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Bamboo biodiversity

Africa, Madagascar and the Americas

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THE UNEP WORLD CONSERVATION MONITORING CENTRE is the biodiversity assessment and policy implementation arm of the United Nations Environment Programme (UNEP), the world's foremost intergovernmental environmental organization. UNEP-WCMC aims to help decision-makers recognize the value of biodiversity to people everywhere, and to apply this knowledge to all that they do. The Centre's challenge is to transform complex data into policy-relevant information, to build tools and systems for analysis and integration, and to support the needs of nations and the international community as they engage in joint programmes of action.

UNEP-WCMC provides objective, scientifically rigorous products and services that include ecosystem assessments, support for implementation of environmental agreements, regional and global biodiversity information, research on environmental threats and impacts, and development of future scenarios for the living world.

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THE INTERNATIONAL NETWORK FOR BAMBOO AND RATTAN (INBAR) is an international organization established by treaty in November 1997, dedicated to improving the social, economic, and environmental benefits of bamboo and rattan. INBAR connects a global network of partners from the government, private and not-for-profit sectors in over 50 countries to define and implement a global agenda for sustainable development through bamboo and rattan.

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Foreword

The bamboo plant supports an international trade, which (even according to our currently imperfect trade statistics) amounts to well over US$2 billion per year. International trade, however, forms only a part of bamboo usage, with domestic use estimated to account for at least 80 per cent of the total. Bamboo is thus a major world commodity.

Despite this, very little is known about the distribution and resources of bamboo. Certain bamboo species (e.g. Chinese Moso bamboo, *Phyllostachys edulis*) have formed the basis of major industrial development and have been domesticated into plantations. Perhaps 50 or 100 bamboo species are preferred for use and are undergoing some degree of domestication. However there are estimated to be nearly 1 500 species in total and the vast majority of these occur only in their native ranges, and many may have uses of local or wider significance that have yet to be documented. Unfortunately, as obligate components of forested ecosystems, their futures are bound up with the survival of their forest habitats. This work indicates that as forest ecosystems shrink under human pressure the survival of many potentially important bamboo species may be threatened.

This work is a first step towards quantifying existing resources of bamboo. Knowledge of the magnitude and distribution of these resources is a necessary precursor to planning and implementing conservation and sustainable management of bamboos in the wild.

The innovative approach used here can be applied to the study of other species associated with mapped ecosystems.

This study would not have been possible without collaboration between INBAR and UNEP-WCMC. It was the detailed map-based databases of UNEP-WCMC that made the development of the methodology possible. This study thus represents an excellent example of two organizations working together to combine their strengths.

Ian Hunter
Director General
International Network for Bamboo and Rattan

Preface

Wherever they occur, woody bamboos are of direct importance to people. They are used for everything from construction to irrigation systems, from musical instruments to food and fuel. Their greatest economic importance is in the Asia-Pacific region, but they are also fundamental to local economies in other regions of the world. Despite their value to humanity, we still know relatively little about most bamboos in the wild.

Bamboos are an ancient group of plants that play a distinctive role in the forest ecosystems of which they are a part. For example, they support a range of specialized and rare species, such as the greater bamboo lemur of Madagascar. This report (like its companion volume for the bamboos of the Asia-Pacific region) applies innovative approaches and analytical tools to expand our understanding of the ecological role of bamboos substantially. The authors have generated a revealing overview of the distribution of bamboos in Africa, Madagascar and the Americas, which provides the first sound basis for a description of their importance and an analysis of their conservation needs.

This work directly supports the *Global Strategy for Plant Conservation*, adopted under the Convention on Biological Diversity, which expressly recognizes the need for more knowledge on distribution and threats as a basic requirement for effective conservation measures. A Global Partnership for Plant Conservation has recently been formed to help implement the *Global Strategy*, and UNEP-WCMC is pleased to be one of its founding members. By assessing conservation status, identifying areas important for bamboo diversity and *in situ* conservation of threatened species, and providing information on the use of wild species, this report contributes directly to implementation of the *Global Strategy* and achievement of its targets.

Conserving such genetic resources as wild bamboos is an essential step towards solving the problems of poverty alleviation and sustainable development. Because of their many uses, bamboos exemplify the connection between biodiversity and livelihoods very clearly. This report will help range states to recognize, and value, the bamboo genetic resources on their own doorsteps, and to conserve them for future generations.

I welcome this opportunity to collaborate with INBAR, the world's bamboo and rattan trade network. I hope that our first analyses will form the basis for future in-depth assessments of bamboo resources and their conservation status. Bamboos are a fascinating group of plants that bring benefits to people everywhere; they should be conserved as an important resource for all our futures.

Mark Collins
Director
UNEP World Conservation Monitoring Centre

Bamboo biodiversity

Bamboos are distinct and fascinating plants, with a wide range of values and uses. Although their diversity and their importance are highest in, and have been best documented for, the Asia-Pacific region, they are also important in continental Africa, Madagascar and the Americas. Worldwide they are associated with unique elements of biodiversity, many with great conservation significance. They are important in local cultures and economies, and contribute to soil and water management. The purpose of the present study is to synthesize existing knowledge to provide an overview of the richness and distribution of woody bamboos in Africa, Madagascar and the Americas. It shows that a number of bamboo species in these regions are potentially threatened by the destruction of natural forest cover. Conservation and sustainable management of wild populations of bamboo should be a priority, especially where diversity is high or deforestation is a significant threat.

Bamboos are plants of global interest because of their distinctive life form, their ecological importance and the wide range of uses and values they have for humans. Woody bamboos are an ancient group of forest plants, which evolved in the lowland tropics of Gondwanaland during the Tertiary (Clark 1997).

Bamboos are a significant structural component of many forest ecosystems and play a major role in ecosystem dynamics through their distinctive cycles of mass flowering and subsequent die-off, which may increase the importance of fire (Keeley and Bond 1999). Inhabiting moister, more benign habitats in old-growth forests, bamboos are often associated with threatened plants, and there are many specialized animal species that depend upon them. There are also many little-known invertebrates specially adapted to the environment within hollow bamboo culms. These specialized relationships, which reflect a long history of co-evolution between bamboos and other species, can shed light on evolutionary and ecological processes.

Bamboos are multipurpose crops, with over 1 500 documented uses. Their most important traditional uses include housing, food and material for handicrafts. Worldwide, over 2.5 billion people trade in or use bamboo (INBAR 1999). Globally, domestic trade and subsistence use of bamboo are estimated to be worth US$4.5 billion per year, and export of bamboo generates another US$2.7 billion (INBAR 1999). The many uses and the economic importance of bamboo mean that it plays a considerable role in improving the livelihoods of rural poor people. The

In East Africa the 'Endangered' mountain bongo (*Tragelaphus euryceros* ssp. *isaaci*) relies on montane bamboo thickets for food and shelter during the dry season.

rural poor, especially women and children, harvest much of the bamboo used.

The extensive rhizome system of bamboos lies primarily in the top layers of soil, so bamboos often play a major role in stabilizing soils on slopes and river banks, preventing erosion and land slips. This also makes them important in securing the hydrological function of catchments and rivers. Many forest bamboos are characteristic of high-altitude ecosystems on steep slopes in zones of high seismic activity, so their role in soil stabilization may be critical.

The scientific, environmental, economic and social importance of bamboos means that it is essential that strategies be developed for their sustainable management. However, knowledge to support such planning is limited.

Bamboos are of conservation significance in their own right and may also serve as indicators of high biodiversity in other groups. As most bamboo species are potentially threatened bamboos outside the Asia-Pacific region. In this work, we extend the approach used by Bystriakova *et al.* (2003a,b) to Africa, Madagascar and the Americas, to synthesize existing knowledge on bamboo distribution and identify bamboo species in the three focal regions that may be of conservation concern.

STATE OF KNOWLEDGE OF BAMBOOS, BAMBOO RESOURCES AND THEIR MANAGEMENT

Despite their importance, very little is known about bamboo distribution and resources, especially in natural forests. As a non-timber forest product, bamboo is not routinely included in forest inventories. According to the FAO (2001), statistical data on bamboo are available for the period 1954 to 1971 only. Today, very few countries monitor non-timber forest product (NTFP) supply and utilization at the national level. The difficulty of assessing bamboo (and other NTFP) resources and their use arises from:

- uncertainty associated with their taxonomy (see below);
- the large number of, and wide variation in, their uses at local, national and international levels;
- the fact that many bamboo products are used or marketed outside traditional economic structures;
- the lack of common terminology and units of measurement (FAO 2001).

The description of bamboos is an ongoing process; not only do new species remain to be discovered and described, many earlier descriptions and classifications of species are being revised. According to Ohrnberger (1999), the subfamily Bambusoideae (of the family Poaceae, or Gramineae) comprises both woody and herbaceous bamboos with 1 575 species altogether. In the most recent (and narrower) classification (Grass Phylogeny Working Group 2001) the subfamily Bambusoideae includes two tribes and approximately 1 200 species.

Although some bamboos have been the subject of