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Inventory of birds in the coastal *restinga* of a Private Natural Heritage Reserve in northeastern Brazil

Inventário de aves da restinga de uma Reserva Particular do Patrimônio Natural, Nordeste do Brasil

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Abstract

The knowledge of the characteristics of bird communities found in each habitat type and the ecological requirements of each species helps to define the environmental conditions of an area. In the present study, we provide an inventory of the bird community of the Caju Private Natural Heritage Reserve (RPPN Caju), in Itaporanga d'Ajuda, Sergipe, Brazil. We conducted a rapid assessment of the bird community between October 21st and 31st, 2014, using MacKinnon's lists and mist-netting. We identified 89 bird species representing 36 families, of which the most diverse were Thraupidae (S=11), Tyrannidae (S=11), Columbidae (S=5), Falconidae (S=4) and Psittacidae (S=4). Five of the species recorded are endemic to Brazil and one (*Herpsilochmus pectoralis*) is considered vulnerable to extinction, according to IUCN criteria. We recorded bird species that are predominantly insectivorous (40.45%), omnivorous (25.84%), and carnivorous (11.24%). Other guilds (frugivorous, granivorous, detritivorous, piscivorous, and nectarivorous) represented together less than 25% of the records. The bird richness recorded at the RPPN Caju confirms the potential importance of the area as a conservation unit.

Keywords: protected area, avian fauna, Sergipe.

Resumo

Conhecer as exigências ecológicas das espécies e a composição da comunidade de aves auxilia na identificação das condições ambientais de determinada área. Nesse sentido, o presente estudo apresenta resultados de um inventário de aves de restinga da Reserva Particular do Patrimônio Natural do Caju, em Itaporanga d'Ajuda, Sergipe, Brasil. O inventário foi realizado com base no método de levantamento rápido, durante dez dias de outubro de 2014, através de amostragens com a confecção de listas de MacKinnon e uso de redes de neblina. Foram identificadas 89 espécies de aves distribuídas em 36 famílias, sendo Thraupidae (S=11), Tyrannidae (S=11), Columbidae (S=5), Falconidae (S=4) e Psittacidae (S=4) as mais representativas. Entre os registros totais, cinco espécies são endêmicas do Brasil, e uma é considerada vulnerável (*Herpsilochmus pectoralis*), de acordo com os critérios da IUCN. As espécies de aves insetívoras foram mais bem representadas (40.45%), seguidas das omnívoras (25.48%) e das carnívoras (11.24%). Outras guildas tróficas (frugívoros, granívoros, detritívoros, piscívoros e nectarívoros) representaram em conjunto menos de 25% do total dos registros. Os resultados indicam que a RPPN do Caju abriga uma diversidade de aves considerável, confirmando a importância da área enquanto unidade de conservação.

Palavras-chave: área protegida, avifauna, Sergipe.

Introduction

Birds constitute a highly diverse vertebrate group, with 1,901 species known to occur in Brazil (CBRO, 2014), most of which are habitat specialists. Knowledge of the ecological requirements of some bird families, genera and species may be sufficient, in some cases, to determine the environmental conditions to which the birds are sensitive (Donatelli *et al.*, 2004). These characteristics (habitat and ecological requirements) contribute to the role of birds as one of the principal bio-indicators of environmental quality in terrestrial ecosystems (Canterbury *et al.*, 2000).

Coastal restingas are highly diverse environments, resulting from the formation of distinct phtyophysiognomies, related to the distinct structural features of coastal plains, including the beach line, dunes, swamps, lagoons, and forests (Silva, 1999). Due to their coastal location, restingas are among the most endangered Brazilian ecosystems, which are threatened primarily by urban growth and development (Rocha *et al*., 2007).

While bird species adapted to open habitats are common in restingas, these systems are assumed to have low levels of bird diversity and endemism (Alves *et al*., 2004), which are reflected in the limited interest of ornithological researchers (Gonzaga *et al.*, 2000). Another factor that contributes to the lack of knowledge on the fauna of restingas is the intense colonization of the Brazilian coast, which began in the sixteenth century, and has intensified in recent decades, with extensive impacts on the local environments and their resident fauna (Mittermeier *et al.*, 2005; Rocha *et al.*, 2004; Sick, 1997).

One of the most effective strategies for the conservation of natural ecosystems is the establishment of an effective system of protected areas (Bruner *et al.*, 2001). In Brazil, these areas include zones of permanent protection (e.g., riparian forest and mangroves), legal reserves (i.e., the forested portion of private properties), indigenous lands and conservation units. Conservation units can be established on either public land or private properties. In this context, the establishment of Private Natural Heritage Reserves (RPPNs) is an important complement to the conservation of species and ecological services without requiring public resources.

Faunal inventories are an important component of environmental conservation, especially in areas that suffer intense anthropogenic pressures, such as the coast of Sergipe. In this study, we present the results of a rapid assessment of the bird community of the RPPN Caju, providing important new insights into the complexity of the fauna of Brazilian coastal restinga ecosystems.

Methods

Study site

Caju Private Natural Heritage Reserve, RPPN Caju (11°6'10.12" S, 37°11'4.59" W), declared a conservation unit in 2011, is located in Itaporanga d'Ajuda, at km 24 of the SE-100 state highway in Sergipe, northeastern Brazil (Figure 1). The RPPN Caju encompasses an association of Atlantic Forest environments, including shrubby-arboreal restinga, mangroves, sand dunes, and salt marshes in an area of 763.37 hectares (EMBRAPA, 2013). The main plant species present in the study area are *Schinus terebinthifolius* Raddi 1820, *Anacardium occidentale* L., *Psidium* sp., *Andira fraxinifolium* Benth, *Byrsonima sericea* DC,

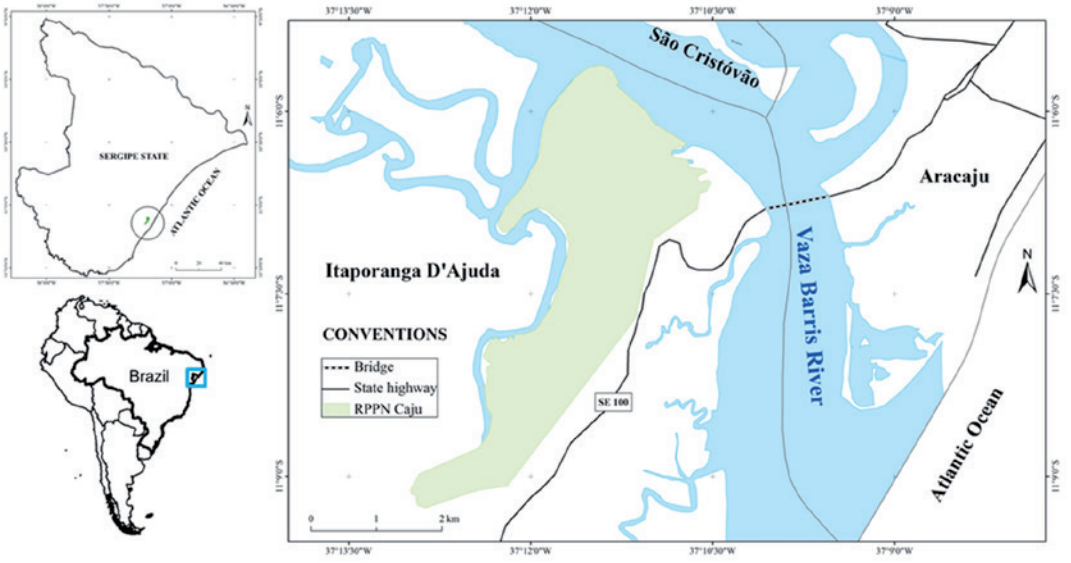

Figure 1. Localization of the Caju Private Natural Heritage Reserve, municipality of Itaporanga d'Ajuda, Sergipe, Brazil.

and *Campomonesia* sp. (EMBRAPA, 2013). The local climate is Tropical Megathermal with a dry season in the austral summer, corresponding to the *As* type in Köppen's classification system (Alvares *et al.*, 2013). Mean annual rainfall is typically above 1,250 mm (EMBRAPA, 2013).

Local topography is typical of the coastal lowlands of the state of Sergipe (Silva *et al.*, 2000), which are predominant flat, with subtle undulations and few areas above 10 m in altitude, corresponding to the sand dunes (EMBRAPA, 2013). The soils are sandy and have low natural fertility (Araujo Filho *et al.*, 1999; Silva *et al.*, 2000).

Inventory of the avian fauna

We conducted the bird inventory, between October 21st and 31st, 2014, using two different methods simultaneously, MacKinnon lists and mist-netting. In both methods, we used pre-established trails located within the different vegetation types of the RPPN Caju, and a field guide (Sigrist, 2013) for the identification of the bird species. The MacKinnon list procedure is based on MacKinnon and Phillips (1993), where the observer walks through a pre-established area, listing the bird species encountered up to a predetermined number of taxa. Each list constitutes a sampling unit. In the present study, we used lists of 10 species, in order to maximize the number of sampling units (Herzogh *et al.*, 2002), and minimize the probability of recording a species more than once in the same unit. We (up to three observers) collected MacKinnon lists during the periods of greatest bird activity, i.e., early morning (6h-9h) and late afternoon (15h-18h), using binoculars (8x40), with a total sampling effort of 60 hours, with 60 MacKinnon lists being collected. In order to avoid over-estimates, we used five different transects, which were alternated every five days.

To complement these lists, we captured birds in mist nets, enabling the register of bird species less easily detected by visual or auditory methods (Roos, 2010). We set eight mist nets (2.5 x 12 m; 36 mm mesh) over a total of 128 hours, divided between morning (5-10 h) and afternoon (15-18h) sessions, checking the nets at 20-minute intervals to minimize the risk of predation (Ruiz-Esparza *et al.*, 2011). We changed the sampling point every two days, in order to sample the different microhabitats (freshwater lagoons, mangroves, and grassland, shrub and shrubby-arboreal restingas) found within the RPPN Caju. We removed the trapped birds carefully, and after biometry, photography and banding, we released the birds at the capture site (CEMAVE, 1994).

Data analysis

We classified all bird species observed and captured in the RPPN Caju according to their feeding habits, using eight categories: carnivorous (CAR), detritivorous (DET), frugivorous (FRU), granivorous (GRA), insectivorous (INS), nectarivorous (NEC), omnivorous (ONI) and piscivorous (PIS), based on the trophic guilds proposed by Lourdes-Ribeiro *et al.* (2011), Piratelli and Pereira (2002), Sick (1997), and Telino-Júnior *et al.* (2005).

Opportunistic records of bird species encountered outside the principal sampling areas were included in the species inventory. The taxonomic ordination adopted follows the proposition of the Comitê Brasileiro de Registros Ornitológicos (CBRO, 2014). We estimated the total species richness of the study area (Jackknife 1) using Estimates 9.0 (Colwell *et al*., 2012), and we calculated the Shannon-Wiener diversity index (H') and Pielou's equitability index, E' (Pielou, 1966; Tramer, 1969).

To assess the residence status of the species, we calculated the Frequency of Occurrence (FO) of the species recorded in the MacKinnon lists, which we presented as a daily rate of occurrence: FO = n/N*100, where n = the number of days on which the species was recorded, and N = the total number of observation days. Residence status was defined as Occasional (O: FO < 15%), Possibly Resident (P: 60% > FO ≥ 15%), and Resident (R: FO ≥ 60%), following Mendonça-Lima and Fontana (2000).

Results

Considering MacKinnon lists, captures in the mist nets and occasional observations, we recorded 89 bird species in the RPPN Caju (Appendix 1). These species are distributed in 36 bird families, of which the most diverse were Thraupidae (S=11), Tyrannidae (S=11), Columbidae (S=5), Falconidae (S=4), and Psittacidae (S=4). If we consider only MacKinnon lists, 78 species were recorded. According to the species richness estimator Jackknife 1, we should have recorded 89 species (Figure 2). This was 13% more than the number recorded in the lists, but it corresponds to the total recorded in the combined dataset (including mist-netting and occasional sightings). The diversity index (H') was 3.82 and the equitability index (E') was 0.87.

We captured 77 individuals in the mist nets, corresponding to 31 species. The most common species were *Columbina squammata* (Lesson 1831) (N=12; 15.5%), *Chiroxiphia pareola* (Linnaeus 1766) (N=6; 7.7%), *Neopelma pallescens* (Lafresnaye 1853) (N=6; 7.7%), and *Elaenia cristata* Pelzeln 1868 (N=4; 5.1%). Together, these four species represent 36.3% of the total captures (Figure 3). Five of the species recorded in this study are endemic to Brazil (CBRO, 2014), *Aratinga jandaya* (Gmelin 1788), *Thamnophilus pelzelni* Hellmayr 1924, *Paroaria dominicana* (Linnaeus 1758) and *Compsothraupis loricata* (Lichtenstein 1819) and *Herpsilochmus pectoralis* Sclater 1857. *Aratinga jandaya* is also considered to be endemic to northeastern Brazil (CBRO, 2014). In addition, *H. pectoralis* is classified as

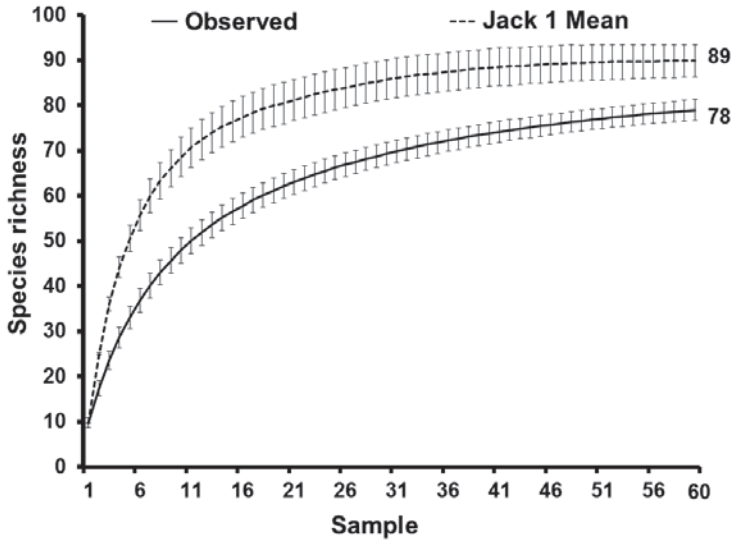

Figure 2. Species accumulation curve (line) and rarefaction curve (dashed) of the Jackknife 1 estimator for the bird species recorded using MacKinnon lists in the Caju Private Natural Heritage Reserve, Itaporanga d'Ajuda, Sergipe, Brazil. The vertical bars correspond to the standard deviation.

Figure 3. The bird species captured most frequently in mist nets at the Caju Private Natural Heritage Reserve in Itaporanga d'Ajuda, Sergipe, Brazil. (a) *Columbina squammata*, (b) *Chiroxiphia pareola*, (c) *Neopelma pallescens*, and (d) *Elaenia cristata*.

vulnerable to extinction in the IUCN Red List (BirdLife International, 2015). Two other records also deserve attention – one is *Conirostrum bicolor* (Vieillot 1809), which preferably inhabits mangroves, and the other is *Mimus gilvus* (Vieillot 1807), a species typical of restinga habitats.

The bird species recorded in the present study were predominantly insectivorous (40%), omnivorous (25%) and carnivorous (11.2%). Other guilds (frugivorous, granivorous, detritivorous, piscivorous, and nectarivorous) together represented less than 10% of the records (Figure 4).

Discussion

The 89 bird species recorded in the RPPN Caju represent 26% of the 340 bird species recorded to date in the state of Sergipe (Sousa, 2009). The bird species richness found in the present study is similar to that of other restinga sites in northeastern Brazil, which vary among 79 species recorded in Piaçabuçu, in the state of Alagoas (Cabral *et al.*, 2006), 96 species in Imbassaí, in the state of Bahia (Mota *et al.*, 2012), and 127-136 species in Aracajú, Sergipe (Almeida *et al.*, 2012; Ruiz-Esparza *et al.*, 2014). Inventories conducted in coastal restingas in southern and southeastern Brazil have generally recorded higher species richness (Table 1). In the arboreal restinga of Itanhaém/Mongaguá, in the state of São Paulo, Lima (2010) recorded 262 bird species, Vieira *et al*. (2014) registered 227 species in the Carijós Ecological Station (state of Santa Catarina), and Sanabria *et al*. (2010) recorded 111 species in northern Rio Grande do Sul. In the Restinga de Jurubatina National Park, in the state of Rio de Janeiro, however, Alves *et al*. (2004) found only 84 bird species. These differences may at least partially be the result of the different methods or sampling effort used in each study (Bibby *et al*., 2000), in addition to the heterogeneity of the habitats, the size of the study area, and the surrounding matrix (Watson *et al*., 2005).

While coastal restinga ecosystems in Brazil are protected by law, together with mangroves, it is important to note that only four of the 13 sites in Table 2 are located in protected areas, and eight are close to urban zones characterized by intense anthropogenic pressure, including urban development. Despite the legal protection of habitats, the fauna of these areas may be vulnerable, and the total area of conservation units should be increased, especially to endemic birds or migratory species that use the sites to breed.

While some species that occur in the region, such as frigatebirds, terns and sandpipers (Almeida *et al.*, 2012; Cabral *et al.*, 2006; Mota *et al.*, 2012; Sanabria *et al.*, 2010), were not recorded in the present study, we did record one species – *Paroaria dominicana* (Cracraft, 1985) – which is endemic to the Caatinga biome. This species is popular in the illegal wildlife trade, especially in the Brazilian Northeast (Pereira and Brito, 2005), and is often released illegally. It thus seems possible that the present record represents an expansion of the original species range as a consequence of human activities (i.e., illegal wildlife trade and habitat changes), probably supported by its ecological flexibility and to the mobility of the species in open habitats (Olmos *et al.*, 2005).

Only three species captured in the mist nets were not recorded in the MacKinnon lists – *Chloroceryle americana* (Gmelin 1788), *Hydropsalis albicollis* (Gmelin 1789) and *Neopelma pallescens*. A total of 50 species were recorded

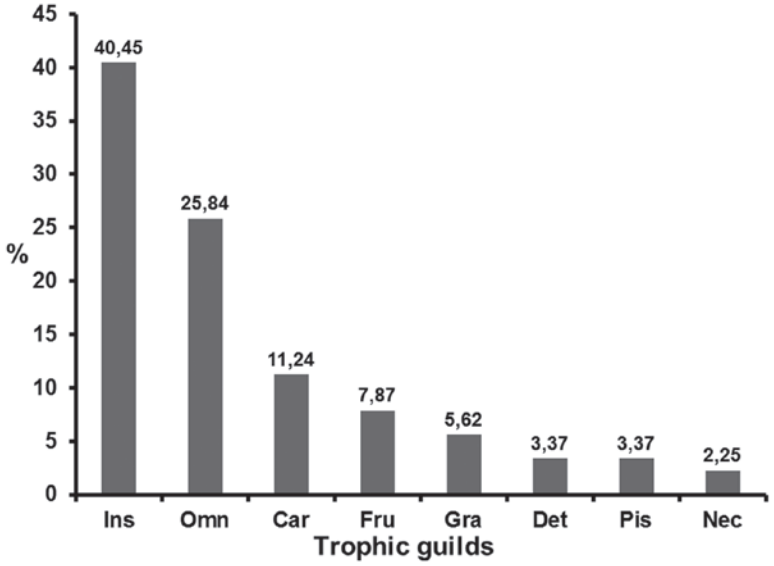

Figure 4. Trophic composition of the bird community at Caju Private Natural Heritage Reserve in Itaporanga d'Ajuda, Sergipe, northeastern Brazil.

Table 1. Bird species richness of recorded in coastal restinga habitats in Brazil, according to published data. Abbreviations: AR – Arboreal Restinga, L – Lagoons, LR – Literature Review, ML – MacKinnon Lists, M – Mangrove, MN – Mist Nets, O – Observations, O – Ocean, P – Pasture, PC – Point Counts, RA – Rapid Assessment, R – Restinga, RI – River, RO – Roads, SM – Salt Marshes, SD – Sand Dunes, SR – Sound Record, T – Transects, UZ – Urban Zone. (*) Protected Areas.

Regions of Brazil	State	Locality - Study Site	Area (hectares)	Richness	Sampling effort	Methods	Matrix	References
Southeast	RJ	Jurubatina National Park*	14922	96	2260 (net hours)	MN, T	L, O, SD	Alves *et al*. (2004)
	SP	Restinga Forest of Itanhaém/ Mongaguá		262	Not informed	O, SR	AR, O, UZ	Lima (2010)
		Ubatuba Restinga Forest	10	114	36 (hours)	PC	O, R, RO	Dario and De Vicenzo (2011)
South	PR	Pontal do Sul	4	64	57 (hours)	T	O, SD, UZ	Pedroso Junior (2003)
	RS	Urban Area of Capão da Canoa	138	111	72 (hours)	T	O, RO, UZ	Sanabria *et al*. (2010)
		Peninsula of Mostardas		165	Not informed	RA	L, O, SM	Harrison *et al*. (2013)
	SC	Carijós Ecological Station*	759	227	38,880 h·m²	LR, MN, O, PC	M, O, RI, RO, UZ	Vieira *et al*. (2014)
Northeast	AL	Piaçabuçu Area of Environmental Protection*	18000	79	252 (hours)	O, SR	L, M, O, R, SD	Cabral *et al*. (2006)
	BA	Imbassaí Reserve	139	96	21600 h.m². (MN), 50 (PC)	MN, PC	AR, O, UZ	Mota *et al*. (2012)
	PB	Mining Area		140	10.704 h·m²	MN, O, SR	O, R, RI, SD, UZ	Araújo *et al*. (2010)
	SE	Expansion Zone of Aracaju	5000	136	73 (hours)	O, PC	O, RI, UZ	Almeida *et al*. (2012)
		Santa Maria Airport (Aracaju)	387	127	313 (hours)	T	RI, UZ	Ruiz-Esparza *et al*. (2014)
	SE	Caju Private Reserve of Natural Patrimony*	763	89	128 (net hours); 60 (ML)	ML, MN	L, M, P, R, RI	Present study

only in the MacKinnon lists, however, which reinforces the utility of this technique in rapid assessment surveys (Ribon, 2010).

The majority of the bird species we recorded is insectivorous (40%). Such guild plays an important ecological role in the maintenance of plant community. Insectivorous birds, for example, are important for the biological control of insect pests, which may be potentially detrimental to agriculture (Andrade, 1988). In the specific case of the present study area, insectivorous birds provide an important ecosystem service, given that EMBRAPA keeps an active germplasm reserve of coconut (*Cocos nucifera* L.) and mangaba (*Hancornia speciosa* Gomes) in the RPPN Caju (EMBRAPA, 2013).

The other trophic guilds were more poorly represented, although they may also have their ecological importance in the study area. Frugivorous species play an important role in seed dispersion (Fadini and Marco Jr., 2004), for example, and nectarivorous birds are important pollinators. In tropical forest ecosystems, more than 80% of the plant species are dependent on vertebrates for their dispersal (Howe and Smallwood, 1982), and, in the Neotropical region, hummingbirds are responsible or the pollination of up to 15% of all angiosperms (Feinsinger, 1983).

In addition to its overall diversity, the inventory of the RPPN Caju recorded a number of specific cases that highlight the importance of the study area, including the vulnerable *Herpsilochmus pectoralis*, species typical of coastal habitats (*Mimus gilvus* and *Conirostrum bicolor*), and evidence of the range expansion of a Caatinga endemic *Paroaria dominicana*. The RPPN Caju clearly has a potentially important role to play in the conservation of the region's fauna, and in the ecosystem services it provides, especially in the context of ongoing urban development and expansion.

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Appendix

Appendix 1. Bird species recorded between October 21st and 31st, 2014 at the Caju Private Natural Heritage Reserve, Sergipe, Brazil. The classification and nomenclature follow the Comitê Brasileiro de Registros Ornitológicos (CBRO, 2014). Residence status was based on the Frequency of Occurrence in the MacKinnon lists: occasional (O), possibly residents (P), residents (R). (*) = Endemic. C = Capture in Mist Nets, carnivorous (CAR), detritivorous (DET), frugivorous (FRU), granivorous (GRA), insectivorous (INS), L = MacKinnon List, nectarivorous (NEC), omnivorous (ONI), piscivorous (PIS), R = Occasional records.

Family/Species	English common name	Status	Type of record	Trophic guild
Tinamidae Gray, 1840				
Rhynchotus rufescens (Temminck, 1815)	Red-winged Tinamou	P	L	Ins
Cracidae Rafinesque, 1815				
Ortalis guttata (Spix, 1825)	Speckled Chachalaca	P	L	Fru
Ardeidae Leach, 1820				
Botaurus pinnatus (Wagler, 1829)	Pinnated Bittern		R	Car
Ardea alba Linnaeus, 1758	Great Egret	R	L	Oni
Egretta thula (Molina, 1782)	Snowy Egret		R	Oni
Cathartidae Lafresnaye, 1839				
Cathartes aura (Linnaeus, 1758)	Turkey Vulture	P	L	Det
Cathartes burrovianus Cassin, 1845	Lesser Yellow-headed Vulture	O	L	Det
Coragyps atratus (Bechstein, 1793)	Black Vulture	R	L	Det
Accipitridae Vigors, 1824				
Rostrhamus sociabilis (Vieillot, 1817)	Snail Kite		R	Car
Urubitinga urubitinga (Gmelin, 1788)	Great Black-Hawk	O	L	Car
Rupornis magnirostris (Gmelin, 1788)	Roadside Hawk	R	L	Car
Rallidae Rafinesque, 1815				
Aramides cajaneus (Statius Muller, 1776)	Gray-necked Wood-Rail	P	L	Oni
Charadriidae Leach, 1820				
Vanellus chilensis (Molina, 1782)	Southern Lapwing	P	L	Oni
Columbidae Leach, 1820				
Columbina talpacoti (Temminck, 1811)	Ruddy Ground-Dove	P	L, C	Gra
Columbina squammata (Lesson, 1831)	Scaled Dove	R	L, C	Gra
Patagioenas picazuro (Temminck, 1813)	Picazuro Pigeon	P	L	Gra
Patagioenas cayennensis (Bonnaterre, 1792)	Pale-vented Pigeon	P	L	Gra
Leptotila verreauxi Bonaparte, 1855	White-tipped Dove	P	L, C	Fru
Cuculidae Leach, 1820				
Piaya cayana (Linnaeus, 1766)	Squirrel Cuckoo	R	L, C	Ins
Crotophaga ani Linnaeus, 1758	Smooth-billed Ani	P	L, C	Ins
Guira guira (Gmelin, 1788)	Guira Cuckoo	R	L	Ins
Strigidae Leach, 1820				
Glaucidium brasilianum (Gmelin, 1788)	Ferruginous Pygmy-Owl	P	L	Car
Athene cunicularia (Molina, 1782)	Burrowing Owl	P	L	Car
Nyctibiidae Chenu and Des Murs, 1851				
Nyctibius griseus (Gmelin, 1789)	Common Potoo		R	Ins
Caprimulgidae Vigors, 1825				
Antrostomus rufus (Boddaert, 1783)	Rufous Nightjar		R	Ins
Hydropsalis albicollis (Gmelin, 1789)	Pauraque		C	Ins
Trochilidae Vigors, 1825				
Chlorostilbon lucidus (Shaw, 1812)	Glittering-bellied Emerald	R	L, C	Nec
Thalurania glaucopis (Gmelin, 1788)	Violet-capped Woodnymph	O	L, C	Nec
Trogonidae Lesson, 1828				
Trogon curucui Linnaeus, 1766	Blue-crowned Trogon	R	L, C	Oni

Appendix 1. Continuation.

Family/Species	English common name	Status	Type of record	Trophic guild
Alcedinidae Rafinesque, 1815				
Megaceryle torquata (Linnaeus, 1766)	Ringed Kingfisher	O	L, C	Pis
Chloroceryle amazona (Latham, 1790)	Amazon Kingfisher	O	L	Pis
Chloroceryle americana (Gmelin, 1788)	Green Kingfisher		C	Pis
Galbulidae Vigors, 1825				
Galbula ruficauda Cuvier, 1816	Rufous-tailed Jacamar	O	L, C	Ins
Picidae Leach, 1820				
Colaptes melanochloros (Gmelin, 1788)	Green-barred Woodpecker	P	L	Ins
Dryocopus lineatus (Linnaeus, 1766)	Lineated Woodpecker	O	L	Ins
Campephilus melanoleucos (Gmelin, 1788)	Crimson-crested Woodpecker	P	L	Ins
Cariamidae Bonaparte, 1850				
Cariama cristata (Linnaeus, 1766)	Red-legged Seriema		R	Car
Falconidae Leach, 1820				
Caracara plancus (Miller, 1777)	Southern Caracara	R	L	Oni
Milvago chimachima (Vieillot, 1816)	Yellow-headed Caracara	R	L	Car
Herpetotheres cachinnans (Linnaeus, 1758)	Laughing Falcon	R	L	Car
Falco sparverius Linnaeus, 1758	American Kestrel		R	Car
Psittacidae Rafinesque, 1815				
*Aratinga jandaya** (Gmelin, 1788)	Jandaya Parakeet	R	L	Fru
Eupsittula aurea (Gmelin, 1788)	Peach-fronted Parakeet	P	L	Fru
Forpus xanthopterygius (Spix, 1824)	Blue-winged Parrotlet	R	L	Fru
Amazona amazonica (Linnaeus, 1766)	Orange-winged Parrot		R	Fru
Thamnophilidae Swainson, 1824				
Formicivora grisea (Boddaert, 1783)	White-fringed Antwren	P	L, C	Ins
*Herpsilochmus pectoralis** Sclater, 1857	Pectoral Antwren	P	L	Ins
*Thamnophilus pelzelni** Hellmayr, 1924	Planalto Slaty-Antshrike	R	L, C	Ins
Dendrocolaptidae Gray, 1840				
Dendroplex picus (Gmelin, 1788)	Straight-billed Woodcreeper	P	L, C	Ins
Furnariidae Gray, 1840				
Furnarius rufus (Gmelin, 1788)	Rufous Hornero	P	L, C	Ins
Pipridae Rafinesque, 1815				
Neopelma pallescens (Lafresnaye, 1853)	Pale-bellied Tyrant-Manakin		C	Fru
Chiroxiphia pareola (Linnaeus, 1766)	Blue-backed Manakin	P	L, C	Oni
Rhynchocyclidae Berlepsch, 1907				
Tolmomyias flaviventris (Wied, 1831)	Yellow-breasted Flycatcher	P	L	Ins
Todirostrum cinereum (Linnaeus, 1766)	Common Tody-Flycatcher	P	L	Ins
Hemitriccus margaritaceiventer (d'Orbigny and Lafresnaye, 1837)	Pearly-vented Tody-tyrant	P	L	Ins
Tyrannidae Vigors, 1825				
Camptostoma obsoletum (Temminck, 1824)	Southern Beardless-Tyrannulet	R	L, C	Ins
Elaenia flavogaster (Thunberg, 1822)	Yellow-bellied Elaenia	P	L	Oni
Elaenia cristata Pelzeln, 1868	Plain-crested Elaenia	P	L, C	Oni
Myiarchus swainsoni Cabanis and Heine, 1859	Swainson's Flycatcher	P	L	Ins
Myiarchus tyrannulus (Statius Muller, 1776)	Brown-crested Flycatcher	P	L	Ins
Pitangus sulphuratus (Linnaeus, 1766)	Great Kiskadee	R	L	Oni
Machetornis rixosa (Vieillot, 1819)	Cattle Tyrant	P	L	Ins
Megarynchus pitangua (Linnaeus, 1766)	Boat-billed Flycatcher	R	L	Oni
Myiozetetes similis (Spix, 1825)	Social Flycatcher	R	L	Oni

Appendix 1. Continuation.

Family/Species	English common name	Status	Type of record	Trophic guild
Tyrannus melancholicus Vieillot, 1819	Tropical Kingbird	R	L	Ins
Sublegatus modestus (Wied, 1831)	Southern Scrub-Flycatcher	P	L	Ins
Vireonidae Swainson, 1837				
Cyclarhis gujanensis (Gmelin, 1789)	Rufous-browed Peppershrike	R	L, C	Ins
Vireo chivi (Vieillot, 1817)	Red-eyed Vireo	R	L, C	Ins
Hirundinidae Rafinesque, 1815				
Stelgidopteryx ruficollis (Vieillot, 1817)	Southern Rough-winged Swallow	P	L, C	Ins
Progne tapera (Vieillot, 1817)	Brown-chested Martin	P	L	Ins
Troglodytidae Swainson, 1831				
Troglodytes musculus Naumann, 1823	Southern House Wren	R	L	Ins
Pheugopedius genibarbis (Swainson, 1838)	Moustached Wren	O	L	Ins
Polioptilidae Baird, 1858				
Polioptila plumbea (Gmelin, 1788)	Tropical Gnatcatcher	R	L	Ins
Turdidae Rafinesque, 1815				
Turdus leucomelas Vieillot, 1818	Pale-breasted Thrush	P	L, C	Oni
Mimidae Bonaparte, 1853				
Mimus gilvus (Vieillot, 1807)	Tropical Mockingbird	P	L	Oni
Parulidae Wetmore, Friedmann, Lincoln, Miller, Peters, van Rossem, Van Tyne and Zimmer 1947				
Myiothlypis flaveola Baird, 1865	Flavescent Warbler	P	L	Ins
Icteridae Vigors, 1825				
Icterus pyrrhopterus (Vieillot, 1819)	Variable Oriole	R	L	Oni
Thraupidae Cabanis, 1847				
Coereba flaveola (Linnaeus, 1758)	Bananaquit	R	L, C	Oni
*Compsothraupis loricata** (Lichtenstein, 1819)	Scarlet-throated Tanager	O	L	Ins
Nemosia pileata (Boddaert, 1783)	Hooded Tanager	P	L	Oni
Tachyphonus rufus (Boddaert, 1783)	White-lined Tanager	O	L, C	Oni
Tangara sayaca (Linnaeus, 1766)	Sayaca Tanager	R	L, C	Oni
Tangara palmarum (Wied, 1823)	Palm Tanager	R	L, C	Oni
Tangara cayana (Linnaeus, 1766)	Burnished-buff Tanager	R	L, C	Oni
Paroaria dominicana * (Linnaeus, 1758)	Red-cowled Cardinal	P	L, C	Gra
Dacnis cayana (Linnaeus, 1766)	Blue Dacnis	P	L	Oni
Conirostrum bicolor (Vieillot, 1809)	Bicolored Conebill	O	L, C	Ins
Emberizoides herbicola (Vieillot, 1817)	Wedge-tailed Grass-Finch	O	L	Ins
Fringillidae Leach, 1820				
Euphonia chlorotica (Linnaeus, 1766)	Purple-throated Euphonia	P	L	Oni