Preliminary survey of avifauna in a remnant of the Atlantic Forest in the municipality of Jesuítas – PR, Brazil

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Resumo

O Brasil possui uma ampla diversidade de aves, com aproximadamente 1.919 espécies registradas. Entretanto, os processos de fragmentação, supressão e alteração de hábitats contribuem para o declínio populacional da avifauna. O levantamento das espécies é parte fundamental da conservação. O presente estudo avaliou a ocorrência das espécies de aves, por meio do método qualitativo, em um remanescente de Mata Atlântica no município de Jesuítas – PR, Brasil. O estudo foi realizado de forma direta e indireta, com o auxílio de metodologias de ponto fixo e transecto-trilha. Os avistamentos foram realizados quatro vezes por semana, nos períodos da manhã e da tarde, com três horas contínuas em cada período, totalizando um esforço amostral de 318 h. Durante o período foram identificadas 116 espécies de aves, agrupadas em 17 ordens e 40 famílias, não sendo avistadas espécies pertencentes a fauna exótica, doméstica ou em risco de extinção. Através desse estudo, pioneiro para localidade, foi possível conhecer a diversidade da avifauna em um fragmento de floresta no município de Jesuítas, assim como, registrar a ocorrência de espécies anteriormente não catalogadas na região. Dessa forma ressalta-se a importância de estudos como este, que fornecem dados para estudos posteriores e subsidiar medidas para a conservação das espécies.

Palavras-chave: Biodiversidade; Bioma; Inventário; Ornitologia

Abstract

Brazil has a wide diversity of birds, with approximately 1,919 recorded species. However, the processes of fragmentation, suppression, and alteration of habitats contribute to the decline of bird populations. The survey of species is a fundamental part of conservation. Thus, this study assessed the occurrence of bird species, using the qualitative method, in a remnant of Atlantic Forest in the Municipality of Jesuítas – PR, Brazil. The study was carried out directly and indirectly, with the help of fixed-point and trail-transect methodologies. The sightings were made four times a week, in the morning and afternoon, with three continuous hours in each period, totaling a sampling effort of 318 h. During the period 116 bird species were identified, grouped into 17 orders and 40 families, with no species belonging to exotic, domestic, or endangered fauna. This pioneer study allowed us to know the diversity of the avifauna in a forest fragment in the municipality of Jesuítas, as well as to record the occurrence of previously uncatalogued species in the region. Thus, we emphasize the importance of studies such as this, which provide data for further studies and support measures for the conservation of species.

Key words: Biodiversity; Biome; Inventory; Ornithology

Introduction

It is estimated that there are approximately 10,488 bird species worldwide, 18% of them found in Brazil, distributed in 26 orders and 96 families (MENEZES *et al.*, 2004; PIACENTINI *et al.*, 2015). Among the Brazilian biomes, the Atlantic Forest presents the greatest biodiversity of avifauna, with 1,020 recorded species, of which 188 are endemic (PIACENTINI *et al.*, 2015).

The fragmentation and degradation of natural habitats are some of the causes of population decline of many bird species (PRIMACK & RODRIGUES, 2002). Part of the pressure and reduction of avian biodiversity, in areas of Atlantic Forest, are correlated with the edge effect, which alters the structure, composition, and relative abundance of species in the marginal part of a forest fragment, thus creating an unfavorable environment for their survival (LIMA & BATALLA, 2018).

Bird fauna studies are carried out through surveys, sampling, observations, and taxonomy (PAUW & LOUW, 2012). Species surveys are an essential starting point for animal conservation strategies, since it provides data on local avifauna, even if only in a preliminary form, which are used to support the construction of management plans and effective actions for the maintenance and improvement of environmental quality (RODRIGUES *et al.*, 2005). In addition, the biodiversity inventory allows the understanding of regional endemism, and quantify game species and those threatened with extinction (FREITAS & MORAES, 2009).

Given this scenario, this work aimed to catalog, even if only in a preliminary way, the bird species present in a remnant of the Atlantic Forest located in the municipality of Jesuítas, Paraná, Brazil.

Material and Methods

This study was approved by the Ethics Committee on Animal Use of the Palotina Sector of the Federal University of Paraná, under protocol CEUA/Palotina 10/2020.

Study area

The survey was undertaken in a remnant of Atlantic Forest (24°22'55"S and 53°22'34"W, 417 m altitude) in the municipality of Jesuítas – PR. The site sampled is a Permanent Preservation Area (PPA) of 32,309 m², belonging to a rural property composed of anthropic fields with agricultural and livestock activities.

The vegetation of the sampled area is classified as a Semideciduous Seasonal Forest, the soil is predominantly red latosol, and the region belongs to the third plateau. According to Kottek *et al.* (2006), the climate of the municipality is classified as Humid Subtropical (Mesothermal).

Collections

The local avifauna survey was conducted qualitatively, according to Develey (2009), by means of fixed-point, transect, and photographic and auditory recording methods.

The sampling period occurred between April and July 2020, corresponding to the seasons of autumn and winter. Observations were made four times a week, on alternate days, for 3 h in the morning (starting at sunrise) and afternoon (starting at 4 pm), totaling 53 days of observation and a sampling effort of 318 h. Observations were made on the edges of the remaining Atlantic Forest.

The definition of the fixed points for observation was obtained with the geographic coordinates assistance

(georeferencing) and the local phytophysiognomy (LUGARINI *et al.*, 2014). A total of three fixed points, with distances of approximately 100 meters each, were used for observations, and were named P1, P2, and P3, according to their physiognomy. Thus, P1 consisted of large trees of approximately ten meters in height; P2 consisted of shrubs of nearly six meters in height, and P3 consisted of shrubs and mainly shrubby vegetation of up to six meters in height. The fixed observation points have different morphologies in their forest structure (Figure 1)

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FIGURE 1: Delimitation of the sampled area. Determination of PPA (in yellow). Fixed observation point 1 (24°34'75"S and 53°36'75"W - blue); Fixed point of observation 2 (24°34'71"S and 53°36'72"O - red); Fixed point of observation 3 (24°34'69"S and 53°36'63"W - purple).



The environmental conditions were registered at the beginning of the activities. The observer's stay at each fixed point lasted 50 minutes, rotating between each point. Using the fixed-point method, the observer remained at each point and the birds sighted at this location were listed.

Using the transect method, the species found on the path between the fixed points were computed, and approximately ten minutes were spent walking between them.

The species were observed directly with the unaided eye or using binoculars (10 x 25 mm, Nautika FF205) along the fixed points and transects, as well as indirectly through photographic (FinePix S4000) and auditory (LYB - 06 recorder) records, as used by Rodrigues *et al*. (2005) and Straube and Urben-Filho (2005).

Species identification was carried out based on the works of Grantsau (2010a; 2010b), Marcelino and Martins (2014), Sigrist (2014), Stencel and Caxambu (2018), and through information obtained from digital platforms.

Results

A total of 116 bird species were identified at the study site, distributed in 17 Orders and 40 Families (Table 1), and no species belonging to exotic, domestic, or endangered avifauna were seen. One individual of the species *Tringa solitaria*, with migratory characteristics, was observed at the study site, representing 0.86% of the species recorded.

TABLE 1: Bird species, environmental condition, and observation biotopes, recorded during the fauna survey carried out in an Atlantic Forest remnant, located in the municipality of Jesuítas/PR, between April and July 2020.

Order/Family	Scientific name	Name in english	Biotype/Environmental conditions
Accipitriformes			
Accipitridae	*Elanus leucurus* (Vieillot, 1818)	White-tailed Kite	Flying/Clear sky
	Rupornis magnirostris (Gmelin, 1788)	Roadside Hawk	Flying/Partly cloudy
	Leptodon cayanensis (Latham, 1790)	Gray-headed Kite	Canopy/Clear sky
	Circus buffoni (Gmelin, 1788)	Long-winged Harrier	Flying/Cloudy
	Buteo brachyurus (Vieillot, 1816)	Short-tailed Hawk	Flying/Clear sky
Anseriformes			
Anatidae	*Dendrocygna viduata* (Linnaeus, 1766)	White-faced Whistling-Duck	Weir/Partly cloudy
	Amazonetta brasiliensis (Gmelin, 1789)	Brazilian Teal	Weir/Clear sky
Apodiformes			
Apodidae	*Chaetura meridionalis* (Hellmayr, 1907)	Sick's Swift	Flying/Cloudy
Trochilidae	*Hylocharis chrysura* (Shaw, 1812)	Gilded Hummingbird	Underwood/Clear sky
	Chlorostilbon lucidus (Shaw, 1812)	Glittering-bellied Emerald	Underwood/Cloudy
	Eupetomena macroura (Gmelin, 1788)	Swallow-tailed Hummingbird	Stratum/Clear sky
	Anthracothorax nigricollis (Vieillot, 1817)	Black-throated Mango	Underwood/Cloudy
	Phaethornis pretrei (Lesson e Delattre, 1839)	Planalto Hermit	Stratum/Partly cloudy
Caprimulgiformes			
Caprimulgidae	*Nyctidromus albicollis* (Gmelin, 1789)	Common Pauraque	Stratum/Cloudy
Cathartiformes			
Cathartidae	*Coragyps atratus* (Bechstein, 1793)	Black Vulture	Stratum/Clear sky
Columbiformes			
Columbidae	*Patagioenas picazuro* (Temminck, 1813)	Picazuro Pigeon	Underwood/Few clouds
	Zenaida auriculata (Des Murs, 1847)	Eared Dove	Underwood/Partly cloudy
	Columbina squammata (Lesson, 1831)	Scaled Dove	Underwood/Clear sky

	Leptotila rufaxilla (Richard e Bernard, 1792)	Gray-fronted Dove	Stratum/Few clouds
	Leptotila verreauxi (Bonaparte, 1855)	White-tipped Dove	Stratum/Clear sky
	Columbina talpacoti (Temminck, 1810)	Ruddy Ground-Dove	Underwood/ Cloudy
	Columbina picui (Temminck, 1813)	Picui Ground-Dove	Underwood/Clear sky
Coraciiformes			
Momotidae	*Baryphthengus ruficapillus* (Gray, 1840)	Rufous-capped Motmot	Underwood/ Clear sky
	Chloroceryle americana (Gmelin, 1788)	Green Kingfisher	Weir/Clear sky
Alcedinidae	*Megaceryle torquata* (Linnaeus, 1766)	Ringed Kingfisher	Weir/Few clouds
	Chloroceryle amazona (Latham, 1790)	Amazon Kingfisher	Weir/Partly cloudy
Charadriiformes			
Charadriidae	*Vanellus chilensis* (Molina, 1782)	Southern Lapwing	Stratum/Clear sky
Jacanidae	*Jacana jacana* (Linnaeus, 1766)	Wattled Jacana	Weir/Clear sky
Recurvirostridae	*Himantopus melanurus* (Vieillot, 1817)	White-backed Stilt	Weir/Few clouds
Scolopacidae	*Tringa solitaria* (Wilson, 1813)	Solitary Sandpiper	Weir/Cloudy
	Gallinago paraguaiae (Vieillot, 1816)	South American Snipe	Weir/Clear sky
Cuculiformes			
Cuculidae	*Piaya cayana* (Linnaeus, 1766)	Squirrel Cuckoo	Underwood/Few clouds
	Guira guira (Gmelin, 1788)	Guira Cuckoo	Underwood/Partly cloudy
	Crotophaga ani (Linnaeus, 1758)	Smooth-billed Ani	Underwood/Clear sky
Falconiformes			
	Milvago chimachima (Vieillot, 1816)	Yellow-headed Caracara	Flying/Clear sky
	Caracara plancus (Miller, 1777)	Southern Caracara	Canopy/Few clouds
Falconidae	*Falco femoralis* (Temminck, 1822)	Aplomado Falcon	Dossel/Clear sky
	Micrastur semitorquatus (Leach, 1820)	Collared Forest-Falcon	Scrub/Clear sky
Gruiformes			
Rallidae	*Gallinula galeata* (Lichtenstein, 1818)	Common Gallinule	Weir/Few clouds
	Aramides saracura (Spix, 1825)	Slaty-breasted Wood-Rail	Stratum/Partly cloudy
	Pardirallus nigricans (Vieillot, 1819)	Blackish Rail	Weir/Cloudy
Passeriformes			
Corvidae	*Cyanocorax chrysops* (Vieillot, 1818)	Plush-crested Jay	Underwood/Clear sky

Troglodytidae	*Troglodytes musculus* (Naumann, 1823)	Southern House Wren	Stratum/Few clouds
Turdidae	*Turdus rufiventris* (Vieillot, 1818)	Rufous-bellied Thrush	Underwood/Clear sky
	Turdus amaurochalinus (Cabanis, 1850)	Creamy-bellied Thrush	Underwood/Partly cloudy
	Turdus leucomelas (Vieillot, 1818)	Pale-breasted Thrush	Underwood/Few clouds
Parulidae	*Basileuterus culicivorus* (Deppe, 1830)	Golden-crowned Warbler	Underwood/Clear sky
	Setophaga pitiayumi (Vieillot, 1817)	Tropical Parula	Canopy/Partly cloudy
Passerellidae	*Arremon flavirostris* (Swainson, 1838)	Saffron-billed Sparrow	Stratum/Few clouds
	Zonotrichia capensis (Statius Muller, 1776)	Rufous-collared Sparrow	Underwood/Clear sky
Fringillidae	*Euphonia chlorotica* (Linnaeus, 1766)	Purple-throated Euphonia	Underwood/Partly cloudy
	Spinus magellanicus (Vieillot, 1805)	Hooded Siskin	Flying/Clear sky
Rhynchocyclidae	*Todirostrum cinereum* (Linnaeus, 1766)	Common Tody-Flycatcher	Underwood/Clear sky
Thamnophilidae	*Thamnophilus caerulescens* (Vieillot, 1816)	Variable Antshrike	Scrub/Few clouds
	Thamnophilus daliatus (Linnaeus, 1764)	Barred Antshrike	Scrub/Clear sky
Mimidae	*Mimus saturninus* (Lichtenstein, 1823)	Chalk-browed Mockingbird	Canopy/Clear sky
Furnariidae	*Certhiaxis cinnamomeus* (Gmelin, 1788)	Yellow-chinned Spinetail	Scrub/Clear sky
	Lochmias nematura (Lichtenstein, 1823)	Sharp-tailed Streamcreeper	Scrub/Few clouds
	Furnaris rufus (Gmelin, 1788)	Rufous Hornero	Underwood/Partly cloudy
Tityridae	*Tityra inquisitor* (Lichtenstein, 1823)	Black-crowned Tityra	Canopy/Clear sky
	Pachyramphus validus (Lichtenstein, 1823)	Crested Becard	Canopy/Few clouds
Thraupidae	*Cissopis leverianus* (Gmelin, 1788)	Magpie Tanager	Underwood/Cloudy
	Saltator similis (d'Orbigny e Lafresnaye, 1837)	Green-winged Saltator	Underwood/Partly cloudy
	Sicalis flaveola (Linnaeus, 1766)	Saffron Finch	Underwood/Clear sky
	Sporophila caerulescens (Vieillot, 1823)	Double-collared Seedeater	Underwood/Clear sky
	Sporophila lineola (Linnaeus, 1758)	Lined Seedeater	Scrub/Partly cloudy
	Coryphospingus cucullatus (Statius Muller, 1776)	Red-crested Finch	Underwood/Cloudy
	Pipraeidea melanonota (Vieillot, 1819)	Fawn-breasted Tanager	Scrub/Partly cloudy
	Volatinia jacarina (Linnaeus, 1766)	Blue-black Grassquit	Scrub/Clear sky
	Tachyphonus coronatus (Vieillot, 1822)	Ruby-crowned Tanager	Underwood/Few clouds

	Coereba flaveola (Vieillot, 1822)	Bananaquit	Underwood/Partly cloudy
	Conirostrum speciosum (Temminck, 1824)	Chestnut-vented Conebill	Canopy/Clear sky
	Tersina viridis (Illiger, 1811)	Swallow Tanager	Canopy/Few clouds
	Dacnis cayana (Linnaeus, 1766)	Blue Dacnis	Canopy/Partly cloudy
	Tangara cinzento (Linnaeus, 1766)	Sayaca Tanager	Underwood/Clear sky
	Tangara palmarum (Wied, 1821)	Palm Tanager	Underwood/Few clouds
	Agelaioides badius (Vieillot, 1819)	Grayish Baywing	Underwood/Clear sky
	Molothrus bonariensis (Gmelin, 1789)	Shiny Cowbird	Canopy/Partly cloudy
Icteridae	*Icterus pyrrhopterus* (Vieillot, 1819)	Variable Oriole	Canopy/Clear sky
	Cacicus haemorrhous (Linnaeus, 1766)	Red-rumped Cacique	Canopy/Few clouds
	Sturnella superciliaris (Bonaparte, 1850)	White-browed Meadowlark	Scrub/Clear sky
	Serpophaga subcristata (Vieillot, 1817)	White-crested Tyrannulet	Underwood/Partly cloudy
	Tyrannus savana (Daudin, 1802)	Fork-tailed Flycatcher	Scrub/Clear sky
	Myiarchus ferox (Gmelin, 1789)	Short-crested Flycatcher	Canopy/Clear sky
	Myiodynastes maculatus (Statius Muller, 1776)	Streaked Flycatcher	Canopy/Partly cloudy
	Pitangus sulphuratus (Linnaeus, 1766)	Great Kiskadee	Underwood/Clear sky
Tyrannidae	*Pitangus sulphuratus* (Linnaeus, 1766)	Social Flycatcher	Canopy/Partly cloudy
	Camptostoma obsoletum (Temminck, 1824)	Southern Beardless-Tyrannulet	Canopy/Few clouds
	Tyrannus melancholicus (Vieillot, 1819)	Tropical Kingbird	Canopy/Clear sky
	Machetornis rixosa (Vieillot, 1819)	Machetornis rixosa	Stratum/Partly cloudy
	Pyrocephalus rubinus (Boddaert, 1783)	Vermilion Flycatcher	Canopy/Clear sky
Vireonidae	*Cyclarhis gujanensis* (Gmelin, 1789)	Rufous-browed Peppershrike	Scrub/Partly cloudy
Hirundinidae	*Pygochelidon cyanoleuca* (Vieillot, 1817)	Blue-and-white Swallow	Flying/Clear sky
Pipridae	*Pipra fasciicauda* (Vieillot, 1817)	Band-tailed Manakin	Underwood/Clear sky
Pelecaniformes			
	Syrigma sibilatrix (Temminck, 1824)	Whistling Heron	Flying/Clear sky
	Ardea alba (Linnaeus, 1758)	Great Egret	Weir/Clear sky

Ardeidae	*Egretta thula* (Molina, 1782)	Snowy Egret	Weir/Clear sky
	Bubulcus ibis (Linnaeus, 1758)	Cattle Egret	Stratum/Partly cloudy
	Tigrisoma lineatum (Boddaert, 1783)	Rufescent Tiger-Heron	Weir/Partly cloudy
	Butorides striata (Linnaeus, 1758)	Striated Heron	Weir/Clear sky
	Nycticorax nycticorax (Linnaeus, 1758)	Black-crowned Night-Heron	Canopy/Partly cloudy
Threskiornithidae	*Mesembrinibis cayennensis* (Gmelin, 1789)	Green Ibis	Canopy/Clear sky
	Phimosus infuscatus (Lichtenstein, 1823)	Bare-faced Ibis	Stratum/Clear sky
	Theristicus caudatus (Gmelin, 1789)	Buff-necked Ibis	Stratum/Partly cloudy
Piciformes			
Picidae	*Melanerpes candidus* (Otto, 1796)	White Woodpecker	Underwood/Partly cloudy
	Celeus flavescens (Gmelin, 1788)	Blond-crested Woodpecker	Underwood/Clear sky
	Colaptes campestres (Vieillot, 1818)	Campo Flicker	Underwood/Partly cloudy
	Picumnus temminckii (Lafresnaye, 1845)	Ochre-collared Piculet	Underwood/Clear sky
	Veniliornis spilogaster (Wagler, 1827)	White-spotted Woodpecker	Underwood/Partly cloudy
Ramphastidae	*Pteroglossus castanotis* (Gould, 1834)	Chestnut-eared Aracari	Canopy/Clear sky
Psittaciformes			
Psittacidae	*Brotogeris chiriri* (Vieillot, 1818)	Yellow-chevroned Parakeet	Canopy/Partly cloudy
	Psittacara leucophthalmus (Statius Muller, 1776)	White-eyed Parakeet	Canopy/Clear sky
	Myiopsitta monachus (Boddaert, 1783)	Monk Parakeet	Canopy/Partly cloudy
Strigiformes			
Strigidae	*Athene cunicularia* (Molina, 1782)	Burrowing Owl	Underwood/Clear sky
Tinamiformes			
Tinamidae	*Rhynchotus rufescens* (Temminck, 1815)	Red-winged Tinamou	Stratum/Partly cloudy
	Crypturellus tataupa (Temminck, 1815)	Tataupa Tinamou	Stratum/Clear sky

The species were observed in different biotopes, namely: canopy, understory, scrub, stratum, and weir, in addition to the birds that flew over the fixed observation points. Among the sampled species, 58.62% (68/116) were identified by direct sighting, 22.42% (26/116) by bioacoustics, and 18.96% (22/116) by photographic records.

According to the classification of environmental conditions used by Donatelli *et al*. (2002) and Gimenes and Anjos (2003), in our study, 48.27% (56/116) of the species were sighted on clear days, 27.60% (32/116) on partly cloudy days, 15.51% (18/116) on days with few clouds, and 8.62% (10/116) on cloudy days. These data are different from those presented in the samples of Donatelli et al. (2002) and Gimenes and Anjos (2003). No activities were performed on a total of three non-consecutive days, due to weather conditions unfavorable to observations, such as strong winds and torrential rain.

Discussion

The results obtained in the present study resemble those found by Stencel and Caxambu (2018), who sighted 126 bird species at a place with equivalent geographic characteristics. As in the previous work, the observations in this study did not occur in the months of October and November, breeding period of most avian species. The exclusion of this period, when the animals are more active and therefore easier to be seen, may have underestimated the number of species seen in the fragment.

According to Donatelli *et al*. (2002), Gimenes and Anjos (2003), adverse environmental conditions affect observations and hence the number of species found. Sampling days in which environmental conditions are unfavorable, such as heavy rainfall and strong winds, interfere with the ability to detect species.

Approximately 9.4% (11/116) of the species recorded in this study have not been catalogued in previous surveys in the region, namely, *Agelaioides badius*, *Brotogeris chiriri*, *Circus buffoni*, *Chaetura meridionalis*, *Mesembrinibis cayennensis*, *Myiopsitta monachus*, *Serpophaga subcristata*, *Sporophila lineola*, *Syrigma sibilatrix*, *Tangara palmarum*, and *Theristicus caudatus*. Nevertheless, according to Grantsau (2010a; 210b) and Sigrist (2014), these species are found in almost all the territory of Paraná, including the sampled region.

The species of the orders Anseriformes, Caprimulgiformes, Cathartiformes, Columbiformes, Coraciiformes, Cuculiformes, Gruiformes, Piciformes, and Tinamiformes sighted have a common distribution in most of the entire Brazilian territory (SIGRIST, 2014), and have already been described in the region in other surveys (MARCELINO & MARTINS, 2014; SIGRIST, 2014; STENCEL & CAXAMBU, 2018).

The Order Passeriformes houses the largest number of bird species ever catalogued (BEJCEK & STASTNY, 2003). The Piacentini *et al*. (2015) estimates that there are more than 6,000 passerine species in Brazil. Therefore, the presence of a larger number of species belonging to this Order is expected. The Order Charadriiformes was represented by five species, all commonly found in the region in previous studies (SIGRIST, 2014). However, the presence of the species *Tringa solitaria*, a migratory bird from the Northern Hemisphere, recorded in southern Brazil between April and September, stands out (NUNES & TOMAS, 2008).

Knowing the characteristics of each species allows us to understand the conditions that make their presence possible in a given location (STENCEL & CAXAMBU, 2018). Thus, the wide range of bird species found in this study indicates that the sampling area presents some degree of preservation of natural resources necessary for the occurrence of local avifauna. However, these data alone do not guarantee environmental quality and animal conservation, since the species may be subject to external threats, such as illegal hunting (GIMENES & ANJOS, 2003).

According to data published by Brasil (2018), there are nearly 118 endangered bird species in the state. Thus, the absence of sightings of these species in the present study highlights the difficulty in observing these individuals in their natural habitat and the problem of native avifauna conservation (SILVEIRA & OLMOS, 2007).

Studies such as the fauna survey allow us to know the species that occur in a given area and the ecological aspects necessary for their survival, besides offering support for studies with specific populations and for the development of public policies for the conservation of species. It is noteworthy that this is a pioneering study carried out in the municipality of Jesuítas, which allowed us, even if preliminarily, to learn about the local avifauna and to register species that had not been seen in previous studies on the region.

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