

## Salgado Paraense: an inventory of a forgotten coastal Amazonian avifauna Salgado Paraense: inventário de uma avifauna amazônica costeira esquecida

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**Abstract:** We report on the poorly-known, coastal avifauna of the Salgado Paraense (in the state of Pará, Brazil) east of the delta of the Amazonas river, combining data from recent surveys with an analysis of historical records. Three-hundred and twenty three species were recorded in the habitats inventoried: estuarine, beach and mangrove habitats, restinga, seasonally-flooded grasslands and secondary forest. Particularly noteworthy records included: the discovery of a disjunct population of *Laterallus jamaicensis*; a previously unrecorded staging ground for *Stercorarius* spp.; the second documented Brazilian record of *Calidris pugnax*; the first documented records in Pará for a number of marine species, including the regionally-threatened *Sterna dougallii*, and the rediscovery of '*Picumnus pallidus*', a taxon of uncertain validity, all documented by archived digital vouchers. Coastal habitats represent an important contribution to local avian species-richness in Amazonia and they are theoretically better-protected by existing conservation units than neighboring terra firme habitats, yet this region's biodiversity remains threatened by habitat loss, hunting, and major infrastructure improvements.

**Keywords:** Bird survey. Coastal Brazil. Conservation. Mangrove. Seabirds. Shorebirds.

**Resumo:** Apresentamos uma avifauna costeira pouco conhecida do Salgado Paraense, combinando dados de recentes levantamentos e análises de registros históricos. Trezentas e vinte e três espécies foram registradas em todos os *habitats* visitados, que incluem estuário, praias e manguezais, restingas, campos hipersalinos que são inundados sazonalmente e florestas secundárias. Entre os registros importantes, incluem-se: uma população disjunta de *Laterallus jamaicensis*; a descoberta de uma área de repouso para *Stercorarius* spp.; o segundo registro documentado de *Calidris pugnax* para o Brasil; os primeiros registros para o Pará de algumas espécies marinhas, incluindo a regionalmente ameaçada *Sterna dougallii*; e a redescoberta do '*Picumnus pallidus*' de Sneath. Todos os registros foram arquivados em *voucher* digitais, publicamente acessíveis. *Habitats* costeiros contribuem significativamente para a riqueza da avifauna local na Amazônia e são teoricamente mais protegidos do que as vizinhas áreas de terra firme, devido à presença de unidades de conservação. Entretanto, a biodiversidade nessa região está ameaçada pela perda de *habitat*, pela caça e pelo aumento dos investimentos em infraestrutura.

**Palavras-chave:** Levantamento de aves. Litoral brasileiro. Conservação. Mangue. Aves marinhas. Limícolas.

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## INTRODUCTION

Amazonia remains one of the great frontiers in biodiversity research and major gaps in our knowledge remain to be filled, including even a basic understanding of the distribution patterns of many species (e.g. Peres *et al.*, 2010). Most such gaps of biodiversity knowledge in the Amazon basin are centered on remote interfluvial regions (e.g. Aleixo, 2009), yet despite an increase in fieldwork in the interior, the avifauna of the coastal regions has been relatively neglected by comparison. One such understudied area is the 'Salgado Paraense' alternatively known as the 'Reentrâncias Paraenses', which lie east of the delta of the Amazonas river in the Brazilian state of Pará. This heavily indented and geomorphologically dynamic coastline is characterized by mangrove peninsulas crossed by tidal channels, with smaller areas of flooded saline campos and coastal restinga forests. The region has been poorly-inventoried recently, although fieldwork in the region spans 179 years. J. Natterer was the first ornithologist to investigate the area; he made a significant collection of birds on the Ilha Cajutuba (0° 36' S, 47° 42' W, henceforth Cajutuba) between 20 February and 30 April 1835 (Pelzeln, 1871). Workers at the Museu Paraense Emílio Goeldi (MPEG), notably E. Snethlage and F. Lima at the start of the 20<sup>th</sup> century, subsequently made regular collecting trips to this area, yet the only publications treating this area specifically, reported on the avifauna of the Campos de Bragança (63 species collected 1968-1970; Novaes & Pimentel, 1973) and of Vista Alegre in the municipality of Marapanim (35 species; Novaes, 1981). Kober & Bairlein (2006a, 2006b) later studied shorebird foraging ecology and their prey base around Ilha de Canelas, Bragança (0° 47' S, 46° 43' W). Most recently, waterbird counts from key sites using rapid, boat-based assessments of various coastal areas in Pará and Maranhão (Rodrigues, 2007) complemented previous aerial surveys in this region (Morrison & Ross, 1989). Based largely on these latter studies, the area was designated as an Important Bird Area

(MA/PA01 – the Reentrâncias Maranhenses/Paraenses, De Luca *et al.*, 2009) given its importance to transient and wintering shorebirds, and for its population of breeding *Eudocimus ruber*. Much of the area is also considered an Área de Proteção Ambiental (APA) and several sites are designated as extractive reserves, although this means relatively little in practical terms. We report on a series of rapid avifaunal assessments conducted between 2011 and 2013 across a 150 km-wide coastal belt of the Brazilian state of Pará between the municipalities of São Caetano de Odivelas and Augusto Corrêa. We also review historical records to provide background for our reports in this understudied region.

## MATERIALS AND METHODS

### STUDY LANDSCAPE: BIOPHYSICAL CONDITIONS AND CLIMATE

The region studied is located in northeastern Pará (Figure 1), east of the delta of the rio Amazonas. Our surveys concentrated on coastal habitats that had been poorly-inventoried historically, at least relative to adjacent terra firme forests. The coastal plain is extremely heterogeneous; for example Souza Filho & Paradella (2002) identified 19 distinct geobotanical units on the Bragança Peninsula. We designed our survey to maximize the coverage of these habitats, and in particular, marine and estuarine environments (tidal estuaries, sandy beaches and spits, and the open ocean), mangrove forests, and salt-marshes (Figure 2). The mangrove forests are locally dominated by three species: *Rhizophora mangle* (Rhizophoraceae), *Avicennia germinans* (Acanthaceae), and *Laguncularia racemosa* (Combretaceae), with the former species being the most abundant (Matni *et al.*, 2006).

Small areas of 'inner salt marsh' (*sensu* Souza Filho & Paradella, 2002) and flooded campos are nested within areas of mangrove forests in the inner part of the Bragança Peninsula, several kilometers from the immediate coast and are known locally as the 'Campos de Bragança',

'Campos de Tracuateua' and 'Campos de Quatipuru' which are orientated east-west (Cohen & Lara, 2003). These open, hypersaline flats are flooded less frequently than the surrounding mangrove forests (< 28 days/year), and the 'outer salt marshes' (Cohen & Lara, 2003). The dry season (June-November) vegetation at these sites is dominated by Poaceae (*Sporobolus virginicus*), but in the wet season the vegetation is dominated by Cyperaceae (*Eleocharis geniculata* and *Fimbristylis spadicea*; Cohen & Lara, 2003). The dominant flora includes species in the genera *Sagittaria*, *Pontederia*, *Eichornia*, *Benjaminia*, *Azolla*, and *Pistia* (Novaes & Pimentel, 1973).

We also briefly visited restinga habitats, vegetative communities that occur on the sandy, coastal plain that includes herbaceous plant communities in addition to assemblages dominated by shrubs or trees. For a review of the floristic composition see Silva *et al.* (2010). The climate is hot and humid (Köppen type Am2) with well-defined wet (December-May) and dry (June-November) seasons, and an annual precipitation averaging 3,000 mm with a relative humidity of 80-91% (Martorano *et al.*, 1993).

## BIRD SURVEYS

Fieldwork in the municipality of Salinópolis (10-12 March 2011, 4-7 May 2011, 13-16 October 2011, 30 January-1 February 2013, 7 July 2013; ACL, NGM and IT) focused on Praia da Corvina and adjacent mangroves and estuary (0° 36' S, 49° 22' W), Praia do Atalaia and adjacent degraded restinga (0° 35' S, 47° 17' W), and the estuary at Cuiarana (0° 38' S, 47° 15' W). Fieldwork in the municipality of Bragança (23 January 2013, 23-24 February 2013, 17-18 March 2013, and 3-4 May 2013; 7 September 2013, 29 September 2013 and 5-7 October 2013; ACL, NGM and IT) principally consisted of surveys from the road between Bragança (starting at 0° 58' S, 46° 44' W) and the fishing village of Ajuruteua (0° 51' S, 46° 36' W), but also visiting the Campos de Bragança and Campos de Tracuateua (0° 57' S, 46° 50' W) and Ponta do Urumajó (0° 57' S, 48° 36' W). Fieldwork in the municipality of Marapanim (1-3

February 2013 and 25-26 May 2013; ACL, NGM and IT) concentrated on the beach and estuary at Marudá (0° 37' S, 47° 38' W), and in restinga and savannah-like habitat around the Praia do Crispim (0° 35' S, 47° 39' W). We attempted to obtain voucher documentation, archived as digital vouchers for any records of significant biogeographic interest. Our images have been archived in the Brazilian avian photo database WikiAves (2008-2014) and our sound-recordings are archived on the global avian sound library Xeno-Canto (2005-2014). Vouchers on both sites are searchable using the catalogue number provided in the text and Appendix.

To provide a historical context for our recent observations, we compiled a list of specimens collected by previous workers. We used the digital database ORNIS (undated) to search American institutions, in which we found records from the American Museum of Natural History (AMNH), Carnegie Museum of Natural History, Pittsburgh (CM), the Field Museum of Natural History, Chicago (FMNH), the Louisiana State University Museum of Zoology (LSUMZ), the United States National Museum, Washington, D.C. (USNM), and the Peabody Museum at Yale University, New Haven (YPM). We also checked specimens held at MPEG and solicited specimen data from the Naturhistorisches Museum Wien in Vienna, Austria (NMW), and the Museum für Naturkunde der Humboldt-Universität in Berlin, Germany (ZMB). We also list additional specimens exchanged by MPEG to other institutions, namely the British Museum of Natural History (BMNH), Museum für Naturkunde/Berlin (ZMB), Museu Nacional, Universidade Federal do Rio Janeiro (MNRJ) and the Naturhistorisches Museum Bern (NMBE). Collecting localities were located using Paynter Jr. & Traylor Jr. (1991). Our taxonomy follows the checklist of Brazilian birds compiled by the Comitê Brasileiro de Registros Ornitológicos (CBRO, 2014) and age coding of temperate-tropical migrant birds follows Pyle (1997): hatching or first calendar year (HY), second calendar year (SY), third calendar year (TY) and at least third calendar year (ASY).

## RESULTS AND DISCUSSION

### SPECIES RICHNESS AND COMPOSITION

We recorded 247 bird species in all habitats surveyed, for which we provide digital vouchers for 232 species (Appendix). A search of historical collections revealed 238 species from the region held in 13 ornithological collections (Appendix). By combining historical records with those obtained from our fieldwork and the records of other species supported by digital vouchers the final regional list totals 323 species. In addition we have multiple undocumented sight records of three species: *Ictinia plumbea*, *Geranoaetus albicaudatus* and *Aramides cajaneus* all of which are biogeographically expected in the region (and represented by specimens from neighboring municipalities) and list two other species from the region from previous studies that are not represented by documentary material – *Bartramia longicauda* (Novaes & Pimentel, 1973) and *Limosa fedoa* (Kober *et al.*, 2006). The total also includes two introduced commensal species: *Columba livia* and *Passer domesticus*.

The landbird community in the mangrove forests away from ecotones is depauperate with species such as *Dendroplex picus*, *Todirostrum maculatum*, *Myiarchus tyrannulus*, *Conirostrum bicolor* and *Tangara palmarum* most frequently encountered. Small savannah enclaves also showed low species-richness and were dominated by many of the same non-forest species that were found in the herbaceous flats (e.g., *Sturnella militaris*) but also some species typical of Amazonian savannah enclaves such as *Elaenia cristata*, *Hemitriccus margaritaceiventer*, *Ammodramus humeralis* and *Schistochlamys melanopis*. Both *A. humeralis* and *S. melanopis* also colonize cattle pastures and young secondary forests in eastern Amazonia (Lees *et al.*, 2012). We did not find *H. margaritaceiventer* during our field surveys, the species is represented by a single record of one collected at Votorantim, municipality of Primavera, on 7 October 2010 (J. Pinho, MPEG #72435). The closest location for this species in Pará lies 600 km SW,

on the Serra dos Carajás (Pacheco *et al.*, 2007), but F. Olmos (personal communication) found this species to be common in restinga around Alcântara, Maranhão state, 300 km SE of Votorantim, so we presume that the latter location must lie at the northern range limit of this species. Our surveys for marine and coastal species were likely near-asymptotic. Particularly well-represented in regional terms were totals of six species of waterfowl, 26 species of shorebirds, and 15 species of jaegers, gulls, and terns.

### NOTEWORTHY RECORDS

#### *Anas discors*

Blue-winged Teal. A record of a flock of 11 individuals on the flooded campos between Ajuruteua and Bragança on 23 February 2013 (ACL, NGM, IT) was followed by an observation of 97 birds present at the same location on 17-18 March 2013 (Figure 3, WA #912777). The initial flock foraged on their own whilst the March birds were loosely associated with *Anas bahamensis* and *Dendrocygna viduata*. The count of 97 is the largest ever recorded in Brazil and together these reports apparently represent the first field observations of this species from the state of Pará, where all ten previous reports were provided by band recoveries (Mestre *et al.*, 2010).

#### *Fregata magnificens*

Magnificent Frigatebird. A single immature of this species was photographed foraging approximately 2 km offshore from Praia do Crispim on 2 February 2013 (ACL, P. Cormons, and H. Hays; WA #879478) providing the first recent, documented record for the state of Pará. Subsequently, an immature was seen foraging along the coast at Ajuruteua on 18 March 2013 and three individuals were observed from land, foraging distantly offshore at Praia do Crispim on 25 May 2013 (ACL, NGM, IT; Figure 4, WA #895441). Natterer collected one individual (NMW #39.856) at Cajutuba in 1835 (Pelzelin, 1871) and Murphy (1936) mentioned frigatebirds for Marajó

Island, which is west of the area here considered. The only other contemporary reports from the state of Pará concerns a sight record from Salinópolis on 10 September 2010 (IT) and an immature photographed at Fazenda Jaranduba, on the north-eastern coast of Marajó Island, municipality of Soure on 23 October 2013 (ACL and B. Darski; WA #1135567).

### *Botaurus pinnatus*

Pinnated Bittern. A single adult hunting in sedge beds on the Campos de Bragança on 4 May 2013 (ACL, NGM; WA #952467) was followed by a second sighting the following day in sedge beds on the road between Bragança and Ajuruteua (ACL). Subsequently an adult was photographed on the Campos de Tracueteua on 5 October 2013 (ACL, NGM, Figure 5, WA #1111949). The only previous records from Pará state were provided by a single individual collected at Tauari on the Rio Tapajós by A. M. Olalla (MCZ #173069) and sight records (Henriques & Oren, 1997) and a recent photograph (P. Lima; WA #1122444) from Marajó Island. The species has been recorded with more regularity from the neighboring state of Maranhão, where it was collected at Primeira Cruz (AMNH #469508) on 26 July 1906, and there are multiple recent records of birds photographed in flooded rice fields south of Arari (3° 29' S, 44° 48' W; ACL, NGM, IT; WA #865377).

### *Laterallus jamaicensis*

Black Rail. Prior to 2012 the only documented record of this species from Brazil was a single individual collected on 3 October 1994 on the research campus of the MPEG in Belém, Pará (R. Neto, MPEG #51002; Novaes & Lima, 1994). Eighteen years later the species was discovered in flooded rice fields south of Arari, Maranhão, on 26 October 2012 (O. A. Fenalti and T. Rodrigues), when several calling birds were encountered and photographed (e.g., WA #789456). Using tape playback of this species from the eastern United States, ACL, NGM, and IT

located a minimum of six *L. jamaicensis* territories on 23-24 February 2013 in patches of *Paspalum pleostachyum* on the hypersaline, herbaceous flats between Bragança and Ajuruteua (0° 54' S, 46° 41' W). These birds, which provided the first Brazilian records from 'natural' wetland habitats, were photographed (Figure 6, WA #894871) and sound-recorded (XC #133709). They were still present at this site on 4 May 2013. These discoveries in Pará and Maranhão suggest that this Near threatened species (IUCN, 2013) may be patchily distributed in natural and artificial wetland areas in northeastern Brazil, which have not been adequately sampled. Searches should be conducted on Marajó Island and in coastal Amapá; there is an unpublished sight record from the latter state of one flushed from a grassy wetland besides the BR-156 over the rio Matapi on 24 June 2011 (K. Okada, F. Olmos and S. Rumsey, personal communication). The nearest confirmed records of this species come from coastal Peru to the west and the Greater Antilles to the north e.g. Taylor (1996). The taxonomic status of this disjunct Brazilian population is under investigation by ACL, G. Gonsioroski, P. Cerqueira, and E. Portes.

### *Aramides mangle*

Little Wood-rail. Four individuals were observed foraging in mangroves from the raised boardwalk adjacent to the Praia do Maçarico in Salinópolis on 16 October 2011 (ACL, NGM; Figure 7, WA #471478) and one was photographed at the same site on 6 July 2013 (IT; WA #1008889). The only previous report from Pará was provided by a series of specimens collected at Vista Alegre on 6-24 October 1981 (MPEG #33924-33929, #33383-33384; Novaes, 1981). This was also the northernmost locality known for the species until a bird was photographed on 10 July 2010 along the rio Kourou near Kourou (5° 9' N, 52° 39' W), French Guiana (Ingels *et al.*, 2011), although it is at present unclear if this discovery is representative of a vagrant or a disjunct breeding population.



*Tringa flavipes*

Lesser Yellowlegs. A wintering concentration of *Tringa flavipes* was discovered foraging in association with small numbers of *Tringa melanoleuca*, *Calidris himantopus*, and *Himantopus mexicanus* in flooded salt-marsh on the road between Bragança and Ajuruteua. A total of forty individuals were counted at this site on 27 January 2013, when most of the flat was exposed mud, increased to 2,000 individuals on 23 February 2013, by which time the campo had become totally flooded and the birds spent virtually their entire time swimming, and the total peaked at 3,500 on 17-18 March 2013 (Figure 8, WA #912924), before dropping to ten birds on 4 May 2013. One hundred and fifty individuals were counted on the Campos de Tracuateua on 7 September 2013 with 30 between Bragança and Ajuruteua the same day; with 30 on the Campos de Tracuateua on 5 October 2013 and finally 20 between Bragança and Ajuruteua on 6 October 2013. Away from the Bragança area, four were photographed at Salinópolis on 31 January 2013. This species was not recorded during the surveys conducted by Rodrigues (2007), who may not have visited these non-tidal habitats. Nevertheless, there are several historic records from Bragança, with six birds collected in January 1961 (J. Hidasi; MPEG #18758-198760, #18787-18789), one collected on 7 March 1963 (P. Humphrey; USNM #512924), and flocks of 10-15 individuals observed in February 1968 and March 1970 (Novaes & Pimentel, 1973), and this species was also collected in 1835 at Cajutuba by J. Natterer (Pelzeln, 1871). The population of this species is declining globally (Andres *et al.*, 2012) and the campos of northern Pará may represent an important wintering/staging area. Peak numbers of this species also occur in coastal Surinam between January and March (Spaans, 1978a) where the species is regular in both tidal and non-tidal habitats.

*Calidris himantopus*

Stilt Sandpiper. We counted 50 individuals foraging with a large flock of *Tringa flavipes* on flooded campos

between Bragança and Ajuruteua on 23 February 2013, and 60 birds at the same spot on 17-18 March 2013 (ACL, NGM, IT; WA #912757). A single individual was photographed on the Campos de Tracuateua on 3 May 2013 (ACL, NGM; Figure 9, WA #953447) and 20 individuals were counted at the same site on 7 September 2013 (ACL, NGM, IT) with 15 between Bragança and Ajuruteua on the same day (ACL, NGM, IT). To our knowledge, these observations are the first documented records from the coast of Pará, and the first report of a wintering concentration of this species in northern Brazil. The only other documented records from the state involve one collected along the rio Tapajós at Tauari on 17 February 1963 (Stotz *et al.*, 1992) and an adult female collected at Serra Norte, Serra do Carajás, on 19 September 1983 (MPEG #35229). Spaans (1978a) reported a strong southbound passage of this species along the Surinam coast, peaking in August but relatively few records in January-May suggesting few winter in this region. Spaans (1978a) also noted the species to be 'confined to shallow lagoons and brackish herbaceous swamps', with 'no observations of this species from the tidal flats' which mirrored our experience with this species, which along with *Calidris melanotos* and *C. fuscicollis* only occurred in brackish or freshwater wetland habitats.

*Calidris pugnax*

Ruff. A single HY individual was photographed and video-recorded on the Campos de Tracuateua on 5 and 7 October 2013 (ACL, NGM; Figure 10, WA #1111996). It was observed foraging alongside *Tringa flavipes*, *T. melanoleuca*, *T. solitaria*, *Calidris fuscicollis*, *C. melanotos* and *Vanellus chilensis* and was approximately the same size as accompanying *T. melanoleuca* suggesting it was most likely a male. This represents the second documented record of *C. pugnax* for Brazil after two individuals were photographed at Lagoa da Pampulha, Minas Gerais between 24 February and 10 March



2013 (Dias *et al.*, 2013). There are in addition two published (but undocumented) Brazilian records of single individuals on 30 October 1985 at the Estação Ecológica do Taim in Rio Grande do Sul (Pacheco, 2000) and at Capão Seco, Rio Grande do Sul on 29 June 1998 (Maurício & Dias, 2000).

### *Stercorarius pomarinus*

Pomarine Jaeger. Our first confirmed records of this species were made 3-4 May 2013, when two adults (with diagnostic tail 'spoons') and at least two immature individuals were seen harassing terns and gulls at Ajuruteua (ACL, NGM; Figure 11, WA #952489). These records are the first from the coast of Pará, where the only other record from the state, and the first for Brazil, was provided by a light-morph immature collected on 7 May 1960 in the Amazonian interior at Urucurituba 160 km south of Santarém (ca. 3° 30' S, 55° 30' W) (A. Pimentel; Museum of Zoology of the University of São Paulo [MZUSP] #61777, Escalante, 1972).

### *Stercorarius parasiticus*

Parasitic Jaeger. Considering that *S. parasiticus* were practically unrecorded from northeastern Brazil, we were surprised to discover a previously unreported wintering concentration along the Pará coast. At least ten individuals were seen at Salinópolis on 30-31 January 2013 and five others were seen at Praia do Crispim on 2 February 2013 (ACL). Fifteen birds were subsequently seen at Ajuruteua on 23 February 2013, when one individual was photographed as it alternated between loafing on the beach and chasing terns and *Leucophaeus atricilla* (ACL, NGM, IT; Figure 12, WA #895416). A minimum of 20 jaegers, possibly representing more than one species, were present on 17-18 March 2013, and a minimum of 30 birds were present on 3-4 May 2013, including one group of 16 *S. parasiticus* observed together. The only previous record of this species from Pará involved a HY male collected along the Tocantins river at the Tucuruí Dam on

12 December 1984 (Figure 13; E. Dente; MPEG #36558). Re-examination of this specimen by ACL, combined with evaluation of images circulated to Northern Hemisphere experts, revealed that the specimen was instead a HY *S. pomarinus* based on the blunt rectrices with no tail protrusions, an evenly-barred rump and vent, and a short, stout bill (with a depth at the gonys of 10.7 mm) that was uncharacteristic of *S. parasiticus*. The maximum bill depth reported for juvenile *S. longicaudus* Vieillot, 1819 is 9.5 mm (Olsen & Larsson, 1997), compared to a mean of 11.1 mm and range of 10.3-12.5 mm for *S. pomarinus*. Although Rodrigues (2007) reported two unidentified jaegers at Otelina Island on an unspecified date, our records from the Salgado Paraense represent the first for *S. parasiticus* in Pará. The occurrence of a concentration of jaegers of any species has not been reported for northeastern Brazil until now, but both *S. pomarinus* and *S. parasiticus* are regular off Venezuela in April-June (Casler & Pirela, 2005) with many immature individuals over-summering. It is possible that some jaegers may over-summer in coastal Pará, but none were observed at Praia do Crispim on 25-26 May 2013, nor any at Ajuruteua in September-October 2013. The jaegers are probably tracking the movements of terns which are, in turn, following migratory movements of sardines (*Sardinella* sp.) and other baitfish, which local fisherman indicated are abundant locally between March and June.

### *Chroicocephalus cirrocephalus*

Gray-hooded Gull. ACL photographed single, basic-plumaged adults at Salinópolis on 30 January 2013, Praia do Crispim on 2 February 2013 (WA #879620), and ACL and NGM observed a single, alternate-plumaged adult with a flock of 3,000 *Leucophaeus atricilla* at Ajuruteua on 3 May 2013. These records, along with a single basic-plumaged adult photographed at the fishing port at Vigia (0° 51' S, 48° 8' W) on 3 February 2013 (ACL; WA #879469), represent the first from the state of Pará. However, the species is to be expected

as an occasional visitor given that apparently resident populations occur in the neighboring states to the east (Oren & Roma, 2011).

### *Larus dominicanus*

Kelp Gull. A single ATY individual was photographed in primary molt at Salinópolis on 7 July 2013 (IT; Figure 14, WA #1010043). The only other record for Pará concerns an adult photographed inland at Santarém on 2 June 2013 (L. P. Cruz; WA #995713). This species is a vagrant in Brazil north of Bahia, with the northernmost previous record in Brazil coming from Fernando de Noronha (Silva & Olmos, 2006). The combination of a heavy body, deep and robust bill, broad wings rule out the similar *L. fuscus* Linnaeus, 1758. The western race *graellsii* of *L. fuscus* can also be excluded out by the absence of contrast between the uniformly dark mantle and primaries, it is this subspecies that is expected as a vagrant, having already been reported from as close as São Luís, Maranhão to the south (Almeida *et al.*, 2013) and French Guiana to the north (Devillers, 1979). *Larus marinus* Linnaeus, 1758 can be discounted by this individual's yellow-green (rather than pink legs) and a lack of a strong gonydeal angle, *L. marinus* has recently been documented as a vagrant to South America for the first time in Trinidad (Kenefick, 2010).

### *Sternula antillarum*

Least Tern. On 18 February 2013 two basic-plumaged, adult *S. antillarum* were observed with a flock of 35 *S. supercilialis* at Ajuruteua (ACL, NGM) and on 4 May 2013 45 *S. antillarum* (mostly alternate-plumaged adults, but also with some dark-billed, presumed immature individuals) were observed loosely-associating with a flock of 70 *S. supercilialis* and 300 *Sterna hirundo* at Ajuruteua (ACL, NGM; Figure 15, WA #952502). On 24 May 2013, a flock of about 20 *S. antillarum* (ASY birds with black-tipped yellow bills and SY individuals with all dark bills) were observed at Praia do Crispim as they flew east

down the coast without interacting with *S. supercilialis* that were foraging at the creek mouth (ACL, NGM, IT). The following morning a further ten individuals flew east at this site (ACL, NGM, IT; WA #971182). Two adults were photographed at Salinópolis on 7 July 2013 (IT; WA #1008886) and 115 individuals were counted at a high tide roost at Ajuruteua on 6 October 2013 (ACL, NGM; e.g. WA #1111981). A disjunct colony of 60-70 pairs of this species, the first known for Brazil was recently documented north of São Luís at Ilha de Curupu, Maranhão (2° 24' S, 44° 5' W; Rodrigues *et al.*, 2010). Rodrigues *et al.* (2010) suspected that the colony had existed at this site for at least ten years and noted that birds were sitting on eggs from mid-late May, indicating a reproductive cycle that is comparable with Northern Hemisphere populations. These authors, however, did not mention two specimens (FMNH #64083-64084) collected at São Luís on 31 July 1923 that suggest the colony may have been occupied for a much longer period. The nearest breeding records to the north are on islands in the southern Caribbean off Venezuela (Phelps & Phelps Jr., 1958) although the species is also regular off Suriname all year round, perhaps also suggesting local breeding (Spaans, 1978b). It is unclear whether our observations reflect local breeding or boreal migrants given historic recoveries of banded, North American birds from Pará (Mestre *et al.*, 2010), but it seems unlikely that adults of Northern Hemisphere populations would be present in May-June (Carlos & Fedrizzi, 2013). Rodrigues *et al.* (2010) did not provide any information on the biometrics and plumage variation of the Maranhão breeding population, which should be the subject of future taxonomic study to evaluate its uniqueness. Searches should also be conducted between May and July for other colonies along the coasts of Maranhão, Ceará and Pará.

### *Sterna dougallii*

Roseate Tern. Four encounters from the municipalities of Salinópolis and Maracanã provide the first records of this



regionally-threatened species for the state of Pará. Three banded adults were photographed with *Rynchops niger* and *Phaetusa simplex* on 6 May 2011 as they rested on sand bars in the estuary at Praia da Corvina, Salinópolis (ACL, NGM; WA #345567, 345565). These individuals were fitted with both standard metal bands and colored, lettered 'field readable' bands. Although it was impossible to read the numbers, based on band colors they likely originated from one of four colonies in the northeastern United States: Great Gull Island in New York State, Bird Island and Ram Island in Massachusetts, or Falkners Island in Connecticut (H. Hays, personal communication). A transitional-plumaged adult with metal bands was photographed with 350 *S. hirundo* at the Praia da Corvina on 14 October 2011 (ACL, NGM; WA #622132) and two SY individuals were photographed with eight *S. hirundo* at the same site on 1 February 2013 (ACL and P. Cormons; WA #879618). Six individuals (one adult and five SY birds) were photographed at Praia do Crispim on 25 May 2013 (ACL, NGM, IT; Figure 16, WA #971164) and five individuals (two adults and three SYs) were again seen at the same site the following day. Two more adults were seen with 1,500 *S. hirundo* nearby at Marudá on this same day.

### *Sterna paradisaea*

Arctic Tern. Our only record involved a single individual photographed alone on Praia da Corvina, Salinópolis, on 13 October 2011 (ACL, NGM; Figure 17, WA #622469-622470). There are less than 30 records of this species from all of Brazil, and this record represented the first for Pará and only the third from northeastern Brazil, where singles were previously photographed in Ceará at Porto do Pecém on 8 October 2006 (C. Albano; Girão *et al.*, 2008) and at Praia da Emboaca (3° 32' S, 38° 48' W) on 23 October 2009 (T. Pinto; WA #606237). The clustering of these three records into a 15-day window in mid-October corresponds well with the results of geolocator tracking of *S. paradisaea* (see Egevang *et al.*,

2010). The average departure date for *S. paradisaea* in this study from stopover sites in the Central-Western North Atlantic (over the eastern portion of the Newfoundland Basin and the western slope of the mid-North Atlantic Ridge) was 15 September and the mean arrival in their Southern Ocean and Weddell Sea wintering grounds was 24 November. Nevertheless, these birds were tracked passing well offshore to the north of the region here discussed and beyond the Continental shelf, which in this region extends approximately 210 km offshore. Presumably only birds in poor condition and/or those displaced by storms make landfall on the Brazilian coast.

### *Coccyzus minor*

Mangrove Cuckoo. We recorded this species in the same area of mangroves behind Praia da Corvina, Salinópolis, on both 6 May 2011 (ACL, NGM; WA #351961, XC #88795) and on 16 October 2011 (Figure 18, WA #471461). A third bird was seen in mangroves close to the town of Marudá on 26 May 2013 (NGM). Additional records from the Pará coast involve one photographed in mangroves between Ajuruteua and Bragança on 11 January 2011 (R. Cassou; WA #297341), one collected at Vista Alegre on 13 October 1981 (MPEG #34042), and two collected at Cajutuba in 1835 by J. Natterer (Pelzeln, 1871).

### *Amazilia leucogaster*

Plain-bellied Emerald. We recorded this species with certainty on two occasions: on 18 March 2013, a single *Amazilia leucogaster* was observed foraging in the sand dunes on the landward side of the community of Ajuruteua (ACL, NGM) and on 25 May 2013 a single individual was photographed in an open savannah behind the community of Praia do Crispim (ACL, NGM, IT; Figure 19, WA #971179). The only other record for the Pará coast that we have been able to locate concerns a single adult photographed at Salinópolis on 12 October 2010 (Marco Rocha; WA #244856).

*Picumnus cf. pallidus*

We photographed males of rufous-toned, spot-breasted *Picumnus* on our first visit to mangrove forests at Salinópolis in May 2011 (WA #400194) and initially assigned these individuals to a previously undiscovered population of *Picumnus pygmaeus* (Lichtenstein, 1823), a species that we had recently recorded for the first time in Pará around Paragominas (Lees *et al.*, 2012). We also encountered *Picumnus* with barred breasts occurring sympatrically in mangroves at Salinópolis and initially considered that these might pertain to *P. cirratus macconnelli* Sharpe, 1901 or to hybrids between *P. pygmaeus* and *P. cirratus* or *P. pygmaeus* and *Picumnus albosquamatus* D'Orbigny, 1840. But later fieldwork both at Salinópolis and around Bragança revealed that these birds did not conform to any readily identifiable taxon and that both male and female plumages were quite variable. Males were observed with both scaled and spotted breasts (e.g. Figure 20) and females typically showed barred (or in some cases scaled) breasts and unbarred lower bellies (e.g. WA #476407). Novaes (1981) listed three specimens (MPEG #33386-33388) of *P. cirratus macconnelli* from Vista Alegre that apparently represent the only documented records of this taxon from the coast of Pará away from the neighboring (but subtly biogeographically distinct) Marajó Island. Silva *et al.* (1997) examined the Vista Alegre specimens and observed that they did not resemble *P. c. macconnelli*, but instead, that they might pertain to *P. c. confusus*, which was described from Guyana (Kinnear, 1927), or alternatively that they pertain to an undescribed taxon. A subsequent literature review revealed that the population of *Picumnus* occurring in mangroves along the Pará coast has a valid name. Sneath (1924) collected a series of four individuals from the Campos de Quatipuru in 1916 that she named *Picumnus pallidus*. This treatment was followed by Pinto (1938), but not by Griscom & Greenway Jr. (1941), who ranked this taxon as *Picumnus guttifer pallidus*; *guttifer* is now treated as a subspecies of *Picumnus albosquamatus*. Pinto (1978) subsequently

treated this taxon as a subspecies of *Picumnus minutissimus* Pallas, 1782 and the most up-to-date treatment (Winkler & Christie, 2002) included *pallidus* as a subspecies of *Picumnus spilogaster* Sundevall, 1866. ACL found the Vista Alegre skins to appear to be a good phenotypic match for *pallidus*. We were provided with digital photographs of two of the original four type specimens whose phenotype corresponds to that of individuals we have photographed in the same region (ZMB #31.1524 and #31.1525). That at one time or another the populations of *Picumnus* occurring in coastal Pará have been assigned to any one of five different currently-recognized species, or potentially even a new species, highlights the taxonomic conundrum that this population represents, and given the degree of variation evident, we suppose that hybridization may be a factor. Based on phenotypic characteristics we do not consider '*pallidus*' to be correctly placed as a subspecies of *Picumnus spilogaster*, as it has in recent treatments.

*Mimus gilvus*

Tropical Mockingbird. We recorded this species at both Bragança and Maracanã. A pair was observed attending a nest in an isolated bush in a narrow belt (ca. 50 m wide) of dune slacks between the beach and the village at Praia do Crispin on 2 February 2013 (ACL; WA #879482), with a pair present at the same locality on 25 May 2013 and another pair located 2 km inland in less degraded restinga on the same date. Another pair was photographed at the ecotone of restinga and mangrove just inland of Vila dos Pescadores at Ajuruteua on 18 March 2013 (ACL, NGM; WA #913050). Aside from a pair collected at Cajutuba in March 1835 by J. Natterer (NMW #35.851, #35.852; Pelzeln, 1871), the only previously documented records we can locate for the Pará coastline concern a pair photographed on 10 July 2010 in the municipality of Marapanim (C. Timm; WA #164716) and another pair photographed on 26 May 2012 in degraded restinga behind Praia do Atalaia, Salinópolis (IT; WA #658249).

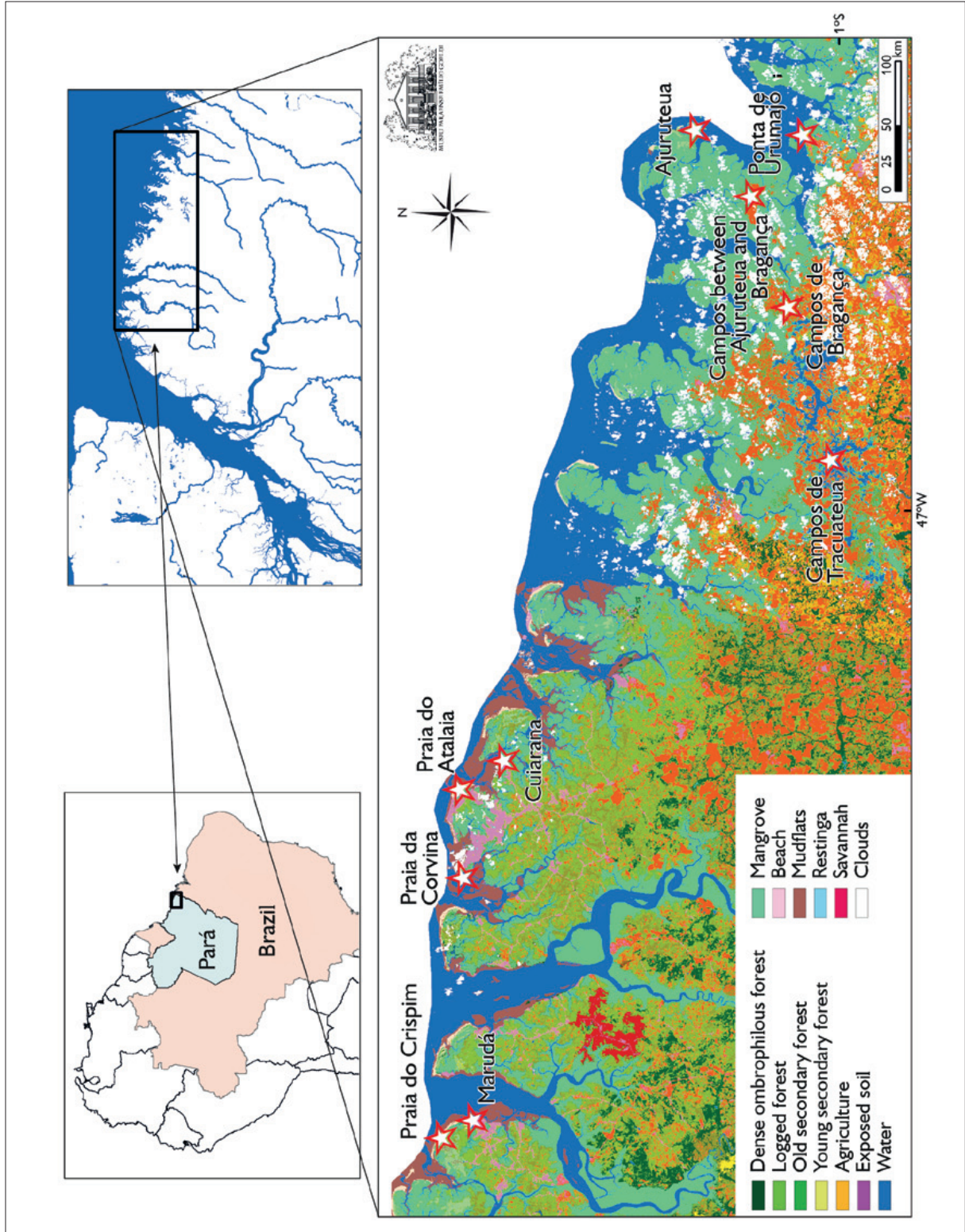


Figure 1. Map of the study region, principle localities mentioned in the text are depicted as stars.





Figure 2. General aspects of vegetation types on the Pará coast: A) mangrove forest at Cuiarana, SE of Salinópolis in May 2011; B) the Campos de Bragança in flood in May 2013; C) flooded campos between Bragança and Ajuruteua in March 2013; D) dry and extensively burnt campos behind Bragança and Ajuruteua in February 2013; E) savannah vegetation behind the Praia do Crispim in May 2013; F) foreshore (and high tide shorebird roost) at Ajuruteua in October 2013. Photos: A. C. Lees.





Figure 3. *Anas discors* (center four individuals) with *Himantopus mexicanus* (foreground) and *Tringa flavipes* and *Calidris himantopus* (background), Bragança, 17 March 2013. Photo: A. C. Lees.



Figure 4. *Fregata magnificens*, Ajuruteua, 18 March 2013. Photo: A. C. Lees.



Figure 5. *Botaurus pinnatus*, Campos de Tracuateua, 5 October 2013. Photo: A. C. Lees.



Figure 6. *Laterallus jamaicensis* between Bragança and Ajuruteua, 23 February 2013. Photo: A. C. Lees.



Figure 7. *Aramides mangle*, Salinópolis, 16 October 2011. Photo: A. C. Lees.



Figure 8. Flock of *Tringa flavipes* between Bragança and Ajuruteua, 23 February 2013. Photo: A. C. Lees.





Figure 9. *Calidris himantopus*, Campos de Tracuateua, 3 May 2013. Photo: A. C. Lees.



Figure 10. *Calidris pugnax*, Campos de Tracuateua, 7 October 2013. Photo: A. C. Lees.



Figure 11. *Stercorarius pomarinus* (far right) with *Leucophaeus atricilla*, Ajuruteua, 4 May 2013. Photo: A. C. Lees.



Figure 12. *Stercorarius parasiticus* (foreground) with *Leucophaeus atricilla*, Ajuruteua, 23 February 2013. Photo: A. C. Lees.



Figure 13. Composite image of *Stercorarius pomarinus* specimen (MPEG #36558) collected along the Tocantins river at the Tucuruí Dam on 12 December 1984. Photo: A. C. Lees, copyright Museu Paraense Emílio Goeldi.





Figure 14. Composite image of *Larus dominicanus*, Salinópolis, 7 July 2013. Photos: I. Thompson.



Figure 15. Eight *Sternula antillarum* with three *Sternula superciliaris*, Ajuruteua, 4 May 2013. *S. superciliaris* are the fourth and fifth individuals from the right with heavier bills and the individual sitting on the beach. Photo: A. C. Lees.



Figure 16. *Sterna dougallii*, Praia do Crispim, 25 May 2013. Photo: A. C. Lees.



Figure 17. *Sterna paradisaea*, Salinópolis, 13 October 2011. Photo: A. C. Lees.



Figure 18. *Coccyzus minor*, Salinópolis, 6 May 2011. Photo: A. C. Lees.

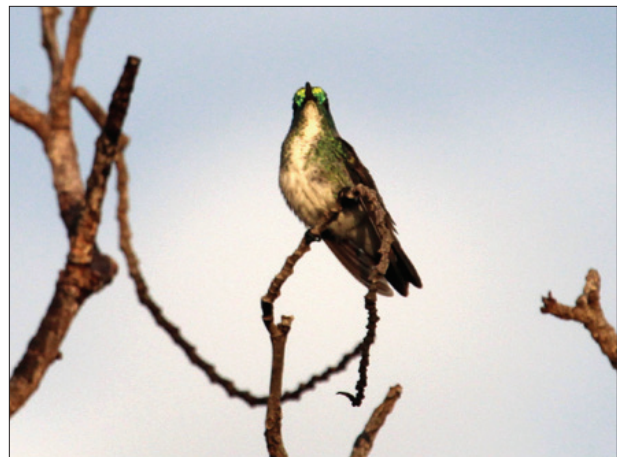


Figure 19. *Amazilia leucogaster*, Praia do Crispim, 25 May 2013. Photo: A. C. Lees.



Figure 20. '*Picumnus pallidus*', Bragança, 23 February 2013. Photo: A. C. Lees.

## CONCLUSIONS

Coastal habitats contribute greatly to regional diversity in Amazonia and they provide important breeding, wintering, and staging habitat for species that do not occur anywhere else in the basin. Our survey produced many records of birds previously unknown from the region and we anticipate many future discoveries of both vagrants and potentially also populations of wetland species with cryptic habitats such as *Ixobrychus exilis* (Gmelin, 1789) and *Pseudocolopteryx sclateri* (Oustalet, 1892).

Although the immediate coastline and its mangrove forests are far better preserved than the interior terra firme forests of eastern Pará (e.g. Almeida & Vieira, 2010); a review of historical data reveals that the baseline avifaunal community has still shifted. For example, Natterer collected two *Phoenicopterus ruber* from a flock of 18 individuals on 3 March 1835 at Praia de Cajutuba (NMW #47.631, #47.637; Pelzeln, 1871). There have been no subsequent reports of this species from the region, and this species may now be extinct as a breeding species in Brazil as a result of human persecution (Sick, 2001). Similarly, Natterer also collected the type specimen of *Crax fasciolata pinima* in the same area on 24 February 1835 (Pelzeln, 1871), yet there have been no confirmed records of this taxon, endemic to the Belém area of endemism, anywhere in its range since 1978 (Lees *et al.*, 2012).

The region remains threatened by unregulated and disorderly development, particularly by the tourism sector

(Martins & Filho, 2013), pollution associated with urbanization (Guimarães *et al.*, 2009), and direct (hunting and exploitation) and indirect disturbance (from people and dogs) of waterbird populations. This is particularly likely to be the case for ground-nesting species such as *Haematopus palliatus* which we found to be surprisingly rare; most beaches we were able to visit were over-run by domestic dogs from neighboring communities, which no doubt take a heavy toll on eggs and nestlings. Potentially the greatest threat to regional biodiversity are plans to construct an offshore 'super port', the 'Terminal Marítimo Offshore do Espadarte' within the Reserva Extrativista Mãe Grande de Curuçá on Ilha dos Guarás in the municipality of Curuçá (CDP, 2013). This project could potentially lead to major environmental problems and catalyze development in this still relatively unspoiled region. There is an urgent need for quantitative monitoring of waterbird populations (both of globally declining migrant shorebirds and colonies of resident herons and ibis which are reportedly exploited for food) in addition to targeted surveys for rare species such as *Laterallus jamaicensis*. Quantitative surveys examining the conservation efficacy of existing extractive reserves versus unprotected areas are also crucial to determine if current protected areas will be effective in conserving the region's unique biota.

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**APPENDIX.** List of 323 species recorded from the Salgado Paraense region (Pará, Brazil). Taxonomy and nomenclature follows CBRO (2014): ORDER (-iformes), SUBORDER (-i), PARVORDER (-ida), SUPERFAMILY (-oidea), FAMILY (-idae) and SUBFAMILY (-inae). Scientific names in square parentheses are those currently on the secondary list of Brazilian birds which lack supporting documentation. We present qualitative estimates of abundance for each species observed during our fieldwork in suitable habitat, abundance codes and habitat categorizations are adapted from Lees *et al.* (2013). The categories are as follows: C = 'common' (five or more individuals expected daily in appropriate habitat and at appropriate season for migrants), FC = 'fairly common' (less than five birds expected in appropriate habitat on most days or encountered irregularly in larger numbers), U = 'uncommon' (encountered in small numbers on a less than daily basis), R = 'rare' (encountered only a few times per season or resident locally in very small numbers), and VR = 'very rare' (recorded on fewer than two occasions). Habitat categories are coded as follows: CO = coast and estuaries (including open ocean, mudflats and beaches); MA = mangrove; CA = campos, including both freshwater and brackish areas and associated islands of scrub; NF = non-forest, open-country habitats, such as cattle pastures; PF = palm forest (refers to patches of swampy forest composed mostly of *Mauritia flexuosa*); RI = riverine/river edge within otherwise terra firme habitats; SF = secondary forest and scrub; SA = savannah and restinga habitats. Where more than one habitat is listed, we order them in decreasing order of preference in the region. Most species only occur seasonally in the region, these are denoted as AM = austral migrants (if followed by \* some individuals also resident), BM = boreal migrants (species occurring mostly on passage – August-November and March-May and not staying to spend the whole boreal winter are marked with a \* (some individuals may also spend the boreal summer – May-August in the region); OW = vagrant from the Palearctic; or UM = unspecified, intratropical migrants (if followed by \* some individuals may also be resident) and R = resident. Numbers in parentheses listed after museum acronyms indicate the number of specimens held in each collection. Photo reference and sound reference numbers are searchable in the online databases of WikiAves (WA) and Xeno-canto (XC). Initials given in parentheses are non-author contributions, as follows: SA = S. Almeida, RB = R. Becker, SD = S. M. Dantas, FF = F. Furtado, AM = A. Mesquita, TS = T. Schnaider and CT = C. Timm. For those species without digital vouchers, the name of the observer is listed or the study from which the species was reported: 'Kober' = Kober *et al.* (2006), 'Novaes' = Novaes & Pimentel (1973), 'Pelzeln' = (Pelzeln, 1871), and 'Rodrigues' = Rodrigues (2007).

(Continue)

Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
Tinamiformes Huxley, 1872					
Tinamidae Gray, 1840					
<i>Crypturellus soui</i> (Hermann, 1783)	FC	R	SF	MPEG (2)	XC150019
Anseriformes Linnaeus, 1758					
Anatidae Leach, 1820					
<i>Dendrocygna viduata</i> (Linnaeus, 1766)	FC	UM*	CA		WA895425
<i>Dendrocygna autumnalis</i> (Linnaeus, 1758)	FC	UM*	CA, CO		WA898602
Anatinae Leach, 1820					
<i>Cairina moschata</i> (Linnaeus, 1758)	U	R	CA, RI		WA967068
<i>Amazonetta brasiliensis</i> (Gmelin, 1789)	U	R	CA, RI	MPEG (1)	WA964623
<i>Anas bahamensis</i> Linnaeus, 1758	U	UM	CA	NMW (2)	WA954278
<i>Anas discors</i> Linnaeus, 1766	VR	BM	CA		WA912777
Galliformes Linnaeus, 1758					
Cracidae Rafinesque, 1815					
<i>Ortalis superciliaris</i> (Gray, 1867)	FC	R	SF, CA	MPEG (1)	XC150019
<i>Crax fasciolata</i> Spix, 1825				NMW (1)	
Podicipediformes Fürbringer, 1888					
Podicipedidae Bonaparte, 1831					
<i>Tachybaptus dominicus</i> (Linnaeus, 1766)	R	R	CA, RI	NMW (1)	ACL, NGM
<i>Podilymbus podiceps</i> (Linnaeus, 1758)	U	R	CA, RI		WA971193
Ciconiiformes Bonaparte, 1854					
Ciconiidae Sundevall, 1836					





## APPENDIX.

(Continue)

Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Ciconia maguari</i> (Gmelin, 1789)	VR	UM	CA		WA1111965
Suliformes Sharpe, 1891					
Fregatidae Degland & Gerbe, 1867					
<i>Fregata magnificens</i> Mathews, 1914	R	UM	CO	NMW (1)	WA895441
Phalacrocoracidae Reichenbach, 1849					
<i>Phalacrocorax brasilianus</i> (Gmelin, 1789)	C	R?	CO, CA, MA, RI	MPEG (4)	WA967085
Pelecaniformes Sharpe, 1891					
Ardeidae Leach, 1820					
<i>Tigrisoma lineatum</i> (Boddaert, 1783)	R	R	CA, RI		WA321467 (TS)
<i>Cochlearius cochlearius</i> (Linnaeus, 1766)				MPEG (1)	
<i>Zebrius undulatus</i> (Gmelin, 1789)				MPEG (1)	
<i>Botaurus pinnatus</i> (Wagler, 1829)	R	R	CA		WA1111949
<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	FC	R	MA, CO, CA, RI		WA351636
<i>Nyctanassa violacea</i> (Linnaeus, 1758)	C	R	MA, CO, CA	MPEG (1)	WA351641
<i>Butorides striata</i> (Linnaeus, 1758)	C	R	CA, CO, MA, RI	MPEG (6), NMBE (1), USNM (1)	WA953448
<i>Bubulcus ibis</i> (Linnaeus, 1758)	FC	UM*	CA, NF		WA895396
<i>Ardea cocoi</i> Linnaeus, 1766	U	R	CA		WA1077361
<i>Ardea alba</i> Linnaeus, 1758	C	R	CA, CO, RI, NF	MPEG (2)	WA967057
<i>Egretta tricolor</i> (Statius Muller, 1776)	FC	R	CO, MA, CA	MPEG (2)	WA351920
<i>Egretta thula</i> (Molina, 1782)	C	R	CA, CO, MA, RI	MPEG (4)	WA476365
<i>Egretta caerulea</i> (Linnaeus, 1758)	C	R	MA, CA, CO, RI	MPEG (4)	WA351898
Threskiornithidae Poche, 1904					
<i>Eudocimus ruber</i> (Linnaeus, 1758)	C	R	MA, CA, CO	MPEG (7)	WA356061
<i>Mesembrinibis cayennensis</i> (Gmelin, 1789)					ACL
<i>Platalea ajaja</i> Linnaeus, 1758	FC	R	MA, CA, CO		WA351939
Phoenicopteriformes Fürbringer, 1888					
Phoenicopteridae Bonaparte, 1831					
<i>Phoenicopiterus ruber</i> Linnaeus, 1758				NMW (2)	
Cathartiformes Seebohm, 1890					
Cathartidae Lafresnaye, 1839					
<i>Cathartes aura</i> (Linnaeus, 1758)	C	R	CA, NF, MA, CO, RI, SF, PF		WA967043
<i>Cathartes burrovianus</i> Cassin, 1845	C	R	CA, NF, MA, CO, RI, SF	MPEG (2)	WA964612



## APPENDIX.

(Continue)

Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Coragyps atratus</i> (Bechstein, 1793)	C	R	CA, NF, MA, CO, RI, SF, PF	MPEG (1)	WA967038
Accipitriformes Bonaparte, 1831					
Pandionidae Bonaparte, 1854					
<i>Pandion haliaetus</i> (Linnaeus, 1758)	U	BM	CO, MA, CA, RI		WA475752
Accipitridae Vigors, 1824					
<i>Leptodon cayanensis</i> (Latham, 1790)					WA334491 (AM)
<i>Chondrohierax uncinatus</i> (Temminck, 1822)				MPEG (1)	
<i>Elanoides forficatus</i> (Linnaeus, 1758)	R	UM*, BM	CA, NF, CA	MPEG (1)	WA235325 (CT)
<i>Gampsonyx swainsonii</i> Vigors, 1825	U	R	NF, CA	MPEG (1)	WA972102
<i>Elanus leucurus</i> (Vieillot, 1818)	U	R	NF, CA		WA1077438
<i>Ictinia plumbea</i> (Gmelin, 1788)	VR	UM*	NF		ACL
<i>Busarellus nigricollis</i> (Latham, 1790)	R	R	CA, RI		WA953449
<i>Rostrhamus sociabilis</i> (Vieillot, 1817)	VR	UM	CA		WA967036
<i>Geranoospiza caeruleascens</i> (Vieillot, 1817)	R	R	NF	MPEG (1)	ACL, NGM
<i>Buteogallus aequinoctialis</i> (Gmelin, 1788)	FC	R	MA, CO	MPEG (2)	WA352311
<i>Heterospizias meridionalis</i> (Latham, 1790)	U	R	NF, SA, CA		WA1077405
<i>Urubitinga urubitinga</i> (Gmelin, 1788)	U	R	CA, MA, SF		WA898601
<i>Rupornis magnirostris</i> (Gmelin, 1788)	C	R	NF, CA, SF, SA, PF	MPEG (4)	WA967082
<i>Geranoaetus albicaudatus</i> (Vieillot, 1816)	VR	R	NF, CA		ACL, NGM, IT
<i>Buteo nitidus</i> (Latham, 1790)	R	R	NF, CA, SF		WA210363 (CT)
<i>Buteo brachyurus</i> Vieillot, 1816	U	R	NF, CA, SF		WA971177
Eurypygidae Selby, 1840					
<i>Eurypyga helias</i> (Pallas, 1781)	R	R	MA	MPEG (1)	WA377369 (CT)
Gruiformes Bonaparte, 1854					
Aramidae Bonaparte, 1852					
<i>Aramus guarauna</i> (Linnaeus, 1766)	R	R	CA		WA953454
Rallidae Rafinesque, 1815					
<i>Rallus longirostris</i> Boddaert, 1783	U	R	MA	MPEG (3)	WA952454
<i>Aramides mangle</i> (Spix, 1825)	R	R	MA	MPEG (8)	WA471478
<i>Aramides cajaneus</i> (Statius Muller, 1776)	R	R	CA		ACL, NGM, Pelzeln
<i>Laterallus viridis</i> (Statius Muller, 1776)	FC	R	CA, NF, PF	MPEG (3), YPM (1)	ACL, NGM, IT
<i>Laterallus exilis</i> (Temminck, 1831)	U	R	CA		XC135196
<i>Laterallus jamaicensis</i> (Gmelin, 1789)	U	R	CA		WA894871
<i>Porzana albicollis</i> (Vieillot, 1819)	FC	R	CA, NF		WA902746



## APPENDIX.

(Continue)

Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Gallinula galeata</i> (Lichtenstein, 1818)	U	R	CA		WA971156
<i>Porphyrio martinicus</i> (Linnaeus, 1766)	U	UM*	CA		WA967083
<i>Porphyrio flavirostris</i> (Gmelin, 1789)	R	UM*	CA		WA952459
Charadriiformes Huxley, 1867					
Charadrii Huxley, 1867					
Charadriidae Leach, 1820					
<i>Vanellus cayanus</i> (Latham, 1790)	R	UM	CA	MPEG (4)	ACL
<i>Vanellus chilensis</i> (Molina, 1782)	C	R	CA, NF, SA, CO	MPEG (2), USNM (3)	WA967047
<i>Pluvialis dominica</i> (Statius Muller, 1776)	R	BM*	CA, CO		WA472354
<i>Pluvialis squatarola</i> (Linnaeus, 1758)	C	BM	CO, MA, CA	MPEG (13)	WA351948
<i>Charadrius semipalmatus</i> Bonaparte, 1825	C	BM	CO, CA, MA	MPEG (26)	WA445710
<i>Charadrius wilsonia</i> Ord, 1814	U	UM*	CO	MPEG (9)	WA471394
<i>Charadrius collaris</i> Vieillot, 1818	C	UM*	CO, CA, MA	MPEG (7)	WA352323
Haematopodidae Bonaparte, 1838					
<i>Haematopus palliatus</i> Temminck, 1820	U	R	CO	MPEG (3)	WA352309
Recurvirostridae Bonaparte, 1831					
<i>Himantopus mexicanus</i> (Statius Muller, 1776)	FC	UM*	CA	NMW (1)	WA879490
Scolopaci Stejneger, 1885					
Scolopacidae Rafinesque, 1815					
<i>Gallinago paraguayae</i> (Vieillot, 1816)	FC	UM*	CA, CO	MPEG (2)	WA471445
<i>Limnodromus griseus</i> (Gmelin, 1789)	FC	BM	CO, MA, CA	MNRJ (2), MPEG (10)	WA351642
[ <i>Limosa fedoa</i> (Linnaeus, 1758)]					Kober, Rodrigues
<i>Numenius hudsonicus</i> Latham, 1790	C	BM	CO, MA, CA	MPEG (11)	WA352312
<i>Bartramia longicauda</i> (Bechstein, 1812)					Novaes
<i>Actitis macularius</i> (Linnaeus, 1766)	C	BM	CO, CA, MA, RI	MPEG (23), USNM (3)	WA447234
<i>Tringa solitaria</i> Wilson, 1813	U	BM	CA	MPEG (2)	WA912792
<i>Tringa melanoleuca</i> (Gmelin, 1789)	C	BM	CA, CO, MA	MNRJ (1), MPEG (5)	WA351940
<i>Tringa semipalmata</i> (Gmelin, 1789)	C	BM	CO, MA	MNRJ (2), MPEG (16)	WA352316
<i>Tringa flavipes</i> (Gmelin, 1789)	FC	BM	CA, CO, MA	MPEG (8), USNM (1)	WA912924
<i>Arenaria interpres</i> (Linnaeus, 1758)	C	BM	CO, CA	MPEG (28)	WA351957
<i>Calidris canutus</i> (Linnaeus, 1758)	C	BM	CO, CA	MPEG (1)	WA351632
<i>Calidris alba</i> (Pallas, 1764)	C	BM	CO	MPEG (9)	WA445695
<i>Calidris pusilla</i> (Linnaeus, 1766)	C	BM	CO, MA, CA	MPEG (59)	WA471452
<i>Calidris minutilla</i> (Vieillot, 1819)	C	BM	CA, CO, MA	MPEG (36), USNM (14)	WA475751



## APPENDIX.

(Continue)

Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Calidris fuscicollis</i> (Vieillot, 1819)	U	BM*	CA	MPEG (3)	WA1077345
<i>Calidris melanotos</i> (Vieillot, 1819)	R	BM*	CA		WA1103008
<i>Calidris himantopus</i> (Bonaparte, 1826)	U	BM	CA		WA912757
<i>Calidris pugnax</i> (Linnaeus, 1758)	VR	OW	CA		WA1111996
Jacaniidae Chenu & Des Murs, 1854					
<i>Jacana jacana</i> (Linnaeus, 1766)	C	R	CA	MPEG (19), USNM (7)	WA971153
Lari Sharpe, 1891					
Stercorariidae Gray, 1870					
<i>Stercorarius antarcticus</i> (Lesson, 1831)/ <i>S. maccormicki</i> Saunders, 1893				MPEG (1)	
<i>Stercorarius pomarinus</i> (Temminck, 1815)	VR	BM	CO		WA952489
<i>Stercorarius parasiticus</i> (Linnaeus, 1758)	U	BM	CO		WA956932
Laridae Rafinesque, 1815					
<i>Chroicocephalus cirrocephalus</i> (Vieillot, 1818)	R	UM	CO		WA879620
<i>Leucophaeus atricilla</i> (Linnaeus, 1758)	C	BM	CO	NMW (1)	WA351640
<i>Larus dominicanus</i> Lichtenstein, 1823	VR	AM	CO		WA1010043
Sternidae Vigors, 1825					
<i>Sterna antillarum</i> Lesson, 1847	U	BM, UM*	CO		WA952502
<i>Sterna superciliaris</i> (Vieillot, 1819)	C	UM*	CO, CA, RI	MPEG (1), USNM (1)	WA351638
<i>Phaetusa simplex</i> (Gmelin, 1789)	C	UM*	CO, CA, RI	MPEG (1), USNM (4)	WA351922
<i>Gelochelidon nilotica</i> (Gmelin, 1789)	FC	UM*	CO, CA		WA471419
<i>Sterna hirundo</i> Linnaeus, 1758	FC	BM	CO	MPEG (4)	WA345572
<i>Sterna dougallii</i> Montagu, 1813	R	BM*	CO		WA345565
<i>Sterna paradisaea</i> Pontoppidan, 1763	VR	BM*	CO		WA622469
<i>Thalasseus acuffavidus</i> (Cabot, 1847)	FC	AM, UM	CO	MPEG (1)	WA352319
<i>Thalasseus maximus</i> (Boddaert, 1783)	U	UM	CO		WA895403
Rynchopidae Bonaparte, 1838					
<i>Rynchops niger</i> Linnaeus, 1758	FC	UM*	CO, CA, RI	MPEG (1)	WA447232
Columbiformes Latham, 1790					
Columbidae Leach, 1820					
<i>Columbina passerina</i> (Linnaeus, 1758)	C	R	NF, CA, SA	MPEG (1)	WA1077347
<i>Columbina talpacoti</i> (Temminck, 1811)	C	R	NF, CA, SA	MPEG (6)	WA1142596
<i>Columba livia</i> Gmelin, 1789	C	R	NF		WA971166
<i>Patagioenas speciosa</i> (Gmelin, 1789)	U	R	SF, SA, NF	MPEG (1)	ACL, NGM



## APPENDIX.

(Continue)

Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Patagioenas cayennensis</i> (Bonnaterre, 1792)	FC	R	SF, SA, NF, PF, MA		WA972105
<i>Leptotila verreauxi</i> Bonaparte, 1855	FC	R	SF, SA, NF	MPEG (1)	XC150044
<i>Leptotila rufaxilla</i> (Richard & Bernard, 1792)	R	R	SF	MPEG (1)	ACL
Opisthocomiformes Sclater, 1880					
Opisthocomidae Swainson, 1837					
<i>Opisthocomus hoazin</i> (Statius Muller, 1776)				MPEG (2)	
Cuculiformes Wagler, 1830					
Cuculidae Leach, 1820					
Cuculinae Leach, 1820					
<i>Coccyua minuta</i> (Vieillot, 1817)	U	R	CA, NF, SC, RI	MPEG (1)	ACL, NGM
<i>Playa cayana</i> (Linnaeus, 1766)	FC	R	SF, NF, PF	MPEG (1)	WA979679 (SA)
<i>Coccyzus minor</i> (Gmelin, 1788)	R	R	MA	MPEG (1)	WA471461
<i>Crotophaga major</i> Gmelin, 1788	FC	UM*	MA, CA, RI		WA967039
<i>Crotophaga ani</i> Linnaeus, 1758	C	R	NF, CA, SF, RI, SA, PF	MPEG (1), USNM (6)	WA971151
<i>Guira guira</i> (Gmelin, 1788)	C	R	CA, NF, SF	MPEG (3), NMBE (1), USNM (1)	WA971149
Taperinae Verheyen, 1956					
<i>Tapera naevia</i> (Linnaeus, 1766)	U	R	CA, NF, SA	MPEG (1)	XC149792
Strigiformes Wagler, 1830					
Strigidae Leach, 1820					
<i>Megascops choliba</i> (Vieillot, 1817)	U	R	SF, NF	MPEG (2)	WA710533 (CT)
<i>Glaucidium brasilianum</i> (Gmelin, 1788)	U	R	MA, SF	MPEG (1)	ACL, NGM
<i>Athene cunicularia</i> (Molina, 1782)	U	R	CA, NF, SA		WA1077221
<i>Asio stygius</i> (Wagler, 1832)	VR	R	SF		WA977394 (FF)
Nyctibiiformes Yuri, Kimball, Harshman, Bowie, Braun, Chojnowski, Han, Hackett, Huddleston, Moore, Reddy, Sheldon, Steadman, Witt & Braun, 2013					
Nyctibiidae Chenu & Des Murs, 1851					
<i>Nyctibius griseus</i> (Gmelin, 1789)	R	R	SF		WA706264 (CT)
Caprimulgiformes Ridgway, 1881					
Caprimulgidae Vigors, 1825					
<i>Hydropsalis nigrescens</i> (Cabanis, 1848)				MPEG (1)	
<i>Hydropsalis albicollis</i> (Gmelin, 1789)	FC	R	SF, CA, SA	MPEG (3)	ACL, NGM
<i>Hydropsalis parvula</i> (Gould, 1837)				MPEG (1)	
<i>Chordeiles nacunda</i> (Vieillot, 1817)	VR	UM*	CA	ZMB (1)	WA912781



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(Continue)

Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Chordeiles acutipennis</i> (Hermann, 1783)	FC	R	CA, SA	MPEG (2)	WA879611
Apodiformes Peters, 1940					
Apodidae Olphe-Galliard, 1887					
<i>Chaetura brachyura</i> (Jardine, 1846)	C	R	CA, SF, NF, PF, MA	MPEG (8)	WA971190
<i>Tachornis squamata</i> (Cassin, 1853)	FC	R	PF, SF, NF	MPEG (2), USNM (1)	WA972100
Trochilidae Vigors, 1825					
Phaethornithinae Jardine, 1833					
<i>Glaucis hirsutus</i> (Gmelin, 1788)				MPEG (2)	
<i>Threnetes leucurus</i> (Linnaeus, 1766)				MPEG (3)	
<i>Phaethornis ruber</i> (Linnaeus, 1758)	U	R	SF	MPEG (4)	XC150024
<i>Phaethornis superciliosus</i> (Linnaeus, 1766)				MPEG (3)	
Trochilinae Vigors, 1825					
<i>Campylopterus largipennis</i> (Boddaert, 1783)				MPEG (2)	
<i>Anthracothorax nigricollis</i> (Vieillot, 1817)	U	R	SF, CA	MPEG (3)	ACL, NGM
<i>Lophornis gouldii</i> (Lesson, 1832)				MPEG (1)	
<i>Chlorostilbon notatus</i> (Reich, 1793)	U	R	SF	MPEG (1)	ACL
<i>Thalurania furcata</i> (Gmelin, 1788)				MPEG (4)	
<i>Polytmus theresiae</i> (Da Silva Maia, 1843)	FC	R	SA, NF	MPEG (1)	ACL, NGM
<i>Amazilia leucogaster</i> (Gmelin, 1788)	R	R	SA, MA		WA971179
<i>Amazilia fimbriata</i> (Gmelin, 1788)				MNRJ (2), MPEG (1)	
<i>Heliophyx auritus</i> (Gmelin, 1788)					WA712888 (CT)
<i>Calliphlox amethystina</i> (Boddaert, 1783)					WA692800 (CT)
Trogoniformes A. O. U., 1886					
Trogonidae Lesson, 1828					
<i>Trogon viridis</i> Linnaeus, 1766				MPEG (1)	
<i>Trogon curucui</i> Linnaeus, 1766					WA693977 (CT)
Coraciiformes Forbes, 1844					
Alcedinidae Rafinesque, 1815					
<i>Megasceryle torquata</i> (Linnaeus, 1766)	FC	R	CA, CO, MA, RI, NF	MPEG (1)	WA967084
<i>Chloroceryle amazona</i> (Latham, 1790)	FC	R	CA, CO, MA, RI, NF	MPEG (4), USNM (2)	WA475748
<i>Chloroceryle aenea</i> (Pallas, 1764)				MPEG (1)	WA510447 (RC)
<i>Chloroceryle americana</i> (Gmelin, 1788)	U	R	CA, MA, RI	ZMB (1), MPEG (6), USNM (1)	WA475749
<i>Chloroceryle inda</i> (Linnaeus, 1766)				MPEG (1)	





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Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
Momotidae Gray, 1840					
<i>Momotus momota</i> (Linnaeus, 1766)	U	R	SF	MPEG (1), NMBE (1)	WA629567 (CT)
Galbuliformes Fürbringer, 1888					
Galbulidae Vigors, 1825					
<i>Galbula cyanicollis</i> Cassin, 1851				MPEG (2)	WA981375 (SA)
<i>Galbula ruficauda</i> Cuvier, 1816	U	R	SF	MPEG (2)	WA1111940
Bucconidae Horsfield, 1821					
<i>Notharchus hyperhynchus</i> (Sclater, 1856)	R	R	SF, MA	NMW (1)	WA332558 (AM)
<i>Monasa nigrifrons</i> (Spix, 1824)	FC	R	SF, MA, PF	MPEG (12)	WA875744
<i>Chelidoptera tenebrosa</i> (Pallas, 1782)	FC	R	SF, NF, SA	MPEG (5)	WA1077366
Piciformes Meyer & Wolf, 1810					
Ramphastidae Vigors, 1825					
<i>Ramphastos vitellinus</i> Lichtenstein, 1823					XC34961 (SD)
<i>Pteroglossus inscriptus</i> Swainson, 1822	U	R	SF	MPEG (6)	WA1111924
<i>Pteroglossus bitorquatus</i> Vigors, 1826				MPEG (2)	
<i>Pteroglossus aracari</i> (Linnaeus, 1758)	R	R	SF	MPEG (1)	ACL, NGM
Picidae Leach, 1820					
<i>Picumnus exilis</i> (Lichtenstein, 1823)					WA506962 (RC)
<i>Picumnus</i> sp.	FC	R	MA	ZMB (2), MNRJ (2), MPEG (3)	WA895382
<i>Veniliornis affinis</i> (Swainson, 1821)	U	R	SF	MPEG (4)	XC150025
<i>Celeus elegans</i> (Statius Muller, 1776)				MPEG (1)	
<i>Celeus flavus</i> (Statius Muller, 1776)	R	R	SF	ZMB (1), MPEG (2)	WA156253 (CT)
<i>Dryocopus lineatus</i> (Linnaeus, 1766)	FC	R	SF, CA, SA, MA		WA875743
<i>Campephilus melanoleucos</i> (Gmelin, 1788)				MPEG (3)	WA1242898
Falconiformes Bonaparte, 1831					
Falconidae Leach, 1820					
<i>Daptrius ater</i> Vieillot, 1816	U	R	CA, SF		WA952481
<i>Caracara plancus</i> (Miller, 1777)	C	R	CA, NF, MA, CO, RI, SF, SA	MPEG (1)	WA975287
<i>Milvago chimachima</i> (Vieillot, 1816)	C	R	CA, NF, MA, CO, RI, SF, SA	MPEG (4)	WA472356
<i>Herpetotheres cachinnans</i> (Linnaeus, 1758)	U	R	SF, CA, NF, PF		WA875733
<i>Micrastur semitorquatus</i> (Vieillot, 1817)					XC35137 (SD)
<i>Falco ruficularis</i> Daudin, 1800	U	R	SF, CA, NF, PF		WA831005
<i>Falco peregrinus</i> Tunstall, 1771	VR	BM	CA, CO, NF	NMW (2)	WA912764



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Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
Psittaciformes Wagler, 1830					
Psittacidae Rafinesque, 1815					
<i>Orthopsittaca manilatus</i> (Boddaert, 1783)	R	R	PF		WA952500
<i>Primolius maracana</i> (Vieillot, 1816)	FC	R	SF, SA, PF, CA	NMW (1)	WA351634
<i>Diopsittaca nobilis</i> (Linnaeus, 1758)				NMW (1)	
<i>Psittacara leucophthalmus</i> (Statius Muller, 1776)	FC	R	SF, PF, CA, NF	MPEG (4)	XC134178
<i>Brotogeris chrysoptera</i> (Linnaeus, 1766)	R	R	SF	MPEG (1), NMBE (1)	ACL
<i>Pionus menstruus</i> (Linnaeus, 1766)	U	R	SF, PF, NF		WA805079
<i>Amazona amazonica</i> (Linnaeus, 1766)	C	R	SF, PF, SA, NF, CA, MA	MPEG (3)	XC134178
<i>Deropterus accipitrinus</i> (Linnaeus, 1758)				MPEG (6), NMBE (2)	
Passeriformes Linnaeus, 1758					
Tyranni Wetmore & Miller, 1926					
Thamnophilida Patterson, 1987					
Thamnophilidae Swainson, 1824					
Myrmomithinae Sundevall, 1872					
<i>Pygiptila stellaris</i> (Spix, 1825)				MPEG (1)	
Thamnophilinae Swainson, 1824					
<i>Myrmotherula multostriata</i> Sclater, 1858				MPEG (1)	
<i>Iseria hauxwelli</i> (Sclater, 1857)				MPEG (5)	
<i>Myrmotherula axillaris</i> (Vieillot, 1817)	U	R	SF	MPEG (9)	XC150023
<i>Formicivora grisea</i> (Boddaert, 1783)	C	R	SF, CA, SA, NF, PF, MA	MNRJ (3), MPEG (8)	WA972101
<i>Dysithamnus mentalis</i> (Temminck, 1823)	U	R	SF	MNRJ (6), MPEG (2)	ACL, NGM
<i>Herpsilochmus rufimarginatus</i> (Temminck, 1822)				MNRJ (1), MPEG (1)	
<i>Thamnophilus palliatus</i> (Lichtenstein, 1823)	FC	R	SF, NF, CA, PF	ZMB (1), MNRJ (1), MPEG (4)	XC149794
<i>Thamnophilus aethiops</i> Sclater, 1858	R	R	SF	MPEG (2)	XC35137 (SD)
<i>Thamnophilus amazonicus</i> Sclater, 1858	U	R	SF, SA	MPEG (8)	WA1112813
<i>Taraba major</i> (Vieillot, 1816)	FC	R	SF, CA, SA, PF, NF	MNRJ (2), MPEG (4), NMBE (1)	XC135200
<i>Pyriglena leuconota</i> (Spix, 1824)	U	R	SF	MPEG (10)	ACL, NGM
<i>Cercomacra laeta</i> Todd, 1920	R	R	SF	MPEG (5)	ACL, NGM



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Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Phlegopsis nigromaculata</i> (d'Orbigny & Lafresnaye, 1837)				MPEG (3)	
Conopophagidae Sclater & Salvin, 1873					
<i>Conopophaga roberti</i> Hellmayr, 1905				AMNH (1), BMNH (1), MPEG (10)	
Furnariida Sibley, Ahlquist & Monroe, 1988					
Furnarioidea Gray, 1840					
Formicariidae Gray, 1840					
<i>Formicarius colma</i> Boddaert, 1783				MNRJ (1), MPEG (4)	XC35023 (SD)
<i>Formicarius analis</i> (d'Orbigny & Lafresnaye, 1837)				MNRJ (1), MPEG (2)	
Dendrocolaptidae Gray, 1840					
Sittasominae Ridgway, 1911					
<i>Dendrocincla fuliginosa</i> (Vieillot, 1818)				FMNH (1), MPEG (4)	
<i>Deconychura longicauda</i> (Pelzeln, 1868)				MPEG (1)	
Dendrocolaptinae Gray, 1840					
<i>Glyphorhynchus spirurus</i> (Vieillot, 1819)	U	R	SF	MPEG (4)	XC150025
<i>Xiphorhynchus spixii</i> (Lesson, 1830)				MNRJ (1), MPEG (1)	
<i>Xiphorhynchus guttatus</i> (Lichtenstein, 1820)	U	R	SF, MA	MPEG (2)	WA875735
<i>Dendroplex picus</i> (Gmelin, 1788)	FC	R	SF, PF, MA	MPEG (7)	WA967066
Xenopidae Bonaparte, 1854					
<i>Xenops minutus</i> (Sparrman, 1788)	R			MPEG (2)	XC35134 (SD)
Furnariidae Gray, 1840					
Berlepschiinae Ohlson, Irestedt, Ericson & Fjeldså, 2013					
<i>Berlepschia rikeri</i> (Ridgway, 1886)	R	R	PF		WA895465
Synallaxiinae De Selys-Longchamps, 1839 (1836)					
<i>Certhiaxis cinnamomeus</i> (Gmelin, 1788)	FC	R	CA	MPEG (2)	WA895432
<i>Synallaxis albescens</i> Temminck, 1823	FC	R	CA, SA, NF		XC133709
<i>Synallaxis rutilans</i> Temminck, 1823				MPEG (5)	XC34960 (SD)
<i>Synallaxis gujanensis</i> (Gmelin, 1789)	U	R	SF, RI, CA	MPEG (1)	XC135200
Tyrannida Wetmore & Miller, 1926					
Pipridae Rafinesque, 1815					
Piprinae Rafinesque, 1815					
<i>Pipra fasciicauda</i> Hellmayr, 1906				MPEG (1)	



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Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Manacus manacus</i> (Linnaeus, 1766)	U	R	SF	MPEG(33), NMBE(1)	XC150044
Ilicurinae Prum, 1992					
<i>Chiroxiphia pareola</i> (Linnaeus, 1766)	U	R	SF	MPEG (16)	XC150022
Cotingoidea Bonaparte, 1849					
Onychorhynchidae Tello, Moyle, Marchese & Cracraft, 2009					
<i>Onychorhynchus coronatus</i> (Statius Muller, 1776)				MNRJ (1), MPEG (2)	
Tityridae Gray, 1840					
Schiffornithinae Sibley & Ahlquist, 1985					
<i>Schiffornis turdina</i> (Wied, 1831)				MPEG (2)	
<i>Laniocera hypopyrra</i> (Vieillot, 1817)				MNRJ (1), MPEG (1)	
Tityrinae Gray, 1840					
<i>Tityra semifasciata</i> (Spix, 1825)	R	R	SF	MPEG (2)	WA1111907
<i>Pachyramphus rufus</i> (Boddaert, 1783)	FC	R	SF, NF	MNRJ (1), MPEG (1)	XC149793
<i>Pachyramphus polychopterus</i> (Vieillot, 1818)	U	R	SF	ZMB (1), MPEG (2)	ACL, NGM
Cotingidae Bonaparte, 1849					
Cotinginae Bonaparte, 1849					
<i>Lipaugus vociferans</i> (Wied, 1820)				MPEG (1)	XC35134 (SD)
<i>Gymnoderus foetidus</i> (Linnaeus, 1758)				AMNH (1), MPEG (1)	
<i>Xipholena lamellipennis</i> (Lafresnaye, 1839)					WA455392 (CT)
<i>Cotinga cotinga</i> (Linnaeus, 1766)					WA450052 (CT)
Tyrannoidea Vigors, 1825					
Pipritidae Ohlson, Irestedt, Ericson & Fjeldså, 2013					
<i>Piprites chloris</i> (Temminck, 1822)				MPEG (1)	
Rhynchocyclidae Berlepsch, 1907					
<i>Incertae sedis</i>					
<i>Taeniotriccus andrei</i> (Berlepsch & Hartert, 1902)					WA970621 (SA)
Pipromorphinae Wolters, 1977					
<i>Mionectes oleagineus</i> (Lichtenstein, 1823)				MPEG (10)	
<i>Mionectes macconnelli</i> (Chubb, 1919)				MPEG (1)	
<i>Corythopis torquatus</i> (Tschudi, 1844)				MPEG (1)	
Rhynchocyclinae Berlepsch, 1907					
<i>Rhynchocyclus olivaceus</i> (Temminck, 1820)				MNRJ (1)	



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Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Tolmomyias poliocephalus</i> (Taczanowski, 1884)	FC	R	SF, PF	MNRJ (2), MPEG (1), NMBE (1)	XC150023
<i>Tolmomyias flaviventris</i> (Wied, 1831)	FC	R	SF, NF, PF, MA, SA	MPEG (1)	XC150019
Todirosrinae Tello, Moyle, Marchese & Cracraft, 2009					
<i>Todirostrum maculatum</i> (Desmarest, 1806)	FC	R	SF, MA, CA, NF	MPEG (2)	WA983887 (SA)
<i>Todirostrum cinereum</i> (Linnaeus, 1766)	FC	R	CA, NF, SF, SA		XC150019
<i>Todirostrum chrysocrotaphum</i> Strickland, 1850	U	R	SF, PF, SA, NF, CA, MA	AMNH (1), MPEG (2)	WA1111911
<i>Poecilotriccus sylvia</i> (Desmarest, 1806)	FC	R	CA, SF, SA, NF		XC150044
<i>Myiornis ecaudatus</i> (d'Orbigny & Lafresnaye, 1837)				MPEG (1)	
<i>Hemitriccus margaritaceiventer</i> (d'Orbigny & Lafresnaye, 1837)				MPEG (1)	
<i>Lophotriccus galeatus</i> (Boddaert, 1783)	U	R	SF	MNRJ (2), MPEG (3), NMBE (1)	XC150022
Tyrannidae Vigors, 1825					
Elaeniinae Cabanis & Heine, 1860					
<i>Zimmerius gracilipes</i> (Sclater & Salvin, 1868)	U	R	SF, PF	MPEG (3)	XC150018
<i>Camptostoma obsoletum</i> (Temminck, 1824)	FC	R	SF, PF, NF, SA, MA	MPEG (2)	XC150019
<i>Elaenia flavogaster</i> (Thunberg, 1822)	C	R	SF, NF, SA, CA, MA, PF	MPEG (2)	XC149792
<i>Elaenia cristata</i> Pelzeln, 1868	FC	R	SA		WA982803
<i>Myiopagis gaimardii</i> (d'Orbigny, 1839)	U	R	SF	AMNH (1), MPEG (1)	XC150023
<i>Tyrannulus elatus</i> (Latham, 1790)	FC	R	SF, PF, SA		XC150043
<i>Phaeomyias murina</i> (Spix, 1825)	C	R	SF, SA, NF, PF, CA	MPEG (2)	WA975293
Tyranninae Vigors, 1825					
<i>Attila cinnamomeus</i> (Gmelin, 1789)	U	R	SF, CA, RI	MNRJ (2), MPEG (1)	XC150043
<i>Attila spadiceus</i> (Gmelin, 1789)	U	R	SF	MPEG (3)	XC150039
<i>Legatus leucophaeus</i> (Vieillot, 1818)	FC	R	SF, CA, NF, PF, SA		XC150020
<i>Myiarchus ferox</i> (Gmelin, 1789)	FC	R	SF, NF, SA, PF, MA	MPEG (2)	XC150018
<i>Myiarchus tyrannulus</i> (Statius Muller, 1776)	FC	R	SF, CA, MA, SA	MPEG (4)	ACL, NGM
<i>Rhytipterna simplex</i> (Lichtenstein, 1823)				AMNH (1)	
<i>Pitangus sulphuratus</i> (Linnaeus, 1766)	C	R	NF, SF, PF, SA, MA, CA	MPEG (1), NMBE (1), USNM (1)	WA1077334
<i>Philohydor lictor</i> (Lichtenstein, 1823)	FC	R	CA, RI	MPEG (2)	WA1077419



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Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Machetornis rixosa</i> (Vieillot, 1819)	VR	R	CA		WA1242107
<i>Myiodynastes maculatus</i> (Statius Muller, 1776)	FC	R	SF, NF, CA, PF	MPEG (1)	WA658258
<i>Tyrannopsis sulphurea</i> (Spix, 1825)	U	R	PF	MPEG (1)	XC149794
<i>Megarynchus pitangua</i> (Linnaeus, 1766)	U	R	SF, CA, PF, SA	MPEG (2)	WA806379 (CT)
<i>Myiozetetes cayanensis</i> (Linnaeus, 1766)	C	R	NF, CA, SF, PF, SA, MA	AMNH (1), MPEG (3)	WA1077426
<i>Tyrannus melancholicus</i> Vieillot, 1819	C	R	NF, CA, SF, PF, SA, MA	MPEG (4), NMBE (4), USNM (2)	WA1111961
<i>Tyrannus savana</i> Vieillot, 1808	U	AM*	CA, SA, SF	MPEG (1), NMBE (2)	WA964599
<i>Empidonomus varius</i> (Vieillot, 1818)	C	R	SF, NF, CA, PF	AMNH (1), MPEG (3)	WA1077335
Fluvicolinae Swainson, 1832					
<i>Sublegatus obscurior</i> Todd, 1920				MPEG (1)	
<i>Arundinicola leucocephala</i> (Linnaeus, 1764)	R	R	CA	AMNH (1), MNRJ (1), MPEG (3)	WA1240997
Passeri Linnaeus, 1758					
Corvida Wagler 1830					
Vireonidae Swainson, 1837					
<i>Cyclarhis gujanensis</i> (Gmelin, 1789)	FC	R	SF, CA, PF, SA	ZMB (1), MPEG (2)	ACL, NGM
<i>Vireo chivi</i> (Vieillot, 1817)	FC	R	SF, NF, SA	MPEG (1)	WA865726
<i>Hylophilus semicinereus</i> Sclater & Salvin, 1867	U	R	SF	MPEG (1)	ACL, NGM
<i>Hylophilus pectoralis</i> Sclater, 1866	FC	R	SA, SF, MA	MPEG (6)	XC135192
Passerida Linnaeus, 1758					
Hirundinidae Rafinesque, 1815					
<i>Stelgidopteryx ruficollis</i> (Vieillot, 1817)	FC	R	NF, CA, SF	MPEG (7)	WA229604
<i>Progne tapera</i> (Vieillot, 1817)	U	UM*	CA, NF	MPEG (1)	ACL, NGM
<i>Progne chalybea</i> (Gmelin, 1789)	C	UM*, AM	CA, NF, SA, MA, PF	MPEG (1)	WA967086
<i>Tachycineta albiventer</i> (Boddaert, 1783)	C	R	CA, RI	MPEG (2)	WA953456
<i>Riparia riparia</i> (Linnaeus, 1758)				MPEG (1)	
<i>Hirundo rustica</i> Linnaeus, 1758	FC	BM, AM	CA, NF, CO	MPEG (2)	WA1113925
Troglodytidae Swainson, 1831					
<i>Troglodytes musculus</i> Naumann, 1823	C	R	SF, NF, CA, SA	MPEG (1)	WA974873
<i>Pheugopedius genibarbis</i> (Swainson, 1838)	U	R	SF	MPEG (4)	
<i>Cantorchilus leucotis</i> (Lafresnaye, 1845)	U	R	SF, RI, CA	MPEG (3)	ACL, NGM
Donacobiidae Aleixo & Pacheco, 2006					
<i>Donacobius atricapilla</i> (Linnaeus, 1766)	U	R	CA	MPEG (1)	ACL, NGM



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Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
Poliopitidae Baird, 1858					
<i>Poliopitila plumbea</i> (Gmelin, 1788)	FC	R	SF, CA, SA	AMNH (1), ZMB (1), MNRJ (3)	WA974872
Turdidae Rafinesque, 1815					
<i>Turdus nudigenis</i> Lafresnaye, 1848	U	R	SF	MPEG (4)	ACL, NGM
<i>Turdus leucomelas</i> Vieillot, 1818	C	R	SF, NF, PF, CA, MA, SA	MPEG (4)	XC149792
<i>Turdus fumigatus</i> Lichtenstein, 1823				MPEG (2)	
Mimidae Bonaparte, 1853					
<i>Mimus gilvus</i> (Vieillot, 1807)	U	R	SA	NMW (2)	WA912775
Motacillidae Horsfield, 1821					
<i>Anthus lutescens</i> Pucheran, 1855	C	R	CA, NF	MNRJ (2), MPEG (14), ZMB (1)	XC134178
Passerellidae Cabanis & Heine, 1850					
<i>Ammodramus humeralis</i> (Bosc, 1792)	FC	R	NF, SA, CA		WA1077439
<i>Arremon taciturnus</i> (Hermann, 1783)				MPEG (5)	
Parulidae Wetmore, Friedmann, Lincoln, Miller, Peters, van Rossem, Van Tyne & Zimmer, 1947					
<i>Geothlypis aequinoctialis</i> (Gmelin, 1789)	FC	R	CA, NF		WA875732
<i>Myiothlypis mesoleuca</i> (Sclater, 1866)				MPEG (1)	
Icteridae Vigors, 1825					
<i>Psarocolius decumanus</i> (Pallas, 1769)	FC	R	SF, SA, NF, PF		WA879486
<i>Cacicus cela</i> (Linnaeus, 1758)	FC	R	SF, SA, NF, PF	MPEG (8), NMBE (1)	WA1111871
<i>Chrysomus ruficapillus</i> (Vieillot, 1819)	FC	UM*	CA	MNRJ (2), MPEG (2)	WA954279
<i>Molothrus oryzivorus</i> (Gmelin, 1788)	FC	R	CA, NF		WA1113924
<i>Molothrus bonariensis</i> (Gmelin, 1789)	C	R	NF, SF, CA, SA	MPEG (13)	WA1113923
<i>Sturnella militaris</i> (Linnaeus, 1758)	C	R	NF, CA, SA	MNRJ (2), MPEG (6), USNM (4)	WA972099
Thraupidae Cabanis, 1847					
<i>Coereba flaveola</i> (Linnaeus, 1758)	C	R	SF, NF, PF, MA, SA	FMNH (2), MPEG (6)	WA1142595
<i>Saltator grossus</i> (Linnaeus, 1766)				MPEG (1)	
<i>Saltator maximus</i> (Statius Muller, 1776)	FC	R	SF, SA, PF, MA	MPEG (6)	ACL, NGM
<i>Tachyphonus rufus</i> (Boddaert, 1783)	FC	R	SF, SA, NF, MA	MPEG (6)	WA805075
<i>Ramphocelus carbo</i> (Pallas, 1764)	C	R	SF, NF, CA, SA, MA, PF	MPEG (8)	WA971169





## APPENDIX.

(Conclusion)

Latin names	Abundance	Migratory status	Habitat	Specimens	Digital Voucher
<i>Lanio cucullatus</i> (Statius Muller, 1776)					WA983927 (SA)
<i>Lanio penicillatus</i> (Spix, 1825)				MNRJ (2), MPEG (5)	
<i>Tangara episcopus</i> (Linnaeus, 1766)	C	R	SF, NF, PF, MA, SA	MPEG (1)	WA1113920
<i>Tangara palmarum</i> (Wied, 1823)	FC	R	PF, SF, NF, CA, SA, MA	MPEG (3), NMBE (1)	WA286842 (RB)
<i>Schistochlamys melanopis</i> (Latham, 1790)	U	R	SA, NF		WA658256
<i>Dacnis cayana</i> (Linnaeus, 1766)				MNRJ (1), MPEG (2)	ACL
<i>Cyanerpes cyaneus</i> (Linnaeus, 1766)				MPEG (2)	
<i>Hemithraupis guira</i> (Linnaeus, 1766)				MPEG (1)	
<i>Conirostrum speciosum</i> (Temminck, 1824)				MNRJ (2), MPEG (3)	
<i>Conirostrum bicolor</i> (Vieillot, 1809)	C	R	MA	MPEG (22)	WA351912
<i>Volatinia jacarina</i> (Linnaeus, 1766)	C	R	NF, CA, SF, SA	MPEG (6)	XC134177
<i>Sporophila americana</i> (Gmelin, 1789)	U	R	NF, CA, SA	MPEG (4)	WA454957 (CT)
<i>Sporophila lineola</i> (Linnaeus, 1758)					WA586433 (CT)
<i>Sporophila nigricollis</i> (Vieillot, 1823)	U	UM*	NF, CA		WA1111894
<i>Sporophila bouvreuil</i> (Statius Muller, 1776)				MNRJ (1), MPEG (1)	
<i>Sporophila minuta</i> (Linnaeus, 1758)	FC	R	CA, NF	MPEG (3)	WA1077441
<i>Sporophila angolensis</i> (Linnaeus, 1766)	U	R	CA, NF, SF	MPEG (1)	ACL
Cardinalidae Ridgway, 1901					
<i>Caryothraustes canadensis</i> (Linnaeus, 1766)				LSUMZ (1), MPEG (4)	
Fringillidae Leach, 1820					
<i>Euphonia violacea</i> (Linnaeus, 1758)	U	R	SF	MPEG (1)	ACL, NGM
Passeridae Rafinesque, 1815					
<i>Passer domesticus</i> (Linnaeus, 1758)	C	R	NF		WA964604

