

Sponsorship Programme



Průhonice Botany Research and Park Complex

INSTITUTE OF BOTANY, ACADEMY OF SCIENCES

THE PRŮHONICE PARK & CHATEAU

THE ARBORETUM AND PLANT COLLECTIONS

silva tarouca permanent exhibition



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Sponsorship Programme

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Botany Research and Park Complex at Průhonice

Outline of History and the Current Status

The mysterious little **romanesque chapel** *Birth of Virgin Mary*, founded in 1187, shows the richness of the history of the Průhonice Estate. A later chateau, originally gothical, after numerous reshaping and rebuilding in the course of centuries, now represents a jewel of the neo-renaissance style, finished at the break of the 19th century. At that time, the **Chateau** already dominated one of the most important and nicest parks and arboretums in Central Europe. The whole complex and park represents a heritage of the original *opus magnum* of Count (Graf) Arnošt Emanuel Silva-Tarouca, an enthusiast and connoisseur in one person. In collaboration with several prominent contemporary dendrologists and botanists, for instance Camillo Schneider, and thanks to his own unflinching interest and hard work, a fantastic **collection of rare woody plants**, a beautiful park and arboretum came into being, in full accordance with the varied landscape along the brooks of Botič, Dobřejovický potok and Zdiměřický potok. In 1927, under worse economic conditions, Count Silva-Tarouca sold the whole complex for a symbolic price to the Czechoslovak state. Since then, there were several successors in charge of the complex, all of them fortunately very responsible. Since 1963, the management of the park and collections is under the supervision of **Institute of Botany**. The current **richness of the Park** is about 1400 species and varieties of woody plants, a unique collection in an equally unique arrangement of the natural landscape and the sophisticated architectural ideas of the park design.



Research Activities

Institute of Botany is an establishment founded both to pursue **research** in the numerous and ever changing fields of botany, and to manage the whole Průhonice Complex. It is an institution under the umbrella of Academy of Sciences of the Czech Republic, but soon to become an independent non-profit organization (of the Public Research Institution), partly budgeted by the government but fully responsible to the Board of Trustees. The Institute has several branches (in South Bohemia it is in town of Třeboň, in Moravia in Brno) with over 200 employees.



The main **research areas** include

1. Biosystematics of vascular plants and Fungi
2. Geobotany and vegetation mapping
3. Palaeoecology and dendrochronology
4. Grassland and population ecology
5. Ecology of Mycorrhizas
6. Plant invasions and comparative plant ecology
7. Research of meadows and vegetation of clearings at ecosystem level
8. Wetland ecology
9. Systematics and ecology of algae and cyanobacteria
10. Experimental Phycology and Ecotoxicology
11. Plant collections and the Park at Průhonice

The activities in research can be demonstrated by the quality and number of scientific publications written by the scientific staff of the institute. Numerous new plant species have been revealed and described, numerous vegetation communities evaluated and mapped to serve the society in understanding, conserving and sustainably using what the nature yields us.

Position of the Průhonice Complex in the changing society in the 1990's and nowadays

At the end of the 1980's, Průhonice was an almost forgotten village without any proper infrastructure. In the following decade, however, the region witnessed an incredible boom of building activities. Hotels, hypermarkets, logistic centruns and large residential areas for well situated people have mushroomed around Průhonice and the park. The number of visitors of the park increased at the same rate, and adequate measures had to be taken to satisfy their interest in a quiet recreation amongst the beauties of the rare plants and varied landscape. The park itself has undergone many positive changes (with the exception of the immense damage caused by the floods in 2002). A permanent exhibition showing the history of the complex has been established as a first step towards better service for visitors. A continuous repair and maintenance much improved the appearance of the chateau, too.

Institute of Botany substantially changed and improved its image, both in the scientific circles and in the public. The basic budget represents about 50% of the money available. All the rest comes from an increasing activity of the staff of the institute: International research grants (including many from the EU, NATO etc.), many projects supported by national and academic grant agencies, cooperation with governmental institutions and NGO's, represent an essential condition for any research pursued in the institute. Economic activities of the park itself (including medial programmes and movies produced in the park) also support the complex. However, to follow a conception of sound development of the whole complex, regular financial injections from sponsors are inevitable.

The 'symbiosis' of the potential cultural and congress centre (the chateau), a unique park, arboretum and living collections, and a wide range of botanical research with numerous international contacts makes the whole Průhonice complex a national heritage of the highest rank. However, together with the prestigious character of the well-known suburban region, and with about 300.000 visitors a year, the Botany Research Complex represents one of the most important cultural attractions in Prague vicinity, the one with a great potential for further development.



A survey of the activities within the project *closer to public*

The project generally aims at substantial improvements in favour of the visitors of the Průhonice Park. Increasing quality of infrastructure designed to be friendly for visitors, higher standard of services, availability and quality of information, helping disabled and children, it is the main goal of the project. Another task is to contribute to the general understanding and knowledge of problems of biodiversity values and conservation, and on the research pursued at the Institute. All these tasks will be achieved through several steps, none of which can be achieved without the partnership and collaboration of sponsors. The main steps (among numerous actions towards that goal) are:

- I. Visitors' Centre at the main Courtyard, with multimedia presentations*
- II. Children Playground in front of the main gate*
- III. Hall of the Knights - a prestigious conference hall*
- IV. The Chateau Clock - New Design and Maintenance*
- V. Regular Exhibitions within the sector of Living Collections*
- VI. Reshaping the main Courtyard to the original architecture design of Count Silva Tarouca*
- VII. Information System and Detailed Guides*
- VIII. Automatic Check-in System at side entrances to the Park*
- IX. New Comfortable Bench System*
- X. Assortments within the section of live collections: Rosa - a jewel among decorative shrubs*

the activities within the project *plants & human destiny*

Among the numerous results of projects and research programmes pursued in Institute of Botany, Academy of Sciences, there are many having broad international impact, including citations in prominent world and national media, some others have a potential to address general public if properly advertised. Many scientific activities reflect the world-wide need for the action in favour of exploration and conservation of biodiversity for human needs and for sustainable use of the innumerable plant resources allowing the mankind to survive. We have selected the projects that are considered as potentially interesting for sponsors:

- I. A Collection of European Water Plants (Macrophytes)*
- II. A Collection of Autotrophic Plants (Algae, Blue-Green Algae)*
- III. Species Plantarum - Flora of the World: Valerianaceae*
- IV. International Publications and Journals of Institute of Botany*
- V. Poisonous Substances in Blue-Green Algae (Cyanobacteria)*
- VI. Interactions between crops and microscopic fungi - mycorrhiza*

admission card as a gift

Any visitor impressed by the beauties of the Park, Arboretum, Chateau and Collections, and wishing to support the activities of the institution is invited to do so by means of a purchase of a special year family admission card associated with special benefits. Such a special card, either *Platinum Admission Card* or *Silver Admission Card* also represents a recommended gift.

Platinum Admission Card

A year admission to the Park and Exhibitions for a family (two adults and children)

An invited participation in the annual lecture for sponsors, held by the director of the Institute

One free guided tour to the most popular parts of the Park

Silver Admission Card

A year admission to the Park and Exhibitions for a family (two adults and up to three children)

One free guided tour to the most popular parts of the Park

benefits for our partners in the sponsorship programme

The sponsorship programme has been designed to give individual sponsors, with their various interests and limitations, a wide choice of projects they might consider interesting and worth of support. On the other hand, we understand that the Průhonice Research and Park Complex, with over 300 000 visitors and innumerable international contacts a year, provides unique opportunities for partners, either companies or individuals, looking for prestigious sites for their marketing or other medial activities, press conferences etc. We therefore offer the sponsors a range of benefits designed to meet the specific requirements of the modern marketplace. A variety of benefits has been selected, derived from the level of support and individual or corporate character of donations, generally associated with the prestigious social and topographic position of the Complex.

corporate partner benefits

A possibility of inclusion of the Complex in marketing campaigns
Acknowledgement of support at a conspicuous plaque at the main and side entrances
A hire of the Visitor's Centre for corporate events, meetings etc.
Accreditation of Promotional Materials
Promotions at 'key-audience' events, particularly international and national conferences
Presentation of Sponsors in books published by the Institute
Presentation of Sponsors in international journals and newsletters of the Institute
Presentation of Sponsors on Web Pages of the Institute
Acknowledgement in widely distributed Annual Reports
Comprehensive employee benefits (see below)

individual and employee benefits

The Sponsors and representatives of the Corporate Partners are offered various benefits according to the character of their partnership.

The most important Partners are invited to become members of **Director's Circle** (Klub ředitele). They are offered

Golden Admission Card valid throughout the Corporate Partnership Programme, involving a complimentary admission to the Park and Exhibitions (for families)
Invitation to the Annual Lecture and a Dinner offered by the Director of the Institute
Behind-the-scene tours to the parts of the Park not regularly open for public (e.g., the Rock Garden)
Invitations to Institute's events (opening events, anniversary meetings, evening receptions)
One complimentary admission for the employees a year

Partners substantially contributing to the main projects of the Sponsorship Programme are offered the following range of benefits:

Platinum Admission Card involving

A year admission to the Park and Exhibitions for a family (two adults and up to three children)
An invited participation in the annual lecture for sponsors, held by the director of the Institute
One free guided tour to the most popular parts of the Park

A behind-the-scene tour to the parts of the Park not regularly open for public (e.g., the Rock Garden)

Our **Benefactors**, supporting the Institute's activities in various ways, will be offered individually a *Silver Admission Card* involving

A year admission to the Park and Exhibitions for a family (two adults and up to three children)
One free guided tour to the most popular parts of the Park

All the individual sponsors are, on the basis of their activity, eligible for other benefits.

A.

closer to public

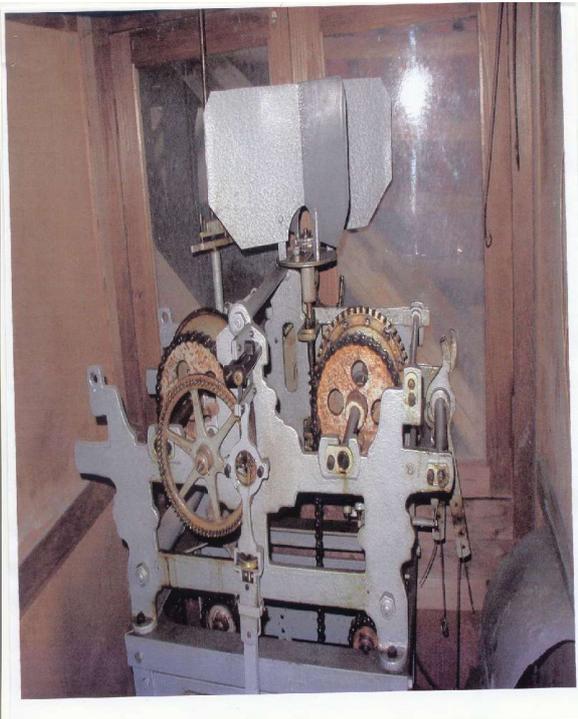
selected examples of projects

IV.

The Chateau Clock - New Engine and Maintenance

Abstract

A new chateau clock engine is required to replace the old one; the clock is installed at the most frequently visited site of the Průhonice Complex. The new clock kit will be very accurate, with much higher electricity safety, and with much lower requirements for maintenance. The acknowledgements of sponsorship at prominent places offers great benefits for sponsors.



Description of the Project:

a. Current situation

One of the most prominent places in the whole Průhonice Complex is the Main Courtyard, dominated by the Chateau (Velký zámek) and a pseudorenaissance side chateau building with a conspicuous clock. The clock is very old (Krečmer Company, Vinohrady), with unfunctional engine, and rather outdated electricity installation. The current safety regulations for electricity engines exclude further use of the clock. Moreover, the accuracy of the engine used to be low, with an interval of up to 5 min. deviation a day. The bells associated to the clock is liable to failure.

b. Action required

It is highly recommended that the old clock engine be replaced by a new one. A specialized company, L. Hainz, Ltd., offers a new technology engine, with 24 V voltage (which corresponds to the safety requirements). The engine recives signals of the DFC system, which ensures an almost absolute accuracy throughout the year. (The system automatically switches from summer time to normal one and vice versa, and there is an electronic memory for the cases of emergency situations.). The new engine doesn require regular service, and the maintenance is easy.

c. Budget

The cost including both the engine and the installation (within 6-8 weeks from the time of order) amounts to 110 000,- Kč.

Responsible person:

Ing. J. Carhoun

V.

Regular Exhibitions within the sector of Living Collections

Facilitation of Guided Excursions in Living Collections through

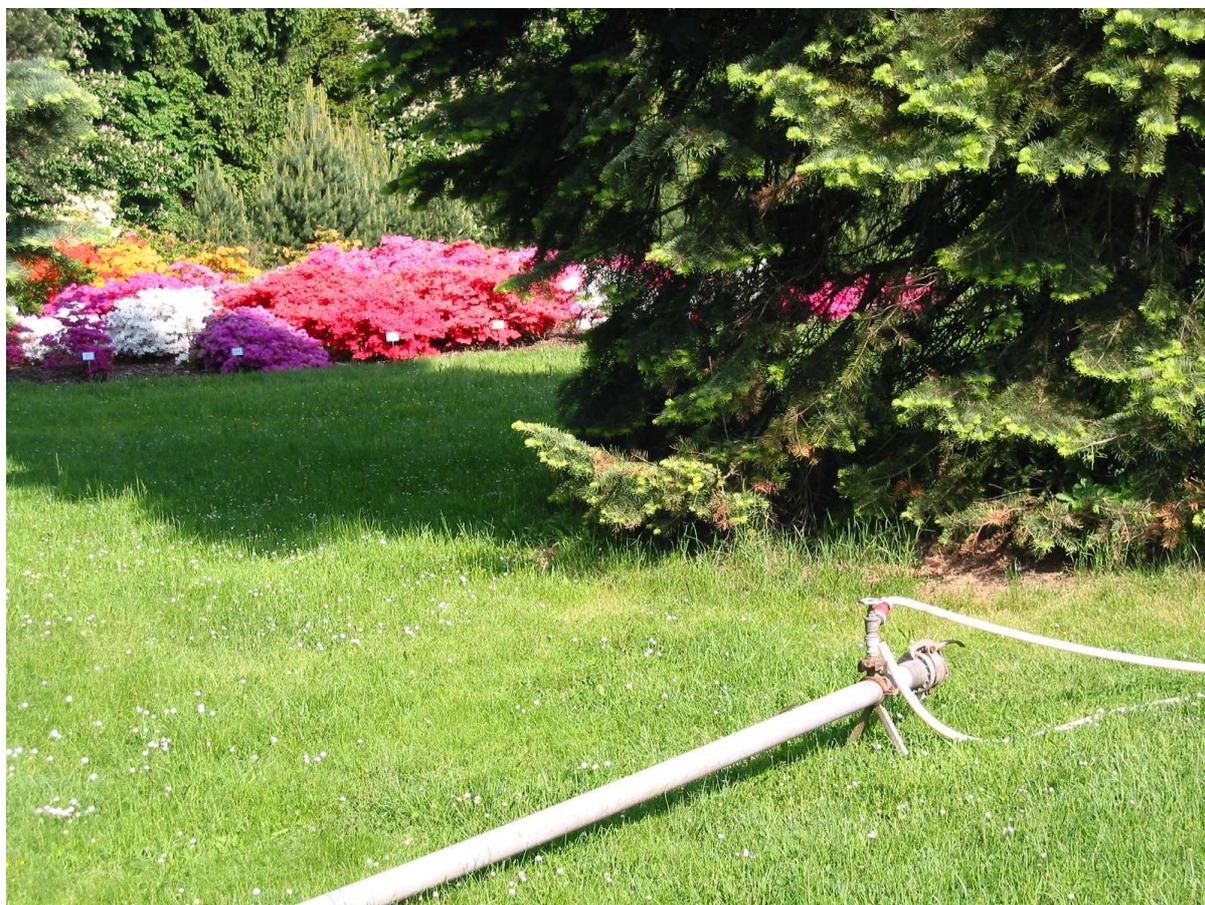
Building of an irrigation system in the exhibition part of the gardens

Abstract

The exposition part of the public garden of the Institute of Botany, Academy of Sciences of the Czech republic, including selected plants from the of collections of the garden, is located in a widened previous Rosarium, neighbouring with the Park of Pruhonice. Prof. Ivar Otruba from G. Mendel's agricultural and Forestry University in Brno is the author of the design of the garden.

The garden, established in 1963 has been reconstructed according to prof. Otruba project since 1994, when besides the original collection of garden roses also the newly organized collections of Rhododendrons, irises, peonies a water lilies were transferred from the larger part of the garden where complete collections were and still are situated. Of these collections only daylilies and wild roses remained in their full count in the working garden part of the till present time. Ornamental trees and one-year garden plants as well as perennials are accompanying the collections for architectonic purpose.

The public part of the garden is open for visitors in the main blooming time of the collections.



Character of the project

Preservation of a rich gene pool in plants represents a demanding goal. One of basic preposition of the maintenance of the plants is a good irrigation system, especially in a public garden spread on a space of 4,2 hectares. Rhododendron groups, covering a space of 1800 m² need urgently an everyday irrigation in dry periods. Even the ponds with examples from our rich collection of water lilies /340 m²/ need continual supply of evaporated water, with respect to the harmful sunrays falling on the uncovered liner. Even the other collections, which consists mostly of less demanding plants, need an irrigation not only after fluent, but also with respect to the basic as well as special care (softening of the extremely hard soil before weeding, or in relationship to the chemical control – protection against diseases and pests, using herbicides) which may be not active in dry soil.

Absolutely necessary it a good irrigation after transplanting – each ear which represents many hundreds of plants every year.

The present primitive irrigation system consists of thick aluminium or plastic pipes and thin hoses, which disturb not only in any care for the grassed space, as well as are influencing the aesthetic quality of whole territory.

Ideal would be an underground system with outlets at each of the collection unit, with a possibility to use corresponding surface equipment (plastic pipes or various types of rainers). Total length of the tubing represents about 800 m; count of outlets is about 40. Their distribution in the space of the garden is shown in the enclosed scheme.



Supposed benefit of the new watering system is obvious: simplified and much more effective irrigation, easier weeding and aerating of the soil, and resulting better quality of plants. Also saving of time and energy by not more necessary manipulation with the present modular surface system at any care of grassed space. Also the negative aesthetic acting of the present primitive field system could be avoided for the next time.

Duration of the Project

In a case of sufficient financial resources the time demands are matter of few weeks

Calculation

Project of the irrigation system	30 000 Kč
Earth work	50 000 Kč
Installations	40 000 Kč
Materials	350 000 Kč
Completion	30 000 Kč

Total sum: 500 000 Kč

X. Assortments within the section of live collections: Rosa - a jewell among decorative shrubs

Incorporation of selected Rosa species into the public part of the garden

Abstract

Dr. Ivan Klášterský, a famous Czech botanist, established the collection of wild roses in 1933. Its original allocation was in the Institute of fruit plants in Prague Troja. The plants were gradually transferred to Pruhonice since 1963 into the newly built Botanical garden of the Czechoslovak Academy of Sciences.

The purpose of the project was a completing of all accessible European species according to the climatic conditions in Pruhonice, and also of further suitable species from the genus *Rosa* area, and a systematic study of these plants.

In the course of time more than 600 individuals, typical species representatives or first generation interspecific hybrids were represented in the collection. By a team of botanists cytological analyses, autogamisation as well as hybridisation, biometric evaluation, chemotaxonomic and phenologic study was carried out. In the most intensive phase of this work the collection was enriched by valuable new hybrids, and rich knowledge and experience was obtained. Our actual goal is to present selected results to a wide public community.



Character of the project

The collection is located in two places in the Pruhonice area at present. In the past years most of original plants worth of preservation were transplanted into a field culture in the garden named “Chotobuz”, where also later obtained plants from genetic experiments survived till the present time. The original space of the collection – „Wild Rosarium“ - should be recultivated in the next future, so a new organization of the collection in the new place is purposeful.

Field culture of previous experimental plants, even if well cared, is not suitable for any exposition aimed as a public garden. Our goal is to select most important and most interesting individuals and include them as an independent unit among the other collections, which have one common purpose – to document relationships between wild plants, and garden plants developed from them, and show them as a steady exposition to the visitors of the garden. This system has been used with all other collections, with exception of the genus *Rosa* where solely *Rosa* cultivars in their historical development are represented.



A space of 3000 m² is reserved in the territory of the garden, where aged rests of a previous apple trees collection remained till the present time, should be used for the Rosa collection in next future.

Dr. Větvička, the present director of the Botanic Garden of the Charles University and a previous long time basic member of Dr. Klášterský team, will help us to select the most important specimens from the collection saved to the present time, as well as to advise in the basic concept of the future exposition of wild roses.

Selected representatives of pure species as well as important hybrids will be planted in a system respecting both taxonomic as well aesthetic principles, corresponding with the concept of all collections situate in the public part of the garden.

Supposed benefit of the project is, like with other collections in the garden, popularisation of genetic diversity of the genus Rosa, and documentation of links between gene pool of wild plants with garden descendants in one of genera, which became basic garden plants in our climatic zone.

Duration of the Project - three years

First two years: Architectural Design of the site and exhibition, cleaning of the space with aged apple trees, recultivation of the field, and selection of plants in their present position, transfer of first plants

Third year: transfer of the plants into the new space, planting a lawn around the exhibition plots

Calculation

Scientific consultations	10.000 Kč
Cutting of woods from previous experimental plantation	20.000 Kč
Stumping, cleaning of the soil from rests of wood	30.000 Kč
Recultivation of the space	16.000 Kč
New planting	4.000 Kč
Grass sowing	20.000 Kč

Total sum: 100 000 Kč

Responsible person

Ing. Uljana Blažková, chief curator of the gene-pool collections

B.

plants & human destiny

selected examples of projects

I.

Collection of Aquatic and Wetland Plants of Europe: Increased availability for guided tours

Abstract

The collection of aquatic and wetland plants represents a unique living collection maintained at the Třeboň Branch of Institute of Botany. Details of the collections, their arrangement and maintenance are described and illustrated in detail below, and are available at www.butbn.cas.cz. At present, the possibility of guided tours in the collection is rather limited, and the education and political potential of the collection remains to be exploited. The increased availability for guided tours requires both a higher intensity of maintenance and investments to make up the infrastructure of the collection and motivate new staff.

Description of the measures to be taken to improve the infrastructure of the collection

There is a necessity to install a new system of shading in the whole collection, but easier to handle, and nicer from the visitor's viewpoint. A new substrate mixture is to be applied in most cultivation tanks, and a portable filtering system should be available. New paving of the paths is required for the safety and convenience of visitors. Barriers (portable) should be bought to fence some parts of the exhibition collections (rare or not yet growing plants). New information system (posters, signs, picture) is essential for the comfort of visitors. A seasonal staff must be hired to look after the collections and visitors, possibly also to guide the groups. A partial reconstruction of the irrigation system is needed (optional). Last, regular travelling is necessary to supply new acquisitions to the collection.

Duration of the Project:

Four years (two with new installations), two with regular guided tours.

Responsible Staff:

RNDr. Luboš Adamec, CSc., RNDr. Štěpán Husák, CSc.

Budget:

New shading	18 000 Kč
Portable barriers	11 000 Kč
New substrate mixture	23 000 Kč
Irrigation system (subterranean pipes)	145 000 Kč
Information system	32 000 Kč
Portable filtering system	12 000 Kč
Hired staff (guide and watch)	120 000 Kč
Total	361 000 Kč

The Collection

The Collection of Aquatic and Wetland Plants (CAWP) in the Section of Plant Ecology of the Institute of Botany, Academy of Sciences of the Czech Republic, at Třeboň (49°N), S. Bohemia, Czech Republic, was started as a collection of Czechoslovak aquatic higher plant species in 1976. In this working place (before 1987 as Department of Hydrobotany), research has been conducted continuously in the field of ecophysiology, production ecology, geobotany, phytosociology, and taxonomy of higher aquatic and wetland plants (and also algae). The necessity to establish a limited CAWP followed clearly from this working activity. The range of species in the Collection has widened markedly since. In the 2001 season, about 350 species, hybrids, or cultivars were kept in the CAWP. The dominant majority of these items (>90 %) are species autochthonous in the Czech Republic; the others are mainly from (Central) Europe. Thus, the CAWP is focused on aquatic and wetland temperate plant species of Central Europe; the proportion of subtropical species or species from other continents is marginal. Taking into account the great number of items kept in the CAWP, it is evident that it is far the greatest collection of native aquatic and wetland plants in Europe and one of the greatest over the world. Many dozens of native aquatic and wetland plants can usually be found in several distinguished botanical gardens in Western Europe but the sortiment in such gardens is mainly focused on conspicuous ornamental species. The CAWP contains both higher plants and Charophytes (stoneworts). All ecological forms of aquatic and wetland plants are represented in the CAWP: rooted and rootless submerged, floating-leaved, free floating, and emergent plants (helophytes), perennial species as well as terophytes (annuals). The CAWP contains all Czech carnivorous plant species and many bog and fen plant species. Very common, as well as critically endangered, rare plant species are part of the Collection; some of the endangered plant species are almost extinct in the Czech flora. Exceptionally, the CAWP contains also species which were extinct in the Czech flora in the last decades (e.g., *Aldrovanda vesiculosa*, *Pilularia globulifera*, *Typha minima*). In spite of the continuous renewal of species in the CAWP, presumably 15-30 susceptible plant species may be lacking from the species list every year. The species most problematic for reliably keeping are aquatic annual species, lemniids, or those growing mostly in cold running waters (e.g., *Ranunculus* /subgenus *Batrachium*/ spp.). A specific section of the CAWP is represented by ephemeral plants (annual terophytes) growing in wet denudated soils. These species (e.g., *Centunculus minimus*, *Illecebrum verticillatum*, *Coleanthus subtilis*, *Cyperus flavescens*, *Juncus capitatus*, *J. tenageia*) belong to the most endangered taxa not only in the Flora of the Czech Republic but also in Europe and to species most rapidly vanishing from



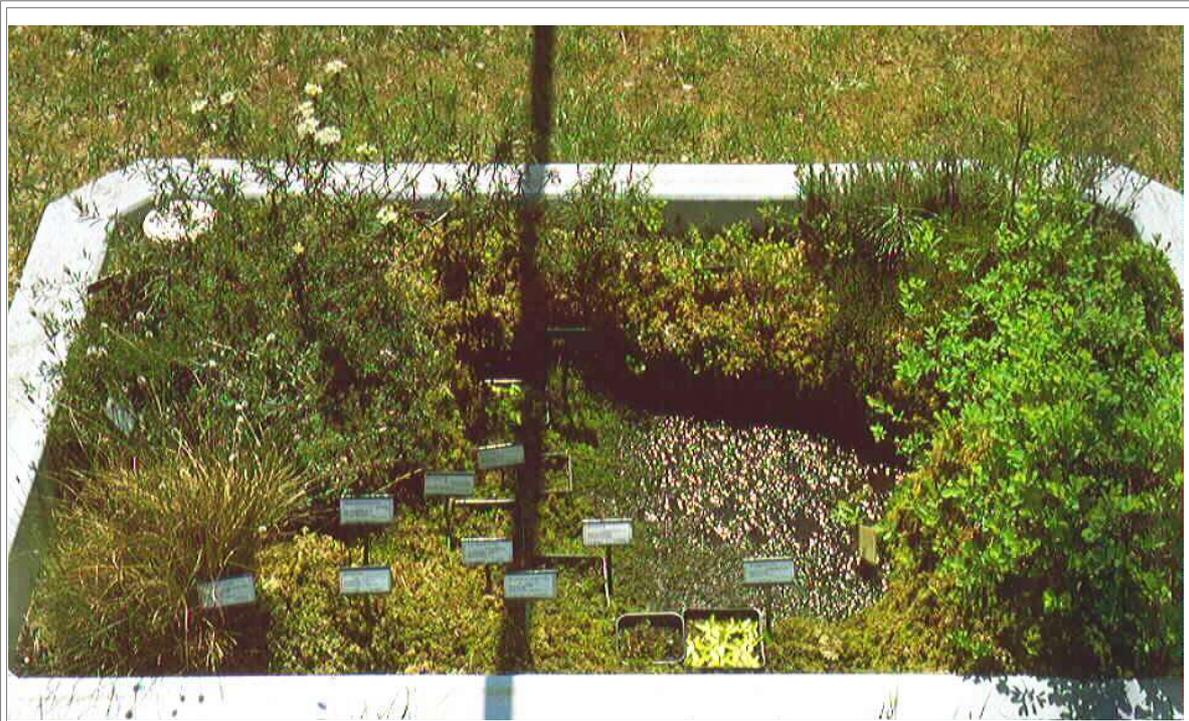
natural sites. Some of them are grown and reproduced with problems. Although the CAWP is not open, for practical reasons, for wide public as botanical garden the Section's purpose has been to make the Collection accessible to as many specialists and students as possible. Every year, the Section's graduated staff guide dozens of school excursions through the CAPW, including primary school pupils to inland and foreign university students and staff, and participants of the UNESCO Training Course on Limnology. Moreover, the CAWP serves as a gene pool for rare and endangered species, provides plant material for experiments and studies, comparative material for determinations and botanical illustrations, and is used for teaching of botany and plant ecology. Also, conservation-based (i.e., rescue) cultivations of ca. 30 endangered species originated with plant specimens from the CAWP. Plants of 17 species from these cultivations have been used for repatriations or introductions mostly to the Třeboňsko Biosphere Reserve in the last six years. In addition to the CAWP, a (sub)tropical carnivorous plant collection (ca. 55 species) is situated in a heated greenhouse. The CAWP is spread out on an area of ca. 0.04 ha. In 1997, the CAWP obtained the final technical design. The temperate-zone plants are grown outdoors, while the several (sub)tropical species are in a heated greenhouse. Each plant species is usually grown in a plastic pot, which are put in bigger containers. Robust helophyte species (e.g., reed, cattails, sedges) grow individually in smaller plastic containers. All plastic containers are sunken and embedded in the ground to minimize thermal fluctuations, both in summer and winter. Smaller aquatic *Utricularia* species grow in 3-l miniaquaria floating in a cooling water in a big container. Their winter buds (turions) overwinter in little flasks in a refrigerator. Rooted aquatic plants growing in deeper containers (65 cm) overwinter under water. During periods of frost, ice cover in these containers may be up to 40 cm thick but the dominant majority of



Conservation-based cultivations with terrestrial plant species.

aquatic plants survive these conditions without being damaged. Yet, frost-sensitive (sub)Atlantic species (e.g., *Pilularia globulifera*, *Littorella uniflora*, *Luronium natans*) are also overwintered for safety in a cool compartment of a greenhouse. Seasonal shading by wooden bands protects the plants from overheating during the summer and reduces the growth of filamentous algae. Nevertheless, the growth of filamentous algae is the crucial problem to grow submerged species. The only effective way is to remove mats of filamentous algae (mainly of genera *Oedogonium*, *Cladophora*, *Spirogyra*) gently and with patience by hand repeatedly. In summer days, pH values in some containers may exceed 10 due to algal photosynthesis. We sometimes add ethanol (ca. 10-20 $\mu\text{l.l}^{-1}$) or starch (ca. 20 mg.l^{-1}) to the containers to decrease high pH by enhanced respiration. Soft tap water is used for watering the plants.

In helophytes, sandy substrates are renewed every 2-3 years. One technical assistant and two graduated curators look after the CAWP.



Outdoor collection of Czech terrestrial carnivorous, fen, and bog plants in an artificial peat-bog.

II.

Collection of Cultures of Autotrophic Organisms, (CCALA)

One of the oldest culture collection of algae in the world

responsible person:
J.Lukavský

Culture Collection of Autotrophic Organisms, CCALA: One of the oldest culture collection of algae in the world

Abstract

The roles of culture collections are pivotal to the ability of the scientific community to undertake high quality science. They provide consistency and quality, traceable, source material and information. In addition, they provide a store of well characterised diversity for research and/or exploitation. Without collections, comparative research on cultures is at best problematic and in many cases impossible.



Worldwide there are probably thousands of algal collections in specialist labs and institutes, however, it is the major service collections that form the “backbone“ of the curatorial and service roles for the phycological community as a whole. Four of the largest culture collections CCALA at třeboň, CCAP at Windereere, SAG at Gottingen and UTEX at Austin, USA (LUKAVSKÝ 2003, LUKAVSKÝ et al. 200..) can all trace their origins back to the pioneering work of Prof E.G. Pringsheim an PhC. Václav Uhlíř, both living in Prague before World War I. Their work, and the inspiration to others, has ensured that today these collections continue to develop to fulfil the requirements of the current and future generations of phycologists. The value of algal collections to the user community and places today’s collections in the historical context of the groundbreaking developments in phycology at the beginning of the 20th Century is out of doubts. Without culture collections a modern phycology is not possible. Cultures serve in all branches of modern phycology as well as in biotechnology, education etc.

Descriptions of the measures to be taken to improve the infrastructure of the Collection

It is vitally important to improve all technical equipments of Collection as PC, autoclaves, etc. Except illumination system in air conditioned room, which was renovated after flooding in 2002, all units are obsolete and they are demanding a great money for continuous reparations. Also such important collection should be guarded by an alarm and anti-fire system.

Duration of the project: 4 years

Responsible Staff: PhD. Jaromír Lukavský, M.Kašpárková, V.Titlová

Budget:

New server for home page, CD, DVD, scanner, etc.	50 000 Kč
Small autoclave	60 000 Kč
Heat air sterilisation unit	150 000 Kč
Laminar unit	150 000 Kč
PB burner, automatic	30 000 Kč
Autoclave, 350L	2 000 000 Kč
Remote alarm and firebox	50 000 Kč
Film about CCALA	50 000 Kč
Total	2 540 000 Kč
(ca 85 000 €)	

Collection of Autotrophic Organisms

CCALA is keeping a set of original strains and isolates of **E.G.Pringsheim**, between Wors, and also collection of algae isolated by J.Komárek and F.Hindák at sixties at Třeboň. At present it keeps Cyanobacteria, Algae, Hepaticae, Musci, Pteridophyta and Lemnaceae, ca 1 000 strains together. Unique are the **collection of mosses** (LUKAVSKÝ & al. 1991) and a working-collection of isolates of **polar algae** (ca 300 strains, ELSTER & al. 2002), probably greatest in the world. Polar algae are prospective in biotechnology, e.g. as producers of polyunsaturated fatty acids (WAN-LOY & al. 2002).

The Collection is sending 200-700 strains/year to different institutions (see Table), to schools, research laboratories etc. to be used in education algal bioassay, physiological, biochemical, genetical experiments, to be cultivated in outdoor units etc.

Requests for strains in CCALA

	1985	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Inland	458	253	483	371	527	299	183	121	655	344	377	331	227	538	264	284
Abroad	37	91	115	145	184	55	36	44	67	182	223	87	139	121	93	27
Total	495	344	598	516	711	354	219	255	732	526	600	418	366	659	357	311



The uniqueness of the Collection is proved by invitation to programme COBRA of European Community, which is focused to implement cryopreservation into all important European collection of Algae (DAY et al. 200..). Students, experts and also public are visiting the Collection regularly.

Collection has published its catalogues (Lukavský et al. 1991, Lukavský et al. 1992) also it has an own home page (<http://www.butbn.cas.cz/ccala/ccala.htm>), with the lists of strains, localities, nutrient media etc., which are often visited.



Strains are maintained by a regular transferring the strains on a fresh nutrient slant, After growing up in laboratory conditions the strains are kept in an air-conditioned room in temperature 10-15 °C to prolong the time necessary for transfer, to ca 3 months.

Collections are said to serve as Noe's Arc, to give a shelter to threatened species. Species richness of Algae is guessed to ca 7 000 for Czech Republic, and to 60 000 species in World, consequently only a small portion of strains is in collections. Potential value of cyanobacteria and Algae is e.g. in their

prospectives for production of special compounds as carotenoids, biologically active compounds: antibacterial, anti HIV, antitumoral, anticancer etc., which are screened.

Collection is registered by World Federation for Culture Collections as member no. WDCM384, which is the prove of its international level. In spite of the facts, mentioned above, Inst. Botany is not given a special budget to keep the Collection, the guessed expenses are ca 0.5 MKč/year.

Culture collection as well as cryolaboratory were flooded during a century flood at 2002 (see Figs). Strains as well as portable equipments were evacuated, but the damages were serious.

Collection is also involved in of education and popularization of science. In our Department dozens of visitors are served with a guided tour every week. We need, however, a modern popularization panel or box. Video would include an interesting facts about algae, history of Collection and of course also some advertisement about sponsoring firms.

References

- LUKAVSKÝ, J., CEPÁK, V., KAŠPÁRKOVÁ, M. & KEIL, M. (1991): Culture collection of Mosses and Ferns. - *The Bryological Times* **64**: 8-9.
- LUKAVSKÝ, J., CEPÁK, V., KAŠPÁRKOVÁ, M., KOMÁREK, J. & TAKÁČOVÁ, M. (1992): Catalogue of the strains of Culture Collection of Autotrophic Organisms 1 (*Cyanophyta, Algae*). - *Arch. Hydrobiol, Suppl.* 91/ *Algological Studies* **63**: 59-112.
- LUKAVSKÝ, J. (2003): Sbírka autotrofních mikroorganismů AV ČR. - *Živa* 3/2003, XXXIX-XL.
- LUKAVSKÝ, J., LORENZ, M., FRIEDL, T., ELSTER, J., DAY, J.G., CAMPBELL, C.N. & BRAND, J.J. (200..): PRINGSHEIM'S LIVING LEGACY: CAUP, CCALA, CCAP, SAG & UTEX. -
- LUKAVSKÝ, J., LORENZ, M., FRIEDL, T., ELSTER, J., DAY, J.G., CAMPBELL, C.N. & BRAND, J.J. (200..): Pringsheim's living legacy: CAUP, CCALA, CCAP, SAG & UTEX. -
- DAY, J. G., BENSON, E. E., HARDING, K., KNOWLES B, IDOWU M., BREMNER D., WATT S., SANTOS L., SANTOS F., FRIEDL, T., LORENZ M, LUKESOVA A., ELSTER J., LUKAVSKY J., HERDMAN M., RIPPKA R., HEDDIN H. & HALL T. (200): The use of cryopreservation to develop a European scientific and biotechnological resource: the COBRA project.

J. Lukavský

Photographs from a century flood at Trebon



III.

Species Plantarum Programme
Flora of the World
Valerianaceae



Centranthus ruber in the Canary Is.

Abstract

A long-term programme called Species Plantarum - Flora of the World has two main general targets: ***Understanding and documenting plant diversity*** and ***Building capacity for the conservation of plant diversity***. Details of the rationale of the programme are given in the *Appendix* below, but two main tools how to achieve the targets are ***Extensive international collaboration among plant taxonomists*** and the publication (traditional and electronic) of a series of ***Taxonomic monographs of plant families***. The methods proved to be very efficient in the pilot study of the Programme: a monographic treatment of the Juncaceae (Kirschner, 2002 a, b, c). In its first stage, the programme is focused on ***plant families of economic importance*** for people, either as crops, technical materials or herbal medicines. At the same time, specialists concentrate on plant families known to be taxonomically difficult or where contrasting views on species numbers or classification were published.

All these criteria are met in the case of a widespread family of ***Valerianaceae***. The family is medium-sized (about 400 species) but there is a disagreement as to the number of genera (eight to fifteen). The family includes many species of human interest: traditional herbal medicines (most species totally unexplored from this point of view), ornamental plants etc. At the same time, several new, hitherto unknown species of the family are described every year. No recent monograph has been published.

Main objective: A taxonomic monograph of the Valerianaceae in both printed and electronic forms.

Main methods: Collaboration of an international consortium of taxonomists, herbarium study, field expeditions and cultivations, karyological analysis

Duration: Four years.

Responsible researcher: Jan Kirschner

Main collaborators: Zdeněk Kaplan, Bente Eriksen, Lazaro J. Novara, Charles D. Bell

Budget (four years):

Consumables (chemicals, cultivation materials, office material etc.)	140 000 Kč
Workshop of the Consortium	170 000 Kč
Travel Expenses (Expedition, Herbarium collections)	330 000 Kč
Publication costs:	180 000 Kč
Maintenance of the special web pages:	20 000 Kč
Total:	840 000 Kč

A brief introduction in the problems of Valerianaceae and the Species Plantarum Programme

Valerianaceae

Habit and leaf form. Herbs (mostly), or shrubs (a few); *bearing essential oils (in rhizomes and roots)*. Annual to perennial; with a basal aggregation of leaves, or with neither basal nor terminal aggregations of leaves; when perennial, rhizomatous (the rhizome usually strongly scented). Stem growth conspicuously sympodial, or not conspicuously sympodial. Helophytic to mesophytic. **Leaves opposite**; flat; petiolate; connate to not connate; foetid (from mono- and sesquiterpenoid essential oils), or without marked odour; simple, or compound, or simple and compound; when compound, pinnate. Lamina when simple dissected, or entire; when simple/dissected, pinnatifid; pinnately veined; cross-venulate. Leaves exstipulate; without a persistent basal meristem. **Leaf anatomy.** Hydathodes present (occasionally), or absent. Stomata present; mainly confined to one surface, or on both surfaces; anomocytic. *Lamina* dorsiventral (usually), or isobilateral, or centric. Minor leaf veins with phloem transfer cells (*Centranthus*, *Fedia*, *Valeriana*, *Valerianella*). **Stem anatomy.** Cork cambium present; initially deep-seated. Nodes tri-lacunar. Primary vascular tissue comprising a ring of bundles (these soon becoming linked). Secondary thickening developing from a conventional cambial ring. Xylem with libriform fibres; with vessels. Vessel end-walls simple. Wood parenchyma absent. **Reproductive type, pollination.** Plants hermaphrodite, or polygamomonoecious. Entomophilous. **Inflorescence, floral, fruit and seed morphology.** Flowers aggregated in 'inflorescences'; in cymes, in corymbs, and in panicles. The terminal inflorescence unit cymose. **Inflorescences dichotomous cymes, close corymbs etc, not heads**; without involucre bracts. **Flowers** bracteate (usually); usually bracteolate; small; *fragrant to malodorous (often sickly-sweet); somewhat irregular to very irregular*; zygomorphic. The floral irregularity involving the perianth and involving the androecium. Flowers cyclic; tetracyclic. **Free hypanthium absent.** **Perianth with distinct calyx and corolla (the calyx usually much reduced at anthesis, but often developing later into a pappus)**; when determinable, 3–10; 2 whorled; isomerous, or anisomerous. **Calyx** rarely obviously 5 (*Nardostachys*, usually not clearly determinable); represented by bristles (often, ultimately), or not represented by bristles; 1 whorled; **polysepalous, or gamosepalous (Nardostachys with well developed segments, but usually reduced or obsolete, sometimes represented by inconspicuous teeth, often (e.g. Valeriana) represented by up to 20 segments that are inrolled at anthesis to form a ring around the base of the corolla, unrolling and expanding in the fruit to become setaceous, plumose and pappuslike)**; entire, or lobulate, or blunt-lobed, or toothed (usually much reduced at anthesis); persistent; accrescent (often forming a pappus in the fruit — e.g. *Valeriana*). Epicalyx absent. Corolla (3–)5; 1 whorled; gamopetalous; imbricate; funnel-shaped, or tubular; unequal but not bilabiate, or bilabiate, or regular; spurred (often), or not spurred. **Androecium** (1–)3(–4). **Androecial members adnate**; free of one another; 1 whorled. Androecium exclusively of fertile stamens. **Stamens** 1 (the posterior only), or 3 (by suppression of the posterior and a lateral), or 4 (usually, by suppression of the posterior); inserted in the throat of the corolla tube (at least, inserted above the middle); **reduced in number relative to the adjacent perianth**; oppositisepalous. Anthers dorsifixed; dehiscent via longitudinal slits; introrse; tetrasporangiate. Endothecium developing fibrous thickenings. Microsporogenesis simultaneous. Anther wall initially with one middle layer; of the 'dicot' type. Tapetum amoeboid. Pollen grains aperturate; 3(–4) aperturate; colpurate (colporoidate); 3-celled. **Gynoecium** 3 carpelled. Carpels reduced in number relative to the perianth. **The pistil 3 celled. Gynoecium syncarpous**; synstylovarious to eu-syncarpous; **inferior**. Ovary 3 locular (but only one of the three locules fertile). Gynoecium stylate. Styles 1; apical. Stigmas 1, or 3. **Placentation apical**. Ovules 1 per locule; pendulous; non-arillate; anatropous; unitegmic; tenuinucellate. Endothelium differentiated. Embryo-sac development *Polygonum*-type. Polar nuclei fusing prior to fertilization. Antipodal cells formed; 3; not proliferating; persistent. Synergids commonly hooked. Endosperm formation cellular. Embryogeny asterad. **Fruit** non-fleshy; indehiscent;

achene-like, or a samara; 1 seeded. **Seeds non-endospermic**. Embryo well differentiated. Cotyledons 2. Embryo chlorophyllous (2/3); straight. **Seedling**. Germination phanerocotylar.

Physiology, biochemistry. Not cyanogenic. Alkaloids present, or absent (4 species listed). Iridoids detected; 'Route I' type (normal and seco). Proanthocyanidins absent. Flavonols present; kaempferol (trace). Ellagic acid absent (*Valeriana*). Aluminium accumulation not found.

Geography, cytology. Temperate to tropical. Almost cosmopolitan, but lacking from tropical Africa, Madagascar, Australasia. $X = (7-9)(-12)$.

Taxonomy. Subclass Dicotyledonae; Dipsacales. Species 400. Genera 8 (or up to 15); *Centranthus*, *Fedia*, *Nardostachys*, *Patrinia*, *Plectritis*, *Pseudobetckea*, *Valeriana*, *Valerianella*. [**Alternatively**: *Aligera* Suksd., *Aretiastrum* (DC.) Spach, *Astrephia* Duf., *Belonanthus* Graebn., *Centranthus* Lam. & DC., *Fedia* Gaertn., *Nardostachys* DC., *Patrinia* Juss., *Phuodendron* (Graebn.) Dalla Torre & Harms, *Phyllactis* Pers., *Plectritis* (Lindl.) DC., *Pseudobetckea* (Hock) Lincz., *Stangea* Graebn., *Valeriana* L., *Valerianella* Mill.

An example of a single species treatment according to the format of the *Species Plantarum Programme*:

43. *Luzula antarctica* Hook.f., *Fl. Antarct.* 1: 359 (1847)

Juncooides antarctica (Hook.f.) Macloskie, *Rep. Princeton Univ. Exp. Patagonia, Bot.* 8: 302 (1904).
T: Chile, Cape Horn, Hermite Is., *J.D.Hooker 14*; holo: K.

Perennials 7–13 cm tall, densely caespitose, densely to sparsely hairy; rhizome short, vertical; stolons absent, plant base greyish straw-brown. Upper part of stem 0.3–0.4 mm in diam., arcuate. Basal leaves usually 3–5 cm long, ±flat to canaliculate, c. 2.0–3.0 (–3.5) mm wide, acute; margins subglabrous to densely ciliate, smooth or very remotely papillose. Cauline leaves (1–) 2, 1.5–3.5 cm long, c. 1.5 mm wide, acute. Lower bract (or uppermost leaf) usually slightly remote from inflorescence, brownish-membranous (or ±herbaceous), hairy, narrow, less than 2 cm long; upper bracts narrowly triangular to lanceolate or ovate-lanceolate, dark castaneous brown, paler above, c. 0.7–1.0 cm long. Inflorescence small, 1.0–1.5 × 0.7–0.9 cm, nodding, compact, dark castaneous brown, few-flowered. Bracteoles ±lanceolate to narrowly triangular, castaneous brown to membranous-brownish, paler near apex, usually 2.5–4.0 mm long. Tepals unequal; inner tepals 2.8–3.4 mm long; outer tepals 3.8–4.7 mm long, lacerate ciliate, dark castaneous brown (including bases of ciliae), lanceolate, acuminate, aristate (with a filiform tip). Stamens (0–2) 3; anthers 0.3–0.6 mm long; filaments 0.7–0.8 mm long; style c. 0.2 mm long; stigmas 1.0–1.2 mm long; gynoecium in some flowers rudimentary, but in most there are rudiments of 1 (–2) stamens. Capsule dark brown, ovoid to subglobular, subobtuse, shorter than perianth; capsule segments usually 2.0–2.3 × 1.1–1.2 mm. Seeds ellipsoidal, brown; seed-coat not distinct, 1.0–1.1 mm long, 0.6–0.7 mm wide; appendage yellowish, 0.10–0.15 mm long, fibrillate.

Tierra del Fuego and adjacent territories, rare. 85: AGS, CLS. Exposed rocky slopes, grasslands. Map 73.

85. ARGENTINA: Tierra del Fuego, Cerro Almanza, Lashifashaj, 900–1000 m, *D.M.Moore 1415* (H, K); Ushuaia, *H.Roivainen 2321* (H). CHILE SOUTH: Tierra del Fuego, Río Azopardo, 600 m, 9 Mar 1896, *P.Dusén 652* (UPS); 3 Mar 1908, *C.J.F.Skottsberg 849* (S); Isla Desolación, Puerto Augusto, 300–400 m, 8 Apr 1896, *P.Dusén 709* (UPS); Sierra Valdiviesa, Río Betbedero, 11 Mar 1908, *C.J.F.Skottsberg s.n.* (SGO, UPS).

Usually compared or synonymized with *L. alopecurus* on the basis of shared irrelevant characters [see D.M.Moore & M.C.Doggett, *Bol. Soc. Argent. Bot.* 17: 150–154 (1976)], but closer to the *L. racemosa* group. Distinct from the former in having three stamens and dark, nodding inflorescence, from the latter it can be distinguished by the compact inflorescence and much longer tepals.

Species Plantarum Programme

or

GLOBAL PLANT TAXONOMY INITIATIVE

*Co-operating to build capacity and create a distributed world flora
information system to overcome the taxonomic impediment*

Drafted by:

Prof G.F. Smith (South Africa)
Mrs R.R. Klopper (South Africa)
Dr R.K. Brummitt (United Kingdom)
Dr A.E. Orchard (Australia)
Dr J. Kirschner (Czech Republic)
Prof W. Berendsohn (Germany)
Dr Karol Marhold (Slovak Republic)
Dr A.C. Chikuni (Malawi)
Prof Sebsebe Demissew (Ethiopia)

The project directly stems from the needs expressed in the missions of several initiatives and institutions under the Convention on Biological Diversity (CBD)

In particular:

- **GLOBAL TAXONOMY INITIATIVE (GTI):** Under the Convention on Biological Diversity (CBD) one of the main thrusts of the GTI is to foster a global dimension (See 1.3. Planned activity 3, p. 9 of the GTI's draft Programme of Work). Given the constitution and composition of the SPP's steering committee and plan of activities, the project is eminently suited to this thrust. It is designed to take a global view of vascular flora, to provide uniform descriptive, ecological, identification and nomenclatural information, and to do this through a process of capacity building and resource sharing between developing and developed countries. The outcome will be greatly enhanced access to taxonomic information, improved training of taxonomic practitioners, improved taxonomic infrastructure, and a sounder basis for decision-making in biodiversity management worldwide.
- **GLOBAL PLANT CONSERVATION STRATEGY (GPCS):** The Conference of the Parties (COP) of the CBD is considering the establishment of a global strategy for plant conservation. The GPCS proposal was submitted at SBSTTA 7, November 2001 (Convention on Biological Diversity 2001). The following objectives and sub-objectives of GPCS are directly relevant to the SPP:

(a) Understanding and documenting plant diversity:

(i) Document the plant diversity of the world, including its use and its distribution in the wild, in protected areas and in *ex situ* collections.

(iii) Develop an integrated, distributed, interactive information system to manage and make accessible information on plant diversity.

(e) Building capacity for the conservation of plant diversity:

(i) Enhance the human resources, physical and technological infrastructure necessary, and necessary financial support for plant conservation.

Certain targets have been set under the various objectives for the GPCS to which the SPP can contribute substantially, namely:

(a) Understanding and documenting plant diversity:

1. A widely accessible working list of known plant species, as a step towards a complete flora.

(e) Building capacity for the conservation of plant diversity:

13. The number of trained people working with adequate facilities in plant conservation and related activities doubled.

14. Networks for plant conservation activities established or strengthened at international, regional and national levels.

Rationale of the Programme:

The importance of taxonomy

- Plants do not recognise national boundaries. Therefore, the most rational approach to their documentation and study should be similarly unconstrained.
- Taxonomy, through provision of a stable and internationally accepted nomenclature provides the most basic of information for biodiversity management: an inventory of resources and a means of organising information in a logical and retrievable way.
- Basic understanding of the higher plant resources of the world for the successful management of biodiversity requires international collaboration and the setting up of a global taxonomic database. Botanists at all levels should be involved in the taxonomic work, and biologists and conservationists need to be actively aware of the need for such work on a global basis. The database must include census, descriptive and identification aspects. At present, existing available information is haphazardly distributed on library shelves and inadequately organised. Published data on threatened species have been shown to be hopelessly inaccurate. The world's botanists have to organise themselves to pool their information, and build capacity in regions of the world where the existing scientific base is inadequate to meet the demands of conservation and ecologically sustainable use. International funding is needed to support this (Brummitt *et al.* 2001).

What is a Flora?

- A Flora can be broadly defined as a treatise on the plants of a given region. Information typically given for each taxon is correct name, synonyms, taxonomic literature references, type specimens, brief description, geographical area, identification keys and illustrations of selected species. Floras are therefore NOT comprehensive monographs or pictorial guides to the plants of a region. They do, however, tremendously facilitate the production of these and numerous other products on the plants of a region (Smith 1998).
- As well as providing a concise and user-friendly account of plants for users of such information, Floras also provide a valuable vehicle for capacity building and training in taxonomy. They are usually multi-author works, providing opportunities for inexperienced taxonomists to work alongside more experienced scientists, learning new skills and polishing existing ones. Mentoring, at both an individual and institutional level is possible, and for trainees working in host institutions, there are also opportunities of advancing the repatriation of information to countries of origin.

The Species Plantarum Programme

- For the past century the great emphasis in plant taxonomy has been on regional and national Floras, and few families apart from very small or local ones have been revised on a world scale in recent times. Those revisions, which have been published, are scattered in diverse publications and formats, in different scientific journals or Floras, which are widely separated on library shelves. There has been little or no effort to standardise data fields or the data in them, though the Taxonomic Databases Working Group (TDWG) set up in 1985 has recently been significant in establishing certain standards (Brummitt *et al.* 2001).
- The narrower focus over the last century or more has resulted in a lack of overall perspective of the taxonomy of higher plants on a broad basis, and in information that is available often being difficult to locate. Existing taxonomic coverage has many gaps, both geographical and systematic. Some areas have no published account of their flora, for historical or economic reasons, and have to compromise by using disparate, often inadequate, Floras from neighbouring regions. The taxonomy of the same groups of plants has often been quite different in different parts of the world. This has had a negative effect on stability of names, for nearly

all name changes these days are the result of continuing taxonomic reassessment over broader geographical ranges rather than for purely nomenclatural reasons. Furthermore, the nearest relative of a species in one country or region is very often a species in a different country or region, and national and regional Floras may convey a very narrow perspective of the group. Plants that may appear to be local endemic species in one country may turn out to be widespread in another. A species name, which has gained a foothold in the literature, may appear unchallenged in checklists for decades until a taxonomist tries to write a key to species and finds that it is no different from something else. **The needs in the new millennium are for the synthesis of all available taxonomic information into one database with standardised data fields and the dissemination of the data in optimal ways** (Brummitt *et al.* 2001).

- A uniform and unified account of the vascular plants of the world will have a huge, beneficial effect on conservation worldwide.
- The idea of producing a world Flora as an achievable, international collaborative project using the collective expertise of the taxonomists of the world will build taxonomic capacity and make information available in countries of origin in a novel manner, accessible to grass-roots user groups. In this respect, having comparative family treatments will be of paramount importance (Smith 2000). Botanists need to organise themselves to work systematically through the world's flora and document the taxonomy as far as it can be reasonably determined. **Accounts of well-known groups can be produced quickly**, and as these are made available attention can be focused on those groups requiring more intense taxonomic work. A co-ordinated programme is necessary (Brummitt *et al.* 2001) and the Species Plantarum Programme (SPP) can achieve these diverse objectives. Some results will be available immediately, and this foundation will be built upon progressively.
- The SPP, subtitled Flora of the World, was set up in 1995 under the International Organisation for Plant Information (IOPI) affiliated to International Union of Biological Sciences (IUBS) (Brummitt *et al.* 2001). The SPP is currently well placed under the IOPI umbrella, especially if it can, as envisaged, directly benefit the Global Plant Checklist (GPC), another of the IOPI's flagship projects, now accessible on the World Wide Web (Smith 1997).
- The SPP is an initiative by **an inclusive, international consortium of taxonomists aimed at producing a database of the vascular plants of the world**. The project's primary aim is to provide in concise format, and with standardised data fields, basic taxonomic information on the vascular plants of the world, and to publish it in both hard copy and electronic form (Smith 1999, Smith 2000).
- The project has an **international Steering Committee representing all regions of the world, and aims to develop a further network of collaborators** (Brummitt *et al.* 2001). It was agreed that the SPP had to be an international project, not just in name, but in its realisation and publication as well. **It provides an ideal vehicle for capacity building in taxonomy** and every effort will be made to involve young taxonomists, **particularly from developing countries**, in all aspects of the project.
- This initiative complements other major international initiatives designed to better understand and manage the world's natural heritage. These include the Convention on Biological Diversity (CBD), the Commission on Sustainable Development (CSD) and the Global Taxonomy Initiative (GTI) (Australian Biological Resources Study 2000).
- Each part published in the Species Plantarum: Flora of the World (SPFW) will deal exclusively with a single vascular plant family (or major subfamilial group of not less than about 50 species) and will be identified by the family name (Smith 1997). All published names and taxa of the group, worldwide, will be accounted for.
- The essential taxonomic work for many families is already done, but the information is scattered in journals or floristic treatments with different data standards (Brummitt 1999) and is often inaccessible particularly to biologists in developing countries. In some cases one or two botanists may have already worked on one family for a long period, and what is needed is to bring their existing data into the accepted format and make it more readily available. SPP has in

view a number of families, which are well known by one or a few people, and they are being encouraged to put all their knowledge into the appropriate form (Brummitt *et al.* 2001).

- Perhaps equally accessible targets are the many small families, which have not been compiled globally. These can be written up relatively easily, though experience has already shown that some surprises may be revealed when the effort is made to assemble all the relevant data and produce detailed distribution maps (Brummitt *et al.* 2001).
- In most cases, however, and particularly in the cases of the larger families, there has probably been no synthesis of the information for many years. In these cases a combination of approaches will be necessary: compilation of those groups where recent, reliable monographs or regional Floras are available, and undertaking of new research to provide missing information, or coverage of geographical or taxonomic gaps in knowledge. Teams of taxonomists will be assembled to work together to produce an integrated account (Brummitt *et al.* 2001). An example of such an approach is the Juncaceae where an international consortium of botanists has just completed work on a SPFW treatment recognising over 500 taxa worldwide.

Taxonomy and conservation

- There is a clear need for the best available taxonomy as the basis of national and international scientific policies conducive to the wise and sustainable use and conservation of global biodiversity. One of the biggest challenges facing the taxonomic community is the provision of scientifically sound hard copy and electronic products that meet the needs of the rapidly emerging international biodiversity stakeholders. If approached with the seriousness it requires and deserves, the SPP with its scope of producing a world Flora will become a useful tool in creating an awareness of the importance, not only of taxonomy, but also of man's dependence on plants in general (Smith 1997). It is intended that as the SPP becomes well known, botanists and institutions will see the value of such a central repository for taxonomic data and will want to contribute. Already volunteer contributions are beginning to be offered, and this trend is expected to accelerate. SPP is a vast project, but the initial proof of concept has been achieved, and a significant first step has been made (Brummitt 1999).
- A very salutary example of the importance of critical taxonomic assessment has been provided by Kirschner & Kaplan (2002) in a paper on those species of Juncaceae and Potamogetonaceae which have been cited as threatened species from a conservation point of view. Their evidence, based on comprehensive accounts of these families very recently completed for SPP, presents a very different picture from that provided by the 1997 *IUCN Red List of Threatened Plants*. An overall level of accuracy of 24% in the *IUCN Red List* was revealed. If this is the level of accuracy throughout the higher plants, our basic information for the management of the world's resources is hopelessly inadequate. The need for taxonomic work on a worldwide basis could not be more clearly demonstrated — only a project of the SPP's scope will be able to identify and mend the gaps within our basic information for the management of the world's resources (Brummitt *et al.* 2001).

Why a World Flora?

- Good regional floristic projects have always generated interest, enthusiasm and expertise among those working in the area concerned. New projects have arisen from the momentum created by such initiatives. The SPP can play a major role in promoting an active interest in biodiversity in this way in both developed and developing parts of the world. Taxonomists need to break out of the artificial confines of national and regional perspectives, and study and document plants throughout their geographic range and in the context of all of their relatives, not just their proximal ones. Now, as never before, there is a need for a world perspective in floristics, in plant studies of all kinds, in conservation, and in management of the environment. A network of workers is needed to develop ideas and understanding of the world's plants, providing opportunities for sharing knowledge and research. Those involved in SPP believe that the project can co-ordinate and stimulate botanical research in floristics and related fields and bring it to a focus in a world database (Brummitt *et al.* 2001).

- In order for such an account to come into being and become operative, certain steps must be taken:
 - a) Higher plant taxonomists must set up an organisation among themselves.
 - b) Appropriate funds must be made available and secure to run an international project.
 - c) A consultative network throughout the world, in both developed and developing countries, must be established.
 - d) Taxonomists worldwide must combine their research efforts to contribute their knowledge and their data to the required global database.
 - e) Recent advances in computer science and biodiversity informatics must be integrated into the SPP's information system to adequately cover the communication, and data entry, retrieval and integration aims laid out above.
 - f) The information must be made widely available in appropriate media.

With the formal establishment of the SPP in 1995, the first of these requirements was met. Since then some progress has been made towards fulfilling steps c), d) and f) (Brummitt *et al.* 2001).

Building taxonomic capacity

- As a result of the composition of the SPP Steering Committee, and the wide support the project already receives from a network of eminent taxonomists, the project is well positioned to contribute extensively to building capacity in all spheres of taxonomic endeavour.
- The next step is to harness resources to conduct research where required, compile accounts of target groups, and manage the dissemination of this information to those who need to use it. This step will provide many opportunities for input from botanists in all countries, but particularly from those that are biodiversity rich, but information poor. SPP aims to facilitate this process, by establishing a mentoring mechanism whereby botanists from developing countries would work in institutions in developed countries, building experience and skills, using SPP as the vehicle for their learning regime.
- This mentoring programme will focus on providing training opportunities for MSc-and PhD-students, as well as post-doctoral fellowships.
- It is envisaged that through interaction with government officials, every effort will be made to ensure that, after completion of their fellowships, the trainees are appointed to permanent taxonomic positions in their home countries. This will strengthen regional and national institutions in these countries, and furthermore enhance the establishment of regional centres of excellence in taxonomy in the developing regions of the world.

Funding required

At the 5th meeting of the Conference of the Parties (COP) to the CBD held in Nairobi, in May 2000, the SPP was mooted as a possible flagship project for funding under the GTI. This proposal was supported by a number of countries, including South Africa, Malawi and the UK. It is anticipated that the national in-country focal points of the CBD will recognise, support and endorse the taxonomic initiatives and outputs that have already been achieved through the established, inclusive structures of the SPP. These structures have a track record of delivering high-quality scientific products. The SPP is well thought-out and well-placed to immediately manage and implement a large-scale collaborative international project that has already received wide support from end-users (Smith 2000).

- The SPP has undertaken the necessary project development work, through workshops in Yokohama (1993), Madrid (1995), San Francisco (1997), Cape Town (1999), Prague (2000) and Sydney (2001). It is an up-and-running practical operation, which we believe will have the broad approval of both the taxonomic community and the users. But it can only develop if it receives the necessary financial and practical support (Brummitt *et al.* 2001).
- Total funding required is estimated at US\$ 30 million, spread over a 10-year period. Components of this expenditure are listed under clause 16 in Part II.

Conclusion

- A first step towards a unified account of the world's higher plant flora has now been taken. The initial step of developing a set of data standards for contributors, and a mechanism for accepting their account into a common database, have been established. The extent to which the project will develop from these small beginnings will depend firstly on whether funding is available, and secondly on whether the botanists of the world are willing to join forces in an international collaborative project. From reactions we have had so far, we are convinced that the botanical community at all levels is actively interested in the project and willing to support it. The need to raise the profile and funding of descriptive systematics in the modern world has been admirably stressed by Landrum (2001). The urgency of completing an inventory has been emphasised recently by Heywood (2001).
- **The SPP is designed to overcome the taxonomic impediment** and promote a proper understanding of plants among all people. We now ask for support for this, both in terms of funding and of collaboration by the taxonomic botanists of the world (Brummitt *et al.* 2001).
- The Species Plantarum Programme is global, it is taxonomic, and it is the biggest initiative in descriptive botany for a very long time (Brummitt *et al.* 2001).

Preparatory work already done includes the following:

- Following discussions chaired by Sir G.T. Prance at the International Botanical Congress (IBC) in Tokyo in 1993, a Steering Committee for the Species Plantarum Programme (SPP) was convened in Madrid in 1995. The project was formally constituted under the International Organisation for Plant Information (IOPI), a body registered under the International Union for Biological Sciences (IUBS). The Steering Committee first met at the Jardín Real Botánico in Madrid, Spain, in September–October 1995. Further Steering Committee meetings have been held at the California Academy of Sciences in San Francisco, USA, in May 1997, at Kirstenbosch National Botanical Garden in Cape Town, South Africa, in February 1999, at the Institute of Biology of the Czech Academy of Sciences, Průhonice, Prague, Czech Republic, in September 2000 and be at the Royal Botanic Gardens, Sydney, Australia, in November 2001. At the Prague meeting a formal committee was appointed to draft a constitution for the project (Smith 1996, Smith 1997, Smith 1999, Smith 2000, Brummitt *et al.* 2001).
- Initial publication in hard copy has been undertaken by the Australian Biological Resources Study (ABRS) for SPP. The following have been published so far:

Introductory part

- Species Plantarum: Flora of the World. Introduction to the Series. 91 pp. By A.E. Orchard. 1999. [Includes History of the Project, Guide for Contributors, and Glossary].
- Species Plantarum: Flora of the World. Introduction to the Series. [Chinese]. 78 pp. 2000. [The above translated into Chinese by Ying Han Brach].

Families published

- Species Plantarum, 1. Irvingiaceae. 25 pp. By D.J. Harris. 1999. [3 genera, 10 spp., trees in Africa and Asia].
- Species Plantarum, 2. Stangeriaceae. 9 pp. By E.M.A. Steyn, G.F. Smith & K.D. Hill. 1999. [2 genera, 3 spp., cycads from South Africa and Australia].
- Species Plantarum, 3. Welwitschiaceae. 8 pp. By E.M.A. Steyn & G.F. Smith. 1999. [1 sp., gymnosperm from Africa].
- Species Plantarum, 4. Schisandraceae. 62 pp. By R.M.K. Saunders. 2001. [2 genera, 39 spp., climbers from East Asia and USA to Mexico].

- Species Plantarum, 5. Prioniaceae. 7 pp. By S.L. Munro, J. Kirschner & H.P. Linder. 2001. [1 sp., perennial hygrophite, South Africa].
- Species Plantarum, 6. Juncaceae I, Juncaceae excluding Juncus. 237 pp. By J. Kirschner and a consortium of collaborators. 2002. [6 genera, 130 species or 173 taxa, worldwide]
- Species Plantarum, 7. Juncaceae II, Juncus subg. Juncus. 336 pp. By J. Kirschner and a consortium of collaborators. 2002. [1 genus, 200 species or 231 taxa, worldwide]
- Species Plantarum, 8. Juncaceae II, Juncus subg. Agathryon. 192 pp. By J. Kirschner and a consortium of collaborators. 2002. [1 genus, 110 species or 133 taxa, worldwide; all three vols. 440 species or 537 taxa]

Families completed and in press or awaiting editing

- Chrysobalanaceae. By G.T. Prance & C.A. Sothers. [8 genera, 530 spp., trees and shrubs, pantropical].
- Amborellaceae. By J. Jérémie. [1 genus, 1 species, scrambling shrub, endemic to New Caledonia].
- Hydrostachyaceae. By C. Cusset. [1 genus, 22 species, hydrophytes of Madagascar and southern Africa].
- Tristichaceae. By C. Cusset. [5 genera, 10 species, pantropical].
- Gyrostemonaceae. By A.S. George. [5 genera, 18 species, herbs, shrubs or trees, endemic to Australia].

Future publications

- Work has been started on accounts of several other families, some of considerable size. Some 40 authors have expressed an interest in submitting accounts of families in the relatively near future (Smith 2000, Brummitt *et al.* 2001). The Rubiaceae is seen as an important target family.
- To date, the completion and submission of Species Plantarum contributions have relied almost exclusively on the good will of the contributors and their respective institutions. The sum of A\$ 30 000 was made available to the project by the Australian Government in 1998, and the Bergius Foundation, Sweden, has committed US\$ 6 973. Both of these contributions are to support publication costs (Smith 2000).

a) Objectives:

- To build taxonomic capacity in developing countries.
- To stimulate activity and develop expertise in formal taxonomic work and Flora-writing wherever in the world it is needed.
- To set up an active organisation in developed and developing parts of the world to promote and co-ordinate taxonomic work on the higher plants.
- To establish a database to include a synthesis of all formal taxonomic data on higher plants (including descriptions), while involving a wide range of contributors from throughout the botanical world.
- To focus attention on major plant groups, especially families, on a global basis and produce integrated taxonomic accounts for the database.
- To make such accounts as widely available as possible in a range of media.
- To maintain and develop the database, incorporating new information, which may become available in the future.
- To endeavour to appoint trainees of the project as botanists in their home countries.
- To build on the strengths of and co-operate with existing networks.

Expected outcomes:

- Provide a practical vehicle for capacity-building in taxonomy, and make every effort to involve young taxonomists, particularly from developing countries, in all aspects of the project.
- Employ staff directly to work on the project, both through direct funding and through partnerships.
- Create much-needed opportunities for training in formal plant taxonomy for younger botanists from the lesser-developed countries: we envisage that post-doctoral taxonomists will be required for writing accounts.
- Create similar training opportunities for trainee editors and botanical artists.
- Provide mentoring opportunities at those institutions that already have worldwide herbarium collections and library holdings, and facilitate their supportive role in hosting trainee botanists and those seeking to hone their skills.
- Encourage local and national herbaria to give advice on the plants of the area for which they have expertise.
- Appoint a professional project manager to co-ordinate the work.
- Provide scope for bridging the so-called North-South divide, through the involvement of people from many countries, in roles ranging from researcher to compiler, from editor to mentor.
- Develop expertise in taxonomy and knowledge of plants at all levels.
- Develop a semi-automatic electronic system for generating distribution maps.
- Facilitate access to herbarium collections by databasing specimen label data.
- Build upon the existing international network of the world's botanists to advance the project in all its aspects.

World floristic database

- Write comprehensive accounts, on a world basis, detailing all basic taxonomic information of Angiospermae, Gymnospermae and Pteridophyta, including families and infrafamilial taxa, genera and infrageneric taxa, and species and infraspecific taxa.
- Establish simple guidelines that will make it easy for anyone to contribute, making the project accessible to all taxonomists.
- Produce end products that will be user-friendly and serve the purpose of rapidly providing familial taxonomic treatises that are truly global in focus.
- Include all the necessary information required to provide adequate taxonomic resolution (and identification) at all lower ranks for each family, on a world scale.
- Publish submitted contributions in a series of volumes or fascicles that will also be made available in appropriate electronic media.
- Ensure that each volume deals with a single family, or major subfamilial group, with the division always on systematic lines, not geographical.
- Undertake original research work, as required, to supplement existing monographs or regional Floras.

Standardised, structured world floristic format

- Provide for every recognised taxon the accepted name and any synonyms with their author(s), places and dates of publication, and all type information.
- Discuss phylogenetic relationship of families, with similar notes for any lower taxon as required.
- List standard published references at both family and genus levels.
- Provide references to previously published illustrations and maps, after the synonymy at species level and below.
- Include dichotomous keys at all relevant levels.

- Provide concise but comparable descriptions of all taxa.
- Provide concise distributional data for species and infraspecific taxa.
- Provide concise information on habitat.
- Cite up to 10 voucher specimens for each species or infraspecific taxon recognised.
- Include black-and-white illustrations of a generous selection of species, and a distribution map for every species and lower taxon.
- Provide chromosome numbers, as well as any other similar relevant information.
- Adopt internationally accepted standards in all data fields, as far as possible:
 - a) Standardise nomenclature according to the current edition of the *International Code of Botanical Nomenclature*.
 - b) Standardise author names according to Brummitt & Powell, *Authors of Plant Names* (1992).
 - c) Standardise journal titles according to Bridson & Smith, *Botanico-Periodicum-Huntianum/Supplementum* (1991).
 - d) Standardise abbreviations of book titles according to Stafleu & Cowan, *Taxonomic Literature*, ed. 2(1976-) where possible, but with initials of major words capitalised.
 - e) Standardise grouping and abbreviations of country citations for geographical distributions according to Brummitt, *World Geographical Scheme for Recording Plant Distributions*, ed. 2 (2001).
 - f) Standardise herbarium acronyms according to Holmgren, Holmgren & Barnett, *Index Herbariorum*, ed. 8 (1990) et seq.

Dissemination of world floristic information

- Provide scientifically sound products that meet the needs of the rapidly emerging international biodiversity stakeholders. Hard-copy will be produced as cheaply as possible to maximise access.
- Develop free and easy access to the information in electronic form with flexible searching options.
- Ensure, at the same time, that the intellectual property rights and other interests of the countries of origin of the biodiversity treated in the accounts are properly respected.
- Consider the optimal approach to provide, manage and present the data electronically. In this respect the Committee agreed that in operation of the SPP's electronic database system:
 - i) The information system will consist of institutional nodes serving data to the Internet.
 - ii) The nodes will take responsibility for certain sectors of the data (e.g. one or more family treatments).
 - iii) Nodes may choose their own choice of database systems to store the data.
 - iv) Nodes will provide the data in a standardised format, which will contain the data in a defined set of fields, allowing for different levels of detail, and will conform to an internationally accepted standard (e.g. XML).
 - v) The data will be accessible via a common system, which consists of broker and database client software.
 - vi) The data will be presented in two basic forms, a user interface to show the information on the WWW and a download facility providing the data for further analysis.
 - vii) Standardise dissemination in a single language (English), but explore options for automatic translation. Instructions to contributors are published in several languages (English and Chinese published, French and Spanish to be published shortly). Manuscripts will be accepted in a range of languages, for editorial translation.

Facilitation of accessibility to world floristic information

- Facilitate dissemination and exchange of information. This will work in two directions:
 - a) Those with detailed knowledge on a national or regional level will be encouraged to contribute accounts on a world basis, alone or as part of collaborative accounts.

- b) Production of world accounts will repatriate data and ideas to local workers, stimulating further interest and research, and preparation of national and regional Floras.
- Encourage conservation of biodiversity and ecologically sustainable use of biological resources through creation of awareness of the importance, not only of taxonomy, but also of man's dependence on plants in general.
- Promote an active interest in biodiversity in both developed and developing parts of the world.
- Promote data repatriation from major northern institutions to their southern counterparts, both indirectly through publication in SPFW, and directly through bilateral arrangements negotiated between trainee botanists and host institutions

Development of a global network of taxonomists

- *Encourage the development of a global dimension in taxonomy.*
- *Seek further wide-ranging, international co-operation to build on the success of existing networks.*
- Facilitate and develop an understanding of the world's plants through such a network.
- *Effectively co-ordinate available taxonomic resources to achieve successful progress within the programme.*
- *Encourage the involvement of larger herbaria in developed countries, as mentors and hosts for collaborating botanists from developing countries.*
- *Co-operate closely with the other activities of IOPI, namely the Global Plant Checklist (GPC) and the information services committees who are concerned, respectively, with drawing up a fully synonymised checklist of vascular plants and providing supporting electronic database and related software facilities.*
- *Co-operate closely with existing regional projects and initiatives, particularly with regard to synergetic effects in the case of plant groups endemic to that region.*
- Create opportunities for exchange of information and skills between regions and sharing of knowledge and research interests.
- Co-ordinate and stimulate botanical research in floristics and bringing it to a focus in a world database.
- *Adopt a decentralised approach to more evenly spread the financial burden required for capturing and managing taxonomic information and encourage the involvement of numerous institutions across the world.*
- Develop a database that is universally acceptable as a basic source of information to significantly manage the world's biodiversity.

Total estimated project budget

- The total estimated project budget is US\$ 30 million.
- Funding requirements have been identified for:
 - a) Employing a project manager and support staff who will develop the network.
 - b) Training taxonomists from developing countries through:
 - Employing post-doctoral writers of taxonomic accounts.
 - Training editorial staff and botanical artists.
 - c) Programming support system development and for electronic publication (manpower, software, hardware).
 - d) Publishing costs.
 - e) Travel funds for secretariat and committee members.
 - f) Project co-ordination expenses.
 - g) Running expenses for inter-institutional collaboration.

a) Project manager and staff

- To date the project has proceeded without permanent staff. Now, as the project gathers pace it will be necessary to employ a designated manager and some support staff. The main tasks of these personnel will be:
 - Day-to-day management of the project.
 - Liaison with potential contributors.
 - Providing secretarial services to the Steering Committee.
 - Recruiting and managing trainee Flora writers and Editors from developing countries.
 - Recruiting assistance from herbaria and other institutions in developing countries, for mentoring and hosting trainees, and matching trainees with host institutions.
 - Organising workshops.
 - Developing a long-term structure for the SPP, beyond the PDF-funded period. Complete final project proposal, including incremental cost analysis, co-financing arrangements, and circulation of document to stakeholders for comment, editing and submission.
 - Seeking long-term funding for SPP, beyond the PDF-funded period.

b) Training taxonomists from developing countries

- The core of this proposal, long term, is to build taxonomic capacity, by placing botanists (post-graduates, especially MSc- and PhD-students, but also post-doctoral fellows) from developing countries in herbaria and other institutions in developed countries, using SPP as the vehicle for skill-enhancement, building experience and networks, and knowledge transfer. Every effort will be made to ensure that these trainees are eventually appointed to permanent taxonomic positions in their home countries.
- The trainees would receive their travel and subsistence costs for a 1 to 3 year training period.
- The host institutions would provide laboratory accommodation, access to collections, libraries, and other resources, and mentoring support for the trainees.
- SPP (through its Steering Committee and the Project Manager) would provide guidance on project selections, standards to be achieved, monitoring of progress, and a vehicle for publication of resulting manuscripts.

Trainees would mainly be recruited for Flora-writing and research, but some would also be recruited to learn and participate in the scientific editing, illustration and publication of parts of SPFW (see attached letters of support in Appendix 1).

c) Development of electronic dissemination platforms

- Several possible models already exist (Flora Iberica, Australian Biological Information Facility, etc.), but none is necessarily ideal for this project. Existing models need evaluation, and if necessary, adaptation, to deliver SPP efficiently and effectively on the World Wide Web.
- This needs to be done in full cognisance of, and co-operation with, other initiatives delivering similar or related material (GBIF, BioNET-INTERNATIONAL, IPNI, etc.).

d) Publishing costs

- Costs of publishing the initial parts in hard copy have been supported by funding from Australia and Sweden.
- The policy has been to produce these parts as cheaply as possible, with sales barely recouping printing and postage.
- If this policy, designed to maximise circulation and use, is to continue, while the tempo of publication increases, then supplementary on-going funding will be needed.
- Parallel (but different) costs will also be incurred for electronic dissemination of SPFW.