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Capa: Quatro espécies de aves pouco conhecidas fotografadas na Floresta Nacional do Tapajós, Estado do Pará; um inventário sobre a avifauna da região de Santarém é publicado neste volume por Lees e co-autores. Imagens (da esquerda para a direita): gavião-miudinho (*Accipiter superciliosus*), maria-mirim (*Hemitriccus minimus*), bem-te-vi-pequeno (*Conopias trivirgatus*) e vite-vite-de-barriga-amarela (*Hylophilus hypoxanthus*) (Fotos: Alexander C. Lees).

Front cover: Four poorly-known bird species photographed in the Floresta Nacional do Tapajós, Estado do Pará; an inventory of the avifauna of the wider Santarém region is collated in this volume by Lees and co-authors. Images (from left to right): Tiny Hawk (*Accipiter superciliosus*), Zimmer's Tody-Tyrant (*Hemitriccus minimus*), Three-striped Flycatcher (*Conopias trivirgatus*), and Dusky-capped Greenlet (*Hylophilus hypoxanthus*) (Images: Alexander C. Lees).

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SUMÁRIO / CONTENTS

ARTIGOS / PAPERS

NOTAS / SHORT-COMMUNICATIONS

Revista Brasileira de Ornitologia, 21(1), 1-4
March 2013

ARTICLE

Plumage variation in the Planalto Woodcreeper *(Dendrocolaptes platyrostris)* and the *melanocortin-1 receptor* gene *(MC1R)*

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ABSTRACT: The Planalto Woodcreeper (*Dendrocolaptes platyrostris*) presents "pale" and "dark" plumage variants, which are distributed throughout the Cerrado and Caatinga, and throughout the Atlantic Forest, respectively. To understand the genetic nature of the plumage variation in the species, we partially sequenced the *melanocortin-1 receptor* (*MC1R*) gene, which is associated with melanic phenotypes in vertebrates. We found no correlation between variation at *MC1R* sequences and plumage color in *D. platyrostris*. Aminoacid sites that were correlated with variation in melanic plumage in other bird species were monomorphic in *D. platyrostris*. Our results suggested that *MC1R* seems not to be involved in controlling plumage variation in *D. platyrostris*.

KEY-WORDS: plumage color polymorphism; melanocortin-1 receptor, *Dendrocolaptes*

INTRODUCTION

The genetic basis of phenotypic diversity within species is of great interest to evolutionary biologists because adaptive evolution depends on selection of genetic variants (Theron *et al.* 2001). Genetic changes resulting in color and pigmentation variation among closely related taxa might represent important evolutionary events. However, the molecular basis and developmental pathways responsible for phenotypic difference are unknown in most cases (Cheviron *et al.* 2006). Recently, it has been suggested that the locus encoding the *melanocortin-1 receptor* (*MC1R*) may cause color polymorphisms in wild populations (Mundy 2005). This gene encodes the MC1R protein, which is expressed in the melanocytes of developing feathers and hair follicles and plays a critical role in the control of melanin synthesis (Theron *et al.* 2001, Baião *et al.* 2007). Point mutations in this locus were associated with color polymorphisms based on melanin and can cause changes from light to dark color all over the body in a variety of taxa (revision in Corso *et al.* 2012).

The planalto woodcreeper (*Dendrocolaptes platyrostris*) is an endemic bird of the Atlantic forest that inhabits forest enclaves and gallery forests within the Cerrado, Chaco, and Caatinga (Figure 1). As many other woodcreepers, *D. platyrostris* does not have plumage sexual dimorphism. It has two parapatrically distributed subspecies: *D. p. platyrostris* – dark plumage morph - individuals are predominantly streaked buff, have blackish crown, dull chestnut wings and tail, and brown underparts, and inhabit the Atlantic Forest domain in southeastern Brazil, eastern Paraguay and extreme northeastern Argentina; *D. p. intermedius* – pale plumage morph - individuals have browner crown, almost no streaking on mantle, paler and brighter rufous wings and tail, and slightly paler underparts, and inhabit gallery forests of Cerrado / Caatinga domains (Ridgely & Tudor 1994, Willis & Oniki 2001, Cabanne *et al.* 2011; Figure 1). The study of Cabanne *et al.* (2011) indicated that plumage type in *D. platyrostris* (i.e., dark and pale morphs) was not correlated with neutral genetic divergence (mitochondrial DNA) but confirmed that it

was correlated to different types of habitats, with dark and pale morphs occurring respectively in more humid (Atlantic Forest) and dry (Cerrado / Caatinga) habitats.

In this study we examined the *MC1R* sequence variation of *D. p platyrostris* and *D. p. intermedius*. Specifically, we looked for fixed non-synonymous differences in *MC1R* between plumage morphs. Our main question was whether the light and dark phenotypes of this species could be related to changes in the *MC1R* coding region.

FIGURE 1. Distribution of biomes and of the two subspecies of *Dendrocolaptes platyrostris*. Modified from Cabanne *et al.* (2011).

MATERIAL AND METHODS

We sampled five adult individuals of *D. platyrostris intermedius* and five *D. p. platyrostris*, from localities that are 1600 km apart (Table 1). Total genomic DNA was isolated from blood or muscle samples by a standard phenol/chloroform extraction protocol (Sambrook *et al.* 2001). A fragment of approximately 500 bp of the avian *MC1R* gene was amplified by PCR using the following primers: lcorMSHR72 – 5' AYGCCAGYGAGGGCAACCA 3' (Cheviron *et al.* 2006) and MC1RIntRev – 5' AACATGTGRATGTAGAGCACC 3'. PCR

conditions were: initial denaturation for 3 min at 94°C, followed by 45 cycles (denaturation at 94°C for 45 s, annealing at 50-60°C for 60 s and extension at 72°C for 90 s) and a final extension at 72°C for 5 min. This *MC1R* fragment includes main sites previously shown to be associated with melanic phenotypes in birds (Cheviron *et al.* 2006). Each specimen was submitted to at least two independent amplification and sequencing reactions (using the same primers used in the PCR) to confirm the sequences. Consensus sequences were obtained and deposited in GenBank under the accession numbers: FJ985683–FJ985688, JN224986-JN224989.

DNA sequences were aligned and their nucleotides and deduced amino acids were compared to those from bananaquits (*Coereba flaveola*; GenBank number AF362605 and AF362598) using BIOEDIT v. 7 (Hall, 1999; Table 2). We tested for evidence of selection at *MC1R* by calculating Tajima's D statistic using MEGA 5 (Tamura *et al.* 2011).

TABLE 1. Specimens sequenced, sampling localities, sample identification, and voucher identification of tissue samples.

Taxon[a]	Locality (habitat)	Tissue identification[b]	Vouchers[c]
D. p. platyrostris	Pinhalão, Paraná (PR). 23°46'S; 50°3'W (Atlantic forest)	LGEMA P885	MZUSP 75622
	Wenceslau Braz, PR. 22°5'S; 48°47'W (Atlantic forest)	LGEMA P957	MZUSP 75690
	Morro Grande State Park, São Paulo (SP). 23°42'S; 46°59'W (Atlantic forest)	LGEMA P2480, P2482	-
	Barreiro Rico, SP. 22°38'S; 48°13'W (Atlantic forest)	LGEMA P1696	-
D. p. intermedius	National Park of Serra das Confusões, Piauí. 9°40'S; 44°8'W (Caatinga)	LGEMA P2277, P2278, P2329, P2379, P2418	MZUSP 77719, 77720, 77721, 77722

[a] *D. p.= Dendrocolaptes platyrostris.*

[b] Samples are deposited at the Laboratório de Genética e Evolução Molecular de Aves (LGEMA), Universidade de São Paulo, São Paulo, Brazil.

[c] Voucher specimens housed at MZUSP: Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil. A dash indicates that a voucher specimen does not exist.

TABLE 2. *MC1R* sequences of *Dendrocolaptes platyrostris*. Sites are numbered based on the alignment with bananaquit (*Coereba flaveola*) *MC1R* sequences (see methods). Sites in bold are associated with color polymorphism in other avian taxa (amino acid replacement), all *D. platyrostris* individuals are monomorphic at these sites. Variable sites in *D. platyrostris* that resulted in putative aminoacid substitution are underlined. Asterisks show sites that are identical to those of *Coereba flaveola*.

Taxa	Nucleotide site					Aminoacid position										Plumage
	1	1	2	**2**	5	**1**	**3**	6	**8**	**9**	1	**1**	1	1	**2**	
	1	2	0	**7**	1	**6**	**8**	8	**5**	**2**	1	**5**	6	7	**0**	
	3	0	3	**4**	4						1	**7**	6	2	**7**	
C. flaveola M5	T	C	A	A	G	A	I	H	V	K	V	Q	V	V	H	melanic
C. flaveola Y24	*	*	*	G	*	*	*	*	*	E	*	*	*	*	*	yellow
D. p. platyrostris P885; P2480; P2482; P1696	*	T	*	G	*	.	*	*	*	E	*	*	*	*	*	dark
D. p. platyrostris P957	*	T/C	*	G	*	.	*	*	*	E	*	*	*	*	*	dark
D. p. intermedius P2278; P2379; P2418	*	T	*	G	A	.	*	*	*	E	*	*	*	I	*	pale
D. p. intermedius P2329	T/A	T	*	G	A	.	*	*	*	E	*	*	*	I	*	pale
D. p. intermedius P2277	*	T	G	G	*	.	*	R	*	E	*	*	*	*	*	pale

RESULTS

The alignment matrix presented 525 characters encompassing sites 100 to 624 of the *MC1R* gene. It had 96–97% nucleotide identity with sequences from other passerine birds such as *Coereba flaveola* (Theron *et al.* 2001), *Phylloscopus* warblers (MacDougall-Shackleton *et al.* 2003), and *Lepidothrix coronata* (Cheviron *et al.* 2006). Two *D. platyrostris* individuals presented heterozygous sites at positions 113 and 120 (Table 2). There were three variable sites that resulted in non-synonymous substitutions (amino acid positions 38, 68, and 172), which allowed us to identify three polymorphic DNA sites in pale morph birds: c.113 T > A , c.203 A > G, and c.514 G > A (Table 2). These changes could not be correlated with phenotype differences, once those changes maintain the same polarities of original aminoacids. As the number of variable sites observed was very low, our statistical power to detect selection was also low (Tajima's D: -0.78, not significant at P > 0.10).

DISCUSSION

The results obtained are in contrast with some studies of vertebrate taxa, including birds (reviewed in Mundy 2005), which observed a linkage between *MC1R* mutations and the appearance of melanic phenotype. In *Coereba flaveola*, a non-synonymous substitution (E92K) was associated with melanic plumage (Mundy *et al.* 2004). In the red-footed booby (*Sula sula*), the white/melanic polymorphism observed was associated to two point substitutions, V85M and H207R (Baião *et al*. 2007). These three sites were monomorphic in *D. platyrostris* (Table 2). However, these results should be interpreted with caution, as our sample size is small and it may not have allowed the identification of association between phenotypic and genotypic variations. However, even though we did not completely sequence the *MC1R*, the segment studied contained the majority of sites previously shown to be correlated with plumage differences in birds (Mundy *et al.* 2004, Mundy 2005, Cheviron *et al.* 2006). Therefore, *D. platyrostris* seems to be another instance of a bird species that does not present any evidence that *MC1R* is correlated with pigmentation differences as documented previously in *Phylloscopus* warblers (MacDougall-Shackleton *et al.* 2003) and *Lepidothrix coronata* (Cheviron *et al*. 2006), the latter belonging to the same Passeriformes suborder (Tyranni) as *D. platyrostris*.

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ARTICLE

Early singing onset in the black-cheeked gnateater *(Conopophaga melanops)*

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ABSTRACT: Early singing onset in the black-cheeked gnateater (*Conopophaga melanops*). Song learning in birds has been intensively studied, mostly in the suborder Oscines. While studying the black-cheeked gnateater *Conopophaga melanops* (Suboscine) in southern Brazil nestling vocalizations were observed. Adult and nestlings vocalizations were described and compared to examine age-specific variation in song structure. Nestling vocalization was more similar to adult song than to alarm calls. However, nestling and adults songs differed primarily in maximum frequency and total length of the song. Nestling age was also correlated with some nestling song features. These patterns suggest that while vocalization at an early age may be innate, nonetheless, there may also be a stage during which individuals could learn the adult song. Because this early song is not the same as the adult song, we suggest that some Suboscines may achieve their song only after practice, although not necessarily with an imitative-learning basis, such as in Oscines. Further study will be required, with observations beginning with young birds on the nests, to better understand the ontogeny of song and individual variability in adults Suboscines.

KEY-WORDS: Conopophagidae; innate behavior; learning; Suboscine; vocalization.

INTRODUCTION

Questions about the development of avian song learning have a long history of debate (Marler & Tamura 1964, Nottebohm 1970, Immelmann 1975). One general pattern is clear in which some songbirds, parrots, and hummingbirds learn from imitation (Gaunt *et al*. 1994, Farabaugh *et al*. 1994, Berg *et al*. 2011) while other birds inherit song templates (Kroodsma 1984, Kroodsma & Konishi 1991). Oscines (songbirds, suborder Passeri), the best studied group, may learn and modify their songs over time (Marler & Tamura 1962, Chaiken *et al*. 1994, Brenowitz & Beecher 2005, Kirn 2010), while the Suboscines (the other passerines, suborder Tyranni) are poorly studied and thought to have innate songs that are relatively unmodified over time (Kroodsma 1984). Although this pattern is widely accepted, more empirical and experimental data are available for those species that "learn" than there is for the non-learners, the Suboscines (and others). However, learning may be more common than thought, even among the Suboscines (Leger 2005, Saranathan *et al*. 2007).

In those species that learn songs, young birds pass through a sensitive period during which they acquire information that will shape song development. In some species, song learning occurs at a certain age, while others may learn at any age (Nottebohm 1970, Farabaugh *et al*. 1994, Tramontin & Brenowitz 1999). The learning stage (involving auditory and recording mechanisms prior to song production) usually begins the first month after hatching and may continue through the first year (Kroodsma & Konishi 1991, Marler 1997, Brenowitz & Beecher 2005). In most species within the Suboscines, when singing begins and when the song acquires the adult form are unknown. Although they are not expected to go through a typical song-learning phase, it is unlikely that the first vocalizations of a young bird will be that of an adult song (Kroodsma 1984).

The Atlantic Forest endemic black-cheeked gnateater *Conopophaga melanops* (South American bird family Conopophagidae) is a tracheophone Suboscines (Irestedt *et al*. 2002). This gnateater is a socially monogamous and territorial species, and in general has life history traits more related to slow pace species (Wiersma *et al*. 2007). Such traits would include an extended nest cycle, low clutch size and extended parental care. As example, the nest cycle may take more than 50 days since the nest building (Lima & Roper 2009a).

While studying the population dynamics of the black-cheeked gnateater in southern Brazil (Lima &

Roper 2009a), an unusual nestling singing behavior was observed. While based on few and sporadic observations, the lack of knowledge on song ontogeny within the Suboscines suggests that our information may be useful to better understand such process. Thus, we describe and compare adult and nestling vocalizations to discuss a first approach on the song development in this Suboscine passerine.

METHODS

The black-cheeked gnateater *Conopophaga melanops* was studied at a Private Reserve located in the municipality of Guaraqueçaba, state of Paraná, southern Brazil (25°13′S, 48°17′W). The reserve is at the lowland and mountain tropical forest, comprising approximately 2300 ha, in a larger matrix of mixed successional forest stages (> 400 000 ha) contiguous with the largest area of well-preserved Atlantic Forest. We captured and monitored gnateaters in a 25 ha plot (Lima & Roper 2009a).

Nestlings were observed and monitored at five of 18 nesting attempts. Some nestlings (three individuals in two nests) were observed as they occasionally vocalized. In eight observations, vocalizations were digitally recorded (Tascam DR08 with an external microphone Sennheiser ME66). Also, digital videos were recorded twice of singing nestlings on the nest (Sony DSC/H2). Songs of the three nestlings were recorded from 2-4 times on different days (thus, diverse ages). Nestling age was estimated based on the last date eggs were found and in comparison with nests found before hatching. Songs of adult males were recorded in the field (N = 10). One song per adult was used.

Sound was analyzed in Raven Lite 1.0 (Cornell Lab of Ornithology, USA). Audio spectrograms were compared among nestlings and adults. Acoustic parameters used for comparison include total length (s), note rate (s^{-1}), and fundamental frequency range (kHz), measured as the maximum and the minimum frequencies at two moments of each song: after the first second (f1) and at the beginning of the last second (f2) (i.e., a song that last 8.3 s had frequencies measured at 1.0 s, as f1, and f2 at 7.3 s). Adult and nestling song features were compared using *t* tests and regression analysis. We carried out regression analysis for checking the correlation between nestling age and song features. Tests were considered statistically significant when $P \leq 0.05$.

RESULTS

Adults sing a long and multi-note song (mean + SD = 9.3 + 0.8 s, with 12.2 + 0.2 notes s^{-1}, n = 10, Figure 1). Adult song had usually presented two or three harmonics, with the lower frequency harmonic ranging around 2.7 – 4.2 kHz ($f1_{max}$ + SD = 3.5 + 0.2 kHz, and $f2_{max}$ + SD = 4.0 + 0.3 kHz, n = 10). The two succeeding harmonics ranges around 4.7 – 5.7 and 6.2 – 7.7 kHz. A unique recording presented four evident harmonics, which was the only one including the harmonic with the lower and fundamental frequency (1.5 – 1.9 kHz), with a second and dominant harmonic around 2.8 – 3.9 kHz. Comparisons of initial and final frequencies were possible for the dominant harmonic, which increased the modulation toward the end of the song ($f1_{min-max}$ = 2.7 – 3.7 kHz, $f2_{min-max}$ = 3.3 – 4.2 kHz, r = 0.49, df = 9, P < 0.05). The alarm call is quite different than the song (Fig. 1) and it is a single short pulse (~ 0.2 s) with a high and broad frequency (3.2 – 16 kHz).

The nestling emits a similar but shorter song (mean + SD = 3.9 + 0.3 s, 12.2 + 0.6 notes s^{-1}, n = 8; Figure 1). Nestling songs start and finish at lower frequencies than those of adults ($f1_{max}$ + SD = 2.8 + 0.2 kHz, t = 4.08, P < 0.05, and $f2_{max}$ + SD = 3.4 + 0.2 kHz, t = 6.5, P < 0.05), and there is an increase in the modulation throughout the song for nestlings (r = 0.84, df = 7, P < 0.05). Only one harmonic, at 4.7-5.9 kHz, were found in one recording (from the older nestling in the sample, with the higher maximum frequency in figure 2). The emission of the sound was in apparent response to approach, during which the nestling stayed in the usual nestling posture. During sound emission, the body of the nestling vibrated in synchrony with the sound (we can send the video file for those interested). Begging was never seemed during observations of parental care at five nests where nestlings had survived (Lima e Roper 2009a). No other sounds were noted, even when nestlings were manipulated (for banding).

The age of nestlings was estimated for one nest found on 10 December 2006 with two eggs that by 12 December had hatched. The first juvenile observed singing in that nest was on 22 December (at 10-11 days after hatching). Another nest was found with two chicks on 12 January 2007, and when compared to nestlings of known age, they were estimated to be 8 days old. One nestling were recorded singing when the nest was found, and then, both nestlings "sang" in three (13, 18 and 23 January) of six observations before they fledged on 25 January, a date that corroborate with the estimated age (Lima & Roper 2009a). Thus, the age of nestlings at this nest was 8 and 9 days after hatching when was it found.

Nestling age was correlated with some characteristics of the song. Maximum frequency at the end of the song (f2) and nestling age were correlated (r = 0.83, df = 7, P < 0.05, Figure 3). Total song length and age were correlated (r = 0.64) but at n = 9, P = 0.07. Minimum and maximum frequencies at the beginning of the song (f1) were independent of nestling age.

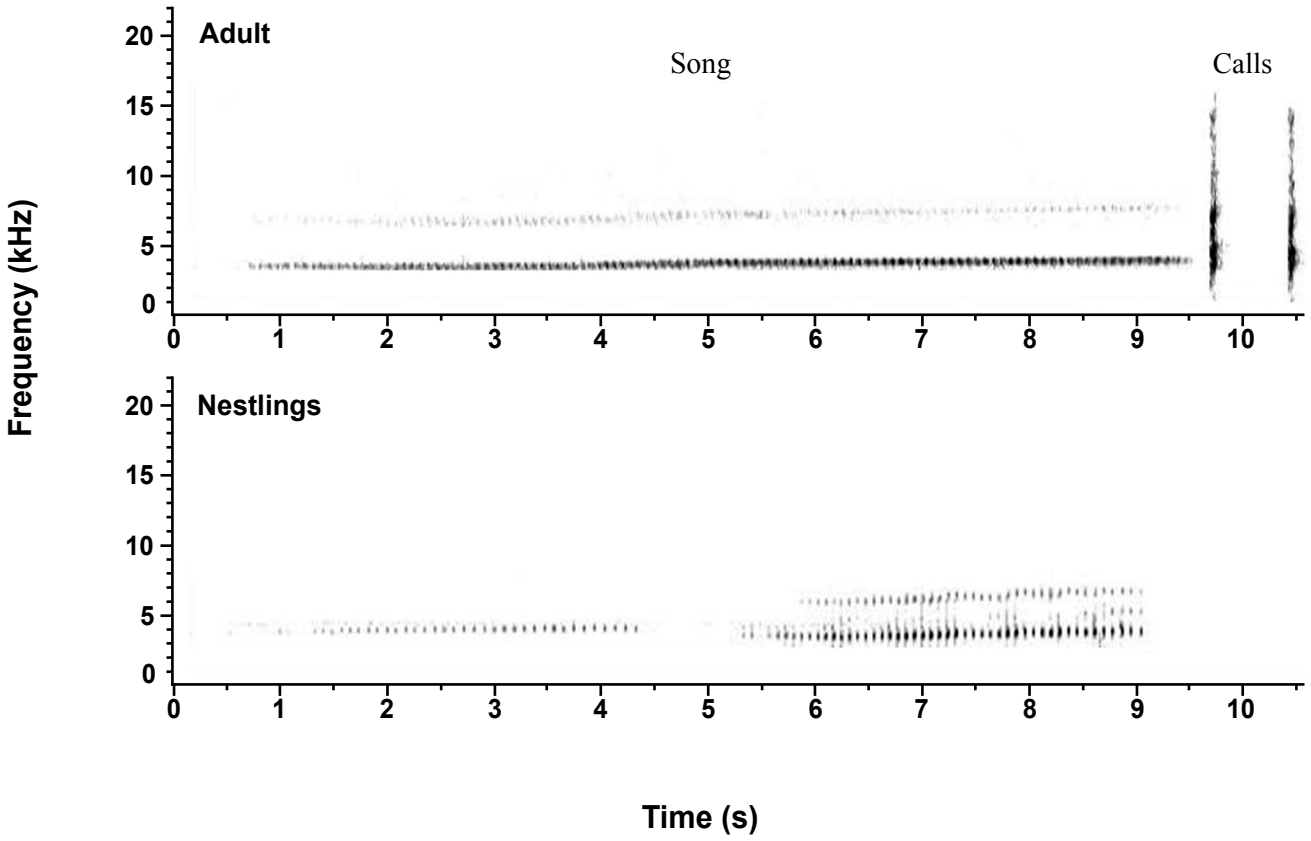

FIGURE 1. Song and call spectrogram of the adult black-cheeked gnateater *Conopophaga melanops,* and the audio spectrogram of two nestlings.

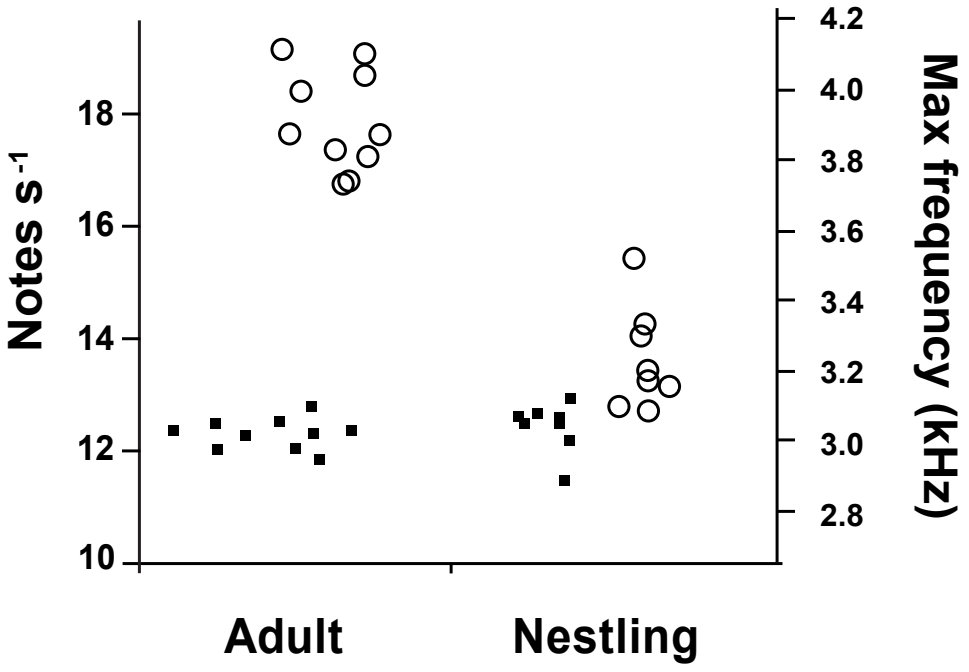

FIGURE 2. Song features points for adults and nestlings of black-cheeked gnateater *Conopophaga melanops*: black dots show note rate and white circles show maximum frequency (kHz).

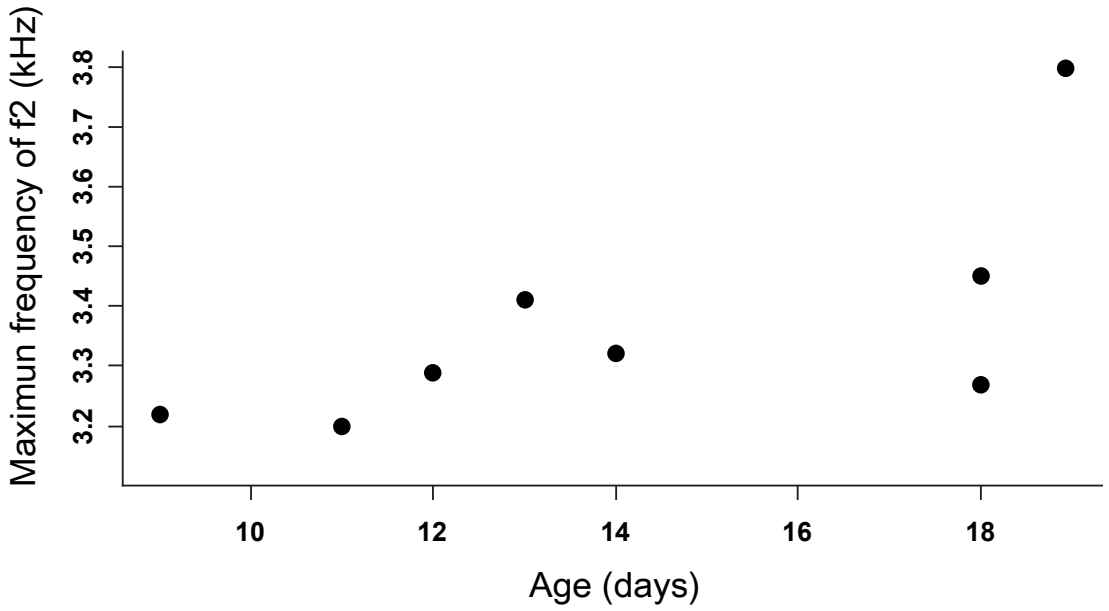

FIGURE 3. Correlation between maximum frequency (kHz) in the end of the song (*f2*) and the age (in days) of nestlings of black-cheeked gnateater *Conopophaga melanops*.

DISCUSSION

Nestling vocalizations always more closely resembled adult songs than they did begging or alarm calls. This was somewhat surprising because vocalizations seemed to be in response to our approaching the nest, and so might have been in alarm. Or, perhaps the noise we made suggested to the bird that adults were returning with food. Despite of the reason they sang, the similarity between adult and young songs suggests that a song template is inherited, as expected for Suboscines (Kroodsma 1984, Kroodsma & Konishi 1991), but which must be improved as the nestling grows.

Nestling black-cheeked gnateaters begin to sing earlier than other not related species (Kroodsma & Pickert 1984, Podos *et al*. 2004). Furthermore, some features of the song seem age-dependent. The maximum frequency of the dominant harmonic increased with age approaching that of the adult song, while young birds remained on the nest (Figure. 3). A similar process goes through the total length of their song (Figure 1). This appears to be learning on the part of the young black-cheeked gnateater and which would aim to result in an adult song with respect to frequency and song length. Thus, while nestling black-cheeked gnateaters inherit a song template, apparently the song is being practiced since early age such that learning may be involved to "fine-tuned" the song into that of an adult (such as longer duration and higher frequencies).

Such fine-tuning may be due to the young bird comparing its own song with that of the adult singing nearby (Leger 2005, Saranathan *et al*. 2007). Or also, it may be due to the young bird comparing its own song with some innate "template", because nestlings can sing similar to an adult prior to leaving the nest. This could be also somehow associated to the fitness or the body developmental rate of each individual, such as an age-dependent tonus of the syringe´s muscles, or the body (and vocal tract) size (Marler 1997, Podos *et al*. 2004, Cardoso 2010).

Nevertheless, even if the song ontogeny does not include any auditory feedback-imitation, the song of young birds did not entirely fit as an adult song. As adult' songs presents some variation in the maximum frequency, and the song has an ascendant modulation, potential song individual variability would likely appears in adults by differences in the frequency level in the end of the song, and perhaps either in the song duration. Thus, it is likely that grown-up individuals will not achieve exactly the same song features when adults (Lampe & Espmark 1994, Nelson & Marler 2005, Berg *et al*. 2011), even being a Suboscine species (Ippi *et al*. 2011).

We suspect that learning may be more broadly correlated with song ontogeny here than previously thought. This could be potentially important for this species, due to the role of the song as a territory-maintenance device (Lima & Roper 2009a, b). If so, then social context, phenotypic and environmental variation may also influence song development in this and perhaps several others Suboscine species, but not essentially as it does in the Oscines (Mace 1987, Hoi-Leitner *et al*. 1995, Nowicki *et al*. 2002, O'Loghlen & Rothstein 2002, Kojima & Doupe 2011).

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ARTICLE

Sazonalidade na assembleia de aves aquáticas em uma lagoa marginal do rio Mogi Guaçu, estado de São Paulo, Brasil

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ABSTRACT: Seasonality in an assemblage of waterbirds in a marginal lake of the Mogi Guaçu River, São Paulo state, Brazil. I analyzed the seasonality of a non-passerine waterbird assemblage in a marginal lake of the Mogi Guaçu River during monthly visits from March 2003 to February 2004. I found a total of 15 species belonging to eight families. Ardeidae (five species) and Anatidae (four) were the families with the highest number of species. There was no significant variation in the number of species between the rainy and dry seasons. However, the number of recorded individuals approximately doubled during the rainy season. There was high rate of temporal succession among species throughout the year, because more than half of the species were recorded only once during the year. *Vanellus chilensis* (Molina, 1782) and *Amazonetta brasiliensis* (Gmelin, 1789) were the commonest species, but they were not considered residents. Apparently the occurrence of waterbirds at the study sites may be primarily related to their foraging strategies, so I suggest that for any individual species there are periods of higher probability of occurrence according to both its foraging strategy and the local climate seasonality.

KEY-WORDS: feeding guilds, foraging strategy, temporal succession.

INTRODUÇÃO

Aves aquáticas não-Passeriformes possuem adaptações biológicas e ecológicas que propiciaram uma grande radiação adaptativa e, consequentemente, grande proporção das espécies desse grupo é cosmopolita (Sick 2001). Devido à grande capacidade de locomoção, esse grupo de aves realiza deslocamentos regionais e algumas espécies fazem migrações continentais (Sick 2001). Dessa forma, pequenos açudes e lagoas propiciam ambiente de descanso e alimentação ao longo de suas rotas de deslocamentos e migrações (Sick 2001).

O deslocamento das aves aquáticas em geral pode ser influenciado por diversas razões, como por exemplo, competição (Cox 1968), abundância de presas em potencial como insetos e macro-invertebrados (Wolda 1988, Marques & Vicente 1999), alterações no nível de água (tanto excesso quanto falta), procura de locais para descanso e muda de penas (Sick 2001), variações climáticas (Alves & Pereira 1998), sazonalidade na disponibilidade de hábitat em geral (Hayes & Fox 1991) e provavelmente a poluição. Além desses fatores que podem promover deslocamento espaço-temporal, é de esperar que as aves aquáticas com semelhantes estratégias de forrageamento e guildas de alimentação tendam a possuir períodos semelhantes de deslocamentos para os mesmos hábitats por fins característicos, como disponibilidade dos respectivos hábitats apropriados, alimentos, início e fim do período reprodutivo propício para cada espécie.

Dessa forma, esse estudo enfoca uma assembleia de aves aquáticas em relação à variação temporal entre grupos com semelhantes estratégias de forrageamento e guildas de alimentação, e se atenta a responder as seguintes questões: [1] A riqueza e abundância de aves aquáticas durante o ano têm relação com a sazonalidade climática do período de estudo? Meu prognóstico é que o maior número de indivíduos ocorra durante a estação seca devido ao menor volume de água aumentar a chance de captura de alimentos (Alves & Ferreira 1998, Ishikawa-Ferreira *et al*. 1999, Rodrigues & Michelin 2005); [2] Caso haja sazonalidade, as diferentes estratégias de forrageamento e guildas de alimentação auxiliam no entendimento do padrão de distribuição encontrado? Meu prognóstico é que piscívoros pernaltas (Ardeidae) e piscívoros subaquáticos (Phalacrocoracidae e Alceadinidae) utilizem preferencialmente a estação seca, provavelmente devido

à diminuição do nível de água que facilita a captura de alimento (Alves & Ferreira 1998), enquanto onívoros flutuantes (Anatidae) podem aumentar em densidade em relação ao aumento das chuvas e nível da água e fim do período reprodutivo (Sick 2001).

MÉTODOS

Realizei esse estudo em uma lagoa marginal do rio Mogi Guaçu localizada dentro da Reserva Particular do Patrimônio Natural (RPPN) São Marcelo (22°21'50"S; 46°58'47"W) e pertencente à empresa de papel e celulose International Paper do Brasil. Essa lagoa está situada à margem esquerda do rio Mogi Guaçu (a 20 m do rio), distando cerca de 20 km à montante da Estação Ecológica Mogi Guaçu (Fazenda Campininha) e a 15 km à jusante do Reservatório Usina Mogi Guaçu. Em seu entorno (cerca de 500 metros) há talhões de reflorestamento de espécies nativas em diferentes estágios de sucessão, um talhão de eucalipto formando assim um mosaico com diferentes tipos de cobertura vegetacional.

A lagoa apresentou formato circular com cerca de 608 m^2 de lâmina d' água na estação chuvosa e cerca de 510 m^2 durante a estação seca, com variação de 20 cm do nível da água durante o ano. Suas margens estavam desprovidas de macrófitas e árvores, havendo pouca vegetação rasteira e substrato composto por manchas de argila e seixos em baixa inclinação, caracterizando um ambiente bastante homogêneo durante o período de estudo.

O clima para a região de Mogi Guaçu tem precipitação média anual de 1365 mm e temperatura média anual de 20,6ºC entre o período de 1971 a 2003. A precipitação do período de estudo foi de 1411 mm e a temperatura média de 20,5°C. Em geral o clima para a região de Mogi Guaçu é caracterizado por uma estação chuvosa e quente (verão) de outubro a abril, com precipitação superior a 100 mm e uma estação seca e fria (inverno) de maio a setembro, com precipitação em torno de 60 mm e déficit hídrico entre os meses de julho e agosto. Todos os dados climáticos foram cedidos pela estação meteorológica da Estação Ecológica Mogi Guaçu, que dista cerca de 20 km da lagoa estudada.

Durante um ano (março de 2003 a fevereiro de 2004) realizei visitas mensais de cinco dias consecutivos à lagoa ao final de cada mês. Fiz três visitas diárias com duração de 30 minutos cada: amanhecer (6 h às 6 h30 min), entardecer (18 h às 18 h 30 min) e noturna (21 h às 21 h 30 min). Fiz as observações com um binóculo (8 x 42) e utilizei uma lanterna nas observações noturnas. O maior número de indivíduos encontrados entre os cinco dias de cada mês foi considerado como a população mensal.

Agrupei as espécies da mesma família que possuem estratégias de forrageamento e guildas tróficas semelhantes, resultando em quatro grupos de aves: Piscívoros Pernaltas (PP): aves pernaltas da família Ardeidae que se alimentam preferencialmente de peixes às margens do corpo d'água, sem flutuar sobre a mesma; Piscívoros Subaquáticos (PS): espécies das famílias Phalacrocoracidae e Alcedinidae que pairam ou voam sobre os corpos d'água, mergulhando e perseguindo ativamente peixes como principal fonte de alimentação; Onívoros Flutuantes (OF): aves da família Anatidae que flutuam sobre a água e filtram sedimentos, com alimentação preferencialmente baseada em algas, pequenos insetos e organismos que se fixam em seu aparato bucal adaptado à alimentação por filtração; e Insetívoros das Margens (IM): aves das famílias Jacanidae, Charadriidae, Scolopacidae e Recurvirostridae, preferencialmente insetívoras que forrageiam as margens dos corpos d'água, se alimentando geralmente de larvas, lagartas e pupas de insetos aquáticos que utilizam as margens de corpos d'água em algum período de seu ciclo de vida.

O critério para separação entre estação seca e chuvosa foi baseada na pluviosidade mensal, onde a estação chuvosa e quente (verão) de outubro a abril (precipitação > 100 mm) e a estação seca e fria (inverno) de maio a setembro (precipitação < 60 mm). O número de espécies e indivíduos foram considerados nas respectivas estações e devido a baixa recorrência amostral não foi necessário realizar uma estatística robusta para visualização da sazonalidade, somente fenogramas foram suficientes. Para comparar o número de espécies e indivíduos entre estações utilizei o teste de Mann-Whitney (*U*) (Zar 1999).

Para uma análise com toda amostragem da assembleia de aves aquáticas, utilizei correlação linear simples de Spearman (Zar 1999) onde o número total de espécies e indivíduos quantificados mensalmente (variáveis dependentes) foi correlacionado com a precipitação, temperatura e comprimento do dia (variáveis independentes) do mesmo período (mês). Cada variável ambiental foi correlacionada individualmente com cada variável dependente. Utilizei o mesmo procedimento entre os grupos com diferentes estratégias de forrageamento (PP, PS, OF e IM) e as mesmas variáveis independentes. Construí fenogramas com o número de indivíduos durante os meses do ano para visualização da variação temporal segundo cada categoria de estratégia de forrageamento. Considerei espécie residente as que permaneceram no lago por 10 ou mais meses do ano segundo Alves & Pereira (1998).

RESULTADOS

Não houve diferença entre o número de espécies entre as estações (U = 11,5; P = 0,357), dessa forma cinco espécies foram encontradas somente na estação chuvosa, cinco na estação seca e cinco espécies permaneceram ao menos um mês na estação chuvosa e seca. Porém, apesar do teste de Mann-Whitney não indicar significância (U

= 22,5; P = 0, 460), quando são considerados números de indivíduos os meses da estação chuvosa apresentaram média de 10.4 aves/mês, enquanto que na estação seca foi de 6 aves/mês. (Tabela 1). Das 15 espécies pertencentes a oito famílias que utilizaram a lagoa marginal durante o ano de estudo (Tabela 1), mais da metade (53,3%) foi avistada apenas um mês durante o ano de coleta, caracterizando sucessivas trocas entre espécies ao longo do ano (Figura 1). A espécie que utilizou a lagoa com maior freqüência foi *Vanellus chilensis* (oito meses), seguida por *Amazonetta brasiliensis* (sete) e *Ardea alba* Linnaeus, 1758 e *Dendrocygna autumnalis* (Linnaeus, 1758) (quatro meses cada). *Actitis macularius* (Linnaeus, 1766) foi a única espécie migratória setentrional e permaneceu três meses consecutivos durante a estação chuvosa. Não encontrei nenhuma espécie residente ou nidificando próximo ao

TABELA 1: Composição das espécies, estratégias de forrageamento, número de indivíduos e freqüência relativa para cada espécie de ave aquática encontrada na lagoa marginal do rio Mogi Guaçu, Mogi Guaçu, São Paulo. PS = Piscívoro Subaquático, PP = Piscívoro Pernalta, OF = Onívoro Flutuante e IM = Insetívoro das Margens. Área em cinza = precipitação média superior a 100 mm.

TABLE 1: Species composition, foraging strategy, number of individuals and relative frequency of encounter for each species of waterbird found in the marginal lake of Mogi Guaçu river, Mogi Guaçu, São Paulo. PS = Piscivorous underwater, PP = piscivorous waders, OF = Floating omnivorous and IM = insectivorous of margins. Gray area = average rainfall exceeding 100 mm.

FAMÍLIA/Espécie	**Estratégias de captura**	**mar**	**abr**	**mai**	**jun**	**jul**	**ago**	**set**	**out**	**nov**	**dez**	**jan**	**fev**	**freq. (%)**
ANATIDAE Leach, 1820														
Dendrocygna viduata (Linnaeus, 1766)	OF	0	7	0	0	0	0	0	0	0	0	0	0	8.33
Dendrocygna autumnalis (Linnaeus, 1758)	OF	0	7	0	0	2	0	0	0	4	0	2	0	33.33
Cairina moschata (Linnaeus, 1758)	OF	0	0	1	0	0	0	0	0	0	0	0	0	8.33
Amazonetta brasiliensis (Gmelin, 1789)	OF	4	10	2	2	2	0	0	0	0	0	10	5	58.33
PHALACROCORACIDAE Reichenbach, 1849														
Phalacrocorax brasilianus (Gmelin, 1789)	PS	0	0	0	0	2	2	0	0	0	0	0	0	16.67
ARDEIDAE Leach, 1820														
Butorides striata (Linnaeus, 1758)	PP	0	0	0	0	0	0	0	0	0	0	0	2	8.33
Bubulcus íbis (Linnaeus, 1758)	PP	0	0	0	0	0	1	0	0	0	0	0	0	8.33
Ardea alba Linnaeus, 1758	PP	0	0	0	1	1	1	0	0	0	0	2	0	33.33
Ardea cocoi Linnaeus, 1776	PP	0	0	0	1	1	0	0	0	0	0	1	0	25.00
Egretta thula (Molina, 1782)	PP	0	0	0	0	0	1	0	0	0	0	0	0	8.33
CHARADRIIDAE Leach, 1820														
Vanellus chilensis (Molina, 1782)	IM	2	1	2	0	2	1	4	2	0	4	0	0	66.67
RECURVIROSTRIDAE Bonaparte, 1831														
Himantopus melanurus Vieillot, 1817	IM	0	2	0	0	0	0	0	0	0	0	0	0	8.33
SCOLOPACIDAE Rafinesque, 1815														
Actitis macularius (Linnaeus, 1766)	IM	0	0	0	0	0	0	0	0	3	1	3	0	25.00
JACANIDAE Chenu & Des Murs, 1854														
Jacana jacana (Linnaeus, 1766)	IM	0	1	0	0	0	0	0	0	0	0	0	0	8.33
ALCEDINIDAE Rafinesque, 1815														
Megaceryle torquata (Linnaeus, 1766)	PS	0	0	0	0	0	1	0	0	0	0	0	0	8.33
Total de espécies		2	6	3	3	6	6	1	1	2	2	5	2	
Total de indivíduos		6	28	5	4	10	7	4	2	7	5	18	7	

lago. Não houve correlação significativa entre o número de espécies e indivíduos totais em relação à precipitação, temperatura e o comprimento do dia.

Em relação às estratégias de forrageamento, somente piscívoros subaquáticos apresentaram correlação negativa significativa com a temperatura (r = - 0,591; P = 0,043). Piscívoros pernaltas pertencentes à família Ardeidae (cinco espécies) ocorreram com no máximo três indivíduos tanto durante a estação seca quanto na estação chuvosa, porém de forma descontínua (Figura 2a). Piscívoros subaquáticos de duas espécies pertencentes a duas famílias ocorreram somente durante a estação seca, com no máximo três indivíduos no mês de agosto (Figura 2b). Onívoros flutuantes da família Anatidae (quatro espécies) foram os mais abundantes durante o período chuvoso, sendo que o máximo de indivíduos ocorreu durante o mês abril, com 24 indivíduos (Figura 2c). Insetívoros das margens (quatro espécies pertencentes a quatro famílias) ocorreram praticamente durante todo o ano, sendo ausentes somente durante os meses de junho e fevereiro (Figura 2d).

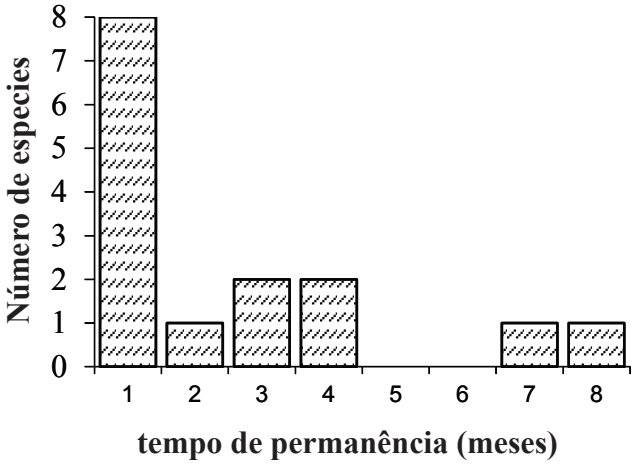

FIGURA 1. Distribuição das espécies segundo o tempo de permanência (em meses) para a assembléia de aves aquáticas observadas na lagoa marginal da RPPN São Marcelo, Mogi Guaçu, São Paulo, Brasil.

FIGURE 1. Species distributions according to occurrence at the study site (in number of months) for waterbird species in a marginal lake of the Mogi Guaçu River, São Paulo state, Brazil

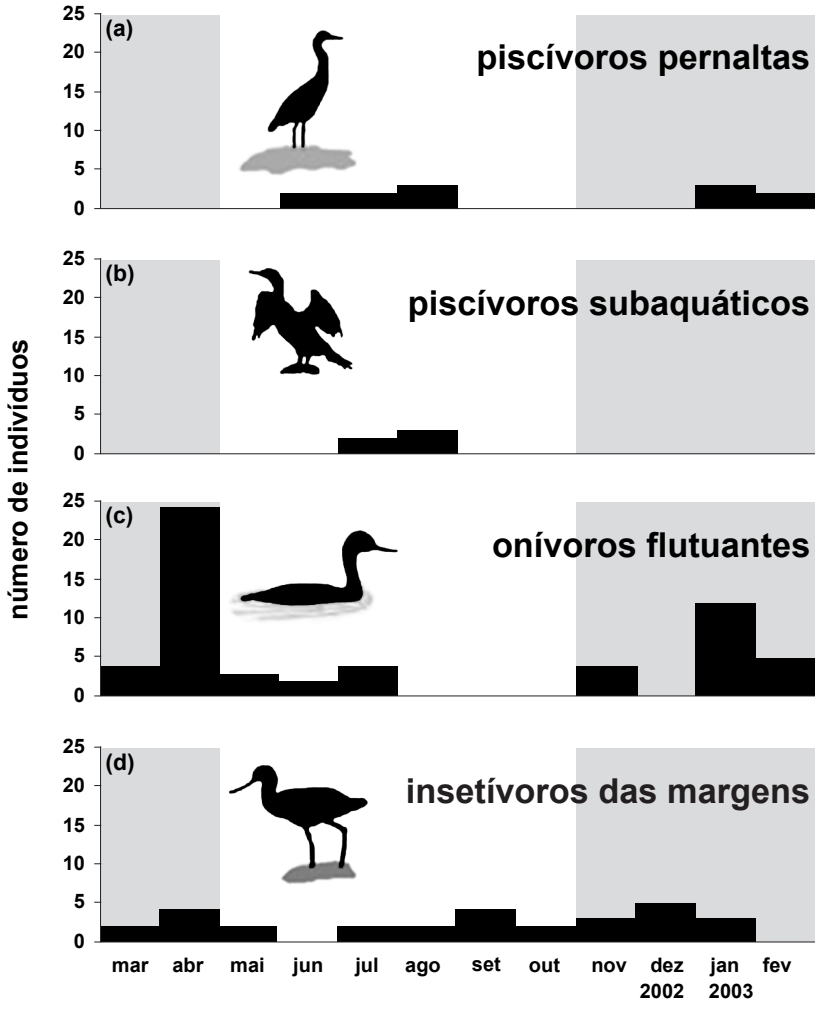

FIGURA 2. Distribuição anual de indivíduos de aves aquáticas agrupadas segundo sua estratégia e guilda de alimentação na lagoa marginal do Rio Mogi Guaçu, RPPN São Marcelo, São Paulo, Brasil. Área em cinza = precipitação média superior a 100 mm.

FIGURE 2. Annual distribution of waterbirds following according to feeding guild in a marginal lake of the Mogi Guaçu River, São Paulo state, Brazil. Gray area= average rainfall exceeding 100 mm.

DISCUSSÃO

Pequenas variações na riqueza de espécies durante o ano também foram encontradas em outros dois estudos em ambiente lóticos no estado de São Paulo (Ishikawa-Ferreira *et al*. 1999) e Rio de Janeiro (Alves & Pereira 1998), Minas Gerais (Rodrigues & Michelin 2005) e estuarino de Santa Catarina (Branco 2007). Porém esses mesmos estudos evidenciaram maior número de indivíduos durante a estação seca, discordando com meus dados e prognóstico inicial. Bandos de Anatídeos, principalmente *Amazonetta brasiliensis* ocorreram durante abril de 2003 e janeiro de 2004 foram responsáveis pelo aumento significativo no número de indivíduos na estação chuvosa. Essa espécie é uma das mais abundantes na Estação Ecológica Mogi Guaçu (Willis & Oniki 1981), que dista cerca de 20 km da lagoa do presente estudo e responsável pelo padrão encontrado.

A diversidade e sazonalidade de aves aquáticas podem ser fortemente influenciadas de maneira geral pela heterogeneidade temporal de hábitat (Hayes & Fox 1991), configuração da paisagem (Guadagnin *et al.* 2009) e mais especificamente por diferentes tipos de vegetação (Anderson *et al*. 1983). A lagoa estudada não possui vegetação aquática, troncos, rochas e macrófitas, propiciando um ambiente com pouca diversidade estrutural em suas margens e conseqüentemente não oferecem local para esconderijo ou nidificação. Portanto, o número de espécies encontradas pode ser reflexo da homogeneidade de ambientes na lagoa estudada. Por exemplo, os martins-pescadores preferencialmente empoleiram num galho a margem do corpo d'água antes mergulhar a perseguição da presa (Skutch 1957). A pequena taxa de encontro com os martins-pescadores provavelmente foi influenciada pela escassez de poleiros de pouso ou também devido à escassez de alimento.

Actitis macularius foi a única espécie migratória encontrada durante o verão do período de estudo. No interior do estado de São Paulo, essa espécie é encontrada esporadicamente, sendo que a principal rota de migração no estado ocorre no litoral durante verão (Willis & Oniki 2003). *Actitis macularius* e *Himantopus melanurus* Vieillot, 1817 não foram encontrados em nenhum dos dois estudos realizados em reservatórios no estado de São Paulo (Ishikawa-Ferreira *et al.* 1999) e Rio de Janeiro (Alves & Pereira 1998), indicando que essas espécies não necessariamente utilizam grandes corpos d'água como área de alimentação e rotas de migrações e deslocamentos. Porém, Rodrigues & Michelin (2005) classificaram *Himantopus melanurus* como provável residente em lago em Minas Gerais.

Apesar da baixa abundância de aves aquáticas encontrada, houve um significativo número de espécies utilizando a lagoa em pequenos períodos sucessionais, provavelmente para intervalos de descansos durante rotas maiores de deslocamentos reprodutivos e de alimentação das aves aquáticas da região. Piscívoros pernaltas e subaquáticos utilizaram a lagoa preferencialmente durante a estação seca, resultado similar ao encontrado por Alves & Pereira (1998), e concordando com meu prognóstico inicial. Esse resultado provavelmente é devido à menor quantidade de água na lagoa, facilitando a captura de presas. A procriação das garças geralmente ocorre no início ou fim da estação seca, quando o alimento para estas aves aquáticas é normalmente mais abundante (Sick 2001). Não foi observado nenhum ninhal de ardeídeo nos arredores ao lago, e parece que sua presença nesse período se deveu à diminuição do volume de água durante a estação seca.

Onívoros flutuantes ocorreram em maior número de indivíduos durante a estação chuvosa, concordando com meu prognóstico inicial. A maioria das espécies de aves se reproduz durante a estação chuvosa (Sick 2001), e a maioria dos bandos encontrados de anatídeos durante o verão possuía filhotes e jovens, o que influenciou na abundância desse grupo durante esse período. Insetívoros das margens foram observados durante quase todo o ano devido à permanência de *Vanellus chilensis* por oito meses não consecutivos. *Jacana jacana* e *Himantopus melanurus* ocorreram apenas um mês ao final da estação chuvosa, provavelmente em movimentação à procura de sítio de alimentação. *Actitis macularius* ocorreu provavelmente devido a seu período de migração. Houve pouca coexistência temporal entre as espécies dessa categoria, provavelmente devido a diferentes períodos de migração e também possivelmente para diminuir a competição, já que a lagoa possui pequena área de forrageio para muitos indivíduos em suas margens. Riveros *et al*. (1981) encontraram diferentes áreas de forrageio entre espécies simpátricas em lago no Chile. Provavelmente essas espécies insetívoras possuem territórios diferentes para forrageio enquanto utilizam a lagoa no mesmo período.

Estudos populacionais podem detalhar melhor os padrões de sazonalidade inter e intra-anual de um grupo específico, como o exemplo de *Phalacrocorax brasilianus* em ambiente estuarino (Branco 2002), que ficam obscuros em estudos em nível de comunidade. Os resultados indicam que aparentemente há alternância temporal no período de permanência das aves aquáticas segundo as suas respectivas estratégias de forrageamento e guildas tróficas, por esse motivo, sugiro existir períodos com maior probabilidade de encontro com determinada espécie focal.

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ARTICLE

One hundred and thirty-five years of avifaunal surveys around Santarém, central Brazilian Amazon

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ABSTRACT: We present an updated annotated avifaunal checklist for the Santarém region of central Pará state, Brazil, an area that has one of the oldest histories of ornithological exploration in South America. We combine data from a five-month quantitative survey of the birds of the municipalities of Santarém and Belterra (east of the Tapajós River) between 2010 and 2011 with an exhaustive search of material in museum collections worldwide and digital vouchers deposited online. Our own survey sampled habitats across a gradient of disturbance ranging from 'undisturbed' primary forest, through logged and burnt forest, patches of secondary forest, cattle pastures and intensive mechanized agriculture. Given the potential for species misidentifications in avian inventories, we paid special attention to obtaining voucher documentation. Here we present a collection of publicly accessible digital vouchers for all of the new species, in addition to providing museum catalogue numbers for all old records. We added 24 species to the regional list, principally species associated with anthropogenic land-uses, but also including seven species restricted to primary forest habitats which were missed from both recent published inventories and over the course of two centuries of intensive collecting efforts. The regional list now stands at 583 species for which voucher documentation is available, with an additional 26 undocumented species. Many of the species reported here are poorly known or represent notable range extensions, and we present new data on their status and distribution.

KEY-WORDS: bird survey, Amazonia, conservation, range extension, digital voucher.

INTRODUCTION

The compilation of accurate biodiversity inventories represents a critical first step for understanding natural patterns of environmental heterogeneity and species-specific responses to human-induced environmental change. Even for birds, perhaps the best studied of the Neotropical biota, such inventories remain a labor intensive and error prone task, particularly in extremely diverse tropical forest regions such as the Amazon basin (Remsen 1994, Cohn-Haft *et al.* 1997).

The Santarém region of central Pará (PA) state, south of the Amazon and east of the Tapajós Rivers, is one of the ornithologically best-studied landscapes in Amazonian Brazil, with a history of specimen collection starting from at least 1834 (Pelzeln 1871) and avian inventories spanning over 135 years (*e.g.* Allen 1876, Sclater & Salvin 1878, Riker 1891, Griscom & Greenway 1941, Henriques *et al.* 2003). Intensive sampling effort in the 19th and early 20th centuries saw many thousands of specimens collected in the region, but this data has never been synthesized in one place. The fruits of this labour during this period included the discovery of several new birds to science including Klage's Antwren *Myrmotherula klagesi*, Bare-eyed Antbird *Rhegmatorhina gymnops* and Point-tailed Palmcreeper *Berlepschia rikeri.*

The most exhaustive contemporary inventory undertaken in the region - Henriques *et al.* (2003) -

focused on the *terra firme* forest avifauna in the Floresta Nacional do Tapajós (Tapajós National Forest, hereafter FLONA), a 560,000-ha protected area managed by the Instituto Chico Mendes de Conservação da Biodiversidade - ICMBio. Subsequent studies in the FLONA have investigated avian response to forest gaps (Wunderle *et al.* 2005) and reduced impact logging (Wunderle *et al.* 2006, Henriques *et al.* 2008). Elsewhere, the savannah enclave of Alter do Chão has been the subject of several quantitative avian studies (see *e.g.* Sanaiotti & Cintra 2001 and Cintra & Sanaiotti 2005). However, beyond the FLONA and Alter do Chão, the region has been relatively poorly inventoried, especially in non-forest landscapes.

We carried out a five month survey of the birds of the municipalities of Santarém and Belterra under the auspices of the 'Rede Amazônia Sustentável' (RAS: www.redeamazoniasustentavel.org), a collaborative research initiative focused on the study of land-use sustainability in eastern Amazonia, involving more than 30 institutional partners from Brazil, the UK, Australia and US. Coordinating institutions are the Goeldi Museum and Embrapa Amazônia Oriental (Belém), and the Universities of Cambridge and Lancaster in the United Kingdom. The overall aim of RAS is to contribute towards an improved understanding of the long-term environmental and socio-economic consequences of current land-use and land-use change processes in the eastern Brazilian Amazon (Gardner *et al. in press*). In this paper we present an updated and annotated species list derived from the avian component of RAS study region in the municipalities of Santarém/Belterra, our incidental observations from surrounding non-study landscapes *e.g.* Alter do Chão, and a critical review of old records, including a search of global museum holdings from the region.

METHODS

Study Landscape: climate and biophysical conditions

Santarém has a mean annual temperature of 25°C and a mean relative humidity of 86%, with annual rainfall averaging 1920 mm and a short dry season of 2–3 months, usually between August and October with severe droughts in El Niño years (Parrotta *et al.* 1995, Nepstad *et al.* 2002). Canopy heights of undisturbed *terra firme* forests are typically in the range of 30 to 40 m, with occasional emergent species up to 50 m tall. Most of the survey landscape is situated on a flat terrace of Tertiary sediments capped by the Belterra Clay Formation (Clapperton 1993), at least 90 m above the water level of the adjacent Tapajós and Amazon rivers. Regional soils are predominantly oxisols dominated by kaolinite clay minerals and free of hardpan or iron oxide concretions in the upper 12 m (Nepstad *et al.* 2002). Originally the survey region was entirely covered by lowland tropical forest. By 2008 approximately one third had been deforested with much of the forest outside the FLONA having been degraded from the impacts of logging and fire (RAS *unpubl. data*).

At the extreme north-western point of the region (Figure 1), there is an enclave of about 10,000 ha of savannah habitat on a peninsula beyond the town of Alter do Chão. The vegetation here is dominated by an herbaceous stratum composed principally of tuft-forming grasses (*e.g. Paspalum carinatum* and *Trachypogon plumosus*) and sedges (*e.g. Rhyncospora hirsute*) interspersed with patches of trees and shrubs (principally the families *Myrtaceae* and *Rubiaceae*) (Miranda 1993, Magnusson *et al.* 1999, Magnusson *et al.* 2008) and some larger forest fragments. The trees are short in stature, often with tortuous trunks, a thick cortex and leathery leaves, and do not form a continuous canopy. Regular semi-annual burning can significantly reduce the area covered by the common shrub species, which then become dominated by the grass *P. carinatum* (Sanaiotti & Magnusson 1995). Such savannah formations were formerly more widespread; Griscom & Greenway (1941) states of the environs of the city: '*the built-up part is surrounded by savannahs for a distance of about two kilometres, beyond which the dense vegetation, high and savage, begins*.'

The northern border of the region is delimited by the *várzea* forests and associated series of sedimentary islands and channels resulting from constant fluvial action. Behind these, on clay soils, lie savannahs and open lakes, both of which flood seasonally. The lakes swell and retract according to the flood cycle, sometimes covering tens of square kilometers. Large grasses found on the flooded savannah include *Echinochloa polystachya*, *E. spectabilis*, *Hymenachne amplexicaulis* and *Leersia hexandra*, in addition to sedges such as *Scirpus cubensis*, *Cyperus luzulae* and *Scleria geniculata*. At the ecotone between the savannah and forest habitats dominant shrubs and small vines include *Artemisia artemisiifolia*, *Ipomoea fistulosa*, *Polygonum punctatusm*, *Mimosa pigra*, *Montrichardia linifolia*, *Rhabdadenia macrostoma* and *Clitonia triquetum* (Pires & Prance 1985, Daly & Mitchell 2000).

2010-2011 survey experimental design

To develop our sampling approach the municipalities of Santarém-Belterra in the region between the Tapajós and Curuá-Una rivers, bordered to the north by the Amazon river and extending approximately 140 km south along the BR-163 highway (Figure 1), were divided up into catchments of 5,000 – 6,000 ha, which were delineated using a digital elevation model and SWAT (Soil and Water Assessment Tool) for ARCGIS 9.3

(ESRI 2008). We then selected a subset of 18 catchments (Table 1, Figure 1) to represent a gradient of accumulated forest loss from 78% (28% remaining forest cover) to 0% (100% remaining forest cover) (Figure 1). Total deforestation extent is correlated with many other factors including age of occupation, types of historical land-use change, road access as well as biophysical variables (such as topography). Once a set of candidate catchments was identified to capture the full deforestation gradient, a final selection of 18 catchments was made to ensure satisfactory representation of current land-use practices, the spatial distribution of the rural population, and major soil types. All landowners in each catchment were visited prior to any fieldwork to introduce the RAS project and secure permissions for surveys in private properties (Gardner *et al in press*).

Within each catchment, we used a stratified-random sampling design that helped ensure that sample data provide a representative assessment of the overall environmental condition. In each catchment a standard density (1 per 400 ha) of 300 m study transects was distributed across the landscape in proportion to the percent cover of forest (including primary and secondary forests) and production areas (including agriculture,

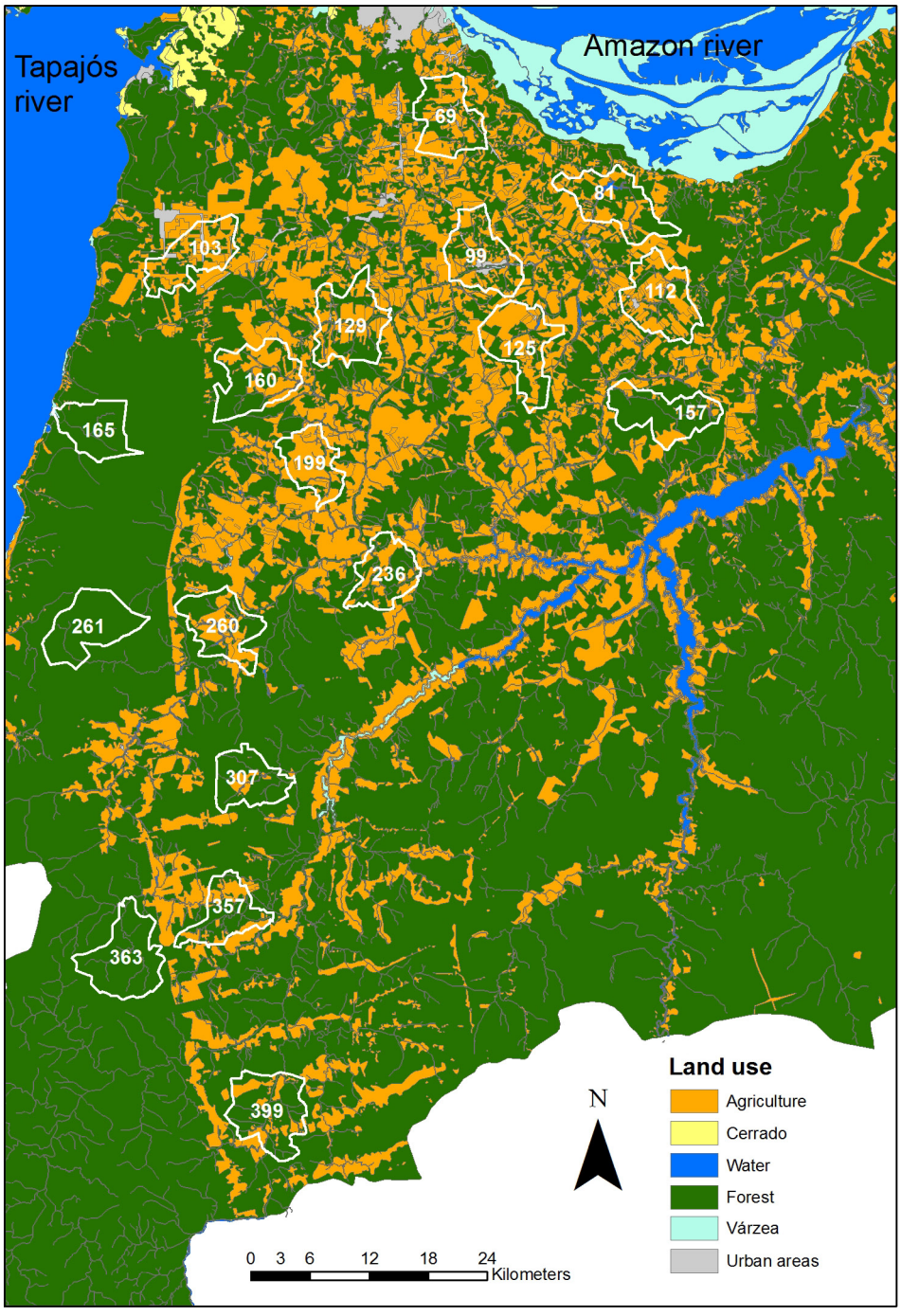

FIGURE 1. A map of the municipality of Santarém illustrating major land-use types and the locations (and numbers) of the 18 study catchments.

pasture, fruticulture and silviculture) – such that if half of the catchment is covered by forest then it receives only half of the study transects. Within each of these major land-use categories sample transects were distributed randomly to increase the likelihood that we captured important internal heterogeneities in forest and/or production systems. A minimum separation distance rule of 1,500 m between transects was employed to minimize dependence between points. Where forest cover fell below 1,200 ha, we maintained a minimum of three sample transects in forest (ensuring we captured a reasonable sample of the state of the forest in that catchment).

TABLE 1. Co-ordinates, total area and percentage forest cover (using using a 2008 Landsat-Palsar classified image courtesy of The Nature Conservancy) of the 18 catchments sampled during the study.

Catchment code	Latitude and Longitude of catchment centroid	Catchment size (ha)	% forest cover
69	2°32'53"S; 54°40'35"W	4299	46
81	2°37'45"S; 54°31'23"W	4659	57
99	2°40'28"S; 54°38'44"W	4546	47
103	2°40'30"S; 54°54'33"W	4105	39
112	2°42'37"S; 54°28'55"W	4795	38
125	2°45'21"S; 54°36'32"W	4852	39
129	2°44'17"S; 54°45'57"W	4963	52
157	2°49'8"S; 54°28'48"W	4321	81
160	2°47'0"S; 54°51'5"W	4841	60
165	2°49'44"S; 54°59'51"W	3447	99
199	2°51'52"S; 54°47'58"W	3228	28
236	2°57'50"S; 54°44'1"W	3681	63
260	3°1'7"S; 54°52'55"W	4219	59
261	3°1'7"S; 55°0'12"W	4654	100
307	3°9'14"S; 54°51'27"W	3451	87
357	3°16'50"S; 54°52'41"W	3518	67
363	3°19'1"S; 54°58'12"W	5166	100
399	3°27'40"S; 54°50'17"W	5215	77

Avian Sampling

Fieldwork by A. C. L., N. G. M., C. B. A., B. J. W. D. and E. V. L. was conducted from 16 October 2010 to 8 February 2011. We conducted two repetitions of three fixed width (75 m) 15-minute point counts per transect situated at 150 m intervals along a 300 m transect. All point counts (PCs) were conducted by principal observers A. C. L., N. G. M., C. B. A. and B. J. W. D. with the exception of two transects carried out independently by E. V. L. in Catchment 236 (see Figure 1 for numbering of study catchments). Surveys were not carried out on days with persistent rain and/or strong winds. Any systematic effect of seasonality (presence/absence of austral/boreal migrants and peaks and troughs in vocalization activity) was minimized by systematically rotating surveys between catchments of varying total forest cover and between habitat types.

Digital Vouchers

We have archived digital vouchers (photo and sound-recording e-vouchers) on the internet to provide documentary evidence for all species recorded (Appendix 1). Such vouchers are not intended to supplant traditional specimen vouchers (*cf.* Monk & Baker 2001), although even these can be wrongly identified, but instead are aimed at providing the opportunity for general peer-review, which is not possible if documentary vouchers such as archived museum skins, photographs or sound recordings are not also made electronically available. Minimum criteria for inclusion on the list include multiple sight records by multiple observers, of species easy to identify and considered to be biogeographically likely in the region (i.e. there are documented records at other sites close to the study region). Our images have been archived on the Brazilian avian photo archive Wikiaves (www.

wikiaves.com.br) and our sound-recordings are archived on the global avian sound library Xeno-canto (www.xeno-canto.org). Recordings on both sites are searchable by the catalogue number provided in Appendix 1, in addition we also provide catalogue numbers for 'background species' on Xeno-canto recordings. Where we are unable to provide a voucher (4% of species) we moved the species to Appendix II and also provide observer(s) names and date and details of the sighting.

Historical Analysis

We provide accession numbers for voucher specimens of species previously collected in the region in Appendix 1. We compiled a list of specimens collected by previous fieldworkers from the Museu Paraense Emílio Goeldi, Belém, Brazil (MPEG) and were provided with digital data for the holdings of the Carnegie Museum of Natural History, Pittsburgh, USA (CM) and partial data (only non-passerines available) for the Museu de Zoologia Universidade de São Paulo, São Paulo, Brazil (MZUSP). We used the digital database *Ornis* http://www.ornisnet.org/ to search for historically-collected specimens and retrieved records from the American Museum of Natural History, New York, NY, USA (AMNH), the Academy of Natural Sciences, Philadelphia, PA, USA (ANSP), the Field Museum of Natural History, Chicago, IL, USA (FMNH), the Los Angeles County Museum of Natural History, Los Angeles, CA, USA (LACM), the Louisiana State University, Baton Rouge, LA, USA (LSU), the University of Michigan, Museum of Zoology, Ann Arbor, MI, USA (UMMZ) and the United States National Museum, Washington, D.C., USA (USNM). Collecting localities were located using Paynter & Traylor (1991).

We critically reviewed specimens and solicited photographic documentation of any specimens deemed by us and independent collaborators (Curtis Marantz & Bret Whitney) to be biogeographically unlikely. This search of museum holdings was accompanied by a review of previous published ornithological inventories from the region and we also include digital vouchers of images and sound-recordings archived on Wikiaves and Xeno-Canto by non-authors separately, coupled with voucher numbers for sound-recordings archived at the Macaulay Library http://macaulaylibrary.org/ (principally by Curtis Marantz) of species listed in Henriques *et al.* (2003).

Our taxonomy follows the checklist of Brazilian birds compiled by the Comitê Brasileiro de Registros Ornitológicos (CBRO 2011).

RESULTS

During our 100 days of fieldwork we recorded 427 species in 70 families (Appendix I), of these we provide our own digital vouchers for 375 species (88%, 250 species represented by images and 266 by sound-recordings). Historical collecting effort in Santarém was intense; we located records of over 10,000 specimens of 531 species in 10 collections. This in addition to a significant number of early skins deposited at the British Museum, Tring, UK which are as yet undigitalised. By totaling these historical records (and other contemporary records supported by digital vouchers) we can add a further 156 species to the total giving a total of 583 species in 70 families. Species recorded by us and missed by all previous inventories included the expected transient or scarce resident waterbirds (*e.g.* Snowy Egret *Egretta thula*), potentially colonizing non-forest species (*e.g.* Plain-breasted Ground-dove *Columbina minuta*), the poorly sampled nocturnal avifauna (*e.g.* Long-tailed Potoo *Nyctibius aethereus* but also that would be considered core members of the *terra firme* forest community such as Brown-banded Puffbird *Notharcus ordii* and Grey Elaenia *Myiopagis caniceps*. These latter species represent surprising omissions, but their canopy lifestyles probably put them 'beyond the shotgun reach' of many earlier collectors and may have been missed in contemporary surveys by a combination of local rarity and their unobtrusive habits. We retained one unvouchered species: Para Gnatcatcher *Polioptila paraensis* on the main list given multiple detections by our and past inventories; the presence of this species in the region is also supported by documented records from adjacent municipalities.

A number of species from recent inventories or unpublished observations (including our own) did not meet our minimum criteria for inclusion in the main list and these records (of 26 species) are summarized in Appendix II. In most cases we simply consider these records to be unproven and are not inferring necessarily that an identification is certainly in error. However, in the case of the report of Green-barred Woodpeckers *Colaptes melanochloros* from Alter do Chão listed in Sanaiotti & Cintra (2001) we consider it highly likely that these were misidentified Spot-breasted Woodpeckers *Colaptes punctigula* which are a common resident in that region and absent from the list of Sanaiotti & Cintra (2001). Likewise, the records of Rufous-capped Motmots *Baryphthengus ruficapillus* listed in Henriques *et al.* (2008) appeared in error and referred to Rufous Motmots *B. martii*.

We follow Silveira *et al.* (2005) in considering the presence of Sulphur-breasted Parakeet *Aratinga maculata* in the region as unproven. There are two specimen records from Santarém - one collected by E. Garbe in 1920 (MZUSP 10644) and the other by A. M. Olalla in 1935 (MZUSP 18451). The former is suspected as having come from Monte Alegre and the latter was apparently of captive origin (Silveira *et al.* 2005). In addition to these two specimen records, Silva & Willis (1986) reported a series of sight records of this species from Santarém – groups of

3, 5 and 6 in *várzea* forest at Maicá on 16 January 1984, 2 feeding on small melastomataceous fruits in seasonally flooded forest at Rodagém, Santarém on 18 October 1984 and groups of 3 and 5 in secondary forest at Urumari, in February 1985, all considered unproven by Silveira *et al.* (2005). Given that this species' distribution has recently been found to be far more extensive than previously thought, extending east to Amapá (da Costa *et al.* 2011) and north into Suriname (Mittermeier *et al.* 2010), then a confirmed record from the south bank of the Amazon river seems less far-fetched than was previously considered.

We paid particular attention to trying to validate historical records that were not supported by recent field observations and those which appeared to be biogeographically unlikely. At the top of this list was a record of Brown Tanager *Orchesticus abeillei* (UMMZ 22269) collected by Joseph Steere. We were unable to obtain images of the specimen but this record of an Atlantic Forest endemic is entirely unlikely and presumably either refers to a misidentified or mislabeled specimen. A number of skins collected by A. M. Olalla from the region were adjudged to be likely misidentified and this proved to be the case on examining images of the original skins. These included a specimen of Semipalmated Sandpiper *Calidris pusilla* which we re-identified as Least Sandpiper *Calidris minutilla* (MCZ 173283 see separate species account below); a specimen of Black-bellied Antwren *Formicivora melanogaster* (MCZ 174889) which we reidentified as a female Rusty-backed Antwren *F. rufa*; and a specimen of Black-necked Red-cotinga *Phoenicircus nigricollis* (MCZ 171158) which we reidentified as Guianan Red-cotinga *P. carnifex.* In addition we consider the identification of a female Thick-billed Euphonia *Euphonia laniirostris* (MCZ 176604) to be improbable by range and more likely to relate to a Violaceous Euphonia *E. violacea*, separation of females of these two replacement species is very difficult. Riker & Chapman (1891) list a record of an unidentified *Attila* sp. that they considered '*may be the as yet undescribed female of A. citriniventris*' [Citron-bellied Attila]. The specimen is deposited in the collection of the National Museum of Natural History (USNM 121134) and until recently was labeled as *A. citriniventris*. However, this would be biogeographically unlikely considering that this species is restricted in Brazil to the western Guianas. T. Chesser (*in litt.*) examined the specimen on our behalf and found the plumage to be in poor condition, stained by some unknown chemical, but noted that plumage coloration (to the extent that it can be discerned) and bill morphology and coloration match those of Dull-capped Attila *A. bolivianus*. Moreover, "yellow iris" is noted on the back of the original collector's label; a yellowish-white iris is found among species of *Attila* only in *bolivianus*. An old specimen record of Peruvian Recurvebill *Simoxenops ucayalae* (MPEG 32018), purportedly from Santarém has proven rather controversial. Novaes (1978) considered the specimen likely mislabeled, as at the time there were no records from the eastern Amazon, but the species has subsequently been found at various disjunct locations in eastern Amazonia, including as close as Altamira (230 km south-east), so although there have been no subsequent records from the region this species may occur in (or close to) the region (Aleixo *et al.* 2000). These exceptions aside we are confident that specimens labeled as 'Santarém' were taken from our study region south of the Amazon River and east of the Tapajós given the absence of specimens of common replacement *terra firme* forest species from adjacent areas of endemism (such as the west bank of the Tapajós, or north of the Amazon). However, an element of doubt remains over records of the following generalist and edge species which are typically widespread in anthropogenic habitat elsewhere in Amazonia: Rusty-fronted Tody-Flcatcher *Poecilotriccus latirostris*, Euler's Flycatcher *Lathrotriccus euleri* and Chalk-browed Mockingbird *Mimus saturninus* but which are only represented by historic specimens (and no contemporary observations). There remains the possibility that these species might have been collected from river-islands closer to the north than the south bank of the river Amazon or have simply failed to colonize *terra firme* habitats in the region.

Our own fieldwork produced several unconfirmed records (Appendix II). The most notable of these were the multiple detections of Spix's Guan *Penelope jacquacu*, which most contemporary distribution maps indicating that this species does not occur north of the Serra do Cachimbo (a significant faunal and floral barrier 600 km south of the region) in the Tapajós-Xingu interfluvium. However, this species was reported north of the Serra do Cachimbo, in Novo Progresso by Pacheco & Olmos (2005), has been collected 200 km SW of our region at Fazenda Jamanxim, Altamira, PA on 24 November 2005 by A. A., E. Portes and M. Silva (MPEG 59303) where the species was also recently recorded by C. B. A. and A. Whittaker, suggesting that our records may not be in error, despite the lack of previous reports of this large and generally conspicuous species.

Although not listed in Appendix II, a possible aural contact of Black-chested Tyrant *Taeniotriccus andrei* from secondary forest in catchment 112 is worthy of mention here given the lack of previous reports from the western half of the Tapajós-Xingu interfluvium. The distant and poorly heard single note contact call was only detected on revision of the point count recording, and therefore cannot be confirmed. Although Zimmer & Whittaker (2004) list a specimen (MPEG 49278) from 'Novo Fazenda, Jaburu, Santarém, PA' this actually refers to a bird collected at Fazenda Jaburu, Novo Santarém; confusion owing to a slightly ambiguous specimen label. Novo Santarém lies east of Belém, a region where *T. andrei* is reasonably common (*cf.* Lees & Moura 2011).

Selected species accounts for taxa of significant biogeographic or conservation interest recorded during RAS fieldwork

Brown Tinamou *Crypturellus obsoletus*

N. G. M. sound recorded several vocalising individuals in river-edge forest in catchment 165 on 14 December 2010 (Moura 2010a). This species was unrecorded by Henriques *et al.* (2003), but has previously been collected from the region by S. M. Klages who obtained three individuals at 'Colônia do Mojuy' (=Mojuí dos Campos) in November 1919 (Blake 1961). These birds pertain to the subspecies *griseiventris* which is significantly vocally and morphologically distinct from other Amazonian and Atlantic Forest populations and might be better considered a separate species.

Crested Eagle *Morphnus guianensis*

Although recorded from the first inventory, we include an account for this species given the collection of data on the species' breeding biology. João Batista Ferreira, a local landowner on whose property we had a transect (catchment 103), took us to see a nest of an 'eagle', which transpired to be the active nest of a pair of *Morphnus guianensis* with a dependent (circa 7 month old) juvenile (Andretti 2010a). The nest (Figure 2, Lees 2010a) was located within a patch of old secondary forest on the edge of the town of Belterra. The structure was quite small, 120 cm x 105 cm and 62 cm deep, positioned 30 m up in a 'morototó' tree, family Araliaceae (Programa de Conservação do Gavião-real *in litt.* 2011). This is the first report of a suburban pair of *Morphnus* from anywhere in the world and only the 7th nest of this species recorded from Brazil. This discovery parallels that of a suburban pair of Harpy Eagles *Harpia harpyja* in Alta Floresta, Mato Grosso (MT), which bred successfully for at least three consecutive years in a 270 ha forest fragment (Lees 2006). These two examples illustrate how large forest eagles may not be prey-limited in small forest fragments, but are probably extremely susceptible to being hunted should they become accustomed to prey upon small livestock (Trinca *et al.* 2008).

Aplomado Falcon *Falco femoralis*

We first recorded this falcon in catchment 260 where A. C. L. observed a single adult hunting over soy bean fields on 6 December 2010 (Lees 2010b). We subsequently recorded this species on a further five occasions including an additional two catchments (99 and 125), all hunting over open farmland. In addition, E. V. L. photographed a juvenile (Lopes 2011a) at Alter do Chão on 6 March 2011; a location where this species has previously been reported by Sanaiotti & Cintra (2001), who suspected on the basis of a single July record that this species may be a migrant in the region. Considering our records in the austral summer, we assume this species to be a rare resident in the region. There is one historical record from the region: one (MCZ 173143) collected by A. M. Olalla from 'Santarém, Tapajós river'. These records are apparently the only ones from central Amazonia, with the closest records coming from the southern savannahs of Guyana and Roraima (RO), 650 km NW (Robbins *et al.* 2004, Santos & Silva 2007), Vila Nova, AP, 520 km NE (Schunk *et al.* 2011), and Alta Floresta, MT, 815 km south (Mahood *et al.* 2012, Lees *et al.* 2013).

Plain-breasted Ground-dove *Columbina minuta*

We recorded this species on two occasions: single individuals photographed (Moura 2011a), and sound-recorded (Moura 2011b) by N. G. M. from cattle pasture in catchment 69 on 8 January 2011, and from a smallholder's fruit farm in catchment 112 on 31 January 2011. We are only aware of two previous reports from central Amazonia – an individual collected from the savannahs of Monte Alegre, PA (Vasconcelos *et al.* 2011) and sight records from the Juruti region, PA (Santos *et al.* 2011) but this species has been reported from several peri-Amazonian sites (*e.g.* Schunk *et al.* 2011, Somenzari *et al.* 2011). Our records probably relate to individuals colonizing anthropogenic habitats from these savannah enclaves rather than individuals spreading in from peri-Amazonian areas. We predict that this species will prove to be considerably more widespread in Amazonia than these scant records indicate.

Hyacinth Macaw *Anodorhynchus hyacinthinus*

We encountered this threatened macaw on two occasions from two different catchments; C. B. A. observed a single individual flying overhead on 17 October 2010 in catchment 261, and B. J. W. D. and A. C. L. independently heard and sound-recorded a single passing over the canopy in catchment 363 on 23 January 2011 (Davis 2011a). We assume that these pertain to wandering individuals from populations further south along the BR-163 (*e.g.* Pacheco & Olmos 2005) and highlight the current local rarity of the species. The species was formerly more widespread in the Santarém region; Riker (1891) obtained three specimens '*twenty-five miles back from Santarém*' on 10 June 1887.

Long-tailed Potoo *Nyctibius aethereus*

We recorded this enigmatic potoo on two occasions, the first records from the Santarém region. C. B. A. sound-recorded one singing distantly (Andretti 2010b)

from catchment 261 on 20 October 2010 and B. J. W. D. sound-recorded one in catchment 363 on 24 January 2011. Despite regular night-time searches (and fairly regular aural contacts with White-winged Potoos *Nyctibius leucopterus*) we were unable to find Rufous Potoo *N. bracteatus* in the region. The closest records of this latter species are one sound-recorded 200 km south of the region from Trairão on 7 June 2008 by C. B. A. and on the west bank of the lower Tapajós at Juruti (Santos *et al.* 2011) and the Reserva Extrativista Tapajós-Arapiuns (MPEG 72300 and 72301).

Great Horned Owl *Bubo virginianus*

E. V. L. photographed a single individual day-roosting on the campus of the Universidade Federal do Oeste do Pará on 13 October 2011 (Lopes 2011b). There are few records of this species from the central Amazon, although this species is present on savannahs in Roraima (Naka *et al.* 2006) and Suriname (Mittermeier *et al.* 2010).

Streak-throated Hermit *Phaethornis rupurumii*

We recorded the *amazonicus* subspecies of this hermit on eight occasions from three different (although geographically adjacent) catchments (99, 125 and 129); most of these were secondary forest sites although we also encountered this species in logged and burnt primary forest. A. C. L. located two different leks – one each in 125 and 129 where the birds were photographed (Figure 3, Lees 2011a) and sound recorded (Lees 2011b). This taxon is typically considered to be restricted to the *várzeas* of the river Amazon and its major tributaries. However our observations, of leks in secondary forest over 25 km from a major river, mirror those of Schunck *et al.* (2011) from Vila Nova, Amapá, who found this species '*in woodlots and narrow riverine forest within the mosaic of savannistic formations of Vila Nova, distant from the widest rivers*'. This confirms that this species has a broader tolerance of forest habitats than previously suspected but we cannot rule out that this expansion into non-riparian habitats may be a recent phenomenon following land-use change. We may have overlooked this species if present at a low density elsewhere in the region owing to the sympatric presence of as many as six species of *Phaethornis* hermits (and *Glaucis hirsutus*), which made identification of fly-through individuals at times difficult or impossible.

Tapajós Hermit *Phaethornis aethopyga*

This species, recently re-elevated to species status (Piacentini *et al.* 2009) is endemic to the Tapajós-Xingu interfluvium, occurring between the river Teles Pires and the river Amazon and was listed as *Phaethornis*

FIGURE 2. Nest of Crested Eagle *Morphnus guianensis* at catchment 103 in Belterra (A. C. L.).

FIGURE 3. Streak-throated Hermit *Phaethornis rupurumii* at lek in a fragment of secondary forest (A. C. L.).

longuemareus in Henriques *et al.* (2003). We found it to be the most common *Phaethornis* hermit within the FLONA, but to be uncommon or absent from most of the catchments outside of the reserve where it was largely replaced by Reddish Hermit *Phaethornis ruber* and *P. rupurumii*, although S. M. Klages collected one individual at Colônia do Mojuy on 27 October 1919. Whether this current distribution is potentially related to topographically-determined micro-habitat preferences or direct replacement by these more ruderal hermit species remains unclear, but on current evidence this species appears to be quite disturbance intolerant *cf.* Henriques *et al.* (2008) although also see Piacentini *et al.* (2009).

Brown-banded Puffbird *Notharchus ordii*

We recorded this poorly known puffbird on two occasions: C. B. A. tape-recorded (Andretti 2010c) one in catchment 399 on 1 November 2010 and saw a second individual in catchment 261 on 19 October 2010. C. B. A. also recorded this species from the region of Trairão where the species was recorded on four dates in September 2009 on the Transamazônica 80 km NE of Itaituba and on the river Cupariri 92 km east of Itaituba (PA). This species is often reported as being associated with stunted forest on white sandy soils *e.g.* in Acre (Guilherme & Borges 2011), north-eastern Peru (Alonso & Whitney 2003), southwestern Venezuela, and the upper river Negro region of northern Brazil (Zimmer & Hilty 1997) and in dept Pando, Bolivia (Tobias & Seddon 2007). This record however, coupled with others from Alta Floresta (Zimmer *et al.* 1997), Novo Progresso (Aleixo *et al.* 2008), the Juruti region of Pará (Santos *et al.* 2011) and Tambopata, south-eastern Peru (A. C. L. & A. Whittaker) reinforces the notion that this species may be under-recorded in tall stature central Amazonian *terra firme* forests. Vasconcelos *et al.* (2011) lists a record from the opposite bank of the river Amazon at Monte Alegre, PA - a female (MPEG 4405) collected by A. Costa on 17 November which would be the first record of *N. ordii* east of the river Negro and north of the river Amazon. However, there is some uncertainty surrounding the locations of some Costa specimens from the region, which may have been taken on the south bank (F. Lima *in litt.*). Costa collected a second *N. ordii* specimen from Monte Cuçari on the south bank, seven days before collecting MPEG 4405 allegedly from Monte Alegre, this specimen is held in Berlin (ZMB 311582). Given these doubts and a lack of subsequent records, we consider the presence of *N. ordii* north of the Amazon and east of the Negro to be unproven.

Purple-throated Cotinga *Cotinga cotinga*

This spectacular cotinga was recorded on just two occasions: A. C. L. photographed (Lees 2010c) a single adult male from the LBA Tower at KM-67 on 5 December 2010; and observed a female in the canopy of old secondary forest in catchment 160 on 18 December 2010. The only other record for the region we managed to trace were two (USNM 120921 and USNM 120922) collected by C. Riker at Diamantina, one mentioned in Riker & Chapman (1891) as collected on 4 July 1887, the other listed as '1886'.

Pale-breasted Spinetail *Synallaxis albescens*

We recorded this non-forest spinetail from cattle pasture in just two transects (*e.g.* Lees 2011c) in two different catchments (129 and 157), this in sharp contrast to its abundance in our sister landscape in Paragominas where the species was a near-ubiquitous inhabitant of agropastoral landscapes (Lees *et al.* 2012). Both landscapes contain catchments with similar deforestation histories and abut areas where the species ancestrally occurred, so it remains unclear why the species has proliferated in Paragominas and not in Santarém. Aleixo *et al.* (2008) reported this species from disturbed habitats between Moraes de Almeida (50 km north of Novo Progresso) and Santarém on 11 December 2005. The only historical record we were able to find for the region concern a pair collected by S. M. Klages in April 1919, the male of which was later designated as the type of *S. a. griseonota* by Todd (1948). This proposed race was described as having a paler crown and wing-coverts and more greyish underparts than *inaequalis*, but has subsequently been synonymised with the latter (Remsen 2003).

Fiery-capped Manakin *Machaeropterus pyrocephalus*

We encountered this unobtrusive manakin twice: from catchment 157 on 2 February 2011 (A. C. L.), and from catchment 125 on 7 February 2011 (Davis 2011b). This species had been collected three times previously from the region: a male collected from the 'right bank of the Tapajós at Santarém' by A. M. Olalla on 19 June 1934; and two males collected by J. M. Cardoso da Silva at Urumari on 10 January and 2 February 1984. These scant records do not permit a confident appraisal of whether or not the lack of previous records from the FLONA (Henriques *et al.* 2003, our data) reflects a genuine absence from this site and other areas lacking sandy soils along the main Tapajós riverbank or difficulties in detecting the species on account of its relatively cryptic vocalisations and mist-net avoidance combined with its local rarity.

Yellow-crowned Elaenia *Myiopagis flavivertex*

We detected this flycatcher from three transects in two different catchments (69 and 81) between 12 and 17 January 2011 (*e.g.* Lees 2011d). *Myiopagis flavivertex* is widely considered to be a specialist of *várzea* forests, but all of our records come from logged and burnt *terra firme* forest sites on the plateau, although in all cases never more than 5 km from the river Amazon. These records might either represent wandering males which have been unable to secure 'high quality' territories in adjacent *várzea* forests or alternatively indicate a potentially new trend towards colonisation of moderately disturbed *terra firme* forests.

Gray Elaenia *Myiopagis caniceps*

This canopy flycatcher was found to be an apparently rare member of canopy mixed-species flocks and was detected just six times from five different catchments in addition to a pair regularly present at the LBA Tower at KM-67 (Figure 4). This species was missed by both historic and recent inventories owing to its unobtrusive canopy habits. The taxonomy of this species is under investigation by C. B. Andretti and collaborators, birds from Santarém are of the same vocal type as other eastern Amazonian and Atlantic Forest populations (although morphologically distinct from the latter) but are very different from populations in south-west Amazonia and northern Amazonia.

Bank Swallow *Riparia riparia*

A. C. L. photographed two individuals (Lees 2011e) within a migrating flock of c.1000 Barn Swallows *Hirundo rustica* hawking over cattle pasture in catchment 125 on 5 February 2011. This species is apparently rare in central-eastern and eastern Amazonia (Stotz *et al.* 1992), with no records from extensive surveys in the Belém centre of endemism (*e.g.* Novaes & Lima 1998, Portes *et al.* 2011) and only a single record from the Alta Floresta region (Lees *et al.* 2013), although the species was reported by Fávaro & Flores (2009) from the Estação Ecológica Terra do Meio, PA. This rarity should reinforce the notion that Neotropical migrant swallows are not uniformly distributed across the South American continent as illustrated in many published distribution maps and may be very spatiotemporally localised (*cf.* Remsen 2001).

Cocoa Thrush *Turdus fumigatus*

We include a species account for this taxon as it seems a rather odd omission from the Henriques *et al.* (2003) inventory, as it ought to be a 'core *terra firme*' species. However, we only recorded this species from three different transects in three different catchments in

FIGURE 4. Gray Elaenia *Myiopagis caniceps* photographed from the tower at KM-67 in the FLONA (A.C. L.).

addition to a relatively confiding pair that frequented the LBA Base at KM-83 (Figure 5, Lees 2010d). S. M. Klages collected four individuals in 1919, one from 'Colônia do Mojuy' and three from 'Santarém (Tapajós river; Right Bank) and Riker & Chapman (1890) collected three specimens and described the species as '*common in semi-palm growths*'.

Red-crested Finch *Lanio cucullatus*

We recorded this species on two occasions from catchment 369, two different singing males (3 km apart) located on 3 December 2010 by A. C. L (*e.g.* Lees 2010e). The first was singing from the edge of primary forest, bordered by a ploughed field and the second from scrubby second growth bordering primary forest. Further afield, C. B. A. photographed and sound-recorded two individuals of this species from the town of Trairão 220 km south-west of the region on 8 and 15 June 2008. These records represent substantial range extensions from the nearest sites in Alta Floresta (Lees *et al.* 2013) and Paragominas (Portes *et al.* 2011, Lees *et al.* 2012), we cannot eliminate the possibility that such records might relate to local introductions, but considering the speed at which open country species have colonized much of the Amazon, natural colonization seems more likely (*cf.* Mahood *et al.* 2012).

Historical Records

Sharp-shinned Hawk *Accipiter striatus*

Whilst searching through the catalogue of birds collected by S. M. Klages from the region, we came across a record of a female *Accipiter striatus* (CM 72339) collected at Santarém (Tapajós river; Right Bank) on 2 May 1919 and assigned to the subspecies *erythronemius*. *Accipiter striatus* is unrecorded from the Brazilian Amazon, or indeed anywhere in lowland Amazonia, so given the importance of the record we solicited images of the original skin from S. Rogers at the Carnegie Museum. The images (Figure 6) confirm that the specimen pertains to *A. striatus* and can be further aged as a subadult female by the retained (streaked) juvenile feathers on the throat. This record represents the first confirmed record from the Brazilian Amazon. Subsequently M. Cohn-Haft (*in litt.*) collected an immature plumaged bird in savannah woodland on 7 May 2007 in Amazonas (AM) in the Madeira-Purus interfluvium on the Ramal do Mucuim, 50 km west of Porto Velho at 8° 40' S; 64° 25' W. Other

FIGURE 5. Cocoa Thrush *Turdus fumigatus* at the LBA Base KM-83, FLONA forest (A. C. L.).

FIGURE 6. Composite image of the first Brazilian Amazonian record of Sharp-shinned Hawk *Accipiter striatus* (S. Rogers copyright Carnegie Museum).

sight records include two undocumented sight records from Manaus, AM in Cohn-Haft *et al.* (1997) and two sight records from Alter do Chão on 11 and 29 November 2000 (R. Cintra *in litt.*).

Least Sandpiper *(Calidris minutilla)*

A record of a 'Semipalmated Sandpiper *Calidris pusilla*' collected by A. M. Olalla on 18 November 1932 (MCZ 173283) from 'Santarém' (Griscom & Greenway 1941, Stotz *et al.* 1992) was to our knowledge the only documented record of this species in the interior of the Brazilian Amazon. We examined digital images (Figure 7) of the original specimen and reidentified the individual as a Least Sandpiper *C. minutilla* based on the thin, slightly decurved beak, extensive dark-centers to the mantle feathers and yellowish legs. Least Sandpiper is an uncommon vagrant/scarce passage migrant to the interior of Amazonia with documented records from MT, PA, RO and AM (Stotz *et al.* 1992). We consider Semipalmated Sandpiper to be an unproven vagrant to Amazonia and any future reports should preferably be documented with high quality digital images.

Gull-billed Tern *Gelochelidon nilotica*

The only record that we can trace for the region concerns a single breeding-plumaged adult photographed by Kurazo Okada (Aguiar 2010) at the Lago do Maicá on 31 July 2010. The status of this species in the interior of the Amazon basin is unclear, but circumstantial evidence suggests that this species maybe a regular seasonal visitor (breeder?) along the river Amazon. For instance, Kirwan *et al.* (2012) recorded four individuals of *Gelochelidon nilotica* associating with a mixed colony of Large-billed Terns *Phaetusa simplex* and Black Skimmers *Rhynchops niger* and exhibiting indications of breeding on the Ilha da Benta, Itacoatiara, Amazonas state (c.400 km WSW of Santarém) on 21–22 November 2011. Closer to the study region, G. M. Kirwan and C. F. Collins observed one midstream in the river Amazon c.20 km west of Monte Alegre, Pará, on 8 December 2005 (Kirwan *et al.* 2012). Further afield, this species has been collected from Marajó Island (Henriques & Oren 1997) and we (A. C. L. and N. G. M.) have recorded flocks of this species on the Pará coast at Salinópolis, Bragança and Augusto Corrêa (*e.g.* Lees 2011f).

FIGURE 7. Composite image of Least Sandpiper *Calidris minutilla* originally identified as Semipalmated Sandpiper *Calidris pusilla* (J. Trimble, copyright Museum of Comparative Zoology, Harvard University).

Scaled Ground-cuckoo *Neomorphus squamiger*

The type series of the micro-endemic *Neomorphus squamiger* comes from Colônia do Mojuy by S. M. Klages – four individuals (two males and two females) collected on three dates in October and November 1919. Klages, in Todd (1926) remarked of the habitat preferences of this taxon: "*It lives on or near the ground in the dense forest, where it accompanies the hunting ants, and is rare so far as my experience goes. It was never met with in the littoral area, nor yet in the contiguous forested mesa, but only upon penetrating back into the more elevated Mojuy district. We sought for it in vain along the Tapajós*." Subsequently A. M. Olalla collected two (MCZ 173562 and MCZ 173563) at Tauary, 39 km south-west of Santarém and alongside the Tapajós. We know of no subsequent reports for the region. Although we have no evidence for its continued persistence within the FLONA, we assume that the species is likely still extant there in more isolated regions and likely also persists in extensive areas of unsurveyed upland forest in the east of the region. Elsewhere, C. B. A. briefly observed one at Trairão (PA) on 14 September 2009 following a large understorey mixed species bird flock in selectively-logged forest. The absence of a breast band was noted and the bird was observed removing loose bark from a decomposing fallen tree.

Pavonine Quetzal *Pharomachrus pavoninus*

One (MCZ 173835) was collected by A. M. Olalla at Tauary and has apparently been overlooked in subsequent publications. The nearest records from the Tapajós-Xingu interfluvium were made by Pacheco & Olmos (2005) at Vicinal Progresso (07°10'S; 55°06'W), 30 km SSE from Novo Progresso, PA (440 km south of Santarém) on 16 May 2002 and Aleixo *et al.* (2008) recorded this species from the Floresta Nacional de Altamira, near Moraes Almeida (PA) in December 2005 (370 km south of Santarém). The south-central FLONA probably represents the northern limit of the range for a species which generally occurs at low density throughout its range.

Red-billed Scythebill *Campylorhamphus trochilirostris*

Two specimens collected by S. M. Klages from Santarém (Tapajós river; Right Bank) in "swamp forest" on 26 March (CM 71504) and 13 June (73210) 1919 were originally identified as *C. procurvoides multostriatus* by Todd (1948), but later re-identified as *C. trochilirostris snethlageae* by A. A. upon direct examination of the specimens involved and comparison with dozens of *Campylorhamphus* specimens from several collections. Both specimens from Santarém possess the typical brick-reddish hue on the underparts distinguishing the *várzea* specialist *C. t. snethlageae* (Zimmer 1934), rather than the distinct brownish olivaceous, which characterizes the underparts of *C. procurvoides* populations of Santarém found exclusively in upland *terra firme* forest. Despite Todd's misidentification, Klages himself had noticed that those two Santarém specimens collected in *várzea* belonged to a different taxon than the *Campylorhamphus* found in nearby upland *terra firme* forest as shown by his field notes, transcribed as follows: "*The birds with the serial number 2436 were collected in the upland forest. I consider this series to be different from series 2401*". Both Santarém specimens mentioned above belong to Klages' series 2401, whereas all 2436 series birds included only specimens of two *C. procurvoides* taxa associated with *terra firme*: *multostriatus* and *notabilis* (A. A. *pers. obs*). Klages could distinguish those two sympatric (but not syntopic) species of *Campylorhamphus* from Santarém mainly by their bill color, still well preserved shortly after collection, as indicated by his field notes: "*This form with the redder h. (unreadable) and less deeply curved bill seems to be restricted to the swampy-forest*".

Zimmer's Woodcreeper *Dendroplex kienerii*

S. M. Klages collected four individuals of this seasonally-flooded forest (*várzea* and *igapó*) specialist between 24 March and 8 April 1919 from Santarém (Tapajós river; Right Bank) and A. A. and J. D. Weckstein collected two females and one male on 22 July 2000 11 km south east of Santarém, in tall forest at Lago do Maicá (MPEG 55159, 55160, 55290). The distribution of this woodcreeper seems confined mostly to western Amazonia and the Negro river basin, with the easternmost records coming from the vicinity of Santarém.

White-eyed Tody-tyrant *Hemitriccus griseipectus*

S. M. Klages collected one male (Figure 8, CM 74717) as '*Hemitriccus zosterops*' at Colônia do Mojuy on 1 November 1919. At the suggestion of B. M. Whitney we solicited images of the skin to check the identification and on comparison with skins of all Amazonian *Hemitriccus* and *Lophotriccus* species can confirm that the identification is correct (identification also independently checked by M. Cohn-Haft) and we have no reason to doubt the provenance of the skin. We do not believe we missed *H. griseipectus* during our own surveys, the voice of which all observers are familiar, and suggest that this species may be restricted to tall *terra firme* only in the east of the region and its distribution may be associated with as yet undiagnosed topographical factors. The nearest records of this species come from the FLONA do Trairão 90 km east of Itaituba (C. B. A. *unpubl. data*). There are no confirmed records of Snethlage's Tody-tyrant *Hemitriccus minor* from any sites in the Tapajós-Xingu interfluvium north of the Teles Pires river (Cohn-Haft 2000).

FIGURE 8. Composite image of the only regional record of White-belied Tody-tyrant *Hemmitriccus grisepectis* (S. Rogers copyright Carnegie Museum).

'Trail's Flycatcher' *Empidonax traillii/alnorum*

An *Empidonax* flycatcher (Figure 9) was collected by G. P. Silva at Vila Mojuí dos Campos, Estrada do Palhal km 5 on 24 February 1978. This individual (MPEG 32320), was identified as Willow Flycatcher *Empidonax trailli* by E. Eisenmann and A. R. Phillips (Sick 1985), the first and only Brazilian record of this species. However, without comment the same record is listed as Alder Flycatcher *Empidonax alnorum* in Stotz *et al.* (1992) and again in Vasconcelos *et al.* (2008). This has created some confusion in the subsequent literature – for instance Silva (2011) lists February records for both species for Santarém based on different sources. We re-examined the specimen (aged as a first winter based on prominent growth-bars on the tail) but unfortunately its biometrics fell within the range of overlap in the discriminant formulas of Pyle (1997) so robust identification will have to await molecular testing (A. C. L., A. A, G. Thom *in prep*.). Vasconcelos *et al.* (2008) list just three records of *Empidonax alnorum,* the aforementioned Santarém record, a singing bird at Manaus, AM on 15 December 1984 (Stotz *et al.* 1992) and an unsexed individual (DZUFMG 4580) collected by M. F. Vasconcelos on 19 November 2005 in the Pantanal at Fazenda Figueirinha (Corumbá municipality) MS. Additional records include an individual seen and sound-recorded (ML 117234) by Curtis Marantz at Igarape Crajari, AM on 5 April 1997, a female sound-recorded and collected by M. Cohn-Haft at Igrapé Craiata, 9 km ESE of Benjamin Constant AM on 5 April 1991, a male collected at Feijó, Envira river, Locality Novo Porto, Fóz do Igarapé Paraná do Ouro, AC by E. Guilherme and N. S. Brígida on 20 November 2011 and one collected by E. Guilherme and P. Maurício at Manoel Urbano, BR 364, Seringal "Sardinha", AC on 10 November 2004.

Gray-cheeked Thrush *Catharus minimus*

G. P. Silva collected one specimen (MPEG 47943, Figure 10) at KM-84 of the BR-163 on 15 December 1972 and LMPH captured one individual in the FLONA on 20 March 2000. Stotz *et al.* (1992) considered this species to be '*almost completely unknown from south of the Amazon*'. The 1972 record is the first from the southern Brazilian Amazon. Outside of our region, subsequent southern Amazonian records include one collected by G. P. Silva from the Sena Madureira (AC) on 4 November 1976 (Novaes 1978), and a sight record from Alta Floresta (MT) by A. Lang on 12 December 2002 (Lees *et al.* 2013).

DISCUSSION

This updated checklist provides a solid baseline for future quantitative studies and we believe that the list covers all core members of the regional avifauna. However, we anticipate that the list will continue to increase in size as new open-habitat colonizers, migrants and vagrants are added, especially considering the colonization possibilities

FIGURE 9. Composite image of 'Trail's Flycatcher' *Empidonxa traillii/alnorum* (A. C. L. copyright Museu Paraense Emilio Goeldi).

FIGURE 10. Gray-cheeked Thrush *Catharus miniimus* collected on 15 December 1972 (A. C. L. copyright Museu Paraense Emilio Goeldi)

afforded for non-forest species following extensive habitat conversion (Lees & Peres 2006, Mahood *et al.* 2012) and even the periodic incursion of pelagic vagrants into Amazonia (*cf.* Teixeira *et al.* 1986). The region is particularly rich in boreal migrant and vagrant passerines for a central Amazonian site with 12 species recorded, perhaps indicating that the Tapajós may function as a migration corridor for boreal migrants. However, species richness for shorebirds is quite low, with notable omissions including Greater Yellowlegs *Tringa melanoleuca* and White-rumped Sandpiper *Calidris fuscicollis*, more intense surveys of suitable habitats at peak migration times will no doubt plug these gaps in the pool of expected species. Our own fieldwork did not focus on river island and *várzea* habitats which are regionally of high conservation importance, recognized in the Important Bird Area PA04 'Várzeas de Monte Alegre' which includes parts of the municipalities of both Santarém and Belterra (De Luca *et al.* 2009), although historical collecting effort in these areas was quite intense.

A quantitative analysis of regional beta diversity is beyond the scope of this paper, but it is evident that even among least disturbed *terra firme* forests of the region there is considerable heterogeneity, probably driven by topographic and edaphic factors and resulting in a patchy distribution for many species (*cf.* Alonso & Whitney 2003). Nearly two hundred years of fieldwork have failed to find within the study region many *terra firme* forest bird species known from the Tapajós-Xingu interfluvium as close as Trairão 200 km SW of the region. These apparently absent species include Collared Trogon *Trogon collaris*, White-browed Antbird *Myrmoborus leucophrys*, Black-throated Antbird *Myrmeciza atrothorax* and Striped Woodhaunter *Hyloctistes subulatus*, which probably reflects different forest physiognomies between these adjacent regions. This turnover is also reflected in the absence of records of Golden Parakeet *Guaruba guarouba* (Laranjeiras & Cohn-Haft 2009) and documented records of both Band-tailed Antbird *Hypocnemoides maculicauda* and Speckled Spinetail *Cranioleuca gutturata* (B. Whitney *in litt.*) from the southern boundary of the FLONA, but outside of our study region. These absences also illustrate that published distribution maps for many Amazonian bird species are very liberal, as they are frequently based on the extent of occurrence, while the actual area of occupancy for many species is far smaller as they are extremely patchily distributed even with the same interfluvium (*cf.* Gaston & Fuller 2009).

Santarém has one of the longest histories of ornithological fieldwork in the Brazilian Amazon; that our own fieldwork added core *terra firme* birds to the regional list is testament to the low population density and patchy distribution of many rarer taxa, and the importance of thorough familiarity with vocalizations of such species which may be easily missed in rapid inventories or by inexperienced observers Modern avian surveys (*sensu* Aleixo 2009) are an invaluable tool for uncovering true biogeographic patterns, and forming robust baselines for conservation policies, and should include as much accessible documentary evidence as possible to allow for general peer review (Lees *et al.* 2012).

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APPENDIX 1

List of 583 species recorded from the Santarém-Belterra region, south of the Amazon and east of the Tapajós (PA, Brazil). Inventories are as follows: 1= this study (* denotes if recorded during quantitative fieldwork), 2 = Henriques *et al.* 2003, 3 = Sanaiotti and Cintra (2001). Photo reference and sound reference numbers are searchable in the online databases of www.wikiaves.com.br (WA), www.xeno-canto.org (XC) and the Macaulay Library http://macaulaylibrary.org/ (ML). Initials given after online voucher numbers are those of non-author contributors, photographers: DO = D. Oliveira, DLF = Diogo Lagroteria Faria, FG = Felipe Gomes, FS = Francisco Sérgio, FP = Frederico Pereira, GL = Gilmar Leal, HGS = Helena G. Salgado, IT = Ian Thompson, IM = Ingrid Macedo, IG = Ivo Ghizoni-Jr, JAA = J Augusto Alves, KO = Kurazo Okada, LATB = Luiz Álvaro Toledo Barros, RC = Robson Czaban, TD = Tulio Dornas, VH = Valdir Hobus and sound-recordists: CM = Curtis Marantz, JM = Jeremy Minns, PI = Phyllis Isler, Sidnei Dantas. Accession numbers are presented for species previously collected in the region and housed at the American Museum of Natural History, New York City, USA (AMNH), the Academy of Natural Sciences, Philadelphia, USA (ANSP), the Carnegie Museum of Natural History, Pittsburgh, USA (CM), the Field Museum of Natural History, Chicago, USA (FMNH), the Los Angeles County Museum of Natural History, Los Angeles, USA (LACM), the Louisiana State University Museum of Natural Science, Baton Rouge, USA (LSUMZ), the Museu Paraense Emilio Goeldi, Belém, Brazil (MPEG), the Museu de Zoologia Universidade de São Paulo, São Paulo, Brazil (MZUSP), the University of Michigan Museum of Zoology, Ann Arbor, USA (UMMZ) and the United States National Museum, Washington, USA (USNM). Taxonomy and nomenclature follows CBRO (2011).

Family / species	**Inventories**	**This study**			**Previous fieldwork**				
		XC foreground	**XC background**	**Wikiaves**	**Specimen**	**Wikiaves**	**Photographer**	**Sound**	**Recordist**
TINAMIDAE									
Tinamus tao	1*,2	XC91214			MZUSP 10583			ML114917	CM
Tinamus guttatus	1*,2	XC94649			CM 74874			ML115028	CM
Crypturellus cinereus	1*,2	XC90693	XC91205						
Crypturellus soui	1*,2	XC90703	XC90764		CM 72221			ML117119	CM
Crypturellus obsoletus	1	XC94679			CM 74876				
Crypturellus undulatus	1,3		XC94878		CM 78240				
Crypturellus strigulosus	1*,2	XC91207	XC91203		CM 78199				
Crypturellus variegatus	1*,2	XC90705	XC94871		MPEG 56038				
Crypturellus parvirostris	1*,2	XC94650	XC94670		MPEG 47652				
ANHIMIDAE									
Anhima cornuta					CM 73737				
ANANTIDAE									
Sarkidiornis sylvicola					CM 73268				
Cairina moschata	1			WA580720	UMMZ 27966	WA189071	KO		
Amazoneta brasiliensis	1*			WA426586	MZUSP 20920	WA559786	VH		
Dendrocygna autumnalis	1,3			WA429940	CM 73634	WA576641	IT		

Family / species	Inventories	This study			Previous fieldwork				
CRACIDAE									
Ortalis motmot	1*,2,3	XC94608		WA340078	MZUSP 46267				
Penelope superciliaris	1*,2,3				CM 75036				
Penelope pileata	1*	XC91206			MZUSP 21058				
Aburria cujubi	1*,2			WA500190	MZUSP 20832				
Pauxi tuberosum	1*,2		XC91214	WA675633	MZUSP 20467				
ODONTOPHORIDAE									
Odontophorus gujanensis	1*,2	XC94805			MZUSP 10602				
PODICIPEDIDAE									
Tachybaptus dominicus	1			WA500150	MCZ 173025				
CICONIIDAE									
Ciconia maguari					MCZ 23047				
PHALACROCORACIDAE									
Phalacrocorax brasilianus	1				MZUSP 21925	WA185783	KO		
ANHINGIDAE									
Anhinga anhinga	1			WA580721	MCZ 173021	WA98813	JAA		
ARDEIDAE									
Tigrisoma lineatum	1				CM 72000	WA100655	JAA		
Agamia agami					MZUSP 35885				
Cochlearius cochlearius	1			WA359482	MZUSP 35886				
Zebrilus undulatus	1				CM 75076				
Botaurus pinnatus					MCZ 173069				
Ixobrychus exilis					CM 72388				
Nycticorax nycticorax					CM 78113	WA183342	KO		
Butorides striata	1,2			WA580731	MZUSP 61789	WA77559	LATB		
Bulbucus ibis	1,3			WA372477	MPEG 36473	WA185772	KO		
Ardea cocoi	1				MCZ 23190	WA74313	LATB		
Ardea alba	1*			WA329322	LACM 34344	WA557916	VH		
Pilherodius pileatus	1,2				MZUSP 46199				
Egretta thula	1			WA329325					
Egretta caerulea				WA675594		WA183310	KO		

Family / species	Inventories	This study			Previous fieldwork				
THRESKIORNITHIDAE									
Mesembrinibis cayennensis	1*			WA588367	MCZ 173072				
Theristicus caudatus	1*			WA366370		WA205442	KO		
CATHARTIDAE									
Cathartes aura	1*2,3			WA505835	CM 78110	WA242292	IT		
Cathartes burrovianus	1*,3			WA359441		WA189075	KO		
Cathartes melambrotus	1*2,3			WA333384					
Coragyps atratus	1*2,3			WA333385	CM 78109	WA242294	IT		
Sarcoramphus papa	1,2				AMNH 285739				
PANDIONIDAE									
Pandion haileautus	1,3			WA357402	MCZ 173117	WA549592	VH		
ACCIPITRIDAE									
Leptodon cayanensis	1,2				MCZ 173091	WA918207	RC	ML115074	CM
Chondrohierax uncinatus	1*,2			WA435547	MCZ 173092				
Elanoides forficatus	1*2,3			WA429985	CM 73057				
Gampsonyx swainsonii	1			WA629547	MPEG 34430				
Harpagus bidentatus	1*,2				MPEG 15342	WA320216	FG		
Harpagus didon					MPEG 35598				
Accipter superciliosus	1*2			WA361613	CM 72934				
Accipter striatus	3				CM 72517				
Accipter bicolor					CM 72339				
Ictinia plumbea	1,2,3			WA936127					
Busarellus nigricollis	1				FMNH 257783	WA185781	KO		
Rostrhamus sociabilis				WA435213	FMNH 257787				
Geranospiza caerulescens				WA645500	FMNH 257800				
Buteogallus schistaceus					FMNH 101510				
Heterospizias meridionalis	1*,3			WA431330		WA180997	KO		
Urubutinga urubitinga	1*,2,3			WA514779	FMNH 257765				
Rupornis magnirostris	1*,2,3	XC94809		WA329171	MZUSP 10134	WA206722	KO	ML117158	CM
Geranoaetus albicaudatus	1*,3			WA443906	MCZ 173102				
Pseudastur albicollis	1*,2			WA432803	MPEG 13772				
Leucopternis melanops					MZUSP 46240				

Family / species	Inventories	This study			Previous fieldwork				
Leucopternis kuhli	1*,2	XC92080	XC94851	WA514724	FMNH 101120	WA320489	FG		
Buteo nitidus	1*,2,3	XC95086	XC94874	WA491528	MPEG 35598				
Buteo brachyurus	1*,3			WA499991					
Buteo swainsoni					USNM 121073				
Morphnus guianensis	1			WA356485					
Harpia harpyja	1			WA616225	MPEG 1855				
Spizaetus tyrannus	1*,2	XC96328	XC96343	WA329317	FMNH 101130	WA320256	FG	XC85417	JM
Spizastur melanoleucus	1*,2			WA467097	MCZ 173114				
Spizaetus ornatus	1*,2		XC96376		MCZ 173115			XC85417	JM
FALCONIDAE									
Daptrius ater	1*,2			WA347314	CM 74791				
Ibycter americanus	1*,2	XC95591		WA356727	CM 72788			ML115015	CM
Caracara plancus	1*,2			WA580755	ANSP 76478				
Milvago chimachima	1*,2,3			WA500112	MZUSP 35888	WA552031	VH		
Herpetotheres cachinnans	1*,2,3			WA516301					
Micrastur ruficollis	1*,2	XC90680	XC90687						
Micrastur mintoni	1*,2	XC95106	XC90680		MZUSP 18030				
Micrastur mirandollei	1*	XC94623			MZUSP 10862				
Micrastur semitorquatus	1*,2			WA346345	CM 74614			ML114997	CM
Falco rufigularis	1*,2,3			WA447466	CM 75002				
Falco deiroleucus					CM 73801	WA632317	IG		
Falco femoralis	1*,3			WA500144	MCZ173143				
Falco peregrinus						WA325212	FP		
EURYPYGIDAE									
Eurypyga helias				WA517296	CM 72364				
ARAMIDAE									
Aramus guarauna				WA583437	CM 73676	WA185149	KO		
PSOPHIDAE									
Psophia dextralis		XC96488		WA359490	CM 75034				
RALLIDAE									
Aramides cajanea	1*,2	XC94871			CM 72145				
Amaurolimnas concolor					CM 71647				

Family / species	Inventories	This study			Previous fieldwork				
Laterallus viridis	1*,2	XC94670			MZUSP 35891			ML117040	CM
Laterallus exilis	1*				MCZ 173214				
Neocrex erythrops	1*	XC91474			MPEG 74208				
Gallinula galeata					MZUSP 22636				
Porphyrio martinica	1*,2			WA500120	CM 71555	WA104023	GL		
Porphyrio flavirostris					CM 71615				
HELIORNITHIDAE									
Heliornis fulica				WA362963	MZUSP 35892				
CHARADRIIDAE									
Vanellus cayanus	1			WA333899	CM 73189	WA99261	JAA		
Vanellus chilensis	1*			WA583439	CM 73677	WA182115	KO		
Pluvialis dominica					LACM 34401	WA757451	HGS		
Charadrius collaris	1			WA467107	MZUSP 35894	WA546923	VH		
RECURVIROSTRIDAE									
Himantopus mexicanus				WA431336		WA183311	KO		
SCOLOPACIDAE									
Gallinago paraguaiae					MPEG 36472	WA205424	KO		
Bartramia longicauda					MZUSP 35895				
Actitis macularius				WA357318	CM 74312				
Tringa solitaria	1			WA357320	MZUSP 35896	WA242305	IT		
Tringa flavipes				WA508864	CM 73689	WA182114	KO		
Calidris melanotos					MCZ 173293	WA189072	KO		
Calidris minutilla					MCZ 173283				
JACANIDAE									
Jacana jacana				WA511911	MZUSP 3376	WA205425	KO		
STERNIDAE									
Sternula superciliaris				WA435379	CM 78510				
Phaetusa simplex				WA432695	CM 73739	WA549214	VH	ML47954	PI
Gelochelidon nilotica						WA176659	KO		
RYNCHOPIDAE									
Rynchops niger				WA357316	MCZ 23042	WA559241	VH		

Family / species	Inventories	This study			Previous fieldwork				
COLUMBIDAE									
Columbina passerina	1*,2,3		XC94650	WA500208	MPEG 17611	WA550785	VH		
Columbina minuta	1*	XC94621	XC94956	WA441603					
Columbina talpacoti	1*,2			WA333907	CM 73312	WA319722	FG		
Claravis pretiosa	3				MPEG 47665			ML117176	CM
Columba livia	1*			WA333902					
Patagioenas speciosa	1*,3				MZUSP 10607				
Patagioenas cayennensis	1*,3			WA372475	MZUSP 35897	WA205427	KO		
Patagioenas plumbea	1*,2	XC94779	XC94851		AMNH 285541			ML115068	CM
Patagioenas subvinacea	1*,2	XC95107			CM 74472			XC87137	JM
Zenaida auriculata	1*,3			WA359445	MPEG 17612	WA547583	VH		
Leptotila verreauxi	1*,2		XC94620	WA505858	CM 72540				
Leptotila rufaxilla	1*,2,3	XC95111	XC92089		CM 73078				
Geotrygon montana	1*,2,3	XC95572			MZUSP 10606	WA320511	FG		
PSITTACIDAE									
Anodorhynchus hyacinthinus	1*	XC91202			MCZ 173413				
Ara ararauna					CM 72105				
Ara macao	1*,2			WA522295				ML115115	CM
Ara chloropterus	1*,2,3	XC95108			MCZ 173415				
Ara severus	1*,2	XC90773	XC90776	WA444684	MZUSP 11834	WA185148	KO		
Orthopsittaca manilata	1*	XC94856			CM 72174				
Aratinga leucophthalma	1*,2	XC95676	XC96344	WA426594	CM 74387	WA319711	FG		
Aratinga aurea	1*,3	XC94618		WA357380	MPEG 28147	WA180979	KO	ML117043	CM
Pyrrhura amazonum	1*,2	XC94954		WA356522	MZUSP 3416			XC85381	JM
Forpus passerinus	1*			WA467169	MPEG 2330	WA205438	KO		
Brotogeris versicolurus	1*,3	XC94874	XC96344	WA351745	MZUSP 3410				
Brototeris chrysoptera	1*,2	XC94955	XC87290	WA351744	MPEG 8890				
Brotogeris sanctithomae				WA872402	MZUSP 35909	WA183291	KO	XC84943	JM
Touit huetii	1*							ML115198	CM
Pionites leucogaster	1*,2	XC95118			CM 74836				
Pyrilia vulturina	1*,2	XC95120			MZUSP 10630			ML114929	CM
Graydidascalus brachyurus					CM 72417				

Family / species	Inventories	This study			Previous fieldwork				
Pionus menstruus	1*,2,3	XC95117	XC94832	WA352463	MZUSP 10624				
Pionus fuscus	1*,2	XC95125		WA500133	CM 74545			ML115035	CM
Amazona festiva					CM 72900				
Amazona farinosa	1*,2	XC95112	XC90706	WA356731	CM 74734			ML115064	CM
Amazona amazonica	1*,2	XC95122	XC90773		LACM 34501				
Amazona ochrocephala	1*,2	XC94682			CM 73608				
Deroptyus accipitrinus	1*,2	XC95123		WA500189	MZUSP 10618			ML114902	CM
OPISTTHOCOMIDAE									
Opisthocomus hoazin				WA432121	MZUSP 35889	WA183343	KO		
CUCULIDAE									
Coccycua minuta	1*	XC94622		WA567160	CM 72868				
Piaya cayana	1*,2,3	XC96333		WA500202	MZUSP 61865	WA247315	IT		
Piaya melanogaster	1*,2	XC96382		WA432789	MPEG 56039				
Coccyzus melacoryphus					CM 73549	WA182095	KO		
Coccyzus euleri					CM 72739	WA552668	VH		
Crotophaga major	1*,3			WA337955	MZUSP 35904	WA189087	KO		
Crothophaga ani	1*,2,3	XC94607	XC94648	WA500149	MPEG 17617	WA189086	KO		
Tapera naevia	1,2				MPEG 47671				
Dromococcyx phasianellus	1*	XC87287	XC95171		LACM 34519				
Neomorphus squamiger					CM 74616				
TYTONIDAE									
Tyto alba				WA436255	MCZ 173144				
STRIGIDAE									
Megascops choliba	1*,2,3		XC94800	WA432016	CM 73578				
Megascops usta	1*,2		XC94645		MPEG 53840				
Lophostrix cristata	1*,2				CM 72585			ML114946	CM
Pulsatrix perspicillata	1*,2	XC90764			CM 72854				
Bubo virginianus				WA481116					
Strix virgata	1*	XC94713			MCZ 173158				
Strix huhula	1*	XC94712							
Glaucidium hardyi	1*,2	XC94683	XC94710					ML114944	CM
Athene cunicularia	1*			WA509541					

Family / species	Inventories	This study			Previous fieldwork				
Asio clamator				WA357321					
Asio stygius				WA583443	MCZ 173148				
NYCTIBIIDAE									
Nyctibius grandis	1,2,3				MZUSP 35913				
Nyctibius aethereus	1*	XC94710							
Nyctibius griseus	1*,2,3			WA567100	CM 72237	WA49272	IM		
Nyctibius leucopterus	1*,2	XC94711						ML114943	CM
CAPRIMULGIDAE									
Nyctiphrynus ocellatus	1*,2	XC95113			MPEG 54302			ML115108	CM
Antrostomus rufus	1*,3				MZUSP 10894	WA631559	IG		
Antrostomus sericocaudatus	1*	XC86600			MPEG 56042			ML114945	CM
Lurocalis semitorquatus	1*,2	XC90702							
Hydropsalis leucopyga					MZUSP 35916	WA756417	HGS		
Hydropsalis nigrescens	1*,2			WA576637	CM 71585			ML115079	CM
Hydropsalis albicollis	1*,2		XC94800		CM 73263			ML115038	CM
Hydropsalis parvula					CM 73674				
Hydropsalis maculicauda					CM 73816				
Hydropsalis climacocerca				WA431349	CM 71658	WA98817	JAA		
Hydropsalis torquata					MPEG 27368	WA25992	IM		
Chordeiles nacunda					CM 73153	WA178884	KO		
Chordeiles rupestris					MCZ 173600				
Chordeiles acutipennis	1,3				MPEG 37761	WA316733	DLF		
APODIDAE									
Chaetura spinicauda	1*,2				CM 74412			ML115092	CM
Chaetura chapmanii	1*			WA360041					
Chaetura brachyura	1*,2		XC94831			WA320213	FG		
Tachornis squamata	1*,2			WA573688	CM 73577				
Panyptila cayennensis	1,2				MPEG 37764				
THROCHILIDAE									
Glaucis hirsutus	1*,2,3			WA360047	MPEG 53832				
Phaethornis rupurumii	1*	XC84327		WA360065	MPEG 8869				
Phaethornis aethopyga	1*,2,3	XC90519		WA358701	CM 74518				

Family / species	Inventories	This study			Previous fieldwork				
Phaethornis ruber	1*		XC94882		AMNH 148269	WA206708	KO		
Phaethornis bourcieri	1*,2				MPEG 56041				
Phaethornis superciliosus	1*,2,3	XC91212			CM 74606				
Campylopterus largipennis	1,2							ML114922	CM
Eupetonema macroura					CM 78361	WA634736	IT		
Florisuga mellivora	1*,2				MPEG 53839				
Anthracothorax viridigula					CM 73471				
Anthracothorax nigricollis	1*,2,3				CM 73265				
Avocettula recurvirostris	2				MZUSP 3409			ML115199	CM
Topaza pella	1,2							XC5725	SD
Chlorostilbon notatus	3				MPEG 8881				
Thalurania furcata	1*,2,3			WA567110	MPEG 53837				
Hylocharis sapphirina	1,2,3			WA645522	CM 72123				
Polytmus theresiae	1,3				MCZ 173823	WA185793	KO		
Amazilia versicolor					MCZ 173755				
Amazilia fimbriata	1*			WA584520,	MPEG 35617	WA185769	KO		
Heliothryx auritus	1*,2				CM 78631				
Heliomaster longirostris	1,2			WA624861	MZUSP 3404	WA319712	FG		
Caliphlox amethystina				WA625025		WA183292	KO		
TROGONIDAE									
Trogon melanurus	1*,2	XC94717		WA583441	CM 72885			ML115062	CM
Trogon viridis	1*,2,3	XC95314	XC94623	WA500148	MZUSP 35920	WA78768	LATB	ML115159	CM
Trogon ramonianus	1*,2			WA522329	CM 74432				
Trogon rufus	1*,2	XC95308	XC91207	WA676347	MPEG 53841			ML114920	CM
Pharomachrus pavoninus					MCZ 173835				
ALCEDINIDAE									
Megaceryle torquata	1*,2			WA583444	MPEG 27312	WA325211	FP		
Chloroceryle amazona	1,2,3			WA366364	MZUSP 35922	WA98818	JAA		
Chloroceryle aenea	2,3				MZUSP 15947				
Chloroceryle americana	1*,2,3			WA583449	MZUSP 46551	WA185167	KO		
MOMOTIDAE									
Baryphthengus martii	1*,2		XC90680	WA356477	CM 75042				

Family / species	Inventories	This study			Previous fieldwork				
Momotus momota	1*,2		XC94679	WA442693	CM 74832				
GALBULIDAE									
Galbula cyanicollis	1*,2	XC95109	XC95110		CM 74550			XC4883	SD
Galbula ruficauda				WA936123	CM 71853				
Galbula dea	1*,2			WA573667	CM 75062			ML115189	CM
Jacamerops aureus	1*,2	XC94777	XC87290	WA676330	CM 75073			ML115013	CM
BUCONNIDAE									
Notharchus hyperrhynchus	1*,2		XC91203	WA500142	MZUSP 10683	WA320253	FG	ML117113	CM
Notharus ordii	1*	XC94707							
Notharchus tectus	1*,2,3	XC91203		WA363562	MZUSP 10688	WA101535	JAA	ML117107	CM
Bucco tamatia	1*,2			WA544924	CM 71967	WA553066	VH		
Bucco capensis	1*,2	XC94709	XC94871		CM 72995			ML114990	CM
Nystalus maculatus	1*,2,3		XC94618	WA500146	MPEG 17614	WA551718	VH	ML117140	CM
Malacoptila rufa	1*,2		XC90772	WA567157	MPEG 56044				
Monasa nigrifrons	1			WA583455	MZUSP 35926				
Monasa morphoeus	1*,2	XC95269	XC94679	WA500134	MPEG 40577			ML115175	CM
Chelidoptera tenebrosa	1*,2,3			WA428002	MZUSP 35928				
RAMPHASTIDAE									
Ramphastos toco	1,3			WA435202	CM 74281				
Ramphatos tucanus	1*,2		XC90703	WA472581	MZUSP 82495				
Ramphastos vitellinus	1*,2,3		XC90774	WA352476	MPEG 14851			ML114981	CM
Selenidera gouldii	1*,2		XC94803	WA871417	MZUSP 10671				
Pteroglossus inscriptus	1*,2,3			WA352331	MZUSP 3424	WA320254	FG		
Pteroglossus bitorquatus	1*,2	XC95110		WA500203	MZUSP 10659	WA49283	IM	ML117120	CM
Pteroglossus aracari	1*,2,3	XC90777		WA467112	MZUSP 10665	WA319710	FG	ML114949	CM
PICIDAE									
Picumnus aurifrons	1*,2,3		XC90709	WA349052	MPEG 53843				
Picumnus cirratus				WA351754	CM 78190				
Melanerpes candidus					CM 73144			ML47952	PI
Melanerpes cruentatus	1*,2		XC95086	WA573656	CM 73063				
Veniliornis affinis	1*,2	XC95304			MPEG 36697	WA320545	FG	ML114951	CM
Veniliornis passerinus					CM 72952				

Family / species	Inventories	This study			Previous fieldwork				
Piculus flavigula	1*,2,3	XC94957		WA675088	CM 75072			ML114956	CM
Piculus chrysochloros	1*			WA356507	CM 72647				
Colaptes punctigula	1,3			WA366369	MZUSP 3420	WA183309	KO		
Celeus grammicus	1*,2,3	XC91204		WA674439	MZUSP 3419				
Celeus elegans	1*,2,3			WA356077	MPEG 56045				
Celeus flavescens					CM 73169				
Celeus flavus	1*,2	XC95305		WA359486	MZUSP 10708			ML115217	CM
Celeus torquatus	1*,2	XC96148	XC96151		CM 74743	WA919233	RC	ML114909	CM
Dryocopus lineatus	1*,2,3	XC94959		WA349050	MZUSP 10716			XC87455	JM
Campephilus rubricollis	1*2	XC95102	XC95109	WA675642	CM 72866	WA319721	FG	ML114957	CM
Campephilus melanoleucos	1*,3	XC95103		WA442184	MZUSP 35932	WA629817	IT		
THAMNOPHILIDAE									
Myrmornis torquata	2				MPEG 53917				
Pygiptila stellaris	1*2	XC95310	XC90772		CM 74493				
Microrhopias quixensis	1*2	XC94851			MPEG 53900			XC88940	JM
Myrmeciza hemimelaena	1*2	XC95315	XC90760	WA352334	MPEG 56086			ML115203	CM
Epinecrophylla leucophthalma	1*2	XC96451		WA356470	MPEG 56078			ML114994	CM
Epinecrophylla ornata	1*2				MPEG 53893				
Myrmotherula brachyura	1*2	XC94887	XC90774	WA359432	MPEG 56084				
Myrmotherula sclateri	1*2	XC95307	XC90760		CM 74937			ML114962	CM
Myrmotherula klagesi					CM 78427				
Myrmotherula hauxwelli	1*2	XC90707			MPEG 56072				
Myrmotherula axillaris	1*2	XC95311	XC90704	WA621984	MPEG 53897	WA320531	FG		
Myrmotherula longipennis	1*2	XC95317	XC96303		MPEG 56071			ML115032	CM
Myrmotherula menetriesii	1*2	XC95316	XC96455		MPEG 56074			XC88775	JM
Myrmotherula assimilis					CM 73136			ML47950	PI
Formicivora grisea	1*,3	XC94648	XC94670	WA583458	MPEG 35616			ML117125	CM
Formicivora rufa	3				MPEG 37766	WA639485	IT		
Thamnomanes caesius	1*2	XC94719	XC94851		MPEG 56068			ML115122	CM
Dichrozona cincta	2				MPEG 53904			XC88789	JM
Herpsilochmus rufimarginatus	1*2	XC95402	XC90760	WA357413	CM 74645			ML114913	CM
Sakesphorus luctuosos				WA583465	CM 72794	WA185174	KO	XC87606	JM

Family / species	Inventories	This study			Previous fieldwork				
Thamnophilus doliatus	1,3				MPEG 26699	WA634314	FS		
Thamnophilus schistaceus	1*2	XC90697	XC87290		MPEG 56062				
Thamnophilus nigrocinereus					CM 72219				
Thamnophilus stictocephalus	1*,3	XC94611		WA619262	MPEG 26710			ML117126	CM
Thamnophilus aethiops	1*2	XC95318	XC95466		MPEG 53872				
Thamnophilus amazonicus	1*				CM 74955				
Cymbilaimus lineatus	1*2	XC94888	XC91205	WA356488	MPEG 56060			ML115024	CM
Taraba major	1*2		XC94620		CM 72511				
Sclateria naevia	1*2				CM 74856	WA206694	KO		
Schistocichla rufifacies	2				CM 72556			ML115023	CM
Hypocnemoides melanopogon	1				CM 72350				
Hylophylax naevius	1*2	XC90776	XC91214		MPEG 56093			ML115186	CM
Hylophylax punctulatus	1*2	XC94780	XC95401		CM 74463				
Pyriglena leuconota	1*2		XC96494		MPEG 40590			ML115047	CM
Myrmoborus lugubris					CM 72226			ML47948	PI
Myrmoborus myotherinus	1*2	XC90747	XC90773	WA675602	MPEG 56244				
Cercomacra cinerascens	1*2	XC91216	XC91204		MPEG 56064	WA185151	KO		
Cercomacra nigrescens	1*2	XC95465		WA447471	CM 74773			ML114996	CM
Hypocnemis striata	1*2	XC96355	XC90709	WA356468	MPEG 56096	WA320252	FG	ML114911	CM
Hypocnemis hypoxantha	1*2	XC87289	XC94623	WA356117	CM 74732			ML115172	CM
Willisornis poecilinotus	1*2	XC91222			CM 75079				
Phlegopsis nigromaculata	1*2	XC90744	XC91206		MPEG 56104			ML114942	CM
Rhegmatorhina gymnops	1*2	XC96150	XC94872		MPEG 56102			XC90272	JM
CONOPOPHAGIDAE									
Conopophaga aurita	1*2	XC94952		WA357416	MPEG 56105			ML114979	CM
GRALLARIDAE									
Grallaria varia	1*2	XC94645			CM 72858				
Hylopezus macularius	1*2	XC86599	XC90705	WA357411	MPEG 56099			ML115081	CM
Hylopezus berlepschi	1*2	XC94723	XC96341		CM 78386			XC6519	SD
Myrmothera campanisona	1*2	XC94889	XC91202		CM 74656			ML114910	CM
FORMICARIIDAE									
Chameaza nobilis					CM 75049				

Family / species	Inventories	This study			Previous fieldwork				
Formicarius colma	1*2	XC95312			MPEG 53920				
Formicarius analis	1*2	XC95313		WA500201	MPEG 53921				
SCLERURIDAE									
Sclerurus mexicanus	1*2	XC96534			MPEG 53866				
Sclerurus rufigularis	1*2	XC96380	XC90707		MPEG 53869				
Sclerurus caudacutus	1*2	XC94774			MPEG 36465				
DENDROCOLAPTIDAE									
Dendrocincla fuliginosa	1*,2	XC94830	XC95269		MPEG 56046			ML114930	CM
Dendrocincla merula	1*,2,3	XC94829	XC94831		MPEG 53850			ML115052	CM
Deconychura longicauda	1*,2	XC95571			MPEG 53852			ML115073	CM
Certhiasomus stictolaemus	1*,2				MPEG 53851				
Sittasomus griseicapillus	1*,2	XC96151		WA356030	MPEG 47735				
Glyphorynchus spirurus	1*,2	XC95678	XC90709		MPEG 56054	WA320215	FG		
Xiphorhynchus spixii	1*,2	XC94876	XC96376		MPEG 56051			ML115123	CM
Xiphorhynchus obsoletus	1				MPEG 55293				
Xiphorhynchus guttatus	1*,2,3	XC95467	XC90740	WA676332	MPEG 56049			ML114900	CM
Campylorhamphus procurvoides	1*,2	XC90761			MPEG 56093				
Campylorhamphus trochilirostris					CM 71504				
Dendroplex picus	1*,2,3	XC94885	XC90697	WA337960	MPEG 55291	WA189088	KO		
Dendroplex kienerii					MPEG 55160				
Lepidocolaptes angustirostris	1,3			WA337961	MPEG 19701	WA550043	VH		
Lepidocolaptes albolineatus	1*,2	XC96153	XC96154	WA675589	MPEG 56055			ML117115	CM
Nasica longirostris	1				CM 73175				
Dendrexetastes rufigula	1*	XC87286	XC96496						
Dendrocolaptes certhia	1*,2	XC90769	XC94679		MPEG 53855			ML114916	CM
Dendrocolaptes picumnus	1*,2	XC90767	XC90703	WA500147	MPEG 53859			ML115181	CM
Xiphocolaptes promeropirhynchus	1*,2	XC94715	XC95467		MPEG 47698			ML114924	CM
Hylexetastes uniformis	1*,2	XC90740	XC90705	WA360070	MPEG 53857			ML117106	CM
FURNARIIDAE									
Xenops minutus	1*,2		XC96457		MPEG 56057	WA320530	FG	ML115050	CM
Berlepschia rikeri					USNM 109221				
Furnarius figulus	1*			WA359474	CM 72394				

Family / species	Inventories	This study			Previous fieldwork				
Furnarius minor					CM 72014	WA180980	KO		
Ancistrops strigilatus	1*	XC95119			CM 74882				
Automolus ochrolaemus	1*,2	XC94886	XC90693	WA360092	CM 74600				
Automolus paraensis	1*,2	XC95303			MPEG 53864			ML115019	CM
Automolus rufipileatus	1*,2	XC95468	XC96457		MPEG 53863				
Philydor ruficaudatum	1*,2	XC95121			CM 74983				
Philydor erythrocercum	1*,2	XC96455		WA500204	MPEG 56056				
Philydor pyrrhodes	1*,2	XC95124			MPEG 47737				
Certhiaxis cinnamomeus					MPEG 36471	WA98816	JAA		
Certhiaxis mustelinus					CM 72392				
Synallaxis albescens	1*	XC87288	XC94798		CM 72311				
Synallaxis rutilans	1*,2	XC94606			CM 74663			ML114952	CM
Synallaxis gujanensis	1*,2		XC94806		CM 72131			XC6583	SD
Cranioleuca vulpina					CM 72181			XC91265	JM
Cranioleuca muelleri					CM 71831				
PIPRIDAE									
Neopelma pallescens	1,3			WA432109	CM 78332			ML117165	CM
Tyranneutes stolzmanni	1*,2	XC94831	XC94951	WA357339	CM 74778			ML115137	CM
Pipra aureola					CM 73444				
Pipra rubrocapilla	1*,2	XC95466	XC90774	WA360056	CM 72985				
Lepidothrix iris	1*,2	XC95469	XC94872	WA350948	CM 74351			ML115232	CM
Manacus manacus	1*,2,3	XC95470	XC94611		CM 71803	WA552475	VH	ML117132	CM
Heterocercus linteatus	1				CM 74422				
Machaeropterus pyrocephalus	1*	XC91205			MPEG 35610				
Chiroxiphia pareola	1*,2,3	XC90695	XC95100	WA621992	MPEG 27125			ML117138	CM
TITYRIDAE									
Onychorhynchus coronatus	1*,2	XC94724			MPEG 56122			ML114935	CM
Terenotriccus erythrurus	1*,2	XC96314			MPEG 53924	WA320528	FG		
Myiobius barbatus	1*,2				MPEG 53929				
Myiobius atricaudus					MCZ 175749				
Schiffornis major					CM 78261				
Schiffornis turdina	1*,2	XC90687	XC96303		MPEG 56123				

Family / species	Inventories	This study			Previous fieldwork				
Laniocera hypopyrra	1*,2		XC94719		CM 74551				
Iodopleura isabellae	1*,2			WA500136					
Tityra inquisitor	1*,2,3				CM 74683				
Tityra cayana	1*,2				CM 72152				
Tityra semifasciata	1*,2			WA356510	CM 73293			ML115041	CM
Pachyramphus rufus	1*,2	XC96341		WA363556	CM 73309	WA634740	IT	ML115089	CM
Pachyramphus castaneus					CM 73462				
Pachyramphus polychopterus	1*,3				CM 72347				
Pachyramphus marginatus	1*,2		XC90680	WA500164	CM 74892				
Pachyramphus minor	1*,2		XC94849	WA674422	CM 74712			ML115056	CM
Pachyramphus validus					MPEG 56120				
COTINGIDAE									
Lipaugus vociferans	1*,2	XC95589	XC90679		CM 74728			ML114921	CM
Gymnoderus foetidus	1,3				CM 74417				
Xipholena lamellipennis	1*,2	XC96154		WA467154	CM 78385	WA320546	FG		
Cotinga cotinga	1*			WA356517	USNM 120922				
Cotinga cayana	1*,2			WA467112	CM 74452	WA320488	FG		
Querula purpurata	1*,2		XC91212	WA585264	CM 72789	WA320527	FG	ML115077	CM
Phoenicircus carnifex	1*,2		XC90519	WA358706	MZUSP 10781			ML115046	CM
RHYNCHOCYCLIDAE									
Platyrinchus saturatus	1*,2				MPEG 56112			ML114961	CM
Platyrinchus coronatus	2				MPEG 47907			ML114912	CM
Platyrinchus platyrhynchos	1*,2	XC96149			MPEG 56114			ML114975	CM
Piprites chloris	1*,2	XC94949	XC95466		MPEG 53943				
Mionectes oleagineus	1*,2	XC95577			CM 74861				
Mionectes macconnelli	1*,2	XC95582	XC95589	WA358691	MPEG 56109			ML115011	CM
Corythopis torquata	1*,2	XC94832			CM 74611				
Rhynchocyclus olivaceus	1*,2	XC90704	XC90703		MPEG 56119				
Tolmomyias assimilis	1*,2	XC90760	XC94647		CM 75085			ML115022	CM
Tolmomyias poliocephalus	1*,2	XC94953		WA573666	CM 73047			ML115009	CM
Tolmomyias flaviventris	1*,3	XC94813	XC87286	WA584504	MPEG 47911				
Todirostrum maculatum	1,3			WA357387	MPEG 15446	WA181010	KO		

Family / species	Inventories	This study			Previous fieldwork				
Todirostrum cinereum	1,3			WA363019	CM 78277				
Todirostrum chrysocrotaphum	1*	XC95679		WA359478	CM 73630				
Poecilotriccus latirostris					CM 73669				
Myiornis ecaudatus	1*,2		XC94889	WA360064	CM 73468			ML115043	CM
Hemitriccus griseipectus					CM 74717				
Hemitriccus striaticollis	1*,2,3	XC94612		WA361101	MPEG 50976			ML115017	CM
Hemitriccus minimus	1*,2	XC86601	XC95119	WA357409	CM 78150			ML114970	CM
Lophotriccus galeatus	1*,2	XC95590	XC94953		MPEG 56106			ML117099	CM
TYRANNIDAE									
Zimmerius acer	1*,2	XC95352	XC90774	WA357348	CM 78409			ML114932	CM
Inezia subflava					MCZ 175873				
Ornithion inerme	1*,2	XC95592		WA357363	CM 78584			ML117101	CM
Camptostoma obsoletum	1*,2,3		XC94885		MPEG 25716				
Elaenia flavogaster	1*,2,3		XC94776	WA359465	MPEG 35603			ML117175	CM
Elaenia parvirostris	3				CM 73503				
Elaenia cristata	1*,3			WA357381	MPEG 17659	WA206691	KO		
Elaenia pelzelni					CM 73687				
Elaenia chiriquensis	1,3			WA361082	MPEG 32449			ML117144	CM
Suiriri suiriri	3				MPEG 26415				
Myiopagis gaimardii	1*,2,3	XC90775	XC90697	WA444713	CM 74859			ML115069	CM
Myiopagis caniceps	1*	XC104022		WA357356					
Myiopagis flavivertex	1*	XC87285			CM 71927				
Myiopagis viridicata	1*				CM 74642				
Tyrannulus elatus	1*,2,3	XC94803		WA363020	MPEG 47920				
Capsiempis flaveola	1*	XC94620			CM 78368				
Phaeomyias murina	1*,3		XC94648	WA361751	MPEG 40568			ML117159	CM
Serpophaga hypoleuca					CM 72406				
Attila cinnamomeus	1*,2		XC94611	WA352332	MPEG 35605				
Attila spadiceus	1*,2		XC90702	WA676334	MPEG 53931			ML114928	CM
Attila bolivianus					CM 72909				
Legatus leucophaius	1*,2,3		XC94953	WA515389	CM 73516				
Ramphotrigon ruficauda	1*,2	XC94680		WA357403	MPEG 8627				

Family / species	Inventories	This study			Previous fieldwork				
Myiarchus tuberculifer	1*,2			WA472584	MPEG 40565				
Myiarchus swainsonii	3				CM 72386				
Myiarchus ferox	1*,2,3		XC94723	WA361742	MPEG 47899			ML115096	CM
Myiarchus tyrannulus	1*,3			WA357382	MPEG 25539			ML117042	CM
Rhytipterna simplex	1*,2	XC95588	XC95590		MPEG 56121				
Rhytipterna immunda					CM 78626				
Casiornis fuscus					CM 73783				
Pitangus sulphuratus	1*,2,3		XC94775	WA363015	CM 72043				
Philohydor lictor	1*,2			WA584507	CM 73735	WA100649	JAA		
Myiodinastes maculatus	1*,2,3		XC94723		MPEG 47896	WA446708	TD	ML117079	CM
Tyrannopsis sulphurea	1*,3			WA359435	CM 73243				
Megarhynchus pitangua	1*,2,3	XC94956		WA361104	CM 73775			ML47949	PI
Myiozetetes similis	1			WA361748	CM 78404				
Myiozetetes cayanensis	1*,2,3		XC94650	WA361745	MPEG 40564	WA205426	KO		
Myiozetetes luteiventris	1*,2	XC96496		WA515439	CM 74488			ML114934	CM
Tyrannus albogularis	1,3			WA590808	MPEG 26016	WA421557	DO		
Tyrannus melancholicus	1*,2,3		XC94812	WA143667	MPEG 47892	WA446713	TD		
Tyrannus savana	1*,3			WA436252	CM 72317	WA446706	TD		
Griseotyrannus aurantioatrocristatus	1			WA361093	MPEG 26478				
Empidonomus varius	1*,2,3		XC94874	WA361089	MPEG 47895			ML115083	CM
Conopias trivirgata	1*,2	XC87290	XC94680	WA357332	CM 72771				
Colonia colonus	1*	XC95681							
Myiophobus fasciatus	1*	XC94776							
Sublegatus obscurior					MPEG 56107				
Sublegatus modestus					MCZ 175958				
Pyrocephalus rubinus					CM 72875				
Fluvicola albiventer	1				CM 71619	WA185168	KO		
Arundinicola leucocephala	1				MPEG 36694				
Cnemotriccus fuscatus	1*	XC94878			CM 78450				
Lathrotriccus euleri					CM 78471				
Empidonax traillii					MPEG 32320				
Contopus nigrescens								ML114941	CM

Family / species	Inventories	This study			Previous fieldwork				
Knipolegus poecilocercus					CM 78169				
VIREONIDAE									
Cyclarhis gujanensis	1*,2,3		XC94878	WA363554	MPEG 40572				
Vireolanius leucotis	1*,2	XC90679	XC87290	WA357364	CM 74926			ML114963	CM
Vireo olivaceus	1*,2,3	XC90697	XC94648	WA363560	MPEG 54788	WA552752	VH		
Vireo altiloquus	1				MCZ 176304				
Hylophilus semicinereus	1*,2	XC92089	XC94620		MCZ 176308				
Hylophilus pectoralis	1*,2,3		XC94620	WA363555	MPEG 47949			ML117123	CM
Hylophilus hypoxanthus	1*,2	XC94847	XC94680	WA360087	MPEG 47950			XC6510	SD
Hylophilus ochraceiceps	1*,2	XC96312			MPEG 36470			ML115235	CM
HIRUNDINIDAE									
Atticora fasciata	1,2			WA584510					
Stelgidopteryx ruficollis	1*,2,3			WA472579	CM 72747	WA100657	JAA		
Progne tapera	1,3			WA462582	MPEG 54787				
Progne subis	1			WA573665	LACM 38905				
Progne chalybea	1*,2	XC96378	XC95572	WA348548	CM 74309	WA205428	KO		
Tachycineta albiventer	1*,2,3			WA348554	CM 72712	WA206709	KO		
Hirundo rustica	1*,3			WA360057	MPEG 47927				
Riparia riparia	1*			WA360063					
TROGLODYTIDAE									
Microcerculus marginatus	1*,2	XC94706			MPEG 56138			XC6568	SD
Odontorchilus cinereus	1*,2	XC90774	XC94623	WA335247	CM 74980			ML114936	CM
Troglodytes musculus	1*,2,3	XC94798		WA358650	MPEG 47936				
Campylorhynchus turdinus	1*,2	XC96294			CM 75082				
Pheugopedius coraya	1*,2	XC90737	XC86601	WA360049	MPEG 53947			ML115045	CM
Canthorchilus leucotis	1*,2,3	XC94806	XC94620	WA142405	MPEG 47935			ML117127	CM
Cyphorhinus arada	1*,2		XC96732		MPEG 56136			ML117074	CM
DONACOBIIDAE									
Donacobius atricapilla	1*	XC94812			CM 71507				
POLIOPTILIDAE									
Ramphocaenus melanurus	1*,2		XC94882		CM 74871			ML114958	CM
Polioptila plumbea	1			WA352469	CM 78424				

Family / species	Inventories	This study			Previous fieldwork				
Polioptila paraensis	1*,2								
TURDIDAE									
Catharus fuscescens					MPEG 54844				
Catharus mimus					MPEG 47943				
Turdus nudigenis					CM 72988				
Turdus leucomelas	1*,3	XC90695	XC94670	WA443928	MPEG 35602	WA446714	TD		
Turdus fumigatus	1*			WA358714	CM 74475				
Turdus albicollis	1*,2	XC96492			MPEG 56139				
MIMIDAE									
Mimus saturninus					MPEG 08546				
MOTACILIDAE									
Anthus lutescens	1*	XC96368			CM 73185				
COEREBIDAE									
Coereba flaveola	1*,2,3			WA333900	MPEG 53952			ML115037	CM
THRAUPIDAE									
Saltator grossus	1*,2	XC90772	XC92089	WA515530	MPEG 56142			ML114919	CM
Saltator maximus	1*,2	XC96344			MPEG 23662				
Saltator coerulescens	1*			WA610324	CM 72178				
Parkerthraustes humeralis	1*,2	XC104858		WA357371					
Lamprospiza melanoleuca	1*,2	XC94951	XC94949	WA500186	CM 74850				
Nemosia pileata	1,3			WA357328	CM 72632			ML117145	CM
Tachyphonus rufus	1*,2,3	XC96330		WA358064	FMNH 258333	WA509899	IT		
Ramphocelus carbo	1*,2,3		XC94611	WA358061	MPEG 22794	WA100650	JAA	ML115208	CM
Ramphocelus nigrogularis					CM 72702				
Lanio luctuosus	1*,2				CM 75084				
Lanio cristatus	1*,2			WA467147	CM 74707				
Lanio cuculatus	1	XC94890		WA435508					
Lanio versicolor	1*,2	XC96152			MPEG 53955			XC91264	JM
Lanio surinamus	1*,2				CM 75078			ML115051	CM
Lanio penicillatus					CM 73592				
Tangara mexicana	1*,2,3	XC96313			CM 72207			XC5981	SD
Tangara velia	1*,2			WA357353					

Family / species	Inventories	This study			Previous fieldwork				
Tangara varia	1*	XC96295							
Tangara punctata	1*,2			WA467140					
Tangara episcopus	1*,2,3		XC94878	WA358065	MPEG 17778	WA182124	KO		
Tangara palmarum	1*,2,3		XC94648	WA500207	CM 72052	WA182125	KO		
Tangara cayana	1,3			WA444716	CM 78198	WA509900	IT		
Schistoclamis melanops				WA551855	MPEG 37767				
Paroaria gularis	1,2,3			WA340077	CM 73727	WA559505	VH		
Dacnis lineata	1*,2			WA356513					
Dacnis flaviventer					CM 72799				
Dacnis cayana	1*,2,3			WA467126	MPEG 23826				
Cyanerpes caeruleus	1*,2			WA487618	CM 74612				
Cyanerpes cyaneus	1*,2,3			WA356513	CM 72808			ML117142	CM
Chlorophanes spiza	1*			WA443043	MCZ 22928			ML115025	CM
Hemithraupis guira	1*,2			WA500180	CM 74941				
Conirostrum bicolor					CM 73679				
EMBEREZIDAE									
Amnodramus humeralis	1,3			WA544922	MPEG 23449			ML117039	CM
Ammodramus aurifrons	1			WA583468	CM 73732	WA183290	KO		
Sicalis colombiana	1			WA144015	MPEG 36695	WA446718	TD	ML47953	PI
Sicalis luteola					CM 73513				
Volatinia jacarina	1*,2,3		XC94618	WA467122	CM 71954			ML117171	CM
Sporophila schistacea					MPEG 47983				
Sporophila americana	1*		XC94776	WA444715	CM 71800				
Sporophila lineola	1*			WA500123	CM 72651				
Sporophila nigricollis	1*			WA347325		WA576640	IT		
Sporophila caerulescens	2				MCZ 176848				
Sporophila minuta	1*			WA467116	CM 72072				
Sporophila castaneiventris				WA340079	CM 71617				
Sporophila angolensis	1*,2,3		XC94874	WA514803	CM 72521				
Arremon taciturnus	1*,2	XC94778			MPEG 53961			ML115061	CM
CARDINALIDAE									
Piranga flava	3				USNM 276980				

Family / species	Inventories	This study			Previous fieldwork				
Piranga rubra				WA924652	MZUSP 47382				
Habia rubica	1*,2		XC96312		MPEG 35338			ML88362	CM
Granatellus pelzelni	1*	XC92090			CM 74460				
Periporphyrus erythromelas	1*,2	XC104023							
Cyanoloxia cyanoides	1*,2	XC94734			MPEG 35608			ML115042	CM
PARULIDAE									
Phaeothlypis rivularis					MPEG 53957			ML114985	CM
Dendroica striata	3				MPEG 50977			ML117141	CM
Geothlypis aequinoctialis					CM 78459				
ICTERIDAE									
Psarocolius viridis	1*,2		XC91202		CM 75037			ML115067	CM
Psarocolius decumanus	1*,2,3				CM 71975			ML115059	CM
Psarocolius bifasciatus	1*,2		XC94714		CM 73313				
Procacicus solitarius					CM 71999				
Cacicus haemorrhous	1*,2				CM 74580				
Cacicus cela	1*,2,3	XC94775		WA441607	MPEG 23351			ML115210	CM
Icterus cayanensis	1,2			WA675100	CM 72081				
Icterus croconotus					CM 72609			XC91267	JM
Gymnomystax mexicanus	1			WA348555	CM 71607	WA550297	VH		
Chrysomus icterocephalus					CM 71939				
Molothrus oryzivorus	1*,2,3			WA348559	MPEG 15252	WA240665	IT		
Molothrus bonariensis	1*,2			WA348556	MPEG 36693	WA550669	VH		
Sturnella militaris	1*,3			WA467176	MPEG 35614				
FRINGILIDAE									
Euphonia chlorotica	1,3			WA357326	CM 72623	WA370312	IT		
Euphonia violacea	1*,2			WA584513	CM 72853			ML115106	CM
Euphonia minuta	1*,2				CM 73799				
Euphonia xanthogaster					CM 74535				
Euphonia rufiventris	1*,2	XC94738		WA514793				ML115140	CM
PASSERIDAE									
Passer domesticus	1			WA349047					

APPENDIX 2

List of 26 species reported from the Santarém-Belterra region, south of the Amazon and east of the Tapajós (PA, Brazil) but without any permanent vouchering material.

Species	**Details of sighting**
Penelope jacquacu	Sight records, C. B. A., A. C. L., B. J. W. D., Catchments: 69, 81, 99, 103, 157, 165, 236, 260, 261, 307, 399
Egretta tricolor	Sight record, A. Whittaker 14/11/1988, Alter do Chão
Ictinia mississippiensis	Sight record, G. M. Kirwan & C. F. Collins, 19 Alter do Chão 4/12/2005, listed in Whittaker *et al.* (2008)
Helicolestes hamatus	Sight record listed in Henriques *et al.* (2003)
Buteo albonotatus	Sight record listed in Sanaiotti & Cintra (2001)
Falco columbarius	Sight record, E. L., 30/11/2011, campus of the Universidade Federal do Oeste do Pará
Aratinga maculata	Sight records by E. Willis: Maicá 16/011984, Rodagém, 18/10/1984, Urumari, in Feb,1985, listed in Willis & Silva (1986)
Pyrrhura lepida	Aural records, E. L, 15/02/2012, Rio Curuauna
Cypseloides sp.	Sight record, A. C. L., 27/01/2011, Catchment 129
Threnetes leucurus	Mist net captures listed by Henriques *et al.* (2003)
Phaethornis hispidus	Sight record, B. J. W. D. 31/01/2011, Catchment 112
Lophornis ornatus	Sight record Henriques *et al.* (2003)
Chrysolampis mosquituus	Sight record B. Whitney Km 21 on road to Alter do Chão, 19 June and again 7 July 1995)
Trogon curucui	Aural records C. B. A., A. C. L., B. J. W. D., Catchments: 81, 112
Brachygalba lugubris	Sight records in Henriques *et al.* (2003)
Xenops rutilans	Sight records C. B. A., Catchment: 157
Microxenops milleri	Sight records C. Marantz, 23/8/1999, 18/09/1999, 09/10/1999, Base de Sucupira, FLONA
Dixiphia pipra	Mist-net capture, Henriques *et al.* (2003)
Tolmomyias sulphurescens	Mist-net capture, reported in Henriques *et al.* (2003)
Sirystes sibilator	Sight record listed in Sanaiotti & Cintra (2001)
Contopus cooperi	Sight record, C. Marantz, 26/09/1999, Base de Sucupira, FLONA
Petrochelidon pyrrhonota	Sight record, A. Whittaker, 14/111988, Alter do Chão (in Stotz *et al.* 1992)
Atticora tibialis	Sight record, C. B. A.,18/11/2010, Catchment 307
Cyanocorax chrysops	Sight record, B. Whitney, 06/071995, Maicá
Tersina viridis	Sight record in Sanaiotti & Cintra (2001)
Cissopis leverianus	Sight record, C. B. A. 03/11/2010, Catchment 399

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ARTICLE

Las aves de la isla Lobos de Tierra, Perú: revisión bibliográfica y nuevos registros (1684-2011)

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ABSTRACT: The birds of Lobos de Tierra island, Peru: a review and new records (1684-2011). The present work is based on a detailed review of bird observations made on Lobos de Tierra island (06°26'S; 80°51'W) by various authors since 1684, as well as interviews with island rangers and other researchers, and field assessments carried out in 1999, 2000, 2004 and 2011. This compilation came to a total of 43 species (11 breeding), *Sula nebouxii* and *Pelecanus thagus* being the most abundant. The high number of records compared with other islands in Peru are related to the island's proximity to the coast and its location on the convergence zone of the cold waters of the Peruvian Current and the warm waters of the Equatorial Countercurrent. Of all the species, 17 are listed in a conservation category.

KEY-WORDS: birds, Lobos de Tierra island, Peru.

INTRODUCCIÓN

La isla Lobos de Tierra se ubica al norte del Perú, entre las regiones de Piura y Lambayeque. Es una isla deshabitada y un área reservada para la explotación del guano de aves marinas desde inicios del siglo pasado, formando parte de la recientemente creada Reserva Nacional Sistema de Islas, Islotes y Puntas Guaneras (MINAM 2010). Además, está considerada como un área importante para la conservación y reproducción de las aves marinas en el Perú (IBA PE012; Franke *et al.* 2005, Franke 2006).

Los primeros alcances sobre las especies de aves y su abundancia en esta isla fueron realizados por Forbes (1914), Coker (1919), Murphy (1925a, 1936) y Tovar (1968). Posteriormente, se desarrollaron numerosas investigaciones principalmente orientadas a la ecología y dieta de las aves guaneras (*Phalacrocorax bougainvillii, Sula variegata* y *Pelecanus thagus*) y *Sula nebouxii* (Duffy 1987, Jahncke & Goya 1997a, 1998a, Jahncke *et al.* 1997, Zavalaga *et al.* 2007, 2008, 2009a, 2010a, 2010b, 2011).

El objetivo del presente trabajo es sistematizar la información existente relacionada a la avifauna de la isla Lobos de Tierra, así como dar a conocer los nuevos registros, incluyendo en algunos casos su número poblacional y distribución.

MÉTODOS

Área de estudio

La isla Lobos de Tierra (LT) se ubica frente al límite de las regiones Lambayeque y Piura (06°26'S; 80°51'O) (Figura 1). Es una de las islas más grandes del litoral peruano, con un área de 14.3 km^2 (10.5 km de largo por 4.0 km en su parte más ancha). Está orientada en dirección norte-sur, a 11.4 km de la costa, con una altura máxima de 92 m. Presenta una geografía accidentada, con laderas pedregosas de roca granítica y playas arenosas (DHN 2003), casi desprovista de vegetación, a excepción de algunos pequeños parches de verdolaga (*Sesuvium portulacastrum*) en las orillas arenosas del lado sureste de la isla (Figuras 2a y 2b). Como ocurre a lo largo del todo el litoral peruano, las mayores temperaturas del aire se presentan en el primer trimestre del año (23.4°C), disminuyendo en los siguientes trimestres (entre 17.7°C y 20.7°C) y aumentando en el último (18.0°C; Schweigger 1931, BCAG 1934-1941). En el caso de la temperatura superficial del mar también se presenta este mismo comportamiento (Carbajal *et al.* 2003, 2004a, 2004b, 2005b, 2006, De la Cruz *et al.* 2006).

En base a la presencia de indicadores biológicos, como las diatomeas *Lithodesmium undulatum*, *Skeletonema costatum, Chaetoceros debilis*, *Thalassiosira subtilis,* entre otras, se conoce que LT presenta activos procesos de afloramientos costeros (Carbajal *et al.* 2004a, 2004b). Asimismo, los datos oceanográficos (temperatura, salinidad

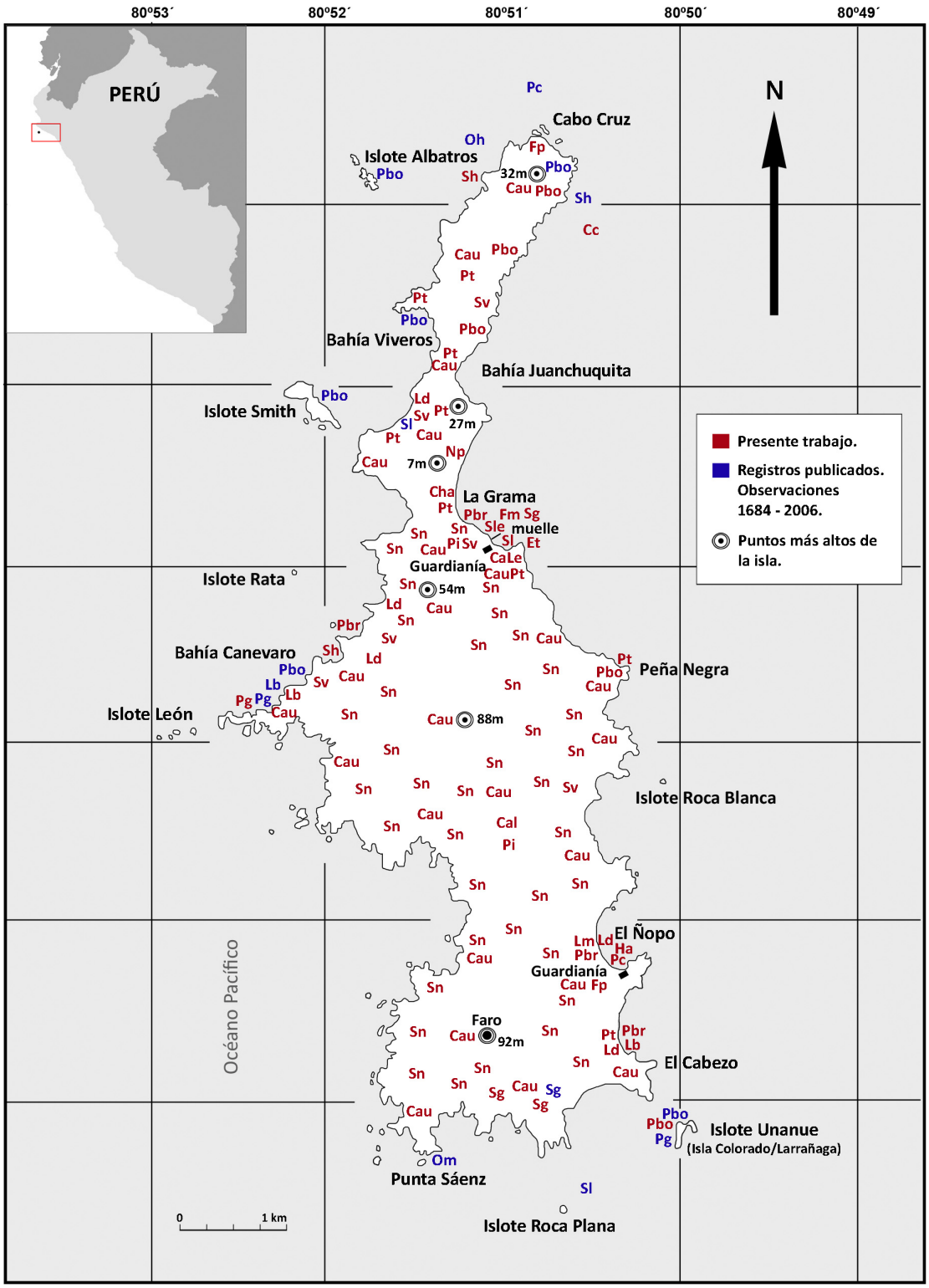

FIGURA 1. Mapa de la isla Lobos de Tierra y lugares donde fueron observadas las aves: Pc - *Phoenicopterus chilensis*, Sh - *Spheniscus humboldti*, Pi - *Phoebastria irrorata*, Pc - *Pterodroma cookii*, Om - *Oceanodroma markhami*, Oh - *Oceanodroma hornbyi*, Pg - *Pelecanoides garnotii*, Fm - *Fregata magnificens*, Sn - *Sula nebouxii,* Sv - *Sula variegata,* Sg - *Sula granti*, Sle - *Sula leucogaster*, Pb - *Phalacrocorax brasilianus*, Pg - *Phalacrocorax gaimardi*, Pbo - *Phalacrocorax bougainvillii*, Pt - *Pelecanus thagus*, Et - *Egretta thula*, Cau - *Cathartes aura*, Fp - *Falco peregrinus*, Cha - *Charadrius alexandrinus*, Ha - *Haematopus ater*, Np - *Numenius phaeopus*, Cal - *Calidris alba*, Cc - *Chroicocephalus cirrocephalus*, Lm - *Leucophaeus modestus*, Lb - *Larus belcheri*, Ld - *Larus dominicanus*, Sl - *Sternula lorata*, Li - *Larosterna inca*.

FIGURE 1. Map of the Lobos de Tierra island and places where birds were observed: Pc - *Phoenicopterus chilensis*, Sh - *Spheniscus humboldti*, Pi - *Phoebastria irrorata*, Pc - *Pterodroma cookii*, Om - *Oceanodroma markhami*, Oh - *Oceanodroma hornbyi*, Pg - *Pelecanoides garnotii*, Fm - *Fregata magnificens*, Sn - *Sula nebouxii,* Sv - *Sula variegata,* Sg - *Sula granti*, Sle - *Sula leucogaster*, Pb - *Phalacrocorax brasilianus*, Pg - *Phalacrocorax gaimardi*, Pbo - *Phalacrocorax bougainvillii*, Pt - *Pelecanus thagus*, Et - *Egretta thula*, Fp - *Falco peregrinus*, Cha - *Charadrius alexandrinus*, Ha - *Haematopus ater*, Np - *Numenius phaeopus*, Cal - *Calidris alba*, Cc - *Chroicocephalus cirrocephalus*, Lm - *Leucophaeus modestus*, Lb - *Larus belcheri*, Ld - *Larus dominicanus*, Sl - *Sternula lorata*, Li - *Larosterna inca*.

a

b

FIGURA 2. (A) Áreas planas al noreste de la isla, con colonias de *Pelecanus thagus*. Foto: M. Stucchi (b) Áreas accidentadas al centro-sur de la isla, con presencia de *Sula nebouxii* y *S. granti*. Foto: JF.

FIGURE 2. (A) Flat areas in the northeast of the island, with colonies of *Pelecanus thagus.* Photo: M. Stucchi. (b) Hilly areas in the center-south of the island, with presence of *Sula nebouxii* and *S. granti*. Photo: JF.

y oxígeno disuelto) y la presencia del dinoflagelado *Protoperidinium obtusum*, señalan que esta isla se caracteriza por la predominancia de aguas costeras frías, cuya salinidad puede variar entre los 35.01 y 35.14 ups (Carbajal *et al.* 2004a, 2004b, De la Cruz *et al.* 2006). A inicios de cada año presenta una ligera influencia de las aguas subtropicales superficiales (Carbajal *et al.* 2004a, 2005b). Alrededor de la isla existen praderas de algas macrofíticas, especialmente del género *Caulerpa* sp. (Carbajal *et al.* 2003, 2005b, De la Cruz *et al.* 2006), las cuales están asociadas con los altos valores de oxígeno disuelto en el mar.

En el lado centro-oeste de la isla, frente a los islotes León, se encuentra un apostadero de lobo marino chusco (*Otaria flavescens*).

Procedimiento y colecta de datos

La lista de aves de la isla LT se ha compilado en base a cinco fuentes de información: (1) Observaciones hechas por la autora el 27 y 28 de marzo de 1999, 9 y 10 de junio de 1999, 10 y 11 de agosto de 1999, 24 y 25 de febrero de 2000, del 6 al 8 de diciembre de 2004 y del 28 de febrero al 3 de marzo de 2011. Estas se realizaron de forma oportunista, en el desarrollo de los censos del lobo marino chusco al oeste de la isla (1999), así como los censos y búsqueda de nuevas áreas de reproducción del piquero de Nazca (*Sula granti*) y la gaviota dominicana (*Larus dominicanus*) (2000, 2004 y 2011). Para estos últimos, los recorridos se realizaron en dos grupos, tratando de cubrir toda la isla, entre las 08 h y 17 h. Se tomaron registros fotográficos de algunas especies.

(2) Observaciones y registros fotográficos realizados por otros investigadores.

(3) Registros entre enero de 2009 a febrero de 2011, proporcionados por tres guarda-islas de AGRORURAL (Programa de Desarrollo Productivo Agrario Rural - Ministerio de Agricultura), quienes se encargan del monitoreo de las aves guaneras, por lo que una vez al mes realizan un censo general de toda el área.

(4) Búsqueda de colectas en la base de datos del American Museum of Natural History (AMNH) (http://entheros.amnh.org/db/emuwebamnh/Query.php) y Natural History Museum of London (NHM) (http://www.nhm.ac.uk/jdsml/research-curation/research/projects/birdtype/search.dsml).

(5) Artículos publicados anteriormente sobre la avifauna de LT.

RESULTADOS Y DISCUSIÓN

Diversidad

Se registraron 43 especies de aves entre marinas y terrestres, 11 de ellas anidando en la isla (Tabla 1). Estas pertenecieron a 18 familias, siendo la más diversa Laridae con ocho especies, seguida de Procellariidae, Hydrobatidae, Sulidae y Scolopacidae, con cuatro especies cada una. Del total de especies, 35 fueron registradas anteriormente en la bibliografía, y ocho correspondieron a nuevos registros para LT: *Phoenicopterus chilensis, Sula leucogaster, Egretta thula, Falco peregrinus, Charadrius alexandrinus, Numenius phaeopus, Chroicocephalus cirrocephalus* y *Leucophaeus modestus.*

Esta diversidad y grandes números poblaciones de algunas especies (*Sula nebouxii* y *Pelecanus thagus*), podrían guardar relación con el conjunto de las siguientes condiciones: a) gran área de extensión (segunda isla más grande del Perú), b) cercanía a la costa, c) clima y fisiografía (Murphy 1925a), d) su ubicación entre las aguas de surgencia fría de la Corriente Peruana y la baja productividad de las aguas cálidas de la Contracorriente Ecuatorial (Duffy *et al.* 1984) y, e) características oceanográficas, que hacen propicio el desarrollo de la anchoveta *Engraulis ringens*, principal especie ictiológica de la dieta de las aves guaneras y otras especies, como *S. nebouxii* y *S. granti*, todas habitantes de LT (Jahncke & Goya 1997a, Jahncke *et al.* 1997, Jahncke 1998, Jahncke & Goya 1998a,).

En comparación con otras islas del Perú el número de especies en LT es mayor [isla Foca (Piura) con 34 especies (Novoa *et al.* 2010, Rivas 2010, Figueroa & Stucchi 2012), Lobos de Afuera (Lambayeque) con 33 especies (Stucchi *et al.* 2011), El Frontón (Callao) con 20 especies (Rivadeneira *et al.* 1986) y San Lorenzo (Callao) con 17 especies (Gonzáles *et al.* 2005)]. Además de las condiciones arriba descritas, esto también podría deberse a que LT es una de las islas más estudiadas del país.

Sin embargo, a pesar que la isla se encuentra cercana a la costa (11.4 km), no se ha registrado un mayor número de especies terrestres. Esto podría estar relacionado a la casi total falta de vegetación en el área. Asimismo, llama la atención la ausencia de *Progne murphyi,* la cual es endémica de la costa peruana (Plenge 2011). Esta ha sido observada en islas cercanas al litoral, ubicadas hasta 5 km de la costa: Santa y Ferrol (Ancash) (Valverde *et al.* 2007), Chao y Corcovado (La Libertad) (Balta *et al.* 2005) y Foca (Piura) (Novoa *et al.* 2010), pero principalmente en áreas costeras (Valverde *et al.* 2007). Parece existir una relación entre la presencia de las colonias de esta especie y la escasa perturbación de las áreas, principalmente por la ausencia de la extracción del guano (Balta *et al.* 2005, Valverde *et al.* 2007), condición que no se da en LT debido a que esta actividad se realizó de forma continua entre 1986 y 1999 (Proabonos 2008), y después de 11, años en el 2010. Por otro lado, existe la posibilidad de que la falta del registro de *P. murphyi* y de otras aves terrestres, sean debido a que las observaciones fueron realizadas solo de forma oportunista.

TABLA 1. Lista de aves registradas en la isla Lobos de Tierra (1684-2011)

Registros previos: (1) AMNH (2011), (2) Ayala (2006), (3) Coker (1919), (4) Dampier (1729), (5) Duffy (1987), (6) Duffy *et al.* (1984), (7) Figueroa (2010), (8) Figueroa *et al.* (2011b), (9) Forbes (1914), (10) Guillén (1991), (11) Jahncke & Goya (1997a), (12) Jahncke & Goya (1997b), (13) Jahncke & Goya (1998a), (14) Jahncke & Goya (1998b), (15) Jahncke & Paz-Soldán (1998), (16) Jahncke *et al.* (1997), (17) Mills (1968), (18) Murphy (1925a), (19) Murphy (1925b), (20) Murphy (1936), (21) NHM (2011), (22) Nelson (1978), (23) Schulenberg & Parker (1981), (24) Schweigger (1947), (25) Taylor *et al.* (2010), (26) Tovar (1968), (27) Vogt (1942), (28) Wetmore (1923), (29) Zavalaga (2003), (30) Zavalaga *et al.* (2002), (31) Zavalaga *et al.* (2007), (32) Zavalaga *et al.* (2008), (33) Zavalaga *et al.* (2009a), (34) Zavalaga *et al.* (2009b), (35) Zavalaga *et al.* (2010a), (36) Zavalaga *et al.* (2010b), (37) Zavalaga *et al.* (2011).

Evidencia: O - Observado, C - Colectado, F - Fotografiado.
Cantidad: ME - Muy Escaso: menos de diez individuos, E - Escaso: decenas de individuos, M - Medio: centenares de individuos, A - Abundante: miles individuos.
Frecuencia: Cm - Común: observada en toda la isla, L - Localizado: habita en zonas específicas, O - Ocasional: llegan a la isla accidental o eventualmente.
Estacionalidad: Re - Residente, M - Migratorio, R - Reproductivo, I - Indeterminado.

[a]Ministerio de Agricultura: Categorización de especies amenazadas de fauna silvestre del Perú.
[b]IUCN: CR - En peligro crítico, EN - En peligro, VU - Vulnerable, NT- Casi amenazado.
[c]CITES: Apéndice I: Especie en peligro de extinción, Apéndice II: Especie cuyo comercio debe controlarse a fin de evitar una utilización incompatible con su supervivencia.
[d]CMS: Apéndice I: Especie migratoria en peligro, Apéndice II: Especie migratoria cuyo estado de conservación es desfavorable.

TABLE 1. List of birds recorded on the Lobos de Tierra island (1684-2011).

Previous records: (1) AMNH (2011), (2) Ayala (2006), (3) Coker (1919), (4) Dampier (1729), (5) Duffy (1987), (6) Duffy *et al.* (1984), (7) Figueroa (2010), (8) Figueroa *et al.* (2011b), (9) Forbes (1914), (10) Guillén (1991), (11) Jahncke & Goya (1997a), (12) Jahncke & Goya (1997b), (13) Jahncke & Goya (1998a), (14) Jahncke & Goya (1998b), (15) Jahncke & Paz-Soldán (1998), (16) Jahncke *et al.* (1997), (17) Mills (1968), (18) Murphy (1925a), (19) Murphy (1925b), (20) Murphy (1936), (21) NHM (2011), (22) Nelson (1978), (23) Schulenberg & Parker (1981), (24) Schweigger (1947), (25) Taylor *et al.* (2010), (26) Tovar (1968), (27) Vogt (1942), (28) Wetmore (1923), (29) Zavalaga (2003), (30) Zavalaga *et al.* (2002), (31) Zavalaga *et al.* (2007), (32) Zavalaga *et al.* (2008), (33) Zavalaga *et al.* (2009a), (34) Zavalaga *et al.* (2009b), (35) Zavalaga *et al.* (2010a), (36) Zavalaga *et al.* (2010b), (37) Zavalaga *et al.* (2011).

Evidence: O - Observed, C - Collected, F - Photographed.
Quantity: ME - Very low: less than ten individuals, E - Low: dozens of individuals, M - Medium: hundreds of individuals, A - Abundant: thousands individuals.
Frequency: Cm - Common: seen throughout the island, L - Located: living in specific areas, O - Occasional: arriving on the island accidentally or eventually.
Seasonality: Re - Resident, M - Migratory, R - Reproductive, I - Indeterminate.

[a]Ministry of Agriculture: Categorization of endangered species of wildlife of Peru.
[b]IUCN: CR - Critically Endangered, EN - Endangered, VU - Vulnerable, NT- Near Threatened.
[c]CITES: Appendix I: Includes species threatened with extinction, Appendix II: Includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival.
[d]CMS: Appendix I: Endangered migratory species, Appendix II: Migratory species conserved through agreements.

FAMILIA / Especie	Reportes previos	Evidencia, año del registro	Cantidad / Frecuencia	Estacionalidad	Categoría de Amenaza			
					MINAG 2004[a]	IUCN 2011[b]	CITES 2011[c]	CMS 2009[d]
Phoenicopteridae (1)								
Phoenicopterus chilensis		O2011	ME / O		NT	NT	II	
Spheniscidae (1)								
Spheniscus humboldti	4, 6, 20, 26	O1684, 1920, 1979, 1982; F2011	E / L	Re, R	EN	VU	I	I
Diomedeidae (3)								
Phoebastria irrorata	3, 20	C1912; O1908, 1920, 2002	ME / O	M	VU	CR		II
Thalassarche melanophris	20	C1912, 1920	ME / O	M		EN		II
Thalassarche salvini	20, 21	C1912	ME / O	M		VU		

FAMILIA / Especie	Reportes previos	Evidencia, año del registro	Cantidad / Frecuencia	Estacionalidad	Categoría de Amenaza			
					MINAG 2004[a]	IUCN 2011[b]	CITES 2011[c]	CMS 2009[d]
Procellariidae (4)								
Daption capense	24	O1939	ME / O	M				
Pterodroma cookii	20	C1922	ME / O	M		VU		
Pachyptila belcheri	23	O1978	ME / O	M				
Puffinus griseus	18	O1920	ME / O	M		NT		
Hydrobatidae (4)								
Oceanites gracilis	20	C1920	ME / O	I				
Oceanodroma markhami	20	O1920	ME / O	I	VU			
Oceanodroma hornbyi	17, 28	O1922, 1965	ME / O	I				
Oceanodroma melania	28	O1922	ME / O	I				
Pelecanoididae (1)								
Pelecanoides garnotii	9, 14, 20	O1913, 1996	I	I	CR	EN		I
Fregatidae (1)								
Fregata magnificens	3, 20	O1907, 1920, 2011; F2006	ME / O					
Sulidae (4)								
Sula nebouxii	2, 3, 5, 10, 15, 16, 20, 25, 26, 31, 32	O1907, 1920, 1963, 1978, 2002, 2003; F2011	A / Cm	Re, R				
Sula variegata	2, 5, 9, 11, 13, 15, 16, 20, 22, 25, 33, 35	O1913, 1920, 1978; F2011	A / L	Re, R	EN			
Sula granti	12, 16	O1996; F1999, 2004, 2011	E / L	Re, R	EN			
Sula leucogaster		F2011	ME / O					
Phalacrocoridae (3)								
Phalacrocorax brasilianus	3, 9	O1907, 1913; F2011	E / Cm	Re, R				
Phalacrocorax gaimardi	9, 26, 30	O1913, 1963, 1999, 2010	E / L	Re, R	EN	NT		
Phalacrocorax bougainvillii	3, 9, 11, 13, 15, 16, 20, 22, 27	O1907, 1913, 1920; F2011	A / L	Re, R	EN	NT		
Pelecanidae (1)								
Pelecanus thagus	3, 20, 22, 27, 36, 37	O1907, 2010; C1920; F2011	A / L	Re, R	EN	NT		
Ardeidae (1)								
Egretta thula		O2010	ME / O					
Cathartidae (1)								
Cathartes aura jota	3, 8, 9, 29	O1907, 1913, 2000, 2002, 1999, 2004; F2011	M / Cm	Re, R				
Falconidae (1)								
Falco peregrinus		F2011	ME / O	M	NT		I	

FAMILIA / Especie	Reportes previos	Evidencia, año del registro	Cantidad / Frecuencia	Estacionalidad	Categoría de Amenaza			
					MINAG 2004[a]	IUCN 2011[b]	CITES 2011[c]	CMS 2009[d]
Charadriidae (2)								
Charadrius alexandrinus		O2010	ME / O	I				
Oreopholus ruficollis pallidus	1	C1912	ME / O	M				
Haematopodidae (2)								
Haematopus palliatus pitanay	19, 20	O1920	ME / O	I				
Haematopus ater	3	O1907, 2010	ME / O	I				
Scolopacidae (4)								
Numenius phaeopus		O2011	ME / O	M				
Tringa incana	3	O1907	ME / O	M				
Calidris alba	3	O1907; F2011	ME / O	M				
Calidris mauri	3	O1907	ME / O	M				
Stercorariidae (1)								
Stercorarius chilensis	20	O1913	ME / O					
Laridae (8)								
Creagrus furcatus	20	O1920	ME / O	M				
Chroicocephalus cirrocephalus		F2011	ME / O	M				
Leucophaeus modestus		O1999; F2011	ME / O	M				
Leucophaeus pipixcan	20	O1920	E / O	M				
Larus belcheri	20	O1920; F2011	E / L	R				
Larus dominicanus	3, 6, 7, 20, 26	O1907, 1920, 1963, 1979; F2004, 2011	M / L	Re, R				
Sternula lorata	20, 34	O1920, 2006, 2010	E / O	I	VU	EN		I
Larosterna inca	26	O1963, 2011	E / L	Re, R?	VU	NT		

Especies registradas

Phoenicopterus chilensis

A principios de diciembre de 2010, A. Oliva (*com. pers.*) observó un individuo en la playa El Ñopo, que se encontraba en malas condiciones de salud, muriendo al día siguiente de ser visto. Este podría tratarse de un individuo perdido que formó parte de los grandes grupos de *P. chilensis* (~7000 individuos) que migraron a la laguna de Ñapique (Piura) a fines del 2010 (F. Angulo *com. pers.*).

Spheniscus humboldti (Figura 3a)

Es una especie endémica de la Corriente Peruana, actualmente muy escasa en la isla LT. Dampier (1729), a mediados de noviembre de 1684 arribó al lado noreste de LT encontrando una gran cantidad de individuos de esta especie. Posteriormente, esta población decreció considerablemente. Murphy (1936) no observó individuos vivos en la isla; en enero de 1920 solo encontró la piel de un pingüino que recientemente había sido cazado cerca de los campamentos de pesca. Al

respecto, el administrador de operaciones de extracción del guano, le informó que en años pasados, en los islotes adyacentes, grandes números de pingüinos mantenían sus madrigueras dentro del guano. En febrero de 1979 y mayo de 1982, se observaron cinco individuos en cada caso (Duffy *et al.* 1984). Estos mismos autores nombran otros conteos realizados en LT por Pesca Perú, 1000 individuos en diciembre de 1980 y 900 individuos en marzo de 1981, sin embargo, señalan que podrían estar sobrevalorados. El 24 de febrero de 1999, se observaron seis pingüinos en muda en la bahía Canevaro. En marzo de 2011 se encontró en esta misma bahía, una colonia conformada por 38 individuos (36 adultos en muda y dos jóvenes), así como un individuo joven descansando en una punta al norte de la isla.

Phoebastria irrorata (Figura 3b)

Fue observado en 1908, entre LT y Eten, volando en grupos de 30 individuos (Coker 1919). Posteriormente, en mayo de 1912 y enero de 1920 se registraron pequeños grupos nadando cerca a LT (Murphy 1936). En julio de 2002, G. Mori (*com. pers.*) encontró un individuo descansando en un área plana en la parte central de LT, y el 24 de junio de 2006, I. García-Godos (*com. pers.*) observó otro individuo adulto descansando en la isla, a 200 m al sur de la guardianía de La Grama.

Thalassarche melanophris

H. O. Forbes colectó dos especímenes en los alrededores de LT en junio de 1912. Murphy cazó otro espécimen en 1920 (Murphy 1936).

Thalassarche salvini

Cuatro especímenes (tres machos y una hembra) fueron colectados por H. O. Forbes en los alrededores de LT entre el 28 de mayo y 27 de junio de 1912, y depositados en el NHM, donde posteriormente fueron identificados como *Diomedea cauta salvini* (Murphy 1936, Hellmayr & Conover 1948). Además, en esta colección, se tiene el registro de un albatros macho adulto también colectado por H. O. Forbes cerca a LT el 5 de marzo de 1912, e identificado como *Diomedia cauta peruvia* (Mathews 1933, Warren 1966), el cual fue identificado como sinónimo de *D. c. salvini* (Mayr & Cottrell 1979). Posteriormente, *Diomedea* fue cambiado al género *Thalassarche*, y *T. salvini* fue separado de la especie politípica *D. cauta* (Robertson & Nunn 1998).

Daption capense

Schweigger (1947) señaló que esta especie fue observada cerca de las islas de Lobos (LT y Lobos de Afuera) en septiembre de 1939, e indicó que en años posteriores no la volvió a ver.

Pterodroma cookii

C. L. Fagan colectó dos especímenes al norte de LT el 31 de julio de 1922 (Murphy 1936).

Pachyptila belcheri

Entre el 26 de junio y 15 de julio de 1978, M. Williams (Schulenberg & Parker 1981) encontró en Lambayeque varios individuos muertos: uno en Pimentel, tres en San José y uno en la isla LT.

Puffinus griseus

Varios individuos de esta especie fueron observados por Murphy (1925b) a 3.5 km de LT, en enero de 1920.

Oceanites gracilis

Murphy (1936) detalla las medidas morfométricas de 40 ejemplares colectados entre Chilca y LT.

Oceanodroma markhami

Murphy (1936) observó una bandada en punta Sáenz.

Oceanodroma hornbyi

Esta especie fue registrada por Wetmore (1923) el 20 de julio y 24 de noviembre de 1922, a 4.8 km y 8 km, respectivamente de la isla LT. Asimismo, Mills (1968) observó un individuo al noroeste de esta isla, el 4 de octubre de 1965.

Oceanodroma melania

Wetmore (1923) observó un individuo hembra el 24 de noviembre de 1922, a 8 km de LT.

Pelecanoides garnotii

Es una especie endémica de la Corriente Peruana, actualmente se desconoce su situación en la isla. Forbes (1914), en febrero de 1913, observó grandes bandadas de esta especie en el islote Unanue (conocido también como isla El Colorado o Larrañaga). Murphy (1936) señaló a LT como una de las áreas de reproducción de *P. garnotii* anteriormente registrada. Posteriormente, entre mayo y noviembre de 1996, Jahncke & Goya (1998b) encontraron un individuo muerto en las cercanías de la isla. A pesar que en los años 2003, 2004 y 2011 se

volvió a registrar la presencia de *P. garnotii* a 55 km al sur de LT (Figueroa & Stucchi 2008, Figueroa *et al.* 2011a), no se tienen nuevos registros en la isla. Al igual que LT, en otras áreas donde se registró la reproducción de la especie, como las islas Chinchas, Ballestas, Macabí, Guañape, Pescadores, Mazorca y Mongoncillo (Coker 1919, Murphy 1936, Tovar 1968), esta parece estar actualmente ausente. En la última década las únicas colonias reproductivas del Perú se encontraron en las islas La Vieja, San Gallán y Corcovado (Jahncke & Goya 1998b, Valverde 2006). Esta pérdida y disminución poblacional, está relacionada directamente con la actividad extractiva del guano, eliminando el substrato en el que *P. garnotii* anida (Coker 1919, Murphy 1936, Tovar 1968).

Fregata magnificens

La especie fue registrada en LT en abril de 1907 y en enero de 1920. En aquella época, su presencia podría haber estado relacionada con los numerosos campamentos de los pescadores (Coker 1919, Murphy 1936). Posteriormente, G. Mori (*com. pers.*) observó un ejemplar volando sobre la isla el 30 de diciembre de 2006, mientras que M. Bautista (*com. pers.*) observó otro individuo el 26 de febrero de 2011, sobre el muelle de La Grama.

Sula nebouxii

Es la especie de ave marina dominante en la isla. Coker (1919), entre el 29 de marzo y el 6 de abril de 1907, e inicios de diciembre del mismo año, observó a esta especie cerca de su campamento, en grandes cantidades. También señaló que su época de reproducción fue ininterrumpida ya que encontró nidos con huevos, pichones recién nacidos, y jóvenes de diversas edades. Murphy (1936, 1954) y Tovar (1968) también la nombraron como la más abundante en LT, con nidos densamente distribuidos, a menudo muy próximos entre sí, que incluso rodeaban las casas de las guardianías. Posteriormente, Duffy *et al.* (1984) determinaron la presencia de 15,000 parejas en febrero de 1979. Por su parte, Guillén (1991) consideró a LT como una de las áreas con mayor población de la especie en el Perú, que, sin embargo, presenta amplias fluctuaciones poblacionales por año y por mes: 1985 (10,000 - 180,000), 1986 (35,000 - 160,000), 1988 (11,000 - 180,000), 1989 (2500 - 150,000), 1990 (0 - 90,000). Asimismo, se determinó que *S. nebouxii* ocupaba casi dos tercios de la superficie de la isla para su reproducción, con nidos uniformemente distribuidos en grandes sub-colonias (hasta 10,000 pares), separadas entre sí por colinas rocosas, con una estimación de la población reproductiva de 75,000 a 100,000 parejas (Zavalaga *et al.* 2007). En marzo de 2011, se observaron algunos pocos huevos, y pichones de diferentes edades, pero principalmente de 5 a 8 semanas de nacidos, de los cuales la mayoría formaban grupos. La especie se encontró dispersa por toda la isla, pero principalmente en las áreas planas y quebradas del sector sur y centro. Valverde y García (2009), registraron en 1999, un individuo joven con plumaje aberrante, que fue identificado como dilución.

Sula variegata

Es una especie endémica de la Corriente Peruana, cuyas poblaciones en la isla LT varían drásticamente dependiendo de las condiciones ambientales. Murphy (1936, 1954), en enero de 1920, encontró siete grandes colonias, todas ubicadas en terrenos planos, siendo sin embargo, mucho menos numerosa que *S. nebouxii*. En base a una evaluación realizada en la isla en noviembre de 1960 y enero de 1962, esta fue considerada como una de las áreas con mayor densidad poblacional de *S. variegata* en el Perú, con 400,000 y 470,100 individuos, respectivamente (Jordán 1963). Posteriormente, en diciembre de 2006 y entre enero y diciembre de 2009, la población reproductiva fue estimada entre 2000 y 2500 parejas y 11,150 individuos, respectivamente (Zavalaga *et al.* 2009a, 2010a, SERNANP & AGRORURAL 2010). Entre el 28 de febrero y 3 de marzo de 2011, se encontraron dos grandes colonias de esta especie: una adyacente a la guardianía de La Grama y otra frente a Roca Blanca; además se observaron otras cuatro colonias pequeñas: dos frente a la bahía Canevaro, una frente a la bahía Viveros y otra frente a la bahía Juanchuquita, las cuales estuvieron constituidas por pichones de diferentes edades, principalmente entre 3 y 5 semanas de nacidos.

Sula granti (Figura 3c)

Jahncke & Goya (1997b) observaron por primera vez, en los meses de mayo y noviembre de 1996, 10 parejas reproductivas de *S. dactylatra*, ubicadas en el lado sureste de la isla LT, de los cuales algunos individuos fueron anillados. Posteriormente, estas parejas fueron reconsideradas como *S. granti* (Figueroa 2004), ya que en base a criterios morfológicos, ecológicos (Pitman & Jehl 1998, Roberson 1998) y genéticos (Friesen *et al.* 2002), esta especie fue separada de *S. dactylatra*. En años posteriores se han observado individuos reproductivos en esta misma área y en otras zonas más hacia el oeste; en marzo de 1999, diciembre de 2004 y marzo de 2011, se observaron 17, 21 y 12 individuos reproductivos, respectivamente; algunos de ellos presentaron anillos de marcaje de las islas Galápagos y de LT. M. Bautista (*com. pers.*) observó un individuo descansando en el muelle de La Grama, el 27 de diciembre de 2010.

Sula leucogaster (Figura 3d)

Si bien el golfo de Guayaquil (Ecuador) representa formalmente su límite sur de distribución (Nelson 1978), también ha sido reportada en algunas oportunidades en el Perú: isla Foca (Rivas 2010), islas Lobos de Afuera (Stucchi *et al.* 2011) e isla Huampanú (Lima) (Valverde 2007). El 3 de enero de 2011, M. Bautista (*com. pers.*) observó un adulto en el muelle de La Grama.

— Hibridación de Sulidae

Entre los años 1997 y 2005, se observaron en las islas LT individuos con características de coloración compartidas entre *S. nebouxii* y *S. variegata* (Ayala 2006), que posteriormente fueron genéticamente determinados como híbridos (Taylor *et al.* 2010). En junio de 1999 y febrero de 2000, se observaron dos híbridos en la isla, frente al islote Roca Blanca. Por otro lado, en marzo de 1999, se encontró al este del faro de LT una hembra de *S. nebouxii* y un macho de *S. granti*, con comportamiento de cortejo entre ellos.

Phalacrocorax brasilianus

Su reproducción en LT ha sido registrada anteriormente, entre los meses de diciembre y febrero (Forbes 1914, Coker 1919, Tovar 1968). En agosto de 1999 y marzo de 2011 se observaron varios individuos adultos no reproductivos nadando principalmente en el muelle de La Grama y en la bahía Canevaro, entre la colonia de *S. humboldti*.

Phalacrocorax gaimardi

Coker (1919) en sus viajes de 1907 señaló que no observó a esta especie en LT, sin embargo, Forbes (1914) encontró varias parejas reproductivas incubando en febrero de 1913. Posteriormente, en diciembre de 1963, Tovar (1968) solo encontró dos parejas reproductivas que anidaban en un acantilado, sobre el apostadero del lobo marino. En diciembre 1999, Zavalaga *et al.* (2002) encontraron 10 individuos adultos; un año después, M. Bautista (*com. pers.*) observó dos parejas anidando en los acantilados cercanos al apostadero.

Phalacrocorax bougainvillii

Es una especie endémica de la Corriente Peruana, cuyas poblaciones en LT varían drásticamente dependiendo de las condiciones ambientales. Se han observado desde grandes poblaciones reproductivas, dispersas en agregaciones pequeñas, hasta la ausencia total de individuos (Murphy 1936, Jordán 1963). Entre enero y diciembre de 2009, la población promedio en LT fue de 36,083 individuos (SERNANP & AGRORURAL 2010). Las áreas de reproducción de esta especie en LT incluyen las bahías Canevaro y Viveros, los islotes Albatros, Smith y Unanue, y las zonas ventosas de las puntas norte y sur (Forbes 1914, Coker 1919, Vogt 1942, Murphy 1954). En marzo de 2011, se observaron dos grandes colonias, una frente a la bahía Juanchuquita y otra en el islote Unanue.

Pelecanus thagus

Es una especie endémica de la Corriente Peruana, y al igual que otras aves, sus poblaciones en LT varían drásticamente dependiendo de las condiciones ambientales. En enero de 1920, Murphy (1936) encontró 1600 parejas distribuidas en ocho colonias. Posteriormente en noviembre de 1960 y enero de 1962, se contabilizaron 20,000 individuos y la ausencia de estos, respectivamente (Jordán 1963). Entre enero y diciembre de 2009, la población promedio fue de 6644 individuos (SERNANP & AGRORURAL 2010), incrementándose hasta 160,000 a 210,000 parejas un año después (Zavalaga *et al.* 2011). Entre febrero y marzo de 2011, se observaron miles de pichones de diferentes edades (0 a 4 semanas de nacidos), de los cuales la mayoría formaban grupos mientras esperaban ser alimentados. Estos se encontraban asentados principalmente en el lado norte de la isla.

Egretta thula

M. Bautista y A. Oliva (*com. pers.*) observaron un individuo en el muelle de La Grama, en diciembre de 2010.

Cathartes aura jota

Es una especie común en la isla, la cual fue señalada como muy abundante a inicios del siglo XX (Forbes 1914). Su reproducción en LT ha sido registrada en diciembre (Coker 1919). En marzo de 2011, se observaron individuos jóvenes y adultos dispersos por toda la isla, pero principalmente cerca a las colonias de las aves guaneras y *S. nebouxii*, así como en las áreas más altas. Además se encontró un pichón a 500 m al oeste de la guardianía de La Grama. Zavalaga (2003) y Figueroa *et al.* (2011b) registraron la presencia de individuos con plumaje aberrante de color blanco, observados en diversas áreas de la isla entre 1999 y 2011. Estos fueron identificados como leucísticos (Figueroa *et al.* 2011b).

Falco peregrinus (Figura 3e)

M. Bautista y S. García (*com. pers.*) observaron el 15 y 16 de enero de 2011 a un *F. peregrinus* cazar a un individuo adulto de *S. nebouxii* y otro de *Larus belcheri*,

respectivamente. El primer ataque fue observado en la zona sureste de la isla y el segundo en el lado norte, cerca a Cabo Cruz. El 28 de febrero de 2011 se encontró una hembra adulta parada a unos 10 m de una colonia de *S. nebouxii*, a 500 m de El Ñopo.

Charadrius nivosus

En noviembre de 2010, M. Bautista y A. Oliva (*com. pers.*) observaron un grupo de 20 individuos hacia el norte de la playa La Grama.

Oreopholus ruficollis pallidus

H. O. Forbes colectó una hembra el 19 de junio de 1912 en LT (AMNH 2011).

Haematopus palliatus pitanay

Se colectaron especímenes procedentes de LT (Murphy 1925b, 1936).

Haematopus ater

Su primer registro fue hecho por Coker (1919) en 1907. M. Bautista (*com. pers.*) observó dos individuos en unos roqueríos de El Ñopo, a mediados de 2010.

Numenius phaeopus hudsonicus

M. Bautista (*com. pers.*) observó un individuo al norte de la playa La Grama el 15 de febrero de 2011.

Tringa incana

Fue observada por Coker (1919) el 3 de diciembre de 1907.

Calidris alba (Figura 3f)

Fue observada por Coker (1919) el 10 de diciembre de 1907. El 1 de marzo de 2011, en el área central de esta isla, se encontró un individuo muerto.

Calidris mauri

El 13 de diciembre de 1907, Coker (1919) observó a esta especie en LT.

Stercorarius chilensis

Fue registrada por R. H. Beck en LT el 7 de septiembre de 1913 (Murphy 1936).

Creagrus furcatus

Varias bandadas de esta especie fueron observadas por Murphy (1936) entre Lobos de Afuera y LT, el 6 de enero de 1920.

Chroicocephalus cirrocephalus (Figura 3g)

El 3 de marzo de 2011, desde una embarcación artesanal, se observó un individuo adulto volando frente a la bahía de Juanchuquita.

Leucophaeus modestus (Figura 3h)

Murphy (1936) mencionó su sorpresa sobre la ausencia de registros de esta especie en LT, ya que es común su observación en otras islas del Perú, y además, al estar ligada a las playas de arenas, tendría en LT muchas áreas con este hábitat. Se observó un individuo adulto en la playa El Ñopo, el 11 de agosto de 1999 y otro el 28 de febrero de 2011. A pesar de ser un ave endémica de la Corriente de Humboldt, es visitante de la costa del Pacífico entre Ecuador y Chile, llegando ocasionalmente hasta Colombia y Argentina (Harrison 1987), por lo que ciertamente es rara su poca presencia en LT.

Leucophaeus pipixcan

Fue observada en grandes números, descansando en las playas de arena de LT, en diciembre de 1920 (Murphy 1936).

Larus belcheri

Murphy (1936) observó la concentración de esta especie en la bahía Canevaro, cerca de una colonia de *P. bougainvillii*, a quienes les robaban sus huevos. En la actualidad su presencia es muy escasa. El 28 de febrero se observaron dos individuos al sur de la guardianía de El Ñopo, y el 2 de marzo de 2011 se encontraron seis individuos en los alrededores del apostadero del lobo marino.

Larus dominicanus

Desde sus primeros registros en LT, ha sido señalada como abundante (Coker 1919), incluso, LT fue determinada como uno de los centros más grandes de reproducción de la especie en el mundo (Murphy 1936). En febrero de 1979, Duffy *et al.* (1984) calcularon un máximo de 1000 parejas. En base al registro fotográfico, entre el 28 de febrero y 3 de marzo de 2011, la población fue estimada entre 500 y 600 individuos. Esta disminución estaría relacionada a la constante destrucción de sus nidos y huevos, con el objetivo de reducir la depredación de las gaviotas sobre los huevos y pichones de las aves guaneras (Figueroa 2010). Su reproducción ha sido registrada en LT entre noviembre y diciembre (Tovar 1968, Figueroa 2010), sin embargo a fines de febrero se encontraron pichones recién nacidos e incluso huevos recién puestos.

FIGURA 3. (a) *Spheniscus humboldti* en la bahía Canevaro. Foto: J. F. (b) *Phoebastria irrorata* en La Grama. Foto: I. García-Godos. (c) Hembra y pichón de *Sula granti* en el sureste de la isla. Foto: J. F. (d) *Sula leucogaster* en el muelle de La Grama. Foto: M. Bautista. (e) Hembra de *Falco peregrinus* en El Ñopo. Foto: J. F. (f) Individuo muerto de *Calidris alba* en el centro de la isla. Foto: J. F. (g) *Chroicocephalus cirrocephalus* volando sobre la bahía Juanchuquita. Foto: J. F. (h) *Leucophaeus modestus* en El Ñopo. Foto: J. F.

FIGURE 3. (a) *Spheniscus humboldti* in the Canevaro bay. Photo: J. F. (b) *Phoebastria irrorata* in La Grama. Photo: I. García-Godos. (c) Female and pigeon of *Sula granti* in the southeast of the island. Photo: J. F. (d) *Sula leucogaster* on the dock of La Grama. Photo: M. Bautista. (e) Female of *Falco peregrinus* in El Ñopo. Photo: J. F. (f) Individual died of *Calidris alba* in the center of the island. Photo: J. F. (g) *Chroicocephalus cirrocephalus* flying over the Juanchuquita bay. Photo: J. F. (h) *Leucophaeus modestus* in El Ñopo. Photo: J. F.

Sternula lorata

Murphy (1936) observó algunos individuos pescando en la punta sur de LT en enero de 1920; también los observó a 3.5 km de LT, pescando junto con *Oceanodroma markhami* y otras golondrinas de mar (Murphy 1925a). En junio de 2006, I. García-Godos (Zavalaga *et al.* 2009b), observó un grupo de aproximadamente 100 individuos descansando en una llanura a 1.5 km al noroeste de la guardianía de La Grama. A fines de 2010, M. Bautista (*com. pers.*) observó varios individuos descansando en una playa de arena al sureste de La Grama.

Larosterna inca

Tovar (1968) encontró colonias reproductivas de esta especie en LT. M. Bautista y S. García (*com. pers.*) observaron pequeños grupos en los acantilados de la zona noroeste de la isla. Se desconoce el estado de la población en LT.

Estado de conservación y problemática

Del total de especies registradas, trece se encuentran consideradas dentro de alguna de las categorías de protección del Decreto Supremo 034-2004-AG de la legislación peruana (MINAG 2004). Asimismo, trece especies están incluidas en las listas de la Unión Internacional para la Conservación de la Naturaleza (IUCN 2011); tres en la Convención sobre el Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestres (CITES 2011); y cinco en la Convención sobre la Conservación de las Especies Migratorias de Animales Silvestres (CMS 2009) (Tabla 1). Algunas de las especies registradas son afectadas directamente por factores como disturbios humanos y la presencia de fauna exótica.

Ingreso de pescadores — Como parte de su riqueza marina, la isla LT posee bancos naturales de peces de peña, cangrejos, pulpo (*Octopus mimus*), percebes (*Pollicipes elegans*) y conchas de abanico (*Argopecten purpuratus*), de los cuales la última constituye uno de los más importantes del Perú (Carbajal *et al.* 2004a). Debido a su proximidad con la costa, estas especies están sujetas a una fuerte presión pesquera (Carbajal *et al.* 2005a). Desde las primeras investigaciones realizadas en la isla relacionadas a las aves, se ha señalado a estos pescadores como saqueadores de huevos y pichones, principalmente de *P. bougainvillii*, para negociarlos en tierra (Forbes 1914).

Extracción del guano — Asimismo, desde inicios del siglo pasado, Forbes (1914) y Coker (1919) comentaron sobre la perturbación de las aves guaneras en las islas del norte y su desplazamiento hacia otras islas debido a la extracción del guano. En el caso de *P. thagus*, llegaron a abandonar sus huevos y pichones recién nacidos, los cuales fueron atacados por *L. dominicanus, L. belcheri* y *C. aura* (Forbes 1914, Vogt 1942). En la actualidad, la isla LT alberga un importante yacimiento de 20,000 t de guano fosfatado, del cual a fines de 2010 fueron extraídos solo 200 t (SERNANP & AGRORURAL 2010). A finales de diciembre de 2010, miles de nidos fueron abandonados por parte de *P. thagus*. Es posible que una de las causas de este evento sean las perturbaciones producidas por el personal que trabajó en la campaña de extracción del guano (Figueroa & Stucchi 2012).

Presencia de gatos cimarrones *(Felis catus)* — En marzo y junio de 1999, se observaron dos gatos en el lado sureste de LT. Posteriormente, el 1 de marzo de 2011, se encontraron su huellas entre la colonia de *P. thagus* en la bahía Viveros. Al día siguiente, se hallaron en el lado centro-norte, heces frescas junto a un nido de *S. nebouxii*. Ese mismo día, a las 09 h 21 min, se observaron dos cachorros en el lado centro-oeste, descansando en un área sombreada; al vernos uno salió huyendo mientras que el otro se quedó observándonos por unos segundos. Al parecer, estos gatos cimarrones se distribuyen por toda la isla (Figuras 4a y 4b).

Coker (1919) señaló que los gatos introducidos en las islas Lobos, se tornaron cimarrones, alimentándose de los huevos y pichones del *P. thagus*. Asimismo, Vogt (1942) y Duffy *et al.* (1984) observaron que estos también atacaron a individuos jóvenes de *S. variegata* y *S. nebouxii*. Los tres autores recomendaron como acción primordial su erradicación. Sin embargo, a pesar que el gato cimarrón ha sido identificado como uno de los depredadores introducidos por el hombre con mayor impacto sobre las poblaciones de aves marinas en las islas (Ebenhard 1988, Álvarez-Romero *et al.* 2008), en LT la presencia de este felino data de más de un siglo y, al parecer, no ha interferido con las poblaciones de aves guaneras y *S. nebouxii*. Sin embargo, para otras especies menos numerosas, podrían representar un peligro. En este sentido, será importante desarrollar un estudio detallado al respecto, para evaluar si existe un verdadero impacto.

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FIGURA 4. (a) Cachorro de gato en el centro-oeste de la isla. Foto: J. F. (b) Heces de gato en el centro-norte de la isla. Foto: M. Stucchi.
FIGURE 4. (a) Kitten in the center-west of the island. Photo: J. F. (b) Cat feces in the central-north of the island. Photo: M. Stucchi.

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ARTICLE

Aves da Serra de Maracaju, Mato Grosso do Sul, Brasil

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ABSTRACT: Birds of the Serra de Maracaju, Mato Grosso do Sul, Brazil. The Serra de Maracaju stands out in the orography of Mato Grosso do Sul as a watershed between the Upper Paraguay and Upper Parana river basins. In this study, we report on the occurrence of 413 species of birds based on historical records and field data collected by us. The records of species such as *Aburria nattereri*, *Ictinia mississippiensis*, *Spizaetus tyrannus*, *Micrococcyx cinereus*, *Berlepschia rikeri*, *Oxyruncus cristatus*, *Knipolegus lophotes*, *Myiarchus tuberculifer*, *Tyrannopsis sulphurea*, *Tityra semifasciata*, *Cyanerpes cyaneus*, and *Poospiza cinerea* are the first for the state of Mato Grosso do Sul. The Serra de Maracaju act as an important dispersal corridor for elements of the Amazon and Atlantic Forest in the eastern border of the Pantanal. Fifteen species reported for the area are regarded as globally or nationally endangered, such *Harpia harpyja*, *Alectrurus tricolor*, and *Sporophila maximiliani*. Human impacting activities such as agriculture, monoculture of exotic trees, and conversion of wood into charcoal, seriously threaten the survival of these and other bird species occurring in the region. The creation of a large conservation unit and the proper management of the landscape, so as to maintain the local diversity and habitat structure, are crucial to ensure the conservation these species and, therefore, the biodiversity of the surrounding plateaus and plains of Pantanal.

KEY-WORDS: bird communities, central Brazil, cerrado, conservation.

INTRODUÇÃO

O Cerrado é um dos principais *hotspots* para a conservação da biodiversidade mundial (Myers *et al.* 2000). Destaca-se como a mais rica flora dentre as savanas tropicais, com mais de 7.000 espécies identificadas, das quais 40% são endêmicas (Ratter *et al.* 1997). No entanto, nas últimas três décadas mais da metade dos seus 2 milhões de km^2 de vegetação original foram suprimidos e/ou substituídos por pastagens exóticas (*Brachiaria*), culturas anuais (em especial soja, milho e cana-de-açúcar) e monoculturas de *Pinus* e *Eucalyptus* (Klink & Machado 2005). Originalmente, o Cerrado cobria aproximadamente 61% do território de Mato Grosso do Sul, entretanto, a ocupação do estado a partir da década de 60 reduziu drasticamente a cobertura para apenas 32% (Sano *et al.* 2010).

No aspecto geomorfológico, o estado de Mato Grosso do Sul é caracterizado principalmente pela planície do Pantanal e seus planaltos circundantes, tais como Urucum, Amolar, Bodoquena, Maracaju - Campo Grande e Taquari - Itiquira, sendo estes dois últimos formadores da Serra de Maracaju (Boggiani *et al.* 1998).

A avifauna da Serra de Maracaju tem sido estudada desde 1926, quando o naturalista E. R. Blake, a serviço do The Field Museum of Natural History, coletou exemplares de várias espécies na Fazenda Capão Bonito (Straube 2011). Posteriormente, destacaram-se as expedições do Museu de Zoologia da Universidade de São Paulo, coordenadas por Olivério Pinto e colaboradores, que coletaram vários espécimes em Aquidauana e Coxim (Pinto 1932, 1938, 1944, 1964). Os membros do Museum of Comparative Zoology também visitaram a região em 1931, quando realizaram várias coletas

em Aquidauana (Tubelis & Tomas 2003). Em 1981 o naturalista J. Hidasi coletou espécimes em Aquidauana, que atualmente encontram-se depositados na coleção da Fundação Museu de Zoologia, em Goiânia, Goiás.

Apesar dessas importantes contribuições, a avifauna da Serra de Maracaju ainda é pouco conhecida. Neste estudo apresentamos uma lista das espécies de aves registradas na região, com base em dados literários e registros obtidos em estudos de campo realizados pelos autores.

MÉTODOS

Área de estudo

A Serra de Maracaju estende-se no sentido norte-sul por todo o estado de Mato Grosso do Sul, atuando como um divisor de águas entre as bacias hidrográficas do Alto Rio Paraguai, a oeste, e do Alto Rio Paraná, a leste (Boggiani *et al.* 1998). Segundo Damascenso *et al.* (2000), a Serra de Maracaju é coberta principalmente por cerradão (savana florestada), florestas estacionais semideciduais, vegetação ripária (mata de galeria e mata ciliar) e veredas. Entretanto, o desenvolvimento agropecuário reduziu e alterou drasticamente a paisagem natural da região, cujos remanescentes naturais encontram-se imersos em uma matriz de pastagens exóticas e monoculturas (Harris *et al.* 2006).

O clima na região é tropical subúmido (Aw), com estações chuvosa (novembro a abril) e seca (maio a outubro) bem definidas. A precipitação anual pode atingir até 1.180 mm, com temperatura média mensal oscilando entre 21°C e 33°C (Soriano & Alves 2005).

Amostragem

A lista de espécies da Serra de Maracaju foi produzida com base em revisão de registros históricos obtidos por E. R. Blake a serviço do The Field Museum of Natural History, bem como dados de bibliografia (Pinto 1940, Tubelis & Tomas 2003, Hass 2004, Junqueira 2008, Whittaker *et al.* 2008, Nunes *et al.* 2012) e estudos de campo realizados pelos autores entre 2005 e 2011. No entanto, não foi possível resgatar informações referentes à natureza dos registros (visual, auditivo ou espécime coletado) publicados por Hass (2004).

Informações sobre os exemplares depositados em coleções ornitológicas foram obtidos com base em Tubelis & Tomas (2003) e compilado com base nas seguintes instituições: Museum of Comparative Zoology - MCZ (Cambridge, EUA); The Field Museum of Natural History - FMNH (Chicago, EUA); Museu de Zoologia da Universidade de São Paulo – MZUSP (São Paulo, SP); Fundação Museu de Ornitologia – FMO (Goiânia, GO).

As localidades amostradas, coordenadas, autores, período de estudo e esforço amostral estão sintetizados na tabela 1. De forma geral, o método utilizado pelos autores na coleta de dados foi o censo por observação direta (Bibby *et al.* 1992), que consiste em caminhar por diferentes tipos de habitats obtendo registros visuais e auditivos do maior número possível de espécies de aves.

A lista de espécies segue a ordenação taxonômica e a nomenclatura científica propostas pelo Comitê Brasileiro de Registros Ornitológicos (CBRO 2011), com exceção das propostas recentemente indicadas para as famílias Caprimulgidae e Thraupidae/Emberizidae e, ainda, de situações provisórias (*incertae sedis*) de alguns grupos ou espécies, para os quais utilizamos edição anterior da mesma lista (CBRO 2009). Adicionalmente, adotamos os limites de espécies para *Aburria* Reichenbach, 1853 apresentados por Lopes (2009) *contra* Grau *et al.* (2004) e CBRO (2011), particularmente na aceitação de *A. grayi* e *A. nattereri* como espécies plenas.

RESULTADOS E DISCUSSÃO

Neste estudo relacionamos a ocorrência de 413 espécies distribuídas em 303 gêneros e 66 famílias de aves para a Serra de Maracaju (Tabela 2). Aproximadamente 63% desse total apresentam registros comprobatórios de ocorrência na região por meio de coleta de espécime(s), fotografia, gravação de áudio e outros tipos de documentos que permitam a determinação segura e a aferição posterior do táxon. As demais estão inclusas na lista secundária, pois ainda aguardam documentação comprobatória adequada conforme as normas propostas pelo CBRO (2011).

A região abriga aproximadamente metade das espécies de aves ocorrentes no Mato Grosso do Sul (Nunes *et al.* no prelo). Comparada à avifauna de outros planaltos de Mato Grosso do Sul, a Serra da Maracaju pode ser considerada muito diversificada. No Planalto da Bodoquena, Pivatto *et al.* (2006) relacionaram a ocorrência de 353 espécies. Para a borda oeste do Pantanal, que inclui a Serra do Amolar e o Maciço do Urucum, Tomas *et al.* (2010) citam a ocorrência de 380 espécies.

Entretanto, a riqueza de espécies de aves da Serra de Maracaju ainda pode estar sendo subestimada, uma vez que o esforço amostral empregado em algumas localidades visitadas nesse estudo foi pequeno e pontual. Assim como em várias outras regiões do Mato Grosso do Sul, ainda existem grandes lacunas de conhecimento sobre a avifauna ocorrente nos planaltos e bordas da Serra de Maracaju.

TABELA 1. Localidades com registros de espécies de aves na Serra de Maracaju, Mato Grosso do Sul, Brasil.

TABLE 1. Localities with records of bird species in the Serra de Maracaju, state of Mato Grosso do Sul, Brazil.

N	Localidades	Coordenadas	Município	Altitude (m)	Fonte	Período
1	PCH Santa Gabriela	17°32'18"S, 54°26'32"O	Sonora	540	F, G	2010 (fevereiro, maio, agosto e novembro); 2011 (fevereiro); 140 horas/observações
2	Sonora	17°33'45"S, 54°48'45"O	Sonora	440	D, F	2008 (março); 2011 (abril, agosto e dezembro); 2012 (março); 80 horas/observações
3	Parque Estadual Nascentes do rio Taquari	18°02'25"S, 53°20'03"O	Costa Rica e Alcinópolis	-	C	1998 a 2000; 100 horas/observações
4	Fazenda Recreio	18°13'27"S, 54°39'03"O	Coxim	-	A	1937 (agosto)
5	Coxim	18°30'02"S, 54°48'05"O	Coxim	260	H	2011 (setembro); 8 horas/observações
6	Rio Verde	18°56'13"S, 54°54'07"O	Rio Verde de Mato Grosso	380	O	2011 (novembro)
7	Fazenda Trilha do Sol	19°26'40"S, 54°49'12"O	Rio Negro	406	I	2011 (março e dezembro); 100 horas/observações
8	Chapadão	19°28'00"S, 54°49'20"O	Rio Negro	630	I	2011 (março e dezembro); 20 horas/observações
9	Pousada Quinta do Sol	19°46'02"S, 55°14'35"O	Corguinho	869	J	2005 (agosto); 2006 (janeiro); 18 horas/observações
10	Fazenda Rodeio	19°44'59"S, 55°09'42"O	Corguinho	1388	J	2005 (agosto); 2006 (janeiro); 15 horas/observações
11	Fazenda Constantino	19°49'02"S, 55°15'18"O	Corguinho	783	J	2005 (agosto); 2006 (janeiro); 10 horas/observações
12	RPPN Vale do Bugio	19°56'20"S, 55°04'26"O	Corguinho	370	K	2009 (outubro); 25 horas/observações
13	RPPN Gavião de Penacho	19°57'13"S, 55°03'48"O	Corguinho	451	K	2009 (outubro); 31 horas/observações

N	Localidades	Coordenadas	Município	Altitude (m)	Fonte	Período
14	Brejão	20º07'05"S, 55º23'08"O	Cipolândia	830	J	2005 (setembro); 2006 (fevereiro); 6 horas/observações
15	Fazenda Bocaina	20º04'00"S, 55º34'60"O	Aquidauana	534	J	2005 (setembro); 2006 (fevereiro); 16 horas/observações
16	Fazenda Taboco	20º04'10"S, 55º38'46"O	Aquidauana	524	J	2005 (setembro); 2006 (fevereiro); 20 horas/observações
17	Fazenda Estância Crioula	20º30'02"S, 55º31'60"O	Dois Irmãos do Buriti	680	L	2010 (abril e maio); 20 horas/observações
18	Aquidauana	20º29'15"S, 55º48'45"O	Aquidauana	150	B, E	1930 a 1931; 2003 (outubro)
19	Fazenda Jatiúca	20º31'57"S, 55º50'19"O	Aquidauana	182	K	2008 (fevereiro e setembro); 27 horas/observações
20	Fazenda Boa Esperança	20º43'32"S, 56º02'24"O	Aquidauana	173	K	2008 (fevereiro e setembro); 28 horas/observações
21	Fazenda Correntes	20º34'09"S, 55º24'24"O	Aquidauana	250	K	2008 (fevereiro e setembro); 33 horas/observações
22	Fazenda Vô Fiorindo	20º35'44"S, 55º25'21"O	Aquidauana	211	K	2008 (fevereiro e setembro); 22 horas/observações
23	Fazenda Taruana	20º30'16"S, 55º15'51"O	Aquidauana	216	K	2008 (fevereiro e setembro); 26 horas/observações
24	Sidrolândia	20º57'15"S, 55º03'30"O	Sidrolândia	350	M	2011 (abril); 4 horas/observações
25	Fazenda Capão Bonito	21º17'05"S, 54º49'02"O	Sidrolândia	-	N	1926 (julho, agosto e novembro); 1937 (setembro e outubro)
26	Usina Vista Alegre	21º47'30"S, 55º32'53"O	Maracaju	560	F	2009 (dezembro); 2010 (janeiro, abril, outubro e novembro); 120 horas/observações

Fonte/Source: A (Pinto 1940); B (Tubelis & Tomas 2003); C (Hass 2004); D (Junqueira 2008); E (Whittaker *et al.* 2008); F (Maurício Neves Godoi); G (José Carlos Morante Filho); H (Caroline Leuchtenberger e Carlos Rodrigo Lehn); I (Eduardo Weffort Patrial); J (Alessandro Pacheco Nunes, Paulo Antonio Silva e Marco de Barros Costacurta); K (Maria Antonieta Castro Pivatto); L (Vanessa Katherinne Stavis); M (Daniel De Granville Manço); N (The Field Museum of Natural History, Chicago); O (Nunes *et al.* 2012).

Tabela 2. Espécies de aves registradas na Serra de Maracaju, Mato Grosso do Sul. Registros: e (espécime coletado), v (visual), a (auditivo), f (foto), g (zoofonia), i (video). Acrônimos das instituições que abrigam espécimes: The Field Museum of Natural History, Chicago (FMNH); Museum of Comparative Zoology, Cambridge (MCZ); Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP); Fundação Museu de Ornitologia, Goiânia (FMO).

Table 2. Bird species recorded in the Serra de Maracaju, state of Mato Grosso do Sul. Records: e (skin), v (visual records), a (vocal records), f (photo), g (taped vocalization), i (vídeo). Institutions with specimens: The Field Museum of Natural History, Chicago (FMNH); Museum of Comparative Zoology, Cambridge (MCZ); Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP); Fundação Museu de Ornitologia, Goiânia (FMO).

Táxons	**Localidades**	**Registros**	**Acrônimos**
Struthioniformes			
Rheidae			
Rhea americana (Linnaeus, 1758)	1, 2, 3, 7, 9, 10, 11, 16, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH
Tinamiformes			
Tinamidae			
Crypturellus undulatus (Temminck, 1815)	1, 2, 3, 4, 7, 11, 12, 13, 15, 16, 19, 20, 21, 22, 23, 26	e, v, a	MZUSP
Crypturellus parvirostris (Wagler, 1827)	1, 2, 3, 7, 9, 10, 11, 12, 13, 18, 19, 20, 21, 22, 23, 25, 26	e, v (f), a (g)	FMNH, MZUSP
Crypturellus tataupa (Temminck, 1815)	1, 2, 3, 10, 15, 19, 21, 26	a	
Rhynchotus rufescens (Temminck, 1815)	1, 2, 3, 7, 8, 9, 10, 13, 20, 21, 22, 23, 25, 26	e, v, a	FMNH
Nothura minor (Spix, 1825)	25	e	FMNH
Nothura maculosa (Temminck, 1815)	2, 3, 8, 9, 10, 14, 23, 25, 26	e, v (f)	FMNH
Anseriformes			
Anhimidae			
Anhima cornuta (Linnaeus, 1766)	2, 3, 14, 23, 26	v (f), a	
Chauna torquata (Oken, 1816)	15, 16	v, a	
Anatidae			
Dendrocygna viduata (Linnaeus, 1766)	2, 3, 10, 16, 20, 21, 25, 26	e, v	FMNH
Dendrocygna autumnalis (Linnaeus, 1758)	2, 15, 16	v	
Cairina moschata (Linnaeus, 1758)	1, 2, 3, 7, 15, 22, 23	v (f)	
Amazonetta brasiliensis (Gmelin, 1789)	2, 3, 11, 13, 14, 15, 18, 20, 22, 25, 26	e, v (f)	FMNH, MZUSP
Anas bahamensis Linnaeus, 1758	2	v (f)	
Nomonyx dominica (Linnaeus, 1766)	18	e	MZUSP
Galliformes			
Cracidae			
Ortalis canicollis (Wagler, 1830)	15, 16, 19, 20, 21	v, a	
Penelope superciliaris Temminck, 1815	1, 3, 13, 20, 21, 22, 26	v (f), a	

Táxons	Localidades	Registros	Acrônimos
Aburria grayi Pelzeln, 1870	7, 11, 15, 16, 20, 22, 23	v (f), a (g)	
Aburria nattereri Reichenbach, 1862	4	e	MZUSP
Crax fasciolata Spix, 1825	1, 3, 9, 12, 16, 20, 25, 26	e, v (f), a (g)	FMNH
Podicipediformes			
Podicipedidae			
Tachybaptus dominicus (Linnaeus, 1766)	2, 3, 18, 20, 25, 26	e, v	FMNH, MZUSP, MCZ
Ciconiiformes			
Ciconiidae			
Ciconia maguari (Gmelin, 1789)	1, 2	v	
Jabiru mycteria (Lichtenstein, 1819)	2, 14, 26	e, v	FMNH
Mycteria americana Linnaeus, 1758	2, 16	v	
Suliformes			
Phalacrocoracidae			
Phalacrocorax brasilianus (Gmelin, 1789)	1, 2, 16, 20	v	
Anhingidae			
Anhinga anhinga (Linnaeus, 1766)	1, 2, 16, 20	v	
Pelecaniformes			
Ardeidae			
Tigrisoma lineatum (Boddaert, 1783)	2, 9, 11, 14, 16, 20, 22, 23, 25, 26	e, v, a	FMNH
Tigrisoma fasciatum (Such, 1825)	6	v (f)	
Cochlearius cochlearius (Linnaeys, 1766)	16	v	
Nycticorax nycticorax (Linnaeus, 1758)	16	v, a	
Butorides striata (Linnaeus, 1758)	1, 2, 3, 7, 9, 10, 11, 16, 20, 22, 25, 26	e, v, a	FMNH
Bubulcus ibis (Linnaeus, 1758)	1, 3, 9, 10, 11, 13, 15, 16, 20, 21, 22	v (f)	
Ardea cocoi Linnaeus, 1766	2, 16, 18	v, a	
Ardea alba Linnaeus, 1758	1, 2, 3, 7, 9, 14, 18, 20, 26	e, v	MZUSP
Syrigma sibilatrix (Temminck, 1824)	1, 2, 3, 7, 9, 10, 11, 16, 19, 20, 21, 22, 23, 25, 26	e, v, a	FMNH
Pilherodius pileatus (Boddaert, 1783)	3, 9, 18, 22	e, v	MZUSP
Egretta thula (Molina, 1782)	11, 15, 16, 20, 26	v	
Threskiornithidae			
Plegadis chihi (Vieillot, 1817)	1, 2, 3, 4, 9, 12, 13, 16, 19, 20, 23, 26	e, v, a	MZUSP
Mesembrinibis cayennensis (Gmelin, 1789)	18, 20	v	
Phimosus infuscatus (Lichtenstein, 1823)	2, 16, 18	e, v, a	MZUSP

Táxons	Localidades	Registros	Acrônimos
Theristicus caerulescens (Vieillot, 1817)	1, 3, 7, 9, 10, 12, 13, 16, 18, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Theristicus caudatus (Boddaert, 1783)	1, 2	e, v	MZUSP
Cathartiformes			
Cathartidae			
Cathartes aura (Linnaeus, 1758)	1, 2, 3, 7, 10, 12, 13, 15, 16, 19, 20, 21, 22, 23, 26	v (f)	
Cathartes burrovianus Cassin, 1845	1, 2, 3, 9, 15, 16, 20, 26	v (f)	
Coragyps atratus (Bechstein, 1793)	1, 2, 3, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 20, 21, 22, 23, 24	v (f)	
Sarcoramphus papa (Linnaeus, 1758)	2, 3, 7, 8, 10, 12, 15, 26	v (f)	
Accipitriformes			
Pandionidae			
Pandion haliaetus (Linnaeus, 1758)	16	v	
Accipitridae			
Leptodon cayanensis (Latham, 1790)	1, 7	v	
Elanoides forficatus (Linnaeus, 1758)	1	v	
Gampsonyx swainsonii Vigors, 1825	1, 7, 19	v (f)	
Elanus leucurus (Vieillot, 1818)	1, 3	v	
Harpagus diodon (Temminck, 1823)	6	v	
Circus buffoni (Gmelin, 1788)	1, 25, 26	e, v	FMNH
Accipiter striatus Vieillot, 1808	1	v	
Accipiter bicolor (Vieillot, 1817)	4	e	MZUSP
Ictinia mississippiensis (Wilson, 1811)	18	v (i)	
Ictinia plumbea (Gmelin, 1788)	1, 2, 3, 7, 10, 13, 20, 21, 22, 23	v	
Busarellus nigricollis (Latham, 1790)	2, 3, 16, 25	v, a	
Rostrhamus sociabilis (Vieillot, 1817)	16, 20, 25	e, v, a	FMNH
Geranospiza caerulescens (Vieillot, 1817)	1, 7, 9, 18, 22	v	
Heterospizias meridionalis (Latham, 1790)	1, 2, 3, 4, 7, 10, 11, 16, 20, 21, 22, 23, 25	e, v (f), a	FMNH, MZUSP
Urubitinga urubitinga (Gmelin, 1788)	1, 2, 3, 16, 20	v	
Urubitinga coronata (Vieillot, 1817)	3, 5	v (f), a	
Rupornis magnirostris (Gmelin, 1788)	1, 2, 7, 9, 10, 11, 13, 15, 16, 18, 19, 20, 21, 22, 23, 26	e, v (f), a	MZUSP
Geranoaetus albicaudatus Vieillot, 1816	1, 2, 3, 7, 8, 11, 23, 26	v (f)	
Pseudastur albicollis (Latham, 1790)	7	v (f)	
Buteo brachyurus Vieillot, 1816	18, 19	v	
Buteo albonotatus Kaup, 1847	1, 21, 22	v	

Táxons	Localidades	Registros	Acrônimos
Harpia harpyja (Linnaeus, 1758)	17	v (f), a	
Spizaetus melanoleucus (Vieillot, 1816)	7	v	
Spizaetus ornatus (Daudin, 1800)	7, 12, 13	v (f)	
Falconiformes			
Falconidae			
Ibycter americanus (Boddaert, 1783)	3, 4	e, v	MZUSP
Caracara plancus (Miller, 1777)	1, 2, 3, 7, 9, 10, 11, 13, 15, 18, 19, 20, 21, 22, 23, 25, 26	e, v, a	FMNH
Milvago chimachima (Vieillot, 1816)	1, 2, 3, 4, 9, 10, 11, 13, 18, 19, 20, 21, 22, 23	e, v (f), a	MZUSP, MCZ
Herpetotheres cachinnans (Linnaeus, 1758)	1, 2, 3, 7, 11, 19, 21, 22, 23, 26	a	
Micrastur ruficollis (Vieillot, 1817)	1, 7	a	
Micrastur semitorquatus (Vieillot, 1817)	7, 15	v, a	
Falco sparverius Linnaeus, 1758	1, 3, 4, 7, 9, 12, 13, 15, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Falco rufigularis Daudin, 1800	7, 11, 15, 19, 21	v	
Falco deiroleucus Temminck 1825	3		
Falco femoralis Temminck, 1822	1, 2, 3, 4, 7, 9, 10, 21, 22, 25	e, v (f)	FMNH, MZUSP
Eurypygiformes			
Eurypygidae			
Eurypyga helias (Pallas, 1781)	3		
Gruiformes			
Aramidae			
Aramus guarauna (Linnaeus, 1766)	16, 18, 25	e, v, a	FMNH, MZUSP
Rallidae			
Aramides cajanea (Statius Muller, 1776)	1, 2, 3, 4, 10, 11, 16, 20, 23, 26	e, v, a	MZUSP
Laterallus viridis (Statius Muller, 1776)	9	v	
Porzana albicollis (Vieillot, 1819)	1, 2, 10, 15, 16, 18, 21, 23, 26	a	
Gallinula galeata (Lichtenstein,1818)	3		
Porphyrio martinica (Linnaeus, 1766)	15, 23, 26	v	
Porphyrio flavirostris (Gmelin, 1789)	16, 26	a	
Heliornithidae			
Heliornis fulica (Boddaert, 1783)	3		
Cariamiformes			
Cariamidae			
Cariama cristata (Linnaeus, 1766)	1, 2, 3, 7, 9, 10, 11, 12, 13, 15, 16, 19, 20, 21, 22, 23, 25, 26	e, v (f), a (g)	FMNH

Táxons	Localidades	Registros	Acrônimos
Charadriiformes			
Charadriidae			
Vanellus chilensis (Molina, 1782)	1, 2, 7, 9, 10, 11, 13, 15, 14, 18, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Recurvirostridae			
Himantopus melanurus Vieillot, 1817	2, 20, 25	e, v	FMNH
Scolopacidae			
Gallinago paraguaiae (Vieillot, 1816)	3		
Bartramia longicauda (Bechstein, 1812)	3, 25	v	
Tringa solitaria Wilson, 1813	3, 7, 20, 22, 23, 25	e, v (f)	FMNH
Tringa melanoleuca (Gmelin, 1789)	20	v	
Tringa flavipes (Gmelin, 1789)	2, 3, 25	e	FMNH
Phalaropus tricolor (Vieillot, 1819)	25	e	FMNH
Jacanidae			
Jacana jacana (Linnaeus, 1766)	2, 3, 11, 15, 16, 18, 20, 23, 25, 26	e, v, a	FMNH, MZUSP
Sternidae			
Phaetusa simplex (Gmelin, 1789)	1, 2	v	
Rynchopidae			
Rynchops niger Linnaeus, 1758	25	v	
Columbiformes			
Columbidae			
Columbina talpacoti (Temminck, 1811)	1, 2, 3, 4, 7, 9, 10, 11, 13, 15, 16, 19, 20, 21, 22, 23, 25, 26	e, v, a	FMNH, MZUSP
Columbina squammata (Lesson, 1831)	1, 2, 3, 7, 9, 10, 13, 16, 19, 20, 21, 22, 23, 25, 26	e, v, a	FMNH
Columbina picui (Temminck, 1813)	1, 15, 16, 18, 19, 20, 21, 23	v, a	
Claravis pretiosa (Ferrari-Perez, 1886)	2, 4, 7, 12, 19, 21	e, v	MZUSP
Columba livia Gmelin, 1789]	1, 15, 16	v	
Patagioenas speciosa (Gmelin, 1789)	3		
Patagioenas picazuro (Temminck, 1813)	1, 2, 3, 7, 9, 10, 11, 13, 15, 16, 18, 20, 21, 22, 23, 26	v, a	
Patagioenas cayennensis (Bonnaterre, 1792)	1, 2, 3, 7, 9, 10, 11, 12, 13, 16, 19, 20, 21, 22, 23, 25, 26	e, v, a	FMNH
Patagioenas plumbea (Vieillot, 1818)	2	v	
Zenaida auriculata (Des Murs, 1847)	1, 2, 3, 4, 7, 10, 15, 18, 21, 22, 23, 26	e, v, a	MZUSP
Leptotila verreauxi Bonaparte, 1855	1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Leptotila rufaxilla (Richard & Bernard, 1792)	1, 2, 3, 10, 11, 12, 25, 26	e, v (f), a	FMNH

Táxons	Localidades	Registros	Acrônimos
Psittaciformes			
Psittacidae			
Anodorhynchus hyacinthinus (Latham, 1790)	3, 7, 9, 12, 13, 16	v (f), a	
Ara ararauna (Linnaeus, 1758)	1, 2, 3, 7, 9, 11, 13, 16, 19, 20, 21, 22, 23	v (f), a	
Ara chloropterus Gray, 1859	1, 2, 3, 7, 11, 12, 13, 16, 19, 20, 21, 23, 26	v (f), a	
Orthopsittaca manilata (Boddaert, 1783)	1, 3, 10, 21, 22, 23	v, a	
Primolius maracana (Vieillot, 1816)	1, 18	v (f), a	
Primolius auricollis (Cassin, 1853)	9, 15, 16	v (f), a	
Diopsittaca nobilis (Linnaeus, 1758)	1, 2, 3, 4, 7, 9, 13, 25	e, v (f), a	FMNH, MZUSP
Aratinga acuticaudata (Vieillot, 1818)	15, 16, 25	e, v	FMNH
Aratinga leucophthalma (Statius Muller, 1776)	1, 3, 7, 9, 10, 12, 15, 16, 19, 20, 21, 22, 23	v (f), a	
Aratinga nenday (Vieillot, 1823)	15, 16	v, a	
Aratinga aurea (Gmelin, 1788)	1, 2, 3, 7, 9, 10, 11, 12, 13, 19, 21, 21, 22, 23, 25, 26	e, v (f), a	FMNH
Pyrrhura devillei (Massena & Souancé, 1854)	7, 11, 12, 13, 15, 16, 19, 20	v (f), a	
Myiopsitta monachus (Boddaert, 1783)	15, 16, 18	v, a	
Forpus xanthopterygius (Spix, 1824)	3		
Brotogeris chiriri (Vieillot, 1818)	1, 3, 4, 7, 9, 10, 11, 13, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26	e, v, a	FMNH, MZUSP, MCZ
Alipiopsitta xanthops (Spix, 1824)	1, 2, 3, 9, 11	v (f), a	
Pionus menstruus (Linnaeus, 1766)	3		
Pionus maximiliani (Kuhl, 1820)	3, 11, 15, 16, 19, 20	v, a	
Amazona amazonica (Linnaeus, 1766)	1, 3, 13, 19, 20, 21, 22, 23, 25	e, v (f), a	FMNH
Amazona aestiva (Linnaeus, 1758)	1, 3, 4, 7, 9, 10, 11, 15, 16, 19, 20, 23, 26	e, v, a	MZUSP
Cuculiformes			
Cuculidae			
Micrococcyx cinereus (Vieillot, 1817)	25	e, v	FMNH
Piaya cayana (Linnaeus, 1766)	1, 2, 3, 7, 9, 10, 11, 12, 13, 16, 18, 20, 21, 23, 25, 26	e, v (f)	FMNH, MZUSP, FMO
Coccyzus americanus (Linnaeus, 1758)	2, 12, 21	v (f)	
Crotophaga major Gmelin, 1788	1, 2, 9, 10, 11, 16, 19, 20, 23	v (f), a	
Crotophaga ani Linnaeus, 1758	1, 2, 3, 7, 9, 10, 11, 13, 14, 15, 16, 19, 20, 21, 22, 23, 25, 26	e, v, a	FMNH
Guira guira (Gmelin, 1788)	1, 2, 3, 7, 9, 10, 11, 13, 15, 16, 20, 21, 22, 23, 25, 26	e, v, a	FMNH
Tapera naevia (Linnaeus, 1766)	1, 2, 3, 11, 18, 20, 21, 22, 23	e, v (f), a	MZUSP
Dromococcyx phasianellus (Spix, 1824)	12, 13, 15, 20, 23	v (f)	
Dromococcyx pavoninus Pelzeln, 1870	1	v	

Táxons	Localidades	Registros	Acrônimos
Strigiformes			
Tytonidae			
Tyto alba (Scopoli, 1769)	1, 3, 7, 15, 16, 23	a	
Strigidae			
Megascops choliba (Vieillot, 1817)	3, 7, 10, 12, 13, 16, 19, 21, 22, 23	v, a	
Pulsatrix perspicillata (Latham, 1790)	12, 13	v	
Bubo virginianus (Gmelin, 1788)	12, 13, 16	v, a	
Glaucidium brasilianum (Gmelin, 1788)	1, 3, 4, 7, 9, 10, 11, 12, 13, 15, 16, 19, 20, 21, 23, 25, 26	e, v, a (g)	FMNH, MZUSP
Athene cunicularia (Molina, 1782)	1, 2, 3, 7, 9, 10, 13, 16, 20, 21, 22, 23, 25, 26	e, v, a	FMNH
Asio clamator (Vieillot, 1808)	1, 2	a	
Caprimulgiformes			
Nyctibiidae			
Nyctibius grandis (Gmelin, 1789)	10	v	
Nyctibius griseus (Gmelin, 1789)	3, 9, 13, 21, 22	v, a	
Caprimulgidae			
Lurocalis semitorquatus (Gmelin, 1789)	3, 7, 13	v	
Podager nacunda (Vieillot, 1817)	1, 2, 3, 10, 12, 15, 16, 20	v, a	
Nyctidromus albicollis (Gmelin, 1789)	1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 16, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Nyctiphrynus ocellatus (Tschudi, 1844)	1	v	
Caprimulgus rufus Boddaert, 1783	12, 22	v	
Caprimulgus parvulus (Gould, 1837)	1, 3, 20, 21, 22, 23, 25, 26	e, v	FMNH
Hydropsalis torquata (Gmelin, 1789)	11	v	
Apodiformes			
Apodidae			
Cypseloides senex (Temminck, 1826)	1	v (f)	
Streptoprocne zonaris (Shaw, 1796)	1, 3, 7, 12, 22	v (f)	
Chaetura meridionalis Hellmayr, 1907	1, 3, 12, 13, 15, 19, 21, 22	v	
Tachornis squamata (Cassin, 1853)	3, 4, 10, 21, 22, 23	e, v	MZUSP
Trochilidae			
Phaethornis pretrei (Lesson & Detattre, 1839)	1, 3, 7, 11, 21, 22, 23, 26	v (f)	
Phaethornis eurynome (Lesson, 1832)	9, 10, 15	v	
Eupetomena macroura (Gmelin, 1788)	1, 2, 3, 4, 7, 9, 11, 13, 16, 19, 22, 23, 26	e, v	FMNH, MZUSP
Florisuga fusca (Vieillot, 1817)	7	v	

Táxons	Localidades	Registros	Acrônimos
Colibri serrirostris (Vieillot, 1816)	1, 3, 4, 7, 8	e, v	MZUSP
Anthracothorax nigricollis (Vieillot, 1817)	1, 2, 3, 12, 15, 18, 21, 23	e, v	MZUSP
Lophornis magnificus (Vieillot, 1817)	4	e	MZUSP
Chlorostilbon lucidus (Shaw, 1812)	1, 2, 3, 7, 9, 10, 11, 12, 13, 15, 16, 19, 21, 22, 23, 25, 26	e, v (f), a	FMNH
Thalurania furcata (Gmelin, 1788)	1, 2, 3, 8, 13, 14, 25, 26	v (f)	
Hylocharis cyanus (Vieillot, 1818)	3		
Hylocharis chrysura (Shaw, 1812)	1, 2, 4, 7, 10, 11, 12, 13, 15, 16, 18, 19, 20, 21, 23	e, v	MZUSP, MCZ
Polytmus guainumbi (Pallas, 1764)	1, 4, 13, 16, 19, 23, 25, 26	e, v	FMNH, MZUSP
Amazilia versicolor (Vieillot, 1818)	4, 7, 9, 10, 12, 19, 21	e, v	MZUSP
Amazilia frimbiata (Gmelin, 1788)	1, 2, 3, 21, 239	v	
Heliactin bilophus (Temminck, 1820)	4	e	MZUSP
Heliomaster furcifer (Shaw, 1812)	1, 4, 9, 19, 21	e, v (f)	MZUSP
Calliphlox amethystina (Boddaert, 1783)	4	e	MZUSP
Trogoniformes			
Trogonidae			
Trogon surrucura Vieillot, 1817	1, 25	v	
Trogon curucui Linnaeus, 1766	2, 3, 4, 7, 9, 10, 12, 13, 15, 16, 19, 10, 21, 22, 23, 26	e, v (f), a	MZUSP
Coraciiformes			
Alcedinidae			
Megaceryle torquata (Linnaeus, 1766)	1, 2, 3, 9, 11, 16, 20, 26		
Chloroceryle amazona (Latham, 1790)	1, 2, 3, 7, 11, 16, 20, 21, 22, 25	e, v (f)	FMNH
Chloroceryle aenea (Pallas, 1764)	1	v	
Chloroceryle americana (Gmelin, 1788)	1, 2, 3, 7, 10, 11, 16, 20, 22	v (f)	
Momotidae			
Momotus momota (Linnaeus, 1766)	1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 16, 19, 20, 22, 26	e, v, a	MZUSP
Galbuliformes			
Galbulidae			
Brachygalba lugubris (Swainson, 1838)	4	e	MZUSP
Galbula ruficauda Cuvier, 1816	1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 15, 16, 19, 20, 21, 22, 23	e, v (f), a	MZUSP
Bucconidae			
Nystalus chacuru (Vieillot, 1816)	1, 3, 4, 7, 10, 11	e, v (f), a (g)	MZUSP
Nystalus striatipectus (Sclater, 1854)	1, 2, 7, 15, 18, 19, 20, 21, 22, 239	e, v (f)	MZUSP, MCZ
Nonulla rubeculla (Spix, 1824)	3, 12	v (f)	

Táxons	Localidades	Registros	Acrônimos
Monasa nigrifrons (Spix, 1824)	1, 2, 3	v (f), a	
Chelidoptera tenebrosa (Pallas, 1782)	3, 4	e	MZUSP
Piciformes			
Ramphastidae			
Ramphastos toco Statius Muller, 1776	1, 2, 3, 7, 9, 10, 11, 12, 13, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Ramphastos vitellinus Lichtenstein, 1823	3		
Pteroglossus castanotis Gould, 1834	1, 3, 7, 12, 13, 16, 20, 23, 25, 26	v (f), a	
Picidae			
Picumnus cirratus Temminck, 1825	26	v	
Picumnus albosquamatus d'Orbigny, 1840	1, 2, 3, 4, 7, 9, 10, 11, 15, 16, 20, 23	e, v	MZUSP
Melanerpes candidus (Otto, 1796)	1, 3, 4, 7, 10, 13, 15, 16, 18, 19, 20, 21, 22, 23, 24, 26	e, v, a	FMNH, MZUSP, MCZ
Veniliornis passerinus (Linnaeus, 1766)	1, 2, 3, 4, 7, 9, 10, 11, 15, 16, 18, 19, 20, 21, 23	e, v (f), a	MZUSP
Piculus chrysochloros (Vieillot, 1818)	19	v	
Colaptes melanochloros (Gmelin, 1788)	1, 3, 4, 7, 9, 11, 12, 13, 16, 20, 21, 22, 23, 25	e, v (f)	FMNH, MZUSP
Colaptes campestris (Vieillot, 1818)	1, 3, 4, 7, 9, 10, 11, 13, 16, 19, 20, 21, 23, 26	e, v, a	FMNH, MZUSP
Celeus lugubris (Malherbe, 1851)	3, 12, 13, 15, 16, 19, 20, 21, 22, 23, 25	v	
Celeus flavus (Statius Muller, 1776)	3		
Dryocopus lineatus (Linnaeus, 1766)	1, 3, 4, 7, 9, 10, 13, 15, 19, 20, 21, 22, 23	e, v (f), a	FMNH, MZUSP
Campephilus melanoleucos (Gmelin, 1788)	1, 3, 7, 15, 16, 18, 20, 21, 22, 23	e, v (f)	FMO
Passeriformes			
Thamnophilidae			
Formicivora melanogaster Pelzeln, 1868	3		
Formicivora rufa (Wied, 1831)	1, 4, 9, 10, 11, 15, 16, 18, 19, 20, 21, 22, 23	e, v (f), a	MZUSP
Herpsilochmus atricapillus Pelzeln, 1868	3		
Herpsilochmus longirostris Pelzeln, 1868	1, 2, 3, 4, 7, 9, 12, 22, 23, 26	e, v (f), a	MZUSP
Thamnophilus doliatus (Linnaeus, 1764)	1, 2, 3, 4, 7, 9, 10, 11, 13, 15, 16, 18, 19, 20, 21, 22, 23, 25	e, v (f), a	FMNH, MZUSP, FMO
Thamnophilus torquatus Swainson, 1825	3		
Thamnophilus sticturus Pelzeln, 1868	18	e	FMO
Thamnophilus pelzelni Hellmayr, 1924	1, 2, 3, 4, 7, 10, 12, 13, 15, 19, 21, 22, 23	e, v, a	MZUSP
Thamnophilus caerulescens Vieillot, 1816	3, 7, 19, 20, 21	v	
Taraba major (Vieillot, 1816)	2, 3, 10, 11, 15, 16, 18, 19, 20, 21, 23, 26	e, v (f), a	MZUSP
Melanopareiidae			
Melanopareia torquata (Wied, 1831)	3, 4	e	MZUSP

Táxons	Localidades	Registros	Acrônimos
Dendrocolaptidae			
Sittasomus griseicapillus (Vieillot, 1818)	1, 2, 3, 4, 10, 11, 12, 19, 20, 21, 22, 23	e, v	MZUSP
Xiphorhynchus guttatus (Lichtenstein, 1820)	2, 10, 11	v, a	
Campylorhamphus trochilirostris (Lichtenstein, 1820)	1, 4, 7, 9, 11, 15, 16, 19, 20, 23	e, v, a	MZUSP
Dendroplex picus (Gmelin, 1788)	1, 2	v (f), a (g)	
Lepidocolaptes angustirostris (Vieillot, 1818)	1, 2, 3, 7, 9, 10, 13, 16, 18, 19, 20, 21, 22, 23, 26	e, v (f), a	MZUSP, MCZ
Dendrocolaptes picumnus Lichtenstein, 1820	9, 10, 15, 18	e, v	FMO
Dendrocolaptes platyrostris Spix, 1825	3, 4, 12, 13, 19, 20, 21, 22, 23, 26	e, v	MZUSP
Xiphocolaptes major (Vieillot, 1818)	2, 15, 16, 20, 21, 22	v, a	
Furnariidae			
Xenops rutilans Temminck 1821	3, 19	v	
Berlepschia rikeri (Ridgway, 1886)	3		
Furnarius leucopus Swainson, 1838	16, 18	e, v	MZUSP
Furnarius rufus (Gmelin, 1788)	1, 2, 3, 4, 7, 9, 10, 11, 13, 15, 16, 18, 19, 10, 21, 23, 25, 26	e, v (f), a	FMNH, MZUSP, MCZ
Lochmias nematura (Lichtenstein, 1823)	3, 7	v	
Hylocryptus rectirostris (Wied, 1831)	3, 4, 7, 9, 19, 21, 22, 23	e, v (f)	MZUSP
Philydor rufum (Vieillot, 1818)	4, 12, 13	v (f)	
Syndactyla dimidiata (Pelzeln, 1859)	4	e	MZUSP
Pseudoseisura unirufa (d'Orbigny & Lafresnaye, 1838)	16	v, a	
Phacellodomus rufifrons (Wied, 1821)	3, 16, 18, 19, 20, 21, 22, 23	e, v, a	MZUSP, MCZ
Phacellodomus ruber (Vieillot, 1817)	3, 9, 10, 18, 19, 20, 21, 22, 23	v, a (g)	
Schoeniophylax phryganophilus (Vieillot, 1817)	1, 20	v	
Certhiaxis cinnamomeus (Gmelin, 1788)	1, 2, 3, 9, 11, 16, 20, 22, 23, 26	v, a	
Synallaxis frontalis Pelzeln, 1859	1, 2, 3, 4, 7, 9, 10, 19, 21, 22, 23, 25	e, v (f), a	FMNH, MZUSP
Synallaxis albecens Temminck, 1823	1, 19, 22, 26	v, a (g)	
Synallaxis hypospodia Sclater, 1874	20, 21, 22, 23	v, a	
Synallaxis albilora Pelzeln, 1856	15, 16	v	
Synallaxis scutata Sclater, 1859	3		
Pipridae			
Neopelma pallescens (Lafresnaye, 1853)	1, 3, 11, 25	v, a	
Pipra fasciicauda Hellmayr, 1906	3, 12, 22, 26	v (f), a	
Antilophia galeata (Lichtenstein, 1823)	1, 2, 3, 4, 8, 11, 13, 14, 16, 17, 25, 26	e, v (f), a	FMNH, MZUSP

Táxons	Localidades	Registros	Acrônimos
Tityridae			
Oxyruncus cristatus Swainson, 1821	3		
Schiffornis virescens (Lafresnaye, 1838)	10	v	
Tityra inquisitor (Lichtenstein, 1823)	3, 11, 13, 16, 19, 20	v, a	
Tityra cayana (Linnaeus, 1766)	3, 10, 11, 19, 22, 26	v, a	
Tityra semifasciata (Spix, 1825)	1, 3, 7, 26	v (f)	
Pachyramphus viridis (Vieillot, 1816)	2, 10, 11, 18, 20, 21, 23	e, v (f), a	MZUSP
Pachyramphus polychopterus (Vieillot, 1818)	1, 3, 7, 26	v, a	
Pachyramphus validus (Lichtenstein, 1823)	3, 11, 12, 13, 19, 22	v	
Xenopsaris albinucha (Burmeister, 1869)	3		
Rhynchocyclidae			
Leptopogon amaurocephalus Tschudi, 1846	2, 3, 7, 11, 12, 13, 26	v, a	
Corythopis delalandi (Lesson, 1830)	12	v	
Hemitriccus striaticollis (Lafresnaye, 1853)	1, 7, 18	e, v (f)	FMO
Hemitriccus margaritaceiventer (d'Orbigny & Lafresnaye, 1837)	1, 2, 3, 4, 7, 10, 13, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26	e, v, a	FMNH, MZUSP
Poecilotriccus latirostris (Pelzeln, 1868)	1, 9, 7, 10, 15, 16, 18	e, a	MZUSP
Tolmomyias sulphurescens (Spix, 1825)	1, 3, 9, 7, 10, 12, 13, 16, 19, 20, 21, 22, 23, 26	a	
Platyrinchus mystaceus Vieillot, 1818	20	v	
Todirostrum cinereum (Linnaeus, 1766)	1, 2, 3, 4, 15, 16, 20, 25, 26	e, v, a	FMNH, MZUSP
Tyrannidae			
Hirundinea ferruginea (Gmelin 1788)	3, 7	v	
Inezia inornata (Salvadori, 1897)	21	v	
Euscarthmus meloryphus Wied, 1831	18, 21	e, v	MZUSP
Camptostoma obsoletum (Temminck, 1824)	1, 2, 3, 7, 9, 10, 11, 13, 16, 20, 21, 22, 23, 26	v (f), a	
Elaenia flavogaster (Thunberg, 1822)	1, 2, 3, 4, 7, 9, 10, 13, 15, 16, 19, 20, 21, 22, 23, 25, 26	e, v, a	FMNH, MZUSP
Elaenia spectabilis Pelzeln, 1868	10, 20, 21, 23, 25, 26	e, v, a	FMNH
Elaenia chilensis Hellmayr, 1927	2, 25	e	FMNH
Elaenia chiriquensis Lawrence, 1865	1, 3, 7, 9, 11, 13	v, a (g)	
Suiriri suiriri (Vieillot, 1818)	1, 3, 4, 7, 19, 21, 23	e, v, a (g)	MZUSP
Myiopagis gaimardii (d'Orbigny, 1839)	3		
Myiopagis caniceps (Swainson, 1835)	1, 3, 19, 21, 26	v, a	
Myiopagis viridicata (Vieillot, 1817)	3, 9, 10, 12, 16, 19, 20, 21, 22	v, a	

Táxons	Localidades	Registros	Acrônimos
Capsiempis flaveola (Lichtenstein, 1823)	19, 20, 21	v	
Phaeomyias murina (Spix, 1825)	1, 2, 7, 21, 25	e, v (f), a	FMNH
Phyllomyias fasciatus (Thunberg, 1822)	1, 10	v (f)	
Serpophaga subcristata (Vieillot, 1817)	10, 11, 15, 16, 25, 26	e, v, a	FMNH
Legatus leucophaius (Vieillot, 1818)	1, 2, 3, 13, 26	v (f), a (g)	
Myiarchus tuberculifer (d'Orbigny & Lafresnaye, 1837)	1	v (f)	
Myiarchus swainsoni Cabanis & Heine, 1859	3, 18, 20, 21, 22, 23	e, v, a	FMNH
Myiarchus ferox (Gmelin, 1789)	1, 2, 3, 4, 9, 10, 11, 12, 13, 18, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Myiarchus tyrannulus (Statius Muller, 1776)	1, 2, 3, 4, 7, 9, 10, 13, 14, 16, 19, 20, 21, 25	e, v (f), a	FMNH, MZUSP
Sirystes sibilator (Vieillot, 1818)	3, 12, 19, 21, 23	a	
Casiornis rufus (Vieillot, 1816)	1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 15, 16, 19, 20, 21, 22, 23, 26	e, v, a	FMNH, MZUSP
Pitangus sulphuratus (Linnaeus, 1766)	1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 15, 14, 18, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Philohydor lictor (Lichtenstein, 1823)	1, 11, 16	v (f), a	
Machetornis rixosa (Vieillot, 1819)	1, 2, 3, 7, 9, 10, 11, 13, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25	e, v	FMNH, MZUSP
Myiodynastes maculatus (Statius Muller, 1776)	1, 2, 3, 9, 10, 12, 13, 16, 19, 18, 21, 22, 23	v (f), a	
Tyrannopsis sulphurea (Spix, 1825)	1	v (f)	
Megarynchus pitangua (Linnaeus, 1766)	1, 2, 4, 7, 9, 10, 11, 12, 13, 15, 16, 19, 20, 21, 22, 23, 26	e, v (f), a	MZUSP
Myiozetetes cayanensis (Linnaeus, 1766)	1, 2, 3, 9, 11, 12, 14, 19, 20, 22, 23, 25	a	
Myiozetetes similis (Spix, 1825)	1, 2, 26	v, a	
Tyrannus albogularis Burmeister, 1856	1, 2, 7, 20, 21, 22, 23	e, v (f)	FMNH
Tyrannus melancholicus Vieillot, 1819	1, 2, 3, 9, 10, 11, 12, 13, 15, 16, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH
Tyrannus savana Vieillot, 1808	1, 2, 3, 9, 10, 11, 19, 20, 21, 22, 23, 25, 26	e, v	FMNH
Griseotyrannus aurantioatrocristatus (d'Orbigny & Lafresnaye, 1837)	1, 2, 9, 13, 15, 19, 21, 25	e, v (f)	FMNH
Empidonomus varius (Vieillot, 1818)	1, 2, 3, 7, 12, 13, 19, 20, 21, 26	v (f), a	
Colonia colonus (Vieillot, 1818)	3, 4, 11, 21, 23	e, v	MZUSP
Myiophobus fasciatus (Statius Muller, 1776)	1, 2, 4, 19, 23, 26	e, v, g (a)	MZUSP
Sublegatus modestus (Wied, 1831)	10, 18	e, v	MZUSP
Pyrocephalus rubinus (Boddaert, 1783)	1, 2, 3, 4, 9, 11, 18, 19, 20, 21, 22, 23, 25, 26	e, v (f)	FMNH, MZUSP
Fluvicola albiventer (Spix, 1825)	2, 9, 15, 16, 18, 20, 22, 23, 25, 26	e, v (f), a	FMNH
Arundinicola leucocephala (Linnaeus, 1764)	1, 9, 18, 20, 21, 22, 23, 25, 26	e, v	FMNH
Alectrurus tricolor (Vieillot, 1816)	25	e	FMNH
Cnemotriccus fuscatus (Wied, 1831)	1, 7, 9, 10, 11, 13, 15, 16, 19, 20, 21, 22, 23	v, a	

Táxons	Localidades	Registros	Acrônimos
Lathrotriccus euleri (Cabanis, 1868)	3, 7, 9, 10, 16, 21	v, a	
Contopus cinereus (Spix, 1825)	4, 19, 21	e, v (f), a	MZUSP
Knipolegus lophotes Boie, 1828	4	e	MZUSP
Satrapa icterophrys (Vieillot, 1818)	12, 18, 23	v	
Xolmis cinereus (Vieillot, 1816)	1, 2, 3, 7, 10, 13, 18, 19, 20, 21, 22, 23	e, v (f), a	MZUSP
Xolmis velatus (Lichtenstein, 1823)	2, 3, 7, 9, 10, 13, 15, 16, 19, 20, 21, 22, 23, 26	e, v (f)	FMNH
Vireonidae			
Cyclarhis gujanensis (Gmelin, 1789)	1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26	e, v, a (g)	FMNH, MZUSP
Vireo olivaceus (Linnaeus, 1766)	1, 2, 3, 10, 11, 12, 15, 16, 18, 19	e, v (f), a (g)	FMO
Corvidae			
Cyanocorax cyanomelas (Vieillot, 1818)	2, 9, 10, 11, 15, 16, 18, 21, 22, 23	e, v, a	MZUSP
Cyanocorax cristatellus (Temminck, 1823)	1, 3, 4, 7, 9, 21, 22, 25, 26	e, v, a	FMNH, MZUSP
Cyanocorax chrysops (Vieillot, 1818)	1, 2, 4, 7, 9, 10, 11, 12, 13, 15, 16, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Hirundinidae			
Pygochelidon cyanoleuca (Vieillot, 1817)	1	v	
Alopochelidon fucata (Temminck, 1822)	1, 3	v	
Stelgidopteryx ruficollis (Vieillot, 1817)	1, 2, 3, 4, 9, 13, 18, 20, 21, 22, 23	e, v (f)	MZUSP
Progne tapera (Vieillot, 1817)	1, 2, 7, 9, 10, 11, 14, 15, 18, 19, 20, 21, 22, 23, 26	e, v (f), a	FMO
Progne chalybea (Gmelin, 1789)	1, 7, 15, 19, 20, 23, 25, 26	e, v	FMNH
Tachycineta albiventer (Boddaert, 1783)	1, 16, 20, 21, 22	v	
Tachycineta leucorrhoa (Vieillot, 1817)	3, 22, 23	v	
Hirundo rustica Linnaeus, 1758	2, 20	v	
Troglodytidae			
Troglodytes musculus Naumann, 1823	2, 3, 4, 7, 9, 10, 11, 15, 16, 26	e, v, a	MZUSP
Campylorhynchus turdinus (Wied, 1831)	9, 7, 10, 11, 13, 15, 16, 18, 19, 20, 21, 22, 23	e, v, a	MZUSP
Cantorchilus leucotis (Lafresnaye, 1845)	2, 3, 4, 15, 20, 21, 22, 23	e, v, a	MZUSP
Donacobiidae			
Donacobius atricapilla (Linnaeus, 1766)	2, 10, 16, 20, 21, 26	v (f), a	
Polioptilidae			
Polioptila dumicola (Vieillot, 1817)	1, 2, 3, 4, 9, 10, 11, 18, 19, 20, 21, 26	e, v (f), a	MZUSP, MCZ
Turdidae			
Catharus fuscescens	7	v (f)	
Turdus rufiventris Vieillot, 1818	1, 2, 3, 7, 9, 11, 12, 13, 15, 16, 18, 19, 20, 22, 23, 26	e, v, a	MZUSP

Táxons	Localidades	Registros	Acrônimos
Turdus leucomelas Vieillot, 1818	1, 2, 3, 4, 7, 9, 10, 12, 13, 15, 16, 20, 21, 22, 23, 25, 26	e, v, a	FMNH, MZUSP
Turdus amaurochalinus Cabanis, 1850	1, 2, 3, 4, 7, 15, 16, 19, 20, 21, 22, 23	e, v, a	MZUSP
Turdus subalaris (Seebohm, 1887)	3		
Turdus albicollis Vieillot, 1818	10	v	
Mimidae			
Mimus saturninus (Lichtenstein, 1823)	1, 3, 4, 7, 9, 10, 11, 13, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP, FMO
Mimus triurus (Vieillot, 1818)	25	e	FMNH
Motacilidae			
Anthus lutescens Pucheran, 1855	2, 3, 7, 23, 25, 26	e, v, a	FMNH
Coerebidae			
Coereba flaveola (Linnaeus, 1758)	1, 2, 3, 4, 7, 18	e, v, a	MZUSP
Thraupidae			
Saltator maximus (Statius Muller, 1776)	3		
Saltator coerulescens Vieillot, 1817	16, 20, 23	v, a	
Saltator similis d'Orbigny & Lafresnaye, 1837	1, 2, 3, 4, 7, 9, 12, 13, 15, 19, 20, 21	v, a	
Saltatricula atricollis (Vieillot, 1817)	1, 3, 4, 7, 9, 11, 15, 19, 20, 21, 22, 25	e, v (f), a (g)	FMNH, MZUSP
Schistochlamys melanopis (Latham, 1790)	3, 4	e, v	MZUSP
Schistochlamys ruficapillus (Vieillot, 1817)	1, 21, 23	v (f), a	
Nemosia pileata (Boddaert, 1783)	1, 3, 4, 9, 10, 11, 15, 19, 20, 22	e, v, a	MZUSP
Thlypopsis sordida (d'Orbigny & Lafresnaye, 1837)	4, 21	e, v	MZUSP
Cypsnagra hirundinacea (Lesson, 1831)	15, 26	v (f), a (g)	
Trichothraupis melanops (Vieillot, 1818)	3, 4, 7	e, v	MZUSP
Eucometis penicillata (Spix, 1825)	1, 2, 3, 7, 9, 11, 12, 16, 19, 20, 22, 23, 26	v (f), a	
Tachyphonus rufus (Boddaert, 1783)	1, 2, 3, 4, 11, 12, 13, 19, 20, 21, 22, 23, 25	e, v (f), a	FMNH, MZUSP
Ramphocelus carbo (Pallas, 1764)	1, 2, 3, 4, 7, 10, 11, 16, 18, 19, 20, 22, 23, 25	e, v, a	MZUSP, FMO
Thraupis sayaca (Linnaeus, 1766)	1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 15, 16, 17, 19, 20, 21, 22, 23, 25, 26	e, v, a	FMNH, MZUSP, FMO
Thraupis palmarum (Wied, 1823)	1, 2, 3, 4, 9, 10, 11, 13, 15, 16, 19, 20, 22, 23, 25	e, v, a	FMNH, MZUSP
Tangara cayana (Linnaeus, 1766)	1, 2, 3, 4, 7, 9, 10, 12, 13, 20, 21, 22, 23, 26	e, v (f)	MZUSP
Tersina viridis (Illiger, 1811)	1, 3, 4, 7, 9, 12, 13, 21, 22, 23, 26	e, v	MZUSP
Dacnis cayana (Linnaeus, 1766)	1, 2, 3, 7, 9, 11, 12, 13, 19, 20, 21, 22, 23, 26	v (f)	
Cyanerpes cyaneus (Linnaeus, 1766)	1, 2, 3, 7, 23	v	
Hemithraupis guira (Linnaeus, 1766)	1, 2, 3, 4, 7, 9, 10, 11, 19, 20, 21, 23, 26	e, v, a	MZUSP
Conirostrum speciosum (Temminck, 1824)	1, 9, 10, 13, 15, 18, 19, 20	e, v (f)	MZUSP

Táxons	Localidades	Registros	Acrônimos
Emberizidae			
Zonotrichia capensis (Statius Muller, 1776)	3, 4, 10, 20, 21, 22	e, v, a	MZUSP
Ammodramus humeralis (Bosc, 1792)	1, 2, 3, 4, 7, 9, 10, 11, 13, 15, 16, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Porphyrospiza caerulescens (Wied, 1830)	3		
Poospiza cinerea Bonaparte, 1850	4	e	MZUSP
Sicalis citrina Pelzeln, 1870	3, 8	v	
Sicalis flaveola (Linnaeus, 1766)	1, 2, 3, 7, 10, 13, 15, 16, 18, 19, 20, 21, 22, 23	e, v (f), a	MZUSP, MCZ
Emberizoides herbicola (Vieillot, 1817)	1, 3, 4, 8, 9, 11, 20, 21, 22, 23, 26	e, v (f)	MZUSP
Volatinia jacarina (Linnaeus, 1766)	1, 2, 3, 7, 9, 10, 11, 13, 16, 20, 21, 22, 23, 26	v, a	
Sporophila plumbea (Wied, 1830)	1, 2, 3, 4, 20	e, v (f)	MZUSP
Sporophila collaris (Boddaert, 1783)	2, 11, 15, 16, 20, 22, 23, 26	v	
Sporophila lineola (Linnaeus, 1758)	1, 9, 10, 15	v, a	
Sporophila nigricollis (Vieillot, 1823)	1, 2, 3, 21	v (f)	
Sporophila caerulescens (Vieillot, 1823)	1, 2, 3, 19, 21, 23	v (f), a	
Sporophila leucoptera (Vieillot, 1817)	1, 15, 18, 20, 21, 23	e, v (f), a	MZUSP, MCZ
Sporophila bouvreuil (Statius Muller, 1776)	2, 3	v	
Sporophila angolensis (Linnaeus, 1766)	1, 2, 3, 9, 15, 20, 22, 23, 25	e, v (f), a	FMNH
Sporophila maximiliani (Cabanis, 1851)	15	v	
Arremon taciturnus (Hermann, 1783)	3		
Arremon flavirostris Swainson, 1838	4, 12, 13, 20, 21, 23	e, v	MZUSP
Charitospiza eucosma Oberholser, 1905	11	v	
Coryphospingus cucullatus (Statius Muller, 1776)	1, 2, 3, 4, 9, 10, 11, 13, 15, 16, 18, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Paroaria coronata (Miller, 1776)]	16	v	
Paroaria capitata (d'Orbigny & Lafresnaye, 1837)	15, 16	v	
Cardinalidae			
Piranga flava (Vieillot, 1822)	4, 18	e, v	MZUSP
Cyanoloxia brissonii (Lichtenstein, 1823)	3, 18, 19, 21, 23, 25	e, v (f)	FMNH, MZUSP
Parulidae			
Parula pitiayumi (Vieillot, 1817)	1, 7, 9, 10, 11, 13, 16, 18, 19, 20, 21, 23, 26	e, v (f), a	MZUSP
Geothlypis aequinoctialis (Gmelin, 1789)	1, 3, 16, 19, 20, 21, 23, 25, 26	e, v (f), a	FMNH
Basileuterus culicivorus (Deppe, 1830)	26	v	
Basileuterus hypoleucus Bonaparte, 1830	1, 2, 4, 9, 10, 11, 12, 13, 16, 18, 19, 20, 21, 22, 23, 26	e, v	MZUSP

Táxons	Localidades	Registros	Acrônimos
Basileuterus flaveolus (Baird, 1865)	1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 15, 16, 18, 19, 20, 21, 22, 26	e, v (f), a	MZUSP
Basileuterus leucophrys Pelzeln, 1868	1, 3	v	
Icteridae			
Psarocolius decumanus (Pallas, 1769)	3, 7, 11, 12, 15, 16, 20	v, a	
Procacicus solitarius (Vieillot, 1816)	11, 15, 16, 26	v, a	
Cacicus chrysopterus (Vigors, 1825)	15, 16, 19, 20	v	
Cacicus haemorrhous (Linnaeus, 1766)	3, 19, 20, 21, 25, 26	e, v	FMNH
Cacicus cela (Linnaeus, 1758)	3		
Icterus pyrrhopterus (Vieillot, 1819)	2, 4, 9, 10, 11, 15, 16, 18, 19, 21, 22, 23, 25	e, v, a	FMNH, MZUSP
Icterus croconotus (Wagler, 1829)	3, 15, 16, 19, 20, 21, 22, 23, 25	v, a	
Gnorimopsar chopi (Vieillot, 1819)	1, 3, 4, 7, 10, 12, 13, 15, 16, 19, 20, 21, 22, 23, 25	e, v (f), a	FMNH, MZUSP
Agelasticus cyanopus (Vieillot, 1819)	16	v	
Pseudoleistes guirahuro (Vieillot, 1819)	1, 3, 23, 25, 26	e, v (f)	FMNH
Agelaioides badius (Vieillot, 1819)]	7, 15, 16, 23	v	
Molothrus rufoaxillaris Cassin, 1866	1, 10, 13, 15, 16, 23	v (f), a	
Molothrus oryzivorus (Gmelin, 1788)	20, 23	v, a	
Molothrus bonariensis (Gmelin, 1789)	1, 3, 7, 8, 10, 11, 13, 15, 16, 18, 26	e, v (f), a	MZUSP
Sturnella superciliaris (Bonaparte, 1850)	1, 3, 7, 16, 23, 26	v	
Fringillidae			
Sporagra magellanica (Vieillot, 1805)	4, 16, 18	e, v	MZUSP
Euphonia chlorotica (Linnaeus, 1766)	1, 2, 3, 4, 7, 9, 10, 11, 12, 15, 16, 19, 20, 21, 22, 23, 25, 26	e, v (f), a	FMNH, MZUSP
Passeridae			
Passer domesticus (Linnaeus, 1758)	15, 16	v	

Registros duvidosos

D'Horta *et al.* (2008) admitem a existência de quatro espécies antes agregadas em *Icterus cayanensis*: *I. pyrrhopterus*, *I. valenciobuenoi*, *I. periporphyrus* e *I. tibialis*, sendo as três primeiras ocorrentes no Mato Grosso do Sul (Omland *et al.* 1999, Sturge *et al.* 2009). No entanto, com base no padrão de coloração da dragona dos indivíduos observados em campo, optamos por converter todos os registros de *I. cayanensis* em favor de *I. pyrrhopterus*, táxon aceito como espécie plena (CBRO 2011).

Alguns registros mencionados por Tubelis & Tomas (2003) para Aquidauana, bem como aqueles citados por Hass (2004) para a vertente do Rio Taquari, no entorno do Parque Nacional de Emas, e Nunes *et al.* (2008) para a Fazenda Taboco, foram reavaliados e necessitam de revisão e comprobação documentada, por se tratarem de equívocos de identificação e incoerências biogeográficas. Nesse contexto, enquadram-se os seguintes táxons:

Phaethornis ruber: menção em lista de espécies (Hass 2004), porém, não há registro comprobatório e a distribuição é incompatível.

Thalurania glaucopis: menção em lista de espécies (Tubelis & Tomas 2003); sem registro comprobatório. O registro não é passível de reavaliação.

Melanerpes flavifrons: menção em lista de espécies (Hass 2004), porém, não há registro comprobatório e a distribuição é incompatível.

Celeus flavescens: menção em lista de espécies (Hass 2004), porém, não há registro comprobatório e a distribuição é incompatível.

Formicivora grisea: menção em lista de espécies (Hass 2004), sem registro comprobatório. As espécies do gênero são muito similares, fato que pode ter gerado equívoco de identificação. O referido táxon possui distribuição ampla distribuição na América do Sul (norte), principalmente na Amazônia (Sick 1997). Desta forma, o registro atribuído a esse táxon foi convertido em favor de *Formicivora melanogaster*, que conforme a literatura consultada (Sick 1997), possui distribuição compatível para ocorrência na Serra de Maracaju.

Myiornis auricularis: menção em lista de espécies (Nunes *et al.* 2008), porém, não há circunstanciação e a distribuição é incompatível.

Euphonia violacea: menção em lista de espécies (Hass 2004), porém, não há circunstanciação e a distribuição é incompatível.

Aspectos biogeográficos

Do ponto de vista biogeográfico, a Serra de Maracaju atua como um importante corredor para dispersão de espécies típicas do Cerrado. Neste sentido enquadram-se espécies tidas como endêmicas do bioma Cerrado (Silva 1995, Silva & Santos 2005), tais como *Nothura minor*, *Alipiopsitta xanthops*, *Melanopareia torquata*, *Antilophia galeata*, *Cyanocorax cristatellus* e *Saltatricula atricollis*.

A ocorrência de táxons como *Aburria nattereri*, *Pseudastur albicollis*, *Hylocharis cyanus*, *Celeus flavus*, *Dendroplex picus*, *Myiarchus tuberculifer*, *Tyrannopsis sulphurea*, *Tityra semifasciata* e *Cyanerpes cyaneus* é notável, uma vez que tais aves possuem a bacia do Rio Amazonas como centro de distribuição (Silva 1996). Provavelmente as matas de galeria ao longo dos principais rios que cortam a Serra de Maracaju e a borda leste da planície pantaneira atuam como importantes corredores para a dispersão desses elementos amazônicos na região, tal como proposto por alguns autores (Brown 1986, Nunes & Tomas 2004).

Segundo Straube *et al.* (1996) e Pivatto *et al.* (2006), grande parte das espécies endêmicas da Mata Atlântica cessam suas distribuições para oeste nas florestas estacionais semidecíduas do sul do Mato Grosso do Sul, oeste do Paraná, Paraguai oriental e extremo nordeste da Argentina. Elementos típicos desse bioma, tais como alguns membros da família Thraupidae (como *Tangara seledon*, *Pyrrhocoma ruficeps* e *Orthogonys chloricterus*), estão ausentes na Serra de Maracaju. No entanto, algumas espécies atlânticas podem ser avistadas na região, como *Florisuga fusca*, *Lophornis magnificus* e *Phyllomyias fasciatus*.

Espécies como *Ortalis canicollis*, *Aratinga nenday*, *Celeus lugubris*, *Nystalus striatipectus*, *Xiphocolaptes major*, *Pseudoseisura unirufa*, *Mimus triurus* e *Agelaioides badius* apresentam distribuição centrada na bacia do alto rio Paraguai, na planície do Pantanal e borda oeste do território brasileiro, contígua ao leste e norte da Bolívia. Tais aves podem ser consideradas elementos de influência chaquenha na região (Short 1975, Straube *et al.* 2006).

Apesar da proximidade com o Pantanal, algumas espécies tidas como abundantes e comuns na planície pantaneira, notadamente aves paludícolas, são incomuns na Serra de Maracaju. Nesse contexto encontram-se *Chauna torquata*, *Jabiru mycteria*, *Mycteria americana*, *Phalacrocorax brasilianus*, *Anhinga anhinga*, *Theristicus caerulescens*, *Rostrhamus sociabilis*, *Busarellus nigricollis* e *Agelasticus cyanopus*. Essas aves foram avistadas com mais frequência em localidades próximas à planície de inundação, como Aquidauana e Fazenda Taboco. Mesmo espécies não relacionadas a ambientes aquáticos como *Paroaria capitata*, *Paroaria coronata* e *Agelaioides badius* têm suas distribuições restritas às regiões de ecótono entre o planalto e a planície do Pantanal.

Espécies ameaçadas

Quinze espécies presentes na Serra de Maracaju constam em listas de espécies criticamente ameaçadas, vulneráveis, ameaçadas ou quase-ameaçadas de extinção em âmbito global (BirdLife International 2009) e nacional

(Silveira & Straube 2008). Nesse sentido encontram-se *Rhea americana*, *Nothura minor*, *Tigrisoma fasciatum*, *Urubitinga coronata*, *Harpia harpyja*, *Anodorhynchus hyacinthinus*, *Primolius maracana*, *Pyrrhura devillei*, *Alipiopsitta xanthops*, *Culicivora caudacuta*, *Alectrurus tricolor*, *Porphyrospiza caerulescens*, *Poospiza cinerea*, *Sporophila maximiliani* e *Charitospiza eucosma*.

A espécie *A. hyacinthinus* é tida como ameaçada de extinção em âmbito global e vulnerável à extinção em âmbito nacional e sua distribuição na Serra de Maracaju parece estar restrita às regiões de contato do planalto com a planície pantaneira, que abriga suas maiores populações no estado de Mato Grosso do Sul (Nunes 2010).

O desmatamento e a descaracterização da paisagem são as principais intervenções humanas apontadas como ameaças à conservação de outras espécies de psitacídeos ocorrentes na região (Silveira & Straube 2008, BirdLife International 2009), dentre as quais podemos destacar *P. maracana*, *P. devillei* e *A. xanthops*.

Apesar da espécie *P. caerulescens* não estar presente em nenhuma categoria de ameaça de extinção em âmbito nacional, seu estado de conservação no Mato Grosso do Sul deve ser considerado preocupante (Nunes 2009). Sua área de ocorrência é disjunta e grande parte das populações ocorrentes em território sul mato-grossense está restrita aos campos nos topos de morros do Maciço do Urucum, na borda oeste do Pantanal (Nunes 2009, Lopes 2012). Nunes (2009) relata ainda que tais habitats têm sido drasticamente reduzidos e alterados pela extração de minério de ferro.

Outro caso preocupante é o da espécie *S. maximiliani* que se encontra criticamente ameaçado de extinção em âmbito nacional devido a sua captura na natureza e comércio no tráfico de animais silvestres (Silveira & Straube 2008).

Para espécies raras e ecologicamente exigentes quanto ao uso de hábitat, como *T. fasciatum*, a situação é preocupante. Esta espécie ocorre exclusivamente em rios límpidos com corredeiras e orlados por densas florestas (Faria 2008). Desta forma, o desmatamento e a descaracterização da vegetação ripária ao longo dos rios que cortam a região, bem como a implantação de pequenas centrais hidroelétricas (PCHs) podem ser apontados como as principais ameaças à sua conservação (Nunes *et al.* 2012).

Algumas espécies relacionadas para a região são conhecidas apenas por registros históricos, podendo ter sido extintas localmente devido às alterações no hábitat. Nesse contexto enquadram-se o *L. magnificus*, *C. caudacuta* e *P. cinerea*. Por outro lado, a ocorrência de grandes rapinantes na região, tais como *U. coronata*, *H. harpyja* e *S. ornatus* é um bom indicativo da qualidade do habitat, uma vez que tais aves necessitam de grandes territórios para sobreviver e se reproduzir (Robinson 1994).

Registros notáveis

Nothura minor: espécie vulnerável à extinção em âmbito global e nacional, com registros históricos para a Fazenda Capão Bonito (FMNH-110492) e o Parque Estadual das Nascentes do rio Taquari (Hass 2004). Os demais registros no Mato Grosso do Sul incluem a região de Campo Grande (Sick 1997), onde provavelmente a espécie já esteja extinta.

Anas bahamensis: marreca errante tida como rara e incomum no Centro Oeste do Brasil (Gwynne *et al.* 2010). Há apenas um registro na Serra de Maracaju, no município de Sonora (Junqueira 2008). Considerando o Mato Grosso do Sul, essa marreca era conhecida apenas no Pantanal do Abobral (Nunes *et al.* 2010).

Aburria nattereri: espécie típica da bacia amazônica que estende sua área de distribuição até as matas de galeria dos planaltos da região de Coxim (Fazenda Recreio), bem como os pantanais do Paiaguás, Miranda e Aquidauana (Nunes 2011), onde possivelmente ocorre em simpatria com sua congênere *A. grayi*.

Tigrisoma fasciatum: espécie rara, ameaçada de extinção e de ocorrência restrita a rios encachoeirados e com lajedos rochosos escorregadios em meio às águas turbulentas (Gwynne *et al.* 2010). Há poucos registros dessa espécie em território sul-mato-grossense, que incluem além da região do Rio Verde, o Rio Sucuriú, o Planalto da Bodoquena (Pivatto *et al.* 2006, Nunes *et al.* 2012) e a Planície de Inundação do Alto Rio Paraná (Gimenes *et al.* 2007).

Ictinia mississippiensis: migrante setentrional registrado em um grande bando sobrevoando a região de Aquidauana (Whittaker *et al.* 2008). Os demais registros desse gavião no Mato Grosso do Sul incluem algumas áreas da planície pantaneira e o Maciço do Urucum (Vasconcelos *et al.* 2008, Nunes 2011).

Pseudastur albicollis: espécie típica da bacia amazônica, até então registrada apenas na Serra do Amolar, na borda oeste da planície do Pantanal. A ocorrência dessa espécie na Fazenda Trilhas do Sol pode ser considerada o registro mais ao sul da área de sua distribuição no Brasil.

Harpia harpyja: espécie quase-ameaçada de extinção (Birdlife Internacional 2009) que recentemente era conhecida apenas no Planalto da Bodoquena (Pivatto *et al.* 2006). No entanto, essa ave tem sido registrada constantemente nos arredores da Fazenda Estância Crioula, no município de Dois Irmãos do Buriti. A ocorrência dessa espécie evidencia o bom estado de conservação da região, uma vez que depende de grandes áreas para sobreviver e se reproduzir.*Spizaetus tyrannus*: o avistamento desse gavião em Sidrolândia pode ser considerado o primeiro registro documentado da espécie em território sul-mato-grossense. Até então a espécie só era conhecida para a Fazenda Porto Conceição, no Chaco brasileiro (Straube *et al.* 2006).

Spizaetus ornatus: espécie tida como rara e incomum no Brasil (Carlos & Girão 2006). Apesar de não constar nas listas de espécies ameaçadas de extinção em âmbito global e nacional, seu estado de conservação é preocupante em detrimento da perda de hábitat e abate como forma de retaliação devido o ataque a animais domésticos (Nunes 2010). Há poucos registros desse gavião no Mato Grosso do Sul, que incluem regiões como o Complexo Aporé-Sucuriú (Silva *et al.* 2006), Porto Murtinho (Tubelis & Tomas 2003) e o Maciço do Urucum (Tomas *et al.* 2010). Desta forma, os registros obtidos na Fazenda Trilha do Sol e nas Reservas Privadas do Patrimônio Natural (RPPNs) Vale do Bugio e Gavião de Penacho são muito importantes para a conservação da espécie no estado.

Falco deiroleucus: falcão raro e incomum no Mato Grosso do Sul, com apenas dois registros, Fazenda Rio Negro (Donatelli 2005) e Fazenda Barranco Alto (Leuzinger 2009), ambas localizadas no Pantanal. Embora não esteja presente em nenhuma lista de espécies ameaçadas de extinção em âmbito global e nacional, seu estado de conservação em território sul-mato-grossense requer atenção especial devido a sua raridade.

Patagioenas speciosa: espécie florestal comum na bacia amazônica e tida como rara no Mato Grosso do Sul, sendo registrada apenas na região conhecida como complexo Aporé-Sucuriú (Silva *et al.* 2006) e em Três Lagoas (J. C. Morante Filho *com. pess.*), ambas na região leste do estado.

Pionus menstruus: psitacídeo incomum em território sul-mato-grossense, com registros na região leste na Fazenda Pouso Frio (Silva *et al.* 2006) e Pantanal, em localidades como Salobra (Tubelis & Tomas 2003), Fazenda Rio Negro (Donatelli 2005) e Fazenda Barranco Alto (Leuzinger 2009).

Celeus flavus: Antas & Palo Jr. (2009) destacam que a RPPN SESC Pantanal é o limite sul da área de ocorrência dessa espécie típica da bacia amazônica. No entanto, tem sido registrada nos planaltos do entorno do Pantanal (Parque Estadual das Nascentes do Rio Taquari) e na planície pantaneira (Nunes 2011), onde ocorre em simpatria com o congênere chaquenho *C. lugubris*.

Formicivora melanogaster: embora Gwynne *et al.* (2010) relacionem a ocorrência dessa espécie em grande parte do território sul-mato-grossense, há apenas um registro para o estado, no Parque Estadual das Nascentes do Rio Taquari.

Berlepschia rikeri: espécie típica de veredas e buritizais do Brasil Central cuja ocorrência no Parque Estadual das Nascentes do Rio Taquari é esperada e pode ser considerado o primeiro registro em território sul-mato-grossense.

Synallaxis scutata: espécie rara e incomum no Mato Grosso do Sul. Além do Parque Nacional das Nascentes do Rio Taquari, há registros para o Maciço do Urucum (Naumburg 1930), região leste do estado (Piratelli 1999) e Pantanal da Nhecolândia (Tubelis & Tomas 2003).

Oxyruncus cristatus: ave incomum na Bacia do Alto Paraguai, sendo registrada apenas na Serra das Araras, Mato Grosso (Willis & Oniki 1990). O avistamento no Parque Estadual das Nascentes do Rio Taquari é o único registro oficial dessa espécie no Mato Grosso do Sul.

Tityra semifasciata: sua área de ocorrência no Mato Grosso do Sul é muito interessante, pois ocorre desde os cerrados no norte do estado até regiões de transição entre o Cerrado e as florestas estacionais da Bacia do Alto Rio Paraná (sul e sudeste do estado), o que amplia em mais de 600 km ao sul sua área de distribuição conhecida no Brasil (Godoi *et al.* 2011).

Tyrannopsis sulphurea: ocorre na Amazônia, Maranhão, Piauí, Tocantins, Goiás e oeste de Minas Gerais (Pacheco *et al.* 2010). O registro desse tiranídeo no município de Sonora (Pequenas Centrais Hidroelétricas - PCH Santa Gabriela) pode ser considerado o primeiro para o Mato Grosso do Sul e o limite mais ao sul de sua área de ocorrência conhecida no Brasil.

Myiarchus tuberculifer: trata-se do primeiro registro dessa espécie no Mato Grosso do Sul. No Brasil, segundo Sick (1997) ocorre em toda a Amazônia e porção oriental do país (de Alagoas ao Rio de Janeiro), sendo a região da PCH Santa Gabriela possivelmente o limite mais ao sul conhecido de sua área de distribuição.

Catharus fuscescens: migrante setentrional até o momento registrado apenas no Maciço do Urucum, em Corumbá (Vasconcelos *et al.* 2008). Seu avistamento na Fazenda Trilhas do Sol amplia em mais de 280 km para o leste sua área de ocorrência conhecida no Mato Grosso do Sul.

Saltator maximus: táxon típico do cerrado e considerado raro no Mato Grosso do Sul. Registrado apenas para os cerrados da região leste do estado (Pinto 1932) e em algumas áreas do Pantanal (Donatelli 2005).

Porphyrospiza caerulescens: espécie de ocorrência disjunta e restrita a campos e cerrados de topos de morros no Mato Grosso do Sul, sendo mais comum no Maciço do Urucum, borda oeste do Pantanal (Nunes 2009). Classificada na categoria de quase ameaçada (BirdLife International 2009), segundo Nunes (2009), a maior ameaça às populações dessa espécie na Bacia do Alto Paraguai e Mato Grosso do Sul é a perda e a descaracterização do hábitat.

Poospiza cinerea: espécie rara e de ocorrência localizada nos cerrados e campos cerrados do Brasil Central e estados de São Paulo (região norte) e Minas Gerais (Sick 1997). No Mato Grosso do Sul, existe apenas um registro oriundo de um espécime coletado na Fazenda Recreio. Provavelmente é substituída geograficamente por sua congênere *P. melanoleuca*, que é típica do Chaco (Straube *et al.* 2006). Consta como vulnerável à extinção em âmbito global de acordo com a BirdLife International (2009).

Sporophila maximiliani: táxon raro e incomum no Mato Grosso do Sul, com um único registro obtido na Fazenda Bocaina, região de transição para a planície do Pantanal (brejos do rio Taboco). É considerada criticamente ameaçada de extinção no Brasil (Silveira & Straube 2008) devido a sua captura na natureza para abastecer o comércio ilegal de animais silvestres, atividade comum na região (Nunes 2010).

Arremon taciturnus: emberezídeo raro e incomum no Mato Grosso do Sul, sendo até então registrado apenas na Fazenda Lagoinha (Silva *et al.* 2006). O registro no Parque Estadual das Nascentes do Rio Taquari pode ser considerado o primeiro para a Bacia do Alto Rio Paraguai e amplia a área de distribuição conhecida dessa ave no estado.

Charitospiza eucosma: espécie rara e quase-ameaçada de extinção em âmbito global (BirdLife International 2009) com poucos registros em território sul-matogrossense. Há apenas um registro para a área de estudo, a Fazenda Constantino, no município de Corguinho. Os demais registros estão concentrados na região leste do estado, como Três Lagoas (MZUSP 12677, Pinto 1932) e Inocência (Bucci 2009).

Considerações finais

Comparada a outras regiões de Mato Grosso do Sul, notadamente o sul e leste do estado, os planaltos da Serra de Maracaju ainda mantém mosaicos de paisagens importantes para a conservação de aves no Mato Grosso do Sul e Cerrado do Brasil Central. A região abriga várias espécies ameaçadas e quase-ameaçadas de extinção e de distribuição restrita, atuando como uma área de extrema importância para a conservação de aves no Mato Grosso do Sul.

As principais ameaças à biodiversidade local são o desmatamento promovido pela expansão da atividade agropecuária, ação de carvoarias e silvicultura, como plantações de *Eucalyptus*, que tem causado a perda e fragmentação de habitats naturais (Harris *et al.* 2006). A instalação de Pequenas Centrais Hidroelétricas (PCHs), além de aumentar as taxas de desmatamento e permitir o aumento na caça de animais silvestres, pode alterar o regime hidrológico dos rios da região e em longo prazo promover um grande desastre ambiental no interior da planície pantaneira, tal como o que ocorreu com o rio Taquari (Galdino *et al.* 2005, Tomas *et al.* 2007).

Apesar da Serra de Maracaju estar inserida no Corredor de Biodiversidade Maracaju-Negro (Machado *et al.* 2009) e ser considerada área prioritária para a conservação da biodiversidade do Cerrado e Pantanal (MMA 2007), poucas são as unidades de conservação existentes. Estas áreas estão representadas principalmente por parques estaduais (Parque Estadual da Serra de Sonora e Parque Estadual das Nascentes do rio Taquari) e Reservas Particulares do Patrimônio Natural (RPPNs Gavião de Penacho, Vale do Bugio, Lajedo e Morro da Peroba/Fazenda Capão Bonito). Estas RPPNs e parques estaduais protegem apenas pouco mais de 10.000 ha de áreas naturais. Nesse sentido, faz-se urgente a criação de uma grande unidade de conservação que contemple os diferentes habitats existentes na paisagem regional, de modo a garantir a manutenção e sobrevivência no longo prazo da comunidade de aves presente na Serra de Maracaju.

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SHORT-COMMUNICATION

On the nest, eggs and nestlings of the Short-tailed Antthrush *(Chamaeza campanisona)*

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ABSTRACT: I characterize the nest, eggs and nestlings of the Short-tailed Antthrush (*Chamaeza campanisona*) based on a nest found in an Atlantic semideciduous forest in southern Brazil. The nest was in a natural cavity 1.5 m above the ground and it was 87 cm deep. Three pure white eggs were recorded on a bed of leaves. The nestlings had pink skin, blackish gray down and they left the nest 16-19 days after hatching. Images from inside the nest, the eggs and nestlings are first presented, even for the genus. The *Chamaeza* nest type and egg coloration resemble nest describe for the family Formicariidae, supporting the separation from the family Grallariidae.

KEY-WORDS: breeding, cavity nest, formicarids, Formicariidae, nesting

The new Neotropical family Formicariidae, after the recent separation of the antpittas (Grallariidae), comprises 12 species (genera *Formicarius* and *Chamaeza*), and is closely related to Rhinocryptidae and Furnariidae (Irestedt *et al*. 2002, Krabbe & Schulenberg 2003, Chesser 2004, Rice 2005, Moyle *et al*. 2009). Mainly due to the difficulty of finding nests, basic reproductive aspects are poorly known in ground antbirds, including common species (Krabbe & Schulenberg 2003). This is the case to the *Chamaeza* antthrushes with only some scatter and poorly documented nesting records (Cadena *et al*. 2000). I characterize the nest, eggs and nestlings of the Short-tailed Antthrush (*C. campanisona*). Although *C. campanisona* is the most widespread *Chamaeza*, it have a patchy distribution between northern Venezuela and central Bolivia, also in the tepuis of southern Venezuela to Guyana, and more widely in Brazil, eastern Paraguay and northern Argentina, and there are 12 recognized subspecies (Ridgely & Tudor 1994, Krabbe & Schulenberg 2003).

I found the nest in a forest patch surrounded by a rural landscape in Sapiranga city, state of Rio Grande do Sul, southern Brazil (29º37'S; 51º02'W; 150m altitude). The semi-deciduous forest patch, with 80 ha, form part of the Atlantic Forest biome (*sensu* Teixeira *et al*. 1986). The landscape is a mosaic dominated by agricultural/livestock with sparse forest patches. In the study site, the forest seems to have an advanced stage of succession, with canopy reaching between 10 and 20 m height. The vegetation is characterized by trees such as *Trichilia claussenii*, *Cabralea canjerana*, *Cedrela fissilis* (Meliaceae), *Sorocea bonplandii* (Moraceae), *Nectandra megapotamica*, *N. oppositifolia* (Lauraceae), *Inga marginata* (Fabaceae), *Trema micrantha* (Cannabaceae) and *Allophylus edulis* (Sapindaceae). Common birds are Red-crowned Ant-tanager (*Habia rubica*), Rufous-breasted Leaftosser (*Sclerurus scansor*), Golden-crowned Warbler (*Basileuterus culicivorus*), White-browed Warbler (*B. leucoblepharus*), Buff-browed Foliage-gleaner (*Syndactyla rufosuperciliata*), Yellow-olive Flycatcher (*Tolmomyias sulphurescens*), Surucua Trogon (*Trogon surrucura*), and Olivaceous Woodcreeper (*Sittasomus griseicapillus*), among others.

I measured the nest with ruler and tape-measure to the nearest 0.5 cm. I conducted weekly inspection of the nest and took photographs of the cavity interior to document its contents. I conducted two short videos (30 min each) at mid-day with a small video camera located 6 m from the nest. Because the distance from the cavity entrance to bottom was greater than my arm, I could not access the eggs or nestling to take measurements, thus all my data is descriptive. The nest was classified based on Simon & Pacheco (2005).

The nest was discovered on 12 November 2011 when I flushed a bird during an avifaunal inventory. It was 15 m from the forest edge. The nest cavity was in a 5 m tall living *Allophylus edulis* (Sapindaceae) tree, which had 17 cm in diameter at breast height and was partially tangled by a bamboo (*Chusquea tenella*). The ground

was fully covered with litter and the forest understory is moderately lightened. The cavity entrance was vertical with an irregular entrance 9.5 x 12.5 cm (Figure 1a), facing north. The bottom margin of the cavity entrance was 151 cm above the ground (Figure 1b) and 87 cm deep. At the bottom of the cavity (incubation chamber), the internal diameter was 11.5 x 9.5 cm.

When located, three white eggs rested on a "bed" of green leaves of 1.5 cm of deep. As it was still green, I assumed that the birds led the leaves to cover the bottom of the cavity. The nest can be classified as cavity/with-tunnel/simple/platform (*sensu* Simon & Pacheco 2005), although the "platform" is just a layer of loose leaves rather than a well-defined and built platform. The eggs are ovoid and pure white opaque without spots (Figure 1c).

On 19 November 2011 there were three small nestlings on the bed of dried leaves, therefore, less than 6 days old. Their eyes were closed, pink skin, light yellow bill and rictus and a blackish gray down covering the entire body. After knocking tree, I observed that one of the nestlings curved the neck, suggesting that it was dead (Figure 1d), remaining in this position for at least 5 min, when I left the place. I returned after 30 min and the three nestlings were in normal position, always quiet (like a dark "spot" amid the leaves). No provisioning visit was recorded.

FIGURE 1: Nest cavity (a and b), eggs (c), and nestlings <6 days of age (d) and 9-12 days of age (e) of the Short-tailed Antthrush (*Chamaeza campanisona*) recorded in November 2011 in southern Brazil.

On 26 November 2011 9-12s day old nestlings still have a lot of down but their eyes were open, gray pin feathers were appearing in the tail, wings, and chest (apparently with some brownish), their bills were dark gray with light yellow on the rictus and yellow on the commissure and the distal end (Figure 1e). A 27 s feeding event was observed where one parent entered quickly and quietly the cavity, apparently relying on the cavity walls with his long legs. When the bird was leaving the nest it remained 4 s in the entrance of the cavity, then it flew quietly. On 3 December 2011 the nest was empty and I could not determine the nest fate. But it is estimated that nestlings left the nest when 16-19 days old, assuming the nest was not predated.

The photos of the nest cavity inside, eggs and nestlings of the Short-tailed Antthrush are first presented, even considering the genus *Chamaeza*. Recently, Maders & Matuchaka (2011) described the nest, eggs and nestlings of *C. campanisona tshororo* (the same subspecies of this study) based on a nest found in September 2002 in the province of Misiones, Argentina, without present images. Additionally, a photo of an adult of the species in the nest cavity entrance was presented in Krabbe & Schulenberg (2003), from Alagoas, Brazil (presumably the nominal subspecies). Although there is mention that antthrushes also nests among plants in the ground or on tree trunks (Sick 1997), nests in cavities appears to be a tendency, at least for *Chamaeza*. The nest described here resembles that of Argentina, but with shorter distance from the ground (1.5 x 3 m) and greater depth of the cavity (87 x 21 cm). These also resembles a nest of Striated Antthrush (*C. nobilis*) recorded in the Colombian Amazon, in a cavity 3 m above the ground with a depth of 30 cm (Cadena *et al*. 2000). Representatives from another genus of Formicariidae, *Formicarius*, also use natural cavities in trees for nesting (Cherrie 1916, Skutch 1945, Krabbe & Schulenberg 2003). The difficulty of finding nests and monitor its content does seem to be the main reason why so little information about the reproduction of Formicariidae is available.

Instead of a clutch size of two eggs, as reported in the literature as apparently normal for the family (Sick 1997, Krabbe & Schulenberg 2003), I found three, as well as in the nest found in Argentina (Maders & Matuchaka 2011). As also noted by these authors, the eggs of *Chamaeza campanisona* are clearly unequal poles instead of almost spherical (Sick 1997, Krabbe & Schulenberg 2003). It was not possible to measure eggs to compare with existing data, which refer to averages between 27 and 28 x 22-24 mm (Ihering 1900, Schönwetter 1979, Fraga & Narosky 1985) or slightly larger (32 x 23 mm; Maders & Matuchaka 2011). All eggs of Formicariidae (*Chamaeza* + *Formicarius*) described have white color without spots.

The only previous description of the Short-tailed Antthrush´s nestlings was by Maders & Matuchaka (2011): "grayish feathers on the head, wings and tail, the rest of the body naked." Thus, this study has contributed with more information and greater detail, presenting the first images of the nestlings. If confirmed as such, the observed "play possum/dead" behavior can be equivalent to the one recorded in the Rusty-breasted Antpitta (*Grallaricula ferrugineipectus*) by Schwartz (1957), but see Niklison *et al*. (2008). It would be interesting to manipulate antthrush nestlings to ascertain the occurrence of such behavior. I estimated in 16-19 days the time to the nestlings leave the nest, which is consistent with the value found for *Formicarius analis* (18 days; Sick 1997). The color and general appearance of young *Chamaeza campanisona* when leave the nest remains unknown.

When compared with the representatives of the Grallariidae (revision in Greeney *et al*. 2008), Formicariidae have remarkable differences in relation to reproductive attributes. The most evident are the nest type (open cup *vs*. cavity, respectively) and the egg color (bluish, greenish, turquoise, pale buff or brown with or without spots *vs*. white without spots). In antthrushes, these features seem to be quite consistent and corroborate their separation from antpittas (Rice 2005). The tendency to hide the eggs (mostly nesting in cavities) and whitish eggs are shared by the large group composed by Formicariidae + Rhinocryptidae + Furnariidae *sensu lato* + Scleruridae + Dendrocolaptidae, corroborating the molecular phylogenies (Irestedt *et al*. 2002, Chesser 2004, Moyle *et al*. 2009). Thamnophilidae, Grallariidae and Conopophagidae, more basal Furnariides, have open nests and lay colored and/or spotted eggs (Rice 2005). Finally, I emphasize that information such as duration of incubation, nestling development and parental care remain virtually nonexistent for the representatives of the Formicariidae and therefore worthy of study efforts.

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SHORT-COMMUNICATION

Registros documentados da gaivota-de-franklin *Leucophaeus pipixcan* (Wagler, 1831) no Nordeste do Brasil e da gaivota-de-cabeça-cinza *Chroicocephalus cirrocephalus* (Vieillot, 1817) nos Estados de Alagoas e Pernambuco

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ABSTRACT: First documented records of Franklin's Gull *Leucophaeus pipixcan* (Wagler, 1831) from north east Brazil and Grey-headed Gull *Chroicocephalus cirrocephalus* (Vieillot, 1817) in the states of Alagoas and Pernambuco. We report on the first documented record of Franklin's Gull in north-eastern Brazil, when one individual was found dead in Maceió, state of Alagoas, on 27 July 2010, and other was found and photographed very weak on the same beach on 8 May 2011. Since most records of this species in South America come from the western part of the continent, this individual probably reached northeastern Brazil through the Caribbean. About 25 Grey-headed gulls were photographed at Barra de São Miguel, state of Alagoas, on 5 March 2010, and two individuals were observed at the same place on 23 April 2010. In the state of Pernambuco, two birds were photographed at Itapissuma on 1 October 2010. These are the first records of the Grey-headed Gull for Pernambuco and Alagoas states in northeastern Brazil.

KEY-WORDS: gulls**,** migration, photographed records.

No Brasil há nove espécies de gaivotas (CBRO 2011), dos quais seis ocorrem na região Nordeste: *Chroicocephalus maculipennis, C. cirrocephalus, Leucophaeus atricilla, L. pipixcan*, *Larus dominicanus* e *L. fuscus* (Sick 1997, Azevedo-Junior *et al*. 2004, Girão *et al*. 2006, Albano *et al*. 2007, Farias *et al*. 2008, Souza & Borges 2008, Lepage & Pereira 2010, Lima *et al*. 2010). Alguns desses registros, como o de *L. pipixcan* em Fernando de Noronha (Antas *et al*. 1988), não foram acompanhados de nenhum tipo de documentação científica (fotografia, gravação da voz ou coleta de espécimes), gerando questionamentos sobre suas legitimidades, conforme exposto em Nacinovic & Teixeira (1989).

Nesse trabalho, divulgamos o primeiro registro documentado de *L. pipixcan* no Nordeste do Brasil e os primeiros registros de *C. cirrhocephalus* para os estados de Alagoas e Pernambuco. Os indivíduos foram identificados através das pranchas, fotos e informações morfológicas disponíveis em Harrison (1983, 1987), Burger & Gochfeld (1996), Enticott & Tipling (1997), Erize *et al*. (2006) e Howell & Dunn (2007).

Leucophaeus pipixcan

A gaivota-de-franklin *Leucophaeus pipixcan* ocorre no interior da América do Norte, onde se reproduz, migrando durante o inverno para o continente sulamericano, permanecendo na costa do Peru, Chile, Patagônia, Tristão da Cunha, Terra do Fogo e Argentina. Vagantes já foram encontrados na Europa, África, Cazaquistão, Emirados Árabes Unidos, Israel, China, Japão e Austrália (Harrison 1983, 1987, Burger & Gochfeld 1996, Enticott & Tipling 1997, Olsen & Larsson 2003, Smith 2004, Holt 2005, Howell & Dunn 2007, Dias *et al*. 2010, Wassink *et al*. 2011). No Brasil, há registros da espécie em Fernando de Noronha, em maio de 1988 (Antas *et al*. 1988), no Amazonas, em março de 1994 (Pacheco 1995), em São Paulo, em setembro de 2002 (Almeida 2003) e no Rio Grande do Sul, em abril de 1999, março de 2007, janeiro e abril de 2009, e em maio de 2010 (Dias *et al*. 2010). O registro em Fernando de Noronha, como não foi documentado, foi considerado duvidoso, havendo a possibilidade de confusão com *L. atricilla*, mais comum na região (Nacinovic & Teixeira 1989).

Um indivíduo de *Leucophaeus pipixcan* foi encontrado morto na praia de Jacarecica, Maceió, Alagoas (9°36'S; 35°41'W), em 27 de julho de 2010. Um segundo indivíduo foi fotografado enquanto estava bastante debilitado na mesma praia em 8 de maio de 2011 (Figura 1). O bico curto e avermelhado, as primárias negras com pontas brancas e as medidas de comprimento (38 cm) e envergadura (90 cm) indicam ser um indivíduo adulto com a plumagem reprodutiva (Harrison 1983, Howell & Dunn 2007), não correspondendo a *L. atricilla*, que ocorre em áreas do Nordeste do Brasil (Albano *et al*. 2007). Esses e outros indivíduos vagantes na costa brasileiras podem ser oriundos do leste dos Andes, podendo cruzar a cordilheira e entrar no continente pelo Caribe durante sua migração para o sul ou como vagantes que cruzam o Oceano Atlântico em direção à África (Dias *et al*. 2010).

FIGURA 1: *Leucophaeus pipixcan*, Praia de Jacarecica, Maceió, Alagoas, Brasil (Foto de Sergio Leal).
FIGURE 1: Franklin's Gull, Jacarecica Beach, Maceió, Alagoas, Brazil (Photo by Sergio Leal).

Chroicocephalus cirrocephalus

A gaivota-de-cabeça-cinza *Chroicocephalus cirrocephalus*, ao contrário da anterior, é uma espécie localmente residente nos continentes sulamericano e africano, havendo registros de indivíduos vagantes no Panamá, Norte do Mar Vermelho, América do Norte e Europa (Harrison 1983, 1987, Enticott & Tipling 1997, Olsen & Larsson 2003, Howell & Dunn 2007). No Brasil, há registros para os Estados do Rio de Janeiro, São Paulo, Maranhão, Mato Grosso do Sul, Santa Catarina, Rio Grande do Sul, Piauí, Ceará e Rio Grande do Norte (Sick 1997, Azevedo-Junior *et al.* 2004, Albano *et al*. 2007, Barbieri *et al*. 2010).

Um bando com 25 indivíduos adultos, com plumagem reprodutiva e em descanso reprodutivo, foi fotografado na Praia das Conchas, Barra de São Miguel, Alagoas (9°50'S; 35°53'W), em 5 de março de 2010 (Figura 2). Dois indivíduos foram registrados no mesmo local, em 23 de abril do mesmo ano. Em Pernambuco, dois indivíduos jovens foram fotografados em Itapissuma (07°46'S; 34°56'W), em 1 de outubro de 2011 (Figura 3). Os dois não possuíam as pontas das coberteiras das primárias brancas, no entanto, de acordo com Howell & Dunn (2007), alguns indivíduos podem não apresentar essa característica. Esses são os primeiros registros dessa espécie para os estados de Alagoas e Pernambuco. *C. cirrocephalus* se dispersa para o norte do continente durante o inverno austral, principalmente entre os meses de maio a outubro (Howell & Dunn 2007), coincidindo justamente com o período em que os registros desse trabalho foram realizados.

FIGURA 2: *Chroicocephalus cirrocephalus*, Praia das Conchas, Barra de São Miguel, Alagoas, Brasil (Foto de Sergio Leal).
FIGURE 2: Grey-headed Gull, Conchas Beach, Barra de São Miguel, Alagoas, Brazil (Photo by Sergio Leal).

FIGURA 3: *Chroicocephalus cirrocephalus*, Itapissuma, Pernambuco, Brasil (Foto de Lúcio Cláudio Serapião).
FIGURE 3: Grey-headed Gull, Itapissuma, Brazil (Photo by Lúcio Cláudio Serapião).

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9 770103 565003