Inventory and Implications of Plant Use for Environmental Conservation in Visconde de Mauá, Serra da Mantiqueira, Brazil

Mariana Martins da Costa Quinteiro, Ana Mayumi Gonçalves Tamashiro, Marcelo Guerra Santos, Luiz José Soares Pinto, and Moemy Gomes de Moraes

Research

Abstract

The community of Visconde de Mauá is located in the Serra da Mantiqueira Environmental Protection Area, characterized by high mountain rainforest vegetation. Despite a resident population predominantly from outside the region, inhabitants follow local patterns of plant use. Local plant uses were identified using participant observation, semi-structured and informal interviews, and guided tours. Uses were sorted in categories: medicine, food, handicrafts, fuel, construction, ornamental, and symbolic. Among the categories, medicinal use included the largest number of plant species. Tourism is intense in the area and has already affected community patterns of plant use by reducing demand for food cultivation. Alternatively, tourism has instead spurned demand for fuel and handmade crafts, a practice deemed to be incompatible with the preservation of the environment and local plant species.

Introduction

The Atlantic Forest is a highly degraded tropical ecosystem (Viana & Tabanez 1996) considered by some as the most endangered tropical forest in the world. The Atlantic Forest is included in a list of global biodiversity hotspots due to its high indices of endemism and biodiversity and threats from human activities (Myers et al. 2000). Ribeiro et al. (2009) estimated the existing Atlantic Forest cover ranges from 11.4% to 16% of its original size. This estimate, however, may be too optimistic; Sloan et al. (2014) estimated the natural intact vegetation of the Atlantic rainforest at 3.5%.

Biodiversity conservation in the Atlantic Forest is severely threatened by soil erosion, loss of biological diversity, the invasion of foreign species, and the degradation of hydrographic basins (Pereira et al. 2006). Uncontrolled real estate expansion and tourism practices coupled with over-exploitation of endemic natural resources also contribute to forest destruction (Pavan-Fruehauf 2000).

Even so, southeastern Brazil still harbors the main preserved areas in the Atlantic Forest domain, and fragments of secondary forests constitute the majority of the remaining vegetation. Presently, only a few regions can be characterized as primary forests, and these are typically found in high altitude areas within Environmental Conservation Units (ECUs) (Câmara 2003).

However, for the effective protection of endangered ecosystems, additional measures are necessary. The development of management projects enlisting society as a responsible agent for environmental conservation is urgent.
Ethnobotany Research & Applications

In this respect, ethnobotanical studies may support the elaboration of appropriate practices for management of vegetation with utilitarian purposes; these practices employ time-tested traditional knowledge to solve community issues for conservation purposes (Albuquerque 1999).

Gathering information on the use of natural resources by traditional people has revealed models permitting their sustainable use (Albuquerque 1999). This is based on the knowledge of such groups about the use and protection of the biological resources (Arruda 1997). Therefore, studies in this perspective must be considered in environmental discussions.

In the Atlantic Forest biome, ethnobotanical research was carried out with artisanal fishers (Fonseca-Kruel & Peixoto 2004, Hanazaki et al. 2000), local farmers (Medeiros et al. 2004, Pinto et al. 2006, Silva & Andrade 2005), and in popular produce markets (Azevedo & Silva 2006). Regarding these biome ecosystems, past studies have primarily focused on coastal plain formations (Fonseca-Kruel et al. 2006, Santos et al. 2009) and coastal forests (Hanazaki et al. 2000, Medeiros et al. 2004, Pinto et al. 2006). Mountainous biomes and the high mountain Atlantic Forest have yet to be studied using ethnobotanical methods.

Visconde de Mauá is a rural agglomeration of villages located in the larger Serra da Mantiqueira, a mountainous Atlantic Forest ecosystem in southeastern Brazil. The region has several environmental attractions, including, but not limited to, waterfalls, mountains, lakes, and preserved forest areas (Richter & Souza 2013). Thus, tourism dominates economic activities in Visconde de Mauá (Neves & Maia 2012, Richter & Souza 2013) with both positive and negative impacts on the environment and on native communities. On a local scale, tourism can generate economic growth and population change as tourists later decide to retire or reside permanently in the area. However, tourism can promote deforestation and the unsustainable misuse of a landscape to meet its demands (Buckley 2012, Ruschmann 2013).

This work is a case study with the aim of generating an ethnobotanical inventory in the community of Visconde de Mauá, Brazil, relating the use of plant species to the tourism activities in this region and analyzing its consequences for the conservation of local ECUs.

Methods

Study area

Visconde de Mauá is located in Serra da Mantiqueira Environmental Protection Area on the periphery of Itatiaia National Park. For further reference, this area sits on the far western part of the state of Rio de Janeiro (RJ) while overlapping into the neighboring state of Minas Gerais. In total, it encompasses three municipalities: Resende, Itatiaia, and Bocaina de Minas. Visconde de Mauá comprises villages and valleys settled in the territory of Alto Rio Preto micro-basin, and in 2012 the estimated population was 8000 (Neves & Maia 2012). The economic activities in Visconde de Mauá are based on tourism, motivated especially by the environmental characteristics of the region (Neves & Maia 2012, Richter & Souza 2013). In addition, gastronomy and craftwork trade help propel the local economy in response to the typical tourists’ expressed interests.

Settled in the Atlantic Forest domain, the vegetation of Visconde de Mauá is a transition between mountain rainforest and high mountain rainforest (Oliveira-Filho et al. 2004). The climate is subtropical humid (Köppen’s Cwa), marked by a dry winter and a hot and rainy summer with high humidity levels. The average annual temperature varies from 18°C (64°F) to 21°C (70°F) with an annual rainfall ranging 1500–1800 mm (59–71 inches). The region has ecological refuges with low forest relics from the Pleistocene called high altitude fields (IBAMA 2007).

Ethnobotanical survey

The field work included monthly trips of ten days on average from January 2006 to October 2007. The collection sites used during the research were at 1024–1350 m (3360–4430 ft) in the rural communities of Mauá, Maromba, Maringá, Santa Clara, Lote 10, and Ponte dos Cachorros (Figure 1).

The research followed methodological recommendations adapted for field practices suggested by Albuquerque and Lucena (2004). The process was based on sociability, full participant observation, registering information in a field diary, and prior-approved recordings of formal interviews. Semi-structured and informal interviews were also performed to learn botanical knowledge.

The selection of interviewees focused on the local populous that ostensibly used plant resources, defined henceforth as generalists (Albuquerque & Lucena 2004). Once the first generalist was identified, we used a snowball technique (Bailey 1994) to identify other generalists in the community who correspondingly helped identify other generalists. However, some of the interviewees were peer-recognized as more astute in their botanical knowledge, thus they were considered and designated as key informants. During the interviews, research personnel also collected information from key informants via free-listing. Guided tours and walk-in-the-woods were also used for direct verification of plants and in situ collection. The sampling scale was defined using a collectors’ curve (accumulation curve), adapted for this research (Borba & Macedo 2006).

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The plants were analyzed according to purpose and the plant part utilized, following the methods described in Borba and Macedo (2006) and Fonseca-Kruel and Peixoto (2004). The definition of categories of use of the plant resources was based on the considerations of Albuquerque and Andrade (2002), Fonseca-Kruel and Peixoto (2004), Shanley and Rosa (2005), and Vendruscolo and Mentz (2006) and are as follows:

1. **Alimentation**—plants eaten directly or used in preparation of products for household consumption;
2. **Craftwork**—plants used in manufacturing **bijou**, handicrafts, home ornaments, and other products intended for sale to obtain income;
3. **Fuel wood**—plants used for firewood such as leaves and branches used to ignite and sustain a fire;
4. **Construction**—plants used in building structures, fences, and furniture;
5. **Cosmetic**—plants used with aesthetic purposes;
6. **Medicinal**—plants used in prevention and treatment of specific diseases or indicated to help some organic function;
7. **Ornamental**—used in decoration of houses and gardens;
8. **Symbolic**—plants used in rituals, superstitions, and in the prevention and treatment of cultural diseases (e.g., **quebrante**, **vento-virado**, **mau-olhado**, **des-carrego**).

Due to the importance of commerce for tourism in this community, a rank matrix was elaborated to verify the preferred species used in the craftwork category (Albuquerque & Lucena 2004).

The collection of the botanical samples was performed under licensing from Brazilian Institute for the Environment - IBAMA (11307-1). The collected specimens were cataloged and identified using a specific bibliography and/or via comparisons with exsiccates. The classification systems used were APG III for angiosperms (Reveal & Chase 2011), Smith *et al.* (2006) for pteridophytes, and Kramer and Green (1990) for gymnosperms. The TROPICOS database (www.tropicos.org) and Lista de Espécies da Flora do Brasil (2014) were used to check nomenclatural information and also to verify whether the species was foreign or native. After cataloging, samples were deposited at the herbarium of the Universidade Federal do Rio de Janeiro (RFA).

**Figure 1.** Study site and location of the Serra da Mantiqueira Environmental Protection Area (green), Rio de Janeiro, Brazil. Small squares denote the location of the villages of Visconde de Mauá: Mauá, Maromba, Maringá, Santa Clara, Lote 10, and Ponte dos Cachorros. Adapted from IBAMA (2007).
Results

The respondents and their perceptions on plant resources

Forty people were interviewed and categorized as 27 generalists and 13 key informants. These key informants were identified according to their activities in the following groups: general users, medicine collectors, faith-curers, healers, artisans, and small local farmers. When compared to the generalists, key informants constituted a distinct group (Table 1). The key informant group was almost equally comprised of men and women, while women predominantly made up the generalists group (81.5%).

The majority of women in the key informant group (89%) cultivated plants in their backyards. They reported the exchange of cultivated specimens with friends and neighbors, mainly for medicinal purposes; this practice occurred typically when their cultivated specimens were damaged or if they expressed interest in cultivating a previously unknown species of plant.

Contrasting with generalists, the majority of key informants were 50 or more years old. Most key informants (62%) were either illiterate or only studied up through elementary school, while only 14.8% of the generalists settled into this category.

Representing their connection to the land, Visconde de Mauá was the birthplace of most key informants (85%), while only 22% of generalists were native (local) to the area. However, most generalists reported living in Visconde de Mauá for at least 10 years and considered themselves familiar with the local landscape dynamics and resources. Southeastern Brazil was the native homeland of 70% of all respondents, characterizing the regional-centric source of information among interviewees.

Most individuals in both the generalists and key informants groups were engaged in more than one activity as a source of income. Activities related to tourism, such as craftwork commerce and lodging rental, were reported as at least one occupation in 80% of the respondents.

For most of the key informants, oral transmissions and auditory learning were essential for knowledge acquisition on the use of plants. A great part of such knowledge was acquired by more than one source. The primary information sharers were parents or other relatives (70%). However, other local specialists (40%); books, television and other media (40%); and spiritual sources (20%) were also cited.

The use of plant resources

Two hundred forty plant ethnospecies were identified as cultivated or collected, representing 198 botanical species (Table 2). From the 30th to the 40th respondent, no further species were added (Figure 2). The species are dis-

Table 1. Characteristics of all respondents and key-informants from Visconde de Mauá, Rio de Janeiro, Brazil.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All respondents</th>
<th>Key informants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>31%</td>
<td>57%</td>
</tr>
<tr>
<td>Female</td>
<td>69%</td>
<td>43%</td>
</tr>
<tr>
<td>Age</td>
<td>38% &gt; 50 years-old</td>
<td>77% &gt; 50 years-old</td>
</tr>
<tr>
<td>Education</td>
<td>31% up to elementary school</td>
<td>62% illiterate or up to elementary school</td>
</tr>
<tr>
<td>Origin</td>
<td>43% local</td>
<td>85% local</td>
</tr>
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</table>

Table 2. Collected species (n = 198) in different categories of use cited by the community of Visconde de Mauá; Ref = Collection number (MQ = Mariana Quinteiro); Nat = Native species; Exo = Exotic species; C = Cultivated species; E = Extracted species; N = undetermined. Within Category of Use: Med = Medicinal; Al = Alimentation; Crf = Craftwork; Sym = Symbolic; Cos = Cosmetic; Con = Construction; Fw = Fuel wood; Or = Ornamental.

<table>
<thead>
<tr>
<th>Species</th>
<th>Local name</th>
<th>Ref. (MQ)</th>
<th>Origin</th>
<th>C/E</th>
<th>Category of use</th>
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<tbody>
<tr>
<td>Acanthaceae</td>
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<tr>
<td>Justicia sp.</td>
<td>Camarão-amarelo</td>
<td>137</td>
<td>-</td>
<td>C/E</td>
<td>Med</td>
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<td>Alismataceae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Echinodorus grandiflorus (Cham. &amp; Schtlld.) Micheli</td>
<td>Chapéu-de-couro</td>
<td>96; 124</td>
<td>Nat</td>
<td>E</td>
<td>Med</td>
</tr>
<tr>
<td>Amaranthaceae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternanthera dentata (Moench) Stuchlik ex R.E.Fr.</td>
<td>Amoxicilina terramicina trimicina</td>
<td>128; 168; 209; 343</td>
<td>Nat</td>
<td>C</td>
<td>Med</td>
</tr>
<tr>
<td>Amaranthus blitum L.</td>
<td>Cariru, caruru</td>
<td>9; 170</td>
<td>Exo</td>
<td>E</td>
<td>Med; Al</td>
</tr>
</tbody>
</table>

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### Species Inventory and Implications of Plant Use for Environmental Conservation in Visconde de Mauá, Serra da Mantiqueira, Brazil

<table>
<thead>
<tr>
<th>Species</th>
<th>Local name</th>
<th>Ref. (MQ)</th>
<th>Origin</th>
<th>C/E</th>
<th>Category of use</th>
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<td>Schinus terebinthifolius Raddi</td>
<td>Aroeira</td>
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<td>Centelha-asiática</td>
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<td>Asclepias curassavica L.</td>
<td>Ersa-braba</td>
<td>38</td>
<td>Nat</td>
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<td><strong>Araceae</strong></td>
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<td>Xanthosoma sagittifolium (L.) Schott</td>
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<td>E</td>
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<td>Artemisia camomila, mil-rama, novalgina, macela-canforada, macelinha, milfolhas, ponta-livre, pronto-alívio</td>
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<td>Exo</td>
<td>C</td>
<td>Med</td>
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<td>Med; Crf</td>
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<td>Bidens pilosa L.</td>
<td>Picão, picão-de-praia</td>
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<td>Exo</td>
<td>C/E</td>
<td>Med</td>
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<th>Category of use</th>
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<td>Fumo-bravo</td>
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<td>Arnica, arnica-caseira, arnica-de-horta, arnica-do-mato, arniquinha</td>
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<td>Nat</td>
<td>C/E</td>
<td>Med</td>
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<td>Med; Al</td>
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<td>Ormosia arborea (Vell.) Harms</td>
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**Geraniaceae**

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**Ginkgoaceae**

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**Lamiaceae**

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<td>Hyptis radicans (Pohl) Harley &amp; J.F.B.Pastore</td>
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<td>Alecrim, poejo, poejo-caseiro, poejo-de-horta, poejo-menta</td>
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Among the plants identified to the species level, there was near equality between native (45%) and exotic (55%) species. Furthermore, 44% of the species could only be found cultivated, and 45% were discovered via wild collection. The remaining 11% were found in both cultivated gardens and among wild growth in Visconde de Mauá. Backyard gardens held 55% of all species and contained at least one species in each verified category of use; most predominantly, medicinal species were found in every backyard analyzed. Thus, in Visconde de Mauá backyard gardens can be considered as a relevant landscape unit.

**Medicinal plants**

The majority of species listed in this study (172) were reportedly used for medicinal purposes. From the species with determined origin, 45% are native species. The use of medicinal plants does not seem a threat to environmental conservation. The plant parts most used were leaves and aerial stems (87%), which are regularly available and easily regenerated. Additionally, approximately half of the medicinal species are cultivated.

<table>
<thead>
<tr>
<th>Species</th>
<th>Local name</th>
<th>Ref. (MQ)</th>
<th>Origin</th>
<th>C/E</th>
<th>Category of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>sp. 5</td>
<td>Rosa-mosqueta</td>
<td>180</td>
<td>-</td>
<td>C</td>
<td>Con</td>
</tr>
<tr>
<td>sp. 6</td>
<td>Agrimoni</td>
<td>121</td>
<td>-</td>
<td>C</td>
<td>Al; Med</td>
</tr>
<tr>
<td>sp. 7</td>
<td>Cedro</td>
<td>99</td>
<td>-</td>
<td>E</td>
<td>Con; Med</td>
</tr>
<tr>
<td>sp. 8</td>
<td>Hortelã-menta, menta</td>
<td>133</td>
<td>-</td>
<td>C</td>
<td>Med</td>
</tr>
<tr>
<td>sp. 9</td>
<td>Azedinho</td>
<td>248</td>
<td>-</td>
<td>E</td>
<td>Al</td>
</tr>
<tr>
<td>sp. 10</td>
<td>Patchouli</td>
<td>192</td>
<td>-</td>
<td>C</td>
<td>Sym</td>
</tr>
</tbody>
</table>

Distributed in 61 families, especially Asteraceae, Lamiaceae, and Fabaceae (Figure 3).

![Figure 2](http://dx.doi.org/10.17348/era.14.0.027-047)
Plants used for craftwork

Another prominent category of plant use is craftwork as tourism in Visconde de Mauá pushes trade in local products, especially handmade ones. Half of the respondents make and/or sell craftwork with local plant resources, three of whom were key informants. However, this activity does not seem to be traditional since most artisans we interviewed came from other regions.

The main species used for manufacturing homemade jams, jellies, and brandies were *Rubus rosifolius* Sm., *Rubus brasiliensis* Mart., *Rubus sellowii* Cham. & Schldl., *Araucaria angustifolia* (Bertol.) Kuntze, *Plinia cauliflora* (Mart.) Kausel, *Eriobotrya* sp., *Passiflora edulis* Sims, and *Prunus persica* (L.) Batsch. Artisanal herbal pillows are made using *Achyrocline satureioides* (Lam.) DC., *Cymbopogon citratus* (DC.) Stapf, and *Matricaria chamomilla* L. For making ornaments and jewelry, the most cited species were *Ormosia altimontana* J.E.Meireles & H.C.Lima (85%), *Ormosia arborea* (Vell.) Harms (69%), *A. angustifolia* (46%), *Poaceae* spp. (46%), *P. persica* (31%), *Jacaranda mimosifolia* D.Don (38%), and *A. satureioides* (23%). The preferential ordering of use of the main artisanal plants were: *Ormosia altimontana*, *O. arborea*, *A. angustifolia*, and *J. mimosifolia*.

Plants used for alimentation

Though Visconde de Mauá is a rural region, only 35% of the respondents cultivate food crops. Community members purchase sporadically available products in a few local markets despite their expense. The respondents declared cultivating plants for alimentation is laborious and brings less financial return than tourism-related activities. Additionally, interviewees indicated intent to use fertile spaces capable of plant cultivation to construct new housing structures.

In total, this research categorized 72 species as crops, but only 8% of these plants were not cultivated, due to being collected directly from the forest and its surroundings. The main extracted species are: *Rubus rosifolius*, *A. angustifolia*, *P. edulis*, an unidentified bamboo (*Poaceae* sp.), and *Melastomataceae* sp. 1 and sp. 2. Some species (11%) were obtained by both extraction and cultivation such as *Sonchus oleraceus* (L.) L., *Citrus* sp. 2, *P. persica*, *R. brasiliensis*, *R. sellowii*, *Eriobotrya* sp., *Nasturtium officinale* W.T.Aiton, *Tropaeolum majus* L., and *Symphytum officinale* L.

Regarding these cultivated vegetables, 63% were herbaceous, 18% arboreal, 14% shrubby, and 5% climber, showing an overall herbaceous habit predominance.
Interviewees did not mention the use of agrochemicals, pesticides, and industrial fertilizers in crops. As local agriculture is performed in small scale without chemical input, agro-toxins do not threaten the conservation aims of the Environmental Protection Area.

**Plants used for construction**

Nine species were reported for construction: *Araucaria angustifolia*, *Jasminum polyanthum* Franch., *Malvaviscus arboreus* Cav., *Calliandra* sp., *Cupressus* sp., *Eucalyptus* sp., *Vernonia* sp. 2, *Asteraceae* sp. 4, and one undetermined species (popularly known as *cedro*). This category includes plants used for construction of housing foundations and anchors (pieces to anchor walls), planks for the floor and ceiling, hedges, cable hoe, and furniture such as tables, sofas, and chairs. Table 2 includes these plants and their functions.

The felling of some of these species is forbidden now by IBAMA, and informants were aware of this restriction. Nevertheless, they reported they still retain the knowledge of how to use these species. Due to its inclusion in the list of Brazilian endangered species, *A. angustifolia* use for construction is prohibited. Correspondingly, civil buildings are predominantly constructed via imported outside wood.

**Fuel wood**

Respondents reported using *A. angustifolia*, *Eucalyptus* sp., and *Vernonia* sp. 2 for fuel wood in addition to their use in construction. The use of plants as fuel wood requires particular attention, due to the intense local tourism and the climate of the region. Though respondents acknowledged the prohibition on the use of these plants, these species are still commonly found in many hostels and hotels. Representing a conflict between earning income and following the law, selling firewood is a profitable activity in the region as a pack of firewood often found in local markets costs around R$15.00 (US$ 7.50).

**Ornamental plants**

This category includes plants used for decorative purposes with the intent to “spruce up” a dwelling, and the majority of plants are species that require little care in backyards or in indoor pots. Ornamental plant use was more pronounced in the inns and hotels as fundamental components in landscaping to attract attention of guests and tourists. The plants most cited for this purpose were *Jasminum polyanthum*, *Impatiens walleriana* Hook.f., *Adiantum raddianum* C.Presl, and two species of Rosaceae (*Rosa* sp. 1 and *Rosa* sp.2).

**Plants of symbolic use**

Plants included in this category are used in superstitions, rituals for healing, and prevention of “cultural illnesses” interpreted as manifestations, and diseases that do not present a reasoned scientific cause. Patients are usually treated via a “blessing of the sick person,” prayers performed in the presence of a fresh plant and the Catholic rosary, the use of plants in a sitz bath, and for other treatments.

The baths are taken “neck down,” so as not to ward off the person’s “guardian angel.” In addition, fumigation is carried out with a dried version of the plant, after being placed in containers or directly via burning its branches. These plants can also be planted at the entrance or the back of the house, in pots or gardens, to bring good luck and “not let the evil eye come.” Due to the use of plant parts in this category, symbolic plants have cultural importance in Visconde de Mauá.

**Discussion**

*The respondents and their perceptions on plant resources*

The groupings of informants in this study were similar to those found by Voeks (2007) and Fonseca-Kruel and Peixoto (2004). The relative dominance of women in comparison to men evidences the role of key informant women as guardians of the knowledge on medicinal plants; similar results on women’s knowledge about plants were found by Medeiros et al. (2004), Pinto et al. (2006), and Voeks (2007). In general, women had higher enrollment with cultivated plants in backyards and gardens as the practice required less concerted effort. Additionally, a fear of wild animals in the surrounding areas contributed to their preference for plant cultivation. Contrary to domestic cultivation, men focused on collecting medicinal plants in wild fields, guided by popular knowledge. This method has previously been demonstrated to increase the number of native species used for medical purposes by the local rural communities (Pinto et al. 2006).

The advanced age of most informants is consistent with other studies (Fonseca-Kruel & Peixoto 2004, Pinto et al. 2006, Schardong & Cervi 2000, Voeks & Leony 2004). This statistic may be resultant of many young individuals in these communities becoming less interested in understanding local plants and their potential uses. Ethnobotanical knowledge of these informants did not seem to be related to the formal school education, which previous scholarly works indicate sometimes actually hinders it. Di Stasi (1996) and Voeks and Leony (2004) stressed that mandatory education systems seem to be inversely related to empirical knowledge of medicinal plants.

The findings here that a majority of respondents were involved in aspects of the tourism trade are similar to findings of Voeks (2007) when studying the very touristic re-

[http://dx.doi.org/10.17348/era.14.0.027-047](http://dx.doi.org/10.17348/era.14.0.027-047)
The use of plant resources

Backyard gardens hold economic, nutritional, and social community characteristics. These systems are germplasm banks that allow cultivation of plants of interest and also the exchange of this material among community members (Albuquerque 1999). The horticultural activities in backyards result in regular production of fruit and medicinal plants, thus, inhabitants reduce their dependence on products acquired externally (Pasa et al. 2005). Despite their importance, backyard gardens have been in decline in Visconde de Mauá due to the conversion of these spaces into hostels, campsites, and small cottages in order to shelter tourists.

Medicinal plants

The great number of species reported in this category of use reflects the local reality; the population of Visconde de Mauá is far from urban centers, with difficult road access and generally low incomes. The community lacks health services, such as hospitals and ambulances for emergencies, thus the alternative medicinal practices are regular. These practices persist when health services are inaccessible for part of the population (Rezende & Cocco 2002). Another reason for the preference for treatment based on traditional medicine knowledge is the high cost of allopathic medicines (Medeiros et al. 2004).

The loss of traditional knowledge of medicinal plants is apparent. People ascribe commercial drug names to some of the cultivated medicinal species, as can be seen in amoxilina, terramicina, novalgin, atroveram, and anador. This decline has also happened in other Brazilian regions (Pinto et al. 2006, Voeks 2007).

Plants used for craftwork

The dissemination of new technologies, increased by globalization and considerable local tourism, seems to seasonally affect the distribution of plants in the categories of use. This is the case of plants used for making homemade jams and jellies. In past times when tourism was not intense in Visconde de Mauá, these plants may have been used exclusively for food. Nowadays, with the tourism-induced seasonal changes in the local economic relations, such products are destined for the local markets in order to create or increase family income. For this reason, these plants were categorized into the commercial craftwork category. Similarly, in traditional communities, plants used for stuffing pillows may be classified within the category “technology” (Fonseca-Kruel & Peixoto 2004), but in Visconde de Mauá, pillows are produced for sale to tourists and not used in the community. Therefore, these pillows are not considered as a technology employed to their benefit, but as commercial craftwork products that augment the income of the local residents. This therefore represents one alternate categorization of the preferred use of certain plant species to the community throughout its historical and economic process.

The most preferred species in the craftwork category, O. altimontana, is locally known as angelim, caju, caju-zinho, and olho-de-cabra-amarelo. It is an endemic species from Atlantic Forest, and its natural growth is restricted to elevations only above 1000 m (3300 ft) (Meireles 2014). In Visconde de Mauá, O. altimontana seeds are used to produce ornaments due to its beautiful morphology (Figure 4). Additionally, its endemism in high mountains influences the preference for using this species, which results in unique artisanal products and therefore greater commercial value.

The orange-reddish integument of O. altimontana seeds is hard and impermeable, which likely prevents germination. Another species of the genus found in this region, O. arborea, has seeds with dormancy imposed by the integument, which is difficult for seedling production (Zamith & Scarano 2004). The majority of seeds of O. altimontana are collected from the ground, at the time of fruit ripening. Some of the respondents also reported sifting the soil around the trees to collect more seeds from the soil seed bank. Large amounts of seeds are sold at low prices to intermediaries, for resale in large cities. Considering the limited availability, the difficulties in propagation, and also the interference on soil seed bank, the over-exploita-
Figure 4. *Ormossia altimontana* J.E.Meireles & H.C.Lima (A), tree with fruit (B), fruit and seed (C), and craftwork using *O. altimontana* seeds (D).
Figure 5. *Araucaria angustifolia* (Bertol.) Kuntze tree (A), strobilus (B), and seeds (C).

The gymnosperm *A. angustifolia* is the symbol of the Paraná Pine Forest. In this study, *A. angustifolia* was the species most mentioned across categories of use. The local importance of this species is evident by the annual local Pine Nut Fair. Although pine nut is a non-timber forest product, Brazilian law regulates its extraction and trade (Brazilian Forestry Code, law 4771 of September 15, 1965). Pine strobili are freely sold in large quantities, especially the cones (seeds) intended for food and handicrafts (Figure 5). Some families sell large amounts during harvest season in order to increase income, and sales in small scale are also observed in many local markets. As a forest species, cutting *A. angustifolia* is forbidden by I-BAMA (Aquino 2005). In lieu of this, the local community frequently prevents this species’ growth in order to permit space for future buildings or other private property use. This practice, predominantly motivated to improve tourism, results in attitudes incompatible with the aimed preservation of the species. As seen previously, Aquino (2005) pointed out that laws pertaining to the use of species exclusively for species preservation typically only emphasize restrictions and punishments. However, these laws lack recommendations of methods favoring initiatives towards planting for commercial purposes.

**Plants used for alimentation**

Silva and Andrade (2005) wrote that a near-equal proportion of arboreal and herbaceous species should indicate

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the existence of many fruit ranches in the community; however, Visconde de Mauá showed a predominance of herbaceous species. Other populations living in Atlantic Forest peripheries rarely go to the forest in search of food, yet, when occurring, residents predominantly seek out fruits (Cunha & Albuquerque 2006). Contradictorily, the traditional fisherman communities along the Atlantic Forest coast more frequently use the edible plants found in their natural habitat, probably because they preserved the way of life of the ancient people (Fonseca-Kruel & Peixoto 2004, Hanazaki et al. 2000).

Conclusion

The ethnobotanical knowledge in Visconde de Mauá is the result of the historical conglomeration of several groups, which came into the region with distinct and diverse origins. However, the specific analysis of key informant characteristics shows its similarity to those from ethnobotanical works involving traditional communities. Therefore the group can be considered as a vestige of the local natives or direct descendants of these local indigenous populations. The key informants are linked to the preservation of traditional values and cultures on plants and regional landscapes and can assimilate knowledge from different ethnicities. However, their knowledge has not been substantially transmitted to younger generations, thus making ethnoscience nature study an urgent matter.

Although the medicinal category of use includes the highest number of useful species, it is unlikely that it represents a threat to local conservation. Specifically, the reported species are cultivated more than they are collected, and the plant parts used, mostly leaves and branches, do not compromise the viability of the individual plants.

Other categories less representative in numeric terms of useful species, such as craftwork, construction, and fuel wood, show a more intense exploitation via use of seeds and entire trees. This is likely to be incompatible with local conservation. In this context, O. altimontana and A. angustifolia are highlighted as extensively used species, indicating a priority for local conservation management projects.

The low percentage of edible plant crops, the undesirability of searching for such plants in the forest, and the poor commercial offering of such items may result in reduced community use of such species. In this context, tourism is potentially contributing to the decline in horticulture and fruit cultivation and ultimately undermining local traditional culture.

The current environmental policy at Serra da Mantiqueira Environmental Protection Area, in Visconde de Mauá, is dependent on oppression and lacks scientific background and social legitimacy; it could propose more alternatives and educational solutions regarding the use of local plant resources. Ignoring the conservationist potential of the different cultures that live inside this protected area, area managers created policy insufficient for the complete reproduction of the ecosystems, biodiversity conservation, and cultural plurality. Therefore, future policy should include people’s perspective from within the conservation area, as well as the investment of their identity recognition. This ultimately will value their knowledge and improve their living conditions as a means to guarantee their participation in the elaboration of a conservation policy that will benefit the protected areas as well.

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