Biodivers Conserv (2015) 24:2129–2133
DOI 10.1007/s10531-015-0995-4

EDITORIAL

The Brazilian Atlantic Forest: new findings, challenges and prospects in a shrinking hotspot

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Published online: 10 September 2015

The Brazilian Atlantic Forest has been explored and degraded for more than 500 years (Morellato and Haddad 2000; Ribeiro et al. 2011). The forest fragments that still exist, except in protected areas such as National Reserves and Biological Reserves, are concentrated on the tops of mountains and/or steeper slopes, where agricultural activity is difficult or unfeasible, either for access or due to the generally low soil fertility (Moreno et al. 2003). This biome is, however, recognized as one of the 35 world hotspots for conservation priorities (Myers et al. 2000; Zachos and Habel 2011), and has even been referred as a "hottest hotspot" (Laurance 2009), "shrinking hotspot" (Ribeiro et al. 2011), or "top hotspot" (Eisenlohr et al. 2013). It is for this reason that a special issue is devoted to these forests here.

Researchers have responded to this scenario, addressing important floristic and phytogeographic features of the Atlantic Forest vegetation, and producing works revealing major implications for biodiversity conservation (e.g. Oliveira-Filho and Fontes 2000; Marques et al. 2011; Werneck et al. 2011). These studies focused on tree species, the component on which there is far more available data than on most other plant types. However, in recent years, the number of surveys dealing with other growth forms has increased, along with the inclusion of life-forms other than trees in sampling protocols and floristic surveys. Including non-tree life-forms in investigations contributes to our knowledge of the geographic limits and the historical processes acting in the Atlantic Forest, in addition to providing a sounder basis for the development and technical planning of conservation policies.

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The goal of this special issue is to provide a substantial contribution to the conservation of the Brazilian Atlantic Forest by bringing together contributions by teams of researchers engaged with biodiversity and conservation in this biome. The audience of the journal will have the opportunity to assess articles from a variety of vegetation components, from fungi to angiosperms, from herbs to trees, and in different habitats with both semi-deciduous and evergreen physiognomies.

Synopsis

How much do we know about the endangered Atlantic Forest? This essential question is addressed by Lima et al. (2015) who compiled quantitative tree community surveys on all types of the Atlantic Forest until 2013, investigating where and how these surveys were conducted. They found that some regions and forest types of the biome are less studied than others; in this sense, survey efforts should focus on evergreen and deciduous forests, especially in the Brazilian states of Bahia and Mato Grosso do Sul, as well as in Paraguay and Argentina. Some subtypes of vegetation, such as: Cloud forests, Swamps, Caxetal, and Mussununga forests, are still underrepresented within studies on the Brazilian Atlantic Forest and need more (high-quality) data to be available in order to make informed decisions in this hotspot.

Another important question is: Should species conservation be prioritized within specific belts along altitudinal gradients? Rezende et al. (2015a) demonstrate that, in the Brazilian Atlantic Semideciduous Forests, different altitudinal belts have specific conservation issues to be considered in decision-making for trees. For example, taxa richness and number of endemic and threatened species decreased with increasing altitude, while the number of indicator species for each zone increased with altitude. Endemic and endangered species listed in the Supplementary Material to this article provides material to be considered when selecting and prioritizing possible areas for conservation in that vegetation physiognomy. Woody plants of Myrtaceae, one of the richest families in the Brazilian Atlantic Forest, are reported on by Lucas and Bünger (2015). The concept of the 'model taxon' and its relationship with biological conservation is discussed, through a review in which the target questions rely on how this family fits the 'model' criterion by examining its distribution throughout the Brazilian Atlantic Forest.

Phytogeographical issues are addressed by Vieira et al. (2015), who examined whether the herb species of these forests are distributed in a similar pattern to the trees. The analyses distinguished three floristic centers for the herb-layer species: Seasonal Forest, Lowland Rainforest, and Upland Rainforest. While the tree flora varies in gradients along latitude, longitude, and also altitude, the herb-layer flora presents distinct floristic centers. Tree and herb-layer species do not have completely coincident distribution patterns, implying that the same conservation units do not manage to conserve both species sets; the herb-layer needs to be included in developing protection programmes.

Because bryophytes (hornworts, liverworts, and mosses) are sensitive to environmental changes and can be used as bioindicators of local environmental and microclimatic conditions, they are very important to consider in conservation practices. Costa et al. (2015) investigated the bryoflora of the Itatiaia National Park, the most important area for bryophyte conservation area in Brazil, and found that the species richness of mosses and liverworts reached their peaks in the mid-altitudinal range (2100–2200 m). The numbers of threatened species increased up to this elevation. These authors emphasize the importance of giving priority to the protection of Upper Montane Forests and High-Altitude Fields in the Brazilian Atlantic Forest.

Fungi are a key, but often overlooked, element in the maintenance of tropical ecosystems, and because of this we illustrate their importance by two examples in this issue. Silva et al. (2015) investigated the community composition of arbuscular mycorrhizal fungi (AMF) in natural and revegetated coastal areas of the 'Restingas'. They found that the revegetated areas had higher species richness than the natural ones, thereby emphasizing the importance of biodiversity inventories in coastal areas subjected to natural and anthropic pressures. Gilbertoni et al. (2015) explored the polypore communities in the Atlantic Rain Forest in northeast Brazil, and argued that the protection of every forest fragment of any type of Atlantic Rain Forest is needed to protect these fungi, which are widely recognized as being indicators of long-established forests. Further, dead wood should not be removed from a forest in order to protect the diversity of polypores, and also the numerous other groups of saprobic fungi.

Ecological aspects, including functional ecology, regeneration, and succession, are covered by De Paula et al. (2015), Rezende et al. (2015b), and Robinson et al. (2015). The first authors investigated functional traits in inselbergs, isolated granite and gneiss rocks that rise sharply above the level of the Lowland Surrounding Forests. Significant advances in identifying the environmental drivers of biological invasion in resource-limited environments are reported. The authors are especially concerned with further trait-based approaches, which can become critical for developing conservation and management strategies for inselberg plant communities, in the context of rapid habitat loss and fragmentation of the Atlantic Forest. Rezende et al. (2015b) highlight that Secondary Forests provide ecosystem services that can turn into economic benefits, and allowing natural regeneration can reduce restoration costs. Active restoration of the area studied would have required an impressive US$ 15.1 million. Consequently, spontaneous natural regeneration should be accounted for and incorporated into plans for restoration in the Atlantic Forest. With respect to ecological succession, Robinson et al. (2015) provides evidence that recovery of secondary forest and below and above ground carbon storage is limited by the amount of adjacent forest, some soil properties, and with dense shrub establishment down-regulating the succession process. Perhaps more importantly, the potential to improve the recovery of damaged Atlantic forest through ecologically relevant seeding/planting programmes and selective shrub removal could benefit carbon storage in the ecosystem.

Examples of direct disturbances in the Atlantic Forest are provided by Padilha et al. (2015) in *Hovenia dulcis*, an aggressive non-native tree species in the subtropical Atlantic forest ecosystems, and Magnago et al. (2015) who addressed important issues relating to forest edges. *H. dulcis* successfully invaded closed-canopy forest fragments, thus highlighting that undisturbed Subtropical Brazilian Atlantic Forest habitats are as susceptible to biological invasions as disturbed ones. In the case of forest edge habitats, these are shown to be significantly more susceptible to strong winds, lower humidity and higher air temperatures than are habitats in the forest interior. Even large forest fragments in the Brazilian Atlantic Forest may be impacted by the negative effects of forest edges.

Finally, Scarano and Ceotto (2015) revised the vulnerabilities of biodiversity and society in the Brazilian Atlantic Forest to climate change and land use, taking particular note of recent biological evidence of strong synergies and feedbacks. They provide consistent arguments as to why the Atlantic Forest could turn from a "shrinking biodiversity hotspot" to a climate-adapted "hope spot". There are three reasons for optimism: the natural resilience of the biome; the increasing production of papers that are solutiondriven; and policies and agreements already in place, such as the payment for ecosystem services in many states and the "Restoration Pact".

Acknowledgments We thank the authors who chose this special issue as an outlet for their studies, and the reviewers, who provided high-quality contributions. Renuka Nidhi (Editorial Office Assistant) and David L. Hawksworth (Editor-in-Chief) of *Biodiversity and Conservation*, are also thanked for their support during the preparation of this Special Issue.

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