BRAHMS

BOTANICAL RESEARCH AND HERBARIUM MANAGEMENT SYSTEM

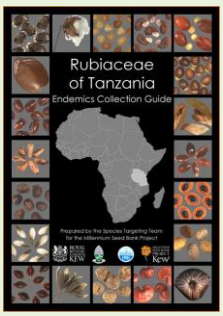
Updated October 2011

BRAHMS manages and integrates data and images from specimens, botanical surveys, field observations, living collections, seed banks and literature. The system puts you in control of your data, optimizing its use for the widest possible range of curation and research services and outputs. System development, while broadly planned, is demand driven and over the years, this has led to a tremendous diversity of functionality for collection managers and researchers alike. An international advisory group for BRAHMS was established in 1999.

http://dps.plants.ox.ac.uk/bol/

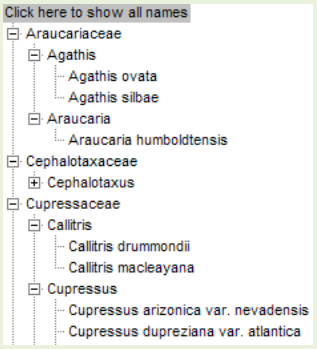
Plants for the 21st Century

The BRAHMS project is developed under and linked to the conservation component of the recently launched *Plants for the 21st Century* initiative (P21C) in the Department Plant Sciences at the University of Oxford. A key P21C activity is to develop innovative ways to capture, analyse and publicise the large volumes of plant diversity data that are needed to underpin conservation and wider environmental action. P21C is affiliated with the James Martin 21st Century School.



Users and projects

BRAHMS is used by projects in over 50 countries worldwide. Some projects are based at the world's largest herbaria such as those at RBG Kew while others are in small, often remote field stations or university departments. At the outset, BRAHMS development was closely linked to the forestry sector in tropical countries and to this day, many projects are based in challenging and species rich, tropical regions. The News and Events section on the website reports on selected project activities. The largest single database to date with over 2 million specimens logged is operating at Leiden in the Netherlands and is accessed from all the main Dutch herbaria via Terminal Services with up to 20 concurrent users. The country with the highest number of individual projects is currently Brazil. The database with the best track record for publishing outputs is the Conifer database. This database can be downloaded in full from the BRAHMS website and is used extensively in the 2011 training guide.



Flexibility for research and collection management

Together with an efficient data/image capture module known as Rapid Data Entry (RDE), BRAHMS provides tools to view, edit, select, query, report, map, export and publish your data. There are also tools to sort, filter, calculate, tabulate and analyze data in many different ways. Those with more experience can add their own processing scripts and build custom queries and it is also possible to extend the structure of the data tables to ensure all your project data are captured. The entire system is highly configurable and on networked systems, individual users control their personal preferences including the selection of menus and modules to activate.

The taxonomic framework

All BRAHMS databases, whether focusing on curation or research, include a central list of taxonomic names. While some projects may only need a basic species list, others will assemble comprehensive nomenclature with synonymy, literature, text descriptions, distribution details, conservation status and further facts as appropriate. Tools to assemble and format taxonomic data lie at the heart of the reporting system. Automated links to online resources such as IPNI assist with the verification of names.

Managing collections

Specimen management is the key focus for many herbarium based projects. All categories of specimen registered in your system, for example, herbarium sheets, wood samples, DNA vouchers and spirit collections can be catalogued, barcoded and imaged. In addition to the standard outputs of 'loans, lists and labels', collection data can be further developed and utilized for a host of research activities and outputs, for example, to build check lists, analyse phenology and study collecting patterns.

Sample plots and botanical survey

The samples module manages data from plots. These may range in size from small botanical survey areas to large forest blocks. They may be temporary or permanent and have multiple research objectives. The simplest plot data files may only register species presence. More complex files, for example, those used in a detailed forest inventory, may include species identification, tree number, diameter, height, stem form, habit images, a voucher reference, and more. There are no restrictions on the data fields added. Plot data can be combined with other data sources for diversity analysis.

Seed banking

The seed management module has broad applications for projects collecting, storing and distributing seed including the conservation of genetic resources. The development of this module started in 1995 with the UK Forestry Commission Seed Bank. More recent collaboration with RBG Kew and the Millennium Seed Bank Partnership, has given rise to new functions for the management of seed collection data and for the transfer of accession data and germination test results between banks.

Living collections

For botanic gardens and other living collections, comprehensive facilities are provided to document and image plants, tracking material origin from the wild or other sources including garden exchanges. A history of management events including cloning, crossing, plant movement and standard inventory is maintained. Voucher links can be added. Common names, conservation status, species descriptions and their natural ranges together with other relevant facts are drawn from the main species list.

Images and documents

Images of specimens, living plants, illustrations, maps and others as well as documents such as PDF files can be linked to data throughout BRAHMS. The tools provided to rename and auto-link images to records based on file names are life savers for larger projects. Many herbaria now use rapid imaging techniques for specimens and use these images as the basis for subsequent data capture.

Calculating and mapping diversity

Maps are created by establishing direct links between your data and a preferred GIS. In recent years, the number of BRAHMS mapping and diversity analysis options has increased rapidly with tools to generate species distribution summaries and to calculate diversity indices which can then be mapped to regions or grid cells at different scales. By applying map style settings for symbols, colours, opacity and point size based on the values in one or more data fields, you can present your data innovatively.

Get publishing

BRAHMS accelerates access to specimens, literature and other primary botanical data. For those producing revisions, monographs, flora accounts and checklists, flexible and dependable tools are provided to assemble and format taxa, their descriptions, selected references, specimens and related indexes. Text reporting delivers formatted outputs directly to your word processor for final editing.

Networks, security, portability

A single installation of BRAHMS can be linked to many different databases and each database may have one or many simultaneous users. On networks, user access and editing rights are controlled by your system administrator who can also configure system-wide database properties. Data managed within the system are easily transferred to other databases (SQL Server, MySQL, Access and others); to software packages for mapping and analysis (Excel, GIS, PC-ORD, *etc.*); and to data portals such as GBIF or BRAHMS online. The XML exporter opens up a further tier of transfer options.

Promoting your project online

Many projects (see examples) want to create their own personal web pages to promote their institute and projects and to offer their data directly. BRAHMS WebConnect provides the tools to design project websites and to upload selected data and images to the BRAHMS online server. BRAHMS online can also be installed on your own server.

Training opportunities

Training courses are held each year in different regions based on the 2011 training guide. Courses are adjusted to suit specific project needs and data handling requirements. Contact advisory@brahmsonline.com for further details.

Images from top: BRAHMS website; collection guide published using BRAHMS text reporting; a navigation tree view tool for taxa; At work in the herbarium; Botanical survey plots; Seed arriving at the Millennium Seed Bank for processing; Diversity maps calculated and plotted from BRAHMS; Conifers online designed and published using the BRAHMS online update service.