

# Birds of the Lower Middle São Francisco River

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**ABSTRACT:** The Lower Middle São Francisco (LMSF) river encompasses the region of the river basin in the State of Bahia from the border with Minas Gerais down to Remanso. We present the results of field surveys done between 2007 and 2009 in three regions within the LMSF (Correntina, Ibotirama and Boqueirão da Onça). Data were gathered with mist nets and through direct observations. In total, we recorded 315 bird species, 139 of them with at least one physical documentation. The richest families were Tyrannidae (41 species) and Furnariidae (17). We ringed about 1,350 individuals representing 112 species. Five species threatened with extinction were found during our surveys, in addition to 13 species endemic to *caatinga* and 4 endemic to *cerrado*. Our recordings of *Penelope jacucaca*, *Anodorhynchus leari*, *Lepidocolaptes wagleri* and *Sporagra yarrellii* are among the most noteworthy.

**KEY-WORDS:** *Anodorhynchus leari*; avifauna; Bahia State; bird banding; São Francisco river.

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## INTRODUCTION

The Middle São Francisco river basin (MSF) comprises 1,152 out of the 2,863 km of the entire river and is located between Pirapora (Minas Gerais) and Remanso (Bahia). It is the largest of the four physiographic regions of the São Francisco basin having 401,559 km<sup>2</sup>, which corresponds to 63.1% of the whole basin (Brasil 2004). The MSF can be further divided into Upper Middle and Lower Middle river. The first region extends from Pirapora to the border of Minas Gerais and Bahia states, whereas the second ranges from the border down to Remanso (CODEVASF 2010).

The ornithological knowledge of the MSF is fairly satisfactory, since it has been visited by many naturalists that fostered the present knowledge on the birds of countryside Brazil, especially the *caatinga* biome (Pacheco 2004). The first naturalists to survey that region were Johann Baptist Von Spix and Karl Friedrich Philip

Von Martius in May 1818 and again in March 1819 (Papavero 1971).

The travel by Spix and Martius was doubtless one of the most important expeditions ever done in Brazil, given the high number of taxa described upon specimens collected by them (see Pacheco 2004). Perhaps the most singular bird species collected in that expedition was the type of *Cyanopsitta spixii* (*Sittace spixii* Wagler, 1832).

By the beginning of the 20<sup>th</sup> century, another ornithological survey took part in the São Francisco basin: the Austrian Expedition, between February and September 1903 (Pacheco 2004). The ornithologist in charge, Otmar Reiser, collected several new birds, among them *Bubo magellanicus deserti* Reiser, 1905 (= *Bubo virginianus deserti*), from Salitre, Bahia, within the MSF (Pacheco 2004).

About a decade later, in 1912, Instituto Oswaldo Cruz did two big expeditions passing through many localities in that arid countryside of northeastern Brazil

(Pacheco 2004). The ornithological highlights resulting from those trips are the oldest records of many species to the *caatinga* of central-western Bahia, in addition to reports of the “very rare *Sittace spixii*”, which was found in captivity in Remanso as well as “flying in flocks” in the surroundings of Sento Sé (Pacheco 1995, Fiúza 1999). Following that, Ernst Garbe, from the Museu Paulista, undertook an expedition to Barra and Juazeiro (both in Bahia) between September 1913 and January 1914 (Pinto 1945).

Several ornithologists and bird collectors surveyed Bom Jesus da Lapa (Bahia) and its surroundings, such as M. Rudolf Pfrimer in the early 1920's (material at Museu Nacional, Rio de Janeiro), Emilie Sneath in 1926, and José Blaser in 1942 (Ruschi 1951, Pinto 1952, Gonzaga 1989, Pacheco 2004). The first of them is probably the source for the intriguing report of *Cyanopsitta spixi* in Januária by Miranda Ribeiro (1937). The occurrence of that species originally extending through the MSF was also speculated by Juniper & Yamashita (1991). On the other hand, from March to May 1958 the Departamento de Zoologia, Secretaria de Agricultura de São Paulo (currently Museu de Zoologia da Universidade de São Paulo), undertook an expedition to Buritirama, Ibipetuba and Barra in search for *Cyanopsitta spixii* and *Anodorhynchus leari*. However, the expedition failed to find those enigmatic macaws (Pinto & Camargo 1961). Both species were found in nature only many years later: *C. spixii* was rediscovered around Curaçá, Bahia, in 1985, and *A. leari* was found in the region of Raso da Catarina, also in Bahia, in 1978 (Sick & Teixeira 1979, Sick *et al.* 1987, Juniper & Yamashita 1991).

The Middle São Francisco was fairly explored in the 19<sup>th</sup> and 20<sup>th</sup> centuries, when most of the data on its birds was gathered. Nonetheless, recent fieldwork in that region and surroundings has supplied valuable data that complement the knowledge previously available on the birds of the São Francisco river (see Mattos *et al.* 1991, Olmos 1993, Nascimento & Schulz Neto 2000, Kirwan *et al.* 2001, Lima *et al.* 2003, Santos 2004, Olmos *et al.* 2005, and Roos *et al.* 2006).

In this work we present the results of bird surveys done at three regions within the Lower Middle São Francisco, which sampled both the main biomes of the São Francisco river (*caatinga* and *cerrado*) as well as the transition zones between them.

## METHODS

### Study Area

We surveyed three regions of the lower Middle São Francisco between August 2007 and August 2009, with a total of nine localities in western and northern Bahia State

(Table 1 and Figure 1). The three regions were selected following the “Priority Areas for the Conservation of Biodiversity” [in Brazil] (MMA 2007a).

### Sampling

Birds were surveyed with mist nets and through direct observation. In each locality we set a net lane of 20 mist nets (12 x 2.6 m, mesh 36 mm, 4 pockets). The nets were opened in the morning (from 6:00h to 11:00h) and in the afternoon (from 16:00h to 18:00h) during 2 or 3 consecutive days (see Table 1 for details), totaling 6600 hours-net. The birds were ringed with CEMAVE rings and basic biometric and biological data were gathered (to be presented elsewhere). Some individuals were collected and are now held in the collections of Museu de Zoologia da Universidade de São Paulo (MZUSP; birds from Correntina and Ibotirama) and Universidade Federal de Pernambuco (COUFPE; birds from Boqueirão da Onça).

Sampling by direct observations was done in the same days we ran the nets, from 6:00h to 10:00h in the morning, totaling about 50 hours of surveys at each locality (Table 1).

Bird sounds were tape-recorded with Sony TCM 5000-EV and Sony Hi-MD recorders coupled with shotgun microphones Sennheiser ME 66 and Yoga HT81. Currently all photographs and recordings are still privately held by F.S. and M.A.R. (Correntina region) and V.Q.P. and E.F.M. (Ibotirama), and are available upon request.

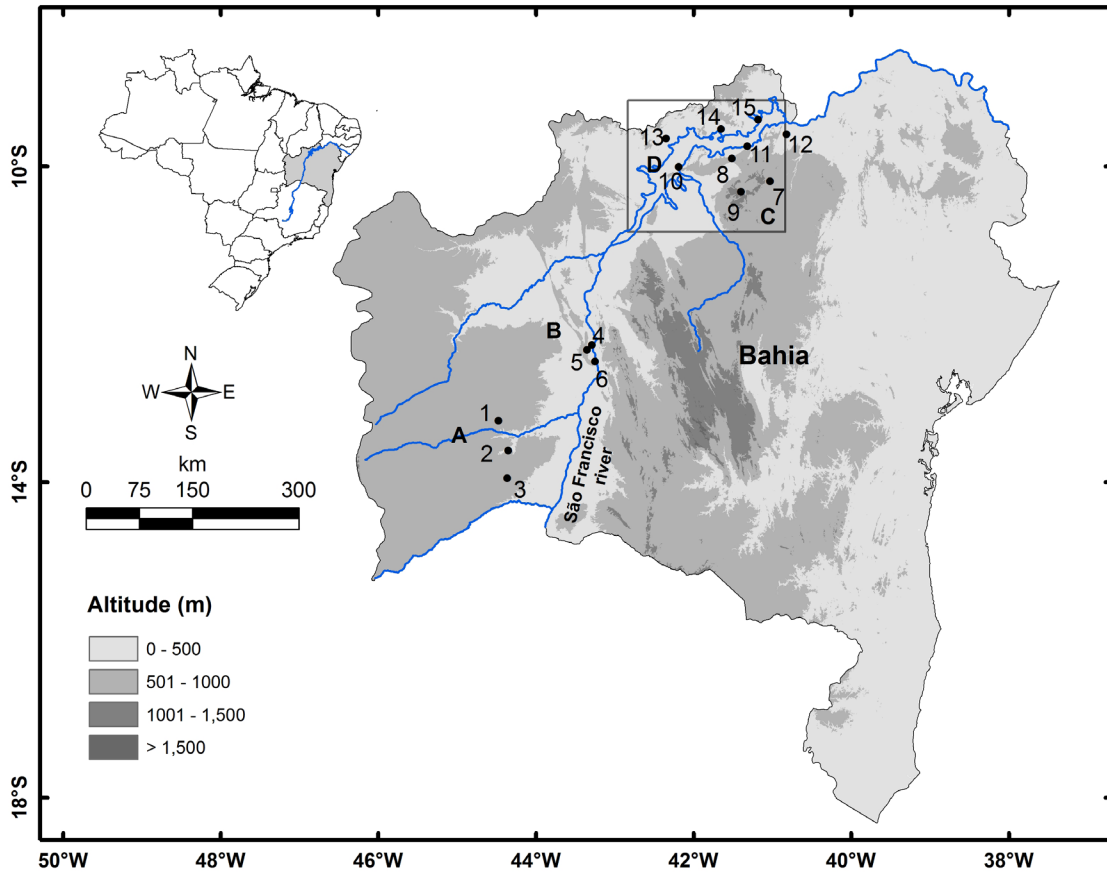
To complement the characterization of the bird fauna of the LMSF, we included the results from Roos *et al.* (2012) for Boqueirão da Onça and Nascimento & Schulz Neto (2000) and Roos *et al.* (2006) for the Sobradinho lake area.

The nomenclature and systematic order follow CBRO (2011).

## RESULTS

We recorded 315 species (139 with documentation) belonging to 62 families (Table 2). The most representative families were Tyrannidae (41 species), Furnariidae (17), Trochilidae (13), Thraupidae (13), Accipitridae (13), Psittacidae (12), Emberizidae (11), Thamnophilidae (11) and Columbidae (11). In total, 1,350 individuals belonging to 112 species were ringed (Table 2).

Boqueirão da Onça was the richest region, with 213 species recorded and 964 individuals ringed (96 species). At Correntina we recorded 179 species and ringed 208 individual (37 species), whereas at Ibotirama we recorded 154 species and ringed 178 individuals (34 species). Taken together, Nascimento & Schulz Neto (2000) and Roos *et al.* (2006) recorded 191 species at Sobradinho (Table 2).



**FIGURE 1.** Location of sampling areas in the Middle São Francisco. Numbers refer to the following localities: A) Correntina region: 1. Pedra Preta, 2. Rio Formoso, 3. Vereda do Francês; B) Ibotirama region: 4. Comunidade Riacho, 5. Fazenda Santo Antônio, 6. Fazenda Quebra Linha; C) Boqueirão da Onça region: 7. Mata Roçada/Gameleira, 8. Fazenda Brejinho, 9. Fazenda Cristalina; D) Sobradinho Lake region (Roos *et al.* 2006): 10. Faz. Campo Alegre, 11. Faz Serrote, 12. Assentamento Canaã, 13. Remanso, 14. Pau-a-pique, 15. Umbuzeiro. The squared area represents the approximate area sampled by Nascimento & Schulz Neto (2000).



**FIGURE 2.** General aspect of the *caatinga* scrub found in Correntina, Bahia, with a strong influence of *cerrado* savanna. The net lane is in the background (photo: F. Schunck).

Fabio Schunck, Vitor de Q. Piacentini, Elivan Arantes de Souza, Antônio Emanuel Barreto Alves de Sousa, Marco Antonio Rego, Ciro Albano, Maria Flávia Conti Nunes, Fernando de Lima Favaro, Isaac Simão Neto, Erich de Freitas Mariano, Diego Mendes Lima, Flor Maria Guedes de Las-Casas, Roberta Costa Rodrigues, Francisco Pedro Fonseca Neto

**TABLE 1:** Location, habitat and dates of sampling at the study areas. The field “date” shows the days when the mist nets were opened and the direct observations of birds were made (see Methods)

Region	Municipality	Locality	Coordinates	Date	Habitats
Correntina	Correntina	Pedra Preta	13°13'19" S 44°28'21" W	16-17 Sept 2007	<i>Cerrado Alto</i> , <i>caatinga</i> scrub, <i>carrasco</i> scrub
	Jaborandi /Coribe	Rio Formoso	13°35'55,4" S 44°20'56,1" W	19-20 Sept 2007	Riverine forest, <i>cerrado</i> savanna
	Coribe	Vereda do Francês	13°57'05,7" S 44°21'45,7" W	25-26 Sept 2007	<i>Cerrado</i> savanna, palm swamps
Ibotirama	Muquém de São Francisco	Comunidade Riacho	12°19'28" S 43°20'49" W	19-21 Aug 2007	<i>Caatinga</i> bushy scrub
		Faz. Santo Antônio	12°15'52" S 43°17'04" W	22-25 Aug 2007	Dry forest, <i>caatinga</i> scrub, water pools
		Faz. Quebra Linha	12°28'23" S 43°14'47" W	26-29 Aug 2007	<i>Caatinga</i> scrub, riverine forest
Boqueirão da Onça	Campo Formoso	Mata Roçada/ Gameleira	10°11'15,5" S 41°01'27,6" W	20-21 May 2009 and 27-29 Aug 2009	<i>Caatinga</i> scrub, riverine forest, <i>campo rupestre</i>
	Sento Sé	Faz. Brejinho	09°54'01,9 S 41°30'36,5" W	24-26 May 2009 23-25 Ago 2009	<i>Caatinga</i> scrub
		Faz. Cristalina	10°19'24,9" S 41°23'43" W	28-29 Mai 2009 e 20-21 Ago 2009	<i>Caatinga</i> scrub, <i>campo rupestre</i>

**TABLE 2:** Bird species recorded in the Lower Middle São Francisco. † - species endemic to *caatinga* (Pacheco 2004, Faria *et al.* 2009); + - species endemic to *cerrado* (Silva & Bates 2002, MMA 2007a, Faria *et al.* 2009). Threatened species are noted according to their status (MMA 2003): EN – Endangered; VU- Vulnerable. Habitat: aa (open, anthropized areas), wl (wetlands), ca (*caatinga* scrub), ce (*cerrado* savanna), gr (grassland), rf (riverine forest). Evidence: a (aural record), v (visual record), p (photograph), s (sound recording), c (specimen collected), k (captured), r (ringed), x (evidence unspecified). \* denotes the species recorded exclusively by Nascimento & Schulz Neto (2000) at Sobradinho Lake.

Taxon	Habitat	Locality / Evidence			
		Correntina	Ibotirama	Boqueirão da Onça	Sobradinho
Struthioniformes					
Rheidae (1)					
<i>Rhea americana</i>	aa, ce		v	x	
Tinamiformes					
Tinamidae (6)					
<i>Crypturellus noctivagus zabelê</i>	ca	v,s	s		
<i>Crypturellus parvirostris</i>	ca,ce	a		x	
<i>Crypturellus tataupa</i>	ca,ce	a	a	x	x
<i>Rhynchotus rufescens</i>	ce,gr			x	
<i>Nothura boraquira</i>	ca,gr		v,s	x	x
<i>Nothura maculosa</i>	ca,gr			x	x
Anseriformes					
Anatidae (9)					
<i>Dendrocygna bicolor</i>	wl				x*
<i>Dendrocygna viduata</i>	wl			x	a,v
<i>Dendrocygna autumnalis</i>	wl			x	v
<i>Cairina moschata</i>	wl				x*
<i>Sarkidiornis sylvicola</i>	wl				v
<i>Amazonetta brasiliensis</i>	wl		v	x	v
<i>Anas bahamensis</i>	wl				x*

Taxon	Habitat	Locality / Evidence			
		Correntina	Ibotirama	Boqueirão da Onça	Sobradinho
<i>Netta erythrophthalma</i>	wl				x*
<i>Nomonyx dominica</i>	wl				x*
Galliformes					
Cracidae (2)					
<i>Penelope superciliaris</i>	ca,ce,rf			x	x
<i>Penelope jacucaca</i> † <sup>VU</sup>	ca,rf		v	x	
Podicipediformes					
Podicipedidae (2)					
<i>Tachybaptus dominicus</i>	wl				x*
<i>Podilymbus podiceps</i>	wl			x	x*
Ciconiiformes					
Ciconiidae (1)					
<i>Mycteria Americana</i>	wl				x*
Suliformes					
Phalacrocoracidae (1)					
<i>Phalacrocorax brasilianus</i>	wl		v	x	X
Anhingidae (1)					
<i>Anhinga anhinga</i>	wl				x*
Pelecaniformes					
Ardeidae (8)					
<i>Tigrisoma lineatum</i>	wl			x	x*
<i>Nycticorax nycticorax</i>	wl		v		x*
<i>Butorides striata</i>	wl	v	s	x	X
<i>Bubulcus ibis</i>	wl	v	v	x	X
<i>Ardea cocoi</i>	wl				V
<i>Ardea alba</i>	wl		v	x	X
<i>Syrigma sibilatrix</i>	wl				x*
<i>Egretta thula</i>	wl		v	x	X
Threskiornithidae (4)					
<i>Mesembrinibis cayennensis</i>	wl,rf				x*
<i>Phimosus infuscatus</i>	wl		v		x*
<i>Theristicus caudatus</i>	aa,wl,gr				x*
<i>Platalea ajaja</i>	wl				x*
Cathartiformes					
Cathartidae (4)					
<i>Cathartes aura</i>	aa	v	v	x	X
<i>Cathartes burrovianus</i>	aa	v	v	x	X
<i>Coragyps atratus</i>	aa	v	v	x	X
<i>Sarcoramphus papa</i>	aa			x	
Accipitriformes					
Pandionidae (1)					
<i>Pandion haliaetus</i>	wl				x*
Accipitridae (13)					
<i>Gampsonyx swainsonii</i>	ca,ce,aa			x	X
<i>Elanus leucurus</i>	ca,ce,aa			x	
<i>Accipiter striatus</i>	ca,ce			x	
<i>Ictinia plumbea</i>	ca,ce,aa			x	
<i>Rostrhamus sociabilis</i>	wl				V
<i>Geranospiza caerulescens</i>	ca,ce,rf		v	x	X
<i>Heterospizias meridionalis</i>	ca,ce,aa	v		x	x*
<i>Rupornis magnirostris</i>	ca,ce,aa	p,s,c	v	r	X
<i>Parabuteo unicinctus</i>	ca,ce,aa		p		
<i>Geranoaetus albicaudatus</i>	ca,ce,aa				x*
<i>Geranoaetus melanoleucus</i>	ca,ce,aa			p	x*
<i>Buteo brachyurus</i>	ca,ce,aa			x	
<i>Buteo albonotatus</i>	ca,ce,aa	v			

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Taxon	Habitat	Locality / Evidence			
		Correntina	Ibotirama	Boqueirão da Onça	Sobradinho
Falconiformes					
Falconidae (7)					
<i>Caracara plancus</i>	ca,ce,aa	v	v	x	X
<i>Milvago chimachima</i>	ca,ce,aa	v	v	x	X
<i>Herpetotheres cachinnans</i>	ca,ce	s	a	x	X
<i>Micrastur ruficollis</i>	ca,ce		a	x	
<i>Falco sparverius</i>	ca,ce,aa	v	v	x	X
<i>Falco rufigularis</i>	ca,ce,aa	v		x	
<i>Falco femoralis</i>	ca,ce,aa	v	v	x	X
Gruiformes					
Aramidae (1)					
<i>Aramus guarana</i>	wl		v		X
Rallidae (7)					
<i>Aramides ypecaba</i>	wl		v,s		
<i>Aramides cajanea</i>	wl				x*
<i>Laterallus viridis</i>	wl			x	
<i>Porzana albicollis</i>	wl	s			
<i>Pardirallus nigricans</i>	wl			x	
<i>Gallinula galeata</i>	wl		v,s	x	x*
<i>Porphyrio martinica</i>	wl		v	x	
Cariamiformes					
Cariamidae (1)					
<i>Cariama cristata</i>	aa,gr	v	a	x	X
Charadriiformes					
Charadriidae (3)					
<i>Vanellus cayanus</i>	wl		p		X
<i>Vanellus chilensis</i>	aa,wl	v	v	x	X
<i>Charadrius collaris</i>	wl		v		x*
Recurvirostridae (2)					
<i>Himantopus mexicanus</i>	wl		v		X
<i>Himantopus melanurus</i>	wl		v		
Scolopacidae (6)					
<i>Gallinago paraguayiae</i>	wl				x*
<i>Gallinago undulata</i>	wl	s			
<i>Actitis macularius</i>	wl			x	
<i>Tringa solitaria</i>	wl			x	x*
<i>Tringa melanoleuca</i>	wl				x*
<i>Calidris fuscicollis</i>	wl				x*
Jacaniidae (1)					
<i>Jacana jacana</i>	wl	v	v	x	X
Sternidae (1)					
<i>Phaetusa simplex</i>	wl		v		x*
Columbiformes					
Columbidae (11)					
<i>Columbina passerina</i>	ca,ce,aa				x*
<i>Columbina minuta</i>	ca,ce,aa			r	x*
<i>Columbina talpacoti</i>	ca,ce,aa	v	c	r	X
<i>Columbina squammata</i>	ca,ce,aa	v	c,r	r	X
<i>Columbina picui</i>	ca,ce,aa	v	v	r	X
<i>Claravis pretiosa</i>	ca,ce			r	
<i>Patagioenas picazuro</i>	ca,ce,aa	v,s	v	x	X
<i>Patagioenas cayennensis</i>	ca,ce	v			
<i>Zenaida auriculata</i>	ca,ce,aa	v		r	X
<i>Leptotila verreauxi</i>	ca,ce	s	c,r	r	
<i>Leptotila rufaxilla</i>	ca,ce	p,s,c,r	r	r	X

Taxon	Habitat	Locality / Evidence			
		Correntina	Ibotirama	Boqueirão da Onça	Sobradinho
Psittaciformes					
Psittacidae (12)					
<i>Anodorhynchus leari</i> † <sup>EN</sup>	ca			p	
<i>Ara ararauna</i>	ca,ce,aa	v,s			
<i>Primolius maracanã</i>	ca,ce,aa	v	v,s	x	X
<i>Diopsittaca nobilis</i>	ca,ce,aa	v			
<i>Aratinga leucophthalma</i>	ca,ce,aa				X
<i>Aratinga auricapillus</i>	ce				x*
<i>Aratinga aurea</i>	ce,aa	a,v			
<i>Aratinga cactorum</i> †	ca,aa	s	v,s	r	X
<i>Forpus xanthopterygius</i>	ca,ce,aa	v	v,s	x	X
<i>Brotogeris chiriri</i>	ca,ce,aa	a,v	a,v		X
<i>Pionus maximiliani</i>	ca,ce	s	a,v		
<i>Amazona aestiva</i>	ca,ce	a,v	a	x	X
Cuculiformes					
Cuculidae (7)					
<i>Piaya cayana</i>	ca,ce	v	a,v	x	X
<i>Coccyzus melacoryphus</i>	ca,ce			r	
<i>Crotophaga major</i>	ca,ce,wl				V
<i>Crotophaga ani</i>	ca,ce,aa	v	c	x	X
<i>Guira guira</i>	ca,ce,aa	v	v	x	X
<i>Tapera naevia</i>	ca,ce	a		x	X
<i>Dromococcyx phasianellus</i>	ca,ce		s		
Strigiformes					
Tytonidae (1)					
<i>Tyto alba</i>	ca,ce,aa		a		X
Strigidae (3)					
<i>Megascops choliba</i>	ca,ce	a,r	c,r	x	X
<i>Glaucidium brasilianum</i>	ca,ce	p,c	s,c,r	x	X
<i>Athene cunicularia</i>	ca,ce,aa	v	v	x	X
Caprimulgiformes					
Nyctibiidae (1)					
<i>Nyctibius griseus</i>	ca,ce		a	x	X
Caprimulgidae (7)					
<i>Antrostomus rufus</i>	ca,ce,aa	a,v		x	X
<i>Hydropsalis albicollis</i>	ca,ce,aa	a,v	s	x	
<i>Hydropsalis parvula</i>	ca,ce,aa	a,v	a	x	X
<i>Hydropsalis hirundinacea</i>	ca,ce,aa			r	
<i>Hydropsalis torquata</i>	ca,ce,aa	v		c	x*
<i>Chordeiles pusillus</i>	ca,ce,aa			x	X
<i>Chordeiles acutipennis</i>	ca,ce,aa			x	X
Apodiformes					
Apodidae (2)					
<i>Streptoprocne zonaris</i>	ca,ce,aa	v			x*
<i>Tachornis squamata</i>	ca,ce,wl	v			X
Trochilidae (13)					
<i>Anopetia gounellei</i> †	ca		v	r	X
<i>Phaethornis pretrei</i>	ca,ce	c		r	
<i>Eupetomena macroura</i>	ca,ce	v,c	v	r	X
<i>Colibri serrirostris</i>	ca,ce			x	
<i>Chrysolampis mosquitus</i>	ca,ce	v		r	X
<i>Chlorostilbon lucidus</i>	ca,ce	c	v,s	r	X
<i>Polytmus guainumbi</i>	ca,ce		v	x	
<i>Amazilia versicolor</i>	ca,ce			x	
<i>Amazilia fimbriata nigricauda</i>	ca,ce	p,c,r	s,c	r	
<i>Augastes lumachella</i>	ca			v,c,r	

Fabio Schunck, Vitor de Q. Piacentini, Elivan Arantes de Souza, Antônio Emanuel Barreto Alves de Sousa, Marco Antonio Rego, Ciro Albano, Maria Flávia Conti Nunes, Fernando de Lima Favaro, Isaac Simão Neto, Erich de Freitas Mariano, Diego Mendes Lima, Flor Maria Guedes de Las-Casas, Roberta Costa Rodrigues, Francisco Pedro Fonseca Neto

Taxon	Habitat	Locality / Evidence			
		Correntina	Ibotirama	Boqueirão da Onça	Sobradinho
<i>Heliactin bilophus</i>	ca,ce	v		x	
<i>Helimaster longirostris</i>	ca,ce			x	
<i>Helimaster squamosus</i>	ca,ce				K
Trogoniformes					
Trogonidae (1)					
<i>Trogon curucui</i>	ca,ce		v		
Coraciiformes					
Alcedinidae (3)					
<i>Megaceryle torquata</i>	wl,rf	v	v	r	x*
<i>Chloroceryle amazona</i>	wl,rf	v	v		
<i>Chloroceryle americana</i>	wl,rf	v	c		
Galbuliformes					
Galbulidae (1)					
<i>Galbula ruficauda</i>	rf	a,c			
Bucconidae (1)					
<i>Nystalus maculatus</i>	ca,ce	s	c,r	r	X
Piciformes					
Ramphastidae (1)					
<i>Ramphastos toco</i>	ca,ce	a,v			
Picidae (9)					
<i>Picumnus pygmaeus</i> †	ca	p,c,r	s,c,r	c,r	X
<i>Melanerpes candidus</i>	ca,ce	a,c			x*
<i>Veniliornis passerinus</i>	ca,ce	v	c,r	r	X
<i>Piculus chrysochloros</i>	ca,ce	p,c	c	r	
<i>Colaptes melanochloros</i>	ca,ce		v	r	X
<i>Colaptes campestris</i>	ca,ce	v			x*
<i>Celeus flavescens</i>	ca,ce	s	c,r	r	X
<i>Dryocopus lineatus</i>	ca,ce		p,s	x	
<i>Campephilus melanoleucos</i>	ca,ce	v		x	X
Passeriformes					
Thamnophilidae (11)					
<i>Myrmorchilus strigilatus</i>	ca	p,s,c,r	s	c,r	X
<i>Formicivora grisea</i>	ca,ce			x	
<i>Formicivora melanogaster</i>	ca,ce	c,r	s,c,r	c,r	X
<i>Formicivora rufa</i>	ca,ce	s			
<i>Herpsilochmus sellowi</i> †	ca	p,s,c,r	c	r	X
<i>Herpsilochmus atricapillus</i>	ca,ce	p,s,c	c	x	
<i>Sakesphorus cristatus</i> †	ca	p,s,c		c,r	
<i>Thamnophilus capistratus</i>	ca	s	s,c,r	c,r	X
<i>Thamnophilus torquatus</i>	ca,ce	a,v		x	
<i>Thamnophilus pelzelni</i>	ca,ce	p,s,c,r	s,c,r	c,r	
<i>Taraba major</i>		p,c,r	c,r	r	X
Melanopareiidae (1)					
<i>Melanopareia torquata</i> +	ca,ce	s,c			
Conopophagidae (1)					
<i>Conopophaga lineata lineata</i>	ca,ce	p,c			
Grallariidae (1)					
<i>Hylopezus ochroleucus</i> †	ca	s		x	
Dendrocolaptidae (7)					
<i>Sittasomus griseicapillus</i>	ca,ce	p,s,c,r	c,r	r	X
<i>Campylorhamphus trochilirostris</i>	ca,ce	p,c	c,r	r	
<i>Dendroplex picus</i>	ca,ce			x	
<i>Lepidocolaptes angustirostris</i>	ca,ce	a	c,r	r	X
<i>Lepidocolaptes wagleri</i> <sup>VU</sup>	ca,ce	p,c			
<i>Dendrocolaptes platyrostris</i>	ca,ce	p,s,c,r	c,r		X
<i>Xiphocolaptes falcirostris</i> † <sup>VU</sup>	ca,ce		s,r		



Taxon	Habitat	Locality / Evidence			
		Correntina	Ibotirama	Boqueirão da Onça	Sobradinho
Furnariidae (17)					
<i>Furnarius figulus</i>	ca,ce,aa	v	v	r	
<i>Furnarius leucopus</i>	ca,ce,aa	p,c,r	c,r	r	
<i>Furnarius rufus</i>	ca,ce,aa	a,v	c	x	x*
<i>Hylocryptus rectirostris</i> +	rf	a,p,s,c			
<i>Megaxenops parnaguai</i>	ca			r	X
<i>Pseudoseisura cristata</i>	ca,ce,aa		v	x	X
<i>Phacellodomus rufifrons</i>	ca,ce,aa	v			x*
<i>Phacellodomus ruber</i>	ca,ce,aa	s			
<i>Schoeniophylax phryganophilus</i>	ce		v		
<i>Certhiaxis cinnamomeus</i>	ca,ce,wl	p	v	x	X
<i>Gyalophylax bellmayri</i> †	ca			r	X
<i>Synallaxis frontalis</i>	ca,ce	s,c	c	r	X
<i>Synallaxis albescens</i>	ca,ce			x	
<i>Synallaxis spixi</i>	ca,ce	a			
<i>Synallaxis scutata</i>	ca,ce	p,c			
<i>Cranioleuca vulpina</i>	ce,rf	a	c		
<i>Cranioleuca semicinerea</i>	ca,ce			r	
Pipridae (1)					
<i>Neopelma pallescens</i>	ca,ce	p,c,r			
Tityridae (5)					
<i>Myiobius atricaudus</i>	ca,ce	p,c,r			
<i>Pachyramphus viridis</i>	ca,ce	a	c	x	X
<i>Pachyramphus polychopterus</i>	ca,ce			r	X
<i>Pachyramphus validus</i>	ca,ce			x	
<i>Xenopsaris albinucha</i>	ca,ce	v	c	x	X
Rhynchocyclidae (7)					
<i>Leptopogon amaurocephalus</i>	ca,ce	p,c			
<i>Tolmomyias sulphurescens</i>	ca,ce	p,c,r	c		
<i>Tolmomyias flaviventris</i>	ca,ce	a,p,c,r	s,c,r	r	X
<i>Todirostrum cinereum</i>	ca,ce	s	c	x	X
<i>Poecilatriccus plumbeiceps</i>	ca,ce	p,s,c			
<i>Hemitriccus striaticollis</i>	ca,ce,rf	p,s,c	c,r		
<i>Hemitriccus margaritaceiventer</i>	ca,ce	p,s,c,r	s,c	r	X
Tyrannidae (41)					
<i>Hirundinea ferruginea</i>	ca,ce,aa			x	
<i>Stigmatura napensis</i>	ca,ce			r	
<i>Stigmatura budytoides gracilis</i>	ca,ce		v,s	r	X
<i>Euscarthmus meloryphus</i>	ca,ce			c,r	X
<i>Camptostoma obsoletum</i>	ca,ce	p,s,c,r	c	r	X
<i>Elaenia flavogaster</i>	ca,ce	s		c,r	X
<i>Elaenia chilensis</i>	ca,ce			c,r	
<i>Elaenia parvirostris</i>	ca,ce	c,r			
<i>Elaenia mesoleuca</i>	ca,ce			c,r	
<i>Elaenia cristata</i>	ca,ce	c,s,r		r	
<i>Elaenia chiriquensis albivertex</i>	ca,ce	s		r	
<i>Suiriri suiriri</i>	ca,ce	c			
<i>Myiopagis caniceps</i>	ca,ce	s			
<i>Myiopagis viridicata</i>	ca,ce			r	X
<i>Phaeomyias murina</i>	ca,ce	c,s	c	r	X
<i>Phyllomyias fasciatus</i>	ca,ce	s	a	r	X
<i>Serpophaga subcristata</i>	ca,ce			x	
<i>Legatus leucophaius</i>	ca,ce				K
<i>Myiarchus swainsoni</i>	ca,ce	p,s,c,r	a	r	
<i>Myiarchus ferox</i>	ca,ce	a	c	x	X
<i>Myiarchus tyrannulus</i>	ca,ce	p,c,s,r	c,r	r	X

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Taxon	Habitat	Locality / Evidence			
		Correntina	Ibotirama	Boqueirão da Onça	Sobradinho
<i>Syrstes sibilator</i>	ca,ce	s			
<i>Casiornis fuscus</i>	ca,ce	v	c,r	r	X
<i>Pitangus sulphuratus</i>	ca,ce	s,c,r	s,c	r	X
<i>Machetornis rixosa</i>	ca,ce,aa		v	x	X
<i>Myiodynastes maculatus</i>	ca,ce			r	X
<i>Megarynchus pitangua</i>	ca,ce	s	c,r	c,r	X
<i>Myiozetetes similis</i>	ca,ce	s,c,r	c,r	x	X
<i>Tyrannus albogularis</i>	ca,ce	v			
<i>Tyrannus melancholicus</i>	ca,ce	v	c,r	r	X
<i>Tyrannus savana</i>	ca,ce,aa	v			
<i>Empidonomus varius</i>	ca,ce	v		r	X
<i>Myiophobus fasciatus</i>	ca,ce	p,s,c		x	X
<i>Sublegatus modestus</i>	ca,ce			x	
<i>Fluvicola albiventer</i>	ca,ce		v,s		X
<i>Fluvicola nengeta</i>	ca,ce		v	x	X
<i>Cnemotriccus fuscatus</i>	ca,ce	a,v	c,r	r	
<i>Lathrotriccus euleri</i>	ca,ce	a	c		
<i>Satrapa icterophrys</i>	ca,ce,aa	v			
<i>Xolmis cinereus</i>	ce,aa	v			
<i>Xolmis irupero</i>	ca,ce,aa		v	x	X
Vireonidae (4)					
<i>Cycularhis gujanensis</i>	ca,ce	p,s,c,r	c,r	r	X
<i>Vireo olivaceus</i>	ca,ce	c		r	
<i>Hylophilus poicilotis</i>	ca,ce			r	
<i>Hylophilus amaurocephalus</i>	ca,ce	p,c		r	X
Corvidae (2)					
<i>Cyanocorax cristatellus</i> +	ce	s			
<i>Cyanocorax cyanopogon</i> †	ca,ce	v,s	s,c	c,r	X
Hirundinidae (6)					
<i>Pygochelidon cyanoleuca</i>	aa	v		x	
<i>Stelgidopteryx ruficollis</i>	aa	v		x	x*
<i>Progne tapera</i>	aa			x	x*
<i>Progne chalybea</i>	aa			x	X
<i>Tachycineta albiventer</i>	wl		v	x	X
<i>Hirundo rustica</i>	aa				x*
Troglodytidae (3)					
<i>Troglodytes musculus</i>	ca,ce,aa	s,c		r	X
<i>Cantorchilus leucotis</i>	ce,	a	c		
<i>Cantorchilus longirostris</i>	ca	a	c	r	X
Poliptilidae (2)					
<i>Poliptila plumbea</i>	ca,ce	a,p,c	c,r	c,r	X
<i>Poliptila dumicola</i>	ce	a,v			
Turdidae (4)					
<i>Turdus rufiventris</i>	ca,ce	a,r	c	r	X
<i>Turdus leucomelas</i>	ca,ce	s,r		r	X
<i>Turdus amaurochalinus</i>	ca,ce	c,r	c,r	r	X
<i>Turdus albicollis</i>	ca,ce	v,r			
Mimidae (1)					
<i>Mimus saturninus</i>	ca,ce,aa	v,c	v	r	X
Motacillidae (1)					
<i>Anthus lutescens</i>	ca,ce,aa				x*
Coerebidae (1)					
<i>Coereba flaveola</i>	ca,ce	a,v	c	r	X
Thraupidae (13)					
<i>Saltator coerulescens</i>	ca		v		
<i>Saltator similis</i>	ce	a,p,c,r		r	

Taxon	Habitat	Locality / Evidence			
		Correntina	Ibotirama	Boqueirão da Onça	Sobradinho
<i>Saltatricola atricollis</i>	ce			x	X
<i>Compsothraupis loricata</i>	ca,ce	p,s	v,s	r	X
<i>Nemosia pileata</i>	ce		v,s	x	X
<i>Thlypopsis sordida</i>	ca,ce	v	c	x	X
<i>Tachyphonus rufus</i>	ca,ce			r	
<i>Ramphocelus carbo</i>	ca,ce,rf	v,c,r			
<i>Lanio pileatus</i>	ca,ce	a,p,c,r	s,c,r	r	X
<i>Tangara sayaca</i>	ca,ce,aa	v,r	v	r	X
<i>Tangara cayana</i>	ca,ce,aa	p,c,r		r	
<i>Neothraupis fasciata</i>	ce			x	
<i>Schistochlamys ruficapillus</i>	ca,ce			r	
<i>Paroaria dominicana</i> †	ca,aa	v	s,c	r	X
<i>Conirostrum speciosum</i>	ca,ce	v	v,s	x	
Emberizidae (11)					
<i>Zonotrichia capensis</i>	ca,ce,aa	s,c,r		r	X
<i>Ammodramus humeralis</i>	ca,ce,aa			x	X
<i>Sicalis columbiana</i>	ce,aa		v		
<i>Sicalis flaveola</i>	ca,ce,aa			x	X
<i>Sicalis luteola</i>	ca,ce,aa			x	
<i>Volatinia jacarina</i>	ca,ce,aa	v	v	x	X
<i>Sporophila plumbea</i>	ca,ce	v			x*
<i>Sporophila lineola</i>	ca,ce				x*
<i>Sporophila nigricollis</i>	ca,ce			r	X
<i>Sporophila albogularis</i> †	ca,ce		v,s	x	X
<i>Sporophila leucoptera</i>	ca,ce			x	
Cardinalidae (2)					
<i>Piranga flava</i>	ca,ce	s,c			
<i>Cyanoloxia brissonii</i>	ca,ce	p,c	k	r	X
Parulidae (5)					
<i>Parula pitiayumi</i>	ca,ce	v		x	
<i>Geothlypis aequinoctialis</i>	ca,ce	c			
<i>Basileuterus culicivorus</i>	ca,ce	p,s,c		r	
<i>Basileuterus flaveolus</i>	ca,ce	p,c	c,r,r	r	X
<i>Basileuterus leucophrys</i> +	ce,wl	c			
Icteridae (8)					
<i>Procacicus solitarius</i>	ca,ce		v		
<i>Icterus pyrrhopterus</i>	ca,ce	p,c	c,r	x	X
<i>Icterus jamacaii</i>	ca,ce	v	v,s	r	X
<i>Gnorimopsar chopi</i>	ca,ce	a,v,r	a	x	x*
<i>Chrysomus ruficapillus</i>	ca,ce		v	x	x*
<i>Agelaioides fringillarius</i>	ca,ce		v,s	x	
<i>Molothrus bonariensis</i>	ca,ce,aa	v	v	x	X
<i>Sturnella superciliaris</i>	ca,ce,aa		v	x	x*
Fringillidae (2)					
<i>Sponagra jarrellii</i> <sup>VU</sup>	ca			r,v	
<i>Euphonia chlorotica</i>	ca,ce	v,s	s,c	r	X
Passeridae (1)					
<i>Passer domesticus</i>	ca,ce,aa		v	x	x*

Altogether, we recorded five species threatened with extinction in Brazil (following MMA 2003): *Penelope jacucaca* (Vulnerable – VU), *Anodorhynchus leari* (Endangered – EN), *Xiphocolaptes falcirostris* (VU), *Lepidocolaptes wagleri* (VU), and *Sporagra yarrellii* (VU). Additionally, we recorded 13 species endemic to the *caatinga* biome (Pacheco 2004, Roos *et al.* 2006, Faria *et al.* 2009): *P. jacucaca*, *A. leari*, *A. cactorum*, *Anopetia gounellei*, *Picumnus pygmaeus*, *Sakesphorus cristatus*, *Herpsilochmus sellowi*, *Hylopezus ochroleucus*, *X. falcirostris*, *G. hellmayri*, *Cyanocorax cyanopogon*, *Sporophila albogularis*, and *Paroaria dominicana*; and 4 species endemic to the *cerrado* (Silva & Bates 2002, MMA 2007b, Faria *et al.* 2009), which were recorded only at Correntina: *Melanopareia torquata*, *Hylocryptus rectirostris*, *Cyanocorax cristatellus* and *Basileuterus leucophrys* (but see Silva *et al.* 2003 for a different view on the endemism of these species).

Several migratory species were recorded in the LMSF, including both Nearctic and Neotropical migrants (Sick 1997, Silva *et al.* 2003), such as *Pandion haliaetus*, *Actitis macularia*, *Tringa solitaria*, *T. melanoleuca*, *Calidris fuscicollis* and *Hirundo rustica* (all Nearctic), and *Elaenia chilensis*, *E. parvirostris*, *Tyrannus savana* and *Turdus amaurochalinus* (Neotropical).

Among the species with high sensitivity to environmental disturbance (Stotz *et al.* 1996, Silva *et al.* 2003), we found in the LMSF the following: *P. jacucaca*, *Gallinago undulata*, *Phaetusa simplex*, *A. leari*, *A. gounellei*, *L. wagleri*, *Campylorhamphus trochilirostris*, *H. rectirostris*, *Megaxenops parnaguae*, *Compsotrappis loricata*, and *Sporagra yarrellii*.

Many game birds were also recorded in the LMSF, especially at Boqueirão da Onça and at Sobradinho Lake, such as *Dendrocygna bicolor*, *D. viduata*, *D. autumnalis*, *Anas bahamensis*, *Netta erythrophthalma*, *Amazonetta brasiliensis*, *Sarkidiornis sylvicola*, *Cairina moschata*, *Nomonyx dominica*, *Gallinula galeata* and *Jacana jacana*. Despite those aquatic species, there is also hunting pressure over the tinamous and allies, the guans (*Penelope superciliaris* and *P. jacucaca*), and the pigeons and doves, especially *Zenaidura macroura*. A further threat to the birds in the LMSF is the illegal trade for pet animals, which affects mainly Psittacidae, Turdidae, Emberizidae, Thraupidae, Cardinalidae, Icteridae and Fringillidae.

### Noteworthy records

#### *Penelope jacucaca*

We recorded this threatened and highly sensitive species (MMA 2003, Silva *et al.* 2003, IUCN 2011) at Fazenda Brejinho and Fazenda Cristalina (Boqueirão da Onça) in May 2009, when pairs and small groups were sighted. One pair was also sighted at Fazenda Santo Antônio (Ibotirama) in August 2009.

#### *Geranoaetus melanoleucus*

C.A. found the species breeding and photographed a bird on the nest in August 2009 at Sento Sé, Boqueirão da Onça.

#### *Himantopus mexicanus* and *H. melanurus*

Although *H. mexicanus* was fairly seen at Ibotirama, V.Q.P. found a typical *H. melanurus* at Fazenda Quebra Linha in 28 August 2007. The bird was foraging in the São Francisco river about 15-20 m from a pair of *H. mexicanus*. There seem to be a contact zone between both species in Northeastern Brazil, where some intermediate birds were seen and photographed (e.g. Parnamirim – Pernambuco, September 2004, C.A. data).

#### *Gallinago undulata*

This species was tape-recorded by F.S. at dawn (5 am) in September 2007 at Vereda do Francês, Coribe (Correntina). It is scarce in northeastern Brazil (Teixeira *et al.* 1983) with few records in Bahia (Sick 1997, Souza & Borges 2008). Sick (1997) also mentions the species could be heard (at unspecified localities) in December and January in Bahia.

#### *Phaetusa simplex*

Two fledglings and a nest with three eggs were found on 22 August 2007 on a sand islet in the São Francisco river in Ibotirama region. There were several other empty “nests” on the ground, thus suggesting August/September is the end of the breeding season for the species at that region.

#### *Anodorhynchus leari*

This threatened species (MMA 2003, IUCN 2011) was found at Cercadinho (10°08'10,8" S, 41°10'26,3" W), between Sento Sé and Campo Formoso, in August and September 2005, July 2007, and August 2009, when two individuals were photographed by C. A. and co-workers. According to local people, only two individuals have been seen in the region in the last 10 years. The absence of breeding activities in the last decade suggests that both individuals have the same sex or, less likely, that the couple did not achieve sexual maturity. That population had about 25 individuals when first located by Pedro Lima in 1994 (IBAMA 2006) and this is the only known locality of occurrence for this species outside Raso da Catarina.

#### *Augastes lumachela*

Several individuals were seen and two were mist-netted (one collected; COUFPE 4657) at Boqueirão da Onça in May and August 2009. These records extend the known range of this species, as anticipated by Souza *et al.* (2009).

### *Melanopareia torquata*

One individual was mist-netted and collected (MZUSP 83287) in an area with natural grassland and *cerrado* around a palm swamp (*vereda*) at Vereda do Francês, Coribe (Correntina) in September 2007. Our record of this species in western Bahia, which is endemic to the *cerrado*, highlights the need to conserve the natural grasslands of Central Brazil.

### *Herpsilochmus sellowi* and *H. atricapillus*

On 23 August 2007, in a dry forest close to the São Francisco river in Muquém do São Francisco, a female *H. sellowi* was collected after being netted in the same net where a male *H. atricapillus* was also captured and collected, though in a different moment. The identity of both specimens was confirmed by morphology and morphometry following Whitney *et al.* (2000). We also recorded both species in syntopy in Coribe and Correntina, in an area of transition between *caatinga* and *cerrado*. Even though the sympatry between the two species is quite large, their syntopic occurrence is still restricted to a few localities (Whitney *et al.* 2000).

### *Hylopezus ochroleucus*

This poorly known species is endemic to *caatinga* and was recorded in September 2007 at Pedra Preta, Correntina, and in August 2009 at Mata Roçada in Campo Formoso and Fazenda Cristalina in Sento Sé.

### *Xiphocolaptes falcirostris*

Another endemic species to *caatinga*, it was tape-recorded on 20 and 21 August 2007 at Fazenda Santo Antônio, Muquém de São Francisco. Two individuals were netted and ringed in the same area. These records are in one of the areas suggested to become a reserve that may help conserve this threatened woodcreeper (Straube & Piacentini 2008).

### *Lepidocolaptes wagleri*

We recorded this threatened, range restricted species at Pedra Preta, Correntina (in *caatinga*) and at Jaborandi (riverine forest of Rio Formoso). This woodcreeper was only recently split from *L. squamatus* (Silva & Straube 1996, Garcia-Moreno & Silva 1997), and, thus, still lacks data on its distribution and natural history.

### *Hylocryptus rectirostris*

We recorded this typical inhabitant of riverine forests of Central Brazil and Paraguay at Rio Formoso, Jaborandi, when a pair was tape recorded close to a possible nest in a ravine. Our record is close to the northernmost occurrence of the species.

### *Poecilatriccus plumbeiceps*

This species is mostly restricted to southern and

southeastern Brazil, with few records to the northeast. Two couples were sighted and tape-recorded in dense vegetation, with one individual collected (MZUSP 83367), at Pedra Preta, Correntina. Another couple was tape-recorded by F.S. also in dense vegetation close to Rio Formoso. These seem to be the first records ever made to the west of the São Francisco river and belong to *P. plumbeiceps cinereipectus*, previously known only from Espírito Santo and Minas Gerais (Novaes 1953).

### *Sporagra yarrellii*

This species is vulnerable to extinction (MMA 2003, IUCN 2011) and was recorded at Fazenda Cristalina (Boqueirão da Onça) in riverine forest and *caatinga* scrub. At least eight individuals were observed by D.M.L. and A.E.B.A.S in May 2009 foraging in a pasture with some sparse trees, and two individuals were captured and ringed in August 2009.

## DISCUSSION

The total number of species recorded in the LMSF (315) represents c. 61% of the birds recorded in the *caatinga* (510 species; Silva *et al.* 2003). Boqueirão da Onça was the richest area, but this result must be viewed cautiously. The much higher field effort spent at Boqueirão da Onça region compared to Ibotirama and Correntina may have influenced the total number of species found there, even though Boqueirão da Onça indeed has much of its original habitats preserved, which includes *caatinga* scrub, *cerrado* savanna and *campos rupestres*. This heterogeneity of habitats and the altitudinal gradient also enhances the number of species present in this area.

Although the different methods and sampling efforts prevent a valid comparison with other areas, the total number of species in each of the three regions we sampled are within the known numbers found in other areas in the *caatinga* and indeed are higher than many of them (Santos 2004, Olmos *et al.* 2005). More important, the 213 species found in Boqueirão da Onça make this region one of the richest *caatinga* areas together with the National Parks Serra da Capivara (238 species; Olmos & Albano 2012) and Serra das Confusões (225 species Silveira & Santos 2012).

The LMSF holds a very rich bird fauna with several endemic and/or threatened species. This is not surprising given that the entire region has many areas classified as holding high to extremely high biological diversity, yet poorly known (MMA 2003). Boqueirão da Onça, Correntina and the area south of Sobradinho Lake are also classified as “extremely high priority” for conservation, whereas Ibotirama and the area north of Sobradinho Lake are classified as “high priority” (MMA 2007a). Nine Important Bird Areas (IBA) of BirdLife further stress the

great value of the MSF to the conservation of birds and other animals. Despite its importance, the LMSF has few reserves. The Ibotirama region is the least protected one, with only one small private reserve (Fazenda Pé de Serra). On the other hand, there is an ongoing study to create a mosaic of reserves at Boqueirão da Onça (Biondi 2010).

The establishment of reserves in the area is badly needed and can potentially reduce the current threat posed by the expansion of agricultural activities in western Bahia. Nonetheless, several other threats still exist in the area, such as hunting and capture of birds for pet trade. Thus, the enforcement of law is also needed to fully protect the birds of the LMSF. If these measures are taken, future records of rare birds such as the Rufous-vented Ground-Cuckoo *Neomorphus geoffroyi* in the region (Roos *et al.* 2012) will likely be secured.

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