BGCI's global living collections database: a resource to document botanic garden contributions to halting the loss of plant diversity

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Introduction

Since BGCI's establishment in 1987, a key role of the organisation has been to manage information on botanic gardens and their plant collections, particularly those of conservation interest and importance. Even from the first days of the organisation, efforts were made to record such data electronically. In 2000 those files moved to the new BGCI website, providing for the first time internet-accessible databases on botanic gardens (the Garden Search) and on plants held *ex situ* in botanic gardens worldwide (called the Plant Search) (see Figures 1 & 2).

The adoption of the Global Strategy for Plant Conservation by the U.N. Convention on Biological Diversity provided a new impetus for the development of this system as a worldwide mechanism to monitor progress towards the achievement of the target relating to *ex situ* conservation (Target 8). This was urgently required.

Since 2004, *ex situ* collection holders have been able to update their own botanic garden information and upload their plant records via a login screen. Once uploaded, the plant records received from a botanic garden are then automatically and electronically compared with lists of plant species of conservation interest to identify priority conservation holdings in each botanic garden. The garden is also able to see how many other botanic gardens are growing material of the same species or taxon. The aim of this database development has been to help botanic gardens identify and prioritise key species within their garden collections and encourage them to give special attention to important collections, particularly those that are critically endangered or cultivated in few other botanic gardens..

BGCI is continuing to develop this on-line database by building up these lists of plants in cultivation that are of conservation interest and to develop further aspects of the system. In 2007 BGCI has developed further aspects of the system linked to the Plant Search to include a Propagation Database and a database documenting species included in Reintroduction and/or Restoration projects.

Although to date a considerable amount of data has been incorporated into the Plant Search, your help will be required to help populate existing and new database fields to help ensure that the Plant Search continues

to develop as a major resource for botanic gardens worldwide and an effective means to accurately monitor and assess the achievement by botanic gardens of Target 8 of the GSPC.

Target 8: *Ex Situ* Conservation

60 per cent of threatened plant species in accessible ex situ collections, preferably in the country of origin, and 10 per cent of them included in recovery and restoration programmes.

The achievement of this target required the establishment of a global living collection database to assess its success effectively. How else can the *ex situ* plant collections of the world be collated? Databases of plant genetic resources in the world's genebanks in part already exist but for botanic gardens this was a significant challenge and requirement. The database is unlikely to have been able to be created except under the auspices of an international organisation such as BGCI. BGCI is a unique organisation - founded in 1987 to link botanic gardens as a co-operating global network for effective plant conservation. It links over 800 institutions in over 120 countries, working together to preserve and promote plant diversity for people and the planet. Its mission is "to mobilise botanic gardens and engage partners in securing plant diversity for the well-being of people and the planet". In 2000 BGCI developed and published an International Agenda for Botanic Gardens in Conservation (Wyse Jackson and Sutherland, 2000) to provide a global policy framework for botanic gardens' work in plant conservation. The International Agenda has now been formally endorsed by almost 500 botanic gardens worldwide.

BGCI has played an essential role in the development and ultimate adoption by 188 governments of the Global Strategy for Plant Conservation (GSPC), helping to change the political face of plant conservation and helping to introduce for the first time the application of outcome-orientated targets in biodiversity conservation at the international level.

Following the adoption of the GSPC, BGCI was requested by the Executive Secretary of the Convention on Biological Diversity to help facilitate an international stakeholder consultation of Target 8 of the GSPC (Wyse Jackson et al. 2003). Working with Bioversity International (previously the International Plant Genetic Resources Institute - IPGRI), BGCI has become a key facilitator for the achievement of Target 8.

BGCI's mission is achieved through the following activities:

- Networks supported by BGCI now exist in all regions of the world, bringing together botanic gardens with an astonishing wealth of knowledge and experience to share.

- BGCI runs a unique database on endangered plants, documenting over 100,000 species in cultivation in botanic gardens. More than 11,000 of these are known to be under threat of extinction in the wild.

- BGCI has developed new models of interpretation and engagement which are being adopted by botanic gardens around the world.

- BGCI's work has had a significant impact in countries where botanic gardens reach massive audiences, e.g. China, India, Indonesia and the United States. With the growing importance of botanic gardens for raising awareness and developing a conservation and sustainable development agenda, impact in these areas cannot be underestimated.

- Supporting and encouraging the development of botanic gardens and their work throughout the world.

The development of BGCI's on-line monitoring databases have fulfilled an urgent need for the international botanic garden community. However it is no substitute (nor is it intended to be a substitute) for the development of effective in-garden collections data management systems. Individual botanic gardens needs are still widely different – the idea of one 'generic' plant record keeping database programme will never be an option available to the botanic garden community. Data module programmes can address this diversity in a limited way. However the actual data fields allowed for within these modules will always swing between not being detailed enough for one institution and yet another institution will reject the module completely as it will be too complex for their requirements.

Nevertheless the development of the International Transfer Format for Botanic Gardens (Versions 1 and 2) helped to standandise data collection and management in botanic gardens, providing a useful baseline of minimum data requirements and formats.

There are exceptions to every rule though and several excellent examples of botanic garden networks joining together to agree on the collective requirements of the group – for example, the Botanic Garden Networks in Brazil, Colombia and the Netherlands are good models of where collective agreement on the adoption and use of a single standardised information system for plant records has been achieved.

Web-based on-line databases by definition are not constrained by location. Data can be updated by multiple users across wide geographical regions. But the majority of organisations will only submit information if there is an incentive and if there can be a positive return on their investment of time and data. Symbiotic relationships work – two or more parties combine for a mutual benefit. BGCI's online databases (Garden Search and Plant Search) are a clear example of a symbiotic relationship for the mutual benefit of both the botanic garden contribution information and for BGCI's work in the assessment of the achievement of Target 8. The benefits gained by the individual botanic garden include:

- regular and easy assessment of the importance of their collections in comparison with every other botanic garden providing data worldwide;

- identification of spelling errors amongst their plant collection data sets;

- Promotional opportunities by publicising their botanic garden facilities, resources and activities on a major on-line database increasingly accessed by web users worldwide.

The Garden Search concentrates on the documenting the facilities in each botanic garden institution. Every effort is made to ensure that the Garden Search contains a comprehensive and up-to-date list of the world's botanic gardens. Compiled originally from the International Directory of Botanical Gardens (Heywood et al., 1990) it now includes information on over 2,000 institutions. Individual botanic garden staff can apply to

become the garden editor of the information held about their institution and update their garden's profile as required. BGCI hopes that each botanic garden will review and update its entry at least once or twice a year. Botanic gardens are constantly evolving entities and it is important to keep the botanic garden's record current and up to date.
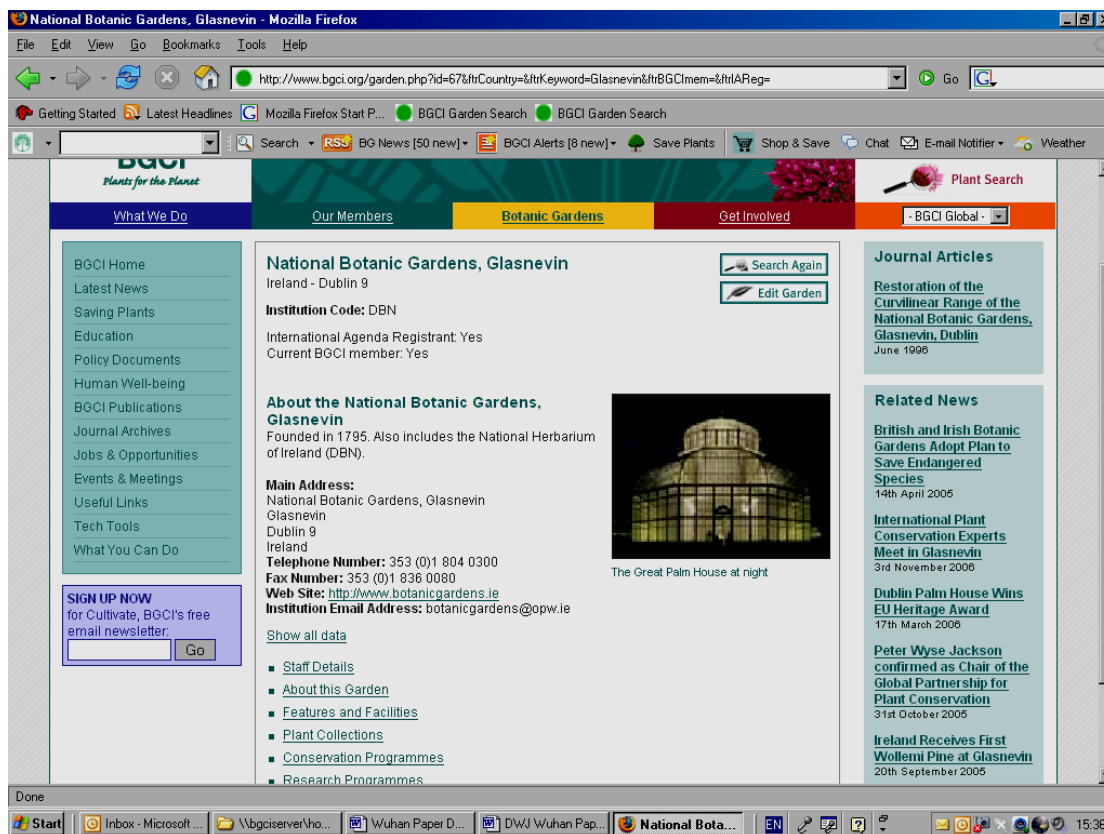

Figure 1 An example from BGCI's website - Garden Search showing the entry for the National Botanic Gardens in Dublin, Ireland – note the Edit Garden tab.

The Plant Search database includes a list of the plants grown in *ex situ* collections. BGCI only information on seven fields relating to each botanic garden holding added to the database. Data uploaded requires being in a simple 7 field csv (commas separated variable) format for a garden to enter a plant record. Only fields that include information are required to be filled, the rest can contain a blank (null) value.

The Seven required fields are (abbreviations of field names taken from ITF2 Standard Field Names (1998):

- Genus Hybrid (genhyb)

- Genus Name (gen)

- Species Hybrid (sphyb)

- Species Name (sp)

- Infraspecific rank (isprk)

- Infraspecific epithet (isp)

- Cultivar name (cul)

As a CSV file, this would be written as: genhyb,gen,sphyb,sp,isprk,isp,cul. Any field can hold a blank value, which will be recorded as a comma (which indicates to the computer programme to move to the next field).

If a record only includes the generic and specific names, the record would be written as: -,gen,-,sp,-,-,-

With the blanks (-) removed, the record would be ,gen,,sp,,,. So a plant list prepared by a botanic garden to cpload to the Plant Search might look as follows:

,Abronia,,turbinata,,,
,Abronia,,villosa,,,
,Acacia,,asepala,,,
,Acacia,,blakelyi,,,
,Acacia,,bussei,,,
,Acacia,,carens,,,
,Acacia,,circummarginata,,,
,Acacia,,cuneifolia,,,
,Acacia,,filifolia,,,
,Acacia,,paolii,,,
,Acacia,,stereophylla,,,

Once the plant list has been prepared, a botanic garden must login to its own botanic garden entry screen where the plant list is added to the database by clicking on either 'Append to plant list' or 'Replace current plant list'. (Wyse Jackson, D 2003)

This plant list is then incorporated into the BGCI Plant Search. Once uploaded it will be automatically compared with the database of names included the International Plant Names Index (IPNI), included in the website www.ipni.org. It will also be compared with the IUCN-WCMC 1997 Red List, and the IUCN 2006 Red List to see if there are any matches between plants in the Garden's list and those registered by IUCN as threatened. Further checks are done against the 1998 WCMC Threatened Tree Database, and a file of generic names of Crop Wild Relatives.

By April 2007 it is intended that all plant names included in the Plant Search will also be checked against the following additional lists:

- CITES appendices (Appendices i, ii, or iii);

- a global list of plants of medicinal uses;

- the Sabonet (Southern African Botanical Network) countries conservation lists (excluding South Africa – as that is already incorporated in the IUCN 2006 Red List);

- the Chinese Information Species List;

- the 2002 threatened plants list for Mexico, and

- the recently published 2007 New Zealand Threatened species list.

BGCI is aware that not all these lists are definitive and that there will always be those who feel that BGCI is not using the most up to date list. Nevertheless it is important to remember and recognize that BGCI's database should always be viewed as 'work in progress' and that changes and list updates will be incorporated as they become available and are easily accessible by electronic means.

At the end of 2006, BGCI took its first major data dump, so that over a period of five years, comparisons should be able to be made on an annual basis. Then it is proposed to keep five yearly intervals data dumps to allow scientists compare the available *ex situ* data over set time periods. i.e. 1 to 5 years, 10 years, 15 years.

One important consideration that should be highlighted - prior to the year 2000, BGCI's reports included the names of each botanic garden growing a particular plant species. In recent years, due to concerns about collections security and data confidentiality, BGCI has only given the <u>number</u> of other gardens that report growing a particular plant. Nevertheless the database allows users to send a blind email to botanic gardens with a query or a request.

During the 3GBGC in Wuhan, BGCI would like to survey botanic gardens as to whether BGCI could reprogram its database to show the names of botanic gardens holding particular taxa. Botanic gardens could choose whether to use a tick 'opt-out' box on the data entry screen so that their holding(s) would not be listed under their botanic garden's name. This opt-out box is planned to be on two levels a) for an individual species name, and b) for the complete listing of plant data contributed by the garden.

Many users of the database feel that they really want to know which botanic gardens are maintaining collections of particular plants. As BGCI is only holding a plant name without any provenance details, it is not felt that this information should not be viewed as particularly sensitive. Others feel however that they could be inundated by requests for plant material and information from people worldwide should information on their collections be freely available. The new op-out option would however allow botanic gardens to make their own choice as to how much information they wish to make freely available.
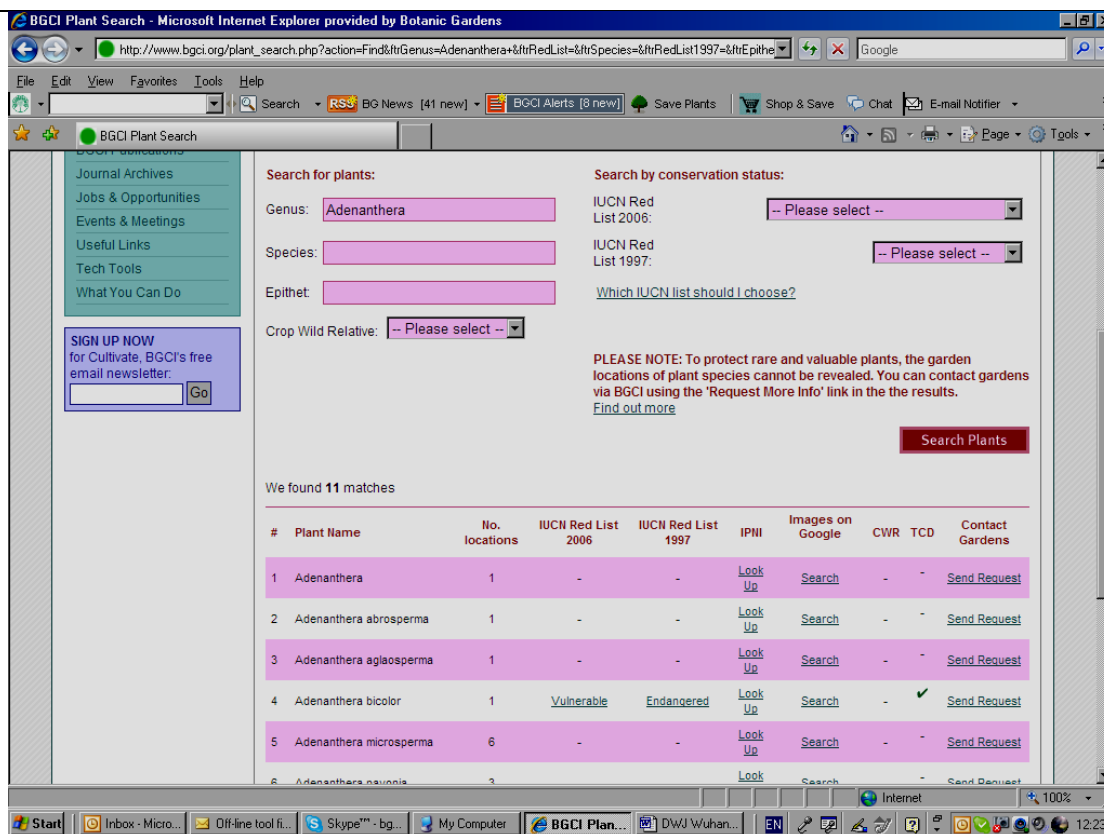
Figure 2   Example of a screen of the Plant Search database showing different threat categories on the current database.

BGCI has two new on-line database initiatives that will be launched at the 3GBGC in Wuhan, China.

Reintroduction Search: an online database for species included in reintroduction, restoration or recovery programmes and projects.

Propagation Search: an online database of information about the propagation and cultivation of selected species.

Data entry on both these new databases will be by a unique downloadable tool that will operate as a stand-alone module on an individual's own workstation, but can also be uploaded and synchronized with BGCI's global living collection database. In the case of the Reintroduction database, users will only be able to know that there is a programme or project in operation within a country and who are the key players and where to contact them. The propagation database will give much more information on the methods that institutions have found successful for the propagation of individual species – it is hoped to concentrate on the species of conservation interest, but will build up a cultivation profile for a number of other species.

BGCI is also reviewing the current methods used to edit botanic garden details and the entering of the *ex situ* plant names. Unfortunately improvements agreed will not be ready for implementation by April 2007, but they too will also be subsequently based on unique stand-alone models that will be easily downloaded from the BGCI website. We also hope to make them more user friendly by translating the input program in various languages.

It is BGCI's objective that all botanic gardens will find BGCI's website informative and helpful and therefore it will be worth each botanic garden making time to update their garden profile and upload their plant information regularly onto www.bgci.org. Botanic gardens throughout the world have been leaders in the development and implementation of the Global Strategy for Plant Conservation. The on-line monitoring databases provide valuable tools not only to monitor the achievement of our objectives but also to ensure that we meet the challenge of developing botanic gardens worldwide as an effective and closely-cooperating network for plant conservation, managing the global collection of ex situ wild plant resources.

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