Conservation planning: Chinese Magnolias at the Shenzhen Fairy Lake Botanical Garden

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Abstract

The collection of magnolias in Shenzhen Fairy Lake Botanical Garden started in 1991 when the Magnolia Garden was established. The collections now include more than 124 taxa. Among them 37 taxa have 1-2 known distribution sites, 33 taxa are listed in the IUCN red list and 22 taxa are included in the list of China Rare and Endangered Plants. Study of the collections has identified 3 new species. A number of collections need further study to clarify their taxonomical identities. Further conservation significance of the collections includes the living collections of some critically endangered species of which the protection status has not been recognized by any authority organizations, e.g., Manglietia rostrata D. X. Li et R. Z. Zhou, Michelia guangxiensis Y. W. Law et R. Z. Zhou, Michelia microcarpa B. L. Chen et S. C. Yang, Michelia fulva Chang et B. L. Chen, etc. The living collections provide a suitable platform for understanding and conserving the diversity of China magnolias.

Introduction

Conserving plant diversity is the goal of many projects and organizations of global, regional, and national levels and actions taken place include networking institutions and individuals, promoting government to provide in time financial support, etc. The results of these actions are not very often encouraging. Good wishes from individuals of scientific communities were not very often well understood by other social classes and not even by other members of scientific communities. In a perspective view, political and economical issues will still be the main obstacle for the networking approach of conservation. Facing this difficult situation, Dr. C. Samper of Smithsonian National Museum of Natural History proposed an alternative approach of an individual one in a workshop of the 17th International Congress of Botany held in Vienna, Austria. If each one of the more than 4200 participants in the congress went into the field and found a single endangered species and got it saved, then more than 4200 species had been saved and all the complexity with networking approach would be avoided. The author was sitting in the workshop and realized the sense and power of this individual approach and decided first to have one plant species saved in the name of himself. China magnolias had been chosen because they have a high ratio of threatened taxa and the authors' institution has a well developed living Magnolia collection. After less than two years' work, the results are very encouraging and demonstrative of the effectiveness of the individual approach. This paper summarizes the main outcomes and demonstrates that promoting an individual immediate response to the Global Strategy for Plant Conservation (GSPC) without waiting for establishing comprehensive networks and applying big grants from governmental agencies is practical and important for achieving GSPC targets.

Study of the living Magnolia collections of Shenzhen Fairy Lake Botanical Garden

Living plant collections of botanic gardens have often been regarded as a 'plant show' place and botanic gardens compete to increase the number of taxa of their living collections. An easy way to increase the taxa number is to obtain new collections from other botanic gardens. Therefore, botanic gardens are likely to have a high degree of overlapping collections. This attitude also resulted in collections of many cultivated plants in botanic gardens. The Magnolia garden of Shenzhen Fairy Lake Botanical Garden has more than 128 taxa of wild Magnolia plants and more than 50 taxa of cultivated Magnolia plants. This collection fashion does not fit well with the mission of conserving plant diversity in botanic gardens.

A thorough study has been undertaken on the living Magnolia collection in order to allow them to fit well with the goal of conserving plant diversity. First, the historical records of the living collections were computerized and studied in detail. For collections coming from other botanic gardens, information on the geographical site of the original collection was required and added into the records. Information on the conservation status from the IUCN Red List and China National Key Protected Wild Plants (1989) was added to the records. The historical plant performance information was integrated into the records and plant performance was observed carefully and recorded in the year of 2006. Analysis of the plant performance data found that success in developing fruit and time required for the plant to reach flowering age were two important factors correlated with Magnolia threatened status in the wild (Table 1).

	Number of taxa*							Percentage (%)	
	Total	China	IUCN	New	Combined	Flowering	Fruiting	Threatened	Flowering
Magnolia	28	4	3	5	8	7	0	28.6	87.5
Manglietia	23	4	12	8	15	10	6	65.2	66.7
Michelia	50	2	10	11	21	3	1	42.0	14.3

Table 1. The number and percentage of flowering, fruiting, and threatened taxa of Magnolia, Manglietia*, and* Michelia*.* ** China denotes protection by China national regulation, IUCN protection by IUCN, New newly recommended for protection, Combined a combination of all the three kinds of protection, Flowering in flowering age, Fruiting developing fruit.*

Confirming taxonomic identities of the living collection found that the identities of many taxa had been mistaken for years and several new taxa had been found. For example, *Manglietia stella* G. L. Jiao had been mistaken as *M. paruicula* Law et R. Z. Zhou for many years. Only when they started to flower and fruit (Figure 1), their novo taxonomic identity became evident. What is very interesting is that this tree grows very fast and is, very likely, the fourth kind of known fast growing tree after poplar, Paulownia, and eucalypt. Finding new taxa from living plant collections raised many questions as where they are in the field, what their conservation status is, if immediate conservation actions are needed, etc.

Figure 1. The flower (A) and fruit (B) of Manglietia stella *G. L. Jiao*

Studying the original collection data and interviewing those who did the collections allowed preliminary assessment of the conservation status of all the taxa in the living collections to be made (Table 2). To our surprise, China magnolias have a very high ratio of threatened taxa. The IUCN Red List includes more China Magnolia taxa than that of the China National Key Protected Wild Plants (Ministry of Agriculture, 1989), probably due to the more recent assessment of Chinese magnolias for the IUCN Red List than that for China National List. The study recommended a further 25 taxa to be included in the living Magnolia collections for protection. The total number of protected taxa from 128 taxa of the living Magnolia collection was 63, nearly 50%. China magnolias might be an exceptional case, but the very high ratio of threatened taxa makes conservation very difficult.

	Number of taxa
Wild Magnolia plants of the Magnolia Garden	128
Protection by China National List	18
Protection by IUCN	30
Recommended for protection from this study	25
Combination of the above 3 kind protections	63

Table 2. Number of protected taxa and recommended taxa for protection in the living Magnolia collections of Shenzhen Fairy Lake Botanical Garden

The newly published book, China Magnolias (Law *et al*., 2004), summarized almost all known China Magnolia plants. Based on information from this book, most of China magnolias had been discovered rather recently (Figure 2). We visited people who had many years field experience of magnolias to assign each Magnolia taxa a proper conservation status (Figure 2). Many newly discovered magnolias have no field information to assign conservation status but, very likely, are threatened.

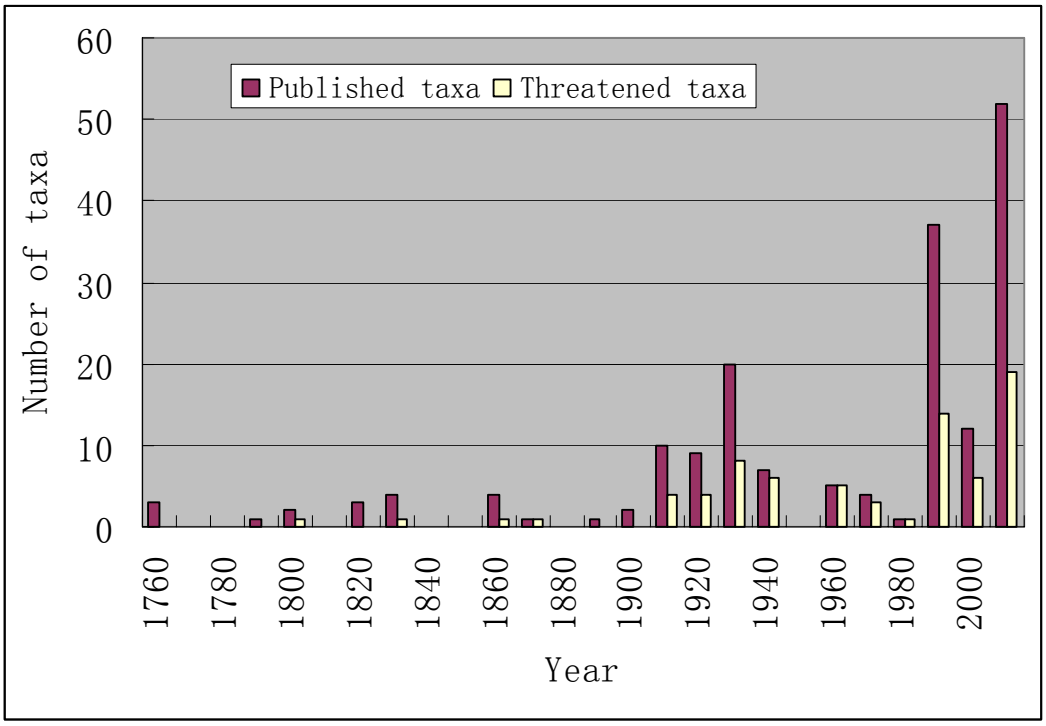

Figure 2. The number of published taxa and threatened taxa in very ten years over the discovering history of China magnolias

The threatened taxa were a combination of protection by China national regulation, IUCN, and recommendation for protection from this study.

Surveying magnolias in other ex situ collections and in field

In order to better focus our conservational work, we visited a number of living Magnolia collection sites to understand the ex situ conservation status of China magnolias. Living Magnolia collections very often started as a conservational project. A good number of Magnolia taxa had been collected during the project time. After the project was over, financial support ended and personnel doing collecting and gardening left. No further development of the collection occurred and the collections were left alone. Comparing with other collections, the living Magnolia collections of Shenzhen Fairy Lake Botanical Garden are outstanding because collecting and studying continued ever since its begin. It is evident that supporting ex situ conservation in the form of a grant for a few years is not proper. Ex situ conservation need to find a way to continue the work for long.

In order to confirm our work of assessment of China Magnolias conservation status, we conducted a field survey in southeast of Yunnan, China. In a field site of *Michelia pachycarpa* Y. H. Law et R. Z. Zhou (Figure 3), only tow giant tree were found. It was fruiting season and no a single fruit was found on the trees. A local guider told the author that there are about 50 individuals in the whole area and in some years seeds could be collected from the trees. The main threat comes from the local people who might cut the tree on any day for house building timber. Although a small number of individuals occurred in the field, a good number of individuals had been in ex situ collections.

Figure 3. Michelia pachycarpa *(A) and* Michelia ingrata *(B) in the field near Bazai of Maguan county of Yunnan, China*

The *Michelia ingrata* B. L. Chen et S. C. Yang site (Figure 3) was located on top of a small hill aside a village of Maguan county of Yunnan, China. Three big plants and one sapling were found. Two big plants had been cut in different years and the regenerated shoots had developed in different stages. It was in fruiting season and infertile fruit was found on the intact big tree. The local guider told the author that the tree rarely makes seeds. There are only three known sites and about 10 individuals in total. The site was very wet and limestone hill landscape provided good aeration for their root system. The plant provides a very hard case for ex situ conservation. Only one individual survived in ex situ collection so far and after 20 years growth the plant was a little more than one meter high.

Discussion

A lot of effort had been devoted into networking botanic gardens and individuals and applying governmental grant for plant conservation. The effort yielded nothing important when the application was rejected. We had presented here a case of an individual approach for plant conservation. People from one institution formed a group and used readily available resources to undertake tasks formulated in the GSPC. A working list of China magnolias was formed by computerizing the historical records of our Magnolia Garden. Taxonomical identification of the living collections resulted in finding of several new taxa. To understand the peculiar high ratio of threatened taxa in China magnolias, plant performance of flowering and fruiting in the living collections was analyzed and found that both factors were correlated with plant threatened status in the wild. A preliminary assessment of conservation status of China magnolias was achieved through interviewing people who collected the plants and had field experience of China magnolias. A big number of newly discovered magnolias had no proper field information for assigning conservation status. The current China magnolia ex situ conservation situation was assessed by visiting several ex situ conservation sites. Some once great ex situ collections are short of maintenance money. Field work had found very rare and critically endangered magnolias for future conservation work. All these important achievements demonstrate that serious

conservational targets could be met with individual approach of conservation. Each member of plant conservation community could consider what kind of GSPC targets could be met with readily available resources.

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