

Biocultural conservation as a botanic garden conservation strategy

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Abstract

Concerns continue to mount regarding potential impacts of global climate change, habitat loss, and other environmental changes on the world's biota and peoples, especially in island systems. Just as floristic diversity is impacted by environmental change, so too are cultural and linguistic diversity. It is not enough to consider just the effects of environmental change on plant life within the context of the Global Strategy for Plant Conservation and the Convention on Biological Diversity. Rather, botanic gardens should actively engage in understanding the broader impacts of environmental change to biocultural diversity.

Key words

Biocultural diversity, botanic gardens, CBD, endangered languages, GSPC, hotspots, islands

Introduction

Historically, botanic gardens have focused primarily on aesthetically appealing displays, plant exploration and collecting, and taxonomy. The social relevance of gardens to the general public has been largely recreational and aesthetic. Until the mid-20th Century, many botanic gardens and arboreta offered little else to public users and visitors.

As a result of well-documented threats to the world's biological diversity, many botanic gardens now consider conservation as a key component of their programmes and mission. In addition to biological conservation, botanic gardens have new opportunities to increase their relevance, importance, and appreciation by embracing biocultural conservation.

Global plant conservation

Attention to plant conservation and biodiversity is an important way for gardens to regain social relevance (Maunder *et al.*, 2001). It is well-documented that a large proportion of plants and animals are at risk of extinction, with the magnitude of risk varying by region of the world (Myers *et al.*, 2000; Thomas *et al.*, 2004) (Table 1). Thomas *et al.* (2004) estimate that up to 30% of all species will face serious extinction risks by 2050. In the Hawaiian Islands, for example, 90% of the 1200 native flowering plant taxa are endemic to the islands, with more than 30% listed by the US Fish & Wildlife Service as threatened or endangered. Given continued threats from land use change, urban development, invasive species, climate change, and sea level rise, the threats of extinction are likely to increase.

Table 1. Extinction risks for plants in four world regions (from Thomas *et al.*, 2004)

Region	% of plants at risk
Amazonia	53-87
Cerrado (Brazil)	40-50
South African Proteaceae	24-34
Europe	4-17

As threats to plants escalate, other organisms within their ecological setting are also threatened. Recognition of the broader threats to entire ecological systems has led to the identification of “biodiversity hotspots” (Myers *et al.*, 2000); namely, regions of the world that face particularly grave threats to ecosystems and ecosystem integrity. Recognition of such hotspots (most of which are concentrated in the tropics, island systems, and Mediterranean) has been useful in shaping conservation priorities and strategies.

Hawai'i is included in the Polynesia/Micronesia hotspot (Myers, 2000). Because of the high extinction risks to plants and the high endemism in these islands, the efforts of many conservation organizations and government programmes are needed to meet the extinction challenge. To avoid redundancy of effort, many organizations focus on some specific aspect of the larger conservation imperative. Lyon Arboretum in Honolulu, Hawai'i, for example, specializes in *ex-situ* conservation using micropropagation, or tissue culture. Of the 400 threatened or endangered Hawaiian plant taxa, 200 are now in tissue culture; five of these are extinct in the wild.

Climate change presents considerable challenges for the natural world, botanic garden management, and home gardening. Studies at the Royal Botanic Gardens, Kew (UK) and the Arnold Arboretum (Harvard University, USA) clearly demonstrate the changing phenology of plants during the past century. At RBG Kew, for example, many spring flowering plants now bloom 1–3 weeks earlier than 20–30 years ago (Bell, 2007; Royal Botanic Gardens Kew, 2008). Such phenological data are readily obtained from plant collections and curatorial records at botanic gardens and herbaria. Thus, the critical importance of botanic garden resources, data, and scientific programmes to better understanding global environmental issues cannot be overstated. Yet, few botanic gardens and botanic gardens associations have developed clear strategies to adapt to climate change. Notable exceptions include BGCI and Australian botanic gardens (Council of Heads of Australian Botanic Gardens, 2008).

Loss of cultures and languages: the special vulnerability of islands

Largely lost in the discussion of loss of plant diversity is its effect on human cultures. Loss of “cultural keystone species” as a result of environmental changes will severely compromise cultural integrity. In the most vulnerable parts of the world (e.g., Pacific Island nations), the effects of environmental changes (such as sea level rise) threaten to erode biological diversity as well as cultural and language diversity. As botanic gardens (and other plant conservation organizations) develop and implement conservation strategies, they have a unique opportunity to participate in cultural and linguistic restoration.

Concerns about the present and future loss of plant species are considerable. By some estimates, the world could be losing 25–50 plant taxa per year (Peter Raven, pers. comm.), or about 100 times the background rate of 1 extinction per million species per year (Stuart Pimm, pers. comm.). Sutherland (2003) documented threats to birds, mammals, and languages (Table 2) using the IUCN-based threat categories of critical, endangered, and vulnerable (IUCN, 2001). He showed that 12% of birds and 24% of mammals worldwide are at risk. He further attempted to fit IUCN criteria to the world's languages. By his estimation, 25% of languages are at risk. Most linguists who document endangered languages put this number considerably higher. The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2013) estimates that of the ca. 6900 extant languages, 50% are endangered and the world is losing, over the long-term, one language every two weeks. Linguists now identify and map “language extinction hotspots” (e.g., National Geographic Society's Enduring Voices Project; NGS, 2013). Human culture is at greater risk than other biotic elements. Loss of cultures and languages results in lost knowledge of the plant world, of the uses of plants, and traditional ecological knowledge, not to mention loss of a significant part of our humanity.

Plant and of cultural/language diversity are linked in significant ways. As threats (climate change, sea level rise, land conversion) to Pacific Island nations increase, threats to various “cultural

keystone species” (see Garibaldi and Turner, 2004) also increase. For example, many Pacific cultures rely on *Colocasia esculenta* (L.) Schott (taro) for food and for spiritual purposes, with many such cultures of the belief that their ancestry derives from taro. Thus, if taro (or other culturally significant plants) were to disappear, so too will that people’s cultural integrity. Taro is so central to some cultures that, for instance, the Vanua Lavans state, “we do grow taro to live, we live to grow taro” (Caillon and Desgeorges, 2007). Loss of culture and language is not restricted to the Pacific nor to islands.

Table 2. Global threats to three entities of conservation concern (from Sutherland, 2003).

<u>Category</u>	<u>Critical</u>	<u>Endangered</u>	<u>Vulnerable</u>	<u>Extant</u>	<u>% C, E or V</u>
Birds	182	321	680	9797	12
Mammals	180	340	610	4630	24
Languages	43	506	732	6809	25

Because biological diversity and cultural diversity are linked, considerations of “biocultural diversity” (Maffi, 2001, 2005; Dunn, 2008) and conservation should be key elements of any restoration and recovery strategy. Awareness of this link between erosion of biological and cultural integrity has led to the suggestion of hotspots and indices of biocultural diversity (Loh and Harmon, 2005). It is no coincidence that hotspots of biological and biocultural diversity overlap considerably, and is a useful reminder of the interdependence of natural and human communities. As early as the 1980s, the French 1965 Nobel Laureate in Medicine, Francois Jacob (1982), noted that “in humans, natural diversity is further strengthened by cultural diversity.”

Botanic gardens conservation and biocultural diversity

Acknowledging threats to both biological and cultural aspects of the world has been incorporated into important global strategies. Article 8(j) of the Convention on Biological Diversity (CBD, 1992) encourages all nations to “...respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities...for the conservation and sustainable use of biological diversity.” As important a statement as this is, it places primacy on conserving biological heritage, rather than on cultural and human heritage (Dunn, 2008). Nonetheless, it does recognize the link between biological and cultural diversity.

More satisfying is Target 13 of the *Global Strategy for Plant Conservation* (BGCI, 2012) which states “Indigenous and local knowledge, innovations and practices associated with plant resources, [be] maintained or increased, as appropriate, to support customary use, sustainable livelihoods, local food security and health care.” Here plant life and cultures are considered equally.

Botanic gardens are taking an increasingly prominent role in local and global plant conservation efforts (Maunder *et al.*, 2001; Miller *et al.*, 2004; Blackmore *et al.*, 2011; Wyse Jackson and Sharrock, 2011). Given that erosion of biological diversity can lead to erosion of cultural diversity, botanic gardens with a strong conservation mission have an opportunity to play a key role in biocultural conservation (Dunn, 2008). This role can take any number of forms, from training indigenous peoples in conservation methods to learning from indigenous peoples regarding traditional ecological knowledge, and learning local languages. The Lyon Arboretum (University of Hawai’i) has incorporated the concept of biocultural conservation into its mission statement and is leading an effort to establish a new Center for Biocultural Studies at the University of Hawai’i. The Center brings together faculty and students who are concerned about threats to biocultural diversity from the viewpoints of anthropology, ethnobotany, ethnoecology, ethics, law, linguistics, political science, and other disciplines. In addition, the arboretum is developing memoranda of agreement with other institutions in the Pacific (University of Auckland, University of the South Pacific) and has signed a formal Memorandum of Agreement with the Smithsonian Institution (National Museum of Natural History) to facilitate exchange of information, faculty, and students.

For gardens without international activities, increasing awareness of threats to biocultural diversity can be incorporated into education programmes and special events. Many gardens are located in regions with diverse cultures and ethnicities. The Queens Botanical Garden (New York City) has a rich tapestry of events that encourage residents to express their cultural heritage within the context of a metropolitan botanic garden. The Garden's mission statement (2013) directly interrelates "people, plants, and culture...innovative educational programs and demonstrations of environmental stewardship" (Queens Botanical Garden, 2013).

For new gardens in the process of developing a conservation strategy, incorporating biological and cultural diversity is much simpler than for long-established gardens, and will immediately raise their profile on the global conservation stage. As a new arboretum is being established on the west coast of South Korea (Dunn, 2012), a great opportunity exists to take a leading role in biocultural conservation and in implementing the resolution (M041) passed at the 2012 IUCN World Conservation Congress in Jeju, which explicitly addresses biological and cultural diversity in Korea and East Asia.

Conclusions

As botanic gardens and arboreta position themselves for the future, they should not lose sight of their core mission. However, it is necessary that conservation science at gardens consider ways in which cultural diversity can be incorporated into broader conservation programmes and strategies. Partnerships with other organizations is one way to more efficiently and effectively develop strong and meaningful initiatives. As threats to biological diversity intensify globally, threats to cultural diversity also intensify. Thus, there is a dual imperative for all gardens engaged in plant conservation to consider innovative ways in which they can enhance and increase awareness of cultural diversity as part of their conservation mission.

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