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THE ALIEN STREET TREES OF FORTALEZA (NE BRAZIL): QUALITATIVE OBSERVATIONS AND THE INVENTORY OF TWO DISTRICTS

A ARBORIZAÇÃO ALIENÍGENA DE FORTALEZA (NORDESTE DO BRASIL): OBSERVAÇÕES QUALITATIVAS E UM LEVANTAMENTO EM DOIS BAIRROS

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ABSTRACT

Public tree planting is important for cities. It produces shadow, brings well-being for humans, and supports the urban fauna. But the cultivation of exotic plants can also be responsible for dissemination of invasive species. This paper aims to evaluate public tree planting in Fortaleza, Ceará state, in northeastern Brazil. From 2005 to 2009, qualitative observations on tree composition in the city were made. In 2006, a detailed inventory of all public trees was carried out in two districts of Fortaleza. Jointly, 2075 individuals grew here. Most of the tree species planted in Fortaleza are aliens, some are even invasive. The massive use of exotic plants in Fortaleza has negative consequences for the environmental education. People do not know the regional native trees, and thus are not concerned about the local biodiversity conservation. In spite of the huge amounts of native species available for ornamental purposes in the Brazilian flora, the street trees of Fortaleza are overwhelmingly aliens.

Keywords: ornamental plants; street trees; exotic species; urban biodiversity.

RESUMO

A arborização tem um papel importante nas cidades. Ela fornece sombra, traz bem-estar aos seres humanos e dá suporte para a fauna urbana. Mas o cultivo de plantas exóticas também pode ser uma via de disseminação de espécies invasoras. A arborização da cidade de Fortaleza, estado do Ceará, foi avaliada. Este trabalho se baseou em observações qualitativas da arborização da cidade de 2005 até 2009 e no inventário da arborização de dois bairros em 2006. Estes, juntos, possuíam 2.075 árvores ou arbustos, dos quais a maioria das espécies e dos espécimes era exótica (alguns também invasores). O cultivo excessivo de exóticas na arborização tem como consequência a desvalorização da flora nativa. A despeito da grande diversidade de espécies nativas disponíveis para cultivo ornamental na flora brasileira, a arborização de Fortaleza é essencialmente exótica.

Palavras-chave: plantas ornamentais; arborização de ruas; espécies exóticas; biodiversidade urbana.

INTRODUCTION

During the 20th century, the concern over biodiversity in urban ecosystems began growing, turning it an important topic in today's conservation biology (PICKETT et al., 2001; ADAMS, 2005; SMITH et al., 2005). Nowadays, cities occupy some 471 millions of hectares (about 4% of Earth surface), with the expectation of continued growth in the future (UNDP, UNEP, WB, WRI, 2000).

Urban expansion changes ecosystems and environmental conditions drastically, apart from fragmenting ecosystems and introducing certain exotic species (ZIPPERER et al., 1997; PICKETT et al., 2001; ZIPPERER, 2002; SMITH et al., 2006b). Biological invasions are one of the most important problems for biological conservation (RICHARDSON et al., 2000a; RICHARDSON et al., 2000b; SECRETARIADO DA CONVENÇÃO SOBRE DIVERSIDADE BIOLÓGICA, 2006), and

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cultivation of exotic plants for ornamental purposes is one of the ways on which potential invasive plants are introduced voluntarily into a certain locality (ZIPPERER et al., 1997; HARRINGTON et al., 2003). Public imagination generally relates plant cultivation in urbanization and gardening to an attitude of taking care of nature, but the cultivation of ornamental trees can also be a means of alien species dissemination (RICHARDSON et al., 2000a; ZIPPERER, 2002; HARRINGTON et al., 2003).

Planting trees has great positive impact, not only on humans. A considerable number of species manages to survive in urban environments (OWEN, 1991; PICKETT et al., 2001; THOMPSON et al., 2004; SMITH et al., 2005): diverse arthropods, molluscs and vertebrates, as well as other groups of plants and animals, exploit the urban zones and establish populations in them (OWEN, 1991; SMITH et al., 2006a; SMITH et al., 2006b). The planning of tree planting and gardening can be an important tool to augment survival capacity for biodiversity in urban environments.

In urban avian communities, exotic species sometimes dominate (PICKETT et al., 2001; DANIELS and KIRKPATRICK, 2006). In the same urban areas, however, even with the dominance of the exotics, endemic and threatened species can exploit residential gardens (DANIELS and KIRKPATRICK, 2006), demonstrating thus the importance of knowing the features that affect urban biodiversity in order to assure a better handling of these ecosystems.

Native mammals are also present in urban areas and establish their populations there (OWEN, 1991; PICKETT et al., 2001; SMITH et al., 2005). Various bat species (Chiroptera), for example, inhabit Brazilian cities (REIS et al., 2002; BARROS et al., 2006). In the United Kingdom, foxes (*Vulpes vulpes*), hedgehogs (*Erinaceus europaeus*), squirrels (*Sciurus carolinensis*) and other mammals were registered exploiting a residential garden (OWEN, 1991) and, in Fortaleza, populations of bats, marmosets (*Callithrix jacchus*) and opossums (*Didelphis albiventris*) survive utilizing vegetation fragments and planted trees (pers. obs.; see MENEZES, 2004 for a study case). The future conservation of these animals depends on the conservation of the vegetation fragments that support their populations and on choosing adequate ornamental trees, aiming to supply nutrients and to construct ecological corridors for these animals.

Also for humans, the benefits of urban trees are obvious. Trees and vegetation cover reduce the intensity of heat islands (LOMBARDO, 1985; SUKOPP, 2004), bring well-being (KWEON et al., 1998), offer shadow (especially important in tropical regions exposed to an elevated solar radiation) and influence urban ecology. Another hardly perceived aspect is that people with a typically urban life only become acquainted with plants present in urban forestry and gardening. If street and garden plants are only composed of exotic species, these people are only in contact with alien plants. And this could result in an even weaker support for the conservation of native species (MCKINNEY, 2006). In this sense, we studied the problem of alien dominance in street trees in Fortaleza (Ceará).

MATERIALS AND METHODS

The study area

Fortaleza is the capital of Ceará (3º 43' 02'' S and 38º 32' 35'' W), NE Brazil. With a population of 2,141,402 inhabitants, it is one of the major cities of Brazil (IBGE, 2000b). It is a coastal city at 16 m above sea level with 1338 mm of mean annual precipitation; its climate is tropical hot sub-humid (IPECE, 2008).

During the 20th century, it suffered a process of intense urbanization; the population grew from little more than 48.000 to over 2 million inhabitants in 100 years – a 44-fold increase (IBGE, 2000a; IBGE, 2000b). The result was the elimination of most of town's plant cover, currently estimated to be less than 10% of its original area (FORTALEZA, 2003).

Methodology of the inventory

This study is based on a quantitative inventory of street trees in two districts and five years (2005-2009) of qualitative observations of the species grown in Fortaleza, performed especially in the districts Aldeota, Dionísio Torres, Fátima, José Bonifácio, Benfica, Jardim América, Damas, Parangaba, Montese, Rodolfo Teófilo, Parquelândia, Cidade dos Funcionários, Parque Manibura, Cambeba, Antônio Bezerra, Presidente Kennedy and Pici. During the period of the qualitative survey, we observed which species were grown for ornamental purposes, which species were most cultivated, and, especially, if their origins were native or exotic. Visually, it was possible to see that exotic species were far more abundant than native ones in town.

To determine to which extend exotics superseded natives, a quantitative survey in two districts of the city was performed.

The quantitative inventories were carried out in the districts Benfica and Jardim America. The latter has an area of 71.3 ha and a population of 11,799 inhabitants and Benfica 143.1 ha and 12,932 inhabitants (SECRETARIA MUNICIPAL DE DESENVOLVIMENTO URBANO E INFRA-ESTRUTURA, 2007).

Jardim America was inventoried in March and Benfica in September 2006. We walked through all public spaces (streets and squares) within the limits of the two districts and registered all woody plants encountered (trees and shrubs – with climbers excluded) with a minimum height of 2 m. Every woody plant with 2 m minimum height in the public spaces of the districts was registered in a field notebook and the quantities of each species was obtained by the sum of the individuals recorded in the field. Plants in private areas, even with free access as in private parking lots, were excluded from sampling. To be considered native, species must have their native distributional range in the coastal region of Ceará, or in the semi-arid vegetation called 'caatinga', that occurs adjacent to the coastal region, following the definitions proposed by Richardson et al. (2000b). The names of the plant families follow APG II (2003). The orthography of all botanical names was checked using the 'Tropicos' database (MISSOURI BOTANICAL GARDEN, 2009).

RESULTS AND DISCUSSION

During this inventory, 1195 individual plants (from 89 species) were registered in Benfica and 880 (from 51 species) in Jardim America (Table 1). Benfica had one public tree per 10.8 inhabitants and 8.35 public trees per hectare, Jardim America one public tree per 13.4 inhabitants and 12.34 public trees per hectare.

The relative abundances of the species were very uneven. *Ficus benjamina*, the most abundant species, represents 46% of all trees. In Jardim America, even 58% (512 of 880) of all trees belonged to this species. Not only the high number of *Ficus benjamina* requires attention, but the elevated number of exotic trees in general, ignoring the native biodiversity of the coastal vegetation of Ceará. Nine of the ten most abundant species registered in this survey were exotic, and 1,921 (95%) of 2,014 plants from which origin was identified were from abroad.

The overrating of few species and the predominance of aliens are a typical characteristic of Fortaleza's tree composition. *Ficus benjamina* is the most common species all over the town, but today is rapidly being replaced by another exotic one: *Azadirachta indica*. The missing of knowledge on environmental damage resulting from dissemination of alien plants and the lack of understanding about the ecological value, associated with native biodiversity, result in support for any foreign species that receive public attention for being a "novelty".

Azadirachta indica, originating from Asia, was introduced to Brazil for economic reasons. Its planting was strongly promoted in urban and rural areas by NGOs and local governments because of its insecticidal properties and rapid growth, giving shadow after a short time. This species, however, reproduces freely under Ceará environmental conditions and has already become naturalized (*sensu* RICHARDSON et al., 2000b) in this state (pers. obs.). In case of turning into an invader, it might cause environmental damage in vegetation fragments of Fortaleza. As this species produces a great quantity of seedlings and re-sprouts after cutting (pers. obs.), ecological damages originating from it might be serious and its control might be expensive.

In a survey of the Fortaleza district Padre Andrade, carried out in 2002, *Ficus benjamina* had a frequency of 68% while not a single plant of *Azadirachta indica* was registered (BORGES, 2002). Our data from 2006 (Benfica and Jardim America) showed that *Ficus benjamina* had a relative abundance of 46% and *Azadirachta indica* of 7.8%. A recent (2008) study on urban forestry in Fortaleza revealed that *Azadirachta indica* has already reached almost the same abundance of *Ficus benjamina* (MORO 2009). Along with the current tendency to grow mainly *Azadirachta indica*, it might rapidly turn into the predominant Fortaleza's street tree, while the invasive risks of this species are still to be studied.

Once the "fever" for the cultivation of *Ficus benjamina* had finished, a new "fever" began – for another trendy exotic species, *Azadirachta indica*. Our observations during the last five years have shown that the substitution of *Ficus benjamina* by *Azadirachta indica* is really an overall trend in Fortaleza. The overrating of *Azadirachta indica* is even perceived in rural areas like ranches and farms.

TABLE 1: Species used as street trees in the districts 'Benfica' and 'Jardim America', including abundances and origin (native or exotic to the coastal region of Ceará). Fortaleza, Ceará, NE Brazil, 2006. Ben= Benfica; J.A= Jardim América.

TABELA 1: Espécies utilizadas na arborização pública dos bairros Benfica e Jardim América, acompanhadas das abundâncias e origem (nativa ou exótica para a região costeira do Ceará). Fortaleza, Ceará, NE do Brasil, 2006. Ben= Benfica; J.A= Jardim América.

	Species	Family	Popular Name	Origin	Ben	J.A	Total	%
1	*Acrocomia intumescens* Drude	Arecaceae	Macaúba	Native	3	0	3	0,14%
2	*Adenanthera pavonina* L.	Fabaceae – Mim	Carolina, falso-pau-brasil	Exotic	31	5	36	1,73%
3	*Albizia lebbeck* (L.) Benth.	Fabaceae – Mim	Esponjinha	Exotic	14	10	24	1,16%
4	*Anacardium occidentale* L.	Anacardiaceae	Cajueiro	Native	2	1	3	0,14%
5	*Annona squamosa* L.	Annonaceae	Ateira	Exotic	1	1	2	0,10%
6	*Ardisia humilis* Vahl	Myrsinaceae	Ardísia	Exotic	1	0	1	0,05%
7	*Auxemma oncocalyx* (Allemão) Baill.	Boraginaceae	Pau-branco	Native	8	0	8	0,39%
8	*Averrhoa bilimbi* L.	Oxalidaceae	Azedinho, bilimbi	Exotic	1	0	1	0,05%
9	*Azadirachta indica* A. Juss.	Meliaceae	Nim, ninho, neem	Exotic	105	56	161	7,76%
10	*Bauhinia monandra* Kurz	Fabaceae – Caes	Pata-de-vaca	Exotic	3	1	4	0,19%
11	*Bougainvillea spectabilis* Willd.	Nyctaginaceae	Bouganvilea, três-marias	Exotic	3	4	7	0,34%
12	*Caesalpinia echinata* Lam.	Fabaceae – Caes	Pau-brasil	Exotic	1	0	1	0,05%
13	*Caesalpinia ferrea* Mart.	Fabaceae – Caes	Jucá, pau-ferro	Native	1	0	1	0,05%
14	*Caesalpinia peltophoroides* Benth.	Fabaceae – Caes	Sibipiruna	Exotic	1	1	2	0,10%
15	*Calotropis procera* (Aiton) W.T. Aiton	Apocynaceae	Hortênsia, ciume	Exotic	0	1	1	0,05%
16	*Carica papaya* L.	Caricaceae	Mamoeiro	Exotic	5	1	6	0,29%
17	*Caryota* sp.	Arecaceae	Palmeira rabo-de-peixe	Exotic	3	0	3	0,14%
18	*Cassia fistula* L.	Fabaceae – Caes	Cassia, chuva-de-ouro	Exotic	5	4	9	0,43%
19	*Casuarina* sp.	Casuarinaceae	Cassuarina, cipreste	Exotic	5	9	14	0,67%
20	*Clitoria fairchildiana* R.A. Howard	Fabaceae – Pap	Clitória, sombreiro	Exotic	33	21	54	2,60%

Continues ...

TABLE 1: Continued ...
TABELA 1: Continuação ...

	Species	Family	Popular Name	Origin	Ben	J.A	Total	%
21	*Cocos nucifera* L.	Arecaceae	Coqueiro	Native	4	4	8	0,39%
22	*Codiaeum variegatum* (L.) Rumph. ex A. Juss.	Euphorbiaceae	Cróton	Exotic	0	1	1	0,05%
23	*Delonix regia* (Bojer ex Hook.) Raf.	Fabaceae – Caes	Flamboiã	Exotic	7	0	7	0,34%
24	*Dillenia indica* L.	Dilleniaceae	Dilenia	Exotic	2	0	2	0,10%
25	*Dracaena fragrans* (L.) Ker Gawl.	Ruscaceae	Pau-d'água	Exotic	1	1	2	0,10%
26	*Dracaena marginata* Hort.	Ruscaceae	Dracena-de-Madagascar	Exotic	2	0	2	0,10%
27	*Dracaena reflexa* Lam.	Ruscaceae	Pau-d'água	Exotic	2	0	2	0,10%
28	*Duranta repens* L.	Verbenaceae	Pingo-de-ouro	Exotic	1	0	1	0,05%
29	*Erythrina indica* Lam.	Fabaceae – Pap	Brasileirinho	Exotic	4	12	16	0,77%
30	*Ficus benjamina* L.	Moraceae	Ficus, sempre-verde	Exotic	442	512	954	45,98%
31	*Ficus elastica* Roxb.	Moraceae	Figueira	Exotic	0	1	1	0,05%
32	*Ficus elliotiana* S. Moore	Moraceae	Figueira	Native	1	0	1	0,05%
33	*Ficus microcarpa* L. f.	Moraceae	Benjamim	Exotic	17	3	20	0,96%
34	*Gmelina arborea* Roxb. ex Sm.	Lamiaceae	Guimelina	Exotic	0	9	9	0,43%
35	*Guazuma ulmifolia* Lam.	Malvaceae	Mutamba	Native	0	1	1	0,05%
36	*Hibiscus rosa-sinensis* L.	Malvaceae	Papoula	Exotic	1	5	6	0,29%
37	*Hibiscus tiliaceus* L.	Malvaceae	Algodão-da-praia	Exotic	36	20	56	2,70%
38	*Inga* sp.	Fabaceae – Mim	Ingazeira	-	1	2	3	0,14%
39	*Ixora finlaysoniana* Wall. ex G. Don	Rubiaceae	Ixora	Exotic	1	1	2	0,10%
40	*Jatropha gossypiifolia* L.	Euphorbiaceae	Pinhão-roxo	Exotic	2	2	4	0,19%
41	*Jatropha multifida* L.	Euphorbiaceae	Pinhão	Exotic	1	0	1	0,05%
42	*Labramia bojeri* A. DC.	Sapotaceae	Abricó-da-praia	Exotic	1	0	1	0,05%
43	*Leea coccinea* Bojer	Vitaceae	Léia	Exotic	1	0	1	0,05%
44	*Leucaena leucocephala* (Lam.) de Wit	Fabaceae – Mim	Leucena	Exotic	5	2	7	0,34%
45	*Licania tomentosa* (Benth.) Fritsch	Chrysobalanaceae	Oiti, goiti	Native	30	22	52	2,51%
46	*Malpighia glabra* L.	Malpighiaceae	Aceroleira	Exotic	1	2	3	0,14%

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TABLE 1: Continued ...
TABELA 1: Continuação ...

	Species	Family	Popular Name	Origin	Ben	J.A	Total	%
47	*Mangifera indica* L.	Anacardiaceae	Mangueira	Exotic	47	9	56	2,70%
48	*Manilkara zapota* (L.) P. Royen	Sapotaceae	Sapotizeiro, sapoti	Exotic	1	0	1	0,05%
49	*Melia azedarach* L.	Meliaceae	Cinamomo	Exotic	1	0	1	0,05%
50	*Musa* X *paradisiaca* L.	Musaceae	Bananeira	Exotic	1	0	1	0,05%
51	*Nerium oleander* L.	Apocynaceae	Espirradeira	Exotic	2	0	2	0,10%
52	*Pachira aquatica* Aubl.	Malvaceae	Munguba	Exotic	23	10	33	1,59%
53	*Pithecellobium dulce* (Roxb.) Benth.	Fabaceae – Mim	Mata-fome	Exotic	6	8	14	0,67%
54	*Plumeria caracasana* Johnston	Apocynaceae	Jasmim	Exotic	3	0	3	0,14%
55	*Plumeria rubra* L.	Apocynaceae	Jasmim	Exotic	3	1	4	0,19%
56	*Polyscias guilfoylei* (W. Bull) L.H. Bailey	Araliaceae	Árvore-da-felicidade	Exotic	1	0	1	0,05%
57	*Pseuderanthemum carruthersii* (Seem.) Guillaumin	Acanthaceae	Pseuderântemo	Exotic	2	0	2	0,10%
58	*Psidium guajava* L.	Myrtaceae	Goiabeira	Exotic	5	2	7	0,34%
59	*Roystonea* sp.	Arecaceae	Palmeira-imperial	Exotic	13	7	20	0,96%
60	*Sabal* sp.	Arecaceae	Palmeira-sabal	Exotic	3	1	4	0,19%
61	*Sanchezia oblonga* Ruiz & Pav.	Acanthaceae	Sanquésia	Exotic	1	0	1	0,05%
62	*Senna siamea* (Lam.) H.S. Irwin & Barneby	Fabaceae – Caes	Sena, acácia-amarela	Exotic	52	30	82	3,95%
63	*Spathodea nilotica* Seem.	Bignoniaceae	Tulipeira-africana	Exotic	1	0	1	0,05%
64	*Syagrus cearensis* Noblick	Arecaceae	Coco-catolé	Native	3	0	3	0,14%
65	*Syzygium cumini* (L.) Skeels	Myrtaceae	Azeitona-roxa	Exotic	3	3	6	0,29%
66	*Syzygium malaccense* (L.) Merr. & L.M. Perry	Myrtaceae	Jambeiro	Exotic	94	52	146	7,04%
67	*Tabebuia aurea* (Silva Manso) Benth. & Hook. f. ex S. Moore	Bignoniaceae	Caraúba, craibeira	Native	12	0	12	0,58%
68	*Tabebuia s.l.* sp1	Bignoniaceae	Ipê	-	13	0	13	0,63%
69	*Tabebuia s.l.* sp2	Bignoniaceae	Ipê	-	10	0	10	0,48%

Continues ...

TABLE 1: Continued ...
TABELA 1: Continuação ...

	Species	Family	Popular Name	Origin	Ben	J.A	Total	%
70	*Tabebuia s.l.* sp3	Bignoniaceae	Ipê	-	3	0	3	0,14%
71	*Tabebuia s.l.* sp4	Bignoniaceae	Ipê	-	1	0	1	0,05%
72	*Tabebuia s.l.* sp5	Bignoniaceae	Ipê	-	1	0	1	0,05%
73	*Tabebuia s.l.* sp6	Bignoniaceae	Ipê	-	1	0	1	0,05%
74	*Tabernaemontana divaricata* (L.) R. Br. ex Roem. & Schult.	Apocynaceae	Jasmim-crepe	Exotic	1	0	1	0,05%
75	*Tabernaemontana laeta* Mart.	Apocynaceae	Jasmim	Exotic	1	0	1	0,05%
76	*Talisia esculenta* (A. St.-Hil.) Radlk.	Sapindaceae	Pitombeira	Native	1	0	1	0,05%
77	*Tamarindus indica* L.	Fabaceae – Caes	Tamarindo	Exotic	8	0	8	0,39%
78	*Tecoma stans* (L.) Juss. ex Kunth	Bignoniaceae	Ipezinho-de-jardim	Exotic	6	0	6	0,29%
79	*Terminalia catappa* L.	Combretaceae	Castanholeira	Exotic	60	27	87	4,19%
80	*Thevetia peruviana* (Pers.) K. Schum.	Apocynaceae	Chápeu-de-Napoleão	Exotic	0	3	3	0,14%
81	*Veitchia merrillii* (Becc.) H.E. Moore	Arecaceae	Palmeira-de-manila	Exotic	0	2	2	0,10%
82	*Vitex agnus-castus* L.	Lamiaceae	Árvore-da-castidade	Exotic	2	2	4	0,19%
	Non identified				21	8	29	1,40%
	Total				1195	880	2075	100,00%

The predominant cultivation of few species (even: monoculture) and/or the overrating of exotics are not uncommon in Brazil. In Juazeiro, Bahia, a survey of four districts revealed that the exotic *Ficus benjamina* constituted 81% of planted trees (SILVA et al., 2006). In Campos dos Goytacases, Rio de Janeiro, *Caesalpinia peltophoroides* (Fabaceae) represented more than 50% of street trees in some districts (PEDLOWSKI et al., 2002). In Campos do Jordão, São Paulo, two alien species, *Platanus acerifolia* (Platanaceae) and *Liquidambar styraciflua* (Altingiaceae), constituted more than 80% of the tree species inventoried (ANDRADE, 2002). In a housing estate of Santa Maria, Rio Grande do Sul, *Melia azedarach* and *Ligustrum lucidum*, both exotics, were the most abundant street trees, with relative abundances of 18.1% and 11.7 %, respectively (TEIXEIRA, 1999). The same ideals – overestimation of exotics at the expense of native species – guide tree planting in Fortaleza.

Urban trees, ecological processes and invasions

As there is the possibility of cultivated exotic trees becoming invaders (RICHARDSON et al., 2000a; ZIPPERER, 2002; HARRINGTON et al., 2003), their planting should no longer be stimulated. *Ligustrum lucidum*, one of the species most cultivated in southern and south-eastern Brazil (LORENZI et al., 2003), turned from an ornamental into an invader in Brazil as well as in Australia (RICHARDSON et al., 2000a; MONDIN, 2006). The same occurred with *Acer platanoides* (Sapindaceae) in the USA (ZIPPERER, 2002).

Azadirachta indica, *Albizia lebbeck*, *Terminalia catappa*, *Syzygium cumini* and *Leucaena leucocephala*, used as street trees in Fortaleza,

are examples for plants that behave as invaders or naturalized species in Ceará (*sensu* RICHARDSON et al., 2000b), and thus should be avoided.

Missing ecological/environmental planning in Fortaleza results in a city dominated by exotic species, with trees damaged by inadequate pruning and with cultivation of species of minor value for urban fauna. The syconia of *Ficus benjamina,* for example, which corresponds to quasi half of the trees in the districts studied, do not ripen in Brazil because of missing pollinators (CARAUTA and DIAZ, 2002), resulting in a restricted nutritive value for the fauna. The native fig *Ficus elliotiana*, which has a reproductive population in Fortaleza, as well as the exotic *Ficus microcarpa,* the pollinators of which were introduced from Asia into the American continent (CARAUTA and DIAZ, 2002), are much visited by birds and bats when bearing ripe fruit (pers. obs.). Seedlings of these two figs are easily encountered all over Fortaleza, demonstrating that both species supply nutrient resources to the urban fauna that, on the other hand, serves as a dispersal agent for these two species. Occasionally, their seedlings develop in open spaces and in waste grounds and reach reproductive maturity, turning into sources of new diaspores (as is the case of the only specimen of *Ficus elliotiana* registered in this survey, growing in a square). This is especially interesting for the native *Ficus elliotiana* that is able to survive in vegetation fragments (MORO, 2009) as well as in urban areas of Fortaleza.

CONCLUSION

Fortaleza has to include preoccupation with biodiversity into its gardening practices and street tree planting. Exotic plants (95% of the registered individuals) are much more abundant than native ones; very few native plants are represented as ornamentals in the city. Citizens in Fortaleza no longer know the regional native trees and, as a consequence, cannot effectively contribute to biological conservation. Programs of tree planting and even reforestation are executed by people that only experienced alien urban species during their life and lost connection with the biodiversity characteristic for their surroundings. Thus, exotic trees have been preferred in planting projects, even when the objective was ecosystem restoration – as in the case of "replanting" of riparian forests with exotic species in Ceará. Urban trees might (and should) be a useful instrument to sensitize citizens for their proper native vegetation.

Currently, *Ficus benjamina* is the most abundant species in town, but it is rapidly being replaced by *Azadirachta indica*. This is worrying as *Ficus benjamina* is not an invasive species while *Azadirachta indica* might rapidly turn into an invader as it is already naturalized here and reproduces freely.

A diversified cultivation of native species, on the other hand, could provide nutrients for the urban fauna and at the same time eliminate the risk of bio-invasion. Exotic seeds arriving at a vegetation fragment might be an indicator for a process of invasion while native seeds might mean new genotypes, bringing more genetic variability to the fragment and avoiding local extinction.

Bringing native trees into towns will also benefit the environmental education. Town residents will know and give more importance to species of their proper region; and consequently they will give higher support for their conservation. Currently, urban street trees in Fortaleza assume a role in environmental miseducation, where alien trees receive better recognition than the local biodiversity.

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