



BATS (MAMMALIA: CHIROPTERA) FROM THE TAPACURÁ ECOLOGICAL STATION, STATE OF PERNAMBUCO, NORTHEASTERN BRAZIL: FIRST CHECKLIST 50 YEARS AFTER ITS CREATION (1975-2025)

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Abstract: The Atlantic Forest constitutes a biologically rich yet severely endangered biome in Brazil, with only a limited proportion of its original spatial extent currently preserved. In this study, we have made a compiled review of the bat fauna of the Tapacurá Ecological Station (TES), one of the first protected areas created in Brazil. We compiled records available in scientific collections, online databases, and published scientific literature, and included new data from captures conducted with mist nets. Forty bat species belonging to 26 genera and distributed in five families were recorded: Phyllostomidae, Emballonuridae, Molossidae, Vespertilionidae, and Noctilionidae. In the review of the literature, 12 species were recorded in the regurgitation pellets of *Tyto furcata* (Temminck, 1827) (Aves, Tytonidae). Moreover, *Lonchorhina aurita* Tomes, 1863 (Chiroptera, Phyllostomidae) was captured for the first time in this protected area in

the present study. The bat species richness recorded in this study is the highest among Atlantic Forest fragments within the Pernambuco Endemism Center and represents 43% of the Chiroptera richness in the state of Pernambuco. Even though this area is still poorly sampled for bats in the northeastern Atlantic Forest, the high richness recorded for the TES highlights its importance for the conservation of bat fauna in a unique biogeographic region. We emphasize the need for long-term systematic sampling using different methods, such as acoustic monitoring and searches for daytime shelters, to improve the understanding of bat populations in the TES.

Keywords: Atlantic Forest; Pernambuco Endemism Center; protected area; species richness.

INTRODUCTION

The Atlantic Forest is one of the most threatened biomes in Brazil. Because of the threats it faces, alongside its high species richness and extremely high levels of endemism, the Atlantic Forest has been classified as one of the world's main biodiversity hotspots (Myers et al. 2000). Currently, the Brazilian Atlantic Forest is home to more than 145 million inhabitants distributed across 3,429 Brazilian municipalities, most of them with their entire territories within the biome (SOS Mata Atlântica 2023). Moreover, over 50% of the endangered Brazilian fauna inhabit the Atlantic Forest (ICMBio 2025), an area that faces historical vegetation cover suppression that has reduced the original area for over 500 years of occupation and exploitation, resulting in only 12.3% of the original cover remaining, mostly within small fragments (Ribeiro et al. 2009, SOS Mata Atlântica 2023, Vancine et al. 2024). Habitat degradation is even more accentuated in northeastern Brazil, where the Atlantic Forest is heavily fragmented, mainly because of the cultivation of sugarcane monocultures (Ribeiro et al. 2009).

Among the six Brazilian biomes, the Atlantic Forest has the second highest bat richness and is one of the most studied regarding its bat fauna (Bernard et al. 2011, Delgado-Jaramillo et al. 2020). The Atlantic Forest has more than 120 bat species (Delgado-Jaramillo et al. 2020), nine of which are endemic (Abreu et al. 2024). Its bat fauna represents approximately 65% of the bat species recorded in Brazil (Abreu et al. 2024) and 15% of the native mammal species recorded in the Atlantic Forest (Graipel et al. 2017). Bats are a highly diverse group of mammals and present great morphological diversity, including various feeding habits and foraging strategies, performing several

important ecosystem services, such as pollination, seed dispersal, and the control of the population of insects (i.e., including agricultural pests and disease vectors) and other invertebrate and vertebrate species (Reis et al. 2017, Arias-Aguilar et al. 2018, Carvalho et al. 2024). Furthermore, bats can be preyed by other animals, such as owls, snakes, and foxes (Bigai & Faria 2018, Barbier et al. 2023), and are one of the main organisms responsible for the input of organic matter into subterranean ecosystems (Piló et al. 2023).

However, information on the occurrence and distribution of bats in Brazil is still very fragmented and heterogeneously distributed (Bernard et al. 2011, Delgado-Jaramillo et al. 2020). Formal records indicate that less than 10% of the Brazilian territory is considered minimally sampled, whereas there is no formal record of the occurrence of bats for approximately 60% of the country's area, with many records concentrated in southeastern Brazil (Bernard et al. 2011, Delgado-Jaramillo et al. 2020). These enormous gaps in sampling and knowledge occur because few locations have been adequately inventoried, and local lists are usually incomplete (Esbérard 2003, Costa et al. 2005), even in Brazilian biomes that have well-inventoried bat fauna (Bernard et al. 2011). Given the country's large territorial extension, with distinct anthropogenic pressures in each place (Chiarello et al. 2009), local species lists provide subsidies for future studies on biology, ecology, taxonomy, and geographical distribution, in addition to providing appropriate information for decision-makers regarding conservation measures concerning the remaining diversity (Esbérard 2003).

In the state of Pernambuco, there are records of 94 bat species distributed in eight families, 11 subfamilies, and 51 genera (Willig 1983, Ascorra et al. 1991, Williams et al. 1995, Peters et al. 2002, Sousa

et al. 2004, Guerra 2007, Gardner 2008, Silva et al. 2010, Moratelli et al. 2011, Santos et al. 2013, Rocha et al. 2014, Azevêdo & Bernard 2015, Moratelli & Dias 2015, Vilar et al. 2016, Silva & Bernard 2017, Barbier et al. 2018, Loureiro et al. 2018, Hintze et al. 2019, Hintze et al. 2020, Martins-Leal et al. 2020, Silva et al. 2020, Sales et al. 2023). Pernambuco is located in northeastern Brazil, and most of its territory is occupied by the Caatinga biome (3,342,244.0 ha; 84.2%), with the Atlantic Forest restricted to 626,006.2 ha (15.8%) of its original area (Plataformaeco 2024). Within the small portion of the Atlantic Forest located in Pernambuco, only 74,005.7 ha (9%) are Protected Areas (PAs) (Plataformaeco 2024). Pernambuco has 113 PAs located in the Atlantic Forest, 40 of which are Strictly Protected Areas (SPAs) and 73 are areas with Sustainable Use of Natural Resources (Plataformaeco 2024). The Tapacurá Ecological Station (TES) is an important preserved area managed by the Federal Rural University of Pernambuco (UFRPE), which houses three large forest fragments (two of which are categorized as Wildlife Refuges through State Law; Pernambuco 2011), located around a huge public water reservoir.

Information on bats from the TES began to be recorded in the late 1970s (Guerra 2007). However, the data available are still scattered in the literature, and there is currently no formal list of the bat fauna of this PA (Moura et al. 2012). Considering the importance of species lists as essential instruments for supporting strategies for the conservation of PAs, as well as assisting in the preparation of the Management Plans, we have made a compiled review of the bats of the TES, 50 years after its establishment.

MATERIAL AND METHODS

Study area

The Tapacurá Ecological Station (TES) is in the westernmost part of the municipality of São Lourenço da Mata (08°03'00" S; 35°10'00" W), at an altitude of 150 m a.s.l., in the Metropolitan Region of Recife, state of Pernambuco, Brazil (Figure 1). It covers a total area of approximately 800 ha, of which approximately 400 ha are forested areas represented by Mata do Camucim (approximately 200 ha), Mata do Toró (approximately 100 ha), and Mata do Alto da Buchada (approximately 100 ha). The first two

fragments are adjacent and separated from the third by approximately 4 km due to the presence of a lake, Lake Tapacurá (area under the responsibility of Companhia Pernambucana de Saneamento – COMPESA, in Portuguese). This body of water resulted from the damming of the Tapacurá River in 1973, a tributary of the Capibaribe River (Coelho 1979), and has been subjected to intense human activity, such as a large input of solid waste (Barboza et al. 2020), artisanal fishing that causes wildlife mortality through bycatch (Santos et al. 2020), and heavy metal contamination (Santos et al. 2024).

The TES is not part of the Brazilian Conservation Units System (SNUC, Law No. 9,985/2000; Brasil 2000), being recognized locally only administratively, since it is an advanced campus of UFRPE. However, the Mata do Camucim and the Mata do Toró that are included in the TES, were recognized as Wildlife Refuges by Law No. 14,324/2011 (Pernambuco 2011) and are currently part of the State System of Conservation Units (SEUC; Law No. 13,787/2009; Pernambuco 2009). The vegetation in the fragments is classified as Lowland Semi-deciduous Seasonal Forest, with an average annual rainfall of 1,300 mm and an As' climate in Köppen's climate classification, with well-defined dry (September to February) and rainy seasons (March to August) (Lyra-Neves et al. 2007, Moura et al. 2012, Alvares et al. 2013). The matrix surrounding the TES is mainly characterized by sugarcane monocultures but also by small pasture areas and livestock farms. The Mata do Toró has a slightly different floristic composition compared with the other two fragments, with some plant species exclusive to this fragment; the faunal composition, however, does not significantly vary for most of the studied groups (Moura et al. 2012).

Data collection and analysis

Literature review

We conducted a search on Google Scholar (<https://scholar.google.com>) for papers containing data on the occurrence and ecological and/or taxonomic aspects of bats from the TES. We used the following combination of keywords, both in English and in Portuguese: “bats”, “Chiroptera”, “Pernambuco”, “Ecological Station”, and “Tapacurá”. We also

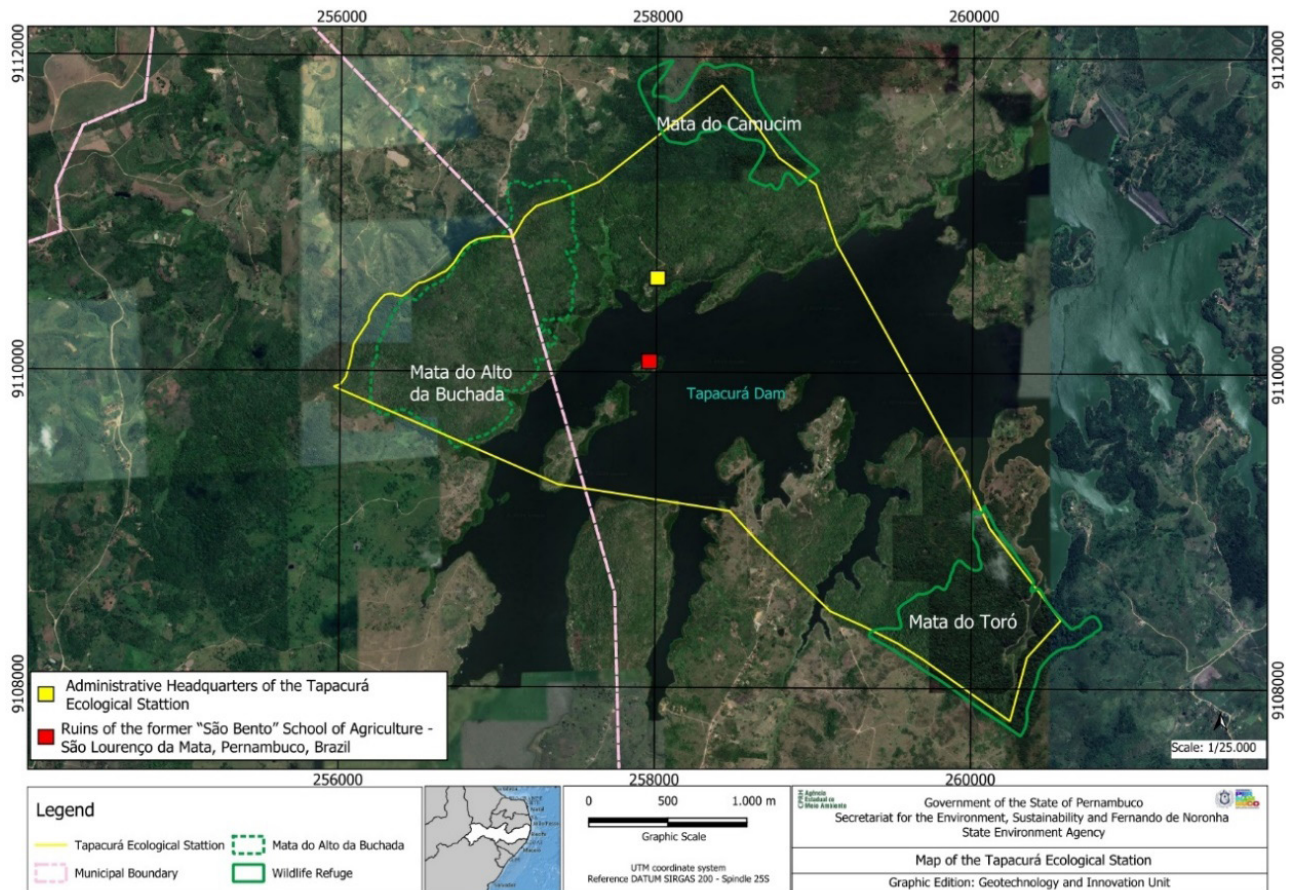


Figure 1. Location of the Tapacurá Ecological Station (yellow polygon), including the forest fragments Mata do Toró, Mata do Camucim, and Mata do Alto da Buchada, in the municipality of São Lourenço da Mata, state of Pernambuco, Brazil.

searched for unpublished data in monographs, master thesis and PhD dissertations in the libraries of the three largest universities in Pernambuco: Universidade Federal de Pernambuco (UFPE - <https://attenu.ufpe.br/>), Universidade Federal Rural de Pernambuco (UFRPE - <http://ww2.bc.ufrpe.br/pergamum/biblioteca/index.php>), and the Universidade de Pernambuco (UPE - <https://pergamum.upe.br/>). We filtered the results from 1975 to 2025, covering 50 years since the establishment of this Ecological Station.

Data collection

We also consulted mammal collections from different institutions to access unpublished material that could provide more complete information on the bats collected in the study area. We consulted the following collections: the Mammal Collection of the Universidade Federal de Pernambuco (UFPE),

Recife, Brazil; Mammal Collection Universidade Federal da Paraíba (UFPB), João Pessoa, Brazil; and National Museum of Natural History, Smithsonian Institution (USNM), Washington DC, USA. For each specimen consulted, we recorded the voucher number and information on the area and type of vegetation.

Bat captures

To increase the number of species records and provide more updated information, we conducted bat captures in the three Atlantic Forest fragments located within the TES: Mata do Toró, Mata do Camucim, and Mata do Alto da Buchada. Captures were conducted during three consecutive days, one in each fragment, in May 2015 and in May 2018, using between four to six mist nets (12×2.5 m each), depending on the size of the area, that were deployed at the ground-level (approximately 0.5-2.6 m above the ground) along natural paths in the

interior of the fragments. Nets were opened at 5:00 p.m., stayed open until 11:00 p.m. or midnight and were inspected every 15 min. The total sampling effort was 3,240 h.m², which was calculated according to the method proposed by Straube & Bianconi (2002). Moreover, between 2017 and 2024, sporadic captures were conducted in the areas during field classes assisted by the first author. Bats were captured under a permanent license issued by SISBIO (permit #551993/2011-1), identified following the identification keys of Gardner (2008) and Díaz et al. (2021), and released after processing.

Data analysis

We consulted the following lists to consult species conservation status, traffic threats, or special protection: the Red List of the International Union for Conservation of Nature - IUCN (IUCN 2025); the Brazilian National List of Threatened Species (ICMBio 2025); Appendices I, II and III of the Convention on International Trade in Endangered Species of Wild Fauna and Flora - CITES (CITES 2023), and Appendices I and II of the Convention on the Conservation of Migratory Species - CMS (Brasil 2025).

The nomenclature and taxonomic order of the species presented in the list followed those of Garbino et al. (2024), and the classification of bats into different feeding guilds was adapted from Kalko et al. (1996) and Tavares et al. (2012).

RESULTS

Based on the information available in the literature, voucher specimens from the consulted collections, and the results from field captures conducted in 2015 and 2018, the bat fauna of the TES consists of 40 species belonging to 26 genera distributed in the families: Phyllostomidae (26 spp.), Emballonuridae (05 spp.), Molossidae (04 spp.), Vespertilionidae (04 spp.), and Noctilionidae (01 sp.) (Table 1). Most of the recorded bat species belong to the trophic guild of aerial insectivores (32.5% of recorded species), followed by gleaning insectivores (22.5%), frugivores (22.5%), hematophagous (7.5%), gleaning insectivores/omnivores (7.5%), gleaning insectivores/carnivores, nectarivores and piscivores (2.5% each) (Table 1).

Regarding bat captures conducted in 2015 and 2018, the Phyllostomidae family was the most represented, with 142 captured individuals, accounting for 99.3% of the total abundance. One single individual of Vespertilionidae (*Myotis lavalii* Moratelli et al., 2011) was also captured. In these samplings, the species with the greatest number of captured individuals was *Desmodus rotundus* (E. Geoffroy, 1810) (N = 42), followed by *Carollia perspicillata* (Linnaeus, 1758) (N = 42), *Artibeus cinereus* (Gervais, 1856) (N = 13), *Artibeus planirostris* (Spix, 1823) (N = 12), and *Artibeus lituratus* (Olfers, 1818) (N = 10). The other species were represented by less than 10 captures each, namely: *Phyllostomus discolor* Wagner, 1843 (N = 9), *Glossophaga soricina* (Pallas, 1766) (N = 6), *Platyrrhinus lineatus* (E. Geoffroy, 1810) (N = 1), *Phyllostomus hastatus* (Pallas, 1767) (N = 1), and *M. lavalii* (N = 1).

During one of the sporadic captures conducted in field classes, we captured one individual of *Lonchorhina aurita* Tomes, 1863, a species with no previous records for the area (Figure 2). On the night of August 17, 2023, an adult male with scrotal testes was captured with a mist net placed near one of the sheds that serves as a space for holding classes and practical experiences for students visiting the Tapacurá Ecological Station. The specimen was released after being photographed, as it is an almost endangered species in the Brazilian territory (ICMBio, 2025).

Mata do Camucim had 14 species, eight of which were recorded only in this fragment (Table 1). Moreover, the Mata do Toró had 10 species, four of which were unique to this fragment, and Mata do Alto da Buchada had 8 species, one of which was recorded only in this fragment (Table 1). Among the bat species recorded in the TES (40 spp.), 12 were recorded in regurgitation pellets of the Barn Owl, *Tyto furcata* (Temminck, 1827) (Aves, Tytonidae), with predation occurring expressively on the insectivorous *Molossus molossus* Pallas, 1766, *Molossus rufus* É. Geoffroy, 1805, and *Eumops* sp., as well as on the omnivorous *P. discolor* (Table 1).

Most of the bat species recorded in the TES are widely distributed, occurring in several states of Brazil and in most Brazilian biomes, and are not classified in any threat category, either nationally or globally. Four species deserve special attention: *Lonchorhina aurita*, considered Near Threatened (NT) nationally (ICMBio 2025); *Tonatia bidens* (Spix,

Table 1. Checklist of bats recorded at the Tapacurá Ecological Station, municipality of São Lourenço da Mata, a remnant of Atlantic Forest in the state of Pernambuco, Northeastern Brazil, with their respective characterization of species trophic guilds and occurrence in the three fragments located in the area (Mata do Toró, Mata do Camucim, and Mata do Alto da Buchada). Trophic Guilds: AI – Aerial Insectivore; CAR – Carnivore; FR – Frugivore; GI – Gleaning Insectivore; HE – Hematophagous; NE – Nectarivore; OM – Omnivore; PI – Piscivore, adapted from Kalko et al. (1996) and Tavares et al. (2012). Fragments: MAB = Mata do Alto da Buchada; MC = Mata do Camucim; MT = Mata do Toró. * = Bat species recorded in the diet of *Tyto furcata* (Aves, Tytonidae) by George (1984), Roda (2006), & Bastos Pimenta et al. (2025).

Taxon	Trophic guild	Fragment	Reference
Family Emballonuridae Gervais, 1856 (3 genera, 5 species)			
Subfamily Enballonurinae Gervais, 1856			
<i>Peropteryx kappleri</i> Peters, 1867	AI	MC	George (1984); Hood & Gardner (2008)
<i>Peropteryx leucoptera</i> Peters, 1867	AI	MC	Guerra (2007); Neves (2018)
<i>Peropteryx macrotis</i> (Wagner, 1843)	AI	MC	Mares et al. (1981); George (1984); Carvalho-Neto (2013); USMN 555698
<i>Rhynchonycteris naso</i> (Wied, 1820)	AI	MC	George (1984); Neves (2018)
<i>Saccopteryx leptura</i> (Schreber, 1774)	AI	MT	George (1984)
Family Phyllostomidae Gray, 1825 (17 genera, 26 species)			
Subfamily Desmodontinae Wagner, 1840			
<i>Desmodus rotundus</i> (É. Geoffroy, 1810)	HE	MC, MAB	Mares et al. (1981); George (1984); Carvalho-Neto (2013); Neves (2018); ♀ UFPE 1804, ♀ UFPE 1807, ♂ UFPE 1810, ♂ UFPE 1812, ♂ UFPE 2006, ♂ UFPE 2007, ♂ UFPE 2008, ♂ UFPE 2009, ♂ UFPE 2010, ♂ UFPE 2011, ♂ UFPE 2282; Mares et al. (1981); George (1984)
<i>Diaemus youngii</i> (Jentnik, 1893)	HE	-	Guerra (2007)
<i>Diphylla ecaudata</i> Spix, 1823	HE	-	
Subfamily Glossophaginae Bonaparte, 1845			
<i>Glossophaga soricina</i> (Pallas, 1766)*	NE	MT, MC, MAB	Mares et al. (1981); George (1984); Carvalho-Neto (2013); Neves (2018); ♂ UFPE 2187, ♂ UFPE 2188, ♂ UFPE 2189, ♂ UFPE 2194, ♂ UFPE 1341, ♀ UFPE 1342, ♀ UFPE 1343, ♀ UFPE 1344, ♂ UFPE 1345, ♂ UFPE 1346, ♀ UFPE 1347, ♀ UFPE 1348, ♀ UFPE 1349, ♀ UFPE 1350;

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Taxon	Trophic guild	Fragment	Reference
Subfamily Lonchorhininae Gray, 1866			
<i>Lonchorhina aurita</i> Tomes, 1863	GI	MC	Present study
Subfamily Phyllostominae Gray, 1825			
<i>Lophostoma brasiliense</i> Peters, 1867	GI	-	Mares et al. (1981); George (1984); Carvalho-Neto (2013); ♀ UFPP 1076
<i>Lophostoma silvicola</i> d'Orbigny, 1836	GI	MC	Guerra (2007); Carvalho-Neto (2013); ♂ UFPE 2110
<i>Macrophyllum macrophyllum</i> (Schinz, 1821)	GI	-	George (1984); Feijó & Langguth (2011); Cruz et al. (2012)
<i>Phyllostomus discolor</i> Wagner, 1843*	GI/OM	MT, MAB	George (1984); Carvalho-Neto (2013); Bastos Pimenta et al. (2025); Neves (2018); ♂ UFPE 2283, ♀ UFPP 1694, ♀ UFPP 1695, ♀ UFPP 1704
<i>Phyllostomus elongatus</i> (E. Geoffroy, 1810)	GI/OM	MT	George (1984)
<i>Phyllostomus hastatus</i> (Pallas, 1767)*	GI/OM	MAB	George (1984); ♂ UFPE 2141, ♀ UFPP 1677
<i>Tonatia bidens</i> (Spix, 1823)	GI	-	George (1984)
<i>Tonatia maresi</i> Williams, Willig & Reid, 1995	GI	-	Guerra (2007)
<i>Trachops cirrhosus</i> (Spix, 1823)	GI/CAR	MT	George (1984); Neves (2018); ♂ UFPE 1021
Subfamily Micronycterinae Van Den Bussche, 1992			
<i>Micronycteris megalotis</i> (Gray, 1842)	GI	-	George (1984)
<i>Micronycteris minuta</i> (Gervais, 1856)	GI	-	Sergio (2012); Neves (2018); UFPE 1083, UFPP 3217
<i>Micronycteris schmidtorum</i> Sanborn, 1935	GI	-	George (1984); Ascorra et al. (1991); Simmons (1996); USMN 555703
Subfamily Carolliinae Miller, 1924			
<i>Carollia perspicillata</i> (Linnaeus, 1758)*	FR	MT, MC, MAB	Mares et al. (1981); George (1984); Carvalho-Neto (2013); Bastos Pimenta et al. (2025); Neves (2018) ♂ UFPE 1809, ♀ UFPE 1811, ♀ UFPE 2133, ♂ UFPE 2134, ♂ UFPE 2135, ♂ UFPE 2136, ♂ UFPE 2281
Subfamily Rhinophyllinae Baker et al., 2016			
<i>Rhinophylla pumilio</i> Peters, 1865	FR	MT	George (1984)
Subfamily Stenodermatinae Gervais, 1856			
<i>Artibeus cinereus</i> (Gervais, 1856)*	FR	MT, MC, MAB	George (1984); Carvalho-Neto (2013); Neves (2018); ♂ UFPE 2379

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Taxon	Trophic guild	Fragment	Reference
<i>Artibeus obscurus</i> (Schinz, 1821)	FR	-	Neves (2018)
<i>Artibeus lituratus</i> (Olfers, 1818)	FR	MT, MC, MAB	George (1984); Ascorra et al. (1991); Carvalho-Neto (2013); Neves (2018)
<i>Artibeus planirostris</i> (Spix, 1823)*	FR	MT, MC, MAB	George (1984); Araújo & Langguth (2010); Carvalho-Neto (2013); Bastos Pimenta et al. (2025); Medeiros-Filho et al. (2018); Neves (2018) ♂ UFPE 1813 ♀ UFPE 2148; UFPB 3642, UFPB 3643, UFPB 3654
<i>Chiroderma villosus</i> Peters, 1860	FR	-	Guerra (2007)
<i>Platyrrhinus lineatus</i> (É. Geoffroy, 1810)*	FR	MC	Souza & Araújo (1990); Bastos Pimenta et al. (2025); ♂ UFPE 2377
<i>Sturnira lilium</i> (É. Geoffroy, 1810)	FR	-	George (1984); Souza & Araújo (1990); Carvalho-Neto (2013); ♂ UFPE 1805, ♀ UFPE 1806;
Family Noctilionidae Gray, 1821 (1 genera, 1 species)			
<i>Noctilio leporinus</i> (Linnaeus, 1758)*	PI	-	George (1984); Bastos Pimenta et al. (2025); ♂ USNM 536439
Family Molossidae Gervais, 1856 (3 genera, 4 species)			
Subfamily Molossinae Gervais, 1856			
<i>Cynomops planirostris</i> (Peters, 1866)*	AI	-	Mares et al. (1981); George (1984); ♂ USNM 555727
<i>Eumops glaucinus</i> (Wagner, 1843)*	AI	-	George (1984); Roda (2006);
<i>Molossus molossus</i> (Pallas, 1766)*	AI	-	George (1984); Roda (2006); Bastos Pimenta et al. (2025)
<i>Molossus rufus</i> É. Geoffroy, 1805*	AI	-	George (1984); Roda (2006); Bastos Pimenta et al. (2025); ♂ UFPE 1808
Family Vespertilionidae Gray, 1821 (2 genera, 4 species)			
Subfamily Vespertilioninae Gray, 1821			
<i>Lasiurus ega</i> (Gervais, 1856)	AI	-	George (1984)
<i>Lasiurus egregius</i> (Peters, 1870)	AI	-	Guerra (2007)
Subfamily Myotinae Tate, 1942			
<i>Myotis riparius</i> Handley, 1960	AI	-	Willig & Mares (1989)
<i>Myotis lavali</i> Moratelli et al., 2011	AI	MC	Mares et al. (1981); George (1984); Carvalho-Neto (2013); Moratelli & Wilson (2014); USMN 555712, ♀ UFPB 1629
Total (26 genera, 40 species)			



Figure 2. Male specimen of *Loncorhina aurita* (Chiroptera, Phyllostomidae) captured, photographed, and released on the night of August 17, 2023, representing the first record of the species at the Tapacurá Ecological Station, in the municipality of São Lourenço da Mata, state of Pernambuco, Brazil.

1823) and *Lasiurus egregius* (Peters, 1870), both considered Data Deficient (DD) globally (IUCN 2025); and *Tonatia maresi* Williams, Willig and Reid, 1995, which was not evaluated in either instance (ICMBio 2025, IUCN 2025). Moreover, *P. lineatus* is listed in Appendix III of CITES (2023), and *Lasiurus ega* (Gervais, 1856) is listed in Appendix II of CMS (Brasil 2025).

DISCUSSION

Despite being a severely fragmented and highly anthropized area, the TES has one of the richest bat faunas in the Pernambuco Endemism Center - PEC, which reinforces the importance of its remnants for the maintenance of the chiropterofauna in the northeastern Atlantic Forest. The bat richness recorded in this PA corresponds to 43% of the species reported for the state of Pernambuco (Leal et al. 2023), and 22% and 33% of the species that occur in Brazil and in the Brazilian Atlantic Forest, respectively (Graipel et al. 2017, Muylaert et al. 2017, Delgado-Jaramillo et al. 2020, Garbino et al. 2022, Feijó et al. 2023, Lopes et al. 2023, Garbino et al. 2024). Considering the bat inventories conducted in the PEC and the patterns found in this region (Feijó et al. 2023), the TES stands out for presenting one of the highest values of species richness (40 spp.). In the PEC, previous inventories carried out in different areas indicated a local diversity of bats ranging from nine species in the UFPE campus in Recife (Leal et al. 2013) to 34 species at the Guaribas Biological Reserve, state of Paraíba (Feijó et al. 2016).

Combining the number of bat species recorded in the present study with the species richness of different orders of mammals evaluated in previous studies (53 spp.) (Oliveira 2012, Nascimento & Feijó 2017, Ramos et al. 2024), the mammal fauna in the TES is composed of 93 species. These species belong to 73 genera and are distributed in 28 families from ten different orders, with Sirenia being the only order that occurs in Brazil and was not recorded in the area (Abreu et al. 2024).

Phyllostomidae was the most diverse family within the TES, with 24 species. The highest abundance and diversity of this family can be explained by the fact that it is usually the most representative and abundant family in captures conducted in the Neotropical region (Fenton et

al. 1992, Kalko et al. 1996). The Phyllostomidae family presents the greatest number of feeding guilds in the order Chiroptera, which tends to reduce intraspecific competition, thus facilitating sympatry and consequently increasing their dominance in communities (Kalko et al. 1996). Moreover, the highest richness of Phyllostominae observed in this protected area may be an indication of the integrity of the vegetation in the fragments, as phyllostomids are considered especially sensitive taxa to vegetation changes (e.g., Fenton et al. 1992, Medellín et al. 2000).

On the other hand, capture with mist nets, the methodology that is usually used in researches with Neotropical bats, tends to overestimate the Phyllostomidae family and consequently underestimate other families, such as Vespertilionidae, Emballonuridae, and Molossidae (Silva & Bernard 2017). Those families may represent up to 50% of the total number of bats in Neotropical regions, which indicates important undersampling when conducting captures with mist nets (Kalko 1998). This undersampling can be considerably mitigated using ultrasonic recorders to maximize the number of records of insectivorous bats (Silva & Bernard 2017).

Some of the species that were recorded in the TES were rarely reported in inventories conducted in the Atlantic Forest in the state of Pernambuco. Among these, *Peropteryx kappleri* Peters, 1867 was cited for the municipalities of Cabo de Santo Agostinho, Recife, São Louenço da Mata, Sirinhaém and Tamandaré (Guerra 2007, Gardner 2008, Hintze et al. 2019); *Peropteryx leucoptera* Peters, 1867 was captured with mist nets in the municipalities of Igarassu, Recife, Rio Formoso and São Lourenço da Mata (Guerra 1980, Silva & Guerra 2000, Guerra 2007, Gardner 2008); *Saccopteryx leptura* (Schreber, 1774) was recorded in the municipalities of Água Preta, Exu, Gameleira, Igarassú, Moreno, Paudalho, Paulista, São Lourenço da Mata, Recife, Rio Formoso and Tamandaré (Willig 1985, Guerra 2007, Gonçalves et al. 2018, Neves 2018, Hintze et al. 2019, Hintze et al. 2021); *Macrophyllum macrophyllum* (Schinz, 1821) was recorded only in the municipality of Sirinhaém and São Lourenço da Mata (Guerra 2007); and *Phyllostomus elongatus* (E. Geoffroy, 1810) in the municipalities of Caruaru, Recife, Rio Formoso, São Lourenço da Mata,

Sirinhaém, Tamandaré and Timbaúba (Sousa et al. 2004, Guerra 2007, Oliveira 2010, Barbier et al. 2018). Moreover, the first record of *L. aurita* in the TES, a species that is considered Near Threatened (NT) in Brazil (Bernard et al. 2023), highlights the importance of this area to the conservation of bats in Pernambuco.

The high capture rates of frugivorous species are usually related to their foraging behavior (Bernard & Fenton 2002, Loayza & Loisele 2008, Bobrowiec & Gribel 2009) and to the structure of the vegetation found on primary forests, in the understory, and in disturbed areas (Bernard & Fenton 2002), which can facilitate their capture with mist nets (Calouro et al. 2010). The second most abundant species in the TES, *C. perspicillata*, is an understory specialist species that feeds on fruits of pioneer plants that occur mainly in forest gaps, in regenerating areas, and on forest edges (Mello et al. 2004). This species, which is usually associated with the presence of Piperaceae plants (Reis et al. 2003), is one of the most abundant in inventories conducted in the Atlantic Forest (Muyllaert et al. 2017) and, despite being common, it is not associated with highly degraded habitats, such as urban areas (Nunes et al. 2017). Other frugivorous species, however, are generally associated with – or very tolerant to – anthropized areas (Nunes et al. 2017) and are among the most abundant species in urban inventories. This is the case of *A. cinereus*, *A. lituratus* and *A. planirostris*, which are usually captured both in degraded areas and in more pristine environments (Nunes et al. 2017) and are some of the most recorded species in the TES.

The most recorded species in the captures conducted in 2015 and 2018, however, was the hematophagous bat *D. rotundus*. The highest number of captures for this species may be associated with the presence of domestic animals on rural properties located near the TES (Franco et al. 2019). Although there are no records of bat attacks on these animals (Franco et al. 2019), the presence of chicken and cattle farms may represent important food sources for hematophagous species, and monitoring these species and eventual conflicts should be continually conducted.

Bastos Pimenta et al. (2025) found a high occurrence of bats from the Molossidae family in the regurgitation pellets of *T. fuscata* at the

TES. The literature already documents molossid bats as customary prey of Barn Owls in previous studies, corroborating the findings of this work. For instance, the first record of bat predation by *T. fuscata* in the TES occurred in 1978, when skulls of the molossid *Eumops glaucinus* (Wagner, 1843) were found in regurgitation pellets of the species (Guerra 2007). According to records in the literature, predation occurs expressively on the insectivorous bats *M. molossus*, *Eumops* sp., and *M. rufus* (George 1984, Roda 2006, Bastos Pimenta et al. 2025). The marked representation of insectivorous bats in the diet of *T. fuscata* found in the TES (George 1984, Roda 2006, Guerra 2007, Bastos Pimenta et al. 2025) is consistent with those found in previous studies conducted in different areas (Motta-Júnior & Alho 2000, Escarlata-Tavares & Pessôa 2005, Motta-Júnior 2006, Roda 2006, Souza et al. 2010, Lemos et al. 2015), which suggests that these bats are the most accessible secondary resources for the *T. fuscata* diet. Furthermore, the omnivorous bat *P. discolor* was also one of the most preyed upon species in the area, which represented a new record in the diet of *T. fuscata* (Roda 2006, Bastos Pimenta et al. 2025). In addition to *P. discolor*, the species *C. perspicillata*, *A. planirostris*, *Platyrrhinus lineatus*, and *Noctilio leporinus* also represented new records of bat predation by *T. fuscata* in the TES (Bastos Pimenta et al. 2025).

CONCLUSION

The results from the TES indicate that the area supports a high diversity of bat species, demonstrating the need for its conservation for maintaining biodiversity and ecosystem stability (Kunz et al. 2011, Ramírez-Fráncel et al. 2022). The bat species that occur at the TES have been mentioned in few previous studies, but there is no official list of species recorded in the three fragments (Mata do Toró, Mata do Camucim, and Mata do Alto da Buchada). Thus, the publication of this list is important for understanding which species inhabit the area, favoring the development of new research and stronger conservation strategies.

Considering the scarcity of studies on bats at the TES, the data presented demonstrate the

importance of studies registering the bat fauna in the area, especially regarding rare or infrequent species. In future studies, the use of different sampling methods, such as mist netting at the canopy level and near water bodies, acoustic monitoring, and active searches for daytime roosts, is essential to better understand the bat fauna in the area. Moreover, future implementation of continuous and long-term surveys is essential to evaluate bat fauna across all areas and the impacts of human activities on their populations. Given the importance of bats as ecosystem service providers (Reis et al. 2017) and the insufficient knowledge of their diversity and distribution in Brazil (Delgado-Jaramillo et al. 2020), inventories of this group are still considered important and necessary for bat and ecosystem conservation.

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