

# An overview of migratory birds in Brazil

Marina Somenzari<sup>1,12</sup>; Priscilla Prudente do Amaral<sup>1,13</sup>; Víctor R. Cueto<sup>2</sup>; André de Camargo Guaraldo<sup>3</sup>; Alex E. Jahn<sup>4</sup>; Diego Mendes Lima<sup>1,14</sup>; Pedro Cerqueira Lima<sup>5</sup>; Camile Lugarini<sup>1,15</sup>; Caio Graco Machado<sup>6</sup>; Jaime Martinez<sup>7,22</sup>; João Luiz Xavier do Nascimento<sup>1,16</sup>; José Fernando Pacheco<sup>8</sup>; Danielle Paludo<sup>1,17</sup>; Nêmore Pauletti Prestes<sup>7,23</sup>; Patrícia Pereira Serafini<sup>1,18</sup>; Luís Fábio Silveira<sup>9</sup>; Antônio Emanuel Barreto Alves de Sousa<sup>1,19</sup>; Nathália Alves de Sousa<sup>1,20</sup>; Manuella Andrade de Souza<sup>1,21</sup>; Wallace Rodrigues Telino-Júnior<sup>10</sup> & Bret Myers Whitney<sup>11</sup>

- <sup>1</sup> Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), Centro Nacional de Pesquisa e Conservação de Aves Silvestres (CEMAVE). Cabedelo, PB, Brasil.
- <sup>2</sup> Centro de Investigación Esquel de Montaña y Estepa Patagónica (CIEMEP), Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Universidad Nacional de la Patagonia San Juan Bosco. Esquel, Chubut, Argentina. ORCID: 0000-0001-9594-0086. E-mail: [vcueto@conicet.gov.ar](mailto:vcueto@conicet.gov.ar)
- <sup>3</sup> Universidade Federal do Paraná (UFPR), Departamento de Zoologia (DZOO), Laboratório de Ecologia Comportamental e Ornitologia. Curitiba, PR, Brasil. ORCID: 0000-0003-1705-2926. E-mail: [ac@guaraldo.bio.br](mailto:ac@guaraldo.bio.br)
- <sup>4</sup> Universidade Estadual Paulista (UNESP), Instituto de Biociências, Departamento de Zoologia. Rio Claro, SP, Brasil. ORCID: 0000-0002-6195-3505. E-mail: [JahnA@si.edu](mailto:JahnA@si.edu)
- <sup>5</sup> Fundação BioBrasil. Salvador, BA, Brasil. ORCID: 0000-0002-0810-5208. E-mail: [pedroclima@gmail.com](mailto:pedroclima@gmail.com)
- <sup>6</sup> Universidade Estadual de Feira de Santana (UEFS), Departamento de Ciências Biológicas (DCBIO), Laboratório de Ornitologia. Feira de Santana, Bahia, Brasil. ORCID: 0000-0002-8070-8601. E-mail: [gracom@uol.com.br](mailto:gracom@uol.com.br)
- <sup>7</sup> Universidade de Passo Fundo (UPF), Instituto de Ciências Biológicas (ICB). Passo Fundo, RS, Brasil.
- <sup>8</sup> Comitê Brasileiro de Registros Ornitológicos (CBRO). Rio de Janeiro, RJ, Brasil. ORCID: 0000-0002-2399-7662. E-mail: [jfpacheco@terra.com.br](mailto:jfpacheco@terra.com.br)
- <sup>9</sup> Universidade de São Paulo (USP), Museu de Zoologia (MZUSP). São Paulo, SP, Brasil. ORCID: 0000-0003-2576-7657. E-mail: [ifs@usp.br](mailto:ifs@usp.br)
- <sup>10</sup> Universidade Federal Rural de Pernambuco (UFRPE), Unidade Acadêmica da Garanhuns (UAG). Garanhuns, PE, Brasil. ORCID: 0000-0002-5570-1993. E-mail: [telinojunior@gmail.com](mailto:telinojunior@gmail.com)
- <sup>11</sup> Louisiana State University, Museum of Natural Science. Baton Rouge, Louisiana, USA. ORCID: 0000-0001-8442-9370. E-mail: [ictinia@earthlink.net](mailto:ictinia@earthlink.net)
- <sup>12</sup> Current address: Parque das Aves. Foz do Iguaçu, PR, Brasil. ORCID: 0000-0003-1706-7175. E-mail: [masomenzari@gmail.com](mailto:masomenzari@gmail.com) (corresp. author)
- <sup>13</sup> ORCID: 0000-0003-1044-5807. E-mail: [priscilla.amaral@icmbio.gov.br](mailto:priscilla.amaral@icmbio.gov.br)
- <sup>14</sup> ORCID: 0000-0002-3790-6928. E-mail: [diego.lima@icmbio.gov.br](mailto:diego.lima@icmbio.gov.br)
- <sup>15</sup> ORCID: 0000-0001-7589-7113. E-mail: [camile.lugarini@icmbio.gov.br](mailto:camile.lugarini@icmbio.gov.br)
- <sup>16</sup> ORCID: 0000-0002-6616-3975. E-mail: [joaolxnascimento@gmail.com](mailto:joaolxnascimento@gmail.com)
- <sup>17</sup> ORCID: 0000-0003-3547-7717. E-mail: [daniellepaludo@gmail.com](mailto:daniellepaludo@gmail.com)
- <sup>18</sup> ORCID: 0000-0002-2448-7621. E-mail: [patricia.serafini@icmbio.gov.br](mailto:patricia.serafini@icmbio.gov.br)
- <sup>19</sup> ORCID: 0000-0002-8339-8274. E-mail: [antonio.sousa@icmbio.gov.br](mailto:antonio.sousa@icmbio.gov.br)
- <sup>20</sup> ORCID: 0000-0002-5759-1548. E-mail: [nathalia.sousa@icmbio.gov.br](mailto:nathalia.sousa@icmbio.gov.br)
- <sup>21</sup> ORCID: 0000-0002-7868-8728. E-mail: [manuella.souza@icmbio.gov.br](mailto:manuella.souza@icmbio.gov.br)
- <sup>22</sup> ORCID: 0000-0002-7164-1951. E-mail: [martinez@upf.br](mailto:martinez@upf.br)
- <sup>23</sup> ORCID: 0000-0003-3291-2955. E-mail: [prestes@upf.br](mailto:prestes@upf.br)

**Abstract.** We reviewed the occurrences and distributional patterns of migratory species of birds in Brazil. A species was classified as migratory when at least part of its population performs cyclical, seasonal movements with high fidelity to its breeding grounds. Of the 1,919 species of birds recorded in Brazil, 198 (10.3%) are migratory. Of these, 127 (64%) were classified as Migratory and 71 (36%) as Partially Migratory. A few species (83; 4.3%) were classified as Vagrant and eight (0.4%) species could not be defined due to limited information available, or due to conflicting data.

**Key-Words.** Migration; Partial migration; Austral migration; Breeding displacement; Altitudinal movement.

## INTRODUCTION

Bird migration – the cyclic and seasonal movement of individuals between their breeding and non-breeding sites (Webster *et al.*, 2002) – is a phenomenon that has been captivating and fascinating mankind for centuries (Lincoln, 1979). In the Americas, the historic scientific interest in bird

migration is reflected in the wide array of literature on the topic (*e.g.*, Rappole, 1995; Greenberg & Marra, 2005; Faaborg *et al.*, 2010a). This literature also reveals that most studies are biased towards migration patterns of North American species, whereas migratory patterns in the Southern Hemisphere are relatively poorly studied (Faaborg *et al.*, 2010b).

In Brazil, bird migration (especially that of continental species) was overviewed by Sick (1983, 1997). However, despite the efforts of many authors, major gaps in our knowledge remains (see Alves, 2007). The Comitê Brasileiro de Registros Ornitológicos – CBRO (Piacentini *et al.*, 2015) maintains a list of all Brazilian birds with documented occurrence in Brazil (as well as those of reported but undocumented occurrence), and classifies all species' general migratory movements. The CBRO does not, however, identify which species breed in Brazil and migrate to neighboring or other countries; which complete their entire migratory cycle within Brazilian territory; and which are partial migrants (*i.e.*, only part of their population migrates).

There are, therefore, major gaps in our understanding of when, how and where different populations of Brazilian birds migrate, and little information about these species' ecology, especially away from the breeding grounds. For these reasons, as well as to provide basic information to federal regulatory agencies (CONAMA, 2014), we performed a wide and thorough data compilation from conventional and 'gray' literature to develop the most complete assessment to date of seasonal movements and migratory patterns for all bird species in Brazil. Through revision of the current state of knowledge and by setting clear criteria to support our judgments and reviewing the current state of knowledge, including data held in an open access digital database, we present the first annotated list of migratory species of birds in Brazil.

## MATERIALS AND METHODS

Migration is defined herein as a movement executed by a population or part of a population between at least one breeding site to which it exhibits fidelity and another, non-breeding site or sites in a cyclical, seasonal manner (following Berthold, 2001, and Dingle, 2014, unless otherwise stated).

The following were not considered migratory movements: (1) juvenile dispersal after leaving the nest, which has been defined as one-way (Dingle, 2014) and having no fidelity to a breeding site; and (2) daily movements that are routine, such as commuting between resting and feeding sites or even during foraging, which is usually restricted to an individual's home range (Newton, 2010).

We analyzed all species present on both the primary and secondary lists of Brazilian birds (Piacentini *et al.*, 2015) in terms of movement patterns, and then classified them into one of the four following categories: (a) Migratory (MGT) – species with populations moving away from their breeding sites in a regular and seasonal manner, then returning for each breeding season; (b) Partially Migratory (MPR) – species whose populations are part migratory and part resident; (c) Resident – species that occupy the same area all year round or that have unpredictable movement patterns, without fidelity to a breeding site, this also includes species considered nomads by some authors, such as Winkler (2005), Newton (2010) and Kristensen *et al.* (2013); and (d) Vagrant – a species with

localized and occasional occurrence within Brazilian territory, mostly with records of isolated individuals. Species with little or no information available, or with conflicting data, such that they could not be placed into any of the categories above, were classified as "Not Defined" (ND).

The categorization of species was done in two steps: first, we compiled a list of all species for which there was at least some indication of migratory movement in the literature. These were obtained from Google Scholar, Scielo, Web of Science and Zoological Records; publications from the last ten years that contained key-words such as "bird migration, seasonal movement, altitudinal movement" and related movements, and including those regarded as migratory by BirdLife International (2016). These species were then individually classified into one of the above categories.

In this step we used data from the Brazilian National Banding System database – Sistema Nacional de Anilhamento de Aves Silvestres (SNA) managed by Cemave/ICMBio and from the website WikiAves ([www.wikiaves.com.br](http://www.wikiaves.com.br)). Photographs of species that are difficult to identify were carefully analyzed and, in cases of uncertainty, were discarded. We most recently consulted these databases in July, 2016. We also compiled data from the three major museum collections of Brazilian birds – Museu de Zoologia da Universidade de São Paulo (MZUSP), Museu Nacional do Rio de Janeiro (MNRJ) and Museu Paraense Emílio Goeldi (MPEG).

Once we had defined the preliminary list of migratory birds, approximately 30 researchers with experience in bird migration in Brazil and elsewhere were consulted and some of their contributions, based on field experience, gray literature, and/or unpublished data, augmented our list.

Assessment of Partially Migratory species was especially difficult; details concerning different populations are explained, whenever possible, to clarify their geographical distributions. Although such populations may be distinct taxonomically at a subspecific level, those differences have not been addressed here, since taxonomic and nomenclatural issues are beyond the scope of this study.

We do, however, call special attention to species whose population movements are poorly known and which would benefit from focused study. Gaps in knowledge are detailed whenever possible, suggesting the type of study necessary to better comprehend a species' movement patterns.

The species list follows the nomenclature proposed by the Comitê Brasileiro de Registros Ornitológicos and, as such, species that do not have documented records for the Brazilian territory are cited between brackets (Piacentini *et al.*, 2015). Brazilian states are represented by their official codes (ISO/TC 46, 2013).

## RESULTS

Of the 1,919 bird species in Brazil, 198 (10.3%) exhibit migratory behavior. Of these, 127 (64%) were considered

Migratory and 71 (36%) Partially Migratory. Eighty-three species (4.3% of the total) were classified as “Vagrant” and eight (0.4%) as “Not Defined” (Table 1).

Of the 103 bird families in Brazil, 37 (35.9%) are represented by at least one migratory or partially migratory species. Of these, the most numerous are Tyrannidae (33 spp.), Scolopacidae (21 spp.), Procellariidae (20 spp.), Thraupidae (13 spp.) and Anatidae (12 spp.), which account for 50% of the 198 species, as shown in Table 2. In a field of study as incipient as it is the case of migratory bird ecology in Brazil, these results should be interpreted with caution, and subject to frequent revision.

### Migratory species accounts (MGT)

#### Anatidae

*Anas sibilatrix* (MGT): endemic to South America, breeding in southern Argentina, central Chile and on the Malvinas/Falkland Islands (Chesser, 1994; Sick, 1997). Populations that breed in the southern part of the distribution migrate to lower latitudes during austral winter and reach southern Brazil (Carboneras, 1992a). In Brazil, there are records of few individuals, which suggest that it is a marginal population that possibly represents less than 1% of the global population (ARA, 2016). For Rio Grande do Sul (RS) there are records in June and August (Maurício & Dias, 1996) and isolated records in October, February and July (Belton, 1984). Photographic records are restricted to September and October for RS and to September for São Paulo (SP) (WikiAves, 2016).

*Anas discors* (MGT): breeds in North America from southern Alaska to central USA and the Gulf Coast. It spends the boreal winter in part of the USA, the Antilles, the Bahamas, Central America and northern South America, including northern Brazil (Carboneras & Kirwan, 2016). In late August it reaches the floodplains of Marajó Island/Pará (PA) and lowlands of Maranhão (MA) (Antas, 1987) probably in non-stop flights originating from its breeding sites. Juveniles banded in Canada and the USA ( $n = 93$ ) between July and September were recovered in the Brazilian states of Acre (AC), PA, MA, Piauí (PI), Ceará (CE), Rio Grande do Norte (RN), Paraíba (PB), Minas Gerais (MG) and Rio de Janeiro (RJ) between December and February (Mestre *et al.*, 2010; MZUSP 42153 [PA, 1959, January]). In addition, there are records between January and March for Roraima (RR), Amazonas (AM), PA and MA (Azevedo-Júnior, 2007; WikiAves, 2016). However, there are also records for RJ between April and August (Sick, 1997; MZUSP 78523 [1966, May]), as well as for SP (Silva-e-Silva & Olmos, 2007; WikiAves, 2016). For Paraná (PR) (Vallejos *et al.*, 2011) and RS, where it appears to be vagrant, there are records only in November (Belton, 1978). However, the occurrence of this species outside northern Brazil is occasional and irregular.

*Oxyura vittata* (MGT): occurs in Chile, Argentina and southern Brazil. Populations that breed to the south of

the distribution migrate north during winter, especially from April to August, and reach RS and Mato Grosso do Sul (MS) (Carboneras, 1992). In Brazil, this species occurs from January to July in RS, from January to May in Santa Catarina (SC), in February and March in PR and in July in MS (SNA, 2016; WikiAves, 2016; MZUSP 2415 [RS, 1894, April]).

#### Phoenicopteridae

*Phoenicopus chilensis* (MGT): occurs from central western Ecuador to the south, through the Andes, as far as Tierra del Fuego, and to the east reaching southern Brazil and Uruguay (del Hoyo *et al.*, 2016a). It breeds in the region of Buenos Aires and Córdoba provinces in Argentina and migrates east towards the coastal lagoons in southern Brazil and Uruguay (Antas, 1994), reaching the Lagoa do Peixe/RS, where they are recorded in large numbers from April to September (Belton, 1984; Sick, 1997; Bencke *et al.*, 2006). There is no evidence of breeding activity in Brazil, but photographic records suggest that the species is present all year round in RS (WikiAves, 2016), possibly represented by non-breeding individuals that are immature and remain in the state until they reach breeding age (FZBRS, 2013). There are records of this species for PR only in October, for SP between June and January, and for RJ specifically in April, June, September, November and December (WikiAves, 2016; MZUSP 101724 [SP, 2016, January]; MNRJ 39058 [RJ, 1994, June]).

#### Spheniscidae

*Spheniscus magellanicus* (MGT): occurs in Chile, Argentina, Uruguay and Brazil. It departs from its breeding site in Patagonia and Tierra del Fuego in April and migrates at each austral winter to the mouth of the Plata River, Uruguayan coast and southern and southeastern Brazil north to the state of RJ (Sick, 1997; ICMBio, 2010). It reaches Brazil in mid-May and departs from the coast in September (Antas, 1987). It is vagrant in northeastern Brazil and records in this region have been increasing (Martínez, 1992), which suggests that this region is an extension of the wintering area of the species, especially since 2008 (Dantas *et al.*, 2013). Photographic and museum records endorse a major Brazilian occurrence of the species in the period between June and December from RS until RJ. Outside this period there are few isolated records to RJ, SC and RS (WikiAves, 2016; MZUSP; MNRJ).

#### Diomedidae

*Thalassarche chlororhynchos* (MGT): breeds on the group of islands of Tristan da Cunha (Tristan da Cunha, Inaccessible, Nightingale, Middle and Stoltenhoff) and Gough Island (Olmos *et al.*, 2006). In Brazilian waters it occurs more frequently from RS to RJ (MZUSP; MNRJ). However, there are records from northeastern Brazil (Olmos *et al.*, 2006), for Sergipe (SE) in June, Alagoas (AL) in May and June (Sousa *et al.*, 2005; MNRJ 36008 [AL, 1988, May]), Pernambuco (PE) in May (Carlos *et al.*, 2005a), MA in

October (Carvalho *et al.*, 2010) and even in PA, in Muaná, in July (WikiAves, 2016). During winter, the number of individuals in oceanic Brazilian waters rises considerably (Neves *et al.*, 2006). Individuals banded at breeding sites were recovered in the states of SP in September, SC in June (Olmos, 2002a) and RS in November (Soto & Riva, 2001).

*Thalassarche melanophris* (MGT): occurs on Southern seas from Cape Horn east to Antipodes Islands and from Campbell Islands south to New Zealand (Carboneras, 1992b). Its breeding season extends from September to April in the Malvinas/Falkland Islands, where the largest breeding colonies of this species are located (Neves *et al.*, 2006) and where most individuals that visit Brazil originate from (ACAP, 2009). Nestlings ( $n = 52$ ) banded on the Malvinas/Falkland Islands were recovered between May and September along the Brazilian coast, most of them south of Arraial do Cabo/RJ (Olmos, 1997), which suggests that the species is more common – though not exclusive – during winter in latitudes superior to 21°S (Olmos, 2002a). These recoveries, alongside sightings in open sea, suggest that records of this species in the southern coast of Brazil are mainly of juveniles (Olmos, 1997) that use the waters over the Brazilian continental shelf as feeding areas (Piacentini *et al.*, 2005). Museum records also confirm the species' presence on the Brazilian coast mainly between May and September at RJ, SP, SC e RS (MZUSP; MNRJ).

*Thalassarche cauta* (MGT): occurs in Tasmania and Auckland Islands, Crozet, Snares, Bounty and Chatham (Carboneras, 1992b) and breeds only on three islands south of Australia: Albatross, Pedra Branca and Mewstone (ACAP, 2009). They also occur in the western South Atlantic, where they are bycatch in pelagic longline fishing in Brazil and Uruguay (Gianuca *et al.*, 2011). It occurs regularly in Brazilian waters, on the continental slope region along RS and SC, since juveniles were recorded in open sea between May and September from 2005 to 2011, one adult in August 2011 (Gianuca *et al.*, 2011) and one photographic record in October for RS (WikiAves, 2016). There is also one record in PR, although the month is not mentioned (Scherer-Neto *et al.*, 2011). Besides these, two other Brazilian specimens remain to be identified (Dénes *et al.*, 2007): one from RS collected in April (Petry *et al.*, 1991) and another from Bahia (BA) in September (Lima *et al.*, 2004a). In this paper we follow CBRO (Piacentini *et al.*, 2015). However, recent data reveals that there is no confirmed record of *Thalassarche cauta* in the Southwestern Atlantic, but of *Thalassarche steadi* instead, suggesting review of these seabirds identification as necessary (Gianuca *et al.*, 2011; Seco-Pon & Tamini, 2013; Jiménez *et al.*, 2015).

*Diomedea epomophora* (MGT): occurs in southern seas and breeds in New Zealand, in the Auckland Islands (99% of the population) and Campbell (ACAP, 2009) from November to March (Neves *et al.*, 2006). After breeding, it migrates across the Pacific and Cape Horn to feed on

the continental shelf of Argentina (including the Malvinas/Falklands) and southern Brazil, where it remains for months before migrating back across the Atlantic and Indian Oceans (Olmos, 2002a; Neves *et al.*, 2006). One chick banded in New Zealand in October 1976 was found dead almost one year later in RS, in August (Sick, 1997). Two specimens captured in RS in July and August were banded in Campbell (Olmos, 2002a) and there are records in April, August, September and November for Rio Grande/RS (WikiAves, 2016).

*Diomedea sanfordi* (MGT): breeds in New Zealand, only in the Chatham Islands and the Otago Peninsula (Taiaroa Head) (Olmos *et al.*, 2006) from September to April. After breeding, it migrates east to the coast of Chile and Peru, where it molts. It then goes around Cape Horn to reach the continental shelf of Argentina (including the Malvinas/Falklands) and southern Brazil before crossing the Atlantic Ocean via the South African coast and migrating through the Austral Ocean to its breeding site (Neves *et al.*, 2006). For RS there are photographic records in the months of May, August (Bencke *et al.*, 2010) and October (WikiAves, 2016) and also as bycatch in the longline fishing fleet of Brazil in August (Carlos *et al.*, 2004a). For SC there is only one record in July 2001 away from the continental shelf (Olmos, 2002b).

*Diomedea exulans* (MGT): occurs across most of the Austral Ocean, from the Antarctic Circle (68°S) to the Tropic of Capricorn (23°S). It breeds in the South Georgia Islands on the Atlantic Ocean, mainly on Bird Island. It also breeds on Prince Edward and Marion Islands, Crozet and Kerguelen Islands, and Macquarie Island, which belongs to South Africa, France and Australia respectively. This species has a long reproductive period (55 weeks) and individuals that nest in the Atlantic migrate east reaching the south coast of Australia and the Pacific Ocean (Neves *et al.*, 2006). Individuals ( $n = 12$ ), mostly nestlings, banded on Bird Island/South Georgia in October were recovered in Brazil mainly in July and September, on the coast of RS or in open sea in RS and SP (Mestre *et al.*, 2010).

*Diomedea dabbenena* (MGT): occurs in the central South Atlantic Ocean and it currently breeds only on Gough and Inaccessible Islands, since it is extinct in Tristan da Cunha (Olmos, 2008). Geolocation data suggests that 14 non-breeding adults used the southwestern Atlantic during the austral summer and migrated to the southeastern Atlantic and Indian Ocean to the east as far as Australia during the austral winter (Reid *et al.*, 2013). Two male specimens banded on Gough Island in January and October were bycatch in longline fishing in Brazil in RS in October and November, respectively (Neves & Olmos, 2001). Records in Brazilian waters for SP (August), SC (November) and RS (October, November) suggest that the species is more frequent in waters under the influence of the Subtropical Convergence away from the coast of RS (Neves & Olmos, 2001). Museum records date for SC in September and RS in June, September and October (MZUSP specimens).



## Procellariidae

*Macronectes giganteus* (MGT): has a circumpolar distribution on southern seas and breeds from October to March in Antarctica and on islands from Chile to Argentina east through subantarctic islands to Heard and Macquarie Islands (Carboneras, 1992c; Olmos *et al.*, 2006; Grantsau, 2010). Adults move only through waters that are adjacent to colonies, but the young perform circumpolar migration across the southern ocean when leaving the nest, with mainly westerly winds, before returning to the colony (Olmos, 2002a; Olmos *et al.*, 2006). Birds banded as chicks and/or juveniles in South Georgia (Bird Island), South Orkney Islands and the Antarctic Peninsula between January and March were recovered in Brazil between June and October in the states of RJ, SC and RS (Olmos, 2002a). Brazilian museum records confirm that pattern from specimens collected in RJ in July (MNRJ) and from SP in June and SC in July (MZUSP). Nestlings ( $n = 10$ ) banded between January and March on Elephant Island were mostly recovered in RS, but also in SC, PR, SP and RJ between June and November and in the Atol das Rocas/RN in February (SNA, 2016). There is one other recovery in Brazil in June without a known locality, which is of a chick banded in Australia in January (Sick, 1997). In addition, there are records of juveniles for RJ, SP, SC and RS between March and November (WikiAves, 2016).

*Macronectes halli* (MGT): breeds on South Georgia, Prince Edward, Crozet, Kerguelen, Macquarie, Auckland, Campbell, Antipodes and Chatham Islands and moves broadly through southern seas, usually between latitudes 30°S and 64°S. It is possible that the young circumnavigate before returning to the colony for the first time (Carboneras, 1992c). In Brazil, there are records for the coast in the states of SP and RS; most are from September to December (Carlos *et al.*, 2005b). There are photographic records for the municipalities of Rio Grande and Tavares in RS between August and October (WikiAves, 2016) and museum records from SP in September and October (MZUSP).

*Fulmarus glacialisoides* (MGT): occurs in the southern seas and breeds in Antarctica and neighboring islands, migrating during austral winter to the southern coasts of Oceania, Africa and South America (Carboneras, 1992c). In Brazil, records are mainly from the southern and southeastern coasts, and can be observed in RS from June to November (Belton, 1984; WikiAves, 2016; MNRJ), in RJ in June (WikiAves, 2016), July and September (MNRJ) and in SP in February, August and September (MZUSP). In BA, one specimen (MZUSP 101816) was collected in Mangue Seco, Jandaíra in July 1994 (Lima, 2006).

*Daption capense* (MGT): breeds on subantarctic islands, in the Peninsula and in continental Antarctica. It begins moving between February and March and reaches Ecuador, Colombia, Mexico and even northern California. On the Atlantic coast, it reaches Uruguay and Brazil, where it

was recorded for northern RJ (Carlos *et al.*, 2004b). Two individuals recovered in Brazil in September (Santos/SP and São Francisco do Sul/SC) were banded in the South Orkneys in February (Sick, 1997; Olmos, 2002a). In addition, one specimen was collected in June 1863 in Cabo de São Roque/RN (Carlos *et al.*, 2004b) and another four in the municipality of Lauro de Freitas/BA in August 1999 (Lima, 2006). There are also records for SC and RS between June and October (WikiAves, 2016). Museum records indicate presence in RS in July (MNRJ) and in SP in July and August (MZUSP).

*[Pterodroma madeira]* (MGT): breeds only on Madeira Island, with an estimated population of only 80-85 pairs before the fire in 2010 that devastated its breeding site (Flood & Fisher, 2013). Geolocation studies suggest that the species is highly dispersive on the Atlantic Ocean, but it visits the Brazilian coast regularly during the non-breeding season (Zino *et al.*, 2011).

*[Pterodroma deserta]* (MGT): moves through the subtropical waters of the Atlantic, returning to the breeding sites on Madeira Island in Portugal in June (Carboneras, 1992c). This species' breeding season extends from early June to mid-November. Its migration starts in November, and wintering areas are usually reached around 10 days later. Geolocation data showed that 17 individuals banded on Bugio Island remained in northern Atlantic waters before laying eggs, incubating and caring for the young. Two wintering areas were identified on the coast of Brazil: one between the states of CE and PE, and another to the south, near the Tropic of Capricorn. Return migration usually starts in the second week of May (Ramírez *et al.*, 2013).

*Pterodroma mollis* (MGT): occurs mainly between latitudes 30°S and 60°S on the Atlantic and Indian oceans and, during winter, in the southern seas below the Tropic of Capricorn (Carboneras, 1992c). Three specimens were found at Cassino beach/RS in September and October (Vooren & Fernandes, 1989). There are also records for SE in May (Carboneras, 1992c), SC in June and two more for the coast of RS in November (WikiAves, 2016). Brazilian museum records indicate the species presence in BA in February, August and September and in SP in May (MZUSP; MNRJ).

*Pterodroma incerta* (MGT): breeds in Tristan da Cunha (Sick, 1997) and moves through the South Atlantic between the South American and African coasts (Carboneras, 1992c). In Brazil, three individuals were collected in RS: one in November 1972 and two in March 1973 (Belton, 1984). Two specimens were collected at Tucuruí Dam in eastern PA in September 1984, 400 km away from the coast (MPEG). This species uses the southern and southeastern coasts of Brazil as a feeding area, but there are also records for the northeastern region (Bugoni, *in press*). There are photographic records for SC in February and June, and only one record for Mangue Seco/BA in June (WikiAves, 2016). For RS state the records are

from the period between October and April (WikiAves, 2016; MNRJ) and in SP the collected specimens are from January, September and November (MZUSP).

*Pachyptila desolata* (MGT): breeds on the islands of Crozet, Kerguelen, Macquarie, Heard, in Auckland, Arco Scotia, South Georgia, South Sandwich, South Shetland and in Antarctica between October and March, and moves through the southern Atlantic, Indian and Pacific Oceans (where it is rarer). After breeding it migrates north, and there are records for Brazil for PE in July (Carlos *et al.*, 2005a) and for Marajó Island/PA in August (Martuscelli *et al.*, 1997). In RS, four specimens were found dead at Cassino beach (in June, July, October and November) and another one was collected to the south of Pinhal in September 1990 (Belton, 1994). There are records in June and July for RS (WikiAves, 2016; MNRJ) and for the Arvoredo Marine Biological Reserve in SC (Naka *et al.*, 2002). In July and August in SP (Martuscelli *et al.*, 1997; MZUSP; MPEG), RJ (MNRJ). In BA, this species is largely recorded throughout the coast between May and July (C.G. Machado, *pers. obs.*) with photographic and museum records, respectively, in June and July (WikiAves, 2016; MNRJ).

*Pachyptila belcheri* (MGT): occurs in the southern Atlantic, Indian and Pacific oceans. Geolocation studies show that the species flies north for as far as 3,000 km after breeding (Carboneras, 1992c). Brazil is used as a wintering area (Martuscelli *et al.*, 1997). There are widespread records on the coast of BA between May and July (C.G. Machado, *pers. obs.*; WikiAves, 2016; MNRJ). In RJ, specimens have been collected in June-August (MNRJ). In SP, the specimens were collected in June-August and October and December (MZUSP; MPEG; MNRJ). In RS, it is considered common in the Cassino beach region, although time of year is not specified (Belton, 1994).

*Bulweria bulwerii* (MGT): has a pantropical distribution and moves through tropical and subtropical waters across the Atlantic, Indian and Pacific oceans. The Atlantic populations migrate to deep equatorial waters between Cape Verde and the Brazilian coast after breeding (Carboneras, 1992). Records in Brazil are quite rare, with only one photographic record for Campos dos Goitacazes/RJ in December (Klein, 2011). However, recent geolocation studies determined that parts of the Brazilian territorial sea are regular wintering areas between August and May (Dias *et al.*, 2015).

*Procellaria aequinoctialis* (MGT): nests on the Malvinas/Falklands and South Georgia on the Atlantic Ocean. It also breeds on Prince Edward and Marion, Crozet, Kerguelen, Auckland, Campbell and Antipodes (Neves *et al.*, 2006). It moves broadly through the three oceans between latitudes 30°S and 55°S. In Brazil, it is more common southern and southeastern coastal regions (Carboneras, 1992c). Data from geolocators and from satellite transmitters showed that ten individuals captured in South Georgia migrated to areas east of the La Plata River estuary in Argentina and wintered between

February and April between Tierra del Fuego and southeastern Brazil until October, when they returned to South Georgia to breed and then lay eggs between November and December (Phillips *et al.*, 2006). In Brazil, there are records for RS in July, August, September, November, December, April and May (Belton, 1984; MNRJ; MZUSP). In April-October at the coast of SP and RJ (Sick, 1997; MNRJ; MZUSP). There are also records for the coast of BA in April and May (WikiAves, 2016), as well as specimens collected in June-August (MZUSP; MNRJ). In PA, the records are from August and September (Sick, 1997; MPEG).

*Procellaria conspicillata* (MGT): breeds on Inaccessible, Tristan da Cunha and Gough Islands (Olmos *et al.*, 2006). It moves broadly on the Atlantic between latitudes 23°S and 36°S, between the South American coast (from southeastern Brazil to Uruguay) and the African coast (Carboneras, 1992c). In Brazil, it occurs on the southern and southeastern coastal regions (Grantsau, 2010), and there are records for RS in September and November, SC in February, June, July, August and November, and for PR, Espírito Santo (ES) and BA in May (WikiAves, 2016).

*Calonectris borealis* (MGT): individuals were equipped with geolocators at three different breeding sites (the Azores, Canary Islands and Mediterranean). Four out of the eight individuals equipped in the Azores and one out of the seven equipped on Canary Islands wintered in the southwestern Atlantic Ocean, associated with the Brazil Current (González-Solís *et al.*, 2007). In February 1971, one specimen banded on Savage Islands (between Canary Islands and Madeira) was found dead in Tramandaí/RS and six other individuals were collected on the same beach (February, March, April, October and December) (Belton, 1984). There are photographic records for almost the entire Brazilian coast from RS to MA between November and June (WikiAves, 2016). Museum specimens were collected in July-August in BA and in January in SP (MZUSP).

*Calonectris edwardsii* (MGT): breeds in Cape Verde, from where it migrates between November and February to winter in little-known areas. On the Brazilian coast, there are records for BA – two individuals were collected at Praia do Forte in June of 1995 (Lima *et al.*, 2002), for SP in May, for PR in December (WikiAves, 2016) and for RS in May (Petry *et al.*, 2000). This characterizes the species as a migrant in the Brazilian open sea. It is probably recorded when flying to the productive waters of the southern platform and Subtropical Convergence (Olmos & Bugoni, 2006).

*Puffinus griseus* (MGT): is a widespread species that occurs on all seas (Carboneras, 1992c; Grantsau, 2010). It nests in Chile, Australia, New Zealand, Tasmania, Malvinas/Falklands and islands around Tierra del Fuego from November to April. It also performs transequatorial migrations outside this period (Cooper *et al.*, 1991; Carboneras, 1992c; Hamilton *et al.*, 1997; Petry *et al.*, 2008). They reach RJ every year and rarely BA during austral

winter (Sick, 1983). The records for Brasil are located in: BA in May, June, October and November (Lima, 2006; WikiAves, 2016; MZUSP); RJ in May, June and October (WikiAves, 2016; MNRJ); SP in May to August (WikiAves, 2016; MZUSP); SC in May-June (WikiAves, 2016) and RS in different months with a population peak in July (Petry *et al.*, 2008).

*Puffinus gravis* (MGT): breeds on the Malvinas/Falklands, Tristan da Cunha and Gough (November to April) in southern Atlantic waters (Carboneras, 1992c). Its transequatorial migration begins in April and it returns to the colony in September (Harrison, 1983). This species comes near the Brazilian coast between April and May, when it is flying from the south to the north (Sick, 1997). It is recorded for the northeastern region of Brazil between May and June (Carboneras, 1992c), and for RS in August, October and November, as well as March and May (Petry *et al.*, 2008). Most records are from April to July for the southern and southeastern regions, but there are also records for BA (WikiAves, 2016; MNRJ; MZUSP).

*Puffinus puffinus* (MGT): breeds on the sea of Ireland and stays on the South American coast during boreal winter from December to March (Guilford *et al.*, 2008), especially between Brazil and Argentina, according to data from bands and satellite transmitters (Carboneras, 1992c). This species performs transequatorial and transatlantic migrations. Data from 12 geolocators suggests that migration southwards is through the western African coast, across to the Brazilian coast by the shortest route and then to the south and southwest to winter near the coast of Argentina, south of the La Plata River. The return to the north tends to go through a short westward route through the eastern Caribbean to the east coast of the USA and then through the North Atlantic. All individuals made stops ranging from a couple of days to two weeks in different places and dates (Guilford *et al.*, 2009). Individuals banded in Wales, Ireland and Scotland in July, August and September were recovered in 13 Brazilian states, especially in the southern and southeastern regions of the country, in SC, SP, RS and RJ in September, October, November and December (Mestre *et al.*, 2010). In Brazil, museum records are from September-December in RJ, SP and RS, and in BA there are isolated records in July and November (MZUSP, MNRJ).

*Puffinus lherminieri* (MGT): its movements are little known. It occurs in Bermuda, Caribbean, Galápagos Islands, Pacific Ocean, Indian Ocean, Arabian Sea and, in Brazil, throughout the southeastern and northeastern coasts (Efe & Musso, 2001; Silva-e-Silva & Olmos, 2010). In Brazil, it currently breeds only on Morro da Viúvina and Morro do Leão Islands in Fernando de Noronha/PE. The Brazilian population is restricted to 30 fully grown individuals and tends to stabilize, with no signs of influx from individuals from foreign populations (Efe & Serafini, *in press*). Data from banding and recapture of the young and of adults confirms nest fidelity; the species returns to breed with the same partner every year (Efe, 2004).

## Hydrobatidae

*Fregetta grallaria* (MGT): occurs in tropical and subtropical seas of the Southern Hemisphere. It breeds on the islands of Lord Howe, Kermadec, Tristan da Cunha, Gough, St. Paul, Amsterdam, Juan Fernandez and Austral (Rapa Island). It apparently migrates to lower latitudes and reaches the Brazilian coast (Carboneras, 1992c; Olmos, 2000a), where it occurs in open sea between RJ and BA in October (Coelho *et al.*, 1990; Sick, 1997).

*Fregetta tropica* (MGT): after breeding on Antarctic and subantarctic islands, migrates north to subtropical and tropical zones, reaching most of the Brazilian coast (Carboneras, 1992c). The subspecies *F. t. tropica*, which occurs in Brazil, breeds on South Georgia, South Shetland and South Orkney Islands to the east as far as the Antipodes. It uses Brazil as a wintering area (Grantsau, 2010) and there are records for the coast of BA in January (Olmos, 2000b) and for RS (Petry *et al.*, 2016), where it was photographed in November 2011 (WikiAves, 2016).

*Oceanites oceanicus* (MGT): breeds on subantarctic islands from Cape Horn east to Kerguelen Islands, and on southern seas on South Shetland and South Sandwich islands and the Antarctic coast (Carboneras *et al.*, 2016). It has been mainly recorded between April and November for several places on the Brazilian coast, from BA to RS (Belton, 1984; MZUSP; MNRJ; WikiAves, 2016). However, there are isolated records for RN in January and for BA in March (WikiAves, 2016; MZUSP).

*Oceanodroma leucorhoa* (MGT): after breeding in the Northern Hemisphere and in South Africa, its populations migrate mainly southwards as far as the Cape of Good Hope. Part of the population overwinters on the equatorial coast of Brazil (Carboneras, 1992c), and there are records from Amapá (AP) to SP without defined dates (Grantsau, 2010), except for those on the coast of RN that are from January 2015 (WikiAves, 2016) and for some specimens collected in AP in February and May, for PA in January and February, and in CE in January (MZUSP; MPEG).

## Pandionidae

*Pandion haliaetus* (MGT): occurs on all continents except Antarctica and is migratory across most of its distribution. It migrates from the Northern Hemisphere to the Amazon Basin and the northern coast of South America between August and November and from Florida to South America through the Caribbean (Poole *et al.*, 2014). The subspecies *P. h. carolinensis* is a migrant from the north that occurs in Brazil at a higher rate between the end and the beginning of the year, but it can be found there throughout the year (WikiAves, 2016), since immature individuals can remain in the country at least for the first three years of their life (B. Whitney, *pers. obs.*). Breeding in South America has not been reported, but individuals carrying sticks have been seen, which can be regarded as "learning or practicing" breeding behavior as seen in



the Northern Hemisphere (B. Whitney, *pers. obs.*). Some 28 individuals banded in the USA were recovered in AM; one individual born near New York was collected in Ilhéus/BA (August); two chicks banded in Maryland, USA (July) were recovered in Mato Grosso (MT) (September) and on the Madeira River/AM (October) (Sick, 1997). This species is recorded throughout the year near Manaus, but it is very common from September to March (Stotz *et al.*, 1992). In addition, individuals banded in North and Central America in June and July were recovered in Brazil in 17 different states – AP, RR, AC, Rondônia (RO), AM, PA, MT, MS, Goiás (GO), MG, MA, CE, PB, BA, RJ, SP and PR – especially from October to January (Mestre *et al.*, 2010). Specimens have been collected in Brazil from August to May (MZUSP; MNRJ; MPEG).

### Accipitridae

*Harpagus diodon* (MGT): breeds from August to April in the Atlantic Forest and in forest fragments in the Cerrado, and overwinters mainly in the equatorial forests of the Amazon Basin with some individuals staying further north in the Guiana Shield (Cabanne & Seipke, 2005; Lees & Martin, 2014). The species needs to be better studied in the Atlantic Forest in the northeastern region of Brazil to determine if records in austral winter are of a resident population, vagrant individuals (Lees & Martin, 2014) or overwintering individuals from the south (B. Whitney, *pers. obs.*). In RS, where it is considered rare, there are records in October, November and May (Belton, 1994).

*Ictinia mississippiensis* (MGT): occurs in southern central USA from Kansas, Arizona and New Mexico south to Florida (White & Marks, 2016). It breeds in North America and overwinters in South America (Ferguson-Lees & Christie, 2001), especially in Paraguay, southeastern Bolivia, southwestern Brazil and northeastern Argentina (White & Marks, 2016). It breeds in North America between May and July and pre-migration flocks gather in early August in groups of 200-300 birds that move south in early September (Thiollay, 1994). The migration south between September and November seems to be through the foothills of the Andes as far as the Amazonian lowlands (Stotz *et al.*, 1992). From December to February, the species is found in central South America, where the Chaco forest is its main wintering site (Juhant & Areta, 2013). The migration north occurs from late February to April departing from central and northern Argentina, over the Colombian Andes (Juhant & Areta, 2013). In Brazil, this pattern is supported by records from RO, MT, MS, PR and RS (WikiAves, 2016) and by data from AM, PA and MG (Stotz *et al.*, 1992; Vasconcelos *et al.*, 2008a, 2011) that are restricted to the period between September and March. The scarce records of this species for South America during austral winter are of juvenile individuals (Juhant & Areta, 2013) that probably got lost during migration (Bildstein, 2004).

*Buteo platypterus* (MGT): breeds from central Canada to southern USA and virtually its entire population (except

birds from southern Florida) migrates to South America during boreal winter and reaches northwestern Brazil, with some of the birds covering up to 8,800 km (White *et al.*, 1994) in very large flocks (Bildstein, 2004). In Brazil, it occurs mainly in the Amazon Basin, but there are some records in the Cerrado and the Atlantic Forest, with no apparent flocks forming. It can be observed from October to March in the Amazon region and in the Pantanal (in spite of one record for MT in June), and in the southeastern and southern Atlantic Forest – in RJ, MG, PR, SC and RS – from November to January (WikiAves, 2016; MNRJ; MZUSP, MPEG).

*Buteo swainsoni* (MGT): breeds in central and western North America and migrates to South America in boreal winter, especially to northern Argentina, southern Brazil and Paraguay (White *et al.*, 1994). It apparently moves through the inland of the continent heading to the Pampas in Argentina, Uruguay and Brazil and it overwinters on the Atlantic coast in southern Brazil (Antas, 1987; Sick, 1997). It is suspected that age separation exists since there is a great concentration of juveniles in Argentina (White *et al.*, 1994) and of immature individuals in Brazil (Sick, 1997) during boreal winter. Studies with satellite transmitters showed that this species gathers on the eastern coast of Mexico and flies from there mainly along the Pacific coast and eastern Andes until it reaches central Argentina, and there are some localized records for instance for RR (Stotz *et al.*, 1992; White *et al.*, 1994). Radio-satellite data showed that the northbound and southbound migration routes use similar paths comprised almost entirely of continental stretches, except in Central America, where some coastal stretches are used (Fuller *et al.*, 1998). One individual banded in Oklahoma (USA) was recovered in AC in February and one chick banded in Alberta (Canada) in August was recovered in November of the same year in RS (Belton, 1984; Sick, 1997). This species can be observed in Tocantins (TO) in March and August (Dornas & Pinheiro, 2011) and in RJ, SP, PR, SC and RS between November and January, and a flock of over 100 individuals has also been reported in AM in November (WikiAves, 2016). Additionally, there is one collected specimen from SC in October (MZUSP 92336).

### Charadriidae

*Pluvialis dominica* (MGT): exhibits an elliptic pattern of migration. After breeding in the tundra of northern Canada and Alaska, it migrates to Hudson and James Bay in August, from where it crosses the Atlantic – on a non-stop flight when climate conditions are favorable (Wiersma, 1996) – following a coastal pathway until it reaches its wintering area in southern South America in early September, namely the Pampas of RS, Paraguay and Argentina, with records of some individuals reaching Tierra del Fuego regularly (Wiersma, 1996; Morrison *et al.*, 2008). During the non-breeding season from September to April, it was recorded in all Brazilian states except MA, PB, SE, BA and ES (WikiAves, 2016). There are population



peaks in October and December on the beaches and lagoons in RS (Vooren & Chiaradia, 1990; Dias *et al.*, 2011), large numbers of individuals in November and December in the Paraíba do Sul River Valley in SP (Crozariol, 2011), in the Amazonian region between September and March, presenting peaks in October and November in Manaus/AM and in September and October in RR (Stotz *et al.*, 1992). The species begins its return to the breeding site between January and April through inland South and Central America (Sick, 1983; Wiersma, 1996), quickly reaching northern South America, and going from there to southern USA through the grasslands as far as Canada (Antas, 1987).

*Pluvialis squatarola* (MGT): breeds in the Arctic, in the tundra in northern Canada, Alaska and Russia. It leaves its breeding areas heading south between July and September, and juveniles depart 5 to 6 weeks after adults. In general, this species reaches the coast of Guyana and then the Gulf of Maranhão during fall migration. The return from its wintering areas (coasts of North, Central and South America) occurs between April and mid-May (Wiersma, 1996). Although there are localized records in November for the Marchantaria and Anavilhanas Islands (Stotz *et al.*, 1992), most records are associated with coastal areas throughout the Brazilian coast and are centered in the period between September and May (WikiAves, 2016; MZUSP; MPEG; MNRJ). There are records in all months of the year for RS, but the species is recorded mainly from September to April in this state (Belton, 1994).

*Charadrius semipalmatus* (MGT): departs from breeding sites in Canada between July and September (adults fly before juveniles) and overwinters on the coast and on all major islands from North, Central and South America. It reaches South America between September and early November and returns from April forward. In boreal spring, Delaware Bay, USA is an important stopover area, where around 70% of the population meets to prey on larvae of the horseshoe crab *Limulus polyphemus* (Wiersma, 1996). As part of its pathway, it flies across Brazil from São Luís and the mouth of the Parnaíba River to the Baía de Todos os Santos (Antas, 1983), reaching the coast of SP in late August and early September, where it remains during spring and the beginning of summer. The number of individuals begins to decrease in mid-April when adults return to the Northern Hemisphere for breeding and only juveniles remain. It is suggested that the municipality of Ilha Comprida/SP is one of the stopover areas for foraging and resting during the return migration to the Northern Hemisphere (April) and to foraging areas in the Southern Hemisphere (September) (Barbieri *et al.*, 2000). The species appears to be present in Lagoa do Peixe/RS throughout the year, reaching as many as 300 individuals in March (Belton, 1984). There are records for the Amazon Basin in Macapá/AP, Manaus/AM and PA between September and December (Stotz *et al.*, 1992; Campos *et al.*, 2008; Cintra *et al.*, 2011; Silva, 2011b; Valente, 2011).

*Charadrius modestus* (MGT): breeds in southern South America, on the Malvinas/Falklands, and departs between March and April to its northern wintering areas, which includes Buenos Aires, Argentina and the southern and southeastern regions of Brazil (as far as RJ), and returns between August and September (Belton, 1984; Wiersma, 1996; Azpiroz *et al.*, 2012). It apparently exhibits two migratory routes: one over the Pacific and another over the Atlantic (Blanco *et al.*, 2004). Records confirm the presence of this species between April and August in RJ, SP, PR, SC and RS (Cestari, 2008; Ghizoni-Jr. & Azevedo, 2010; Simpson & Simpson, 2011; WikiAves, 2016; MZUSP).

*Oreopholus ruficollis* (MGT): the subspecies *O. r. ruficollis* breeds in southern South America, on Chilean coastal islands and in Tierra del Fuego. It migrates in March-April to Ecuador and extreme southern Brazil (Sick, 1997), reaching RS between May and July (Belton, 1984) and possibly reaching SC and RJ, and returning to its breeding sites between August and September (Wiersma *et al.*, 2016). There are records for RJ in May, SC in June and RS from April to August, which confirms this pattern (Maciel & Blanco, 2014; WikiAves, 2016).

## Chionidae

*Chionis albus* (MGT): breeds on the Antarctic Peninsula, on South Shetland, Elephant, South Orkney and South Georgia islands and probably on South Sandwich Islands (Harrison, 1983). Most individuals depart from the breeding site between late April and early July and although its migratory routes are little known, its main wintering areas seem to be the Malvinas/Falklands, Tierra del Fuego and southern Patagonia, with some individuals reaching Uruguay (Burger, 1996). Burger (1996) suggests that this species is vagrant in Brazil, as Accordi & Hartz (2013) classified it for RS, where it was recorded for the first time in May 1973 (Belton, 1974). However, its occurrence is limited to the period between April and August in the southern states of PR, SC and RS (Dias *et al.*, 2010a), which is also illustrated by photographic records available for RS (WikiAves, 2016).

## Scolopacidae

*Limnodromus griseus* (MGT): females depart before males and juveniles from breeding areas in Alaska, USA and Canada in early July, and the species overwinters in the USA, Central America and the coast of South America (van Gils & Wiersma, 1996). It seems that individuals fly non-stop when migrating south from North America and across the Atlantic to Suriname, where there are population peaks between September and November; when migrating north, its route seems to go through the coast of Guyana and from there across the Atlantic (Rodrigues, 2000). The species seems to use the coast of MA as a stopover area before flying south between September and December to the wintering areas (Carvalho & Rodrigues, 2011). Records confirm this species' presence in Brazil for

PA, MA, PI, CE, RN, SE, BA, RJ and RS mainly from October to March (WikiAves, 2016; MZUSP, MPEG, MNRJ). There are also records between April and September for AP, PA, MA, PI, CE, RN and BA (WikiAves, 2016; MZUSP, MPEG, MNRJ), probably of non-breeding individuals, since several one-year-old shorebirds mostly stay on wintering grounds through first summer (Cristol *et al.*, 1999).

*Limosa haemastica* (MGT): after breeding in the Arctic, a large part of its population gathers along Hudson Bay and James Bay in Canada between late July and mid-August (van Gils & Wiersma, 1996). The species crosses the Atlantic and reaches northern South America, including the Amazon Basin, at the Sustainable Development Reserves of Mamirauá (Melo *et al.*, 2011), Amanã (Santos *et al.*, 2011) and Piagaçu-Purus (Cintra *et al.*, 2011), Anavilhanas National Park (Cintra & Rosas, 2011), Alto Guaporé region (d'Horta, 2011) and the Pantanal (Poconé/MT; Cintra, 2011) between September and November. From October to April, the species reaches southern Brazil in SP, PR, SC and RS (Vallejos *et al.*, 2011; Krul *et al.*, 2011; Ferreira *et al.*, 2011; Fedrizzi & Carlos, 2011; Dias, 2011; Barbieri, 2011; MZUSP), in addition to Uruguay and Argentina. Over 1,000 individuals use the Lagoa do Peixe National Park as a stopover site during migration (Belton, 1994; Nascimento, 2011), but their main wintering areas are in extreme southern South America, Tierra del Fuego and southern central Chile. The young appear to depart after the adults, and the return to the north from April onwards is completed with use of little or no (Harrington *et al.*, 1986) stopover sites (van Gils & Wiersma, 1996).

*Numenius borealis* (MGT): an extinct species that bred in the inland Canadian Arctic and northern central Canada. Millions of individuals gathered on stopover areas throughout the countryside in the USA. In South America, its wintering areas were in the Argentinean Pampas, and it was first recorded in early 19<sup>th</sup> century in Brazil with specimens collected in Ipanema/SP in September-October and also for AM and MT between September and November (Pelzeln, 1870; Sick, 1997).

*Numenius hudsonicus* (MGT): breeds in Alaska and Canada and migrates to southern USA and South America during boreal winter (van Gils & Wiersma, 1996). During this migration south, which occurs from September to November, it reaches Suriname and then follows to the Gulf of Maranhão, where there are population peaks between December and February (Rodrigues, 2000). Large gatherings were also recorded on the Reentrâncias Paraisens Environmental Protection Area (Rodrigues & Carvalho, 2011a), and 10,879 individuals were recorded between Belém/PA and São Luís/MA in January 1982, 1983 and 1986 (Morrison & Ross, 1989). During the migration north from March to May, there is a population peak on Caranguejo Island/MA (Carvalho & Rodrigues, 2011). There are records for Brazil from AP to RS, as well as on Fernando de Noronha/PE (Sick, 1997) throughout the year (WikiAves, 2016), which represents non-breeding

individuals, since some one-year-old shorebirds mostly stay on wintering grounds through first summer (Cristol *et al.*, 1999).

*Bartramia longicauda* (MGT): breeds in Alaska, southern Canada and northern USA, and overwinters in Suriname, Paraguay, southern Brazil, northern Argentina and Uruguay (van Gils & Wiersma, 1996). After breeding, it migrates between August and September from central North America to grasslands in central and eastern South America through the Amazon Basin (Capllonch, 2011), where it is recorded in small numbers between October and February on Marchantaria Island/AM and in RO (Stotz *et al.*, 1992). It overwinters in the Pampas in southern Brazil (Di Giacomio & Krapovickas, 2005) and the Pantanal (Morrison *et al.*, 2008). Photographic records associated to literature data suggest the species occurs in all of Brazil between September and April (Belton, 1984; Cintra, 2011; Cintra & Rosas, 2011; d'Horta, 2011; Melo *et al.*, 2011; Nunes *et al.*, 2011; Schunck, 2011a, b; Silva, 2011a, b, c; Vallejos *et al.*, 2011; WikiAves, 2016; MZUSP; MPEG).

*Actitis macularius* (MGT): widely distributed in North America, where it nests in open areas close to water bodies and reservoirs. It overwinters in southern USA, Central America and southern South America as far as northern Chile and Argentina (van Gils *et al.*, 2016a). It was recorded in September and November for RR and from July to May for Manaus and Marchantaria Island/AM (Stotz *et al.*, 1992), as well as for RS (Belton, 1984). It visits the Central Plateau from August to October (Negret, 1988). There are recent photographic records for all Brazilian states between September and May. Scarce records between June and August (WikiAves, 2016) are probably of juveniles, since some one-year-old shorebirds mostly stay on wintering grounds through the first summer (Cristol *et al.*, 1999).

*Tringa solitaria* (MGT): breeds in North America and migrates to Central America during boreal winter (including the Antilles and Bahamas) and to the south as far as southern Argentina (van Gils & Wiersma, 1996). Individuals banded in Canada and the USA in July and August were recovered in the northern and northeastern regions of Brazil (as far as northern BA) in October, November, December and January (Mestre *et al.*, 2010). The species seems to be resident in the northern Amazon Basin in Macapá/AP (Campos *et al.*, 2008). It is common near lakes and rivers in the Amazon Basin and can be seen near Manaus/AM from July to April (Stotz *et al.*, 1992), rarely in flocks (van Gils & Wiersma, 1996). It overwinters in or uses the Pantanal as a stopover ground (Nunes & Tomas, 2008) and it is recorded for RS between September and April (Belton, 1984). It appears in Brazil only from August to May in all states. There are some scarce records during the austral winter (WikiAves, 2016; MZUSP; MNRJ; MPEG), but they are probably of juveniles, since some one-year-old shorebirds mostly stay on wintering grounds through their first summer (Cristol *et al.*, 1999).

*Tringa melanoleuca* (MGT): breeds from Alaska to eastern Canada and flies through James Bay, British Columbia, Mexico, Central and South America as far as Tierra del Fuego during spring (Piersma *et al.*, 1996). It is a migrant that presents records from August to November for Manaus/AM and Marchantaria Island/AM; it is common during fall, there are small numbers during winter, and only occasional records in spring (Stotz *et al.*, 1992). During the migration south, it occurs in the Pantanal (Morrison *et al.*, 2008) and records suggest that it also flies over the central region of Brazil when returning to the Northern Hemisphere, which reinforces the importance as stopover grounds in the plains and basins of the Tocantins and Araguaia Rivers (Crozariol *et al.*, 2012). The species occurs in all months of the year in Brazil (WikiAves, 2016). Its occurrence during winter months is probably due to immature, non-breeding individuals that remain on wintering areas all year round (van Gills & Wiersma, 1996).

*Tringa semipalmata* (MGT): breeds in North America and presents population peaks in both Suriname and the Gulf of Maranhão during the migration south between September and November, which suggests that the species goes over the coast of French Guiana, from where it crosses the Atlantic Ocean on a non-stop flight (Rodrigues, 2000). It flies over the continent between São Luís and the mouth of the Parnaíba River to the Todos os Santos Bay, BA (Antas, 1983). It exhibits patterns of seasonal abundance on Caranguejo Island/MA with a population peak during spring migration between March and May (Carvalho & Rodrigues, 2011). Photographic records reveal the occurrence of this species along the Atlantic coast of the entire Brazilian territory throughout the year (WikiAves, 2016). However, scarce records during winter months (from May to July) are probably related to juveniles, since some one-year-old shorebirds mostly stay on wintering grounds through the first summer (Cristol *et al.*, 1999).

*Tringa flavipes* (MGT): breeds from May to August from Alaska to southern central Canada as far as James Bay in Canada. It flies through eastern Canada, inland USA and the Atlantic coast, going over Mexico, Antilles and Bahamas to South America, reaching as far as Tierra del Fuego (van Gils *et al.*, 2016b). In Brazil, the species occurs in the entire national territory and there are records for AM from July to February (Stotz *et al.*, 1992), for the Pantanal during the migration south (Morrison *et al.*, 2008) and for RS in all months, especially between September and March (Belton, 1984). Despite being found throughout the year in Brazil (WikiAves, 2016; MZUSP, MNRJ, MPEG), records during winter in June and July are probably of juveniles, since some one-year-old shorebirds mostly stay on wintering grounds through the first summer (Cristol *et al.*, 1999).

*Arenaria interpres* (MGT): breeds in Alaska and the Canadian Arctic and flies along the Pacific and Atlantic coasts to winter on the coast in the Americas, reaching the

entire Brazilian coast and Uruguay. There are large gatherings in Delaware Bay, USA, but the species migrates in small flocks. Juveniles depart around one month after the adults, that is, from mid-August to September (van Gils & Wiersma, 1996; Araújo *et al.*, 2014). During fall migration from September to November, the species first reaches the coast of Guyana and then migrates to the Gulf of Maranhão; during spring migration from March to May, it performs transoceanic flights from the coast of MA to North America (Rodrigues, 2000). In Brazil, it is seen all year round in some places: Lagoa do Peixe/RS (Belton, 1994), the coast of PE (Azevedo-Júnior *et al.*, 2001), Mangue Seco/BA (Lima, 2006) and Caranguejo Island/MA (Carvalho & Rodrigues, 2011). Data from banding and recapture shows that the individuals that winter in PE originate from the east coast of the USA (Azevedo-Júnior *et al.*, 2001).

*Calidris canutus* (MGT): breeds in the Canadian Arctic. It gathers in great numbers in Delaware Bay, USA and migrates southwards, reaching the Brazilian coast, as well as Tierra del Fuego and Patagonia, where it stays during the non-breeding season. Some individuals may overwinter in French Guiana or Venezuela (van Gils & Wiersma, 1996; Baker *et al.*, 2005). After leaving the breeding area, the species flies south crossing over or stopping in the mid-Atlantic coast of the USA and on the Antilles, before reaching Brazil. One individual with a geolocator overwintered on the northern coast of Brazil, on the border between MA and PA. Another went south through MA and overwintered around 1,100 km east, and a third one stopped in MA for 12 days and then stopped again at Lagoa dos Patos/RS and went on to overwinter in Argentina. The return flight of this last individual was through the Pantanal (Niles *et al.*, 2010). Population peaks are recorded in the Gulf of Maranhão: a large number of individuals arrive during fall migration from September to November (Carvalho & Rodrigues, 2011) and during spring migration from March to May, which suggests transoceanic flights from the coast of MA to North America (Rodrigues, 2000). In RS, over 20,000 individuals were seen using the Lagoa do Peixe National Park and the Pinhal region as stopover grounds during their migration north. Banding data suggests that the flight between the southern coast of Brazil and Midwestern USA is a direct one (Harrington *et al.*, 1986) that lasts approximately 13 days – 7,600 km (Sick, 1997). Ilha Comprida/SP is also a stopover site used for resting and feeding during the return migration (Barbieri & Paes, 2008), as well as the mangroves from Mangue Seco/BA, where the species was recorded in mid-April (Lima, 2006). There are recent photographic records for almost all coastal states and they are centered on the period between September and April (WikiAves, 2016).

*Calidris alba* (MGT): breeds in the northern Arctic. Its wintering area extends from California to northern Chile on the Pacific and from the north coast of Brazil to Argentina on the Atlantic (Antas, 1987). It is one of the species that flies the longest distance during migration: around



20,000 km from the Arctic to RJ, and then more 5,000 km to Tierra del Fuego (Sick, 1997). During fall migration from September to November, the species reaches the coast of Guyana and then migrates to the Gulf of Maranhão, from where it leaves to perform transoceanic flights back to North America during spring migration from March to May (Rodrigues, 2000). Most individuals that overwinter (from December to February) in Peru and Chile perform a continental clockwise flight by migrating north along the Pacific coast and returning south along the Atlantic coast. There are three main flyways for its return across North America: (a) through the Pacific coast, (b) through the Gulf of Mexico and Great Lakes region, and (c) through the Atlantic coast (Myers *et al.*, 1985). The species exhibits fidelity to Coroa do Avião/PE, where recovered individuals show the link between migratory sites in PE and Lagoa do Peixe/RS, MA and the USA through field-readable colored bands (Lyra-Neves *et al.*, 2004). There are records from October to December for Marchantaria Island/AM and for the area surrounding the Solimões River (Stotz *et al.*, 1992). During both migrations north and south, it is present in large quantities in Ilha Comprida/SP, a stopover ground used for resting and feeding (Barbieri & Paes, 2008). Beaches in RS were recognized as the most important wintering areas for this species on the Atlantic coast of South America (Morrison & Ross, 1989). There are records all year round for Lagoa do Peixe/RS, approaching 6,000 individuals in November/December (Belton, 1994). There are recent records for all coastal states, as well as some occasional ones in GO, MG and AM. Most records are from September to April, although the species can be found throughout the year in Brazil (WikiAves, 2016). Some individuals remain in the wintering areas in South America during the breeding season from June to July (Myers *et al.*, 1985; van Gils & Wiersma, 1996),

*Calidris pusilla* (MGT): breeds in northern Canada and Alaska, and overwinters mainly in South America (Gratto-Trevor & Dickson, 1994). It flies non-stop for as long as 4,000 km and is known to form flocks of 350,000 individuals. The species presents high fidelity to its breeding sites, but little is known about its wintering areas. Around 2/3 of the juveniles remain in non-breeding areas throughout the year (van Gils & Wiersma, 1996). Long-distance migration between the wintering area in the Southern Hemisphere and the breeding area in high latitudes from the Northern Hemisphere are interspersed with long stopover periods for energy storing, especially in Delaware Bay on the east coast of the USA, where it usually begins to arrive in early May and remains until early June (Mizrahi *et al.*, 2012). In the Amazonian region, there are records throughout the year for PA and AP (Stotz *et al.*, 1992; Campos *et al.*, 2008; WikiAves, 2016) with a population peak in AP in November and December (Campos *et al.*, 2008). There are recent records in all coastal states (WikiAves, 2016). It is recorded all year round in PE, CE and MA and there are population peaks on Caranguejo Island/MA during the fall migration from September to November due to the arrival in northern Brazil

of migrants originating from stopover sites in northern South America (Carvalho & Rodrigues, 2011; WikiAves, 2016). The species can be observed in other states in northeastern Brazil (PI, CE, RN, PB, PE, AL, SE and BA) from August to April (Azevedo-Júnior *et al.*, 2001; Cardoso & Nascimento, 2007; Cardoso & Zappellini, 2011; WikiAves, 2016; MZUSP; MPEG; MNRJ). There are population peaks between November and February in SE (Almeida & Ferrari, 2010) and in March in the Piaçabuçu Environmental Protection Area/AL (Cabral *et al.*, 2006). It is also recorded from August to April for the states in the southeastern and southern regions (WikiAves, 2016; MZUSP).

*Calidris minutilla* (MGT): breeds from Alaska to Quebec, including Newfoundland and Nova Scotia, and migrates through inland North America, reaching the southern USA, Antilles, Gulf of Mexico and northeastern South America (van Gils & Wiersma, 1996). Migration between the wintering area in the Southern Hemisphere and the breeding area is interspersed with long stopover periods for energy storing, especially in Delaware Bay on the eastern coast of the USA, where they start arriving in mid-April and depart from around the third week of May (Mizrahi *et al.*, 2012). There are records from August to April in the Amazonian region for AM, RR, AP and PA (Stotz *et al.*, 1992; Campos *et al.*, 2008; Cintra & Rosas, 2011; Cintra *et al.*, 2011; Santos *et al.*, 2011; Silva, 2011a, b; Valente, 2011; WikiAves, 2016), as well as for MA, PI, CE, RN, PB, PE, AL, SE and BA on the northeastern coast (Sick, 1997; Albano & Girão, 2011; Azevedo-Júnior & Larrazábal, 2011a; Cardoso & Zappellini, 2011; Girão & Albano, 2011a; Irusta & Sagot-Martin, 2011; Santos, 2011; Serrano, 2011; WikiAves, 2016) and for the coast of RJ, SP, SC and RS (Crozarior, 2011; Santos & Alves, 2011; WikiAves, 2016). It was recorded in September for MT (Cintra, 2011; d'Horta, 2011) and in May for AP (MPEG).

*Calidris fuscicollis* (MGT): breeds in the Canadian Arctic and migrates to wintering areas in Patagonia. It flies from northeastern North America over the Atlantic Ocean to northern South America and reaches the Guianas in late August, where they remain until mid-September. It moves gradually through the northern coast of South America to areas southeast of the mouth of the Amazon River, when it enters the continent and flies for approximately one month until it reaches Paraguay and RS between mid and late October (Harrington *et al.*, 1991). Some individuals remain during the entire summer in this locality and there are peaks of nearly 7,000 individuals in November and December in Lagoa do Peixe/RS (Belton, 1994), but the main non-breeding area for this species is in southern Argentina and Chile, where it arrives in mid-September, October and November. During its migration to the most meridional regions of South America, it can fly over the Amazon Basin and other humid areas in the country – using the Pantanal as a stopover area (Nunes & Tomas, 2008) – before it reaches Lagoa do Peixe/RS and Tierra del Fuego in Argentina (Barbieri & Paes, 2008). Spring migration starts in late March and early April and seems to be done in long flights. Eventually, it uses Ilha Comprida/

SP as a stopover ground for resting and feeding (Barbieri & Paes, 2008) on its way to North America, where it likely stops to obtain enough fat reserves to accomplish a direct flight to the Canadian Arctic between late May and mid-June, and then breed (Harrington *et al.*, 1991). There are records centered in the period between August and May for almost all states in Brazil that are scarce in June and July and restricted to BA, SC and RS (WikiAves, 2016), probably represented by young non-breeding individuals, since some one-year-old shorebirds mostly stay on wintering grounds through their first summer (Cristol *et al.*, 1999). There is also one museum record for SP in June (MZUSP 2094).

*Calidris bairdii* (MGT): breeds in northern North America, departs in mid-August from its breeding grounds to winter in South America, and returns in late June (Steeves & Holohan, 1995). Its migration occurs especially through the inland, through grasslands in North America, the Rocky Mountains and Andes. Females depart first and are followed by the young (van Gils & Wiersma, 1996). Two individuals banded in the USA and Canada were recovered in the estuary of the Amazon River in January and April (Sick, 1997) and there are also other records for this locality in September (Melo *et al.*, 2011; Santos *et al.*, 2011). There is evidence that this species uses the Pantanal as a stopover site (Nunes & Tomas, 2008). Photographic records are restricted to RS, where it is recorded between September and April (Belton, 1984; Dias, 2011; WikiAves, 2016). There is just one museum record for SP in May (MZUSP 102373).

*Calidris melanotos* (MGT): breeds on the northern coast of North America, from western and northern Alaska to northern central Canada, to Hudson Bay, as well as in northwestern Siberia. It migrates south during winter and reaches from southern Bolivia, Paraguay and northern Argentina to southern South America and southeastern Australia and New Zealand (van Gils & Wiersma, 1996). Its migration seems to be elliptic because it moves south over the western Atlantic Ocean and returns through central regions of North America. Its wintering area includes the entire Pantanal (Nunes & Tomas, 2008) and the area south of it, which makes this the second most numerous Nearctic shorebird species in a census taken in these plains (Morrison *et al.*, 2008). There are photographic records for almost all of Brazil, but records for the northeastern region are quite scarce and restricted to September, October and February. Records in the Amazonian region are restricted to the period between August and December and those in the southeastern and southern regions are distributed from September to April (WikiAves, 2016). Museum records are distributed irregularly across several states but restricted to the period between August and November (MZUSP; MNRJ, MPEG).

*Calidris himantopus* (MGT): breeds in northern Alaska east to Victoria Island and west and south to Hudson Bay in Canada. It migrates to South America (northern Chile,

Bolivia, Brazil, northern Argentina and Uruguay) in winter and small populations winter in southern USA (van Gils & Wiersma, 1996). Its flyway seems to go from Venezuela straight to the Upper Amazon and Central Brazil, reaching the Atlantic coast in RS (Sick, 1997). Females start migrating from the second week of July on, males start a week after, and juveniles only in mid-August. The return flight is over the coast of Colombia and Venezuela. It reaches the USA in April and the breeding areas in Canada in late May. Males arrive two days before females. Some individuals remain in the wintering areas all year round, but they usually migrate in groups as large as hundreds of individuals (van Gils *et al.*, 2016c). In Brazil, records are centered in the period between September and April and show the presence of this species in Amazonian regions – AM, PA and RO (WikiAves, 2016; MZUSP; MPEG) – in southeastern and southern Brazil – RJ, SP, PR, SC and RS –, in the Pantanal – MT and MS –, and in CE, RN and PE in northeastern Brazil (WikiAves, 2016).

*Calidris subruficollis* (MGT): breeds in the central and western Arctic and migrates from late July to mid-September to wintering areas in the Southern Hemisphere, which are located mainly in the Pampas in Argentina and Uruguay. In general, it flies non-stop through inland North America and coastal Canadian provinces, crosses the Gulf of Mexico and flies as far as northern South America. It moves inside the continent and has wintering areas in southeastern Bolivia, Paraguay, southern Brazil and northern Argentina (Piersma *et al.*, 1996). The migration south is probably non-stop and adults depart before juveniles. Some individuals fly over Hudson Bay in Canada and the region of the Great Lakes, and then cross the Atlantic heading south (van Gils *et al.*, 2016d). Its main wintering area is on the coast of the La Plata River in the eastern Pampas in Argentina, adjacent to the large lagoon complexes in Uruguay and RS in Brazil. The migration north starts between February and March and is through the central region of South America, across the Gulf of Mexico and central USA and Canada, before reaching the coast of the Arctic in April-May (Lanctot *et al.*, 2010). In Brazil, there are records between September and April for AC, RO, PA northern Pantanal (MT), and for RJ, SP, PR, SC and RS in (WikiAves, 2016; MPEG; MZUSP).

*Phalaropus tricolor* (MGT): breeds in southern Canada and northern USA from May to June and overwinters from northern Peru to Uruguay, reaching as far as Tierra del Fuego. After breeding, adults migrate to the hypersaline Great Lakes in western North America attracted by food abundance for molting and weight gain. Females migrate in mid-June before males, which migrate before juveniles. The species crosses the Pacific and reaches the western coast of South America as far as the Andes. Its main wintering areas are in Bolivia, Chile and Argentina. It returns through high elevations in South America in mid-March, Central America and the Gulf of Mexico. It reaches its breeding areas in late April/early May. It migrates usually at night and in large groups (van Gils &

Wiersma, 1996). This species is present in Brazil between August and May in GO, MT, MS, MG, RJ, SP, PR, SC and RS, and there is a unique record for MS in July (WikiAves, 2016).

### **Stercorariidae**

*Stercorarius skua* (MGT): breeds in northern and eastern Europe and overwinters on the coast of the Iberian Peninsula, Cape Verde, Caribbean and northern Brazil and one small group overwinters in Grand Banks/Newfoundland, Canada. This species departs from its breeding areas in August–September, heading south. It overwinters mainly in open sea and its return migration is between March and April. Immature individuals eventually remain in the south during the breeding season (Furness, 2016). In RS, there are records of ill or dead individuals in the open sea or occasionally along beaches in April, July and August (Belton, 1994). There are reports of individuals banded in Europe without confirmed dates that were recovered in MA in February and in CE and PI in March (Sick, 1997). Museum records are restricted to PA in December and January (MPEG) and to SP in August (MZUSP).

*Stercorarius chilensis* (MGT): its movement is little known, but it seems to fly north after breeding on islands and remote coastal areas in Chile and Argentina, reaching southern Peru and possibly to the east as far as west of the Malvinas/Falklands (Furness, 1996). It is considered a winter visitor in Brazil (Furness, 1996) and there are few records published for the country (Olmos *et al.*, 2006), for SC in July, September and November (Piacentini *et al.*, 2005) and many others without accurate locality for BA, ES, RJ, SP and RS (Olmos *et al.*, 2006; Grantsau, 2010). The abundance of records in WikiAves, which are centered in the period between June and September, suggests a regular presence of this species in the country, especially in RS and SC; there are also records for PR, SP and ES (WikiAves, 2016).

*Stercorarius maccormicki* (MGT): nests in Antarctica, leaves the colonies in March and returns in October–November (Furness, 1996). In general, it flies towards the North Atlantic through the African coast. Adults seem to remain near the colonies, but there are records of some juveniles performing long migrations (Olmos *et al.*, 2006). This species occurs in Brazil mainly during the non-breeding season and there are photographic records for MA in December, RN in October, SE in September and May, and for BA from September to November, as well as from April to June (WikiAves, 2016). There are also records for SP in May (MZUSP 102643), August and November, PR in May, SC in July, August and November, and for RS in April (WikiAves, 2016).

*Stercorarius antarcticus* (MGT): occurs below the Tropic of Capricorn on southern seas and reaches Tierra del Fuego, the Antarctic Peninsula and New Zealand. The subspecies *S. a. antarcticus* is more frequent in Brazil; it breeds on the Malvinas/Falklands and in southeastern Argentina

and overwinters in the open sea in southeastern South America (Furness, 1996). Individuals from the subspecies *S. a. lonnbergi*, which breed on the islands of the Austral Ocean, in the Antarctic Peninsula and islands south of New Zealand, were recovered in RS, SC, PE, AL and CE (Sick, 1997; Olmos, 2002a). Most populations probably remain near their breeding areas, but especially those located more to the south are considered migratory (Olmos *et al.*, 2006). Photographic records for Brazil are centered in the winter and they document the species' presence in BA in May, PR in June and September, SC in August and RS between June and October (WikiAves, 2016) and occasionally on the coast of MA (Hurtado *et al.*, 2012).

*Stercorarius pomarinus* (MGT): nests in the tundra between Greenland, Canada, Alaska, Siberia, northern Russia and extreme northern Scandinavia (Olmos *et al.*, 2006). After breeding, it begins long transequatorial migrations mainly in September to overwinter in low latitude seas especially in the Northern Hemisphere. It returns in May, usually in smaller flocks (Furness, 1996). In Brazil, there are records for PA, SP and RS (Olmos, 2000c) and photographic records for the coast between SE and RS, as well as for PA, MA, PI and RN, which are centered in the period from September to May (WikiAves, 2016).

*Stercorarius parasiticus* (MGT): breeds in the Arctic, in the coastal tundra region, primarily between 57°N and 80°N. It overwinters on oceans in the Southern Hemisphere, especially near the coast of South America, southern Africa, southern Australia and New Zealand. It is mostly a transequatorial migrant and few individuals overwinter in the Northern Hemisphere. It departs from the colony in August flying south along the coast. The return journey is quick and happens between April and May (Furness, 1996). On the Brazilian coast, particularly in RJ, it occurs in larger numbers in January, but there are records from March to May and from September to December. One individual banded as a chick in Finland was recovered in RJ in June and another banded in Scotland was recovered in AL in May (Sick, 1997). The species occurs regularly on the coast of SC, and although most records and most individuals are from November to April (Piacentini *et al.*, 2005), there are occasional records throughout the year, which also happens in RS (Belton, 1994; WikiAves, 2016). For all other states (PA, MA, PI, CE, RB, BA, ES, RJ, SP and PR), records are restricted to the period between September and May (WikiAves, 2016; MZUSP).

*Stercorarius longicaudus* (MGT): nests on the central region of Scandinavia, Siberia, Alaska and Greenland, and there are occasional records for Scotland and Spitsbergen (Olmos *et al.*, 2006). This species is a highly pelagic transequatorial migrant that moves south between August and October and returns to the Northern Hemisphere between April and May (Furness, 1996). Its flyways and wintering grounds are little known (Furness *et al.*, 2016), but there are records for Brazil for SE, BA, SP, SC and RS between October and April (Belton, 1994; WikiAves, 2016).



## Laridae

*Leucophaeus atricilla* (MGT): breeds in northern USA and southern Canada and migrates to South America. It overwinters from Mexico to southern Peru on the Pacific coast and from North Carolina to Brazil on the Atlantic coast (Burger *et al.*, 2016). In Brazil, it occurs from the mouth of the Amazon River to the bay of São Marcos/MA (Antas, 1987) Although its typical distribution on the Brazilian coast is in AP, PA and MA, there are also records for AM, CE, RJ, SP (Lima *et al.*, 2010) and Trindade Island (Dias *et al.*, 2010a). In the Amazonian region, records are for AP from August to April and for PA from September to July (Valente, 2011; Xavier & Boss, 2011; WikiAves, 2016; MPEG). In the Northeast region, it occurs in MA in almost every month of the year (Rodrigues & Carvalho, 2011b; WikiAves, 2016) and in CE, PI, RN and BA from September to May (Albano & Girão, 2011; Girão & Albano, 2011a, b; WikiAves, 2016), but there are also records of what probably are juveniles for CE and RN in July (WikiAves, 2016). For RJ and SP, there are few records in January, April and November (WikiAves, 2016) and for RS, the species was recorded in January and July (Sick, 1997; WikiAves, 2016).

*Larus atlanticus* (MGT): occurs from southeastern Uruguay to Argentina, where it breeds (Grantsau, 2010). An estimated number of 150 individuals overwinter annually in RS and they occupy sparsely the oceanic coast and the estuary from Lagoa dos Patos, where at most 50 individuals occur regularly between April and August (FZ-BRS, 2013). Although records are centered in the period between April and August, there are occasional records from September to November, February and March (WikiAves, 2016). The species also occurs in SC (Burger *et al.*, 2016) in June and August (WikiAves, 2016) and PR in April and June (Pacheco *et al.*, 2009; WikiAves, 2016).

## Sternidae

*Onychoprion fuscatus* (MGT): occurs on tropical and subtropical seas and is widely distributed on all oceans. As soon as chicks fly, all birds depart from the colony; adults return after 2-3 months at sea and use the colony as a roost before beginning a new breeding cycle (Gochfeld *et al.*, 2016a). The subspecies *O. f. fuscatus* is the only one that occurs in Brazil and it breeds in the USA, in islands in the Gulf of Guinea and in the South Atlantic (Gochfeld & Burger, 1996). In Brazil, it breeds between September and March in Fernando de Noronha/PE, Trindade/ES, Atol das Rocas/RN, Abrolhos/BA, Ilha Guarita/BA and Martin Vaz/ES (Sick, 1997; Alves *et al.*, 2004; Fonseca-Neto, 2004). Specimens were collected at BA in March and July (Lima, 2006; MZUSP) and at ES in January, April and December (MZUSP).

*Chlidonias niger* (MGT): breeds in continental regions in Europe, Asia and North America, and it migrates through the coast of both the Pacific and Atlantic to overwinter on the coast of Africa and of Central and South America (Burger & Gochfeld, 1996). In Brazil, there are records

of one individual recovered in Macau/RN in September 1986 that had been banded in Berlin (Germany), one individual in nuptial plumage in RS in June (Belton, 1994), and records for CE in October (Albano & Girão, 2011). Several records for CE, MA and RS centered in the period between September and February (WikiAves, 2016) suggest that Brazil is an important wintering destination for this species.

*Sterna hirundo* (MGT): breeds in North America, Eurasia and the southern Caribbean from April to August. It migrates from late August to October to Santa Cruz Province in Argentina through the Atlantic Ocean, and to Peru through the Pacific Ocean. It returns in mid-March and April (Cordeiro *et al.*, 1996; Gochfeld *et al.*, 2016b). The population that overwinters in Brazil originates from breeding colonies on the east coast of the USA and Canada, as well as from the Great Lakes in North America. Adults reach the northern coast of Brazil around late September and fly over the Caribbean and Guianas before the young. There are population peaks between October and November, and it is in November that this species flies south through the inland northeastern region of Brazil, as far as RS, along the Atlantic coast (Hays *et al.*, 1997), as found through statistical analyses (Mestre, 2007). Breeding adults return in March/April (Hays *et al.*, 1997), but immature individuals or those that cannot breed may remain (Antas, 1987). Individuals banded on the Portuguese islands of Azores and in southern Spain between April and July were recovered mainly on the coast of BA, but also in CE and PE, between December and May (Lima *et al.*, 2005; Mestre *et al.*, 2010). The largest gatherings of individuals of this species in Brazil are in BA and RS (within which Lagoa do Peixe is an important site for resting, molting and weight gain) (Nascimento & Santos, 2010), with peaks of up to 14,000 individuals recorded in January and February (Belton, 1994). Individuals banded in Argentina and in southern Brazil were recovered on the coast of BA, which suggests that there are stopover grounds on the coast of Brazil used during the migration north (Lima *et al.*, 2005). Although there are records from the entire Brazilian coast throughout the year, they are centered in the period of September to April (Wikiaves, 2016; MZUSP; MPEG; MNRJ).

*Sterna dougallii* (MGT): breeds in areas in the Northern Hemisphere – North and Central America, Azores, Great Britain, Sri Lanka and islands in the North Pacific – and migrates south during winter. It is resident on oceanic islands and small regions in the northern coast of South America, Africa, Arabia, Asia and Oceania (Gochfeld & Burger, 1996). The population that overwinters in Brazil originates mainly from breeding colonies on the east coast of the USA and Canada, as well as on the Great Lakes in North America (Antas, 1987). Individuals banded in North and Central America in June and July were recovered in Brazil in 11 states from the coast of AP to northern ES, especially between December and February (Mestre *et al.*, 2010). Tavares *et al.* (2013) suggest that this species is a regular migrant in northern RJ. It also seems

to use a transatlantic flyway, as shown by an individual banded in Mangue Seco/BA that was recovered in a breeding colony in Azores and another one banded in England recovered in Mangue Seco (Lima *et al.*, 2001a). Museum records are restricted to BA in August, February and March (MZUSP).

*Sterna paradisaea* (MGT): breeds from May to July in septentrional zones of the Holarctic and flies along the Brazilian coast when migrating to Antarctica to overwinter. When migrating south, the North American population follows the Gulf Stream as far as Europe and then flies south along the African coast, crossing once again the Atlantic at the level of the current of Guinea (Antas, 1987). Recent geolocation studies showed that this species is able to travel more than 80,000 km in one year. Eleven individuals were attached with geolocators in Greenland, seven of which used flyways that were parallel to the African coast and four that went along the east coast of Brazil (Gochfeld *et al.*, 2016c). All birds remained in the Atlantic sector of the Antarctic Ocean at latitude 58°S from December to March (Gochfeld *et al.*, 2016c). Individuals banded in the USA were recovered in Brazil in BA in July and August, RJ in March, SC in November and RS in December (Belton, 1994; Sick, 1997; Lima *et al.*, 2004c; Girão *et al.*, 2008). Photographic records suggest the scarce presence of the species on the entire Brazilian coast from Marajó Island/PA to RS, especially from September to April (WikiAves, 2016).

## Cuculidae

*Micrococcyx cinereus* (MGT): occurs in Bolivia, Uruguay, northern Argentina and Brazil and is migratory at the extreme south of its distribution (Payne, 1997), with records for the Brazilian Amazon associated with migrants that originated in the south (Sick, 1997). It seems that this species breeds in southern and southwestern Brazil and migrates north during winter (Payne & Bonan, 2013). Records of breeding activity for RS in November, combined with a lack of records for the south during colder months from May to July in SC and RS (Belton, 1994; WikiAves, 2016), seem to confirm the migratory pattern. In other states – AC, RO, PA, TO, MT, MS, GO, CE, RN, PB, AL, SE, BA and SP – records are scarcely distributed throughout the year (Lyra-Neves *et al.*, 2012; WikiAves, 2016; MPEG; MZUSP).

*Coccyzus melacoryphus* (MGT): occurs from northern South America to Bolivia, Paraguay, Argentina and all of Brazil (Sick, 1997). There is a lack of data about its migratory pattern, but it seems to be a migrant, especially in the extreme south of its entire distribution (Payne, 1997). In southern and southeastern Brazil – MG, ES, RJ, SP, PR, SC and RS – photographic and museum records are centered in the period of October and April (MZUSP; MNRJ; MPEG; WikiAves, 2016). However, in northern, northeastern and central-western Brazil, although there are records sparsely all over the year, it seems to be concentrated between January and September (MZUSP; MNRJ;

MPEG; WikiAves, 2016). Breeds in BA and RS (Maurício *et al.*, 2013; WikiAves, 2016).

*Coccyzus americanus* (MGT): breeds in North and Central America and flies at night during fall to the Antilles and Bahamas (2,000-3,000 km) from where it moves south in non-stop flights of over 4,000 km to wintering grounds in South America. Its migration occurs during the night mainly across the ocean, though it also flies over the continent. This species overwinters east of the Andes, from Colombia and Venezuela to Brazil (MT), Uruguay and Argentina (Payne, 1997), and reaches Brazil during boreal winter (Sick, 1997). Geolocation data showed that one individual flew around 9,500 km during its migration south through Central America to overwinter in Bolivia, Brazil, Paraguay and Argentina. Its spring flyway went over the Caribbean, which was different from its fall flyway. In addition, it also flew round-trip between New Mexico and Mexico at the end of the summer during both years it was monitored before it was captured at the breeding site (Sechrist *et al.*, 2012). In Brazil, except for SP where it seems to be recorded all year round (Crozarior, 2011), its occurrence is limited to November until May in almost all states (Belton, 1984; Fedrizzi & Carlos, 2011; Melo *et al.*, 2011; Nunes *et al.*, 2011; Vallejos *et al.*, 2011; Vasconcelos *et al.*, 2011; Xavier & Boss, 2011; WikiAves, 2016; MZUSP), which corroborates the presented migratory pattern.

## Caprimulgidae

*Chordeiles minor* (MGT): breeds in North and Central America and overwinters in South America as far as central Argentina (Sick, 1983; Cleere, 2016). It has many subspecies and one of them, *C. m. chapmani*, overwinters in central Brazil and northern Argentina (GROMS, 2008). All Brazilian records, including photographic, vocal and collected specimens are restricted to September to April (Albano & Girão, 2011; Costa *et al.*, 2011; d'Horta, 2011; WikiAves, 2016, MZUSP, MPEG, MNRJ). However it is important to emphasize that photographic record must be carefully analysed due to the difficulty in distinguishing this species from *C. acutipennis*.

## Apodidae

[*Cypseloides niger*] (MGT): breeds in North America and migrates south, sometimes in large flocks, and groups of 300 to 400 individuals have already been recorded in California (Chantler, 1999). Geolocation data showed that the fall migration of *C. n. borealis* started between September 10<sup>th</sup> and 19<sup>th</sup>, that it reached the wintering grounds in Western Amazonia (especially in AM) between September 28<sup>th</sup> and October 12<sup>th</sup>, and that it departed from these grounds heading to the breeding sites between May and June (Beason *et al.*, 2012). This is the first piece of evidence of wintering grounds for this species in Brazil, which is why it is considered migratory.

*Chaetura meridionalis* (MGT): breeds in Bolivia, Brazil, Paraguay and Argentina, and migrates to Panama,

northern Colombia, Venezuela, Suriname and French Guiana during winter. It reaches its breeding site in early September, where it remains until mid-April (Chantler, 1999; del Hoyo *et al.*, 2016b). It breeds in SP in September–March and departs from Atlantic Forest lowlands in southeastern SP in April–August (Aleixo & Galetti, 1997). It also can be seen in RJ, breeding between late August and early September; it departs in March/April. It nests in MT in October and November (Sick, 1997) and it is considered a migrant in RS (Accordi & Hartz, 2013), where there are records of breeding activity from November to January (Belton, 1984). Photographic records suggest breeding activity in CE, BA, MG, RJ, SP, PR, SC and RS between October and January (WikiAves, 2016). Occurrence records are centered in the period of September to April (WikiAves, 2016; MNRJ; MZUSP; MPEG).

### Falconidae

*Falco peregrinus* (MGT): occurs in all regions of the world and is migratory in only part of its distribution. In Brazil, it occurs as a migrant (White *et al.*, 1994) originating from breeding areas in the Northern Hemisphere. Individuals banded in the USA, Canada and on the islands of Saint Pierre and Miquelon on the Canadian coast mainly between April and October were recovered in 16 Brazilian states between November and March, especially SP, PR and RS (Mestre *et al.*, 2010). This species can be seen along the Amazon River and its main tributaries during the boreal winter from October to May (Stotz *et al.*, 1992; Costa *et al.*, 2011; Melo *et al.*, 2011) and in PA in October, November (Silva, 2011c; MPEG) and March (Silva, 2011b). It was recorded in northern Cantão State Park/TO in April, when it was probably returning to the Nearctic region for the start of the next breeding season, using the Araguaia River channel as flyway (Pinheiro & Dornas, 2009; Dornas & Pinheiro, 2011). There are also records in November for the region of Banco dos Cajuais/CE-RN (Girão & Albano, 2011a), for CE from October to May, for RN and SE from November to March (Sousa, 2011; WikiAves, 2016), in BA from December and January (MZUSP) and for RJ, SP, PR, SC and RS from October to April (Belton, 1984; WikiAves, 2016; MNRJ; MZUSP).

### Psittacidae

*Amazona pretrei* (MGT): endemic to Brazil and occurs in SC and RS. Breeding grounds are known for this species only in RS (Belton, 1984; Prestes *et al.*, 1997). After leaving the breeding areas in several regions of RS, the entire population performs a longitudinal and altitudinal migration from January, searching for a larger supply of *Araucaria angustifolia* seeds, to northeastern RS and from there to southeastern SC (Martinez & Prestes, 2002) when juveniles are already part of the flock. The return to its breeding areas occurs between June and August, depending on the availability and duration of the pine season in the highlands of SC (Prestes & Martinez, 2008). Photographic records (WikiAves, 2016) and field data (N.P. Prestes & J. Martinez, *pers. obs.*) show the presence

of this species in SC from January to June and in RS almost in every month, but with few records in April and May.

### Furnariidae

*Cinclodes fuscus* (MGT): is regarded as resident in Colombia, Venezuela, Ecuador, Peru, Bolivia, Chile and Argentina, but the population that breeds in central and southern Chile and Argentina migrates to southern Brazil, southeastern Paraguay, Uruguay and northern Argentina during winter (Remsen Jr., 2003). In Brazil, the northern-most record of the species is for Lagoa do Peri in Florianópolis, SC in May and other records are restricted to RS (Naka *et al.*, 2000) between April and September (WikiAves, 2016; MNRJ; MZUSP).

### Tityridae

*Phytotoma rutila* (MGT): occurs in Bolivia, Argentina, Paraguay, Uruguay and Brazil, where it is recorded only in RS and occurs occasionally as a winter visitor in the extreme western region of the state (Belton, 1985), especially in the region of the Espinilho State Park (FZBRS, 2013). Photographic records indicate that this species occurs in RS only between April and August (WikiAves, 2016).

### Tyrannidae

*Inezia inornata* (MGT): breeds in Argentina, Paraguay and eastern Bolivia, and has been recorded in Peru, Brazil and northern Bolivia during austral winter (Fitzpatrick, 2004), when it settles in tropical lowlands that are hot and humid (Joseph, 1996). Available data about breeding activities are restricted to the presence of birds with enlarged gonads in November in Bolivia (Fitzpatrick, 2016). It occurs in MT and MS from May to September (MZUSP). There is also a localized banding record for southeastern PA in September (SNA, 2016), and records for RO in July (Capllonch *et al.*, 2009) and August and in AC from May to August (MPEG). Further studies are necessary to fully comprehend this species' migratory pattern.

*Elaenia chilensis* (MGT): breeds mainly in southern Argentina and Chile in Patagonia (Capllonch *et al.*, 2011), but it can also be further north in Chile, for instance in the Fray Jorge Reserve (Pyle *et al.*, 2015). It migrates north during austral winter, at least in part through the Brazilian coast, but it also seems to fly along the east slope of the Andes (Marini & Cavalcanti, 1990), reaching northeastern and northern Brazil (Amazon Basin included), Peru, and possibly Colombia, respectively (Hosner, 2016). In Bolivia there are records during the breeding season, but they are probably related to late migrants (Hosner, 2016). The migration southwards seems to follow a diffuse route from the Amazon to Central Brazil (Marini & Cavalcanti, 1990). West-central Argentina (*e.g.*, Mendoza and San Juan Provinces) also seems to be part of a spring migration route to Patagonia (Cueto *et al.*, 2016), and this species reaches its breeding sites in Patagonia in mid-October (Brown



*et al.*, 2007). Geolocation data (Jiménez *et al.*, 2016) suggested that three individuals banded on Navarino Island in Tierra del Fuego migrated north at the end of February along the eastern coast of South America, stopped for around 10 days on the eastern coast of Brazil, before flying west to wintering grounds in east-central Amazonia, where they arrived between late April and early June. They departed from this site between late September and late October and arrived back at the breeding site between late November and early December (Jiménez *et al.*, 2016). In Brazil, vocal records and collected specimens corroborate this pattern to the Amazon region (WikiAves, 2016; MPEG). In northeastern Brazil, records include data from the literature and are from February to July (WikiAves, 2016; Ruiz-Esparza *et al.*, 2011; MPEG). In southeastern and southern Brazil, records are centered in February and May (Pacheco & Gonzaga, 1994; WikiAves, 2016; MZUSP).

*Pseudocolopteryx acutipennis* (MGT): occurs in central and eastern Andes from Colombia to northwestern Argentina and in lowlands in western Paraguay, in addition to occasional records for southeastern Peru, northeastern and eastern Bolivia and extreme southwestern Brazil (MT and MS) (Grantsau, 2010; Bostwick, 2016). It breeds from December to April in the Bolivian highlands and populations from Bolivia, as well as those from Argentina, migrate along the Andes towards the Amazonian lowlands and the Paraguayan Chaco. It is recorded for the lowlands of Bolivia and Peru only as an austral winter visitor (Bostwick, 2016). In Brazil, there are records for the coast of PR without precision of date, for a fluvial island in RO in June-July and for the Pantanal in MT and MS in May and September (Vasconcelos *et al.*, 2008a). Although there is a lack of museum data, photographic records corroborate a migration during austral winter with records for the central-western region (MT, MS and GO) from May to September. There are two records for RS in December (WikiAves, 2016).

*Pseudocolopteryx flaviventris* (MGT): breeds in central Chile, northern and eastern Argentina, Uruguay and southern Brazil from September to March and, during the non-breeding season, it migrates to extreme northern Argentina, Bolivia and Brazil, reaching SP and Paraguay (Bostwick, 2004a). In Brazil, records corroborate this migratory pattern by showing occurrences between April and September for RS, SC, PR and SP (Ridgely & Tudor, 1994; Scherer-Neto *et al.*, 2011; WikiAves, 2016; MZUSP 10947 [SP, 1922, June]). However, there is no recent evidence of breeding activity in Brazilian territory.

*Serpophaga griseicapilla* (MGT): breeds in northwestern Argentina and perhaps southern Bolivia. During its non-breeding season, it migrates to Paraguay, Uruguay and southern Brazil (Cueto *et al.*, 2008; Fjeldså, 2013). A winter visitor in extreme southern Brazil (Straneck, 1993), first documented in the country in RS in May of 2001 (Bencke *et al.*, 2002). Photographic records verify its presence in SC in September, and in RS centered in the

period between May and September (WikiAves, 2016; MZUSP 86172 [RS, 2009, August]), corroborating such a migratory pattern.

*Attila phoenicurus* (MGT): occurs in Paraguay, Argentina, Bolivia, Venezuela and Brazil. It breeds in southern and southeastern Brazil (from RS to southern RJ) and probably in northeastern Argentina and eastern Paraguay (Walther, 2016). Migrants are recorded from Paraguay, eastern Bolivia, and central Brazil to southern Venezuela during austral winter (Walther, 2016). In the Brazilian Amazon, it is recorded only during austral winter from May to October (Ridgely & Tudor, 1994; MZUSP; MPEG), as corroborated by photographic records, museum specimens and banding data, while records for the southeastern and southern regions are centered in the period between October and April (Belton, 1985; SNA, 2016; WikiAves, 2016; MZUSP; MPEG).

*Tyrannus tyrannus* (MGT): breeds in North America and stays during boreal winter in South America as far as Argentina, especially in the Amazon, and there are some records for the Cerrado and the Atlantic Forest (Sick, 1997; Mobley, 2004f). It reaches the southwestern Amazon in late September, clearly associated to fruit availability (Antas, 1987). It is seen arriving in great flocks in the Peruvian Amazon in mid-October (Fitzpatrick, 1980). Its migration to the southern Amazon is fast, after which it migrates north heading to Central America (also following fruit availability), where it arrives in January/February, and migrates back to the North America (Antas, 1987). According to geolocation data, the species departs from its breeding area in the Great Plains of North America in August or early September, migrates through the Caribbean Sea or through the Gulf of Mexico to the Amazon Basin (Bolivia and Brazil) – which is a distance of 6,400 km from its breeding area – and arrives there in October, where they remain for around  $100 \pm 11$  days. After this period, it flies to a second wintering area in northwestern South America (Colombia, Ecuador and Peru), where it remains for  $75 \pm 12$  days before returning to its breeding site in April (Jahn *et al.*, 2013a). There are records for AM and AC between October and March (Almeida, 2011a, b; Guilherme & Aleixo, 2011; WikiAves, 2016; MPEG), for AC, AM, MT, MS and RJ between November and February, and for RR in October and PR in November (WikiAves, 2016; MZUSP; MPEG). Museum records for PA are widely distributed from April to December (MPEG) and need to be better understood.

*Empidonax alnorum* (MGT): breeds from western Alaska to British Columbia, Canada and the USA and overwinters in western South America in Colombia, Ecuador, Peru, northern and eastern Bolivia, northern Argentina and western Brazil (Farnsworth & Lebbin, 2004a). In Brazilian territory there are records for PA in February, AM in December and April, the Pantanal in MS in November (Vasconcelos *et al.*, 2008; MPEG) and AC from October to March (WikiAves, 2016; MPEG).

*Contopus cooperi* (MGT): occurs from Alaska, across Canada, the USA and Mexico to the Amazonian region in Panama, Colombia, Venezuela, Peru, Bolivia and Brazil including its southeastern region (Farnsworth & Lebbin, 2004b). It is a nocturnal migrant that flies great distances through the forests in western North and Central America and overwinters (boreal) in South and Central America. It departs from its breeding site in North America between August and September, reaches South America in October–November, and departs again in March–April (Altman & Sallabanks, 2000; Farnsworth & Lebbin, 2004f). In Brazil, there are records of a population from October to April for western Amazonia (in RR, AC, AM, PA and MT), and of another for the Atlantic Forest south of the São Francisco River in BA, ES, RJ, SP and PR (WikiAves, 2016).

*Contopus virens* (MGT): breeds in Canada and the USA in August and September, overwinters in Colombia, Venezuela, Bolivia and western Brazil, occasionally remaining further north (Costa Rica), and returns in April (Farnsworth & Lebbin, 2004c). It remains during winter in Brazil (Sick, 1997) and there are photographic records for AC, AM, RO, MT and GO between October and May (WikiAves, 2016), which corroborates available literature records for AM from November to April (Almeida, 2011a, b; Costa *et al.*, 2011) and museum data from November to March for AC, AM, RO (MPEG).

*Lessonia rufa* (MGT): breeds in central Chile and Argentina and migrates north, dispersing along the coast and then into the lowlands of the continent. It overwinters in northern Chile, southern and eastern Bolivia, Argentina, Paraguay, Uruguay and Brazil (Farnsworth & Lebbin, 2004d), and there are records for SP (Silva-e-Silva & Olmos, 2007), PR (Bornschein *et al.*, 1997), SC (Azevedo & Ghizoni-Jr., 2005) and RS (Belton, 1985; Bencke, 2001). According to photographic records, it is present in RS from January to September, in SC in February and in SP in September (WikiAves, 2016). Museum records are restricted in July (MZUSP).

*Xolmis coronatus* (MGT): breeds in central Argentina and migrates north to central Bolivia, western Paraguay, Uruguay and extreme southern Brazil (western RS) (Farnsworth & Langham, 2004a; Cueto *et al.*, 2008). Some breeding populations migrate to winter in tropical latitudes, while others overwinter in south temperate latitudes (Jahn *et al.*, 2004). It seems to be present in RS from May to August (Belton, 1985), which is confirmed by photographic records for this state between April and September, and there is also a record of a possible vagrant for SP in May (WikiAves, 2016). There is only one museum record in RS in July (MZUSP 8829).

### Vireonidae

*Vireo olivaceus* (MGT): breeds in North America, from where it flies to join *Vireo chivi* in Brazil during boreal winter (Sick, 1983). Geolocation data suggests that ten individuals from one breeding population that had been

captured in northwestern Pennsylvania, USA, wintered in northwestern South America. Most of them used only one wintering site, but two individuals used one wintering site from late October to early December before reaching their final wintering site, where they remained for four months. During spring migration, individuals migrated through Central America through the Yucatán Peninsula and crossed the Gulf of Mexico, landing near the delta of the Mississippi River in Louisiana. Fall flyways could not be properly mapped. The dates in which individuals reached the wintering area varied from October 14<sup>th</sup> to November 4<sup>th</sup>, and the departure dates from South America in spring in late March were correlated with the arrival dates to the wintering site (Callo *et al.*, 2013). The lack of specimens in the Brazilian Amazon when compared to eastern Peru suggests that most of the population overwinters in the foothills of the Andes and only a small number does so to the east in the Amazon (Stotz *et al.*, 1992). However, this species is present in the Amazonian region in Brazil from September to March (Almeida, 2011a, b; Stotz *et al.*, 1992), as suggested by photographic and museum records for RR, AM, RO, PA and MT between August and April (WikiAves, 2016; MZUSP; MPEG). Also, there are two specimens collected in AM in July (MZUSP).

*Vireo altiloquus* (MGT): breeds in Florida, Bahamas, Cuba and Cayman Islands and migrates to the Amazon Basin (Sick, 1997; Brewer & Orenstein, 2010). Records in Brazil are mainly to the north of the Basin and are from September to February (Stotz *et al.*, 1992). Only small numbers occur south of the Amazon River, and the southernmost record is for Sinop/MT in March (WikiAves, 2016). Photographic records and collected specimens for AM and PA are from September to March (WikiAves, 2016; MPEG), which confirms the pattern suggested in the literature.

### Hirundinidae

*Pygochelidon melanoleuca* (MGT): occurs in extreme eastern Colombia, southern and eastern Venezuela, Guianas, Amazon and southern Brazil, and there are occasional records for southeastern BA, upper Paraná River, southern GO and for the border between Brazil and Argentina in Iguazu Falls (Turner, 2016a). It associates with rivers that have falls and rapids (Sick, 1997). In RO, forms large flocks, breeds from June to October, uses emerged stony grounds on river channels and vanishes when rainfall starts in mid-November (M. Somenzari, *pers. obs.*). Records for the Amazonian region in RR, AP, AM, PA, RO, MT and TO are centered in the period between April and November, but there are also records for GO and for MG in almost all months of the year (WikiAves, 2016).

*Progne subis* (MGT): breeds in Canada and the USA and overwinters in South America, mainly in Bolivia and Brazil (Turner, 2004). It migrates south across Central America, gathers in great numbers in the Manaus region/AM, and then flies especially to SP and MT (Antas, 1987; Sick, 1997). Recorded once in large flocks in interior SP but

last seen in 1993 (Willis & Oniki, 1982). Geolocation data showed breeding in northern Pennsylvania, and that migration south started in late August in a non-stop flight to the Yucatán Peninsula, where individuals remained for 3 to 4 weeks before flying to overwinter in the Amazonian region (October to April). Another tracked individual flew even more during winter and reached the Pantanal region (according to a description in Antas *et al.*, 1987). They departed from the wintering site in the first two weeks of April (Stutchbury *et al.*, 2009). Individuals banded in the USA and Canada in June and July were mostly recovered in the Brazilian Amazon, especially in AM between October and April (Mestre *et al.*, 2010). Large gatherings of the species were recorded for TO, reaching as many as 40,000 individuals (Olmos & Pacheco, 2008), especially in the regions of the Cantão State Park and in the city of Caseara between November and December in consecutive years (Pinheiro & Dornas, 2009), as well as in RO in October and from February to April, according to photographic records (WikiAves, 2016). In most Brazilian states (except for SC and RS), it can be observed between August and May (WikiAves, 2016) and in BA it arrives in mid-October and departs in March (P.C. Lima, *pers. obs.*).

*Progne elegans* (MGT): breeds from October to February-March in southern Bolivia and Argentina. After the breeding season, it forms great flocks and migrates to western Amazonia, including southeastern Colombia, northeastern Peru, and western Brazil, where it spends all winter from April to October, and it can even reach as far as eastern Panama. There are also incidental records for the USA (southern Florida) and the Malvinas/Falklands (Turner, 2016c). In Brazil, it has been photographed in AM between June and October, in AC in March and June, in AP in July and in RO in October (WikiAves, 2016). There is just one collected specimen from AM in April (MPEG 54096 [AM, 1997, April]).

*Tachycineta leucopyga* (MGT): breeds from central Chile and southwestern Argentina to Tierra del Fuego and migrates north during austral winter to central Bolivia, Paraguay and southern Brazil, which presents records for RS (Belton, 1985; Turner, 2004), SC, PR, SP and RJ, that are centered in the period between April and October (WikiAves, 2016; MZUSP 98240 [SP, 1968, July]).

*Riparia riparia* (MGT): breeds in high latitudes in the Northern Hemisphere and migrates to lower latitudes and to the Southern Hemisphere in boreal winter. The subspecies *R. r. riparia* breeds in North America (from central and western Alaska to southern central and northeastern Mexico), in Eurasia, and locally in northwestern Africa. During boreal winter, it flies to South America and Africa (Turner, 2004). The species occurs in almost all of Brazil (Sick, 1997) and records are centered in the period between September and April (Belton, 1985; Sick, 1997; Nunes & Tomas, 2008; Cintra, 2011; Costa *et al.*, 2011; Dias, 2011; Dias *et al.*, 2011; Ferreira *et al.*, 2011; Melo *et al.*, 2011; Vasconcelos *et al.*, 2011; Accordi & Hartz, 2013; Silva *et al.*, 2013; WikiAves, 2016). Collected

specimen data corroborates this period but are restricted to AM and PA (MPEG).

*Hirundo rustica* (MGT): breeds in medium and high latitudes in the Northern Hemisphere and migrates during boreal winter to lower latitudes and to the Southern Hemisphere (Turner, 2004). The subspecies *H. r. erythrogaster* flies from North America to Tierra del Fuego and occurs in large flocks in virtually all of Brazil from September to March (Belton, 1985; Sick, 1997). Although it breeds mainly in the Northern Hemisphere, part of its population has settled in eastern Argentina since the early 1980's (Azpiroz *et al.*, 2012). The number of pairs has since risen and today there are two different breeding populations: one in North America and another more recent one in South America. Genetic testing of the South American population suggested that there is still a significant genetic flow with the North American population (Billerman *et al.*, 2011). The South American population is supposed to molt during austral winter (June, July and August) in northeastern South America (specifically in northern Brazil, French Guiana, Suriname, Guyana and Venezuela), which are areas that become available as soon as swallows from North America migrate to their breeding areas in the Northern Hemisphere (Garcia-Perez *et al.*, 2013). A recent geolocator study from nine birds has confirmed that the South American population migration goes no further than northern South America in austral winter (Winkler *et al.*, 2017). Recent data corroborates that the species occurs in almost all of Brazil but are centered in the period between September and April (WikiAves, 2016; MPEG). The records of AM are distributed throughout the year (WikiAves, 2016), probably due to population overlap. It is important to mention that the differentiation within the populations is complicated owing to the occurrence of migratory individuals from both populations.

## Turdidae

*Catharus fuscescens* (MGT): breeds in the USA and Canada and migrates in late August and early September to South America, where it overwinters between September and April. Literature and geolocation data suggest that many individuals depart from southeastern USA in the fall and fly over 1,500 km across the Caribbean Sea to northern South America, where they restore their energy reserves in coastal stopover grounds. Between the Caribbean coast and wintering grounds located 3,000 km to the south, there are many areas with suitable habitat in the Amazon Basin. They probably stop for multiple days during this route and can do so as many as two times (Bayly *et al.*, 2012). This species' wintering grounds include the Amazon, Cerrado, and Atlantic Forest from the Southeast region of Brazil (Collar, 2005; Heckscher *et al.*, 2011), but the south-central and southeastern regions of Brazil (Cerrado areas) were identified as its main wintering areas (Remsen Jr., 2001). Photographic and museum records confirm its presence in Brazil between October and April (WikiAves, 2016; MZUSP; MPEG). The return



north from the wintering grounds is probably through the eastern Amazon Basin (Stotz *et al.*, 1992). The highly seasonal occurrence pattern in RO (September to November) and afterwards in Manaus/AM (February to April) suggests that the species moves regularly in the Amazon. Recent geolocation data suggests that the species settles in non-breeding areas in South America – most of them west of the Central Brazil Shield – and then migrates to a second region in lowland Amazonia and on the Guiana Shield before returning north, probably induced by flood cycles in the southern Amazon Basin. Thus, this species has two wintering sites in the Amazon, perhaps following the local increase on food abundance associated with river levels in the Amazon Basin (Heckscher *et al.*, 2011).

*Catharus minimus* (MGT): departs from breeding areas (Siberia, Alaska and Canada) in mid-August and reaches northern South America in September-October, where it overwinters. The return migration starts in April-May and this species reaches its breeding areas in late May/early June. Its migration flights cover an average of 300 km and individuals rest for one or more nights in between flights (Collar & Christie, 2013). It is a rare migrant in Manaus/AM with a similar number of records during the period between October and December and March-April, but it seems that it does not winter in the Manaus region, and its wintering grounds are practically unknown (Stotz *et al.*, 1992). Museum records are from AC in November, AM in February and March (MPEG) and PA in November and December (Silva, 2011b; Valente, 2011; MPEG).

*Catharus swainsoni* (MGT): breeds in North America and overwinters southwards as far as Argentina and northwestern Brazil (Collar, 2005) between November and March, where there are records for AM in November, February and March (Sick, 1997), MT in December (MZUSP 89116), and for AC in the period of October to March (WikiAves, 2016; MPEG). There are also records for the southeastern and southern regions of Brazil, namely for RJ in November (Scott & Brooke, 1985), SP in February (MZUSP 64231), SC in January and June, and RS in January, as well as records without dates for RO (Olmos *et al.*, 2011).

*Turdus flavipes* (MGT): occurs in Colombia, Venezuela, Trinidad, Tobago, Guyana, Paraguay, Argentina and Brazil (Collar *et al.*, 2016). It migrates altitudinally occupying higher regions during spring and summer and foothills during winter (Antas, 1987; Joseph, 1996; Alves, 2007). Populations from the mountains of RJ and ES fly to lower elevations in the austral winter, enlarging their coastal populations (Sick, 1997). In Intervalas State Park in southeastern SP, there are records for a lowland region of the Atlantic Forest (70-350 m) only during winter between May and August (Aleixo & Galetti, 1997), but in northeastern SP there is a record of a nesting event at 60 m asl in October (Oliveira Jr. *et al.*, 2014). At Ilha da Queimada Grande, it is one of the most abundant species during austral winter (Marques *et al.*, 2012), as well as at Ilha do Cardoso, where it is stated as a partial migrant recorded

mainly between April and October (Castro *et al.*, 2012). Photographic records suggest this species' presence throughout the year in ES, RJ, SP, PR and SC, but it is restricted to the period between September and April in RS (WikiAves, 2016), where it breeds (Belton, 1985; Maurício *et al.*, 2013). In BA, it also seems to be present all year round, though there are no records in March, May and June. Records of breeding activity are centered in the period between September and January, and they are from elevations both higher and lower than 600 m in WikiAves (at 2 and 741 m in SP and at 10 and 906 m in PR). SNA data suggests that this species is present in SP all year round, both at an elevation of 3 and 750 m (SNA, 2016), which does not fully either support or refute the hypothesis of altitudinal migration. However, it is widely accepted that the species migrates altitudinally in the Serra do Mar, therefore a project aiming specifically to elucidate its migratory pattern is being conducted (A.C. Guaraldo, *pers. obs.*).

### Mimidae

*Mimus triurus* (MGT): breeds in Bolivia, Paraguay and Argentina, and occurs in southern and southwestern Brazil in the non-breeding season (Cody, 2005). Photographic records confirm its occurrence in Brazil between March and November in MT, MS, RJ, SP, PR, SC and RS, without any evidence of breeding activity (Pinto, 1944; Belton, 1985; Bornschein *et al.*, 1997; Bencke, 2001; Lima & Aulicino, 2008; Maciel & Gaertner, 2014; WikiAves, 2016).

### Parulidae

*Setophaga ruticilla* (MGT): breeds in Alaska, Canada and eastern USA and migrates to Central America, Caribbean and northwestern South America, as well as to southern USA in small numbers (Curson, 2016a). In Brazil, it occurs only in the Amazon: in RR with records between September and April (Stotz *et al.*, 1992; Sick, 1997; WikiAves, 2016), and in AM with records in January (WikiAves, 2016), April and November (Stotz *et al.*, 1992) and October (MPEG 43351). This species departs from breeding areas in North America between July and September and reaches South America in October, returning from late March on and arriving at the breeding site in April-May (Curson, 2016a). It seems to exhibit higher fidelity to wintering areas in the Neotropics than to breeding areas in the North Temperate Zone, probably because individuals remain in the wintering area during their first year of life (Holmes & Sherry, 1992). Populations from the west of the wintering area originate from the northwest of the breeding areas and populations from the east of the wintering area originate from the east and south of the breeding areas. In general, this species reduces its migration distance by flying mainly along a north-south axis between its breeding and wintering sites (Norris *et al.*, 2006).

*Setophaga petechia* (MGT): occurs from Canada and the USA to northern South America in Colombia, Venezuela and northwestern Brazil. Individuals overwinter from

western and southern Mexico to the south through Central America and in northern South America from southern to northern Bolivia and in the Brazilian Amazon (Curson, 2010). In Brazil, records are restricted to the period of September to May in the Amazon region in the states of RR, AP, AM, PA (Stotz *et al.*, 1992; WikiAves, 2016; MPEG).

*Setophaga striata* (MGT): originates from North America overwinters regularly in Amazonian lowlands, and its main wintering site in South America is in the Orinoco and Upper Amazon (Sick, 1997). This species arrives in Brazil between September and October (Sick, 1997) and visits forest edges and conserved forests in Manaus/AM. In Brazilian Amazon records are centered in the period between November and April (Stotz *et al.*, 1992). In southeastern Brazil, it occurs only occasionally (Curson, 2010), with records for RJ from January to May (Sick, 1997). Photographic and museum records confirm the pattern found in the literature: the species is present in RR, AP, AM and PA between October and May, in BA in January, in Distrito Federal (DF) in April, in MG in May, in RJ in February and March, and in SP in March (WikiAves, 2016; MZUSP 103227 [SP; 1969, March]; MPEG), which defines it as a boreal winter migrant.

## Icteridae

*Dolichonyx oryzivorus* (MGT): breeds in North America from May to July and flies non-stop in August through the sea of the Antilles and the coast of Venezuela. In Florida these birds converge into large flocks until they reach their wintering areas in eastern Bolivia, southern central Brazil, Paraguay and northern Argentina, covering 20,000 km in this round trip. Its main wintering site is the Pampas from southeastern South America (Di Giacomo & Krapovickas, 2005; Azpiroz *et al.*, 2012). This species reaches the Pantanal in MT in Brazil in November, and then northeastern Bolivia, Paraguay and the Pampas in Argentina, after crossing the entire Amazonian region (Sick, 1983, 1997; Fraga & Christie, 2016). Three individuals were recorded for Cachoeira de Nazaré/RO in November while flying across the Amazon (Stotz *et al.*, 1992). Geolocation data from 15 individuals captured in three different breeding areas in the USA suggested that fall migration occurs through the Caribbean with a stopover in northern Venezuela, and another in Bolivia in November. 12 individuals flew to a region in Argentina between December and March, where they molted completely before the spring return migration (Renfrew *et al.*, 2013). Records for RS were made in December (Belton, 1985) and sound records for MT in November, while photographic records for MS were between November and March. For SP there is only one record in January (WikiAves, 2016). Museum records are restricted to AM in April (MPEG).

## Thraupidae

*Sporophila beltoni* (MGT): endemic to Brazil. Occurs in the Cerrado from BA (bordering GO) to RS (Repenning &

Fontana, 2013). Sexually active individuals start to arrive at the breeding site (from northeastern PR to northeastern RS) in mid-October and depart in late January, disappearing completely in the first week of March. There is evidence suggesting that individuals of this population arrive with others from the same genus in southern MG and surrounding states, which are possibly wintering sites. The center of the state of SP seems to be a passing or resting area during migration (Repenning & Fontana, 2013). Photographic records confirm this pattern and present the first record of this species for BA (WikiAves, 2016).

*Sporophila palustris* (MGT): breeds in northeastern Argentina, extreme southern Brazil, Uruguay and possibly southeastern Paraguay during austral spring and summer. It migrates to the Central-West and Southeast regions of Brazil and eastern Paraguay (Jaramillo, 2011c; Rising, 2011). It has been recorded in flocks with other species from the same genus from the Amazon and Central Brazil (Sick, 1997), and has been observed in flocks of more than 1,000 individuals foraging in pastures in the Araguaia River basin in southeastern PA in mid-September 2009, 2010 and 2013 (Cavarzere *et al.*, 2015). Photographic records are scarce and distributed between PA, MT, TO, MS, GO, MG, SP and RS, as well as DF, between September and April (WikiAves, 2016). The northern limit of its wintering site is in Bico do Papagaio/northern TO (Dornas *et al.*, 2013) and the breeding population from Brazil is restricted to RS. It is definitely a migratory species, but details of its movements are not fully known.

*Sporophila hypochroma* (MGT): occurs in northeastern and eastern Bolivia, in the North, Central-West and South regions of Brazil, central Paraguay and northeastern Argentina (Rising, 2011). Its wintering area reaches the central eastern portion of Bolivia and northern and central Brazil (Ridgely & Tudor, 2009). In Brazil, recent records for RS are distributed between October and February, and for MT and MS between June and November (WikiAves, 2016). For GO, it was recorded for the Emas National Park in October (Sick, 1997). For the North region of the country, it was recorded for tributaries of the Mamoré River in RO in June (Whittaker, 2004), and for TO, in the municipalities of Filadélfia (inside the boundaries of the Fossil Trees Natural Monument) and Dueré (Dornas *et al.*, 2013) in July and October respectively.

*Sporophila cinnamomea* (MGT): breeds during spring and austral summer in the Pampas in southeastern South America (Azpiroz *et al.*, 2012), which includes RS (Maurício *et al.*, 2013), and flies north right after that period (Jaramillo, 2011d). It has been recorded for Paraguay, Argentina and Uruguay in August and from October/November to May. Monospecific gatherings of tens of individuals were observed in late February before the migration. This species is rare in PR, especially during spring and summer, and it is likely that only localized records occur during its migration, as well as in MT and central SP, where it flies through Dourados and

Itirapina heading south during spring. In the region of the Triângulo Mineiro, this species has been observed in mid-September with other seedeaters that also migrate south, such as *S. palustris*, *S. melanogaster*, *S. hypoxantha* and *S. pileata* (Krügel *et al.*, 2013). Photographic records confirm the distribution pattern from the literature, in which the species is recorded in Brazil from September to May, namely in TO, GO, MT, MS, MG, SP, PR, SC, RS, and evidence of breeding activity exists for MS and RS in January and February (WikiAves, 2016; MZUSP 88533 [SC, 2009, December]).

*Sporophila melanogaster* (MGT): endemic to Brazil, and occurs from the Central-West east to the Southeast and South regions (Jaramillo & de Juana, 2016). All breeding population is confined to the *campos de altitude* in SC and RS (Rovedder *et al.*, 2013). It reaches its breeding site between October and November, and between February and March (Rising, 2011) it flies north searching for hotter, more humid regions (Azpiroz *et al.*, 2012). The Jaguaruaíba region/PR seems to be used as a stopover ground during migration (Carrano & Ribas, 2000). Photographic records suggest that this species' presence is restricted to the period between September and March in TO, GO, MG, SP, PR, RS and SC (WikiAves, 2016). There are also collected specimens from SC in December (MZUSP). Its occurrence during winter remains unknown and needs to be studied further.

## Cardinalidae

*Piranga rubra* (MGT): breeds in the USA and Mexico and overwinters in a large area from Central America to the western Amazon. In South America this species seems to be more abundant along lower slopes of the Andes (Hilty, 2011). It is an uncommon winter visitor in Manaus/AM and there are records for RR and PA in December (Stotz *et al.*, 1992; Silva, 2011c). Museum and photographic records confirm its presence in RR, AP, AM and PA between October and March (WikiAves, 2016; MPEG), but there are occasional records for AM in May and July (WikiAves, 2016).

*Pheucticus aureoventris* (MGT): occurs mainly in the Andes from Venezuela to Bolivia, Paraguay, Argentina and southwestern Brazil (Sick, 1997). Breeding records are restricted to Colombia from November to January and to Argentina in December (Brewer & de Juana, 2017). It is only recorded in MT, MS and RO in Brazil during winter from May to September (WikiAves, 2016), as well as in AM and GO in July and August (Serpa *et al.*, 2014; MPEG 73473 [AM, 2011, August]).

## Partially Migratory species accounts (MPR)

### Anatidae

*Dendrocygna bicolor* (MPR): occurs from California to Argentina, in all of Brazil and also in Africa and India. It

is, however, rare or it appears only occasionally in many places (Sick, 1997). There are populations residing in CE, MG, SP, PR, SC and RS, as suggested by occurrence records (WikiAves, 2016) distributed throughout the year, as well as in the Araguaia River region (L.F. Silveira, *pers. obs.*). In RS, part of the population remains in the state all year round, but another part migrates (Belton, 1984) following the same pattern as *Netta peposaca*: it flies to the lower Paraná River region in Argentina, which is its main breeding area according to banding and recapture records (Antas, 1994; Nascimento *et al.*, 2003). Its movement inside the Brazilian territory is not fully understood, but it was suggested that it moves because of local droughts and floods (Antas, 1994; Sick, 1997). There are records of breeding activity for SP (between September and March), SC (December), and RS in May (WikiAves, 2016) and in October and December (Belton, 1984). In BA, this species is present on lagoons and wetlands during winter (P.C. Lima, *pers. obs.*).

*Coscoroba coscoroba* (MPR): occurs in South America from central Chile, Pantanal, and southern Brazil south to Tierra del Fuego. In Brazil, it can be found in PR, SC, RS (Grantsau, 2010) and Mato Grosso do Sul (MS) (Conservation International, 2009). It breeds in RS (Belton, 1984; Nascimento *et al.*, 2001; Maurício *et al.*, 2013), where the Taim wetlands and Ecological Station are the most important breeding sites in Brazil. Part of its population departs from the Station between December and February and returns between late June and September, but most return in August and remain for at least 60 days, during which they molt. Built nests are seen in late June and chicks begin to appear in the first week of August, though most of them appear only in September. The exit route from Brazil to Argentina is the natural corridor composed of rivers, lakes and wetlands in the central plains of RS from the flood plains of the Ibicuí, Butuí, Santa Maria, Vacacaí and Jacuí Rivers (Calabuig *et al.*, 2010). Individuals that reach southern Brazil seem to fly up to 1,700 km in a straight line and the only route is through extreme western RS, which is evidence of the connection between southern Brazil and northeastern Argentina (Calabuig *et al.*, 2010). However, available photographic records on WikiAves confirm its year-round presence in RS, which corroborates the fact that its migration to Argentina is only partial (Calabuig *et al.*, 2010). Data on WikiAves also suggests the presence of this species during almost the entire year in SC (except for February and June), in PR (except January, March, May and November) and in MS between June and October, which is the northern limit of its distribution. This way, geolocation studies should be performed to investigate how regular this movement to the south (to Uruguay and Argentina) made by the population that breed in Brazil is.

*Neochen jubata* (MPR): occurs from Venezuela to Bolivia, Paraguay, Argentina and Brazil, both in the Amazon and in Central Brazil (Sick, 1997). It is considered sedentary in most of its distribution, but there are records of small movements. It exhibits migratory behavior in the



Amazon: there is a large breeding population in the Juruá River between June and October, after which disperses widely in the Amazon Basin (Carboneras, 1992a; Endo *et al.*, 2014). Photographic and sound records available on WikiAves corroborate literature data and show that this species is present in the Amazon Basin only during the dry season (July to October), with records of breeding activity in November and December for Roraima (RR) (WikiAves, 2016). In Mato Grosso (MT) it is present between March and August (WikiAves, 2016; MZUSP), and in Goiás (GO) and Tocantins (TO) it is resident and there are records of breeding activity between April and September (WikiAves, 2016).

*Callonetta leucophrys* (MPR): occurs from northern Argentina to Bolivia, Paraguay, and Brazil in MT, RS, SP, Distrito Federal (DF) and MG (Sick, 1997). Literature data suggests that it is a migratory species that originates from extreme southern South America (Chesser, 1994; Sick, 1997; Nunes & Tomas, 2004). The direction and amplitude of its movements are not well defined, but there certainly is dispersal after breeding, which expands its distribution near to the coast and in lower latitudes (Carboneras, 1992a). However, photographic records available on WikiAves show that the species is present all year round in RS and that there are even records of breeding activity between November and February (Belton, 1994; Maurício *et al.*, 2013; WikiAves, 2016). It is also recorded for Mato Grosso do Sul (MS) from May to November, SP in August, PR in May, MT in September and SC from February to May and from October to December (Straube *et al.*, 2006; WikiAves, 2016). Such data suggests that there are resident populations in RS and at least some migration to other states.

*Anas georgica* (MPR): occurs from extreme southern Colombia to Tierra del Fuego, including the Malvinas/Falklands, South Georgia, Argentina, Paraguay, Uruguay and Brazil as far as SP (Carboneras, 1992a), with occasional records for RR and CE (Sick, 1997). Individuals banded in Argentina were recovered in RS (Olrog, 1971) and one individual banded in RS was recovered on the Pacific coast of Chile, which suggests east-west movements (Silva, 1987). The main breeding site in Brazil is the coastal region and the highlands of RS. Thousands of individuals have been recorded near the border with Uruguay, where they molt between January and March (Antas, 1994). The wetlands of RS are used in migration routes (Antas, 1994), as well as its Central Depression (Nascimento *et al.*, 2000). Photographic records show the presence of the species all year round in RS and SC, and records of breeding activity between June and December. It seems to occur in SP between July and October, and in Rio de Janeiro (RJ) in January and October (WikiAves, 2016).

*Anas versicolor* (MPR): occurs from Chile and Argentina to Paraguay, Bolivia and Brazil (Sick, 1997). Populations that breed further south of the distribution migrate north during winter and reach southeastern Brazil (Carboneras, 1992a). Banding data proves the west-east migration

between Argentina and Brazil (Belton, 1984; Antas, 1994; Sick, 1997; SNA, 2016). The species seems to move in RS through a main corridor formed by coastal wetlands and the Central Depression, similar to *Netta peposaca* (Nascimento *et al.*, 2000). Part of its population is present throughout the year from RS to SP, and there are records of breeding activity in September and October for RS, SC, PR (WikiAves, 2016), SP (F. Schunck, *pers. comm.*), and occasionally in RJ (Sick, 1997).

*Anas platalea* (MPR): occurs from southern South America to Peru, Bolivia, Paraguay and RS in Brazil, occasionally as far as RJ (Sick, 1997). Populations that breed further south of the general distribution migrate to lower latitudes during winter (Carboneras, 1992a). In RS, it occurs mainly as a winter visitor, though breeding has been confirmed in the state (Belton, 1984; FZBRS, 2013). Presents irregular records for MS, SP and PR (WikiAves, 2016).

*Netta peposaca* (MPR): occurs in the Southern Cone of South America and, in Brazil, in wetlands and floodplains in RS and in the coastal zone of PR, SC, SP and RJ (Nascimento *et al.*, 2000). Individuals from RS, where there is a resident population, come from different areas in Argentina and fly from the Paraná River delta near Buenos Aires almost to the Paraná and Paraguay Rivers junction (Belton, 1984; Antas, 1987; Sick, 1997), and then fly to the south coast of Brazil (Antas, 1994). The species flies along coastal lagoons in RS and reaches lower Paraná, which is its main breeding site, through eastern Uruguay or through the Central Depression of the state (Antas *et al.*, 1990; Antas, 1994; Nascimento *et al.*, 2000). The migration after breeding occurs from April to September and occasionally some individuals arrive in the Pantanal in MS (Nascimento *et al.*, 2000). There are also historic records for RJ (J.F. Pacheco, *pers. obs.*). In SP, it has been recorded for the Tanquã region in the municipality of Piracicaba all year round, and there is also evidence of breeding activity (WikiAves, 2016).

*Heteronetta atricapilla* (MPR): occurs from Chile and Argentina to southern Brazil, Paraguay and Bolivia (Sick, 1997). Populations that breed further south of the distribution fly north during winter (Carboneras, 1992a). Calabuig *et al.* (2010) suggest that this species presents the same pattern as *Coscoroba coscoroba*, in which part of the population migrates and the rest remain in one area throughout the year. Individuals that were banded in Santiago del Estero in June and then recovered in RS in August (Olrog, 1974) proved migration between Argentina and Brazil (RS). This species breeds in RS between October and December (Maurício *et al.*, 2013).

## Procellariidae

*Pterodroma arminjoniana* (MPR): adults seem to be sedentary in great part of its distribution while immature individuals are more dispersive and can move through tropical and subtropical Atlantic waters. It breeds in Trindade and Martin Vaz (Carboneras, 1992c), but its

breeding is currently restricted to Trindade Island and other near islets (Neves *et al.*, 2006). On Trindade, active nests and pairs doing flight displays can be seen all year round (Neves *et al.*, 2006), but records of immature individuals are more common on the North Atlantic Ocean than in the South Atlantic (Abreu *et al.*, 2010). There are, however, records of adults for the coast of Rio Grande do Norte (RN) in January 2015 (WikiAves, 2016) and of immature individuals for Argentina in July (Savigny *et al.*, 2005) and for Uruguay in April (Abreu *et al.*, 2010).

### Ardeidae

*Nyctanassa violacea* (MPR): occurs from the coast of the USA to northern Peru and Brazil in all coastal states from AP to RS (Sick, 1997; WikiAves, 2016). Movements from the subspecies *N. v. cayennensis*, which occurs in Brazil, are little known (Martínez-Vilalta & Motis, 1992). In the estuary from Lagoa dos Patos/RS, where it breeds, its occurrence is seasonal between August and April (Gianuca, 2007) and a large part of the population is absent from this state between April and August, when its main prey (the crab *Neohelice granulata*) remains in its burrows (Martínez-Vilalta & Motis, 1992). There are other records for RS in September, October, November, December and February (Belton, 1984; WikiAves, 2016), which confirm the migratory pattern in the state even though it is present in all other states throughout the year (WikiAves, 2016).

### Threskiornithidae

*Plegadis chihi* (MPR): occurs from central California and northwestern USA to the coast of Mexico, and in southern central South America from southeastern Bolivia, Paraguay and southern Brazil to Uruguay and northern central Chile and Argentina (Matheu & del Hoyo, 1992). In Brazil, it seems to breed only in RS and there is a record of 12,000 pairs in the Taim Ecological Station (Belton, 1984), where there are also records all year round, as well as in SC (P.P. Serafini, *pers. obs.*), PR and SP (WikiAves, 2016). However, banding and recapture data proves that this species migrates between Argentina and RS, and records for Argentina are centered in the period between January and April and for RS between June and December (Olrog, 1971; Belton, 1984; SNA, 2016).

*Platalea ajaja* (MPR): occurs from southeastern USA to northern Argentina, and there are records in all of Brazil. It is considered sedentary in most of its global distribution, but it is partially migratory in North America and its movements in South America are little known (Matheu & Del Hoyo, 1992). In Brazil, it breeds in RS (September to December), where it is present throughout the year (Belton, 1994), and also in the Pantanal according to banding data (SNA, 2016). Nestlings and juveniles banded in RS were recovered in SC, SP, MG and RJ (Nunes & Tomas, 2008). This species was classified as partially migratory due to the fact that breeding data is restricted to RS and Pantanal, which suggests that this species returns to these places to breed.

### Accipitridae

*Elanoides forficatus* (MPR): occurs from the southeast coast of the USA to eastern Bolivia, Paraguay and northern Argentina, and two subspecies are recognized: *E. f. forficatus* and *E. f. yetapa*, both which occurs in Brazil (Bierregaard & Kirwan, 2016a). There are records of breeding activity in the Brazilian territory for MT, TO, SP, PR, SC and RS between November and February (WikiAves, 2016). In the Amazon, where it also breeds, only one nest was recorded in the Upper Negro River (Thiollay, 1994). It is relatively common in most of its distribution and migratory in the extreme north and south of its global occurrence: chicks banded in Florida in June were recovered in PR in December and in MT in October and November (Sick, 1997). There are also records for RS between September and March (Belton, 1984). There is no doubt about its migratory behavior, but tracking studies should be performed due to the presence of both subspecies in Brazil sharing geographical areas for at least part of the year (B. Whitney, *pers. obs.*).

*Ictinia plumbea* (MPR): occurs from northeastern Mexico to western Ecuador, Paraguay and northern Argentina and Brazil (Bierregaard *et al.*, 2016). It is migratory in the north and south of its global distribution (Jahn & Cuello, 2012), and the limits of its populations are not well known. Groups, probably of nomads, appear sporadically throughout the Amazon (Bierregaard *et al.*, 2016) and are recorded in the region of Alter do Chão/PA only during the rainy season from February to July (Sanaiotti & Cintra, 2001). In Brazil, this species occurs sporadically in the Northeast and it breeds in the Amazon and in the Central-West, Southeast and South regions. For PR, SC and RS, records are restricted to the period between August and April (WikiAves, 2016; MNRJ; MZUSP). Therefore, there is a resident and a migratory population in the Brazilian national territory.

*Rostrhamus sociabilis* (MPR): occurs from southeastern USA to northeastern Argentina and populations from the south of the global distribution are migratory (Sick, 1997). This species performs nomadic movements triggered by drought or drainage of its feeding areas (Bierregaard & Kirwan, 2016b). It departs from the southern region of Brazil in April and returns in September, and some individuals fly to the Pantanal, where they form groups of up to 600 individuals in feeding areas (Bierregaard & Kirwan, 2016). There is no record of breeding in the Pantanal and large groups (40-80) have been seen departing from the central area and heading south (Antas, 1994). In the Paraguay River, it is more common in October, when it flies south in flocks (Thiollay, 1994). There are records of flocks of about 1,000 individuals flying from the north to the south over Sapucaia do Sul/RS in October 1976 (Sick, 1983). In October 2010, a flock of thousands of individuals (between 2,500 and 3,000) was seen flying from the north to the south in Chapada dos Guimarães/MT (P.P. Amaral, *pers. obs.*). There are records of breeding activity for CE, Alagoas (AL), Piauí (PI), Espírito Santo (ES), RJ and

RS, where the species has been recorded in all months of the year (WikiAves, 2016), as well as in MG and SP (L.F. Silveira, *pers. obs.*).

## Rallidae

*Pardirallus sanguinolentus* (MPR): occurs in Peru, Chile, Bolivia, Paraguay, Uruguay, Argentina and the southeastern and southern regions of Brazil (Taylor, 1996). It breeds in RS (Belton, 1994; Maurício *et al.*, 2013), SC, PR, SP and RJ (WikiAves, 2016). The population from southwestern Pampas seems to migrate north during winter, while populations from the Atlantic coast and coastal swamps are sedentary (Taylor, 1996). Records for western RS – in the municipalities of Quaraí, Alegrete and Uruguiana – are restricted to the period between May and September (WikiAves, 2016; MZUSP).

*Porphyrio martinicus* (MPR): occurs from southeastern USA to Peru, Paraguay, Uruguay, northern Argentina and all of Brazil (Taylor, 1996; Grantsau, 2010). Although the literature indicates that this species moves seasonally in northeastern Brazil (Sick, 1983), photographic records (WikiAves, 2016) and banding data (SNA, 2016) do not corroborate this pattern. There are scarce records of breeding activity in the entire Northeast region from January to October, and also in CE, Pernambuco (PE) and BA throughout the year (WikiAves, 2016). Populations from the extreme south of the distribution (Argentina, Uruguay and southern Brazil) fly north during austral winter (Taylor, 1996), when they disappear completely (Sick, 1997) from the RS, where records are restricted to the period between September and May (Belton, 1984; MZUSP 637 [RS, 1897, October]), when they also breed (Maurício *et al.*, 2013). As the species is recorded virtually all year round in SC (WikiAves, 2016), migration seems to be restricted to RS.

## Charadriidae

*Charadrius falklandicus* (MPR): migrates after breeding from Patagonia to Uruguay, RS and the Southeast region of Brazil (Wiersma, 1996). It has a resident population in RS, where breeding has also been recorded (Belton, 1984; Sick, 1997; Maurício *et al.*, 2013). For SP, there are records in May to August (Barbieri *et al.*, 2013; WikiAves, 2016). There are also records for SC between May and July (WikiAves, 2016).

## Sternidae

*Sternula antillarum* (MPR): breeds from April to July on the east coast of the USA, it migrates to the Caribbean and South America, and overwinters mainly in Brazil (Gochfeld & Burger, 1996) according to data from two individuals banded in the USA and recovered in AL in January (Olmos, 2002a). However, there is a breeding colony on Curupu Island/MA monitored between May and July (Rodrigues *et al.*, 2010) that suggests that there are possibly two populations in Brazil and their limits are not yet known. This way, occurrence data in Brazil may

include birds both from the Brazilian populations and migrants from the Northern Hemisphere. There are records for AP between October and April (Xavier & Boss, 2011; WikiAves, 2016) that are probably individuals from North America, and for PA between May and October (Valente, 2011; WikiAves, 2016; MPEG) that would belong to the Brazilian population. In the Northeast region, there are records in BA (Lima, 2006), PE (Azevedo-Júnior & Larrazábal, 2011a), SE and AL (Azevedo-Júnior & Larrazábal, 2011b), from September to May (WikiAves, 2016; MZUSP), which suggests that these are records of the north population. Records for CE, RN (Girão *et al.*, 2008; Albano & Girão, 2011; Girão & Albano, 2011a) and MA are distributed in all months of the year (WikiAves, 2016), which suggests that there is an overlap of migratory and resident individuals. In RS, records are probably of migrants and from November to April (WikiAves, 2016).

*Gelochelidon nilotica* (MPR): occurs in tropical and subtropical seas in all continents. Birds from eastern USA migrate to southeastern USA and to the Gulf of Mexico. Some individuals cross to the Pacific, while others overwinter along Costa Rica or reach southern Brazil and Peru (Gochfeld & Burger, 1996). It is usually not common in most of Brazil and its distribution is disjunct and centered in two different areas: through the coast from the estuary of the Amazon River (including Mexiana and Marajó islands/PA) to RN; and in coastal lagoons, rice fields and swamps in southern Brazil (RS), and this second population is contiguous to the ones in Uruguay and Argentina. There are few records of breeding activity in Brazil (De Luca *et al.*, 2006), and most records of nesting are old. This species nests in the estuary of the Amazon River in August (Sick, 1997) and in RS between November and January (Belton, 1994). Photographic records confirm the disjunct distribution pattern and show its presence in the Northeast all year round, which suggests that part of the Brazilian population is resident, but records in RS are restricted from September to May (WikiAves, 2016). There are also documented records in inland Brazil, such as in MG (Nóbrega *et al.*, 2015) and in the Amazon River channel, where it might breed (Kirwan *et al.*, 2012).

*Sterna hirundinacea* (MPR): occurs from the south coast of Peru and southeastern Brazil to Tierra del Fuego and on the Malvinas/Falklands. During winter, its distribution expands further north to southern Ecuador on the Pacific coast and to BA on the Atlantic coast (Gochfeld & Burger, 1996). There are two breeding populations on the Atlantic coast. The population from southern Uruguay and Argentina breeds every year from December to February during austral summer and then migrates north and arrives in Brazil from April to May to winter possibly between the coast of RJ and southern BA. The Brazilian population from SC to ES begins breeding activities in April-May (Antas, 1987). There are also records of breeding activity on coastal islands from RJ (Coelho *et al.*, 1990) and SC (Branco, 2003). Museum records are restricted to June to September in RJ (MZUSP, MNRJ, MPEG), to July to October and April in SP and to August in RS (MZUSP).



*Sterna trudeaui* (MPR): occurs on the coast of and in inland South America, and breeds from southern Brazil to Patagonia and Chile (Gochfeld & Burger, 1996). There is evidence of breeding activity in RS (Sick, 1997) in November and December (WikiAves, 2016), where it is considered resident (Belton, 1984; Accordi & Hartz, 2013). Out of the breeding season, it flies north through the Pacific coast to southern Peru and through the Atlantic coast to RJ (Gochfeld & Burger, 2016a). Photographic records suggest it is present on the Brazilian coast from RS to northern SP, but records for SP are restricted between May and November, for PR from July to November, and for RS in August (WikiAves, 2016; MZUSP).

*Thalasseus acutiflavus* (MPR): occurs in eastern North America, Antilles and Caribbean and overwinters from the southern Caribbean to southern Peru and Uruguay (Gochfeld & Burger, 2016b). Individuals from North America migrate south across the Caribbean and over the coasts from both Central and South America (Gochfeld & Burger, 2016b). In Brazil, this species breeds on coastal islands in the South and Southeast regions, and the largest breeding colony of the South Atlantic is in ES with around 14,000 individuals (M.A. Efe, *pers. comm.*). In RS, (Accordi & Hartz, 2013) and BA, it can be observed all year round, but there are large gatherings of individuals on the coast of BA from September to April originated from breeding colonies in ES according to banding data (Lima *et al.*, 2004b). Although this species is considered migratory by Jahn & Cueto (2012), available data shows it is only partially migratory.

*Thalasseus maximus* (MPR): occurs from the southwest coast of the USA to northwestern Mexico and from eastern USA to the Guianas and Brazil, through the Antilles and Bahamas. Its breeding populations are disjunct and occur in the Yucatán Peninsula and in southern Brazil, Uruguay and northern Patagonia (Gochfeld & Burger, 1996). Individuals that arrive in Brazil come from southern USA and Caribbean and land in the north and northeast coasts during austral summer, and also individuals that come from Patagonia during austral winter (De Luca *et al.*, 2006). There are records of this species all year round in Ilha Comprida/SP both of breeding individuals and of those originating from southern South America (Barbieri & Paes, 2008). Although this species have had been considered resident in RS (Accordi & Hartz, 2013), its records are scarce from October to December, which suggests return to breeding colonies further south of the continent in this period (Belton, 1984), confirming the migratory behavior as already proposed by Jahn & Cueto (2012).

### Rynchopidae

*Rynchops niger* (MPR): occurs as resident in some coastal areas in eastern USA, Mexico and northern South America; occurs as migrant in the coast of South America, Central America and part of the USA. It breeds in the Amazon and in great part of central and eastern Brazil (Zusi,

1996). This species is recorded in Brazil all year round, but evidence of breeding activity seems to be restricted to RS, the Amazonian and Central-West regions, specifically in AM, PA, RO, TO, MT, MS, GO (WikiAves, 2016). Data from banding and recapture suggests that nestlings born in the Pantanal in MT and in the Manaus region/AM fly to southern Brazil in RS, to Uruguay and Argentina (SNA, 2016). During a one-year study in the estuary of Cananéia-Iguape-Ilha Comprida/SP, this species was present in all months exhibited no evidence of breeding activity and presented population fluctuations (Barbieri, 2007). Although the available data is still not enough to define a migratory pattern, the fact that this species only breeds in the aforementioned places suggests the existence of migratory movement.

### Caprimulgidae

*Lurocalis semitorquatus* (MPR): occurs from southern Mexico to northern Argentina (Cleere, 1999). There are records of breeding activity of the subspecies *L. s. nattereri* in lowland Atlantic Forest in SP between September and March, and of it departing from this area between April and August (Aleixo & Galetti, 1997). In the Carlos Botelho State Park/SP, it has been considered locally migratory and its records are centered in the period between September and April (Antunes *et al.*, 2013), which also happens with its photographic records for the entire South and Southeast regions – RJ, SP, PR, SC, RS (WikiAves, 2016). The species seems to fly to regions further north of the country during winter, including the Amazon, where there is a resident population (*L. s. semitorquatus*) that gathers with migratory populations. Important vocal distinctions possibly prevent population cross-breeding during the wintering season of *L. s. nattereri* in the Amazon (T.V.V. Costa, *pers. comm.*). Museum data confirms the described pattern once records for South and Southeast regions are restricted to the period of September to April (MZUSP, MPEG, MNRJ) and for Amazonian region all over the year (MZUSP, MPEG).

*Hydropsalis parvula* (MPR): occurs from eastern Peru to northern Argentina and Uruguay and all through Brazil, especially south of the Amazon River. The species seems to be migratory in Brazil (Cleere, 1999) and is present in the Central-West, Southeast and South regions especially between September and April, and in the Amazon, where it overwinters, it is restricted between April and August. In the Northeast, it seems to be present all year round. There are records of breeding activity for GO, DF, MT, MS, MG, CE, BA, AL, SE, ES, RJ, SP, PR (WikiAves, 2016) and RS (Belton, 1984).

*Podager nacunda* (MPR): the subspecies *P. n. nacunda* breeds in temperate and tropical regions in South America and migrates to hotter, more humid regions in the continent (Azpiroz *et al.*, 2012), where it joins the resident taxon *P. n. minor* (Barbosa *et al.*, 2015). Its migratory pattern is less known (Cleere, 1999) and the overlap of the two subspecies makes it harder to differentiate records

of the migratory from those of the resident population. There are records for almost the entire Brazilian territory and they are distributed in all months of the year, while evidence of breeding activity is restricted to PA, TO, GO, RJ, SP, PR and RS between September and December (WikiAves, 2016).

### Trochilidae

*Florisuga fusca* (MPR): occurs in southeastern Paraguay, northeastern Argentina, northern Uruguay and part of Brazil (Schuchmann, 1999). It breeds on mountains in southeastern Brazil and migrates altitudinally, moving to lower grounds during winter. It is a regular winter visitor in the province of Misiones in Argentina and rare in eastern Paraguay (Areta & Bodrati, 2010). In Brazil, there are records in all months of the year in the Southeast, the South, and in BA. In GO and MS, records are centered in the period between April and October. Breeding activity (November to March) has an altitudinal tendency, and most records come from elevations higher than 600 m (WikiAves, 2016). Further studies are necessary to better understand its migratory patterns.

*Anthracothorax nigricollis* (MPR): occurs from Panama to northeastern Argentina and southern Brazil. It migrates to higher elevations in August and September and long-distance migration in eastern Brazil is also known (Schuchmann, 1999). There is one record of breeding activity in lowland Atlantic Forest in SP between September and March, and it departs from this region between April and August (Aleixo & Galetti, 1997). The species has been recorded in Carlos Botelho State Park/SP from October to April (Antunes *et al.*, 2013), and is considered locally migratory. According to photographic and banding records, it occurs in the Amazon all year round, where it breeds from April to July. This species seems to vanish from RJ, PR and RS during winter (from May to July), and from ES in June and July. Although there are records for SP during winter, its numbers are low. Records of breeding activity in the South and Southeast are restricted to lower elevations (under 600 m) and centered in the period between October and February (SNA, 2016; WikiAves, 2016). This described pattern is confirmed by museum data (MZUSP, MPEG, MNRJ) although the presence of two isolated records in the winter: in MG in June (MZUSP 97891) and in RJ in July (MNRJ 41474).

### Tityridae

*Pachyramphus polychopterus* (MPR): occurs from Guatemala to eastern Brazil and northern Argentina (Mobley, 2016). There are records of breeding activity in lowland Atlantic Forest areas in SP between September and March, and records for the Carlos Botelho State Park/SP are restricted between September and April (Antunes *et al.*, 2013). It seems to depart from southeastern SP in April (Aleixo & Galetti, 1997), which is corroborated by data from the Southeast and South regions, where records are centered in the period between September

and April (Belton, 1985; WikiAves, 2016; MZUSP; MPEG; MNRJ). In the Northeast, Central-West and Amazonian regions, records are distributed in all months of the year (WikiAves, 2016).

*Pachyramphus validus* (MPR): occurs from southern Peru and eastern Bolivia to northern Argentina, Paraguay and Brazil (Mobley, 2016) on Marajó Island and eastern PA, and from RO to RS. Joseph (1996) classified it as migratory, but this is not a consensus in literature. It breeds in lowland Atlantic Forest areas in SP between September and March and it seems it departs from this region between April and August (Aleixo & Galetti, 1997). Analyses of data from WikiAves, museums and SNA show a reduced number of records in the colder months (from May to July) in the states from the Southeast and South, and its absence from SC and RS (Belton, 1985; WikiAves, 2016; SNA, 2016; MZUSP, MPEG, MNRJ), which shows that the species exhibit migratory movement. Although further studies are necessary to better understand its migratory pattern in all Brazilian territory.

### Tyrannidae

*Elaenia spectabilis* (MPR): breeds from the eastern Andes in Bolivia to southwestern and eastern Brazil, northern Argentina and Uruguay; it overwinters in northeastern Brazil and in the Amazon (Hosner, 2004a). Museum and sound records show its sparse presence throughout the year in almost the entire national territory. Records for Amazonian states are restricted in the period between April and November and centered between May and August (WikiAves, 2016; MZUSP; MNRJ; MPEG). The records from the South region (PR, SC and RS) are restricted to September and March (WikiAves, 2016; MZUSP; MPEG), which suggests a migratory pattern. However, there is only evidence of breeding activity for the Northeast, Southeast and South regions between September and April (WikiAves, 2016) indicating why this species was classified as partially migratory.

*Elaenia parvirostris* (MPR): breeds in eastern and southeastern Bolivia, southeastern and southern Brazil, northeastern Argentina and Uruguay. After breeding, it migrates during winter (April to October) mainly to northern South America, crossing the entire Amazon and flying as far as southern Caribbean (Netherlands Antilles, Trinidad) (Fitzpatrick, 2004). Available records, vocal and museum, corroborate this pattern: those for the Amazonian region are restricted to the period between April and October, while those for Southeast and South are centered from August to March (WikiAves, 2016; MZUSP; MPEG). Breeding data for the Southeast and South are between October and February (WikiAves, 2016).

*Elaenia chiriquensis* (MPR): occurs from Costa Rica to eastern Brazil and northeastern Argentina. It is considered resident in most of its distribution (Hosner, 2004b), but some individuals migrate to breed (Jahn *et al.*, 2004). The coexistence of migratory and resident populations

hinders the identification of flyways (Marini & Cavalcanti, 1990). There seems to be a population quite common in Central Brazil between August and December that also breeds there and fly north during winter (Hosner, 2004b; Medeiros & Marini, 2007) and west to the Amazonian region (Sick, 1983, 1997; Marini & Cavalcanti, 1990). This migratory pattern is corroborated by an absence of records south of Brasília/DF and Cuiabá/MT between June and August (Marini & Cavalcanti, 1990). Nevertheless, a study using stable isotope analysis of tissues of individuals from this population reveals that individuals never leave the Cerrado for molting and wintering (Guaraldo *et al.*, 2016). In addition, unpublished data from Charles G. Duca reports a quick passage of individuals through the coast of ES in February that were molting flight feathers, which suggests that the southeast coast of Brazil may be a stopover or molting ground for this species.

*Myiopagis viridicata* (MPR): occurs from Mexico to Venezuela and Ecuador, also in Guyana, Peru, Bolivia, Paraguay, Argentina and virtually all of Brazil. It is mainly resident, but populations in extreme southern Brazil migrate north after the breeding season (Fitzpatrick, 2004). Photographic records restricted to the period between September and May in PR, SC and RS corroborate this, while in other states it is found throughout the year (Belton, 1985; WikiAves, 2016).

*Serpophaga munda* (MPR): breeds in Argentina between October and January and flies to lower elevations, to the north and east of the Chaco and to Patagonian lowlands during austral winter, with some individuals flying to coastal regions in southeastern of Brazil and Uruguay (Fitzpatrick, 2004). It migrates every year from the Andes to the Pantanal during colder periods (D. Oliveira, *pers. comm.*), as shown by recaptures in the Pantanal Matogrossense National Park in June 2013 (Cemave, unpublished data). All photographic and sound records available are for RS and are distributed throughout the year (WikiAves, 2016), which suggests a resident population (even though there is no evidence of breeding activity). Because of its migratory behavior in the Pantanal, this species was considered partially migratory.

*Legatus leucophaius* (MPR): occurs from Mexico to northern Argentina and in all of Brazil (Mobley & Kirwan, 2016). It has been considered a migratory species (Jahn & Cueto, 2012), and records for the northeastern, southeastern and southern regions are centered in the period between September and March (Belton, 1985; Antunes *et al.*, 2013; WikiAves, 2016; MZUSP; MNRJ). However, the species is recorded all year round for the northern region (WikiAves, 2016; MZUSP; MPEG) and there is evidence of breeding activity for all of Brazil between September and February (WikiAves, 2016), which characterizes it as a partially migratory species.

*Myiarchus swainsoni* (MPR): the subspecies *M. s. swainsoni* occurs in the most meridional regions of South America, breeds in the temperate zones of Argentina

and overwinters in northern South America (Sick, 1997; Joseph, 2004; Cueto *et al.*, 2008). In Brazil, it breeds in RS (Belton, 1985; Maurício *et al.*, 2013), where it is considered an austral migrant (Accordi & Hartz, 2013). Photographic, museum records and banding data in RS are centered on the period between September and April (Belton, 1985; SNA, 2016; WikiAves, 2016; MZUSP) as well as for SC and PR (WikiAves, 2016; MZUSP). In SP, it has been regarded as migratory (Willis, 2004; Silva-e-Silva & Olmos, 2007; Antunes *et al.*, 2013), but photographic records and banding data show its presence in all months of the year (SNA, 2016; WikiAves, 2016). Sedentary populations may be represented by the subspecies *M. s. pelzelni* in Central Brazil (Lanyon, 1982), but preliminary data and capture records suggest a migratory pattern for this subspecies around Brasília/DF, as seen as the result of a pilot project with geolocators and isotopic analyses in Brasília and in Chapada dos Guimarães/MT (A. Guaraldo, *pers. obs.*).

*Casiornis fuscus* (MPR): endemic to Brazil and occurs in the southern Amazon from lower Tapajós River east to PE and south to northeastern MT and central MG, including the entire Caatinga and part of the Cerrado (Scholes, 2004; Scholes & Boesman, 2016). As stated by Sick (1997), it seems to be present in the north of its distribution only as a visitor during winter. This statement was recently confirmed and deepened a space-time analysis of historic records of museum specimens, field observations and digital vouchers at WikiAves and *e-bird* (Lees, 2016). In this analysis, a migratory pattern from part of the Caatinga and adjacent ecotones was identified, where records are centered in the period between December and March, expanding west to northern Cerrado and eastern Amazon between June and September. Although it can be recorded throughout the year in the Caatinga, where it also breeds, as corroborated by banding data (SNA, 2016), its occurrence in the Amazon is restricted to the period between April and October, when they use mainly open formations and young secondary forests as wintering areas (Lees, 2016).

*Pitangus sulphuratus* (MPR): occurs from extreme southern USA to Argentina. Its migratory habits are little known and it is resident in most of its distribution. It seems to depart from higher altitudes and colder regions in southern Brazil during austral winter (Mobley, 2004a). One individual banded in Santiago del Estero, Argentina was recovered in SC in January (Olrog, 1969). There are large numbers of this species in Serra da Bodoquena in western MS during winter and then it disappears during summer, which suggests a west-east movement through the Argentinian Chaco region to Brazil (Capllonch *et al.*, 2009). During a banding course in the Pantanal Matogrossense National Park in July 2013, 11 individuals were captured simultaneously in two mist nets (Cemave, unpublished data). However, further studies are necessary to better understand this species movement patterns.

*Myiodynastes maculatus* (MPR): occurs from Mexico to Argentina and in all of Brazil (Mobley, 2004b). It is considered



migratory (Jahn & Cueto, 2012) in the extreme north and south of its distribution and seems to move altitudinally (Mobley, 2004b), but this is yet to be confirmed. It breeds in almost all of Brazil from September to April (SNA, 2016; WikiAves, 2016) and, according to Sick (1983), it departs from southern regions in the winter to join the sedentary populations from the north (Sick, 1983). Photographic records (WikiAves, 2016) and banding data (SNA, 2016) confirm its presence all year round in all of Brazil, but in the southeastern and southern regions they are centered in the period between September and April, which suggests a winter migration that should be better studied. Central-western records are far more numerous in the period of August to December (WikiAves, 2016).

*Tyrannus albogularis* (MPR): occurs from Venezuela to the Guianas south to northern Bolivia and Brazil. It has been classified as an austral migrant, but its movement pattern is not fully known and populations further north of the distribution may be resident. During austral winter (approximately from May to August), it migrates west through the Amazon, reaching extreme southeastern Colombia, eastern Ecuador and northeastern Peru (Mobley, 2004c). Photographic records and banding data show that the species breeds in Brazil between October and April in PA, RN, TO, GO, MG and SP. Its occurrence records are sparse throughout the year in the national territory (SNA, 2016; MZUSP; MPEG). However, there are fewer records in GO, MG and SP between May and August than in the rest of the year (SNA, 2016; MZUSP; MPEG), which suggests a reduction in population during winter. Further studies are necessary to understand its migratory pattern.

*Tyrannus melancholicus* (MPR): occurs from extreme southwestern USA to central Argentina and in all of Brazil (Mobley, 2004d). Populations from southern Brazil remain in their breeding area only during the hotter months of the year and depart during winter (Sick, 1997), which classifies it as migratory (Jahn & Cueto, 2012) in part of its distribution (Mobley, 2004d). Museum records and banding data are restricted to the period between October and March in PR, SC and RS, and in MG, RJ and SP it is centered on September to March, when there are far more records (Belton, 1985; Accordi & Hartz, 2013; SNA, 2016; MZUSP; MPEG). However, the species is recorded all year round in the entire national territory and there is an overlap of resident and migrant populations, whose individuals can be morphologically differentiated by their wings (Jahn *et al.*, 2010). Evidence of breeding activity is available for almost all Brazilian states (SNA, 2016; WikiAves, 2016).

*Tyrannus savana* (MPR): occurs from southern Mexico to Argentina and all of Brazil, with both resident and migratory populations, whose movement patterns are not fully understood (Mobley, 2004e). It breeds in Argentina and southern Brazil from September to February and then flies north in flocks (Sick, 1983; Belton, 1985; Cueto *et al.*, 2008; Azpiroz *et al.*, 2012). It overwinters in the

Amazon, but not always does the entire population migrate. During the non-breeding season (March to September), individuals of meridional populations invade areas of the sedentary septentrional populations. This species migrates in flocks that use different pathways to fly to and from the Amazon Basin, where they gather by the hundreds or even thousands (Sick, 1997). Three pairs captured in their breeding territory in Argentina and monitored by geolocators bred from late November to mid-January, started fall migration between late January and late February, and then migrated to the northwest, heading to northern South America and using one or two wintering grounds. Five individuals stayed in the western Amazon (mainly in Peru, northwestern Brazil and southern Colombia) for several weeks in April and May before flying to spend the rest of the non-breeding season in central Venezuela and northern Brazil. Fall migration lasted between 7 and 12 weeks and covered a distance of 2,888 to 4,105 km (Jahn *et al.*, 2013b). According to photographic records and banding data, it occurs in the southeastern and southern regions of Brazil only from September to March, when it breeds (Belton, 1985; SNA, 2016; WikiAves, 2016). According to the literature, in the Amazonian region, it occurs all year round but it is but it is represented by both resident and migratory individuals (SNA, 2016; WikiAves, 2016). It has been recently discovered through geolocation data that individuals breeding in SP overwinter mainly in Colombia and Venezuela (Jahn *et al.*, 2016).

*Griseotyrannus aurantioatrocristatus* (MPR): breeds in temperate zones in Argentina and migrates during austral winter to hotter, more humid latitudes in South America (Cueto *et al.*, 2008). Part of its population is migratory and part is resident (Jahn *et al.*, 2004). The nominotypical subspecies breeds in northern and eastern Bolivia, central-western and southern Brazil, northern and central Argentina, Paraguay and Uruguay; is migratory and flies mainly to western Amazonia. During the non-breeding season, it is recorded in northeastern Peru, eastern Ecuador, southeastern Colombia, Brazil – in AC, RO, AM and PA –, extreme southern Venezuela and southern Guyana. The subspecies *G. a. pallidiventris* occurs from eastern PA to MA and PI and in GO (Mobley, 2004g) and is sedentary. In Brazil, photographic records showing evidence of breeding activity are scarce and they are restricted to the period between October and December in BA, GO, MG, SP (WikiAves, 2016) and RS (Belton, 1985). Occurrence records and banding data show its presence in central-western, southeastern and southern regions between September and January, while in the Amazonian region it can be observed throughout the year (SNA, 2016; WikiAves, 2016), probably due to the existence of a resident population and a seasonal increment of migratory individuals.

*Empidonomus varius* (MPR): occurs in almost the entire continent of South America (except in the Andes and extreme south of the continent), and is migratory in the west and south of its distribution (Fitzpatrick, 2004). In

Brazil, two subspecies occur: *E. v. rufino*, in Venezuela, Guianas, northern and eastern Brazil; and *E. v. varius*, in Bolivia, central and southern Brazil, northern Argentina, Paraguay and Uruguay, which seems to be migratory (Mobley, 2004h). Photographic records show evidence of breeding activity in the Amazonian region and in the northeastern, southeastern and southern regions from October to February (WikiAves, 2016). This, alongside banding data, shows its presence all year round in the northern region (SNA, 2016). In Caatinga regions in Northeast Brazil, its occurrence may be related to the rainy season, when there is a larger concentration of individuals between December and June. This pattern should be studied further. In the central-western, southeastern and southern regions, the species occurs mainly between September and April (SNA, 2016; WikiAves, 2016; MZUSP), as already stated in the literature for SP (Aleixo & Galetti, 1997; Willis, 2004; Antunes *et al.*, 2013) and RS (Belton, 1985). It seems to fly to the northern region during winter (Sick, 1983), where the resident population receives an increment of migrant individuals.

*Myiophobus fasciatus* (MPR): occurs from Costa Rica to northeastern Argentina, and is recorded in all of Brazil. It is resident, but there are migratory populations in the south of its distribution (Farnsworth & Lebbin, 2004e). In Brazil, it breeds in RS (Maurício *et al.*, 2013), where it is considered migratory (Accordi & Hartz, 2013). Banding data and photographic records show its presence in this state between September and April, and only two individuals were banded outside of this period (one in May and another in June). In all other states the species is present all year round (SNA, 2016; WikiAves, 2016).

*Sublegatus modestus* (MPR): migratory in the south of its distribution. Populations that breed in Argentina migrate to the Amazon during winter (Robbins, 2004; Cueto *et al.*, 2008; Capllonch *et al.*, 2009). Records for RS are restricted to the western region and are centered in the summer from October to February with evidence of breeding activity (Belton, 1985), despite a specific record in June (WikiAves, 2016). Photographic records and banding data are pretty scarce for the Amazon Basin (SNA, 2016; WikiAves, 2016), but they are restricted to the period between April and August in AC, RO, AP and the Amazonian region in MT, which confirms the migratory pattern suggested in the literature (WikiAves, 2016). It is still not securely known if the Amazonian populations are exclusively composed of austral migrants (Sick, 1997) or if there is a resident population in there. Studies with this species in this region are necessary.

*Pyrocephalus rubinus* (MPR): occurs from southern USA to south-central South America, and it is migratory in most of its distribution. It breeds in southeastern Bolivia, Paraguay, northern Argentina, Uruguay and southeastern and southern Brazil, and it overwinters mainly east of the Andes north to as far as southeastern Colombia, eastern Ecuador, northeastern Peru and the Brazilian

Amazon (Fitzpatrick, 1980; Sick, 1983; Jahn *et al.*, 2004; Farnsworth & Lebbin, 2004f). In other areas, it moves altitudinally (Fitzpatrick, 2004). Adults from the population that breeds in Argentina depart to Ecuador and Colombia immediately after breeding, while the young remain for three more months and depart only when winter is near, in late April. Populations from southern Brazil migrate during winter and invade areas from resident populations in Central Brazil and in the Amazon (Sick, 1997). The species breeds in RS (Belton, 1985; Maurício *et al.*, 2013) and PR (WikiAves, 2016). Photographic records show its presence all year round in almost the entire Brazilian territory, except for the Northeast, where there are records only for BA between May and November (WikiAves, 2016). In RS, records are also distributed in the entire year, but they are scarce from May to July (WikiAves, 2016).

*Fluvicola albiventer* (MPR): breeds from northern central and eastern Brazil to eastern Bolivia, Paraguay, northern Argentina and western Uruguay. It occurs as a winter migrant in the western Brazilian Amazon, southeastern Peru, northern Bolivia. There are few records for northeastern Peru and is also vagrant in Ecuador (Farnsworth & Langham, 2004b). In Brazil, according to photographic records (WikiAves, 2016) and banding data (SNA, 2016), the species seems to be resident in the Southeast and Northeast regions. Records are scarce in the south of the country and they seem to be centered in the period between July and December for the Amazonian region, even though in AM it was also recorded in January and February (SNA, 2016; WikiAves, 2016; MZUSP; MPEG). Its seasonality in the Amazon was important for its classification as partially migratory, but moving patterns are not well defined and further studies are necessary.

*Lathrotriccus euleri* (MPR): occurs in Venezuela, Colombia, Guianas, Ecuador, Peru, Bolivia, Argentina, Paraguay, Uruguay and the entire Brazil. It is mainly resident, but populations from the south migrate north during winter (Farnsworth & Lebbin, 2004g) in July, and return in January (Joseph, 1996). According to photographic records, the species is present in the Southeast and Central-West regions all year round and records are scattered along the year without an apparent pattern. In the South (PR, SC and RS), the species vanishes during winter, especially in June and July (WikiAves, 2016). In RS, data from band recovery suggests fidelity to site and period (Belton, 1985).

*Hymenops perspicillatus* (MPR): occurs in Chile, Argentina, Paraguay, Uruguay, Bolivia and Brazil. It is resident in part of southern Brazil, but migratory in the southeast, moving north during winter (Farnsworth & Lebbin, 2004h) and remaining in the breeding area only in the hotter months of the year (Sick, 1997). This species is recorded all year round for RS and SC (WikiAves, 2016), which indicate that it is resident in these states (Belton, 1985). However, records for PR, SP, RJ, MS and MT are restricted to the period between April and November (WikiAves, 2016).

## Vireonidae

*Vireo chivi* (MPR): breeds between late September and early April in central western and southern Peru, Brazil – in BA, GO, MT, RJ, SP, PR, SC and RS (WikiAves, 2016) –, west-central Paraguay and northern Argentina as far as Buenos Aires, between 15°S and 36°S (Capllonch & Wagner, 2009; Brewer & Orenstein, 2010). In SP, records are restricted to the period between September and March (Aleixo & Galetti, 1997; Machado, 1997; Willis, 2004; Antunes *et al.*, 2013; MZUSP), as well as in PR (Vallejos *et al.*, 2011; MZUSP), the Pantanal (Nunes & Tomas, 2008), and MS (Nunes *et al.*, 2011). In PE, records are centered in the period between October and February (W. Telino-Júnior, *pers. obs.*), while in SE it has been recorded only in December (Ruiz-Esparza *et al.*, 2011). For RS, there are records between September and May (Belton, 1985) and for RJ all year round, but it is usually silent between April and August as it follows mixed-species flocks (J.F. Pacheco, *pers. obs.*). After breeding, it moves to the Amazon and southern Venezuela, where it remains during austral winter (Capllonch & Wagner, 2009; Brewer & Orenstein, 2010). Its wintering areas are little known, but there are reports for Jaraguá/GO and Chapada dos Guimarães/MT (Capllonch & Wagner, 2009).

## Hirundinidae

*Stelgidopteryx ruficollis* (MPR): occurs from Costa Rica to northeastern Argentina; it seems to be resident in the north and migratory in the south of its distribution, forming large flocks after the breeding season (Turner, 2004). The only subspecies in Brazil, *S. r. ruficollis*, occurs in southeastern Colombia, eastern Venezuela, Guianas and Brazil to eastern Peru, Bolivia, northern and northeastern Argentina and Uruguay. It has been recorded in Colombia and Suriname during the non-breeding season and it seems to also occur in neighboring countries. However, its distribution during the non-breeding season is still unknown (Turner, 2016b). This species seems to occur in tropical, hot, humid lowlands during winter in the Southern Hemisphere and fly between breeding areas in January, and non-breeding areas in July (Joseph, 1996). In Brazil, according to photographic records and banding data, it is resident in almost the entire national territory, except for RS (Accordi & Hartz, 2013) and SC, from where it vanishes in June and July (SNA, 2016; WikiAves, 2016).

*Progne tapera* (MPR): the nominotypical subspecies is resident and occurs from northern South America and Central America to the Amazonian region and northeastern Brazil. The subspecies *P. t. fusca* is migratory; breeds in eastern Bolivia, Argentina, southeastern and southern central Brazil; and migrates to northern South America and Panama. It gathers in large flocks of hundreds or thousands of individuals after the breeding season, and eventually joins other swallows (Turner, 2004). These populations reach Central America usually in large numbers, where they join resident populations of *P. t. tapera* (Sick, 1997). In Brazil, there is evidence of breeding

activity in BA, MS, GO, MG, RJ, SP, PR, SC (WikiAves, 2016) and RS (Belton, 1985; Maurício *et al.*, 2013). In RS, it is considered an austral migrant (Accordi & Hartz, 2013) – present from September to May (Belton, 1985) –, as well as in SC (WikiAves, 2016). In the region of Camaçari/BA, both subspecies were recorded between May and August, and one individual of *P. t. fusca* banded in Camaçari in May was recovered in Serra do Caraça/MG in December, probably returning from the north (Vasconcelos *et al.*, 2003).

*Progne chalybea* (MPR): occurs from Mexico to northern Argentina and exhibits a migratory pattern in the south part of its distribution (Turner, 2004), where it is represented by the subspecies *P. c. macrorhamphus* (Grantsau, 2010). It begins nesting in RJ and MT in August–September, and departs from southern and central Brazil in the fall (March–May), when it migrates to the north of the continent, where there is a resident Amazonian population (*P. c. chalybea*). Large flocks have been recorded in ES (February), AM (July) and MT (October) (Sick, 1997). In RS, it breeds from October to December (Belton, 1985; Maurício *et al.*, 2013; WikiAves, 2016) where it is considered migratory (Accordi & Hartz, 2013). According to photographic records, there is also evidence of breeding activity in the Amazon and in the Southeast and South regions. In addition, it is present in SP, PR, SC and RS all year round (WikiAves, 2016), which suggests a need for further studies to confirm if only part of its population is migratory.

*Petrochelidon pyrrhonota* (MPR): breeds in North America between late April and early August, and remains during boreal winter in South America, gathering in flocks that can reach thousands of birds. Individuals depart from their colonies between July and September, reach South America between October and December and return between February and April (Turner, 2004). Specimens banded as chicks in the USA in June were recovered in SC and SP in Brazil in January (Sick, 1997), which confirms that the Southeast and South regions of Brazil are wintering areas. In Brasília/DF, it is extremely localized when passing through to the south in early October (Antas, 1987). In the region of Itirapina/SP, it has been recorded from late October to November, including in large numbers (around 850 individuals) in 1992 (Willis, 2004). In RS, it has been recorded from September to April (Belton, 1985), and there seems to be a recently established breeding population in the southeast of the Pampas in South America (Azpiroz *et al.*, 2012). Photographic records in Brazil are centered in the period between October and April (WikiAves, 2016), which confirms the known migratory pattern.

## Turdidae

*Turdus amaurochalinus* (MPR): occurs in Peru, Bolivia, Paraguay, central and northern Argentina, Chile, Uruguay and almost all of Brazil (Collar & Juana, 2015), but with few records for the Amazon. During austral winter, many individuals fly northwards, and flocks fly over RJ in late April and early May, reaching MA and eastern PA (Sick,



1997) mainly between June and October. The large number of individuals of this species in the southeast coast of Brazil between June and July may be because of immigrants coming from regions further south (Collar & Juana, 2015). During migration, a large number of individuals from southern population cross the marshes east of Tucumán and west of Santiago del Estero in Argentina to Bolivia and Peru between May and June. Another part of the migration occurs east going up along the Atlantic coast to northeastern Brazil. The return migration in spring starts in October in northern Argentina. There is a population that is supposed to be resident in the convergence zone of the Paraná and Uruguay Rivers, in a large region of deltas and marshes in the provinces of Entre Ríos and Buenos Aires (Capllonch *et al.*, 2008). The species breed in multiple localities – CE, MS, GO, MG, RJ, SP, PR, RS – in Brazil (WikiAves, 2016; Maurício *et al.*, 2013). Photographic and museum records document its presence mainly from September to January in southeastern and southern regions, while in central-western and northeastern Brazil they seem to be irregularly spread throughout the year (WikiAves, 2016; MZUSP; MNRJ; MPEG). Although these records do not suggest a migratory pattern probably due to the coexistence of resident and migratory populations, banding and recovery data confirms is movement between the south of the country and RJ in January and June respectively (SNA, 2016).

*Turdus subalaris* (MPR): occurs in Paraguay, Argentina and central-western, southeastern and southern regions of Brazil (Collar, 2016). The cis-andean population is migratory, breeds in southern Brazil, Argentina and the border with Paraguay, and seems to overwinter in the eastern part of the Cerrado/Amazon transition, flying over Brasília/DF between September and October (Antas & Valle, 1987; Ferreira & Bagno, 2000; WikiAves, 2016). In addition, there are records for PA (Somenzari *et al.*, 2011), TO (Pinheiro *et al.*, 2008), RJ (Pacheco *et al.*, 2010), MT, GO, BA, MG, SP, PR, SC and RS (Grantsau, 2010). In SC and RS, it has been recorded in large numbers from September to April and there is also evidence of breeding activity (Belton, 1985; Maurício *et al.*, 2013). Museum records are centered in the period of April-September in the states of PA, TO, MT, GO, BA, SP and SC (MZUSP; MPEG).

### Motacillidae

*Anthus correndera* (MPR): occurs in Peru, Chile, Bolivia, Argentina, Uruguay and southern Brazil. The Brazilian subspecies *A. c. correndera* occurs in southern Paraguay, northern Argentina, Uruguay and extreme southern Brazil (Tyler, 2004). In Brazil, there are records for RS throughout the year, where it breeds (Belton, 1985; Maurício *et al.*, 2013), and for SC in June, September and October (Azevedo & Ghizoni-Jr., 2005; WikiAves, 2016).

### Thraupidae

*Tangara peruviana* (MPR): is endemic to southern and southeastern Brazil in the Atlantic Forest. During austral

winter, it migrates to RJ and ES (Hilty, 2011), as corroborated by photographic records (WikiAves, 2016) and banding data (SNA, 2016). Records for these states are centered in the period between April and September, while those for SP, PR and SC are in all months of the year, which suggests that part of the population is resident. Sparse records in May, August and September for RS and one localized record for BA in July seem to confirm the austral migration. In addition, there is also evidence of breeding activity in SP and PR (WikiAves, 2016).

*Tersina viridis* (MPR): occurs from Panama to eastern Brazil and northeastern Argentina, represented by resident populations as well as migratory populations that move short distances. Populations from the extreme south of the distribution (northern Argentina and southern Brazil) are migratory and fly north during austral winter (Hilty, 2011). In Brazil, it is present in RS only between September and April (Belton, 1985) and there are records of breeding activity in lowland Atlantic Forest areas in SP between September and March, which suggests that the species leaves this region between April and August (Aleixo & Galetti, 1997). Groups of 100 individuals or more have been reported between March and August in MG (Hilty, 2011). In the region of Garanhuns/PE, the species can be observed from May to September, which coincides with mistletoe fructification (W. Telino-Júnior, *pers. obs.*) and with the hypothesis of migration north during austral winter. In the region of Alter do Chão/PA, it is recorded only during the rainy season between January and June (Sanaiotti & Cintra, 2001). Photographic records (WikiAves, 2016) and banding data (SNA, 2016) do not confirm such patterns available in the literature, but in GO, MG, SP, PR, SC and RS the species presents breeding activity (September-December) related to the elevation: most records (78% or 18 out of 23) are from localities with an elevation of over 600 m. Breeding data from lower elevations need to be confirmed by the respective authors, because they may have been obtained in areas that are higher than the altitude of the center of the municipality (which is the available coordinate). The same altitudinal pattern has been observed for most of the young (72% or 8 out of 11) remaining over 600 m even though their records were more dispersed during the year. In the Amazon, its presence seems to be distributed in the months of the year, which suggests a pattern of regular occurrence, even though there are no records of breeding activity (WikiAves, 2016). This way, the species was classified as partially migratory due to its tendency of altitudinal restriction in breeding activity of the Atlantic Forest population and it needs to be studied further.

*Dacnis nigripes* (MPR): is endemic to Brazil and occurs in coastal areas in the southeast from BA to SC. It is an altitudinal migrant that can roam widely in its distribution (Hilty, 2011) as reported for the region of Magé/RJ (Gonzaga, 1983), where flocks were recorded at sea level during winter (Sick, 1997). Photographic records of breeding activity are restricted to the period between November and February in localities over 600 m high

in SP, which suggests that the species tends to occupy higher elevations during the breeding season and that it moves to lower areas in all other months (from March to October). However, this pattern is not observed in other states in which the species occurs, perhaps as a reflection of poor sampling. In RJ, records are centered in the period between March and September (MPEG; MNRJ; WikiAves, 2016) without an apparent altitudinal pattern. In SC and RS, records have elevations lower than 400 m and are centered in the period between June and January (WikiAves, 2016).

*Sporophila lineola* (MPR): occurs in Bolivia, Paraguay, northern Argentina and Brazil and there are two different populations. The first one occurs in the south and nests in southeastern Brazil, northern Argentina and Paraguay between November and February, crosses through Central Brazil and Eastern Bolivia and reaches central and western Amazonia, Peru, Ecuador, and Colombia between May-June and September-October. The other breeds in the Caatinga region between January and May-June, migrates to the region of the Llanos in Venezuela and the Guianas through eastern PA and Suriname from June to December, apparently determined by the rainfall regime. Despite these patterns, the species is recorded during almost the entire year in central and western Amazonia (Silva, 1995, 1999; D'Angelo-Neto & Vasconcelos, 2007) and it is not clear whether this is a resident population or individuals from different populations that visit this area at different times (Jaramillo & Kirwan, 2015). Photographic records are distributed in all months of the year (WikiAves, 2016). The migratory pattern in the Caatinga is corroborated by data from WikiAves: records are centered in the period between December and June. In RS, the few available records are centered in the period between December and May (WikiAves, 2016) and there is evidence of breeding activity (Maurício *et al.*, 2013). There is also a possibility that there is a resident population in the Amazon, so the species was classified as partially migratory and further studies are necessary to confirm these patterns.

*Sporophila caerulescens* (MPR): occurs in Bolivia, Paraguay, Argentina, Uruguay and almost all of Brazil. Its movement pattern is not fully understood. Some populations are resident, while the ones further south of its distribution migrate north during winter and are recorded only seasonally in some areas such as eastern Peru and Central Brazil (Jaramillo, 2011a). In Argentina, large numbers of males are captured alone in November and December. It has been suggested that they leave first for winter migration north in February, since only females and their young that had yet to molt into full adult plumage were observed in the end of summer and beginning of fall. Populations from northeastern and northwestern Argentina are also peculiar: they migrate in different directions and for different distances (Ortiz & Capllonch, 2007). In Brazil, the species flies over the Pantanal when moving from the south to the north of the country especially in April, as well as when returning south in

September (Sick, 1997). However, photographic records for the Pantanal show its presence in MT between May and December and in MS from April to November and in February (WikiAves, 2016). In RS, most individuals seem to disappear during winter (Belton, 1985). There is evidence of breeding activity between September and May and it is restricted to GO and other states from the Southeast and South (Belton, 1985; Maurício *et al.*, 2013; WikiAves, 2016), which suggests that the species is partially migratory. Further studies are still necessary to fully comprehend its movements.

*Sporophila bouvreuil* (MPR): occurs in Suriname and Brazil, from AP to northeastern SP (Machado & Silveira, 2010). It is resident in most of its distribution, but migratory in the south (Rising, 2011). Populations that breed in the Amazon seem to fly to the Cerrado or Caatinga, where they join resident populations that breed in these dominions and probably migrate only short distances. In the Atlantic Forest, part of the population is resident and remains all year round in this biome (Machado & Silveira, 2010). This species has been observed as part of flocks of over 1,000 individuals foraging in pastures in the Araguaia River Basin in southeastern PA, as reported in mid-September 2009, 2010 and 2013 (Cavarzere *et al.*, 2015).

*Sporophila hypoxantha* (MPR): occurs in eastern Bolivia, Paraguay, northeastern Argentina, Uruguay and Brazil (Grantsau, 2010). Four populations were recently identified based on vocalizations (dialects): two of them are resident, one is partially migratory, and another completely migratory. It moves between Corrientes and Entre Ríos in Argentina and southern Brazil, where it breeds from mid-October/November to March/April (Areta & Repenning, 2011). The movement pattern of this species in Brazil is not fully understood, but it is known that populations move to the north and center of its distribution (SP, MG, GO, MT and MS) after the breeding season, where they join other *Sporophila* species (Machado, 2009). This species has been observed in interspecific flocks together with their Amazonian and Central Brazilian congeners (Sick, 1997), and composing mixed flocks – mainly represented by *Sporophila bouvreuil* – foraging in pastures in the Araguaia River basin in southeastern PA in mid-September 2009, 2010 and 2013 (Cavarzere *et al.*, 2015). The most northern limit of its wintering grounds is southeastern PA (Somenzari *et al.*, 2011) and TO (Dornas *et al.*, 2013). In PR, it performs migratory movements and there are more individuals during spring and summer, even though there are other resident individuals all year round in this state (Straube *et al.*, 2004), as well as breeding populations. Banding data shows the species in SC from November to March, and in RS in December and January (SNA, 2016), but there is also evidence of breeding activity in April and November (Belton, 1985).

*Sporophila ruficollis* (MPR): occurs in northern and eastern Bolivia, western and central Paraguay, northern Argentina, northern and western Uruguay and Brazil (Jaramillo, 2011b). It arrives on the breeding site in late

November and remains there until December; a large part of the population overwinters in the Cerrado in MT and in other hotter, more humid regions on the continent (Jaramillo, 2011b; Azpiroz *et al.*, 2012). In Brazil, it breeds only in a restricted area on the western border of RS (FZBRS, 2013). It has been observed in interspecific flocks together with their Amazonian and Central Brazilian congeners (Sick, 1997) and composing mixed flocks – mainly represented by *Sporophila bouvreuil* – foraging in pastures in the Araguaia River basin in southeastern PA in mid-September 2009, 2010 and 2013 (Cavarzere *et al.*, 2015). For southeastern PA and southern TO, there are also records in July, August and September (Somenzari *et al.*, 2011; Dornas *et al.*, 2013; MZUSP). Photographic records show a sparse presence of this species for AM, RO, MT, MS, GO, ES, SP, PR and RS between August and April (WikiAves, 2016; MZUSP; MPEG), and also an influx of individuals that come from outside Brazil in the winter (FZBRS, 2013). Records for AM in September and November contradict the migratory pattern described in the literature, since the species is expected to be restricted to its breeding area (RS) during this time, which allows us to assume the existence of a resident population for this species. Because of this, further studies are necessary to unveil its movements and properly delimit its breeding grounds.

### Cardinalidae

*Cyanoloxia glaucocaerulea* (MPR): breeds south of the Tropic of Capricorn in the South and Southeast regions of Brazil, northeastern Argentina, and northern, eastern and western Uruguay (Brewer, 2011), and migrates north during winter (Chesser, 1994). In Brazil, it occurs in MS and from SP to RS (Grantsau, 2010). In SC, PR and RS, it is present all year round, but in MT (Pelzelin, 1870), MS, MG (Sick, 1997; MZUSP), GO, ES (WikiAves, 2016) and RJ (Mallet-Rodrigues, 2003), records are restricted to the winter between May and October. In SP, although there are records in February, April and November, most records are centered in the winter (WikiAves, 2016), which confirms its migratory pattern.

### Vagrant species accounts (VAG)

#### Anatidae

*Chloephaga picta* (VAG): occurs from central Chile and Argentina to Tierra del Fuego and the Malvinas/Falklands. It is migratory in the south of its distribution and reaches northern Buenos Aires Province in Argentina and exceptionally Uruguay during austral winter (Carboneras, 1992). During winter it reaches the Pampas in southern Brazil (Azpiroz *et al.*, 2012), where it is considered vagrant and has been recorded in the Lagoa do Peixe National Park in Rio Grande do Sul (RS) (Bencke & Souza, 2013).

*Anas acuta* (VAG): occurs in Nearctic and Palearctic regions, and overwinters in tropical and subtropical areas

of the Northern Hemisphere. It breeds mainly in Canada, Alaska, northern USA, Siberia, Russia and Scandinavia, and overwinters south as far as in northern South America, southern Europe, Sub-Saharan Africa, and southern and southeastern Asia (Carboneras, 1992). In Brazil, it is considered vagrant and there are only a few records in Fernando de Noronha/Pernambuco (PE) (Sick, 1997; Silva-e-Silva & Olmos, 2006; Burgos & Olmos, 2013) and exceptionally in Rio de Janeiro (RJ) (Nacinovic, 1991).

*Anas cyanoptera* (VAG): occurs in central western North America, Colombia, from Peru to Tierra del Fuego, and in Brazil. Populations that are more meridional fly to lower latitudes in the winter (Carboneras, 1992). The subspecies *A. c. cyanoptera* occurs from southern Peru to Tierra del Fuego, on the Malvinas/Falklands, and in southwestern, central-western and southern Brazil, but there are only few documented records in MS in July (Nunes *et al.*, 2008) and in RS (Belton, 1994), where there is also a recent photograph taken in the estuary of Lagoa dos Patos in August 2009 (WikiAves, 2016).

#### Podicipedidae

*Podiceps occipitalis* (VAG): occurs in patches from Colombia to southern Peru and continuously from northern Chile to southern South America, occurring sparsely through southern and southeastern Brazil (Llimona & del Hoyo, 1992). The subspecies *P. o. occipitalis* occurs from north-central Chile and Argentina south as far as Tierra del Fuego and Malvinas/Falklands. In Brazil, there are sparse records of vagrant individuals for Santa Catarina (SC), Paraná (PR) (Bornschein *et al.*, 2004) and São Paulo (SP) (Schunck, 2007).

#### Phoenicopteridae

*Phoenicoparrus andinus* (VAG): occurs in southern Peru, Bolivia, northern Chile, northwestern Argentina and occasionally in southern Brazil (Grantsau, 2010). Ghizoni-Jr. & Piacentini (2010) suggest that it occurs in Brazil as a result of juvenile dispersal or of storms and that it is more common during winter. In the Canto dos Ganchos beach in Governador Celso Ramos/SC, a small population was detected and then monitored for 27 months (June 2008 to August 2010) and a specimen was collected in July 2009 (MZUSP 84351). There are also many photographs for SC (WikiAves, 2016), a specimen collected at PR (Scherer-Neto *et al.*, 2011) and records for Lagoa do Peixe National Park/RS (Belton, 1994; IBAMA, 1999; De Luca *et al.*, 2006; WikiAves, 2016). This species was first recorded for the Amazonian region in 2007, when an individual was killed by fishermen in the Amanã Sustainable Development Reserve and donated to the Mamirauá Institute (Bernadon & Valsecchi, 2014). There do not seem to be breeding colonies in Brazil.

*Phoenicoparrus jamesi* (VAG): occurs in southern Peru, northern Chile, western Bolivia and northwestern Argentina (Grantsau, 2010). It is considered vagrant in Brazil,



where there is only one published record for Acre (AC) (Guilherme *et al.*, 2005; MPEG 58950), one photographic record for RS (Dias & Cardozo, 2014) and another record for Amazonas (AM) (M. Cohn-Haft, *in prep.*).

### Spheniscidae

*Aptenodytes patagonicus* (VAG): occurs on the Malvinas/Falklands and South Georgia, from Marion Island east to Macquarie (Martínez, 1992). The subspecies *A. p. patagonicus* breeds on the Malvinas/Falklands and South Georgia, and it is considered vagrant in Brazil, where there are records for RJ and RS (Mohr, 2004; Barquete *et al.*, 2006).

*Eudyptes chrysolophus* (VAG): occurs on the South Atlantic and South Indian oceans, mainly on subantarctic islands, but it also breeds in small numbers south of the Antarctica Peninsula (Martínez, 1992; Grantsau, 2010). There are occasional records in southern Brazil in the mouth of the Chuí River/RS in July 1964 that were associated with the collection of a voucher specimen (Belton, 1984; MZUSP 60062).

*Eudyptes chrysocome* (VAG): occurs in Cape Horn, Malvinas/Falklands, Prince Edward Island to the Antipodes in the South Atlantic Ocean (from Tristan da Cunha to Gough Islands), and in the South Indian Ocean (in St. Paul and Amsterdam Islands) (Martínez, 1992). The subspecies *E. c. chrysocome* breeds in Tierra del Fuego and adjacent islands (Ildefonso and Diego Ramírez), and in Malvinas/Falklands. In Brazil, it is considered vagrant and occurs occasionally in RS (Belton, 1994; Barquete *et al.*, 2006) with one specimen collected in July (MNRJ 33381).

### Diomedidae

*Phoebetria fusca* (VAG): occurs on the South Atlantic and South Indian oceans. It breeds from Tristan da Cunha and Gough Islands east to Kerguelen, Amsterdam and St. Paul Islands (Carboneras, 1992; Grantsau, 2010). In the Brazilian coast, there are records for RS (Bencke, 2001), SP (Olmos *et al.*, 1995; MZUSP 37152 [SP, 1954, August]), RJ (MNRJ A1749 [RJ, 1994, December] and Bahia (BA) (Lima *et al.*, 2004c).

*Phoebetria palpebrata* (VAG): has a circumpolar occurrence in the oceans of the Southern Hemisphere, and breeds from South Georgia Island east to Campbell Island and the Antipodes (Carboneras, 1992; Grantsau, 2010). On the Brazilian coast, there are records for RS (Belton, 1994; Bencke *et al.*, 2010), SC (Roos & Piacentini, 2003; MZUSP 75196 [SC, 2001, November]), RJ (Corrêa & Pereira, 2016) and BA (Sampaio & Castro, 1998; MZUSP 102477 [BA, 1997, August]). It is considered vagrant in Brazil and occurs in really small numbers, representing a marginal population.

*Thalassarche chrysostoma* (VAG): has a circumpolar distribution in the southern seas and breeds from Cape

Horn east to Campbell Island (Carboneras, 1992; Grantsau, 2010). It disperses widely throughout the Southern Hemisphere between 65°S and 35°S, but it can reach 15°S in the region of the Humboldt Current (Carboneras, 1992). There are few confirmed records for Brazil: due to the constant confusion with the more abundant *T. chlororhynchos*, only the specimens of *T. chrysostoma* that have been collected in SP (Olmos *et al.*, 1995; MZUSP) and RJ (Teixeira *et al.*, 1985; MNRJ) were considered confirmed records of the species in the country (Bencke *et al.*, 2010).

### Procellariidae

*Lugensa brevirostris* (VAG): occurs on southern seas and breeds on Tristan da Cunha, Gough, Prince Edward, Crozet and Kerguelen Islands; it is highly dispersive and also occurs on Antarctic and Subantarctic waters as far as 40°S in latitude (Carboneras, 1992). In Brazil, it is considered vagrant and there are occasional records for RS, RJ and BA (Maurício *et al.*, 2014; MZUSP 101821 [BA, 1994, July]).

[*Pterodroma hasitata*] (VAG): breeds in Cuba and Hispaniola, and probably in Jamaica, Guadeloupe, Dominica and Martinique. Its oceanic distribution is little known, but this species flies mainly north through the West Atlantic to southern Canada. It exceptionally reaches British and Spanish waters and Trindade Island in Brazil (Carboneras, 1992). There are no documented records of this species in Brazil.

*Pterodroma lessonii* (VAG): occurs on Southern seas in the New Zealand region, on Macquarie, Auckland and Antipodes Islands, in the South Indian Ocean on Crozet and Kerguelen Islands. The species moves widely throughout the South Atlantic above 30°S in latitude and probably performs circumpolar flights (Carboneras, 1992; Grantsau, 2010). It is considered vagrant in Brazil, and there are occasional records for SC and RS (Sick, 1997; Azevedo & Wedekin, 2000).

*Pterodroma macroptera* (VAG): occurs in New Zealand on the subantarctic islands of Tristan da Cunha, Kerguelen and in Australia. It moves widely through the Atlantic and Pacific Oceans, mainly between latitudes 25°S and 50°S. There are recent records for the South America coast for Uruguay and RS (Carboneras, 1992). In Brazil, it is considered vagrant and there are records in its territorial sea (Harris & Hansen, 1974); one female was collected in RS in March 2004 (Bugoni, 2006).

*Halobaena caerulea* (VAG): occurs in Southern Seas, on subantarctic islands from Diego Ramírez, Cape Horn and South Georgia Island east through islands on the Indian Ocean to Macquarie Island (Carboneras, 1992; Grantsau, 2010). Even though they can forage over 1,000 km from breeding sites, adults are probably sedentary, while the young are more dispersive (Carboneras, 1992). It occurs occasionally on the coast of the southern and southeastern regions of Brazil, and there are records for BA, RJ and

RS (Sick, 1997; Fonseca *et al.*, 2001; Grantsau, 2010; MNRJ [RJ, 1984, July]).

*Pachyptila vittata* (VAG): occurs in New Zealand, Chatham Islands and Tristan da Cunha, Gough and South Georgia Islands (Carboneras, 1992; Grantsau, 2010). Adults remain in areas adjacent to their breeding colony and the young are highly dispersive (Carboneras, 1992). It occurs quite rarely in Brazil, where there are records for PE (Rodrigues *et al.*, 2007), RJ (Alves & Vecchi, 2009), BA and RS (Grantsau, 2010), so it is considered vagrant. *Pachyptila desolata* was considered a subspecies of *P. vittata* (e.g., Newman, 1983), therefore some of the Brazilian records are probably of *P. desolata*.

*Procellaria cinerea* (VAG): occurs on Southern seas and breeds from Tristan da Cunha and Gough Islands east through the South Indian Ocean to Campbell Islands and the Antipodes (Carboneras, 1992; Grantsau, 2010). It circulates through the Atlantic, Indian and Pacific Oceans, especially between latitudes 25°S and 58°S, but it can be observed as far as 18°S on the west coast of South America (Carboneras, 1992). In Brazil, it occurs from the southern coast, which includes RS (Belton, 1994), to northern BA (Lima *et al.*, 2004c; Bencke *et al.*, 2010; Grantsau, 2010), where it is considered vagrant.

*Puffinus tenuirostris* (VAG): breeds in Australia and Tasmania and circulates through the Pacific Ocean (Carboneras, 1992; Grantsau, 2010). In Brazil, it has been recorded once for Salvador/BA at the Stella Maris beach in 2005 (Souto *et al.*, 2008; MZUSP 102489). This was the first documented record of this species for the Atlantic.

[*Puffinus assimilis*] (VAG): occurs on Southern seas and tropical and subtropical zones of the Northern Hemisphere. Most of its population is sedentary, but some individuals disperse, mainly the immature (Carboneras, 1992). In Brazil, there are records for its territorial sea (Harris & Hansen, 1974), but these are occasional and not documented.

### Hydrobatidae

*Pelagodroma marina* (VAG): occurs on Savage Islands, Cape Verde, and Tristan da Cunha, and possibly Gough, Kermadec, Australia and New Zealand; some populations have migratory behavior and others disperse (Carboneras, 1992). In Brazil, there is only one record of a specimen in Mangue Seco/BA in 1996 (Lima *et al.*, 2001b).

[*Oceanodroma castro*] (VAG): occurs in the eastern Atlantic Ocean from Berlengas to Azores, Ascension and Saint Helena, in the Pacific Ocean and in Galápagos. Part of the population is sedentary and another part is highly dispersive. Although it has been mentioned for RJ (Carboneras, 1992), Fernando de Noronha/PE (IBAMA, 2005) and Atol das Rocas/Rio Grande do Norte (RN), (Schulz-Neto, 2004), its occurrence in Brazil is not documented. Alleged historic records for the Brazilian coast may derive from its confusion with *O. leucorhoa* (J.F. Pacheco, *pers. obs.*).

### Pelecanoididae

*Pelecanoides magellani* (VAG): occurs on the Atlantic and Pacific Oceans in extreme southern South America and breeds on the coast of Chile and Tierra del Fuego (Carboneras, 1992; Grantsau, 2010). It seems to be sedentary and to disperse to some extent to adjacent coastal waters (Carboneras, 1992). In Brazil, there is only one record for RS (Vooren & Fernandes, 1989).

### Phaethontidae

*Phaethon rubricauda* (VAG): occurs in the eastern and western Indian Ocean and in the central, western and southern Pacific Ocean. Its migration is irregular. Some adults can be observed near breeding colonies all year round. Populations from the south may perform transequatorial migrations quite regularly, as they follow warm currents to the east coast of the continents (Orta, 1992a). The species occurs occasionally in Brazil and is considered vagrant: there is only one record in the Abrolhos Archipelago/BA (Couto *et al.*, 2001).

### Sulidae

*Morus capensis* (VAG): breeds on the coast of southern Africa and in Namibia. It overwinters along the African coast west to the Gulf of Guinea, in eastern Mozambique, and exceptionally as far as Kenya. Most adult individuals remain in the waters close to the colony after breeding. Young individuals migrate north to the Gulf of Guinea (Carboneras, 1992). The species occurs occasionally in Brazil outside the coast of RS (Vooren, 2004) and SC (Olmos, 1997).

*Morus serrator* (VAG): breeds in the east coast of Australia, Tasmania and New Zealand and there is also a small colony on Norfolk Island. It overwinters in waters adjacent to the east coast and in western Australia. Adults remain in areas around the colony, while immature individuals are more dispersive (Carboneras, 1992). There is only one documented record in the country for the Moleques do Sul Islands/SC (Bege & Pauli, 1989; MNRJ 36164 [SC, 1987, June]).

### Phalacrocoracidae

[*Leucocarbo bransfieldensis*] (VAG): occurs in the Antarctic Peninsula and on South Shetland Islands (Orta, 1992b). In Brazil, its only record is of a band found in BA that belonged to an individual banded on the South Shetland Islands in Antarctica (Lima *et al.*, 2001b).

### Pelecanidae

*Pelecanus occidentalis* (VAG): occurs on the coast of the American continent on the Pacific and Atlantic Oceans, wandering north as far as British Columbia and Nova Scotia in Canada and south as far as Tierra del Fuego (Elliott, 1992). During its migration south, it can reach

inland rivers in AM – the Tapajós and Branco Rivers (Sick, 1997). It has been recorded for the Amazônia National Park (AM and PA) in January (Kasecker & Silva, 2011), PA in November (Almeida-Santos *et al.*, 2015) and December (MPEG 443) and AL in December (Patrial *et al.*, 2011).

### Ardeidae

*Ardeola ralloides* (VAG): occurs in southwestern and central Europe, northwestern Africa east to the Aral Sea and southeastern Iran. Some populations from the north winter in the Mediterranean and the Middle East, but its main wintering area is in tropical Sub-Saharan Africa (Martínez-Vilalta & Motis, 1992). The species occurs accidentally in Azores, Cape Verde, Seychelles and Brazil (Bonan, 2014). The relatively frequent record of the species in Fernando de Noronha/PE since 1986 is considered accidental (Martínez-Vilalta & Motis, 1992), even though the simultaneous presence of multiple individuals represent an unexpected case of transatlantic movement and may be the first step in establishing a local population (Silva-e-Silva & Olmos, 2006). Since 2008, there are 30 photographic records for Fernando de Noronha (WikiAves, 2016).

*Ardea cinerea* (VAG): occurs in most of the Palearctic region (Grantsau, 2010). Records in Fernando de Noronha/PE show its presence in small numbers for almost six years during the first decade of 2000 (Silva-e-Silva & Olmos, 2006) and it was also recorded for PA (Sick, 1997), but it still is considered vagrant in Brazil (Martínez-Vilalta & Motis, 1992). There is also one photographic record for Fernando de Noronha in September 2013 (WikiAves, 2016).

[*Ardea purpurea*] (VAG): occurs in the western Palearctic region, in northern Africa and in Cape Verde. It is occasionally recorded for Brazil (Grantsau, 2010) mainly based on an immature sighted in Fernando de Noronha/PE (Nacinovic & Teixeira, 1987), but there is still no documented proof.

*Egretta gularis* (VAG): occurs in Africa and it is a textbook example of a transoceanic vagrant recorded for Fernando de Noronha/PE in two separate occasions in 1996 and 2004 (Silva-e-Silva & Olmos, 2006) and in the Saint Peter and Saint Paul Archipelago in 2006. Both individuals recorded in this last place remained there healthy and feeding for at least eight months from February to September (Fedrizzi *et al.*, 2007). There is also an additional photographic record for Fernando de Noronha in December 2006 (WikiAves, 2016).

*Egretta garzetta* (VAG): occurs in France and Spain, from Africa to Korea and Japan in Asia and in northern and eastern Australia and New Zealand (Martínez-Vilalta & Motis, 1992). Its occurrence in Brazil is occasional and was documented for the first time for the Saint Peter and Saint Paul Archipelago, BA (Bencke *et al.*, 2005).

### Cathartidae

[*Vultur gryphus*] (VAG): occurs in the Andes from Venezuela to Tierra del Fuego, and at sea level in Peru and Chile (Houston, 1994). In Brazil, there are only two old, occasional and undocumented records: on the Jauru River/Mato Grosso (MT) and western PR (Sick, 1997).

### Accipitridae

*Milvus migrans* (VAG): occurs in almost the entire Old World and Australasia, and the nominotypical subspecies is highly migratory. It breeds in continental Europe, northwestern Africa and western Asia, and overwinters mainly south of the Sahara in Africa (Ferguson-Lees & Christie, 2001). Vagrant individuals have been recorded in New Zealand and on Hawaiian islands in the Pacific. One adult individual was recently recorded in the Saint Peter and Saint Paul Archipelago, 1,100 km away from the Brazilian coast, between April 16<sup>th</sup> and May 17<sup>th</sup> 2014, probably by following winds from northwestern Africa (Nunes *et al.*, 2015) that are tangent to the main flyway used by this species when moving between the wintering and breeding areas in western Europe (Sergio *et al.*, 2014).

[*Geranoaetus polyosoma*] (VAG): occurs from central Andes in Colombia to Patagonia, Tierra del Fuego, Malvinas/Falklands and Juan Fernández Islands on the coast of Chile (Bierregaard, 1994). During austral winter, birds from the Chilean Andes and from Patagonia fly north to subtropical plains in northern and eastern Argentina, Paraguay and perhaps Uruguay (Thiollay, 1994). In Brazil, there are few records: none is documented and only one has a specific locality on Cabo Frio Island in Arraial do Cabo/RJ (Pacheco, 2005).

### Rallidae

*Crex crex* (VAG): occurs in western and northwestern Europe east to northwestern China and central Siberia. It breeds in a large part of Europe and overwinters in southern central Africa (Taylor, 1996). In Brazil, this species is vagrant and there is only one documented record for Fernando de Noronha/PE (Burgos & Olmos, 2013).

*Gallinula angulata* (VAG): occurs in Senegal and Gambia east to Ethiopia and south to northern and eastern Namibia, Botswana and northeastern South Africa (Taylor, 1996). In Brazil, there is only one record of an immature individual collected in the Saint Peter and Saint Paul Archipelago. This is the first record for the New World and possibly the first documented case of transoceanic vagrancy in this species (Bencke *et al.*, 2005).

### Scolopacidae

*Limosa lapponica* (VAG): breeds in the Arctic and migrates to the coast of Africa, Asia and Oceania in the non-breeding season (van Gils & Wiersma, 1996). There are sparse



records for the island of Fernando de Noronha/PE since 1988 (Silva-e-Silva & Olmos, 2006) and Atol das Rocas/RN in February/March 1990 (Antas *et al.*, 1992). It was considered vagrant in the Northern Hemisphere, but has been recorded for RN in October, January, February and August (Irusta & Sagot-Martin, 2011), and for the coast of Ceará (CE) in March and November 2006 (Girão *et al.*, 2006). There are also recent photographic records for Fernando de Noronha in September and December; for MA in January, March and April; for CE in April and from August to December; for RN in October; for AL in April; and for BA in November and December (WikiAves, 2016).

*Numenius phaeopus* (VAG): breeds in higher latitudes in Asia and Europe and spends the non-breeding season in Africa, southern Asia and Oceania (adapted from van Gils & Wiersma, 1996). In Fernando de Noronha/PE, some specimens were collected in 1973 by Olson (Olson, 1981) and four individuals were recorded in November 2004 (Silva-e-Silva & Olmos, 2006). There are also two recent photographic records for the island from February 2015 (WikiAves, 2016).

*Xenus cinereus* (VAG): breeds in northern Europe and Siberia, overwinters in southwestern, southern and eastern Africa, and moves through the Middle East, southern Asia and Indonesia to Australia (van Gils *et al.*, 2016d). In Brazil, it is considered vagrant and there are only two known records: one in Porto Seguro/BA and another in Paraty/RJ (White *et al.*, 2006).

*Calidris pugnax* (VAG): breeds from northwestern Europe across the entire Siberia and overwinters in the Mediterranean, in Sub-Saharan Africa and in the Indian subcontinent (van Gils & Wiersma, 1996). Its occurrence in Brazil is occasional: there is one undocumented record for the Taim Ecological Station/RS in October 1985 (Sick, 1997; Pacheco, 2000) and recent records with photographic documentation for PA in October and for Minas Gerais (MG) in March (Dias *et al.*, 2013). There is also one additional photographic record for the coast of SP (WikiAves, 2016).

*Phalaropus fulicarius* (VAG): breeds in the Arctic and overwinters mainly in western South America and western Africa (van Gils & Wiersma, 1996). In Brazil, there are records of an individual collected in Aripuanã/MT in March 1979 (Sick, 1997; Grantsau, 2010) and in Joinville/SC in January 2011 (Grose & Cremer, 2011).

### Thinocoridae

*Thinocorus rumicivorus* (VAG): occurs in southwestern Ecuador, Peru, Chile, Bolivia, Argentina and Uruguay (Castro *et al.*, 2012). It breeds in southern South America and migrates in austral winter (Azpiroz *et al.*, 2012). In Brazil, one young individual was recorded for the margin of the Lagoa do Peixe/RS in April 1990 by P.T.Z. Antas (Belton, 1994), but it was not documented; and another was recorded for the coast of Ubatuba/SP in April 2012 that was documented with a photograph (Castro *et al.*, 2012). In

addition, the species was also photographed in Mostardas/RS in May 2013 and 2014 (WikiAves, 2016).

### Glareolidae

*Glareola pratincola* (VAG): occurs in Europe and Africa (Maclean, 1996). In Brazil, it is considered vagrant and there are records for Atol das Rocas/RN (Soto & Filippini, 2003; Schulz-Neto, 2004), and Caucaia/CE in April 2015 (WikiAves, 2016).

### Laridae

*Xema sabini* (VAG): breeds in the Arctic, overwinters in the southeastern Atlantic in open sea in southwestern Africa, and in the eastern Pacific in open sea in northwestern South America (Burger & Gochfeld, 1996). The first record for Brazil was of an individual presenting a basic non-nuptial plumage at Cassino beach/RS (Parrini & Carvalho, 2009). It was later photographed in Maranhão (MA) in 2013 (WikiAves, 2016).

*Leucophaeus pipixcan* (VAG): breeds in inland North America from British Columbia to Alberta and from Montana to Minnesota. There are also sparse populations north of the Rocky Mountains to the Great Basin. It overwinters mainly on the Pacific coast of South America as far as Chile (Burger & Gochfeld, 1996). It migrates through Mexico to the Pacific coast, where it arrives in late September to remain during boreal winter on the west coast of South America, along the coast of Ecuador to central Chile (Burger & Gochfeld, 1996; Dias *et al.*, 2010a). In Brazil, Dias *et al.* (2010a) show records for Fernando de Noronha/PE, lower Japurá River/AM, south coast of SP, Trindade Island/Espírito Santo (ES), and multiple municipalities in RS. There are also documented records for Jacarecica, Maceió/AL (Leal *et al.*, 2013), Cáceres/MT in the Pantanal (Kantek & Onuma, 2013) and Raposa/MA (Gonsioroski, 2014). Photographic records also show its presence in MA, BA, RJ and SC (WikiAves, 2016). There is also one specimen from AM that was collected in April, 2015 (MPEG 80618).

[*Larus delawarensis*] (VAG): breeds in central and eastern North America; it overwinters in part of the USA, Mexico and Central America (Burger & Gochfeld, 1996) and occasionally northern South America and northern Brazil (Sick, 1997; Grantsau, 2010). Its episodic presence in Tefé/AM is because of a specimen collected in November 1968 that had been banded five months before at the border between Canada and the USA (Sick, 1979).

*Larus fuscus* (VAG): breeds in northern Eurasia and overwinters to the south, reaching the center and the coast of Africa (as far as Mozambique) and the coast of the Arabian Peninsula and India (Burger & Gochfeld, 1996). It is also considered at least accidental in four countries in South America (Almeida *et al.*, 2014). In Brazil, it is considered vagrant: it has been recorded for the coast of CE near the mouth of the Jaguaribe River in 2005 (Girão

*et al.*, 2006) and photographed in São Luís/MA in November 2011 (Almeida *et al.*, 2014).

### Sternidae

*Chlidonias leucopterus* (VAG): breeds in Europe, Siberia, Mongolia and New Zealand and overwinters in Africa, southern Asia and Oceania (Burger & Gochfeld, 1996). The first record of this species in Brazil and in South America was made in 2008 in the Lagoa do Peixe National Park (Aldabe *et al.*, 2010). New photographs were also taken in the same region in 2010 (WikiAves, 2016).

*Sterna vittata* (VAG): breeds in the Antarctic Peninsula and overwinters on the east coast of the South America and in southern Africa. There are resident populations on subantarctic islands. In Brazil, it was recorded during austral winter historically for RJ and SC without precise localities (Sick, 1997) and there are recent records for BA (Lima *et al.*, 2004c).

### Falconidae

*Falco tinnunculus* (VAG): occurs in Europe, Africa and Asia (Orta, 1994). Only one individual was recorded in the Saint Peter and Saint Paul Archipelago in Brazil, which was the first record for Brazil and for South America and the third one for the New World (Bencke *et al.*, 2005).

*Falco columbarius* (VAG): breeds in the Arctic and migrates to lower latitudes in the Northern Hemisphere during boreal winter (White *et al.*, 1994). In Brazil, there are few records of this species and all for the North region (Grantsau, 2010) in Jaú National Park/AM (Borges *et al.*, 2001) and in Roraima (RR), PA, Tocantins (TO) and AC (WikiAves, 2016).

*Falco aesalon* (VAG): occurs in northern Eurasia from Faroe Islands east to central Siberia. When migrating, it moves south to the Mediterranean, northern Africa, Persian Gulf, Iraq, Iran, China, Japan and Korea, and there also recent documented records for Bangladesh (White *et al.*, 2016). The first and only known record for South America is of a female captured on a ship on the coast of BA in 1963 (Baars-Klinkenberg & Wattel, 1964).

### Furnariidae

*Asthenes pyrrholeuca* (VAG): breeds in Chile and Argentina and overwinters in northern Argentina, Bolivia and Paraguay (Remsen Jr., 2003). In Brazil, it is possible that it occurs only occasionally when flying in its austral migration. There are three records for RS, but only one of them is documented. There are doubts as to whether the species uses the extreme western RS as a wintering ground (Repenning & Fontana, 2008).

### Tyrannidae

[*Pseudocolopteryx dinelliana*] (VAG): occurs in Bolivia, Argentina and Paraguay. It migrates to extreme southern

Bolivia and western Paraguay during austral winter (Bostwick, 2004b). In Brazil, there is only one undocumented record for the Binational Maracaju Sanctuary/MS close to the border with Paraguay, but this document has been lost (Pérez-Villamayor *et al.*, 2014).

*Tyrannus dominicensis* (VAG): breeds in southeastern USA, Bahamas, Greater Antilles, Trinidad and Tobago, Curaçao, Bonaire, locally in central Venezuela and possibly in northern Colombia. It overwinters from southern Panama to central Colombia and southern and eastern Venezuela. Most populations migrate during boreal winter in November and the species occurs irregularly in extreme northern Brazil (Mobley, 2004i). It also occurs in the Guianas as a regular visitor (Paynter Jr., 1995). There are few records of this species in Brazil: it was observed occasionally in Amapá (AP) and in RR, where it was also photographed (WikiAves, 2016), and in AM (Nassar & Melo, 2015).

*Alectrurus risora* (VAG): occurs in northern Argentina, eastern Paraguay and Uruguay and there are localized records for Brazil (mostly historic) in southern MT, MS, SP and RS (Grantsau, 2010). There is also a historic accidental record for RJ (Pacheco & Gonzaga, 1994). In the past, a population from northeastern Argentina bred in the province of Buenos Aires and wintered in Brazil. Current populations are resident throughout the year and do not migrate to Brazil anymore (Di Giacomo & Di Giacomo, 2004). There is only one photographic record for the Brazilian territory for Bonito/MS in August (WikiAves, 2016).

*Knipolegus striaticeps* (VAG): occurs in eastern and southern Bolivia, western Paraguay, northwestern Argentina and it reaches Brazil at the end of the austral winter, between August and September (Sick, 1997) near Corumbá/MS (Tubelis & Tomas, 2003). The movement pattern of this species is still unknown, but migratory movements have been observed in the south part of its distribution (Farnsworth & Langham, 2004c). In Brazil, there are no photographic records available (WikiAves, 2016) although there are two specimen from MS collected in May 1944 (MZUSP).

*Knipolegus hudsoni* (VAG): breeds in central Argentina, flies north during winter in August and September, and reaches Paraguay, Bolivia and eventually Brazil in MT and MS (Sick, 1997). The Serra do Roncador seems to be the northern limit of its migration (Farnsworth & Langham, 2004d). There are photographic records for MS in April, July and August (WikiAves, 2016).

[*Knipolegus aterrimus*] (VAG): occurs from southern Bolivia to western Argentina and migrates north in March-April to winter in Paraguay and northeastern Argentina (Farnsworth & Langham, 2004e). In Brazil, there are few records and all of them are near the western and southwestern border of the country in MS and RS (Bornschein *et al.*, 2003; Farnsworth & Langham, 2004e; WikiAves, 2016).

*Muscisaxicola maclovianus* (VAG): is a migratory species that breeds in southern Chile and Argentina and overwinters in northern Peru, northeastern Argentina and Uruguay (Farnsworth & Langham, 2004f). In Brazil, there is one record for the Lagoa do Peixe National Park/RS in May (Schwertner *et al.*, 2011) that is linked to seven photographs, and two other photographic records for Rio Grande/RS in June (WikiAves, 2016).

*Xolmis rubetra* (VAG): occurs in Argentina, breeds in central Argentina and migrates north during winter (Farnsworth & Langham, 2004g). In Brazil, there is only one record for extreme western RS in August (Bellagamba-Oliveira *et al.*, 2013), and two photos available at WikiAves (2016).

*Agrionis micropterus* (VAG): occurs from southern Bolivia to Santa Cruz Province in Argentina and breeds in the steppes and prairies from southern Peru to the province of Santa Cruz. Populations from the south of its distribution are represented by the nominate subspecies and are migratory. It departs from its breeding areas at the end of the summer in February and migrates north to spend the austral fall and winter in southern Bolivia, Paraguay, Uruguay and part of northern Argentina. It is rare in Paraguay and Uruguay (Farnsworth *et al.*, 2016). In Brazil, the first documented record was obtained for extreme western RS in September 2012. Although this species may be a regular migrant of low density in Brazil (Bellagamba *et al.*, 2014), here it is considered vagrant due to a lack of data that corroborates this hypothesis and to the fact that there is only one record in Brazil.

*Agrionis murinus* (VAG): breeds from October to March in plains with scattered shrubs in northwestern and southern central Argentina, and migrates to the north of the country, to western Paraguay and southern Bolivia during austral fall and winter, along a north-south axis. It is considered vagrant in extreme southern Brazil (Farnsworth & Langham, 2004h; Dias *et al.*, 2010b) and there are two photographic records for Rio Grande/RS, one in April and another in July (WikiAves, 2016).

*Neoxolmis rufiventris* (VAG): breeds from southeastern Argentina (and extreme southern Chile) south to Tierra del Fuego and migrates north during austral winter to central Argentina and Uruguay (Farnsworth & Langham, 2004i). There is only one relatively old record for the southwest from Rio Grande in fall 1973, suggesting it is a vagrant species (FZBRS, 2013). In addition, there are photographic records for western RS in June and for the south in April (WikiAves, 2016).

### Vireonidae

*Vireo flavoviridis* (VAG): is a visitor from the north that nests in Central America, migrates to northwestern South America in September (Sick, 1997) and overwinters mainly east of the Andes in the Peruvian and Bolivian Amazon and in western Brazil (Brewer & Orenstein, 2010).

This species has been observed in western AC and specimens have been collected in western AM (Whittaker & Oren, 1999; Whitney & Pacheco, 2000) and in AC (MPEG). There are also photographic records for MT in October and for AC in January and March (WikiAves, 2016).

### Turdidae

*Turdus iliacus* (VAG): breeds in northern and eastern Europe and in Siberia, and migrates during boreal winter to central and southern Europe and northern Africa (Collar, 2005). The only record of this species in Brazil is of an individual that died on a ship in open sea on the coast of ES (Brito *et al.*, 2013).

### Parulidae

*Parkesia noveboracensis* (VAG): is a migratory species that departs from breeding areas in Alaska, Canada and the USA in late July/early August, reaches its wintering areas (Central America and from southern to northern Amazon) in September, and begins to return in March (Curson, 2016b). It has been recorded for PA in November (Sick, 1997; MPEG 32507 [PA, 1978, November]), for Viruá National Park/RR in January (Laranjeiras *et al.*, 2010) and abril (MZUSP 99534 [RR, 2014, April]), for Presidente Figueiredo/AM in January (WikiAves, 2016) and for Boa Vista/RR in February (WikiAves, 2016).

[*Setophaga cerulea*] (VAG): is an endangered migratory species that breeds in Canada and the USA, and overwinters mainly in the foothills of the Andes in Venezuela and Colombia to southern Peru and western Bolivia (Curson, 2010). Douglas Stotz recorded many individuals in 1991 in the montane forests from southeastern Brazil (Robbins *et al.*, 1992). There are also records for RJ in October and November (Scott & Brooke, 1985), SP in January (Willis & Oniki, 2003) and MG in April (J.F. Pacheco, *pers. obs.*). This species probably occurs in Brazil, but there is no known or available documented evidence of this occurrence.

*Setophaga fusca* (VAG): is a migratory species. It occurs from North America to northern South America (Grant-sau, 2010). It breeds in North America and overwinters mainly in intermediate elevations in the Andes and Tepuis (Stotz *et al.*, 1992). It has been considered vagrant in Brazil (Curson, 2010) and recorded for ES in December (Sick, 1997), CE in March (Teixeira *et al.*, 1993), PA in October and November (Silva, 2011b; MPEG 21513 [PA, 1961, October]), Jaú National Park/AM in January (Whitney, 1994), region of Manaus/AM in March (Stotz *et al.*, 1992) and in January, when it was photographed (WikiAves, 2016).

[*Setophaga virens*] (VAG): breeds in Canada and the USA and migrates during winter to Central America and the Caribbean, locally to Mexico and in smaller numbers to southern USA, northern Colombia and Venezuela (Curson, 2010). Two undocumented sightings have been reported for Conceição do Castelo/ES and the Itaitaia



National Park/RJ in April 2000 and September 2001 respectively (Parrini *et al.*, 2002).

*Geothlypis agilis* (VAG): is a long distance migrant that breeds in southern Canada and northern USA, from where it departs in mid-August and reaches its wintering areas in the plains of South America in eastern Colombia and Venezuela, northern Bolivia and northern central Brazil in mid-October. Its return is in May (Curson, 2010). Its wintering area is little known and it is possible that this species only passes through Brazil (M. Cohn-Haft, *pers. comm.*), even though the Amazonian region has been recognized as its main wintering area (Stotz *et al.*, 1992). There are historic records for AM and MT (Sick, 1997; Nunes & Tomas, 2008) one recent documented record obtained for AC (Marques & Guilherme, 2014) and one specimen collected in RO in April (MPEG 35169).

[*Cardellina canadensis*] (VAG): breeds in southern Canada and northeastern USA, from where it departs in late July or August to fly mainly south through the Mississippi Valley and the Appalachian Mountains to the Gulf of Mexico and reach South America by different pathways in late September (Curson, 2016c). Spring migration starts from March in Peru to mid-April in Colombia. The species reaches the south of the breeding area in late April and the north in late May (Curson, 2016c). The alleged Brazilian record for RR in April (Sick, 1997) is of a skin collected in the Venezuelan portion of the Serra Parima (Mallet-Rodrigues, 2002). There are two undocumented records for RJ in November 2004 and January 2006 (Whittaker & Foster, 2005; Gagliardi, 2006).

## Thraupidae

*Rhopospina fruticeti* (VAG): occurs in Peru, Bolivia, Chile and Argentina (Jaramillo, 2011e). In Brazil, it is considered vagrant and there are only two records of this species, both for RS: one female found dead in the Highway BR 471 in Banhado do Taim in 1971 (Grantsau, 2002), and one individual seen in Vila Operária de Candiota in August 1997 (Bencke, 2001). Photographic records for the north coast of RS (WikiAves, 2016) are also of individuals brought to Brazil by ships (*i.e.*, "ship-assisted").

*Conothraupis speculigera* (VAG): departs from the Andes region (especially from Peru to Ecuador) after the breeding season between June and November, moving with the rainfall regime (Sick, 1997) to Amazonian lowlands (Lebbin, 2005). The movement pattern and routes of this species in the Amazon Basin are not known (Hilty, 2011). In Brazil, there are documented records only for AC during austral winter (Whittaker & Oren, 1999; Guilherme, 2007; MPEG).

*Hedyglossa diuca* (VAG): occurs in Chile, Bolivia, Argentina, Uruguay and southern Brazil, but records in the country exist only for western RS, where four specimens were collected in June 1914 in the region of Uruguaiana (Belton, 1994). It is mainly resident, but the subspecies

*H. d. minor* is partially migratory (Jaramillo, 2011f). In Brazil, it is considered vagrant and there are no available photographic records (WikiAves, 2016).

*Tiaris obscurus* (VAG): occurs from the region of the Andes in western Venezuela south as far as northwestern Argentina (Rising, 2011). It is resident in a large part of its distribution, but it may move altitudinally from the Andes to lowlands after breeding (Rising, 2011). Migratory movements are still little known, but records in Brazil suggest that this species overwinters in the regions of Chiquitano and Pantanal (Whittaker & Carlos, 2004; Vasconcelos *et al.*, 2008a). There are no photographic records of this species in the national territory (WikiAves, 2016).

*Saltatricula multicolor* (VAG): occurs in Bolivia, Paraguay, Argentina and Uruguay (Brewer, 2011). In Brazil, it has been photographed in multiple occasions in May, July and August 2013 in Uruguaiana/RS, and in Porto Murinho/MS in August 2015 (Bellagamba *et al.*, 2013; WikiAves, 2016).

*Piranga olivacea* (VAG): breeds in Canada and the USA, and overwinters in northwestern South America, especially in the Amazon Basin in Colombia, Ecuador, Peru, Bolivia and western Brazil (Hilty, 2011). Its presence in the national territory is localized: there are two records for Manaus/AM in December (Stotz *et al.*, 1992) and two other recent photographic records for AM in October and November, and three for AC in March (WikiAves, 2016) and December (MPEG 52253).

*Spiza Americana* (VAG): breeds in Canada and the USA; migrates to Central America and northern South America during winter as far as the central Amazon in Brazil. It has been recorded for RR with a single photographic record in March (Sick, 1997; Orenstein, 2011), and for AM in September (WikiAves, 2016).

*Carduelis carduelis* (VAG): occurs in Europe, Asia and northern Africa. It has been introduced in the USA and in Australia (Clement *et al.*, 2010). In Brazil, this species has been recorded in RS since 1994, probably originating from the geographical expansion of a resident population in Uruguay, which was also introduced in this country (FZBRS, 2013).

## Not Defined species accounts (ND)

### Phoenicopteridae

*Phoenicopus ruber* (ND): occurs in the Caribbean, Galápagos and northern South America (del Hoyo, 1992). Despite historic reports of breeding colonies on Marajó Island/Pará (PA) and Lago Piratuba/southern Amapá (AP) (Sick, 1969), there are no current records of it breeding in the country (Nascimento *et al.*, 1992). In the area between the lighthouse at Cape Orange and the mouth

of the Oyapock River, groups of 600 and 350 individuals have been recorded respectively in November 1991 and May 1992 (Nascimento *et al.*, 1992). In the same region, around 90 individuals have been recorded in April 2014 and another small group in February 2015 (WikiAves, 2016). One adult has also been recorded in Galinhos/Rio Grande do Norte (RN) between January and March 2001 (Azevedo-Júnior *et al.*, 2004) and one specimen collected in Ceará (CE) (Oren, 1991). Museum records are restricted to AP in August and in PA in February and December (MPEG). This suggests that its occurrence in Brazil is due to irregular movements that originate in the north of the distribution of the species and that further studies are necessary to confirm its migratory pattern.

### Rallidae

*Porphyrio flavirostris* (ND): occurs from eastern Colombia through southern central Venezuela to the Guianas, south as far as eastern Ecuador, northern and southeastern Peru, northern Bolivia, and central Paraguay to extreme northern Argentina, and there are also sparse records in the entire Brazil (Taylor, 1996). Its occurrence is highly seasonal in parts of its distribution and it seems to coincide with the flood season: in southwestern Amazon and Paraguay, it occurs mainly between October and January; in eastern Amazon, between February and August; in western Amazon, records peak in January; and in the Upper Amazon, it is present only between January and July. It is considered vagrant in southern Brazil (Remsen Jr. & Parker III, 1990; Taylor, 1996; Dias *et al.*, 2010b). Photographic records do not corroborate the pattern described in the literature. The occurrence of this species in the South region is restricted to sporadic records for all three states (Dias *et al.*, 2010b; Meyer, 2015). More data is necessary to classify this species as migratory. Individuals collected in Fazenda Fatura in Santana do Araguaia/PA had developed gonads, which indicates that the species breeds in Brazil (L.F. Silveira, *pers. obs.*). Museum collection data are restricted to MT in May and in PA in March, April, August, November and December (MPEG).

### Cuculidae

*Coccyzus erythrophthalmus* (ND): breeds in Canada and the USA; overwinters in northwestern and central western South America (Payne, 1997). In Brazil, it was recorded only in western Acre (AC) in February (Whittaker & Oren, 1999, MPEG 48047 [AC, 1992, Feb]) and in AP in November (Xavier & Boss, 2011), which suggests that the country could be a wintering area. However, its occurrence may be incidental and further studies are necessary to classify it as migratory.

### Columbidae

*Zenaida auriculata* (ND): out of the four subspecies that occur in Brazil, *Z. a. noronha* occurs in the semiarid Caatinga in the Northeast region and presents large population variations because of flock gatherings during the

rainy season while searching for breeding sites, where it forms breeding colonies with thousands of nests (Azevedo-Júnior & Antas, 1990). It seems to breed itinerantly in the Northeast (Bucher, 1982), which is corroborated by banding data from up to 2005 (SNA, 2016). According to this pattern, the first colonies appeared around the middle of the São Francisco River in Bahia (BA) between February and March. The species appeared soon after in western Pernambuco (PE), southern CE and southwestern Piauí (PI) and then, between May and June, in southern central PE (Sertão do Pajeú), Seridó region (on the border between PB and RN) and RN (Azevedo-Júnior & Antas, 1990). However, there is an annual change in total precipitation in the Caatinga that may favor the opportunistic occurrence of colonies in places they do not usually occur in years of irregular precipitation (Azevedo-Júnior & Antas, 1990). The species has been classified as migratory (except for in Fernando de Noronha/PE, where it is resident) because it moves in response to rain movements in the Caatinga (Antas, 1987; Azevedo-Júnior & Antas, 1990; Souza *et al.*, 2007), slowly flying from the southwest to the northeast (Nimer, 1977). However, Sick (1983) states that it is not every year that this species gathers by the thousands in the Northeast, and this, when associated to the fact that it can be observed in the Northeast during the entire year (WikiAves, 2016) without a clear seasonal population fluctuation, conflicts with its classification as migratory. For this reason, the species is here classified as not defined.

### Apodidae

[*Chaetura pelagica*] (ND): has been classified as a Neotropical migrant (Allen & Connor, 2000). It breeds in North America and overwinters in Ecuador, Peru, northern Chile and possibly northwestern Brazil (Chantler, 1999). Stotz *et al.* (1992) discuss difficulties in confirming alleged records of this species for the Manaus region/ Amazonas (AM). Undocumented flocks of this species have been seen in four different dates and they originated in western AC (Whittaker & Oren, 1999).

### Tyrannidae

*Phaeomyias murina* (ND): occurs from Panama to eastern Brazil and northwestern Argentina. Populations from the south of the distribution (Bolivia, Brazil, Argentina and Paraguay) seem to migrate north and winter in the Amazon Basin (Fitzpatrick, 2004). In Brazil, it occurs year round except for PR where the records are restricted to the period of September to January (WikiAves, 2016; MZUSP; MNRJ; MPEG). However, data is still insufficient to determine a migratory pattern and further studies are necessary.

*Myiodynastes luteiventris* (ND): breeds from southwestern USA, Mexico, Guatemala, and Belize south as far as Costa Rica. It overwinters in eastern Ecuador, eastern Peru, Bolivia and in western and southwestern Amazon in Brazil between October and April (Mobley, 2004j). There are

**Table 1.** List of Brazilian migratory (MGT), partially migratory (MPR), vagrant (VAG) and not defined (ND) bird species, with remarks on breeding activity in the national territory. Those marked with asterisks should be prioritized in further studies. Species present on the secondary list of Piacentini *et al.* (2015) are between brackets.

Taxon name	Portuguese Name	English Name	Status	Reproduces in Brazil
Anseriformes Linnaeus, 1758				
Anatidae Leach, 1820				
Dendrocygninae Reichenbach, 1850				
<i>Dendrocygna bicolor</i> (Vieillot, 1816)	marreca-caneleira	Fulvous Whistling-Duck	MPR	Yes
Anserinae Vigors, 1825				
<i>Coscoroba coscoroba</i> (Molina, 1782)	capororoca	Coscoroba Swan	MPR	Yes
Anatinae Leach, 1820				
<i>Chloephaga picta</i> (Gmelin, 1789)	ganso-de-magalhães	Upland Goose	VAG	No
<i>Neochen jubata</i> (Spix, 1825)	pato-corredor	Orinoco Goose	MPR	Yes
<i>Callonetta leucophrys</i> (Vieillot, 1816)	marreca-de-coleira	Ringed Teal	MPR	Yes
<i>Anas sibilatrix</i> Poepig, 1829	marreca-oveira	Chiloe Wigeon	MGT	No
<i>Anas acuta</i> Linnaeus, 1758	arrabio	Northern Pintail	VAG	No
<i>Anas georgica</i> Gmelin, 1789	marreca-parda	Yellow-billed Pintail	MPR	Yes
<i>Anas versicolor</i> Vieillot, 1816	marreca-cricri	Silver Teal	MPR	Yes
<i>Anas discors</i> Linnaeus, 1766	marreca-de-asa-azul	Blue-winged Teal	MGT*	No
<i>Anas cyanoptera</i> Vieillot, 1816	marreca-colorada	Cinnamon Teal	VAG	No
<i>Anas platalea</i> Vieillot, 1816	marreca-colhereira	Red Shoveler	MPR	Yes
<i>Netta peposaca</i> (Vieillot, 1816)	marrecão	Rosy-billed Pochard	MPR	Yes
<i>Heteronetta atricapilla</i> (Merrem, 1841)	marreca-de-cabeça-preta	Black-headed Duck	MPR	Yes
<i>Oxyura vittata</i> (Philippi, 1860)	marreca-rabo-de-espinho	Lake Duck	MGT	No
Podicipediformes Fürbringer, 1888				
Podicipedidae Bonaparte, 1831				
<i>Podiceps occipitalis</i> Garnot, 1826	mergulhão-de-orelha-amarela	Silvery Grebe	VAG	No
Phoenicopteriformes Fürbringer, 1888				
Phoenicopteridae Bonaparte, 1831				
<i>Phoenicopterus ruber</i> Linnaeus, 1758	flamingo	American Flamingo	ND	No
<i>Phoenicopterus chilensis</i> Molina, 1782	flamingo-chileno	Chilean Flamingo	MGT	No
<i>Phoenicoparrus andinus</i> (Philippi, 1854)	flamingo-dos-andes	Andean Flamingo	VAG	No
<i>Phoenicoparrus jamesi</i> (Sclater, 1886)	flamingo-da-puna	James's Flamingo	VAG	No
Sphenisciformes Sharpe, 1891				
Spheniscidae Bonaparte, 1831				
<i>Aptenodytes patagonicus</i> Miller, 1778	pinguim-rei	King Penguin	VAG	No
<i>Spheniscus magellanicus</i> (Forster, 1781)	pinguim	Magellanic Penguin	MGT	No
<i>Eudyptes chrysolophus</i> (Brandt, 1837)	pinguim-macaroni	Macaroni Penguin	VAG	No
<i>Eudyptes chrysocome</i> (Forster, 1781)	pinguim-de-penacho-amarelo	Southern Rockhopper Penguin	VAG	No
Procellariiformes Fürbringer, 1888				
Diomedidae Gray, 1840				
<i>Phoebastria fusca</i> (Hilsenberg, 1822)	piau-preto	Sooty Albatross	VAG	No
<i>Phoebastria palpebrata</i> (Forster, 1785)	piau-de-costas-claras	Light-mantled Albatross	VAG	No
<i>Thalassarche chlororhynchos</i> (Gmelin, 1789)	albatroz-de-nariz-amarelo	Yellow-nosed Albatross	MGT	No
<i>Thalassarche melanophris</i> (Temminck, 1828)	albatroz-de-sobrancelha	Black-browed Albatross	MGT	No
<i>Thalassarche chrysostoma</i> (Forster, 1785)	albatroz-de-cabeça-cinza	Gray-headed Albatross	VAG	No
<i>Thalassarche cauta</i> (Gould, 1841)	albatroz-arisco	White-capped Albatross	MGT	No
<i>Diomedea epomophora</i> Lesson, 1825	albatroz-real	Royal Albatross	MGT	No
<i>Diomedea sanfordi</i> Murphy, 1917	albatroz-real-do-norte	Northern Royal Albatross	MGT	No
<i>Diomedea exulans</i> Linnaeus, 1758	albatroz-errante	Wandering Albatross	MGT	No
<i>Diomedea dabbenena</i> Mathews, 1929	albatroz-de-tristão	Tristan Albatross	MGT	No
Procellariidae Leach, 1820				
<i>Macronectes giganteus</i> (Gmelin, 1789)	petrel-grande	Southern Giant-Petrel	MGT	No
<i>Macronectes halli</i> Mathews, 1912	petrel-grande-do-norte	Northern Giant-Petrel	MGT	No
<i>Fulmarus glacialis</i> (Smith, 1840)	pardelão-prateado	Southern Fulmar	MGT	No
<i>Daption capense</i> (Linnaeus, 1758)	pomba-do-cabo	Cape Petrel	MGT	No
<i>Lugensa brevirostris</i> (Lesson, 1831)	grazina-de-bico-curto	Kerguelen Petrel	VAG	No
[ <i>Pterodroma madeira</i> Mathews, 1934]			MGT	No
[ <i>Pterodroma deserta</i> Mathews, 1934]			MGT	No
<i>Pterodroma mollis</i> (Gould, 1844)	grazina-delicada	Soft-plumaged Petrel	MGT	No



Taxon name	Portuguese Name	English Name	Status	Reproduces in Brazil
[ <i>Pterodroma hasitata</i> (Kuhl, 1820)]			VAG	No
<i>Pterodroma incerta</i> (Schlegel, 1863)	grazina-de-barriga-branca	Atlantic Petrel	MGT	No
<i>Pterodroma lessonii</i> (Garnot, 1826)	grazina-de-cabeça-branca	White-headed Petrel	VAG	No
<i>Pterodroma macroptera</i> (Smith, 1840)	fura-buxo-de-cara-cinza	Great-winged Petrel	VAG	No
<i>Pterodroma arminjoniana</i> (Giglioli & Salvadori, 1869)	grazina-de-trindade	Trindade Petrel	MPR	Yes
<i>Halobaena caerulea</i> (Gmelin, 1789)	petrel-azul	Blue Petrel	VAG	No
<i>Pachyptila vittata</i> (Forster, 1777)	faigão-de-bico-largo	Broad-billed Prion	VAG	No
<i>Pachyptila desolata</i> (Gmelin, 1789)	faigão-rola	Antarctic Prion	MGT	No
<i>Pachyptila belcheri</i> (Mathews, 1912)	faigão-de-bico-fino	Slender-billed Prion	MGT	No
<i>Bulweria bulwerii</i> (Jardine & Selby, 1828)	alma-negra	Bulwer's Petrel	MGT	No
<i>Procellaria cinerea</i> Gmelin, 1789	pardela-cinza	Gray Petrel	VAG	No
<i>Procellaria aequinoctialis</i> Linnaeus, 1758	pardela-preta	White-chinned Petrel	MGT	No
<i>Procellaria conspicillata</i> Gould, 1844	pardela-de-óculos	Spectacled Petrel	MGT	No
<i>Calonectris borealis</i> (Cory, 1881)	cagarrá-grande	Cory's Shearwater	MGT	No
<i>Calonectris edwardsii</i> (Oustalet, 1883)	cagarrá-de-cabo-verde	Cape Verde Shearwater	MGT	No
<i>Puffinus griseus</i> (Gmelin, 1789)	pardela-escura	Sooty Shearwater	MGT	No
<i>Puffinus tenuirostris</i> (Temminck, 1836)	pardela-de-cauda-curta	Short-tailed Shearwater	VAG	No
<i>Puffinus gravis</i> (O'Reilly, 1818)	pardela-de-barrete	Great Shearwater	MGT	No
<i>Puffinus puffinus</i> (Brünnich, 1764)	pardela-sombria	Manx Shearwater	MGT	No
[ <i>Puffinus assimilis</i> Gould, 1838]			VAG	No
<i>Puffinus lherminieri</i> Lesson, 1839	pardela-de-asa-larga	Audubon's Shearwater	MGT	Yes
Hydrobatidae Mathews, 1912				
Oceanitinae Forbes, 1882				
<i>Fregatta grallaria</i> (Vieillot, 1818)	painho-de-barriga-branca	White-bellied Storm-Petrel	MGT	No
<i>Fregatta tropica</i> (Gould, 1844)	painho-de-barriga-preta	Black-bellied Storm-Petrel	MGT	No
<i>Oceanites oceanicus</i> (Kuhl, 1820)	alma-de-mestre	Wilson's Storm-Petrel	MGT	No
<i>Pelagodroma marina</i> (Latham, 1790)	calcamar	White-faced Storm-Petrel	VAG	No
Hydrobatinae Mathews, 1912				
[ <i>Oceanodroma castro</i> (Harcourt, 1851)]			VAG	No
<i>Oceanodroma leucorhoa</i> (Vieillot, 1818)	painho-de-cauda-furcada	Leach's Storm-Petrel	MGT	No
Pelecanoididae Gray, 1871				
<i>Pelecanoides magellani</i> (Mathews, 1912)	petrel-mergulhador	Magellanic Diving-Petrel	VAG	No
Phaethontiformes Sharpe, 1891				
Phaethontidae Brandt, 1840				
<i>Phaethon rubricauda</i> Boddaert, 1783	rabo-de-palha-de-cauda-vermelha	Red-tailed Tropicbird	VAG	No
Suliformes Sharpe, 1891				
Sulidae Reichenbach, 1849				
<i>Morus capensis</i> (Lichtenstein, 1823)	atobá-do-cabo	Cape Gannet	VAG	No
<i>Morus serrator</i> (Gray, 1843)	atobá-australiano	Australasian Gannet	VAG	No
Phalacrocoracidae Reichenbach, 1849				
[ <i>Leucocarbo bransfieldensis</i> (Murphy, 1936)]			VAG	No
Pelecaniformes Sharpe, 1891				
Pelecanidae Rafinesque, 1815				
<i>Pelecanus occidentalis</i> Linnaeus, 1766	pelicano	Brown Pelican	VAG	No
Ardeidae Leach, 1820				
<i>Nyctanassa violacea</i> (Linnaeus, 1758)	savacu-de-coroa	Yellow-crowned Night-Heron	MPR	Yes
<i>Ardeola ralloides</i> (Scopoli, 1769)	garça-caranguejeira	Squacco Heron	VAG	No
<i>Ardea cinerea</i> Linnaeus, 1758	garça-moura-europeia	Gray Heron	VAG	No
[ <i>Ardea purpurea</i> Linnaeus, 1766]			VAG	No
<i>Egretta gularis</i> (Bosc, 1792)	garça-negra	Western Reef-Heron	VAG	No
<i>Egretta garzetta</i> (Linnaeus, 1766)	garça-pequena-europeia	Little Egret	VAG	No
Threskiornithidae Poche, 1904				
<i>Plegadis chihi</i> (Vieillot, 1817)	carauína	White-faced Ibis	MPR*	Yes
<i>Platalea ajaja</i> Linnaeus, 1758	colhereiro	Roseate Spoonbill	MPR*	Yes
Cathartiformes Seebohm, 1890				
Cathartidae Lafresnaye, 1839				
[ <i>Vultur gryphus</i> Linnaeus, 1758]			VAG	No
Accipitriformes Bonaparte, 1831				
Pandionidae Bonaparte, 1854				
<i>Pandion haliaetus</i> (Linnaeus, 1758)	águia-pescadora	Osprey	MGT	No

Taxon name	Portuguese Name	English Name	Status	Reproduces in Brazil
<b>Accipitridae Vigors, 1824</b>				
<i>Elanoides forficatus</i> (Linnaeus, 1758)	gavião-tesoura	Swallow-tailed Kite	MPR*	Yes
<i>Harpagus diodon</i> (Temminck, 1823)	gavião-bombachinha	Rufous-thighed Kite	MGT	Yes
<i>Milvus migrans</i> (Boddaert, 1783)	milhafre-preto	Black Kite	VAG	No
<i>Ictinia mississippiensis</i> (Wilson, 1811)	sovi-do-norte	Mississippi Kite	MGT	No
<i>Ictinia plumbea</i> (Gmelin, 1788)	sovi	Plumbeous Kite	MPR*	Yes
<i>Rostrhamus sociabilis</i> (Vieillot, 1817)	gavião-caramujeiro	Snail Kite	MPR*	Yes
[ <i>Geranoaetus polyosoma</i> (Quoy & Gaimard, 1824)]			VAG	No
<i>Buteo platypterus</i> (Vieillot, 1823)	gavião-de-asa-larga	Broad-winged Hawk	MGT	No
<i>Buteo swainsoni</i> Bonaparte, 1838	gavião-papa-gafanhoto	Swainson's Hawk	MGT	No
<b>Gruiformes Bonaparte, 1854</b>				
<b>Rallidae Rafinesque, 1815</b>				
<i>Crex crex</i> (Linnaeus, 1758)	codornizão	Corn Crake	VAG	No
<i>Pardirallus sanguinolentus</i> (Swainson, 1838)	saracura-do-banhado	Plumbeous Rail	MPR*	Yes
<i>Gallinula angulata</i> Sundevall, 1850	galinha-d'água-pequena	Lesser Moorhen	VAG	No
<i>Porphyrio martinicus</i> (Linnaeus, 1766)	frango-d'água-azul	Purple Gallinule	MPR	Yes
<i>Porphyrio flavirostris</i> (Gmelin, 1789)	frango-d'água-pequeno	Azure Gallinule	ND	Yes
<b>Charadriiformes Huxley, 1867</b>				
<b>Charadrii Huxley, 1867</b>				
<b>Charadriidae Leach, 1820</b>				
<i>Pluvialis dominica</i> (Statius Muller, 1776)	batuiriçu	American Golden-Plover	MGT	No
<i>Pluvialis squatarola</i> (Linnaeus, 1758)	batuiriçu-de-axila-preta	Black-bellied Plover	MGT	No
<i>Charadrius semipalmatus</i> Bonaparte, 1825	batuira-de-bando	Semipalmated Plover	MGT	No
<i>Charadrius falklandicus</i> Latham, 1790	batuira-de-coleira-dupla	Two-banded Plover	MPR	Yes
<i>Charadrius modestus</i> Lichtenstein, 1823	batuira-de-peito-tijolo	Rufous-chested Dotterel	MGT	No
<i>Oreopholus ruficollis</i> (Wagler, 1829)	batuira-de-papo-ferrugíneo	Tawny-throated Dotterel	MGT	No
<b>Chionidae Lesson, 1828</b>				
<i>Chionis albus</i> (Gmelin, 1789)	pomba-antártica	Snowy Sheathbill	MGT*	No
<b>Scolopaci Stejneger, 1885</b>				
<b>Scolopaciidae Rafinesque, 1815</b>				
<i>Limnodromus griseus</i> (Gmelin, 1789)	maçarico-de-costas-brancas	Short-billed Dowitcher	MGT	No
<i>Limosa haemastica</i> (Linnaeus, 1758)	maçarico-de-bico-virado	Hudsonian Godwit	MGT	No
<i>Limosa lapponica</i> (Linnaeus, 1758)	fuselo	Bar-tailed Godwit	VAG	No
<i>Numenius borealis</i> (Forster, 1772)	maçarico-esquimó	Eskimo Curlew	MGT	No
<i>Numenius hudsonicus</i> Latham, 1790	maçarico-de-bico-torto	American Whimbrel	MGT	No
<i>Numenius phaeopus</i> (Linnaeus, 1758)	maçarico-galego	Eurasian Whimbrel	VAG	No
<i>Bartramia longicauda</i> (Bechstein, 1812)	maçarico-do-campo	Upland Sandpiper	MGT	No
<i>Xenus cinereus</i> (Guldenstadt, 1774)	maçarico-tereque	Terek Sandpiper	VAG	No
<i>Actitis macularius</i> (Linnaeus, 1766)	maçarico-pintado	Spotted Sandpiper	MGT	No
<i>Tringa solitaria</i> Wilson, 1813	maçarico-solitário	Solitary Sandpiper	MGT	No
<i>Tringa melanoleuca</i> (Gmelin, 1789)	maçarico-grande-de-perna-amarela	Greater Yellowlegs	MGT	No
<i>Tringa semipalmata</i> (Gmelin, 1789)	maçarico-de-asa-branca	Willet	MGT	No
<i>Tringa flavipes</i> (Gmelin, 1789)	maçarico-de-perna-amarela	Lesser Yellowlegs	MGT	No
<i>Arenaria interpres</i> (Linnaeus, 1758)	vira-pedras	Ruddy Turnstone	MGT	No
<i>Calidris canutus</i> (Linnaeus, 1758)	maçarico-de-papo-vermelho	Red Knot	MGT	No
<i>Calidris alba</i> (Pallas, 1764)	maçarico-branco	Sanderling	MGT	No
<i>Calidris pusilla</i> (Linnaeus, 1766)	maçarico-rasteirinho	Semipalmated Sandpiper	MGT	No
<i>Calidris minutilla</i> (Vieillot, 1819)	maçariquinho	Least Sandpiper	MGT	No
<i>Calidris fuscicollis</i> (Vieillot, 1819)	maçarico-de-sobre-branco	White-rumped Sandpiper	MGT	No
<i>Calidris bairdii</i> (Coues, 1861)	maçarico-de-bico-fino	Baird's Sandpiper	MGT	No
<i>Calidris melanotos</i> (Vieillot, 1819)	maçarico-de-colete	Pectoral Sandpiper	MGT	No
<i>Calidris himantopus</i> (Bonaparte, 1826)	maçarico-pernilongo	Stilt Sandpiper	MGT	No
<i>Calidris subruficollis</i> (Vieillot, 1819)	maçarico-acanelado	Buff-breasted Sandpiper	MGT	No
<i>Calidris pugnax</i> (Linnaeus, 1758)	combatente	Ruff	VAG	No
<i>Phalaropus tricolor</i> (Vieillot, 1819)	pisa-n'água	Wilson's Phalarope	MGT	No
<i>Phalaropus fulicarius</i> (Linnaeus, 1758)	falaropo-de-bico-grosso	Red Phalarope	VAG	No
<b>Thinocoridae Sundevall, 1836</b>				
<i>Thinocorus rumicivorus</i> Eschscholtz, 1829	agachadeira-mirim	Least Seedsnipe	VAG	No
<b>Glareolidae Brehm, 1831</b>				
<i>Glareola pratincola</i> (Linnaeus, 1766)	perdiz-do-mar	Collared Pratincole	VAG	No

Taxon name	Portuguese Name	English Name	Status	Reproduces in Brazil
Lari Sharpe, 1891				
Stercorariidae Gray, 1870				
<i>Stercorarius skua</i> (Brünnich, 1764)	mandrião-grande	Great Skua	MGT	No
<i>Stercorarius chilensis</i> Bonaparte, 1857	mandrião-chileno	Chilean Skua	MGT	No
<i>Stercorarius macconnicki</i> Saunders, 1893	mandrião-do-sul	South Polar Skua	MGT	No
<i>Stercorarius antarcticus</i> (Lesson, 1831)	mandrião-antártico	Brown Skua	MGT	No
<i>Stercorarius pomarinus</i> (Temminck, 1815)	mandrião-pomarinino	Pomarine Jaeger	MGT	No
<i>Stercorarius parasiticus</i> (Linnaeus, 1758)	mandrião-parasítico	Parasitic Jaeger	MGT	No
<i>Stercorarius longicaudus</i> Vieillot, 1819	mandrião-de-cauda-comprida	Long-tailed Jaeger	MGT	No
Laridae Rafinesque, 1815				
<i>Xema sabini</i> (Sabine, 1819)	gaivota-de-sabine	Sabine's Gull	VAG	No
<i>Leucophaeus atricilla</i> (Linnaeus, 1758)	gaivota-alegre	Laughing Gull	MGT	No
<i>Leucophaeus pipixcan</i> (Wagler, 1831)	gaivota-de-franklin	Franklin's Gull	VAG	No
<i>Larus atlanticus</i> Olrog, 1958	gaivota-de-rabo-preto	Olrog's Gull	MGT	No
[ <i>Larus delawarensis</i> Ord, 1815]			VAG	No
<i>Larus fuscus</i> Linnaeus, 1758	gaivota-da-asa-escura	Lesser Black-backed Gull	VAG	No
Sternidae Vigors, 1825				
<i>Onychoprion fuscatus</i> (Linnaeus, 1766)	trinta-réis-das-rocas	Sooty Tern	MGT	Yes
<i>Sternula antillarum</i> Lesson, 1847	trinta-réis-miúdo	Least Tern	MPR	Yes
<i>Gelochelidon nilotica</i> (Gmelin, 1789)	trinta-réis-de-bico-preto	Gull-billed Tern	MPR	Yes
<i>Chlidonias leucopterus</i> (Temminck, 1815)	trinta-réis-negro-de-asa-branca	White-winged Tern	VAG	No
<i>Chlidonias niger</i> (Linnaeus, 1758)	trinta-réis-negro	Black Tern	MGT	No
<i>Sterna hirundo</i> Linnaeus, 1758	trinta-réis-boreal	Common Tern	MGT	No
<i>Sterna dougallii</i> Montagu, 1813	trinta-réis-róseo	Roseate Tern	MGT	No
<i>Sterna paradisaea</i> Pontoppidan, 1763	trinta-réis-ártico	Arctic Tern	MGT	No
<i>Sterna hirundinacea</i> Lesson, 1831	trinta-réis-de-bico-vermelho	South American Tern	MPR	Yes
<i>Sterna vittata</i> Gmelin, 1789	trinta-réis-antártico	Antarctic Tern	VAG	No
<i>Sterna trudeaui</i> Audubon, 1838	trinta-réis-de-coroa-branca	Snowy-crowned Tern	MPR	Yes
<i>Thalasseus acufflavivus</i> (Cabot, 1847)	trinta-réis-de-bando	Cabot's Tern	MPR	Yes
<i>Thalasseus maximus</i> (Boddaert, 1783)	trinta-réis-real	Royal Tern	MPR	Yes
Rynchopidae Bonaparte, 1838				
<i>Rynchops niger</i> Linnaeus, 1758	talha-mar	Black Skimmer	MPR	Yes
Columbiformes Latham, 1790				
Columbidae Leach, 1820				
<i>Zenaida auriculata</i> (Des Murs, 1847)	avoante	Eared Dove	ND	No
Opisthocomiformes Sclater, 1880				
Opisthocomidae Swainson, 1837				
Cuculiformes Wagler, 1830				
Cuculidae Leach, 1820				
Cuculinae Leach, 1820				
<i>Micrococcyx cinereus</i> (Vieillot, 1817)	papa-lagarta-cinzeno	Ash-colored Cuckoo	MGT*	Yes
<i>Coccyzus melacoryphus</i> Vieillot, 1817	papa-lagarta	Dark-billed Cuckoo	MGT	Yes
<i>Coccyzus americanus</i> (Linnaeus, 1758)	papa-lagarta-de-asa-vermelha	Yellow-billed Cuckoo	MGT	No
<i>Coccyzus erythrophthalmus</i> (Wilson, 1811)	papa-lagarta-de-bico-preto	Black-billed Cuckoo	ND	Yes
Caprimulgiformes Ridgway, 1881				
Caprimulgidae Vigors, 1825				
<i>Lurocalis semitorquatus</i> (Gmelin, 1789)	tuju	Short-tailed Nighthawk	MPR	Yes
<i>Hydropsalis parvula</i> (Gould, 1837)	bacurau-chintã	Little Nightjar	MPR	Yes
<i>Podager nacunda</i> (Vieillot, 1817)	corução	Nacunda Nighthawk	MPR	Yes
<i>Chordeiles minor</i> (Forster, 1771)	bacurau-norte-americano	Common Nighthawk	MGT	No
Apodiformes Peters, 1940				
Apodidae Olphe-Galliard, 1887				
[ <i>Cypseloides niger</i> (Gmelin, 1789)]			MGT	No
[ <i>Chaetura pelagica</i> (Linnaeus, 1758)]			ND	No
<i>Chaetura meridionalis</i> Hellmayr, 1907	andorinhão-do-temporal	Sick's Swift	MGT*	Yes
Trochilidae Vigors, 1825				
Trochilinae Vigors, 1825				
<i>Florisuga fusca</i> (Vieillot, 1817)	beija-flor-preto	Black Jacobin	MPR*	Yes
<i>Anthracothorax nigricollis</i> (Vieillot, 1817)	beija-flor-de-veste-preta	Black-throated Mango	MPR	Yes



Taxon name	Portuguese Name	English Name	Status	Reproduces in Brazil
Falconiformes Bonaparte, 1831				
Falconidae Leach, 1820				
<i>Falco tinnunculus</i> Linnaeus, 1758	peneireiro-de-dorso-malhado	Eurasian Kestrel	VAG	No
<i>Falco columbarius</i> Linnaeus, 1758	esmerilhão	American Merlin	VAG	No
<i>Falco aesalon</i> Tunstall, 1771	esmerilhão-europeu	Eurasian Merlin	VAG	No
<i>Falco peregrinus</i> Tunstall, 1771	falcão-peregrino	Peregrine Falcon	MGT	No
Psittaciformes Wagler, 1830				
Psittacidae Rafinesque, 1815				
<i>Amazona pretrei</i> (Temminck, 1830)	papagaio-charão	Red-spectacled Parrot	MGT	Yes
Passeriformes Linnaeus, 1758				
Tyranni Wetmore & Miller, 1926				
Furnariida Sibley, Ahlquist & Monroe, 1988				
Furnarioidea Gray, 1840				
Furnariidae Gray, 1840				
Furnariinae Gray, 1840				
<i>Cinclodes fuscus</i> (Vieillot, 1818)	pedreiro-dos-andes	Buff-winged Cinclodes	MGT	No
Synallaxiinae De Selys-Longchamps, 1839 (1836)				
<i>Asthenes pyrrholeuca</i> (Vieillot, 1817)	lenheiro-de-rabo-comprido	Sharp-billed Canastero	VAG	No
Tyrannides Wetmore & Miller, 1926				
Tyrannida Wetmore & Miller, 1926				
Tityridae Gray, 1840				
Tityrinae Gray, 1840				
<i>Pachyramphus polychopterus</i> (Vieillot, 1818)	caneleiro-preto	White-winged Becard	MPR	Yes
<i>Pachyramphus validus</i> (Lichtenstein, 1823)	caneleiro-de-chapéu-preto	Crested Becard	MPR*	Yes
Cotingidae Bonaparte, 1849				
Phytotominae Swainson, 1837				
<i>Phytotoma rutila</i> Vieillot, 1818	corta-ramos	White-tipped Plantcutter	MGT	No
Tyrannoidea Vigors, 1825				
Tyrannidae Vigors, 1825				
Elaeniinae Cabanis & Heine, 1860				
<i>Inezia inornata</i> (Salvadori, 1897)	alegrinho-do-chaco	Plain Tyrannulet	MGT*	Yes
<i>Elaenia spectabilis</i> Pelzeln, 1868	guaracava-grande	Large Elaenia	MPR	Yes
<i>Elaenia chilensis</i> Hellmayr, 1927	guaracava-de-crista-branca	Chilean Elaenia	MGT	No
<i>Elaenia parvirostris</i> Pelzeln, 1868	tuque-pium	Small-billed Elaenia	MPR	Yes
<i>Elaenia chiriquensis</i> Lawrence, 1865	chibum	Lesser Elaenia	MPR	Yes
<i>Myiopagis viridicata</i> (Vieillot, 1817)	guaracava-de-crista-alaranjada	Greenish Elaenia	MPR	Yes
<i>Phaeomyias murina</i> (Spix, 1825)	bagageiro	Mouse-colored Tyrannulet	ND	Yes
<i>Pseudocolopteryx acutipennis</i> (Sclater & Salvin, 1873)	tricolino-oliváceo	Subtropical Doradito	MGT	No
[ <i>Pseudocolopteryx dinelliana</i> Lillo, 1905]			VAG	No
<i>Pseudocolopteryx flaviventris</i> (d'Orbigny & Lafresnaye, 1837)	amarelinho-do-junco	Warbling Doradito	MGT	Yes
<i>Serpophaga griseicapilla</i> Straneck, 2008	alegrinho-trinador	Straneck's Tyrannulet	MGT	No
<i>Serpophaga munda</i> Berlepsch, 1893	alegrinho-de-barriga-branca	White-bellied Tyrannulet	MPR	No
Tyranninae Vigors, 1825				
<i>Attila phoenicurus</i> Pelzeln, 1868	capitão-castanho	Rufous-tailed Attila	MGT	Yes
<i>Legatus leucophaeus</i> (Vieillot, 1818)	bem-te-vi-pirata	Piratic Flycatcher	MPR	Yes
<i>Myiarchus swainsoni</i> Cabanis & Heine, 1859	irré	Swainson's Flycatcher	MPR	Yes
<i>Casiornis fuscus</i> Sclater & Salvin, 1873	caneleiro-enxofre	Ash-throated Casiornis	MPR	Yes
<i>Pitangus sulphuratus</i> (Linnaeus, 1766)	bem-te-vi	Great Kiskadee	MPR*	Yes
<i>Myiodynastes luteiventris</i> Sclater, 1859	bem-te-vi-de-barriga-sulfúrea	Sulphur-bellied Flycatcher	ND	No
<i>Myiodynastes maculatus</i> (Statius Muller, 1776)	bem-te-vi-rajado	Streaked Flycatcher	MPR	Yes
<i>Tyrannus albogularis</i> Burmeister, 1856	suiriri-de-garganta-branca	White-throated Kingbird	MPR*	Yes
<i>Tyrannus melancholicus</i> Vieillot, 1819	suiriri	Tropical Kingbird	MPR	Yes
<i>Tyrannus savana</i> Daudin, 1802	tesourinha	Fork-tailed Flycatcher	MPR	Yes
<i>Tyrannus tyrannus</i> (Linnaeus, 1758)	suiriri-valente	Eastern Kingbird	MGT	No
<i>Tyrannus dominicensis</i> (Gmelin, 1788)	suiriri-cinza	Gray Kingbird	VAG	No
<i>Griseotyrannus aurantioatrocristatus</i> (d'Orbigny & Lafresnaye, 1837)	peitica-de-chapéu-preto	Crowned Slaty Flycatcher	MPR	Yes
<i>Empidonomus varius</i> (Vieillot, 1818)	peitica	Variiegated Flycatcher	MPR*	Yes
Fluvicolinae Swainson, 1832				
<i>Myiophobus fasciatus</i> (Statius Muller, 1776)	filipe	Bran-colored Flycatcher	MPR	Yes
<i>Sublegatus modestus</i> (Wied, 1831)	guaracava-modesta	Southern Scrub-Flycatcher	MPR	Yes

Taxon name	Portuguese Name	English Name	Status	Reproduces in Brazil
<i>Pyrocephalus rubinus</i> (Boddaert, 1783)	príncipe	Vermilion Flycatcher	MPR	Yes
<i>Fluvicola albiventer</i> (Spix, 1825)	lavadeira-de-cara-branca	Black-backed Water-Tyrant	MPR*	Yes
<i>Alectrurus risora</i> (Vieillot, 1824)	tesoura-do-campo	Strange-tailed Tyrant	VAG	No
<i>Lathrotriccus eulari</i> (Cabanis, 1868)	enferrujado	Euler's Flycatcher	MPR	Yes
<i>Empidonax alnorum</i> Brewster, 1895	papa-moscas-de-alder	Alder Flycatcher	MGT	No
<i>Contopus cooperi</i> (Nuttall, 1831)	piuí-boreal	Olive-sided Flycatcher	MGT	No
<i>Contopus virens</i> (Linnaeus, 1766)	piuí	Eastern Wood-Pewee	MGT	No
<i>Lessonia rufa</i> (Gmelin, 1789)	colegial	Austral Negrito	MGT	No
<i>Knipolegus striaticeps</i> (d'Orbigny & Lafresnaye, 1837)	maria-preta-acinzentada	Cinereous Tyrant	VAG	No
<i>Knipolegus hudsoni</i> Sclater, 1872	maria-preta-do-sul	Hudson's Black-Tyrant	VAG	No
[ <i>Knipolegus aterrimus</i> Kaup, 1853]			VAG	No
<i>Hymenops perspicillatus</i> (Gmelin, 1789)	viuvinha-de-óculos	Spectacled Tyrant	MPR	Yes
<i>Muscisaxicola maclovianus</i> (Garnot, 1826)	gaúcha-de-cara-suja	Dark-faced Ground-Tyrant	VAG	No
<i>Xolmis coronatus</i> (Vieillot, 1823)	noivinha-coroada	Black-crowned Monjita	MGT	No
<i>Xolmis rubetra</i> (Burmeister, 1860)	noivinha-castanha	Rusty-backed Monjita	VAG	No
<i>Agriornis micropterus</i> Gould, 1839	gaúcho-de-barriga-cinza	Gray-bellied Shrike-tyrant	VAG	No
<i>Agriornis murinus</i> (d'Orbigny & Lafresnaye, 1837)	gauchinho	Lesser Shrike-tyrant	VAG	No
<i>Neoxolmis rufiventris</i> (Vieillot, 1823)	gaúcho-chocolate	Chocolate-vented Tyrant	VAG	No
Passeri Linnaeus, 1758				
Corvida Wagler 1830				
Vireonidae Swainson, 1837				
<i>Vireo olivaceus</i> (Linnaeus, 1766)	juruvira-boreal	Red-eyed Vireo	MGT	No
<i>Vireo chivi</i> (Vieillot, 1817)	juruvira	Chivi Vireo	MPR	Yes
<i>Vireo flavoviridis</i> (Cassin, 1851)	juruvira-verde-amarelada	Yellow-green Vireo	VAG	No
<i>Vireo altiloquus</i> (Vieillot, 1808)	juruvira-barbuda	Black-whiskered Vireo	MGT	No
Passerida Linnaeus, 1758				
Hirundinidae Rafinesque, 1815				
<i>Pygochelidon melanoleuca</i> (Wied, 1820)	andorinha-de-coleira	Black-collared Swallow	MGT	Yes
<i>Stelgidopteryx ruficollis</i> (Vieillot, 1817)	andorinha-serradora	Southern Rough-winged Swallow	MPR	Yes
<i>Progne tapera</i> (Vieillot, 1817)	andorinha-do-campo	Brown-chested Martin	MPR	Yes
<i>Progne subis</i> (Linnaeus, 1758)	andorinha-azul	Purple Martin	MGT	No
<i>Progne chalybea</i> (Gmelin, 1789)	andorinha-grande	Gray-breasted Martin	MPR*	Yes
<i>Progne elegans</i> Baird, 1865	andorinha-do-sul	Southern Martin	MGT	No
<i>Tachycineta leucopyga</i> (Meyen, 1834)	andorinha-chilena	Chilean Swallow	MGT	No
<i>Riparia riparia</i> (Linnaeus, 1758)	andorinha-do-barranco	Bank Swallow	MGT	No
<i>Hirundo rustica</i> Linnaeus, 1758	andorinha-de-bando	Barn Swallow	MGT	No
<i>Petrochelidon pyrrhonota</i> (Vieillot, 1817)	andorinha-de-dorso-acanelado	Cliff Swallow	MPR	Yes
Turdidae Rafinesque, 1815				
<i>Catharus fuscescens</i> (Stephens, 1817)	sabiá-norte-americano	Veery	MGT	No
<i>Catharus minimus</i> (Lafresnaye, 1848)	sabiá-de-cara-cinza	Gray-cheeked Thrush	MGT	No
<i>Catharus swainsoni</i> (Tschudi, 1845)	sabiá-de-óculos	Swainson's Thrush	MGT	No
<i>Turdus iliacus</i> Linnaeus, 1766	sabiá-ruivo	Redwing	VAG	No
<i>Turdus flavipes</i> Vieillot, 1818	sabiá-una	Yellow-legged Thrush	MGT	Yes
<i>Turdus amaurochalinus</i> Cabanis, 1850	sabiá-poca	Creamy-bellied Thrush	MPR	Yes
<i>Turdus subalaris</i> (Seebohm, 1887)	sabiá-ferreiro	Eastern Slaty Thrush	MPR	Yes
Mimidae Bonaparte, 1853				
<i>Mimus triurus</i> (Vieillot, 1818)	calhandra-de-três-rabos	White-banded Mockingbird	MGT	No
Motacillidae Horsfield, 1821				
<i>Anthus correndera</i> Vieillot, 1818	caminheiro-de-espora	Correndera Pipit	MPR*	Yes
Parulidae Wetmore, Friedmann, Lincoln, Miller, Peters, van Rossem, Van Tyne & Zimmer 1947				
<i>Parkesia noveboracensis</i> (Gmelin, 1789)	mariquita-boreal	Northern Waterthrush	VAG	No
<i>Setophaga ruticilla</i> (Linnaeus, 1758)	mariquita-de-rabo-vermelho	American Redstart	MGT	No
[ <i>Setophaga cerulea</i> (Wilson, 1810)]			VAG	No
<i>Setophaga petechia</i> (Linnaeus, 1766)	mariquita-amarela	Yellow Warbler	MGT	No
<i>Setophaga striata</i> (Forster, 1772)	mariquita-de-perna-clara	Blackpoll Warbler	MGT	No
<i>Setophaga fusca</i> (Statius Muller, 1776)	mariquita-papo-de-fogo	Blackburnian Warbler	VAG	No
[ <i>Setophaga virens</i> (Gmelin, 1789)]			VAG	No
<i>Geothlypis agilis</i> (Wilson, 1812)	mariquita-de-connecticut	Connecticut Warbler	VAG	No
[ <i>Cardellina canadensis</i> (Linnaeus, 1766)]			VAG	No

Taxon name	Portuguese Name	English Name	Status	Reproduces in Brazil
Icteridae Vigors, 1825				
<i>Dolichonyx oryzivorus</i> (Linnaeus, 1758)	triste-pia	Bobolink	MGT	No
Thraupidae Cabanis, 1847				
Porphyrospizinae Burns, Shultz, Title, Mason, Barker, Klicka, Lanyon & Lovette, 2014				
<i>Rhopospina fruticeti</i> (Kittlitz, 1833)	canário-andino-negro	Mourning Sierra-Finch	VAG	No
Thraupinae Cabanis, 1847				
<i>Hedyglossa diuca</i> (Molina, 1782)	diuca	Common Diuca-Finch	VAG	No
<i>Tangara peruviana</i> (Desmarest, 1806)	saíra-sapucaia	Black-backed Tanager	MPR	Yes
Tachyphoniinae Bonaparte, 1853				
<i>Conothraupis speculigera</i> (Gould, 1855)	tiê-preto-e-branco	Black-and-white Tanager	VAG	No
Dacninae Sundevall, 1836				
<i>Tersina viridis</i> (Illiger, 1811)	saí-andorinha	Swallow Tanager	MPR*	Yes
<i>Dacnis nigripes</i> Pelzeln, 1856	saí-de-pernas-pretas	Black-legged Dacnis	MPR*	Yes
Coerebinae d'Orbigny & Lafresnaye, 1838				
<i>Tiaris obscurus</i> (d'Orbigny & Lafresnaye, 1837)	cigarra-parda	Dull-colored Grassquit	VAG	No
Sporophilinae Ridgway, 1901				
<i>Sporophila lineola</i> (Linnaeus, 1758)	bigodinho	Lined Seedeater	MPR	Yes
<i>Sporophila beltoni</i> Repenning & Fontana, 2013	patativa-tropeira	Tropeiro Seedeater	MGT	Yes
<i>Sporophila luctuosa</i> (Lafresnaye, 1843)	papa-capim-preto-e-branco	Black-and-white Seedeater	ND	No
<i>Sporophila caerulea</i> (Vieillot, 1823)	coleirinho	Double-collared Seedeater	MPR*	Yes
<i>Sporophila bouvreuil</i> (Statius Muller, 1776)	caboclinho	Copper Seedeater	MPR	Yes
<i>Sporophila hypoxantha</i> Cabanis, 1851	caboclinho-de-barriga-vermelha	Tawny-bellied Seedeater	MPR	Yes
<i>Sporophila ruficollis</i> Cabanis, 1851	caboclinho-de-papo-escuro	Dark-throated Seedeater	MPR*	Yes
<i>Sporophila palustris</i> (Barrows, 1883)	caboclinho-de-papo-branco	Marsh Seedeater	MGT	Yes
<i>Sporophila hypochroma</i> Todd, 1915	caboclinho-de-sobre-ferrugem	Rufous-rumped Seedeater	MGT	No
<i>Sporophila cinnamomea</i> (Lafresnaye, 1839)	caboclinho-de-chapéu-cinzento	Chestnut Seedeater	MGT	Yes
<i>Sporophila melanogaster</i> (Pelzeln, 1870)	caboclinho-de-barriga-preta	Black-bellied Seedeater	MGT	Yes
Saltatorinae Bonaparte, 1853				
<i>Saltator bicolor</i> (Burmeister, 1860)	batuqueiro-chaquenho	Many-colored Chaco Finch	VAG	No
Cardinalidae Ridgway, 1901				
<i>Piranga rubra</i> (Linnaeus, 1758)	sanhaço-vermelho	Summer Tanager	MGT	No
<i>Piranga olivacea</i> (Gmelin, 1789)	sanhaço-escarlata	Scarlet Tanager	VAG	No
<i>Pheucticus aureoventris</i> (d'Orbigny & Lafresnaye, 1837)	rei-do-bosque	Black-backed Grosbeak	MGT	No
<i>Cyanoloxia glaucocerulea</i> (d'Orbigny & Lafresnaye, 1837)	azulinho	Glaucous-blue Grosbeak	MPR*	Yes
<i>Spiza americana</i> (Gmelin, 1789)	papa-capim-americano	Dickcissel	VAG	No
Fringillidae Leach, 1820				
Carduelinae Vigors, 1825				
<i>Carduelis carduelis</i> (Linnaeus, 1758)	pintassilgo-europeu	European Goldfinch	VAG	No

**Table 2.** List of all represented families within the 198 migrant species and number of migrant species for each of them.

Family	Number of migrant species (% of family)	Family	Number of migrant species (% of family)
Tyrannidae	33 (23%)	Rallidae	2 (6%)
Scolopacidae	21 (70%)	Laridae	2 (22%)
Procellariidae	20 (69%)	Apodidae	2 (10.5%)
Thraupidae	13 (8.2%)	Trochilidae	2 (2.4%)
Anatidae	12 (46%)	Tityridae	2 (8.7%)
Sternidae	11 (61%)	Phoenicopteridae	1 (25%)
Hirundinidae	10 (62.5%)	Spheniscidae	1 (25%)
Diomedidae	7 (70%)	Ardeidae	1 (4%)
Accipitridae	7 (14.6%)	Pandionidae	1 (100%)
Charadriidae	7 (70%)	Chionidae	1 (100%)
Stercorariidae	7 (100%)	Rynchopidae	1 (100%)
Turdidae	6 (31.6%)	Falconidae	1 (4.8%)
Hydrobatidae	4 (67%)	Psittacidae	1 (1.1%)
Caprimulgidae	4 (16%)	Furnariidae	1 (0.9%)
Cuculidae	3 (15%)	Cotingidae	1 (3.2%)
Vireonidae	3 (17.6%)	Mimidae	1 (33%)
Parulidae	3 (13.6%)	Motacilidae	1 (20%)
Cardinalidae	3 (18.7%)	Icteridae	1 (2.4%)
Threskiornithidae	2 (22%)		



records for AC (Whittaker & Oren, 1999) and PA (Pacheco *et al.*, 2007; Aleixo *et al.*, 2012, MPEG).

## Thraupidae

*Sporophila luctuosa* (ND): occurs in small regions of Venezuela and Colombia. It also occurs in Ecuador, Peru, northern Bolivia and western Brazil (Grantsau, 2010), more precisely on Upper Juruá River/AC according to records from 1992 and 1995 (Whittaker & Oren, 1999). There is not much information about its movements, which could be seasonal and related to the elevation (Ridgely & Tudor, 1989; Whittaker & Oren, 1999). This species may exhibit nomadism to a certain degree when searching for grassland seeds (Jaramillo, 2011g). Museum records show its presence in AC in February (MPEG).

## CONCLUSIONS

In view of the wide range of migratory behaviors in the tropical region, prioritizing studies that aim to reveal the causes and the ecological and evolutionary mechanisms that drive migration (Sekercioglu, 2010) are strongly encouraged. A better understanding of the migration patterns and of the geographical connectivity between populations at different times of the year is essential for the planning of long-term conservation actions (Martin *et al.*, 2007; Jones *et al.*, 2008).

We recognize that compiling all migratory birds in Brazil into a list is a challenge of extreme importance and enormous complexity. This work represents only the first step of what should be a continuous and dynamic process that will count on the collaboration of multiple researchers and birdwatchers for its next updates.

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