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Checklist of bat species from the Tapacurá Ecological Station

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

Edson Silva Barbosa Leal [1,2,3*], *Daniel de Figueiredo Ramalho* [2,4], *Juliana Pereira Bezerra*[5,6], *Wesley Manoel Silva Santos*[5,6], *Arthur Macário Lopes*[7], *Wallace Rodrigues Telino-Júnior*[8,9,10] & *Geraldo Jorge Barbosa de Moura* [1,2,3,10]

[1]Universidade Federal Rural de Pernambuco, Departamento de Biologia, Programa de Pós-Graduação em Biociência Animal, Av. Dom Manoel de Medeiros, s/n, Dois Irmãos, CEP 52171-900, Recife, PE, Brazil.

[2]Agência Estadual de Meio Ambiente, Diretoria de Monitoramento Ambiental e Inovação, Rua Oliveira Góes, 395, Poço da Panela, CEP 52061-34, Recife, PE, Brazil.

[3]Universidade Federal Rural de Pernambuco, Departamento de Biologia, Laboratório de Estudos Herpetológicos e Paleoherpetológicos de Pernambuco, Av. Dom Manoel de Medeiros, s/n, Dois Irmãos, CEP 52171-900, Recife, PE, Brazil.

[4]Universidade de Brasília, Instituto de Ciências Biológicas, Departamento de Zoologia, Laboratório de Biologia e Conservação de Morcegos, Asa Norte, CEP 70910-900, Brasília, DF, Brazil.

[5]Universidade Federal de Pernambuco, Centro de Biociências, Programa de Pós-Graduação em Biologia Animal, Rua Nelson Chaves, s/n, Cidade Universitária, CEP 50670-901, Recife, PE, Brazil.

[6]Universidade Federal de Pernambuco, Centro de Biociências, Departamento de Zoologia, Laboratório de Ciência Aplicada à Conservação da Biodiversidade, Rua Nelson Chaves, s/n, Cidade Universitária, CEP 50670-901, Recife, PE, Brazil.

[7]Universidade Federal Rural de Pernambuco, Departamento de Medicina Veterinária, Av. Dom Manoel de Medeiros, s/n, Dois Irmãos, CEP 52171-900, Recife, PE, Brazil.

[8]Universidade Federal do Agreste de Pernambuco, Laboratório de Ensino de Zoologia, Av. Bom Pastor, s/n, Boa Vista, CEP 55292-270, Garanhuns, PE, Brazil.

[9]Universidade Federal do Agreste de Pernambuco, Programa de Pós-Graduação em Ciências Ambientais, Av. Bom Pastor, s/n, Boa Vista, CEP 55292-270, Garanhuns, PE, Brazil.

[10]Universidade Federal Rural de Pernambuco, Programa de Pós-Graduação em Biodiversidade, Av. Dom Manoel de Medeiros, s/n, Dois Irmãos, CEP 52171-900, Recife, PE, Brazil.

E-mails: edson.leal76@gmail.com (*corresponding author); daniel.f.ramalho@gmail.com; juliana.pbezerra1@gmail.com; wesley.manoel@ufpe.br; arthurmacario5@gmail.com; wallace.telinojr@ufape.edu.br; geraldojbm@gmail.com

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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 (EET), 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 EET 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 EET.

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 (Plataformaecope 2024). Within the small portion of the Atlantic Forest located in Pernambuco, only 74,005.7 ha (9%) are Protected Areas (PAs) (Plataformaecope 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 (Plataformaecope 2024). The Tapacurá Ecological Station (EET) 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 EET 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 EET, 50 years after its creation.

MATERIAL AND METHODS

Study area

The Tapacurá Ecological Station (EET) is in the westernmost part of the municipality of São Lourenço da Mata (08º03'00" S; 35º10'00" 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 Camocim (approximately 200 ha), Mata do Toró (approximately 100 ha), and Mata 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 Pernambuco Sanitation Company – 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).

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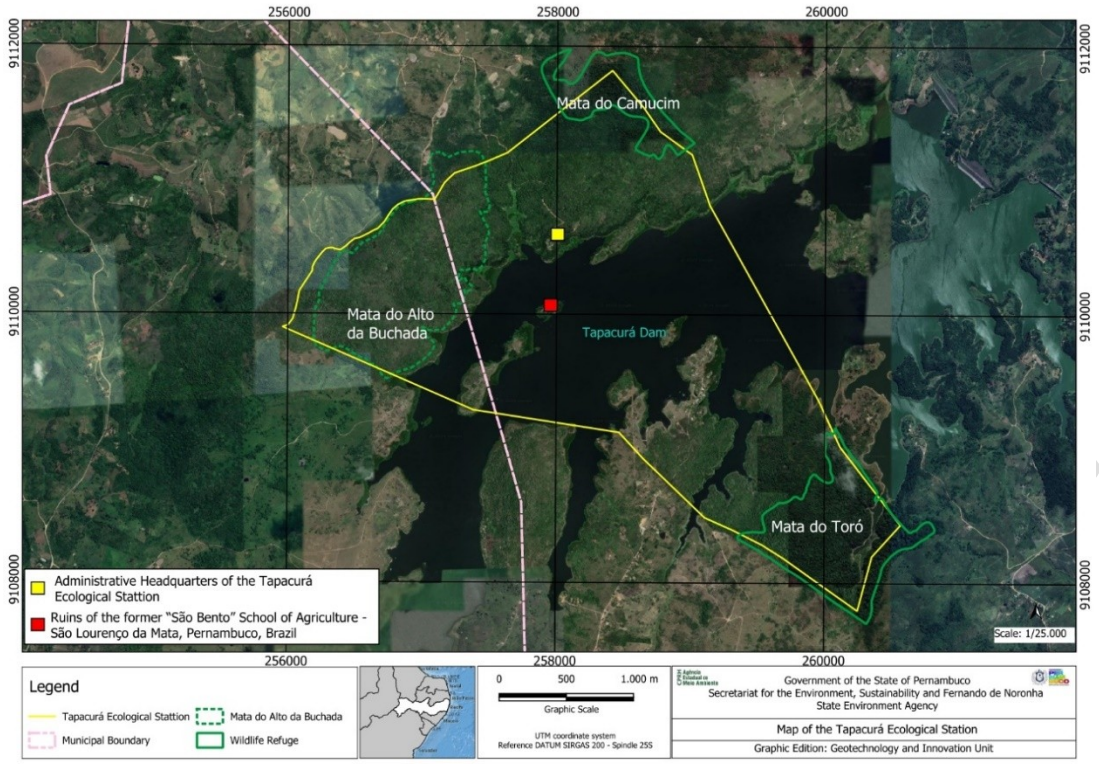

Figure 1. Location of the Tapacurá Ecological Station (yellow polygon), including the forest fragments Mata do Toró, Mata do Camocim, and Mata Alto da Buchada, in the municipality of São Lourenço da Mata, state of Pernambuco, Brazil.

The EET is not part of the Brazilian Conservation Units System (SNUC, in Portuguese acronym; Law No. 9,985/2000; Brasil 2000), being recognized locally only administratively, since it is an advanced campus of UFRPE. However, the Camucim Forest and the Toró Forest that are included in the EET, 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 EET is mainly characterized by sugarcane monocultures but also by small pasture areas and livestock farms. The Mata do Toró fragment 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 EET. We used the following combination of keywords, both in English and in Portuguese: "bats", "Chiroptera", "Pernambuco", "Ecological Station", and "Tapacurá". We also searched for unpublished data in monographs, master thesis and PhD dissertations in the libraries of the three largest universities in Pernambuco: Center of Biosciences of the Federal University of Pernambuco (CB-UFPE - https://attena.ufpe.br/), the Central Library of the Federal Rural University of Pernambuco (UFRPE - http://ww2.bc.ufrpe.br/pergamum/biblioteca/index.php), and the Library of the University of Pernambuco (UPE - https://pergamum.upe.br/). We filtered the results from 1975 to the present date (December 2024), including all 50 years since the creation 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 Federal University of Pernambuco, municipality of Recife, state of Pernambuco, Brazil (UFPE); the Mammal Collection of the Federal University of Paraíba, municipality of João Pessoa, state of Paraíba, Brazil (UFPB); and the Smithsonian Institution, National Museum of Natural History, Washington, United States of America (USNM). 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 EET: Mata do Toró, Mata do Camocim, and Mata 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 Permanent License (SISBIO #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

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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 EET 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).

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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 Camocim, and Mata 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 Alto da Buchada; MC = Mata do Camocim; MT = Mata do Toró. * = Bat species recorded in the diet of *Tyto furcata* (Aves, Tytonidae) by George (1984), Roda (2006), & Pimenta (2016)

Taxon	Trophic guild	Fragment	Reference
Family Emballonuridae Gervais, 1856 (3 genera, 5 species)			
Subfamily Enballonurinae Gervais, 1856			
Peropteryx kappleri Peters, 1867	AI	MC	George (1984); Hood & Gardner (2008)
Peropteryx leucoptera Peters, 1867	AI	MC	Guerra (2007); Neves (2018)
Peropteryx macrotis (Wagner, 1843)	AI	MC	Mares *et al.* (1981); George (1984); Carvalho-Neto (2013); USMN 555698
Rhynchonycteris naso (Wied, 1820)	AI	MC	George (1984); Neves (2018)
Saccopteryx leptura (Schreber, 1774)	AI	MT	George (1984)
Family Phyllostomidae Gray, 1825 (17 genera, 26 species)			
Subfamily Desmodontinae Wagner, 1840			
Desmodus rotundus (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;

Diaemus youngii (Jentnik, 1893)	HE	-	Mares *et al.* (1981); George (1984)
Diphylla ecaudata Spix, 1823	HE	-	Guerra (2007)
Subfamily Glossophaginae Bonaparte, 1845			
Glossophaga soricina (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, ♀ UFPB 1342, ♀ UFPB 1343, ♀ UFPB 1344, ♂ UFPB 1345, ♂ UFPB 1346, ♀ UFPB 1347, ♀ UFPB 1348, ♀ UFPB 1349, ♀ UFPB 1350;
Subfamily Lonchorhininae Gray, 1866			
Lonchorhina aurita Tomes, 1863	GI	MC	Present study
Subfamily Phyllostominae Gray, 1825			
Lophostoma brasiliense Peters, 1867	GI	-	Mares *et al.* (1981); George (1984); Carvalho-Neto (2013); ♀ UFPB 1076
Lophostoma silvicola d'Orbigny, 1836	GI	MC	Guerra (2007); Carvalho-Neto (2013); ♂ UFPE 2110
Macrophyllum macrophyllum (Schinz, 1821)	GI	-	George (1984); Feijó & Langguth (2011); Cruz *et al.* (2012
Phyllostomus discolor Wagner, 1843*	GI/OM	MT, MAB	George (1984); Carvalho-Neto (2013); Pimenta (2016); Neves (2018); ♂ UFPE 2283, ♀ UFPB 1694, ♀ UFPB 1695, ♀ UFPB 1704
Phyllostomus elongatus (E. Geoffroy, 1810)	GI/OM	MT	George (1984)
Phyllostomus hastatus (Pallas, 1767)*	GI/OM	MAB	George (1984); ♂ UFPE 2141, ♀ UFPB 1677
Tonatia bidens (Spix, 1823)	GI	-	George (1984)
Tonatia maresi Williams, Willig & Reid, 1995	GI	-	Guerra (2007)
Trachops cirrhosus (Spix, 1823)	GI/CAR	MT	George (1984); Neves (2018); ♂ UFPE 1021

Subfamily Micronycterinae Van Den Bussche, 1992			
Micronycteris megalotis (Gray, 1842)	GI	-	George (1984)
Micronycteris minuta (Gervais, 1856)	GI	-	Sergio (2012); Neves (2018); UFPE 1083, UFPB 3217
Micronycteris schmidtorum Sanborn, 1935	GI	-	George (1984); Ascorra *et al.* (1991); Simmons (1996); USMN 555703
Subfamily Carolliinae Miller, 1924			
Carollia perspicillata (Linnaeus, 1758)*	FR	MT, MC, MAB	Mares *et al.* (1981); George (1984); Carvalho-Neto (2013); Pimenta (2016); Neves (2018) ♂ UFPE 1809, ♀ UFPE 1811, ♀ UFPE 2133, ♂ UFPE 2134, ♂ UFPE 2135, ♂ UFPE 2136, ♂ UFPE 2281
Subfamily Rhinophyllinae Baker *et al.*, 2016			
Rhinophylla pumilio Peters, 1865	FR	MT	George (1984)
Subfamily Stenodermatinae Gervais, 1856			
Artibeus cinereus (Gervais, 1856)*	FR	MT, MC, MAB	George (1984); Carvalho-Neto (2013); Neves (2018); ♂ UFPE 2379
Artibeus obscurus (Schinz, 1821)	FR	-	Neves (2018)
Artibeus lituratus (Olfers, 1818)	FR	MT, MC, MAB	George (1984); Ascorra *et al.* (1991); Carvalho-Neto (2013); Neves (2018)
Artibeus planirostris (Spix, 1823)*	FR	MT, MC, MAB	George (1984); Araújo & Langguth (2010); Carvalho-Neto (2013); Pimenta (2016); Medeiros-Filho *et al.* (2018); Neves (2018) ♂ UFPE 1813 ♀ UFPE 2148; UFPB 3642, UFPB 3643, UFPB 3654
Chiroderma villosum Peters, 1860	FR	-	Guerra (2007)
Platyrrhinus lineatus (É. Geoffroy, 1810)*	FR	MC	Souza & Araújo (1990); Pimenta (2016); ♂ UFPE 2377
Sturnira lilium (É. Geoffroy, 1810)	FR	-	George (1984); Souza & Araújo (1990); Carvalho-Neto (2013); ♂

			UFPE 1805, ♀ UFPE 1806;
Family Noctilionidae Gray, 1821 **(1 genera, 1 species)**			
Noctilio leporinus (Linnaeus, 1758)*	PI	-	George (1984); Pimenta (2016); ♂ USNM 536439
Family Molossidae Gervais, 1856 **(3 genera, 4 species)**			
Subfamily Molossinae Gervais, 1856			
Cynomops planirostris (Peters, 1866)*	AI	-	Mares *et al.* (1981); George (1984); ♂ USNM 555727
Eumops glaucinus (Wagner, 1843)*	AI	-	George (1984); Roda (2006);
Molossus molossus (Pallas, 1766)*	AI	-	George (1984); Roda (2006); Pimenta (2016)
Molossus rufus É. Geoffroy, 1805*	AI	-	George (1984); Roda (2006); Pimenta (2016); ♂ UFPE 1808
Family Vespertilionidae Gray, 1821 **(2 genera, 4 species)**			
Subfamily Vespertilioninae Gray, 1821			
Lasiurus ega (Gervais, 1856)	AI	-	George (1984)
Lasiurus egregius (Peters, 1870)	AI	-	Guerra (2007)
Subfamily Myotinae Tate, 1942			
Myotis riparius Handley, 1960	AI	-	Willig & Mares (1989)
Myotis lavali 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)			

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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 lavali* 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. lavali* (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 Camocim 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 Alto da Buchada had 8 species, one of which was recorded only in this fragment (Table 1). Among the bat species recorded in the EET (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).

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.

Most of the bat species recorded in the EET 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, 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 EET has one of the richest bat faunas in the Pernambuco Endemism Center - CEPE, 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 CEPE and the patterns found in this region (Feijó *et al.* 2023), the EET stands out for presenting one of the highest values of species richness (40 spp.). In the CEPE, 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 EET 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 EET, 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 PA may be an indication of the integrity of the vegetation in the fragments, as phylostomids 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 EET 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 EET, 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 & Loiselle 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 EET, *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 (Muylaert *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 EET.

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 EET (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.

The present study found a high occurrence of bats from the Molossidae family in the regurgitation pellets of *T. furcata* at the EET. 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. furcata* in the EET 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, Pimenta 2016). The marked representation of insectivorous bats in the diet of *T. furcata* found in the EET (George 1984, Roda 2006, Guerra 2007, Pimenta 2016) is consistent with those found in previous studies conducted in different areas (Motta-Júnior & Alho 2000, Escarlate-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. furcata* 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. furcata* (Roda 2006, Pimenta 2016). 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. fucarta* in the EET (Pimenta 2016).

CONCLUSION

The results from the EET 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 EET 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 Camocim, and Mata 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 EET, 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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