

## **Atlantis-BG a standard for comprehensive, web-based collection management.**

**Hans G.M. Persoon<sup>1</sup>, Eric J. Gouda<sup>2</sup> & Peter van Diermen<sup>3</sup>**

<sup>1</sup>Dept. Director/Curator University Botanical Gardens, P.O. Box 80162, 3508 TD Utrecht, The Netherlands

<sup>2</sup>Curator University Botanical Gardens, P.O. Box 80162, 3508 TD Utrecht, The Netherlands

<sup>3</sup>Director DEVENTit Multimedia BV, P.O. Box 60, 3750 GB Bunschoten, The Netherlands

### **Abstract**

Atlantis-BG is a state-of-the-art programme that links the plant collection database of a botanical garden to other relevant scientific data, such as literature, authors, collectors and illustrations. It also contains address information of relations such as gardens, contact persons etc. Atlantis is a new development in the information technology supporting scientific collection management. It incorporates the new advantages of the web as well as GIS. An overall-shell has been developed so that the databases of the several gardens can appear as one national database.

**Keywords:** APG III, collection management botanic garden, database, event, mapping, seed list processing, taxonomic tree

### **Introduction**

The development of standards concerning collection management databases for botanical gardens in The Netherlands started in 1984 (Aleva et al, 1984). Dutch Botanical gardens have been working with collection management databases since 1987. In spite of agreed functional standards, different technical solutions were used by different botanical gardens. All solutions were character oriented and covered only a part of the necessary processes. For example for literature, relation and seed management separate databases were used, all character orientated, or even lists on paper or in books, for example for author abbreviations (Brummitt & Powell, 1992).

At the end of the Nineties, thanks to governmental foundations, as a part of a national project aiming at the disclosure and digitalisation of academic collections in The Netherlands, means were found to obtain a new database for the 5 Universal Botanical Gardens mentioned above. A common database should make exchange of information a lot easier and a uniform presentation of (National) collections on the internet possible. It should also combine all sorts of small databases used into an all-containing one, and should disclose localities of collection elements by means of a GIS-like functionality.

In the process of deciding whether to obtain an existing standardised database (such as BG-base or SysTax, both of which were looked at thoroughly) or to develop a completely new one, the choice was made for a new one. It was agreed that the advantages of a development with the newest technologies such as an object-orientated database (Martin 1993) (Booch et al, 1998) which can include all sorts of multimedia objects and a standard web (and windows)-interface balanced out the disadvantages of starting something new and unknown, while a widely accepted relational database such as BG-base, although older and many times upgraded, is already used (still often in the DOS-version) by many Botanical Gardens in the world.

A combination of technical knowledge, and knowledge of the demands of collection management, and the structure of its database, were found in the co-operation of the curator of the Utrecht Botanical garden (Dr. E.J. Gouda), with a software-house specialising in the development of software for collections and archives in general. It took three years of development and testing to accomplish the first version of the database.

The newly developed application "Atlantis Botanic Garden" is a standard application on the Atlantis platform, which is developed specifically for museums and archives. All applications of this platform

have functionality in common, such as an object oriented database for storing images and other multi media information, a reporting option, and a super fast full text search engine with synonym and phonetic search capacity for finding information in the database. However, every Atlantis program is specifically designed for its own particular type of collection.

### **Description data structure (partly)**

The kernel consists of 4 levels: Taxon, Accession, Accession-location and Event (*fig. 1*).

#### **Taxon**

On taxon level it is possible to display the whole taxonomic system (Cronquist and/or APG III are available) as a tree (31 ranks are possible, from Regnum to forma and hybrids) and using drag and drop features you can easily make changes in taxonomy, i.e. a genus with all species belonging to it can be hung under a different family in one action. This can be done on all levels. The parent taxon (or taxa, in case of hybrids) of a taxon determines its place in the tree. Correct names are bold, synonyms are not, so they are easily distinguishable. Higher taxonomical levels can be left out of the tree for transparency's sake. The number of living accessions are indicated in the tree.

Each garden can choose its own taxonomy tree, or can choose to follow a standard (such as Cronquist (Cronquist, 1981) or APG (Judd et al, 2007, APG III, 2009, Chase & Reveal, 2009, [www.mobot.org/mobot/research/apweb/](http://www.mobot.org/mobot/research/apweb/)) or an alternative. The taxonomical tree is on the left side of the screen.

On the right side of the screen information on a specific taxon is displayed in six property sheets (*fig. 2*), one of which contains multimedia objects. A multimedia object can be a picture or a distribution map or a film or an article on that taxon. The first property sheet contains a button to enter the accessions linked to this taxon. Another property sheet gives access to all relevant literature in the database to be attached to the taxon. On the other hand one literature reference has links to all relevant taxa and accessions. A direct link can be made to sites on the internet like IPNI, IUCN, IOPI, USDA, FL\_EU etc. for a direct check of the name and an indication of its distribution. Standard taxon use categories can be applied including geographical information.

#### **Accession**

An accession is a plant or group of plants of one taxon, originating from the same source (e.g. seeds from one seed list number, plant, cutting, etc.) and obtained at the same time. An accession may be found in the garden at more than one location.

The screen structure is the same as in taxon. On the left side is the accession tree. Branches show the identifications and verifications; information about where the accession is located (the accession location) in the garden and information about derived material, such as seeds and herbarium specimens and seed list information.

The property sheets on the right side of the screen contain all relevant information on an accession, such as source, donor, agreement notes, propagation etc., including a property sheet for multimedia objects for that accession. Standard ITF2 abbreviations (Jackson, 1998) are used for all relevant fields on an accession.

When searching for a certain accession there is an option to run the search criteria over any text in the accession part of the database, or part of the database, or over text within specified fields. This can be done in any specified tree.

For each accession in the tree, there is an indication of its status (current or not). Each verification for an accession, and other relevant information such as the date, the name of the verifier and the level of identification can be recorded. The most recent one will be the accepted name for this accession.

**Accession location**

On this level specific information of individual plants, or a group of plants, is given including the location in the garden where it can be found. Co-ordinates can be added from GPS-measurements and maps of the garden and with selected accession numbers drawn in it can be processed. In the illustration property sheet, Garden location maps can be added in different formats. Then by means of two reference co-ordinates these maps can be synchronized to the attached co-ordinates of each accession, so that in the mapping report the position of the plant is printed at the right place on the map. One specific report starts and uses Google earth satellite maps to project the place of the plants on the map. One accession location can be linked to more events.

**Event**

An Event occurs to an accession at a certain location, for example sowing, germinating, flowering and dying. The users are free to define Event types themselves. This feature can be used by the head gardener on location.

**Free fields**

User-defined fields can be imported in a special screen at the accessions and taxa, for example for horticultural information.

**Relations**

In the tree 'Relations' names and addresses of relations, such as companies, colleague gardens, etc. can be inserted. Atlantis-BG has a mail merge facility for mailing to a number of selected relations.

E-mail addresses and web-sites can be recorded as well, and Atlantis-BG can send e-mails to relations or connect with a web-site.

**WGS system**

A geographical standard WGS-tree is added (Hollis & Brummitt, 1992).

**Processes****Reports**

Reports can be made using XML ruler templates producing HTML output. Within these templates different criteria, sorting priorities, fields, etc. can be chosen. Reports can be drawn up for each desired object and can include images, maps, www links etc.

**Labels**

For the production of labels of relations or plants mail-merge for MS Word is used. Any selection can be made and any field, size and lay-out chosen. It is also possible to use reports instead.

**Seed list**

A seed list can be generated directly from the database as a report. It can also be exported in ITF2 format. The seed list may be composed in HTML format, allowing the user to publish the seed list via the Internet. In this seed list, illustrations (for example photographs in .jpg) of the accessions or taxa can be inserted.

Available amounts and seed orders from other gardens can be inserted, and at sending time the database can process all the relevant labels (gardens and accessions) in the right order. In this way the whole seed list process is covered.

### **Import and export**

Data can be imported and/or exported in ITF2 and/or XML format, making exchange of data possible.

### **Thematis**

It is possible to connect distributed Atlantis databases in such a way, that to any requests, they appear as one single database. Thematis is an extra tool especially developed to connect different (i.e. not only Atlantis) databases to appear as a single one. ([www.thematis.nl/botanicportal/](http://www.thematis.nl/botanicportal/))

### **Web-interface**

A user-friendly web-interface with search-possibilities on various levels is added.

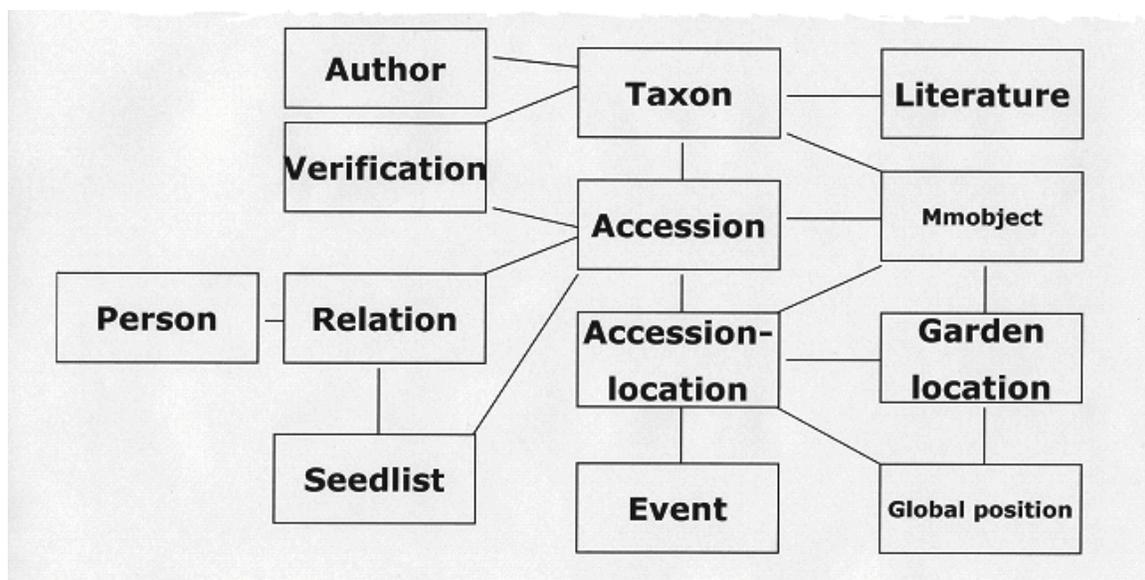
### **Conclusions**

Development of Atlantis-BG is never finished, since new demands and possibilities on collection management in botanical gardens will rise. Atlantis has already proved to be a database with many possibilities. It speeds up the routine-parts of the administration process of collection management, and uses the present communication possibilities very efficiently. It makes it possible to cope with changing ideas in taxonomy. It will be easy to incorporate the APG (III) system, which is available, in Atlantis so that the taxonomic tree of Atlantis will reflect the latest taxonomical insights. The disclosure of botanical collections to the public forces curators to clear any possible backlogs in administration as quickly as possible. This is a great challenge as a result of creating a completely new database.

### **References**

- Aleva, J. F. and G.W.M. Barendse, J. Tolsma, G.J.C.M. van Vliet. 1984. Computerisatie in de Botanische Tuinen van Nederland en België.
- APG III. 2009. *Botanical Journal of the Linnean Society*, 2009, 161, 105–121
- Booch, G., J. Rumbaugh, I., Jacobson. 1998. *Unified Modelling Language User Guide*. Addison-Wesley, Reading.
- Brummitt, R.K. and C.E. Powell. 1992. *Authors of plant names*. Royal Botanic Gardens, Kew.
- Chase, M.W. & Reveal, J. I. 2009. A phylogenetic classification of the land plants to accompany APG III. *Botanical Journal of the Linnean Society*, 2009, 161, 122–127
- Cronquist, A. 1981. *An integrated system of classification of flowering plants*. Columbia University Press, New York.
- Hollis, S. & Brummitt, R. K. 1992. *World Geographical Scheme for Recording Plant Distributions*. Plant Taxonomic Database Standards No. 2. Version 1.0. Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh. Brummitt, R.K., F. Pando, S. Hollis, N. A. Brummitt. et al. 2001., version 2.
- Jackson, D.W.. 1998. *International Transfer Format for Botanic Garden Plant Records*. Version 2. Botanic Gardens Conservation International.
- Judd, W.S. and C.S. Campbell, E.A. Kellogg, P.F. Stevens, M.J. Donoghue. 2007. *Plant systematics. A phylogenetic approach*. Sinauer Associates Inc. Sunderland.
- Martin, J. 1993. *Principles of object-oriented analysis and design*. P T R Prentice Hall, Englewood Cliffs.

## Figures



*Fig. 1 Simplified database structure*

The screenshot displays the Atlantis Botanic Garden software interface. The window title is "Atlantis Botanic Garden - [Taxon [utrecht]]". The menu bar includes "Record", "Multimedia", "Results", "Multi records", "Maintenance", "Botanic Garden", "Window", and "Help". The toolbar contains various icons for navigation and data management. On the left, a tree view lists various taxa, with "pycnanthum (2)" selected. The main area shows the "Literature and Use" tab, which contains several property fields:

Name	Hybrid	Features	Literature and Use	Illustration	Additional
Perennation	Description	Feature			
PD	Deciduous polycarpic plants	Dioecious (male & female plants)			
Red list cate	Description				
V	Vulnerable				
Floron	Description	Tolerance			
		Completely hardy (DTF)			
Range	Japan (Mts. Honshu)				
Biotope	Damp locations				
Altitude	400-500 m.				
Label range	Japan (bergen Honshu)				
Label text					
Description	<p>HABIT: A tree, much like <i>A. rubrum</i>, but usually smaller; branches reddish brown to gray-brown.  LEAVES: Shallowly 3-lobed, suborbicular to ovate, 3-8 mm across, glabrous beneath; bases subcordate; margins remotely serrate; petioles 3-5 cm long, often reddish.  BUD SCALES: 4- 7- paired, red. Terminal buds larger than those of <i>A. rubrum</i>  INFLORESCENCES: Fasciculate, mostly 5-flowered, axillary from leafless buds; appearing before the leaves, more terminal than those of <i>A. rubrum</i>, although lateral inflorescences occur frequently.  FLOWERS: 5-merous, red; sepals connate, stamens mostly 5; discs intrastaminal.  FRUITS: Samara's erect, 3 cm long, ripening very early in June or July. seeds germinate immediately.  CHROMOSOME NUMBER: 2n = 78</p>				

The Windows taskbar at the bottom shows the Start button, several application icons, and the system tray with the time 9:44.

Fig. 2 Third property screen of Taxon including Red List Status.