ANALYSIS OF THE COMPOSITION OF THE VERTEBRATE FAUNA OF THE CIRCULAR AND JACUI PARKS – ENG. ANTÔNIO ARNALDO DE QUEIROZ E SILVA AND THEIR CHARACTERIZATION AS A SECTION OF AN ECOLOGICAL CORRIDOR, SÃO PAULO, SP

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ABSTRACT

The Atlantic Forest is considered one of the world's greatest biodiversity hotspots, with a high degree of endemism, but it has suffered intense deforestation, exploitation, and fragmentation, aggravated by invasions, pollution, and the destruction of its biomes. the remaining areas, although small, serve as refuges for various animals, and the study of these regions allows us to learn about their inhabitants, promote actions against anthropogenic impacts, and raise awareness among nearby communities, favoring the conservation of fragments of the biome. The objective of this study was to survey fauna species in a floodplain area of the Tietê River, in the São Miguel neighborhood, in the far east of São Paulo, seeking to identify species that are sensitive or resistant to local conditions resulting from human action and to assess the possibility of the space functioning as a section of an urban ecological corridor. Fifteen non-avian species were recorded, including one frog, two species of lizards, and twelve mammals, of which three were domestic and one was exotic, while among the birds, 128 species were identified, distributed across 21 orders and 42 families, of which eighteen are migratory, representing about 14% of the total and subdivided into migratory and partially migratory. Research focused on fauna and flora reinforces the resilience and adaptability of ecosystems, even in adverse conditions, and justifies the

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protection of small urban green spaces, which play an essential role in maintaining biodiversity and ecological connectivity in fragmented areas.

Keywords: Conservation. Atlantic Forest. Ecological Corridor. Bioindicators.

RESUMO

A Mata Atlântica é considerada um dos maiores hotspots de biodiversidade do mundo com elevado grau de endemismo, mas tem sofrido intensos desmatamentos e explorações. As fragmentações foram agravadas por invasões, poluição e destruição de diferentes ecossistemas. As áreas remanescentes, ainda que pequenas, funcionam como refúgio para diversos animais, o estudo dessas regiões permite conhecer seus habitantes, promover ações contra impactos antrópicos e conscientizar comunidades próximas favorecendo a conservação de fragmentos do bioma. Este trabalho teve como objetivo levantar espécies da fauna em uma área de várzea do Rio Tietê, no bairro de São Miguel, extremo leste de São Paulo, buscando identificar espécies sensíveis ou resistentes às condições locais resultantes da ação humana e avaliar a possibilidade de o espaço funcionar como trecho de corredor ecológico urbano. Foram registradas quinze espécies não pertencentes às aves, sendo uma rã, duas espécies de lagartos e doze mamíferos, dos quais três domésticos e um exótico, enquanto entre as aves identificaram-se 128 espécies distribuídas em 21 ordens e 42 famílias, das quais dezoito são migratórias, representando cerca de 14% do total e subdivididas em migratórias e parcialmente migratórias. Pesquisas voltadas à fauna e flora reforçam a resiliência e adaptabilidade dos ecossistemas, mesmo em condições adversas, e justificam a proteção de pequenos pontos verdes urbanos, que desempenham papel essencial na manutenção da biodiversidade e na conexão ecológica em áreas fragmentadas.

Palavras-chave: Conservação. Mata Atlântica. Corredor Ecológico. Bioindicadores.

RESUMEN

La Mata Atlántica es considerada uno de los principales puntos críticos de biodiversidad del mundo, con un alto grado de endemismo, pero ha sufrido una intensa deforestación, explotación y fragmentación, agravadas por invasiones, contaminación y la destrucción de sus biomas. las áreas remanentes, aunque pequeñas, funcionan como refugios para diversos animales, y el estudio de estas regiones permite conocer a sus habitantes, promover acciones contra los impactos antrópicos y concienciar a las comunidades cercanas, favoreciendo la conservación de fragmentos del bioma. El objetivo de este trabajo fue censar las especies de fauna en una zona de llanura aluvial del río Tietê, en el barrio de São Miguel, en el extremo este de São Paulo, con el fin de identificar especies sensibles os resistentes a las condiciones locales resultantes de la acción humana y evaluar la posibilidad de que el espacio funcione como tramo de corredor ecológico urbano. Se registraron quince especies no pertenecientes a las aves: una rana, dos especies de lagartos y doce mamíferos, de los cuales tres eran domésticos y uno exótico. mientras que entre las aves se identificaron 128 especies distribuidas en 21 órdenes y 42 familias, de las cuales dieciocho son migratorias, lo que representa alrededor del 14 % del total, subdivididas en migratorias y parcialmente migratorias. Las investigaciones centradas en la fauna y la flora refuerzan la resiliencia y la adaptabilidad de los ecosistemas, incluso en condiciones adversas, y justifican la protección de pequeños espacios verdes urbanos, que desempeñan un papel esencial en el mantenimiento de la biodiversidad y la conectividad ecológica en áreas fragmentadas.

Palabras clave: Conservación. Mata Atlántica. Corredor Ecológico. Bioindicadores.

1 INTRODUCTION

Traditionally, the term Atlantic Forest has been used to designate all or part of a continuum of predominant forest formations that extended continuously across the eastern region of South America along its Atlantic coast (Lima, 2014). The Atlantic Forest is considered by many to be a World Heritage Site, due to the fact that it is home to great diversity that is at a high level of threat, its entire ecosystem and associates are considered a priority for there to be a biological balance on the planet. Tropical rainforests occupy 7% of the earth's surface and are responsible for sheltering about 50% of the total species on the planet, which is why they are considered the richest environments when related to the level of biodiversity (Franke, *et al*. 2005). This biome is classified as one of the largest tropical forests in area, second only to the Amazon forest, thus occupying the second place in the American continent. Considering the topoFigurey and altitude, it is possible to identify five distinct forest formations: lowland forest, hillside forest, high-altitude forest, tableland forest, and humid mountain ranges (Franke, *et al*. 2005).

One of the main biomes in Brazil, which originally extended for about 1,360,000 km², 70% of its cover was dense arboreal forest formations, in addition to being a territory that extends through eastern Brazil and also through Argentina and Paraguay (Filho, *et al*. 2011). The Atlantic Forest is distributed in 17 Brazilian states, even occupying a large territory when it comes to its extension, it is possible to notice a neglect of conservation as soon as its devastation lasts for centuries, about 87% of its extension has been exploited since the arrival of foreign peoples, who used the resources and occupied places previously covered by vegetation. Many conservation works in recent years have helped the recovery of these forest formations that characterize the biome (Filho, *et* al.2011).

The connectivity between conservation units, or between fragmented areas of the Atlantic Forest, the so-called "ecological corridors," used as a survival strategy, has minimally allowed the conservation of fragements and their inhabitants. With the increase in these connectivities, more remote areas and ecological units will have the opportunity for their functional recovery (Záu, 1998). Connectivity allows this displacement, providing an increase in the population of different species, such as examples of endangered species that are located in conservation units (natural spaces protected by law) (Heinisch, 2007).

The Ecological Corridors help in the maintenance of fragmented sites, but also serve as shelter for species, reproductive sites and resting places as in the case of migratory birds. Many species flee places due to human actions, ecological niche factors, resources, competition between different individuals or the same species. Groups or communities are forced to seek different strategies for the survival of the species as an example of these

migration strategies (Záu, 1998. Heinisch, 2007).

Studies on Bioindicators aim to record species and/or taxa, which indicate some level of disturbance in the environment, whether these species belong to fauna or flora. Some species may have a low rate of acceptability of changes in the environment, being evidenced by rapid responses to changes in the ecosystem in which they are found. Abiotic and physicochemical means such as rivers, lakes and springs can be used to comprise the system as a whole (Piratelli, *et al*. 2006, Campanaro, 2020).

Birds are classified as one of the groups that have high sensitivity to human action, not susceptible to changes related to environmental and/or habitat conditions. Some characteristics place them as excellent indicators, being one of the ways to measure the level of conservation of the place (Campanaro, 2020). According to Piratelli (2006), due to particular characteristics and knowledge about this bird taxon, the use for ecological research has been intensified in recent years, due to its sensitivity to habitat fragmentation, a characteristic evidence in other clades such as amphibians.

According to Piratelli, (2006) in a research carried out in the mountainous region of Rio de Janeiro, which aimed to survey bioindicator species of forest fragmentation, he classified 4 species of birds as the best indicators, namely: *Sclerurus scansor* (Ménétries, 1835), *Mionectes rufiventris* (Cabanis, 1846), *Chiroxiphia caudata* (Shawn & Nodder, 1793), *Habia rubica* (Vieillot, 1817). According to the research, no species was associated with small fragments, but because these species belonging to the order Passeriforme are specialists in many aspects such as: (foraging substrate, nesting sites, rarity status) they can serve as great bioindicators (Piratelli, *et al*. 2006. Campanaro, 2020).

2 OBJECTIVE

To carry out the characterization of the vertebrate fauna in the Circular Park (Bike Path) and in the Jacuí Park - Núcleo Engº Antônio Arnaldo de Queiroz e Silva.

2.1 SPECIFIC OBJECTIVES

- Carry out an inventory of the herpetofauna, avifauna and mammal fauna of the study area.
- Identify the possible bioindicator species present in the study area.
- Verify if the study area acts as a stretch of an ecological corridor for local fauna.

3 METHODOLOGY

The vertebrate characterization study was carried out in two parks (Circular and Jacuí) located near a floodplain area of the Tietê, in the extreme east of the municipality of São Paulo, São Miguel Paulista neighborhood.

Circular park (Figure 1) known as a bike path by local residents, it is a linear park with a length of about 7 km (-23.477884, -46.499633.) (-23.473284, -46.434486). This area is on the banks of the Tietê River, presents some forest physiognomies in different stages of ecological succession: open areas, swamps and dense forest composed of primary to tertiary formations, free of some cases in which there is the approximation of the canopies of well-developed trees.

Figure 1

Map of the extension of the circular park (Bike path)

Source: Google Earth, 2025.

Jacuí Park (Figure 2) - Núcleo Engº Antônio Arnaldo de Queiroz e Silva, (-23.485325, -46.454064). This park has about 170,000 m² of area in total place, it is a leisure area with native and exotic introduced trees, composed of undergrowth, such as grasses and small shrubs, presenting a small amount of large trees that function as shelter from the sun for visitors.

Figure 2

Jacuí Park - Núcleo Engº Antônio Arnaldo de Queiroz e Silva

Source: Google Earth, 2025.

3.1 SURVEY OF VERTEBRATES

Frequent visits were made to the study area, using free transection methodology. Used when the researcher chooses not to have any type of contact or capture of individuals, only using techniques of direct observation of the animals or indirect by means of waste left on the trails. The visits took place three to four times a month for a period of twelve months lasting about 4 hours at different times of the day: morning, afternoon and evening.

With the help of a camera (Power shot sx50 Canon), bird song identification application (Merlin), notebook and a pen. It was traveled on a road at the edge of the forest using the notebook to write down morphological characteristics and the name of the species identified through hearing or sight, prioritizing the registration of the largest number of characteristics for a later confirmation of the sighting made in full or recorded in the form of image or sound, the help of specialists in the clades found was essential to confirm the observed species (Penter *et al*. 2008. Lopes, 2009. Shibatta *et al*. 2009. Matter, 2010. Teixeira and Frenedozo, 2026).

a) Avifauna:

The survey of the birds was carried out through frequent visits with the help of the materials mentioned above. All the information pertinent to the place: weather, date and time, was noted. The subsequent identification of non-photoFigureed species was done by noting the largest number of morphological and behavioral characteristics observed in the individuals. Applications were used to identify birds and confirmed by means of comparative examination of the database of songs to confirm the identification, the same method was used for the identification of photoFigures with applications and photoFigureic database in addition to identification guides and

literature (CBRO - Brazilian Committee of Ornithological Records, Marini & Garcia, 2005. Silveira, 2011. Lima, 2014. Pacheco, *et al*. 2021. Teixeira and Frenedozo, 2026).

b) Herpetofauna:

A standard survey methodology was used for the various species and groups and/or clades. This methodology sought to use direct observation with the help of a notebook, to note the physical and behavioral characteristics, which may vary according to the need and/or opportunity. There was the use of photoFigurey for confirmation using applications (leans) and identification guide and articles on reptiles and amphibians of the Atlantic Forest, in addition to comparative tests morphologically analyzing the characteristics described and observed (Monteiro & Conte, 2017. Amaral, 2018. Segala. *et al*. 2019. Costa, *et al*. 2021).

c) Mastofauna:

In addition to the method adopted for all clades, this group differed by the difficulty of identification by means of sounds, except for some cases (marmosets and coatis). Another approach was the identification by sightings of waste and footprints left on the road or at the edge of the forest, as in the other cases the use of photoFigureic data and comparative examination in databases and identification guides and articles were essential for accurate confirmation (Graipel, M. 2017. Quintela, *et al*. 2020. Anibal, *et al*. 2021).

4 RESULTS AND DISCUSSIONS

Four monthly visits were carried out, over a twelve-month period covering all seasons of the year (summer, autumn, winter and spring) from July 2023 to June 2024. Each visit lasted an average of four to five hours, totaling an average of about 48 visits and 190 hours of observation, with travel over an area of approximately three to four kilometers. The activities took place at different times of the day (morning, afternoon and night), ensuring a greater diversity of observations.

The fauna inventory was subdivided into two tables (1 and 2) individualizing the birds from the others, due to the number of species found, the division provides a facilitation for the interpretation of the data and understanding of the composition. Table (1) recorded one (n=1) species of frog, two (n=2) species of lizards and twelve (n=12) species of mammals, three (n=3) of which are domestic and only one is exotic, totaling fifteen (n=15) species of animals not belonging to the clade of birds. The inventory was separated into columns, with

the individuals organized into taxonomic clades, feeding, conservation status, type locality and habitat.

Table 1

Inventory of vertebrate fauna (amphibians, reptiles and mammals)

Ordem	Sub-ordem	Família	Sub-família	Genero	Espécie (Nome Científico)	Espécie (Nome Popular)	Alimentação	Status de conservação	Localidade tipo	Migratorios ou residentes	Habitat	Sensibilidade
Anfíbios, Repteis e Mamíferos												
Anuro		Leptodactylidae	Leptodactylinae	Leptodactylus	*Leptodactylus mystacinus*, (Burmeister, 1861)	Rã de bigodes	Insetivoro	Pouco p.			Semi aberto e aquatico	
Squamata		Teiidae	Teiinae	Ameiva	*Ameiva ameiva*, (Linnaeus, 1758)	Lagarto ameiva	Insetivoro	Pouco p.			Semi aberto / Floresta	
			Tupinambinae	Salvator	*Salvator merianae*, (Duméril & Bibron, 1839)	Lagarto teiu	Onivoro	Pouco p.			Semi aberto / Floresta	
Perissodactyla		Equidae		Equus	*Equus feroz*	Cavalo	Granivoros	Pouco p.	*Domestico*		Aberto	
Carnivora		Procyonidae		Nasua	*Nasua nasua*, (Linnaeus, 1766)	Quati	Onivoro	Pouco p.			Semi aberto / Floresta	
Carnivora		Felidae		Felis	*Felis catus*	Gato	Carnivoro	Pouco p.	*Domestico*		Aberto	
Cetartiodactyla		Suidae		Sus	*Sus scrofa domesticus*	Porco	Onivoro	Pouco p.	*Domestico*		Aberto	
Cetartiodactyla		Cervidae		Mazama	*Mazama gouazoubira*, (Fischer, 1814)	Verdo/cervo	Granivoros	Pouco p.			Semi aberto / Floresta	
Didelphimorphia		Didelideos	Didelphinae	Didelphis	*Didelphis aurita*, (Wied-Neuwied, 1826)	Sarue	Onivoro	Pouco p.			Semi aberto / Floresta	
Rodentia		Caviidae		Hydrochaeris	*Hydrochoerus hydrochoeris*, (Linnaeus, 1766)	Capivara	Granivoros	Pouco p.			Aberto/ Aquatico	
Rodentia		Caviidae		Cavia	*Cavia aperea*, (Erxleben, 1777)	Preá	Granivoros	Pouco p.			Semi aberto / Floresta	
Rodentia		Dasyproctidae		Dasyprocta	*Dasyprocta azarae*, (Lichtenstein, 1823)	Cutia	Granivoros	Pouco p.			Semi aberto / Floresta	
Rodentia		Echimyidae		Myocastor	*Myocastor coypus*, (Molina, 1782)	Ratão do banhado	Granivoros	Pouco p.			Aberto/ Aquatico	
Rodentia		Muridae	Myocastorinae	Rattus	*Rattus norvegicus*	Ratazana	Onivoro	Pouco p.	*END*		Aberto/ Aquatico	
Primata		Callitrichidae		Callithrix	*Callithrix penicillata*, (Geoffroy, 1812)	Sagui	Onivoro	Pouco p.			Semi aberto / Floresta	

Source: The authors, 2025.

In the inventory (Table 2), the birds were organized in alphabetical order with the objective of reaching a larger audience and facilitating the understanding of the data presented. Taking into account the final public, which may not understand the technical criteria used by a small portion of the population that has comprehensive knowledge about cladistics. In this way, this type of distribution of species, in addition to facilitating general understanding, works as scientific dissemination to different audiences.

In (Table 2), columns were inserted that help to understand the individuals that can be observed in the study area, addressing aspects such as: food, conservation status, type locality, habitat, sensitivity and level of migration or residence. One hundred and twenty-eight species (n=128) were recorded, distributed in twenty-one (n=21) orders and forty-two (n=42) families.

Table 2

Inventory of vertebrate fauna (birds)

Ordem	Sub-ordem	Família	Sub-família	Genero	Espécie (Nome Científico)	Espécie (Nome Popular)	Alimentação	Status de conservação	Localidade tipo	Migratorios ou residentes	Habitat	Sensibilidade
Accipitriformes	-	Accipitridae	Accipitrininae	Accipiter	*Accipiter striatus*, (Vieillot, 1808)	Tauato-miudo	Carnivoro	Pouco p.			Semi aberto / Floresta	Media
	-			Amadonastur	*Amadonastur lacernulatus*, (Temminck, 1827)	Gavião pombo pequeno		Vulneravel	*END*		Florestas	alto
	-			Geranoaetus	*Geranoaetus albicaudatus*, (Vieillot, 1816)	Gavião de rabo branco		Pouco p.			Aberto	Baixo
	-			Rupornis	*Rupornis magnirostris*, (Gmelin, 1788)	Gavião carijo		Pouco p.			Aberto/ Semi aberto	Baixo
Anseriformes	-	Anatidae	Anatinae	Amazonetta	*Amazonetta brasiliensis*, (Gmelin, 1789)	Marreca ananai	Onivoro	Pouco p.			Aquatico	Baixo
	-		Anatinae	Anas	*Anas bahamensis*, (Linnaeus, 1758)	Marreca Toicinho		Pouco p.			Aquatico	Baixo
	-		Dendrocygninae	Dendrocygna	*Dendrocygna viduata*, (Linnaeus, 1766)	irere		Pouco p.			Aquatico	Baixo
Apodiformes		Apodidae		Chaetura	*Chaetura meridionalis*, (Hellmayr, 1907)	Andorinhão de temporal	Insetivoro	Pouco p.		Migratorio	Aberto e Floresta	Baixo
		Trochilidae	Phaethornithinae	Phaethornis	*Phaethornis pretrei*, (Lesson & Delattre, 1839)	Rabo branco acanelado	Nectivoro	Pouco p.			Semi aberto	Baixo
			Trochilinae	Chlorostilbon	*Chlorostilbon lucidus*, (Shaw, 1812)	Besourinho de bico verm.		Pouco p.			Aberto/ Semi aberto	Baixo
				Eupetomena	*Eupetomena macroura*, (Gmelin, 1788)	Beija flor tesoura		Pouco p.			Aberto/ Semi aberto	Baixo
Caprimulgiformes		Caprimulgidae		Nyctidromus	*Nyctidromus albicollis*, (Gmelin, 1789)	Bacurau	Insetivoro	Pouco p.			Aberto/ Semi aberto	Baixo
Cathartiformes		Cathartidae		Coragyps	*Coragyps atratus*, (Bechstein, 1793)	Urubu cabeça preta	Detritivoro	Pouco p.			Aberto e Floresta	Baixo
Charadriiformes	Charadrii	Charadriidae		Vanellus	*Vanellus chilensis*, (Molina, 1782)	Quero-quero	Carnivoro	Pouco p.			Aberto	Baixo
	Ploeuvirostridae			Himantopus	*Himantopus melanurus*, (Vieillot, 1817)	Pernilongo de costas branca	Onivoro	Pouco p.			Aberto	Medio
	Scolopaci	Jacanidae		Jacana	*Jacana jacana*, (Linnaeus, 1766)	Jaçana	Carnivoro	Pouco p.			Aquatico	Baixo
		Scolopacidae	Tringinae	Tringa	*Tringa solitaria*, (Wilson, 1813)	Maçarico solitario		Pouco p.		Migratorio	Aquatico	?
Columbiformes		Columbidae	Columbinae	Columba	*Columba livia* / Gmelin, 1789)	Pombo domestico	Granivoros	Pouco p.	*END*		Aberto	Baixo
				Leptotila	*Leptotila verreauxi*, (Bonaparte, 1855)	Juriti pupu		Pouco p.			Semi aberto / Floresta	Baixo
				Patagioenas	*Patagioenas cayennensis*, (Bonnaterre, 1792)	Pomba Galega		Pouco p.			Aberto/ Semi aberto	Medio
					Patagioenas picazuro, (Temminck, 1813)	Asa branca		Pouco p.			Aberto/ Semi aberto	Medio
				Zenaida	*Zenaida auriculata*, (Des Murs, 1847)	Avoante		Pouco p.			Aberto	Baixo
			Claravinae	Columbina	*Columbina talpacoti*, (Temminck, 1811)	Rolinha roxa		Pouco p.			Aberto	Baixo
Coraciiformes		Alcedinidae		Chloroceryle	*Chloroceryle Amazona*, (Latham, 1790)	Martin pescador verde	Carnivoro	Pouco p.			Aquatico	Baixo
	-		-	Megaceryle	*Megaceryle torquata*, (Linnaeus, 1766)	Martin pescador G.		Pouco p.			Aquatico	Baixo
Cuculiformes		Cuculidae	Crotophaginae	Crotophaga	*Crotophaga ani*, (Linnaeus, 1758)	Anu preto		Pouco p.			Aberto	Baixo
				Guira	*Guira guira*, (Gmelin, 1788)	Anu branco		Pouco p.			Aberto	Baixo

Source: The authors, 2025.

The families were grouped according to the number of species found, those with only one representative were directed to (Table 3-A), while those with more than one representative were included in (Table 3-B).

Table 3

Index of bird families observed

Familia	N° Ind
Anhingidae	1
Apodidae	1
Aramidae	1
Caprimulgidae	1
Cathartidae	1
Charadriidae	1
Corvidae	1
Cracidae	1
Dendrocolaptidae	1
Estrildidae	1
Jacanidae	1
Mimidae	1
Parulidae	1
Passerellidae	1
Passeridae	1
Phalacrocoracidae	1
Ramphastidae	1
Recurvirostridae	1
Rhynchocyclidae	1
Scolopacidae	1
Troglodytidae	1

Familia	N° Ind
Accipitridae	4
Alcedinidae	2
Anatidae	3
Ardeidae	4
Columbidae	6
Cuculidae	3
Falconidae	3
Furnariidae	5
Hirundinidae	2
Icteridae	6
Picidae	6
Psittacidae	5
Rallidae	4
Strigidae	2
Thraupidae	19
Threskiornithidae	3
Tityridae	2
Trochilidae	3
Turdidae	4
Tyrannidae	19
Vireonidae	2

Source: The authors, 2025.

Due to the intensification of anthropic action and the modification of forest areas by human constructions, for centuries the inhabitants of these places have been forced to seek different ways of living in the midst of so many changes. Small refuges color the large metropolises and can serve as shelter, whether fixed or temporary. Parks located in large centers, called "urban parks", play an important role in the conservation of several species (Almeida & Candido Júnior, 2017).

It was possible to observe a higher number of records when it comes to birdlife. This factor can be attributed to the ease of locomotion by flight, when compared to the movement of individuals who need to travel through trails and roads. The green spots in large cities have proven to be great shelters for birds, but not only do they use these spots as shelter, but also several other individuals.

Forty-two (n=42) bird families were recorded, of which 50% had more than one representative. Among these, two families stood out for concentrating a higher number of species: *Thraupidae* and *Tyrannidae*. Both presented nineteen (n=19) different species each, housing about 33% of the species recorded. This result as a whole represents 24% of the species recorded for the municipality of São Paulo (Figueiredo & Lo, 2000).

Recent surveys carried out in parks near and adjacent to the study area can help in the interpretation of the data and in the understanding of the individuals recorded. Studies conducted over more than ten years in the Tietê Ecological Park, Engenheiro Goulart nucleus (PET), have shown that the park is home to about two hundred and seventy-four species (n=274) of birds. With an extensive area, the presence of diverse forest physiognomies and the proximity of environmental protection centers, favored by the ease of movement of individuals between these areas, the high biodiversity observed is a differential of the park (Dores *et al*., 2020).

The study area is interconnected with the Tietê Ecological Park (PET), so that most of the animals found in the Circular Park can also be seen in the PET. Only one record differentiates the data: *Amadonastur lacernulatus* (Temminck, 1827), known as the little pigeon hawk, a bird of prey whose occurrence is more abundant in coastal areas.

Due to the proximity between the parks, both can function as escape routes and stopping points for short- or long-distance migrants, whether for feeding and/or breeding. Birds can use the Circular Park as an intermediate area to reach the PET or as a temporary destination – for example, as a breeding site (Dores *et al*. 2020).

An unusual behavior was observed in two species (*Nasua nasua* and *Mazama gouazoubira*), both sighted in areas with scarce vegetation and high incidence of traffic of vehicles and people, in addition to many clandestine constructions. The exit from the PET using the Circular Park as an escape route can be motivated by: intra or interspecific competition (Dores *et al*. 2020).

In a recent survey, some data were similar regarding the abundance of species in two families: (*Thraupidae* and *Tyrannidae*). The birds of these families demonstrate great plasticity in the face of environmental changes, being generally associated with areas and parks close to urban centers (Teixeira *et al.* 2025).

According to Teixeira *et al.* (2025), in the survey of the avifauna carried out along the course of the Tiquatira stream, located in the municipality of São Paulo, east zone, it was possible to identify eighty-four (n=84) species distributed in twenty-eight (n=28) different families. This number differs from the present study in terms of diversity, due to the location of the stream and a higher rate of urbanization, as it is more centralized in the distribution of the municipality (Teixeira *et al.* 2025).

The authors describe the park as a functional place, as it establishes a spatial connection between dispersed green areas, a characteristic related to the longitudinal extension present in linear parks. The linear structure found in these parks plays a primary role in favoring the movement of birds, which use these remnants as ecological corridors,

promoting connectivity between environments and urban forest fragments, which act as stopping points and/or reproductive sites (Teixeira *et al.* 2025).

In addition, the authors report the ability of birds to adapt to urban environments, demonstrating great plasticity in the face of changes caused by human action. This characteristic can be observed at both extremes: both in individuals highly sensitive to human interference and in species adapted to environmental changes, and can be used, in both cases, as efficient indicators through the presence or absence of adaptability (Teixeira *et al.* 2025).

In a recent study, Oliveira (2024) conducted a survey of avifauna in the Itaquaquecetuba Ecological Park – Mário do Canto, located in São Paulo, SP. Ninety-one (n=91) species distributed in thirty-seven (n=37) families were recorded, with *Thraupidae* and *Tyrannidae standing* out as those with the highest number of individuals (Oliveira, 2024).

Although the study was conducted in another municipality, which differs subtly from the present one in terms of faunal composition, it is possible to observe a standardization in most of the individuals identified. The parks belong to the same protection area, connected to the Tietê River, which brings them closer in physiological characteristics to forest formations (Oliveira, 2024).

There is the possibility of two hypotheses: one linked to the standardization of individuals adapted to urban parks, varying subtly taking into account the location of the park. Another in which it presents a relevant change within the same biome, but brings together parks that demonstrate characteristics close to forest formations (Oliveira, 2024).

The bird fauna associated with urban environments can vary according to the time of year, plant diversity, forest area and location. However, the presence of resident individuals reveals a continuity and standardization that indicate plasticity in certain species, in addition to representing their adaptability to urban environments and active performance in new ecological niches.

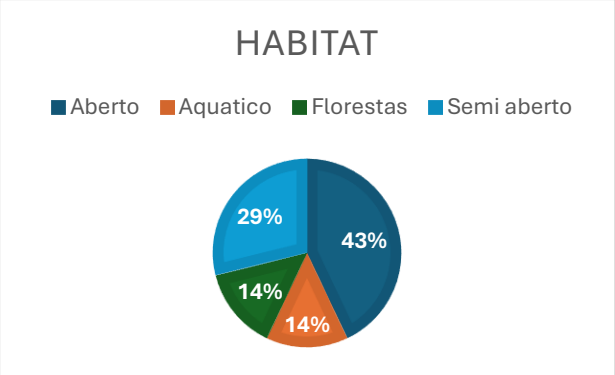
On the other hand, the advance of urbanization, the loss of habitat and the occupation of pre-existing niches can be evidenced by the absence of diversity and the high level of standardization of species. The disappearance of biodiversity, in this context, can be used as a unit of measurement for the advance and expansion of non-green areas.

In (Figure 3), it can be observed the marked presence of individuals with low floristic needs and independence from factors that function as shelter, whether fixed or for rapid escape action, demonstrating adaptability to stressful situations such as human presence. The high level of individuals living in open and semi-open areas reaches about 70% of the species found.

The data presented demonstrate the possibility of the faunal composition being linked to urban areas, differing from the majority the presence of individuals linked to forest areas of 14% demonstrates potential floristic diversity, even if minimally. Only 14% of the registered individuals are aquatic, the low concentration of aquatic individuals emphasizes the absence of specialist individuals, a factor that can be attributed to a high rate of pollution of the waters of the rivers and lakes linked to the Tietê.

Figure 3

Relationship between species and their preferences for habitat types



Source: The authors, 2025.

Ecological suppression, exercised for centuries, can be observed in simple studies of fauna composition. The advance of anthropic actions enables the increase of generalist fauna with a low sensitivity index to anthropization, the absence of a higher percentage in relation to the presence of aquatic and/or semiaquatic species may be related to the pollution of rivers and lakes. The physical and chemical alteration of the water can hinder and even inhibit the development of individuals dependent on these environments, later affecting an entire production chain.

The seasons of the year are another important factor that must be considered, as they influence the composition of the fauna and its activity. Animals can modify their routine according to the time of year, such as in some cases reducing metabolic activity or just changing locations. In winter, some animals can change their metabolism, reducing their metabolic activity known as hibernation in mammals and brumation in some reptiles (Silva, 2017).

Birds, in addition to changing activity according to temperature and time, they can also change their location based on the time of year, the seasons have a great influence on birds, being even greater in migratory individuals: partial, southern and nearctic. It is possible to observe in (Figure 4) that each time of the year presents a different characteristic of activity,

and they may present preferences for increased activity, considering factors that favor foraging, rest, and reproductive activity.

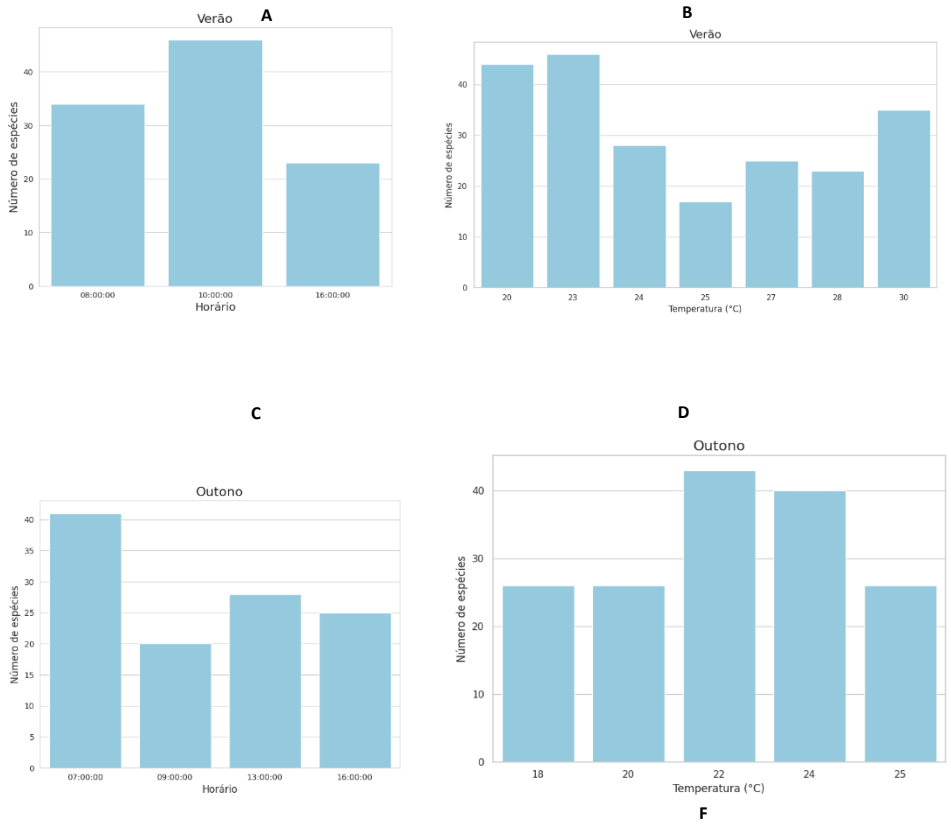
In the summer, the activity indicated by (Figure 4 A and B) shows a greater amount of movement on colder days and at a time a little distant from dawn. A shorter foraging was observed on hot days and/or at strategic times for individuals that feed on insects looking for the time of greatest activity of their food.

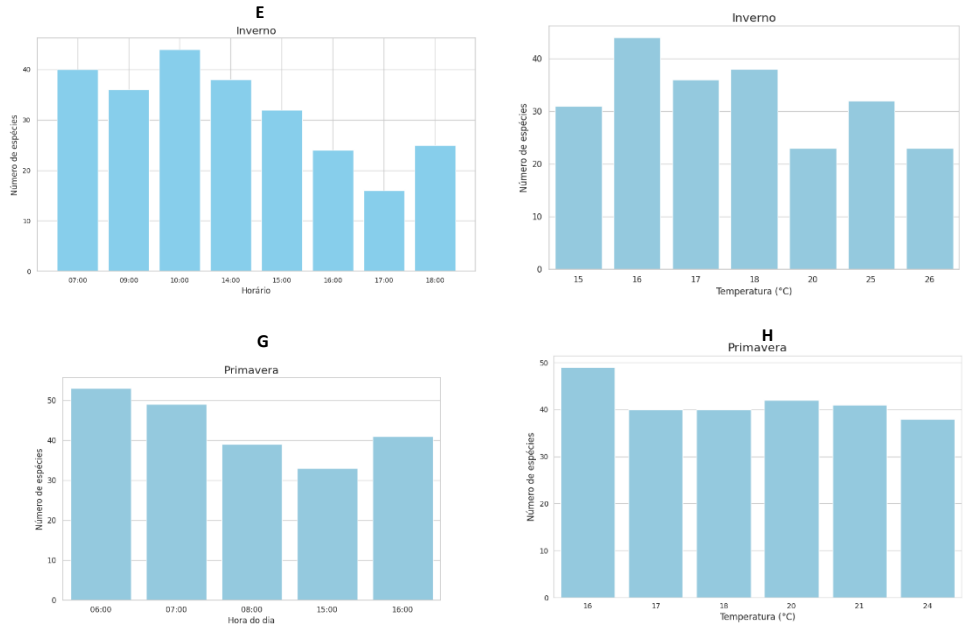
Unlike summer, autumn and winter may present longer nights and days with low temperatures, and the activity may be fixed at dawn and the foraging intensified with the appearance of sun beams in addition to a continuity in relation to the number of individuals at different times of the day (Figure 4- C, D, E e F).

In spring, with the arrival of the reproductive season of several species and migratory individuals, the data show an increase in activity that can be observed in (Figure 4- G and H). The increase in sound effects, caused by birds in the reproductive season for attraction and dispute for territory, allows a higher rate of observation as soon as their activities are intensified and movements are more evident.

Figure 4

Seasonality index of species and climate x period relationship





Source: The authors, 2025.

Eighteen (n=18) migratory species were recorded, about 14% of all species observed. And subdivided into two groups (migratory and partially migratory), in (Figure 5) both groups are represented and the representation of all the others that do not present characteristics of large displacements.

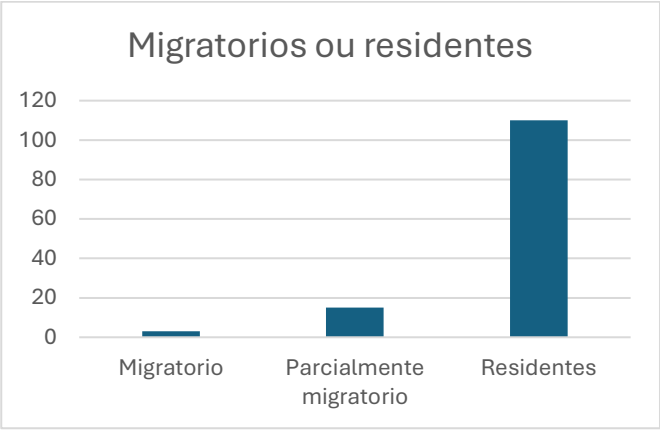
These movements, named migration, can be caused by several reasons: reproduction, escape and/or search for places to spend the winter. Of the species observed, fifteen (n=15) of them can be considered partially migratory because a portion of the population remains resident, not translocating.

Birds, which make these movements of displacement over long distances, need places to take short breaks, either for rest or feeding. The green dots found today in urban centers can function as pause points for these travelers, in addition to, in some cases, being the final point, where they usually go to use a reproductive site if they find the necessary qualities and characteristics to raise the young.

In many cases, green dots work as stepping stones: birds that are in a state of flight can use squares, urban parks and small fragments of forest as temporary stops and later arrive in protected areas or large forests. The act of migration may be more common in birds, but it is not exclusive to this group; other animals may be part of the migratory group (Teixeira *et al.* 2025).

Figure 5

Migratory and/or resident birds



Source: The authors, 2025.

To understand, if a certain place functions as an ecological corridor and/or a stretch of a corridor, it is necessary to identify if there are species that use this park or green spot as an escape route, feeding and/or resting point. In addition to the birds observed, it was possible to verify that some mammals were using the park as an escape route: *Mazama gouazoubira* (Fischer, 1814) *and Nasua nasua* (Linnaeus, 1766), both species can be seen in the PET, and *Nasua* sp has a great abundance, and can be seen throughout the park area.

Some observed events may help to understand the motivation for certain movements of these species out of the park. Taking into account that the escape towards a smaller area in extension and with greater anthropic activity is not a common strategy, some questions are raised: due to the lack of predators and the great availability of food, the increase in the number of specimens of these two species is inevitable, causing a greater dispute for food.

The search for places with a smaller number of individuals signals the possibility of overcrowding, since the different places where coatis families were sighted had great human activity. This only reinforces the importance of places that can act as bridges to more arboreal areas that can serve as temporary or final shelter.

Another question about these small migrations argues that the high rate of visitors to the PET can exert anthropic pressure on animals with a high level of sensitivity. Causing the search for means of escape, using small stretches of continuous corridors in search of a new place to live or temporary shelter.

Mazama gouazoubira (Fischer, 1814), a species of deer sighted about 7 km away from the PET in an environment with less afforestation and variety of biodiversity. Based on the premise that species use green dots as escape routes, these observed species can

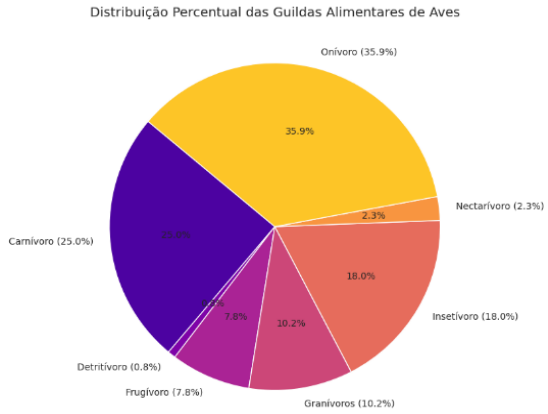
symbolize not only that this study area can be a stretch of ecological corridor, but that human activity can also have a negative effect on areas that were supposed to be protected.

The production of a food guild (Figure - 6) was carried out, so that there was a better understanding of the environment as a whole. The feeding of birds was used as a criterion for environmental evaluation, the food guild presented about 35% of omnivorous species, represented by generalist species with great capacity for adaptation and linked to areas with a certain environmental imbalance. More than 1/3 of the species found have a comprehensive feeding habit, which can be a negative indicator for the area studied, even if 2/3 or 65% of the species are represented by specialists, the high rate of generalists demonstrates the probability of floristic modifications (Paiva, 2021).

On the other hand, the second and third place of this guild was represented by respectively (carnivore and insectivore), indicating recent environmental changes and the loss of fauna as something subsequent, but of low value, since the number of specialist individuals (carnivore and insectivore) represents almost 50% of the observed bird population. (Paiva, 2021).

Figure 6

Food guild of the observed bird species.



Source: The authors, 2025.

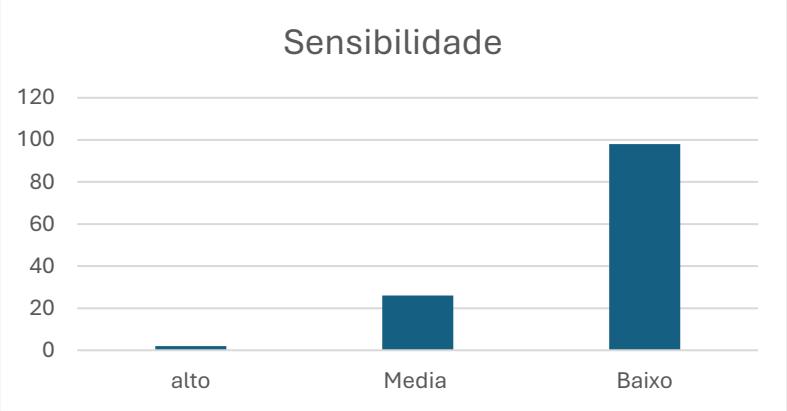
The use of other data can help to better understand the environment and such data when aligned represent a solid basis for determination, understanding and reinforce the capacity of birds and fauna composition as indicators. For greater representativeness, the analysis of factors such as (sensitivity, conservation status and type location) can present the conditions and where the environment is when dealing with anthropic actions. The high rate of representatives with low sensitivity to human actions demonstrates that the observed

species are adapted to human presence and in some cases the incorporation of foods found in urban areas as part of their diet.

In (Figure - 7) it is possible to observe (n=98) about 76% of the species have low sensitivity. Two other factors observed locality, type and conservation status, among the total number of species it was possible to observe: four (n=4) endemic, four (n=4) exotic and three (n=3) domestic, the low rate of endemic species and the presence not only of exotic invaders, but also domestic in a place considered one of the largest hotspots in the world and with a high degree of endemism evidence of years of exploitation and the continuous advance of human actions (Franke, *et al*. 2005).

Figure 7

Level of sensitivity to human action, adapted from (Sick, 1997)



Source: The authors, 2025.

The observed species show stability in relation to conservation status, except for one specific case where an unusual species was recorded. The *Amadonastur lacernulatus* (Temminck, 1827), popularly known as the little pigeon hawk, this species of raptor is generally linked to coastal environments, hardly observed in urban centers. This specific individual is one of the representatives of endemic species, with a high level of sensitivity in addition to being represented as vulnerable according to (IUCN) – International Red List of Threatened Species.

The appearance of this individual raised questions about a possible release or wandering individual. The release of captured species happens frequently and has been observed in other cases: *Gnorimopsar chopi* (Vieillot, 1819), *Icterus jamacaii* (Gmelin, 1788), *Sporophila albogularis* (Spix, 1825) and *Sporophila angolensis* (Linnaeus, 1766) until after their establishment in the place, which was not the case of this hawk, which did not exceed the period of 7 days in the place. In addition, there is a prevalence of the use and transport of songsong species in trafficking, with much fewer cases involving species of prey.

On the other hand, this raptor is not indicated in the literature as a possible migratory, which raises several questions about the appearance of this individual so far from the coast. A researcher registered in a citizen science application, where he reports seeing the same species in another area far from the one mentioned in this work, an individual was registered in the west zone of São Paulo. For a better understanding of the facts, a direct approach with the individual in question or a more comprehensive analysis of the behavior of the species would be necessary.

5 CONCLUSION

In this work, in addition to the production of the fauna inventory, the objectives included the determination of the site as a stretch of ecological corridor and the understanding of bioindicator species. During the period of development of the research, it was possible to raise data, questions and hypotheses that served as a basis for the confirmation and achievement of the objectives.

Taking into account the time available for the research and the use of simple methodology, it is possible to estimate that the survey presents approximate data on the actual composition of the local fauna. Later, if there is continuity of the research, it will be necessary to use more complex methodologies, both for a better understanding of the fauna and for carrying out statistical analyses that allow understanding the level of significance and/or abundance of the species. In addition, research more focused on understanding the translocation of non-migratory individuals will be needed, with observed escape strategies.

Works aimed at understanding fauna and florism reinforce the resilience and adaptability of ecosystems, even in adverse conditions, and serve as a sufficient basis to justify the care and protection of small urban green spots. Research is the basis for public policies for environmental protection, and the data and information obtained should not remain restricted to a specific public or group, but should be freely accessible to the population, through social actions and scientific dissemination aimed at the various visitors to these study sites.

A fact that can be achieved, some actions have already been carried out, such as the publication of composition data on citizen science websites (Ebird and wikiaves), in addition to publications on social networks (Instagram), always aiming at popular knowledge and scientific dissemination by communities adjacent to the park areas.

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ANNEX

Link and Qrcode to access the fauna inventory:

https://1drv.ms/x/c/b312b594791ee4a7/EWG49lpuj_xLpSbt5e3erJYBOF3ch2AkbIKF6pdYt94R2Q?e=Gd27nE.