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Compilation of woody species occurring in the Brazilian Atlantic Forest complex

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Abstract. The Atlantic Forest is a hotspot for biodiversity conservation because of its high levels of endemism and threatened areas. Three main forest types, differentiated by their floras, compose the Atlantic Forest: 'Atlantic Forest' *sensu strictu*, 'Araucaria Mixed Forest' and 'Seasonal Forest'. The flora comprises taxa from the Amazon forest, Cerrado gallery forests and the Andean region, which makes the Atlantic Forest a relevant study system for ecologists and biogeographers. Here, we present data from 206 floristic checklists describing the occurrence of 1,916 species across the southern portion of the Atlantic Forest. This dataset can be useful for understanding mechanisms underlying plant community assembly processes and the historical relationships between different forest formations.

Keywords. Tropical forest, Araucaria Mixed Forest, Seasonal Forest, Atlantic Forest, community, shrub species, tree species.

Introduction

The Atlantic Forest is the second largest tropical forest in South America. It occurs along the Brazilian east coast and inwards as far as eastern Paraguay and northeastern Argentina, covering an area with high climatic variability (Oliveira-Filho and Fontes 2000) with a remarkable range of latitudinal and altitudinal gradients. Such heterogeneous environments capture climatic gradients related to annual rainfall (approximately 800–4,000 mm) and mean annual temperature (15–25°C), which influence species' distributions (Scudeller et al. 2001, Oliveira-Filho et al. 2005, Marques et al. 2011). According to Oliveira-Filho and Fontes (2000), Atlantic Forest can be classified in two main forms, *sensu strictu* (s.s.) and *sensu lato* (s.l.). The Atlantic Forest s.s. comprises the forests distributed close to the Brazilian coast, where local rainfall is influenced by ocean winds and mountain slopes. The Atlantic Forest s.l. also includes Seasonal Forest, Araucaria Mixed Forest, Coastal Pioneer Forest (also known as Restinga Forest) and Highland Grassland.

The Brazilian Atlantic Forest is considered a hotspot for biodiversity conservation (Myers et al. 2000) and shelters about 14,000 vascular plants, 48% of which are endemic (Werneck et al. 2011). Two centres of endemism are mainly recognized in Atlantic Forest: the northern and the southern (Fiaschi and Pirani 2009). The northern ranges from Rio Grande do Norte to north of Espírito Santo states. This centre of endemism shows floristic affinities with Amazon forest and Caatinga. The southern part ranges from Espírito Santo to Rio Grande do Sul states, and is strongly influenced by elements from other biogeographic origins, such as Andean and Austral-Antarctic lineages.

Given that the southern part of the Atlantic Forest s.l. represents an important centre of endemism, with the floristic differences from the northern part supported by phylogenetic data (Fiaschi and Pirani 2009), here we present a compilation of woody species from this region. In the southern and southeastern Brazilian Atlantic Forest biome, three main forest types are recognized: Atlantic Forest *strictu sensu*, Araucaria Mixed Forest and Seasonal Forest. This database is mainly to support comparison between these three main forest types, of which Araucaria Forest does not occur in the northern portion.

Atlantic Forest s.s. is associated with the Atlantic coast and once included a large area of lowland (up to ~ 50 m a.s.l.) and slope forests (~ 50–2,200 m a.s.l.) (Fig. 1). The climate is heterogeneous, being hot and wet in the lowlands and cold and wetter on the slopes (IBGE 1992, Oliveira-Filho and Fontes 2000). The vegetation in the lowlands comprises forests, determined by rainfall and soil sandiness (Marques et al. 2011). Among species that determine the vegetation in the coastal plain are *Maytenus obtusifolia*, *Byrsonima sericea*, *Ilex theazans*, *Calophyllum brasiliense*, *Ocotea pulchella* and *Myrcia multiflora* (Marques et al. 2011). In the slopes, forests are highly differentiated by altitude, and species such as *Drimys brasiliensis*, *Ilex microdonta* and *Weinmannia paulliniifolia* characterize the vegetation (Bertoncello et al. 2011).

Araucaria Forest occurs in the highland plateau, ranging from 500 to 1600 m a.s.l. in southern and southeastern Brazil (Klein 1960). The climate is tropical and sub-tropical humid without pronounced dry periods. The mean annual rainfall ranges from 1400 to 2200 mm, and the annual mean temperature mainly ranges from 12 to 18°C (Behling 2002). The presence of species phytogeographically related to temperate Austral-Antarctic and Andean floras distinguishes communities within the Araucaria Mixed Forest from more tropical types of Brazilian Atlantic Forest (Rambo 1951). Besides *Araucaria angustifolia*, some other typical species found in those forests are *Podocarpus lamberti* (conifer), *Dicksonia sellowiana* (tree fern), *Drimys* spp. (Winteraceae), and several species of Myrtaceae and Lauraceae.

Seasonal Forest occurs in the hinterland Parana River basin in the south and southeast Brazil. It is characterized by two distinct seasons with marked alternation from tropical (intense summer rainfall) to subtropical (with low winter temperatures and scarce precipitation). During the cold and dry period, 20–50% of the canopy trees drop their leaves (deciduous; IBGE 1992). The mean temperature in the winter is lower than 15°C. The flora of Seasonal Forest is often influenced by taxa typical of open areas (Brazilian savanna). This forest type has dominance of species of *Parapiptadenia, Pel-*

tophrum, Cariniana, Lecythis, Tabebuia and *Astronium*, among others (IBGE 1992).

Compilation of shrub/tree species of Atlantic Forest complex

We present compiled information from 206 floristic checklists describing the occurrence of 1,917 shrub and tree species across the geographic range of the Southern Brazilian Atlantic Forest (Figure 1). Floristic data were obtained from published studies (see Appendix 1 for the complete list of published papers) and unpublished information (e.g. PhD and Masters research). These different sources of data employed distinct survey methodologies, such as floristic surveys, plots and point-centred quarters, varying in sample effort and size criteria for individual inclusion (minimum diameter at breast height, minimum plant height).
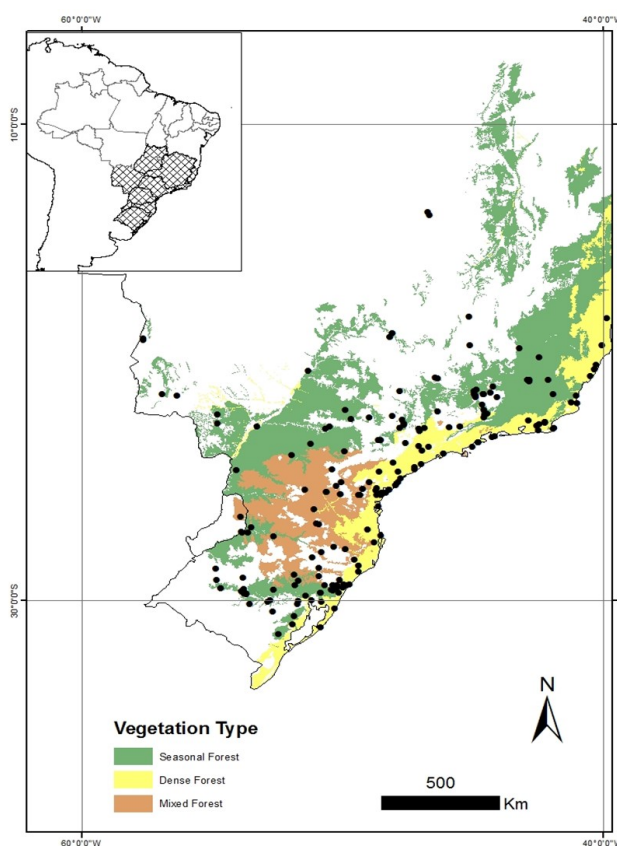

Figure 1. Distribution of 206 floristic checklists (black points) along the vegetation types of the Atlantic Forest biome (62 in Atlantic Forest s.s., 47 in Araucaria Mixed Forest and 97 in Seasonal Forest). Points outside of the highlighted vegetation types, are areas of Seasonal Forest or Araucaria Mixed Forest occurring within open ecosystems such as grasslands, Pantanal and Cerrado (savanna).

Structure of the database

The information from the 206 checklists is presented in the datasets *Sites_info.txt* and *Species_sites.txt*.

Site information

- Identity: *Sites_info.txt*
- Size: 207 rows (sites, including header) and 10 columns (site descriptors, including header)
- Format and storage mode: Tab-delimited ASCII text (.txt).
- Header information: Table 1 describes the information given in the column headers.

Plant community composition

- Identity: *Species_sites.txt*
- Size: 1,917 rows (species, including header) and 207 columns (sites, including header).
- Format and storage mode: tab-delimited ASCII text (.txt).
- Header information: the first column is headed "Species" and contains the species' names. Headers in columns 2–207 name the sites.

Variables in columns 2–207 describe the occurrence (1: present, 0:absent) of each plant species in each site. We follow the botanical nomenclature used in the Missouri Botanical Garden's TROPICOS database[1] and the Flora do Brasil database[2], as of 2013. We used both databases because for many plant families Flora do Brasil does not provide the synonyms of the species.

Table 1. Summary of variable information for file *Sites_info.txt*.

Variable	Variable definition	Units	Data type	Codes for character data
Cod.	Unique identifier for each site	NA	Character	NA
Vegetation type	Atlantic Forest type that characterizes the site	NA	Character	Dense Forest: dense rain forest; Mixed Forest: mixed rain forest; Seasonal Forest: seasonal deciduous and semi-deciduous forest.
Site	Site location (name of city or protected area)	NA	Character	NA
State	Brazilian State where site is located	NA	Character	NA
Lat	Latitude data for study sites, extracted from original studies	°	Numeric	NA
Long	Longitude data for study sites, extracted from original studies	°	Numeric	NA
Inclusion	The inclusion criteria for plants in the site	NA	Float	All shrub/tree spp: all shrub and trees species are sampled. DBH ≥ "x": only shrub and tree species with diameter at breast height equal or greater than a specified value, 'x'.
Method	Method of sampling	NA	Character	Plot: plot sampling method Floristic: floristic inventory sampling method. Point: point-centred quarter sampling method
Effort	The total sampling area (m²) or number of points for the site	NA	Float	NA
Source	Simple citation of the data source (Complete references in metadata)	NA	String	NA

1 http://www.tropicos.org, last accessed 09/2013
2 http://floradobrasil.jbrj.gov.br, last accessed 09/2013

Potential uses for our compilation of woody species occurring in the Brazilian Atlantic Forest complex

The dataset is useful for understanding mechanisms underlying plant community assembly processes and the historical relationships between different forest formations. Analyses of phylobetadiversity among forest types using this dataset (Duarte et al. 2014) showed differentiation in phylogenetic composition among forest types, with higher phylogenetic diversity in Araucaria Mixed Forest. This kind of approach is important, for example, for a wider interpretation of species conservation in Brazilian Atlantic Forest. The information on species' occurrence, matched with appropriate GIS layers, can help to produce species' distributional ranges. Moreover, the data could be used to calibrate environmental niche models and project them into the past and/or future, with different climate scenarios, to model changes in the distributions of target species.

Publications using the data set

Duarte et al. (2014).

Sources of funding

References

Behling, H. (2002) South and southeast Brazilian grasslands during Late Quaternary times: a synthesis. Palaeogeography Palaeoclimatology Paleoecology, 177, 19–27.

Bertoncello R., Yamamoto K., Meireles L.D. & Shepherd, G.J. (2011) A phytogeographic analysis of cloud forests and other forest subtypes amidst the Atlantic forests in south and southeast Brazil. Biodiversity and Conservation, 20, 3413–3433.

Duarte, L.D.S., Bergamin, R.S., Marcilio-Silva, V., Seger, G.D.D.S. & Marques, M.C.M. (2014) Phylobetadiversity among Forest Types in the Brazilian Atlantic Forest Complex. PLoS ONE, 9, e105043.

Fiaschi, P. & Pirani, J.R. (2009) Review of plant biogeographic studies in Brazil. Journal of Systematics and Evolution, 47, 477–496.

IBGE (1992) Manual técnico da vegetação brasileira. Série Manuais Técnicos em Geociências – IBGE, Rio de Janeiro.

Klein, R.M. (1960) O aspecto dinâmico do pinheiro brasileiro. Sellowia, 12, 17–48.

Marques, M., Swaine, M. & Liebsch, D. (2011) Diversity distribution and floristic differentiation of the coastal lowland vegetation: implications for the conservation of the Brazilian Atlantic Forest. Biodiversity and Conservation, 20, 153–168.

Myers, N., Mittermeier, C.G., Fonseca, G.A.B., et al. (2000) Biodiversity hotspots for conservation priorities. Nature, 403, 845–853.

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

Oliveira-Filho, A.T., Tameirão-Neto, E., Carvalho, W.A.C., Werneck, M., Brina, A.E., Vidal, C.V., Rezende, S.C. & Pereira, J.A.A. (2005) Análise florística do compartimento arbóreo de áreas de Floresta Atlântica sensu lato na região das Bacias do Leste (Bahia, Minas Gerais, Espírito Santo e Rio de Janeiro). Rodriguésia, 56, 185–235.

Rambo, B. (1951) O elemento andino no pinhal riograndense. Anais Botânicos do Herbário Barbosa Rodrigues, 3, 3–39.

Scudeller, V.V., Martins, F.R. & Shepherd, G.J. 2001. Distribution and abundance of arboreal species in the atlantic ombrophilous dense forest in Southeastern Brazil. Plant Ecology, 152, 185–199.

Werneck, M.S., Sobral, M.E.G., Rocha, C.T.V., Landau. E.C. & Stehmann, J.R. (2011) Distribution and endemism of angiosperms in the Atlantic Forest. Natureza e Conservação, 9, 188–193.