



BGCI Technical Review

The importance of botanic gardens
in tackling the illegal plant trade



**BOTANIC
GARDENS**
CONSERVATION
INTERNATIONAL

BGCI Technical Review

The importance of botanic gardens in tackling the illegal plant trade

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Acknowledgements



Crassula columnaris (BGCI Photo Library)

This technical review is a collaborative effort, telling the story of botanic garden interactions with illegal plant trade as well as the specific stories and actions taken by them. A full list of contributing organisations is given in Annex 1 and we thank all who took the time to complete the survey which forms the foundation of this report. Additionally, we share our thanks to everyone who contributed images and case studies. All individual credits are given alongside images and case studies. Additional thanks to UK Border Force for use of their images. Institutional contribution is also recognised on page 38 of this report.

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Abbreviations

ABS	Access and Benefit Sharing
BGCI	Botanic Gardens Conservation International
CBD	Convention on Biological Diversity
CITES	Convention on the International Trade in Endangered Species
GPPC	Global Partnership for Plant Conservation
GSPC	Global Strategy for Plant Conservation
IUCN SSC	International Union for the Conservation of Nature Species Survival Commission
UNODC	United Nations Office of Drugs and Crime
USFWS	United States Fish and Wildlife Services

Cover images:

Top left: Confiscated bulbous plants in South Africa (Emily Kudze, SANBI)

Top Middle: *Astrophytum asterias* with Border Force officer (UK Border Force)

Top right: The endangered *Parodia haselbergii* growing in Jardim Botânico, Caxias do Sul BG Brazil

Middle left: *Conophytum bilobum* subsp. *gracilistylum* (Emily Kudze, SANBI)

Middle right: *Pachypodium geayi* (BGCI Image Library)

Bottom left: Cycad collection, Durban Botanic Garden

Bottom right: *Astrophytum asterias* with officer (UK Border force)

Executive Summary



Cycad Collection Kirstenbosch Botanic Garden (BGCI Image Library)

Plant poaching is on the rise. Plants are being plundered from the wild and even plucked from our very own botanic garden collections. This is resulting in the loss of many species; both in the form of functional extinction in the wild to complete extinction from our planet.

So, what can we in botanic gardens do about this? BGCI was commissioned by its International Advisory Council in July 2023 to undertake a survey of botanic gardens for us to understand the role they are playing in tackling the illegal trade of plants. We undertook a survey of all our members, which covered topics including strategy and implementation, species inventory, who our audience is, challenges and obstacles facing gardens in tackling illegal plant trade and the research and technology that botanic gardens are undertaking to deal with this problem. The survey also provided an opportunity for respondents to share case studies showcasing practical examples of actions they are taking in addressing illegal plant trade.

Botanic gardens are repositories for lots of rare and threatened plant material and yet more than half of the gardens who completed the survey did not employ a strategy to reduce the demand for illegally traded plants. We need to change this and support each other in developing and implementing such strategies that will assist in reducing plant poaching. The South African National Biodiversity Institute in collaboration with government and NGO partners assisted in developing a National Response Strategy and Action Plan for succulent plants in South Africa. The key activities of the strategy are provided in a case study and could be the impetus for more gardens to develop their own strategies.

This review provides a robust baseline to help us understand what role botanic gardens are playing in tackling this global problem. One obvious solution is to raise awareness amongst our visitors of the damage caused by buying plants from unsustainable sources, including through social media platforms. Responses to this question show the botanic gardens are engaging with our visitors, yet we found that it is a difficult subject to engage visitors on, in one aspect it's very complex to explain and then it may not be the information garden visitors want to hear. Some excellent examples are provided, for instance Naples Botanic Garden in Florida have their volunteers sharing this exact information on garden tours, and at the Huntington Gardens in California, they use signage to highlight that they too have been victims of plant theft.

Looking at the plant species which are provided refuge in botanic gardens following confiscation by law enforcement, there were no species unknown to the illegal plant trade. Plant species listed in the Appendices of The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) were all identified by the survey respondents. These include orchids, cycads, cacti and carnivorous plants. The vast majority of succulent plant species are also now being received as confiscations, but many are not yet listed on CITES.

This technical review finishes with calls to action for the global botanic garden community and for botanic gardens as individuals, it provides implementable actions at various levels as a multi-pronged approach is needed to tackle this global, growing issue. This will not easily be remedied but botanic gardens are ideally placed to lead the solutions. Indeed, BGCI is developing an evergreen behavioural change campaign with partner botanic gardens and organisations, to raise awareness and highlight the loss of our precious plant species and biodiversity integrity at a larger scale. BGCI encourages you to take up the call to action and join our campaign to raise awareness of the illegal trade of plant species.

Introduction



Conophytum flavum subsp. *novicium* (Emily Kudze SANBI)

Many plant species are threatened in the wild due to their use and trade. In fact, five times more wild plants are harvested and traded annually than animals (UNODC 2020). Although not all are threatened by this activity, there is a growing concern in the conservation and botanic garden community about plant trade and in particular the growing threat of illegal plant trade.

The breadth of plant species in trade is wide, and traditionally split into medicinal, agricultural, timber and ornamental species. Wild plants are subject to illegal harvest and trade for a variety of reasons such as their ornamental attraction, value and rarity, medicinal uses and non-timber products (resins, perfumes, etc.).

Different parts of plants may also be traded, such as seeds, leaves, flowers and manufactured materials. For this technical review we are focusing on the trade of live plants in horticulture and ornamental trade, as this is most relevant to botanic gardens.

Many botanic garden visitor favourites are at risk in the wild (pages 8 & 9). For example, at least nine species of succulent are assumed to have gone extinct in the last five years due to poaching in South Africa (SANBI pers. comm. 2023). For orchids there is a similar story, with cases of recently described species becoming functionally extinct in the wild within one year of scientific identification (Averyanov et al. 2014). Other groups experiencing this decline are cacti, cycads and many medicinal plant species [Case Study 1]. There are increasing examples of large volumes of these different plant groups being illegally harvested in the wild, trafficked across borders and sold on to a variety of consumers. One of the main drivers for this trade is the increased use and access to the internet for sales and purchases (Box 1).



Cycad (BGCI Image Library)

Beyond the individual threat to species from illegal plant trade, there are much broader impacts. The loss of species contributes to an overall loss in biodiversity and ecosystem disruption. Alongside this, there is a loss of cultural and traditional knowledge, often associated with the use of these species locally which can also represent a threat to traditional incomes. Economic impact is on a local scale, impacting legal markets and livelihoods of those dependent on sustainable trade but also nationally there is a loss of revenue from taxes and fees related to legal plant sales. Finally, and maybe of growing relevance is the spread of invasive pests and diseases and plants themselves, as illegally traded plants are not subject to the same scrutiny as material imported legally (Box 7).

Despite these numerous issues and the growing threat to plants from trafficking there is still a lack of public awareness that such trade occurs and is leading to species extinction. There can also be a lack of attention on traded plant species from policy makers, and enforcement officials in comparison to charismatic animals subject to trade and due to restrictions in financial and other resources available for plants.

Consumers in Europe, the UK, US and China are considered to be those driving the demand for wild harvested species. However, the species impacted by illegal wildlife trade are found in many biodiversity hotspots such as Mexico, South Africa, Indonesia and many other parts of the world. Due to this global spread of supply and demand, botanic gardens are perfectly positioned to help tackle the illegal plant trade as they are found in over 100 countries. Many countries have national botanic garden networks, and the key focus of many is to engage their visitors with relevant information.

Box 1: The Role of the Internet



Wildlife crime linked to the Internet is defined in the [CITES Glossary](#) as: Crime involving any wildlife specimen, enabled or facilitated by the use of information and communication technology networks or any application in the digital world, including inter alia the public (clear) web, the dark web, online marketplaces, social network platforms, instant chat applications, peer to peer networks or email services.

The internet is the largest global marketplace and it is projected to increase steadily. Numerous businesses have taken advantage of the digital consumer population and unfortunately so have criminals, for all the benefits of the internet it also provides illegal traders ambiguity and distance from enquiries. With the advent of the internet, the threat to plant species from illicit activity is growing due to the multitude of interactions it offers to both traders and consumers. Several terms are used to refer to illegal wildlife trade online, these include internet-facilitated wildlife crime, wildlife cybercrime, the illegal online trade in wildlife, wildlife trafficking online and wildlife trafficking linked to the internet.

How the internet is used for wildlife crimes by cybercriminals is not fully understood, and the scope and significance of the internet to trafficking of wildlife remains undetermined (Lavorgna et al. 2020). Enforcement of cybercrime is complex, and monitoring of illegal plant markets continues to be poorly resourced. Enforcement agencies have insufficient skills to identify many plant species, and many are not trained botanists. Technical capacity for investigations and prosecution services are often focused on higher profile crimes such as narcotics, weapons and human trafficking. Still much is being done to combat wildlife crimes on the internet [[Case Study 12](#)].

As custodians of plant diversity botanic gardens have a huge role to play in the protection of threatened plant species. Botanic gardens are often the authorities of plant expertise in countries, they have national and global reach enabling them to have a great impact outside their garden walls. Botanic gardens provide a unique resource in collections, expertise and contact with visitors and local communities to contribute and promote a sustainable international plant trade. It is through these resources that botanic gardens can maximise their impact for protecting species and raising awareness of threats to plants.

Botanic gardens are uniquely placed to take action to tackle the illicit movement of plants and many are already doing so. In this technical review we will examine the different methods by which botanic gardens help protect plant species from illegal trade, opportunities for other botanic gardens to be involved and challenges that are being faced. Case studies will be highlighted throughout the report, alongside key BGCI resources.

Focal groups of the illegal plants trade

CACTI



There are an estimated 1,500 species of Cactaceae found in the New World across North, Central and South America. Species in Chilean deserts, as well as Mexico are particularly targeted for the illegal plant trade. All Cactaceae are listed on CITES, with the higher risk species being listed on Appendix I. Individuals most frequently found in trade are globular cacti to be kept as house plants.

Species example: *Mammillaria* spp. (Arias et al. 2005, Hernández Rosas 2017), *Atrophytum asterias*



The endangered *Parodia rechensis* growing in Caxias do Sul BG Brazil

SUCCULENTS



Succulent plants have a broad botanical definition, that includes numerous species from different plant families. Some common families are Euphorbiaceae, Aizoaceae and Crassulaceae. The term succulent is used to describe plants which have thickened, fleshy or engorged parts and retain a fluid for survival in arid areas they inhabit. Similar to cacti, the favoured succulents in trade are small. They often occur in small numbers, and are hard to find or monitor unless in flower. The plants are harvested for houseplants. The illegal trade of this group is currently focused in southern Africa e.g. Namibia. [Case Study 13]

Species example: *Conophytum* spp. see Marquies et al. 2023



Conophytum bilobum subsp. *gracilistylum* (Emily Kudze, SANBI)

CYCADS



All species of Cycad are listed on the CITES appendices. There are 376 (Calonje et al. 2013-2024) species of Cycad. Of those that are assessed on the IUCN Red List, 68% (IUCN 2024) are threatened with extinction making them one of the most at risk plant groups. Cycads are found in cultivation across the globe. Ornamentally they are found as house plants and in home gardens as well as botanic garden collections. Some species also have medical properties, but it is the ornamental trade of live specimens of particularly uncommon species (The Wild Cycad Conservancy 2024) that is a major threat to this ancient plant lineage.

Species example: *Microcycas calocoma* [Case Study 10] *Encephalartos* spp. (Williamson et al. 2016)



Cycad (San Diego Botanic Garden, US)

ORCHIDS



Orchidaceae is the most diverse plant family but not all orchids are known to science yet. Current estimates suggest there are at least 30,000 species. Orchids are valued for ornamental display, presenting in different colours, shapes and sizes. Orchidaceae boasts

some of the rarest plants, known from just a single locality or very few individuals (Hinsley et al. 2018). It is this rarity that puts them at significant risk from plant collectors and illegal plant trade. Due to this all species of Orchidaceae are listed on CITES.

Species example: *Cypripedium* spp. [Case Study 11]
Pahioepidulum (Averyanov et al. 2014)



Bletia purpurea (Brett Adams, Belize BG)

OTHER GROUPS OF CONCERN



In different countries, groups outside of these iconic four plants may be at risk, for example across the US carnivorous plants are targeted for national and international trade this includes species of pitcher plant (Family Sarraceniaceae) and wild individuals of Venus fly traps –

despite their wide cultivation for horticultural trade. In other places such as China, Magnolia species are at risk (Rivers et al. 2016) due to their ornamental and horticultural value as well as the non-forest products (such as health teas) that can be derived from them.

Example: *Yucca queretaroensis* and *Ceratozamia hildae* in Mexico [Case Study 15]



Magnolia sharpii
(Neptali Ramirez Marcial)



Cycad Collection Kirstenbosch Botanic Garden, South Africa



Cycas revoluta Barcelona Botanic Gardens, Spain

Case Study 1: Law and Protecting the World's Plants

BGCI
Resource
Available

END
WILDLIFE
CRIME

John E Scanlon AO

The **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)** plays a critical role in protecting plant species from overexploitation. It does this by regulating and monitoring international trade in about 35,000 plant species – the majority of which are orchids. These are the species listed in the various appendices to the Convention, and new species can be listed, and existing species can be uplisted or downlisted (meaning being given a different level of protection) or delisted, by following the processes outlined in the Convention.

CITES primary mandate is to ensure that any international trade in specimens of a listed species, including their parts and derivatives, does not threaten their survival, which it advances through a structured system of appendices, permits, certificates, scientific assessments, compliance processes, and international cooperation. By aiming to ensure that any exploitation of these plants for international trade is sustainable, CITES contributes towards broader efforts to protect biodiversity. It does not, however, address the domestic taking or consumption of plants, or trade in plant species that are not listed in its appendices. Interestingly, CITES has not yet included any fungal species in its appendices.

CITES is not a self-executing convention, which means that implementing its terms relies upon each country that has joined the Convention, known as a Party, to enact sound national laws. As such, CITES' effectiveness relies on the commitment and cooperation of its Parties at the national level, including through ongoing efforts to enact and update laws, enforce their provisions, enhance the science base, and raise public awareness.

CITES obliges its Parties to penalise non-compliance with the Convention through the adoption of national laws that enforce its provisions. The Convention's Secretariat assists Parties to ensure that their legislation meets CITES requirements, failing which a Party may find itself the subject of a compliance process under the Convention. Such a process can lead to various compliance measures, which can include a recommendation to suspend trade in a species, or for all species, with that country.

National legislation is critically important for regulating international trade in the 35,000 species of plants falling within CITES trade controls. However, it is also important to protect the other 315,000 plant species that are not listed under CITES, including those that are native to a country and those that are not.



Astrophytum asteria with Border Force officer (UK Border Force)

National legislation should not only implement CITES requirements, but extend protection to all species of plants native to a country, including those that are not listed under CITES, and address the taking and consumption of plants for domestic purposes.

Today, many countries have laws to protect all of their native species of plants from overexploitation and to prohibit them from being taken without authorisation. However, they do not often extend that same protection to imported species that are not native to the country.

It is important for countries to prohibit bringing any plant, its part or derivative, into a country if it is taken contrary to the laws of the source country. This should extend to any species of plant protected under a source country's national laws, and not just the limited number of species listed under CITES.

There are gaps in our national laws and in the international legal framework to protect plants, as well as animals and fungi. The Global Initiative to [End Wildlife Crime](#) (EWC), Chaired by John Scanlon, was established four years ago to address these gaps, especially at the international level.

Wildlife crime is an illicit industry with impacts estimated at between \$1-2 trillion a year. It threatens biodiversity globally, exacerbates climate change, and exposes people to the risk of future pandemics. Yet there is no global agreement on how to prevent and combat such highly destructive crimes, including on agreed definitions, such as we see for trafficking in persons, migrant smuggling and firearms trafficking.

The EWC is supporting the countries that have called for a new international legal agreement to prevent and combat wildlife trafficking, including Angola, and engaging in processes under the UN Crime Commission, and various Conventions, to consider how to strengthen the international legal framework.

In doing so, EWC has brought together a coalition of over 40 like-minded organisations from across all sectors that participate as International Champions, including the Botanic Gardens Conservation International. These organisations, together with EWC's technical advisers, work to support countries in advancing international and national efforts to prevent and combat wildlife trafficking.

Relevance of international policy conventions and the role of botanic gardens in their implementation

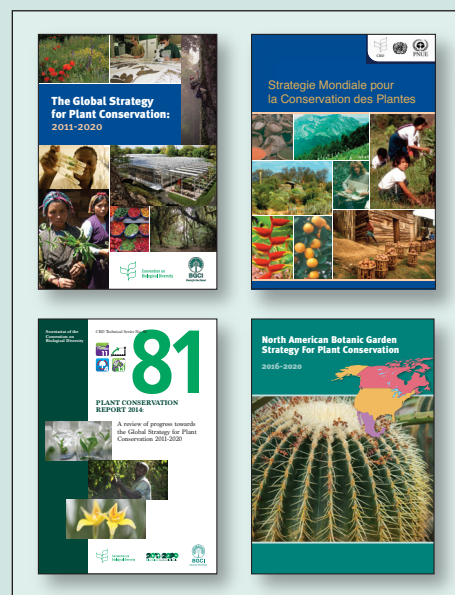
THE CONVENTION ON BIOLOGICAL DIVERSITY

What: The Convention on Biological Diversity (CBD) is the international legal instrument for “the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources” that has been ratified by 196 nations.

Why: The CBD is a global agreement that aims to bring the world together under a ten-year plan to reverse the loss of biodiversity. It’s a crucial space for countries to make decisions together on nature, for the benefit of all people and the planet.

Relevance: The Global Biodiversity Framework (GBF) and the related Global Strategy for Plant Conservation (GSPC) Complimentary Actions, provide a focus for plant diversity conservation. Target 5 of the GBF and respective GSPC Action 5 are on trade and ensuring trade is sustainable and equitable.

BGCI
Resource
Available



Various GSPC policy documents and reports

NAGOYA PROTOCOL AND ACCESS AND BENEFIT SHARING

What: The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity, also known as the Nagoya Protocol on Access and Benefit Sharing, is a 2010 supplementary agreement to the 1992 Convention on Biological Diversity.

Why: The Nagoya Protocol establishes a framework that helps researchers access genetic resources for biotechnology research, development and other activities, in return for a fair share of any benefits from their use.

Relevance: The Nagoya Protocol ensures fair and equitable sharing of genetic resources. It focuses on all plant trade and use, and is a legally binding global agreement that implements the access and benefit-sharing obligations of the CBD.

BGCI
Resource
Available

SUSTAINABLE DEVELOPMENT GOALS

What: The 2030 Agenda for Sustainable Development, adopted by all United Nations members in 2015, created 17 world Sustainable Development Goals (SDGs). They were created with the aim of “peace and prosperity for people and the planet...” – while tackling climate change and working to preserve oceans and forests.

Relevance: For sustainable development to be achieved, it is crucial to harmonize three core elements: economic growth, social inclusion and environmental protection. These elements are interconnected, and all are vital for the well-being of individuals and societies and are inextricably linked to the illegal trade in plants.

BGCI
Resource
Available



Sustainable Development Goals

Survey and Research

Development

The formulation of an effective questionnaire was crucial for gathering relevant data and insight.

A comprehensive questionnaire was designed to delve into the roles of botanic gardens worldwide in addressing the critical issue of the illegal plant trade. By examining various aspects, the survey aimed to gain a thorough understanding of these efforts. The survey was open for responses for a specific data collection period, and engagement levels were assessed throughout to encourage greater breadth of feedback where possible.



Ghost Orchid (John Eder)

In the context of botanic gardens' efforts to combat the illegal trade of plant species, the following considerations guided the development of the survey:

1. Strategy & Implementation

- How aware are botanic gardens of the issue of the illegal plant trade?
- How many gardens actively engage in combatting the illegal plant trade?
- What strategies do they employ to engage with this issue?
- Are there specific geographic regions where they focus their engagement?

2. Species Inventory

- How many species have botanic gardens received as a result of confiscations due to illegal plant trade? To standardise the data received from respondents, we requested that data provided represented specimens received in a defined period of time (2019-present).
- What plant families are most affected?
- Do respondents collaborate with other institutions to track and document these species? Respondents were asked about their engagement with law enforcement agencies, or other key stakeholders, to gauge their level of engagement in the wider community addressing the illegal plant trade.

3. Partners & Collaborations

- How do botanic gardens interact with local communities, indigenous groups, law enforcement agencies or governing bodies in their efforts to address the illegal trade of plants?
- Are there successful models of community involvement in combating illegal plant trade?

4. Audience

- How aware is the general public regarding the issue of illegal plant trade?
- How do botanic gardens engage with this audience to promote the issue and outline their engagement in this sector to the wider community?
- What innovative approaches or best practice strategies do botanic gardens use to advocate the issue to the public?

5. Challenges & Obstacles

- What hurdles do botanic gardens face in their anti-trafficking efforts?
- Are there legal or logistical challenges?
- How do they address these obstacles?

6. Research & Technology

- What research initiatives or technological tools do botanic gardens utilize?
- Are there innovative approaches to monitoring and preventing the illegal plant trade?

As well as specific questions, the survey provided a platform for respondents to share valuable insights from which case studies were developed for this report. These real-life scenarios shed light on the lessons learnt, actions taken, and challenges faced by botanic institutes and their partners as they combat the illegal trade of plant species.

Scope of Audience and Timeframe

Botanic Gardens Conservation International (BGCI) conducted the survey across its ~900 member organisations to understand global botanic garden engagement in combatting the illegal plant trade. The survey was disseminated through personalised outreach, resulting in a high degree of engagement. Other means of dissemination included sharing the survey link on various social media platforms.

Of the organisations directly contacted, 139 completed the survey. The data revealed a distinct dichotomy in engagement levels, with a majority (104/139) of respondents hailing from countries in the global north (HandWiki 2024). The United States had the largest national representation with 36 respondents. North American countries collectively contributed 49 responses, while Europe had 56. Asia, Africa, and South America had fewer responses, with 11, 10, and 8 respondents respectively. Australia was the only Australasian country to participate, contributing five responses. North America and Europe exhibited robust interaction, while other continents showed varying degrees of involvement.

This highlights both successes and opportunities within BGCI's survey engagement strategy. Future efforts could focus on improving engagement from underrepresented regions, thereby providing a more comprehensive understanding of global conservation efforts.



Succulents (BGCI Image Library)



Paphiopedilum rothschildianum (Magnus Liden)

Results

Overview

The majority of gardens who answered the survey were involved in plant conservation activities, either *in situ* or *ex situ*. Eighty-six gardens employ a strategy or guidance to support this activity, to conserve threatened plants in their wild habitats. However, when asked to specify if there is guidance available in their institute to reduce the demand for illegally sourced/traded specimens only 56 respondents said 'yes' (59% say no – Figure 2). Examples of such work is given across several case studies in this section.

When asked whether confiscated specimens had been received in the last three years, 79% stated that they had not received any confiscated specimens of threatened plant species due to illegal trade.

Of the 21% who had received specimens, 28 provided data on the number and specific families or groups that had been received (Figure 2). In the past three-years approximately

720,000 specimens have been received by botanic gardens. The South African National Biodiversity Institute alone noted that they had received 340,000 specimens due to the rampant poaching of succulents in the country since 2019 [Case Study 2].

Specific plant families that were identified through the survey as being received from confiscations were CITES listed species (Figure 3) already known to be threatened by trade. The families of Cactaceae and Orchidaceae were cited the most, succulent plants from the families of Asphodelaceae, Euphorbiaceae and Aizoaceae were the next largest amount received (mainly due to plant poaching in South Africa). Other plant groups included cycads, carnivorous plants and bulbous species such as *Galanthus* spp. It is worth noting that some species mentioned are highly threatened e.g. *Cattleya wittigiana* (synonym - *Hadrolaelia wittigiana*) and *Dicksonia sellowiana* both of which are on the Brazilian list of endangered plants (BGCI ThreatSearch 2024). Numerous cactus species were shared including *Ariocarpus retusus* and *Ariocarpus fissuratus*, traded for their appeal as horticultural specimens but also used due to psychoactive properties. Overall no new or unique species were mentioned as being received by gardens.

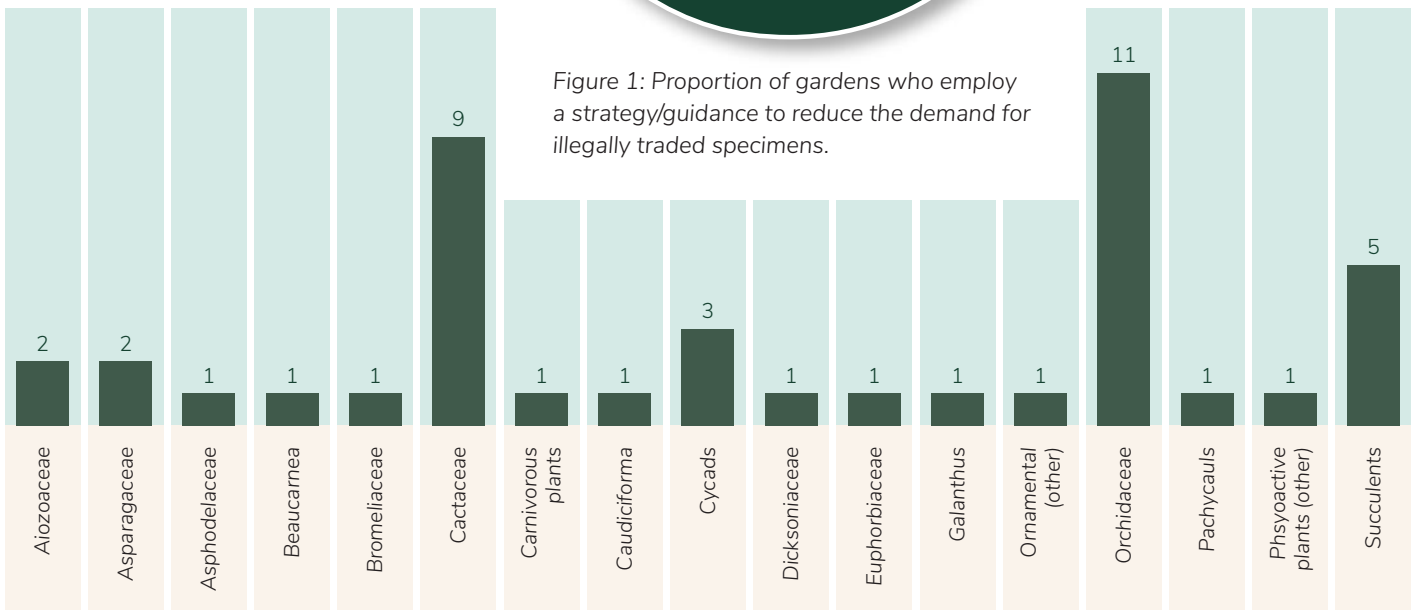
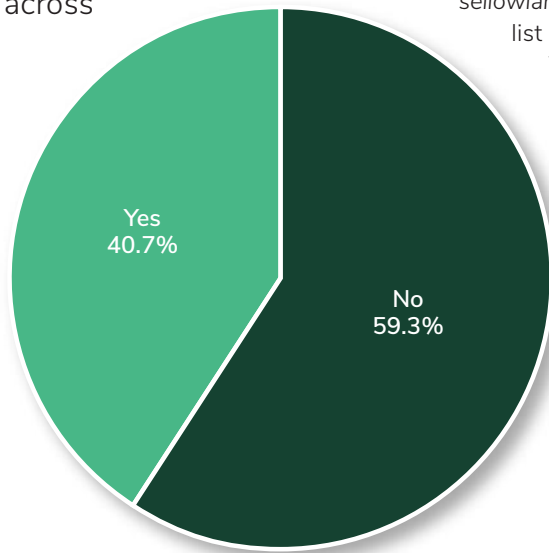


Figure 1: Proportion of gardens who employ a strategy/guidance to reduce the demand for illegally traded specimens.

Figure 2: Numbers of different plant families received by botanic gardens as a result of illegal plant trade.

Case Study 2: Confiscated Plant Management in South Africa

**Carina Becker Du-toit, Nora Mulcahy with Sicelo Sithole,
Adam Harrower, Etwin Eslander,
South African National Biodiversity Institute**

Since late 2019, South Africa has experienced a surge in plant poaching of succulents from the Karoo Biome. The South African National Biodiversity Institute (SANBI) has three botanical gardens receiving confiscated plants from law enforcement, totalling over 1.6 million plants to date. One of these, the Karoo Desert National Botanical Garden, has received over 394,500 confiscated plants. Due to staff shortages, the impact of Covid, variable condition of plants on arrival, lack of infrastructure and the volume of plants received, only 24,089 living plants survived. WWF-South Africa seconded a staff member to the gardens, and an appeal was made to Botanic Gardens around the world via a BGCI symposium. The National Botanic Gardens of Ireland secured funding from the Irish Museums Trust to send a trained and experienced horticulturist to assist in dealing with the crisis.

On receipt, plants are drenched in a contact fungicide and left to dry in the sun. After identification, a triage system was employed to prioritise the Critically Endangered (CR) and Endangered (EN) red listed species. A potting mix was proposed by internal and external independent growers (Ernst van Jaarsveld and Etwin Eslander) particularly for *Conophytum* as their cultivation needs are wide and varied. Plants were grouped depending on growing conditions. Propagation and seed collection was prioritised. Vegetative cuttings are undertaken to ensure healthy stock. Seed is given to the Millenium Seed Bank (UK), donated to external growers and put in storage for potential ex situ collections.

External organisations have donated funding for materials. Expert succulent growers in South Africa and the USA have assisted with identification, advice and training to SANBI (and non-SANBI) horticulturists.



Confiscated succulent nursery in South Africa
(Emily Kudze SANBI)



The survey confirmed that most of these plants are confiscated due to CITES Compliance (50%), followed by lack of transport or phytosanitary permits (28.6%), national laws that identify species as invasive/restricted in a country (27.1%) or where the country of origin has legislation affecting the species (18.6%). Some plant seizures may be attributed to multiple reasons such as not having CITES permits and/or phytosanitary certificates. For instance, commercialisation of specimens collected in the wild is not permitted in Brazil and many specimens are confiscated under these laws.

Information on the country of origin of seized shipments of illegally traded plants was also obtained in the survey. Although this data only gives the country from which a shipment was sent it is useful as a species can be matched to botanic garden records of origin all transit ports and countries can be identified for illicit trade routes. The map in Figure 3 provides hot spots of areas identified as the origins of confiscated shipments, the darker the colour the more frequently these areas were mentioned in the survey.

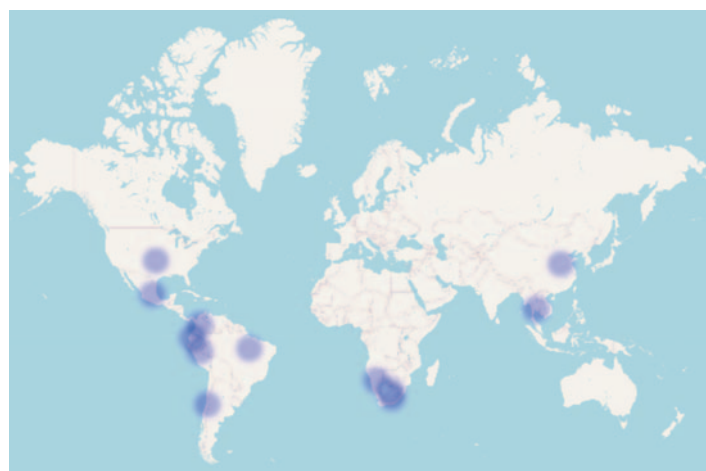


Figure 3: Map showing where the confiscated specimens originated from



Orchids Singapore Botanic Garden (Megan Barstow)

Propagation and Maintaining Collections

Actions of staff should be supported by a strong collections policy, guiding activities in the field and in the garden towards the protection of species threatened by illegal plant trade. Of the responding gardens, currently 56 have strategies or guidance towards reducing demand for illegally sourced or traded specimens, with the majority being guided by their collections policy only [Box 2]. Several gardens discussed the importance of propagation to reduce wild harvest of species. Zurich Succulent Centre has an intricate propagation system, which enables them to track progeny of plants they are replicating [Case Study 3].

One of the greatest skill sets of botanic gardens is their horticultural leadership and expertise. This is the greatest asset currently being used to tackle plant trafficking, with survey respondents often referencing caring for seized plant collections [Case Study 4]. At the United States Botanic Garden, they also use their confiscated plants in garden displays, a unique opportunity for storytelling for these plants and to raise awareness of illegal plant trade. BGCI itself has several resources to support collections management, propagation and sharing of material between botanic gardens [Box 3].

Box 2: The Use of Collection Policies

The information and documentation associated with plant collections, is often guided by a garden's collection policy. This policy guides the development and management of the plants in the garden and helps the garden stay true to its mission. A collection policy covering living plants can be used to provide direction on the management of any illegal material that may enter the garden by whatever route. Having standardised actions for acquisition, accessioning and de-accessioning makes it easier and more systematic to deal with illegal material that may exist or enter the garden.

Common prerequisites for acquisition and consequent accession, to prevent illegal material entering collections, is as follows:

- Plant material has been legally obtained and carries necessary documentation
- Institutional need
- Quality of associated information accompanying the acquisition

Most gardens that acquire illegal material do not accession this material unless officially donated or with permissions from CITES authorities/law enforcement etc. This material will often have management information dictated by individual agreements of the authorising body for example no onward sale of confiscated plants or their progeny. In addition to these agreements, the garden collection policy can provide advice and also provide examples of cases when material in gardens may need de-accessioning e.g. for live plants that came into the living collection after a taxa had been CITES listed.

Collections policies often address CITES [Case Study 1]

- In existing collections, identifying CITES-listed plants in collections
- Ensuring CITES-listed species are collected legally
- Having a policy on maintaining plants seized or confiscated by customs [Case Study 4]

Individuals can find out if a species is listed on CITES on the [CITES Website](#) or on [BGCI's PlantSearch Database](#) [Box 3].

CITES policies can provide guidance on the management of plants entering collections from natural habitats, exchanges between gardens, donations from private collections and purchases from commercial enterprises. Having the plan in place will flag when illegal material arrives and will therefore need to be dealt with by different methods to legally acquired acquisitions.

It is important to understand that plants existing in collections before conventions were established or prior to a species listing on a CITES appendix or with the correct paper work/collection permits etc. are not subject to these policies. This should be checked when acquiring material from private collections, to decide if a species should progress through accession or not.

More information on collections policies can be found on the [BGCI website](#) which provides examples of comprehensive collection policies. Training materials are also available (Box 6).

Box 3: BGCI's Database Supporting Action Against Illegal Plant Trade



Plant Search

BGCI's PlantSearch database is the most comprehensive list of plants held at the world's botanical institutions. It is freely

available and searchable. Our latest version can be used to identify plants that are CITES listed. <https://plantsearch.bgci.org/>



PlantConnect

PlantConnect is BGCI's tool for mobilising plant exchange between botanical organisations. Botanic gardens can

upload material available for exchange, and then requests can be managed within the exchange tool. For gardens hosting a large quantity of confiscated materials PlantConnect will become a useful tool for managing collections and exchange. This is particularly due to the Compliance Certification options hosted on the database.

<https://plantconnect.bgci.org/>



BGCI Compliance Certifications

To encourage responsible supply and acquisition of plant material and associated data for biodiversity conservation, research and education worldwide, BGCI has developed three Compliance Certifications that identify institutions that are applying best practice with regard to Access and Benefit-Sharing (ABS), biosecurity and CITES regulations. <https://www.bgci.org/our-work/sharing-knowledge-and-resources/bgci-compliance-certification/>

Case Study 3: Propagation Policy at the Zurich Succulent Plant Collection

Felix F. Merklinger,
Zurich Succulent Plant Collection, Switzerland

The Zurich Succulent Plant Collection (ZSS) cultivates ca. 5,600 taxa of succulent plants, which makes it one of the most diverse collections of this group of plants in the world. Approximately 80% of these plants are of known provenance. To safeguard this collection in the long term, and to produce high quality seed material, we have developed a strict propagation process, which forms a fundamental element of our day-to-day work.

The basis of this process is an accession number for each plant record, as is common practice in most gardens. At ZSS, we further distinguish individual plants belonging to the same accession by using a qualifier at the end of the accession number. This qualifier identifies a particular individual as the product of vegetative or generative propagation, facilitating not only the gardener's decision to attempt pollination but also ensures that we maintain genetically diverse collections over time.

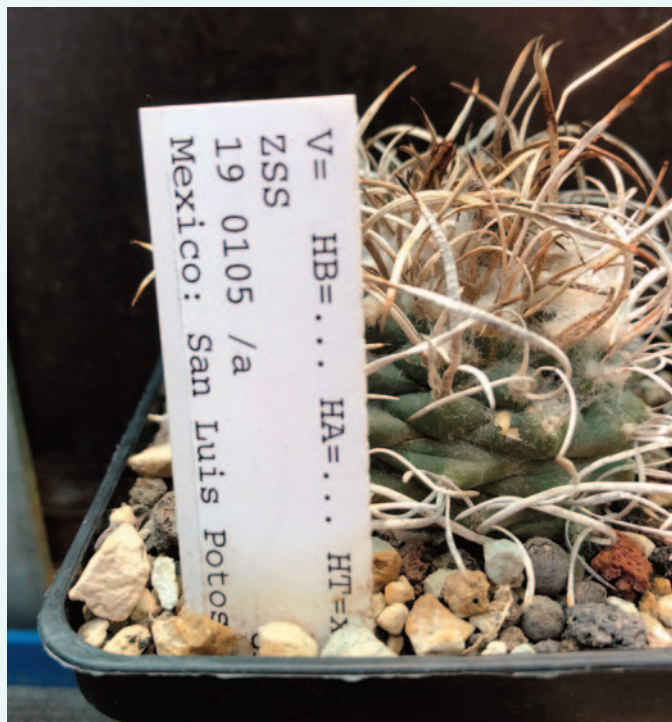
Example: Several seeds are germinated. This seedling pot receives a new accession number, where the first two digits state the year in which the material was received, followed by a sequential number. 19 0105 would be the 105th position received in the year 2019. This accession number is followed by a solidus and a zero (/0), indicating the mother plant or "seedling pot".

Upon separating these seedlings out of the mother plant, the first plant would remain with the accession number 19 0105 /0, the second plant receives 19 0105 /a, the third plant 19 0105 /b, etc. If during the life of 19 0105 /0 cuttings were taken from it, the qualifier in the accession number would change from a letter to a number, so 19 0105 /1. If cuttings are taken from any of the other seedlings from the original batch, the qualifiers would be 19 0105 /a1, 19 0105 /b1, etc. All these events are registered in the database, allowing for a traceable life history of each plant, and supporting scientific research, including genetic studies, re-introduction efforts and horticultural practices.

Pollination at the ZSS happens in a controlled environment under the exclusion of insects. We use purpose-build pollination "cages", wooden frames lined in an insect screen. Alternatively, fruit protection netting bags with a drawstring are used for plants that cannot be placed in the pollination cage.



Turbinicarpus schmiedickeanus ssp. klinkerianus. Each pot at ZSS contains a single plant and a label. (Felix Merklinger)



Turbinicarpus schmiedickeanus ssp. klinkerianus. The reverse side of the label provides the accession number. (Felix Merklinger)

Case Study 4: Plant Rescue Center - United States Botanic Garden

Devin Dotson

United States Botanic Garden, Washington DC, US

The United States Botanic Garden (USBG) serves as a Plant Rescue Center for illegally trafficked rare and endangered plants, seized at US borders via the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Plants transported across international boundaries without required CITES permits can be confiscated by border authorities.

If plants seized due to lack of proper documentation cannot be sent back to their country of origin, they are placed into a Plant Rescue Center, which agrees to accept the entire shipment and maintain and care for the plants in perpetuity. The USBG is one of 62 botanical gardens, arboreta, zoos, and research institutions that participate in the Plant Rescue Center Program across the US. The program was established in 1978 by the U.S. Fish and Wildlife Service (USFWS), the agency in charge of implementing the requirements of CITES in the United States.

The USBG became a CITES plant rescue center in July 1980, one of the first gardens to sign on to the program. The garden primarily accepts orchids, cacti, and succulents. About 500 protected and threatened plants in 193 taxa, mostly orchids and succulents, have been accepted into the USBG collections through the Plant Rescue Center Program and used for conservation and education programs. The oldest CITES plant in our collection was accepted into the collection in 1986.

The plants received are often not in good health, so USBG horticulture experts work to bring them back to health. For orchids, it might take several years to get them healthy enough to bloom so they can be identified. Some CITES plants live at the USBG Production Facility and are brought up to the Conservatory periodically for display when they are in bloom or the subject of an exhibit. Other CITES plants are permanently on display in the



Dendrobium lindleyi (United States Botanic Garden)



Confiscated CITES listed *Aloe* species
(United States Botanic Gardens)

Conservatory. Several dozen *Dendrobium lindleyi* CITES orchids on display in the Plant Conservation house grow beautiful orange blooms each spring. Additionally, several plants in our World Deserts house are on permanent display. Since many of the plants are rare and threatened, we propagate them and share them with other Plant Rescue Centers for conservation purposes. We have received fewer shipments over the past several years compared to a decade ago, but anecdotal information from USFWS seems to say the number of shipments being seized at the border continues to be about the same.

The lady slipper orchid *Paphiopedilum glaucophyllum* came to the collection in 1999, part of a large shipment of orchids seized at Los Angeles International Airport. They were apparently illegally harvested from the wild in Indonesia and shipped mislabeled as hybrids to a California orchid nursery. The nursery in California where these plants were destined was given two choices – accept the order and face prosecution or, refuse the shipment and walk away from the plants. They chose to abandon the plants and they were transferred to the USBG. As they bloomed, a botanist identified them – a process that took a few years. The number of these orchids has been significantly reduced in the wild due to many threats – agriculture, forestry, the expansion of human settlements, and especially illegal collection for horticultural purposes.

Those orange flowering orchids in the Conservatory's Plant Conservation house are part of a group of 99 *Dendrobium lindleyi* orchids native to southeast Asia that we received in a single shipment. The concern when receiving such a large quantity of one species is that someone collected most of a population, leaving few to no individuals in the wild to reproduce.

As a botanic garden, participating as a Plant Rescue Center allows us to protect these trafficked rare and endangered plants, use them for education and conservation, and develop horticultural care practices, all without contributing to the removal of rare and endangered plants from the wild.

Visitors and Education

Globally botanic gardens have over 500 million visitors annually (bgci.org 2024). This provides a huge opportunity to engage the public with the issues related to illegal plant trade. Through the survey 48 gardens have stated that they provide education programmes, outreach activities or exhibits to raise awareness among visitors. Specifically, 34 gardens include this information in guided tours [Case study 5]. Guided tours provide the opportunity to show which plants are at risk from the illegal plant trade and growing in garden collections. It can be the first step towards activating visitors in this subject.

Botanic gardens themselves are at risk from plant poaching, with more cases of plants being stolen from collections being recorded. Although our survey did not look into this, The Huntington Botanical Garden in California has used this as an opportunity to engage its visitors in this problem by installing a small sign where plants have been stolen instead of replanting the area [Case Study 6]. Signage is an easy way to reach a wider audience, by including information on illegal plant trade alongside collections which are at risk in the wild.

There is a wide scope for botanic gardens to engage more with their visitors and provide additional education and outreach to engage with this topic. Less than thirty gardens are currently engaged in the following activities:

- Using social media to engage audiences on the issues
- Encouraging visitors to participate in conservation efforts for plant species threatened by trafficking
- Collaborating with other like-minded organisations on developing outreach and educational materials

Of the few gardens pursuing these activities, they are often working with national botanic garden networks or other local botanic gardens. One successful campaign has been initiated by Cadereyta Regional Botanic Garden in Mexico whose “Leave them in their land” (“Déjalos en su tierra”, in Spanish) campaign runs on social media, has merchandise and regular public discussions [Case Study 7].

Garden Circle Insider Tour, Naples Botanical Garden, US (John Eder)

Case Study 5: “Cultivating Awareness: Addressing the Illegal Plant Trade with the Garden Visitors”

Britt Patterson-Weber, Vice President of Education & Interpretation, Naples Botanical Garden, Florida, US

The mission of Naples Botanical Garden is to conserve the plants and habitats of the tropics, cultivate beauty, offer knowledge, and inspire the protection of nature. The Garden offers a wide range of informal learning opportunities to its 260,000 annual visitors, including Daily Tours included with admission and a casual drop-in program for adults called Dig Deeper. Educating visitors about the illegal plant trade is not the core objective of any programming; however, inspiring the protection of nature is. Therefore, several of our programs discuss the illegal plant trade out of necessity: when we talk about why a species is threatened or endangered, poaching is typically among the culprits. Nowhere is this truer than in programs about cacti and succulents, orchids and epiphytes, and palms and cycads, all of which are the subject of their own daily tours.

Garden educators research, and write all tours and programs, referencing resources like the IUCN Red List of Threatened Species, to give context to plants outside the confines of our grounds. What educators have discovered in interpreting the illegal plant trade to thousands of tour-goers is that there is low awareness of the plant trade in general—illegal or legal. Non-plant enthusiasts are mystified by plant collecting, let alone poaching, which complicates explaining regulations like The Convention on International Trade in Endangered Species (CITES). We introduce this topic by explaining how we legally acquired our collections, or why species are disappearing from Earth.

Plant indifference is pervasive, but through storytelling we can connect people and plants for the benefit of plants.



Case Study 6: Linking Garden Thefts to Plant Poaching in the Wild Through High Impact Garden Signage

Sean Lahmeyer, Nicole Cavender, John Trager, Sandy Masuo
The Huntington Library, Art Museum, and Botanical Gardens,
California, US.

The Huntington hosts more than 1.3 million visitors annually and continues to serve as a gathering place for both Los Angeles residents and tourists alike. Following a string of plant thefts from the Desert Garden in 2021, staff leveraged the power of these high visitation rates and installed a simple, effective sign that raises awareness of plant theft as a problem in our garden as well as the larger crisis of plant poaching from the wild. Situated at the location where an accessioned plant was stolen, the sign follows the precedent set by art museum responses to thefts from galleries. It consistently sparks discussion and debate over how to address the issue among the many visitors who frequent the Desert Garden as well as by bloggers, on social media, and among botanical garden professionals. The sign features two QR codes that link to details about how plants from our living collection are used in conservation efforts as well as information on illegal plant trafficking at the global level.



This plant was stolen sign (Linnea Stephan)

Case Study 7: A Permanent Campaign to Urgently Discourage the Devastating Effects of Illegal Trade

Emiliano Sánchez Martínez, María Magdalena Hernández
Martínez, Yazmin Hailen Ugalde de la Cruz, Daniel Camacho
Martínez, José Antonio Aranda Pineda and Beatriz Maruri
Aguilar, Cadereyta Regional Botanic Garden, México

The Cadereyta Regional Botanic Garden (CRBG), México, has been at the forefront of documenting the urgent and devastating effects of the illegal plant trade. Several evaluations over the



Pin-back buttons to showcase some of the most threatened Cactaceae species, lying over a plot of *Mammillaria herrerae*, an endangered species. (Daniel Camacho Martínez).

years have revealed dramatic decreases in species populations. This has necessitated a comprehensive message and a call to consciousness and care about the illegal trade of flora for our visitors, users, and followers.

The campaign “Leave them in their land” (“Déjalos en su tierra”, in Spanish), is a call to action for everyone. It aims to raise awareness of the illegal poaching of plants and to discourage illicit trade at any level, including unlawful recollection, trade, and even purchase in nurseries whose legal provenance is not guaranteed. The campaign runs through social media posts, merchandise, and public discussions. A series of periodic posts on Facebook and Instagram speak about illegal trade with the hashtag #DejalasensuTierra. The media team of the CRBG has produced several editions of pin-on buttons to showcase some of the most threatened Cactaceae species and the slogan (“Déjalas en su tierra”). These buttons are distributed freely in forums and events, including the annual “ExpoCactus”, a regional exhibition that brings together dozens of succulent plant producers and promotes plant legal provenance.

As a part of the permanent campaign, in 2023, a public, hybrid panel with renowned guests from different fields took place during the CRBG annual forum of scientific research, the “Cátedras del Semidesierto”. The panel, called “Déjalas en su tierra”, aimed to raise awareness in an audience of undergraduate students.

Research and Technology

Visitors are only part of the puzzle when it comes to botanic gardens and illegal plant trade. The expertise of horticulturalists, curators, conservation research and laboratory staff are all essential to tackling this issue; however only 6% of botanic gardens reported conducting research into illegal plant trade (Figure 4). The majority of research tools employed were related to seed banking or producing metacollections. Overall, this shows a lack of research interest and capacity towards illegal plant trade within botanic gardens.

One example is Kadoorie Farm and Botanic Garden which is undertaking DNA research to identify illegal orchid species in trade in Hong Kong and South China [Case Study 8]. This work involves both *in situ* and *ex situ* activities, including development of a DNA library for orchids in trade and collections.

Other research is more multidisciplinary, such as that currently being undertaken by TRAFFIC and Royal Botanic Gardens, Kew, which is conducting isotope analysis of wild plants and at the same time using AI to help enforcement identify illegal trade on the internet . They then take this one step further and are talking to internet market platforms to develop standards for legal trade in plants online [Case Study 9].



Wild orchids sold as ornamental plants in south China (S. Gale)



Artificial plant propagation ground, Korea National Arboretum

General day to day activities of gardens may not seem like direct research for illegal plant trade, but establishing propagation or germination protocols for species, genera or families in collections which may be illegally traded will contribute to the future ethical and sustainable trade of these species. As will establishing cultivated seed supplies and metacollections, as demonstrated by Montgomery Botanical Center [Case Study 10].

Some gardens may also undertake *in situ* research activities, such as monitoring, surveying and locating new localities of traded species. This action, as seen in Case Study 11, led by the Korea National Arboretum, can contribute to protective actions for species being put in place and in general all contributes to understanding the species in the wild.

There is a need to both allow gardens to identify these actions as taking steps towards tackling illegal plant trade, as well as encouraging more of the existing activities. The provision of resources and priority setting is needed to help botanic gardens who have capacity undertake research into this issue.

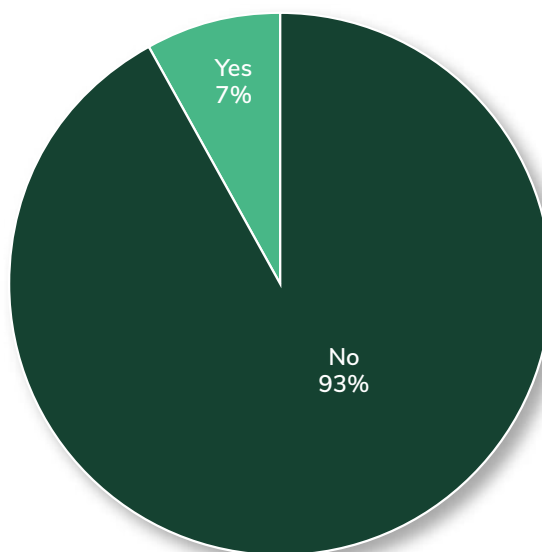


Figure 4: Proportion of botanic gardens involved in research related to the illegal plants trade

Case Study 8: Tackling Wild Orchid Trade in Hong Kong and South China Using Market Surveys and DNA Forensics

Huarong Zhang, Feng Yang, Stephan W. Gale
Kadoorie Farm and Botanic Garden, Hong Kong SAR, China

Orchids are threatened by over-exploitation for trade globally. In China, millions of individuals from many species of wild orchids are collected and traded as Traditional Chinese Medicine (TCM) and ornamental plants. It is critical to study orchid trade dynamics and trends to inform mitigation and conservation efforts.

Kadoorie Farm and Botanic Gardens (KFBG) survey TCM markets in Hong Kong to monitor medicinal orchid trade, and use DNA-based techniques to identify species in traded products. TCM products are usually processed at high temperatures or with chemicals, and thus their DNA is typically degraded, rendering standard extraction and diagnostic methods insufficient. Accordingly, a workflow was developed to amplify short DNA fragments in TCM products that avoids contamination under forensic conditions. Because reference data for many orchids are not available in [GenBank](#), we make use of the living orchid collections at KFBG to generate reliable reference data based on vouchered specimens. We also combine different genetic markers (both nuclear and chloroplast) to achieve better identification resolution for TCM products.

The preliminary results suggest that over ten species from five genera of Orchidaceae are routinely sold as TCM in Hong Kong, and that most of these do not match with species listed in the standard pharmacopoeia. By comparison against the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) database it was also found that many traded species are not recorded amongst Hong Kong's declared imports.



Orchid products (coiled stems of *Dendrobiums*) sold as Traditional Chinese Medicine in Hong Kong SAR (F. Yang)



Wild orchids sold as ornamental plants in south China (S. Gale)

To quantify the scale of wild-collected ornamental orchid trade across the South China region, a systematic monthly survey at five market sites along a West-East transect from Yunnan to Hong Kong for one year was conducted. The findings revealed that, although orchid diversity in the wild is greatest in Yunnan, the diversity of species in trade and their volume increased eastwards, and that mean price per stem rose more than four-fold. However, vendors consistently priced wild-collected orchids significantly cheaper than artificially produced hybrids on sale at the same site.

A parallel investigation of consumer preferences indicated that price is the single-most important factor shaping the majority of purchases. Further, the vast majority of orchids at points of sale conformed to most stated consumer preferences (in terms of price, inflorescence size, flower colour, scent, scarcity in trade and rarity in the wild), such that the overwhelming supply of low-value plants from the wild can easily satisfy demand. Market dynamics therefore leave wild orchids extremely vulnerable to unsustainable collection and trade, an inference that is borne out by our conservative estimate of more than 1.2 million plants in trade at these sites over the study period. A combination of supply-side enforcement measures and farming of exploited species, as well as market reduction methods and strategies for behaviour change is urgently needed to mitigate the impacts of this trade.

Case Study 9: The Royal Botanic Gardens, Kew and TRAFFIC's Partnership to Combat Succulent Plant Trafficking

David Whitehead, Royal Botanic Gardens, Kew, UK and Dominique Prinsloo, TRAFFIC

In 2022, the Royal Botanic Gardens Kew and TRAFFIC identified the need for greater understanding of succulent plant trade dynamics to inform law enforcement strategy and action given the exponential rise in illegally harvested succulent plants in southern Africa. The organisations were awarded funding from the UK Government through the Illegal Wildlife Trade Challenge Fund (IWTCF) for the "Harnessing technology to end the illegal trade in succulent plants" project, which runs from 2022 to 2025.

The organisations conducted multidisciplinary research, from the use of Artificial Intelligence (AI) tools, such as the big data web scraper called [FloraGuard](#), to personal interviews, which will inform a comprehensive understanding of the trade in Southern African succulents. Findings from this research has informed the design and production of training materials, delivered by TRAFFIC as a specialised curriculum for Environmental Management Inspectors (EMIs) in South Africa. TRAFFIC and Kew engaged with an online platform to encourage the adoption of trading policies and standards in their online sale of succulent plants. The project will also support the platform's efforts through the provision of awareness of the illegal online plant trade to their monitoring teams. Kew is developing a provenance testing tool for succulent plants based on the analysis of stable isotopes and trace elements within plant tissues to determine the geographic origin of these organisms. This partnership has been really successful in combining a diverse range of expertise and complimentary techniques, and the organisations hope to continue this work.

At the time of writing this case study, research outputs were in development and were due for publication in late 2024/early 2025.

David Whitehead and Dominique Prinsloo speaking at the Arid Zone Ecology Conference in South Africa.



Case Study 10: Cycad Conservation Through Propagation: Insights From Montgomery Botanical Center

Daniel A. Tucker, Michael Calonje, Joanna Tucker Lima, Patrick Griffith. Montgomery Botanical Center, Florida, US

Addressing the illicit plant trade presents a nuanced challenge with limited straightforward solutions. At Montgomery Botanical Center (MBC) in Coral Gables, Florida, US, our seedbank program focuses on propagating cycad and palm seeds for distribution to researchers, other botanical institutions, and the horticulture industry. Through our seedbank, we aim to reduce the pressure on wild populations by providing propagated seeds to the market. This approach offers collectors an accessible and crucially, ethical means to obtain these seeds.

An exemplary case of our strategy in action involves *Microcycas calocoma*, commonly known as "Palma Corcho", a Critically Endangered and highly sought-after cycad species. Efforts to pollinate and distribute seeds of *Microcycas calocoma* began in the 1970s with just three individual plants that were brought into the ex situ conservation collection decades before and had finally reached reproductive maturity. By introducing hand-pollinated seeds to the market, and therefore increasing their supply, MBC has successfully halved the average price per seed of *Microcycas calocoma*, and made the species much more common in cultivation.

As exemplified by the *Microcycas calocoma* case study¹, we believe that our seed bank program may benefit *in situ* species conservation by increasing supply and reducing the economic incentive for collecting seeds from the wild.

¹Kay, Judy & Strader, Arantza & Murphy, Vickie & Nghiem-Phu, Lan & Calonje, Michael & Griffith, M.. (2011). Palma Corcho: A Case Study in Botanic Garden Conservation Horticulture and Economics. *Horttechnology*. 21. 474-481. 10.21273/HORTTECH.21.4.474.

Microcycas calocoma cone, Montgomery Botanical Center (MBC)



Case Study 11: Conservation and Propagation Research in the Genus *Cypripedium*

Ji-young Jung and Kae Sun Chang
Korea National Arboretum of the Korea Forest Service



Korea National Arboretum

The genus *Cypripedium*, a member of the orchid family, is listed under CITES Appendix II. In the Korean Peninsula, three species—*C. japonicum*, *C. guttatum*, and *C. macranthos*—are considered threatened according to global and national red list assessments. To effectively conserve these species, the Korea National Arboretum is conducting research on their ecology, genetic diversity, propagation, and storage, alongside *in situ* conservation efforts.

The *Cypripedium japonicum*, known for its large and showy flowers, has been highly valued for horticultural purposes. Due to its rarity, it has been illegally harvested from its natural habitats for over 50 years. To combat the decline in its population, the Korea National Arboretum has installed protective fences and motion-sensor cameras in four major habitats since 2008. The arboretum has been monitoring the number of individuals, flowering, and fruiting conditions annually. As a result, the population within these protected sites has increased from about 180 individuals to approximately 320 over the past decade. Less than 1,000 individuals of *C. japonicum* remain in the wild in Korea. In areas without protective facilities, entire populations continue to disappear, and signs of individual plants being damaged are frequently observed. Therefore, efforts to expand these conservation measures will be intensified.

Additionally, the Korea National Arboretum is developing artificial propagation methods and cultivation techniques using the seeds of *Cypripedium* species. These efforts aim not only at conservation and species recovery but also at eliminating the

illegal collection and distribution of wild populations. Notably, *C. guttatum* and *C. macranthos* have benefited from the development of propagation and cultivation techniques, leading to the establishment of cultivation facilities capable of large-scale production. For the globally endangered *C. japonicum*, the arboretum secured technology for sexual propagation in 2021.

The Convention on Biological Diversity (CBD) emphasises the collaboration between CITES and the Global Strategy for Plant Conservation (GSPC). Developing artificial propagation and cultivation techniques for threatened plant species is a crucial means of preventing illegal collection and trade, thereby supporting sustainable use and conservation of these species.



Cypripedium japonicum, Korea National Botanic Garden

Engagement with Law Enforcement

Out of the 139 botanical gardens surveyed, 77 (55%) reported that they do not collaborate with law enforcement agencies or regulatory bodies to address the illegal trafficking of plant species (Figure 5). However, a significant number, 62 (45%), confirmed that they do engage in such collaborations. This indicates a significant level of involvement in this issue such as the action of the South African National Biodiversity Institute (SANBI) towards creating a National Response Plan for Illegal Plant Trade [Case Study 12].

When asked to specify the agencies they collaborate with, 35 respondents reported working with Customs/Border Officials, 23 with the Police, and 22 with Environmental Agencies [Figure 6- Case Study 6]. Only a small number, four, reported collaborating with other types of bodies. Interestingly, only one botanic garden each reported collaborating with Interpol and the Military. It's important to note that 70 botanic gardens did not respond to this question, which could suggest either a lack of collaborations, a reluctance to disclose information, or a lack of knowledge of who to contact within law enforcement (e.g. the specific person or organisation).

A way in which botanic gardens can be involved in enhancing enforcement for plant trafficking is the provision of knowledge beyond the garden walls [Case Study 13]. In addition to the actions taken in Case Study 13, Royal Botanic Gardens, Kew also provide identification information and other resources to law enforcement agencies. Regarding this engagement 111 botanic gardens reported that they do not engage in such activities and only 26 botanic gardens confirmed their engagement in these efforts. Among the botanical gardens that do engage in building plant identification capacity, 12 reported providing formal training, 11 reported raising selection awareness, and nine reported capacity building. Only five botanical gardens reported providing identification on request.

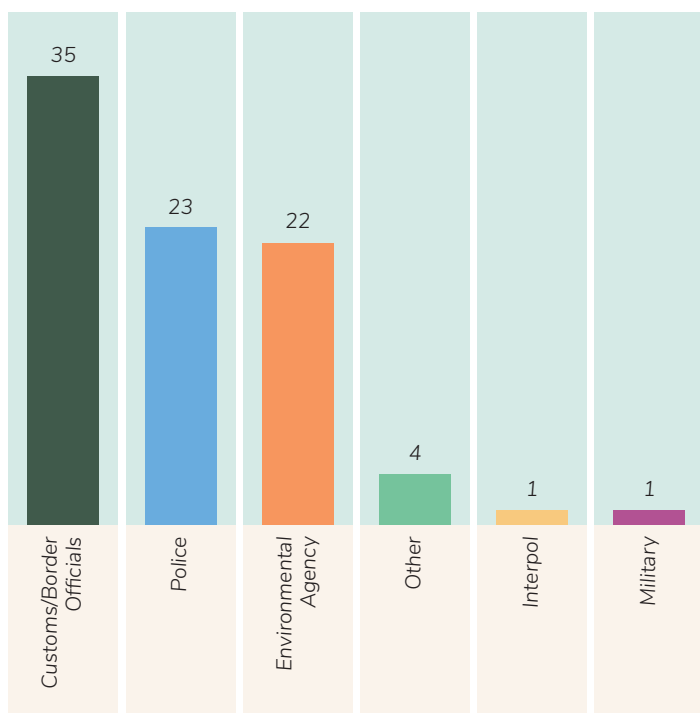


Figure 6: Number of gardens working with different enforcement agencies or regulatory bodies.

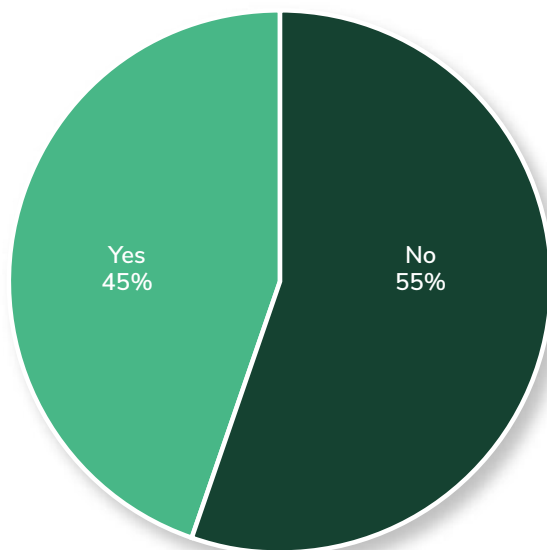


Figure 5: Proportion of botanic gardens collaborating with law enforcement agencies to address illegal trafficking of plant species.

In Namibia these actions have been exemplified through establishment of a taskforce consisting of botanic garden staff and enforcement agencies from across Namibia dedicated to stopping plant poaching, trafficking and illegal trade [Case Study 14].



Seizure of illegal orchids by UK Border Force (UK Border Force)



Confiscated succulent plants in South Africa (Emily Kudze, SANBI)

Case Study 12: National Response Strategy and Action Plan Addressing the Illegal Trade of Succulent Flora in South Africa



Confiscated plants in South Africa (Emily Kudze, SANBI)

Emily Norma Kudze, South African National Biodiversity Institute (SANBI)

Recently, there has been a dramatic increase in the illegal trade of South African succulents from the succulent Karoo, a biodiversity hotspot. Through extensive collaboration with governmental and NGO partners, the National Response Strategy and Action Plan was developed and implemented in 2022. The strategy aims to combat the illegal trade in South African succulent flora, particularly in the Succulent Karoo Biome. It is co-lead by the Department of Forestry Fisheries and Environment (DFFE), the South African National Biodiversity Institute (SANBI) and WWF South Africa along with 16 other state and NGO partners. The strategy involves a multi-faceted approach to ensure the conservation and sustainable use of these unique plants.

Key activities in the strategy include:

1. Ensuring the long-term survival of succulent flora in their natural habitat.
2. Establishing well-managed *ex situ* collections.
3. Strengthening the compliance and enforcement sector.
4. Streamlining policy and regulatory frameworks.
5. Engaging local communities and promoting livelihood diversification.
6. Developing effective communication strategies.
7. Exploring options for a formal economy around succulents.

Overall, this comprehensive strategy represents a collaborative effort to address the illegal trade in succulents, ensuring both conservation and socio-economic benefits. To date there have been significant strides in some objectives like 1, 3, 6. But others – such as 5 & 7 have been more challenging to move forward due to complexities and numbers of role players involved.

Case Study 13: Collaboration with Customs to Tackle IWT, Royal Botanic Gardens, Kew



Astrophytum asterias with officer (UK Border Force)

Sonia Dhanda, Royal Botanic Gardens, Kew, UK

The Royal Botanic Gardens, Kew (Kew) is designated as the UK's CITES Scientific Authority for Flora, providing impartial scientific advice to the Department for Environment, Food and Rural Affairs (Defra) and the Animal and Plant Health Agency to ensure sustainable trade practices.

In the UK, Border Force are responsible for enforcing CITES regulations at the border. Border Force has the authority to seize CITES-listed plants if their import or export contravenes CITES regulations. Kew collaborates with Border Force to facilitate CITES implementation through the identification of seized materials and the housing of these plants in Kew's Quarantine Unit.

The Quarantine Unit supports officers from UK Border Force, the police and Plant Health inspectors by identifying samples or whole consignments of imported plant material. In collaboration with colleagues across Kew, the team identify the material to a species level, whenever possible. The team can also determine whether these plants are wild-collected or artificially propagated. Identification and the source of the plants is critical for understanding the legislation the plants may be protected under.

The consignments received from Border Force can vary significantly in size, ranging from 209 plants in 2021-2022 to 973 plants in 2022-2023. Additionally, the plant health team assesses the biosecurity risks posed by shipments and determines their potential use for conservation efforts. For example, when feasible, Kew aims to hand-pollinate rare orchids during flowering to generate seeds for seed banking, ensuring availability for conservation and research purposes. There have been consignments of rare or endangered plants which have been donated to Kew to accession into the living collections for protection and to exchange or donate material with other botanic gardens. This proactive approach helps support the conservation of threatened plant species in the wild.

Case Study 14: Illegal Succulent Plant Trade, Rescue and Rehabilitation in Namibia



Confiscated *Adenia pechuelii* being planted in its natural habitat.

*Esmeralda Strauss, **Leevi Nanyeni and ***Theunis Pietersen

Introduction

Namibia is renowned for its rich diversity of endemic succulent plants occurring in two biodiversity hotspots namely: (i) the Kaokoveld Centre of Endemism in north-western Namibia which continues into Angola, and (ii) the Gariep Centre of Endemism in south-western Namibia which continues into South Africa. The rare and unique plants that grow here attract plant lovers globally. In the past isolated incidents of plant poaching occurred, however, it has been established that international crime syndicates drive the Namibian plant trafficking operations.

In reaction to these plant poaching activities the interagency Protected Plants Task Team (PPTT) was established in 2023. The PPTT consists of members from the Ministry of Environment, Forestry and Tourism (MEFT) represented by the National Botanical Research Institute (NBRI) of the Directorate of Forestry and the Intelligence Investigation Unit (IIU) of the Directorate of Wildlife and National Parks (DWNP); the Protected Resources Division (PRD) of the Namibian Police and the Namibia Revenue Agency (NamRa) with technical support provided by the United States Forest Service International Program. The PPTT is supported by the Blue Rhino Task Team through the RooiKat Trust; the Namibia Nature Foundation, the US Department of State, Bureau of International Narcotics and Law Enforcement Affairs (INL) and the US Fish and Wildlife Service.

Activities of the PPTT involved the development of an Action Plan including a communication strategy, and awareness material which included: (i) Standard Operating Procedures (SOPs) for issuing permits for indigenous succulent plants; (ii) Guidelines for SOPs for Law Enforcement Officers at the Namibian Border Posts; (iii) Introduction to the management and protection of forest resources in Namibia; (iv) Information and Guidelines on the Trade on

Controlled Wildlife Products for Law Enforcement Officers of the Namibian Border Posts; (v) Law Enforcement Guide for Awareness & Identification of indigenous plants in illegal trade; (vi) Posters; and (vii) Awareness creation sessions aimed at training interagency staff members at the borders; and (viii) Awareness creation sessions for law enforcement officials in the areas where there is significant harvesting of *Adenia pechuelii*. Initial awareness targeted Namibian Border Officials and law enforcement officials and has now been extended to community members in Conservancies.

In addition to the awareness sessions for Namibian Border Officials members of the PPTT undertook a Flora Focused Trafficking visit to South Africa engaging with counterparts to share experiences and lessons learnt on combating illegal harvesting. Counterparts included the Karoo National Botanical Garden, Kirstenbosch National Botanical Garden, CapeNature, SANBI - Custodians of Rare and Endangered Wildflowers (CREW) and the Department of Forestry, Fisheries and the Environment (DFFE).

Collaborating to convict criminals

A total of 16 wildlife crime cases have been registered since January 2021 to April 2024 and 37 suspects arrested. One of the highly sought-after species of interest is the peculiarly shaped slow-growing Elephant's Foot (*Adenia pechuelii*), which is endemic to Namibia. Plants from the wild are preferred as plants grown in the nursery tend to have a uniform habit. *Adenia pechuelii* is threatened with extinction based on the rate of illegal harvesting.

The PPTT have been able to convict individuals found to be illegally trafficking *A. pechuelii*. The success of these cases marks a breakthrough for the Namibian investigation teams led by the Blue Rhino Task Team including the Namibian Police Force and the MEFT IIU. The MEFT IIU team networked with law enforcement agencies across many countries, in particular the Ministry of Natural Resources and Tourism and the Criminal Intelligence Officer from Tanzania.



Intern/student assisting with data collection during planting of the *Adenia pechuelii*.

Case Study 14: Continued

Relocation, replanting and monitoring of confiscated plants

All consignments intercepted and confiscated are handed over to the NBRI in line with the Chain of Custody for initial care, relocation and replanting within its habitat range under custodianship and monitored at least once a year. Once the confiscated plants have been replanted in suitable habitats under custodianship of land owners monitoring is conducted at least once a year to determine the survival rate and status of the plants.

Despite many challenges Namibian authorities have joined forces to combat wildlife crime including the illegal harvesting, trafficking and trade of endemic and protected plant species. This initiative, as well as active awareness campaigns and training of law enforcement officials has shown great progress and success. This is evident by the increase in interception of illegal consignments and number of criminal cases registered.

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Confiscated *Adenia pechuelii* and *Commiphora virgata* being driven for replanting in natural habitat.



Namibian Protected Plants Task Team members engaging with South African counterparts: consultations with Department of Environment, Forestry & Fisheries.



Confiscated *Adenia pechuelii* and *Commiphora virgata* being offloaded for replanting in natural habitat.

Collaboration and Networks

The survey also explored collaborations with local communities or indigenous groups. Out of 139 botanical gardens, 103 reported that they do not engage in such collaborations, while 34 confirmed their involvement (Figure 7). This includes, addressing issues related to the illegal trade of plant species and promoting sustainable conservation practices through a variety of approaches, such as educational workshops, seminars and masterclasses, material repatriation and plant propagation.

In terms of involvement in other partnerships working to address plant trafficking, 115 botanical gardens reported no involvement, while 23 confirmed their participation.

The partnerships that these 23 gardens are involved in are diverse and span across various sectors and regions. One new partnership opportunity is the Illegal Plant Trade Campaign established by BGCI and the IUCN Commission on Education and Communication (Box 4).

Additionally, several respondents are involved in the USFWS Plant Rescue Center Program [Case Study 4], which is a significant initiative in the United States aimed at rescuing plants that have been illegally traded. Others are engaged with urban municipal bodies, indicating a focus on addressing the issue at the city level. Several botanical gardens are actively involved in educational activities. For example, some prepare didactic material for conferences and workshops, contributing to the broader knowledge

Box 4: BGCI's Illegal Plant Trade Campaign

At the end of 2023 BGCI established an Illegal Plant Trade Campaign Working Group alongside the IUCN Committee for Education and Communication (IUCN SSC CEC). The goal of the group is to create an 'evergreen' behavioral change campaign that will engage different audiences towards taking action against illegal plant trade.

The campaign will develop a suite of resources that can be utilised by botanic gardens, consumers, law enforcement and a variety of other stakeholders to raise awareness of the threat to plants from this illegal trade. This includes developing identification guides, sharing information on propagation and managing confiscated collections, a social media toolkit and education and outreach options for botanic gardens.

We are not only engaging with botanic garden members but also law enforcement, horticultural industry and IUCN SSC expert members to ensure we approach the issue holistically, raise awareness across as many audiences as possible and develop useful tools.

The campaign is currently recruiting partners and members, to sign up for more information please follow the link below.
<https://www.bgci.org/our-work/inspiring-and-leading-people/policy-and-advocacy/illegal-plant-trade/>

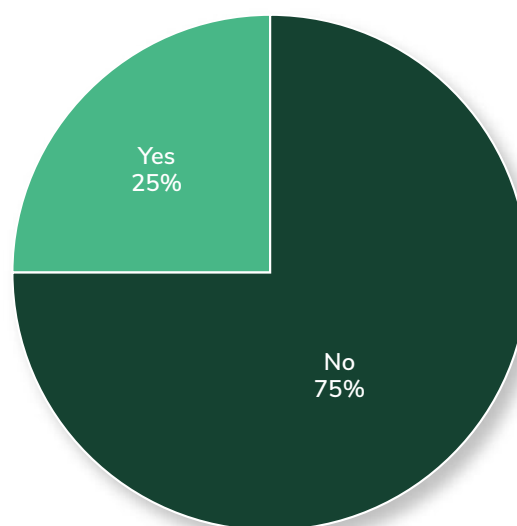


Figure 7: Proportion of botanic gardens collaborating with local communities and indigenous groups

base on the illegal trade of plant species. The New Mexico Native Plant Society, US, for instance, conducts plant rescues and educates the public about the illegal plant trade, particularly of cacti. Cadereyta Regional Botanic Garden in Mexico also works with national CITES authorities to provide research and support for new listings on CITES Appendices [Case Study 15].

International collaborations are also evident. Some botanical gardens are part of the [Global Conservation Consortia](#) for Cycads, Magnolias, Oaks, etc., or BGCI's International Plant Sentinel Network (IPSN – [Box 5](#)) while others are part of the IUCN Species Survival Commission Specialist Group Network [Case Study 16]. There are also botanical gardens associations implementing the Global Strategy for Plant Conservation ([page 11](#)) such as those who are members of the Global Partnership for Plant Conservation and their national network for botanic gardens.

A few botanic gardens also work closely with the CITES Management and Scientific Authorities to ensure a reduction in the illegal trade of threatened plants. They follow national laws for compliance with CITES and the Nagoya Protocol (See [Case Study 1](#) and [page 11](#)). NGOs such as TRAFFIC and WWF SA are all part of SANBI's National response plan [Case Study 11]. Botanic garden accreditation ([Box 8](#)) and BGCI certification ([Box 3](#)) shows commitment of gardens in having collections policies, material agreements (MATs), and responsible material sharing and acquisition in place.



Cacti in cultivation (Kirsty Shaw)

Case Study 15: Collaboration of the Cadereyta Regional Botanic Garden Toward National Goals in the Prevention of Threats to Plant Biodiversity

Emiliano Sánchez Martínez, María Magdalena Hernández Martínez, Yazmin Hailen Ugalde de la Cruz, Daniel Camacho Martínez, José Antonio Aranda Pineda and Beatriz Maruri Aguilar, Cadereyta Regional Botanic Garden, México

Cadereyta Regional Botanic Garden (CRBG) adheres to international and national plant conservation policy strategies to guide its activities and provide framework for effective plant conservation.

Of particular importance is strategic objective 4 of the Mexican Strategy for Plant Conservation (2012-2030) (Estrategia Mexicana para la Conservación Vegetal, EMCV in Spanish) “to prevent, reduce and control threats to plant diversity.” The line of action 4.4, “prevention and control of overexploitation and trade,” includes México’s active participation in ensuring that the CITES appendices are adequately enforced and reflected nationally to protect Mexican native species from international trade.

The CRBG collaborates in joint efforts towards fulfilling the goals and objectives of the EMCV. To reinforce strategic objective 4, the CRBG took part in two assessments of plant species whose distribution lies close to its region of interest and knowledge: *Yucca queretaroensis* Piña (Asparagaceae, “Estoquillo”) and *Ceratozamia hildae* G. P. Landry & M. C. Wilson (Zamiaceae, “Bamboo cycad”).

The *Yucca queretaroensis* assessment was made between 2011 and 2013 in association with the National Commission for the Knowledge and Use of Biodiversity (CONABIO), and the data supported México’s successful proposal to include the species in Appendix II, at CITES COP16. In addition to completing *in situ* surveys for these threatened species, *Y. queretaroensis* is also conserved and propagated at the CRBG.



Ceratozamia hildae G. P. Landry & M. C. Wilson (Zamiaceae, “Bamboo cycad”). (Beatriz Maruri Aguilar)



Yucca queretaroensis Piña (Asparagaceae, “Estoquillo”) (Beatriz Maruri Aguilar)

In 2020, the CRBG collaborated with the Institute of Ecology of the National Autonomous University of México field studies and evaluations to support Mexico’s periodic review for species included in CITES Appendices I and II. The subject of study was *Ceratozamia hildae*. The Review was presented at the Twenty-fifth meeting of the CITES Plants Committee in 2021 (online), and the species remains in Appendix I, along with its whole genus.

Case Study 16: Engaging Voluntary Networks: Membership of IUCN SSC Groups



Megan Barstow, BGCI

The IUCN Species Survival Commission Network (IUCN SSC), is a network of over 10,000 volunteer experts working across many different volunteer groups to tackle the world's biodiversity and climate crises. Volunteers provide knowledge, advice and contribute to policies and guidance documents. Botanic gardens and their staff should be encouraged to join relevant IUCN SSC Groups.

One such group is the IUCN Sustainable Use and Livelihoods group which aims to mobilise global expertise across the science, policy and practice sectors to address the urgent challenges of overexploitation of wild species and support robust, equitable models of sustainable use that meet human needs and priorities. The group attracts individuals operating in different fields relevant to illegal plant trade; work towards this is dealt with specifically in the Plants Use Subgroup.

IUCN SSC Groups are often established for specific groups of species for example the IUCN SSC Global Tree Specialist Group and the IUCN SSC Orchid Specialist Group. Members of these groups can contribute at CITES Plants Committee and other international conservation events. The Orchid Specialist Group has a particular volunteer team engaged in tackling orchid trade. The IUCN SSC Orchid Specialist Group - Global Trade Programme co-chair Jacob Phelps reports the groups has

- Co-developed a draft code of conduct for orchid societies to encourage members to develop ethical and sustainable collections
- Hosted side events for orchids at CITES Plants Committee and CITES Conference of the Parties (CoP) events to raise awareness
- Published articles about orchid trade issues
- Worked towards methods of increasing representation of *Paphiopedilum* orchids in ex situ collections
- Developed a priority list of species for CITES enforcement officials



IPSN
International Plant
Sentinel Network

Box 5: International Plant Sentinel Network

The International Plant Sentinel Network (IPSN), managed by BGCI, is a global network dedicated to safeguarding plant health worldwide. This collaborative network brings together botanic gardens/arboreta, research institutions, National Plant Protection Organisations (NPPOs) and plant health experts worldwide. The IPSN aims to provide an early warning system, identifying and sharing information about new and emerging pests and pathogens risks, and promote best biosecurity practices within botanic gardens/arboreta.

<https://www.bgci.org/our-work/networks/ipsn/>



Vanda spp. National Flower of Singapore (Megan Barstow)

Challenges

For many botanic gardens who answered the survey tackling the illegal plant trade was a relatively new action being taken, and as shown in Figure 1 many gardens do not currently work on this subject. Issues such as funding, capacity, lack of expertise, space and legality are all challenges faced by gardens trying to tackle the illegal plant trade (Figure 8). In general, a lack of funding and capacity are often overarching challenges faced by gardens undertaking conservation action.

Many gardens surveyed have not identified illegal plant trade as a priority issue. Reasons for this identified in the survey are broad for example, they may not be a source country of wild collected plants, or a major destination country, or much of the trade might be online and therefore beyond a gardens jurisdiction to take action. Gardens may not work internationally and be unable to respond to needs of source countries or may not have the networks available to build these relationships.

The challenges faced by gardens are generally interlinked as are the causes of these challenges. For example, a lack of expertise can contribute to a lack of capacity to propose and apply solutions within gardens for illegal plant trade or a lack of funding may mean there is a lack of space to undertake interventions, as new facilities needed can't be built.

Below each challenge has been addressed in turn and the potential causal factors discussed.



Funding – Plant blindness (Marguiles et al. 2019) or lack of awareness about plants, can cause a reduced possibility of achieving funding for illegal wildlife trade, as this is often primarily thought of as impacting iconic mammal species, and some fish and birds. Illegal plant trade is often not top of the political agenda which can limit funding available for national botanic gardens to tackle this issue. Then if gardens have not identified illegal plant trade as a priority action, it is also more difficult to mobilize funding.

Mechanisms need to be put in place to help gardens secure funding for activities towards tackling the illegal plant trade, be that for research activities, partner support or outreach.



Expertise – As illegal plant trade is only now gaining attention in conservation and other spheres, expertise in existing staff towards tackling the issue can be limited. There are also limited resources in terms of communication products, best practice guidelines etc. for garden staff to utilise given that much of the research on this issue is not directed at plants. Garden staff in horticulture, education and research will have training requirements that need to be met for a garden to successfully tackle the issue of illegal plant trade. Already BGCI has several tools that can introduce botanic garden staff to issues related to the illegal plant trade (Box 6).

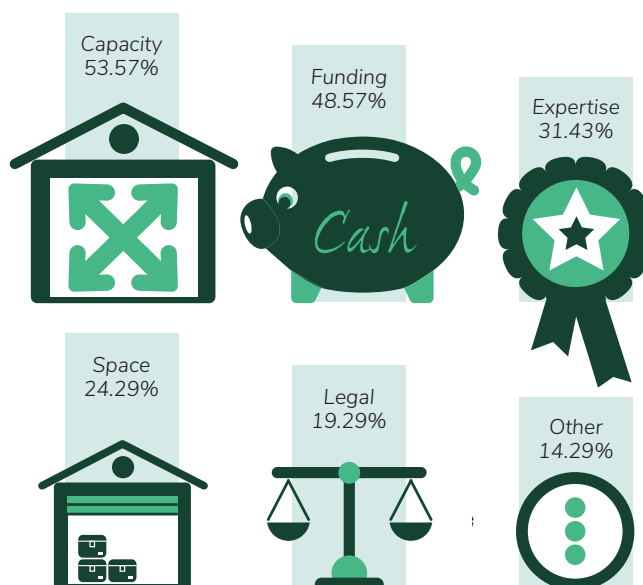


Figure 8: The main challenges faced by botanic gardens in efforts to combat illegal plant trade

BGCI
Resource
Available

Box 6: Learning Opportunities on the BGCI Website

CITES learning modules

As well as tools available on The CITES website, BGCI has a tailor-made set of presentations to guide botanic gardens through CITES nomenclature, and the relation of CITES to botanical institutions.

<https://www.bgci.org/resources/bgci-tools-and-resources/cites-learning-modules/>

Access and benefit sharing resources

BGCI has a suite of resources to help botanic garden staff learn about the international access and benefit sharing (ABS) regime and how the implementation of national and international ABS regulations and legislation impacts on the work of collection-based institutions. The resources can be used as self-learning tools, but can also be used to support capacity building and training within an institution.

<https://www.bgci.org/resources/bgci-tools-and-resources/abs-learning-package/>

Online training modules (BGCI members only)

If you are BGCI member additional learning opportunities are available on the BGCI's online training platform. This includes further information on developing collections policy, managing collections data (including documentation on sharing materials) botanic gardens and international frameworks and propagation. Several of these courses are also available in multiple languages. These are supplied across three learning modules:

- Plant Collection Policy Overview
- Introduction to International Environmental Policies
- Managing Collections Data

<https://training.bgci.org/>



Seized Conophytums potted up for accessioning (Emily Kudze, SANBI)



Capacity – Many botanic gardens are not adequately staffed to deal with modern climate and biodiversity crises, and are unlikely to ever be able to tackle this issue unless national or visitor opinions/needs change to provide gardens with

more funding for staff, and a mandate to tackle illegal plant trade. Consideration needs to be given to small actions that can be taken or implemented by gardens, to take cost effective (and potentially free) steps towards addressing illegal plant trade issues. One example is given in [Case Study 4](#), with garden tours at Naples Botanic Garden, US, discussing the illegal plant trade. This can provide the first step for visitors to become aware of the issue.



Space – Most botanic gardens have completely utilised the space that they have, either in green houses or in outdoor planted areas. Therefore, it is not possible for them to be a refuge for confiscated specimens unless changes are

made to collections policies to make this a priority, or funding is awarded to establish new sites, new infrastructure or to change current planting regimes. In some cases where the scale of confiscation is high, for example in South Africa, the number of specimens needing care is over 100,000 and even if space were available it would still be unable to cope with these volumes.

Space is also a consideration in terms of caring for existing collections ([Box 7](#)). Acceptable quarantine facilities will be needed to protect collections from any biosecurity risk that may be posed from confiscated specimens. And if this space isn't available, the expertise in staff to prevent contamination may be needed. Opportunities to partner with the horticulture industry and others to secure space for these valued collections should be investigated.



Legality – For some gardens working in illegal plant trade is beyond their mandate and would be outside their terms of operation. In some countries, environmental agencies rather than botanic gardens, may be those in charge of

confiscated specimens and do not need the support of gardens. Methods of involving or supporting gardens experiencing these scenarios in work against plant trafficking requires exploration.

Some of these challenges will be easier to address than others, and across this report we have posed different actions already being taken by gardens which could be easily introduced and replicated in others (see case studies). While harder challenges may need wider support, and engagement with governments and other organisations.

Box 7: Biosecurity and the Illegal Plant Trade

Uncontrolled trade of plants and plant products in addition to posing a threat on collected target plant species, leads to an increased risk of the plant health on the areas where traded species are introduced (Cardoso et al. 2021). Traded species and products can carry unwanted hitchhikers with them when transported, such as arthropods, parasites and pathogens, and these, when reaching a new area can become harmful pests and disease for the plants of the new colonised area. In the last decade, the increased international trade of plants and plant products has led to a greater risk to native plants due to the spread of alien plant pests and diseases.

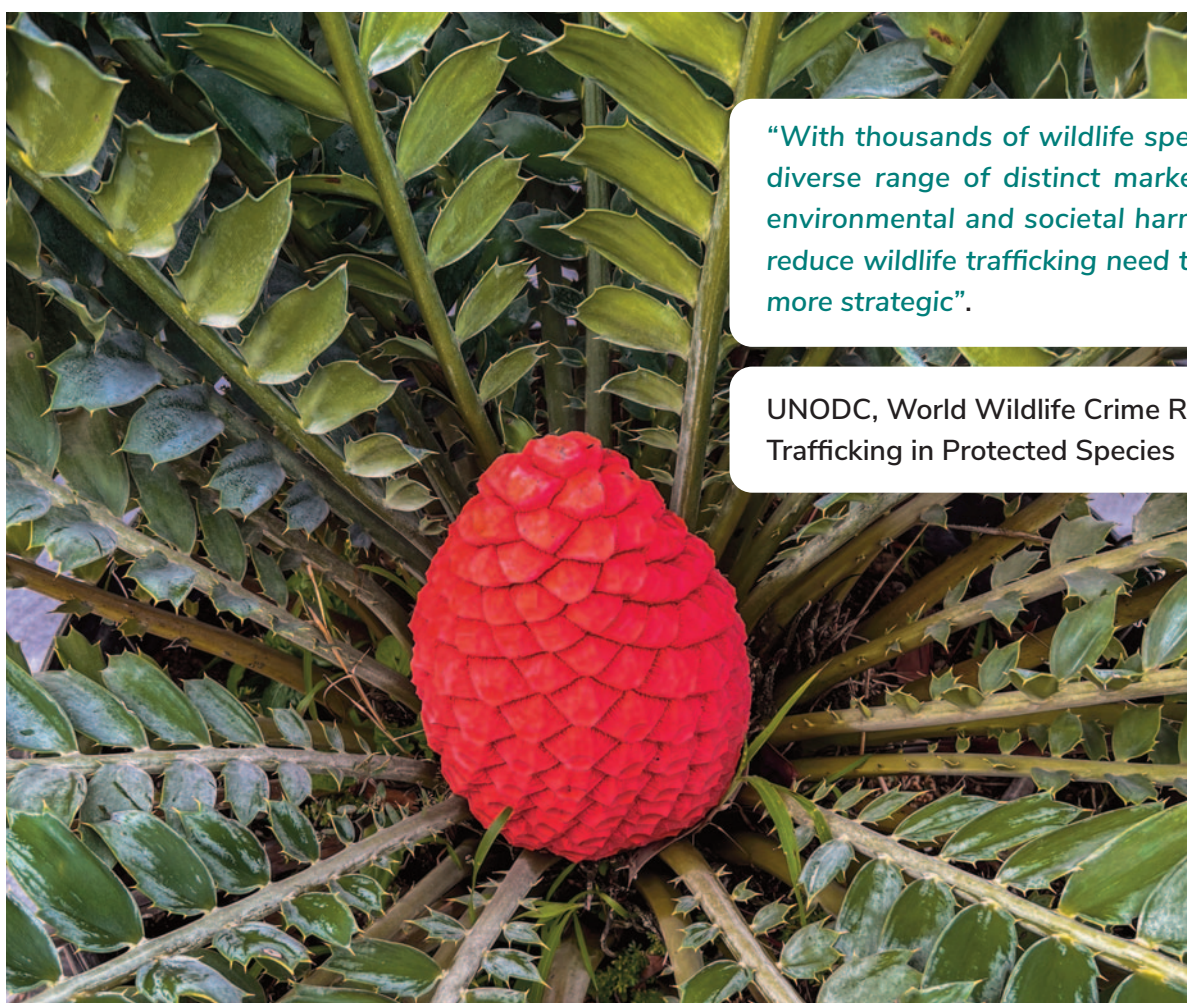
Some actions can be taken to address this risk to keep plants in collections (and the wild) safe and healthy. For example, Royal Botanic Gardens, Kew, UK ensures that all imported plant material (i.e. seeds, cuttings, plants, wood or tissue cultures) are managed in line with plant health legislation and CITES (Avis-Riordan 2019). Plant material requires inspection before it is imported or exported from the UK, to make sure it is not introducing any new pests, diseases, or invasive species, and must be accompanied by a phytosanitary certificate (Avis-Riordan 2019). All the inspections take place in the Quarantine Unit and plants are kept in high containment until they are ready to be released out into the collections (Johnston 2023). Any plant material found to pose a significant pest or disease risk will be destroyed in an incinerator (Johnston 2023). Additionally, staff at Kew work together with officers from the UK Border Force, the police and inspectors from APHA's Plant Health and Seeds Inspectorate to help identify imported plant material to prevent illegal plant trade (Avis-Riordan 2019).



Established seedlings at Zurich Succulent Centre, Switzerland with defined provenance data ready for the permanent exhibition, scientific research, plant exchange, or re-introduction (Felix Merklinger)

Conclusions and Call to Action

While a significant number of botanical gardens are engaged in efforts to combat the illegal trade of plant species, there is considerable potential for increased involvement. This is particularly true in areas such as building plant identification capacity, collaborating with local communities, and participating in relevant networks or initiatives. Further research and funding is needed to explore the barriers to involvement and identify strategies for increasing the role of botanic gardens in addressing this critical issue. This report provides a valuable foundation for such future investigations.



Cycad (BGCI Image Library)

“With thousands of wildlife species affected and a diverse range of distinct markets driving multiple environmental and societal harms, interventions to reduce wildlife trafficking need to be prioritized and more strategic”.

UNODC, World Wildlife Crime Report 2024:
Trafficking in Protected Species

The impact of botanic gardens is at its greatest when working together, across a country, region, or globally. This coordination and collaboration is essential to the prevention of plant extinctions from illegal plant trade. The step change needed for this impact is a big undertaking but with combined efforts is possible. Botanic gardens have an outstanding amount of skills and expertise they can offer towards creating global change. Sharing of this knowledge needs to be mobilised to successfully deter plant trafficking.

Activities taken by botanic gardens are supported by the complementary actions of the Global Strategy for Plant Conservation (2020-2030). This includes alignment with Actions 3a, 3b, 4a, 4c, 4d and 6b calling for elimination of threats to species in the wild and Actions 5a, 5b, 10a, 15a and 15b which call for all trade in plant species to be sustainable. Therefore not only should botanic gardens be working towards these goals but also countries who are ratifying the Convention on Biological Diversity and the Kunming Montreal Global Biodiversity Framework.



Call to Action for Global Community

Below we present several priority actions at a global level that are needed to begin this change.

- Increased awareness of illegal plant trade in/at gardens
 - Before we can raise awareness in the public we need to raise awareness in our gardens. Engagement and resources should be shared with all gardens both in and outside of biodiversity hotspots. This will help tackle the problem where harvesting is happening but also in areas where demand is high for wild plants.
- Build capacity at botanic gardens
 - Training must be produced and delivered to gardens regarding illegal plant trade. Training should address the implementation of international policies within gardens, adapting collections policies and strategies to address the issue, and also deliver skills such as outreach and education to enhance visitor engagement.
- Connect gardens and enforcement agencies
 - Beyond botanic garden networks, connections need to be made between local and national botanic gardens and enforcement agencies whether this is border control, or environmental departments. This will foster knowledge sharing between the different sectors, and allow each to better respond to the growing crisis.
- Funds needed for confiscated specimens to be housed
 - As the illegal trade in plants continues to grow, so does the volume of plants being confiscated and needing refuge. Botanic gardens need to be provided with the financial assets to be able to grow and house these collections. As well as being able to invest in enhancing the skills of their staff to be able to manage and care for such specimens.



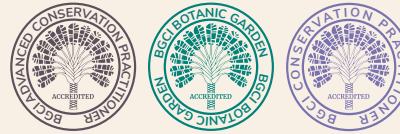
Call to Action for Botanic Gardens

Every botanic garden has a role to play in tackling the illegal plant trade, no matter how big or small this action is. Currently the minority of botanic gardens are taking action towards this issue. It is important that more become involved and that BGCI, botanic garden networks and large botanic gardens provide support and resources for more botanic gardens to take action. As this issue begins to attract more attention within the conservation, horticultural, media and political sectors botanic gardens need to be poised to take action. Their role as hubs of plant diversity expertise is particularly essential to provide advice and information to other sectors. Additionally, the unique asset of botanic gardens, their visitors, needs to be mobilised and activated towards this issue. Small steps botanic gardens could take are suggested below.

- BGCI has a plethora of resources from which to begin your gardens journey into tackling the illegal plant trade.
- In [Case Study 6](#) we see how a simple sign can engage visitors with the issue, but a plant doesn't have to be stolen for signage to be used. Information on illegal plant trade could be shown alongside the living collections of plant groups that are at risk from trafficking.

BGCI
Resource
Available

Box 8: BGCI Botanic Garden Accreditation



There are three types of accreditation. Organisations applying for accreditation will be assessed on criteria encompassing leadership, collections management, horticulture, public education, community/ cultural activities, conservation actions, scientific research, staff, networking and sustainability.

BGCI Botanic Garden Accreditation is aimed at botanical institutions wishing to establish their credentials as botanic gardens. (join second paragraph to here)

The BGCI Conservation Practitioner Accreditation recognises botanic gardens with a conservation-oriented approach. Advanced Conservation Practitioner Accreditation recognises botanic gardens with a focus on conservation actions that support local, national or global conservation goals. Institutions may apply for more than one accreditation.

Botanic gardens seeking to begin pursuing activities towards tackling illegal plant trade may wish to explore accreditation options. Accreditation provides botanic gardens a framework of work to have strategic documentation and processes in place that will support and enhance a gardens work on these issues, and resources are available on how to make improvements to a gardens current operations. This includes developing collections policies ([Box 2](#)) and alignment with international conventions ([page 11](#)).

<https://www.bgci.org/our-work/sharing-knowledge-and-resources/bgci-accreditation-scheme/about-the-bgci-accreditation-scheme/>

- As well as signage, garden tours can also provide a narrative for illegal plant trade if focal groups are part of the tour. See [Case Study 4](#).
- Engage with your national or regional botanic garden network to identify priority messages regarding illegal plant trade, and learn from other gardens who have been working in this field.
- Take local community action, work with community groups to raise awareness of the issue outside of botanic garden walls. Learn from these groups how best to convey information in gardens and also the needs of the community that botanic gardens may be able to provide expertise and knowledge towards [[Case Study 7](#)].
- Join BGCI's Illegal Plant Trade Campaign ([Box 4](#)), this campaign is in its foundational phase and there are many ways to become involved. This campaign will also provide resources which can be used to begin taking action in your botanic garden.

References



Orchids at Longwood Botanic Garden, US

Arias, S., Guzmán, U., Mandujano, M.C., Soto, M. and Golubov, J., (2005). Las especies mexicanas de cactáceas en riesgo de extinción. I. Una comparación entre los listados NOM-059-ECOL-2001 (México), La Lista Roja (IUCN) y CITES. *Cactáceas y suculentas mexicanas*, 5(4), pp.101-125.

Averyanov, L.V., Pham, V.T., Ke, L.P., Tien, H.N., Xuan, C.C., Tien, V.N. and Quan, H.N., (2014). Field survey of *Paphiopedilum canhii*: from discovery to extinction. *Slipper Orchids*, 24(4), pp.16-26.

Avis-Riordan, K. (2019). *Kew's biosecurity bouncers*. Royal Botanic Gardens, Kew.

BGCI. ThreatSearch (2024). Threatsearch online database. Botanic Gardens Conservation International. Richmond, UK. Available at https://tools.bgci.org/threat_search.php.

Calonje M, Stevenson DW, Osborne R. (2013-2024) The World List of Cycads, online edition [Internet]. [cited 2024 Jul 22]. Available from: <http://www.cycadlist.org>.

Cardoso, P., Amponsah-Mensah, K., Barreiros, J.P., Bouhuys, J., Cheung, H., Davies, A., ... & Fukushima, C.S. (2021). Scientists' warning to humanity on illegal or unsustainable wildlife trade. *Biological Conservation*, 263, 109341.

HandWiki. "North-South Divide in the World" Encyclopedia, <https://encyclopedia.pub/entry/37558> (accessed July 01, 2024).

Hernández Rosas, L. (2017) Comercio internacional de Cactáceas mexicanas: estudio de caso de las especies descritas recientemente Master Thesis. International University of Andalucía

Hinsley, A., De Boer, H.J., Fay, M.F., Gale, S.W., Gardiner, L.M., Gunasekara, R.S., Kumar, P., Masters, S., Metusala, D., Roberts, D.L. and Veldman, S., 2018. A review of the trade in orchids and its implications for conservation. *Botanical Journal of the Linnean Society*, 186(4), pp.435-455.

IUCN, (2024). The IUCN Red List of Threatened Species. Version 2023-1. <https://www.iucnredlist.org>

Johnston, E. (2023). *Watch: Inside Kew's secret Quarantine Unit*. Royal Botanic Gardens, Kew.

Lavorgna, A., Middleton, S.E., Whitehead, D., Cowell, C., Payne, M. (2020). *FloraGuard: Tackling the illegal trade in endangered plants*. Royal Botanic Gardens, Kew.

Margulies, J.D., Bullough, L.A., Hinsley, A., Ingram, D.J., Cowell, C., Goettsch, B., Klitgård, B.B., Lavorgna, A., Sinovas, P. and Phelps, J., (2019). Illegal wildlife trade and the persistence of "plant blindness". *Plants, People, Planet*, 1(3), pp.173-182.

Margulies, J.D., Moorman, F.R., Goettsch, B., Axmacher, J.C. and Hinsley, A., (2023). Prevalence and perspectives of illegal trade in cacti and succulent plants in the collectorcommunity. *Conservation Biology*, 37(3), p.e14030.

Rivers, M., Beech, E., Murphy, L., and Oldfield, S. (2016) *The Red List of Magnoliaceae (revised and extended)*. Botanic Gardens Conservation International, Richmond UK.

Spence, N., Hill, L., & Morris, J. (2020). How the global threat of pests and diseases impacts plants, people, and the planet. *Plants, People, Planet*, 2(1), 5-13.

UNODC. (2020) *World Wildlife Crime Report 2020: Trafficking in Protected Species*. UNODC

UNODC. (2024) *World Wildlife Crime Report 2020: Trafficking in Protected Species*. UNODC

The Wild Cycad Conservancy (2024) Homepage: The Wild Cycad Conservancy (online). Available at - <https://wildcycad.org.za/> [Accessed July 2024]

Williamson, J., Maurin, O., Shiba, S.N.S., Van der Bank, H., Pfab, M., Pilusa, M., Kabongo, R.M. and Van der Bank, M., 2016. Exposing the illegal trade in cycad species (Cycadophyta: *Encephalartos*) at two traditional medicine markets in South Africa using DNA barcoding. *Genome*, 59(9), pp.771-781.

Annex 1

List of Contributing Gardens

Adkins Arboretum	Hortus Botanicus Leiden, University of Leiden
Andromeda Botanic Gardens	Hortus Malabaaricus Medicinal Plants Gardem
APIVITA	Houston Botanic Garden
Araribá Botanical Graden	Inala Jurassic Garden
Arboretum & Botanical Garden at California State University, Fullerton	INRAE - Unité Expérimentale Villa Thuret
Arboretum-Pinetum Lucus Augusti	Instituto Inhotim
Baiya Garden	International Institute of Tropical Agriculture (IITA)
Barwaaqo Voluntary Organization (BVO)	IUCN SSC Orchid Specialist Group - Global Trade Programme
Bauru Botanical Garden	Japan Cycad Society, G.I.A.
Beal Botanical Garden & Campus Arboretum	Jardí Botànic de Barcelona-Museu de Ciències Naturals de Barcelona
Bellingrath Gardens & Home	Jardín Botánico de Acapulco 'Esther Pliego de Salinas'
Bergamo Botanical Garden	Jardín Botánico de Cali
Bergius Botanic Garden	Jardín Botánico de Cartagena
Betty Ford Alpine Gardens	Jardín Botánico de la Ciudad de Buenos Aires "Carlos Thays"
Birmingham Botanical Gardens, UK	Jardín Botánico Efraim Hernández Xolocotzi de la Facultad de Ciencias Forestales, UANL
Botanic Garden & Museum of the University of Pisa	Jardín Botánico San Juan Bautista De La Salle
Botanic Garden of Smith College	Jardín Botánico Universitario-BUAP
Botanic Garden of the Ruhr-University Bochum	Jardin botanique de Bordeaux
Botanical Garden Geneva	Jardin botanique de l'Université de Fribourg
Botanical Garden of Salzburg	Joseph Rock Arboretum
Botanical Garden of the University of Bern	Juniper Level Botanic Garden
Botanical Garden of Tver State University	Kadoorie Farm & Botanic Garden, Hong Kong
Brooklyn Botanic Garden	Karura Private arboretum
Budapest Zoo & Botanical Garden	Key West Botanical Garden Society, Inc.
Cadereyta Regional Botanical Garden	Komarov Botanical Institute of Russian Academy of Sciences
Carl Faust Foundation - Marimurtra Botanical Garden	Korea National Arboretum
Cayes Botanical Garden	La Rambertia
Cephalonia Botanica	Lewis Ginter Botanical Garden
Chelsea Physic Garden	Lismore Rainforest Botanic Gardens
Chester Zoo	Lugan Arboretum
Chicago Botanic Garden	Melbourne Arboretum
City of Aurora, Ohio Tree Museum	Merian Gärten
Comenius University Botanical Garden	Ministry of Environment, Forestry & Tourism
Conservatoire botanique de la ville de Mulhouse	Montgomery Botanical Center
Cruickshank Botanic Garden, Univ. of Aberdeen.	Muse. Trento Science Museum
CSIR-Forestry Research Institute of Ghana	Naples Botanical Garden
Denver Botanic Gardens	Northeastern University
Dharohar	Oklahoma City Zoo & Botanical Garden
Elgo Dimitra Balkan Botanic Garden Kroussia	Orto botanico, Università della Calabria
Fanshawe College	Palestine Institute for Biodiversity & Sustainability, Bethlehem University
Finca Cántaros Environmental Association	Palmengarten der Stadt Frankfurt am Main
Friends of the Melton Botanic Garden	Paradise Found Nursery
Future Adventure	Parques de Sintra - Monte da Lua, S.A.
Gradina Agro-Botanica din Cluj-Napoca	Pinecrest Gardens
Harold L. Lyon Arboretum, University of Hawai'i	Qinling National Botanical Garden
Herbarium and Botanic Garden, BUAP	
Honolulu Botanical Gardens	

List of Contributing Gardens, continued

Qur'anic Botanic Garden
 Real Jardín Botánico-CSIC
 Reykjavík Botanic Garden
 Ringve, Botanical Garden, NTNU University Museum
 Rogerson Clematis Garden
 Royal Botanic Garden - Jordan
 Royal Botanic Gardens, Kew
 Royal Zoological & Botanical Gardens Rotterdam
 San Diego Botanic Garden
 São Paulo Botanical Garden
 Science Museums, Aarhus University
 Slovenian Museum of Natural History
 (Alpine Botanical Garden Juliana)
 Soller Botanical Garden
 South African National Biodiversity Institute
 South China Botanical Garden, CAS
 Southwestern College
 Stellenbosch University Botanical Garden
 Technological University of Pereira Botanical Garden
 Terraformation
 The Sofijivka State Dendrological Park of the National
 Academy of Science of Ukraine

The Arboretum at Flagstaff
 The Huntington Library, Art Museum, & Botanical Gardens
 The Linnaean Gardens of Uppsala, Uppsala University
 The Tasmanian Arboretum inc.
 Toronto Zoo
 Tracy Aviary & Botanical Garden, Nature Center at Pia Okwai
 UCLA Mathias Botanical Garden
 United States Botanic Garden
 Universidad del Valle de Guatemala
 University of Bergen, University gardens
 University of California Botanical Garden at Berkeley
 University of Malta, Argotti Botanic Garden
 University of Muenster, Botanical Garden
 University of Warsaw Botanic Garden
 Utrecht University Botanic Gardens
 Vandusen Botanical Garden
 Vilnius University
 Zurich Botanical Garden
 Zurich Succulent Plant Collection



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