An Acad Bras Cienc (2025) 97(3): e20241169 DOI 10.1590/0001-3765202520241169
Anais da Academia Brasileira de Ciências | *Annals of the Brazilian Academy of Sciences*
Printed ISSN 0001-3765 I Online ISSN 1678-2690
www.scielo.br/aabc | www.fb.com/aabcjournal

ECOSYSTEMS

Bat assemblage and its frugivorous diet in a *Eucalyptus* plantation

FÁBIO ANDRÉ F. JACOMASSA, VANESSA F.C. BORTOLOTTI, PEDRO HENRIQUE MIGUEL & MARCO AURÉLIO PIZO

Abstract: Habitat loss and fragmentation have enormous impacts on biodiversity and tree plantations can help alleviate these impacts. We study bat assemblage, as well as the diet of frugivorous bats in a managed *Eucalyptus* plantation of sustainable use in Rio Claro, São Paulo state, Brazil. We captured 86 bats of nine species, where five species of them ate 17 plant species, mostly pioneers (93.7%). Three species were most dominant, frequent and important in seed dispersal: seba's short-tailed bat (*Carollia perspicillata*), great fruit-eating bat (*Artibeus lituratus*), and little yellow-shouldered bat (*Sturnira lilium*). These species are the most abundant and main seed dispersers in Brazil. Compared to literature data from other *Eucalyptus* plantations, we concluded that our studied *Eucalyptus* area with understory and emerging regenerating native species provided greater diversity than in areas where *Eucalyptus* is used commercially and the understory vegetation is constantly altered; the fruits exploited by these three bat species demonstrates their ability to adapt to food availability and coexist with other species; *Eucalyptus* forests cannot be considered as biological deserts if they are not managed so intensively as in commercial plantations.

Key words: Atlantic Forest, bat-plant interactions, Cerrado, pioneer species, survey.

INTRODUCTION

The pressure on natural forests to deliver economic, social, and environmental services has reached alarming levels (Paquette & Messier 2010). This pressure brings habitat loss and fragmentation, causing great, often irreversible, impacts on biodiversity as extinction of species and its interactions, disrupted communities, and polluted or otherwise disturbed ecosystems. The loss of biodiversity requires urgent implementation of novel forest management approaches that, even if not free of disturbances, enable biodiversity to persist (Noble & Dirzo 1997). Native and exotic tree plantations are of particular importance in this regard since their coverage is rapidly expanding in the tropics (Wright 2005). Tree plantations on cleared, formerly forested lands may be subjected to management approaches that can, in the long term and following biodiversity-friendly practices, be beneficial for biodiversity (Parrotta et al. 1997, Fonseca et al. 2009, Paquette & Messier 2010).

Lower biodiversity is expected in tree plantations when compared to native vegetation areas because of the structural simplification of the forest (Vital 2007). However, these areas cannot be considered as 'biological deserts' (in the sense of having reduced biodiversity), as they provide habitat and resources for a variety of species (Lindenmayer et al. 2003). It has been shown that a high number of species found in native forests can occur in exotic tree plantations, suggesting that these habitats may provide complementary conservation services if properly managed (Barlow et al. 2007).

The area of exotic trees planted for industrial purposes in Brazil totaled 10.2 million hectares in 2023 (with additional 6.91 million hectares of Permanent Preservation Areas, Legal Reserves, and Private Natural Heritage Reserves), corresponding to just over 1% of the Brazilian territory, with predominance of *Eucalyptus* plantations (76%) (IBÁ 2024). In contrast, there are 173 million hectares (20.3% of the Brazilian territory) in protected areas (MMA 2018), representing just over 42% of the forest vegetation that still exist in the Brazilian territory (IBGE 2020a), which contribute enormously to biodiversity conservation.

Although this information is apparently positive for the sake of conservation, about 2,7% of the Brazilian fauna and flora (estimated as 166,246 spp.) is threatened (IBGE 2020b, Brasil 2022), and remaining forest vegetation is continuously fragmented and destroyed. This scenario poses the necessity to study the biodiversity in exotic tree plantations as they are used by many species. Such studies help to develop management techniques to improve the necessary conditions to maintain a diverse tree plantation capable of performing ecological services.

Chiroptera is a group whose presence in tree plantations is desired because of the ecological functions bats provides. It is the second most widely distributed order of mammals with more than 1400 species (Mammal Diversity Database 2024). In Brazil there are 186 species, 68 genus and nine families of bats (Garbino et al. 2024). Phytophagous bats pollinate and disperse seeds, thus influencing plant gene flow, while hematophagous, insectivorous and carnivorous species act to control invertebrate and vertebrate populations (Bredt et al. 1996, Witt & Fabián 2012). As highly mobile animals, bats explore different habitats and contribute to the persistence of many plant species (Bernard & Fenton 2003), being considered excellent indicators of human-induced changes (Fenton et al. 1992, Jones et al. 2009). These animals also provide an immeasurable service in the recovery, restoration and maintenance of habitats (Faria 2006, Lobova et al. 2009, Bredt et al. 2012, Jacomassa et al. 2021).

We investigate the richness, abundance, and fruit diet of a bat assemblage in an old *Eucalyptus* plantation with understory and recruiting native species. Our questions were: how was the bat assemblage structured (species and abundance)? Was the bat diversity greater than in areas where *Eucalyptus* is used commercially and the vegetation is constantly altered? Which frugivorous bats occur at the study area and which fruit species they exploit? The frugivorous bats eat a greater diversity in the study area than in commercial *Eucalyptus* plantations?

MATERIALS AND METHODS

Study area

We conducted the study at the Floresta Estadual Edmundo Navarro de Andrade (FEENA), a protected area of sustainable use in the municipality of Rio Claro, state of São Paulo, Brazil (22°25’ S, 47°33’ W). FEENA is a mosaic with 2,230.53 ha formed predominantly by *Eucalyptus* stands of different species and ages, a few stands of *Pinus* spp., and other exotic and native forest plantations, which are eventual cut and used (Reis et al. 2005, Lopes et al. 2015). *Eucalyptus* stands were planted between 1910 and 1990, which enables the development of well-developed understories and recruiting native plant species in several stands (Reis et al. 2005). The closest native forest fragment (250 ha) is 3 km away, separated from FEENA by sugarcane plantations, which form the predominant matrix (Lopes et al. 2015). The region ranges from 580 to 700 m above sea level and the original vegetation was composed of seasonal semideciduous forest (Atlantic Forest *sensu lato*) with Cerrado influence (Veloso et al. 1991). The climate is warm with dry winters and hot summers (Cwa) (Alvares et al. 2013). The average temperature is 20.6°C in the warmer and 17.1°C in the colder months, while the annual precipitation is on average 1534 mm (Reis et al. 2005). The dry season occurs between April and September, and the wet season from October to March (Alves et al. 2005).

Fieldwork

Bats were captured (IBAMA license 40681-2) every month and with the same effort with mist nets (two 9 × 2.5 m, two 6 × 2.5 m and one 12 × 2.5 m) from April 2014 to March 2015 in different sites of FEENA to cover its various phytophysiognomies, but always within *Eucalyptus* stands. Mist nets were arranged about 20 to 50 m away from each other on trails crossing the *Eucalyptus* stands or along their edges close to wetlands and naturally regenerated vegetation between stands. Nets were placed at the understory (2.5 meters high), opened at dusk and closed after five hours. The calculation of sampling effort followed Straube & Bianconi (2002). Plastic sheets were placed under the nets to optimize the collection of feces, and about the record of captured bats transporting fruits or fruit parts, as well as other items (such as leaves, animals or pollen on their faces) (Galindo-González et al. 2009, Jacomassa et al. 2021).

Mist nets were checked every hour, regardless of the time used to perform the previous review. Captured bats were placed in numbered cotton bags for about 30 minutes, a time sufficient for them to defecate. Feces, either retrieved from bags or from the plastic sheets, were placed in plastic tubes (Eppendorf®) containing 70% alcohol with the individual identification of the specimen. Bats were identified according to Gardner (2008), received a numbered metallic ring on the forearm, and had their morphometric and biological information (sex, age and reproductive status) annotated.

Seeds from fecal samples were identified by comparison with our own seed reference collection. The plant species identified in fecal samples were classified into successional categories (pioneer and secondary) according to the literature (Lorenzi 2016, 2020, 2021, Mentz & Oliveira 2004, Thies & Kalko 2004, Zama et al. 2012). The dietary category of bat species followed Reis et al. (2007). The taxonomic order of bats followed Garbino et al. (2024). For plants, the taxonomic order followed the Angiosperm Phylogeny Group (APG IV 2016), and plant names were validated according to Flora e Funga do Brasil (2024).

Data analyses

Bat abundance and richness

We calculated the dominance (D, number of individuals of each species captured divided by the total number of individuals captured) and constancy (C, percentage of the monthly presence of each species over the sampling months) of bat species. Species with a constancy greater than or equal to 50% were considered common, those with a constancy between 50% and 25% were uncommon species, while species whose constancies were below 25% were considered rare (Ciechanowski 2002).

We used the first-order Chao richness estimators (Chao1), which considers rare species and their incidence (Chao 1984), and second-order Jackknife (Jack2), which is the most efficient in estimating bat species richness considering an incomplete inventory

(Rex et al. 2008). Both estimators are widely used in species assemblage studies (Gotelli & Colwell 2010). Diversity was expressed as the Shannon-Wiener index (H'), which gives greater weight to rare species and is widely used in ecological studies, thus permitting the easy comparison with other studies. To assess sampling completeness, collector curves were made based on the addition of new species over the monthly samplings as well as the number of individuals captured.

We used the Bray-Curtis index to access the similarity of our bat assemblage with other *Eucalyptus* areas. We compared our data with Hayashi (1996), who worked in an abandoned monoculture of *Eucalyptus* with understory composed by small pioneer plants about 100 km from our study area, Lima (2008), who worked in several plots of *Eucalyptus* spp. with poorly developed understory used for the production of cellulose 360 km distant from FEENA, and Pina et al. (2013), who studied *Eucalyptus* plantations without understory, 640 km from FEENA. We used these studies because they are the only ones that sampled bats in *Eucalyptus* plantations in Brazil, and used mist nets placed at the understories. For more details on the cited studies see Table II. Analyses were performed using the PAST 4.03 statistical package (Hammer et al. 2001).

Frugivory by bats

To evaluate the contribution of each bat and plant species to the seed dispersal process, we used the importance index (Ij) developed by Murray (2000). This index is calculated using the formula: Ij = Σ [(C*ij*/*Ti*)/*S* where *Ti* is the total number of bat species feeding on plant species *i* or the total number of plant species i on the diet of bat species *i*, and *S* is the total number of plant or bat species include in the sample. C*ij* is 1 if the bat species ate the plant species or 0 if not (presence or absence of interaction). Note that this index allows one to estimate the community-level contribution of a species as a function not only of the number of interactions it performs, but also of the number of other taxa that interact with the same species (Silva et al. 2002).

RESULTS

Bat species richness and abundance

We made 86 captures of nine species from two families of bats, including two recaptures (2.3% of recapture rate; capture success of 0.013 captures/m^2.h) of 84 individuals (monthly average of 7.1 ± 1.6 captures, with a minimum of one capture in September and a maximum of 21 in February) with a total sampling effort of 6,300 m^2.h (525 m^2.h per month). Phyllostomidae was the family mostly captured (eight species; 98.8% of the captures), while Vespertilionidae had only one species. Frugivorous bats form the bulk of species and captures (90.6%). *Artibeus lituratus* (Olfers, 1818), *Carollia perspicillata* (Linnaeus, 1758) and *Sturnira lilium* (È. Geoffroy, 1810) were dominant, with 83.7% of the captures, all of them considered common species, while the other species were considered rare (Table I).

The species richness was estimated at 10.36 (Chao1) and 13.49 (Jack2) species, meaning that our inventory reached, respectively, 86.8% and 66.7% of the estimated species richness. The species accumulation curves stopped increasing in the 9th month of sampling (75% of sampling) and in the 49th capture (57% of captures) (Figures 1a and b). The diversity index H' (Shannon-Wiener) was 1.61. Our bat assemblage was more similar to the Hayashi (1996), followed by Lima (2008) and Pina et al. (2013) (Table II).

Some individuals were collected to confirm species identification and were deposited in the Mammal Collection of the Museum of Zoology

Table I. Bat species and their feeding guilds (G: frugivorous = f, nectarivorous = n, insectivorous = i), number of captures (C) and recaptures (parentheses), dominance (D%) and constancy (C%) in the study area. Species with C ≥ 50% are considered common, 25% ≤ C ≥ 50% are considered uncommon, and C ≤ 25% are considered rare.

Family/Species	G	C	D%	C%
Phyllostomidae				
Micronycteris megalotis (Gray, 1842)	i	1	1.16	0.8
Anoura caudifer (È. Geoffroy,1818)	n	1	1.16	0.8
Glossophaga soricina (È. Geoffroy,1810)	n	5	5.81	4.2
Carollia perspicillata (Linnaeus, 1758)	f	25 (2)	29.07	66.6
Artibeus fimbriatus (Gray, 1838)	f	4	4.65	3.3
Artibeus lituratus (Olfers, 1818)	f	26	30.23	75
Platyrrhinus lineatus (È. Geoffroy,1810)	f	2	2.33	1.7
Sturnira lilium (È. Geoffroy,1810)	f	21	24.42	50
Vespertilionidae				
Myotis nigricans (Schinz, 1821)	i	1	1.16	0.8
Total		**86 (2)**	**100**	

(ZUEC-Mam) of the Universidade Estadual de Campinas (Unicamp), Brazil. The collected individuals were an adult female of *Anoura caudifer* (È. Geoffroy, 1818) (ZUEC-Mam 2702), a juvenile male of *Glossophaga soricina* (È. Geoffroy, 1810) (ZUEC-Mam 2706), and an adult male of *Micronycteris megalotis* (Gray, 1842) (ZUEC-Mam 2726).

During the fieldwork period we occasionally recorded other three bat species in FEENA: *Molossus molossus* (Pallas, 1766) (insectivorous) in a roost with some individuals found on April below the roof of FEENA's administrative headquarters; *Desmodus rotundus* (È. Geoffroy, 1810) (hematophagous) in a roost with about eight individuals found on May under a bridge of the Ribeirão Claro; and *Chrotopterus auritus* (Peters, 1856) (carnivorous) when in October we saw two flying specimens inside a building used as a warehouse. These species were not included in the analyses as they were not captured in our mist net samplings. We also recorded other diurnal roosts with *C. perspicillata, G. soricina, A. caudifer* and *M. megalotis* inside abandoned houses.

Frugivory by bats

A total of 51 fecal samples (from 59.3% of the captured bats) were collected from seven bat species, 46 of which (that came from five Phyllostomidae species) contained seeds (monthly average of 3.8 ± 1.0 samples, ranging from none in September to 13 samples in February). These fecal samples contained a total of 5,354 seeds from 17 species from six plant families. Fourteen of the samples contained seeds of two or three plant species. Fecal samples of *C. perspicillata* contained seeds of two species of plants on six occasions and three species on three occasions, and fecal samples of *S. lilium* contained seeds of two plant species on seven occasions. One fecal sample of *C. perspicillata* besides seeds contained parts of caterpillars and leaf fragments. Five fecal samples not contained seeds. Three of them contained pulp of fleshy fruits (such in *G.*

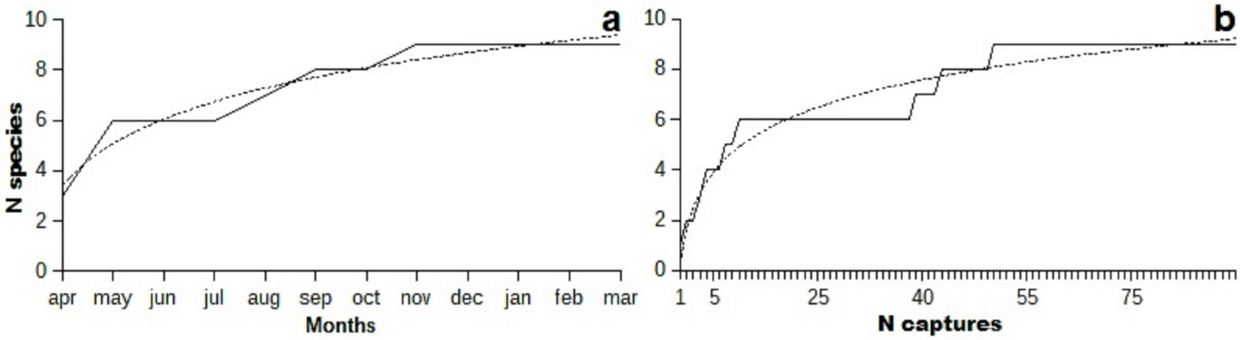

Figure 1. Species accumulation curves by months (a), and by number of captures (b), both with logarithmic trends (dashed lines).

soricina, *A. lituratus* and *S. lilium*), and two only had insect fragments (one of each *G. soricina* and *M. megalotis*). We did not record any other form of frugivory (such bats transporting large-seeded fruits in the mouth).

Most of the seeds (93.7%) and seed species (94.1%) were pioneers. They were present in 97.8% of fecal samples. Piperaceae was the most frequent plant family, with two of six species (*Piper aduncum* L. and *P. amalago* L.) accounting for 60% of seeds collected. *Carollia perspicillata* and *S. lilium* were responsible for 84.8% of the seed-containing fecal samples and 76.5% of the plant species found (13 species), with a predominance of Piperaceae. *Piper aduncum* was consumed by 80% of the bat species. Regarding the contribution of the species to the seed dispersal process (Ij), the bats *C. perspicillata* (Ij = 0.426), *A. lituratus* (0.220) and *S. lilium* (0.279), and the plants *P. aduncum* (0.285) and *Cecropia pachystachya* Trec. (0.200) were the most important (Table III).

DISCUSSION

Bat richness and abundance

We got similar bat species richness (ranging from eight to 11 species) to other studies carried out in *Eucalyptus* plantations in Brazil. In addition to the studies listed in Table II that we used for comparison, Homem et al. (2020) found 11 species (abundance not quantified), with 349,749 m^2.h of sampling effort in an *Eucalyptus* plantation in 25 sampling months (between 2007 and 2011 in mixed area of Atlantic forest and Cerrado). The low number of recaptures we obtained likely reflects the large area of FEENA (> 2,000 ha) which provides a vast habitat to be explored by bats (Fleming 1988, 1991, Voigt et al. 2017). It should be noted that our study showed greater diversity index than the other studies, possibly because our study area has well-developed understory with native trees recruiting among the planted *Eucalyptus*, thus providing a more heterogeneous and complex habitat. Pedro & Taddei (1997) considered that a Shannon diversity index close to 2.0 reflect a high number of individuals in a given area, with few dominant species. The greater similarity in species composition with the study by Hayashi (1996) probably occurred because, in addition to the shorter distance between the areas (100 km), both areas have similar habitat with vegetation composed of seasonal semideciduous forest with Cerrado influence (Veloso et al. 1991).

Species accumulation curves (either based on monthly captures or individual captures) did not present an asymptote, suggesting that the sampling effort was not enough to sample all species, which is reinforced by the estimated species richness we obtained. So, we were

Table II. Comparative data with the bat assemblages sampled in other *Eucalyptus* plantations. Approximate age of plantation during sampling (age), area (ha), biomes (Atlantic Forest - AF; Cerrado - CE; and mixed between the two - MX), understory development, number (N) of captures, number (N) of frugivorous species, number (N) of plant species consumed, sampling effort (m^2.h), diversity index (H'), percentage similarity (%), and distance (km) to our study area. All the values were found or calculated from the data available in the original papers.

	Our study	Hayashi 1996	Lima 2008	Pina et al. 2013
age (years)	24 - 104	40 - 50	20	-
area (ha)	2,230.53	1.37	30	150 - 378.2
biomes	MX	MX	AF	CE
understory	developed	poorly	poorly	without
N captures	86	130	86	75
N species	9	10	11	8
N frugivorous	5	7	5	-
N plant species	17	13	8	-
sampling effort	6,300	37,440	6,720	24,000
H'	1.76	1.55	1.19	1.28
%	-	72	26	38
km	-	100	360	640

not able to sample all species occurring in the area because our sampling with mist nets was restricted to species that move in the understory (where most of the food resources for frugivorous bats like Phyllostomidae are found, Pedro & Taddei 1997). We found three other species (which were also captured with mist nets in the undestory) when using another method (search for shelters), totaling 12 species (also totaling three families and five feeding guilds). This only reinforces that for bat species surveys it is important to use several methods for increasing the number of species sampled in a locality (Bernardi et al. 2009).

The dominant species in this study (*Artibeus lituratus*, *C. perspicillata* and *S. lilium)* are among the five most abundant in Brazil, commonly found in altered areas in fragmented landscapes, secondary forests, and areas of lower structural complexity due to their ecological plasticity, including their diet (Marinho-Filho 1991, Cosson et al. 1999, Schulze et al. 2000, Medellin et al. 2000, Estrada & Coates-Estrada 2001, Gorresen & Willig 2004, Faria 2006, Muscarella & Fleming 2007, Mello & Passos 2008, Bredt et al. 2012). The most abundant species were *Sturnira lilium* in the studies by Hayashi (1996) and Lima (2008), and *Carollia perspicillata* in the study by Pina et al. (2013), two of the three most abundant species in our study. The presence of a few species, some of which abundant and generalist, is typical of altered habitats that characteristically have a greater number of individuals of few species, while preserved environments have a greater diversity of species (Muller & Reis 1992). In commercial plantations, bat communities are made up mainly of generalist species of forest edge, while the greater diversity of the vegetation in native forests allow for specialist species (Zurita et al. 2006).

Table III. Number and percentage of seed-containing fecal samples of bat species. Plant successional category: pioneer = ᵖ; and secondary = ˢ. Bats: *Carollia perspicillata* = Cp; *Anoura caudifer* = Ac; *Artibeus lituratus* = Al; *Platyrrhinus lineatus* = Pl; and *Sturnira lilium* = Sl. Total samples (Ts). Total bat species (Tb). Importance index for plant and bat species = Ij. Some values cited in the text are highlighted in bold or italic.

Bat species	**Cp**	**Ac**	**Al**	**Pl**	**Sl**	**Ts**	**Tb**	**Ij**
Families and plant species	**N(%)**	**N(%)**	**N(%)**	**N(%)**	**N(%)**	**N(%)**	**N (%)**	
Moraceae						3(**60**)		
Ficus citrifolia Mill.[p]			1(20)			1(1.5)	1(20)	0.040
Ficus obtusifolia Kunth[p]			1(20)			1(1.5)	1(20)	0.040
Ficus sp 1			1(20)		1(4.3)	2(3.1)	2(40)	0.065
Myrtaceae								
Psidium guajava L.[p]	1(2.8)				2(8.7)	3(4.6)	2(20)	0.045
Piperaceae	30(**85.5**)				19(**78.1**)	50(**77**)		
Piper aduncum L.[p]	15(42.8)	1(100)	1(20)		6(26)	23(35.4)	4(**80**)	**0.285**
Piper amalago L.[p]	6(17.1)				10(43.5)	16(24.6)	2(40)	0.045
Piper arboreum Aulb.[p]	4(11.4)					4(6.2)	1(20)	0.020
Piper peltatum L.[p]	4(11.4)					4(6.2)	1(20)	0.020
Piper sp 1[p]					1(4.3)	1(1.5)	1(20)	0.025
Piper sp 2[p]	1(2.8)				1(4.3)	2(3.1)	2(40)	0.045
Solanaceae						5(**7.7**)		
Solanum granulosoleprosum Dunal[p]	1(2.8)				1(4.3)	2(3.1)	2(40)	0.045
Solanum pseudocapsicum L.[p]	1(2.8)					1(1.5)	1(20)	0.020
Solanum sanctae-catharinae Dunal[p]	1(2.8)					1(1.5)	1(20)	0.020
Solanum variabile Mart.[p]	1(2.8)					1(1.5)	1(20)	0.020
Rubiaceae								
Genipa americana L.[p]					1(4.3)	1(1.5)	1(20)	0.025
Urticaceae						2(**3.1**)		
Cecropia pachystachya Trec.[p]				1(100)		1(1.5)	1(20)	**0.200**
Coussapoa microcarpa Schott [s]			1(20)			1(1.5)	1(20)	0.040
Total samples and percentage	35(100)	1(100)	5(100)	1(100)	23(100)	65(100)		
Total of plant species	**10**	1	5	1	**8**	**17**		
Ij	**0.426**	0.014	**0.220**	0.058	**0.279**			

The dominance of frugivores in bat assemblages is a recurrent pattern in studies in the Neotropical region (Fenton et al. 1992, Kalko 1998, Simmons & Voss 1998, Schulze et al. 2000, Gorresen & Willig 2004). The great representativeness of such diet category can be explained by the fact that Phyllostomidae is the richest bat family in Brazil (96 species, 51% of the species) (Garbino et al. 2024), and to the use of mist nets in the understory, a less efficient method for capturing insectivores from the families Vespertilionidae and Molossidae that have a higher ability to detect and avoid nets or, like Molossidae, that use more frequently the forest canopy and aerial space above it (Pedro & Taddei 1997, Gregorin et al. 2017, Delgado-Jaramillo et al. 2020).

Phyllostomidae also has the greatest ecological diversity among mammals, including frugivores, nectarivores, carnivores, insectivores and hematophagous species (Fleming 1988, Kalko 1997). Petchey & Gaston (2002) point out that the complementarity in the use of resources is a process that links diversity with ecosystem functioning. So, it should be highlighted the importance of the Phyllostomidae species in an *Eucalyptus* plantation like FEENA, where they likely perform fundamental ecological services such as seed dispersal, pollination and population control of insects and other animals.

Frugivory by bats

In other *Eucalyptus* forests, Hayashi (1996) found seven species of bats consuming 13 plants, while Lima (2008) found eight plants consumed by five bat species. We recorded so far the largest number of plant species consumed by bats in an *Eucalyptus* plantations in Brazil (17 plants, even with a smaller sampling effort, see Table II), with emphasis on pioneer plants, even though there was an invasive exotic species (*Psidium guajava* L., Richardson & Rejmanék 2011). Frugivorous bats contribute to the establishment of many plant species, especially pioneers (Galetti & Morellato 1994, Passos et al. 2003). The fact that pioneer species serve as food for fruit bats may explain their commonness in areas where vegetation has been altered, such as forest fragments, edges and clearings, where the seed dispersal they promoted is important to start the succession process. (Medellin & Gaona 1999, Laurence et al. 2002, Clarke et al. 2005). There are evidence that plantations can facilitate forest succession in their understories through modification of both physical and biological conditions (Parrotta et al. 1997, Fonseca et al. 2009). Such modifications, as changes in light, temperature and moisture at the soil surface, for example, enable germination and growth of seeds transported to the site by wildlife and other vectors from adjacent forest remnants (Parrotta et al. 1997).

The interactions between bats and plants were marked by a certain heterogeneity, where a few species (n = 5) interacted with a considerable number of plants (n = 17) compared to other studies. *Anoura caudifer* and *Platyrrhinus lineatus* (È. Geoffroy, 1810) interacted with only one plant, however these species were captured a few times, suggesting that the low number of interaction is most likely caused by the low number of captures of these species. The most dominant species (and one of the most frequent), *C. perspicillata*, is tolerant to changes in the environment, and can feed on a wide variety of fruits (Galindo-González 2004, Passos et al. 2003). This species had the highest number of interactions and the highest importance value in the dispersal of seeds. It prefers Piperaceae fruits (Gardner 1977) in such a way that the fruiting period of *Piper* spp. is one of the variables that directly affects the reproductive period of this species (Mello et al. 2004). The presence of *C. perspicillata* in areas where fragmentation and habitat modification processes occur can thus be related to the fact that it feeds on pioneer plants (*Piper* spp.) that are generally abundant in the margins of forest fragments and in secondary forests. However, when there are no fruits of this genus available, the species can feed on fruits of Solanaceae and Urticaceae (the formerly Cecropiaceae) (Mello et al. 2004). The importance of the species as seed disperser is related to the consumption of a great variety of fruits, covering long distances in search of food and defecating in temporary shelters used for resting intervals (Fleming 1988), as observed in the study area.

The diet of *Sturnira lilium* includes several plant families, but is concentrated on Solanaceae, mainly the genus *Solanum* (Passos et al. 2003, Jacomassa et al. 2021). Bats of this species are considered efficient dispersers of this genus due to the long distances they travel and their high abundance in different locations (Mello et al. 2008, Jacomassa et al. 2021). This species consumes a wide variety of fruits, as well as insects and pollen (Gardner 1977, Gannon et al. 1989, Jacomassa et al. 2021), which may explain the consumption of other families such as Piperaceae, Myrtaceae, Moraceae and Rubiaceae in places where there is no Solanaceae or its abundance is low.

Artibeus lituratus ingested mostly fruits of Moraceae, being specialist in the fruits of this family, especially in the genus *Ficus* and *Cecropia* (today Urticaceae) (Fleming 1986). As both were found in their diet, in addition to *Piper aduncum*, plant species that presented the greater importance in the seed dispersal process by bats, attention should be paid to the availability of these fruits in the study area throughout the year.

When there is a lack of food, the bat species we sampled has great food plasticity and can feed on a variety of plant matter, such as fruits, flowers, leaves and insects (Gardner 1977, Galetti & Morellato 1994, Passos & Graciolli 2004, Laurindo & Vizentin-Bugoni 2020). These species have great ecological flexibility and can exploit such food resources in different habitats, migrating when there is a shortage of food (Galetti & Morellato 1994, Zortéa & Chiarello 1994, Passos et al. 2003, Laurindo & Vizentin-Bugoni 2020, Jacomassa et al. 2021).

Piper aduncum was the most important plant (Ij) dispersed in the area, likely because it was dispersed by the most important bat seed disperser (*C. perpicillata*), and by the greatest number of species (n = 4 species). *Cecropia pachystachya*, another important pioneer plant in the study region and the second most important dispersed plant, stood out as it was consumed exclusively by one bat species (*P. lineatus*). *Ficus obtusifolia* Kunth, *Psidium guajava* and *Genipa americana* L. identified in fecal samples of *S. lilium*; *P. aduncum* in *Anoura caudifer*; *Solanum pseudocapsicum* L. and *S. sanctae-catharinae* Dunal in *C. perspicillata*; and *Coussapoa microcarpa* Schott in *A. lituratus* were not previously identified in the diet of these bat species. *Coussapoa microcarpa* is described here for the first time in the diet of bats (Fabián et al. 2008, Lobova et al. 2009, Bredt et al. 2012, Laurindo & Vizentin-Bugoni 2020). It is important to note, however, that the methodology used here, although common in diet studies of fruit bats, is limited to characterize the total diet of these animals since many fruits with large seeds that do not pass through the digestive tract are usually not sampled (Galetti & Morellato 1994, Zortéa & Chiarello 1994). Although it is possible to capture bats carrying such fruits when they fall a in mist net (Jacomassa et al. 2021), this did not occur in this study.

Finally, planted forests can contribute to conserve biodiversity when they have an well-developed understory (Fonseca et al. 2009).

Although there is evidence that over time an abandoned area of *Eucalyptus* may present a simplified vegetation structure compared to native vegetation (Vital 2007), they can serve as habitat for bats (and other species, Lindenmayer et al. 2003, Lopes et al. 2015), which may disperse seeds, mainly of pioneer plants, promoting its biodiversity. There are gaps of knowledge about how the fauna in general behaves in exotic tree plantations. In particular, we lack more studies that assess the ecological interactions that are important for the resilience of biodiversity and long-term monitoring of the fauna and their ecological relationships in such areas. There are also few studies on bats in exotic tree plantations, especially addressing questions related to its functional diversity and ecological aspects.

Acknowledgments

We thank Calebe P. Mendes, Paulo R. Siqueira, Marcelle Pedrosa, Patricia K. Rogeri, Rafael S.C. Alves, Gabriel Silva, Jamile Crispiniano, Bianca Costa and Vivian Robinson for fundamental aid. We also thank Ivan Sazima curator of the Mammal Collection of the Museum of Zoology (ZUEC-Mam) of the Universidade Estadual de Campinas (Unicamp), Brazil, for receiving the testimonial specimens. Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) provided scholarship to F.A.F. Jacomassa, and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) provided a research grant to M.A. Pizo (309542/2023-5). Finally, we acknowledge the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) for providing license 40681-2, and Jessie Palma, Sergio R. Christofoletti, Alcides G. Filho and the Instituto Florestal do Estado de São Paulo (IF) for the permission to work at (Floresta Estadual Edmundo Navarro de Andrade) FEENA.

REFERENCES

ALVARES CA, STAPE JL, SENTELHAS PC, MORAES G, LEONARDO J & SPAROVEK J. 2013. Köppen's climate classification map for Brazil. Meteorol Z 22(6): 711-728. https://doi.org/10.1127/0941-2948/2013/0507.

ALVES LM, MARENGO JA, CAMARGO-JR H & CASTRO C. 2005. Início da estação chuvosa na região Sudeste do Brasil: Parte 1 - Estudos observacionais. Rev Bras Meteorol 20(3): 385-394.

APG IV – THE ANGIOSPERM PHYLOGENY GROUP. 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. Bot J Linn Soc 181: 1-20.

BARLOW J ET AL. 2007. Quantifying the biodiversity value of tropical primary, secondary, and plantation forests. PNAS USA 104(47): 18555-18560.

BERNARD E & FENTON MB. 2003. Bat mobility and roosts in a fragmented landscape in Central Amazonia, Brazil. Biotropica 35(2): 262-277.

BERNARDI IP, MIRANDA JMD, SPONCHIADO J, GROTTO E, JACOMASSA FAF, TEIXEIRA EM, ROANI SH & PASSOS FC. 2009. Morcegos de Frederico Westphalen, Rio Grande do Sul, Brasil (Mammalia: Chiroptera): Riqueza e utilização de abrigo. Biota Neotrop 9(3): 349-354.

BRASIL. 2022. Portaria MMA N° 148, de 7 de junho de 2022.

BREDT A ET AL. 1996. Morcegos em áreas urbanas e rurais: manual de manejo e controle. Distrito Federal: Fundação Nacional de Saúde, Ministério da Saúde, 117 p.

BREDT A, UIEDA W & PEDRO WA. 2012. Plantas e morcegos na recuperação de áreas degradadas e na paisagem urbana. Brasília: Rede de Sementes do Cerrado, 273 p.

CHAO A. 1984. Nonparametric estimation of the numbers of classes in a population. Scand J Statist 11(4): 265-270.

CIECHANOWSKI M. 2002. Community structure and activity of bats (Chiroptera) over different water bodies. Mamm Biol 67(5): 276-285.

CLARKE FM, PIO DV & RACEY PA. 2005. A comparison of logging systems and bat diversity in the neotropics. Conserv Biol 19(4): 1194-1204.

COSSON J, PONS J & MASSON D. 1999. Effects of forest fragmentation on frugivorous and nectarivorous bats in French Guiana. J Trop Ecol 15(4): 515-534.

DELGADO-JARAMILLO M, AGUIAR LMS, MACHADO RB & BERNARD E. 2020. Assessing the distribution of a species-rich group in a continental-sized megadiverse country: Bats in Brazil. Divers Distrib 26(5): 632-643.

ESTRADA A & COATES-ESTRADA R. 2001. Bat species richness in live fences and in corridors of residual rain forest vegetation at Los Tuxtlas, Mexico. Ecography 24(1): 94-102.

FABIÁN ME, RUI AM & WAECHTER JL. 2008. Plantas utilizadas como alimento por morcegos (Chiroptera, Phyllostomidade), no Brasil. In: Reis NR et al. (Eds), Ecologia de Morcegos, Londrina: Technical Books, p. 51-70.

FARIA D. 2006. Phyllostomid bats of a fragmented landscape in the north-eastern Atlantic forest, Brazil. J Trop Ecol 22(5): 531-542.

FENTON MB, ACHARYA L, AUDET D, HICHEY MBC, MERRIMAN C, OBRIST MK, SYME DM & ADKINS B. 1992. Phyllostomid bats (Chiroptera: Phyllostimidae) as indicators of habitat disruption in the neotropics. Biotropica 24(3): 440-446.

FLEMING TH. 1986. Opportunism versus specialization: evolution of feeding strategies in frugivorous bats. In: Estrada A & Fleming TH (Eds), Frugivores and seed dispersal, Dordrecht: Dr. W. Junk Publisher, p. 105-118.

FLEMING TH. 1988. The short-tailed fruit bat: a study in plant animal interaction. v. 1, Chicago: The University of Chicago Press, 365 p.

FLEMING TH. 1991. The relationship between body size, diet, and habitat use in frugivorous bats, genus *Carollia* (Phyllostomidae). J Mamm 72(3): 493-501.

FLORA E FUNGA DO BRASIL. 2024. Jardim Botânico do Rio de Janeiro. Available at: http://floradobrasil.jbrj.gov.br/; Accessed on October 10, 2024.

FONSECA CR ET AL. 2009. Towards and ecologically-sustainable forestry in the Atlantic Forest. Biol Conserv 142(6): 1209-1219.

GALETTI M & MORELLATO LPC. 1994. Diet of the large fruit-eating bat *Artibeus lituratus* in a forest fragment in Brasil. Mammalia 58(4): 661-665.

GALINDO-GONZÁLEZ J. 2004. Clasificación de los murciélogos de la región de los Tuxtlas, Veracruz, respecto a su respuesta a la fragmentación del hábitat. Acta Zool Mex 20(2): 239-243.

GALINDO-GONZÁLEZ J, VÁZQUEZ G, SALDAÑA RA & HERNÁNDEZ JR. 2009. A more efficient technique to collect seeds dispersed by bats. J Trop Ecol 25(2): 205-209.

GANNON MR, WILLING MR & JONES JK. 1989. *Sturnira lilium*. Mamm Species 333: 1-5.

GARBINO GST ET AL. 2024. Updated checklist of bats (Mammalia: Chiroptera) from Brazil. Zoologia 41: e23073.

GARDNER AL. 1977. Feeding habitats. In: Baker RJ et al. (Eds), Biology of bats on the New World Family Phyllostomatidae - Part II, Tex Tech Univ Spec publ Mus 13: 293-350.

GARDNER AL. 2008. Mammals of South America. Volume 1: Marsupials, Xenarthrans, Shrews, and Bats. Chicago and London: The University of Chicago Press, 690 p.

GORRESEN PM & WILLIG M. 2004. Landscape responses of bats to habitat fragmentation in Atlantic rain-forest of Paraguay. J Mammal 85(4): 688-697.

GOTELLI NJ & COLWELL RK. 2010. Estimating species richness. In: Magurran AE & McGill BJ (Eds), Biological Diversity: Frontiers in measuring biodiversity, New York: Oxford University Press, p. 39-54.

GREGORIN R, BERNARD E, LOBÃO KW, OLIVEIRA LF, MACHADO FS, GIL BB & TAVARES VC. 2017. Vertical stratification in bat assemblages of the Atlantic Forest of south-eastern Brazil. J Trop Ecol 33(5): 299-308.

HAMMER Ø, HARPER DAT & RYAN PD. 2001. Past - Paleontological statistics software package for education and data analysis. Palaeontol Electron 4(1): 1-9.

HAYASHI MM. 1996. Morcegos frugívoros em duas áreas alteradas da fazenda Lageado, Botucatu, Estado de São Paulo. PhD thesis, Univ. Estadual Paulista, Botucatu, SP, Brazil, 112 p.

HOMEM DH, LIMA EF, NOBRE RA, COLAS-ROSAS PF, TREVELIN LC & LIMA ALA. 2020. Mammal fauna in *Eucalyptus* plantations and forest remnants in Três Lagoas, Mato Grosso do Sul, Brazil. Oecol Aust 24(1): 109-126.

IBÁ. 2024. Report 2024. São Paulo e Brasília: IBÁ - Indústria Brasileira de Árvores, 99 p.

IBGE. 2020a. Monitoramento da cobertura e uso da terra do Brasil: 2016 - 2018. Ministério da Economia. Rio de Janeiro: Coordenação de Recursos Naturais e Estudos Ambientais, Coordenação de Contas Nacionais - IBGE, 27 p.

IBGE. 2020b. Contas de ecossistemas: espécies ameaçadas de extinção no Brasil. Contas Nacionais n. 75. Rio de Janeiro: Coordenação de Recursos Naturais e Estudos Ambientais, Coordenação de Contas Nacionais - IBGE, 132 p.

JACOMASSA FAF, BERNARDI IP& PASSOS FC. 2021. Seasonal diet variation, preferences and availability of resources consumed by *Sturnira lilium* (É. Geoffroy St.-Hilaire, 1810) (Chiroptera: Phyllostomidae) in Brazilian seasonal deciduous forest. An Acad Bras Cienc 93: e20201571. DOI 10.1590/0001-3765202120201571.

JONES G, JACOBS DS, KUNZ TH, WILLIG MR & RACEY PA. 2009. Carpe noctem: the importance of bats as bioindicators. ERS 8: 93-115.

KALKO EKV. 1997. Diversity in tropical bats. In: Ulrich H (Ed), Tropical biodiversity and systematics, Germany: Zoologisches Forschungsinstitut und Museum Alexander Koenig, p. 13-43.

KALKO EKV. 1998. Organization and diversity of tropical bat communities through space and time. Zoology 101: 281-297.

LAURENCE WF, LOVEJOY TE, VASCONCELOS HL, BRUNA EM, DIDHAM RK, STOUFFER PC, GASCON C, BIERREGAARD RO, LAURENCE SG & SAMPAIO E. 2002. Ecosystem decay of Amazonian Forest fragments: a 22-year investigation. Conserv Biol 16(3): 605-618.

LAURINDO RS & VIZENTIN-BUGONI J. 2020. Diversity of fruits in *Artibeus lituratus* diet in urban and natural habitats in Brazil: a review. J Trop Ecol 36(2): 65-71.

LIMA IP. 2008. Morcegos (Mammalia; Chiroptera) de áreas nativas e áreas reflorestadas com *Araucaria augustifolia*, *Pinus taeda* e *Eucalyptus* spp. na Klabin – Telêmaco Borba, Paraná, Brasil. PhD thesis, Univ. Federal Rural do Rio de Janeiro, Seropédica, RJ, Brasil 100 p.

LINDENMAYER DB, HOBBS RJ & SALT D. 2003. Plantation forests and biodiversity conservation. Aust For 66(1): 62-66.

LOBOVA TA, GEISELMAN CK & MORI SA. 2009. Seed dispersal by bats in the Neotropics. New York: The New York Botanical Garden Press, 471 p.

LOPES IT, GUSSONI COA, DEMARCHI LO, ALMEIDA A & PIZO MA. 2015. Diversity of understory birds in old stands of native and *Eucalyptus* plantations. Restor Ecol 23(5): 662-669.

LORENZI H. 2016. Árvores brasileiras: manual de identificação e cultivo de plantas arbóreas nativas do Brasil. v. 1, 5th ed., Nova Odessa: Editora Plantarum, 385 p.

LORENZI H. 2020. Árvores brasileiras: manual de identificação e cultivo de plantas arbóreas nativas do Brasil. v. 1, 8th ed., Nova Odessa: Editora Plantarum, 385 p.

LORENZI H. 2021. Árvores brasileiras: manual de identificação e cultivo de plantas arbóreas nativas do Brasil. v. 3, 3rd ed., Nova Odessa: Editora Plantarum, 385 p.

MAMMAL DIVERSITY DATABASE. 2024. Mammal Diversity Database *(Version 1.13)*. Available at: https://zenodo.org/records/12738010. Accessed October 15, 2024.

MARINHO-FILHO JS. 1991. The coexistence of two frugivorous bat species and the phenology of their food plants in Brazil. J Trop Ecol 7(1): 59-67.

MEDELLIN RA, EQUIHUA M & AMIN MA. 2000. Bat diversity and abundance as indicators of disturbance in Neotropical rainforests. Conserv Biol 14(6): 1666-1675.

MEDELLIN RA & GAONA O. 1999. Seed dispersal by bats and birds in forest and disturbed habitats of Chiapas, Mexico. Biotropica 31(3): 478-485.

MELLO MAR, KALKO EKV & SILVA WR. 2008. Diet and abundance of the bat *Sturnira lilium* (Chiroptera) in a Brazilian Montane Atlantic Forest. J Mammal 89(2): 485-492. https://doi.org/10.1644/06-MAMM-A-411R.1.

MELLO MAR & PASSOS FC. 2008. Frugivoria em morcegos brasileiros. P. In: Pacheco SM et al. (Eds), Morcegos do Brasil: Biologia, Sistemática, Ecologia e Conservação, Porto Alegre: Armazém Digital, p. 221-232.

MELLO MAR, SCHITTINI GM, SELIG P & BERGALLO HG. 2004. A test of the effects of climate and fruiting of *Piper* species (Piperaceae) on reproductive patterns of the bat *Carollia perspicillata* (Phyllostomidae). Acta Chirop 6(2): 309-318.

MENTZ LA & OLIVEIRA PL. 2004. *Solanum* (Solanaceae) na região Sul do Brasil. Pesquisas Bot 54: 1-327.

MMA. 2018. Ministério do Meio Ambiente. Available at: https://antigo.mma.gov.br/informma/item/15239-cop-14-ministro-defende-ferramentas-de-gest%C3%A3o-em-uso-sustent%C3%A1vel-da-biodiversidade.html; Accessed on March 19, 2021.

MULLER MF & REIS NR. 1992. Partição de recursos alimentares entre quatro espécies de morcegos frugívoros (Chiroptera, Phyllostomidae). Rev Bras Zool 9(3-4): 345-355.

MURRAY KG. 2000. The importance of different bird species as seed dispersers. In: Nadkarni N & Wheelwright NT (Eds), Monteverde: Ecology and Conservation of a Tropical Cloud Forest, New York: Oxford University Press, p. 294-295.

MUSCARELLA R & FLEMING TH. 2007. The role of frugivorous bats in tropical forest succession. Biol Rev 82(4): 573-590.

NOBLE IR & DIRZO R. 1997. Forests as human-dominated ecosystems. Science 277: 522-525.

PAQUETTE A & MESSIER C. 2010. The role of plantations in managing the world´s forest in the Anthropocene. Front Ecol Environ 8(1): 27-34.

PARROTTA JA, TURNBULL JW & JONES N. 1997. Catalyzing native forest regeneration on degraded tropical lands. For Ecol Manag 99(1-2): 1-7.

PASSOS FC & GRACIOLLI G. 2004. Observações da dieta de *Artibeus lituratus* (Olfers) (Chiroptera, Phyllostomidae) em duas áreas do sul do Brasil. Rev Bras Zool 21(3): 487-489.

PASSOS FC, SILVA WR, PEDRO WA & BONIN MR. 2003. Frugivoria em morcegos (Mammalia, Chiroptera) no Parque Estadual Intervales, sudeste do Brasil. Rev Bras Zool 20(3): 511-517.

PEDRO WA & TADDEI VA. 1997. Taxonomic assemblage of bats from Panga Reserv Southeastern Brazil: abundance patterns and trophic relations in the Phyllostomidae (Chiroptera). Bol Mus Biol Mello Leitão 6: 3-21.

PETCHEY OL & GASTON KJ. 2002. Functional diversity (FD), species richness and community composition. Ecol Lett 5(3): 402-411.

PINA SMS, MEYER CFJ & ZORTÉA M. 2013. A comparison of habitat use by phyllostomid bats (Chiroptera: Phyllostomidae) in natural forest fragments and *Eucalytus* plantation in the Brazilian Cerrado. Chirop Neotrop 19(3): 14-30.

REIS C, ZANCHETTA D & FACHIN H. 2005. Plano de manejo da Floresta Estadual Edmundo Navarro de Andrade (FEENA). Rio Claro, SP, Brazil.

REIS NR, PERACCHI AL, PEDRO WA & LIMA IP. 2007. Morcegos do Brasil. Londrina, PR, Brasil, 253 p.

REX K, KELM DH, WIESNER K, KUNZ TH & VOIGT CC. 2008. Species richness and structure of three Neotropical bat assemblages. Biol J Linn Soc 94(3): 617-629.

RICHARDSON DM & REJMANÉK M. 2011. Trees and shrubs as invasive alien species – a global review. Divers Distrib 17(5): 788-809.

SCHULZE MD, SEAVY NE & WHITACRE DF. 2000. A comparison of the phyllostomid bat assemblages in undisturbed neotropical forest and in forest fragments of a Slash-and-Burn farming mosaic in Petén, Guatemala. Biotropica 32(1): 174-184.

SILVA WR, DE MARCO-JR P, HASUI É & GOMES SM. 2002. Patterns of fruit-frugivore interactions in two Atlantic Forest birs communities of South-eastern Brazil: implications for conservation. In: Levey DJ et al. (Eds), Seed dispersal and frugivory: ecology, evolution and conservation, New York: CAB International, p. 423-435.

SIMMONS NB & VOSS RS. 1998. The mammals of Paracou, French Guiana: a neotropical lowdland rainforest fauna. Part 1. Bats. Bull Am Mus Nat Hist 237: 1-219.

STRAUBE FC & BIANCONI GV. 2002. Sobre a grandeza e a unidade utilizada para estimar esforço de captura com utilização de redes-de-neblina. Chirop Neotrop 8(1-2): 150-152.

THIES W & KALKO EKV. 2004. Phenology of neotropical pepper plants (Piperaceae) and their association with their main dispersers, two short-tailed fruit bats, *Carollia perspicillata* and *C. castanea* (Phyllostomidae). Oikos 104: 362-376.

VELOSO HP, RANGEL-FILHO ALR & LIMA JCA. 1991. Classificação da vegetação brasileira, adaptada a um sistema universal. Rio de Janeiro: IBGE, Departamento de Recursos Naturais e Estudos Ambientais, 124 p.

VITAL MHF. 2007. Impacto ambiental de florestas de eucalipto. Rev BNDES 14(28): 235-276.

VOIGT CC, FRICK WF, HOLDERIED MW, HOLLAND R, KERTH G, MELLO MAR, PLOWRIGHT RK, SWARTZ S & YOVEL Y. 2017. Principles and patterns of bat movements: from aerodynamics to ecology. Q Rev Biol 92(3): 267-287.

WITT AA & FABIÁN ME. 2012. Guia de Manejo e controle de Morcegos, técnicas de identificação, captura e coleta. Porto Alegre: CEVES/RS, 140 p.

WRIGHT SJ. 2005. Tropical forests in a changing environment. TREE 20(10): 553-560.

ZAMA MY, BOVOLENTA YR, CARVALHO ES, RODRIGUES DR, ARAUJO CG, SIEACE MAF & LUZ DG. 2012. Florística e síndromes de dispersão de espécies arbustivo-arbóreas no Parque Estadual Mata São Francisco, PR, Brasil. Hoehnea 39(3): 369-378.

ZORTÉA M & CHIARELLO AG. 1994. Observations on the Big Fruit-Eating Bat, *Artibeus lituratus*, in an Urban Reserve of South-east Brazil. Mammalia 58(4): 665-670.

ZURITA GA, REY N, VARELA DM, VILLAGRA M & BELLOCQ MI. 2006. Conversion of the Atlantic Forest into native and exotic tree plantations: effects on bird communities from the local and regional perspectives. For Ecol Manag 235(1-3): 164-173.

How to cite

JACOMASSA FAF, BORTOLOTTI VFC, MIGUEL PH & PIZO MA. 2025. Bat assemblage and its frugivorous diet in a *Eucalyptus* plantation. An Acad Bras Cienc 97: e20241169. DOI 10.1590/0001-3765202520241169.

Manuscript received on October 15, 2024;
accepted for publication on April 8, 2025

FÁBIO ANDRÉ F. JACOMASSA
https://orcid.org/0000-0003-0488-4213

VANESSA F.C. BORTOLOTTI
https://orcid.org/0009-0000-6618-7101

PEDRO HENRIQUE MIGUEL
https://orcid.org/0000-0002-6529-9184

MARCO AURÉLIO PIZO
https://orcid.org/0000-0002-3103-0371

Universidade Estadual Paulista Júlio de Mesquita Filho, Departamento de Biodiversidade, Av. 24 A, 1515, Bela Vista, 13506-900 Rio Claro, SP, Brazil

Correspondence to: **Fábio André F. Jacomassa**
E-mail: fabioafj@gmail.com

Author contributions

FAFJ and VFCB - Conceptualization; Data curation; Formal analyses; Investigation; Methodology; Writing-original draft; Writing review & editing. PHM - Investigation. MAP - Writing-original draft; Writing review & editing.