STRUCTURE OF URBAN BIRD ASSEMBLAGES IN THE BRAZILIAN ATLANTIC RAIN FOREST

ESTRUTURA DA ASSEMBLEIA DE AVES EM ÁREAS URBANAS DA MATA ATLÂNTICA BRASILEIRA

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ABSTRACT

Urbanization causes structural modification in bird assemblages by selecting for species with broad ecological niches. The Atlantic Rain Forest in Brazil is one of the densest in human population and one of the most endangered hotspots of biodiversity on the planet. This work aimed to: (1) determine which bird species are most frequent in urban areas within the Atlantic Rain Forest in Brazil; (2) determine whether there is a pattern in the distribution of trophic groups, and (3) evaluate the taxonomic similarities among bird assemblages at the sampled sites. After a literature review, eleven different publications were obtained on this biome, with 321 species recorded. Approximately 18% of the total species records were considered frequent in urban habitats (in > 50% of the analyzed samples) and only four species (*Tangara sayaca*, *Colaptes campestris, Passer domesticus*, and *Pitangus sulphuratus*) occurred at all the sites studied. Insectivorous birds had the highest average frequency of occurrence in the studied assemblages (average richness 43.60 ± 2.94%), followed by omnivorous species (15.93 ± 2.35%). Piscivorous (2.77 ± 3.00%) and necrophagous birds (1.44 ± 0.93%) had the lowest occurrence rates. The taxonomic similarity among the different assemblages was always less than 50%. Lower averages of frequency and higher coefficients of variation in nectarivore, carnivore, piscivore, and necrophage guilds demonstrate that these groups are more sensitive to urbanization than others are.
Keywords: Atlantic Forest. Urban birds. Urban ecosystems.

RESUMO

A urbanização provoca modificações estruturais nas assembleias de aves, selecionando espécies com amplo nicho ecológico. A Mata Atlântica brasileira é um dos *hotspots* mais populosos e com elevado número de espécies ameaçadas de extinção no mundo. Sendo assim, este trabalho teve como objetivos: (1) diagnosticar quais são as espécies de aves mais frequentes em hábitats urbanos do bioma Mata Atlântica; (2) verificar se há um padrão de distribuição dos grupos tróficos existentes; (3) avaliar as semelhanças taxonômicas entre as diferentes assembleias de aves em áreas urbanas da Mata Atlântica. Após revisão de literatura foram encontradas onze publicações sobre a composição da avifauna em campi de universidades no Bioma Mata Atlântica, com 321 espécies registradas. Aproximadamente 18% das aves ocorrentes em hábitats urbanos são frequentes (> 50% dos locais analisados) e apenas quatro espécies (*Tangara sayaca*, *Colaptes campestris*, *Passer domesticus* e *Pitangus sulphuratus*) ocorreram em todos os locais estudados. Aves insetívoras tiveram a maior frequência de ocorrência nos estudos analisados, como a riqueza média de 43,60 ± 2,94%, seguido por espécies

onívoras (15,93 ± 2,35%). Aves piscívoras (2,77 ± 3,00%) e necrófagas (1,44 ± 0,93%) tiveram as menores taxas de ocorrência. A similaridade taxonômica entre as distintas assembleias foi sempre menor que 50%. Frequências médias mais baixas e maiores coeficientes de variações foram encontradas, respectivamente, nas aves nectarívoras, carnívoras, piscívoras e necrófagas, demonstrando que estes grupos são mais sensíveis a urbanização em comparação aos demais.
Palavras-chave: Mata Atlântica. Aves urbanas. Ecossistemas urbanos.

INTRODUCTION

Bird assemblages are structurally modified by the habitat fragmentation caused by the establishment of agricultural and urban areas (CHACE; WALSH, 2006). The urbanization process leads to the selection of some species, mainly generalist ones with a broad ecological niche, that are able to survive resource fluctuations in unstable environments (DAVIS et al., 2013). The habitat fragmentation also reduces migration rates and available nesting sites, mainly for species that build their nests in natural cavities, which are frequently impaired by the lack of old trees (GIMENES; ANJOS 2003, CHACE; WALSH, 2006).

Several studies on habitat changes and their influence on the structural responses in bird assemblages in Brazil have been performed in recent decades (GALINA; GIMENES, 2006; ALEXANDRINO et al., 2013; CAVITION at al., 2014). Forest fragments in urban places can provide some shelter for most local birds, excluding species that are more susceptible to environmental modification (LOPES; ANJOS, 2006; CATIAN; ARANDA, 2009; PINHEIRO et al., 2009).

Urban green areas such as gardens, squares, and small parks are inefficacious to maintain bird populations over time; although birds may utilize these areas for resting sites, for foraging, or as ecological springboards during displacements in the landscape (GALINA; GIMENES, 2006; ALEXANDRINO et al., 2013; CAVITION, 2014). Nevertheless, these sites are important for the maintenance of bird diversity and acts as refuges for several species within the urban environment (SCHERER et al., 2005; CATIAN; ARANDA, 2009).

Urban green areas are formed by scanty vegetation that induces a gradual decrease in the richness of specialist birds, such as leaf and trunk insectivores that use intermediate layers of vegetation (BISPO; SCHERER-NETO, 2010). These habitats are also highly affected by edge effects and cannot support the entire local bird community (GIMENES; ANJOS, 2000). On the other hand, birds are highly relevant in urban environments because they provide important ecosystem services, namely pollination, seed dispersal, and the control of disease-vector and pest-insect species (SEKERCIOGLU; DAILY, 2004; SEKERCIOGLU, 2012).

It may be presumed that green areas on university campuses have a conservationist role within the urban area, as pointed out by several authors (MONTEIRO; BRANDÃO, 1995; CATIAN; ARANDA, 2009; PINHEIRO et al., 2009; CAVITION et al., 2014). The campuses have been employed in the present study as a representative model of the urban green areas that are important for urban sustainability (PINA; GOMES DOS SANTOS, 2012). University campuses are spaces with typical factors common to other urban green areas, featuring native and exotic trees and altered matrixes (MARANHO; PRADO DE PAULA, 2014). Thus, they are a good example of common urban green areas in Brazil.

It is known that habitat fragmentation increases the abundance of omnivorous and insectivorous species (GIMENES; ANJOS, 2003; GALINA; GIMENES, 2006) and in general, the effects of fragmentation and urbanization on bird assemblages are known. Even so, there are still unanswered questions about how bird assemblages are organized in urban green areas. Based on a synthesis of secondary data, we sought the answer to these questions. If all trophic groups have the same pattern of representativeness, it might be possible to predict that insectivorous and/or omnivorous species have the highest percentage contribution in the structure of assemblages. This is because these trophic groups may better accommodate the fluctuation of environmental resources, as was observed at different sampling sites. Therefore, our goals were to: (1) determine which bird species are most frequent in urban areas within the Atlantic Rain Forest in Brazil; (2) determine whether there is a pattern in the distribution of trophic groups, and (3) evaluate the taxonomic similarities among bird assemblages at the sites sampled. This work is expected to provide important data on bird ecology in urban green areas to strengthen the foundation of urban bird conservation.

MATERIALS AND METHODS

The Atlantic Rain Forest

The Atlantic Rain Forest is the second largest tropical forest in the Americas. It once covered 1.5 million square kilometers, with 93% of its area inside the Brazilian borders (MYERS et al., 2000). It is one of the most important biodiversity hotspots and today, perhaps only 7–8% of its original extent remains (TABARELLI et al., 2005). In fact, new data suggest that only 8.5% of the original forest and grasslands are still extant (FUNDAÇÃO SOS MATA ATLÂNTICA; INPE, 2014).

The Atlantic Rain Forest comprises 15 eco-regions distributed between latitude 3° south of the Equator to 30° in the subtropical region in which there are ombrophylous and seasonal forests, associated with ecosystems such as coastal environments and highlands located in seventeen states of Brazil (TABARELLI et al., 2010). It is important to highlight that 70% of the Brazilian (human) population inhabits areas within the limits of the erstwhile Atlantic Rain Forest and Southern Grasslands. There, the average density is 87 persons/km^2, five times the average density in Brazil (MMA/SBF, 2002).

Data collection

This study was conducted by reviewing data from studies performed in the Atlantic Rain Forest Biome. Google's advanced search function (http://www.google.com.br/advanced_search) was used, and data were also retrieved from several indexed databases, including the Directory of Open Access Journals (DOAJ), Information Sciences Institute (ISI), Scientific Electronic Library Online (SciELO), and Elsevier (SCOPUS). Keywords comprised (1) birds + campus (*in portuguese* = aves + campus); (2) bird fauna + campuses (*pt.* avifauna + campus); (3) birds + urban (*pt.* aves + urbanas). Data inclusion criteria comprised: (a) exclusive research performed in the biome Atlantic Rain Forest where the specific site of research was provided; (b) details available on methodological procedures, and (c) exclusive research in journals with International Standard Serial Numbers (ISSN) published between 2000 and 2014. This temporal range was chosen to minimize uncontrollable effects, such as age of the bird assemblage after the urbanization process and to minimize different urbanization intensities (JEBAI et al., 2009). However, the complete elimination of such effects is impossible, because the campuses differ in size and structure.

Analysis of data

The probability of species occurrence was calculated using an occurrence frequency index (LINSDALE; RODGERS, 1937). After that, the species were grouped in classes of occurrence frequency, similar to the approach used in the study by Philippsen et al. (2010), where the categories were: (a) constant (occurrence percentage > 50%); (b) accessory (25–50%) and (c) accidental (< 25%). The total species within each category were compared by χ^2 test with null hypothesis for equality ($\alpha = 0.05$ as minimum limit of statistical acceptability), using Yates's correction when required for unilateral tests. Rarefaction curves were constructed for observed richness of all samplings (each research study) using PAST software (HAMMER et al., 2001) that utilized the *Mao Tau* estimator (COLWELL et al., 2004).

Birds were classified in primary trophic groups based on main diet, without considering specialized diets or food strategies (ALMEIDA et al., 2003; TELINO-JÚNIOR et al., 2005). The percentage of each group was verified with regard to total species per campus and described by measures of dispersion and central tendency (e.g., average, coefficients of variation and standard deviation). Average frequency among trophic groups was compared by Kruskal-Wallis non-parametric variance analysis, with pairwise comparison via the Mann-Whitney post-hoc test (HAMMER et al., 2001).

Jaccard's similarity analysis was performed on a presence/absence matrix. The analysis of grouping was done using the simple link method to quantify taxonomic variation (KREBS, 1999). The nomenclature of the species was based on that of the Brazilian Ornithological Records Committee (PIACENTINI et al., 2015).

RESULTS

Eleven different publications (Appendix 1) were selected about urban birds in the Atlantic Rain Forest biome (Figure 1). In total, the studies reported 321 ± 8.46 species (according to the *Mao Tau* rarefaction method) distributed in 25 orders and 63 families (Supplement 1). The frequency of occurrence list included 58 constant species (18.07%); 85 accessory species (26.47%); and a predominance of 178 accidental species (55.45%), with significant differences between categories of occurrence ($\chi^2_{0.01;\,2} = 74.07$).

The order Passeriformes was represented by 176 species (54.82% of total). Thraupidae (12.15%), Tyrannidae (10.90%) and Trochilidae (5.60%) were the best represented families. *Tangara sayaca*, *Colaptes campestris, Passer domesticus*, and *Pitangus sulphuratus* were recorded in all studies; and in contrast, 114 (35.51%) birds were present at a single site only (Supplement 1).

Eight trophic groups were categorized, with differences in average frequency among them (Figure 2). The highest average frequency occurred in insectivores (43.60 ± 2.94%), followed by omnivores (15.93 ± 2.35%), and granivores (13.12 ± 3.77%). Piscivorous (2.77 ± 3.00%) and necrophagous (1.44 ± 0.93%) species had the lowest average representativeness (Figure 3). There was variation in the average frequency between trophic groups ($KW^2 = 72.2$; $P < 0.01$; Figure 3). The coefficients of variation (CV) oscillated more widely for insectivores, omnivores, granivores, and frugivores; at intervals ranging from 6.75 to 30.41%. There was a variation of 54.68–64.57% for carnivore, nectarivore, and necrophage guilds, with CV reaching 108.36% for piscivores.

Bird assemblage richness ranged from 19 in the UERJ (*Universidade do Estado do Rio de Janeiro*) to 192 species in ESALQ (*Universidade de São Paulo campus; Luiz Queiroz*), where the highest number of exclusive species were registered (Figure 2). The highest similarity indexes occurred between the campus of UNESP (*Faculdade de Ciências e Tecnologia de Presidente Prudente*) and that of the UEM (*Universidade Estadual de Maringá*), with SJ = 0.48 (Figure 4). The campuses of the UNIVALI (*Universidade do Vale do Itajaí*) and of the UERJ (*Universidade do Rio de Janeiro*) in this study was the most external group.

Figure 1 - Distribution of studies on 11 university campuses in the Atlantic Rain Forest biome. Namely: 1 at UEL (*Universidade Estadual de Londrina*); 2 at UERJ (*Universidade do Rio de Janeiro*); 3 at UNIVALI (*Universidade do Vale do Itajaí*); 4 at UNICENTRO (*Universidade Estadual do Centro-Oeste*); 5 at UFGD (*Universidade Federal da Grande Dourados*); 6 at UNOPAR (*Universidade Norte do Paraná*); 7 at UNESP (*Faculdade de Ciências e Tecnologia de Presidente Prudente*); 8 at ESALQ (*Universidade de São Paulo campus Luiz Queiroz*); 9 at UNIVATES (*Unidade Integrada Vale do Taquari*); 10 at PUC (*Universidade Católica de Minas Gerais*), and 11 at UEM (*Universidade Estadual de Maringá*).

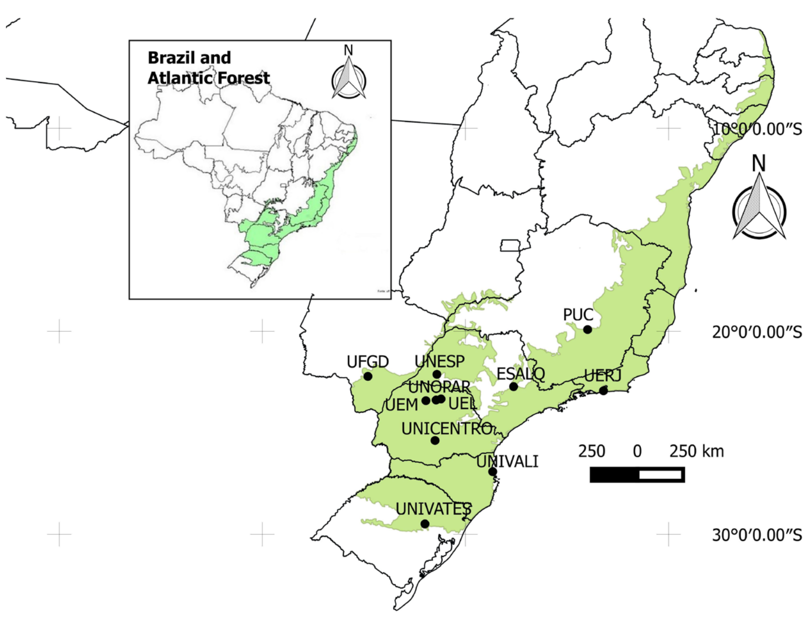


Figure 2 - Total richness and distribution of trophic groups on the university campuses studied. Numbers next to the row names are totals of exclusive species on each campus; (*) represents total species not identified by the authors. Ins = insectivores; Car = carnivores; Fru = frugivores; Nec = nectarivores; Nco = necrophages; Omn = omnivores; Gra = granivores; and Pis = piscivores

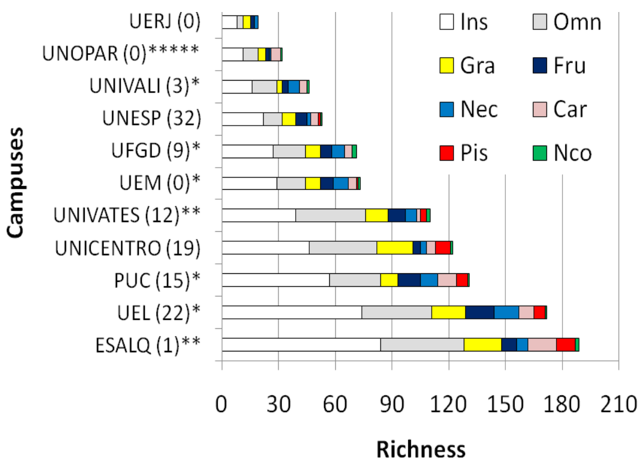


Figure 3 - Frequency variation of each trophic group in eleven urban areas of the Brazilian Atlantic Rain Forest, where: Ins = insectivores; Car = carnivores; Fru = frugivores; Nec = nectarivores; Nco = necrophages; Omn = omnivores; Gra = granivores, and Pis = piscivores).The plus symbol (+) indicates the average. The box-plot indicates the median (center line), maximum, and minimum.

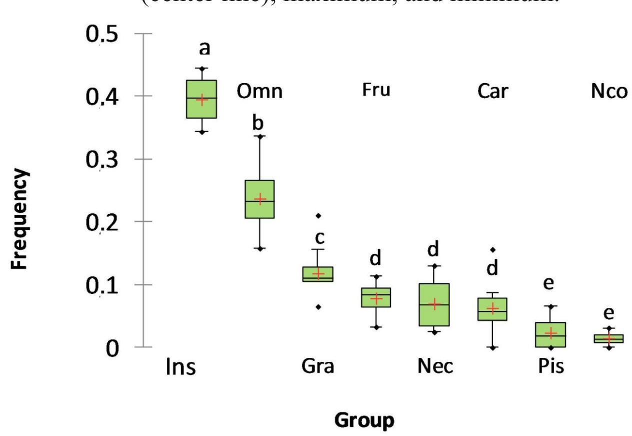
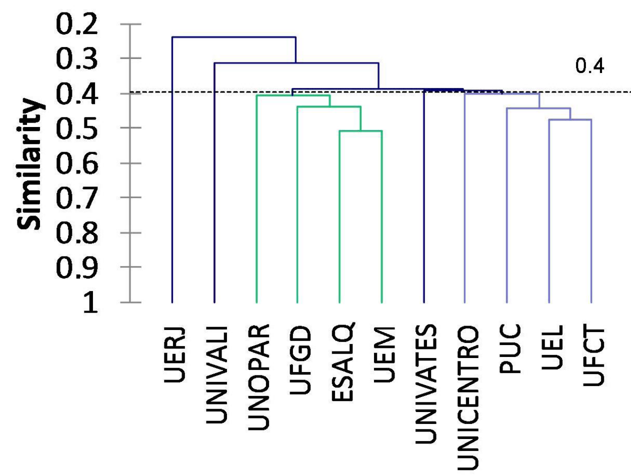


Figure 4 - Taxonomic similarity among university campuses under analysis, based on Jaccard's index. Groups with junctions below the dashed line are more similar.



DISCUSSION

Many factors are responsible to the variability in richness (range of 173 species between ESALQ and UERJ) among the campuses, which differ in intensity of urbanization. The latter factor was partially controlled by the selection only of university campuses, as seen in the analyzed publications. Further, landscape management factors may also be relevant. For instance, suppressed vegetation encourages species from open habitats (e.g., PINHEIRO et al., 2009; FORCATO et al., 2011). Typical species of forest fragments may be observed on the campuses with the greatest forest matrix area (e.g., VOGEL et al., 2011; VASCONCELOS et al., 2013).

The number of species reported (n = 321) corresponds to 16.72% of all Brazilian birds (PIACENTINI et al., 2015) and 35% of total the Atlantic Rain Forest birds (LIMA, 2013) although different levels of effort or sampling methodologies influence richness rates (SILVEIRA et al., 2010). Because approximately 18% of birds in urban habitats are constant, it is clear that the capacity of urban green areas is inadequate to maintain all regional birds, and that such habitats favor generalist and ruderal birds able to survive considerable fluctuations of resources (WILLIS; ONIKI, 2002). In contrast, accessory species (26.47%) are the focus of conservational strategies in urban environments due to the great importance of the ecosystem services they provide, but are more susceptible to changes in the urban habitat (PARSONS, 2007). Likewise, a large number of accidental species (present at < 25% of sites analyzed) eventually use resources available in urban green areas, especially when the urban matrix is close to larger forested areas. In such cases, they use urban green areas for food, as ecological springboards, and as contiguous habitats and resting areas (GALINA; GIMENES, 2006; CATIAN; ARANDA, 2009).

The greatest specific richness, found in family Thraupidae, is directly related to the recent inclusion of the former family Emberezidae; composed of granivore and ruderal birds (PIACENTINI et al., 2015). The family Emberezidae was among the largest bird families recorded in altered habitats (FRANCHIN et al., 2004).

In a study (TELINO-JÚNIOR et al., 2005) of forest environment, the most representative birds were insectivores (44%), followed by omnivores (26.2%). There is a similar occurrence rate among granivores, frugivores, nectarivores, and carnivores, with lower representation rates for necrophages (detritivores) and piscivores. In other environments, such as forest edges, granivore bird richness may be equal to omnivore richness (ROSSI et al., 2014); this is also observed in agroecosystems or in areas close to crop cultivation (VOGEL et al., 2015). Further, in several situations, omnivore richness may be equivalent to the richness of insectivores in urban habitats (CAVITION et al., 2013). The frugivore trophic group that occupies preserved forest habitats exceeds that of omnivores; this is probably associated with the capacity of preserved forest habitats to provide fruits during different periods of the year (DONATELLI et al., 2004).

The order of representativeness of trophic groups among preserved and urban environments was observed to be similar. Consequently, species selection by urbanization occurs with the same intensity in all trophic groups, eliminating the most sensitive species in each group due to habitat changes. One should keep in mind that the current analysis is based on reported frequency and not absolute data, because absolute frequency is normally variable (Figure 2), and depends on factors such as the size of the habitat and its degree of complexity (GIMENES; ANJOS, 2003; BARCELLOS DOS SANTOS; CADEMARTORI, 2010). Species such as *Tangara sayaca*, *Colaptes campestris, Passer domesticus*, and *Pitangus sulphuratus* (reported at all sites) are considerably adaptable with respect to the use of available resources such as food remnants or fruits from exotic vegetation, with low requirements for feeding resources (DARIO, 2008; MARTINS-OLIVEIRA et al., 2012).

Although insectivores make up the highest percentage of birds in the urban environment, strictly insectivorous birds such as species in families Thamnophilidae, Grallariidae, Formicariidae, and Dendrocolaptidae are affected by the decrease in specific forest microhabitats from which they normally gather food, and easily become extinct (POLETTO et al., 2004; LOPES; ANJOS, 2006).

The granivore bird group is also directly affected by landscape management. Urban habitats are subject to constant management such as that of herbaceous vegetation, and urban agriculture is infrequently practiced (CULTRERA et al., 2012), resulting in a reduction of food available for granivorous birds.

Nectarivorous birds in the study areas are almost exclusively in the family Trochilidae (5.6% of total species number). This is probably related to the introduction of native and exotic flower-bearing vegetal species for ornamentation, a common practice in urban spaces that provides a great amount of resources for the group throughout the year (MENDONÇA; ANJOS, 2005; MARANHO; PRADO DE PAULA, 2014). Frugivorous birds are also associated with fruit-bearing plants within the urban matrix (BRUN et al., 2007).

The low frequency rate of necrophagous species of Cathartidae is possibly due to the scantiness of appropriate food items within the urban environment (SILVEIRA, 2012). The broadness of the coefficient of variation for piscivores (or malacophage specialists) is essentially associated with the high number of species at a single campus. This trophic group is linked to the natural complexity of water courses, mainly lakes, which present both a safe habitat and a food source (VALERO DE SOUZA et al., 2014). Therefore, urban spaces without lakes or water reservoirs cannot be appropriate for *in situ* conservation of piscivore or malacophage birds. From the urban management point of view, an increase in bird richness is possible when the availability of structural resources (e.g., urban lakes) enables increase in the number of species that occupy the urban environment (BARCELLOS DOS SANTOS; CADEMARTORI, 2010).

Low taxonomic similarity between the sites analyzed may be due to the distribution of the campuses in the Atlantic Rain Forest. The biome exceeds the range of most taxa. Furthermore, assemblages are also affected by several types of endemism associated with the Atlantic Rain Forest (PACHECO et al., 2008). More specific groups were possible with approximately 40% similarity. Low similarity is caused by ruderal species widely distributed in urban areas (i.e., *Vanellus chilensis*, *Columbina talpacoti*, *Columba livia*, *Piaya cayana*, *Crotophaga ani*, *Guira guira*, *Athene cunicularia*, *Caracara plancus*, *Furnarius rufus*, *Myiarchus swainsoni*, *Tyrannus albogularis*, *Tyrannus melancholicus*, and *Troglodytes musculus*) with a frequency of occurrence > 80%. Certain unavoidable factors affect these results, such as the role of the heterogeneity of the campuses on dissimilarity, and differences in sampling effort, especially at those campuses where lower species richness was found (SILVEIRA et al., 2008; PINHEIRO et al., 2009; FORCATO et al., 2011; MATOS, 2011; BICA et al., 2014).

CONCLUSIONS AND RECOMMENDATIONS

Only 18.07% of birds were considered constant on the 11 campuses of the Atlantic Rain Forest universities. Thraupidae (12.15%) and Tyrannidae (10.90%) were most representative, with the highest mean frequencies observed for insectivorous birds (43.60 ± 2.94%), followed by that for omnivores (15.93 ± 2.35%). High variation coefficients for guilds of nectarivorous, carnivorous, piscivorous, and necrophagous species reveal that they are more easily influenced by urban structures. Low similarity (≤ 0,40) is caused by ruderal species widely distributed in urban areas. Urbanization and landscape strategies may enhance changes in the habitat to conserve these bird guilds *in situ*, such as by planting ornithophilic vegetation (flower- and fruit-bearing) or adding small lakes that might directly conserve piscivores birds while indirectly supporting carnivorous and necrophagous birds. It is also recommended that the management of herbaceous vegetation consider the availability of seeds for food to granivorous bird species, mainly by keeping some of the remaining native grasslands within these habitats.

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Appendix 1. General information about the articles used in the analysis—authors of the study, campus, institutes and universities (city).

Author	Campus (city)	Latitude (S)	Longitude (W)	Elevation m.a.s.l	Climate Koppen
Alexandrino et al. (2013)	ESALQ-Universidade de São Paulo campus Luiz Queiroz (Piracicaba).	22° 43’ 30”	47° 38’ 00”	546	Cwa
Bica et al. (2014)	UNIVATES-Unidade Integrada Vale do Taquari (Lageado).	29° 29’ 13”	51° 59’ 50”	800	Cfa
Catian e Aranda (2009).	UFGD-Universidade Federal da Grande Dourados (Dourados).	22° 13’ 16”	54° 48’ 20”	430	Aw
Forcato et al. (2011)	UNOPAR-Universidade Norte do Paraná (Arapongas).	23°23’10.9”	5° 26’ 54.8”	816	Cfa
Lopes e Anjos (2006)	UEL-Universidade Estadual de Londrina (Londrina).	23° 20’ 23. 45”	51° 12’ 23.31	595	Cfa
Matos (2011)	UNESP-Faculdade de Ciências e Tecnologia de Presidente Prudente (Presidente Prudente)	22° 7’ 19.42”	51° 24’ 31.85”	442	Aw
Pinheiro et al. (2009)	UNIVALE-Universidade do Vale do Itajaí (Itajaí).	26° 54’ 50”	48° 39’ 41”	11	Cfa
Silveira et al. (2008)	UERJ-Universidade do Rio de Janeiro (São Gonçalo).	22° 55’ 48.80”	43° 12’ 30.59”	30	Aw
Vasconcelos et al. (2013)	PUC-Universidade Católica de Minas Gerais (Belo Horizonte).	19° 54’ 58”	43° 59’ 19”	930	Aw/Cwa
Vogel et al. (2011)	UNICENTRO-Universidade Estadual do Centro-Oeste (Guarapuava).	25° 22’ 48”	51° 30’ 00”	1,023	Cfb
Philippsen et al. (2010)	UEM-Universidade Estadual de Maringá (Maringá).	23° 25’ 00”	51° 57’ 00”	542	Cfa

SUPPLEMENT 1: Bird species recorded in 11 research works on the Atlantic Rain Forest biome, observed frequency (OF) and trophic groupings (TG), where: 1 = UEL (**Universidade Estadual de Londrina**); 2 = UERJ (**Universidade do Rio de Janeiro**); 3 = UNIVALI (**Universidade do Vale do Itajaí**); 4 = UNICENTRO (**Universidade Estadual do Centro-Oeste**); 5 = UFGD (**Universidade Federal da Grande Dourados**); 6 = UNOPAR (**Universidade Norte do Paraná**); 7 = UNESP (**Faculdade de Ciências e Tecnologia de Presidente Prudente**); 8 = UNILQ (**Universidade de São Paulo campus Luiz Queiroz**); 9 = UNIVATES (**Unidade Integrada Vale do Taquari**); 10 = PUC (**Universidade Católica de Minas Gerais**) and 11 = UEM (**Universidade Estadual de Maringá**); Ins = insectivores; Car = carnivores; Fru = frugivores; Nec = nectarivores; Nco = necrophages; Omn = omnivores; Gra = granivores; Pis = piscivores.

Taxa	Campuses											OF (%)	TG
	1	2	3	4	5	6	7	8	9	10	11		
Tinamiformes Huxley, 1872													
Tinamidae Gray, 1840													
Crypturellus parvirostris (Wagler, 1827)	+							+		+		27.27	On
Crypturellus tataupa (Temminck, 1815)	+											9.091	Gra
Rhynchotus rufescens (Temminck, 1815)				+								9.091	On
Nothura maculosa (Temminck, 1815)	+			+								18.18	On
Anseriformes Linnaeus, 1758													
Anatidae Leach, 1820													
Dendrocygna viduata (Linnaeus, 1766)	+			+				+				27.27	On
Dendrocygna autumnalis (Linnaeus, 1758)										+		9.091	On
Cairina moschata (Linnaeus, 1758)				+				+				18.18	Gra
Amazonetta brasiliensis (Gmelin, 1789)	+			+				+				27.27	Gra
Anas boschas (Linnaeus, 1758)				+								9.091	Gra
Anser anser (Linnaeus, 1758)				+								9.091	Gra
Galliformes Linnaeus, 1758													
Cracidae Rafinesque, 1815													
Penelope obscura Temminck, 1815										+		9.091	Fru
Ortalis guttata (Spix, 1825)			+						+			18.18	Fru
Podicipediformes Fürbringer, 1888													
Podicipedidae Bonaparte, 1831													
Podilymbus podiceps (Linnaeus, 1758)				+								9.091	Pis
Ciconiiformes Bonaparte, 1854													
Ciconiidae Sundevall, 1836													
Jabiru mycteria (Lichtenstein, 1819)								+				9.091	Pis
Mycteria americana Linnaeus, 1758								+				9.091	Pis
Suliformes Sharpe, 1891													
Phalacrocoracidae Reichenbach, 1849													
Phalacrocorax brasilianus (Gmelin, 1789)	+			+				+		+		36.36	Pis
Anhingidae Reichenbach, 1849													
Anhinga anhinga (Linnaeus, 1766)								+				9.091	Pis
Pelecaniformes Sharpe, 1891													
Ardeidae Leach, 1820													
Tigrisoma lineatum (Boddaert, 1783)								+	+			18.18	Pis
Nycticorax nycticorax (Linnaeus, 1758)								+		+		18.18	Pis
Butorides striata (Linnaeus, 1758)	+			+			+	+	+	+	+	63.64	Pis
Bubulcus ibis (Linnaeus, 1758)	+					+		+	+			36.36	Ins
Ardea cocoi Linnaeus, 1766				+				+				18.18	Pis
Ardea alba Linnaeus, 1758	+			+				+	+	+		45.45	Pis

Continua

Continuação

Taxa	Campuses											OF (%)	TG
	1	2	3	4	5	6	7	8	9	10	11		
Syrigma sibilatrix (Temminck, 1824)				+				+				18.18	Pis
Egretta thula (Molina, 1782)				+				+	+			27.27	Pis
Threskiornithidae Poche, 1904													
Mesembrinibis cayennensis (Gmelin, 1789)				+				+				18.18	Ins
Phimosus infuscatus (Lichtenstein, 1823)									+			9.091	Ins
Theristicus caudatus (Boddaert, 1783)				+								9.091	Ins
Platalea ajaja Linnaeus, 1758								+				9.091	Pis
Cathartiformes Seebohm, 1890													
Cathartidae Lafresnaye, 1839													
Cathartes aura (Linnaeus, 1758)					+			+	+			27.27	Nro
Coragyps atratus (Bechstein, 1793)	+		+	+	+	+	+	+	+	+	+	90.91	Nro
Accipitriformes Bonaparte, 1831													
Accipitridae Vigors, 1824													
Leptodon cayanensis (Latham, 1790)								+				9.091	Car
Elanoides forficatus (Linnaeus, 1758)	+			+					+	+	+	45.45	Car
Elanus leucurus (Vieillot, 1818)	+			+		+		+				36.36	Car
Ictinia plumbea (Gmelin, 1788)					+		+	+	+		+	45.45	Car
Busarellus nigricollis (Latham, 1790)								+				9.091	Car
Geranospiza caerulescens (Vieillot, 1817)								+				9.091	Car
Rupornis magnirostris (Gmelin, 1788)	+		+	+	+	+	+	+		+	+	81.82	Car
Leucopternis melanops (Latham, 1790)					+							9.091	Car
Buteo brachyurus Vieillot, 1816	+							+	+	+		36.36	Car
Gruiformes Bonaparte, 1854													
Aramidae Bonaparte, 1852													
Aramus guarauna (Linnaeus, 1766)								+				9.091	Car
Rallidae Rafinesque, 1815													
Aramides cajaneus (Statius Muller, 1776)	+			+			+	+	+	+		54.55	On
Aramides saracura (Spix, 1825)	+			+				+	+		+	45.45	On
Laterallus melanophaius (Vieillot, 1819)	+											9.091	On
Porzana albicollis (Vieillot, 1819)								+				9.091	On
Neocrex erythrops (Sclater, 1867)										+		9.091	On
Pardirallus nigricans (Vieillot, 1819)								+				9.091	On
Gallinula galeata (Lichtenstein, 1818)	+			+				+				27.27	On
Porphyrio martinicus (Linnaeus, 1766)								+				9.091	On
Charadriiformes Huxley, 1867													
Charadrii Huxley, 1867													
Vanellus chilensis (Molina, 1782)	+		+	+	+	+	+	+	+	+	+	90.91	Ins
Recurvirostridae Bonaparte, 1831													
Himantopus melanurus Vieillot, 1817				+								9.091	Ins
Scolopacidae Rafinesque, 1815													
Gallinago paraguaiae (Vieillot, 1816)				+								9.091	Ins
Tringa solitaria Wilson, 1813	+											9.091	Ins
Calidris alba (Pallas, 1764)				+								9.091	Ins
Jacanidae Chenu & Des Murs, 1854													
Jacana jacana (Linnaeus, 1766)	+			+				+	+			36.36	Ins
Rynchopidae Bonaparte, 1838													

Continua

Continuação

Taxa	Campuses											OF (%)	TG
	1	2	3	4	5	6	7	8	9	10	11		
Rynchops niger Linnaeus, 1758				+								9.091	Pis
Columbiformes Latham, 1790													
Columbidae Leach, 1820													
Columbina minuta (Linnaeus, 1766)					+							9.091	Gra
Columbina talpacoti (Temminck, 1811)	+	+	+	+		+	+	+	+	+	+	90.91	Gra
Columbina squammata (Lesson, 1831)	+				+		+	+			+	45.45	Gra
Columbina picui (Temminck, 1813)	+		+	+	+				+			45.45	Gra
Columba livia Gmelin, 1789	+	+		+		+	+	+		+		63.64	Gra
Patagioenas picazuro (Temminck, 1813)	+			+	+	+	+	+	+	+	+	81.82	Gra
Patagioenas cayennensis (Bonnaterre, 1792)	+											9.091	Gra
Zenaida auriculata (Des Murs, 1847)	+			+	+	+	+	+	+		+	72.73	Gra
Leptotila verreauxi Bonaparte, 1855	+			+				+	+	+	+	54.55	Gra
Leptotila rufaxilla (Richard & Bernard, 1792)	+			+				+	+			36.36	Gra
Geotrygon montana (Linnaeus, 1758)	+											9.091	Gra
Cuculiformes Wagler, 1830													
Cuculidae Leach, 1820													
Coccyzus melacoryphus Vieillot, 1817	+			+					+	+		36.36	Ins
Piaya cayana (Linnaeus, 1766)	+		+	+	+		+	+	+	+	+	81.82	Ins
Crotophaga ani Linnaeus, 1758	+		+	+	+	+	+	+	+	+	+	90.91	Ins
Guira guira (Gmelin, 1788)	+		+	+	+	+	+	+	+	+	+	90.91	Ins
Tapera naevia (Linnaeus, 1766)	+			+				+			+	36.36	Ins
Strigiformes Wagler, 1830													
Tytonidae Mathews, 1912													
Tyto furcata (Temminck, 1827)			+			+	+	+				36.36	Car
Strigidae Leach, 1820													
Megascops choliba (Vieillot, 1817)	+							+				18.18	Car
Glaucidium brasilianum (Gmelin, 1788)										+		9.091	Car
Athene cunicularia (Molina, 1782)	+		+	+		+	+	+	+	+	+	81.82	Car
Asio clamator (Vieillot, 1808)										+		9.091	Car
Asio stygius (Wagler, 1832)			+							+		18.18	Car
Nyctibiiformes Yuri, Kimball, Harshman, Bowie, Braun, Chojnowski, Han, Hackett, Huddleston, Moore, Reddy, Sheldon, Steadman, Witt & Braun, 2013													
Nyctibiidae Chenu & Des Murs, 1851													
Nyctibius griseus (Gmelin, 1789)	+		+				+					27.27	Ins
Caprimulgiformes Ridgway, 1881													
Caprimulgidae Vigors, 1825													
Lurocalis semitorquatus (Gmelin, 1789)	+							+				18.18	Ins
Hydropsalis albicollis (Gmelin, 1789)	+		+			+		+		+		45.45	Ins
Hydropsalis parvula (Gould, 1837)								+				9.091	Ins
Hydropsalis longirostris (Bonaparte, 1825)										+		9.091	Ins
Hydropsalis torquata (Gmelin, 1789)								+				9.091	Ins
Chordeiles nacunda (Vieillot, 1817)				+								9.091	Ins
Chordeiles minor (Forster, 1771)	+							+				18.18	Ins
Apodiformes Peters, 1940													
Apodidae Olphe-Galliard, 1887													

Continua

Continuação

Taxa	Campuses											OF (%)	TG
	1	2	3	4	5	6	7	8	9	10	11		
Streptoprocne zonaris (Shaw, 1796)				+						+		18.18	Ins
Chaetura meridionalis Hellmayr, 1907	+			+				+	+	+		45.45	Ins
Trochilidae Vigors, 1825													
Phaethornis pretrei (Lesson & Delattre, 1839)	+				+			+		+	+	45.45	Nec
Phaethornis eurynome (Lesson, 1832)	+											9.091	Nec
Eupetomena macroura (Gmelin, 1788)	+				+	+	+	+		+	+	63.64	Nec
Florisuga fusca (Vieillot, 1817)	+		+					+	+	+	+	54.55	Nec
Colibri serrirostris (Vieillot, 1816)		+	+	+						+		36.36	Nec
Anthracothorax nigricollis (Vieillot, 1817)	+				+						+	27.27	Nec
Stephanoxis lalandi (Vieillot, 1818)									+			9.091	Nec
Chlorostilbon lucidus (Shaw, 1812)	+			+	+			+	+	+	+	63.64	Nec
Thalurania furcata (Gmelin, 1788)					+					+		18.18	Nec
Thalurania glaucopis (Gmelin, 1788)	+		+						+			27.27	Nec
Hylocharis chrysura (Shaw, 1812)	+						+		+		+	36.36	Nec
Leucochloris albicollis (Vieillot, 1818)	+		+	+								27.27	Nec
Polytmus guainumbi (Pallas, 1764)					+							9.091	Nec
Amazilia versicolor (Vieillot, 1818)	+											9.091	Nec
Amazilia fimbriata (Gmelin, 1788)			+									9.091	Nec
Amazilia lactea (Lesson, 1832)	+							+		+	+	36.36	Nec
Heliomaster squamosus (Temminck, 1823)	+											9.091	Nec
Calliphlox amethystina (Boddaert, 1783)										+		9.091	Nec
Trogoniformes A. O. U., 1886													
Trogonidae Lesson, 1828													
Trogon surrucura Vieillot, 1817									+			9.091	On
Coraciiformes Forbes, 1844													
Alcedinidae Rafinesque, 1815													
Megaceryle torquata (Linnaeus, 1766)	+			+				+		+		36.36	Pis
Chloroceryle amazona (Latham, 1790)	+			+				+		+		36.36	Pis
Chloroceryle americana (Gmelin, 1788)	+							+				18.18	Pis
Galbuliformes Fürbringer, 1888													
Galbulidae Vigors, 1825													
Galbula ruficauda Cuvier, 1816										+		9.091	Ins
Bucconidae Horsfield, 1821													
Nystalus maculatus (Gmelin, 1788)					+							9.091	Ins
Piciformes Meyer & Wolf, 1810													
Ramphastidae Vigors, 1825													
Ramphastos toco Statius Muller, 1776					+			+		+		27.27	Fru
Ramphastos dicolorus Linnaeus, 1766									+			9.091	Fru
Selenidera maculirostris (Lichtenstein, 1823)	+											9.091	Fru
Picidae Leach, 1820													
Picumnus cirratus Temminck, 1825					+			+		+	+	36.36	Ins
Picumnus temminckii Lafresnaye, 1845	+		+									18.18	Ins
Picumnus albosquamatus d'Orbigny, 1840							+					9.091	Ins
Picumnus nebulosus Sundevall, 1866									+			9.091	Ins
Melanerpes candidus (Otto, 1796)	+	+		+	+	+		+			+	63.64	Ins
Melanerpes flavifrons (Vieillot, 1818)	+				+							18.18	Ins

Continua

Continuação

Taxa	Campuses											OF (%)	TG
	1	2	3	4	5	6	7	8	9	10	11		
Veniliornis passerinus (Linnaeus, 1766)							+	+		+		27.27	Ins
Veniliornis spilogaster (Wagler, 1827)	+			+				+	+		+	45.45	Ins
Colaptes melanochloros (Gmelin, 1788)	+			+	+		+	+	+	+	+	72.73	Ins
Colaptes campestris (Vieillot, 1818)	+	+	+	+	+	+	+	+	+	+	+	100	Ins
Celeus flavescens (Gmelin, 1788)	+								+			18.18	Ins
Dryocopus lineatus (Linnaeus, 1766)	+							+				18.18	Ins
Campephilus robustus (Lichtenstein, 1818)								+				9.091	Ins
Cariamiformes Furbringer, 1888													
Cariamidae Bonaparte, 1850													
Cariama cristata (Linnaeus, 1766)								+				9.091	Car
Falconiformes Bonaparte, 1831													
Falconidae Leach, 1820													
Caracara plancus (Miller, 1777)	+		+	+	+	+	+	+		+	+	81.82	Car
Milvago chimachima (Vieillot, 1816)	+		+	+	+			+	+	+	+	72.73	Car
Herpetotheres cachinnans (Linnaeus, 1758)								+		+		18.18	Car
Falco sparverius Linnaeus, 1758	+			+	+	+		+		+	+	63.64	Car
Falco femoralis Temminck, 1822	+						+	+		+		36.36	Car
Falco peregrinus Tunstall, 1771	+											9.091	Car
Psittaciformes Wagler, 1830													
Psittacidae Rafinesque, 1815													
Psittacara leucophthalmus (Statius Muller, 1776)	+					+	+	+		+	+	54.55	Fru
Aratinga auricapillus (Kuhl, 1820)	+											9.091	Fru
Eupsittula aurea (Gmelin, 1788)					+							9.091	Fru
Pyrrhura frontalis (Vieillot, 1817)	+								+			18.18	Fru
Myiopsitta monachus (Boddaert, 1783)									+			9.091	Fru
Forpus xanthopterygius (Spix, 1824)	+						+	+		+		36.36	Fru
Brotogeris chiriri (Vieillot, 1818)					+		+	+		+	+	45.45	Fru
Pionopsitta pileata (Scopoli, 1769)	+											9.091	Fru
Pionus maximiliani (Kuhl, 1820)	+			+				+				27.27	Fru
Amazona aestiva (Linnaeus, 1758)	+									+		18.18	Fru
Passeriformes Linnaeus, 1758													
Thamnophilidae Swainson, 1824													
Dysithamnus mentalis (Temminck, 1823)	+							+		+	+	36.36	Ins
Herpsilochmus atricapillus Pelzeln, 1868					+					+		18.18	Ins
Thamnophilus doliatus (Linnaeus, 1764)	+				+		+	+			+	45.45	Ins
Thamnophilus ruficapillus Vieillot, 1816	+			+					+			27.27	Ins
Thamnophilus caerulescens Vieillot, 1816	+			+				+	+	+	+	54.55	Ins
Taraba major (Vieillot, 1816)							+	+		+		27.27	Ins
Hypoedaleus guttatus (Vieillot, 1816)	+											9.091	Ins
Mackenziaena severa (Lichtenstein, 1823)	+							+				18.18	Ins
Pyriglena leucoptera (Vieillot, 1818)	+											9.091	Ins
Conopophagidae Sclater & Salvin, 1873													
Conopophaga lineata (Wied, 1831)	+							+	+			27.27	Ins
Dendrocolaptidae Gray, 1840													
Sittasomus griseicapillus (Vieillot, 1818)								+				9.091	Ins
Xiphorhynchus fuscus (Vieillot, 1818)					+							9.091	Ins

Continua

Continuação

Taxa	Campuses											OF (%)	TG
	1	2	3	4	5	6	7	8	9	10	11		
Campylorhamphus falcularius (Vieillot, 1822)								+				9.091	Ins
Lepidocolaptes angustirostris (Vieillot, 1818)					+			+				18.18	Ins
Dendrocolaptes platyrostris Spix, 1825	+											9.091	Ins
Xenopidae Bonaparte, 1854													
Xenops rutilans Temminck, 1821	+				+			+				27.27	Ins
Furnariidae Gray, 1840													
Furnarius figulus (Lichtenstein, 1823)										+		9.091	Ins
Furnarius rufus (Gmelin, 1788)	+		+	+	+	+		+	+	+	+	81.82	Ins
Lochmias nematura (Lichtenstein, 1823)								+				9.091	Ins
Clibanornis rectirostris (Wied, 1831)										+		9.091	Ins
Automolus leucophthalmus (Wied, 1821)								+				9.091	Ins
Syndactyla rufosuperciliata (Lafresnaye, 1832)									+			9.091	Ins
Leptasthenura setaria (Temminck, 1824)				+								9.091	Ins
Phacellodomus rufifrons (Wied, 1821)										+		9.091	Ins
Certhiaxis cinnamomeus (Gmelin, 1788)				+				+		+		27.27	Ins
Synallaxis ruficapilla Vieillot, 1819	+							+				18.18	Ins
Synallaxis cinerascens Temminck, 1823									+			9.091	Ins
Synallaxis frontalis Pelzeln, 1859	+						+	+		+	+	45.45	Ins
Synallaxis albescens Temminck, 1823								+				9.091	Ins
Synallaxis spixi Sclater, 1856	+			+				+	+			36.36	Ins
Cranioleuca vulpina (Pelzeln, 1856)					+			+				18.18	Ins
Cranioleuca pallida (Wied, 1831)								+				9.091	Ins
Pipridae Rafinesque, 1815													
Chiroxiphia caudata (Shaw & Nodder, 1793)									+			9.091	Fru
Oxyruncidae Ridgway, 1906 (1831)													
Oxyruncus cristatus Swainson, 1821				+								9.091	Fru
Tityridae Gray, 1840													
Tityra inquisitor (Lichtenstein, 1823)	+										+	18.18	Fru
Tityra cayana (Linnaeus, 1766)	+											9.091	Fru
Pachyramphus viridis (Vieillot, 1816)								+				9.091	Ins
Pachyramphus polychopterus (Vieillot, 1818)	+											9.091	Ins
Pachyramphus validus (Lichtenstein, 1823)	+											9.091	Ins
Platyrinchidae Bonaparte, 1854													
Platyrinchus mystaceus Vieillot, 1818								+				9.091	Ins
Rhynchocyclidae Berlepsch, 1907													
Mionectes rufiventris Cabanis, 1846									+			9.091	Ins
Leptopogon amaurocephalus Tschudi, 1846	+							+		+		27.27	Ins
Corythopis delalandi (Lesson, 1830)	+											9.091	Ins
Phylloscartes ventralis (Temminck, 1824)	+								+			18.18	Ins
Tolmomyias sulphurescens (Spix, 1825)	+							+	+	+		36.36	Ins
Todirostrum poliocephalum (Wied, 1831)								+				9.091	Ins
Todirostrum cinereum (Linnaeus, 1766)	+				+		+	+		+	+	54.55	Ins
Poecilotriccus plumbeiceps (Lafresnaye, 1846)	+								+			18.18	Ins
Myiornis auricularis (Vieillot, 1818)	+							+				18.18	Ins
Tyrannidae Vigors, 1825													
Hirundinea ferruginea (Gmelin, 1788)								+		+		18.18	Ins

Continua

Continuação

Taxa	Campuses											OF (%)	TG
	1	2	3	4	5	6	7	8	9	10	11		
Camptostoma obsoletum (Temminck, 1824)	+			+				+	+	+		45.45	Ins
Elaenia flavogaster (Thunberg, 1822)	+			+	+			+	+	+	+	63.64	Ins
Elaenia parvirostris Pelzeln, 1868	+								+			18.18	Ins
Elaenia mesoleuca (Deppe, 1830)				+					+			18.18	Ins
Myiopagis caniceps (Swainson, 1835)					+					+		18.18	Ins
Myiopagis viridicata (Vieillot, 1817)								+				9.091	Ins
Capsiempis flaveola (Lichtenstein, 1823)	+							+				18.18	Ins
Serpophaga subcristata (Vieillot, 1817)	+		+	+				+		+	+	54.55	Ins
Legatus leucophaius (Vieillot, 1818)	+											9.091	Ins
Myiarchus swainsoni Cabanis & Heine, 1859	+	+						+	+			36.36	Ins
Myiarchus ferox (Gmelin, 1789)					+			+		+	+	36.36	Ins
Myiarchus tyrannulus (Statius Muller, 1776)				+				+		+		27.27	Ins
Sirystes sibilator (Vieillot, 1818)	+				+							18.18	Ins
Pitangus sulphuratus (Linnaeus, 1766)	+	+	+	+	+	+	+	+	+	+	+	100	Ins
Machetornis rixosa (Vieillot, 1819)	+		+	+		+	+	+	+	+	+	81.82	Ins
Myiodynastes maculatus (Statius Muller, 1776)	+			+	+		+	+	+	+	+	72.73	Ins
Megarynchus pitangua (Linnaeus, 1766)	+			+	+			+	+	+	+	63.64	Ins
Myiozetetes similis (Spix, 1825)	+		+					+		+		36.36	Ins
Tyrannus albogularis Burmeister, 1856										+		9.091	On
Tyrannus melancholicus Vieillot, 1819	+		+	+	+	+	+	+	+	+	+	90.91	On
Tyrannus savana Vieillot, 1808	+		+	+	+	+	+	+	+	+	+	90.91	Ins
Griseotyrannus aurantioatrocristatus (d'Orbigny & Lafresnaye, 1837)	+									+		18.18	Ins
Empidonomus varius (Vieillot, 1818)	+			+			+	+	+	+	+	63.64	Ins
Colonia colonus (Vieillot, 1818)	+							+		+		27.27	Ins
Myiophobus fasciatus (Statius Muller, 1776)	+	+		+				+		+	+	54.55	Ins
Sublegatus modestus (Wied, 1831)				+								9.091	Ins
Pyrocephalus rubinus (Boddaert, 1783)	+			+	+	+	+	+	+		+	72.73	Ins
Fluvicola nengeta (Linnaeus, 1766)								+		+		18.18	Ins
Arundinicola leucocephala (Linnaeus, 1764)								+		+		18.18	Ins
Gubernetes yetapa (Vieillot, 1818)								+				9.091	Ins
Cnemotriccus fuscatus (Wied, 1831)								+		+		18.18	Ins
Lathrotriccus euleri (Cabanis, 1868)	+							+		+		27.27	Ins
Satrapa icterophrys (Vieillot, 1818)	+	+		+	+				+	+		54.55	Ins
Xolmis cinereus (Vieillot, 1816)				+				+		+		27.27	Ins
Vireonidae Swainson, 1837													
Cyclarhis gujanensis (Gmelin, 1789)	+			+			+	+	+	+	+	63.64	Ins
Vireo olivaceus (Linnaeus, 1766)	+			+				+	+	+		45.45	Ins
Hylophilus poicilotis Temminck, 1822					+							9.091	Ins
Hylophilus amaurocephalus (Nordmann, 1835)								+				9.091	Ins
Corvidae Leach, 1820													
Cyanocorax cristatellus (Temminck, 1823)								+				9.091	On
Cyanocorax chrysops (Vieillot, 1818)	+			+								18.18	On
Hirundinidae Rafinesque, 1815													
Pygochelidon cyanoleuca (Vieillot, 1817)	+	+	+	+			+	+	+	+	+	81.82	Ins
Alopochelidon fucata (Temminck, 1822)			+	+								18.18	Ins
Stelgidopteryx ruficollis (Vieillot, 1817)	+						+	+		+		36.36	Ins

Continua

Continuação

Taxa	Campuses											OF (%)	TG
	1	2	3	4	5	6	7	8	9	10	11		
Progne tapera (Vieillot, 1817)	+			+						+		27.27	Ins
Progne chalybea (Gmelin, 1789)	+	+		+		+	+		+		+	63.64	Ins
Tachycineta albiventer (Boddaert, 1783)				+								9.091	Ins
Tachycineta leucorrhoa (Vieillot, 1817)	+									+		18.18	Ins
Riparia riparia (Linnaeus, 1758)				+								9.091	Ins
Hirundo rustica Linnaeus, 1758	+											9.091	
Troglodytidae Swainson, 1831													
Troglodytes musculus Naumann, 1823	+	+	+	+	+		+	+	+	+	+	90.91	Ins
Donacobiidae Aleixo & Pacheco, 2006													
Donacobius atricapilla (Linnaeus, 1766)	+							+		+		27.27	Ins
Polioptilidae Baird, 1858													
Polioptila dumicola (Vieillot, 1817)					+				+	+		27.27	Ins
Turdidae Rafinesque, 1815													
Turdus leucomelas Vieillot, 1818	+		+	+	+		+	+	+	+	+	81.82	On
Turdus rufiventris Vieillot, 1818	+	+		+	+	+		+	+	+		72.73	On
Turdus flavipes Vieillot, 1818			+									9.091	On
Turdus amaurochalinus Cabanis, 1850	+		+	+	+			+	+	+	+	72.73	On
Turdus subalaris (Seebohm, 1887)								+	+	+		27.27	On
Turdus albicollis Vieillot, 1818	+								+			18.18	On
Mimidae Bonaparte, 1853													
Mimus saturninus (Lichtenstein, 1823)	+			+	+	+	+	+	+	+	+	81.82	On
Motacillidae Horsfield, 1821													
Anthus lutescens Pucheran, 1855	+			+				+				27.27	Ins
Anthus correndera Vieillot, 1818				+								9.091	Ins
Passerellidae Cabanis & Heine, 1850													
Ammodramus humeralis (Bosc, 1792)				+				+				18.18	Gra
Arremon flavirostris Swainson, 1838								+		+		18.18	Ins
Parulidae Wetmore, Friedmann, Lincoln, Miller, Peters, van Rossem, Van Tyne & Zimmer 1947													
Setophaga pitiayumi (Vieillot, 1817)	+		+	+				+	+			45.45	Ins
Geothlypis aequinoctialis (Gmelin, 1789)	+		+	+				+			+	45.45	Ins
Basileuterus culicivorus (Deppe, 1830)	+								+			18.18	Ins
Myiothlypis flaveola Baird, 1865								+		+		18.18	Ins
Myiothlypis leucoblephara (Vieillot, 1817)	+			+				+	+	+		45.45	Ins
Icteridae Vigors, 1825													
Procacicus solitarius (Vieillot, 1816)					+							9.091	On
Cacicus haemorrhous (Linnaeus, 1766)	+			+								18.18	On
Icterus cayanensis (Linnaeus, 1766)					+							9.091	On
Icterus pyrrhopterus (Vieillot, 1819)								+	+			18.18	On
Gnorimopsar chopi (Vieillot, 1819)	+				+			+		+		36.36	On
Chrysomus ruficapillus (Vieillot, 1819)				+				+	+			27.27	On
Pseudoleistes guirahuro (Vieillot, 1819)				+				+				18.18	On
Pseudoleistes virescens (Vieillot, 1819)									+			9.091	On
Agelaioides badius (Vieillot, 1819)									+			9.091	On
Molothrus bonariensis (Gmelin, 1789)	+		+	+	+	+	+	+	+	+	+	90.91	On
Sturnella superciliaris (Bonaparte, 1850)	+			+		+						27.27	On

Continua

Continuação

Taxa	Campuses											OF (%)	TG
	1	2	3	4	5	6	7	8	9	10	11		
Thraupidae Cabanis, 1847													
Coereba flaveola (Linnaeus, 1758)	+	+	+		+			+	+	+	+	72.73	On
Saltator similis d'Orbigny & Lafresnaye, 1837	+			+				+	+	+		45.45	On
Saltator fuliginosus (Daudin, 1800)								+				9.091	On
Nemosia pileata (Boddaert, 1783)	+						+	+		+	+	45.45	On
Thlypopsis sordida (d'Orbigny & Lafresnaye, 1837)								+		+		18.18	On
Tachyphonus coronatus (Vieillot, 1822)	+		+					+	+			36.36	On
Ramphocelus carbo (Pallas, 1764)								+				9.091	On
Coriphospingus pileatus (Wied, 1821)										+		9.091	Gra
Coriphospingus cucullatus (Statius Muller, 1776)	+			+			+	+	+		+	54.55	Gra
Lanio melanops (Vieillot, 1818)	+								+			18.18	On
Tangara seledon (Statius Muller, 1776)			+						+			18.18	Fru
Tangara cyanocephala (Statius Muller, 1776)			+									9.091	Fru
Tangara sayaca (Linnaeus, 1766)	+	+	+	+	+	+	+	+	+	+	+	100	Fru
Tangara palmarum (Wied, 1823)		+	+				+	+		+		45.45	Fru
Tangara cayana (Linnaeus, 1766)					+			+		+		27.27	Fru
Stephanophorus diadematus (Temminck, 1823)									+			9.091	Fru
Cissopis leverianus (Gmelin, 1788)	+											9.091	Fru
Pipraeidea melanonota (Vieillot, 1819)	+								+			18.18	On
Pipraeidea bonariensis (Gmelin, 1789)				+					+			18.18	Fru
Tersina viridis (Illiger, 1811)	+				+				+	+	+	45.45	Fru
Dacnis cayana (Linnaeus, 1766)	+		+					+	+	+	+	54.55	Fru
Hemithraupis guira (Linnaeus, 1766)	+							+				18.18	Fru
Hemithraupis ruficapilla (Vieillot, 1818)										+		9.091	Fru
Conirostrum speciosum (Temminck, 1824)	+							+		+	+	36.36	On
Haplospiza unicolor Cabanis, 1851								+	+			18.18	Gra
Donacospiza albifrons (Vieillot, 1817)				+								9.091	Gra
Poospiza nigrorufa (d'Orbigny & Lafresnaye, 1837)				+								9.091	On
Poospiza lateralis (Nordmann, 1835)				+					+			18.18	On
Sicalis flaveola (Linnaeus, 1766)			+	+	+			+	+	+		54.55	Gra
Sicalis luteola (Sparrman, 1789)				+				+	+			27.27	Gra
Emberizoides herbicola (Vieillot, 1817)				+	+			+				27.27	Gra
Embernagra platensis (Gmelin, 1789)				+				+				18.18	Gra
Zonotrichia capensis (Statius Muller, 1776)	+		+	+			+	+	+	+		63.64	Gra
Volatinia jacarina (Linnaeus, 1766)	+	+		+	+		+	+		+	+	72.73	Gra
Sporophila lineola (Linnaeus, 1758)								+				9.091	Gra
Sporophila nigricollis (Vieillot, 1823)										+		9.091	Gra
Sporophila caerulescens (Vieillot, 1823)	+			+				+	+	+	+	54.55	Gra
Sporophila minuta (Linnaeus, 1758)				+								9.091	Gra
Tiaris fuliginosus (Wied, 1830)								+				9.091	Gra
Cardinalidae Ridgway, 1901													
Habia rubica (Vieillot, 1817)								+	+			18.18	On
Cyanoloxia brissonii (Lichtenstein, 1823)	+			+				+	+			36.36	Gra
Fringillidae Leach, 1820													
Sporagra magellanica (Vieillot, 1805)	+			+	+			+		+		45.45	Gra
Euphonia chlorotica (Linnaeus, 1766)	+				+		+	+	+	+	+	63.64	Fru

Continua

Conclusão

Taxa	Campuses											OF (%)	TG
	1	2	3	4	5	6	7	8	9	10	11		
Euphonia violacea (Linnaeus, 1758)								+	+			18.18	On
Euphonia cyanocephala (Vieillot, 1818)	+									+		18.18	Fru
Estrildidae Bonaparte, 1850													
Estrilda astrild (Linnaeus, 1758)	+	+	+					+		+		45.45	Gra
Passeridae Rafinesque, 1815													
Passer domesticus (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+	+	100	On