Penelope pileata*), Crimson-bellied Parakeet (*Pyrrhura perlata*) and Snow-capped Manakin (*Lepidothrix nattereri*) are cited in the list by Cracraft (1985) as endemic in this interfluve and were recorded in this work (Appendix). However, later studies showed that White-crested Guan occur in almost the entire southern bank of the middle and lower Amazon River (InfoNatura 2007, Brooks *et al*. 2006) and Crimson-bellied Parakeet and Snow-capped Manakin have been recorded out of the interfluve of the Tapajos/ Madeira Rivers in Rondônia and Mato Grosso States (Cordasso 2014; Lees *et al*. 2013b; Zanon 2013).

## Species Associated with Specific Habitats

The detection of species closely associated with *campina* and species with higher abundance in this habitat is a clear indication of its importance for the maintenance of local biodiversity. It is necessary to find strategies for preserving this ecosystem against anthropogenic alteration. It is important that biological studies be undertaken at these *campinas*, which likely hold other rare or geographically restricted species whose survival depends solely on maintaining this habitat intact. Despite not being as rich in species as other Amazonian environments (Oren 1981; Borges 2004), they contribute significantly to the increase of α (local) and β (regional) diversity because some species are restricted only to this habitat (Oren 1981; Stotz *et. al*. 1996; Guilherme & Borges 2011). In the case of Amana National Forest, it was only possible to sample a small portion of *campina* located at Site 4. It is essential that the other areas of *campina* within Amana be identified, studied, and preserved. It is important not only to preserve the *campinas* intact, but also to maintain the matrix of trees around them. This maintenance may contribute significantly to the health of the environment.

## Environmental impacts

**Mining** -- When gold mining is performed manually, the impacts are minimal. Mechanized operation, on other hand, causes huge changes in the environment. The problem lies in the fact that miners dissolve the forest floor with water jets as they search for small fragments of gold mixed with underground argillaceous rock (Figure 6). As a result of this procedure, damage is caused to fauna and flora on various levels: the first and most harmful is forest destruction (in general, the floodplain forest) in the operation area (Figure 6); the second is the transport of large amounts of sediment into rivers and streams, forming craters without vegetation at places of operation (Figure 6); third is the use of chemicals (*e.g.,* mercury and diesel), the waste of which often remains in the area and is not disposed of properly. Mining, besides destroying the main habitats of shorebird species, can also cause the death of the birds, due to harmful, but commonly used, chemicals being released into the environment through seepage or accidents.

**Hunting** – Hunting, even for subsistence, may reduce the abundance of game species in the Amazon forest (Thiollay 2005). Avian species hunted as game are often naturally rare in tropical forests (Pizo 2001), exacerbating hunting's effects on their populations. If hunting is associated with deforestation or any other type human-caused habitat modification, populations of these species can be drastically reduced and become extinct at certain sites within a few years. Hunting in the FLONA is not yet considered as serious a problem as mining. However, it is necessary to conduct an awareness campaign with local residents. A good awareness campaign could prevent populations of the most persecuted species from being reduced to unsustainable levels. In combination, habitat management tactics like selective logging are essential to ensure persistence of game species' populations. An investigation into the combined effects of this type of forest management as well as hunting pressures on populations of game birds is recommended to understand how best to maintain game species' populations in the long term.

## Final Considerations

Although I remained only four days (on average) at each point, and census methods did not sample the entire avian community, our results are useful. More than half (54.9%) of the expected species for the study area were detected, considering all 448 species recorded in Amazonia National Park and its vicinity (Oren & Parker, 1997). These data were sufficient for performing a Rapid Ecological Assessment (Sayre *et al*. 2003). The survey conducted was preliminary — just enough to compile the REA and identify important areas for biodiversity

conservation in Amana National Forest. Detection of bird species in the Amazon demands an enormous effort of fieldwork. However, this effort is not normally used in rapid studies aimed at implementing Management Plans (Vasconcelos 2006).

Despite problems related to mining and hunting, the general state of Amana National Forest conservation is still satisfactory. The complications seem to be concentrated along major rivers and streams in Amana, which somehow has protected the *terra-firme* (upland) forests in interfluves. The *terra-firme* forests that are distant from areas where mining is more intense are well preserved and meet all the conditions to maintain viable populations of large birds, such as the Razor-billed Curassow (*Pauxi tuberosa*), as well as large birds of prey. In fact, several curassow flocks within Amana were observed, indicating no significant hunting activity in areas where there is no mining. Additionally, local residents have confirmed the presence of Harpy Eagle at almost all sampling points. The presence of the above listed species, coupled with the occurrence of other cracids such as the Red-throated Piping-Guan (*Aburria cujubi*) and guans (*Penelope sp*.), trumpeters (*Psophia viridis*), large Psittacidae (parrots), and Ramphastidae (toucans), indicate good environmental health of much of Amana.

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## APPENDIX:

**List of bird species recorded in Amana National Forest and its surroundings, with information on habitat. Sites**: 1 - Right bank of Montanha Stream; 2 - JMS Gold Mining, right bank of Porquinho Stream; 3 - Maranhense; 4 - São Pedro, on the right bank of Amana River; 5 – Igarapé Preto, Southern FLONA point; 6 - FLONA surrounding area, km 180, at the banks of Transamazon Highway; and 7 - FLONA surrounding area, km 275, Rabelo Location. **Record Type**: I – interview, O - observation, P - photo published on WikiAves (www.wikiaves.org), S - specimen collected and deposited in the Museu Paraense Emílio Goeldi, V - recognized vocalization. **Habitats:** A - anthropogenic area; AE - aerial environment, ETF - edge of *terra-firme* rainforest; EFR - edge of floodplain rainforest, ESR - edge of second-growth forest, FR - floodplain rainforest, O - open area, R – banks of rivers and lakes, P - ponds of water along roads and highways, Pa – pasture, S - sandy soil vegetation, TF – *terra-firme* rainforest.

| Family and Species | English Name | Habitat | Records Type | Sites |
|---|---|---|---|---|
| **TINAMIDAE** | | | | |
| *Tinamus tao* | Gray Tinamou | TF | V, Recorded evidence (egg) | 1, 2, 3, 4, 5 |
| *Tinamus major* | Great Tinamou | TF | I[1] | 2, 3, 4 |
| *Crypturellus cinereus* | Cinereous Tinamou | TF | O, V | 1, 2, 3, 4, 5 |
| *Crypturellus soui* | Little Tinamou | TF | O, V | 1, 2, 3, 4, 5 |
| *Crypturellus variegatus* | Variegated Tinamou | TF | S (MPEG 65102) | 1 |
| **ANATIDAE** | | | | |
| *Dendrocygna autumnalis* | Black-bellied Whistling-Duck | R | O | 1, 4 |
| *Cairina moschata* | Muscovy Duck | R | O | 1, 5 |
| **CRACIDAE** | | | | |
| *Pauxi tuberosa* | Razor-billed Curassow | TF | O, I[1], Recorded evidence (feathers) | 1, 2, 3, 4 |
| *Penelope pileata* | White-crested Guan | TF | O, P(WA436254) | |
| *Aburria cujubi* | Red-throated Piping-Guan | TF | O, S (MPEG 65593) | 1, 3 |
| **PHALACROCORACIDAE** | | | | |
| *Phalacrocorax brasilianus* | Neotropic Cormorant | R | O | 4 |
| **ANHINGIDAE** | | | | |
| *Anhinga anhinga* | Anhinga | R | O | 1, 4 |
| **ARDEIDAE** | | **R** | | |
| *Tigrisoma lineatum* | Rufescent Tiger-Heron | R | O | 1, 4 |
| *Cochlearius cochlearius* | Boat-billed Heron | R | I[1] | 4 |
| *Butorides striata* | Striated Heron | R | O | 1, 3, 4, 5 |
| *Pilherodius pileatus* | Capped Heron | R | O | 1, 5 |
| *Bubulcus ibis* | Cattle Egret | O, Pa | O, S (MPEG 65103) | 3, 4 |
| *Ardea alba* | Great Egret | R | O | 2, 4 |
| *Egretta thula* | Snowy Egret | R | O | 2, 4 |
| *Ardea cocoi* | Cocoi Heron | R | O | 1, 4 |
| **CATHARTIDAE** | | | | |
| *Cathartes aura* | Turkey Vulture | ETF, O | O | 2, 3, 4, 6 |

| Family and Species | English Name | Habitat | Records Type | Sites |
|---|---|---|---|---|
| *Cathartes burrovianus* | Lesser Yellow-headed Vulture | ETF, O | O | 1, 2, 3, 4, 6, 5, 7 |
| *Coragyps atratus* | Black Vulture | O | O | 1, 2, 3, 4, 6, 5, 7 |
| *Sarcoramphus papa* | King Vulture | TF, O | O | 1, 3 |
| **ACCIPITRIDAE** | | | | |
| *Elanoides forficatus* | Swallow-tailed Kite | TF, O | O | 1, 2, 3, 4, 6, 7 |
| *Ictinia plumbea* | Plumbeous Kite | EFR | O | 1, 2, 3, 4, 6, 5, 7 |
| *Geranospiza caerulescens* | Crane Hawk | TF | O | 4 |
| *Urubitinga urubitinga* | Great Black-Hawk | EFR | O | 4 |
| *Rupornis magnirostris* | Roadside Hawk | ETF,FR, O | O | 1, 2, 3, 4, 6, 5, 7 |
| *Buteo nitidus* | Gray Hawk | EFR, O | O | 4 |
| *Buteo brachyurus* | Short-tailed Hawk | O | O | 6 |
| *Harpia harpyja* | Harpy Eagle | TF | O | 4 |
| *Spizaetus tyrannus* | Black Hawk-Eagle | EFR | O | 2 |
| *Spizaetus ornatus* | Ornate Hawk-Eagle | TF | I[1] | 4 |
| **PSOPHIIDAE** | | | | |
| *Psophia viridis* | Green-winged Trumpeter | TF | O | 1, 3, 4 |
| **RALLIDAE** | | | | |
| *Aramides cajaneus* | Gray-necked Wood-Rail | TF | O | 1, 2, 3, 4, 5 |
| **EURYPYGIDAE** | | | | |
| *Eurypyga helias* | Sunbittern | R | I[1] | 1, 2, 4, 5 |
| **CHARADRIIDAE** | | | | |
| *Vanellus cayanus* | Pied Lapwing | R | O, S (MPEG 65595) | 4 |
| *Vanellus chilensis* | Southern Lapwing | O | O | 4, 6, 5 |
| *Charadrius collaris* | Collared Plover | P | O | 6 |
| **JACANIDAE** | | | | |
| *Jacana jacana* | Wattled Jacana | R | O | 4, 5 |
| **STERNIDAE** | | | | |
| *Sternula superciliaris* | Yellow-billed Tern | R | O | 4 |
| **COLUMBIDAE** | | | | |
| *Columbina passerina* | Common Ground-Dove | O | O | 1, 2, 3, 4, 6, 5, 7 |
| *Columba livia* | Rock Pigeon | A | O | 6 |
| *Patagioenas speciosa* | Scaled Pigeon | ETF | O | 3, 4, 5 |
| *Patagioenas cayennensis* | Pale-vented Pigeon | TF | O | 2, 3, 4, 5 |
| *Leptotila verreauxi* | White-tipped Dove | TF | S (MPEG 65596) | 4, 5 |
| *Leptotila rufaxilla* | Gray-fronted Dove | TF | O | 2, 3 |
| *Geotrygon montana* | Ruddy Quail-Dove | TF | S (MPEG 65597) | 1, 4, 5 |
| **OPISTHOCOMIDAE** | | | | |
| *Opisthocomus hoazin* | Hoatzin | R | O | 1, 2, 4 |

| Family and Species | English Name | Habitat | Records Type | Sites |
|---|---|---|---|---|
| **CUCULIDAE** | | | | |
| *Piaya cayana* | Squirrel Cuckoo | TF | O | 1, 2, 3, 4, 5 |
| *Crotophaga major* | Greater Ani | R | O | 1, 2, 4 |
| *Crotophaga ani* | Smooth-billed Ani | ESR, O | O | 2, 3, 4, 6, 5, 7 |
| *Neomorphus squamiger* | Scaled Ground-Cuckoo | TF | O | 1 |
| **STRIGIDAE** | | | | |
| *Megascops choliba* | Tropical Screech-Owl | ETF | V, O | 1, 3 |
| *Athene cunicularia* | Burrowing Owl | O | O | 7 |
| **NYCTIBIIDAE** | | | | |
| *Nyctibius griseus* | Common Potoo | TF | V, O | 1, 5 |
| **CAPRIMULGIDAE** | | | | |
| *Chordeiles nacunda* | Nacunda Nighthawk | O | O | 6 |
| *Hydropsalis albicollis* | Pauraque | ETF | V, O | 1,2,3,4,6,5,7 |
| *Hydropsalis nigrescens* | Blackish Nightjar | S | S (MPEG 65600) | 4 |
| *Hydropsalis torquata* | Scissor-tailed Nightjar | R | S (MPEG 65106) | 2 |
| **APODIDAE** | | | | |
| *Chaetura brachyura* | Short-tailed Swift | AE | O | 2, 3 |
| *Tachornis squamata* | Fork-tailed Palm-Swift | AE | O | 2, 3, 4, 5 |
| *Cypseloides senex* | Great Dusky Swift | AE | O | 4 |
| **TROCHILIDAE** | | | | |
| *Threnetes leucurus* | Pale-tailed Barbthroat | TF | S (MPEG 65604) | 3 |
| *Phaethornis ruber* | Reddish Hermit | TF | O, V | 2, 5 |
| *Phaethornis philippii* | Needle-billed Hermit | S, TF, ETF | S (MPEG 65104, 65605, 65606, 65607, 65110) | 1, 2, 4, 5 |
| *Phaethornis superciliosus* | Long-tailed Hermit | TF | S (65609, 65610) | 1, 2, 3, 4, 5 |
| *Phaethornis malaris* | Great-billed Hermit | TF | S (MPEG 65111) | 3 |
| *Campylopterus largipennis* | Gray-breasted Sabrewing | ESR | S (MPEG 65112) | 3 |
| *Florisuga mellivora* | White-necked Jacobin | ESR | O | 3, 5 |
| *Anthracothorax nigricollis* | Black-throated Mango | ETF | O | 4 |
| *Topaza pella* | Crimson Topaz | TF | S (MPEG 65603) | 3 |
| *Discosura langsdorffi* | Black-bellied Thorntail | ESR | O, P(WA784190) | 3 |
| *Discosura longicaudus* | Racket-tailed Coquette | ESR | S (MPEG 65602), P(WA784194) | 3 |
| *Thalurania furcata* | Fork-tailed Woodnymph | TF | S (MPEG 65611, 65612) | 1, 2, 3, 5 |
| *Hylocharis sapphirina* | Rufous-throated Sapphire | ESR | S (MPEG 65601) P(WA453732) | 3 |
| *Heliothryx auritus* | Black-eared Fairy | ETF | S (MPEG 65608) | 5 |
| **TROGONIDAE** | | | | |
| *Trogon viridis* | White-tailed Trogon | EFR | O | 2 |
| *Trogon curucui* | Blue-crowned Trogon | EFR | O | 1, 2 |

| Family and Species | English Name | Habitat | Records Type | Sites |
|---|---|---|---|---|
| *Trogon violaceus* | Violaceous Trogon | TF | O | 1, 4 |
| *Trogon collaris* | Collared Trogon | TF | O | 3 |
| *Trogon rufus* | Black-throated Trogon | TF | O | 2 |
| *Trogon melanurus* | Black-tailed Trogon | TF | O | 1 |
| **ALCEDINIDAE** | | | | |
| *Megaceryle torquata* | Ringed Kingfisher | R | O | 1, 2, 4 |
| *Chloroceryle amazona* | Amazon Kingfisher | R | O | 1, 2, 4 |
| *Chloroceryle aenea* | American Pygmy Kingfisher | R | O | 1, 2, 4 |
| *Chloroceryle americana* | Green Kingfisher | R | O | 1, 2, 4 |
| *Chloroceryle inda* | Green-and-rufous Kingfisher | TF | O | 1 |
| **MOMOTIDAE** | | | | |
| *Electron platyrhynchum* | Broad-billed Motmot | EFR | O | 1 |
| *Baryphthengus martii* | Rufous Motmot | TF | S (MPEG 65594) | 1, 3, 5 |
| *Momotus momota* | Amazonian Motmot | TF | O | 1 |
| **GALBULIDAE** | | | | |
| *Galbula dea* | Paradise Jacamar | FR | O | 1, 2 |
| **BUCCONIDAE** | | | | |
| *Bucco tamatia* | Spotted Puffbird | TF | O, P (WA785084) | 1 |
| *Malacoptila rufa* | Rufous-necked Puffbird | TF | S (MPEG 65613) | 1, 2, 5 |
| *Monasa nigrifrons* | Black-fronted Nunbird | TF, FR | O | 1, 2, 3, 4 |
| *Monasa morphoeus* | White-fronted Nunbird | ETF | O | 1, 3 |
| *Chelidoptera tenebrosa* | Swallow-winged Puffbird | EFR | O | 1, 2, 4, 6, 5, 7 |
| **RAMPHASTIDAE** | | | | |
| *Ramphastos tucanus* | White-throated Toucan | TF | O | 1, 2, 3, 4, 6, 5, 7 |
| *Ramphastos vitellinus* | Channel-billed Toucan | TF | O | 1, 2, 3, 4, 6, 5, 7 |
| *Pteroglossus inscriptus* | Lettered Aracari | EFR | O | 4 |
| *Pteroglossus aracari* | Black-necked Aracari | TF | O | 1, 2, 3, 4, 5 |
| **PICIDAE** | | | | |
| *Picumnus aurifrons* | Bar-breasted Piculet | TF | S (MPEG 65113) | 3 |
| *Melanerpes cruentatus* | Yellow-tufted Woodpecker | ETF | O | 1, 2, 3, 4 |
| *Piculus flavigula* | Yellow-throated Woodpecker | TF | O | 1 |
| *Celeus grammicus* | Scaly-breasted Woodpecker | EFR | O | 1 |
| *Dryocopus lineatus* | Lineated Woodpecker | EFR | O | 1, 2, 3, 4, 6, 5, 7 |
| *Campephilus rubricollis* | Red-necked Woodpecker | ETF | O | 2 |
| **FALCONIDAE** | | | | |
| *Daptrius ater* | Black Caracara | ETF, FR | O | 2, 4, 6 |
| *Ibycter americanus* | Red-throated Caracara | EFR | O | 1, 4 |
| *Milvago chimachima* | Yellow-headed Caracara | ETF, O | O | 1 |

| Family and Species | English Name | Habitat | Records Type | Sites |
|---|---|---|---|---|
| *Herpetotheres cachinnans* | Laughing Falcon | ETF, O | O | 1, 3, 4, 5 |
| *Falco rufigularis* | Bat Falcon | EFR | O | 1, 4, 5 |
| **PSITTACIDAE** | | | | |
| *Ara ararauna* | Blue-and-yellow Macaw | TF | I[1] | 1, 2, 3, 4, 6, 5, 7 |
| *Ara macao* | Scarlet Macaw | TF | O | 1, 2, 3, 4, 6, 5, 7 |
| *Ara chloropterus* | Red-and-green Macaw | TF | I[1] | 4 |
| *Orthopsittaca manilatus* | Red-bellied Macaw | TF | O | 1, 2, 3, 4, 6, 5, 7 |
| *Guaruba guarouba* | Golden Parakeet | TF, FR | O | 2, 3, 4, 6, 5, 7 |
| *Psittacara leucophthalmus* | White-eyed Parakeet | TF, FR | O | 6, 5 |
| *Pyrrhura perlata* | Crimson-bellied Parakeet | EFR | O | 1, 4 |
| *Brotogeris versicolurus* | Canary-winged Parakeet | EFR | O | 1, 4 |
| *Brotogeris chrysoptera* | Golden-winged Parakeet | ETF | O | 1, 4, 5 |
| *Pyrilia aurantiocephala* | Bald Parrot | EFR | S (MPEG 65599) | 2 |
| *Amazona ochrocephala* | Yellow-crowned Parrot | EFR | O | 4 |
| *Amazona kawalli* | Kawall's Parrot | EFR | O | 4 |
| *Amazona amazonica* | Orange-winged Parrot | ESR | O | 1, 4, 6, 5, 7 |
| *Deroptyus accipitrinus* | Red-fan Parrot | EFR | I[1] | 4 |
| **THAMNOPHILIDAE** | | | | |
| *Epinecrophylla leucophthalma* | White-eyed Antwren | FR | S (MPEG 65127, 65128) | 1 |
| *Myrmotherula multostriata* | Amazonian Streaked-Antwren | TF | O, S (MPEG 65135) | 2, 3 |
| *Myrmotherula axillaris* | White-flanked Antwren | TF | S (MPEG 65625) | 3 |
| *Myrmotherula longipennis* | Long-winged Antwren | TF | S (MPEG 65622) | 3 |
| *Isleria hauxwelli* | Plain-throated Antwren | FR | O | 1 |
| *Thamnomanes saturninus* | Saturnine Antshrike | TF | O, S (MPEG 65125, 65126) | 1, 2, 3, 4, 5 |
| *Thamnomanes caesius* | Cinereous Antshrike | TF | O, S (MPEG 65124) | 1, 2, 3, 4, 5 |
| *Thamnophilus doliatus* | Barred Antshrike | ESR | O | 2, 5 |
| *Thamnophilus schistaceus* | Plain-winged Antshrike | TF | S (MPEG 65123) | 2 |
| *Thamnophilus aethiops* | White-shouldered Antshrike | TF | O | 3 |
| *Thamnophilus stictocephalus* | Natterer's Slaty-Antshrike | TF | O | 1 |
| *Thamnophilus amazonicus* | Amazonian Antshrike | TF | S (MPEG 65626) | 1 |
| *Myrmoderus ferrugineus* | Ferruginous-backed Antbird | TF | O, S (MPEG 65130) | 1, 2, 5 |
| *Hylophylax naevius* | Spot-backed Antbird | FR | O | 1 |
| *Myrmoborus myotherinus* | Black-faced Antbird | TF | O, S (MPEG 65129) | 1, 2 |
| *Hypocnemis striata* | Spix's Warbling-Antbird | TF | O, S (MPEG 65628) | 1, 3, 5 |
| *Willisornis poecilinotus* | Scale-backed Antbird | TF | S (MPEG 65132) | 1, 2, 3, 5 |
| *Phlegopsis nigromaculata* | Black-spotted Bare-eye | TF | O, S (MPEG 65133) | 1, 2, 3, 5 |
| *Phlegopsis borbae* | Pale-faced Antbird | TF | S (MPEG 65631, 65632) | 3 |
| *Rhegmatorhina berlepschi* | Harlequin Antbird | TF | S (MPEG 65131, 65134) | 1, 2, 3, 5 |

| Family and Species | English Name | Habitat | Records Type | Sites |
|---|---|---|---|---|
| **FORMICARIIDAE** | | | | |
| *Formicarius analis* | Black-faced Antthrush | TF | O | 1, 2, 3, 5 |
| **DENDROCOLAPTIDAE** | | | | |
| *Dendrocincla fuliginosa* | Plain-brown Woodcreeper | TF | S (MPEG 65115, 65116, 65615) | 1, 4 |
| *Dendrocincla merula* | White-chinned Woodcreeper | TF | S (MPEG 65614) | 3 |
| *Deconychura longicauda* | Long-tailed Woodcreeper | TF | S (MPEG 65616) | 1 |
| *Certhiasomus stictolaemus* | Spot-throated Woodcreeper | TF | S (MPEG 65617) | 1, 3 |
| *Glyphorynchus spirurus* | Wedge-billed Woodcreeper | TF | S (MPEG 65121) | 1, 2, 3, 4, 5 |
| *Dendrocolaptes hoffmannsi* | Hoffmanns's Woodcreeper | TF | S (MPEG 65117) | 1, 3 |
| *Xiphorhynchus ocellatus* | Ocellated Woodcreeper | FR | S (MPEG 65119) | 1 |
| *Xiphorhynchus elegans* | Elegant Woodcreeper | TF | S (MPEG 65120) | 1, 2 |
| *Xiphorhynchus guttatus* | Buff-throated Woodcreeper | FR | S (MPEG 65118) | 1, 2, 3, 4, 5 |
| **XENOPIDAE** | | | | |
| *Xenops tenuirostris* | Slender-billed Xenops | FR | O | 1 |
| *Xenops minutus* | Plain Xenops | FR | O | 1 |
| **FURNARIIDAE** | | | | |
| *Philydor pyrrhodes* | Cinnamon-rumped Foliage-gleaner | FR | S (MPEG 65122) | 1, 2 |
| *Philydor erythropterum* | Chestnut-winged Foliage-gleaner | FR | O | 1 |
| *Automolus paraensis* | Para Foliage-gleaner | FR | S (MPEG 65620) | 1, 2, 3 |
| *Automolus ochrolaemus* | Buff-throated Foliage-gleaner | FR | O | 2 |
| *Synallaxis gujanensis* | Plain-crowned Spinetail | EFR | S (MPEG 65621) | 4 |
| **PIPRIDAE** | | | | |
| *Pipra fasciicauda* | Band-tailed Manakin | FR | S (MPEG 65152) | 2, 3 |
| *Ceratopipra rubrocapilla* | Red-headed Manakin | FR | O, S (MPEG 65645, 65153) | 1, 2, 3, 4 |
| *Lepidothrix nattereri* | Snow-capped Manakin | FR | S (MPEG 65149, 65150, 65151) | 1, 3, 4 |
| *Manacus manacus* | White-bearded Manakin | S, | S (MPEG 65148) | 4 |
| *Heterocercus linteatus* | Flame-crowned Manakin | FR, S | O, S (MPEG 65158), P(WA784186) | 2, 4, 6 |
| *Chiroxiphia pareola* | Blue-backed Manakin | FR | S (MPEG 65644) | 1 |
| **ONYCHORHYNCHIDAE** | | | | |
| *Onychorhynchus coronatus* | Royal Flycatcher | FR | O | 2, 5 |
| *Myiobius barbatus* | Whiskered Flycatcher | FR | S (MPEG 65634) | 3, 4 |
| **TITYRIDAE** | | | | |
| *Laniocera hypopyrra* | Cinereous Mourner | FR | S (MPEG 65154) | 4 |
| *Tityra inquisitor* | Black-crowned Tityra | S | S (MPEG 65642) | 4 |
| *Tityra cayana* | Black-tailed Tityra | TF, S | O, S (MPEG 65641) | 1, 2, 3, 4, 6, 5. 7 |
| *Tityra semifasciata* | Masked Tityra | EFR | O | 4 |

| Family and Species | English Name | Habitat | Records Type | Sites |
|---|---|---|---|---|
| **COTINGIDAE** | | | | |
| *Lipaugus vociferans* | Screaming Piha | TF,FR | O, V | 1, 2, 3, 4, 5 |
| *Xipholena lamellipennis* | White-tailed Cotinga | FR | O | 3 |
| *Gymnoderus foetidus* | Bare-necked Fruitcrow | FR | O | 2 |
| **TYRANNIDAE** | | | | |
| *Mionectes oleagineus* | Ochre-bellied Flycatcher | FR | O, S (MPEG 65146) | 1, 2, 3, 4 |
| *Mionectes macconnelli* | McConnell's Flycatcher | S | S (MPEG 65638, 65639) | 4 |
| *Hemitriccus minor* | Snethlage's Tody-Tyrant | FR | S (MPEG 65145) | 1 |
| *Myiopagis gaimardii* | Forest Elaenia | ESR | S (MPEG 65635) | 3, 5 |
| *Elaenia parvirostris* | Small-billed Elaenia | EFR | S (MPEG 65139) | 4 |
| *Elaenia spectabilis* | Large Elaenia | ESR | S (MPEG 65142) | 3 |
| *Tolmomyias flaviventris* | Yellow-breasted Flycatcher | ESR | S (MPEG 65636, 65637, 65140, 65141) | 3, 4 |
| *Tolmomyias poliocephalus* | Gray-crowned Flycatcher | ESR | S (MPEG 65633) | 3 |
| *Lathrotriccus euleri* | Euler's Flycatcher | ESR | O | 6 |
| *Legatus leucophaius* | Piratic Flycatcher | ESR | O, S (MPEG 65144) | 1, 2, 3, 4, 6 |
| *Myiozetetes cayanensis* | Rusty-margined Flycatcher | ETF | O | 1, 2, 3, 4, 6, 5, 7 |
| *Pitangus sulphuratus* | Great Kiskadee | ETF | O | 1, 2, 3, 4, 6, 5, 7 |
| *Myiodynastes maculatus* | Streaked Flycatcher | ETF | O | 2, 6 |
| *Megarynchus pitangua* | Boat-billed Flycatcher | EFR | O | 1, 2, 3, 4, 6, 5, 7 |
| *Empidonomus varius* | Variegated Flycatcher | EFR | O, P(WA454249) | 3, 6 |
| *Tyrannus melancholicus* | Tropical Kingbird | EFR | O | 1, 2, 3, 4, 6, 5, 7 |
| *Myiarchus ferox* | Short-crested Flycatcher | EFR | O, S (MPEG 65640) | 1, 2, 3, 4, 6, 5, 7 |
| *Attila spadiceus* | Bright-rumped Attila | FR | O, S (MPEG 65137) | 2, 3 |
| **VIREONIDAE** | | | | |
| *Cyclarhis gujanensis* | Rufous-browed Peppershrike | EFR | O, V | 1, 2, 3, 4, 6 |
| *Vireo olivaceus* | Red-eyed Vireo | ESR | S (MPEG 65647) | 6 |
| *Hylophilus semicinereus* | Gray-chested Greenlet | ESR | S (MPEG 65648) | 6 |
| *Hylophilus ochraceiceps* | Tawny-crowned Greenlet | FR | S (MPEG 65160) | 1 |
| **HIRUNDINIDAE** | | | | |
| *Tachycineta albiventer* | White-winged Swallow | R | O | 1, 2, 4 |
| *Progne tapera* | Brown-chested Martin | O | O | 4, 6 |
| *Progne chalybea* | Gray-breasted Martin | O, A | O | 4, 6, 5, 7 |
| *Atticora fasciata* | White-banded Swallow | R | O, S (MPEG 65162) | 1, 2, 4, 5 |
| **TROGLODYTIDAE** | | | | |
| *Microcerculus marginatus* | Scaly-breasted Wren | TF | S (MPEG 65155) | 1 |
| *Troglodytes musculus* | Southern House Wren | A, O | O | 2, 6 |
| *Campylorhynchus turdinus* | Thrush-like Wren | EFR | O | 1, 2, 3, 4, 5 |
| *Pheugopedius genibarbis* | Moustached Wren | ESR | O, S (MPEG 65156) | 2, 5 |

| Family and Species | English Name | Habitat | Records Type | Sites |
|---|---|---|---|---|
| *Cantorchilus leucotis* | Buff-breasted Wren | S | S (MPEG 65157) | 4 |
| **TURDIDAE** | | | | |
| *Turdus fumigatus* | Cocoa Thrush | EFR | S (MPEG 65654) | 1, 4 |
| *Turdus lawrencii* | Lawrence's Thrush | FR | O, V | 1 |
| *Turdus albicollis* | White-necked Thrush | TF | S (MPEG 65655) | 3, 5 |
| **PASSERELLIDAE** | | | | |
| *Ammodramus aurifrons* | Yellow-browed Sparrow | O | O | 2, 3, 4, 6, 5, 7 |
| *Arremon taciturnus* | Pectoral Sparrow | S | S (MPEG 65168, 65656) | 3, 4 |
| **PARULIDAE** | | | | |
| *Myiothlypis rivularis* | Neotropical River Warbler | FR | S (MPEG 65161) | 1 |
| **ICTERIDAE** | | | | |
| *Psarocolius viridis* | Green Oropendola | EFR, FR | O | 3, 4 |
| *Icterus cayanensis* | Epaulet Oriole | EFR, FR | O | 5 |
| *Cacicus cela* | Yellow-rumped Cacique | EFR | O | 1, 2, 3, 4, 6, 5, 7 |
| *Molothrus oryzivorus* | Bobolink | R | O | 4 |
| *Molothrus bonariensis* | Shiny Cowbird | EFR | S (MPEG 65662) | 2, 4 |
| *Sturnella militaris* | Red-breasted Blackbird | O | S (MPEG 65169) | 4, 5, 7 |
| **THRAUPIDAE** | | | | |
| *Saltator grossus* | Slate-colored Grosbeak | ESR | O | 2 |
| *Saltator maximus* | Buff-throated Saltator | EFR | O | 2, 3, 4 |
| *Habia rubica* | Red-crowned Ant-Tanager | TF | S (MPEG 65657) | 1 |
| *Lanio cristatus* | Flame-crested Tanager | TF | S (MPEG 65653) | 1 |
| *Lanio surinamus* | Fulvous-crested Tanager | EFR | O | 3 |
| *Tachyphonus rufus* | White-lined Tanager | EFR | O, S (MPEG 65164, 65165, 65166) | 2, 4, 6, 5, 7 |
| *Tachyphonus phoenicius* | Red-shouldered Tanager | S | S (MPEG 65159) | 4 |
| *Ramphocelus carbo* | Silver-beaked Tanager | EFR | O, S (MPEG 65658) | 1, 2, 3, 4, 6, 5, 7 |
| *Tangara episcopus* | Blue-gray Tanager | EFR | O | 1, 2, 3, 4, 6, 5, 7 |
| *Tangara palmarum* | Palm Tanager | EFR | O | 1, 2, 3, 4, 6, 5, 7 |
| *Tangara chilensis* | Paradise Tanager | TF | O | 3 |
| *Tangara schrankii* | Green-and-gold Tanager | FR | O, P(WA784182) | 2 |
| *Dacnis lineata* | Black-faced Dacnis | TF, ESR | S (MPEG 65178, 65179) | 3 |
| *Dacnis cayana* | Blue Dacnis | TF, ESR | S (MPEG 65177) | 3 |
| *Cyanerpes nitidus* | Short-billed Honeycreeper | TF, ESR | S (MPEG 65170, 65171, 65172, 65173, 65174) | 3 |
| *Cyanerpes caeruleus* | Purple Honeycreeper | TF, ESR | S (MPEG 65175, 65176) | 3 |
| *Volatinia jacarina* | Blue-black Grassquit | ESR | O | 4, 6, 5, 7 |
| *Sporophila americana* | Wing-barred Seedeater | O | S (MPEG 65167, 65663), P(WA453727) | 4 |

| Family and Species | English Name | Habitat | Records Type | Sites |
|---|---|---|---|---|
| *Sporophila nigricollis* | Yellow-bellied Seedeater | ESR | O, S (MPEG 65664, 65666) | 3, 6 |
| *Sporophila castaneiventris* | Chestnut-bellied Seedeater | O | O | 4, 6, 5, 7 |
| *Sporophila angolensis* | Chestnut-bellied Seed-Finch | O | O, S (MPEG 65665) | 2, 3 , 4 |
| *Paroaria gularis* | Red-capped Cardinal | R | O | 1, 2, 4, 5 |
| **CARDINALIDAE** | | | | |
| *Caryothraustes canadensis* | Yellow-green Grosbeak | S | S (MPEG 65660) | 4 |
| *Cyanoloxia rothschildii* | Rothschild's Blue Grosbeak | TF | O | 1, 3, 4 |
| **FRINGILIDAE** | | | | |
| *Euphonia xanthogaster* | Orange-bellied Euphonia | TF | S (MPEG 65667) | 3 |

[1] - Refers to interviews with local residents (at each sampling point) on the occurrence of some bird species in the Amana National Forest.

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ARTICLE

# Artificial incubation and introduction of a Collared Forest-Falcon *Micrastur semitorquatus* chick into a natural nest in Southern Pantanal, Brazil

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**ABSTRACT:** The Collared Forest-Falcon *Micrastur semitorquatus* is a widespread, relatively common species occurring throughout most of Brazil. Very few data exist on its breeding biology, but it is known to nest mainly in natural cavities of large trees, usually made by other bird species. In this study we report a case of a Collared Forest-Falcon that hatched in an artificial incubator and was introduced into a natural nest previously known with three chicks of same species and similar age. The introduced chick was successfully accepted and fed by the adult parents for more than 15 days, until our last visit to the nest. Although the study case presented here required the existence of an active nest of the same species for an introduction of the chick, it was an alternative, low-cost way to ensure the success of the nestling and avoid the probability of imprinting during the time expended rearing the chicks *in situ*.

**KEYWORDS:** behavior, Falconidae, management, nestling and reproduction.

## INTRODUCTION

The Collared Forest−Falcon *Micrastur semitorquatus* is the largest of the seven currently known species of the genus (White *et al*. 1994; Ferguson-Lees & Christie 2001; Whittaker 2002). It ranges from Mexico through Central and South America, inhabiting lowland tropical rainforest, as well as semi−deciduous and second−growth forests (White *et al*. 1994). Very few studies exist on its natural history (Thorstrom *et al*. 1990; Thorstrom *et al*. 2000), and concerning its reproductive behavior the scarce accounts in the literature are mostly from Central America (White *et al.* 1994; Thorstrom *et al.* 2001).

The first published information on a forest−falcon nest date is from the early 1970's (White *et al*. 1994). Species of the genus *Micrastur* are often monogamous, known to nest in pairs and to occupy natural tree cavities for breeding (Sick 1997), although there are a few reports of the species nesting in abandoned human habitations (Carvalho-Filho *et al.* 1998) and natural caves (Vallejos *et al.* 2008). Concerning *M. semitorquatus*, it nests in natural cavities of large mature trees, where it lays one to three eggs, between March and April in Guatemala (Thorstrom *et al.* 1990; Thorstrom *et al.* 2000; Thorstrom *et al.* 2001) and between September and November in Brazil (Guedes 1993; Carvalho-Filho *et al.* 1998; Ferguson-Lees & Christie 2001; Carrara *et al*. 2007; Vallejos *et al.* 2008). In the Pantanal region, the Collared Forest−Falcon is a potential competitor for natural cavities with Hyacinth Macaw *Anodorhynchus hyacinthinus,* Laughing Falcon *Herpetotheres cachinnans*, and other species (Guedes 1993; Guedes 2011; Barbosa *et al*. in press).

The diet of *Micrastur semitorquatus* is known to be composed mainly of small vertebrates, such as mammals, birds, and lizards (White *et al.* 1994; Ferguson-Lees & Christie 2001; Carrara *et al*. 2007). In the Brazilian Pantanal, the crew of the Hyacinth Macaw Project have worked for the past 20 years monitoring *Anodorhynchus hyacinthinus'* nests and have made occasional observations of adults Collared Forest-Falcons feeding their chicks with birds and lizards, whose bones and feathers were left inside the nests (Guedes 1993, 2011). During our study, adults *M. semitorquatus* were observed with lizards such as Giant Ameiva *Ameiva ameiva* and Gold Tegu

*Tupinambis teguixin*, as well as an unidentified nightjar (Caprimulgidae) and many bodies of prey with distinct feathers, some clearly identified as Plush-crested Jay *Cyanocorax chrysops*, Smooth-billed Ani *Crotophaga ani*, and Guira Cuckoo *Guira guira*.

Here we report the introduction of a chick hatched in an artificial incubator into a natural cavity nest occupied by three *Micrastur semitorquatus* chicks. We also present information about eggs, newborn chicks, and their diet both in the lab and field.

## METHODS AND RESULTS

The study was carried out at Refúgio Ecológico Caiman (19º51'–19º58'S, 56º17'–56º24'W), in the Pantanal of Miranda, Mato Grosso do Sul, Brazil, under the auspices of the Hyacinth Macaw Project. On 6 September 2007, we recorded an egg of *M. semitorquatus* in a natural cavity (Figure 1), previously occupied by an *A. hyacinthinus*. We returned to the nest on 3 October and after three days monitoring the nest, we attested that the parents left it unattended and abandoned for unknown reasons. Thus, on 6 October 2007, we collected the egg and transported it to the laboratory for artificial incubation.

The *M. semitorquatus* nest was in a Manduvi Tree *Sterculia apetala*, with an entrance roughly 4.5 m from the ground. The color of the egg laid was red–brown, with darker spots, corroborating the observations of other authors (Thorstrom *et al*. 1990; Guedes 1993; Carrara *et al*. 2007; Vallejos *et al*. 2008), measuring 5.69 x 2.37 cm, and weighing 60 g. The egg was maintained in a *Premium Ecológica* IP120 incubator with mean temperature of 37.2ºC and turned 180° each 12 h (according to Burnham 1983, with modifications). On 9 October the egg started to hatch, and on 13 October the chick emerged from the egg, after spending almost 24 hours to conclude the process. On hatching day, the chick weighed 40 grams and its measurements were as follows: 105 mm total length, 20 mm tarsus length, 215 mm wing length, 346 mm head length, and 153 mm bill length (exposed culmen). The chick hatched with closed eyes, although they started to open five hours later.

**FIGURE 1:** *Micrastur semitorquatus* egg laid in a Manduvi Tree *Sterculia apetala* cavity in Miranda, Mato Grosso do Sul, Brazil.

The nestling was fed from the second day on, four times a day, with the first feeding at 7 am and the last at 7 pm. The food offered was based on chicken and beef, with some eggshell powder for calcium supplementation, following the foreknown diet most used in captive Falconiformes and according to the food availability at the moment. The meat was cut in small pieces 1x1 cm and provided freely according to the chick's acceptance. The chick was weighed before feeding (Table 1). On 16 October 2007, three days old and weighing roughly 50 grams, the chick was transferred to a known active nest of *Micrastur semitorquatus* with chicks of similar size and age. During the following visit to the nest, two days after the introduction, the parents were absent but the four chicks appeared healthy (Figure 2a). The following day, one parent was observed inside the nest and all the four chicks had full crops, including the recently introduced chick. On 30 October, almost two weeks later, one parent was nearby defending the nest site and all four young still appeared healthy (Figure 2b).

Our last visit to the nest site was on 10 December, when the Collared Forest-Falcons were no longer present and the nest was occupied by a Muscovy Duck *Cairina moschata*. The successful acceptance of the introduced chick and the continued parental care of all nestlings confirms the effectiveness of the management strategy applied.

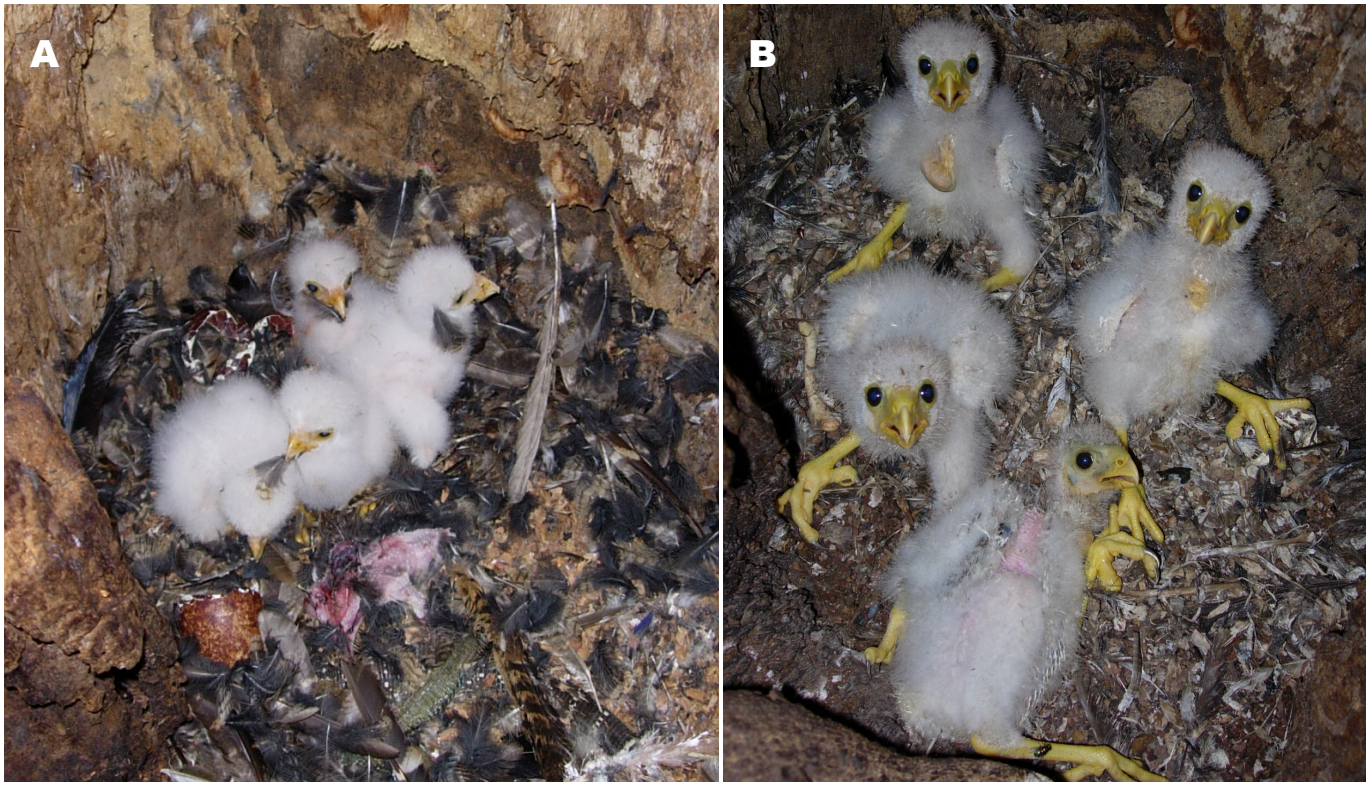


**FIGURE 2:** A) *Micrastur semitorquatus* chicks on the day of introduction. B) *Micrastur semitorquatus* juveniles two weeks after the introduction.

**TABLE 1:** Description of the time and food item offered for the chick of Collared Forest−Falcon (*Micrastur semitorquatus*) hatched in an artificial incubator.

| Date | Time | Chick weight (g) | Food type | Food (g) |
|---|---|---|---|---|
| 14/out | 07:30 | 38 | Chicken | 3 |
| 14/out | 10:38 | 40 | Chicken | 1 |
| 14/out | 14:20 | 40 | Chicken | 2 |
| 14/out | 18:40 | 41 | Chicken | 3 |
| 15/out | 06:30 | 40 | Chicken | 5 |
| 15/out | 10:30 | 44 | Chicken | 4 |
| 15/out | 12:50 | 48 | Ground beef | 3 |
| 15/out | 17:10 | 50 | Ground beef | 6 |
| 16/out | 05:45 | 51 | Ground beef | 6 |

## DISCUSSION

The egg transported to the lab for incubation was observed for a period of 37 days from our first observation of the nest in the wild until the chick emerged from the egg, a period longer than observed in Brazil by Guedes (1993) and in Ecuador by López-Lanús (2000), which was 30 and 27 days, respectively. However, the incubation period in Guatemala was even longer, lasting from 46 to 48 days (White *et al.* 1994; Thorstrom *et al.* 2000). Another difference observed between the artificial incubated egg and a natural one was the time expended for the nestling to open its eyes, which occurred five hours after hatching and has been observed to last roughly three days in the wild (Thorstrom 2001).

*M. semitorquatus* is known to lay one to two eggs per clutch (Guedes 1993; Carrara *et al.* 2007). However, in this study we recorded a natural nest with three chicks. Unfortunately we were not able to make more frequent monitoring trips to the nest with the four chicks, but the absence of the almost two-month-old fledglings indicates that the young likely left the nest naturally. Even though the nesting success could not be estimated (see protocol in Mayfield 1961), the evident acceptance of the introduced chick indicates the effectiveness of the method employed.

The Pantanal is under constant pressure of deforestation and slash and burn activities, which changes the natural environment and affects the survivorship of all biotic communities (Harris *et al.* 2005). One of the effects is the lack of natural cavities in big trees, an important nesting resource for many bird species, notably the large ones like macaws and raptors (Guedes 2011). The use of the same natural cavity by three different bird species (Hyacinth Macaw, Collared Forest-Falcon, and Muscovy Duck) in the same reproductive period, emphasizes the importance of such cavities for the reproduction of many species in the region. For this reason, the observation reported herein demonstrates the need for more studies on the breeding behavior of cavity-nesting species in the Pantanal.

Although the procedure of introducing a chick into a natural nest requires the existence of other active nests of the same species—with foster parents as well as eggs and nestlings in the same stage of development—it also emphasizes the importance of reintroducing a species in nature at an early age. It is a low-cost management strategy that avoids problems inherent to the re-introduction of captive-reared birds, such as imprinting, *ex situ* rehabilitation work, juvenile survival, and individual stress levels (Brown *et al.* 2006; Evans *et al.* 2009; Massei *et al.* 2010). The majority of studies of translocation, rehabilitation, and re-introduction of raptors were conducted with species that were listed as threatened or endangered and were very costly (Fischer & Lindenmayer 2000; Nicoll *et al.* 2004; Campbell-Thompson *et al.* 2012). Although, some smaller-scale, lower-cost cases have been effective, like the successful translocation of an Ornate Hawk-Eagle *Spizaetus ornatus* nest with its nestling after the flooding of the nesting site (Joenck *et al.* 2013). While not currently listed as a threatened species, this case of the Collared Forest-Falcon fits as an excellent model for the development of more elaborate protocols for the rehabilitation of raptor chicks rescued without a natural parental care option.

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ARTICLE

# Possible scavenging behavior in Ornate Hawk-Eagle (*Spizaetus ornatus*) in Amazonas, Brazil

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**ABSTRACT:** We provide documentation of the first observations of interactions with carrion in the Ornate Hawk-Eagle (*Spizaetus ornatus*), a species formerly assumed only to prey on live food items. During fieldwork in RESEX Médio-Juruá reserve, in Amazonas, Brazil, in June-August 2009, images were captured by remote camera traps of an Ornate Hawk-Eagle interacting with a cattle femur, indicating possible scavenging behavior. Additionally, apparent investigatory behavior was also recorded in Slate-colored Hawk (*Buteogallus schistaceus*), a previously unrecorded behavior for the species. We suggest that additional work with camera traps monitoring carrion may reveal opportunistic scavenging to be more widespread in tropical forest raptors than has generally been assumed.

**KEYWORDS:** *Buteogallus schistaceus*; foraging ecology; raptors; scavenging behavior; *Spizaetus.*

## INTRODUCTION

Many tropical raptors, particularly forest dwellers, are secretive and difficult to study. Remote localities, low population densities, inconspicuous behaviors, complex (and often dense) vegetation, and high diversity have led to a generally slow accumulation of basic natural history knowledge of many species (Robinson 1994; Bildstein *et al.* 1998). Raptors are highly susceptible to forest loss, perturbation, and fragmentation: disturbed habitats retain only impoverished raptor communities dominated by open habitat or generalist species (Turley *et al.* 1992).

The Ornate Hawk-Eagle (*Spizaetus ornatus*) is widespread throughout much of the lowland Neotropics, generally occurring below 1,800 m asl. It is resident from northern Mexico to southern Brazil (throughout the Amazon Basin), northern Argentina, and Paraguay (Howell & Webb 1995; Iliff 2010). BirdLife International (2012) classifies the species as 'Near-threatened' on the IUCN Red List, its primary threat being future habitat loss (Bird *et al*. 2012), although arbitrary persecution has also been recorded (Trinca *et al.* 2008).

Hawk-eagles, formerly all subsumed under *Spizaetus* (Aves: Accipitriformes) are now widely separated into *Spizaetus* (New World) and *Nisaetus* (Old World; Helbig *et al.* 2005; Haring *et al.* 2007). Despite these recent taxonomic developments, these species occupy similar ecological niches and this is reflected in their known feeding behaviors. In the Neotropics the *Spizaetus* guild is made up of four species; Black Hawk-Eagle (*Spizaetus tyrannus*), Black-and-white Hawk-Eagle (*Spizaetus melanoleucus*), Ornate Hawk-Eagle, and Black-and-chestnut Eagle (*Spizaetus isidori*). The recorded diets of these species are varied, but their documented hunting strategies are similar and all of a sub-canopy nature (Robinson 1994; Ferguson-Lees & Christie 2001), although Black-and-white Hawk-eagle has also been recorded to hunt by diving from a great height into the canopy (Brightsmith 2002).

### Feeding Ecology and Diet of Ornate Hawk-Eagle and Similar Species

Robinson (1994), groups Ornate Hawk-Eagle in a guild of seven similar species in Amazonian forest that utilize similar hunting strategies, ambushing large birds and mammals from concealed/sub-canopy perches or long-range (> 50m) attacks on congregations of birds and mammals. The other six species are: Collared Forest-Falcon (*Micrastur semitorquatus*), Bicolored Hawk (*Accipiter bicolor*), Black-and-white Hawk-Eagle, Black Hawk-Eagle, Crested Eagle (*Morphnus guianensis*), and Harpy Eagle (*Harpia harpyja*). Documented feeding ecology of Ornate Hawk-Eagles is typical of this grouping; pouncing on prey or giving a short chase (Ferguson-Lees & Christie 2001) and high speed dives, for example on herons and rallids, troops of monkeys, and a Guianan Cock-of-the-rock (*Rupicola rupicola*) lek (Trail 1987; Hilty 2003).

Recorded diet of Ornate Hawk-Eagle is widely varied in terms of species. Flatten *et al.* (1990) found, of 52 prey items at a nest studied in Guatemala, 40.4% were avian, 46.1% were mammalian, and 13.5% unidentifiable. Klein *et al.* (1988) studied a nest in Manaus, Brazil, and found, of 49 prey items; 63.5% were avian, 32.7% mammalian, and 4.1% reptiles. Supporting Robinson (1994), avian prey was of relatively large size such as cracids, macaw sp. (*Ara* sp.), and tinamous; mammals recorded included a porcupine sp. (*Coendu* sp.), opossums, and Common Squirrel Monkey (*Saimiri sciureus*). Other recorded prey items or attacks have been similar, such as Robinson (1994)—small primates, cracids, gallinules, macaw sp. (*Ara* sp.), and Pale-winged Trumpeter (*Psophia leucoptera*); Lyon & Kuhnigk (1985)—tinamous, cracids, and Gray-headed Dove (*Leptotila plumbeiceps*); Russell (1964)—Great Curassow (*Crax rubra*); Kilham (1978)—Crested Guan (*Penelope purpurascens*); Friedmann and Smith (1955)—guan sp. (*Penelope* sp.), and Acosta-Chaves *et al.* (2012) of a Long-tailed Silky-flycatcher (*Ptilogonys caudatus*). A number of other prey types have also been detected, such as Green Iguana (*Iguana iguana*; Clinton-Eitniear *et al.* 1991), a large colubrid-type snake (Robinson 1994), and unidentified snake and lizard sp. (Klein *et al.* 1988). It would appear from this diversity of recorded prey items that this species is opportunistic and generalist in its foraging niche.

Scavenging behavior or feeding on carrion appears to be very rare in this guild of species, although there are some records of species feeding on stored prey that are likely to be at least partially decomposed. A Harpy Eagle, for example, was recorded feeding on a Brown-throated Three-toed Sloth (*Bradypus variegatus*) over a period of three days at the same site, which probably represented the first report of a non-scavenging raptor repeatedly feeding for more than two days on prey (Springer *et al.* 2011). However, it is likely that the Harpy Eagle recorded was released as part of a rehabilitation program, which poses the question whether this behavior is natural or a product of exposure to carcasses throughout the program. Such behavior also seems to be rare or unrecorded in similar species worldwide, although (African) Crowned Eagles (*Stephanoaetus coronatus*) reportedly rarely feed on carrion (although no specific example is given) and, after a kill, have been recorded to cache and re-visit food for several days (Ferguson-Lees & Christie 2001).

Herein, we report photographic evidence of investigation and interactions with carrion indicating possible scavenging behaviors of an Ornate Hawk-Eagle on cattle femurs monitored by remote camera trapping in primary lowland Amazonian rainforest in Amazonas, Brazil. Further, we also documented investigatory behavior by a single Slate-colored Hawk (*Buteogallus schistaceus*), a previously unrecorded behavior for the species.

## METHODS

The femurs (Figure 1) were placed in the forest on 27 July 2009 as part of a larger study investigating nutrient cycling. Over a two month period we spread 186 femurs 150 m apart along six transects tied to trees with wire. Reconyx HP45 camera traps (Reconyx, LLP, 3600 Hwy 157, Suite 205, La Crosse, Wisconsin) were used to monitor 10 femurs for the first five weeks of their placement to record vertebrate scavengers. Despite continuous deployment, problems with batteries meant camera traps were not monitoring continuously for the five week period and a total of 217 camera-trap days were recorded (of a potential 350). Camera traps were placed 30 cm off the ground ~4 m away from the femur, set to their default trail setting; to take three photos at 1-s intervals for every detected motion. We monitored femurs near animal trails or in areas expected to achieve higher capture rates and cameras were placed at least 1 km apart to ensure a degree of independence. Areas being heavily used by local people for hunting and other forest activities were excluded from the camera trapping effort.

## RESULTS

On 28 July 2009 a Reconyx HP45 camera trap captured 12 photos, from 1302-1304 h, of an adult Ornate Hawk-Eagle interacting with a cattle femur (Figure 2) at GPS coordinates 5.36692,S, 67.28954 W in the RESEX Médio-Juruá reserve, in Amazonas, Brazil. The femur had been placed in the forest the day before, on 27 July. While no actual feeding was recorded, the individual approached and interacted with the femur, placing its talons on the femur on two occasions. Figure 1 shows how little flesh there was on the bone, which may explain the absence of feeding. At 1136 h on 13 August 2009, three photos (Figure 3) were captured by a Reconyx HP45 camera trap of a single Slate-colored Hawk briefly investigating a femur site at GPS coordinates 5.37409 S, 67.28370 W. The femur had been placed in the forest 17 days previously, on 27 July.

**FIGURE 1.** Cattle femur (photographed one day prior to the Ornate Hawk-Eagle (*Spizaetus ornatus*) interaction).

**FIGURE 2.** Camera-trap images showing Ornate Hawk-Eagle (*Spizaetus ornatus*) interactions with cattle femur.

**FIGURE 3.** One of three camera-trap images showing Slate-colored hawk (*Buteogallus schistaceus*) investigating cattle femur site.

## DISCUSSION

Across the 10 camera trap sites a total of 217 camera trap days over a five-week period recorded one Ornate Hawk-Eagle interacting with a femur (Figure 2) and one Slate-colored Hawk investigating a femur site (Figure 3). Given the lack of previous records of this behavior, it would appear that this is unlikely to be a common feeding strategy. It is important to note, however, that the bones are unlikely to have attracted scavengers for the entire duration of trapping effort as they become less attractive to scavengers as they decay (Houston 1986).

While some resident raptors such as Turkey Vultures (*Cathartes aura*) rely on olfactory senses to locate carrion (Houston 1986; McShea *et al.* 2000), no vultures were recorded at any of the femur sites. This would suggest

that the Ornate Hawk-Eagle and Slate-colored Hawk located the femurs by sight, as they were not producing strong enough olfactory clues to be discovered by other avian species which were present in the area and known to have highly acute olfactory senses. Indeed, the lack of vultures at these bones may have provided an opportunity for otherwise non-scavenging raptors to exploit carrion in the absence of specialist scavengers.

Although no feeding behavior was recorded, we believe the interactions with carrion by Ornate Hawk-Eagle to be the first records of possible scavenging behavior in the species. In the instance of the Slate-colored Hawk, where no direct contact was recorded, we believe this also to be the first recorded instance of such behavior, although it is unsafe to draw any further conclusions.

As has been elucidated from the recorded diets of Ornate Hawk-Eagle, the species is a generalist feeder and we believe opportunistic scavenging may occur more than is currently documented. Detailed documentation of prey data recorded for many forest raptor species are based primarily on prolonged nest observations, in which *all* recorded prey is assumed to be a 'kill'. Given the similarities in known feeding ecology of sub-canopy raptor guilds, it is valid to suggest that scavenging behavior may occur in a number of species that have, to date, not been recorded to do so. Whether such behavior is opportunistic, driven by stress or resource shortages or as a result of previous anthropogenic interactions with the individual or its environment, however, is open to conjecture.

As shown in previous studies and illustrated by Springer *et al*. (2011), the difficulties of studying and documenting such behaviors are clear and further research effort should be focused by monitoring of carrion by remote camera trapping. The influence of inputting extra (possibly unnatural) carrion into a forest system must be considered, however, and we recommend opportunistic or low-intensity monitoring of carcasses to better understand their role as a possible food resource for non-olfactory species.

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SHORT-COMMUNICATION

# Refining the distribution of the White Woodpecker (*Melanerpes candidus*) in the Caatinga biome

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**ABSTRACT**: The occurrence of *Melanerpes candidus* (White Woodpecker) in Brazil has been documented in all biomes, but so far only marginally in the Caatinga. Herein we provide the first records of the White Woodpecker in the *Depressão Sertaneja Setentrional* ecoregion of the Caatinga biome, consisting of some of the farthest northeastern records for the species. Our results indicate that the White Woodpecker may be distributed throughout the Caatinga biome.

**KEY-WORDS**: Depressão Sertaneja Setentrional; distribution; Picidae.

The White Woodpecker, *Melanerpes candidus* (Otto 1796) occurs in association with open natural vegetation, such as fields, forest patches, and swamp borders, or in anthropogenic vegetation, such as plantations, pastures, parks, and gardens (Sick 1997; Sigrist 2009; Gwynne *et al.* 2010). The distribution of *M. candidus* extends from Argentina, Uruguay, Paraguay, Bolivia, and Brazil, to parts of Peru (Mata *et al.* 2006; Sigrist 2009; del Hoyo 2002). In Brazil, the species has been recorded in all biomes (del Hoyo 2002; Gwynne *et al.* 2010), but so far only marginally in the Caatinga (Naumburg 1928; Snethlage 1928; Pereira *et al.* 2012). Previous records of *M. candidus* in the Caatinga include scattered observations in Maranhão, Piauí, midwestern Bahia, and northeastern Minas Gerais (Figure 1; Naumburg 1928; Snethlage 1928; Pacheco 2003).

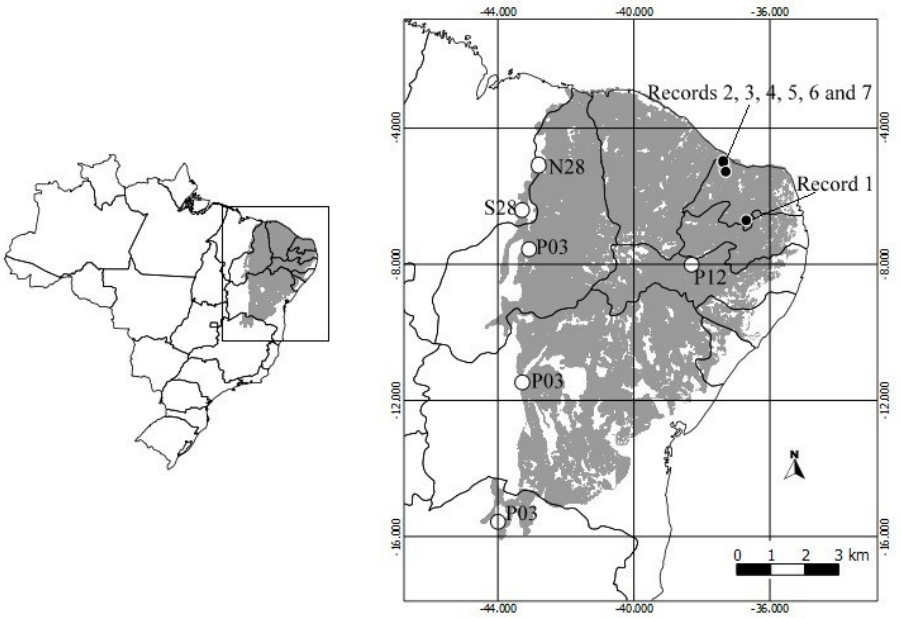


**FIGURE 1.** Map depicting the remaining Caatinga vegetation (in gray; MMA 2003) and the approximate location of *M. candidus* records obtained from literature (large open circles; P03 = Pacheco 2003; P12 = Pereira *et al.* 2012; S28 = Snethlage 1928; and N28 = Naumburg 1928) in addition to the exact location of records obtained in this study (smaller black dots).

In this study we report seven observations of *M. candidus* (Table 1; Figure 2) obtained in Caatinga sites nearby Mossoró and Parelhas, state of Rio Grande do Norte. These cities lie in the *Depressão Sertaneja Setentrional*, an ecoregion that occupies most of the northern part of the Caatinga biome, stretching across the states of Paraíba, Rio Grande do Norte, and Ceará, with a small strip reaching Piauí (Velloso *et al.* 2002). This ecoregion is characterized by a rocky soil, with elevations varying between 20 and 500 m, perennial

**TABLE 1.** Records of *Melanerpes candidus* in the *Depressão Sertaneja Setentrional*, an ecoregion of the Caatinga biome.

| Record | Location (coordinates) | Habitat | Date | Nº of individuals |
|---|---|---|---|---|
| 1 | Parelhas/RN (06º41.40'S; 36º39.48'W) | farm | 26 July 2009 | 3 |
| 2 | Mossoró/RN (05º14.66'S; 37º15.99'W) | seasonally flooded site | January 2011 | 2 |
| 3 | Mossoró/RN (05º03.80'S; 37º24.04'W) | farm | March 2012 | 1 |
| 4 | Mossoró/RN (05º14.66'S; 37º15.99'W) | seasonally flooded site | May 2012 | 4 |
| 5 | Mossoró/RN (05º12.23'S; 37º19.72'W) | riparian vegetation | May 2012 | 2 |
| 6 | Mossoró/RN (05º14.92'S; 37º15.89'W) | farm | June 2012 | 2 |
| 7 | Mossoró/RN (05º03.71'S; 37º24.11'W) | farm | January 2013 | 3 |


**FIGURE 2.** Photographic records of *M. candidus.* (A) Individuals sighted in the Parelhas city (record 1) and (B and C) individuals sighted in the Mossoró city (records 6 and 7). Photos of Luiz Gonzaga de Sena Neto (A) and Pedro Teófilo Silva de Moura (B and C).

rivers, and shrubby or arboreal vegetation (Velloso *et al*. 2002). Our observations occurred during five months across four years, during the dry and wet seasons, with the farthest distance between observation points being ~200 km (between records 1 and 3; Table 1; Figure 1). This spatio-temporal distribution of records suggests that the species is resident in the *Depressão Sertaneja Setentrional* and that it occurs in the Caatinga associated with open natural and disturbed areas as reported previously by Naumburg (1928) and Snethlage (1928).

These are the first records of *M. candidus* for the *Depressão Sertaneja Setentrional* region and the farthest northeast reported so far for the species, implying a range extension of about 350 km in a south-north direction (from a previously published record from Pereira *et al.* 2012; Figure 1), and about 600 km in a west-east direction (based on records from Naumburg 1928; Figure 1). Altogether, our records and those available in the literature (Naumburg 1928; Snethlage 1928; Pacheco 2003; Pereira *et al.* 2012), along with those posted on the WikiAves web site (WikiAves 2013), support the presence of *M. candidus* year-round throughout the Caatinga biome.

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SHORT-COMMUNICATION

# Opportunistic predation by Crested Owl *Lophostrix cristata* upon Seba's Short-tailed Bat *Carollia perspicillata*

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**ABSTRACT:** This note reports two opportunistic events of predation on Seba's Short-tailed Bats *Carollia perspicillata* (Chiroptera: Phyllostomidae) by an immature Crested Owl *Lophostrix cristata* (Strigiformes: Strigidae), in Central Amazonia, Brazil. Both predation events took place while bats were mist-netted. Given the abundance of *C. perspicillata* in the study area we argue that this bat species likely constitutes a natural prey for *L. cristata.*

**KEY-WORDS:** central Amazon; diet; Phyllostomidae; Strigidae; trophic interaction.

The Crested Owl *Lophostrix cristata* is a monotypic medium-sized owl (mass between 400-600 g; total length 36-43 cm), widely distributed across tropical and sub-tropical forest habitats of Central America and central Amazon Basin (Marks *et al*. 1999). Compared to diurnal birds, the knowledge on the ecology and natural history of tropical nocturnal birds is notoriously scarce (Sekercioglu 2010) and *L. cristata* is no exception to this trend (Barros & Cintra 2009). In the Amazon, the species has been found to occur in both secondary and old-growth forest sites (Sberze *et al*. 2010) and its abundance has been suggested to be positively associated with the density of snags (Barros & Cintra 2009). However, information regarding the species' diet is limited to the description of large insects and small vertebrates as prey (Marks *et al*. 1999) and currently no studies on the individual species preyed upon by *L. cristata* are available.

Seba's Short-tailed Bat *Carollia perspicillata* is a small to medium sized bat (mass about 18.5 g; total length 66-95 mm) found in moist evergreen and dry deciduous forests, from Mexico to southern Brazil. It commonly occurs up to 1,000 m and is one of the most frequently captured bats, being especially abundant in secondary growth forests (Cloutier & Thomas 1992; Williams & Genoways 2007). *Carollia perspicillata* feeds predominantly on understory fruits of *Piper*, *Solanum*, and *Cecropia* species, and supplements its diet with nectar, pollen, and insects (Cloutier & Thomas 1992; Williams & Genoways 2007).

Trophic interactions between owls and bats have been reported in numerous locations across the Neotropics (e.g., Motta-Jr. *et al*. 2004; Escarlate-Tavares & Pessoa 2005; Motta-Jr. 2006; Carvalho *et al*. 2011) and Seba's Short-tailed Bats have been suggested to constitute a potential prey of several owl species such as Barn *Tyto alba*, Mottled *Strix virgata*, and Spectacled *Pulsatrix perspicillata* Owls (Cloutier & Thomas 1992; Motta-Jr. & Taddei 1992). Here we report two opportunistic predation events on *Carollia perspicillata* by the *Lophostrix cristata*, in central Amazon, Brazil.

Both predation events took place two days apart and were observed during bat surveys in the Porto Alegre reserve, Biological Dynamics of Forest Fragments Project (for site description, see Gascon & Bierregaard 2001). Bats were captured using 14 mist nets (12 x 3 m) open from 18:00 to 00:00 h and stretched along 2 perpendicular transects of roughly 100 m.

The first event took place on 5 June 2012 in a terra firme forest fragment (2°24'17.20"S, 59°52'16.07"W). Shortly after dusk (18:15 h), a juvenile *Lophostrix cristata* was netted adjacent to an inanimate bat. When

approached, the owl managed to escape leaving behind a dead bat that presented claw perforations on the thorax and wing membranes. The bat was an adult male *Carollia perspicillata* (forearm 39.5 mm; tibia 19.3 mm; weight 12 g).

The second predation event took place 1.4 km away from the first one, on 7 June 2012 in mature *Cecropia*-dominated secondary forest (2°21'58.76"S, 59°58'4.14"W). As in the previous case, the predation event took place just after dusk (18:10 h) and involved a juvenile *Lophostrix cristata* (Figure 1) preying upon an adult male *Carollia perspicillata* (forearm 41.5 mm; tibia 19.7; weight 13 g; Figure 2). Both individuals were entangled and the owl was captured.

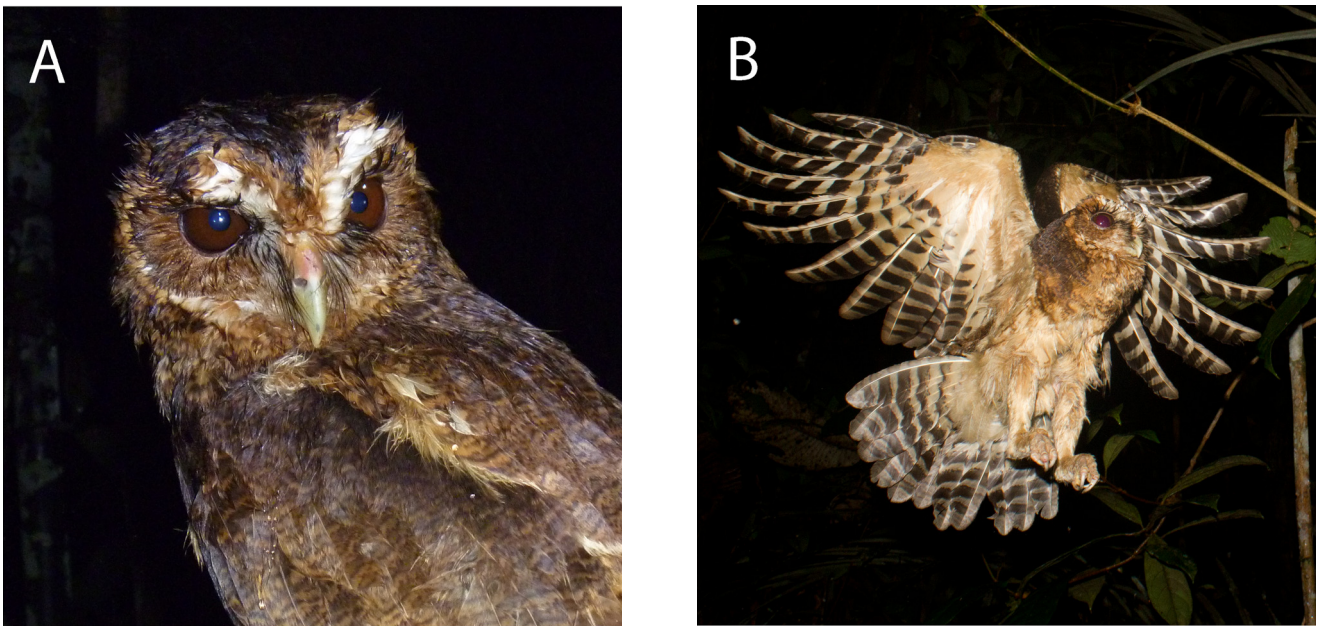


**FIGURE 1.** Juvenile *Lophostrix cristata* captured during bat sampling in mature *Cecropia*-dominated secondary regrowth, Porto Alegre reserve, central Amazon. A) Head detail; B) owl flying upon release.

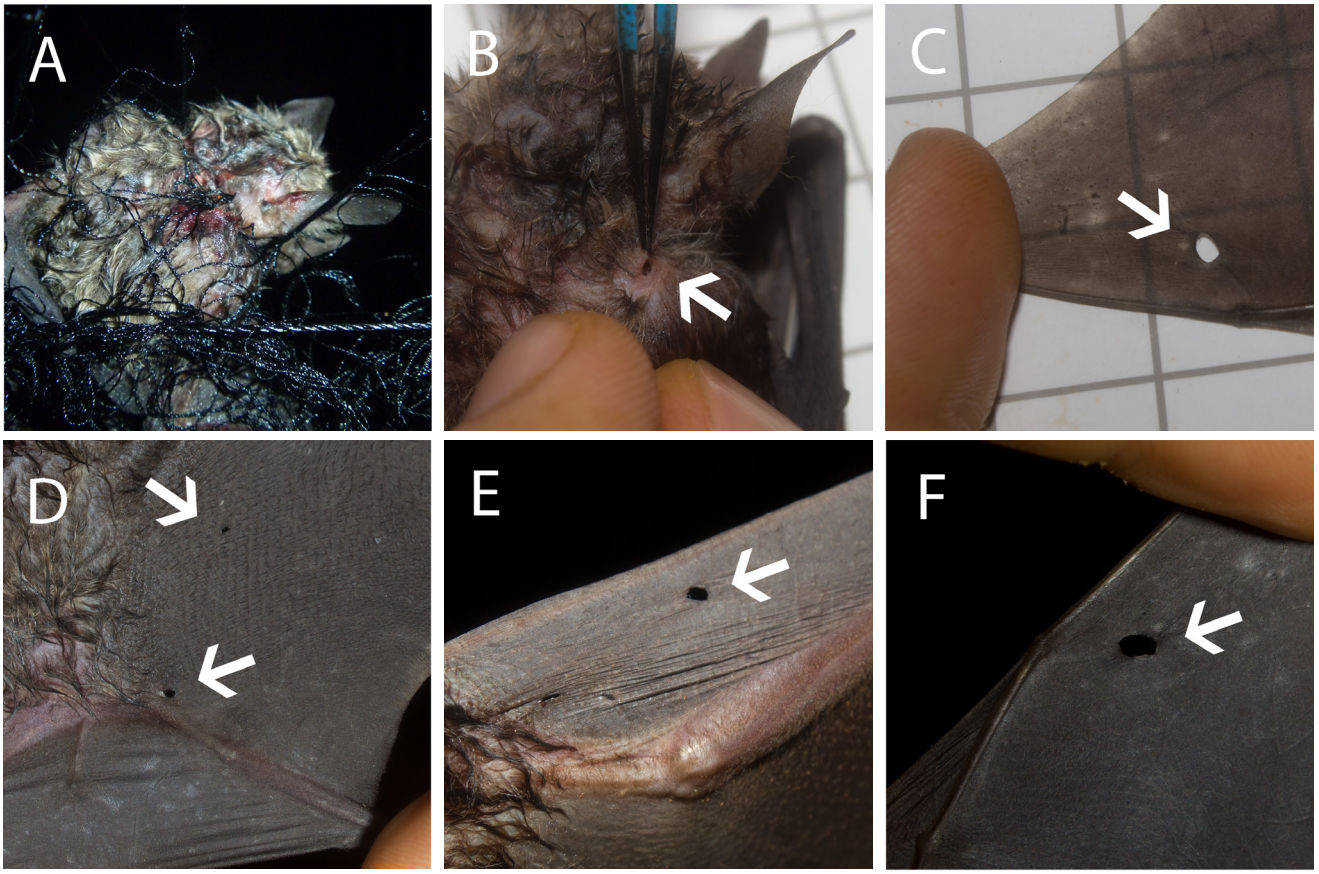


**FIGURE 2.** Adult *Carollia perspicillata* preyed upon by *Lophostrix cristata*. A) bat entangled in the mist-net; B) detail of claw perforation on the bat's dorsum; C)–F) details of claw perforations on the bat's wing membranes.

The owl from the first predation event presented similar size, plumage pattern, and striking bold white eyebrows like those of the *L. cristata* individual captured on the second event. Based on the spatial and temporal proximity of these predation events it is possible that the same owl individual had been responsible for both bat fatalities.

Bat predation by owls is relatively rare. The frequency of bats in the diet of Neotropical owls usually constitutes less than 5% of their vertebrate prey (Escarlate-Tavares & Pessôa 2005; Motta-Jr. 2006), likely because bats are more difficult to capture than amphibians or small terrestrial mammals. Owls are opportunistic predators and their diet is related to the local abundance of prey in their hunting grounds (Bernard *et al*. 2010). The reported predation events may have occurred due to the fact that the bats were entangled in the net. However, *Carollia perspicillata* is the most common bat species in the Biological Dynamics of Forest Fragments landscape (Bobrowiec & Gribel 2010) and could constitute a natural prey of *Lophostrix cristata*. The nocturnal lifestyle of *Lophostrix cristata* and *Carollia perspicillata* contributes to the scarce literature on the natural history and ecology of both species. Thus, similar predation events should be properly reported whenever witnessed to allow a better understanding of the trophic interactions between bats and their avian predators.

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SHORT-COMMUNICATION

# Range extension of the known distribution of the Black-backed Grosbeak, *Pheucticus aureoventris* (Passeriformes: Cardinalidae) in Brazil, with the first records for the states of Rondônia, Amazonas and Goiás

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**ABSTRACT:** We present the first records of *Pheucticus aureoventris* from the states of Rondônia, Amazonas and Goiás in Brazil, which significantly expand the species' known range into central South America and Amazonia. Previously, *P. aureoventris* was known only as an austral migrant to semi-open areas in south-western Brazil. We hypothesize that deforestation (creating additional open habitats) and an increase in the number of ornithologists surveying poorly sampled regions, may be related to the range extension of *P. aureoventris* in Brazil.

**KEYWORDS:** Amazon, Cerrado, Madeira River, wintering areas, deforestation.

The Black-backed Grosbeak, *Pheucticus aureoventris* (d'Orbigny & Lafresnaye, 1837) is a medium-sized passerine bird, typical of shrubby, semi-open areas and dry forests in semi-arid regions, also occurring at the edge of wet, montane forest and highland fields. *Pheucticus aureoventris* is found between 500 m and 3,700 m along the Andean slopes, from Venezuela and Colombia to Argentina, but in Paraguay and southwestern Brazil it occurs only as an austral migrant during the post-breeding season, mostly between July and August (Sick 1997, Nunes 2008, Ridgely & Tudor 2009). Most populations of this species are apparently sedentary, although with possibly some altitudinal movements in northwestern Argentina and adjacent areas (Orenstein & Brewer 2011).

Until recently, *P. aureoventris* was considered as vagrant in Brazil (CBRO 2011). Nunes (2008) compiled Brazilian records for the species and found that they were concentrated in the Pantanal and surrounding plateaus in the upper Paraguay River basin (see in Pelzeln 1871, Naumburg 1930, Stone & Roberts 1934, Pinto 1944, Willis & Oniki 1990, Silveira & D'Horta 2002, Donatelli 2005, Melo 2005). Recent records have expanded the distribution of *P. aureoventris* farther inland in Brazil, reaching the Paraná River basin in the Cerrado (Faxina *et al.* 2010). However, until the present study the known range of *P. aureoventris* was restricted to the states of Mato Grosso and Mato Grosso do Sul.

On 21 and 23 August 2010, G. B. M. recorded two individuals of *P. aureoventris* in the municipality of Porto Velho, state of Rondônia (08°47'29"S; 63°45'50"W; 87 m altitude), on the right bank of the Madeira River, about 3 km from an urban area, at an altered and recently burned site, surrounded by a patch of "terra-firme" forest. One of these birds, a female, was photographed (Figure 1, Malacco 2010), and is the first documented record of the species for Rondônia.

The closest record of *P. aureoventris* to the one in Porto Velho was located in the Victoria region of Bolivia, formerly Department of Beni and currently belonging to the Department of Pando, northern Bolivia (Gyldenstolpe 1945). This region is near the confluence of the Madre de Dios and Beni Rivers, two important tributaries of the

**FIGURE 1.** Female of *Pheucticus aureoventris* photographed at Porto Velho, Rondônia, on 23 August 2010. WA193006. Photo by: G. B. M.

Madeira River, and is covered by a mosaic of forests and patches of savanna (Paynter 1992). The record from Porto Velho is more than 350 km away from the Victoria region. Thus, *P. aureoventris* possibly uses patches of savanna along the Beni River as a dispersal route and is probably benefited from deforestation in the intervening areas.

A. A. and B. D. S. documented the first record of *P. aureoventris* for the state of Amazonas on 27 August 2011 near the settlement of Santa Helena, in the municipality of Manicoré, southern Amazonas state (06°03'02"S; 61°44'18"W; 46 m altitude), on the left bank of the Madeira River. This individual was found on the edge of "várzea" forest, at 11:00 h, next to an area of recently burned vegetation. After confirming the species identification, the individual was collected with a shotgun, prepared as a study skin, and deposited in the ornithological collection of the Museu Paraense Emílio Goeldi (MPEG 73473). It was a male weighing 52 g, with 209 mm of total length (Figure 2).

On 12 July 2012, G. A. S. and S. M. recorded one individual of *P. aureoventris* in the municipality of Rio Verde, state of Goiás (18°15'05"S; 50°51'06"W; 707 m altitude), on a slope covered with shrubby vegetation in a transitional region in southwestern Goiás dominated by savanna and both gallery and dry forests. This individual, a male, remained perched for about 2 minutes at the top


**FIGURE 2.** Male specimen of *Pheucticus aureoventris* (MPEG 73473) collected in the municipality of Manicoré, Amazonas, on 27 August 2011. Photo by: B. D. S.

of a medium-sized tree a few meters away and in apparent response to playback of *Glaucidium brasilianum*, a notorious bird predator (Sick 1997, Sigrist 2006). G. A. S documented the record with a point and shoot camera and the resulting photograph shows some of the unmistakable features of *P. aureoventris*, such as the blackish head and wings with two thick white bars, yellow belly, and the massive beak (picture not shown, available up request to the authors).

This is the first record of *P. aureoventris* for Goiás and only the third record for the Paraná River basin, with the previous two records reported by Faxina *et al.* (2010). Our record from Rio Verde is approximately 250 km away from the closest record at Parque Natural Municipal Salto do Sucuriú, in the municipality of Costa Rica, state of Mato Grosso do Sul (Faxina *et al.* 2010), located on the right bank of the Paraná River.

The records presented here significantly extend the known distribution of *P. aureoventris* in Brazilian territory, not only expanding its known wintering range in the central-western part of the country, but also including Amazonia in it (Figure 3). The presence of *P. aureoventris* between July and August in Brazil reinforces the idea of altitudinal movements for this species, as also verified for other species such as *Tiaris obscurus* (Rising *et al.* 2011) and *Pseudocolpteryx acutipennis* (Fitzpatrick *et al.* 2004).

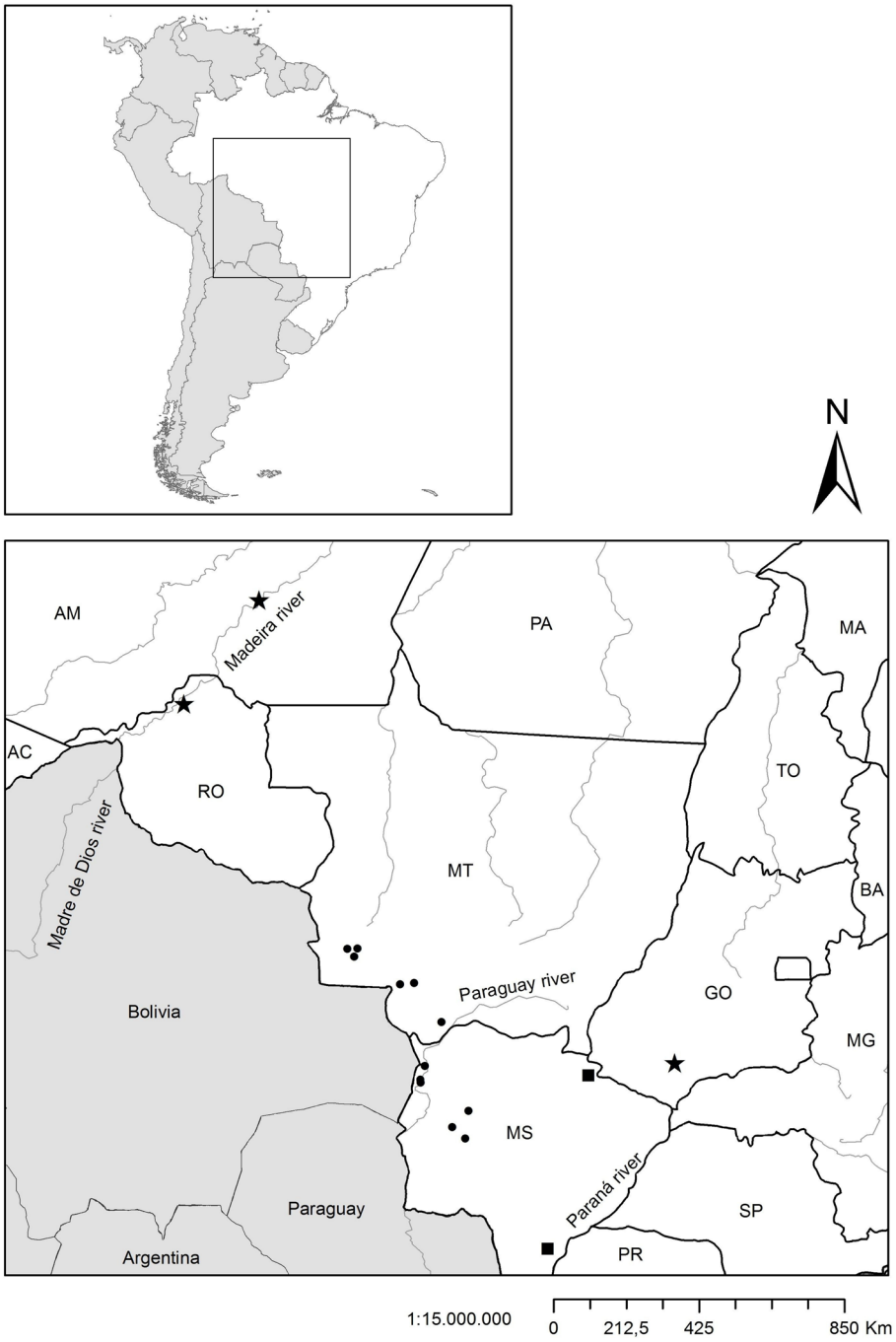


**FIGURE 3.** Map containing the distribution of *Pheucticus aureoventris* in Brazilian territory, including records compiled by Nunes (2008; circles), Faxina *et al.* (2010; squares) and those of the present study (stars).

The extension of the known distribution of *P. aureoventris* reported here could be related to a) an increase in deforestation of Cerrado and Amazon regions, artificially creating favorable areas for the arrival of a species typical of more open environments; and b) an increase in the number of ornithologists sampling poorly known Brazilian regions. Thus, it is possible that records of *P. aureoventris* will become increasingly more common as deforestation progresses across both Cerrado and Amazonia.

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SHORT-COMMUNICATION

# The Kerguelen Petrel *Lugensa brevirostris* in the Southwestern Atlantic Ocean, with notes on osteology - and plumage-based identification

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**ABSTRACT.** Southwestern Atlantic/eastern South American records of the Kerguelen Petrel *Lugensa brevirostris* are scarce, comprised only of specimens found dead on the coast. Here we present a review of records known from this region, including a novel record based on a specimen stranded at Arraial do Cabo, Rio de Janeiro state, Brazil. Additionally, we draw the attention of ornithologists and observers to problems of specimen identification, even in museums, when one needs to separate Kerguelen Petrel from dark-morph Herald Petrel *Pterodroma arminjoniana* or other dark-plumaged gadfly petrels of the genus *Pterodroma*. For identification of museum specimens, we recommend the use of an osteological character state, which allows unequivocal identification of Kerguelen Petrels, namely the wide and fenestrated *fossa glandulae nasalis* of the frontal bone.

**KEY-WORDS:** diagnostic characters, osteological characteristics, petrel, Procellariidae, review, South America.

The Kerguelen Petrel, *Lugensa brevirostris* (Lesson, 1831), is a medium-sized procellariiform that breeds on Tristan da Cunha and Gough Islands, in the Atlantic Ocean, and Marion, Prince Edward, Crozet, and Kerguelen in the Indian Ocean (Brooke 2004). It occurs in cold waters of the Southern Hemisphere oceans, at high latitudes (Harrison 1983; Brooke 2004), commonly around 60°S (Commins *et al.* 2014) and frequently in Antarctic waters near the pack ice (Joiris *et al.* 2013; Orgeira *et al.* 2013). Its range overlaps with other similar-sized, dark-plumaged petrels, with which it could be confused, such as the Great-winged Petrel *Pterodroma macroptera* (Teixeira *et al.* 1985), or the rare dark morph of the Soft-plumaged Petrel *Pterodroma mollis* (Harrison 1983; Shirihai 2007), and the Atlantic Petrel *Pterodroma incerta* (Flood & Fisher 2013). When in temperate/subtropical latitudes, the range of Kerguelen Petrel overlaps with tropical species with which it also could be confused, such as Trindade Petrel *Pterodroma arminjoniana* and Kermadec Petrel *Pterodroma neglecta* which breed on tropical islands in both the Atlantic and Indian Oceans (Luigi *et al.* 2009; Brown *et al.* 2010), as well as wide ranging-species such as Soft-plumaged and Atlantic petrels.

The Kerguelen Petrel had long been placed in the genus *Pterodroma*, but subsequently was regarded to be generically distinct and probably more closely related to the fulmarine petrels, or close to shearwaters (see revision in Olson 2000). The species is usually smaller than other potentially confusing *Pterodroma* gadfly petrels, with a silver underwing pattern and a distinctive white trailing edge from the carpal joint to the body (Brooke 2004). However, misidentifications have occurred (*e.g.*, Cuello 1975; Escalante 1980), and few ornithologists realize that large-sized specimens of *Lugensa* are potentially difficult to discriminate from other dark *Pterodroma* petrels, such as the dark-morph Trindade Petrel. This implies that at least some specimens attributed to these species deserve reexamination. Here we present a review of specimen records of Kerguelen Petrel in southwestern Atlantic Ocean, present a new record from Rio de Janeiro state based on a dead and preserved specimen, and propose a secure approach for specimen identification based on osteological characters.

## Specimen records in the southwestern Atlantic and a new Brazilian record

Escalante (1980) reported the first specimen for the whole southwestern Atlantic coast of South America, a stranded individual found in July 1973 at Canelones, Uruguay (Table 1). This seems to be the only Uruguayan specimen, and there also seem to be no records at sea. Kerguelen Petrels are much more frequent southward, over the Patagonian Shelf (Orgeira 2001), and around the Falkand/Malvinas Islands (Thurston 1982; Bourne & Curtis 1985; White *et al.* 1999), particularly over offshore waters, as well as between southern South America and Antarctica (Orgeira *et al.* 2013). However, to the best of our knowledge, there are no records of stranded specimens along the Argentinean coast (Mazar-Barnett & Pearman 2001).

There are only three published records of Kerguelen Petrel in Brazil, the first one being a stranded specimen from Bahia (September 1985); the second, a bird found in Rio Grande do Sul state in October 1986 (Figure 1; see below); and the third, a male found in Arembepe, Bahia, in July 1994 (Table 1). To the best of our knowledge, no at-sea records off the Brazilian coast exist.

On 28 September 2012, during activities of a beach monitoring program of the Campos and Espírito Santo basins (Projeto Monitoramento de Praias das Bacias de Campos e Espírito Santo – PMP-BC/ES) a dead specimen of an all brown-gray, mid-sized petrel was found at the Monte Alto beach (22°56'S, 42°09'W), municipality of Arraial do Cabo, Rio de Janeiro state, Brazil. Measurements (in mm) of this specimen are as follows: total length 350; exposed culmen 27; wing chord 260; tail 138; tarsus 37.6; middle toe with claw 48.9; middle toe without claw 43.9.

It had the diagnostic whitish leading edge from the carpal joint to the body (Figure 2), which characterizes Kerguelen Petrels (Marchant & Higgins 1990), but it was a relatively large bird, fitting in both the lower range of biometric data of Trindade Petrels (Luigi *et al.* 2009), and in the upper range of Kerguelen Petrels (*e.g.*, Onley & Scofield 2007), which makes plumage- and biometric-based identification difficult. This difficulty is especially true if we consider that light, intermediate, and dark morphs of Trindade Petrels could exhibit a whitish leading edge from the carpal joint to the body (Figure 3; Flood & Fisher 2013:73, 76). This suggests that other characters should be investigated to allow an unequivocal identification. Thus, in the following section, we explore cranial characteristics that allowed unambiguous identification of the Arraial do Cabo specimen as a Kerguelen Petrel.

**TABLE 1.** All known specimen records of Kerguelen Petrels *Lugensa brevirostris* from the southwestern Atlantic Ocean. MNRJ – Museu Nacional, Rio de Janeiro; CAFURG – Coleção de Aves da FURG; RG – Rolf Grantsau private collection; MNHN – Museo Nacional de Historia Natural de Montevideo.

| Specimen | Place | Geographic coordinates | Date | Features used in identification | Source |
|---|---|---|---|---|---|
| *MNRJ 35237 | Salvador, Bahia, Brazil | *ca.*12°59'S, 38°31'W | September 1985 | Plumage and measurements | Teixeira *et al.* (1988) |
| CAFURG 311 | Cassino Beach, Rio Grande do Sul, Brazil | 32°11'S, 52°10'W | 1 October 1986 | Plumage and measurements; skull osteology (this study only) | Vooren & Fernandes (1989); this study |
| *RG 9480 | Arembepe, Bahia, Brazil | 12°43'29''S, 38°10'45''W | 15 July 1994 | Plumage and measurements | Lima *et al.* (2004) |
| CAFURG 450 | Arraial do Cabo, Rio de Janeiro, Brazil | 22°56'S, 42°09'W | 28 September 2012 | Plumage and measurements; skull osteology | This study |
| *MNHN 04142 | La Floresta, Canelones, Uruguay | 34°46'S, 55°37'W | 25 July 1973 | | Cuello (1975), misidentified as *P. macroptera*, corrected by Escalante (1980). See pictures in Jiménez *et al.* (2012). |

*Specimen not examined for the present study.


**FIGURE 1.** Skull of a *Lugensa brevirostris* specimen (CAFURG 311) obtained at Cassino Beach, Rio Grande do Sul, Brazil, on 1 October 1986. This is the only specimen of *L. brevirostris* from this Brazilian state published to date. Identification is now corroborated by the observation of the characteristic fenestrated *fossa glandulae nasalis* (the arrow indicates the rostral fenestra; see text).


**FIGURE 2.** Kerguelen Petrel *Lugensa brevirostris* stranded in Rio de Janeiro in September 2012 (CAFURG 450), showing the whitish leading edge on underwing (arrow).

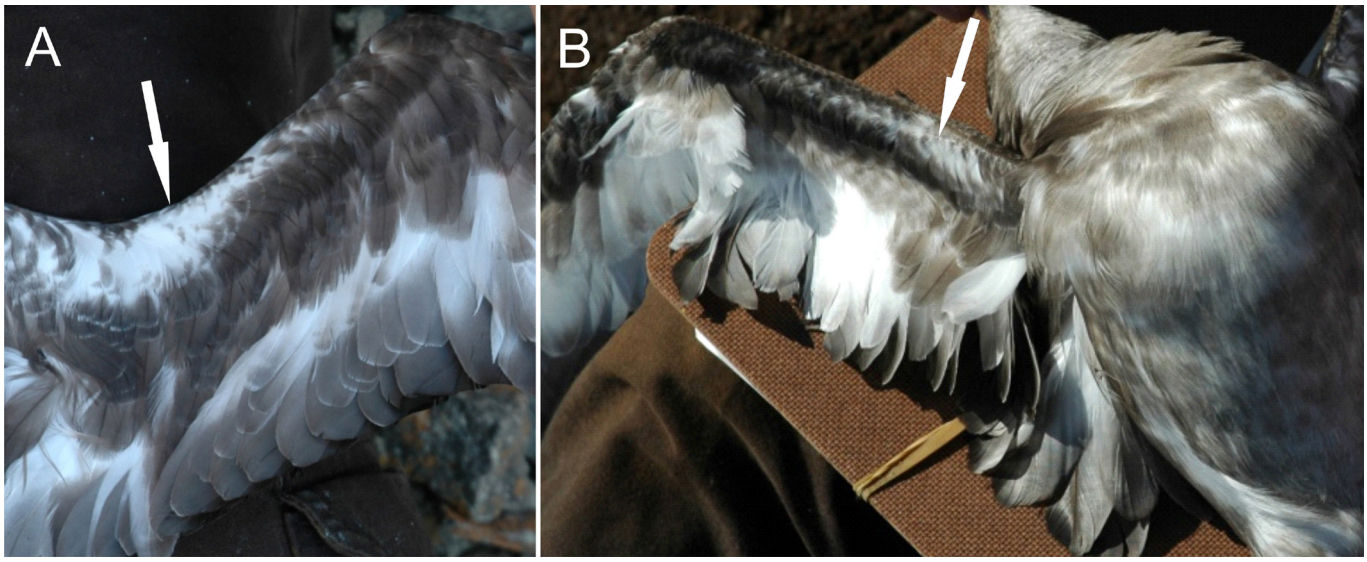


**FIGURE 3.** Trindade Petrels *Pterodroma arminjoniana* from Trindade Island, Brazil, illustrating the whitish trailing edge on underwing, in both the a) light and b) intermediate morphs (arrows).

**Osteology-based identification of gadfly petrels**

Imber (1985), in part based on limited osteological comparisons conducted by Harper (1973), called attention to a condition of the skull distinguishing unequivocally Kerguelen Petrel from any *Pterodroma* species, namely, the lateral extension of the inter-orbital region that covers most of the orbit. Therefore, given the identification problems explained above, the Arraial do Cabo specimen was prepared as a skeleton (Coleção de Aves da Universidade Federal do Rio Grande - CAFURG 450), except for a wing which was left completely feathered to document the wing pattern that helps species identification by plumage (Onley & Scofield 2007). The skeleton was prepared by maceration and hand-cleaning soft tissue from bone (Alvarenga 1992). It was immediately evident that the orbit of the specimen was mostly covered dorsally by a supra-orbital bony extension of the *os frontale*, forming a wide *fossa glandulae nasalis*, a condition in great contrast to that observed in members of the genus *Pterodroma* (Harper 1973; Imber 1985; Figure 4). Additionally, each fossa seen in *Lugensa* skulls bears a large rostral fenestra (Figures 1 and 4) not seen in other procellariid genera (Imber 1985; this study), suggesting it represents an autapomorphy for this taxon. Imber (1985) stated that *Lugensa* has a "unique fenestrated extension of the skull lateral to the supra-orbital gland", but some very small, caudal fenestrae similar to those seen in *Lugensa* are present in some specimens of other presumably related genera of the fulmarine group (*Thalassoica*, *Fulmarus*; Imber 1985, Shearwater.nl. 2013 [http://www.shearwater.nl/?file=kop1.php]), thus indicating that only the rostral fenestra is fully diagnostic of, and autapomorphic for, the genus (see also Mayr & Smith [2012] for a comprehensive phylogenetic analysis of procellariiforms using osteological characters). Preceding Imber (1985), when comparing skulls of Kerguelen and Soft-plumaged petrels, Harper (1973) highlighted the larger width of the lateral edges housing the supraorbital depressions, whose "ledges … are characteristically crenated, fenestrated and ledged along their perimeter to a degree not shown in Soft-plumaged Petrel".

Except for Harper (1973) and Imber (1985), to the best of our knowledge, no other researcher has used the osteological character states mentioned above to identify *Lugensa* specimens (Cuello 1975; Escalante 1980; Teixeira *et al.* 1988; Vooren & Fernandes 1989; Lima *et al.* 2004; Jiménez *et al.* 2012), thus overlooking the opportunity to confirm identification using fully diagnostic and easy-to-see morphological features. Even if one is interested in producing a traditional museum specimen, it is possible to check the condition of the *os frontale* – *i.e.*, if matching or not the *Lugensa* type – by inverting the skin up to the base of the bill during taxidermy and by a simple removal of the soft tissue of the nasal gland. For old museum skins, or those specimens recently prepared, ordinary x-ray radiography could be an option.

The only specimen of Kerguelen Petrel from Rio Grande do Sul state published to date is that mentioned by Vooren & Fernandes (1989), which is deposited at CAFURG under the catalogue number 311. This specimen was not prepared as a skin, being simply wholly dried and preserved in the collection. Overall, it is in poor condition, with exposed bones in several parts of the body. As its skull was greatly exposed, a simple removal of the dried tissue over the salt gland allowed us to examine the condition of the *fossa glandulae nasalis*: the Rio Grande do Sul bird proved to represent a typical *L. brevirostris* specimen by presenting the unique fenestrated extension of the skull lateral to the nasal

gland (Figure 1). Although plumage and measurements (see Vooren & Fernandes 1989) of this specimen are apparently sufficient to determine its specific identity with certainty, the observation of the condition of the *fossa glandulae nasalis* prevents any possible future dispute regarding its identification.


**FIGURE 4.** Skulls of Kerguelen Petrel *Lugensa brevirostris* (above; CAFURG 450) and Atlantic Petrel *Pterodroma incerta* (below; CAFURG 603) in dorsal view. Note the wide, fenestrated *fossa glandulae nasalis* (F) of the former and the contrastingly narrow fossa of the latter. The condition seen in Kerguelen Petrel is fully diagnostic in comparison with any other procellariform taxon.

## Concluding remarks

The status of Kerguelen Petrels in the southwestern Atlantic Ocean seems to be similar to the Great-winged Petrel. Both species are rarely found stranded on the beach along the southwestern Atlantic coast (Bugoni 2006; Jiménez *et al.* 2012), and are nearly absent at sea (Bugoni *et al.* 2008; Jiménez *et al.* 2011), despite both species being common southeastward, *e.g.*, in the Southern Ocean at about 60°S, 0°W (Joiris *et al.* 2013; Commins *et al.* 2014). All five Kerguelen Petrels records on the coast of Brazil and Uruguay are from July to early October, coinciding with the pre-breeding or pre-laying exodus, as eggs are laid in October (Elliott 1957; Shirihai 2007).

Examination of the condition of the *fossa glandulae nasalis* may be the only way to identify decomposed specimens found on beaches, and such possibility may provide more realistic information on the occurrence of *L. brevirostris* in a given region. Finally, we suggest that any dispute regarding identity of supposed *Lugensa* specimens might be solved by radiographing skulls to determine the condition of the fossa.

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## APPENDIX:

Specimens examined at CAFURG for osteological comparisons in this study: *Macronectes halli*: n° 602 (complete skeleton); *Macronectes giganteus*: n° 604 (complete skeleton); *Fulmarus glacialoides*: n° 581 (complete skeleton); *Daption capense*: n° 530 (complete skeleton); *Lugensa brevirostris*: n° 450 (complete skeleton), n° 311 ("skin" with exposed skull); *Pterodroma incerta*: n° 603 (skull); *Pachyptila belcheri*: n° 443 (complete skeleton); *Puffinus gravis*: n° 580 (complete skeleton); *Puffinus puffinus*: n° 579 (complete skeleton).

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SHORT-COMMUNICATION

# First record of Merlin *Falco columbarius* from Tocantins and a review of previous Brazilian records

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**ABSTRACT:** We describe the first record of *Falco columbarius* from Tocantins, central Brazil, made in the contact zone between the Amazon and Cerrado biomes. A review of previous Brazilian records of this species is also presented, showing a previously unrecognized wintering area for this falcon in South America and that its status as a vagrant should be reconsidered. *Falco columbarius* seems a rare but regular winter visitor due to several records in Brazil over the last years.

**KEY WORDS:** Brazil, *Falco columbarius*, Neartic migrant, Tocantins, South America.

The Merlin *Falco columbarius* is a small boreal migrant falcon with a pan-Holarctic breeding range. The species winters at both temperate and tropical latitudes reaching, in the Southern Hemisphere, only South America (White *et al.* 1994; Beaman & Madge 1998; Warkentin *et al.* 2005). Globally, there are nine subspecies, six breeding in Europe and Asia (*F. c aesalon, F. c. subaesalon, F. c. pallidus, F. c. insignis, F. c. lymani, and F. c. pacificus*) and wintering in North Africa and subtropical Asia (Beaman & Madge 1998) and southern China (White *et al.* 1994). Another three subspecies (sometimes considered a different species, American Merlin) breed in North America, *F. c. columbarius, F. c. richardsoni,* and *F. c. suckleyi*; only the nominate migrates to the tropics, reaching the Caribbean, Central America, and northern South America (Hilty & Brown 1986; White *et al.* 1994; Sick 1997; Warkentin *et al.* 2005; Braun *et al.* 2007).

In South America, there are relatively few records of Merlins from a broad area over Peru, Brazil, Ecuador, Colombia, Venezuela, Guyana, and Suriname (Hilty & Brown 1986; White *et al.* 1994; Sick 1997; Hilty 2003; Schulenberg *et al.* 2007). In Brazil *F. columbarius* is considered rare (Sick 1997; Sigrist 2006) with the first record of an individual captured on the Dutch vessel still at sea, in the Atlantic Ocean, near the coast of the state of Bahia (northeast of Brazil) in November 1963 (Sick 1997). This was assumed to belong to the European form (Sick 1997).

A further ten records of Merlins have been made in Brazil (Table 1), most between October and December. Here we present details of a new record of this species from central Brazil. On 13 May 2011 a female-plumaged *F. columbarius* was photographed in Wanderlândia municipality, northern Tocantins (06°44'S, 48°04'W) (Figure 1). Merlins are normally back on their breeding grounds by April-May, thus this individual may be a first-summer male that decided to over-summer on its wintering grounds or was returning north at an atypically late date. The bird was perched atop a dead palm tree (possibly a Macaúba *Acrocomia aculeata*) (Figure 1) and plucked a small passerine, probably a Thraupidae, it had captured.

This region lies along the contact zone of the Amazon and Cerrado biomes in a very disturbed area, adjacent to a land-reform settlement and characterized by forest fragments between 10-100 ha (canopy heights 20-30 m) within a matrix of cattle pasture. Our record from Tocantins was made over 900 km southeast from the nearest previous record, from Santarém (Lees *et al.* 2013), and more than 2,500 km northeast from the record at Xapuri (Mendizabel 2012). The records from Tocantins and Xapuri represent the southernmost records of Merlins anywhere (Figure 2a; White *et al.* 1994; Beaman & Madge 1998).

Our record also reinforces the finding that Merlins routinely use human-modified landscapes (such as farmland) to forage both in the breeding and non-breeding

seasons (White *et al.* 1994). Canadian Merlins have been found to forage extensively around human settlements and prey disproportionately on House Sparrows *Passer domesticus* (Warkentin & Oliphant 1990), an introduced species also widely present in Brazil.

Given the likely low abundance of this species at the southern edge of its wintering range in South America, low observer density, and possibility of confusion with other species, *F. columbarius* is likely under-recorded in Brazil. We suggest that the species status as 'vagrant' in Brazil should be reconsidered as it may simply be a rare but regular winter visitor (Figure 2b).

The Tocantins record, in the anthropogenically influenced contact zone between Amazon and Cerrado, indicates that the winter range of this Nearctic falcon is even more southerly in latitude than previously expected. The success of prey capture in this contact region between biomes indicates that the species may have the capacity to extend its wintering area beyond the limits of the Amazon. Thus, we suspect that central portions of South America, like the Brazilian Cerrado and Pantanal or even northern Paraguay and parts of Bolivia (Figure 2b)—regions supported by the Xapuri record, may also be within the wintering range of *F. columbarius*.

**FIGURE 1.** Female *F. columbarius* found in Wanderlandia, Tocantins, central Brazil. The beheaded prey seems to be a Thraupidae. Photo: Tulio Dornas.

**TABLE 1.** Review of *F. columbarius* records in Brazil. If number of individuals not mentioned, number was not reported in reference.

| REFERENCE | LOCATION | DATE | AGE/SEX | COMMENTS |
|---|---|---|---|---|
| Sick (1997) | At sea, Bahia coast | November 1963 | not reported | One individual, European subspecies |
| Stotz *et al.* (1992) | Manaus, Amazonas | October 1990 | Immature female | One individual, on the banks of the Negro River near Manaus |
| Pacheco & Carvalhães (1994) *apud* Sick (1997) | Jaú River, Amazon | December 1993 | not reported | Mouth the Jaú and Amazon Rivers |
| Pacheco & Carvalhães (1994) *apud* Sick (1997) | Jaú River, Amazon | January 1994 | not reported | Mouth the Jaú and Amazon Rivers |
| Santos & Silva (2007) | Savannas between Rupununi and Roraima, | March 2000 | not reported | Two individuals, border of Brazil and Guyana (record by Robbins *et al.* 2004) |
| Santos & Silva (2007) | Savannas between Rupununi and Roraima, | November 2000 | not reported | One individual, border of Brazil and Guyana (record by Robbins *et al.* 2004) |
| Lees *et al.* (2013) | Santarém, Pará | November 2011 | not reported | One individual, at the campus of the Federal University of Western Pará, mouth of the Tapajós with Amazon Rivers |
| Mendizabel (2012) | Xapuri, Acre | January 2012 | Male | One individual, near of border with Bolivia |
| Luccia (2012) | Boa Vista, Roraima | November 2012 | Female? | One individual, Municipal Park Caçari |
| This paper | Municipality of Wanderlândia, Tocantins | May 2013 | Female? | One individual, Contact zone Amazon/ Cerrado biomes |

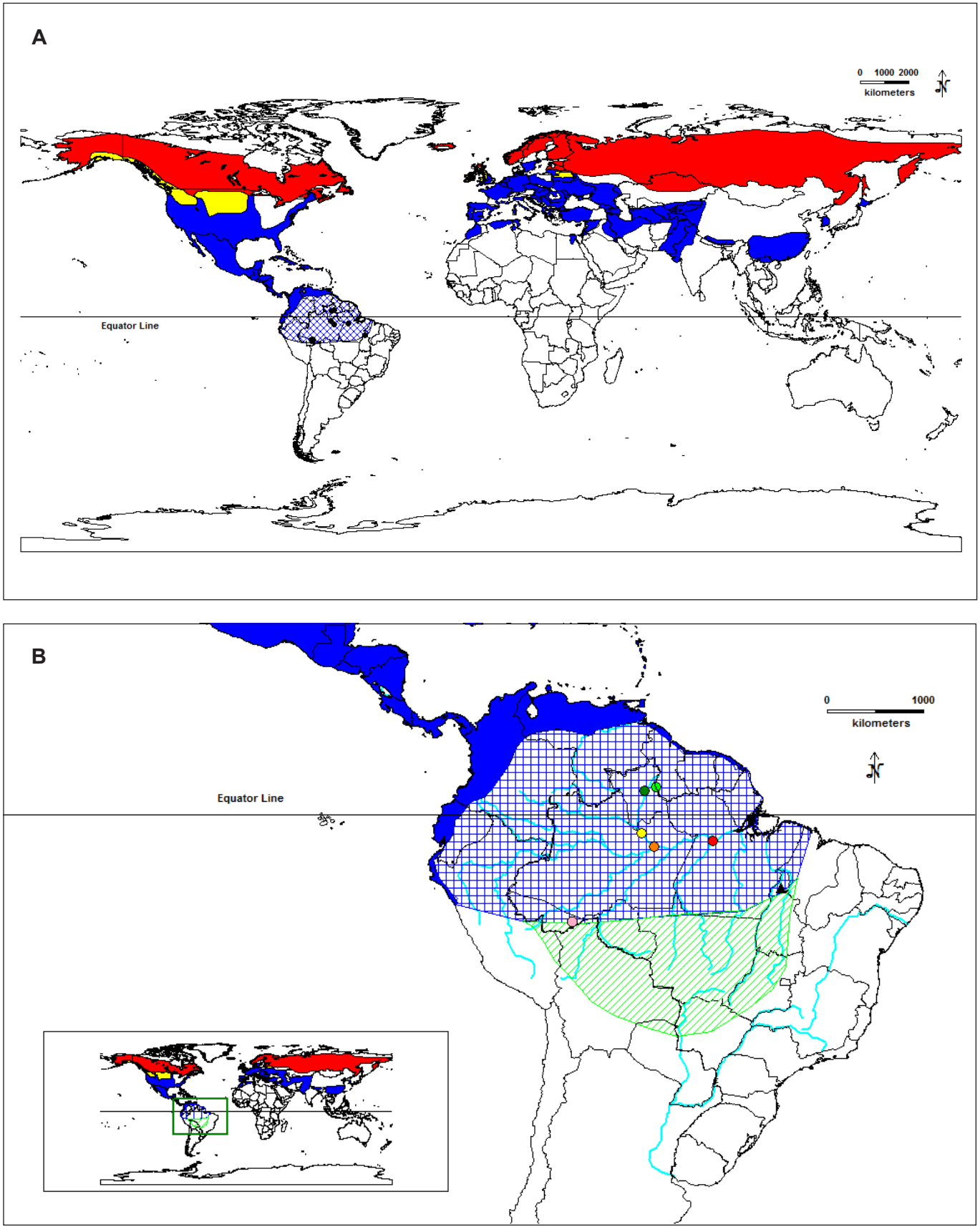


**FIGURE 2.** A) Geographic distribution of *F. columbarius* (White *et al.* 1994). Black dots represent records of *F. columbarius* in Brazil. B) Details of *F. columbarius* records in Brazil: light green, Rupununi/Roraima savanna (Silva & Santos 2007); dark green, Boa Vista, Roraima (Luccia 2012); yellow, Jaú River (Pacheco & Carvalhaes 1994); orange, Manaus, Amazonas (Stotz *et al.* 1992); red, Santarém, Pará (Lees *et al.* 2013); and pink, Xapuri, Acre (Mendizabel 2012). The black triangle represents the record in Tocantins. The blue checkerboard pattern represents the extended wintering area based on our observation reported here. The green diagonal pattern indicates what we suspect to be the actual extension of the wintering grounds of this Neartic migrant.

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SHORT-COMMUNICATION

# On the nest, eggs, and hatchlings of the Yellow-legged Thrush *Turdus flavipes flavipes* in Brazilian Atlantic Forest

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**ABSTRACT:** Here we present a description of a nest, eggs, and hatchlings of Yellow-legged Thrush (*Turdus flavipes flavipes*), from the Coastal Atlantic Forest of southeastern Brazil. The nest was found on 24 October 2011 containing two eggs. It was a "low cup/base" nest hidden inside the dense foliage of an epiphytic bromeliad, built mainly of hairy rhizomes of epiphytic ferns, and small amounts of moss, rootlets, and strips of palm leaves, not presenting the typical mud layers found in nests of other sympatric thrush species. Nest measurements were: outside diameter 14.2 cm, inside diameter 9.1 cm, outside height 12.4 cm, inside height 7.6 cm, and height above ground 1.49 m. Eggs were greenish blue with reddish brown blotches and spots more concentrated at the large end. On 27 October the nest contained two nestlings in early developmental stage, with mouth lining, swallow flanges, and bright yellow beaks, resembling the beaks of the adults. They were covered with a sparse light gray down, and had orange skin. The presence of an active nest at a location near sea level during the summer does not conform with existing information, in particular that this species occurs at low elevations only during the winter. It suggests that future studies involving breeding sites and movements of this species would be worthwhile.

**KEYWORDS:** Brazil; breeding biology; nesting; thrushes; Turdidae.

The Yellow-legged Thrush (*Turdus flavipes*) was formerly classified in the genus *Platycichla*, together with the Pale-eyed Thrush (*T. leucops*; Ridgely & Tudor 1994). However, molecular studies have not supported the separation of this genus from *Turdus* (Voelker *et al.* 2007). It holds five subspecies (*T. f. venezuelensis*, *T. f. melanopleura*, *T. f. xanthoscela*, *T. f. polionota*, and *T. f. flavipes*; Collar 2005). Three nests and eggs of *T. f. melanopleura*, from Trinidad, were described by Belcher & Smooker (1937), and Biancucci & Martin (2010) provide measurements of 46 nests from Venezuela. Wimer & Collins (1994) present data on the pterylosis of two nestlings, also from Venezuelan populations.

The nominal subspecies occurs in southeastern South America, from southeastern Brazil to southeastern Paraguay and northeastern Argentina, and is the only subspecies not distributed in northern South America (Ridgely & Tudor 1994; Collar 2005). To our knowledge, data on its nesting biology is limited to a description of three eggs from Rio de Janeiro (Oates 1905). The objective of our work is to describe a nest, eggs, and hatchlings of *T. f. flavipes* from the coastal Atlantic Forest.

We found a nest of *T. f. flavipes* on 24 October 2011 at Serra do Mar State Park, Caraguatatuba, on the coast of São Paulo state, Brazil. This conservation unit holds 50,000 ha of coastal Atlantic Forest, at an elevation of about 60 to more than 800 m above sea level. The climate is tropical and annual rainfall can reach 3,600 mm, without a remarkable dry season (Morellato & Haddad 2000; Oliveira-Filho & Fontes 2000). The nest contained two eggs that were photographed but not measured. We revisited the nest on 27 October, when two hatchlings were observed.

The nest was located in an artificial forest gap of approximately 1 ha, where the administrative facilities of the conservation unit were located (23º35'S, 45º25'W; elevation 60 m). The form of the nest was "low cup/base" (Simon & Pacheco 2005) and it was hidden inside the dense foliage of an epiphytic bromeliad at a height of 1.49 m above the ground. The bromeliad was on the trunk of an exotic palm (*Phoenix* sp., Arecaceae; Figure 1). Nest

walls were built mainly with hairy rhizomes of epiphytic ferns (some containing live green leaves), varying from 1–2 mm in diameter. Moss, rootlets, and strips of palm leaves were also used in nest walls, while the incubatory chamber was lined with finer roots. A small amount of sandy forest soil rich in humic material (including decaying leaves) was found in the nest base. We measured the nest using metal calipers. Nest measurements were: outside diameter 14.2 cm, inside diameter 9.1 cm, outside height 12.4 cm and inside height 7.6 cm. Eggs were not measured, but were greenish blue with reddish brown blotches and spots more concentrated at the large end (Figure 2a). Oates (1905) measured three eggs found in a nest and found them to be 3.74 x 2.03, 3.0 x 2.03, and 3.1 x 2.03 cm. Once eggs hatched, we observed the nestlings in an early developmental stage with their eyes still closed. Mouth lining, swallow flanges, and beaks were bright yellow, resembling the beaks of the adults. They were covered with a sparse light gray down, and had orange skin (Figure 2b). The nest was not observed until three weeks later, when we found it empty. We collected the nest and deposited in the ornithological collection of the Museum of Zoology of Universidade de São Paulo – MZUSP (# 2280).

**FIGURE 1.** Exotic palm (*Phoenix* sp.) and bromeliad where the nest was found (photograph by P. R. R. Oliveira Jr.).


**FIGURE 2.** Nest, a) eggs, and b) hatchlings of Yellow-legged Thrush, *T. f. flavipes*, at Serra do Mar State Park, Caraguatatuba, São Paulo, Brazil (photograph by M. N. Neto).

The nest we described here was remarkably different in relation to the nests reported by Belcher & Smooker (1937) for the Trinidad subspecies, *T. f. melanopleura*. Although we describe only one nest, so definitive conclusions cannot be drawn, it is useful to compare the nest to previous reports. According to these authors, nests were cups made of roots and mud, lined with moss and finer roots. Our nest had a distinct absence of mud, a characteristic that was also observed for the congeneric *T. leucops* in Ecuador (Marin & Carrion 1991), and in Colombia (Londoño 2005). Mud layers visible in the outer walls are typical features of the nests of other sympatric thrush species, i.e., Pale-breasted Thrush (*T. leucomelas*), and Rufous-bellied Thrush (*T. rufiventris*; Haverschmidt 1959; Lichtenstein 1998). The presence of mud in the nests of *T. f. melanopleura* (Belcher & Smooker 1937) was considered by Londoño (2005) to be the main difference between the nests of *T. flavipes* and *T. leucops*, but this was not supported by our observations. The abundant hairy rhizomes of epiphytic ferns used in nest walls, as well as the humic material found in the nest base were other unique aspects of our nest, not previously reported for other Neotropical thrushes (Haverschmidt 1959; Snow & Snow 1963; Dyrcz 1983; Oniki & Willis 1983; Marin & Carrion 1991; Londoño 2005). Nest placement also diverged. In Trinidad all three of the *T. f. melanopleura* nests observed were located in ravines and rock faces on banks (Belcher & Smooker 1937), rather than in trees. However, this divergence must be viewed with caution because the number of nests described for both subspecies is still low. In *T. leucops*, for instance, nests can be placed in both embankments and trees (Marin & Carrion 1991; Londoño 2005; Halupka & Greeney 2009). Since we have found only one nest, we cannot assume that the characteristics we describe here are representative of the whole subspecies.

The color of the eggs we found matched the description presented by Oates (1905) for *T. f. flavipes*, as well as other Neotropical *Turdus* (Haverschmidt 1959; Snow & Snow 1963; Dyrcz 1983; Oniki & Willis 1983; Marin & Carrion 1991; Londoño 2005). When the hatchlings were observed, a male and a female were repeatedly flying into the nest to feed them, indicating that both sexes shared nestling provisioning activities, as shown by Belcher & Smooker (1937) for *T. f. melanopleura*. The nest was found during the rainy season in southeastern Brazil, when other thrush species also breed in the region. Active nests of *T. leucomelas* and Creamy-bellied Thrush (*T. amaurochalinus*) were found in October in Itatiaia National Park, Rio de Janeiro (Alves 2007), and *T. leucomelas* nested from September to January at Sorocaba, in the countryside of São Paulo (P.V. Davanço, pers. comm.). In the Serra do Mar and Itatiaia mountain ranges, *T. flavipes* is believed to perform elevational migrations, staying at high elevations during the summer and in lowlands during the winter (Alves 2007). The presence of an active nest near sea level during the summer does not conform to existing information. The knowledge about bird migration in the Neotropics is scant, even for common species (Jahn *et al.* 2010), and a broader geographical perspective of the presence and movements of this species in future studies is worthwhile.

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SHORT-COMMUNICATION

# New records of the Rufous-faced Crake, *Laterallus xenopterus* (Gruiformes: Rallidae) in Brazil and observations about its habitat

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**ABSTRACT: New records of the Rufous-faced Crake, *Laterallus xenopterus* (Gruiformes: Rallidae) in Brazil and observations about its habitat.** The Rufous-faced Crake, *Laterallus xenopterus*, is a bird that is rarely spotted at Paraguay, central Brazil, and central Bolivia. There are known species records at the Brazilian states of Distrito Federal, São Paulo, and Minas Gerais. Here, we provide information about new areas of occurrence for this species in Brazil and detailed observations of its habitats. In October 2012, two individuals were registered in the municipality of Cristalina, state of Goiás. In December 2012, the species was found in a new locality of Distrito Federal and at the municipality of Patrocínio, Minas Gerais. In February 2013, a new record for this species was obtained in the municipality of Itiquira, Mato Grosso. In all occasions, the bird was spotted in humid environments, which were characterized by the presence of grass and a thin water layer.

**KEYWORDS:** cerrado; distribution; grasslands; rail; range extension.

The rare Rufous-faced Crake, *Laterallus xenopterus* (Gruiformes: Rallidae), has been recorded in highly disjoint areas of eastern Paraguay, central Brazil, and central Bolivia (Taylor 1998; Bird Life International 2013). Currently, its conservation status in Brazil is "least concern," while at global scales this species is considered "vulnerable" (IUCN 2012). The species is considered "critically endangered" in São Paulo (Antunes 2009) and it is categorized as "data deficient" in Minas Gerais (Fundação Biodiversitas 2008).

There were recent records in Paraguay in Concepción, Canindeyú, Caazapá, Itapúa, San Pedro, and Amambay (Myers & Hansen 1980; Storer 1981; Hayes 1995; Lowen *et al.* 1996; Taylor 1998; BirdLife International 2013). In Bolivia, the only records are from Beni Biological Station Biosphere Reserve and Estancia Cristalino, department of Beni (Brace *et al.* 1998; Tobias & Seddon 2007). In Brazil, the species was registered in the Distrito Federal and in the states of São Paulo and Minas Gerais. In 1978, a specimen was captured at Brasilia National Park, Distrito Federal (Sick 1979). At the beginning of the 1980's, the Rufous-faced Crake was registered at the wet grasslands of the IBGE Ecological Reserve, and later, in March 1989, at the Brasilia Zoo (Negret & Teixeira 1984; Collar *et al.* 1992). In São Paulo, a specimen was found dead in Itirapina (Oniki & Willis 1996). Then, in 2004, a specimen was captured in a trap for small mammals, at Jacaré-Riachão Farm, in the municipality of Felixlândia, Minas Gerais (Vasconcelos *et al.* 2006).

This communication aims to increase the knowledge about *Laterallus xenopterus* at the Brazilian Cerrado, providing additional information about new occurrence areas and species habitats.

On October 25th 2012, V.G.C. observed, photographed, and recorded a call of *L. xenopterus* in the municipality of Cristalina (16°45'S, 47°38'W), state of Goiás, 150 km south of Distrito Federal. The bird inhabited a region of water source amidst a grassland (*campo limpo*), right above *veredas* (*i.e.*, a phytophysiognomy of cerrado predominantly dominated by emergent palms of *Mauritia flexuosa* growing in grass-covered swamps). The environment was characterized by the presence of sparse pteridophytes and dense native grasses, ranging from 0.5 to 0.8 m high. A thin water

layer about 1- to 2-cm deep was covering the soil. The following day, at the same location, two individuals were registered after the use of playback method. One of the individuals was photographed (Figure 1) and had its call recorded, which was then deposited at the website Wikiaves (WA789394). While this specimen was being recorded, the second individual was heard some meters distant from the observer. Although no record was taken, the threatened Dwarf Tinamou, *Taoniscus nanus* (Tinamiformes: Tinamidae), was spotted at the same site, in a place that had exposed soil not covered by water.

On November 15th 2012, an audio record of the an individual was made by V.G.C. at Fazenda Água Limpa (15°56'S, 47°46'W), located south of Brasilia, in Distrito Federal. This bird inhabited a hilly area of dense native grasses near the riparian vegetation. The environment was very humid, with areas covered by a thin water layer about 0.2- to 1.0-cm deep. Some spots had dense pteridophytes tussocks.

On December 27th 2012, two individuals had their calls recorded by V.G.C. and D.W.M.S. They were spotted in a grassland (*campo limpo*), located in the municipality of Patrocínio (19° 2'S, 46°58'W), state of Minas Gerais, about 520 km away from Brasília (the area where was recorded the greatest number of occurrences). Located directly upland from a riparian area and a rugged terrain, this moist environment had dense clumps of pteridophytes and dense tussocks of natural grass, ranging from 0.6 to 0.9 m in height. The water layer varied from 0.3- to 1.5-cm deep. These individuals responded well to the playback and one individual even appeared in a clear area, allowing good visualization.

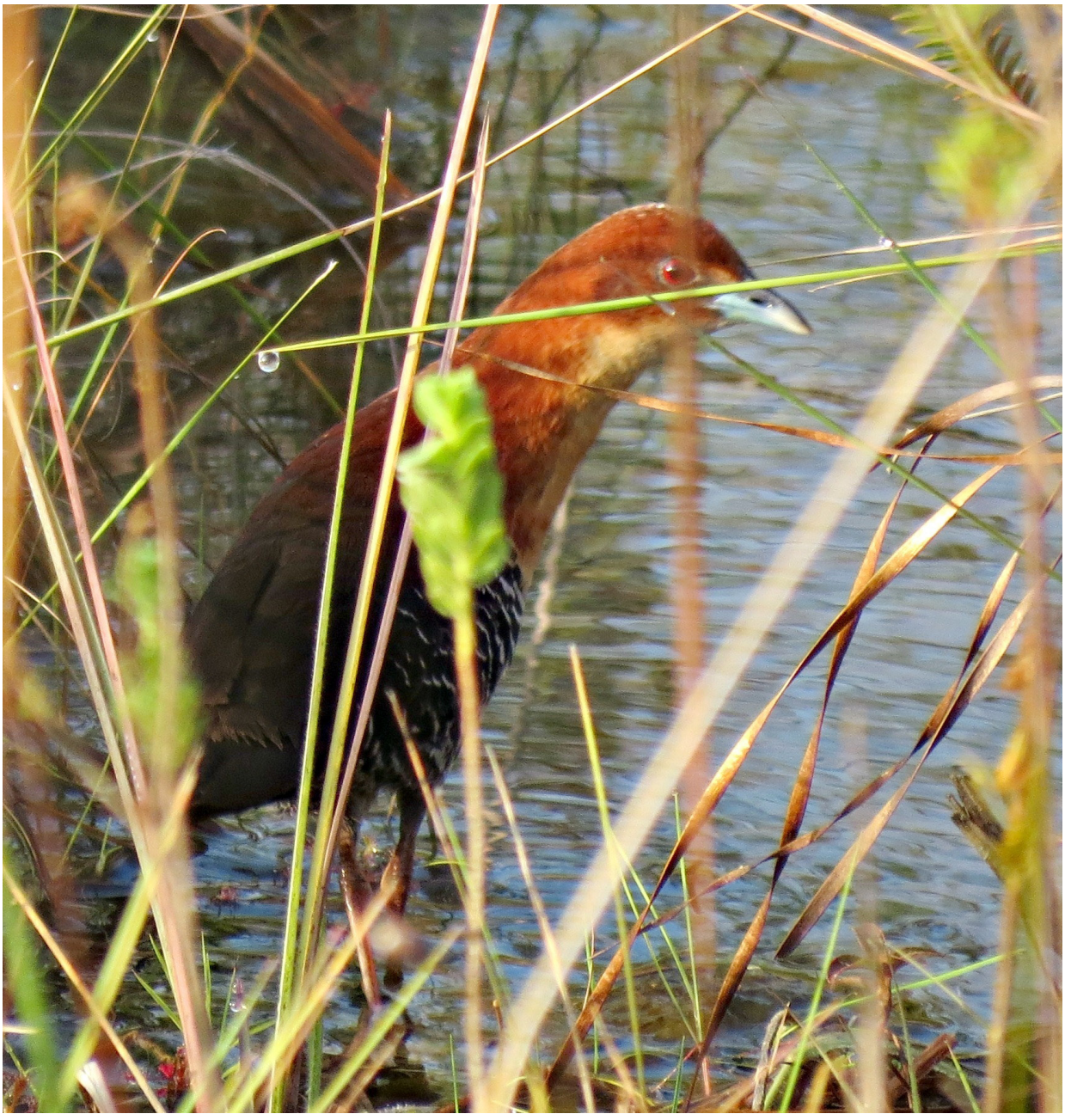

**FIGURE 1.** Rufous-faced Crake *Laterallus xenopterus* observed in the municipality of Cristalina, Goiás (photo by V.G.C.).

On February 28th 2013, another two individuals were photographed and had their calls recorded (Figure 2) by V.G.C. and L.F.S. They were recorded at a preserved area of *veredas*, in the municipality of Itiquira (17°13'S, 54°9'W), state of Mato Grosso, about 850 km from Brasilia. These were the first documented records of this species for the state. The habitat (Figure 3) was humid with a thin water layer (0.4- to 2.0-cm deep) covering the soil and dense clumps of natural glass, varying from 0.3- to 1.4-m tall. We also observed a juvenile *L. xenopterus*. When compared to the adult bird, the juvenile was smaller and had a noticeably paler plumage. While the adult has a ferruginous head and neck, white throat, and cream chest (Gwynne *et al.* 2010), the juvenile form presented shades of dark gray on the head, neck, throat, and chest. Unlike the adult, whose sides are barred black (Gwynne *et al.* 2010), the flanks of the young were also gray.

It is worth mentioning that this record was taken a few kilometers from the border of the state of Mato Grosso do Sul, inferring that the bird might also occur in that state. The record of *L. xenopterus* in the Reserva Natural del Bosque Mbaracayú, Department of Canindeyú, in Paraguay (Brace *et al.* 1998) also points to a potential occurrence of this species in the adjacent Brazilian state of Mato Grosso do Sul. Records from the present study as well as previously documented records of the species in Brazil, Paraguay, and Bolivia are compiled in Figure 4.

In all habitats where the species was registered, the presence of a dense grass cover and a thin water layer appeared to be a determinant factor for the occurrence of this species. These observations corroborate the works of Myers & Hansen (1980) and Brace *et al.* (1998), who also found the bird in flooded areas partially covered by grass tussocks. In the present study it was noted that the Rufous-faced Crake used similar habitat to that of the Ocellated Crake, *Micropygia schomburgkii* (Gruiformes: Rallidae), but Ocellated Crake habitat had no water layer.

It is important to note that a major fire occurred sometime after V.G.C. visited the occurrence site and recorded *Laterallus xenopterus* in the city of Cristalina, state of Goiás. A month later, the same author returned and discovered the fire had significantly modified the

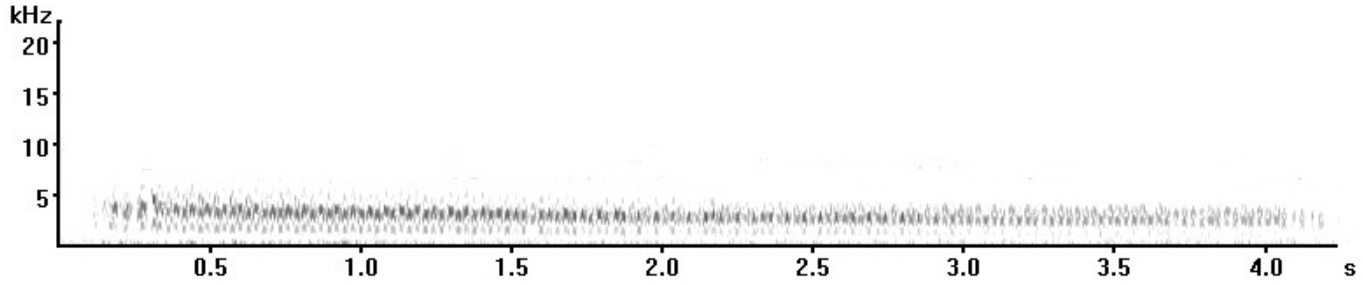


**FIGURE 2.** Spectogram of complete song given by Rufous-faced Crake *Laterallus xenopterus* in the municipality of Itiquira, Mato Grosso.

**FIGURE 3.** *Veredas* habitat in the municipality of Itiquira, Mato Grosso, where two individuals of Rufous-faced Crake *Laterallus xenopterus* were recorded (photo by V.G.C.).

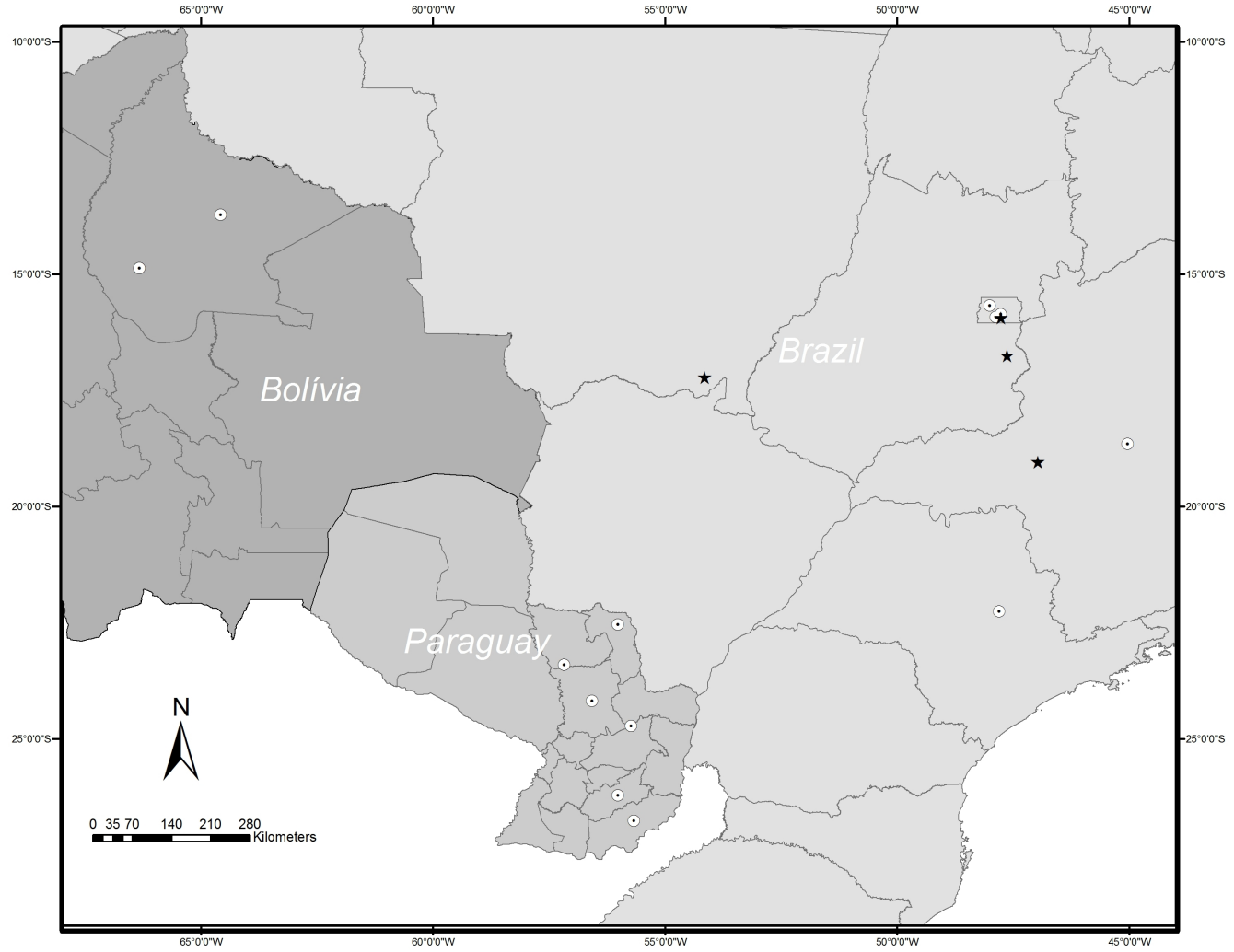


**FIGURE 4.** Distribution of Rufous-faced Crake *Laterallus xenopterus*. White circle: previous records; black star: new records.

habitat. At this time, he registered two *L. xenopterus* individuals, reconfirming the permanence of the species at the site and reinforcing the theory that this bird presents some tolerance to fires (BirdLife International 2013).

The expansion of agriculture, especially of soybean and maize monocultures, cattle raising, *Eucalyptus* and *Pinus* plantations, mining activities, and hydroelectric projects in central Brazil results in habitat loss and modification of habitat quality (Collar *et al.* 1992; Lopes *et al.* 2009). Therefore, these expansions threaten the permanence of many bird species, including *Laterallus xenopterus*. These changes are possibly leading *L. xenopterus* to a population decline (BirdLife International 2013).

In the present study, it was observed that the Rufous-faced Crake often uses a specific habitat type. It was mainly found next to water springs, riparian areas, and *veredas*, which are locations that are very threatened by the expansion of agriculture and livestock. Furthermore, we noticed that not all areas characterized as typical habitat for this species (*i.e.*, with the presence of clumps of grasses and a thin covering of water) had individuals present. Recently acquired knowledge about *L. xenopterus* about its vocalizations and habitat preferences facilitated our field work. Nevertheless, there is a need for more focused research about the species, especially that would provide new information about its biology and geographical distribution, which is necessary for future conservation efforts.

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