

# TDWG Newsletter

International Working Group on Taxonomic Databases for Plant Sciences

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## GPSIS: A Beginning in Delphi

by Larry Morse<sup>1</sup>

At the recent symposium "Designs for a Global Plant Species Information System" (GPSIS), about 90 participants identified the minimum initial needs for a database on the flora of the world. Scientific names, current synonymy, higher-level taxonomy, and general geographical distribution were recognized as high priority data for each species. Such a database would be of great utility not only in taxonomy and floristics, but in plant conservation and other fields, particularly in the tropics. The meeting, convened by TDWG, was organized by F. A. Bisby and G. F. Russell and held 11-16 Oct. 1990 in Delphi, Greece. A proceedings volume is in preparation.

Whether even this much information on all plants could be assembled in a few years time was debated at length, as was the opposite question of whether so few data would be of much use at all. Nevertheless, there was clear agreement that a taxonomic backbone is essential to all other aspects of any global plant information system. A mere list of names, such as a computer file of *Index Kewensis*, provides both too much and too little, since all names back to Linnaeus are included, yet no indication is made of the taxonomic relations among the various entries, or which names have drifted off into obscurity.

Ideally, a floristic checklist should contain all names in current and recent usage, including recent alternative treatments, regularly consulted local works, and older names still likely to appear on herbarium specimens or in nontaxonomic reference works, such as agricultural publications. Ideally, also, such a checklist should include a suggested taxonomic structure for each group,

with synonyms linked to accepted names. Users would not be required to follow such taxonomies unquestioningly, but instead would have this widely available list as a starting-point for itemizing their divergences.

Assembling these names in current use, and working out these taxonomies, are separate tasks that are best pursued together. Yet, either done alone has considerable value. The list of names serves as an outer limit on what is currently known, and also doubles as a reference for editorial spell-checking, an increasingly valuable role as botanical information becomes widely computerized. Taxonomies with too little synonymy also provide considerable information by showing what the plants are believed to be, even if not all names are accounted for. Either of these products will expedite most kinds of botanical research; a synonymized checklist combining both aspects is a powerful tool for consolidating, organizing, and understanding the present state of knowledge of the plants of a region.

Basic geographical distribution, at the level of major nations and other similarly broad regional assemblages, allows the world plant list to be subdivided into more manageable units, but also permits one to see the general overall distribution of any species of interest. More refined geography can be worked out for well-known regions and well-known taxa, but some global minimum of information should be specified. Conservationists would not be alone in wanting to know as well whether each species is native, exotic, or of undetermined status in each such region.

A small amount of specified additional characterizing information, beginning with growth habit, is generally readily available if the plants are at all well known, and

## TDWG 7 IN AUSTRALIA

TDWG is invited to hold its 1991 meeting in Canberra where it will be hosted by the Australian National Botanic Gardens on:

**September 21 - 22th**

In conjunction with TDWG a one day symposium will be held on September 23th:

Data basing diversity:  
the role of specimen  
backed information in environmental decision  
making

Please find the enclosed registration form and for further information contact:

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adds considerably to the value of the list, especially in the applied fields. For each record, citation of one or a few key references would provide an entry into the literature on the species. On the other hand, identification keys and technical descriptions, as well as habitat descriptions, require a much greater degree of understanding of each species and its congeners; demanding this much botanical research in the first data-collection cycle would preclude early worldwide completion of far too many genera.

These proposed priorities for a Global Plant Species Information System - GPSIS - must be seen as a beginning, not an end, to better organized and more widely available taxonomic information on a global basis. The symposium participants resolved to seek ways to make the plan become reality, working with the major user communities as well as large and smaller botanical institutions. Information management strategy is not a limiting factor; any of several existing systems could be adapted to meet the rather simple needs of GPSIS.

Some continents, such as Europe or North America, have many plant groups floristically well known, while some families and major genera, such as the legumes being summarized by ILDIS, are becoming well understood from the global perspective already. Working with the many existing taxonomic and floristic data projects would be essential to the success of GPSIS. Yet, many gaps remain, particularly for poorly known tropical families, for which considerable work by trained botanists would be needed even to summarize the existing state of the knowledge. The closing consensus in Delphi was that GPSIS as outlined could justifiably be funded by the user groups if the botanical community made clear its commitment to prompt drafting and ongoing revision of the first round of the global plant data. An action group volunteered to pursue this goal.<sup>1</sup>

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## Subgroup News

The following section presents the subgroups that are working at present on new standards for TDWG.

Four previous groups produced standards that are on the process to be published: *POSS* (Plant Occurrence & Status System), *Geography*, *XDF* (Exchange Data Format) and *Names in Botanical Databases*. For any information about the standards' publication please contact the TDWG Standards Editors (see "Useful Addresses").

Some other areas of interest are being explored and might be covered by new subgroups: *Geographical Information Systems*, *Data Models* and *Images*. This will be discussed in September in Canberra.

## Accessions

The subgroup on accessions data is in the process of defining a list of conceptual data entities for herbarium specimen information. The concept are based on a data model which describes how systematists interpret and manage specimen information. From the list of data concepts, the subgroup hopes to suggest cataloging rules and implementation level guidelines for describing specimen information. Ultimately recommendations will be made for a self-describing data exchange record format.

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## Descriptors for Plants

At the last TDWG meeting held at Delphi, a group was set up to try to form some preliminary standards for botanical taxonomic characters for use in databases. Such characters or

"descriptors" are already in use with the software for identification and descriptions (especially DELTA), and there are a few characters which have very wide application.

1. The intention at present is only to consider a small number eg. 10-30 of the most important characters. Reasons for selecting any one character might be one or more of the following:

- of general interest i.e. something users want to know e.g. breeding system,
- included in existing databases e.g. life form,
- used in the higher levels of classification e.g. sympetaly versus polypetaly,
- of wide application i.e. not or scarcely dependent on other characters and can therefore be scored for most or all taxa e.g. presence or absence of roots,
- easy to observe.

2. Coverage. It was decided that one descriptor list would not conveniently cover all plants in general. It seems that a separate descriptor list is needed for each major plant group: vascular plants, bryophytes, algae, lichens and fungi. It was agreed that a draft list would be prepared for each group, from suitable sources, and circulated to TDWG members and beyond for discussion before the next TDWG meeting. It is proposed to consult the major botanical institutions and projects as well as any individuals who may wish to contribute. By the next TDWG meeting, a proposed list of descriptors should be available for discussion. At the present stage the purpose is only to agree a set of descriptors for inclusion e.g. "habit"; the question of the states to go with these descriptors e.g. "herb, shrub, tree", will be tackled in a second round of discussions.

3. Richard Pankhurst is coordinating the preparation of a draft list of descriptors for vascular plants. Rosaluz Tavera has agreed to coordinate the list for the algae.

4. Participation of IAPT:  
- volunteers are requested to coordinate the drafting of descriptor lists for lichens, bryophytes and fungi,  
- any views on which characters

should be included in which list, and any suggestions as to which published sources and which database projects ought to be consulted, will be most welcome.

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## Economic Botany

The group will produce a provisional system for classification of uses shortly and this will be sent to all people who have been corresponding so far. If anyone else would like to receive the document please write.

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## Habitats

Contact: Dr. J. M. Lock, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, UK

## Phytogeography

Contact: Mme H. Falaise, Laboratoire de Phanérogamie, Muséum National d'Histoire Naturelle, 16 rue Buffon, 75005 Paris, FRANCE

## Types & Lectotypification Registers

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## GPSIS and SPP: a progress report

by F. A. Bisby<sup>1</sup>

This is an attempt to sketch at least some part of the intensive thinking, planning and discussion that have been going on since the Delphi Symposium, as I know from many enquiries that there is a lot of interest from the botanical database community in general. It is inevitably a personal perspective: others may see things differently, and of course there may be other developments that I am unaware of.

### GPSIS (Global Plant Species Information System)

At the symposium "Designs for a Global Plant Species Information System" held in Delphi (12-16 Oct. 1990), the GPSIS Action Group was formed to carry forward the priorities strongly expressed by the hundred or so taxonomists, botanists and computer scientists present. The priorities were

- 1) to initiate rapid production of a checklist of the world's plants,
- 2) to design and implement a global information system to deliver information on the world's plants,
- 3) to stimulate the linkage of applied species-based information (such as phytochemistry, conservation, germplasm datasets) to the taxonomic checklist at the core of the information system.

The symposium was run by the IUBS Commission for Taxonomic Databases (TDWG) with major financial support from the Commission of the European Communities (DG XII) and the U.S. National Science Foundation. The symposium volume is being published by Oxford University Press in the Systematics Association special volume series.

The GPSIS Action Group has met three times (in London on Nov. 10th, Nov. 14th 1990, and February 18th 1991) and will meet next in Canberra on September 20th 1991. The chairman is Sir John Burnett and the secretary C. F. Russell (see "Useful addresses").

At its November 1990 meetings, the Action Group prepared a paper for the SPP Meeting and was involved in discussions with the organisers of the SPP which was then running in parallel. The object was to ensure some kind of cooperation or convergence between the GPSIS and SPP initiatives, and to put forward the priorities developed at Delphi with a particular hope that the SPP might join in the rapid world checklist task. The Group also started on its second priority: thinking about a workshop/study group to provide a detailed design for the global information system.

### SPP (Species Plantarum Project)

The Species Plantarum Project originated from proposals by R. K. Brummitt at Kew. He proposed a concerted effort by the major plant taxonomic institutions to produce a sequence of high quality monographs that would systematically cover all of the world's vascular plants. In 1988/9 a consortium was formed of six institutions (RGB Kew, Rijksherbarium Leiden, Muséum National d'Histoire Naturelle Paris, New York Botanical Garden, Smithsonian Institution, Missouri Botanical Garden), later joined by the Conservatoire et Jardin botaniques Genève, and preliminary planning went ahead at a series of meetings both for the style and form of the monographic treatments and of a possible database to hold the information created.

By 1990 it was felt that it was time to announce the SPP to the botanical community and to broaden it both to enlist support, participation and funding, and to test ideas as to exactly what depth of information was needed. So it was arranged to hold an open SPP Meeting at the Royal Botanic Gardens Kew on 12th/13th November 1990, the dates being chosen deliberately and with the knowledge of the



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organisers of the Delphi Symposium, so that ideas developed at Delphi could interact with the SPP proposals just a month later.

The SPP Meeting was well attended by systematic botanists but with a smaller involvement by applied botanists and computer scientists than at Delphi. The meeting agreed to establish a co-operative global project managed by an international council. Prof. G. Lucas (see "Useful addresses") was appointed as secretary and RBG Kew promised to provide staff for a secretariat.

Proposals for top priority to be given to rapid production of a world checklist put to the meeting by the GPSIS Action Group were welcomed and gradually adopted into the plan. If a checklist incorporating the best of current knowledge could be generated rapidly, then the in-depth data and critical taxonomic revisions envisaged in the original SPP monographs could, it was thought, be added to the checklist on a slightly longer time scale.

#### Next step for GPSIS and SPP

The project arising out of the SPP meeting at Kew but incorporating the GPSIS checklist concept (it will need a new name) will have its first Council meeting at RBG Kew. Interim members of the Council are to be contacted for a meeting possibly in May 1991. RBG Kew has confirmed the availability of secretariat staff from April 1st and planning must now begin in earnest to establish an international project management, to establish the other international centres involved, to plan the strategy for collating the checklist, and to create publicity and funding.

The GPSIS Action Group is planning a number of activities in areas that complement the checklist project. One of these is its own next meeting devoted to discussion on models for a global system for delivering taxonomic information. In addition Catherine Zellweger and Rusty Russell are setting up a small but important study group of database designers to work on the data model to be used for a central checklist with linked additional datasets. @

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## WORKSHOP: Application of botanical databases within Latin America

by Bob Allkin<sup>1</sup> and Susana Maldonado<sup>2</sup>

The Latin American Plant Sciences Network (Red Latinoamericana de Botánica - RLB) sponsored a recent workshop entitled "The Application of Databases in Botany". The workshop was held in Concepción, Chile from the 11th to the 19th of January 1991. The participants included a selected representation from each of 10 Latin American Countries and 8 Chilean botanists. The primary objectives were to discuss the current state of botanical information management and to consider its importance and particular difficulties within Latin America.

There were lectures, group exercises (primarily to design a herbarium management system) and discussion of management aspects of database projects. Each representative reviewed their own countries botanical databases efforts: past and present.

The sequence of stages in database design and implementation were reviewed. Participants learnt in detail techniques for conceptual modelling (primarily entity-relationship diagrams) and the merits of various database models (eg. relational). The resource implications of design, implementation and maintenance were also discussed. A review of the literature and of experiences of botanical database projects worldwide led to an appreciation of the importance of i) precise objectives, ii) early planning and design, iii) distinguishing software from data and iv) maintenance of the data set. A recurring theme was collaboration among Latin American botanists to avoid duplication of effort and to facilitate effective information exchange. Also vital is greater participation by Latin Americans in international projects eg. the Taxonomic Databases Working Group (TDWG), the Species Plantarum Project (SPP), the Global Plant Species Information System (GPSIS) and the International Legume Database & Information Service (ILDIS).

The workshop improved communication among Latin American botanists working with databases and led to a clearer appreciation of when and why to build databases as well as of their limitations and disadvantages. Practical exercises served to illustrate common errors in project planning and finally the following recommendations were established through active discussion and agreement among all workshop participants.

#### General Funding Recommendations

1) Funding agencies and research institutes should support the urgent and growing need for computing resources within Latin America to manage effectively the great deal of botanical information being accumulated in diverse disciplines. There should be made aware that i) considerable resources are wasted on ill-conceived database projects and ii) the benefits of databases are long-term ones and that such projects therefore require long-term funding.

2) Effective communication among botanical databases, projects, programs and institutes requires standards to be established for i) data terminology, ii) logical rules and logical structure of any implemented system, iii) data exchange mechanisms. Development of standards is labour intensive and funding bodies should support such activities. Agreement on standard software or systems, while beneficial, is far less important and irrelevant if data standards are not agreed.

3) National botanical societies and institutions should participate i) in the TDWG (an IUBS commission) which is currently sparsely represented by Latin Americans and ii) in the establishment of global botanical information systems.

4) The respective national societies, institutions and funding bodies should support meetings that further collaboration among Latin American database projects. This is essential to avert current duplication of effort and to improve effective information exchange.

#### Recommendations for Project Leaders

5) Before selecting any database software, botanists should ascertain that the system give high priority to data validation and verification so that only high quality data be stored. Data - not software - should be of primary concern. Data redundancy and inconsistency are the commonest cause of difficulty in with many current database efforts.

6) that the system provide flexible mechanisms for exporting data into recognised standard data formats to ensure independence from any particular software package and longevity of the data stored.

7) that the system be sufficiently flexible to allow users to control what data is stored and how the data is defined within their own database.

#### Recommendations for Project Funding

The following recommendations are intended to assist funding bodies judge effectively research proposals for botanical database projects.

8) Any proposal for a new database project should demonstrate a commitment to the feasibility of the continuity and long-term maintenance of the data set - independent of the future evolution of software or hardware.

9) Any project proposing to develop new software must i) demonstrate that existing software has been considered and found inadequate and ii) demonstrate that technical competence and experience exist within the research team for appropriate software design and development.

10) That if new software development has been shown to be necessary then software design, implementation and testing should be funded separately and in advance of data capture, data management and data dissemination. This will avoid wasting botanical resources on projects that do not achieve their stated software development goals. Once software is working then funds can be released for botanists and other resources necessary to build the database.

11) sufficient time must be explicitly allocated for software design phases. 80% of all system errors result from inadequate design.

12) resources should be allocated for including both botanical and computing science skills in the design process.

#### Recommendations for Information Dissemination

13) This was a first attempt to bring together Latin Americans from all countries to discuss this topic. Participants should therefore i) disseminate widely within their own countries the results of the workshop and the information obtained, ii) establish better contact with botanists working on database projects within their own countries and iii) maintain communication among themselves and promote greater communication among all other Latin American countries.

14) A second workshop should be held of a similar format: i) to further collaboration, ii) to increase awareness of database project management techniques within Latin America and iii) to complete a conceptual model for a herbarium database management system for Latin America from the basis established in Concepción.

15) Postgraduate and technical training programmes on the use of informatics within botany, should be established within Latin America. Improved communication between information scientists and botanists is essential.

The workshop was directed by Dr. Bob Allkin and, thanks to Dr. Oscar Parra (Director), benefited from the facilities and technical support of the European Latin American University, Concepción. Dr. Roberto Rodriguez and colleagues (Dept. of Botany, University of Concepción) made local arrangements and provided marvellous hospitality. The workshop was sponsored by the RLB. For further details please contact Dr. Mary Kalin Arroyo, RLB Coordinadora. @

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## Alternative herbaria, alternative databases

by E. Parmasto<sup>1</sup>

There are two kinds of botanical institutes (and museums) in our world. Some have a mainframe computer, usually also a Macintosh on everyone's table. However, most of these are in use as good typewriters. Specimen data will be recorded using LABELS3 or other programs. Bibliographic or taxonomic data may be retrieved using network connections. Usually such an institute spends thousands of dollars to order software and is in great need of grants or other financial support.

In some other institutes when a botanist needs data on local flora, he goes to the herbarium room, opens the door of a cupboard, and after less than five minutes all the needed data is on his/her table in a very natural form. When there are less than 200000 specimens, a computer database may be compiled only if there is nothing more interesting to do. But is there a computer at all?

From Poznan in Poland to Vladivostok in the Soviet Union Far East (about 9000 km) a personal computer is a rarity in a botanical institute. In the Soviet Union, an IBM PC XT compatible costs more than a professor's five years salary. The words Bitnet and Internet are as familiar as plant names in Chinese. The prices are falling, however, and after some years in most herbaria there will be a limited number of mainly XT/AT compatible PCs. The main problem will be cheap software if only available. Not so drastic but similar is the picture in several Asian and African countries, but somewhere even worse (Vietnam, North Korea, Mongolia).

For us (i.e. for the TDWG) one of the MAIN problems should be: how to integrate the data from such institutes in the future to have World databases? How would the formats and standards be distributed, compilation of what kind of programs for what type of computers should we encourage? How many compilers of free software like M.J. Dallwitz, T.A. Paine and their granters (who gave the biologists the DELTA system) will there be? Will there be more than one Jan Peter Frahm who organised a public domain library free for all members of the International Association of Bryologists?

Until these questions will be solved, alternative databases are developing here and there. Without any information on recommendable formats and standards, a home made system was introduced in the Department of Mycology of the Institute of Zoology and Botany (Tartu, Estonia) and is soon going to be used in the other departments too.

From field notebooks, herbarium data will be recorded (and labels printed) beginning 1990 using dBase. Estonian VTM 10x10 km grid map square number will be indicated in each record. Based on the same software, some application programs were written by us for i) retrieval of UTM grid notations from the first mentioned file and compilation of a data file

## Project's corner

### Conservation data center of UNIRBMEX

by Ma de Jesus Ordóñez & Luis Bojórquez Tapia<sup>1</sup>

The "Unidad de Información sobre Recursos Bióticos de México" (UNIRBMEX) was founded in 1987 at the "Centro de Ecología" (CE), Universidad Nacional Autónoma de México (UNAM). It is jointly supported by UNAM and Conservation International, Washington.

The UNIRBMEX main objective is to record and to analyze information on Mexican biodiversity and to define priorities for conservation. The method consists of compiling and analyzing available data on endemic species.

The UNIRBMEX is divided in 4 sections: flora, fauna, geographic information system and conservation. The first section integrates information about amphibians, reptiles, mammals, birds and butterflies. The second section compiles information on vascular plants. Each taxonomic group constitutes a computer database. The databases are organized into six files: taxonomy, ecology, ethnobiology, geography, bibliography and conservation.

The taxonomic file includes the complete classification of organisms and serves as a master file. The ecological file contains information about habitat, morphology, life cycle, reproductive aspects, as well as pollinization and dispersion if necessary. The ethnobotanical file stores data on uses, common names, etc. The geographic file contains information about the distribution and locality of specimen collections. The conservation file includes data on international and national conservation categories for the species and its presence in natural protected areas (NPA) of México. The bibliographic file contains all the references consulted.

All files are linked through the numeric code generated for each species and recorded in the master file. Presently, the database holds information on 173 species of amphibians, 172 reptiles, 58 mammals, 51 birds and 627 plants from the states of Guerrero and Oaxaca, México. In the future, as our research group grows, other states and taxonomic groups will be incorporated in the database. @

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for the mapping program DMAP, ii) author's name abbreviations, iii) periodicals abbreviations, iv) bibliography (with key words) and compilation of literature lists, v) taxonomic databases (data entry and information retrieval on species, synonyms, types, etc). Databases on the world species of Hymenochaete and Corticiaceae (Fungi) are compiled at present. Using dBase, all literature data on Estonian fungi (for the second part of the published checklist) are recorded regularly, and a database file on specimens represented in exsiccata in our herbarium is in compilation.

Alan Morton's DMAP (for £ 10 only) gave us the possibility to compile and print distribution maps in 10x10 km or 50x50 km grid (the last one in hopes that the scheme of the Atlas Florae Europaeae will be used in European fungal mapping in the future). DELTA is in use for compilation of descriptions and keys, and for on-line identification; we hope to compile the next book of Estonian flowering plants using this system. All this is going on IBM PC XT compatible with a 20, 31 or 62 Mb hard disk. @

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et du tourisme

Editions des Conservatoire  
et Jardin botaniques

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