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ZOOLOGY

Non-volant mammals of the Ibura National Forest, northeastern Brazil

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ABSTRACT. Less than 10% of the original Atlantic Forest cover now remains standing in the Brazilian state of Sergipe, although few scientific studies have focused on its mammalian diversity. The present study describes the diversity of non-volant mammals found in the Ibura National Forest (INF), based on live trapping, and direct and indirect observations. We sampled the IBF on six days per month between June 2012 and August 2013, using live-traps (Sherman-type) positioned in pairs (ground and understory). We equally sampled semideciduous forest and an abandoned *Eucalyptus* plantation with dense understory (over 30 years). We also used non-systematics methods (direct observations, vestiges, camera-trap, and opportunistic captures). We recorded 18 species, from 12 families and 7 orders considering all the applied methods. Among recorded species, *Bradypus torquatus* and *Lontra longicaudis* are considered threatened of extinction. Considering only the live-trapping (totaling 3,240 trapping nights), we captured 125 individuals (3.85% success) from four species, *Marmosa demerarae* (52%), *Didelphis albiventris* (19.2%), *Cerradomys vivoi* (15.2%), and *M. murina* (13.6%). Estimated and observed richness was the same, suggesting a satisfactory effort. *Didelphis albiventris* and *M. demerarae* showed significantly higher captures in the dry seasons. *Didelphis albiventris* and *C. vivoi* showed significantly higher captures in the substratum, and *M. demerarae* higher in the understory. *Cerradomys vivoi* showed significantly higher captures in the *Eucalyptus* phytophysiognomy. Non-Metric Multidimensional Scaling and the ANOSIM showed a significant difference in the captured species among semidecidual forest and *Eucalyptus*. Despite the small area (144 ha), the INF still houses a relatively high mammalian diversity. Further investigations may help to understand the role of habitat reduction in the diversity and habitat partitioning among mammal species in the Atlantic Forest of Northeastern Brazil.

Keywords: phytophysiognomies; *Eucalyptus* plantation, habitat effect; small mammals; protected area.

Introduction

Brazil has the richest mammalian fauna of any country, with more than 720 species known to occur within its territory (Paglia et al., 2012; Percequillo et al., 2017), although the mammalian diversity of most Brazilian regions is still poorly studied (Carmignotto, Vivo, & Langguth, 2012; Feijó & Langguth, 2013; Carmignotto & Astúa, 2017; Brandão et al., 2019). The Atlantic Forest has the second largest mammal diversity of all Brazilian biomes (Paglia et al., 2012; Graipel, Cherem, Monteiro-Filho, & Carmignotto, 2017), and accounts for approximately 18% of the country's endangered mammal species (Costa, Leite, Mendes, & Ditchfield, 2005). The remnants of the Atlantic Forest currently cover only 7% to 16% of the original area of the biome, depending on the criteria adopted (see Ribeiro, Metzger, Martensen, Ponzoni, & Hirota, 2009). Habitat loss and fragmentation, together with the biome's high biodiversity and endemism, combine to make the Atlantic Forest a conservation hotspot (Myers, Mittermeier, Mittermeier, Fonseca, & Kent, 2000).

In Sergipe state, in the Brazilian Northeast, about only 10% of the Atlantic Forest cover remains (Santos, Carvalho, & Carvalho, 2013; Marques, Ferrari, Beltrão-Mendes, Bitencurti, & Carvalho, 2017). This

remaining cover is distributed in hundreds of small fragments, which are in urgent need of protection. Prior to the mid-2000s, only a few studies had focused on the diversity of mammals in the Atlantic Forest in Sergipe (Oliver & Santos, 1991; Stevens & Husband, 1998; Oliveira, Ferrari, & Silva, 2005), including one, surprisingly, that described a new primate species, *Callicebus coimbrai* (Kobayashi & Langguth, 1999). However, more recent studies have begun to overcome this lack of data, both through inventories (e.g. Chagas, Santos Jr., Souza-Alves, & Ferrari, 2010; Dias et al., 2017; Rocha et al., 2017) and the extension of the known ranges of poorly-known species (e.g. Jerusalinsky et al., 2006; Rocha et al., 2012). New records have included relatively large and conspicuous mammals, such as the Maned Sloth, *Bradypus torquatus* (Chagas, Souza-Alves, Jerusalinsky, & Ferrari, 2009), the Yellow-breasted Capuchin, *Sapajus xanthosternos* (Beltrão-Mendes, Cunha, & Ferrari, 2011), and Coimbra-Filho's Titi, *Callicebus coimbrai* (Marques et al., 2013). Smaller, more cryptic mammals, such as the Gray Slender Opossum, *Marmosops incanus*, have also been recorded in recent years (e.g., Rocha et al., 2012).

In addition to expanding our understanding of the diversity of Brazilian mammals, inventories are essential for establishing and planning effective strategies for the conservation of Atlantic Forest remnants, and its mammalian fauna, as proposed by Gouveia et al. (2017) for the endangered *C. coimbrai*. In the present study, we surveyed the non-volant mammalian diversity at a remnant of Atlantic Forest in Sergipe in order to both complement the known diversity of the state and evaluate patterns of species diversity and distribution in relation to habitat characteristics, in particular, altered forest habitats. The study focused on the mammals of the Ibura National Forest, a federal protected area located in eastern Sergipe, and provides important insights for the development of effective conservation strategies for the mammalian diversity of this site, in particular, and the state of Sergipe, in general.

Material and methods

Study area

The Ibura National Forest (INF; 144 ha; 10°50'26" S, 37°08'30" W; *Datum* WGS84) is a sustainable-use protected area, located in the municipality of Nossa Senhora do Socorro, in the Brazilian state of Sergipe (Figure 1). The INF encompasses a number of different phytophysiognomies, including pasture, mangrove, regenerating forest associated with a 35 year-old eucalypt plantation (*Eucalyptus* sp.), and semideciduous seasonal Atlantic forest (Azevedo, Mello, Ferreira, Sanquetta, & Nakajima, 2011). Most (76.6%) of the area of the INF is covered with the latter two types of forest (Santana, Rocha, Silva, Ribeiro, & Prata, 2017). These two phytophysiognomies can be distinguished by their canopy height and connectivity, with the eucalypt forest having a more open canopy with greater edge. Santana, Rocha, Oliveira, Prata, and Ribeiro (2020) concluded that the area of the eucalypt plantation had still yet to regenerate adequately, even after three decades, with this forest remaining at an early stage of succession, in comparison with the area of native semideciduous seasonal forest. The area surrounding the INF includes pasture, *Eucalyptus* plantations, urban development and small fragments of natural forest. The region's climate is tropical megathermal with dry summers, type *As* in Köppen's classification system (Alvares, Stape, Sentelhas, Gonçalves, & Sparovek, 2013).

Data sampling

Small, non-volant mammals were sampled on six days per month between July, 2012 and August, 2013. We used 36 live Sherman-type traps (22.5 cm x 7.8 cm x 9.2 cm), which we arranged in pairs (on the ground and the understory at a height of approximately 1.5 m) at intervals of at least 50 m. To evaluate the potential effects of habitat on species composition, the traps were first installed in the natural semideciduous forest for three consecutive days, and then repositioned in the regenerated *Eucalyptus* forest for the subsequent three days (each month). The traps were baited with a mixture of corn meal, peanut butter, banana, and sardine, to attract species with different types of diet (Astúa, Moura, Grelle, & Fonseca, 2006).

We also recorded mammals through a number of alternative approaches, including opportunistic captures, direct observation, and indirect evidence (*i.e.*, skulls, feces, footprints, vocalizations, burrows or tree scarification). During one campaign (August 2013), we trialed three camera-traps for a three-day period. Information on the local occurrence of mammalian species was also obtained from local informants, primarily INF staff members.

The animals captured during the study were identified, measured, marked with plastic earrings, and then released near the capture site. To guarantee species identification, voucher specimens were collected according to the protocol Sikes, Gannon, and The Animal Care and Use Committee of the American Society of Mammalogists (2011) and deposited in the mammal collection of the *Universidade Federal de Sergipe* in Aracaju (Appendix 1).
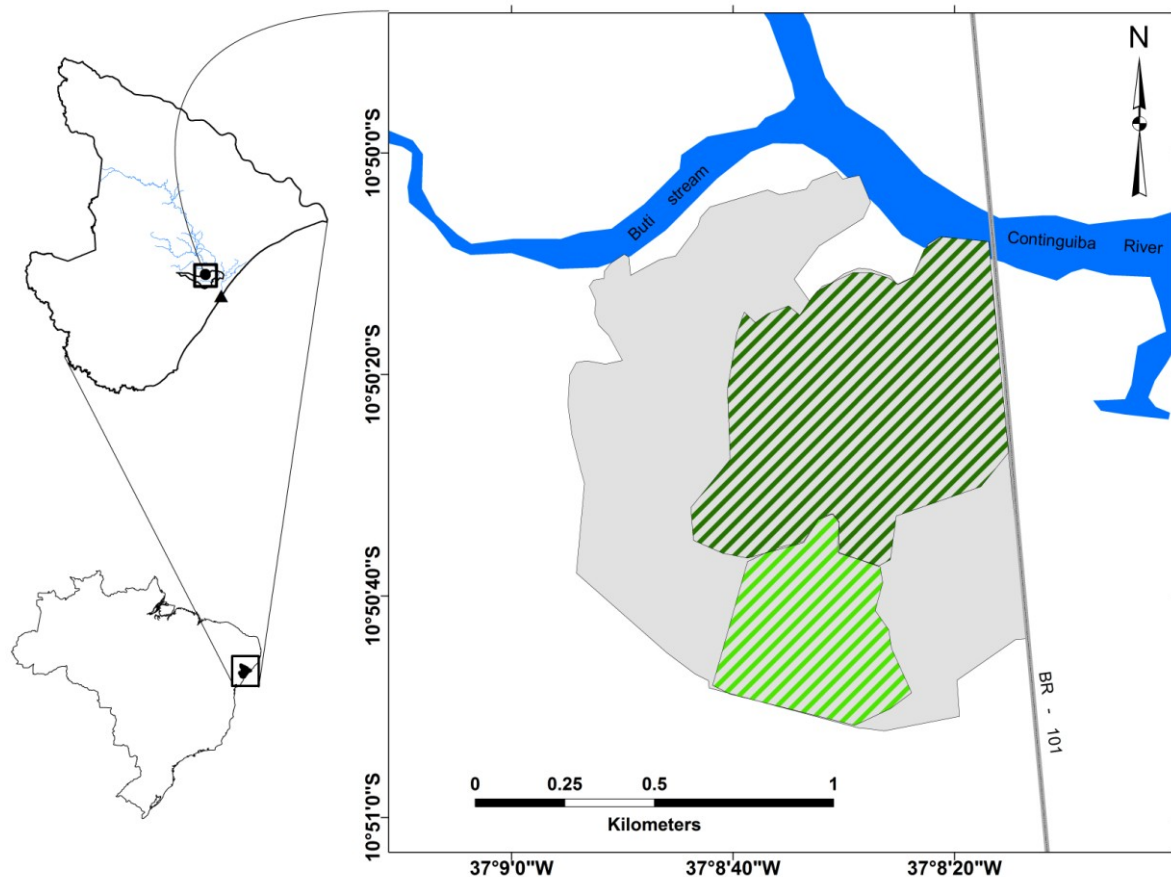

Figure 1. Location of the Ibura National Forest, INF (right), in the municipality of Nossa Senhora do Socorro, in the state of Sergipe (top left), northeastern Brazil (bottom left). Within the INF, natural semideciduous forest is hatched in dark green and the regenerated eucalypt plantation, in light green. Aracaju, the state capital, is shown as a triangle in the map of Sergipe.

Data analyses

The records obtained by direct observation, vestiges, opportunistic captures, and camera-trapping were not included in the quantitative analyses. The taxonomy followed Wilson and Reeder (2005), Rossi, Carmignotto, Brandão, Miranda, and Cherem (2012), Feijó and Langguth (2013), Patton, Pardiñas, and D'Elía (2015), and Graipel et al. (2017). The species conservation status is based on the Red List of the International Union for the Conservation of Nature (International Union for Conservation of Nature [IUCN], 2020), and the Brazilian National List of Threatened Species (Ministério do Meio Ambiente [MMA], 2014).

The sampling effort was calculated by multiplying the number of traps by the total number of sampling nights. The capture rate was obtained by the formula: (total capture sample effort^{-1}) x 100. Species richness was estimated with the Jackknife I estimator (1,000 runs) using EstimateS v.9.0 (Colwell, 2013), based only on the data from Sherman traps. We considered each month as an independent sample.

The nonparametric Mann-Whitney (U) test was used to verify the significance of the variation in capture frequencies between seasons (rainy *vs*. dry; all the data from the INF), habitat strata (understory *vs*. ground; all the INF data), and habitat type (eucalypt *vs*. native forest). We ran these analyses in BioEstat 5.0 (Ayres, Ayres Jr., Ayres, & Santos, 2007), using a significance level of 5%. To evaluate the effects of habitat type on the small mammal community, we ran a Non-Metric Multidimensional Scaling (NMDS), with an Analysis of

Similarity (ANOSIM), based on species abundance with the eucalypt and the natural forests as different groups. These analyses were run in PAST 3.2 (Hammer, Harper, & Ryan, 2001), using the Bray-Curtis similarity index, with a 95% confidence interval.

Results

Species diversity

We recorded 18 species of non-volant mammals belonging to 12 families and seven orders (Table 1). The most diverse orders were Rodentia (4 species), Carnivora (4 species), and Didelphimorphia (3 species). Four of these species were collected in the Sherman traps, with two other species being opportunistically captured. The other 12 species were recorded through field observations or camera-trapping (Table 1; Figure 2). Four of the sampled species were also confirmed by vestigial evidence (vocalizations and skull or carcasses), while 11 were reported by the local informants.

Table 1. Non-volant mammal species recorded during the present study in the Ibura National Forest, northeastern Brazil, between June, 2012 and August, 2013. Type of record: C = captured in Sherman traps; I = report from local informant; O = direct observation; OR = opportunistic recording or other capture; S = skull or carcass; V = vocalization.

Species	Common name	Type of record
Order Didelphimorphia		
Family Didelphidae		
Didelphis albiventris Lund, 1840	White-eared Opossum	C, I, O
Marmosa murina (Linnaeus, 1758)	Murine Mouse Opossum	C
Marmosa demerarae (Thomas, 1905)	Woolly Mouse Opossum	C
Order Cingulata		
Family Chlamyphoridae		
Euphractus sexcinctus (Linnaeus, 1758)	Six-banded Armadillo	I, O
Order Pilosa		
Family Myrmecophagidae		
Tamandua tetradactyla (Linnaeus, 1758)	Collared Anteater	I, O
Family Bradypodidae		
Bradypus torquatus (Illiger, 1811)[1]	Maned Three-toed Sloth	I, O
Bradypus variegatus (Schinz, 1825)	Brown-throated Sloth	I, O
Order Primates		
Family Cebidae		
Sapajus sp.	Capuchin Monkey	I, O, V
Callithrix jacchus (Linnaeus, 1758)	Common Marmoset	I, O, V
Order Lagomorpha		
Family Leporidae		
Sylvilagus brasiliensis (Linnaeus, 1758)	Tapiti	I, OR
Order Carnivora		
Family Canidae		
Cerdocyon thous (Linnaeus, 1766)	Crab-eating Fox	I, O, OR
Family Mustelidae		
Galictis cuja (Molina, 1782)	Lesser Grison	O
Lontra longicaudis (Olfers, 1818)[2]	Neotropical Otter	I, O
Family Procyonidae		
Procyon cancrivorus (Cuvier, 1798)	Crab-eating Raccoon	I, O
Order Rodentia		
Family Cricetidae		
Necromys lasiurus (Lund, 1841)	Hairy-tailed Bolo Mouse	OR
Cerradomys vivoi Percequillo et al. 2008	Vivo's Mouse	C
Family Muridae		
Mus musculus (Linnaeus, 1758)[3]	House Mouse	OR
Family Dasyproctidae		
Dasyprocta sp.	Agouti	S, V

[1]Classified as Vulnerable (VU) by MMA (2014) and IUCN (Chiarello & Moraes-Barros, 2014). [2]Classified as Near Threatened (NT) by the IUCN (Rheingantz & Trinca, 2015). [3]Exotic species captured in the INF lodgings.

The total sampling effort with the Sherman traps was 3,240 trap-nights. This effort resulted in 188 captures of 125 individuals (capture rate: 3.85%) of four species, in two orders. The most abundant species was *Marmosa demerarae*, with just over half of the captures (N = 65 captures; 52%), followed by *Didelphis albiventris*, *Cerradomys vivoi*, and *Marmosa murina* (Figure 3).
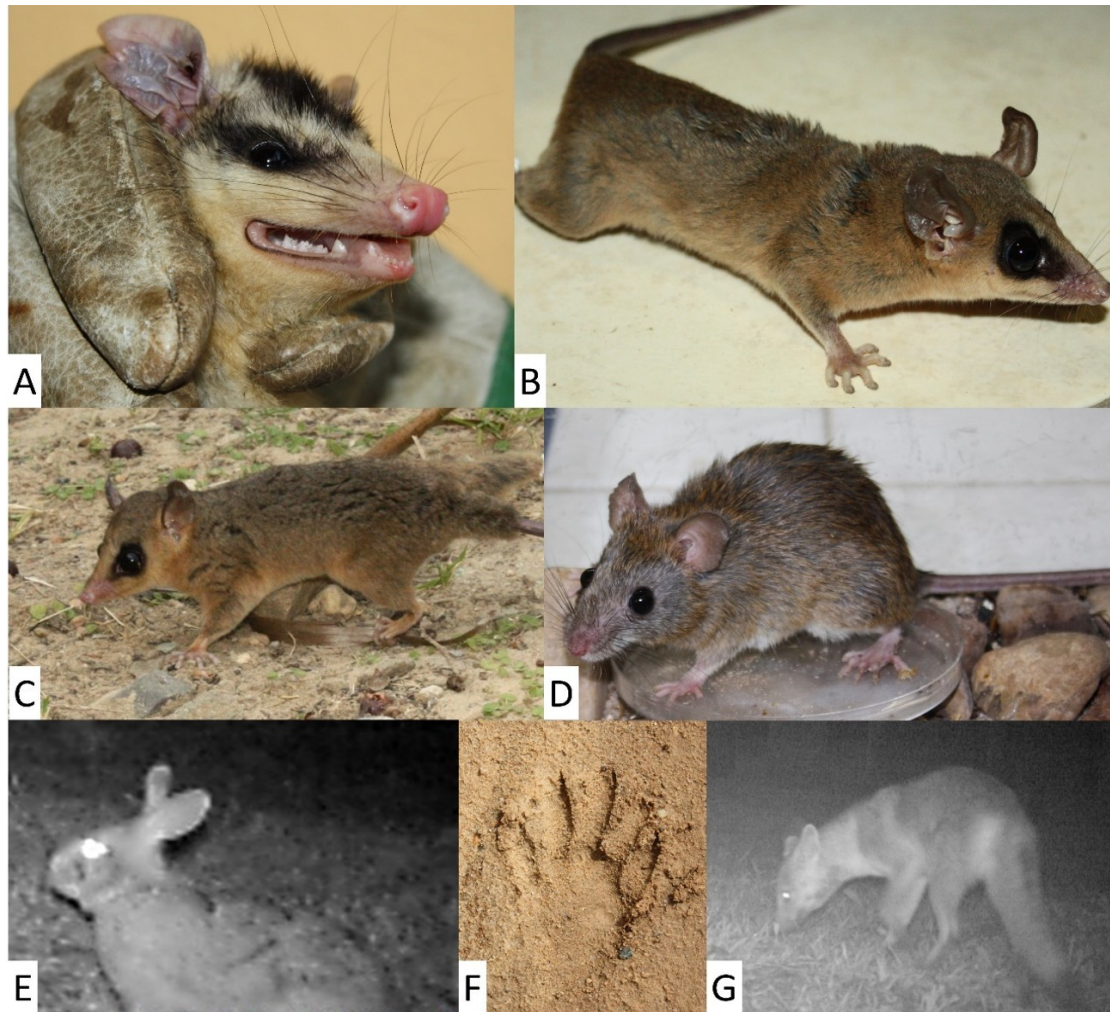
Figure 2. Examples of the mammal species recorded in the Ibura National Forest, Nossa Senhora do Socorro, Sergipe, northeastern Brazil, between June 2012 and August 2013. (A) White-eared opossum (*Didelphis albiventris*); (B) Murine Mouse Opossum (*Marmosa murina*); (C) Woolly mouse opossum (*Marmosa demerarae*); (D) Vivo's Mouse (*Cerradomys vivoi*); (E) Tapiti (*Sylvilagus brasiliensis*); (F) Crab-eating Raccoon (*Procyon cancrivorus*); (G) Crab-eating Fox (*Cerdocyon thous*).
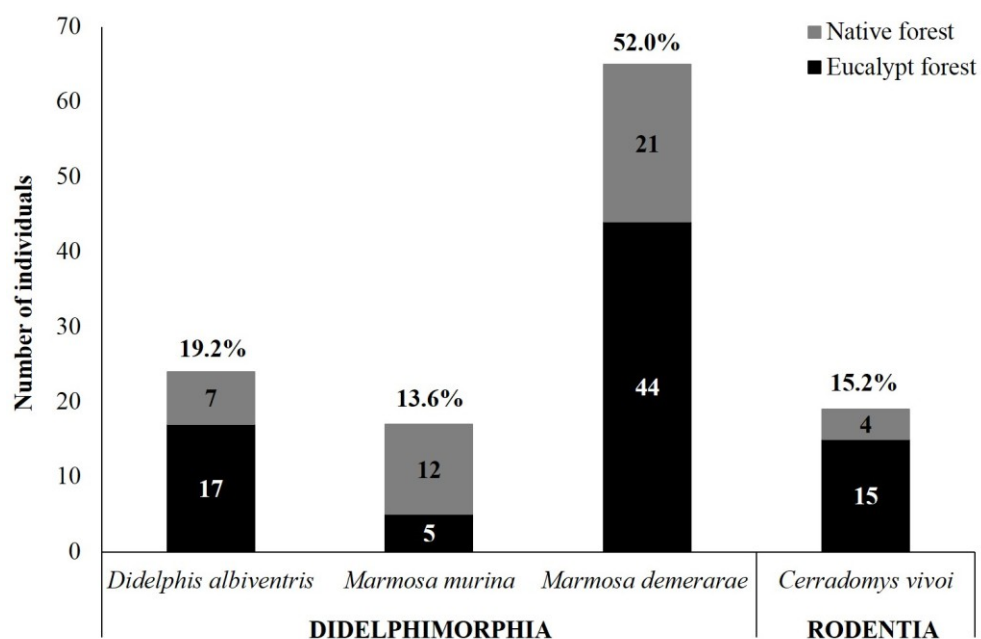

Figure 3. Absolute and relative abundance of the four mammal species captured in the two types of forest using Sherman traps in the Ibura National Forest, Nossa Senhora do Socorro, Sergipe, northeastern Brazil, between June 2012 and August 2013.

The species richness estimated by the Jackknife 1 procedure (Sherman trap data) was s = 4, exactly the number of species captured. This indicate that the sampling effort was satisfactory, with a low probability of recording additional species using the same method. Even so, a second cricetid rodent, *Necromys lasiurus*, was captured opportunistically by the research team during mist net sampling for birds. A sixth rodent was captured at the site, but it was the domestic mouse, *Mus musculus*, an exotic synanthropic species captured in the lodgings.

Two of the species recorded in the present study are considered to be under some threat of extinction. One of the species, *Bradypus torquatus*, is classified as Vulnerable (VU) by both the IUCN (Chiarello & Moraes-Barros, 2014) and the Ministério do Meio Ambiente [MMA] (Brasil, 2014). The second species is *Lontra longicaudis*, which is classified as Near Threatened (NT) by the IUCN (Rheingantz & Trinca, 2015). It is important to note, however, that numerous sloths (*Bradypus* spp.) and capuchins (*Sapajus* sp.) have been released into the forest in the past by the local environmental authorities (PCRB, pers. obs.).

Ecological relationships

Marmosa demerarae (U = 4.5, p < 0.05) was significantly more abundant in the dry season in comparison with the rainy season (Figure 4A). Two species, *D. albiventris* (U = 35; p < 0.05) and *C. vivoi* (U = 42.5; p < 0.05), presented a significant preference for the ground, whereas *M. demerarae* (U = 50.5, p < 0.05) preferred the understory significantly (Figure 4B). Only one species, *C. vivoi* (U = 46, p < 0.05) presented a significant preference for a given type of habitat, specifically, the eucalypt forest (Figure 4C). Even so, the NMDS and the ANOSIM indicated that significant differences exist between the two habitats, *i.e.*, eucalypt *vs.* native forest (*R* = 0.1088; p < 0.05; Figure 5).

Discussion

The capture rate recorded in the present study (3.85%) is within the range of values recorded (1.4–5.9%) at some other Atlantic Forest localities (D'Andrea et al., 2007; Passamani, 2000; Santos, Lóss, & Leite, 2004; Caldara Junior & Leite, 2007; Oliveira, Nessim, Costa, & Leite, 2007). Despite the considerable methodological differences among these studies, the results of the Jackknife 1 estimator indicated that the sampling effort of the present study was adequate. This analysis indicated that the mammal species richness of the INF is naturally low, given that only four species were captured in the Sherman traps over a one-year period. Even so, the opportunistic capture of *N. lasiurus* increased the number of native rodents/didelphimorphians to five species, which suggests that additional species might eventually be recorded over the long term.

In particular, the use of pitfall traps, which were not included in the present study, might result in the capture of additional species (see Williams & Braun, 1983; Umetsu, Naxara, & Pardini, 2006). This conclusion is reinforced by the fact that the first author observed one other small didelphid, *Monodelphis domestica*, in a small fragment of Atlantic forest near the INF (RB-M, pers. obs.). In fact, all the species recorded in the INF in the present study were expected, given that they have been recorded in other locations in Sergipe (Dias et al., 2017; Rocha et al., 2015; Patton et al., 2015), or in other areas within the same region (Gardner, 2008; Patton et al., 2015). The overall scarcity of inventories and the lack of standardization of the available studies of the mammal assemblages of the Atlantic Forest of Northeast Brazil limits the potential for the verification of possible regional patterns (see Feijó, Nunes, & Langguth, 2016 and Dias et al., 2017 for comparisons). The past conversion of the forest of the study site into an anthropogenic landscape may also have affected the mammalian diversity of the area (Umetsu & Pardini, 2007).

Despite the limitations, the number of non-volant mammals recorded in the present study (18) is higher than that recorded at other Atlantic Forest localities in Sergipe. Stevens & Husband (1998) recorded only nine species in the Crasto Forest, for example, while Oliveira et al. (2005) found 12 species in the Serra de Itabaiana National Park, Chagas et al. (2010) recorded 14 species at the Fazenda Trapsa, Dias et al. (2017) registered 13 in the Caju Private Natural Heritage Reserve (RPPN Caju), and Rocha et al. (2017) recorded 16 species in the Mata do Junco Wildlife Refuge. Considering only the small-bodied species (< 1 kg – see Dias et al., 2017), however, similar numbers of species have been recorded at the different sites, with five species being recorded in the present study, eight in the Crasto Forest, six at Serra de Itabaiana, and four in both the RPPN Caju and the Mata do Junco. Chagas et al. (2010) did not survey small mammals at the Fazenda Trapsa.
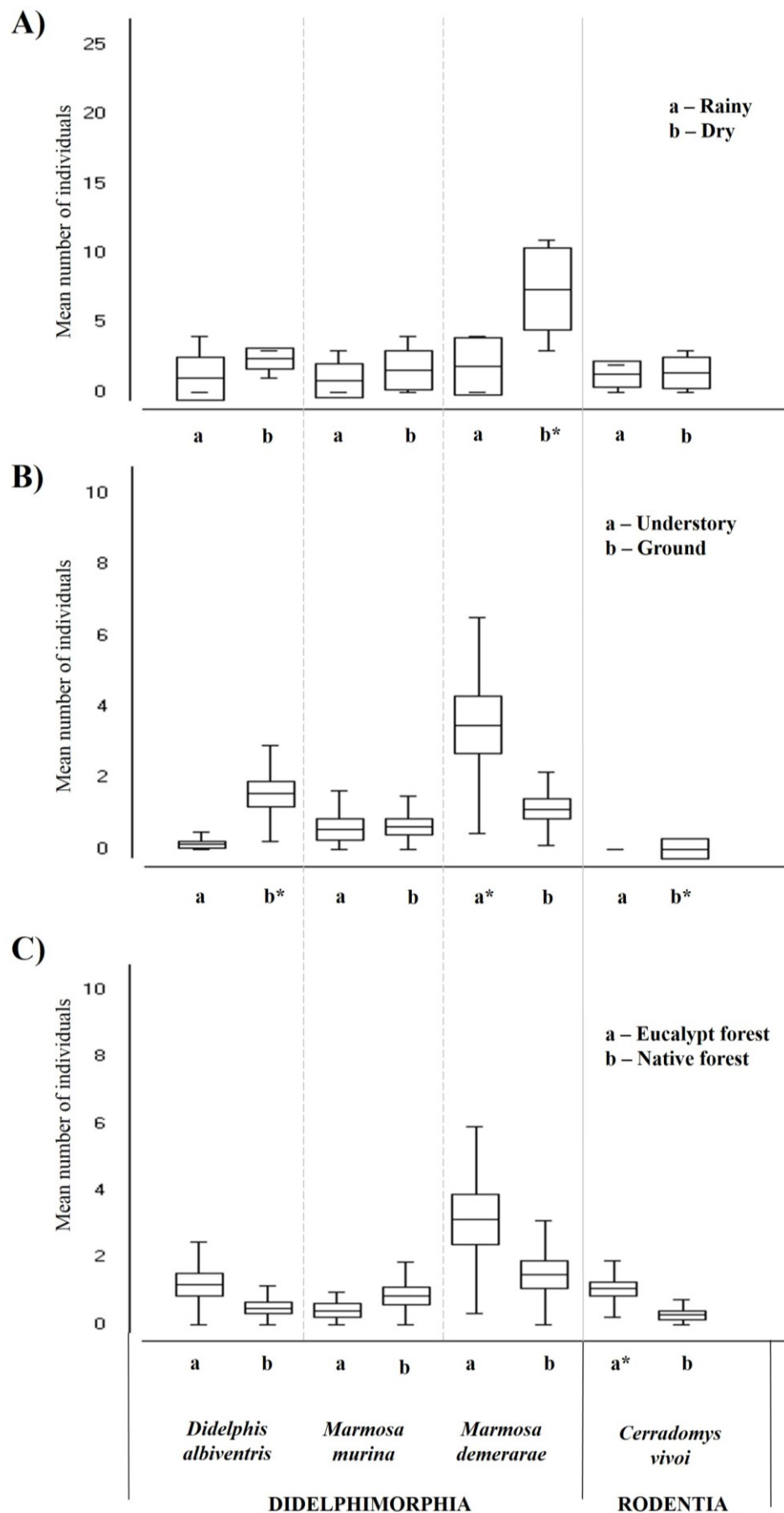
Figure 4. Mean capture frequencies of the mammal species recorded in the Ibura National Forest, Nossa Senhora do Socorro, Sergipe, northeastern Brazil, sampled between June 2012 and August 2013. (A) Rainy *vs.* Dry season; (B) Ground *vs.* understory; (C) Native forest *vs.* eucalypt forest. * = Significant difference (Mann-Whitney's U, p < 0.05) between the means recorded for the different conditions.
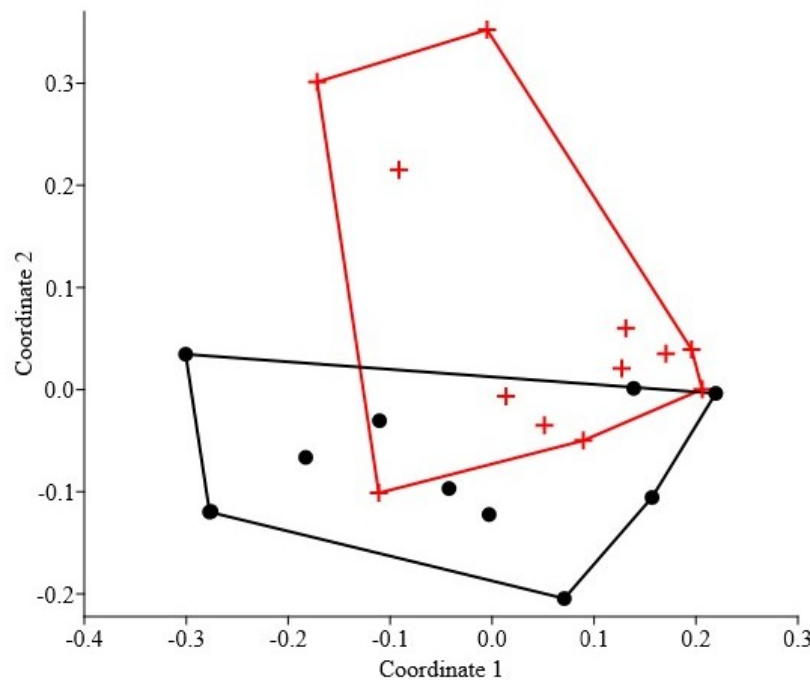
Figure 5. Non-Metric Multidimensional Scaling (NMDS) of the captured mammal species showing significant difference among mammalian communities between native forest (black dots) and eucalyptus forest (red plus), according to the ANOSIM (R = 0.145; p < 0.05).

Overall, then, the available evidence suggests that the diversity of small non-volant mammals in the Atlantic Forest remnants of Sergipe is intrinsically low. This may be a consequence of a number of factors, including the historical degradation and loss of habitats, and the related loss of habitat heterogeneity and complexity, which is characteristic of Sergipe, where only about 10% of the original forest cover survives (Santos et al., 2013; Marques et al., 2017). The observation of fire at the beginning of the study period is an indication of the current threat that pressures the study area and its biodiversity. According to the INF staff, fire is relatively common at the protected area. Nonetheless, the fire did not affect the study sites. We present the effects of habitat disturbance bellow, in the ecological relationship analyses of habitat type.

It is important to note that the current presence of both sloths (*B. torquatus* and *B. variegatus*) and capuchins (*Sapajus* sp.) in the INF is probably the result of animals being released into the local forest without adequate planning by the local environmental authorities (PCRB pers. obs.). While *B. torquatus* naturally occurs in Sergipe (Chagas et al., 2009), it is unclear whether the natural range of the species extends as far north as the INF, although this does not necessarily reduce the importance of the Ibura National Forest as a refuge for this Vulnerable species (Chiarello & Moraes-Barros, 2014; MMA, 2014). This protected area may also be important for the conservation of the local population of the Near Threatened *L. longicaudis* (Rheingantz & Trinca, 2015), given that it includes potential nesting sites along the margins of the Cotinguiba River and Buti stream.

Ecological relationships

Seasonality

The significantly greater abundance of *M. demerarae* recorded during the dry season (Figure 4A) is similar to the pattern found in marsupials by Costa, Vettorazzi, Pardini, and Verdade (2012). However, other studies have found the opposite pattern. Oliveira et al. (2007) captured *D. albiventris* exclusively in the rainy season, for example, while Quental, Fernandez, Dias, and Rocha (2001) recorded a peak of captures of *M. paraguayana* in the middle of the rainy season. Furthermore, Paglia, Lopes, Perini, and Cunha (2005) found no seasonal pattern in the capture rates on any mammal species in seasonal tropical forest (Atlantic Forest) or in tropical bush savanna (Cerrado). Differences in abundance thus appear to be associated with habitat seasonality, and resource availability (Briese & Smith, 1974; O'Connell, 1989). The type of trap and bait may also influence capture rates (see Slade, Eifler, Gruenhagen, & Davelos, 1993; Astúa et al., 2006), although this was not evaluated in the present study.

Habitat type

Marmosa murina was the only species whose abundance did not vary significantly between strata or habitat types (Figure 4B, C), despite the significant differences found in *D. albiventris* and *C. vivoi* (which preferred the ground), and M. demerarae (the understory). In an urban area, Oliveira et al. (2007) obtained higher capture rates on the ground for most marsupials, although two native rodents were more captured more frequently in the understory. Astúa et al. (2006) also found differences between substrates only in rodents.

Even though the two habitats monitored in the present study have different structures (see Santana et al., 2017, 2020) and phenological cycles of zoochoric plants (see Santana, Rocha, Oliveira, Prata, & Ribeiro, 2018), which is reflected in the availability of resources, the small mammal richness and composition was reduced and similar between areas. However, *C. vivoi* was the only species to present significantly different capture rates between habitats (Figure 4C), with a preference for the eucalypt forest. This may have influenced the significant difference found in the general community structure in the ANOSIM and NMDS analyses (Figure 5). This may be typical of closed forest habitats, given that Pardini, Souza, Braga-Neto, and Metzger (2005) observed a similar pattern, where small, connected fragments had a similar diversity to that found in more isolated fragments.

Although habitat structure and resource availability may modulate the structure of forest-dwelling mammal communities (e.g., O'Connell, 1989; Williams & Marsh, 1998), no consistent patterns can be discerned. Paglia et al. (2005), for example, found a greater diversity of small mammals in gallery forest in comparison with open areas in rocky outcrops, although Fonseca (1989) recorded a higher diversity in well-structured secondary forest in comparison with less-structured primary forest. Umetsu and Pardini (2007) found a marked difference between native forest and anthropogenic habitats, such as eucalypt plantations, which may be the result of the amount of habitat available, as well as the proximity of source habitats. Ecological pressures such as habitat degradation and the loss of heterogeneity and complexity, as mentioned above, may impact the mammalian diversity in natural areas (Fonseca, 1989; Chiarello, 1999; Umetsu & Pardini, 2007). Historical effects may also act at different scales in each scenario (Metzger et al., 2009). The conflicting results presented by Stevens and Husband (1998) and Passamani, Dalmaschio, and Lopes (2005) further emphasize the lack of conclusive evidence on the response of mammalian communities to habitat degradation and regeneration.

Small mammals, in particular, marsupials and rodents, have lower mobility compared with larger species, and higher levels of species turnover, in both time and space (see Bonvicino, Lindbergh, & Maroja, 2002; Camargo, Sano, & Vieira, 2018; Corrêa et al., 2018). Given this, these animals and the composition and structure of their communities are good indicators of environmental health and changes in the habitat structure, such as fragmentation and ecological succession (Umetsu & Pardini, 2007; Vieira et al., 2009; Honorato, Crouzeilles, Ferreira, & Grelle, 2015; Delciellos et al., 2018). Although the regenerating forest analyzed in the present study had the same composition as the native forest, differences can still be observed in the structure of the community, even after more than three decades of regrowth of the native understory. As found by Metzger et al. (2009), then, our results indicate that the effects of habitat loss on the mammal community may persist for decades.

Conclusion

Despite its small area, the INF still has a promising diversity of mammals. The combination of sampling methods (trapping, active search, direct observation, and traces) was effective for this present inventory compilation, although the inclusion of complementary methods (analysis of tracks, use of pitfall, canopy traps), may guarantee a more complete inventory of the mammalian fauna of the study area. The present study also indicates that continuing research in Sergipe will expand our understanding of the role of habitat structure in the maintenance of mammalian diversity, both locally, and from a wider perspective in the Atlantic Forest of northeastern Brazil.

Acknowledgements

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**Appendix 1: Specimens examined and deposited in the Conservation Biology Laboratory
(LCB in Portuguese)**

Didelphis albiventris: Male (LBC 39); *Marmosa murina*: Female (LBC 45); *Marmosa demerarae*: Female (LBC 41, 43, 44); *Bradypus torquatus*: Undefined (LBC 80); *Sapajus* sp.: (LBC 84); *Necromys lasiurus*: (LBC 81); *Cerradomys vivoi*: Male (LBC 40, 42); *Mus musculus*: Male (LBC 82); *Dasyprocta* sp.: Skull (LBC 83).