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ARTICLE

Bat species composition associated with restinga lagoons from the Paulo César Vinha State Park, Espírito Santo, Brazil

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Abstract. Restingas are coastal ecosystems associated with the Atlantic Forest. They are threatened by habitat degradation and forest fragmentation due to intense human occupation. Many restingas have coastal lagoons formed by bay sedimentation of bays, the presence of river estuaries, or emerging groundwater. The distance between lagoons and the ocean influences the biotic community in them. This study aimed to compare the diversity (composition, abundance and richness) of bat communities associated with three lagoons within the Paulo Cesar Vinha State Park, Espírito Santo state. Two lagoons ('Feia' and 'Vermelha' lagoons) are 2 km away from the ocean, while the third ('Caraís' lagoon) is just a few meters distant from the ocean. Species composition did not differ among the lagoons. Abundance of *Carollia perspicillata* and *Glossophaga soricina* was higher in the 'Caraís' lagoon. Abundance of *Artibeus lituratus* and *Platyrrhinus lineatus* was higher in the 'Vermelha' lagoon. Species with higher abundance in the 'Vermelha' are usually associated with urban and disturbed environments. 'Vermelha' lagoon is closer to human settlements and this could be a major driver of bat species abundance associated with this lagoon instead of distance from the ocean. These results may be used to guide conservations efforts in the restingas or habitats associated with restingas.

Keywords. Atlantic Forest; Chiroptera; Community; PEPCV; Riparian vegetation.

INTRODUCTION

Restingas are coastal ecosystems associated with the Atlantic Forest. They are threatened by habitat degradation and forest fragmentation due to intense human occupation (Esteves & Lacerda, 2000). Many restingas have coastal brackish water lagoons formed by the sedimentation of bays, river estuaries or emerging groundwater (Esteves, 1998). They are characterized by a sand barrier separating them from the sea (Esteves, 1998). Surrounding the coastal lagoons and connecting the terrestrial and aquatic environments is the riparian zone, with great biodiversity and accumulation of organic matter (Gregory *et al.*, 1991; Bendix, 1994; Naiman & Decamps, 1997). Vegetation surrounding lagoons is influenced by the distance from the ocean, perimeter of the lagoon, and local conditions (pH, water temperature, soil moisture and type and organic matter concentration) (Caumette, 1992). Organic matter increases local productivity, allowing the formation of vegetation patches surrounded by xeromorphic vegetation, the latter characteristic of restinga (Enrich-Prast *et al.*, 2004). These patches are important for food and shelter for many animal species, such as bats (see Kunz & Kurta, 1988), as the other parts of the restinga are dominated

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by herbaceous and shrub vegetation (Martins, 1989; Menezes & Araújo, 1999; Menezes *et al.,* 2007).

Vegetation clutter is one of the most important vegetational trait affecting bat biodiversity (Macient *et al.,* 2015). Bat species richness tend to be higher in riparian vegetation than in less cluttered vegetational types (Enrich-Prast *et al.,* 2004). Bat species composition varies in the riparian vegetation depending on several factors such as vegetation structure and composition, connectivity with continuous vegetation, and degradation status (Luz *et al.,* 2011). Neotropical bats have the most diversified feeding guilds among mammals (Kalko *et al.,* 1996) and are important for pollination and seed dispersal (Fleming, 1988; Patterson *et al.,* 2003). In restingas, there is a lack of even the most basic biological data, such as species composition and conservation status of their remnants (Rocha *et al.,* 2005).

The composition of the bat communities and the structure of the assemblies are related mainly to the diversity of the vegetation and the structural variables of the environment (Hayes & Gruver, 2000; Medellín *et al.,* 2000; Estrada & Coates-Estrada, 2001, 2002; Bobrowiec *et al.,* 2014). Although natural and continuous forests are important for greater bat diversity and abundance (Meyer *et al.,* 2016; Rocha *et al.,* 2017a b; Soares *et al.,* 2017), each species has a difference response to habitat degradation. While some are apparently unaffected, less tolerant species tend to shrink in numbers and more tolerant species to grow (Willig *et al.,* 2007; Medellín *et al.,* 2000; Meyer *et al.,* 2016). Observed that in tropical forests physical obstruction gradients can influence and abundance and local composition of chiropteran species (Presley *et al.,* 2008), since denser vegetation areas allow greater maneuverability in flight, they may reduce the foraging efficiency of some species (Arlettaz *et al.,* 2001; Rainho *et al.,* 2010; Fenton, 1990).

In southeastern Brazil, the Brazilian region with most data on bat distribution, knowledge on bat distribution is biased toward rainforests and restingas remain undersampled and under protected (Bergallo *et al.,* 2003; Muylaert *et al.,* 2017). It has been proposed that a minimum sampling effort of 1,000 captures is necessary to adequately sample bats in Atlantic Forest sites, such as restingas (Bergallo *et al.,* 2003). Unfortunately not a single restinga site has achieved this minimum level of sampling effort, and therefore we do not have even the most basic biological information (species richness and composition) for restingas from Brazil.

This study aimed to assess the richness and composition of Chiroptera communities in the coastal lagoons from the Paulo Cesar Vinha State Park (PEPCV), State of Espírito Santo, Brazil. There are three lagoons in the PEPCV, a large one, Caraís lagoon, close to the ocean and two smaller ones, 'Feia' (meaning ugly in Portuguese) and Vermelha (meaning red), *ca.* 2 km from the ocean. Our initial assumption is that the 'Feia' and 'Vermelha' lagoons, that have similar distance from ocean, have a similar bat species composition compared to the 'Caraís' lagoon. This is expected because distance from ocean is a predictor for local conditions and vegetation clutter surrounding lagoons (Caumette, 1992).

MATERIAL AND METHODS

The Paulo Cesar Vinha State Park (PEPCV) was created by the State Decree No. 2993/90, being one of the last sandbanks in the coastline of the state of Espírito Santo (Rocha *et al.,* 2005). The PEPCV is in the Guarapari municipality, southern coast of Espírito Santo (20°32′02″ to 20°37′50″S and 40º22′43″ to 40°25′59″W) (Fig. 1) (IPEMA, 2005). According to the Köppen classification, the PEPCV has a tropical climate with wet summers and dry winters (Aw), average annual temperature is 23. 3°C, and the average annual rainfall is 1,307 mm (Fabris & César, 1996). The soil in the PEPCV is sandy (Pereira, 1990; Fabris & César, 1996), originated by marine deposits due to a change in the ocean level in the Holocene (Flexor *et al.,* 1984).

It has 12 km of beaches, several typical formations of *restinga* and three lagoons: (i) Caraís, separated from the ocean by a narrow strip of sand, (ii) Feia and (iii) Vermelha are separated from the ocean by a sand strip of about 2 km, they are not connected to the ocean and the vegetation is less dense than in the 'Carais' (IPEMA, 2005). Lake areas have high humidity and the vegetation constitutes of an herbaceous bog, Cyperaceae family (*e.g., Sclearia latifolia, Cyperus articulatus, Eleocharis interstincta;* Martins *et al.,* 1999). Caraís has mangroves on one of its banks and is the only one among the three lagoons permanently connected to the sea (IPEMA, 2005; Oprea *et al.,* 2009a) and the surroundings of this lagoon are occupied by a high density of *Bombacacia* sp. (Bombacaceae). During the wet season, the 'Caraís' lagoon occasionally present a connection to the ocean due to the higher water volume, favoring the development of a mangrove forest in one of its margins (IPEMA, 2005). Bat sampling was performed every two weeks, twice per month, for two consecutive days in different places, totaling 39 nights (Carais lagoon = 14; Feia lagoon = 13 and Lago Vermelha lagoon = 12), from September 2006 to August 2007, using 10 mist nets (six nets of 9.0 × 2.5 m and four nets of 6.0 × 2.5 m) per night. Nets remained open for six hours after sunset and were checked every 30 minutes. They were placed around the three lagoons sampled in PEPCV, one lagoon per night of sampling. Due to its larger size, the 'Caraís' lagoon was divided into two (P1 and P2) sampling sites with five mist nets at each sampling point, this procedure was adopted to ensure the same sampling effort in each lagoon. Mist nets were always placed in different positions from previous nights, decreasing the probability of bat avoidance (Kalko *et al.,* 1996). Captured animals were kept in cotton bags while their weight and forearm measurements were obtained. Bats were identified to the lowest taxonomic level, using the specific literature (*e.g.,* Gardner, 2008) and two individuals from each species, one male and one female, were collected, conserved in 70% ethanol, and deposited at the mammal collection at Universidade Federal do Espírito Santo (UFES-MAM), Brazil. The sampling procedures were carried out with authorization № 57294-2 issued by the Biodiversity Information and Authorization System (SISBIO). The collections were carried out in 2004, before the regulation of Law 11,794, of October 8, 2008, therefore, it does not

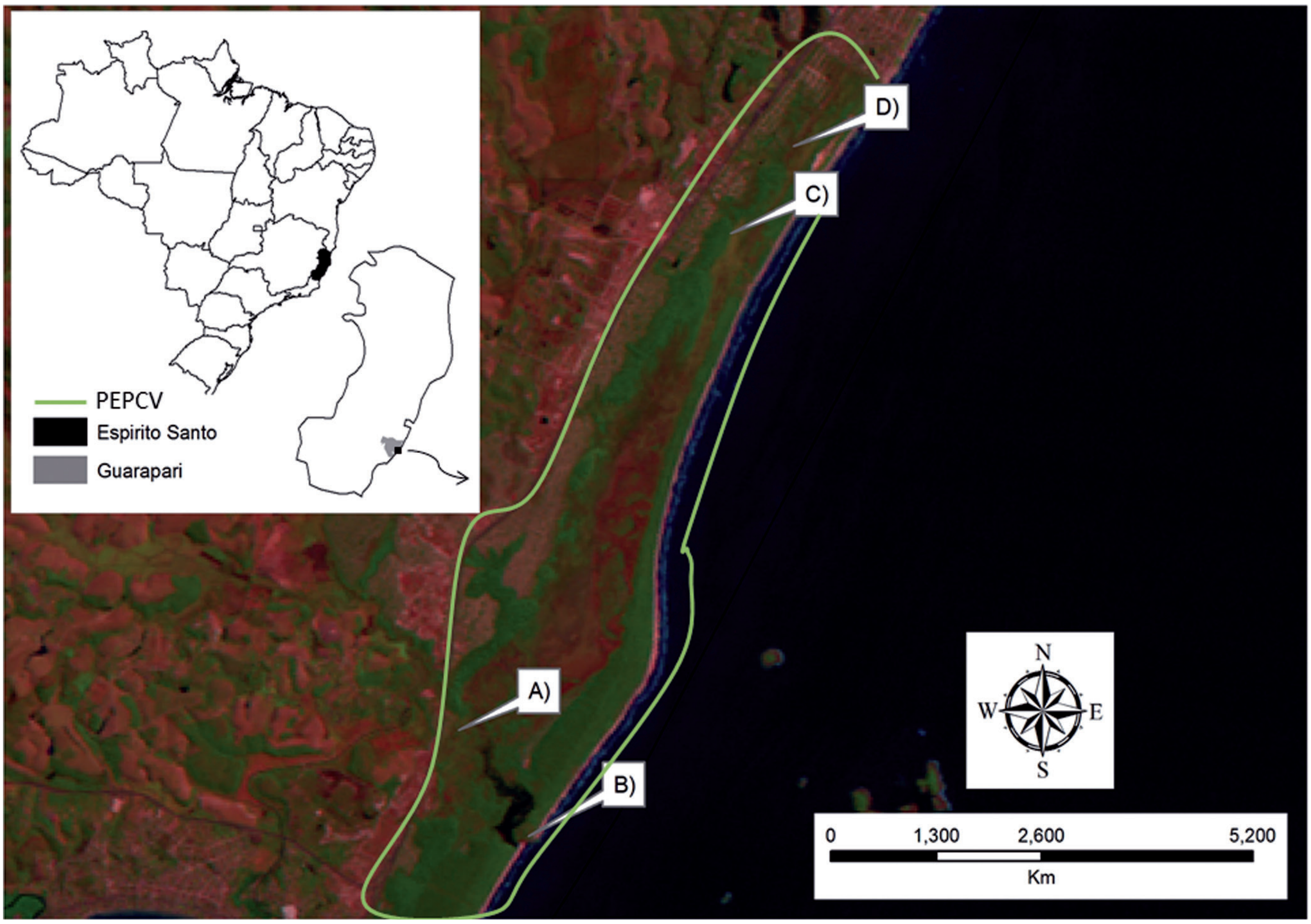

Figure 1. Location of the Paulo Cesar Vinha State Park – PEPCV within Brazil, State of Espírito Santo and Guarapari. Latter A and B are the Sampled point one (P1) and two (P2), letter C and D are Feia and Vermelha lagoon, respectively.

present the authorization document of the Commission for Experimentation and Use of Animals (CEUA).

A total of 80% of the captured individuals (n = 340) were tagged with numbered plastic collars (Esbérard & Daemon, 1999) and released at the place of capture. The food guild was classified following Kalko *et al.,* (1996). Sampling effort was calculated following Straube & Bianconi (2002), and estimated richness was calculated using the first order Jackknife estimator (Heltshe & Forrester, 1983) with 1,000 randomizations. Estimated and observed species richness was compared using the 95% confidence intervals. Species richness in the three lagoons was compared using the intersection among confidence intervals of estimated species richness. For comparing the chiropteran composition among the three PEPCV lagoons, three procedures were adopted: (i) a principal component analysis (PCA), with the abundance matrix transformed by the Hellinger procedure (Legendre & Gallagher, 2001), (ii) a non-parametric multivariate analysis of variance (PERMANOVA; Anderson, 2001), and (iii) a nonparametric multivariate variance analysis (Betadisper; Anderson, 2006) both analysis were performed using the Bray Curtis distance as a measurement of dissimilarity. A PCA was performed to visualize the distance among species in the community and the lagoons. However, it does not test the significance of the patterns and for this reason, we performed a PERMANOVA to look for a possible clustering pattern in the bat composition. Finally, to test the variance in bat composition in each lagoon, we performed a Betadisper analysis.

RESULTS

Bats of 12 species were captured in PEPCV (Table 1), totaling 395 captures and 22 recaptures, with a sampling effort of 49,200 $h.m^2$ of mist nets. The majority of individuals belong to the Phyllostomidae family (98.8%). Sampling completeness was not reached as the species estimator curve did not stabilize (Fig. 2). This is evident when we compare the observed richness to the final estimated richness, as their confidence intervals do not overlap (Fig. 2).

Artibeus lituratus (Olfers 1818) was the most common species in the three lagoons., Among the 232 individuals captured, 52 (22%) were in Caraís lagoon, 85 (37%) in Feia lagoon and 95 (41%) in Vermelha lagoon. Another common species was *Carollia persipicillata,* second most abundant in the lagoons (23% of the total captures), inferior only to *Plathyrrinus lineatus* (n = 12 individuals) in the Feia lagoon. However, some species were unique, such as *Anoura geoffroyi* (n = 2 individuals) in Caraís lagoon, *Pygoderma bilabiatum* (n = 1) in Feia lagoon, *Lasiurus blossevillii* (n = 1), *Phyllostomus discolor* (n = 2) in the red

Table 1. Bat composition sampled in the Paulo Cesar Vinha State Park, Espírito Santo State, Brazil, from September 2006 to August 2007.

Family / Subfamily / *Specie*	Trophic Guild	Lagoon: Carais	Feia	Vermelha	Total
Phyllostomidae Gray, 1825					
Carolliinae Miller, 1924					
Carollia perspicillata (Linnaeus, 1758)	Frugivorous	29	8	59	**96**
Glossophaginae Bonaparte, 1845					
Anoura geoffroyi Gray, 1838	Nectarivorous	2			**2**
Glossophaga soricina (Pallas, 1766)	Nectarivorous	13	1		**14**
Phyllostominae Gray, 1825					
Phyllostomus discolor Wagner, 1843	Omnivorous			2	**2**
Phyllostomus hastatus (Pallas, 1767)	Omnivorous			1	**1**
Stenodermatinae P. Gervais, 1856					
Dermanura cinerea (Gervais, 1856)	Frugivorous	3	5	10	**18**
Artibeus lituratus (Olfers, 1818)	Frugivorous	52	85	95	**232**
Platyrrhinus lineatus (É. Geoffroy, 1810)	Frugivorous	2	12	11	**25**
Pygoderma bilabiatum (Wagner, 1843)	Frugivorous		1		**1**
Uroderma magnirostrum Davis, 1968	Frugivorous		7	9	**16**
Vespertilionidae Gray, 1821					
Lasiurus blossevillii (Lesson and Garnot, 1826)	Insectivorous			1	1
Myotis nigricans (Schinz, 1821)	Insectivorous	1	2	1	4
Abundance		**102**	**121**	**189**	**412**
Richness		**7**	**8**	**9**	**12**

lagoon (Fig. 2). As for the trophic guild, we observed that frugivores are the most abundant in the three lagoons (Table 1). When individually analyzed, the species richness estimator for each of the three PEPCV lagoons also did not indicate a stabilization (Fig. 3). We sampled seven bat species at the Caraís lagoon, nine at the 'Feia', and ten at the Vermelha lagoon. Estimated species richness

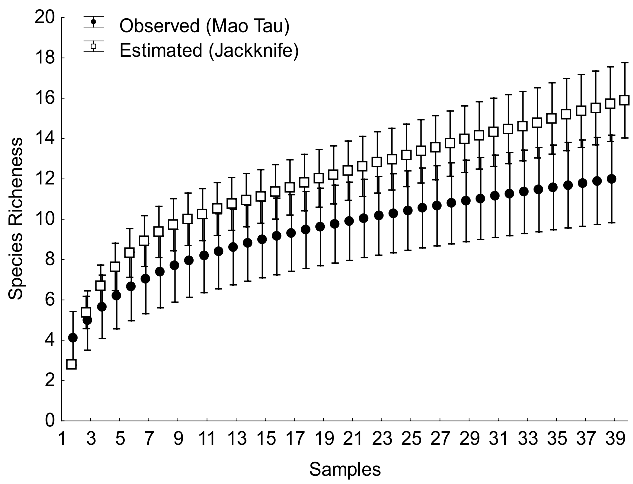

Figure 2. Observed and estimated bat species richness in the Paulo Cesar Vinha State Park – PEPCV, Espírito Santo, Brazil. Vertical bars represent 95% confidence intervals.

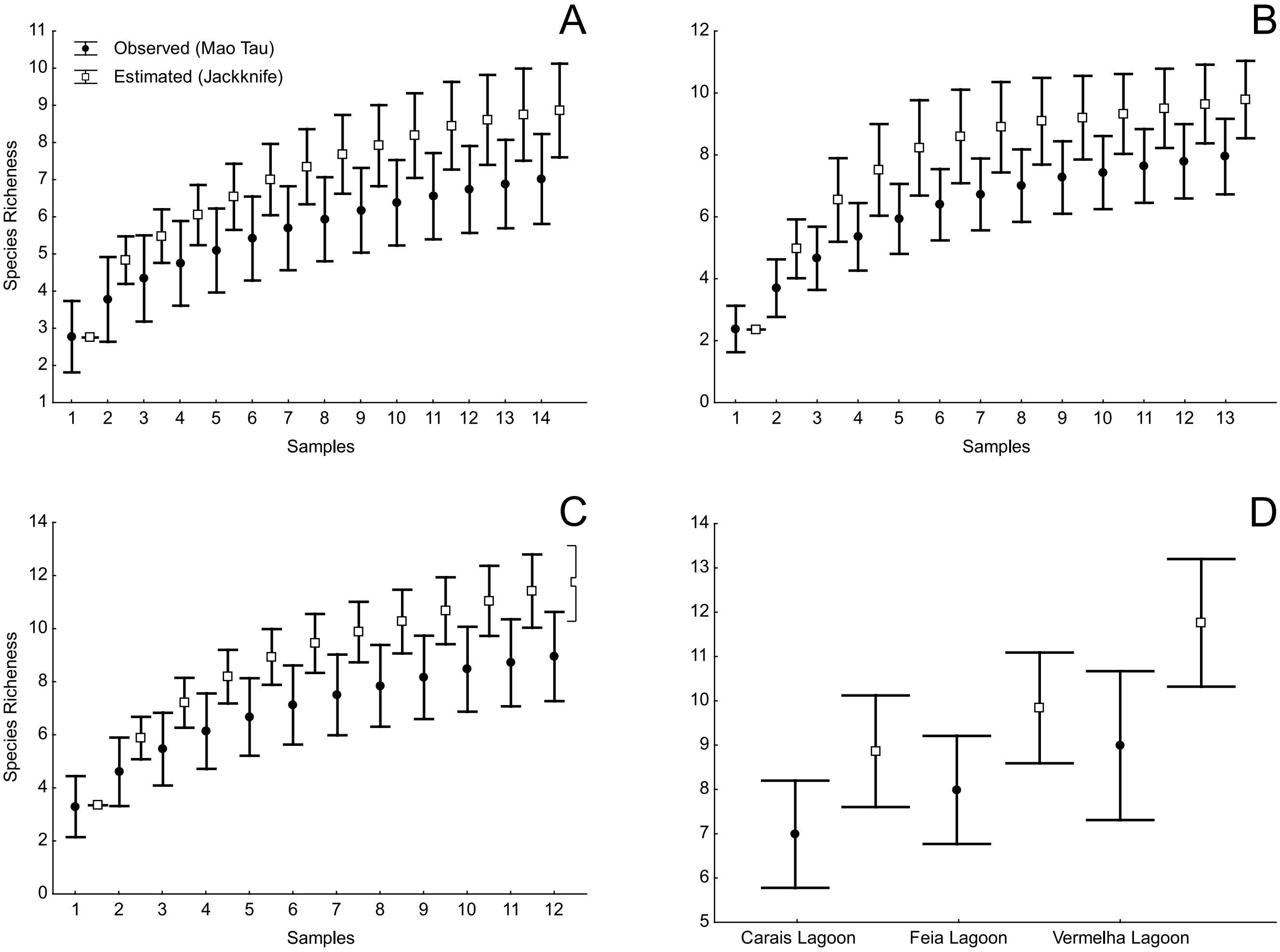

Figure 3. Observed and estimated bat species richness in the tree lagoons sampled in the Paulo Cesar Vinha State Park – PEPCV, Espírito Santo, Brazil. (A) 'Caraís' lagoon, (B) 'Feia' lagoon, (C) 'Vermelha' lagoon, and (D) Final observed and estimated species richness. Vertical bars represent 95% confidence intervals.

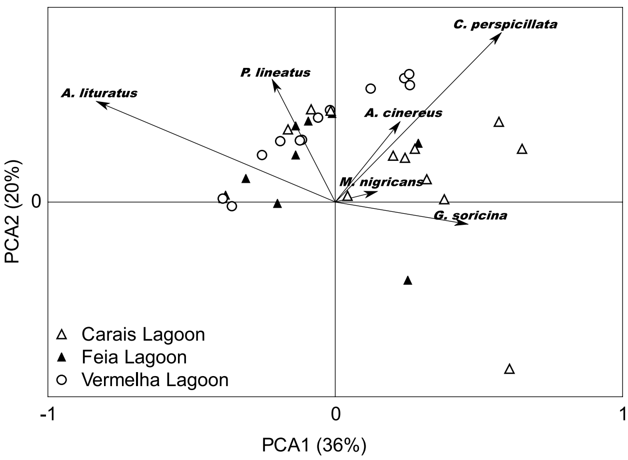

Figure 4. Principal Component Analyses of the bat composition in the Paulo Cesar Vinha State Park – PEPCV, Espírito Santo, Brazil. Ordination was performed by species abundance and the matrix was transformed by Hellinger procedure.

was nine, ten and twelve species, respectively. Observed species richness did not differ among the sampled lagoons. However, estimated richness was higher for the Vermelha lagoon (Fig. 3).

We did not observe a cluster pattern in the bat community among the three lagoons [(PERMANOVA – ($F_{(37,2)} = 0.852$; $p = 0.659$)] and in the variance of the composition (Betadisper – ($F_{(37,2)} = 0.648$, $p = 0.529$)) (Fig. 4). The abundance of *Carollia perspicillata* (Linnaeus 1758) and *Glossophaga soricina* (Pallas 1766) was larger at 'Caraís' lagoon. 'Vermelha' and 'Feia' lagoons had higher abundance of *Artibeus lituratus* and *Platyrrhinus lineatus* (É. Geoffroy 1810) (Fig. 4).

DISCUSSION

The higher abundance of Phyllostomidae species compared to other families can be explained by the use of mist nets as our sampling method. Mist nets captures are biased towards bats that use the lower stratum of vegetation, behavior observed in Phyllostomidae (Oprea *et al.,* 2009a; Straube & Bianconi, 2002; Calouro *et al.,* 2010). Some of the frugivorous bats sampled in this study prefer plants usually found in degraded sites, such as Solanaceae, Piperaceae and Cecropiaceae, (Marinho-Filho, 1991; Zortéa & Chiarello, 1994; Passos *et al.,* 2003). Therefore, the high abundance of Phyllostomidae can be associated to different deforestation indeces, including forested areas with little fragmentation and large deforested areas with few and small patches of forest (Gorresen & Willig, 2004). Frugivores were the most common bat guild in the study, which may also be a result from the use of mist nets to capture bats, as they capture predominantly frugivorous species (Kalko *et al.,* 1996). Stenodermatinaea is the most diverse subfamily in the Neotropical region (Gardner, 2008). Among the species captured, there are species usually abundant and widely distributed in the Neotropics, including *Phyllostomus hastatus, Glossophaga soricina, Carollia perspicillata, Artibeus lituratus, Platyrrhinus lineatus* and *Myotis nigricans* (*e.g.,* Peracchi & Albuquerque, 1971, 1986; Pedro *et al.,* 1995; Reis & Müller, 1995; Bredt & Uieda, 1996; Silva *et al.,* 1996, Silva *et al.,* 2005; Muylaert *et al.,* 2017).

The species richness found was similar to other studies conducted in restingas, such as in the Parque Nacional da Restinga de Jurubatiba, Rio de Janeiro, with 14 species, (Mangolin, 2005), in the Restinga da Ilha de Guriri, Espirito Santo, with 9 species (Moreno *et al.,* 2000), in Praia das Neves, Espírito Santo, with 17 species (Luz *et al.,* 2011), and in PEPCV with 14 species (Oprea *et al.,* 2009a). *Desmodus rotundus, Chiroderma doriae* and *Chiroderma villosum* were caught by Oprea *et al.,* (2009a) in the same park we sampled (PEPCV), but were not captured in this study. On the other hand, *Lasiurus blossevillii* was not captured by Oprea *et al.,* (2009a) but captured in this study. This species had only two records of occurrence in restinga, one collected by Ruschi (1951) and later registered during the data collection of this work, already mentioned by Vieira *et al.,* (2009).

Lasiurus blossevillii is an aerial insectivore, which may justify its low sample representativeness in inventories using mist-nets (Shump-Jr. & Shump, 1982; Genoways & Baker, 1988). However, it has been recorded in every region of Brazil (Tavares & Gregorin, 2008). Regardless, there is still difficulty in defining its geographic distribution, due to its low capture frequency (Rodrigues & Ribas, 2011). All locations sampled in this study were in areas with water bodies. These environments allow for greater concentration and foraging of bats (Adams & Simmons, 2002; Costa *et al.,* 2012), which facilitates the capture of insectivores through the mist-nets (Esbérard *et al.,* 2007; Lourenço *et al.,* 2010; Costa *et al.,* 2012), not always represented in other works (*e.g.,* Gomes *et al.,* 2016).

A total of 15 species have been recorded at PEPCV considering the Oprea *et al.* (2009a) study and the present one. This diversity makes the PEPCV one of the richest restingas in Brazil, along with the Reserva Biológica de Comboios and the Restinga de Praia das Neves, both in the Espírito Santo State. Our prediction that 'Feia' and 'Vermelha' lagoons would have a similar bat species composition compared to 'Caraís' lagoon due to the distance from the ocean was not corroborated. However, some differences were found related to the relative abundance of different species. The nectarivore *G. soricina* was more abundant in the Caraís lagoon and *Anoura geoffroyi* was recorded only in that locality. The high density of *Bombacacia* sp. (Bombacaceae) in this area would justify the presence of the two nectarivores (Fischer *et al.,* 1992; Arias *et al.,* 2009). *Glossophaga soricina* is frequent and abundant in open areas with 30 to 70% of tree cover (Ávila-Gómez *et al.,* 2015), but low anthropogenic disturb. This species requires landscapes with a high percentage of the original forest cover (Ávila-Gómez *et al.,* 2015; Klingbeil & Willig, 2009, 2010).

We observed a higher abundance of *Artibeus lituratus* and *Platyrrhinus lineatus* in the 'Vermelha' Lagoon when compared to the other two lagoons. The 'Vermelha' lagoon is closer to human settlements when compared to the other lagoons, indicating a higher degree of disturbance in the vegetation surrounding this lagoon. Both species are common in urban environments (Oprea *et al.,* 2007; Oprea *et al.,* 2009b; Perini *et al.,* 2003; Ferreira *et al.,* 2010; Prone *et al.,* 2012). Extraction ofsand and wood from restingas may affect bats, altering the composition and structure of vegetation, depleting food resources, and diversity of roosts (Soriano & Ochoa, 2001). The magnitude of the disturbance may manifest itself as changes in species abundances and composition (Clarke *et al.,* 2005a, b; Gorresen *et al.,* 2005; Peters *et al.,* 2006). However, despite presenting the highest degree of human disturbance, the Vermelha Lagoon had the highest number of captures, around 46% (n = 120), including 129 *A. lituratus* and 32 *P. lineatus*. The locality also had higher expected species richness.

The presence of a higher species richness in Vermelha lagoon may be result from the presence of pioneer plants in this area (IPEMA, 2005; Martins *et al.,* 1999), like *Cecropia* (Urticaceae), *Piper* and *Solanum* that are commonly consumed by some species of frugivorous bats. In general, many frugivores and nectarivores exploit food resources provided by pioneer and successional plants (Fleming, 1988; Gorchov *et al.,* 1993; Soriano & Ochoa, 2001). The fruit production of primary forest is less seasonal than secondary species (Opler *et al.,* 1980; Levey, 1988). For these reasons, moderate levels of deforestation increase spatial diversity and enhance abundances of early successional plants. Consequently, moderate or recently deforestation may increase food availability for frugivorous bat species that exploit disturbance-adapted plant species (Gorresen & Willig, 2004).

Here, we observed that the three lagoons have similar bat composition. However, Caraís lagoon has species that are indicators of undisturbed or lowly disturbed sites (*C. perspicillata* and *G. soricina*). On the other hand, Vermelha lagoon has species that are correlated to disturbed areas (*A. lituratus*), and the Feia lagoon may be intermediate in terms of disturbance, with intermediate abundance of *C. perspicillata, G. soricina* and *A. lituratus.* These results may be used to lead conservation efforts or guide new researches in the PEPCV or in the restingas and their associated.

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AUTHORS' CONTRIBUTIONS

T.B.V.: Formal analysis, Writing – original draft. L.C.S.: Writing – review & editing. L.M.S.A.: Writing-review & editing. M.O.: Writing – review & editing. P.M.: Writing – review & editing. A.D.D.: Supervision. All the authors actively participated in the discussion of the results, they reviewed and approved the final version of the paper.

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APPENDIX

Family	Subfamily	Specie	Code	Location
Phyllostomidae	Carolliinae	*Carollia perspicillata*	TV 28	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Carolliinae	*Carollia perspicillata*	TV 34	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Carolliinae	*Carollia perspicillata*	TV 71	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Glossophaginae	*Anoura geofroyii*	TV 78	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Glossophaginae	*Glossophaga soricina*	TV 26	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Glossophaginae	*Glossophaga soricina*	TV 35	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Glossophaginae	*Glossophaga soricina*	TV 38	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Glossophaginae	*Glossophaga soricina*	TV 56	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Phyllostominae	*Phyllostomus discolor*	TV 64	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Phyllostominae	*Phyllostomus hastatus*	TV 31	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 25	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 27	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 32	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 33	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 37	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 39	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 40	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 41	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 49	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 50	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 51	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 54	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 62	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Artibeus lituratus*	TV 63	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Dermanura cinerea*	TV 29	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Dermanura cinerea*	TV 36	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Dermanura cinerea*	TV 48	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Dermanura cinerea*	TV 55	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Pigoderma bilabiatum*	TV 61	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Uroderma magnirostrum*	TV 70	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Phyllostomidae	Stenodermatinae	*Uroderma magnirostrum*	TV 72	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Vespertilionidae		*Lasiurus blossevillii*	TV 53	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Vespertilionidae		*Myotis nigricans*	TV 42	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)
Vespertilionidae		*Myotis nigricans*	TV 47	*Laboratório de Estudos de Quirópteros* (LABEQ) from the Federal University of Espírito Santo (UFES)

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