

THE DATA CAPTURE PROJECT AT THE  
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## ABSTRACT

Botanic gardens, with their large holdings of living plants collected from around the world, are important guardians of plant biodiversity, but acquiring and curating these genetic resources is enormously expensive. For these reasons it is crucial that botanic gardens document and curate their collections in order to gain the greatest benefit from the plants in their care. Great priority is given to making detailed field notes and the process of documentation is often continued during the plants formative years when being propagated. However, for the large majority of plants this process often stops once the material is planted in its final garden location. The Data Capture Project at the Royal Botanic Garden Edinburgh is an attempt to document specific aspects of the plant collections so that the information captured can be of use to the research community even after the plants have died.

## INTRODUCTION

In his erudite paper entitled 'Botanic Garden: A River of Biodiversity', Cronk reminds us of the precarious position of plants in botanic gardens and goes on to say "This high biodiversity is the result of the equilibrium between new accessions and losses, suspended between the plant-hunting expeditions on the one hand and the compost heap on the other hand" (Cronk, 2001). Data from the Royal Botanic Garden Edinburgh (RBGE) plant records are used in his paper to help illustrate the loss of accessions in which "...out of 1,000 plants accessed in any year about half (500) will remain after four years, with half of these (250) remaining after eight years and so on". With these statistics in mind, curators should perhaps design strategies in which those species that are vulnerable in cultivation, such as short-lived perennials, can be better catered for. When a plant does eventually end up in the compost heap, we need to ask some searching questions. The obvious question to ask is 'why did the plant die?' (which is sometimes very difficult to establish) but probably as important, we have to ask 'what information has been amassed from the plant since it was first accessed?' One of the recommendations from the Horticulture Review Group of 2003 was for the Gardens Department to establish a project which would maximise the information recorded

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on the plants in cultivation at RBGE. In 2007, the Director of Horticulture, who has ultimate responsibility for curating the Living Collections, established the Data Capture Project (DCP). With a small grant from RBGE's Membership Fund, a pilot study was initiated using the Juglandaceae as a model family. From this initial work four main components were thought to be of importance for data capture. These were to ensure that every living plant at RBGE should (i) be correctly determined; (ii) have leaf material silica-dried for future molecular research; (iii) have a herbarium voucher collected and (iv) be photographed.

#### TERMINOLOGY USED IN THE IDENTIFICATION OF PLANTS

At this stage it is essential to define the terminology being used in this paper. The term 'identification' which is being used in the generic sense covers the following terms:

'Name determined' – the identification of a plant that has previously been unknown at the family, genus, species or infraspecific level

'Name confirmed' – agrees with a prior identification of a plant, the term verification is also sometimes used for this

'Name changed' – the identification of a plant that was previously incorrectly identified

#### THE PROCESS OF DATA CAPTURE

The project encompasses many disciplines and therefore requires a strong methodology. It is carried out in three main phases.

##### 1. *Background work – identifying groups of plants for data capture*

Background work begins with selecting priority groups of plants for data capture from the 68,857 plants cultivated in RBGE (Rae *et al.*, 2006). Plants from accessions of known wild origin are prioritised. However, a plant derived from cultivated material will be data captured if it represents the only accession of a particular taxon, or adds cultural or historical value to the Living Collection. We suggest adopting a family- or genus-based approach to data capture. This is the most efficient approach particularly for the subsequent targeted verification process (Cubey & Gardner, 2003).

Candidate genera or families are prioritised according to criteria such as:

- level of priority as designated in the *Collection Policy for the Living Collection* (Rae, 2006)
- families, genera and world areas, where there is ongoing RBGE research and horticultural interest e.g. Conifers, Gesneriaceae, Zingiberaceae, *Begonia*, Temperate South America
- collections that are of conservation concern

- enlisting the available knowledge of experienced taxonomists to verify specific groups of plants such as Hugh McAllister for *Betula* and *Sorbus*
- short-lived plants.

A stock list of the selected group of plants is generated from *BG-BASE*<sup>TM</sup>, the plant database used at RBGE. It helps the data capture process greatly when the plants, including their labelling, have been recently monitored so that the printed inventory reflects the up-to-date record of the plant's status and garden location. It is also crucial to ensure that each plant sampled for the purpose of data capture has been assigned an accession number and a qualifier. This unique identity is absolutely essential to enable accurate sampling of individual plants under a single accession number and to distinguish individuals that have been identified (Thomas & Watson, 2000).

A literature search is conducted next in order to follow the most up-to-date taxonomic treatment of the group to be data captured. At this stage the Names table of *BG-BASE*<sup>TM</sup> is reviewed and any taxonomic and geographic changes are made according to the chosen taxonomic treatment. The literature is also used to familiarise oneself with the diagnostic characters of the species so that the herbarium voucher material taken is representative of the diagnostic characters which will ultimately aid the plant's determination.

## 2. Data Capture – practicalities

With each targeted group it is best to adopt a location-based approach to data capture as this is more time efficient. This means that less time is spent mapping the locations within the garden, moving from one location to another and finally locating the plants.

For each individual plant, sampling procedures include taking:

- a voucher herbarium specimen which represents any available diagnostic characters
- a silica-dried leaf sample for molecular research
- three photographs where possible – a general view of the plant within the landscape, the habit and a close-up of any diagnostic characters.

This is an important opportunity to review the accession data in order to make sure that it is complete and accurate. Care must be taken when adding information to ensure it accurately reflects the original collection data.

The herbarium vouchers and silica-dried samples are deposited in the herbarium at Edinburgh. Each collection is accompanied by the following data:

- Project code
- Garden collector's name
- Date of collection
- Description of the material (including diagnostic characters)

### 3. Processing and Evaluating – specimens and data

The final phase of the project consists of processing and evaluating the data. The entire dataset concerning the specimen, silica-dried material and photographs are computerised. The voucher specimen, which has been named, is mounted, labelled, bar-coded and filed in the cultivated section of the herbarium. The name in the Accessions field is updated using the Verifications table. The silica-dried vouchers are filed in a dry and readily accessible place.

The Data Capture Project can act as an important management tool as it gives a good opportunity for curators to scrutinize the collections at many levels, it also assists with operational guidelines on issues such as planting, plant removal, future acquisitions and horticultural practices. One of the most important aspects is that the resulting identifications give curators accurate information about what species are being cultivated. For example, as a result of data capturing the Juglandaceae it was found that five of the accessions at RBGE were incorrectly verified and this consequently reduced the number of species being cultivated from 17 to 15. It also gave the opportunity to remove those accessions not of known wild origin which were already duplicated by accessions of known wild origin.

Another important outcome of having accurately identified reference collections is for their use in education programmes.

### DISCUSSION

An annual target has been set to data capture 1000 plants from the Living Collections. In trying to meet this target it has been found that, while this can be achieved for the collection of plant material and photographs, it is not possible for the process which

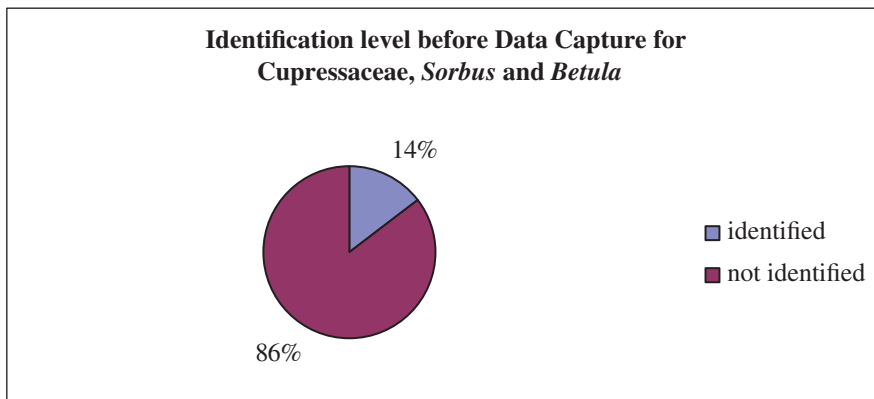


Fig. 1 The chart shows that 86% of plants (from wild and cultivated sources) have not had their identity checked since the date they entered the Living Collections at RBGE. 14% of the plants have had their identity checked since being in cultivation.

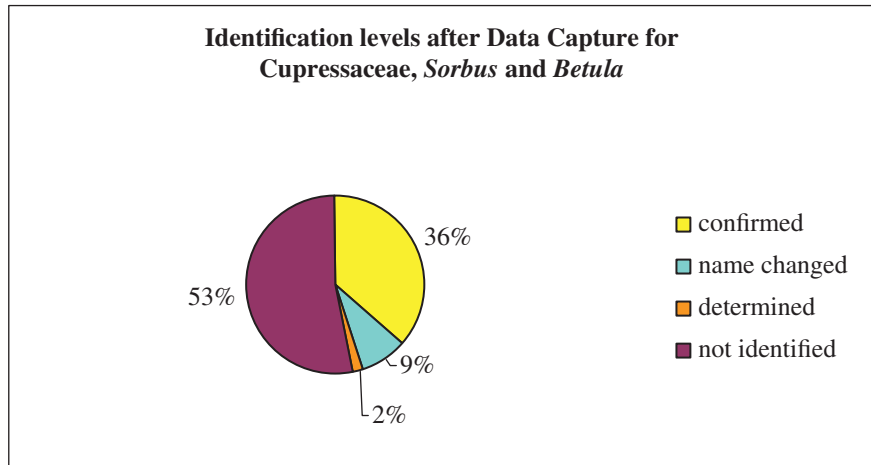


Fig. 2 The chart shows the impact of one year of Data Capture on the level of identification. 53% of plants still need to have their identity checked and 47% of plants have been identified, their names having been changed, confirmed or determined.

takes longer, the record-keeping. To date the process of data capture has started with Juglandaceae, Cupressaceae, *Sorbus* and *Betula*. It should also be noted that a programme of data capture has been started in the RBGE Nursery in order to document the early stages of plant growth. These early stages, which are captured in the form of herbarium vouchers and photographs, are an important contribution to the information held about a plant as they are often missed when field collections are made. This is referred to as 'partial data capture' because at these early stages it is not possible to accurately name most of the plant species or to collect leaf samples for molecular research. It is also worth mentioning that the Phenology Project (Harper *et al.*, 2004), which started in 2002, is also capturing important data using a set of targeted plants.

Currently only 36% of accessions and 20% of the plants at RBGE have been determined, a proportion of these will be new species waiting to be described. The correct identification of plants is not just a problem that RBGE faces but it is a problem for many botanic gardens because the identification of plants is not always considered to be a priority. One of the most important outcomes of the Data Capture Project for RBGE is that the rate of determinations is rising faster than it ever has before (Figs. 1 and 2). It is crucial that this continues in order to help to support the many uses of the Living Collections, whether this is for education or research. In the last five years there has been a large increase in the use of the Living Collections, mainly for molecular research. The collection and vouchering of this material is time-consuming and requires human resources. However, in time, as more and more groups are data captured, it will help to streamline the issuing of requested material by simply drawing on a library of stored leaf samples. It is hoped that eventually we can go one step further by extracting the DNA and then sequencing the appropriate gene regions.

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## REFERENCES

- CRONK, Q. (2001). Botanic Gardens: a River of Biodiversity: lvi—lxi. In: GOVIER, R. *ET AL.* (2001). *Catalogue of Plants 2001*. Royal Botanic Garden Edinburgh.
- CUBEY, R. & GARDNER, M.F. (2003). A new approach for targeting verifications. *Sibbaldia* 1: 19–23.
- HARPER, G.H., MANN, D.G. & THOMPSON, R. (2004). Phenological monitoring at the Royal Botanic Garden Edinburgh. *Sibbaldia* 2: 33–45.
- RAE, D., CUBEY, R., GARDNER, M., LATTA, J. & WALTER, K. (2006). *RBGE Catalogue of Plants 2006*. Royal Botanic Garden Edinburgh.
- RAE, D. (2006). *Collection Policy for the Living Collection*. Royal Botanic Garden Edinburgh.
- THOMAS, P. & WATSON, M. (2000). *Data Management for Plant Collections, A Handbook of Best-Practice*, p. 24. Royal Botanic Garden Edinburgh.
- Horticulture Visiting Group (2003). *RBGE Internal Report*. Unpublished Report from the Horticulture Review Group, Royal Botanic Garden Edinburgh.