Abundance of small mammals in the Atlantic Forest (ASMAF): a data set for analyzing tropical community patterns

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**Introduction**

Local abundance is a result of the interaction between population and environmental processes (Brown 1984). Whether a population will grow or decline depends on the life-history traits, species ecological requirements, the interactions with other species, and the environment. Species abundances in a community are also one of the most basic descriptors of its structure (Magurran 2004). Throughout the history of community ecology, species abundance distribution (SAD) gave origin to many community models, both empirical (Fisher et al. 1943, Preston 1948, 1962a) and mechanistic (MacArthur 1957, King 1964, Sugihara 1980, Hubbell 2001, He 2005). SAD was used to describe community patterns (Preston 1962b, Whittaker 1965, Dornelas et al. 2006), and to infer processes underlying the structure of the communities (Chave 2004, Dornelas et al. 2011). Species abundance has been implicitly considered in metacommunity models (Leibold et al. 2004), and also used to address questions from a functional perspective (Mouchet et al. 2010). Although at the centre of community ecology for more than seven decades, SAD still raises interesting and unanswered questions (McGill et al. 2007, Yen et al. 2017).

Despite its importance, information about species abundances is fragmentary and oftentimes available only from grey literature, or even in unpublished datasets in collections and universities (Cardoso et al. 2011). This creates a knowledge gap about species abundances in time and space, known as the Prestonian shortfall (Hortal et al. 2015). Prestonian shortfall is characteristic of tropical rainforests, which are among the most diverse and structurally complex ecosystems in the world, but present the largest knowledge gaps (Pereira et al. 2012, Zuidema et al. 2013).

The Atlantic Forest of South America is more intensely studied when compared to other tropical forests, but it is also among the most degraded and fragmented biomes worldwide. It is currently reduced to *c*. 12% of its original distribution, and 80% of Atlantic Forest remnants are smaller than 50ha (Ribeiro et al. 2009). The Atlantic Forest encompasses all mesic forest formations east of the South American dry diagonal (Oliveira-Filho and Fontes 2000, Eisenlohr and Oliveira-Filho 2015), and is among the most diverse regions in the world, harboring about 1 to 8% of the world’s species (Silva and Casteleti 2003). For these reasons the Atlantic Forest has received special attention from researchers, conservation agencies and organizations, with special issues dedicated to it in tropical ecology and conservation journals (Morellato and Haddad 2000, Metzger 2009, Eisenlohr et al. 2015).

Mammals are one of the most studied taxa in the world, and we have extensive databases regarding their life history, ecology, physiology, and geographical distributions (Jones et al. 2009, Astúa 2015, Wilson et al. 2016, Bovendorp et al. 2017), besides a recent phylogeny which comprehends all its extant species (Faurby and Svenning 2015). Non-flying small mammals, less than 2 kg, occupy various ecological niches and dominate the terrestrial mammalian fauna (Eisenberg 1981), accounting for more than 55% of its species (Wilson and Mittermeier 2009). In Neotropical region, mammals are represented mostly by species belonging to the Orders Didelphimorphia and Rodentia. Small mammals are particularly suited for testing community patterns due to their richness, higher net speciation rate, greater specialization owing to energetic and dietary constraints, and high turnover of species between habitats and across the landscape compared to large mammals (Brown and Nicoletto 1991, Lopez et al. 2016).

Small mammals play important ecological roles as seed and mycorrhizal fungi dispersers (Grelle and Garcia 1999, Mangan and Adler 1999, 2000, Colgan and Claridge 2002, Vieira et al. 2003, Pimentel and Tabarelli 2004), seed predators (Sánchez-Cordero and Martínez-Gallardo 1998, Vieira et al. 2003, Galetti et al. 2015), arthropod predators (Santori et al. 1997, Carvalho et al. 2005), and prey for larger vertebrates (Wright et al. 1994, Terborgh et al. 2001). They have epidemiological importance, since many species can act as reservoirs for zoonotic diseases (D’Andrea et al. 2002, Oliveira et al. 2004, Teixeira et al. 2014). Small mammal communities have also been used as indicators of habitat quality, as the species respond differently to habitat fragmentation and degradation (Vieira et al. 2009, Caudill et al. 2015, Delciellos et al. 2016).

Many small mammal communities were sampled throughout the entire Atlantic Forest, but most of this information remains dispersed and not systematized. The dataset gathered here is a compilation of published scientific articles, book chapters, unpublished theses, dissertations, monographs, and original unpublished data on species abundance that covers the whole extension of the Atlantic Forest, from northeastern Brazil to northern Argentina and eastern Paraguay. It represents one of the most comprehensive dataset for species abundance in a tropical rainforest. It includes 1,902 records of at least 111 species in 173 samples from 155 localities, totaling 42,617 individuals represented here. Furthermore, it includes additional information regarding the sampled localities, such as ecoregion, predominant vegetation type, and biogeographic subdivision.

**Metadata**

**Class I. Data set descriptors**

**A. Data set identity**: Three files: Localities, Mammal communities and References

**Title:** Abundance of small mammals in the Atlantic Forest (ASMAF): a data set for analyzing tropical community patterns

**B. Data set and metadata identification codes**:

**Suggested Data Set Identity Codes:** Localities.csv, Mammal\_Communities.csv and References.csv

**C. Data set description:**

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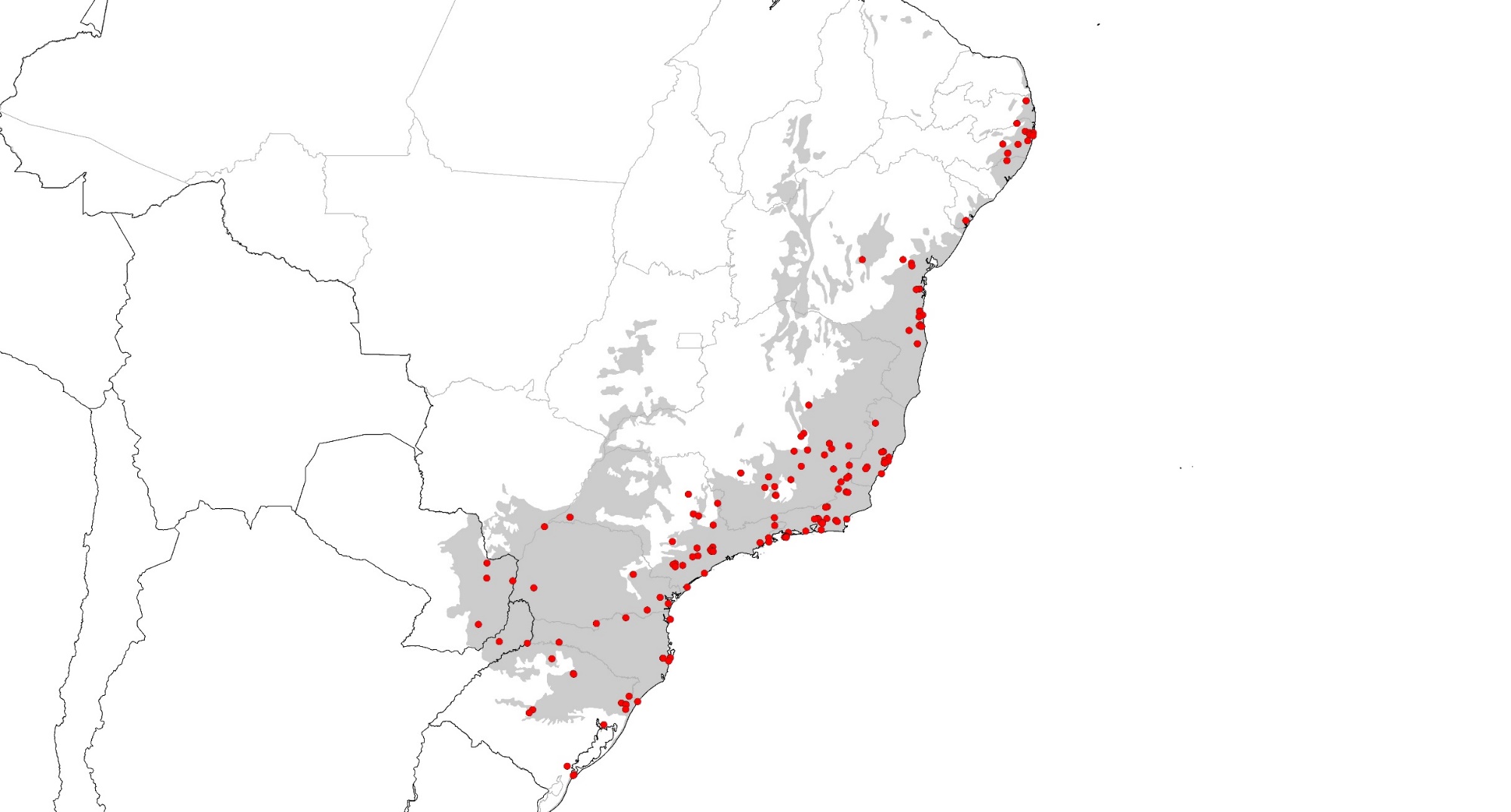
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**Abstract:** Local abundance results from the interaction between populational and environmental processes. The abundance of the species in a community is also one of the most basic descriptors of its structure. Despite its importance, information about species abundances is fragmentary, creating a knowledge gap about species abundances known as Prestonian Shortfall. Here we present a comprehensive dataset of small mammal abundance in the Atlantic Forest. Data were extracted from 114 published sources and from unpublished data collected by our research groups spanning from 1943 to 2017. The data set includes 1,902 records of at least 111 species in 155 localities, totaling 42,617 individuals represented. We selected studies that (i) were conducted in forested habitats of the Atlantic Forest, (ii) had a minimum sampling effort of at least 500 trap-nights, and (iii) contained species abundance data in detail. For each study, we recorded (i) latitude and longitude, (ii) name of the locality, (iii) employed sampling effort, (iv) type of traps used, (v) study year, (vi) country, and (vii) species name with (viii) its respective abundances. For every locality, we also obtained information regarding its (ix) ecoregion, (x) predominant vegetation type, and (xi) biogeographic subdivision. Whenever necessary, we also (xii) updated the species names as new species were described and some genera suffered taxonomic revision since the publication. The localities are spread across the Atlantic Forest and most of the small mammal species known to occur in Atlantic Forest are present in the data set, making it representative of communities of the entire biome. This data set can be used to address various patterns in community ecology and geographical ecology, as the relation between local abundance and environmental suitability, hypothesis regarding local and regional factors on community structuring, species abundance distributions (SAD), functional and phylogenetic mechanisms on community assembling.

**D. *Key words***: abundance; Atlantic Forest; community structure; marsupials; rodents; small mammals; species composition.

**E. Description:** This data set includes 173 samples from 155 localities spread across the entire Atlantic Forest, from northeastern Brazil to northern Argentina and eastern Paraguay (Figure 1). From these samples, we obtained 1,902 records of at least 111 species, totaling 42,617 individuals. These 111 species included almost every species reported to occur in the Atlantic Forest (Paglia et al. 2012). Furthermore, in some of the studies the authors could not identify all species, presenting information only at the level of genus for some. Therefore, the number of species in this data set may be higher than the reported here. There are two regional sampling gaps: (i) a low number of samples on the Paranaense and Paulista plateaus, and (ii) an absence of samples in the north-eastern Minas Gerais e southern Bahia, along the Jequitinhonha river.



**Figure 1.** Distribution of the 155 localities (red dots) included in the data set of non-volant small mammal species abundance in the Atlantic Forest, South America. Each red dot can represent more than one sample as some localities were sampled more than once (total = 173 samples).

Considering the year when the data began to be collected in each sample, the oldest studies we found information are from 1943, but the bulk of the data set is formed by studies that started in the last years of the 1990 decade. The years of 2007 and 2008 had the highest number of small mammal communities sampled, and *c*. 65% of the samples of the last decade correspond to previously unpublished information or information available only in thesis, dissertations and monographs (Figure 2). Sampling effort of the studies ranged from 560 to almost 70,000 trap-nights. More than 75% of the studies had an effort of 10,000 trap-nights or less, but most of the studies (89.6%) employed an effort of more than 1,000 trap-nights (Figure 3).

**Figure 2.** Number of samples of Atlantic Forest non-volant small mammal communities per year (n = 173), from 1943 to 2016, and source of data information included in the dataset (published and unpublished data, thesis, dissertations, and monographs). The year is not the year of the source of the data, but the year data began to be collected in the locality in each sample.

**Figure 3.** Number of samples of Atlantic Forest non-volant small mammals communities per sampling effort measured in trap-nights (n = 173). In orange are samples with a total sampling effort smaller than 1,000 trap-nights.

Our data set contains samples of 155 localities spread across the Atlantic forest, and captures the entire extension of this biome, as the samples are distributed throughout the ecoregions. Most of the localities (*c*. 87%) are in ecoregions where forest predominates, the other 13% are located in forest enclaves and non-forested ecoregions. Eleven of the 12 ecoregions, which form the core of the Atlantic Forest, are represented in this dataset, however, the ecoregions are not proportionally represented. Comparing the proportion of localities in each ecoregion to the relative area occupied by each ecoregion, and excluding the samples located outside of the core of the Atlantic Forest (*Cerrado*, *Caatinga* and Uruguayan savanna ecoregions), we could identify four ecoregions (Alto Parana Atlantic forests, Araucaria moist forests, Atlantic dry forests, and Bahia interior forests) as underrepresented in this dataset, besides the moist forests of the Caatinga Enclave, which are not represented (Table 1).

**Table 1.** Proportion of localities (n=142) and area occupied by each of the 12 ecoregions that form the core of the Atlantic Forest biome. Localities outside the core of the Atlantic Forest (*Cerrado*, *Caatinga* and Uruguayan savanna ecoregions; n=13) were not considered.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Ecoregion | Area km² | % Area | # of localities | % of localities |
| Alto Paraná Atlantic forests | 482851.5 | 36.03% | 19 | 13.38% |
| Araucaria moist forests | 215673.2 | 16.09% | 14 | 9.86% |
| Atlantic Coast *restingas* | 7556.7 | 0.56% | 3 | 2.11% |
| Atlantic dry forests | 114660.0 | 8.56% | 1 | 0.70% |
| Bahia coastal forests | 108802.1 | 8.12% | 24 | 16.90% |
| Bahia interior forests | 229157.1 | 17.10% | 19 | 13.38% |
| Caatinga Enclaves moist forests | 4776.3 | 0.36% | 0 | 0.00% |
| *Campos rupestres* montane savanna | 26313.0 | 1.96% | 4 | 2.82% |
| Pernambuco coastal forests | 17439.9 | 1.30% | 6 | 4.23% |
| Pernambuco interior forests | 22214.1 | 1.66% | 5 | 3.52% |
| Serra do Mar coastal forests | 102218.9 | 7.63% | 45 | 31.69% |
| Southern Atlantic mangroves | 8404.8 | 0.63% | 2 | 1.41% |

The same pattern of variation in the distribution of samples was observed for the vegetation types (Figure 4), as in *c*. 87% of the localities the forests are the predominant vegetation type, where 55% of the localities represent ombrophilous forests and 32% represent seasonal vegetation types. In 8% of the localities there was no predominant vegetation type, thus representing heterogeneous landscapes in which different vegetation types are in contact. All the major vegetation types present in the Atlantic Forest are represented in this data set.

**Figure 4.** Number of localities (n=155) of each vegetation type where small mammal communities included in the dataset were sampled in the Atlantic Forest.

The 155 localities are also distributed among biogeographic subdivisions, but not every Atlantic Forest subdivision as defined by (Silva and Casteleti 2003), is represented in the samples. The Diamantina and Interior forests subdivisions are slightly underrepresented in this dataset, and we could not find any information regarding small mammal abundances for the São Francisco subdivision. The remaining subdivisions are well represented, regarding their relative areas (Table 2).

**Table 2.** Proportion of localities (n=155) and area occupied by each of the eight biogeographic subdivisions that form the Atlantic Forest biome.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Biogeographic subdivision | Area km² | % Area | # of localities | % of localities |
| Araucária forests | 130349.2 | 9.73% | 14 | 9.0% |
| Bahia | 118507.0 | 8.84% | 24 | 15.5% |
| Diamantina | 51431.2 | 3.84% | 4 | 2.6% |
| Interior forests | 482257.1 | 35.99% | 49 | 31.6% |
| Northeastern *brejos* | 4776.3 | 0.36% | 1 | 0.6% |
| Pernambuco | 21544.4 | 1.61% | 13 | 8.4% |
| São Francisco | 232111.1 | 17.32% | 0 | 0.0% |
| Serra do Mar | 299091.3 | 22.32% | 50 | 32.3% |

The number of species in small mammal assemblages ranged from two to 29 species, but the majority of the studies (*c*. 61%) reported assemblages composed of five to 12 species (Figure 5). Few species in the data set are abundant and most of them are rare. The ten most abundant species on the data set accounts for 62.1% of all sampled individuals (Figure 6). Of these ten species, seven are rodents [*Akodon montensis* (n = 5299), *Oligoryzomys nigripes* (n = 4090), *Akodon cursor* (n = 2750), *Euryoryzomys russatus* (n = 2134), *Nectomys squamipes* (n = 1883), *Hylaeamys seuanezi* (n = 1617), and *Thaptomys nigrita* (n = 1406)], and three are marsupials [*Didelphis aurita* (n = 2779), *Marmosops incanus* (n = 2620), and *Metachirus nudicaudatus* (n = 1170)]. A similar pattern was observed regarding species occurrences in the samples, as the ten most frequent species in the data set account for 42.2% of all registered species, and 35 species are present in three samples or less (Figure 7). Seven of the most frequent species are also among the most abundant in the data set [*D. aurita* (n = 114), *O*. *nigripes* (n = 112), *N. squamipes* (n = 86), *M. incanus* (n = 80), *E. russatus* (n = 69), *A. cursor* (n = 68), and *A. montensis* (n = 57)], and the other three species are marsupials *Philander frenatus* (n = 65), *Gracilinanus microtarsus* (n = 57) and *Marmosa paraguayana* (n = 56).

**Figure 5.** Number of samples (n=173) per species richness class for Atlantic Forest non-volant small mammal communities included in the dataset.

**Figure 6.** Species abundance distribution (on logarithmic scale) for the entire dataset (n = 173) of Atlantic Forest non-volant small mammal communities. Species are ranked based on their abundance in the dataset.

**Figure 7.** Number of species occurrences in the samples (n = 173). Species are ranked based on their incidence on the dataset of Atlantic Forest non-volant small mammal communities.

**Class II. Research origin descriptors**

**A. Overall project description**

**Identity:** The structure of mammal communities in the Atlantic Forest

**Originators:** The project was coordinated by Marcus V. Vieira at the Universidade Federal do Rio de Janeiro, and the database was assembled by Marcos Figueiredo, with help from all the other authors.

**Period of Study:** The period of study in the selected studies range from 1943 to 2017.

**Objectives:** To present a comprehensive database regarding species abundance of small mammals from the entire Atlantic Forest. This data set can be used to address various patterns in community and geographical ecology, such as the relation between local abundance and environmental suitability, hypothesis regarding local and regional factors on community structuring, species abundance distributions (SAD), and functional and phylogenetic mechanisms on community assembling.

**Abstract:** Same as above.

**Sources of funding:** During the compilation of this dataset MSLF was supported by a post-doctoral grant from CNPq (150734/2015-8). CSB was supported by a post-doctoral grant from CAPES/FAPERJ (E-26/202.174/2015). ACD was supported by post-doctoral grants from CAPES/FAPERJ (E-26/202.144/2015) and CNPq-PPBio (383546/2014-1). EBG was supported by a graduate grate from CNPq (132758/2016-4). MK received grants from FAPERJ (E-26/110.844/2013, E-26/010.002038/2015) and Prociência/UERJ. MRA received grants from UESC (PROPP 00220.1100.1264 and 00220.1100.1645). PHA and DA received grants from CNPq and FACEPE. RC, LG, CEVG, and MVV received grants from CNPq and FAPERJ. HGB received grants from CNPq (307781/2014-3), FAPERJ and Prociência/UERJ. MW received grants from CNPq (440663/2015-6) and FAPERJ (E-26/110.505/2012). This project is a contribution of Rede de Biodiversidade FAPERJ (E-26/171.595/2004), Projeto Biodiversidade do Bioma Mata Atlântica (MCTI/JBRJ/UFRJ/MMA/PROBIO II), and Rede BioMA (PPBIO Mata Atlântica/MCTIC/CNPq procs: 457524/2012-0, and 457458/2012-7). IOC/Fiocruz provided additional funding for some of the samplings.

**B. Specific subproject description**

**Site description:** This data set is composed of communities sampled in forested environments of the Atlantic Forest biome, from northeastern Brazil to the north of Argentina and eastern Paraguay. The Atlantic Forest encompasses all forest formations east of the South American dry corridor, including semi-deciduous forests, subtropical *Araucaria* forests and northeastern *brejos de altitude* (Oliveira-Filho and Fontes 2000, Eisenlohr and Oliveira-Filho 2015). It is among the most diverse regions in the world, harboring about 1 to 8% of the world’s species (Silva and Casteleti 2003), including more than 300 species of mammals, of which about 90 are endemic to the biome (Paglia et al. 2012). Over 110 species of small mammals were registered for the Atlantic Forest (Paglia et al. 2012), and new species are still being described*(**e**.g.* Gonçalves and Oliveira 2014, Quintela et al. 2014, Pavan 2015).

Due to its geographic location that extends along Brazilian Atlantic coast, the Atlantic Forest was one of the first regions to be explored during Portuguese and Dutch colonization of Brazil (Marcgrave and Piso 1648). The economic cycles of timber logging, sugarcane, coffee plantations, cattle ranching, and later the industrialization and urban occupation, are mostly responsible for the ecosystem degradation (Dean 1995). Currently the natural remnants account for *c*. 12% of the Atlantic Forest original cover, and over 80% of these remnants are smaller than 50ha (Ribeiro et al. 2009). This situation, combined with its high biodiversity, places it on the top of conservation priorities among world ecosystems (Myers et al. 2000). Due to its importance, the Atlantic Forest has been a well-studied biome, and in the last two decades three important ecology and conservation journals dedicated special issues to it: Biotropica (Morellato and Haddad 2000), Biological Conservation (Metzger 2009), and Biodiversity and Conservation (Eisenlohr et al. 2015).

**Research Methods**: We assembled a database by consulting multiple sources of information: (i) 76 published scientific articles or book chapters, (ii) 37 unpublished theses, dissertations, and monographs, (iii) one technical report, and (iv) unpublished data collected by our research groups. We used online academic databases (Google Scholar, Scielo, Scopus) to search for articles and theses by using the keywords “small mammals”, “rodents”, “marsupials”, “community”, “composition”, “assemblage”, and “Atlantic Forest” combined in different ways. Searches were conducted in English and Portuguese. Eventually, an article found among the references of another publication, but not returned by the searches on the online databases, could also be included in our database. For inclusion in the database a study had to attend three criteria: (i) be conducted in forested habitats of the Atlantic Forest, thus excluding studies in open habitats as pastures, crops, scrub *restingas* (but included the *matas de restinga* formations), and *campos de altitude*, (ii) had a minimum sampling effort of at least 500 trap-nights, and (iii) contained species abundance data in details. If the study sampled both forested and open habitats and provided this information separately, we opted to include only the individuals captured in forested habitats, as this is the main focus of the dataset.

Some publications sampled multiple areas in the same region, hence some publications could contain information on more than one locality. To consider a locality as independent, a publication had to present two basic information in a discrete way: (i) coordinates, and (ii) species abundance for each locality. Some localities were sampled by different people on different dates, thus providing independent samples from the same localities. The dataset totals 173 samples from 155 localities spread across the entire Atlantic Forest, from northeastern Brazil to northern Argentina and eastern Paraguay (Figure 1).

**Experimental/Sampling design:** For each locality, we recorded the following information: (i) latitude and longitude, (ii) name of the locality, (iii) employed sampling effort, (iv) type of traps used, (v) study year, (vi) country, and (vii) species name with (viii) its respective abundances. For every locality we also obtained information regarding its (ix) ecoregion (Olson et al. 2001), (x) predominant vegetation type (IBGE 2004), and (xi) biogeographic subdivision (Silva and Casteleti 2003). Whenever necessary, we also (xii) updated the species names following (Astúa 2015) for marsupials, and Patton et al. (2015) for rodents, as new species were described (Costa et al. 2011, Gonçalves and Oliveira 2014, Quintela et al. 2014, Pavan 2015), and some genera suffered taxonomic revision (Weksler et al. 2006, 2017, Voss and Jansa 2009, Asfora et al. 2011, Loss and Leite 2011, Percequillo et al. 2011, Brennand et al. 2013, Pardiñas et al. 2016) since the articles were published. However, some specimens were identified only at genus level on the source of information, and as the genus was revised and divided in several new genera potentially occurring in the same geographic region (*e.g.*, *Oryzomys*; Weksler et al. 2006), it was not possible to update the species name. In these cases, the name presented in the original source was maintained. Also, two species are presented on the dataset as undescribed species (sp. nov.). The first is an echimyid rodent of the *Phyllomys* genus, originally presented by Vieira et al. (2009) as *Phyllomys* sp., and later identified as an undescribed species (*Phyllomys* sp. 3) by Loss and Leite (2011). The other is a cricetid rodent presented by Pedó et al. (2010) as a *Akodon* sp. 2, but later identified as an undescribed form of *Deltamys* by Quintela et al. (2014).

**Class III. Data set status and accessibility**

**A. Status:**

**Latest update:** 04 August 2017

**Latest Archive date:** 04 August 2017

**Metadata status:** 04 August 2017, version submitted

**Data verification:** Marcos Figueiredo, Camila Barros, Ana Delciellos, and Edú Guerra read through the title and abstract of all studies, searching for potential candidates for inclusion on this dataset. Those articles which fulfilled the criteria for inclusion were assessed in detail by either Marcos Figueiredo, Camila Barros, Ana Delciellos, or Edú Guerra. The other authors compiled unpublished data collected by their research groups and passed it to Marcos Figueiredo and Pedro Cordeiro-Estrela for inclusion on the dataset. Marcos Figueiredo, Ana Delciellos, Pedro Cordeiro-Estrela, Lena Geise, and Marcelo Weksler then updated the species names.

**B. Accessibility**

**Storage location and medium:** Original data file is available as Supporting Information to this Data Paper published in *Ecology* (DOI: 10.1002/ecy.2005) and can also be found on GitHub Inc. in .csv format.

**Download link:** https://github.com/marcosfig/ASMAF

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**Copyright restrictions:** None.

**Proprietary restrictions:** Please cite this data paper when the data are used in publications.

**Costs:** None.

**Class IV. Data structural descriptors**

For simplicity reasons, we opted to divide the dataset into three complementary files. The first (Localities.csv) describes the characteristics of the sampled localities. The second (Mammal\_Communities.csv) contains information regarding species composition at each locality. The third (References.csv) contains the references cited on the database assembling.

**A. Data Set Files**

**Identity:** Localities.csv

**Size:** 12 columns and 174 rows records, including header row.

**Format and storage mode:** Text file, semi-colon delimited, no compression.

**Header information:** Header names.

**Alphanumeric attributes:** Mixed.

**Special characters/fields:** None.

**Identity:** Mammal\_Communities.csv

**Size:** 4 columns and 1,903 rows records, including header row.

**Format and storage mode:** Text file, semi-colon delimited, no compression.

**Header information:** Header names.

**Alphanumeric attributes:** Mixed.

**Special characters/fields:** None.

**Identity:** References.csv

**Size:** 2 columns and 115 rows records, including header row.

**Format and storage mode:** Text file, semi-colon delimited, no compression.

**Header information:** Header names.

**Alphanumeric attributes:** Mixed.

**Special characters/fields:** None.

**B. Variable definitions:** An ID number was assigned to each locality. For every locality, we recorded the following information: (i) latitude and longitude, (ii) name of the locality, (iii) employed sampling effort, (iv) type of traps used, (v) study year, (vi) country, (vii) ecoregion, (viii) vegetation type, (ix) species name as provided in the original source, (x) updated species name, for species where taxonomic modifications were made, (xi) its abundance, (xii) the reference from where the data was obtained, and the (xiii) complete citation of the reference.

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable name** | **Variable definition** | **Units** | **Storage type** |
| SampleID | Individual identification number for each sample with abundance information. The same ID number is used on Localities.csv, Mammal\_Comunities.csv, and References.csv files. | N/A | Numeric |
| Latitude | Geographic coordinates (latitude) for each study. When multiple geographic coordinates were provided, we used the mean value to represent the study location. Thus, geographic coordinates for each study were located in the center of the cluster of sampling sites. | Decimal degree | Numeric |
| Longitude | Geographic coordinates (longitude) for each study. When multiple geographic coordinates were provided, we used the mean value to represent the study location. Thus, geographic coordinates for each study were located in the center of the cluster of sampling sites. | Decimal degree | Numeric |
| Locality | Name of sampled locality as described in the study. | N/A | Character |
| Reference | Citation of the study. When this information came from unpublished source collected by our research groups, we cited it as [name of leading researcher] unpublished data. | N/A | Character |
| Sampling\_effort | Total number of traps used to sample the locality, as provided by the authors. When this information was not readily available, we estimated the effort based on the sampling protocol described by the authors, or we contacted the authors to obtain it. | Trap-nights | Numeric |
| Traps | Type of traps used to sample the communities of small mammals at each locality. If more than one size was used for a given trap type, this information was also highlighted in this field. | N/A | Character |
| Study\_year | The duration of study in years. When this information was not available, we contacted the authors to obtain it. | Year | Character |
| Country | Country in which the study was conducted. | N/A | Character |
| Ecoregion | Ecoregion in which the study was conducted (according to Olson et al. 2001). | N/A | Character |
| Vegetation\_type | Predominant vegetation type in the region where the study was conducted [according to IBGE (2004)]. | N/A | Character |
| Biogeographic subdivision | Atlantic Forest biogeographic subdivision where the study was conducted [according to Silva and Casteleti (2005)] | N/A | Character |
| Original\_Species | Species name as provided by the original source. | N/A | Character |
| Valid\_Species | Valid species name for those species for species where taxonomic modifications were made. | N/A | Character |
| Abundance | Number of captured individuals during the study. | # of individuals | Numeric |
| Citation | The complete citation from the reference where the data was obtained | N/A | Character |

**C. Data limitations.** Our dataset has three main limitations: (i) we selected studies carried out in forest ecosystems only, (ii) the coarse spatial resolution of the vegetation type data, and (iii) the assumption that species identification in the original source was correct.

**Class V. Supplemental descriptors**

**A. Data set references**

Asfora, P. H., A. R. T. Palma, D. Astúa, and L. Geise. 2011. Distribution of *Oecomys catherinae* Thomas, 1909 (Rodentia: Cricetidae) in northeastern Brazil with karyotypical and morphometrical notes. Biota Neotropica 11:415–424.

Astúa, D. 2015. Family Didelphidae (Opossums). Pages 70–186*in* D. E. Wilson and R. A. Mittermeier, editors.Handbook of the mammals of the world. Vol. 5. Monotremes and marsupials. Lynx Ediciones, Barcelona.

Bovendorp, R. S., N. Villar, E. F. de Abreu-Junior, C. Bello, A. L. Regolin, A. R. Percequillo, and M. Galetti. 2017. ATLANTIC SMALL-MAMMAL: a dataset of communities of rodents and marsupials of the Atlantic Forests of South America. Ecology 98:2226.

Brennand, P. G. G., A. Langguth, and A. R. Percequillo. 2013. The genus *Hylaeamys* Weksler, Percequillo, and Voss 2006 (Rodentia: Cricetidae: Sigmodontinae) in the brazilian Atlantic Forest: geographic variation and species definition. Journal of Mammalogy 94:1346–1363.

Brown, J. H. 1984. On the relationship between abundance and distribution of species. The American Naturalist 124:255.

Brown, J. H., and P. F. Nicoletto. 1991. Spatial scaling of species composition: body masses of North American land mammals. The American Naturalist 138:1478–1512.

Cardoso, P., T. L. Erwin, P. A. V. Borges, and T. R. New. 2011. The seven impediments in invertebrate conservation and how to overcome them. Biological Conservation 144:2647–2655.

Carvalho, F. M. V., F. A. S. Fernandez, and J. L. Nessimian. 2005. Food habits of sympatric opossums coexisting in small Atlantic Forest fragments in Brazil. Mammalian Biology 70:366–375.

Caudill, S. A., F. J. A. DeClerck, and T. P. Husband. 2015. Connecting sustainable agriculture and wildlife conservation: does shade coffee provide habitat for mammals? Agriculture, Ecosystems and Environment 199:85–93.

Chave, J. 2004. Neutral theory and community ecology. Ecology Letters 7:241–253.

Colgan, W., and A. W. Claridge. 2002. Mycorrhizal effectiveness of *Rhizopogon* spores recovered from faecal pellets of small forest-dwelling mammals. Mycological Research 106:314–320.

Costa, B. M. de A., L. Geise, L. G. Pereira, and L. P. Costa. 2011. Phylogeography of *Rhipidomys* (Rodentia: Cricetidae: Sigmodontinae) and description of two new species from southeastern Brazil. Journal of Mammalogy 92:945–962.

D’Andrea, P. S., F. A. Fernandes, R. Cerqueira, and L. Rey. 2002. Experimental evidence and ecological perspectives for the adaptation of *Schistosoma mansoni* Sambon, 1907 (Digenea: Schistosomatidae) to a wild host, the water-rat, *Nectomys squamipes* Brants, 1827 (Rodentia: Sigmodontinae). Memórias do Instituto Oswaldo Cruz 97:11–14.

Dean, W. 1995. With broadax and firebrand: the destruction of the brazilian Atlantic Forest. University of California Press, Berkeley.

Delciellos, A. C., M. V. Vieira, C. E. V Grelle, P. Cobra, and R. Cerqueira. 2016. Habitat quality versus spatial variables as determinants of small mammal assemblages in Atlantic Forest fragments. Journal of Mammalogy 97:253–265.

Dornelas, M., S. R. Connolly, and T. P. Hughes. 2006. Coral reef diversity refutes the neutral theory of biodiversity. Nature 440:80–82.

Dornelas, M., D. A. T. Phillip, and A. E. Magurran. 2011. Abundance and dominance become less predictable as species richness decreases. Global Ecology and Biogeography 20:832–841.

Eisenberg, J. F. 1981. The mammalian radiations: an analysis of trends in evolution, adaptation, and behavior. The University of Chicago Press, Chicago and London.

Eisenlohr, P. V., and A. T. de Oliveira-Filho. 2015. Revisiting patterns of tree species composition and their driving forces in the Atlantic Forests of Southeastern Brazil. Biotropica 47:689–701.

Eisenlohr, P. V., A. T. de Oliveira-Filho, and J. Prado. 2015. The Brazilian Atlantic Forest: new findings, challenges and prospects in a shrinking hotspot. Biodiversity and Conservation 24:2129–2133.

Faurby, S., and J. C. Svenning. 2015. A species-level phylogeny of all extant and late Quaternary extinct mammals using a novel heuristic-hierarchical Bayesian approach. Molecular Phylogenetics and Evolution 84:14–26.

Fisher, R. A., A. S. Corbet, and C. B. Williams. 1943. The relation between the number of species and the number of individuals in a random sample of an animal population. Journal of Animal Ecology 12:42–58.

Galetti, M., R. S. Bovendorp, and R. Guevara. 2015. Defaunation of large mammals leads to an increase in seed predation in the Atlantic forests. Global Ecology and Conservation 3:824–830.

Gonçalves, P. R., and J. A. Oliveira. 2014. An integrative appraisal of the diversification in the Atlantic forest genus *Delomys* (Rodentia: Cricetidae: Sigmodontinae) with the description of a new species. Zootaxa 3760:1–38.

Grelle, C. E. D. V., and Q. S. Garcia. 1999. Potential dispersal of *Cecropia hololeuca* by the common opossum (*Didelphis aurita*) in Atlantic forest, southeastern Brazil. Revue d’Ecologie (La Terre et la Vie) 54:327–332.

He, F. 2005. Deriving a neutral model of species abundance from fundamental mechanisms of population dynamics. Functional Ecology 19:187–193.

Hortal, J., F. de Bello, J. A. F. Diniz-Filho, T. M. Lewinsohn, J. M. Lobo, and R. J. Ladle. 2015. Seven shortfalls that beset large-scale knowledge of biodiversity. Annual Review of Ecology, Evolution, and Systematics 46:523–549.

Hubbell, S. P. 2001. The unified neutral theory of biodiversity and biogeography. Princeton University Press, Princeton.

IBGE. 2004. Mapa de vegetação do Brasil. IBGE, Rio de Janeiro.

Jones, K. E., J. Bielby, M. Cardillo, S. A. Fritz, J. O’Dell, C. D. L. Orme, K. Safi, W. Sechrest, E. H. Boakes, C. Carbone, C. Connolly, M. J. Cutts, J. K. Foster, R. Grenyer, M. Habib, C. A. Plaster, S. A. Price, E. A. Rigby, J. Rist, A. Teacher, O. R. P. Bininda-Emonds, J. L. Gittleman, G. M. Mace, and A. Purvis. 2009. PanTHERIA: a species-level database of life history, ecology, and geography of extant and recently extinct mammals. Ecology 90:2648.

King, C. E. 1964. Relative abundance of species and MacArthur’s model. Ecology 45:716–727.

Leibold, M. A., M. Holyoak, N. Mouquet, P. Amarasekare, J. M. Chase, M. F. Hoopes, R. D. Holt, J. B. Shurin, R. Law, D. Tilman, M. Loreau, and A. Gonzalez. 2004. The metacommunity concept: a framework for multi-scale community ecology. Ecology Letters 7:601–613.

Lopez, L. C. S., M. S. L. Figueiredo, M. P. de A. Fracasso, D. O. Mesquita, U. U. Anjos, and C. E. V. Grelle. 2016. The role of local versus biogeographical processes in influencing diversity and body-size variation in mammal assemblages. Ecology and Evolution 6:1447–1456.

Loss, A. C., and Y. L. R. Leite. 2011. Evolutionary diversification of *Phyllomys* (Rodentia: Echimyidae) in the Brazilian Atlantic Forest. Journal of Mammalogy 92:1352–1366.

MacArthur, R. H. 1957. On the relative abundance of bird species. Proceedings of the National Academy of Sciences of the United States of America 43:293–295.

Magurran, A. E. 2004. Measuring biological diversity. Blackwell Publishing, Oxford.

Mangan, S. A., and G. H. Adler. 1999. Consumption of arbuscular mycorrhizal fungi by spiny rats (*Proechimys semispinosus*) in eight isolated populations. Journal of Tropical Ecology 15:779–790.

Mangan, S. A., and G. H. Adler. 2000. Consumption of arbuscular mycorrhizal fungi by terrestrial and arboreal small mammals in a panamanian cloud forest. Journal of Mammalogy 81:563–570.

Marcgrave, G., and W. Piso. 1648. Historia Naturalis Brasiliae... in qua non tantum plantae et animalia, sed et indigenarum morbi, ingenia et mores describuntur et iconibus supra quingentas illustrantur. Elsevier, Amsterdam.

McGill, B. J., R. S. Etienne, J. S. Gray, D. Alonso, M. J. Anderson, H. K. Benecha, M. Dornelas, B. J. Enquist, J. L. Green, F. He, A. H. Hurlbert, A. E. Magurran, P. A. Marquet, B. A. Maurer, A. Ostling, C. U. Soykan, K. I. Ugland, and E. P. White. 2007. Species abundance distributions: moving beyond single prediction theories to integration within an ecological framework. Ecology Letters 10:995–1015.

Metzger, J. P. 2009. Conservation issues in the Brazilian Atlantic forest. Biological Conservation 142:1138–1140.

Morellato, L. P. C., and C. F. B. Haddad. 2000. Introduction: the Brazilian Atlantic Forest. Biotropica 32:786–792.

Mouchet, M. A., S. Villéger, N. W. H. Mason, and D. Mouillot. 2010. Functional diversity measures: an overview of their redundancy and their ability to discriminate community assembly rules. Functional Ecology 24:867–876.

Myers, N., R. A. Mittermeier, C. G. Mittermeier, G. A. B. Fonseca, and J. Kent. 2000. Biodiversity hotspots for conservation priorities. Nature 403:853–858.

Oliveira-Filho, A. T., and M. A. L. Fontes. 2000. Patterns of floristic differentiation among Atlantic Forests in southeastern Brazil and the influence of climate. Biotropica 32:793–810.

Oliveira, R. C., T. Rozental, A. A. Alves-Corrêa, P. S. D’Andrea, H. G. Schatzmayr, R. Cerqueira, and E. R. S. Lemos. 2004. Study of hantavirus infection in captive breed colonies of wild rodents. Memórias do Instituto Oswaldo Cruz 99:575–576.

Olson, D. M., E. Dinerstein, E. D. Wikramanaya, N. D. Burgess, G. V. N. Powell, E. C. Underwood, J. A. D’Amico, I. Itoua, H. E. Strand, J. C. Morrison, C. J. Loucks, T. F. Allnutt, T. H. Ricketts, Y. Kura, J. F. Lamoreux, W. W. Wettengel, P. Hedao, and K. R. Kassem. 2001. Terrestrial ecoregions of the world : a new map of life on Earth. BioScience 51:933–938.

Paglia, A. P., G. A. B. Fonseca, A. B. Rylands, G. Herrmann, L. M. S. Aguiar, A. G. Chiarello, Y. L. R. Leite, L. P. Costa, S. Siciliano, M. C. M. Kierulff, S. L. Mendes, V. da C. Tavares, R. A. Mittermeier, and J. L. Patton. 2012. Annotated checklist of Brazilian mammals. Page (2nd Edition, Ed.) Occasional Papers in Conservation Biology. Conservation International, Arlington, VA.

Pardiñas, U. F. J., L. Geise, K. Ventura, and G. Lessa. 2016. A new genus for *Habrothrix angustidens* and *Akodon serrensis* (Rodentia, Cricetidae): again paleontology meets neontology in the legacy of Lund. Mastozoología Neotropical 23:93–115.

Patton, J. L., U. F. J. Pardiñas, and G. D’Elía. 2015. Mammals of South America. Volume 2. Rodents. The University of Chicago Press, Chicago and London.

Pavan, S. 2015. A new species of *Monodelphis* (Didelphimorphia: Didelphidae) from the Brazilian Atlantic Forest. American Museum Novitates 3832:1–15.

Pedó, E., T. R. O. de Freitas, and S. M. Hartz. 2010. The influence of fire and livestock grazing on the assemblage of non-flying small mammals in grassland-Araucaria Forest ecotones, southern Brazil. Zoologia 27:533–540.

Percequillo, A. R., M. Weksler, and L. P. Costa. 2011. A new genus and species of rodent from the brazilian Atlantic Forest (Rodentia: Cricetidae: Sigmodontinae: Oryzomyini), with comments on Oryzomyine biogeography. Zoological Journal of the Linnean Society 161:357–390.

Pereira, H. M., L. M. Navarro, and I. S. Martins. 2012. Global biodiversity change: the bad, the good, and the unknown. Annual Review of Environment and Resources 37:25–50.

Pimentel, D. S., and M. Tabarelli. 2004. Seed dispersal of the palm *Attalea oleifera* in a remnant of the brazilian Atlantic Forest. Biotropica 36:74–84.

Preston, F. W. 1948. The commonness, and rarity, of species. Ecology 29:254–283.

Preston, F. W. 1962a. The canonical distribution of commonness and rarity: part I. Ecology 43:185–215.

Preston, F. W. 1962b. The canonical distribution of commonness and rarity: part II. Ecology 43:410–432.

Quintela, F. M., G. L. Gonçalves, S. L. Althoff, I. J. Sbalqueiro, L. F. B. Oliveira, and T. R. O. Freitas. 2014. A new species of swamp rat of the genus *Scapteromys* Waterhouse, 1837 (Rodentia: Sigmodontinae) endemic to *Araucaria angustifolia* Forest in Southern Brazil. Zootaxa 3811:207–225.

Ribeiro, M. C., J. P. Metzger, A. C. Martensen, F. J. Ponzoni, and M. M. Hirota. 2009. The Brazilian Atlantic Forest: how much is left, and how is the remaining forest distributed? Implications for conservation. Biological Conservation 142:1141–1153.

Sánchez-Cordero, V. S., and R. M. Martínez-Gallardo. 1998. Postdispersal fruit and seed removal by forest-dwelling rodents in a lowland rainforest in Mexico. Journal of Tropical Ecology 14:139–151.

Santori, R. T., D. A. Moraes, C. E. V Grelle, and R. Cerqueira. 1997. Natural diet at a restinga forest and laboratory food preferences of the opossum Philander frenata in Brazil. Studies on Neotropical Fauna and Environment 32:12–16.

Silva, J. M. C. da, and C. H. M. Casteleti. 2003. Status of the biodiversity of the Atlantic Forest of Brazil. Pages 43–59*in* C. Galindo-Leal and I. de G. Câmara, editors.The Atlantic Forest of South America: biodiversity status, trends, and outlook. Center for Applied Biodiversity Science e Island Press, Washington, D.C.

Soberón, J. 2007. Grinnellian and Eltonian niches and geographic distributions of species. Ecology Letters 10:1115–1123.

Sugihara, G. 1980. Minimal community structure: an explanation of species abundance patterns. The American Naturalist 116:770.

Teixeira, B. R., N. Loureiro, L. Strecht, R. Gentile, R. C. Oliveira, A. Guterres, J. Fernandes, L. H. B. V Mattos, S. M. Raboni, G. Rubio, C. R. Bonvicino, C. N. D. Dos Santos, E. R. S. Lemos, and P. S. D’Andrea. 2014. Population ecology of hantavirus rodent hosts in Southern Brazil. American Journal of Tropical Medicine and Hygiene 91:249–257.

Terborgh, J., L. Lopez, P. N. V, M. Rao, G. Orihuela, M. Riveros, R. Ascanio, G. H. Adler, D. Thomas, L. Balbas, J. Terborgh, L. Lopez, P. N. V, M. Rao, G. Shahabuddin, G. Orihuela, M. Riveros, R. Ascanio, and G. H. Adler. 2001. Ecological meltdown in predator-free forest fragments. Science 294:1923–1926.

Vieira, E. M., M. A. Pizo, and P. Izar. 2003. Fruit and seed exploitation by small rodents of the Brazilian Atlantic forest. Mammalia 67:1–7.

Vieira, M. V., N. Olifiers, A. C. Delciellos, V. Z. Antunes, L. R. Bernardo, C. E. V. Grelle, and R. Cerqueira. 2009. Land use vs. fragment size and isolation as determinants of small mammal composition and richness in Atlantic Forest remnants. Biological Conservation 142:1191–1200.

Voss, R. S., and S. A. Jansa. 2009. Phylogenetic Relationships and Classification of Didelphid Marsupials, an Extant Radiation of New World Metatherian Mammals. Bulletin of the American Museum of Natural History 322:1–177.

Weksler, M., E. M. S. Lemos, P. S. D’Andrea, and C. R. Bonvicino. 2017. The taxonomic status of Oligoryzomys mattogrossae (Allen 1916) (Rodentia: Cricetidae: Sigmodontinae), reservoir of Anajatuba hantavirus. American Museum Novitates 3880:1–32.

Weksler, M., A. R. Percequillo, and R. S. Voss. 2006. Ten new genera of Oryzomyine rodents (Cricetidae: Sigmodontinae). American Museum Novitates 3537:1–29.

Whittaker, R. H. 1965. Dominance and diversity in land plant communities. Science 147:250–260.

Wilson, D. E., T. E. Lacher Jr, and R. A. Mittermeier. 2016. Handbook of the mammals of the world. Vol 6. Lagomorphs and rodents I. Lynx Ediciones, Barcelona.

Wilson, D. E., and R. A. Mittermeier. 2009. Handbook of the mammals of the world. Vol 1. Carnivores. Lynx Ediciones, Barcelona.

Wright, S. J., M. E. Gompper, and B. DeLeon. 1994. Are large predators keystone species in Neotropical forests? The evidence from Barro Colorado Island. Oikos 71:279–294.

Yen, J. D. L., J. R. Thomson, J. M. Keith, D. M. Paganin, E. Fleishman, D. S. Dobkin, J. M. Bennett, and R. Mac Nally. 2017. Balancing generality and specificity in ecological gradient analysis with species abundance distributions and individual size distributions. Global Ecology and Biogeography 26:318–32.

Zuidema, P. A., P. J. Baker, P. Groenendijk, P. Schippers, P. van der Sleen, M. Vlam, and F. Sterck. 2013. Tropical forests and global change: filling knowledge gaps. Trends in Plant Science 18:413–419.