Contributions of Rio de Janeiro Botanic Garden, Brazil, to the National GSPC mainstreaming process.

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Abstract

Even though flora conservation is becoming a more popular subject nowadays, and people are starting to realize its importance, Brazil still needs to advance in such a delicate issue. The maintenance of plant diversity is critical for sustainable development and botanic gardens are playing a key role as centres for conservation actions. The Rio de Janeiro Botanic Garden (JBRJ) has consolidated a long history of contributions to the development of scientific knowledge and plant conservation frameworks, protocols and actions. In order to mainstream national efforts with international initiatives towards plant conservation, the National Centre for Plant Conservation (CNCFlora), was created in December of 2008, under the JBRJ infrastructure. The Centre's working program was aligned to the framework established by the Global Strategy for Plant Conservation (GSPC), prioritizing the targets that meet national needs and capacities. Therefore, CNCFlora has focused efforts, during its first year, on achieving advances in specific GSPC targets: 1 and 2. in this paper we have gathered all contributions made by Rio de Janeiro Botanic Garden, on the mainstreaming process for both of these goals. Despite CNCFlora's recent creation, the significant results obtained on the targets mentioned above, evidences the importance of botanic gardens in taking part on the process of flora conservation all over the world, leading the way and working as a model for other scientific institutions and environmental agencies. The contribution of big and important institutions is the first step towards achieving targets, especially in developing countries.

Keywords

Botanic gardens; flora conservation; GSPC targets; listing processes.

Introduction

Botanic gardens all over the world play a key role in conservation by maintaining a wide range of plant specimens in living collections, particularly those considered rare and threatened. According to the 1997 IUCN Red List of threatened plants, 34,000 taxa are considered threatened with extinction. Nowadays, approximately one third, over 10,000 species, are cultivated in botanic gardens. These plants may contribute to species recovery programmes, reintroduction in the wild and provide long-term backup collections. Botanic gardens also protect areas within and outside their property enhancing local biodiversity. Research and education are also important tools for plant conservation and have been widely implemented in such institutions. But, in order to achieve results, networking is mandatory as it provides exchange of expertise and knowledge on the matter.

After 202 years, the Rio de Janeiro Botanic Garden (JBRJ) has a long history of contributions to the development of scientific knowledge and plant conservation frameworks, protocols and actions. Several initiatives can be highlighted, such as the creation of Itatiaia National Park, in 1937, the first Brazilian national conservation unit. Further on, the establishment of an important botanical collection, the RB Herbarium, the DNA bank, the live collection and the institutional seed bank, represent major steps towards effective conservation. For more than two centuries, JBRJ has protected in its boundaries the memory of Brazilian natural landscapes and their transitions, preserving plants introduced during colonial times, since its creation, and at the same time, investing in scientific advances for the challenge of maintaining plant diversity.

In order to mainstream national efforts with international initiatives towards plant conservation, the National Centre for Plant Conservation (CNCFlora) was created in December of 2008, under the JBRJ infrastructure. The Centre's mission is to coordinate national efforts, and to understand, document, and conserve plant diversity in Brazil, in collaboration with research institutions and environmental agencies worldwide. The challenge is being faced according to the framework established by the Global Strategy for Plant Conservation (GSPC), prioritizing the targets that meet national priorities and capacities.

Brazil's extreme plant diversity (Mittermeier *et al.* 1997) and the lack of information on the species constitute a very hard task in establishing conservation priorities. For a long time, the only major work to treat the Brazilian flora in a comprehensive manner was the *Flora Brasiliensis* by Carl von Martius (1846-1906). The list was sponsored by the emperors of Austria and Brazil, and by the King of Bavaria. It was produced in Germany, between 1840 and 1906, by Carl Friedrich Philipp von Martius, and August Wilhelm Eichler e Ignatz Urban, with the contribution of 65 specialists from several countries. The inventory has 19,958 species with confirmed occurrence for Brazil (Urban, 1906), in 15 volumes and 40 parts, with a total of 10,367 pages. It contains taxonomic descriptions in Latin and 3,811 lithographic prints. However, that was done a century ago.

In the following years, many new species and new occurrence records for Brazil were published, but no further inventory was conducted. Recent reviews suggest estimates of described species of plants and fungi, ranging from 63,456 to 73,956 (Lewinsohn, & Prado, 2002). The most recent figures cited for vascular plants are 56,108 species with 12,400 (22%) endemic (Giam, 2010). In this way, an accurate revision of the information on the Brazilian flora needed to be made, in order to guide future conservation efforts.

Any initiative towards assessing plant species extinction risk would rely on the present state of knowledge regarding our flora. Therefore, past attempts were significantly limited by available information on plant species. The first Brazilian Threatened Species List was published in 1968, after the work of the Brazilian Foundation for Nature Conservancy (FBCN). The list was composed by 13 plant species and included extinction risk categories accordingly to IUCN standards. In 1992, the Brazilian Government published the second version of the Official List of Threatened Plant Species. Despite the short number of species included, the list also contained the conservation status accordingly to IUCN and known distribution. The list was composed of 105 plant species.

The present red list of endangered plant species (MMA 2008) considers only two existing categories: a) threatened (*Appendix* 1); b) deficient data (*Appendix* 2). The 471 species included by the Environment Ministry on *Appendix* 1 are those with high risk of extinction from nature in a close future. And, the 1,078 species in *Appendix* 2 are those which available information (geographical distribution, threats/impacts, and others) are still deficient. Nevertheless, the present list generated disagreement between the academy and government sectors.

The aim of this paper is to highlight Brazilian advances in GSPC Targets 1 and 2. We discuss the main challenges faced during the process and point out future steps towards mainstreaming of other GSPC targets in Brazil.

Results

In order to achieve GSPC Target 1, Rio de Janeiro Botanic Garden Research Institute was designated, through the CNCFlora to coordinate the extensive work of consolidating a list of the national Flora. Therefore, in 2008, a technical committee composed by 17 representatives of the Brazilian botanical scientific community was established in order to determine the taxonomic working groups, its coordinators and the information requirements for each plant species mentioned on the list.

The first step was to integrate all existing lists published by taxonomic groups or bioregions. All available data was migrated to a species information system developed specifically for the task. Each specialist group coordinator has received a password for editing the species database, updating the system accordingly to their work group. It was necessary to coordinate c. 400 taxonomists and review c. 94,145 taxa.

The resulting list (Forzza, R.C. *et al.* 2010) is composed of 40,989 plant species, out of which there are 3,608 Fungi, 3,496 Algae, 1,521 Bryophytes, 1,176 Ferns, 26 Gymnosperms and 31,162 Angiosperms. For vascular plants, Brazil is clearly the most diverse country in the world, with documented diversity greater than might have been predicted in comparison with other mega diverse countries. Brazil also has the largest proportion of vascular plant endemism in the Neotropics with 55.9% (18,082) endemic species.

In order to achieve GSPC Target 2, JBRJ was designated, through the CNCFlora to coordinate a preliminary assessment of the conservation status of all known plant species, at national level. A brief overview of the Brazilian threatened species listing historical background makes evident the absence of a particular extinction risk classification system for plant species and of a consistent scientific network capable of supporting strategic decisions regarding biodiversity conservation.

The main challenge is to mainstream national conservation demands with global conservation policies well recognized by the international scientific community, considering specificities of the Brazilian flora and its depletion, demanding new ideas and more up to date tools.

Considering the need to improve conceptual and methodological definitions to address threatened species conservation status assessments in Brazil, CNCFlora has been engaged in the process of diagnosing threatened species listing processes and the present system of threatened species management, identifying globally emerging trends in plant conservation. A technical meeting was organized in June, in order to bring together a formal proposal to be presented to the Environment Ministry, with the specifications of a modern and adequate system of endangered species management, aligned to the GSPC framework. Besides that, 12 recovery plans are being elaborated under the coordination of the Centre. Eight action plans for Orchidaceae, one for Amaryllidaceae and three for Lauraceae species. It is important to note that this represents more than the total number of action plans ever developed in Brazil for threatened plant species, and constitutes an important step in plant conservation policies towards a more proactive approach.

Advances in the target mentioned were possible due to extensive research and discussion on conservation protocols adopted by different countries, its strengths and weaknesses, its adequacy to the Brazilian biodiversity status and its institutional capacities. During the two years of operation, CNCFlora staff have been reviewing all literature on the subject, in order to standardize national efforts for plant conservation.

The present Official List of Brazilian Threatened Plant Species, (MMA, 2008) has 1,547 species. Despite the high percentage of species from the 1992 list, included in the present list, almost 20% of them were maintained without proper documentation. Further on, the number of species considered as endangered by the Brazilian Government does not represent even 5% of the Brazilian flora, which remains a small figure considering the present state of biodiversity depletion. It considers only two existing categories: Threatened (Appendix 1) and Data Deficient (Appendix 2).

The studies have shown that despite controversies regarding advances in the Official List of Brazilian Threatened Plant Species, after the last review conducted in 2008, several improvements were achieved along the way. The first positive aspect is the significant increase in species number. The present list has four times more *taxa* than the last version. But that's not enough. Methodological development is needed in threatened species management policies, reducing the time gap of Government's response actions between information provision and decision-making. Standardization of protocols nationwide is essential to the development of a consistent threatened species database. Defining new conceptual approaches for threatened plant species conservation planning is a matter of extreme urgency and an incredibly difficult task for developing countries.

At the moment the efforts are directed to reviewing the Official List of Threatened Plant Species, in order to publish a new one, well documented and scientifically based. Together with that, the main goal is to be able to develop a Brazilian Threatened Species System Framework and a system enabling a more dynamic process for threatened species listing processes. This will be presented to the scientific community in September at the National Botanic Congress, in Manaus, Brazil.

At the same time, the CNCFlora's team has been working on the production of a National Red Book. Data and photo gathering is a great challenge in such a biodiverse country where the lack of investment in research and the poor networking among institutions and scientists are a reality. It is a time consuming activity but the aim is to be able to put it all together by 2011.

Discussion

To guarantee the long term sustainability of CNCFlora and its actions, investments in capacity building for the conservation of plant diversity has been a priority since the Centre's creation. Therefore, the CNCFlora Grant Programme was established. This already supports 11 professionals, 3 undergraduate, 1 graduate, and 5 post-graduate students. Alignment between the JBRJ and the Brazilian National School of Tropical Botany – ENBT, has been strategic to assure the necessary infrastructure for increasing the number of trained specialists in plant conservation.

However, the most challenging task might be to guarantee proper communication among actors involved in the plant conservation process, avoiding by that, redundant efforts. In this way, CNCFlora has been investing time in establishing working agendas with all government institutions related to biodiversity and plant conservation, in order to consolidate an effective network. Despite people's good will, and existing guidelines for plant conservation, the Brazilian institutions seem to be unsupported in implementing their conservation agendas. This Centre has been playing a key role in articulating actors and focusing efforts in the recommendations of GSPC Target 16, related to building networks.

Despite CNCFlora's recent creation, the significant results obtained on the targets listed above provides evidence of the importance of botanic gardens taking part in the

process of flora conservation all over the world, leading the way and working as a model for other scientific institutions and environmental agencies. Mainstreaming national conservation policies with the GSPC framework is of great relevance. Since biodiversity does not respond to political boundaries, the conservation strategies for plants must be transversely and globally implemented, in order to assure effectiveness of actions.

To face the new challenge of plant conservation worldwide, and halt biodiversity loss, new integrative approaches are needed. It is necessary to establish communication among actors involved in this process, and botanic gardens can play a key role. Science itself can not address all related matters. Therefore it is important to consider political, economical and social aspects of the actions undertaken, establishing a permanent communication channel between scientists and decision makers. The Rio de Janeiro Botanic Garden is highly committed to the challenge and has already consolidated important contributions for the National GSPC mainstreaming process.

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