

Forms of rarity of tree species in the southern Brazilian Atlantic rainforest

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Received: 27 November 2009 / Accepted: 8 May 2010 / Published online: 19 May 2010
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Abstract The assessment of species rarity considers local abundance (scarce or abundant population), habitat affinity (stenoecious or euryecious species), and geographic distribution (stenotopic or eurytopic species). When analyzed together these variables classify species into eight categories, from common species to those having small populations, unique habitats, and restricted geographic distribution (form 7), as proposed by Rabinowitz in 1981. Based on these categories, it is possible to calculate the frequency of the different forms of rarity of the species present in a given site. The Brazilian Atlantic rainforest is considered a hotspot of the world biodiversity harboring many endemic species, which have restricted geographic distribution. Our objective was to identify the forms of rarity of tree species and their proportions in the southern portion of the Brazilian Atlantic rainforest using Rabinowitz's forms of rarity. All the seven forms of rarity are present in the 846 tree species we analyzed: 46% eurytopic and 54% stenotopic, 73% euryecious and 27% stenoecious, 76% locally abundant and 24% locally scarce species. Eurytopic, euryecious locally abundant species accounted for 41.1%, whereas 58.9% were somehow rare: 4.5% eurytopic, euryecious locally scarce, 0.2% eurytopic, stenoecious locally abundant, 0.1% eurytopic, stenoecious locally scarce, 19.5% stenotopic, euryecious locally abundant, 8.0% stenotopic, euryecious locally scarce, 15.6% stenotopic, stenoecious locally abundant, and 11.0% stenotopic, stenoecious locally scarce. Considering that the most restrictive forms of rarity precedes extinction, the application of Rabinowitz's system

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demonstrated that most tree species of the southern Brazilian Atlantic rainforest are threatened due to their restricted geographic distribution, restriction to a single habitat, reduced local abundance, or even to a combination of these variables.

Keywords Rarity · Tree species · Dense Ombrophilous Atlantic Forest · Phytosociology · Databank

Introduction

Local abundance, habitat preference, and geographic range vary greatly among species, even among related species (Ricklefs 2002), being the main variables used in assessing rarity. Habitat type, taxonomic precision, and persistence over evolutive and ecological time can be considered additional variables in identifying rare species and the restrictions influencing them (Gaston 1994). In 1981, Deborah Rabinowitz suggested that rarity could take on different forms depending on a combination of three main variables (Ricklefs 2002). Considering local abundance, habitat affinity, and geographic range to be independent variables, Rabinowitz et al. (1986) established rarity categories based on their different combinations. When analyzed together, these three variables allow species to be classified into eight categories, in which the first category comprises common species and the eighth category encompasses the most restrictive form of rarity, namely the local endemics. It is possible therefore to calculate the frequency of the different forms of rarity among the species present in a given study area. In order to perform this type of analysis a databank containing sufficient information about the three independent variables is necessary (Rabinowitz et al. 1986). This way of assessing rarity was originally applied to the plant species-poor system of the British Islands (Rabinowitz et al. 1986), but it has also been used in rich systems both for plants in the Amazon forest (Pitman et al. 1999) and for animals all over the world (Yu and Dobson 2000).

A report published by the “Conservation International” indicated that Brazil has the greatest biodiversity among the 17 nations that detain 70% of the plant and animal species on the planet (Mittermeier et al. 1997). Additionally, not only is the absolute number of species high in Brazil, but also the number of endemic plants, which puts this country in first place in terms of global diversity (Dias 1998). Myers (1990) indicated 18 global “hotspots”, and the Brazilian Atlantic rainforest stands out among them. Myers et al. (2000) expanded the criteria for selecting “hotspots”, but the Brazilian Atlantic rainforest continued deserving a high ranking, in the fourth place.

The Brazilian Atlantic rainforest is also known by other names, e.g. Atlantic Forest *sensu stricto* (s.s.) and Dense Ombrophilous Atlantic Forest Phyto-Ecological Region (Veloso 1992). It originally extended along the Atlantic Coast of Brazil from near the Cape of São Roque in Rio Grande do Norte State until the municipality of Osório in Rio Grande do Sul State (Andrade-Lima 1966). Presently the forest is devastated over most of its range (Silva and Leitão-Filho 1982; Leitão-Filho 1994). The Dense Ombrophilous Atlantic Forest Phyto-Ecological Region is heterogeneous and composed of many different forest formations (Leitão-Filho 1994) and various associated ecosystems (Scarano 2002) whose species diversity can often be greater than that observed in the Amazon Forest (Silva and Leitão-Filho 1982; Martins 1989; Leitão-Filho 1994).

Martins (1991) observed that 9–39% of the species in any survey in the Atlantic rainforest were represented by just a single individual. Scudeller et al. (2001) reported that the Atlantic rainforest in São Paulo State is characterized by a predominance of species

with low constancy and restricted distribution. Endemism is very high in the Atlantic rainforest (Gentry 1992; Thomas et al. 1998). In Rabinowitz's rarity system, these endemisms are included under forms 6 and 7, in which species have restricted geographic distributions and occur in scarce populations confined to unique habitats (Kruckeberg and Rabinowitz 1985).

When environments are disturbed by human activities the populations of many species are reduced or become extinct. Therefore certain categories of species must be closely monitored and conservation efforts focused on them. These species are especially vulnerable if their area of occurrence is limited, with one or just a few small populations, or if they have special habitat requirements (Primack and Rodrigues 2001)—that is, if the species are rare according to the classification of Rabinowitz et al. (1986). The most restrictive forms of rarity can be seen as precursors to extinction. It is important to determine which forms of rarity are present in a given phyto-ecological region in order to be able to intensify conservation measures and reserve planning (that can help preserve a group of species), as well as to plan actions that will help conserve individual species—mainly those having known economic value (landscaping, chemical, forestry, food source, etc.), or representing key-species in the ecological community.

Our general objective was to identify the forms of rarity and their proportions among arboreal species in the southern portion of the Brazilian Atlantic rainforest using the rarity classification system developed by Rabinowitz. Considering the high indices of regional endemism already noted for this rainforest (Gentry 1992; Thomas et al. 1998) and the known patterns of species with low constancy and restricted distribution (Scudeller et al. 2001), we expected to find most species with forms of rarity related to restricted geographic range (stenotopy). Given the large proportion of species represented by single individuals (Martins 1991), we also expected that most stenotopic species also presented small population wherever they occurred.

Materials and methods

Databank of the tree taxa of the Atlantic rainforest

We used the FITOGEO databank system (in a Microsoft Access 97 format) that was compiled to manage floristic and phytosociological information (Scudeller and Martins 2003). In order to delimit the Dense Ombrophilous Atlantic Forest Phyto-Ecological Region, we used the area defined by the Brazilian Institute of Geography and Statistics (Veloso 1992).

The creation of a databank to analyze the abundance categories of Atlantic rainforest species involved three steps. The first step was to filter and copy all of the phytosociological tables referring to tree communities in the Atlantic rainforest from the databank used by Scudeller et al. (2001). We defined a phytosociological table as a list of species with their respective phytosociological descriptors presented in any publication found during our bibliographic search (Caiafa and Martins 2007). A bibliographic reference could have more than one phytosociological table, as these could refer to different localities, altitudes, or soil types.

The second step of establishing the databank consisted of adding new phytosociological tables concerning the Atlantic rainforest derived from dissertations, thesis, books, and publications in specialized periodicals. We considered only periodicals with an editorial board and ISSN. Only references published until the beginning of 2005 that indicated the numbers of individuals of each species sampled, the total size of the sample, and the size of

the smallest individual sampled were included. We eliminated references that dealt with the initial stages of forest regeneration, as well as those that only furnished information about the most abundant species, or did not include trees, or that stipulated a maximum height for inclusion in the sample. Applying these criteria, we compiled an up-to-date databank with a total of 225 phytosociological tables from 113 bibliographic references.

The third step consisted of verifying valid binomials to assure uniform taxonomic identities. This was done by using specialized literature (such as theses, monographs, and revisions) as well as consulting sites such as W3TROPICOS www.mobot.mobot.org/w3t/search and The International Plant Names Index www.ipni.org/index.html.

Criteria used for including a phytosociological table into the refined databank

Phytosociological surveys have been performed using many different designs and methods (plots or point-quarters, different sizes of the smallest individual sampled, and different sample sizes, plot sizes and sampling techniques). Also, the taxonomic treatments may have been performed with differing degrees of rigor. These differences can influence the results of the metanalysis, as shown by Caiafa and Martins (2007). As such, we adopted certain selection criteria to attain a minimum of homogeneity among the surveys: (1) the survey site had to be located within the Dense Ombrophilous Atlantic Forest Phyto-Ecological Region as delimited by Veloso (1992), independently of the phytogeographic classification adopted by the author of the publication; (2) the publication had to specify the growth habit of the sampled plants (in order to allow us to pick up the tree species from the phytosociological table); (3) the publication had to specify the abundance of each species and the total size of the sample; (4) more than 80% of the taxa sampled had to be identified to the species level; (5) the smallest individual sampled had to have a trunk diameter at breast height (DBH) ≥ 4.8 or 5 cm; and (6) the minimum sample size had to be 300 individuals. These criteria are similar to those that have been used by other authors working with metadata in Brazilian phyto-ecological regions (Castro et al. 1999, Scudeller et al. 2001).

After applying these criteria, we were left with only 41 of the 225 surveys available. The criterion that most contributed to the reduction in the number of acceptable surveys was the size of the smallest individual included in the sample (DBH ≥ 4.8 or 5 cm). This criterion is very important and must not be ignored, as was demonstrated by Caiafa and Martins (2007). Of these 41 surveys, two were from Bahia State and five from Pernambuco, and hence we decided to analyze only the southern region of the Dense Ombrophilous Atlantic Forest—represented by a total of 34 surveys (Fig. 1, Table 1). The southern portion of the Atlantic rainforest includes the states of the Southern Region (Rio Grande do Sul, Santa Catarina, and Paraná) and those of the Southeastern Region (São Paulo, Rio de Janeiro, Minas Gerais, and Espírito Santo).

Classification of the species into forms of rarity

We used the following criteria to classify the species considering the three variables that define the forms of rarity proposed by Rabinowitz et al. (1986):

Geographic distribution

In order to evaluate whether a given species has a wide (eurytopic) or restricted (stenotopic) geographic distribution, the samples were grouped into 2° latitudinal strips

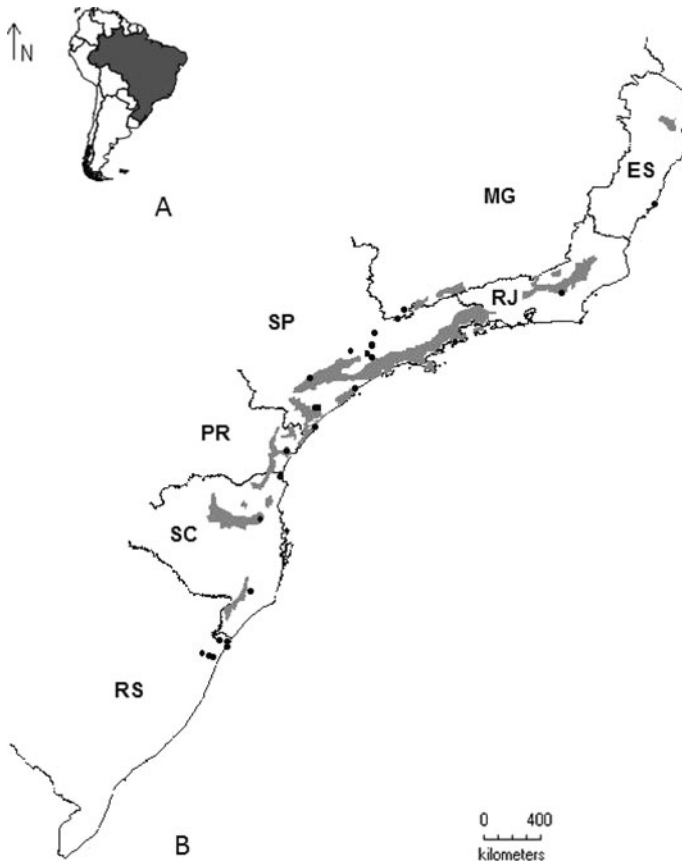


Fig. 1 Position of Brazil in South America (A) and southern Brazil (B). The gray area represents the largest remnants of the Atlantic rainforest. The dots indicate the surveys used in the analysis, and when they are out of the gray area they represent areas below the resolution of the map scale. States: *MG* Minas Gerais, *ES* Espírito Santo, *RJ* Rio de Janeiro, *SP* São Paulo, *PR* Paraná, *SC* Santa Catarina e *RS* Rio Grande do Sul

(approximately 220 km N–S) starting from the most northern survey (4° S) until the most southern (30° S), for a total of 13 latitudinal belts defining an extension of approximately 2,860 km. We considered species as eurytopic if they were distributed on three or more latitudinal belts (occurring on an extension greater than 660 km). We considered a species as stenotopic if it was found on at most two latitudinal belts (occurring on an extension of at most 440 km). For this classification of geographic ranges we used the entire dataset for the full extension of the Atlantic rainforest (i.e. all 225 phytosociological tables).

Habitat preference

In order to evaluate the habitat preference of the species we considered as distinct habitats the different forest formations that occur in the Dense Ombrophilous Atlantic Forest Phyto-Ecological Region. Veloso (1992) distinguished the vegetation formations in terms of altitudinal belts: (1) Lowlands (LL), with altitudes up to 100 m a.s.l. between 4° N and 16° S, up to 50 m between 16° S and 24° S, and up to 30 m between 24° S and 32° S;

Table 1 Surveys of the Brazilian Atlantic Rainforest used to assess forms of tree species rarity

PubCod	References	Year	ES	Municipality
20	Florística e fitossociologia de uma Floresta de restinga em Picinguaba (Parque Estadual da Serra do Mar), Município de Ubatuba, SP. <i>Naturalia</i> 20:89–105.	1995	SP	Ubatuba
61	Fitossociologia do estrato arbóreo da floresta da reserva biológica do instituto de botânica (São Paulo, SP), Tese de Doutorado em Botânica, USP, São Paulo, SP.	1985	SP	São Paulo
86	Fitossociologia e dinâmica do banco de sementes de populações arbóreas de floresta secundária em São Paulo, SP. Dissertação de Mestrado em Ecologia, USP, São Paulo, SP.	1993	SP	São Paulo
144	Estudo Fitossociológico da Mata de Restinga, no Balneário Rondinha Velha, Arroio do Sal, RS. Dissertação de Mestrado em Botânica, UFRGS, Porto Alegre, RS.	1993	RS	Arroio do Sal
146	Estudo Fitossociológico Comparativo entre duas Áreas com Mata de Encosta no Rio Grande do Sul. Tese de Doutorado em Ecologia e Recursos Naturais, UFSCAR, São Carlos, SP.	1994	RS	Morrinhos do Sul
235	Caracterização florística e fisionômica da floresta atlântica sobre a formação Pariquera-Açu, na Zona da Morraria Costeira do estado de São Paulo. Dissertação de Mestrado em Biologia Vegetal, UNUCAMP, Campinas, SP.	1997	SP	Pariquera-Açu
248	Fitossociologia do componente arbóreo da floresta da restinga da Ilha do Mel, Paranaguá, PR. Publicação ACIESP, 87(3):33–48.	1994	PR	Paranagua
452	Ecologia de um fragmento florestal em São Roque, SP: florística, fitossociologia e silvigênese. Tese de Doutorado em Biologia Vegetal, UNICAMP, Campinas, SP. 234p.	1995	SP	São Roque
453	Ecologia de um fragmento florestal em São Roque, SP: florística, fitossociologia e silvigênese. Tese de Doutorado em Biologia Vegetal, UNICAMP, Campinas, SP. 234p.	1995	SP	São Roque
454	Ecologia de um fragmento florestal em São Roque, SP: florística, fitossociologia e silvigênese. Tese de Doutorado em Biologia Vegetal, UNICAMP, Campinas, SP. 234p.	1995	SP	São Roque
467	Estrutura fitossociológica da floresta semidecídua de altitude do Parque Municipal da Grota Funda (Atibaia, Estado de São Paulo). <i>Acta Botanica Brasilica</i> . 4(2):47–64.1990	1990	SP	Atibaia
477	Dinâmica de população de <i>Virola bicuhyba</i> (SCHOTT) WARB. (Myristicaceae) e fitossociologia de floresta pluvial atlântica, sob clima temperado, Blumenau, SC. Tese de Doutorado em Ecologia, USP, São Paulo, SP.	2003	SC	Blumenau
488	Florística e fitossociologia de trecho da Serra da Cantareira, Núcleo Águas Claras, Parque Estadual da Cantareira, Mairiporã, SP. Dissertação de Mestrado em Biologia Vegetal, UNICAMP, Campinas, SP.	2002	SP	Mairiporã
496	Estudo fitossociológico e aspectos fitogeográficos em duas áreas de floresta atlântica de encosta no Rio Grande do Sul. Tese de Doutorado em Ecologia, UFSCAR, São Carlos, SP.	2002	RS	Maquiné
497	Estudo fitossociológico e aspectos fitogeográficos em duas áreas de floresta atlântica de encosta no Rio Grande do Sul. Tese de Doutorado em Ecologia, UFSCAR, São Carlos, SP.	2002	RS	Riozinho
499	Florística, fitossociologia e aspectos da dinâmica de um remanescente de mata atlântica na microbacia do rio Novo, Orleans, SC. Tese de Doutorado em Ecologia, UFSCAR, SÃO Carlos, SP.	1995	SC	Orleans

Table 1 continued

PubCod	References	Year	ES	Municipality
500	Composição florística, estrutura fitossociológica e dinâmica da regeneração da floresta atlântica na reserva Volta Velha. Mun. Itapoá, SC. Tese de Doutorado em Ecologia, UFSCAR, São Carlos, SP.	1995	SC	Itapoá
504	Estudo fitossociológico e análise foliar de um remanescente de mata atlântica em Dom Pedro de Alcântara, RS. Dissertação de Mestrado em Botânica, UFRGS, Porto Alegre, RS.	2001	RS	Dom Pedro de Alcântara
505	Fitossociologia de uma floresta secundária, Maquiné, RS. Dissertação de Mestrado em Botânica, UFRGS, Porto Alegre, RS.	1995	RS	Maquiné
506	Análise fitossociológica de uma comunidade arbórea na floresta ombrófila densa, no Parque Botânico Morro Baú, Ilhota, SC. Dissertação de Mestrado em Biologia Vegetal, UFSC, Florianópolis, SC.	2001	SC	Ilhota
507	Florística das fisionomias vegetacionais e estrutura da floresta alto-montana de Monte Verde, Serra da Mantiqueira, MG. Dissertação de Mestrado em Biologia Vegetal, UNICAMP, Campinas, SP.	2003	MG	Monte Verde
510	Composição florística e estrutura da comunidade arbórea num gradiente altitudinal da mata atlântica. Tese de Doutorado em Biologia Vegetal, UNICAMP, SP.	2001	SP	Ubatuba
512	Composição florística e estrutura do estrato arbóreo de uma Muçununga na Reserva Florestal de Linhares, Espírito Santo. Dissertação de Mestrado em Botânica, UFV, Viçosa, MG.	1998	ES	Linhares
517	Estudo comparativo de dois métodos de amostragem fitossociológica em Caxeitais (floresta ombrófila densa permanentemente alagada). Dissertação de Mestrado em Ciências Florestais, ESALQ, Piracicaba, SP.	1999	SP	Iguape
518	O mosaico vegetacional numa área de floresta contínua da planície litorânea, Parque Estadual da Campina do Encantado, Pariquera-Açu, SP. Revista Brasileira de Botânica, 25(2):161–176.	2002	SP	Pariquera-Açu
519	O mosaico vegetacional numa área de floresta contínua da planície litorânea, Parque Estadual da Campina do Encantado, Pariquera-Açu, SP. Revista Brasileira de Botânica, 25(2):161–176.	2002	SP	Pariquera-Açu
520	O mosaico vegetacional numa área de floresta contínua da planície litorânea, Parque Estadual da Campina do Encantado, Pariquera-Açu, SP. Revista Brasileira de Botânica, 25(2):161–176.	2002	SP	Pariquera-Açu
521	Comparação entre os métodos de quadrantes e parcelas na caracterização da composição florística e fitossociológica de um trecho de floresta ombrófila densa no Parque Estadual Carlos Botelho, São Miguel Arcanjo, SP. Mestrado Recursos Florestais, ESALQ.	2003	SP	São Miguel Arcanjo
530	Composição, estrutura e similaridade florística de dossel em seis unidades fisionômicas de Mata Atlântica no Rio de Janeiro. Tese de Doutorado em Ecologia, USP, São Paulo, SP.	1998	RJ	Nova Friburgo
539	Composição florística e estrutura do componente arbóreo de um trecho de floresta ombrófila densa de terras baixas, periodicamente alagada, na reserva Volta Velha, Itapoá, SC. Dissertação de Mestrado em Botânica, UFPR, Curitiba, Paraná.	2000	SC	Itapoá
578	Estudos de florestas da restinga da Ilha do Cardoso, Cananéia, São Paulo, Brasil. Boletim do Instituto de Botânica, 11:119–159.	1998	SP	Cananéia
580	Composição florística e estrutura fitossociológica da floresta tropical ombrófila da encosta atlântica no município de Morretes (Paraná). Boletim de Pesquisas Florestais. 18/19:23–30.	1989	PR	Morretes

Table 1 continued

PubCod	References	Year	ES	Municipality
594	Composição florística e estrutura do componente arbóreo de uma floresta altimontana no município de Camanducaia, Minas Gerais, Brasil. <i>Revista Brasileira de Botânica</i> , 27(1):19–30.	2004	MG	Camanducaia
595	Fitossociologia de uma floresta de restinga no Parque Estadual Paulo César Vinha, Setiba, município de Guarapari (ES). <i>Revista Brasileira de Botânica</i> , 27(2):349–361.	2004	ES	Guarapari

PubCod. code of the publication, *ES* Federation State

(2) Submontane (SB), situated on slopes at altitudes of 100–600 m a.s.l. between 4° N and 16° S, of 50–500 m between 16° S and 24° S, and of 30–400 m between 24° S and 32° S; (3) Montane (M), situated on the top of high plateaus or mountains from 600 to 2000 m a.s.l. between 4° N and 16° S, from 500 to 1500 m between 16° S and 24° S, and from 400 to 1000 m between 24° S and 32° S; and (4) High-montane (HM), situated above the limits established for the Montane formations. The division of the tree flora into altitudinal belts was confirmed by other authors such as Oliveira-Filho and Fontes (2000) and Scudeller et al. (2001). We considered that species would have only a single habitat (stenoeious species) when they occurred in only one of the four forest formations cited above; and we considered species as having various habitats (euryecious species) when they were found to occur in more than one forest formation of the Dense Ombrophilous Atlantic Forest Phyto-Ecological Region. To determine each species habitat preferences we used the complete set of 225 surveys.

Population size

In order to classify the species into abundance categories, we followed Pitman et al. (1999) with modifications according to Martins (1991), who encountered large numbers of species sampled as single individuals in surveys in the Brazilian Atlantic rainforest, and embraced the theory of “singletons” (species represented by just a single individual) and “doubletons” (species represented by only two individuals) proposed by Preston (1962) and developed by Gaston (1994) and other authors. We considered as scarce those species with up to two individuals in any survey analyzed; and as abundant those species sampled with three or more individuals in at least one survey. In this analysis we only considered the refined 34 surveys from the southern portion of the Brazilian Atlantic rainforest that fitted the criteria we established.

After classifying each species according to these three variables, we proceeded to classify the species into the forms of rarity proposed by Rabinowitz et al. (1986). This way we could calculate the proportion of each rarity form in the southern portion of the Dense Ombrophilous Atlantic Forest.

Results

We found all the seven forms of rarity proposed by Rabinowitz et al. (1986) in the southern portion of the Brazilian Atlantic rainforest (Table 2). Of the 846 arboreal species analyzed 46% had wide geographic distribution (eurytopic species) and 54% showed restricted

Table 2 Percentage of Rabinowitz's rarity forms of tree species in the southern sector of the Brazilian Atlantic Rainforest

Geographic distribution	Wide		Restricted	
	Various	Single	Various	Single
Abundant population	41.1 Common	0.2 Form 2	19.5 Form 4	15.5 Form 6
Scarce population	4.5 Form 1	0.1 Form 3	8 Form 5	11 Form 7

geographic distribution (stenotopic species); 73% occurred in various types of habitats (euryoecious species) and 27% occurred only in unique habitats (stenoecious species); 76% were found in locally abundant populations and 24% were locally scarce. Of the total number of species, 380 (45%) were present only in a single sample.

Of the total 846 species found in the 34 surveys we analyzed, 41.1% were common species (Table 3). These can be considered eurytopic, euryoecious locally abundant species. The other 58.9% species were distributed among rarity forms in the following way. A proportion of 4.5% was rare (form 1) because of their overall small population sizes (Table 4). These species are classified as locally scarce, eurytopic euryoecious species. When a species has a wide geographic distribution with abundant populations, but only occurs in a single habitat, it is rare (form 2) due to its unique habitat, that is, it represents a locally abundant, eurytopic stenoecious species. Only two species (0.2%) had this form of rarity: *Andira nitida* Mart. ex Benth. and *Miconia pusilliflora* (DC.) Naud. Species with wide geographic distributions in a single habitat and having scarce populations are rare (form 3) because of the last two characteristics—being locally scarce, eurytopic stenoecious species. Only one species (0.1%) had this form of rarity: *Guettarda viburnoides* Cham. & Schldtl. A proportion of 19.5% was represented by form 4, that is, locally abundant, stenotopic euryoecious species (Table 5). Locally scarce stenotopic, euryoecious species (form 5) represented 8% of the rare species (Table 6). Locally abundant stenotopic, stenoecious species (form 6) accounted for 15.6% of the total (Table 7), whereas 11% were represented by the most restrictive form of rarity (form 7): stenotopic, stenoecious species with locally scarce populations (Table 8).

Discussion

Variables of rarity

Species with restricted geographic distributions and occurring in only a single or at most a few surveys (low constancy) predominate in the Atlantic rainforest of São Paulo State (Scudeller et al. 2001). Accordingly, our results showed that stenotopic species predominate in the southern portion of the Atlantic rainforest. As such, estenotopy is the most important variable in determining the rarity of most of the tree species in the southern region of the Atlantic rainforest. The rarity of tree species due to stenotopy may be the principal variable related to the observed decay in floristic similarity with increasing geographic distance that was reported by Scudeller et al. (2001) in the Atlantic rainforest in São Paulo State. We believe that distribution at distances not greater than 440 km would be a conservative belt width to use even in an extensive phyto-ecological region such as the Dense Ombrophilous Atlantic Forest, especially considering the low latitudinal range found by Scudeller et al. (2001) for tree species in São Paulo State.

Table 3 Tree species of the southern sector of the Brazilian Atlantic Rainforest classified as common according to Rabinowitz

<i>Abarema langsdorffii</i> (Benth.) Barneby & Grimes	<i>Manilkara subsericea</i> (Mart.) Dubard
<i>Actinostemon concolor</i> (Spreng.) Müll.Arg.	<i>Maprounea guianensis</i> Aubl.
<i>Aegiphila sellowiana</i> Cham.	<i>Margaritaria nobilis</i> L.f.
<i>Aiouea saligna</i> Meisn.	<i>Marlierea eugeniopsoides</i> (D.Legrand & Kausel) D.Legrand
<i>Alchornea glandulosa</i> Poepp.	<i>Marlierea obscura</i> O.Berg
<i>Alchornea sidifolia</i> Müll.Arg.	<i>Marlierea parviflora</i> O.Berg
<i>Alchornea triplinervia</i> (Spreng.) Müll.Arg.	<i>Marlierea racemosa</i> (Vell.) Kiaersk.
<i>Alibertia concolor</i> (Cham.) K.Schum.	<i>Marlierea silvatica</i> (Gardner) Kiaersk.
<i>Allophylus edulis</i> A.St.-Hil., Cambess & A.Juss.) Radlk.	<i>Marlierea tomentosa</i> Cambess.
<i>Alseis floribunda</i> Schott	<i>Matayba elaeagnoides</i> Radlk.
<i>Amaioua guianensis</i> Aubl.	<i>Matayba guianensis</i> Aubl.
<i>Amaioua intermedia</i> Mart.	<i>Maytenus robusta</i> Reissek
<i>Anadenanthera colubrina</i> (Vell.) Brenan	<i>Meliosma sellowii</i> Urb.
<i>Andira anthelmia</i> (Vell.) J.F.Macbr.	<i>Meliosma sinuata</i> Urb.
<i>Andira fraxinifolia</i> Benth.	<i>Miconia budlejoides</i> Triana
<i>Aniba firmula</i> (Nees & Mart.) Mez	<i>Miconia cabussu</i> Hoehne
<i>Annona cacans</i> Warm.	<i>Miconia cinerascens</i> Miq.
<i>Aparisthium cordatum</i> (Juss.) Baill.	<i>Miconia cinnamomifolia</i> (DC.) Naud.
<i>Aspidosperma parvifolium</i> A.DC.	<i>Miconia cubatanensis</i> Hoehne
<i>Aspidosperma pyricollum</i> Müll.Arg.	<i>Miconia cubatanensis</i> Hoehne
<i>Attalea dubia</i> (Mart.) Burret	<i>Miconia dodecandra</i> Cogn.
<i>Bathysa meridionalis</i> L.B.Sm. & Downs	<i>Miconia eichlerii</i> Cogn.
<i>Blepharocalyx salicifolius</i> (HBK) O.Berg	<i>Miconia prasina</i> (Sw.) DC.
<i>Brosimum glazioui</i> Taub.	<i>Miconia pyrifolia</i> Naud.
<i>Brosimum guianense</i> (Aubl.) Huber	<i>Miconia rigidiuscula</i> Cogn.
<i>Brosimum lactescens</i> (Sp. Moore) C.C.Berg	<i>Miconia sellowiana</i> Naud.
<i>Buchenavia kleinii</i> Exell	<i>Micropholis crassipedicellata</i> (Mart. & Eichl.) Pierre
<i>Byrsonima ligustrifolia</i> A.St.-Hil.	<i>Mollinedia schottiana</i> (Spreng.) Perkins
<i>Bathysa meridionalis</i> L.B.Sm. & Downs	<i>Mollinedia triflora</i> (Spreng.) Tul.
<i>Blepharocalyx salicifolius</i> (HBK) O.Berg	<i>Mollinedia uleana</i> Perkins
<i>Brosimum glazioui</i> Taub.	<i>Mouriri chamissoana</i> Cogn.
<i>Brosimum guianense</i> (Aubl.) Huber	<i>Myrceugenia campestris</i> (A.P.DC.) D.Legrand & Kausel
<i>Brosimum lactescens</i> (Sp. Moore) C.C.Berg	<i>Myrceugenia miersiana</i> (Gardner) D.Legrand & Kausel
<i>Buchenavia kleinii</i> Exell	<i>Myrceugenia myrcioides</i> (Cambess)O.Berg
<i>Byrsonima ligustrifolia</i> A.St.-Hil.	<i>Myrceugenia pilotantha</i> (Kiaers.) Landrum
<i>Cabralea canjerana</i> (Vell.) Mart.	<i>Myrcia acuminatissima</i> O.Berg
<i>Calophyllum brasiliensis</i> Cambess.	<i>Myrcia fallax</i> (Rich.) DC.
<i>Calycorectes australis</i> D.Legrand	<i>Myrcia glabra</i> (O.Berg) D.Legrand
<i>Calycorectes psidiiflorus</i> (O.Berg) Sobral	<i>Myrcia guajavifolia</i> O.Berg
<i>Calyptranthes concinna</i> DC.	<i>Myrcia multiflora</i> (Lam.) DC.

Table 3 continued

<i>Calyptranthes eugenioopsoides</i> D. Legrand & Kausel	<i>Myrcia pubipetala</i> Miq.
<i>Calyptranthes grandifolia</i> O.Berg	<i>Myrcia racemosa</i> (O.Berg) Kiaersk.
<i>Calyptranthes lucida</i> Mart. ex DC.	<i>Myrcia richardiana</i> (O.Berg) Kiaersk.
<i>Calyptranthes strigipes</i> O.Berg	<i>Myrcia rostrata</i> DC.
<i>Campomanesia guaviroba</i> (A.P.DC.) Kiaers.	<i>Myrcia tenuivenosa</i> Kiaersk.
<i>Campomanesia guazumifolia</i> (Cambess.) O.Berg	<i>Myrciaria floribunda</i> (West ex Willd.) O.Berg
<i>Campomanesia xanthocarpa</i> Berg	<i>Myrciaria tenella</i> (DC.) O.Berg
<i>Capparis flexuosa</i> (L.) L.	<i>Myrocarpus frondosus</i> Allemao
<i>Cariniana estrellensis</i> (Raddi) Kuntze	<i>Nectandra grandiflora</i> Nees
<i>Casearia decandra</i> Jacq.	<i>Nectandra lanceolata</i> Nees
<i>Casearia obliqua</i> Spreng.	<i>Nectandra megapotamica</i> (Spreng.) Mez
<i>Casearia sylvestris</i> Sw.	<i>Nectandra membranacea</i> (Sw.) Griseb.
<i>Cecropia glaziovii</i> Snelthlage	<i>Nectandra nitidula</i> Nees
<i>Cecropia pachystachya</i> Trécul	<i>Nectandra oppositifolia</i> Nees
<i>Cedrela fissilis</i> Vell.	<i>Nectandra rigida</i> (HBK.) Nees
<i>Chrysophyllum gonocarpum</i> (Mart. & Eichl.) Engl.	<i>Neomitranthes glomerata</i> (D.Legrand) D.Legrand
<i>Chrysophyllum inornatum</i> Mart.	<i>Nephelea setosa</i> (Kaulf.) R.M.Tryon
<i>Chrysophyllum lucentifolium</i> Cronquist	<i>Ocotea aciphylla</i> (Nees) Mez
<i>Chrysophyllum marginatum</i> (Hook. & Arn.) Radlk.	<i>Ocotea brachybotra</i> (Meisn.) Mez
<i>Chrysophyllum viride</i> Mart. & Eichl.	<i>Ocotea catharinensis</i> Mez
<i>Cinnamomum glaziovii</i> (Mez) Kosterm.	<i>Ocotea daphnifolia</i> (Meisn.) Mez
<i>Citharexylum myrianthum</i> Cham.	<i>Ocotea dispersa</i> (Nees) Mez
<i>Citronella paniculata</i> (Mart.) R.A.Howard	<i>Ocotea divaricata</i> (Nees) Mez
<i>Clethra scabra</i> Pers.	<i>Ocotea elegans</i> Mez
<i>Clusia criuva</i> Cambess.	<i>Ocotea glaziovii</i> Mez
<i>Coccoloba alnifolia</i> Casar.	<i>Ocotea indecora</i> (Schott) Mez
<i>Coccoloba warmingii</i> Meisn.	<i>Ocotea lancifolia</i> (Schott) Mez
<i>Copaifera langsdorffii</i> Desf.	<i>Ocotea laxa</i> (Nees) Mez
<i>Copaifera trapezifolia</i> Hayne	<i>Ocotea nectandrifolia</i> Mez
<i>Copaifera trapezifolia</i> Hayne	<i>Ocotea pulchella</i> (Nees) Mez
<i>Cordia ecalyculata</i> Vell.	<i>Ocotea pulchra</i> Vattimo-Gil
<i>Cordia sellowiana</i> Cham.	<i>Ocotea silvestris</i> Vattimo-Gil
<i>Cordia trichotoma</i> (Vell.) Arrab. ex Steud.	<i>Ocotea teleiandra</i> (Meisn.) Mez
<i>Couepia venosa</i> Prance	<i>Ocotea urbaniana</i> Mez
<i>Coussapoa microcarpa</i> (Schott) Rizzini	<i>Ormosia arborea</i> (Vell.) Harms
<i>Coutarea hexandra</i> (Jacq.) K.Schum.	<i>Ouratea parviflora</i> Engl.
<i>Croton floribundus</i> Spreng.	<i>Pachystroma longifolium</i> (Nees) I.M.Johnst.
<i>Cryptocarya aschersoniana</i> Mez	<i>Parinari excelsa</i> Sabine
<i>Cryptocarya moschata</i> Nees	<i>Pausandra morisiana</i> (Casar.) Radlk.
<i>Cupania emarginata</i> Cambess.	<i>Pera glabrata</i> (Schott) Poepp. ex Baill.
<i>Cupania oblongifolia</i> Mart.	<i>Persea venosa</i> Nees
<i>Cupania vernalis</i> Cambess.	<i>Phytolacca dioica</i> L.

Table 3 continued

<i>Cyathea delgadii</i> Sternb.	<i>Pimenta pseudocaryophyllus</i> (Gomes) Landrum
<i>Cyathea schanschin</i> Mart.	<i>Piper cernuum</i> Vell.
<i>Cyathea setosa</i> (Kaulf.) Domin	<i>Piper gaudichaudianum</i> Kunth
<i>Cybianthus peruvianus</i> (A.DC.) Miq.	<i>Piptocarpha angustifolia</i> Dusen ex Malme
<i>Dalbergia brasiliensis</i> Vogel	<i>Piptocarpha axilaris</i> (Less.) Baker
<i>Daphnopsis gemmiflora</i> (Miers) Domke	<i>Pisonia ambigua</i> Heimerl.
<i>Dicksonia sellowiana</i> Hook.	<i>Platymiscium floribundum</i> Vogel
<i>Diospyros inconstans</i> Jacq.	<i>Plinia rivularis</i> (Cambess) A.D.Rotman
<i>Diploön cuspidatum</i> (Hoehne) Cronquist	<i>Podocarpus sellowii</i> Klotz. ex. Endl.
<i>Drimys brasiliensis</i> Miers	<i>Posoqueria acutifolia</i> Mart.
<i>Duguetia lanceolata</i> A.St.-Hil.	<i>Posoqueria latifolia</i> (Rudge) R. & Pavon
<i>Ecclinusa ramiflora</i> Mart.	<i>Pourouma guianensis</i> Aubl.
<i>Endlicheria paniculata</i> (Spreng.) J.F.Macbr.	<i>Pouteria beaurepairei</i> (Glaz. & Raunkier) Baehni
<i>Eriotheca candolleana</i> (K.Schum.) A.Robyns	<i>Pouteria bullata</i> (S.Moore) Baehni
<i>Eriotheca macrophylla</i> (K.Schum.) A.Robyns	<i>Pouteria caimito</i> (R. & Pav.) Radlk.
<i>Eriotheca pentaphylla</i> (Vell. emend K.Schum.) A.Robyns	<i>Pouteria psammophila</i> (Mart.) Radlk.
<i>Erythroxylum cuspidifolium</i> Mart.	<i>Pouteria venosa</i> (Mart.) Baehni
<i>Esenbeckia febrifuga</i> (A.St.-Hil.) A.Juss. ex Mart.	<i>Protium heptaphyllum</i> (Aubl.) Marchand
<i>Esenbeckia grandiflora</i> Mart.	<i>Protium kleinii</i> Cuatrec.
<i>Eugenia beaurepaireana</i> (Kiaersk.) D.Legrand	<i>Prunus myrtifolia</i> (L.) Urb.
<i>Eugenia brasiliensis</i> Lam.	<i>Pseudobombax grandiflorum</i> (Cav.) A.Robyns
<i>Eugenia cerasiflora</i> Miq.	<i>Psidium cattleyanum</i> Sabine
<i>Eugenia cereja</i> D.Legrand	<i>Psychotria carthagenensis</i> Jacq.
<i>Eugenia excelsa</i> O.Berg	<i>Psychotria erecta</i> (Aubl.) Standl. & Steyerm.
<i>Eugenia handroana</i> D.Legrand	<i>Psychotria longipes</i> Müll.Arg.
<i>Eugenia involucrata</i> O.Berg	<i>Psychotria mapouritoides</i> DC.
<i>Eugenia leptoclada</i> O.Berg	<i>Psychotria nuda</i> (Cham. & Schldl.) Wawra
<i>Eugenia monosperma</i> Vell.	<i>Psychotria sessilis</i> (Vell.) Müll.Arg.
<i>Eugenia multicostata</i> D.Legrand	<i>Psychotria suterella</i> Müll.Arg.
<i>Eugenia neoglomerata</i> Sobral	<i>Pterocarpus rohrii</i> Vahl
<i>Eugenia neolanceolata</i> Sobral	<i>Pterocarpus violaceus</i> Vogel
<i>Eugenia oblongata</i> O.Berg	<i>Qualea jundiahay</i> Warm.
<i>Eugenia obovata</i> Poir.	<i>Quiina glaziovii</i> Engl.
<i>Eugenia pruinosa</i> D.Legrand	<i>Rapanea acuminata</i> Mez
<i>Eugenia puniceifolia</i> (Kunth) DC.	<i>Rapanea coriacea</i> (Sw.) Mez
<i>Eugenia schuechiana</i> O.Berg	<i>Rapanea ferruginea</i> (R. & Pav.) Mez
<i>Eugenia speciosa</i> Cambess.	<i>Rapanea gardneriana</i> A.DC.
<i>Eugenia subavenia</i> O.Berg	<i>Rapanea guianensis</i> (Aubl.) Kuntze
<i>Eugenia sulcata</i> Spring ex Mart.	<i>Rapanea parvifolia</i> A.DC.
<i>Eugenia umbelliflora</i> O.Berg	<i>Rapanea parvula</i> (Mez) Otegui
<i>Euterpe edulis</i> Mart.	<i>Rapanea umbellata</i> (Mart.) Mez
<i>Faramea marginata</i> Cham.	<i>Rapanea venosa</i> (A.DC.) Mez
<i>Ficus clusiifolia</i> Schott	<i>Rollinia emarginata</i> Schldl.
<i>Ficus enormis</i> (Mart. ex Miq.) Miq.	<i>Rollinia laurifolia</i> Schldl.

Table 3 continued

<i>Ficus gomelleira</i> Kunth & Bouché ex Kunth	<i>Rollinia sericea</i> (R.E.Fries) R.E.Fries
<i>Ficus insipida</i> Willd.	<i>Rollinia silvatica</i> (A.St.-Hil.) Mart.
<i>Ficus organensis</i> (Miq.) Miq.	<i>Roupala brasiliensis</i> Klotzsch
<i>Garcinia brasiliensis</i> Mart.	<i>Roupala rhombifolia</i> Mart. ex Meisn.
<i>Garcinia gardneriana</i> (Planch. & Triana) Zappi	<i>Rudgea jasminoides</i> (Cham.) Müll.Arg.
<i>Geonoma gamiova</i> Barb.Rodr.	<i>Rudgea recurva</i> Müll.Arg.
<i>Gomidesia affinis</i> (Cambess.) D.Legrand	<i>Schefflera morototoni</i> (Aubl.) Maguire, Steyerl. & Frodin
<i>Gomidesia flagellaris</i> D.Legrand	<i>Schinus terebinthifolius</i> Raddi
<i>Gomidesia martiana</i> O.Berg	<i>Schyzolobium parahyba</i> (Vell.) Blake
<i>Gomidesia palustris</i> (DC.) Kausel	<i>Sloanea guianensis</i> (Aubl.) Benth.
<i>Gomidesia schaueriana</i> O.Berg	<i>Sloanea monosperma</i> Vell.
<i>Gomidesia spectabilis</i> (DC.) O.Berg	<i>Sloanea obtusifolia</i> (Moric.) K.Schum.
<i>Gomidesia tijucensis</i> (Kiaersk.) D.Legrand	<i>Solanum inaequale</i> Vell.
<i>Guapira opposita</i> (Vell.) Reitz	<i>Solanum pseudoquina</i> A.St.-Hil.
<i>Guarea guidonia</i> (L.) Sleumer	<i>Sorocea bonplandii</i> (Baill.) W.C. Burger, Lanj. & Wess. Boer
<i>Guarea macrophylla</i> Vahl	<i>Spirotheca rivieri</i> (Decne.) Ulbr.
<i>Guatteria australis</i> A.St.-Hil.	<i>Styrax acuminatus</i> Pohl
<i>Guazuma ulmifolia</i> Lam.	<i>Syagrus romanzoffiana</i> (Cham.) Glassman
<i>Heisteria perianthomega</i> (Vell.) Sleumer	<i>Symplocos celastrinea</i> Mart. ex Miq.
<i>Heisteria silvianii</i> Schwacke	<i>Tabebuia cassinoides</i> (Lam.) A.P.DC.
<i>Hieronyma alchorneoides</i> Allemao	<i>Tabebuia heptaphylla</i> (Vell.) Toledo
<i>Hirtella hebeclada</i> Moric. ex DC.	<i>Tabebuia serratifolia</i> (Vahl) Nicholson
<i>Hymenaea courbaril</i> L.	<i>Tabebuia umbellata</i> (Sonder) Sandwith
<i>Ilex brevicuspis</i> Reissek	<i>Tapirira guianensis</i> Aubl.
<i>Ilex dumosa</i> Reissek	<i>Ternstroemia brasiliensis</i> Cambess.
<i>Ilex integerrima</i> Reissek	<i>Tetrastylidium grandifolium</i> (Baill.) Sleumer
<i>Ilex paraguariensis</i> A.St.-Hil.	<i>Tetrorchidium rubrinervium</i> Poepp.
<i>Ilex pseudobuxus</i> Reissek	<i>Tibouchina sellowiana</i> Cogn.
<i>Ilex theezans</i> Mart. ex Reissek	<i>Trema micrantha</i> (L.) Blume
<i>Inga capitata</i> Desv.	<i>Trichilia casarettii</i> C.DC.
<i>Inga edulis</i> Mart.	<i>Trichilia elegans</i> A.Juss.
<i>Inga laurina</i> (Sw.) Willd.	<i>Trichilia lepidota</i> Mart.
<i>Inga marginata</i> Willd.	<i>Trichilia silvatica</i> C.DC.
<i>Inga sellowiana</i> Benth.	<i>Trichipteris phalerata</i> (Mart.) Barrington
<i>Inga sessilis</i> (Vell.) Mart.	<i>Urera baccifera</i> (L.) Gaudich. ex Wedd.
<i>Inga striata</i> Benth.	<i>Vantanea compacta</i> (Schnizl.) Cuatrec.
<i>Inga vera</i> Willd.	<i>Vernonanthura discolor</i> (Spreng.) H.Rob.
<i>Jacaranda micrantha</i> Cham.	<i>Vernonanthura divaricata</i> (Spreng.) H.Rob.
<i>Jacaranda puberula</i> Cham.	<i>Vernonanthura puberula</i> (Less.) H.Rob.
<i>Jacaratia spinosa</i> (Aubl.) A.DC.	<i>Virola bicuhyba</i> (Schott.) Warb.
<i>Lacistema pubescens</i> Mart.	<i>Virola gardnerii</i> (A.DC.) Warb.
<i>Lamanonia ternata</i> Vell.	<i>Vitex megapotamica</i> (Spreng.) Moldenke
<i>Leandra dasytricha</i> (A.Gray) Cogn.	<i>Vochysia tucanorum</i> Mart.

Table 3 continued

<i>Licania kunthiana</i> Hook.f.	<i>Weinmannia paulliniifolia</i> Pohl
<i>Licania octandra</i> (Hoffmanns. ex Roem. & Schult.) Kuntze	<i>Xylopia brasiliensis</i> Spreng.
<i>Lonchocarpus guillemineanus</i> (Tul.) Malme	<i>Xylosma pseudosalzmannii</i> Sleumer
<i>Luehea divaricata</i> Mart. & Zucc.	<i>Zanthoxylum fagara</i> (L.) Sarg. Gard. & Forest
<i>Machaerium stipitatum</i> (DC.) Vogel	<i>Zanthoxylum rhoifolium</i> Lam.
<i>Magnolia ovata</i> (A.St.-Hil.) Spreng	<i>Zollernia ilicifolia</i> (Brongn.) Vog.

Table 4 Tree species of the southern sector of the Brazilian Atlantic Rainforest with Rabinowitz's form I of rarity

<i>Albizia polycephala</i> (Benth.) Killip ex Record	<i>Jacaratia heptaphylla</i> (Vell.) A.DC.
<i>Allophylus petiolulatus</i> Radlk.	<i>Lafoensia pacari</i> A.St.-Hil.
<i>Ardisia guyanensis</i> (Aubl.) Mez	<i>Licaria armeniaca</i> (Poepp.) Kosterm.
<i>Bactris setosa</i> Mart.	<i>Lonchocarpus cultratus</i> (Vell.) A.M.G.Azevedo & H.C.Lima
<i>Balizia pedicellaris</i> (A.Rich.) Barneby & Grimes	<i>Lonchocarpus muehlbergianus</i> Hassl.
<i>Barnebya dispar</i> (Griseb.) W.R.Anderson & B.Gates	<i>Maclura tinctoria</i> (L.) D.Don ex Steud.
<i>Bauhinia forficata</i> Link	<i>Miconia latecrenata</i> (DC.) Naud.
<i>Brosimum gaudichaudii</i> Trécul	<i>Neomitranthes obscura</i> (DC.) N. Silveira
<i>Buchenavia capitata</i> (Vahl) Eichler	<i>Piper arboreum</i> Aubl.
<i>Casearia arborea</i> (L.C.Rich.) Urban	<i>Pradosia lactescens</i> (Vell.) Radlk.
<i>Cedrela odorata</i> L.	<i>Protium aracouchini</i> (Aubl.) Marchand
<i>Cheiloclinium cognatum</i> (Miers) A.C.Sm.	<i>Randia nitida</i> (HBK) DC.
<i>Cybistax antisiphilitica</i> (Mart.) Mart.	<i>Schoepfia brasiliensis</i> A.DC.
<i>Dahlstedtia pinnata</i> (Benth.) Malme	<i>SeQUIERIA glaziovii</i> Briq.
<i>Eugenia uniflora</i> L.	<i>Senna multijuga</i> (L.C.Rich.) H.S.Irwin & Barneby
<i>Ficus luschnanthiana</i> (Miq.) Miq.	<i>Swartzia simplex</i> (Sw.) Spreng.
<i>Geonoma schottiana</i> Mart.	<i>Tabebuia chrysotricha</i> (Mart. ex A.DC.) Standley
<i>Gomidesia anacardiaeifolia</i> (Gardner) O.Berg	<i>Xylosma ciliatifolium</i> (Clos) Eichler
<i>Gordonia fruticosa</i> (Schrader) H.Keng	<i>Jacaratia heptaphylla</i> (Vell.) A.DC.
<i>Inga subnuda</i> Salzm. ex Benth.	

Habitat affinity was the second most important variable affecting the forms of rarity of tree species in the southern portion of the Brazilian Atlantic rainforest. In order to classify habitat requirements as either unique (stenoecy) or varied (euryoecy) we considered the occurrence of each species in a single or in more than one altitudinal formations in the Dense Ombrophilous Atlantic Forest Phyto-Ecological Region according to Veloso (1992). In their analysis of the Atlantic rainforest of São Paulo State, Scudeller et al. (2001) detected a strong altitudinal influence on species distribution and abundance, supporting the results of other authors such as Salis et al. (1995) and Torres et al. (1997). As such, we believe that the criteria we adopted to classify the habitat affinity of tree species include important elements of their ecological niche.

Table 5 Tree species of the southern sector of the Brazilian Atlantic Rainforest with Rabinowitz's form 4 of rarity

<i>Actinostemon communis</i> (Müll.Arg.) Pax	<i>Maytenus brasiliensis</i> Mart.
<i>Alibertia myrciifolia</i> Spruce ex K.Schum.	<i>Maytenus evonymoides</i> Reissek
<i>Alsophila sternbergii</i> (Sternb.) D.S.Conant	<i>Metrodorea nigra</i> A.St.-Hil.
<i>Aniba viridis</i> Mez	<i>Miconia valtherii</i> Naud.
<i>Aspidosperma australe</i> Müll.Arg.	<i>Miconia willdenowii</i> Klotzsch
<i>Aspidosperma olivaceum</i> Müll.Arg.	<i>Micropholis venulosa</i> (Mart. & Eichl.) Pierre
<i>Aspidosperma polyneuron</i> Müll.Arg.	<i>Mollinedia clavigera</i> Tul.
<i>Astrocaryum aculeatissimum</i> (Schott) Burret	<i>Mollinedia oligantha</i> Perkins
<i>Aureliana fasciculata</i> (Vell.) Sendtn.	<i>Myrceugenia glaucescens</i> (Cambess) D.Legrand & Kausel
<i>Banara parviflora</i> (A.Gray) Benth.	<i>Myrceugenia kleinii</i> D.Legrand & Kausel
<i>Beilschmiedia emarginata</i> (Meisn.) Kosterm.	<i>Myrceugenia ovata</i> (Hook. & Arn.) O.Berg
<i>Boehmeria caudata</i> Sw.	<i>Myrceugenia scutellata</i> D.Legrand
<i>Calyptranthes grandiflora</i> O.Berg	<i>Myrcia brasiliensis</i> Kiaersk.
<i>Calyptranthes lanceolata</i> O.Berg	<i>Myrcia formosiana</i> DC.
<i>Capsicodendron dinisii</i> (Schwacke) Occhioni	<i>Myrcia heringii</i> D.Legrand
<i>Cathedra rubricaulis</i> Miers	<i>Myrcia laruotteana</i> Cambess.
<i>Cestrum intermedium</i> Sendtn.	<i>Myrcia venulosa</i> DC.
<i>Cestrum schlechtendallii</i> G.Don	<i>Myrciaria plinioides</i> D.Legrand
<i>Chamaecrista ensiformis</i> (Vell.) H.S.Irwin & Barneby	<i>Nectandra leucantha</i> Nees
<i>Chionanthus micrantha</i> (Mart.) Lozano & Fuentes	<i>Nectandra psammophyla</i> Nees
<i>Citronella megaphylla</i> (Mart.) R.A.Howard	<i>Ocotea bicolor</i> Vattimo-Gil
<i>Coccoloba latifolia</i> Lam.	<i>Ocotea corymbosa</i> (Meisn.) Mez
<i>Croton celtidifolius</i> Baill.	<i>Ocotea diospyrifolia</i> (Meisn.) Mez
<i>Croton urucurana</i> Baill.	<i>Ocotea frondosa</i> (Meisn.) Mez
<i>Cryptocarya saligna</i> Mez	<i>Ocotea organensis</i> (Meisn.) Mez
<i>Dalbergia frutescens</i> (Vell.) Britton	<i>Ocotea porosa</i> (Nees) Barroso
<i>Daphnopsis fasciculata</i> (Meisn.) Nevl.	<i>Ocotea spectabilis</i> (Meisn.) Mez
<i>Daphnopsis schwackeana</i> Taub.	<i>Ocotea vaccinioides</i> (Meisn.) Mez
<i>Dendropanax cuneatus</i> (DC.) Decne. & Planch.	<i>Ormosia dasycarpa</i> Jacks.
<i>Diospyros brasiliensis</i> Mart. ex Miq.	<i>Ouratea multiflora</i> Engl.
<i>Drimys winteri</i> J.R.Forst. & G.Forst.	<i>Ouratea semiserrata</i> (Mart. & Nees) Engl.
<i>Erythrina falcata</i> Benth.	<i>Oxandra nitida</i> R.E.Fries
<i>Erythroxylum amplifolium</i> (Mart.) O.E.Schulz	<i>Parinari brasiliensis</i> (Schott) Hook.f.
<i>Erythroxylum argentinum</i> O.E.Schulz	<i>Pera obovata</i> (Klotsch) Baill.
<i>Eugenia bacopari</i> D.Legrand	<i>Persea pyrifolia</i> Nees
<i>Eugenia bimarginata</i> DC.	<i>Picramnia glazioviana</i> Engl.
<i>Eugenia convexinervia</i> D.Legrand	<i>Piptadenia gonoacantha</i> (Mart.) J.F.Macbr.
<i>Eugenia cuprea</i> (O.Berg) Nied.	<i>Piptocarpha macropoda</i> (DC.) Baker
<i>Eugenia gemmiflora</i> O.Berg	<i>Pouteria peduncularis</i> (Mart. & Eichl.) Baehni
<i>Eugenia glazioviana</i> (Kiaersk.) D. Legrand	<i>Protium widgrenii</i> Engl.
<i>Eugenia kleinii</i> D.Legrand	<i>Pseudopiptadenia leptostachya</i> (Benth.) Rauschert
<i>Eugenia melanogyna</i> (D.Legrand) Sobral	<i>Psidium grandifolium</i> DC.

Table 5 continued

<i>Eugenia moraviana</i> O.Berg	<i>Psychotria barbiflora</i> DC.
<i>Eugenia mosenii</i> (Kasusel) Sobral	<i>Rapanea hermosensis</i> Jung-Mend. & Bernacci
<i>Eugenia neomyrtifolia</i> Sobral	<i>Rhammus sphaerosperma</i> Sw.
<i>Eugenia pluriflora</i> DC.	<i>Rudgea gardenioides</i> (Cham.) Müll.Arg.
<i>Eugenia prasina</i> O.Berg	<i>Schefflera calva</i> (Cham.) Frodin & Fiaschi
<i>Eugenia ramboi</i> D.Legrand	<i>Schefflera navarroi</i> (A.Samp. in Andrade & Vecchi) Frodin & Fiaschi
<i>Eugenia riedeliana</i> O.Berg	<i>Sclerolobium denudatum</i> Vogel
<i>Eugenia rostrifolia</i> D.Legrand	<i>Sebastiania klotzschiana</i> (Müll.Arg.) Müll.Arg.
<i>Eugenia stictosepala</i> Kiaersk.	<i>Sebastiania serrata</i> (Baill. ex Müll.Arg.) Müll.Arg.
<i>Eugenia stigmata</i> DC.	<i>Senna macranthera</i> (Collad.) H.S.Irwin & Barneby
<i>Eugenia uruguayensis</i> Cambess.	<i>Sideroxylon obtusifolium</i> (Roem. & Schultes) T.D.Penn.
<i>Euplassa cantareirae</i> Sleumer	<i>Simaba cuneata</i> A.St.-Hil & Tul.
<i>Exostyles venusta</i> Schott	<i>Simira eliezeriana</i> Peixoto
<i>Faramaea montevidensis</i> (Cham. & Schltld.) DC.	<i>Sloanea lasiocoma</i> K.Schum.
<i>Ficus glabra</i> Vell.	<i>Solanum bullatum</i> Vell.
<i>Gochmatia polymorpha</i> (Less.) Cabrera	<i>Solanum caeruleum</i> Vell.
<i>Gomidesia fenziiana</i> O.Berg	<i>Solanum excelsum</i> A.St.-Hil.
<i>Guapira obtusata</i> (Jacq.) Little	<i>Solanum leucadendrum</i> Whalen
<i>Guatteria dusenii</i> R.E.Fries	<i>Solanum sanctae-katharinae</i> Dunal
<i>Guatteria nigrescens</i> Mart.	<i>Solanum swartzianum</i> Roem. & Schult.
<i>Gymnanthes concolor</i> (Spreng.) Müll.Arg.	<i>Styrax pohlii</i> A.DC.
<i>Hedyosmum brasiliense</i> Mart. ex Miq.	<i>Symplocos falcata</i> Brand
<i>Hemecartia omphalandra</i> J.Poiss.	<i>Symplocos laxiflora</i> Benth.
<i>Hexachlamys itatiaiaensis</i> Mattos	<i>Symplocos nitidiflora</i> Brand
<i>Humiriastrum dentatum</i> (Casar.) Cuatrec.	<i>Symplocos tetrandra</i> Mart.
<i>Ilex amara</i> (Vell.) Loes.	<i>Symplocos variabilis</i> Mart.
<i>Ilex microdonta</i> Reissek	<i>Tabebuia alba</i> (Cham.) Sandwith
<i>Ilex taubertiana</i> Loes.	<i>Tibouchina multiceps</i> Cogn.
<i>Ixora burchelliana</i> Müll.Arg.	<i>Tibouchina pulchra</i> (Cham.) Cogn.
<i>Ixora venulosa</i> Benth.	<i>Tovomitopsis saldanhae</i> Engl.
<i>Licania hoehnei</i> Pilg.	<i>Trichilia claussenii</i> C.DC.
<i>Lonchocarpus campestris</i> Mart. ex Benth.	<i>Trichilia pallens</i> C.DC.
<i>Luehea speciosa</i> Willd.	<i>Trichilia pallida</i> Sw.
<i>Machaerium nycitans</i> (Vell.) Benth.	<i>Trichilia pseudostipularis</i> (A.Juss.) C.DC.
<i>Machaerium villosum</i> Vogel	<i>Trichipteris atrovirens</i> Langsd. & Fisch.) R.M.Tryon
<i>Macropeplus ligustrinus</i> (Tul.) Perkins	<i>Vitex polygama</i> Cham.
<i>Malouetia arborea</i> (Vell.) Miers	<i>Vochysia bifalcata</i> Warm.
<i>Marlierea grandifolia</i> O.Berg	<i>Weinmannia discolor</i> Gardner
<i>Marlierea reitzii</i> D.Legrand	<i>Xylopia langsdorffiana</i> A.St.-Hil. & Tul.
<i>Matayba junglandifolia</i> Radlk.	<i>Zollernia glabra</i> (Spreng.) Yakvl.
<i>Maytenus aquifolia</i> Mart.	

Table 6 Tree species of the southern sector of the Brazilian Atlantic Rainforest with Rabinowitz's form 5 of rarity

<i>Abarema brachystachya</i> (DC.) Barneby & Grimes	<i>Mollinedia widgrenii</i> A.DC.
<i>Acnistus arborescens</i> (L.) Schldtl.	<i>Mouriri arborea</i> Gardner
<i>Ardisia laevigata</i> Blume	<i>Myrcia obtecta</i> (O.Berg) Kiaersk.
<i>Casearia commersoniana</i> Camb.	<i>Myroxylon peruiferum</i> L.f.
<i>Cecropia hololeuca</i> Miq.	<i>Nectandra puberula</i> (Schott) Nees
<i>Ceiba speciosa</i> (A.St.-Hil.) Ravenna	<i>Ocotea lanata</i> (Nees) Mez
<i>Centrobium robustum</i> (Vell.) Mart. ex Benth.	<i>Ouratea parvifolia</i> Engl.
<i>Cestrum calycinum</i> Kunth	<i>Paramyrciaria delicatula</i> (DC.) Kausel
<i>Chomelia catharinae</i> (L.B.Sm. & Downs) Steyerm.	<i>Pera leandri</i> Baill.
<i>Cinnamomum riedelianum</i> Kosterm.	<i>Phoebe stenophylla</i> (Meisn.) Mez
<i>Clusia hilariana</i> Planch. & Triana	<i>Picramnia gardneri</i> Planch.
<i>Copaifera lucens</i> Dwyer	<i>Plinia trunciflora</i> (O.Berg) Kausel
<i>Cordia superba</i> Cham.	<i>Polyandrococos caudescens</i> (Mart.) Barb.Rodr.
<i>Coussarea graciliflora</i> (Mart.) Müll.Arg.	<i>Pouteria guianensis</i> Aubl.
<i>Croton macrobothrys</i> Baill.	<i>Psychotria nemorosa</i> Gardner
<i>Dahlstedtia pentaphylla</i> (Taub.) Burkart	<i>Roupala longepetiolata</i> Pohl
<i>Enterolobium contortisiliquum</i> (Vell.) Morong	<i>Ruprechtia laxiflora</i> Meisn.
<i>Eugenia blastantha</i> (O.Berg) D. Legrand	<i>Rustia formosa</i> Kl.
<i>Eugenia catharinensis</i> D. Legrand	<i>Sapium glandulosum</i> (L.) Morong
<i>Eugenia neoverrucosa</i> Sobral	<i>Savia dictyocarpa</i> Müll.Arg.
<i>Eugenia platysema</i> O.Berg	<i>Sclerolobium friburgense</i> Harms
<i>Euplassa incana</i> (Klotzsch) I.M.Johnston	<i>Seguiera langsdorffii</i> Moq.
<i>Inga barbata</i> Benth.	<i>Solanum mauritianum</i> Scop.
<i>Inga lenticellata</i> Benth.	<i>Solanum rufescens</i> Sendtn.
<i>Machaerium brasiliense</i> Vogel	<i>Sorocea jureiana</i> Romaniuc
<i>Machaerium uncinatum</i> (Vell.) Benth.	<i>Spirotheca passifloroides</i> Cuatrec.
<i>Marlierea suaveolens</i> Cambess.	<i>Symplocos trachycarpa</i> Brand
<i>Maytenus communis</i> Reissek	<i>Tabebuia impetiginosa</i> (Mart. ex A.DC.) Mart.
<i>Maytenus obtusifolia</i> Mart.	<i>Terminalia triflora</i> (Griseb.) Lillo
<i>Meriania clausenii</i> Triana	<i>Tibouchina mutabilis</i> (Vell.) Cogn.
<i>Miconia theizans</i> (Bonpl.) Cogn.	<i>Tocoyena sellowiana</i> (Cham. & Schldtl.) K.Schum.
<i>Mollinedia eugeniifolia</i> Perkins	<i>Trichilia catigua</i> A.Juss.
<i>Mollinedia fruticulosa</i> Perkins	<i>Vochysia soldanhana</i> Warm.
<i>Mollinedia oligotricha</i> Perkins	<i>Xylosma glaberrimum</i> Sleumer

Local population size is also an important variable influencing the forms of rarity of tree species in the southern Atlantic rainforest. Our results corroborate other authors, as for example, Scudeller et al. (2001), who concluded that most tree species in the Atlantic Forest s.s. of São Paulo State have restricted ecological niches. Pires and Prance (1977) observed that tree communities of the upland (*terra firme*) Amazon Forest are composed of few locally abundant species and a plethora of locally scarce species. Our results indicated that the same pattern occurs in the southern portion of the Atlantic rainforest.

Table 7 Tree species of the southern sector of the Brazilian Atlantic Rainforest with Rabinowitz's form 6 of rarity

<i>Agonandra excelsa</i> Griseb.	<i>Mollinedia calodonta</i> Perkins
<i>Atouea acarodomatifera</i> Kosterm.	<i>Mollinedia glabra</i> (Spreng.) Perkins
<i>Alibertia sessilis</i> (Vell.) K.Schum.	<i>Myrceugenia acutiflora</i> (Kiaers.) D.Legrand & Kausel
<i>Allophylus guaraniticus</i> A.St.-Hil.) Radlk.	<i>Myrceugenia alpigena</i> (A.P.DC.) Landrum
<i>Annona acutiflora</i> Mart.	<i>Myrceugenia brevipedicellata</i> (Burret) D.Legrand & Kausel
<i>Aspidosperma tomentosum</i> Mart.	<i>Myrceugenia ovalifolia</i> (O.Berg) Landrum
<i>Baccharis lateralis</i> Baker	<i>Myrceugenia reitzii</i> D.Legrand & Kausel
<i>Baccharis oreophila</i> Malme	<i>Myrcia arborescens</i> O.Berg
<i>Bactris vulgaris</i> Barb.Rodr.	<i>Myrcia bergiana</i> O.Berg
<i>Byrsonima bahiana</i> W.R.Anderson	<i>Myrcia bicarinata</i> (O.Berg) D.Legrand
<i>Byrsonima myricifolia</i> Griseb.	<i>Myrcia hatschbachii</i> D.Legrand
<i>Calyptranthes clusiifolia</i> (Miq.) O.Berg	<i>Myrcia insularis</i> (O.Berg) Kiaersk.
<i>Calyptranthes kleinii</i> D.Legrand	<i>Myrcia kunthiana</i> (O.Berg) Kiaersk.
<i>Calyptranthes regeliana</i> O.Berg	<i>Myrcia obscura</i> (O.Berg) N.Silveira
<i>Calyptranthes rubella</i> (O.Berg) D.Legrand	<i>Neomitranthes cordifolia</i> (D.Legrand) D.Legrand
<i>Casearia selloana</i> Eichler	<i>Ocotea bragai</i> Coe-Teixeira
<i>Cecropia cineaea</i> Miq.	<i>Ocotea lobbii</i> (Meisn.) Rohwer
<i>Chrysophyllum januariense</i> Eichl.	<i>Ocotea minarum</i> (Nees) Mez
<i>Cinnamodendron axillare</i> Endl. ex Walp.	<i>Ocotea neesiana</i> (Miq.) Kosterm.
<i>Cinnamomum pickelli</i> (Coe-Teixeira) Kosterm.	<i>Ocotea notata</i> (Nees & Mart. ex Nees) Mez
<i>Coccoloba ovata</i> Benth.	<i>Ocotea tabacifolia</i> (Meisn.) Rohwer
<i>Colubrina glandulosa</i> Perkins	<i>Ocotea tristis</i> (Nees) Mez
<i>Connarus regnellii</i> Schellenb.	<i>Ocotea velloziana</i> (Meisn.) Mez
<i>Crataeva tapia</i> L.	<i>Ocotea venulosa</i> (Nees) Baitello
<i>Cyphomandra sycocarpa</i> (Mart. & Sendtn.) Sendtn.	<i>Opuntia brasiliensis</i> (Willd.) Haw.
<i>Daphnopsis coriacea</i> Taub.	<i>Peltophorum dubium</i> (Spreng.) Taub.
<i>Daphnopsis racemosa</i> Griseb.	<i>Pilocarpus pennatifolius</i> Lem.
<i>Dulacia singularis</i> Vell.	<i>Piptocarpha tomentosa</i> Baker
<i>Erythroxylum oxypetalum</i> O.E.Schulz	<i>Plinia brachybotra</i> Sobral
<i>Erythroxylum vacciniifolium</i> Mart.	<i>Plinia complanata</i> M.L.Kawas. & B.Holst
<i>Eugenia bahiensis</i> DC.	<i>Plinia pauciflora</i> M.L.Kawas. & B.Holst
<i>Eugenia cambucarana</i> Kiaersk.	<i>Pouteria coelomatica</i> Rizzini
<i>Eugenia candolleana</i> DC.	<i>Protium icariba</i> (DC.) Marchand
<i>Eugenia capitulifera</i> O.Berg	<i>Qualea glaziovii</i> Warm.
<i>Eugenia catharinae</i> O.Berg	<i>Quiina magellano-gomezii</i> Schwacke
<i>Eugenia cyclophylla</i> O.Berg	<i>Rapanea loefgrenii</i> (Mez) Imkhan.
<i>Eugenia dodoniifolia</i> Cambess.	<i>Rapanea quaternata</i> Hassl.
<i>Eugenia egenesis</i> DC.	<i>Rauvolfia mattfeldiana</i> Markgr.
<i>Eugenia neotristis</i> Sobral	<i>Rhodostemonodaphne capixabensis</i> Baitello & Coe-Teix.
<i>Eugenia olivacea</i> O.Berg	<i>Rudgea reticulata</i> Benth.
<i>Eugenia pyriformis</i> Cambess.	<i>Rudgea villiflora</i> K.Schum.

Table 7 continued

<i>Eugenia racemosa</i> DC.	<i>Schefflera selloi</i> (Marchal) Frodin & Fiaschi
<i>Eugenia rostrata</i> O.Berg	<i>Sebastiania commersoniana</i> (Baill.) L.B.Sm. & Downs
<i>Ficus cyclophylla</i> (Miq.) Miq.	<i>Sebastiania edwalliana</i> Pax & Hoffm.
<i>Guapira asperula</i> (Standl.) Lundell	<i>Seguieria floribunda</i> Benth.
<i>Hymenaea rubriflora</i> Ducke	<i>Sessea brasiliensis</i> Toledo
<i>Inga edwallii</i> (Harms) T.D.Penn.	<i>Siphoneugena densiflora</i> O.Berg
<i>Inga virescens</i> Benth.	<i>Siphoneugena guilfoyleiana</i> C.Proença
<i>Ixora gardneriana</i> Benth.	<i>Sloanea alnifolia</i> Mart.
<i>Jacaranda obovata</i> Cham.	<i>Solanum cinnamomeum</i> Sendtn.
<i>Kielmeyera albopunctata</i> Saddi	<i>Solanum euonymoides</i> Sendtn.
<i>Kielmeyera petiolaris</i> Mart. & Zucc.	<i>Solanum johannae</i> Bitter
<i>Leandra carassana</i> (DC.) Cogn.	<i>Stillingia oppositifolia</i> Baill. ex Müll.Arg.
<i>Leucochloron incuriale</i> (Vell.) Barneby & Grimes	<i>Strigilia glabrata</i> (Schott) Miers
<i>Lithraea brasiliensis</i> Marchand	<i>Strychnos acuta</i> Progel
<i>Lithraea molleoides</i> (Vell.) Engl.	<i>Symplocos frondosa</i> Brand
<i>Luehea grandiflora</i> Mart. & Zucc.	<i>Tabebuia elliptica</i> (A.P.DC.) Sandwith
<i>Macropheplus dentatus</i> (Perkins) I.Santos & Peixoto	<i>Tapirira marchandii</i> Engl.
<i>Matayba discolor</i> Radlk.	<i>Tibouchina fissinervia</i> Cogn.
<i>Maytenus cassineformis</i> Reissek	<i>Tibouchina schwackei</i> Cogn.
<i>Maytenus salicifolia</i> Reissek	<i>Tibouchina trichopoda</i> Baill.
<i>Maytenus schumanniana</i> Loes.	<i>Tovomitopsis paniculata</i> (Spreng.) Planch. & Triana
<i>Miconia jucunda</i> (DC.) Triana	<i>Vochysia magnifica</i> Warm.
<i>Miconia petropolitana</i> Cogn.	<i>Weinmannia organensis</i> Gardner
<i>Miconia rubiginosa</i> (Bonpl.) DC.	<i>Xylopia laevigata</i> (Mart.) R.E.Fries
<i>Mollinedia argyrogyna</i> Perkins	

Forms of rarity

Our results differed from those reported by Pitman et al. (1999) and Rabinowitz et al. (1986). Pitman et al. (1999) investigated the forms of rarity in little more than 1,500 ha of the lowland rainforest in Peru and analyzed two different matrices: one considering the species occurring in two or more surveys, and another considering the species occurring in three or more surveys. In the study of Rabinowitz et al. (1986) concerning the flora of the British Isles, 15 ecological and taxonomic “judges” classified the species according to rarity variables in order to minimize possible bias in the analyses—which were made by adopting conservative and a liberal criteria. In both studies common species occurred in greater proportions, and some forms of rarity were not found: Pitman et al. (1999) did not find stenotopic species (forms 4–7) and Rabinowitz et al. (1986) did not find some forms of rarity, which varied according to the conservative or liberal criterion used. Differently from Pitman et al. (1999), who examined only a single forest formation, we considered the forms of rarity in the entire southern sector of the Dense Ombrophilous Forest Phyto-Ecological

Table 8 Tree species of the southern sector of the Brazilian Atlantic Rainforest with Rabinowitz's form 7 of rarity

<i>Aegiphila brachiata</i> Vell.	<i>Miconia inconspicua</i> Miq.
<i>Aegiphila obducta</i> Vell.	<i>Miconia octopetala</i> Cogn.
<i>Albizia edwallii</i> (Hoehne) Barneby & Grimes	<i>Miconia tristis</i> Spring
<i>Allophylus puberulus</i> (Cambess.) Radlk.	<i>Mollinedia elegans</i> Tul.
<i>Annona acutifolia</i> Saff. ex R.E.Fries	<i>Mollinedia micrantha</i> Perkins
<i>Aspidosperma camporum</i> Müll.Arg.	<i>Myrceugenia foveolata</i> (O.Berg) Sobral
<i>Campomanesia schlechtendaliana</i> (Berg) Nied.	<i>Myrcia guianensis</i> (Aubl.) DC.
<i>Casearia rupestris</i> Eichler	<i>Myrcia selloi</i> (Spreng.) N.Silveira
<i>Cassia ferruginea</i> (Schrad.) Schrad. ex DC.	<i>Myrcia sosias</i> D.Legrand
<i>Celtis iguanea</i> (Jacq.) Sarg.	<i>Nectandra debilis</i> Mez
<i>Celtis spinosa</i> Spreng.	<i>Ocotea hoehnii</i> (Nees) Mez
<i>Cestrum sessiliflorum</i> Sendtn.	<i>Ocotea nutans</i> (Nees) Mez
<i>Chionanthus trichotomus</i> (Vell.) P.S.Green	<i>Ocotea suaveolens</i> (Meisn.) Benth. & Hook.f. ex Hieron.
<i>Cinnamomum hirsutum</i> Lorea-Hernandez	<i>Ormosia micrantha</i> Ducke
<i>Clusia spiritu-sanctensis</i> G.Mariz & Weinberg	<i>Ottonia martiana</i> Miq.
<i>Coccoloba declinata</i> Mart.	<i>Pachystroma ilicifolium</i> Müll.Arg.
<i>Critoniopsis stellata</i> (Spreng.) H.Rob.	<i>Pilocarpus spicatus</i> A.St.-Hil.
<i>Croton klotzschii</i> (Didr.) Baill.	<i>Piptocarpha regnelii</i> (Sch.Bip.) Cabrera
<i>Cyathea dichromatolepis</i> (Fee) Domin	<i>Plinia edulis</i> (Vell.) Sobral
<i>Cybianthus cuneifolius</i> Mart.	<i>Podocarpus lambertii</i> Klotz. ex. Endl.
<i>Dalbergia foliolosa</i> Benth.	<i>Rauia nodosa</i> (Engl.) Kallunki
<i>Daphnopsis brasiliensis</i> Mart. & Zucc.	<i>Rhamnidium elaeocarpium</i> Reissek
<i>Dasyphyllum spinescens</i> (Less.) Cabrera	<i>Rhodostemonodaphne macrocalyx</i> (Meisn.) Rohwer ex Madriñán
<i>Erythrina crista-galli</i> L.	<i>Rolliniopsis parviflora</i> (A.St.-Hil.) Saff.
<i>Escallonia bifida</i> Link & Otto	<i>Roupala sculpta</i> Sleumer
<i>Esenbeckia leiocarpa</i> Engl.	<i>Salacia elliptica</i> (Mart. ex Roem. & Schult.) G.Don
<i>Eugenia brevipedunculata</i> Kiaersk.	<i>Sapium klotzschianum</i> (Müll. Arg.) Huber
<i>Eugenia burkartiana</i> (D.Legrand) D.Legrand	<i>Schefflera anomala</i> (Taub.) Frodin
<i>Eugenia linguaeformis</i> O.Berg	<i>Sclerolobium pilgerianum</i> Harms
<i>Euplassa itatiaiae</i> Sleumer	<i>Sebastiania brasiliensis</i> Spreng.
<i>Euplassa legalis</i> (Vell.) I.M.Johnston	<i>Senna silvestris</i> (Vell.) H.S.Irwin & Barneby
<i>Fareamea porophylla</i> (Vell.) Müll.Arg.	<i>Senna tropica</i> (Vell.) H.S.Irwin & Barneby
<i>Ficus hirsuta</i> Schott	<i>Siphoneugena dussii</i> (Krug & Urban) C.Proença
<i>Genipa americana</i> L.	<i>Solanum diploconos</i> (Mart.) Bohs
<i>Heterocondylus alatus</i> (Vell.) R.M.King & H.Rob.	<i>Solanum erianthum</i> D.Don
<i>Holocalyx balansae</i> Micheli	<i>Solanum fragrans</i> Hook.
<i>Huberia glazioviana</i> Cogn.	<i>Solanum pabstii</i> L.B.Sm. & Downs
<i>Inga heterophylla</i> Willd.	<i>Tabernaemontana hystrix</i> Steud.
<i>Inga lanceifolia</i> Benth.	<i>Tibouchina fothergillae</i> Cogn.
<i>Inga lentiscifolia</i> Benth.	<i>Verbenoxylum reitzii</i> (Moldenke) Tronc.
<i>Inga platyptera</i> Benth.	<i>Vernonanthura ferruginea</i> (Less.) H.Rob.

Table 8 continued

<i>Licania hypoleuca</i> Benth.	<i>Vochysia rectiflora</i> Warm.
<i>Lonchocarpus nitidus</i> (Vogel) Benth.	<i>Vochysia selloi</i> Warm.
<i>Machaerium paraguayense</i> Hassl.	<i>Zanthoxylum monogynum</i> A.St.-Hil.
<i>Marlierea laevigata</i> (DC.) Kiaersk.	<i>Zanthoxylum naranjillo</i> Griseb.
<i>Maytenus litoralis</i> Car.-Okano	<i>Zanthoxylum rugosum</i> A.St.-Hil & Tul.
<i>Maytenus ubatubensis</i> Car.-Okano	

Region, which included different forest formations. Differently from Rabinowitz et al. (1986), who considered all the different plant formations in England, whether forest or not, we considered only rainforest formations. As such, the different criteria used as well as the different study focuses would explain the different results found. One of the most important obstacles to our analysis of rarity was related to problems of taxonomic identification, mainly the large proportion of unknown taxa in the Dense Ombrophilous Atlantic Forest (Caiafa and Martins 2007).

In order to classify the species according to their affinity for the habitat, we adopted the division of the Atlantic rainforest into formations according to Veloso (1992). The heuristics of this procedure was based on various authors, such as Salis et al. (1995), Torres et al. (1997) and Scudeller et al. (2001), who found great consistency in the classification system adopted by the Brazilian Institute of Geography and Statistics IBGE. More studies will be necessary in the Dense Ombrophilous Atlantic Forest Phyto-Ecological Region to investigate variations in species abundance, as the existing surveys do not provide adequate sampling density (Caiafa and Martins 2007). Additionally, the criteria we used to classify the geographic distribution of the species as wide or restricted was subjective. Scudeller et al. (2001) considered species constancy as well as latitudinal range in investigating geographic distribution. In our study, we opted for a subjective division into two-degree latitudinal belts, as it was not possible to use relative constancy. Some species have low relative constancy but a discontinuous distribution, implying that low constancy does not indicate restricted geographic distribution. Oliveira-Filho and Fontes (2000) reported a north–south differentiation in the Atlantic rainforest that was probably caused by variations in temperature and rainfall regimes. We do not know, however, how much of this variation is included within the two-degree latitudinal belts we used to classify the geographic distribution of the species.

Rabinowitz's approach to classify the forms of rarity involves a certain degree of subjectivity in attributing dichotomic states to each variable of geographic range, habitat preference, and local abundance, whereas these variables are known to vary continuously (Gaston 1994; Pitman et al. 1999). Attributing dichotomic states to continuous variables may imply in classifying some species as common when they are otherwise rare and vice versa. It could be convenient to modify Rabinowitz's rarity classification system in future studies to consider the effects of continuous variations in those variables. However, in spite of some criticism (Gaston 1994; Pitman et al. 1999), Rabinowitz's system represents the first solid approach to rarity that includes and systematizes many concepts that otherwise are sparse throughout the literature. We conclude that the application of Rabinowitz's rarity classification system to the Brazilian Atlantic rainforest confirms stenotopy as the main form of rarity, and also indicates that many tree species are currently threatened due to their restricted geographic distribution, unique habitats, reduced local abundance, or because of a synergism among these variables.

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