

## CORRESPONDENCE

### Orchid Gardens: a species survival tool for a changing planet

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When it comes to speciation and diversification, the myriad members of the Orchidaceae comprise the most successful plant family on earth. Global in their distribution with a high degree of endemism and often very stringent and specific ecological requirements (i. e. species specific pollinators, mycorrhizal and bacterial symbionts, associations with specific trees and adaptation to precise temperatures and climates), orchids may well be the most interdependent of organisms. Their ultimate survival is intrinsically linked with the continued existence of biodiversity on our planet. Beautiful and fascinating, they are far more than just decorations and novelties created by mother nature for our enjoyment.

Preserving this degree of diversity is a monumental task that cannot be performed by one entity. In crisis and on the brink of a mass extinction, it is incumbent on proponents in academia, horticulture and conservation to take serious action on their behalf. Passionate communities exist in the orchid world, all of whom wish to be stewards of the outstanding biodiversity represented in the Orchidaceae. Much progress has been made in recent years to discourage poaching and illegal trade, establish reserves, such as Yotoco and Ecominga, banking of seed and mycorrhizae for future propagation and perhaps most importantly, the knowledge and expertise of the horticultural community to best understand the environmental needs of individual species so we can proficiently cultivate, propagate and hopefully, eventually return them to their historic habitats.

Reintroduction of species to degraded and subsequently restored habitats is a lofty goal and an increasingly unlikely eventuality in a world undergoing climate change. About 5 years ago, the conversation on global warming shifted from “How do we prevent

it?” to “How will we cope with it?” If indeed, climate change is our planet’s destiny, we have a choice to make. Do we allow mass extinction to occur and have only the strong, weedy and adaptable survive? (A world of dandelions and roaches?) Or do we build an *ark* to preserve as much as we can for as long as we can? We are at a crossroads and what pro-active steps we take in the next decade will determine what survives and what does not.

Aside from being global in their distribution, orchids are also globally admired, cultivated and appreciated. If the many factions of the orchid world: ecologists, taxonomists, horticulturists, conservationists, commercial growers as well as the hundreds of thousands of enthusiasts around the world unified around orchid conservation goals, a truly formidable force could be generated. I believe botanical gardens have the capacity to bring together these disparate groups and I am proposing that a **Global Orchid Garden Network** must be created to begin this important work.

Botanical gardens have been keeping orchids in collections for almost 2 centuries and are good at what they do, but the type of orchid gardens/reserves I’m referring to need to be very near natural habitats. As hard as I might try, I can’t replicate an Andean Cloud forest in greenhouse in Washington DC. The wise crafters of the Global Strategy for Plant Conservation (GSPC) have specified rightly in Targets 7 and 8 that species conservation should be conducted in the country of origin. This not only allows for the right cultural conditions, including nearby presence of natural pollinators, arboreal hosts and other symbionts, it allows individual countries to control and assess the value and significance their precious botanical heritage.

As refugia for species adjacent to their natural habitats, orchid gardens offer, similar climatic conditions, local arboreal host species, local fungi, replicable soils and hydrology, presence of natural pollinators, natural population diversity and most importantly, Mother nature does the growing! In addition gardens offer protection from poaching, and habitat degradation. With such easy access and monitoring capability, learning opportunities will abound, i. e. DNA for cladistic studies will be easily accessed, ecological observations such as pollination are facilitated, and experimentation with cultivation techniques can be carried out. Indeed, the mysteries of mycorrhizal associations crucial to the long-term survival of orchids and many other plants can be studied and harnessed.

The fact is, many botanical gardens, tourist organizations, commercial growers and orchid enthusiasts already grow orchids in gardens around the world. Many of these *ex-situ* collections store and preserve important biodiversity often highly endemic to the local environs that could contribute substantially to worldwide orchid conservation efforts. Nonetheless, many of these collections are completely undocumented and there is currently no vehicle for including these species in red-list assessments and recovery programs. If a designated in-country authority (a local university, botanic garden or conservation organization despatched staff, graduate or undergraduate students (or even advanced citizen scientists) to these collections and catalogued them, we could then assign red-list assessments to be done, which in turn would facilitate propagation and redistribution programs. Thousands of orchid species could be preserved and shared in-country with this approach.

Costa Rica is a model country to begin this type of initiative in that Lankester Botanical Garden, operated by the University of Costa Rica has a staff very interested in pursuing such a strategy, a large *ex-situ* repository of orchid species, myriad untapped tourist oriented orchid gardens across the country that could be reasonably easily assessed as well as a vibrant hobbyist community that could participate. Extensive orchid gardens full of local endemics are housed in places like Bosque de Paz in Costa Rica, Inkatererra near Machu Picchu in Peru and Kings Park Botanic Garden in Perth to name just a few.

As outlined in Target 16, of the GSPC we aim to develop a coordinated, informed, ethical and standardized approach towards orchid species conservation by providing access to the knowledge, expertise, infrastructure and capacity offered by disparate stakeholders, often working in isolation, yet all of whom have the same objectives, with larger institutions helping and mentoring those with less infrastructure. The combined passion and motivation of these groups would be formidable once focused into a cohesive and coordinated whole.

Stakeholders in a global orchid garden network would include botanic gardens (offering capacity, databasing, horticulture), tourist-oriented orchid gardens (offering enhanced, ex-situ habitat, natural pollinators, unique germplasm and sanctuary from poaching and deforestation), reserves (in-situ protected populations where natural orchid ecology can still be observed), universities, museums, and herbaria (offering scholarly, taxonomic and technological resources), advocacy groups (facilitating dissemination of information through publications and social media), commercial growers and enthusiasts (offering diverse plant collections; untapped conservation resource), and conservation organizations (offering the framework for all stakeholders to participate in conservation efforts). By sharing resources, such as databases, registrars, seedbanks, mycorrhizal banks, laboratories, nurseries, horticultural & ecological knowledge, as well as capacity, we can more fully realize the unique potential of the orchid world to put all the pieces of the conservation puzzle together. Establishing a global orchid garden is in effect an International Orchid Conservation Network. With this network we could (1) build a worldwide database of orchids in cultivation and *ex-situ* conservation gardens, (2) contribute to the reaching the goals of targets 7, 8 and 16 in the GSPC, (3) include numerous previously undocumented species in conservation efforts, and (4) educate and include an enthusiastic community into the conservation effort. Finally, we could develop a global map that shows where orchid conservation projects are being conducted and identify areas where more such work is needed.

As part of this initiative, Gardens also need to adopt the protocols successfully used by zoos for the conservation of endangered animals (i.e., the

establishment of species survival plans and taxon advisory groups). I believe these groups already exist such as Slipper Orchid Alliance, Pleurothallid Alliance and Angraecoid Alliance. The expertise and passion of such groups needs to be harnessed in conservation context to ensure the survival of species in-situ and ex-situ with real species survival plans.

In North America, the North American Orchid Conservation Center (NAOCC) soon to be Smithsonian International Orchid Conservation Center (SIOCC) is putting these tactics to use for over 200 or so orchid species native to the US and Canada. By dividing into regional groups and enlisting passionate stakeholders in different parts of the country, we are collecting seed, mycorrhizae and monitoring populations across the continent. We are actively developing plans to use these resources for species cultivation, preservation and eventual use in horticulture as well as reintroductions where appropriate. We plan to share our discoveries

and innovations in publications, and workshops in the near future.

With the desire to take the NAOCC model global, and the creation of such a worldwide network in mind, we have proposed a meeting at the upcoming IUCN World Symposium this September to invite and enlist support of worldwide stakeholders for an international orchid conservation initiative. In-country authorities (i. e. botanic gardens, universities, and conservation organizations) willing and able to do the necessary outreach have the capacity to collaboratively design a program that will combine our disparate approaches to orchid conservation into an impeccable moral, legal, progressive and pro-active way forward for a broader community. We wish to establish an inclusive conservation community where we can all help educate each other and contribute to a better future for the orchid world with focus, passion and positivity. We hope you will join us!

