

SABONET *news*

Newsletter of the Southern African Botanical Diversity Network

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SABONET Mid-Term Review

Living Plant Collections: Malawi and Zimbabwe

Genetic Resources and Benefit Sharing

Southern African Herbaria: Windhoek





c o n t e n t s

ON OUR COVER: *Platycerium elephantotis*, an epiphytic fern, growing on a riparian tree in the Luangwa Valley, Zambia.
(Photo: Patrick Phiri)

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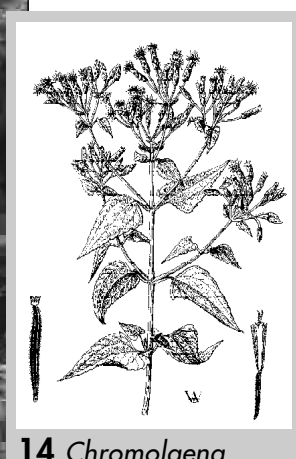
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letter from the editors

EDITORS: STEFAN SIEBERT & MARTHINA MÖSSMER

WELCOME to the first issue of our new-look *SABONET News*! We are starting the new year with a new layout—a streamlined design that packs even more information into our pages. The new *SABONET News* features a Letters column on page 4, so feel free to air your views, ask questions, or comment on articles. If you want to submit articles for the next issue, you will also find *Instructions to Authors* on page 4.

In this issue, we include articles on the living plant collections of Malawi and Zambia, computer viruses, the National Herbarium of Namibia in Windhoek, the triffid weed *Chromolaena*, and many more. Our regular *Profile* feature has now introduced all the National Coordinators to our readers; this issue does not contain a profile. Starting with the next issue, we will be featuring other prominent SABONET colleagues.

The most important SABONET event in recent months was the UNDP/GEF Mid-Term Review of the SABONET Project. The achievements of SABONET during 1996–2000 have been widely recognised, with our status as a flagship regional project being acknowledged by similar regional projects across the world. This achievement is due to the tremendous commitment of all ten participating countries of southern Africa. However, UNDP/GEF regulations require more than global approval to determine and evaluate the state of their projects. One of the major appraisals required is the Mid-Term Review of a UNDP/GEF-funded project. The aim of this assessment is to highlight the lessons learned and to determine the way forward. See our article on page 5 for a summary of the Mid-Term Review Reportback presented in Windhoek, Namibia.

SABONET News was rated very highly: the evaluation team noted that *SABONET News* is widely read and appreciated and is a very valuable project output. It was considered an excellent medium for information sharing and for staff development.

During the next 20 months, participating institutions will be called upon to actively promote and drive our activities towards achieving outputs. By accomplishing this goal, we will be presenting the donor agencies with a measure to evaluate the capacity that has been built in the botanical institutions of southern Africa. 🙌

—Stefan Siebert & Marthina Mössmer



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See Instructions to Authors on page 4

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IUCN
The World Conservation Union



NATIONAL BOTANICAL INSTITUTE

letters to the editors

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THANK YOU TO SABONET-NAMIBIA AND NBI

Prior to my first visit to Namibia and the Western Cape of South Africa in February and March 2001, I considered the Namibian terrain and the northern sector of the Western Cape to be extensively covered by Kalahari sands. This notion was drastically changed after visiting Namibia and participating in a field trip after attending the Global Taxonomic Initiative in Cape Town in February–March 2001! A visit to the National Botanical Gardens of Namibia in Windhoek and a three-day tour of the Western Cape has certainly expanded my knowledge of phytogeography in southern Africa. Thanks to SABONET-Namibia for facilitating the SABONET Steering Committee Meeting in Windhoek and to the National Botanical Institute for organising the field trip across the Western Cape after a successful GTI Workshop. I promise to call again!

—P.S.M. Phiri
University of Zambia
Lusaka, Zambia

See our article on the GTI Workshop on page 31 and a summary of the Mid-Term Review report that was presented in Windhoek on page 5. Eds.



Patrick Phiri leaning against a quiver tree *Aloe dichotoma*, a spectacular floristic feature in the National Botanical Garden, Windhoek, Namibia. (Photo: W. Mziray)

FLATTERED!

I would like to take this opportunity to thank my extended southern African botanical “family” for their touching comments, compliments and best wishes made in the December 2000 edition of SABONET News. I shall certainly try to stay as involved as possible with the many dedicated and committed members of our network spread across southern Africa.

I also wish Stefan Siebert all the best in managing the project for the next two years, and will endeavour to give him all the support I possibly can. I look forward to helping mobilise the botanical garden component of the SABONET Project in the months ahead. *Carpe diem!*

—Christopher Willis
National Botanical Institute
South Africa

TRAINING COURSE

It was an honour to participate in the Herbarium Management Training Course (11–29 October 1999), as someone found worthy to be a steward of the floral treasure in southern Africa—in my days. I know I am a debtor but strongly believe that I am going to be useful; I will try my best to do so. Thanks for investing in me. Kuan-Tzu said, “If you are planning for a year, plant a seed. If you are planning for five years, plant a tree, if you are planning for 100 years, then teach or train the people. When a

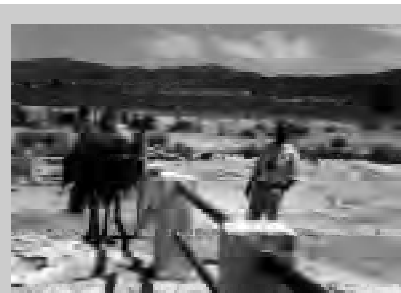
single seed is sown, a single harvest is realised. When you teach the people, you reap a hundred harvests”. So long live SABONET!

—SABONET Student

ORBEA IRRORATA

In 5(2): 105, under Succulenta 2000, you ask about *Orbea irrorata*. This is almost certainly just a variant of *O. verrucosa* and of no taxonomic significance. I will be dropping the name in my forthcoming book *Stapeliads of the World*, unless someone comes up with convincing proof before then that it is a valid species. I tried to persuade Larry Leach to do so when he was revising *Orbea*—he felt that it might have been overlooked by recent collectors, but nothing that has transpired since leads me to feel otherwise. Did anyone come up with a sighting?

—Darrel Plowes
plowes@syscom.co.zw



Patrick Phiri being persuaded to get closer to an ostrich in the Karoo, Western Cape Province, South Africa. Stunted plant growth typical of the biome is visible in the background.

instructions to authors

- 1) Manuscripts should preferably be in English.
- 2) If possible, text should be sent in electronic format via e-mail or on a stiffy disk and should be in Microsoft Word, WordPerfect, or Rich Text Format. Otherwise, hard copy can be sent or faxed to the SABONET head office.
- 3) Tables and charts should be in one of the following formats: Microsoft Excel, Quattro Pro, Lotus 1-2-3, or Harvard Graphics. Data must be supplied with charts.
- 4) If possible, include colour slides, black-and-white photographs, or line drawings to illustrate articles.
- 5) Caption all tables, figures and photographs clearly on a separate sheet. Include photographer credits.
- 6) Each author should provide name, affiliation, postal address, telephone and fax numbers, and an e-mail address (if applicable).
- 7) Look at the most recent issue of SABONET News for stylistic conventions.
- 8) SABONET News holds the right to edit any received copy.
- 9) Manuscripts should be sent to Marthina Mössmer. Via e-mail: editors@sabonet.org
Hard copy: SABONET, National Botanical Institute, Private Bag X101, Pretoria 0001, SOUTH AFRICA. Fax: (27) 12 804-5979/3211.
- 10) Submissions for the next issue should reach the editors before 31 May 2001. Late submissions will not be included.

SABONET

Mid-Term Review

The SABONET Mid-Term Review (MTR) was conducted from 22 January to 5 February 2001 by Mr Jonathan Timberlake (Biodiversity Foundation of Africa, Zimbabwe) and Dr Alan Paton (Kew, United Kingdom). Fifteen days were devoted to this task, with all ten participating countries being assessed to a greater or lesser degree. An oral report-back was presented to the SABONET Steering Committee and interested parties on 5 February 2001 in Windhoek, Namibia. The aim of the presentation was to discuss the recommendations made by the Mid-Term Review evaluation team. An official SABONET Mid-Term Review Report has been prepared by the consultants and submitted to the UNDP-GEF Regional Bureau for Africa. This article is not the official report, but a summary of the presentation made by the consultants in Windhoek.

The main objectives of the evaluation were the following:

- Evaluate progress regionally.
- Get an indication of benefits to the various institutions.
- Get an indication of benefits to botanical users nationally and regionally.
- Obtain suggestions for modifications to project activities and/or design over the next 24 months.
- Develop an “exit strategy” for the existing project.
- Determine the strengths and weaknesses of the existing project, and to learn any lessons.
- Get indications of structure, topics and activities for any future regional botanical project.

The team was required to look at the following aspects:

- How improved capacity of herbaria can be used in plant conservation and sustainable utilisation.
- Whether the needs of users of botanical information had been addressed.
- How the project can be justified regionally, rather than as the sum of its national parts and what the regional benefits are.
- What priorities should be set for the remaining period of the project, given that not all institutions will achieve all the stated outputs.

It was highlighted that the implementation capacity of participating institutions across the region differs greatly. All the countries had a common goal—conservation and sustainable use of plant resources—but each country may not have the same priorities for immediate objectives or activities.

The need to develop an “Exit Strategy” was also emphasised. This will allow the project to best realise its

potential and to provide outputs that can be used as a launch pad for further funding. A further issue that pertains is the project design. A process should be put in place to scrutinise the project implementation in order to redesign the logframe and revise the budget allocation. Such an effort will ensure an efficient final project phase.

Evaluation Conclusions

The review team concluded that SABONET has been a very successful and innovative taxonomy project:

- National capacity in terms of human skills has been built.
- National institutions are satisfied with appropriateness and level of training.
- Institutions purchased essential equipment on a needs basis.
- The project has been flexible and appropriate in terms of national needs.
- The Coordinator’s Office has been strong, supportive, and responsive.
- Many institutions have databased a significant part of their collections.
- Preparation of national and regional Red Data Lists is advanced.
- Regional awareness of botany was created and encouraged mutual support among botanists in the region.

However, the evaluation team also noted a few general concerns:

- Insufficient attention has been given to products derived from this increased capacity and to users of botanical information.



The Education Centre in Zimbabwe where the consultants met with representatives from Malawi, Zambia and Zimbabwe during the MTR. (Photo: C. Willis)

- Only 12 official months remain, and two or three SABONET Steering Committee (SSC) Meetings, therefore it is important that maximum impact is gained from the capacity built thus far. Many recommendations concern prioritisation of activities to focus on outputs from existing strengths.
- Due to large differences in size and implementation capacity between institutions, smaller institutions have a disproportionate burden placed upon them when common activities are undertaken. Not all participating institutions have the same mandate.
- The project is mostly run through only one national institution. This may limit the project's value to the broader botanical community (providers and users of information) in each country.
- The vision of the project by most participants has been national, not regional. This can hinder the best use of regional resources and reduces the potential of botanists in the region to influence policy. Is the project truly regional, that is, building on regional expertise and strengths, and building regional knowledge?
- There is not a clear demarcation between the SABONET and SECOSUD projects, particularly in institutions with a lower implementation capacity and in the National Botanical Institute (NBI) PRECIS support unit.

Training

Training has increased the regional capacity to study plant diversity. It has been flexible and appropriate to institutional needs. A good gender balance of trainees was maintained. Most trainees are, or are likely to be, absorbed into permanent staff, ensuring sustainability. Most training has been utilised, although monitoring has been weak. Training of horticulturists has not yet begun. IUCN NETCAB has already reviewed the training programme; their findings are fair and accurate. A problem exists in the implementation of IT skills, such as in the use of PRECIS. Institutions supported support options that include hosting a fellow, attaching staff to a mentor (remotely or by attachment to another institute), and hosting a national training course. Institutions have been hesitant in requesting funding for such activities.

The following priority areas were identified for further training:

- Ability to produce maps and labels with PRECIS
- General plant identification
- Taxonomic validation of herbarium specimens
- Production of formal taxonomic revisions and nomenclature

Project management training was identified as a priority for future training. Activities must be prioritised to ensure maximum use of capacity built to produce products that fulfil the stated objectives. Such training will ensure that institutions have the capacity to develop proposals and lever funding for further regional

or national projects. Institutions need to express clearly identified and costed priorities, so that the remaining budget can be used efficiently.

The evaluation team made the following recommendations:

- Project management training should be provided. Countries should be proactive and send their staff on local courses.
- Fellowships and mentoring should be resourced and countries encouraged to submit proposals to the Steering Committee in order to consolidate their training and make the best use of the expertise in the region. Proposals must be needs-driven and focussed toward the production of a product which illustrates the relevance of the capacity built, for example, training in identification and validation of herbarium material of a priority group for Red Data listing.
- Training in general identification by specialists could be built onto the end of the next regional field trip. This may help speed up the naming of material collected and thus the delivery of a product from the activity.
- Student progress reports must be submitted to the Secretariat in the quarterly report. Reports should indicate whether the student is making good progress.
- During regional trips the SABONET Information Technology (IT) unit should involve local service providers in the national workshops to ensure that they are also trained in the database. Local service providers should also be encouraged to give after-hours



MTR consultants Jonathan Timberlake and Alan Paton "inspecting" Roma University Botanic Garden with Mofalefa Tlali. (Photo: S. Siebert)

courses to SABONET IT staff at the participating institutions.

- A follow-up should be conducted of all course participants and post-graduate students. This should be presented as a life-history of the training programme and should also look at the impact on the staff duties and efficiency of the project.

Field Trips

A regional trip to the Nyika Plateau of Malawi/Zambia in 2000 provided an excellent opportunity for training in field procedures and identification, and allowed the building of personal contacts between participants. The publication of a *Conservation Checklist of the Plants of the Nyika* is well advanced. A trip to southern Mozambique is planned, but planning is only in the early stages.

Vehicles and funding through SABONET has allowed increased national field collecting. Trips have focussed on increasing herbarium collections. Countries differed in their capacity to carry out field trips. National field trips have mainly only involved people from the specific country.

The evaluation team made the following recommendations:

- The logframe should be adjusted to provide only for the southern Mozambique regional trip. No other large regional trip should be planned for the remainder of this project owing to lack of time. However, if a few countries decide to undertake and organise the third regional field trip, it will be considered by the SSC.
- Countries should be encouraged to submit bids to fund further national field trips. Such trips should have a clearly expressed purpose, focussing on under-collected areas or taxa, and thus feed into outputs such as national checklists or Red Data lists. Proposals should also consider inviting a participant from another regional country who has interests and experience appropriate to the goal of the trip.
- Field trips must be evaluated in terms of the number of specimens collected. It is understood that certain countries do not see field trips as a priority owing to the danger associated with such trips.

Networking

A collaborating Southern African Botanical Diversity Network has been established—this is one of the great successes of the project. Network functions were developed at several levels, from individuals learning from shared experiences to institutions gaining broader understanding of each other's work. The secretariat played an important role, building an atmosphere of

mutual trust and understanding.

SABONET News has been an excellent medium for information sharing and for developing staff. It has also provided an element of peer pressure to further develop capacity by learning from the activities of others. An important function of *SABONET News* has been to raise awareness of relevance and capabilities of botanical institutions. Countries have received feedback from broad community of users of botanical information through the wide distribution of *SABONET News*.

No recommendations were made as networking was felt to have developed well.



***SABONET News* was rated very highly by the MTR consultants. (Photo: C. Willis)**

National Committees

In each country, the National Working Group (NWG) consists of the coordinating institution, representatives of other botanical institutions, related government departments, representatives of universities, and international organisations (IUCN and UNDP). Some countries have wildlife societies or WWF on the NWG, but generally representatives of the broader community of users of botanical information (for example, conservation NGOs, EIA consultants, ecologists) are not represented. NWGs have generally not initiated requests for activities, but have concentrated on monitoring and advice. Lack of broader user group representation has limited the ability of NWGs to facilitate linkages and collaboration with similar activities within the country and region. The NWG attendance level varies between countries; poor turnout is due to members' perception that the project does not benefit their own institution or interest, lack of time, and high staff turnover (especially within UNDP).

The evaluation team made the following recommendations:

- Although National Working Groups fail to monitor and review effectively because they lack the breadth of users of botanical information in each country,

no change to their structure during the existing project is suggested. The project needs to consider outputs as a priority rather than details of operation.

- National Working Groups' outputs should become more proactive. Developing a strong national network can encourage proactive participation.

Electronic Information Systems

The SABONET project has provided all participating countries with computers, training, and software to allow databasing of herbarium collections. The software (PRECIS) is appropriate to countries' needs. South Africa's NBI has provided considerable support. SABONET has also provided resources to check data quality.

Initially, data capture was slow owing to the following reasons:

- Lack of resources directed towards IT support at beginning.
- Difficulty in employing a suitable person to support PRECIS other than in South Africa.
- Lack of IT management skills.
- Data capturers attending courses.
- No working relationship between institutions and local service providers.
- Two institutions had to re-enter approximately 5 000 specimens as the existing database was not compliant with PRECIS. However, most problems have now been solved.

Databasing works best in the institutions where IT is supported, either by a staff member or local service provider (LSP). But LSPs often have a high staff turnover or are situated some distance from participating institutions.

The low implementation capacity of some institutions means staff were unable to develop sufficient IT skills owing to other work pressures. Implementation of PRECIS is sustainable, but there are concerns whether it applies to institutions that lack necessary IT skills.



The beautiful stone building where the University of Lesotho Herbarium is housed. (Photo: C. Willis)

Approximately 200 000 specimens have been databased as a direct result of the project. The mean rate is 11 specimens per data capturer per working day. However, databasing of national collections will not be completed in all institutions before the end of the project. The Poaceae was the priority target group, but otherwise no clear strategy was designed for prioritising data capture. This is important for institutions that will not complete databasing during the project. Databasing of grasses is likely to be completed by all countries by the end of the project.

Production of distribution maps has been identified as a priority, but some countries cannot produce these and will need further assistance. There is also a concern over the quality of geo-referenced data. Some countries only have geo-referenced data for some specimens, others only provide Quarter Degree Grid resolution. There is a need for point data in all the institutions. There is also no clarity concerning priorities: some countries try to database as many specimens as they can; others devote resources to capture quality information to enable mapping.

There is a lack of clarity or understanding of the division of labour between SECOSUD and SABONET, particularly for databasing and mapping. There is a danger that SECOSUD and SABONET will compete for the same resources of time and expertise, particularly in smaller institutions and in the central PRECIS support unit at the NBI.

The SABONET project intends to pool the data gathered during the project to analyse the information on a regional basis. Such regional data is an important resource. Sharing information highlights other issues such as data ownership and control of use. A draft bilateral agreement between the NBI and the National Herbarium of Namibia (WIND) has been drawn up.

The following recommendations were made:

- A strategy outlining databasing priorities must be produced. It is suggested that countries focus on increasing the quality of their data to allow accurate mapping. Latitude and longitude details should be added where possible. Proposals to database additional taxa should demonstrate the importance of the activity to the broader botanical community. Red Data Listed taxa could be given priority.
- SABONET should support the ability to produce distribution maps from PRECIS. However, SABONET should not allocate resources to further GIS research, leaving this element to SECOSUD. There needs to be a clear division of resources between the two projects.
- A regional databasing strategy is needed. The aim of pooling data from all countries needs to be clarified and a product identified. This will help guide the databasing priorities. This strategy should also include data security and the management of data.
- The draft data-sharing agreement between WIND

and the NBI should be completed. This document can then serve as a model to facilitate regional projects, which can highlight to the region the use and relevance of information held in the national institutes.

- The data-sharing agreement should be used by SABONET to influence governments to ensure that legislation covers access to genetic resources and that information derived from them is practical and does not impede cross-border scientific research. This will assist countries to develop protocols and memoranda of sharing.
- For future projects, it should be ensured that PRECIS can accept data transferred using international data standards such as HISPID. This will maximise data input, allow transfer of data to other regions, and facilitate future transfer to GIS.

Outputs

So far, output of products has focussed on training to increase institutional capacity. However, in order to demonstrate this improved capacity, products must be produced. There has been insufficient attention given to this under the project to date. In order to ensure the positive impact of the project, the relevance of any products must also be demonstrated.

Regional publications have been judged as generally useful, especially the *Needs assessments*, *Plant taxonomic expertise* and the *PRECIS user guide*. These publications provide a good regional and international profile for the project. *SABONET News* is widely read and appreciated and is a very valuable project output.

National publications have been few and far between. The ability to support these publications is a valuable component of the project. The publication of national Red Data Lists is a priority. Only one national species checklist—that of Namibia—has been published. Completion of similar checklists is only likely for some countries.

National and regional species distribution maps are unlikely to be done by most countries, because serious problems with databasing have been experienced (insufficient data input, low capacity, lack of geo-referencing). However, regional maps for the Poaceae are possible. Other groups could be mapped for the *Flora of southern Africa* (FSA) region, through the NBI.

No progress has been made in GIS and it is hoped that SECOSUD will provide the necessary expertise for the region. Utility and relevance of some outputs is not clear, for example the proposed vegetation maps. The production of these maps would involve significant additional investment in capacity building. Analysis of distribution data (hot spots, under-collected areas) can only be carried out once all herbarium collections have been databased. This has been done for Namibia and could be done for the FSA region, through the NBI.

Good progress has been made with the Red Data Lists for most countries, even if assessments are not confirmed or are based on old or inadequate information. This product is tangible, applied and requested by a range of users.

The suggestion that the project assists in carrying out taxonomic revisions for the FSA and *Flora Zambesiaca* (FZ) regions would be another relevant output.

The evaluation team made the following recommendations:

- Publication of Regional and National Red Data Lists should be given high priority.
- The Steering Committee should solicit suggestions for appropriate regional and national publications during the remaining part of the project. The project should provide financial and editorial support (if required) for national as well as regional publications if they can be used to demonstrate increased capacity.
- Priority should be given to the production of national species checklists with minimum annotations by each country under the present project. This should be done using the most suitable means, which, in most cases, will not involve the use of PRECIS.
- Production of national and regional species distribution maps be given low priority, except where databasing is almost complete. The Poaceae should receive priority with regards to databasing and distribution maps.
- *SABONET News* should continue in its present format.
- Checklists of specific areas of interest should be produced where a demonstrated need exists. Production of such checklists will demonstrate the value of project activities and databasing. A completed database is not needed to compile a comprehensive checklist.
- Implementation of GIS and vegetation conservation activities should not be attempted in the remaining part of project, unless they can be contracted out.



A view of the building in Windhoek, Namibia, where the reportback session was held. (Photo: S. Siebert)

- Analysis of species distribution data at present should be restricted to those countries with relatively complete specimen databases. A database information strategy should be implemented to include other label information with distribution data analysis.
- Project activities should focus on production of realisable outputs within the current project time frame. These outputs will show improved capacity and demonstrate the value of botanical information to the broader society, for example, in conservation and utilisation. Unrealisable outputs, such as vegetation mapping, should be dropped from the logframe of the present project.

Botanic Gardens

Activities have only recently begun and it is therefore too soon to judge progress. A Needs Assessment has been completed and is very useful. A regional planning workshop is planned for March 2001 when priorities will be set. Countries have expressed the desire that horticultural training be provided for garden staff.

The evaluation team made the following recommendations:

- Planned activities for the remainder of the project should follow the outputs of the March 2001 workshop. Priorities need to be set. Activities should not take implementation capacity away from other project activities aimed at outputs. Planned activities are dependent on the priorities of the SSC and the allocated budget.

Language

Portuguese-speaking countries expressed their concerns regarding data entry in English and the English PRECIS manual. Portuguese trainees have an insufficient understanding of English and cannot benefit from university training in South Africa. This also applies to the short training courses.



The evaluation team made the following recommendations:

- Provision must be made for pre-course training in English for Portuguese-speaking trainees where required. This may be carried out in-country at a national or private institute, or could be done as part of an attachment to another botanical institution in the region. In the latter case, the trainee would attend a part-time language course while also carrying out research or in-service training.

Capital Expenditure

Most countries have used up their capital allocation; further capital allocations have been held up by those who have not. All countries expressed satisfaction with the equipment purchased and the flexibility to do so. Some countries require support for maintenance of infrastructure. Appreciation has been voiced for the provision of four-wheel-drive vehicles and their running costs—this has resulted in numerous field collecting trips.

The evaluation team made the following recommendations:

- Participating countries should be given a few months to utilize their remaining capital budgets. After this, whether utilized or not, there should be a budget call for a new round of capital expenditure for selected items to be decided by the Steering Committee. This may include essential repairs that cannot readily be done through other channels.

Regional Aspects

Under a regional project, it is important to demonstrate increased *regional* capacity and/or knowledge, not just increased national capacity. Different questions can be asked regarding this issue:

- Why a regional project and not just a series of national projects to support botanical institutions?



Training has increased the regional capacity to study our rich plant diversity in southern Africa; the motto of SABONET is **LEARNING BY DOING!** SABONET organises both Herbarium Management and Plant Identification courses for the region. (Photos: C. Willis)

- Has the project increased the voice of botany at a regional level?
- Is the regional view now stronger at continental or international forums?
- Has regional expertise been effectively utilised?

Most countries have looked at the national benefits of project activities, not at regional benefits or possibilities. The regional potential has not been fully realised. Expertise has mostly been used at a bilateral level.

Building regional strength could involve the following:

- Protocols for data exchange between countries and institutions
- Production of a regional Red Data List
- Synthesis of data at a regional level
- Mentoring within the region

Namibia and South Africa are advanced in signing a bilateral agreement for data exchange. This will allow Namibia to access data held at the NBI and *vice versa*.

The following recommendations were made:

- Resources must be made available under the present project for mentoring, using expertise available within the region. This may take the form of
 - A specialist in a particular priority group visiting other herbaria to help with identifications for periods of a few weeks (roving specialist).
 - A bilateral arrangement for a particular specialist to visit an institution to support, advise or carry out informal training on a specified topic.
 - Research or specialist staff at a participating institution visiting another regional institution for a period of a few weeks to increase their knowledge or exposure.
 - Regional specialists being funded to provide peer review, scientific editing, and specialist technical advice on request. This would probably include country visits.
- Strong efforts should be made to produce regional outputs, such as the regional Red Data List, checklists of trans-boundary areas, regional distribution maps, regional inventories of useful plants, and perhaps regional checklists. Some of these may be problematic given the differing status of progress in national databasing.
- The value of regional cooperation in the botanical field, along with the benefits of regional networking, should be publicised.
- Namibia and South Africa should finalise their bilateral data-sharing agreement; this should be regarded as a basis for a regional protocol.
- As SABONET has only three or four Steering Committee meetings left before the planned end of the project, proposals submitted to these meetings need to be well planned. Peer review of proposals from within the region may also help consolidate project management training. Care must be taken that such a review process is simple to ensure that institutions are not deterred from submitting proposals. A *pro*

forma proposal could be developed by the Secretariat to ensure that the Steering Committee has all the necessary information to make a decision.

National User Workshops

National User Workshops were not originally seen as a project activity. However, the need has arisen from the evaluation process. A series of national workshops of providers and users of botanical information need to be organised to address user needs in future. This should form an integral part of the Exit Strategy. Following national workshops a regional synthesis should be carried out, which can include a regional workshop. The synthesis would determine the following at a regional level:

- Who are major users of botanical information?
- What sort of information do they require?
- In what format do they require this information?
- How can any future botanical project address this at either a national or regional level?
- Should a future project be regional or national?

The following recommendations were made:

- Funds should be made available under the remainder of the present project to carry out a national workshop in each participating country. These workshops would comprise, at minimum, representatives of the following providers and users:
 - Herbarium staff
 - National Biodiversity Focal Point
 - Ministry of Environment (or similar)
 - Government/parastatal conservation agencies (National Parks, Forestry)
 - University botany/forestry departments (teaching and research)
 - Persons carrying out vegetation surveys or ecological assessments
 - International conservation NGOs (WWF, IUCN, etc.)
 - National conservation NGOs (wildlife societies, etc.)
 - Environmental consultants and consulting companies
 - Traditional plant users
 - Organisations concerned with botany (Tree Society, Botanical Society)
 - Amateur botanists, visitors to gardens (Friends of Gardens, etc.)
- The output from the workshops should be a brief but clear indication of users, botanical information required, the format in which this is required, and priorities. These workshops should be carried out before the end of the current project so that results obtained can be used either to assist in getting funding for national botanical projects, or to assist in leveraging regional funding.
- National workshops must be followed by a synthesis of information from the national workshops. The synthesis (which could be carried out in a workshop format, or by a consultant followed by national

peer review) should be aimed at determining what, at a regional level, the major botanical information requirements are.

- This process should be funded by and take place under the auspices of SABONET. It should be directed at leveraging future funding for botanical institutions. Representatives of all participating countries should be encouraged to participate in the process.

Strengths

The project has focussed attention on plant conservation as part of the Convention of Biological Diversity. Funding was focused on herbaria as repositories of scientific information on plants. This has assisted a range of herbaria across this region to begin to get this information into a more useable format by initiating a process of computerisation. Most of the activities initiated are sustainable. The project increased human capacity within a range of herbaria and in various skills. Many SABONET trainees have been or are likely to be absorbed into permanent positions. A successful network process was initiated where a range of botanists across the region have regular interaction with other regional botanists. It provided a forum for communication among a whole range of regional and international botanists and those with an interest in the subject. It also created a functional model for regional scientific collaboration. Activities sensitised herbaria and regional botanists to the use of herbarium data in applied conservation. The project enabled herbaria to collect new data through field trips. The NBI's capacity to host the project made it a successful one. Networking and communication formed a good foundation to maximise regional experience through the project.

Weaknesses

Widely differing implementation capacities are present between the participating institutions. Participating institutions sometimes have different roles and mandates. Requirements and priorities differ between different participating institutions. High staff turnover tends to be a problem with regard to training. Uncertainty exists over the sustainability of computerisation in some smaller herbaria. There is a lack of permanent positions for some trained staff. Insufficient attention was given to how information obtained can be disseminated to users and capacity produced used most effectively. There is differing quality of computerised data with regards to determination, nomenclature and georeferencing. Project management skills need strengthening.

Lessons Learned

The project has greatly benefited from having the secretariat based in a strong institution. There has been some anxiety over a perceived lack of transparency that could possibly have detracted from the networking



LMA Herbarium, Mozambique was also visited by the team. (Photo: C. Willis)

objective. Future projects could consider ensuring that all secretariat posts are advertised regionally and that a representative of the SSC is present at interviews, either as an observer or participant.

A regional project needs to pay particular attention to language limitations among participants. Additional allocation of resources (for example, for language training) may be necessary to overcome this problem.

In order to make maximum use of acquired data, any database program used should be compatible with similar databases elsewhere. This can be achieved through the use of international data standards/exchange formats. This also includes transfer to GIS formats. Another facet of data transfer is to ensure that agreements between collaborating institutions are in place.

Dependence on information technology (IT) for project outputs requires that IT is adequately resourced from the beginning of the project and that full technical support is readily available. There is a danger that the tool can become more important than the use and products derived from the data and can take up a disproportionate amount of the human resources available.

In some cases, countries have not been using proper reporting systems, including requests for available funds. There will be a need for more proactive project management. Short-term attachments to the secretariat may help.

Exit Strategy

The evaluation team recommends the development of an Exit Strategy in 2002. An Exit Strategy is necessary for the following reasons:

- It will allow the project to best realise its potential by its programmed end.
- It provides something that can be used as a launch pad or leverage for further regional or bilateral funding.
- It demonstrates the value of capacity built thus far

through the products delivered.

- It displays the project's relevance to its stated wider goal of "Contributing to sustainable human development through the effective conservation and utilisation of natural resources".

The recommended Exit Strategy has three elements:

- User Needs Assessment
- Focus on outputs with high relevance to the broader community
- Increased capacity focussing on these outputs

A User Needs Assessment will identify the users of the capacity built so far and their requirements. A national workshop should be carried out in each participating country before the end of the current project so that results obtained can be used either to assist in getting funding for national botanical projects, or to assist in leveraging regional funding. Outputs from these national workshops should give a brief, but clear, indication of the following:

- Users
- Botanical information required by user group
- Format in which this is required
- Priorities

These national workshops should be synthesised regionally to determine

- Major botanical information requirements
- How this could usefully be addressed and implemented at a regional level

The project should build on its existing strengths to produce products with a high impact. Publication of Regional and National Red Data Lists should be given priority. Priority should also be given to the production of national species checklists by each country, with minimum annotations, under the present project.

The Steering Committee should solicit suggestions for appropriate regional and national publications during the remaining part of the project. Priority should be given to publications with the broadest impact.

Resources should be made available under the present project for mentoring, primarily using expertise available within the region. The goal of mentoring is to enable institutions to produce products that have a high impact, such as national Red Data Lists or National Checklists, or regional products such as regional or cross-border checklists or regional distribution maps.

SABONET has only three or four Steering Committee meetings left before the planned end of the project, therefore proposals submitted to these meetings need to be well planned. Peer review of proposals from within the region may also help consolidate project management training. A *pro forma* proposal could be developed by the Secretariat to ensure that the Steering Committee has all the necessary information to make a decision.

Future Project

If there is to be a future project, the relevance of capacity gained under SABONET will have to be demonstrated. A new project will need to be more user and product-driven than the current project. It should build on the networking strength of SABONET and allow people to make the most of their capacity. National User workshops and a regional synthesis will be part of the process.

National Working Groups will have to be more representative of users, and have a stronger say in directing national outputs. The structure should remain similar to that of SABONET, but there should be broader participation of user groups in setting objectives and broader regional participation in the Secretariat.

A future project could be either regional or national. *National* projects will ensure that each country's needs are appropriately addressed. However, only some countries in the region will get support—mostly those with bigger institutions. A *regional* project will allow the region to speak with a stronger voice at the level of the subcontinent. It will increase the relevance of botanical institutions to broader societal issues through synergy and learning from others. It will also build on regional strengths and expertise, and will provide a model for other regional initiatives worldwide.

There will need to be much flexibility in terms of project activities and outputs given the differing implementation capacity across the region. Activities should be wider than taxonomy and include applied aspects such as vegetation survey, conservation assessments, and production of field guides. There should be a series of regional outputs, such as regional checklists, checklists of trans-frontier conservation areas, regional distribution maps, and regional inventories of useful plants. Regional concerns should be incorporated as activities, for example, monitoring of Red List species across the region and regional vegetation surveys. 📌

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The final document submitted by the Mid-Term Review Team has been accepted by UNDP-GEF, who have informed us that they are in agreement with the findings and recommendations put up by the MTR process, and look forward to seeing these recommendations being implemented in work plans.

Fifth International Workshop on Biological Control and Management of *Chromolaena odorata*

The fifth international workshop on biological control and management of *Chromolaena odorata* (L.) R.M.King & H.Rob. (= *Eupatorium* L.) was held at Umhlanga, KwaZulu-Natal, South Africa, from 23–25 October 2000, with a post-workshop field trip from 26–28 October. The event was organized by the Plant Protection Research Institute, Agricultural Research Council, South Africa. The purpose of this workshop was to facilitate the dissemination of information on the control and management of chromolaena (triffid weed), to identify areas in which new research is needed, and to foster global co-operation on managing and controlling it. Delegates from six countries in Africa attended the workshop.

Of the asteraceous species that have become serious invaders around the world, *C. odorata* (Figure 1) must be considered to have the greatest impact on the tropics (Zachariades *et al.* 1999). The native range of this scrambling perennial shrub extends from northern Argentina to the southeastern United States of America. *C. odorata* has invaded many parts of the Palaotropics, including western, central and southern Africa, India, southeast Asia and Oceania (**The distribution of Siam weed, *Chromolaena odorata*, in Papua New Guinea; A decade of biological control of the Siam weed, *Chromolaena odorata*, in Ghana: lessons and future plans**)*. The spread of *C. odorata* in Asia took place in the early 1800s when it was introduced as an ornamental plant to the Botanical Garden in Calcutta, India. In 1937 it was accidentally introduced to Nigeria. The Com-

monwealth Institute of Biological Control initiated a biological control programme for *C. odorata* in 1966 with the support of the Nigerian Institute for Oil Palm Research (**History of *Chromolaena odorata* biological control programmes**). An outcome of this project was the introduction of the moth *Pareuchaetes pseudoinsulata* to Ghana, Nigeria, India, Sri Lanka and Malaysia during 1970–1978. Based on the encouraging results of the introduction of *P. pseudo-insulata* into the Mariana Islands, the first International Workshop on *Chromolaena odorata* was conducted in Bangkok, Thailand in 1988.

Besides *P. pseudoinsulata*, a gall fly, *Procecidochares connexa*, is also used as a biological control agent (**Impact of *Procecidochares connexa* (Diptera: Tephritidae) on *Chromolaena odorata* in different Indonesian ecologies**). It is now present at release sites in most Indonesian islands and is spreading well and giving good control of *Chromolaena odorata* four to five years after release (***Chromolaena* in Asia and the Pacific: spread continues but control prospects improve**). A third biological agent reported on is a butterfly, *Actinote antea* (A new biological agent in Indonesia from South America for the control of *Chromolaena odorata* (L.) King & Robinson (Asteraceae): *Actinote antea* (Doubleday & Hewitson (Lepidoptera: Nymphalidae: Acraeinae)). Until recently, biocontrol programmes on the weed have focused primarily on the use of arthropods, with little or no consideration of fungal pathogens as biological

control agents. Several pathogens have been reported on *Chromolaena odorata* and are being tested for use in control programmes (***Chromolaena odorata*: biological control using plant pathogens—a South African perspective**).

The post-workshop tour took the delegates to the northern parts of KwaZulu-Natal where they visited the Hluhluwe-Umfolozi Game Reserve and the St Lucia wetland (***Chromolaena odorata* infestation in Hluhluwe Game Reserve—history, impacts management and prospects for the future**). *C. odorata* forms dense impenetrable thickets that displace other vegetation, create fire hazards due to their flammability, and invade subtropical grasslands that are not burnt regularly (**Managing *Chromolaena odorata* (chromolaena)**

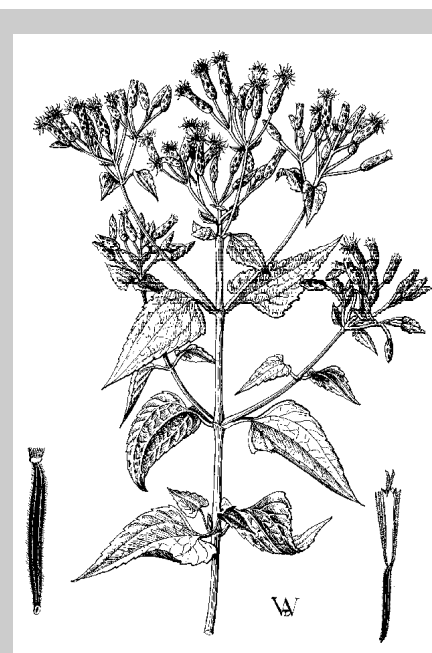


Figure 1. *Chromolaena odorata*.
(Drawing by A. Walters, National Botanical Institute, Pretoria.)

* Papers used to compile this report on a most informative and interesting workshop are in bold.

in subtropical grasslands in KwaZulu-Natal, South Africa) . *C. odorata* was introduced into Ghana in the late 1960s. Early attempts to control the weed were mainly manual. It was either cut to ground level and burnt or the stems and the subterranean portions were uprooted and burnt. Few commercial and medium-size farmers attempted the use of herbicides. Biological control has been introduced since the 1970s. The activities have since remained in the domain of research scientists but are now to include the farming communities. Extension agents and farmers across the country have been trained and will facilitate further releases and monitoring of the bioagent *Pareuchaetes pseudo-insulata* (**Ecologically sustainable *Chromolaena* management in Ghana: past, present and future role of farmer field schools**) .

Chromolaena odorata was first recorded in South Africa in 1947 near Ndwedwe, KwaZulu-Natal (Hilliard 1977) and also from Mozambique, but there is virtually no information on its occurrence in Zimbabwe, Malawi, Zambia, and Angola (Figure 2)—*C. odorata* is invasive in southern Africa and is distinct in its morphology from forms that have invaded other areas of the world. Determining the exact identity and origin is important in order to ensure complete compatibility of candidates for biological control. Various attempts to solve the problem are currently in progress (**Genetic fingerprinting of *Chromolaena odorata* : finding the origin of South Africa's pest**) . Comparing different features of the Eupatorieae occurring in southern Africa, the genus *Mikania*, with three indigenous members, shows strong similarity to *C. odorata* (**The tribe Eupatorieae (Asteraceae) in southern Africa**) and could be af-

fected by biological control agents as reported by Zachariaides *et al.* (1999). In Indonesia it was observed that *Actinote antea*s in addition to *C. odorata*, also fed on *Mikania micrantha* , another aggressive weed in the country. Eradication of *C. odorata* by means of biological control is therefore by no means an easy task! In South Africa *chromolaena* is mainly seen as a threat to conservation, but it also has an impact on forestry, pastoral agriculture, and other land uses (**Spread, impacts and manage-**

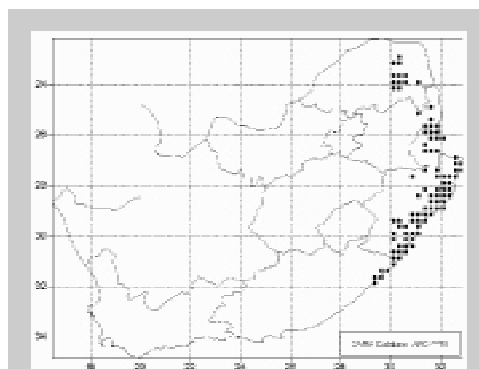


Figure 2. Distribution of *Chromolaena odorata* in southern Africa.

ment of *Chromolaena odorata* in southern Africa) . Although awareness of the weed is now high in this country, its spread has proceeded largely unchecked. *Chromolaena odorata* is often the dominant fallow species in the short fallow-food crop systems that form the basis for subsistence and cash crop farming along the forest margins of southern Cameroon (**The role of *Chromolaena odorata* in the short fallow-food crop systems of the forest margins of southern Cameroon**) .

C. odorata does not only affect humans, but also crocodiles. In a study from 1994–1997, it was observed that most of the nesting Nile crocodiles of Lake St Lucia selected open, sunny, sandy areas in which to deposit their eggs (**Alien plant**

threatens Nile crocodile breeding in Lake St Lucia, South Africa) . However, nests were only found in shaded sites in the Mplate River breeding area and these nests were shaded primarily by the alien plant *Chromolaena odorata*. Shaded site temperatures were well below the pivotal temperature for St Lucia's Nile crocodiles and as a result nests probably produced a female-biased sex ratio. Shaded site temperatures may also prevent embryonic development altogether. It was observed that breeding crocodiles in the Mplate River encountered roots from *C. odorata* while digging their egg chambers. Being unable to dig through the fibrous mat of roots the crocodiles then abandoned these sites. In a mitigation experiment additional nesting sites were created; the percentage of sites utilised increased, indicating that suitable nesting sites were in short supply. *Chromolaena odorata* is thus also posing a very serious threat to the continued survival of the Nile crocodile in Lake St Lucia and unless immediate action is taken, a female-biased sex ratio will result in eventual extirpation of the species from this recently acclaimed World Heritage Site. 🐊

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**IF YOU ARE AWARE OF THIS PLANT IN YOUR AREA IN AFRICA,
PLEASE CONTACT**

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Computer Viruses I

Threats to data, including computer viruses, were discussed at a recent SABONET Database Managers Workshop. At the workshop, data managers and capturers expressed the need to know more about viruses, how they work, and what to do about them. This article is the first in a three-part series on viruses and discusses the different types of viruses.

What Is a Virus?

A computer virus can be defined in various ways:

- A computer program intentionally written to cause some form of damage to computer systems or networks.
- A program that alters the way a computer works without the permission or knowledge of the user. To be considered a virus, it must meet two criteria: self-execution and self-replication.
- A computer program or program-snippet that replicates itself.
- A piece of programming code, not part of the original code, inserted into an executable program.
- A computer program that is intentionally written to attach itself to other programs or disk boot sectors and replicate whenever those programs are executed or those infected disks are accessed.

Virus Types

There are many different kinds of computer viruses:

Boot viruses affect the information system during the start-up process and are written in assembly language. They place their code in the sector whose code the machine will automatically execute when booting, so that when the machine boots, they load and run, for example, the Stoned and Michelangelo viruses.

File/Program viruses affect the program files that a system must load in order to make the software function. There are three different kinds of File/Program viruses:

- *Companion viruses* attach themselves to (or replace) executable program files (.com and .exe files). When you run the infected program, the virus code executes first. After the virus has finished loading and executing, it loads and executes the program it has infected.
- *Logic bomb/time bomb viruses* are pieces of code that are in programs or the operating systems of computers. They wait for particular dates or events before they execute, and then cause damage, for example, the Fu Manchu virus.
- *Trojan horse viruses* are programs that are supposed to do one thing, but when executed do something entirely different, usually destructive, for example, the Pkzip300 and Calculator viruses.

Macro viruses are written in macro language and are always application-specific—they cannot attach themselves to just any program. For instance, the Laroux virus will only infect Microsoft Excel files. These viruses attach their macros to templates and other files in such a way that, when an application loads the file and executes the instructions in it, the first instructions to execute are those of the virus. Examples of macro viruses are Laroux, Green Stripe, Concept, Nuclear, and WM.Cap.

Network worms are programmes that spread through network connections, using usernames as passwords and commands to copy themselves into the system. They can replicate through a network mail facility and they need not attach to particular files or sectors at all, for example, Internet Worm,

Morris Worm, Melissa A., Explore_zip, and PrettyPark. Although these viruses are so different in their makeup, they all use self-mailing as their primary replication technique. These worms mail themselves by attaching the worm to outgoing e-mail messages.

Multi-partite viruses are a combination of boot and file viruses, for example, Natas.

Systemic viruses affect DOS system files, which can prevent the computer from operating.

Hoaxes are not viruses, but e-mail messages that people receive and then forward to all their friends and colleagues, for example, a message saying that you will receive US\$100 for every copy of the message you send to a friend or colleague. These messages work like the old-fashioned chain letters sent by ordinary mail. Hoaxes can cause large amounts of Internet traffic, jamming up servers and preventing legitimate e-mail from reaching recipients.

In the next issue of *SABONET News*, we will discuss the damage caused by viruses, methods by which they spread, and how to detect viruses. 📧

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SSC 10 Held in Windhoek

The Tenth SABONET Steering Committee (SSC) meeting was held at the Safari Court Conference Centre in Windhoek, Namibia, on 6 February 2001. Dr Gillian Maggs-Kölling, Ms Coleen Mannheimer, and Ms Esmeralda Klaassen of the National Botanical Research Institute of Namibia were our hosts.

Prof. Brian Huntley—the SSC Chair—and the National Coordinators or representatives of all ten participating countries, as well as the SABONET Secretariat, attended the SSC Meeting. The following 12 individuals also attended the meeting:

- SABONET IT Centre, South Africa: Mr Trevor Arnold
- UNDP/GEF, Tanzania: Dr Alan Rodgers
- UNDP-Namibia: Ms Midori

- Paxton & Ms Linda Vanherck
- UNDP-South Africa: Mr Thulani Mabaso
- Ministry of Agriculture, Namibia: Mr Hans Venter
- National Botanical Institute, South Africa: Mr Christopher Willis
- SADC FSTCU, Malawi: Mr Ernest Misomali & Dr Mzoma Ngulube
- National Herbarium, Tanzania: Dr William Mziray
- Biodiversity Foundation for Africa, Zimbabwe: Mr Jonathan Timberlake
- Royal Botanic Gardens, Kew, United Kingdom: Dr Alan Paton

The SSC Meeting was arranged to fall between the SABONET Mid-Term Review (MTR) reportback and the SECODSUD Board Meeting.

This collaboration led to huge time and financial savings for both regional projects.

Apart from the usual matters discussed at such regional meetings, the SSC approved the implementation of the recommendations that were put forward by the MTR team. The SSC indicated that a meeting must be scheduled to revise the SABONET logframe and reallocate the budget accordingly. This meeting is being planned for April 2001. To facilitate preparations for this meeting, the SSC requested that all participating countries must provide the Secretariat with their workplan and needs for the remaining 20 months of the project. 📄

—Stefan Siebert

Witwatersrand NBG Development Campaign Brochure

A Development Campaign brochure prepared by the staff of the Witwatersrand National Botanical Garden in Roodepoort/Krugersdorp, South Africa, was published in November 2000. Sponsored by the Bankenveld Branch of the Botanical Society of South Africa, the brochure introduces sponsorship opportunities and outlines completed projects, ongoing projects, and proposed projects planned for the Witwatersrand National Botanical Garden. The brochure will assist sponsors in identifying potential areas of support, and garden staff in focussing their fund-raising efforts towards specific projects.

The value of the 24 proposed future projects described in the brochure is R24 million. The projects include the following:

- Restaurant and Conference Facility (R3 000 000)
- New Visitors' Centre and Entrance (R2 000 000)

- Garden Centre and Shop (R2 000 000)
- Nursery Development (R2 000 000)
- Conservatory/Display Glasshouse (R6 000 000)
- Educational theme gardens:
 - Magico-Medicinal Garden (R120 000)
 - Fragrance Garden (R45 000)
 - Succulent Rockery (R120 000)
 - Geological Garden (R120 000)
 - Bushveld Area (R50 000)
 - Water Garden, stream and water feature (R250 000)
 - Turf Grass Garden (R65 000)
 - Climate Garden (R50 000)
- Upgrading of bridges (R200 000)
- Extension to parking area (R500 000)
- Concert stage (R80 000)
- Four-wheel-drive vehicle for fieldwork and estate management (R170 000)

The design and layout of the brochure was done by Ms Sandra Turck; the text was edited by Ms

Emsie du Plessis (both of the NBI, Pretoria). Similar brochures are planned for each of South

Africa's seven other National Botanical Gardens. Those for the Pretoria and Lowveld NBGs are currently in preparation.

More information on the projects and the brochure can be requested directly from the Curator of the Witwatersrand NBG, Ms Sharon Turner, at the following address:

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Website: <http://www.nbi.ac.za/frames/witsfram.htm> 📄



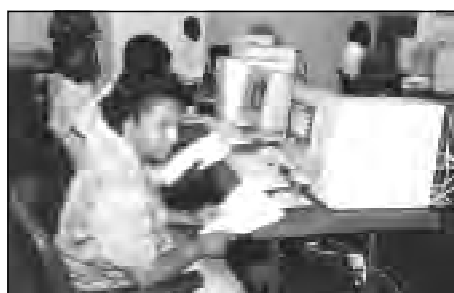
Database Management Course for Beginners

The week of 5–9 December saw yet another successful SABONET course presented at the National Herbarium, Pretoria. Mr Trevor Arnold and the newly appointed SABONET programmer, Mr Franco Alberts, presented a Database Management Course for beginners. Fourteen participants

from nine of the ten SABONET countries attended this regional course. The main focus of the course was basic computer techniques, database management, and data backup; these skills are necessary to ensure rapid computerisation of plant specimens in the southern African herbaria. Five re-

source persons with proficiency in Windows 98 and the PRECIS database acted as demonstrators during the course. The demonstrators were from Mozambique, Namibia, South Africa, Zambia and Zimbabwe. Five regional SABONET courses are planned for 2001. 📌

—Stefan Siebert



Samira Izidine from Mozambique acted as demonstrator for students from Portuguese-speaking countries. (Photo: Adela Romanowski)



Students hard at work: Khotso Sepamo from Lesotho and Comfort Nhleko from Swaziland. (Photo: Adela Romanowski)



The course participants, demonstrators and SABONET staff.

BACK: Comfort Nhleko (Swaziland), Jacob Phiri (Botswana), Cidalio Francisco (Angola), Carlos Zita (Mozambique), Trevor Arnold (NBI Data Management, South Africa), Khotso Sepamo (Lesotho), Hester Steyn (NBI Data Management, South Africa), Franco Alberts (SABONET Programmer), Stefan Siebert (SABONET Regional Coordinator)

MIDDLE: Nikaya Govender (Demonstrator, South Africa), Gladys Msekandiana (Malawi), Nonkululeko Swelankomo (South Africa), Ruvimbo Gwenzi (Zimbabwe), Nancy Mugarisanwa (Zimbabwe), Esmeralda Klaassen (Demonstrator, Namibia), Samira Izidine (Demonstrator, Mozambique), Ana Bela Amude (Mozambique), Shaibu Kananji (Malawi)

FRONT: John Tloubatla (NBI, South Africa), Monicah Kabelo (Botswana), Clara Chisongo (Zambia), Puleng Matebesi (Lesotho), Nyasha Rukazhanga-Noko (SABONET Administrative Officer), Annanah Sakala (Demonstrator, Zambia), Anthony Mapaura (Demonstrator, Zimbabwe) (Photo: Adela Romanowski)

Benefits of Data Capturing in *Herbaria*

All the herbaria involved in the SABONET project have been capturing data in the last couple of years (Siebert & Willis 2000). Computerised herbarium specimens offer improved access to large quantities of data as well as expanded analytical potential. In this article, we discuss the many ways in which such data can be used.

Available Data

The following types of information on herbarium specimens can be computerised:

Localities Locality information is available at a number of different levels.

Minor and precise localities, for example, "Nyika Plateau, Lake Kaulime, marshy area on eastern bank", can be used to map the distribution of a species or vegetation in small areas such as small nature reserves.

When collecting certain species for specific projects, for example, anatomy, revision work, genetic resources, Red Data species, or pharmacological testing, computerised locality information enables one to go directly to a locality and not waste too much time searching for the species.

Habitat Information When used in combination with locality data, habitat information can speed up the process of finding a specific species in the database; it is also useful for locating a rare species that needs monitoring.

Habitat information from the database can also be incorporated in publications. An example of this can be found in *Grasses of south-*

ern Africa (Gibbs Russell *et al.* 1990).

Date of Collection Flowering or fruiting times can be deduced from herbarium specimens, because good herbarium material should be fertile with flowers and/or fruit. Such information is useful for the timing of field trips, for example, when you need to collect fruit for a genus under revision.

In Red Data List work, the collection dates can give an indication of a species that may need to be considered. Possible habitat changes can be inferred from large discrepancies between collecting dates and when a species appears no longer to be collected. For example, *Prionanthium dentata* was first collected in 1775, next collected 1975, and thereafter only collected twice in the 1980s, indicating a very rare species.

Through analysis of collection dates, the date of introduction and the spread of weeds and other alien species can be obtained.

Flowering and fruiting times can also be included in a publication.

Type Specimens A record of type specimens in herbarium collections give researchers an indication of which herbarium to apply to for the loan of types when doing research.

Database Products

Distribution Maps A grid reference is necessary for each specimen if the data is to be used for distribution maps. Once precise locality information has been databased, distribution maps for each taxon can be generated and these have many applications. Maps are like

symbols or illustrations; there is no language barrier and information can be interpreted quickly.

Maps can be drawn on a national or regional basis, indicating the number of species or specimens per grid square (Figure 1). In addition to showing each herbarium how their collections are made up, such maps indicate areas that are under-collected and are invaluable in the planning of general collecting field trips.

Maps are useful when doing identifications: if there is no record of the particular taxon in or near the locality of the specimen under consideration, it may mean the identification is wrong. One can see this at a glance when looking at a map. It can also indicate that the locality given or the label attached is incorrect. Points on a map that appear as outliers from the main distribution could mean that a particular specimen has been incorrectly

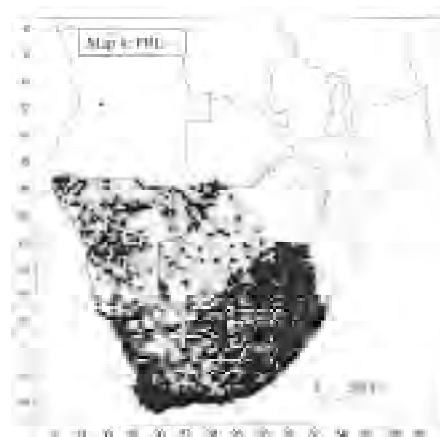


Figure 1. Distribution map showing the number of computerised specimens in the National Herbarium, Pretoria. Grey cells represent grid squares with 1-24 computerised specimens; black cells represent grid squares with 25+ computerised specimens.

named or encoded; this is useful for quality control of the collection and/or information in the data base.

Maps give invaluable information to researchers involved in research on specific taxa or groups of plants. Distribution maps are often published in the final paper(s).

When publishing a new species, maps are included to show the extent of distribution. It therefore increases the information available on the species being described and shows possible geographical links with similar species.

Projects such as a Red Data List also benefit from maps. A shortlist of possible threatened candidates can be drawn up by analysing distribution maps to see which taxa appear to have a restricted distribution or

a limited number of collections.

Maps can be used as part of the starting point in conservation actions to see which areas may need to be conserved.

Weed distribution can be monitored. This helps with control and possible prevention of alien plant invasions, as the distribution maps alert botanists to areas where particular weeds are found.

Gazetteer Because grid references are added to the specimen data that is used for distribution maps, the computerized information can be used to compile a gazetteer of place names by combining grid references and locality names. This can be a valuable product of PRECIS in countries where a gazetteer is not yet available.

Lists Lists of species per grid can be generated on a national or regional basis. Such lists can be used as the basis of checklists for collecting trips; lists can also be generated on request for interested members of the public.

An indication of the biodiversity of an area can be obtained by listing all taxa recorded. Such an area can either be small and local, a National Park, for example, or regional, like the SABONET countries.

Lists can also be used for curatorial purposes, as problems are often highlighted and can then be rectified. An example of incorrect encoding at the National Herbarium, Pretoria, is that of *Lagarus ovatus*, a monotypic genus from the Mediterranean. It is not likely to occur in Namibia, but a number of

Creating Maps

Using PRECIS Specimen Database, the button "Mappit Output" (Reports menu) runs a report to generate a list of grid references for a selected family, genus or species (Prentice & Arnold 1998). Grid references (for example, 2123AC) are then written to a file (see Figure 2), which can be converted to the required format and imported into Mappit or ArcView to create a distribution map (Figure 3). Each dot on the map represents a record of a specimen in the database that was collected in a specific quarter degree grid.

```
*LEGEND
=Hyparrhenia hirta
(L.) Stapf
1713DA
1813BB
1917BC
1917CA
2025BB
2216BD
2216DB
2216DD
2217AD
2217CA
2217CB
2317CA
2329BB
2329CD
2329DD
```

Figure 2. Part of the list of grid references for *Hyparrhenia hirta*.

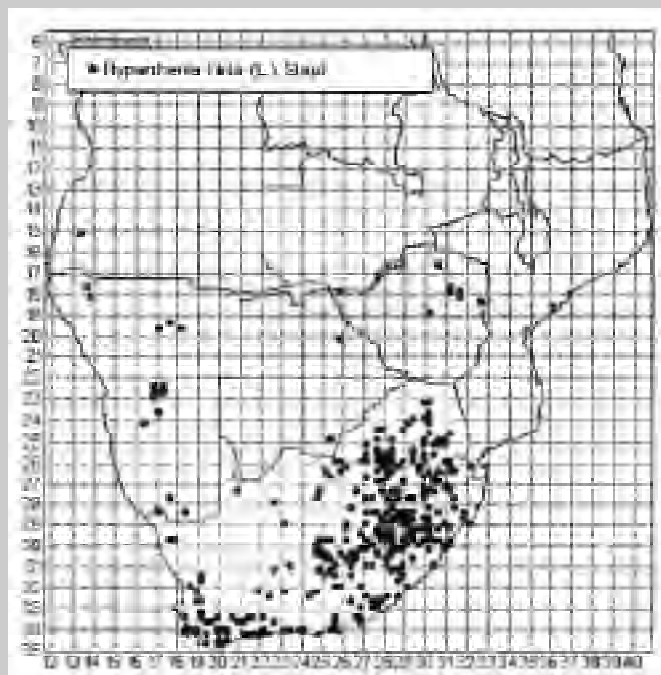


Figure 3. Distribution map of *Hyparrhenia hirta* based on data from participating SABONET herbaria. The map was created using MAPPIT.

Stipagrostis specimens collected in Namibia had been wrongly encoded as *Lagarus* (Craven 1999). At the time of encoding these specimens, the number system was used at PRE. These specimens were encoded under 9902600 (*Lagarus*), instead of 9902611 (*Stipagrostis*), a more likely genus for Namibia. Since the specimens were correctly filed, but the data was incorrect, it took a long time to rectify the mistake in such a large collection.

Using GIS

In a recent issue of *SABONET News*, it was stressed that computerised information will be far more valuable in future if the data is suitable for data manipulation techniques such as Geographical Information Systems (GIS) (Siebert & Willis 2000). GIS technology has the potential to expand the applications of botanical databases through processes such as overlay of collection site data with natural resource and political data. The botanical GIS could allow spatial queries that a herbarium database alone cannot, such as identifying new areas to search for rare species based on the occurrence of habitat characteristics matching those of known collection sites. In this way it could become an important tool in studies of endangered species and conservation efforts (Rhoads & Thompson 1992).

Because of highly variable locality information, there is much botanical data locked into databases that

cannot be easily analysed using GIS. Within the SABONET Project the standardizing of the collection of locality information for herbarium specimens will greatly enhance the usefulness of the resulting databases. When locality is recorded using precise measurements, a variety of maps can be created and it is possible to overlay the distribution data with topographical, geological or other environmental data. However, data gathered only at a low level of resolution (country or region) cannot be used to show a more highly defined locality (Burroughs in Rhoads & Thompson 1992). To be analysed spatially, botanical data must have locality information that can be related to a point on a map (Rhoads & Thompson 1992).

In this regard, georeferencing is of the utmost importance (Siebert & Willis 2000) and precise distribution information, for example, decimal degrees should be attached to computerised specimens where possible. Distribution information should be in one of the following formats: grid reference; degrees, minutes and seconds; degrees decimal. If the specimen label only has a description of the locality but no latitude/longitude information, a gazetteer and/or map should be used to find the precise locality. In the PRECIS Specimen Database, the corresponding quarter degree grid reference is automatically inserted once the longitude and latitude values have been entered. The quarter degree grid reference of the

specimen locality should only be entered when degrees, minutes and seconds, or degrees decimal values are not available. 📍

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National Botanic Gardens of Malawi

There are three National Botanic Gardens in Malawi: Zomba Botanic Garden in the south, Lilongwe Botanic Garden in central Malawi, and Mzuzu Botanic Garden in the northern region. Sir Alexander Whyte, who worked as a government botanist under the British administration, established Zomba Botanic Garden between 1891 and 1895. The garden served as an experimental garden for ornamentals and economic plants collected from the British Empire. Lilongwe and Mzuzu Botanic Gardens were established in 1989, two years after the establishment of the National Herbarium and Botanic Gardens of Malawi as an independent institution. The Lilongwe and Mzuzu Gardens were established with the purpose of conserving regional flora.

The gardens serve as

- Systematic collections of the representatives of the major plant families, and the vegetation types of Malawi including indigenous and exotic plant species of both economic and medicinal value.
- Conservation areas for threatened, endangered, endemic, and indigenous species of Malawi.
- Environmental and educational

facilities.

- Testing grounds for introduced botanical materials in collaboration with other appropriate institutions.
- Areas for the promotion of greater knowledge and expertise in horticulture.
- Areas of public amenity and promenade.
- Areas for carrying out research on the flora and vegetation of Malawi.

The living collections of the three gardens are at different stages of development. The living collection in Zomba Botanic Garden is diverse, owing to its existence for over 100 years. Mzuzu and Lilongwe Gardens have concentrated on *ex situ* conservation of flora specific to the surrounding areas. Because the living collections in the three gardens are so dissimilar, I describe them separately in this article.

Zomba Botanic Garden

The garden is located in the Municipality of Zomba, Malawi's old capital, which experiences a cool temperature climate, owing to its proximity to the Zomba Plateau. It re-

ceives rainfall of around 2 000 mm per year, making it ideal for a large number of both indigenous and exotic species such as *Pinus patula* and *Newtonia buchananii*. At its establishment between 1891 and 1895, the garden covered 20 ha. The garden was later handed over to the Forestry Department, which led to the loss of many species such as *Ginkgo biloba*, *Solandra gattatu*, *Xeroderris stuhlmanii* and *Aleurites montana*. The area occupied by the garden was increased to 50 ha when its management was handed over to National Herbarium and Botanic Gardens in 1989. Today there are over 500 species in the garden; 200 of these have been introduced during the past ten years.



Figure 1. Some of the epiphytic orchids grown at Zomba Botanic Garden.

Fern Collection

Approximately 206 fern species have been recorded in Malawi; 25 of these are cultivated in the garden, especially along the stream banks. The species *Adiantum poiretii*, *Cheilanthes quadripinnata*, *Cheilanthes viridis* var. *glauca*, *Doryopteris poiretii*, *Pellaea angulosa*, *Pellaea doniana*, *Pteris catoptera*, and *Pteris friesii* dominate and have adapted well to the cool temperatures of Zomba.

Orchid Collection

There are over 400 species of orchids recorded in Malawi. Twelve epiphytic orchids species are propagated in wood charcoal and dead wood under a shed (Figure 1), including *Ansellia africana*, *Bulbophyllum sandersonii*, *Angraecopsis parviflora*, *Angraecum cochiferum*, *Acampe praemorsa*, *Calyptrochilum christyanum*, *Cyrtorchis arcuata* and *Bulbophyllum malawiense*. In addition, four terrestrial orchid species have been introduced to the garden, especially those with edible tubers such as *Disa* spp., *Habenaria walleri* and *Satyrium* spp.

Cycad Collection

Encephalartos gratus is the only cycad indigenous to Malawi and endemic to Mulanje Mountain (Figure 2). This species was planted in

the garden in the 1970s. *Cycas revoluta* has also been planted.

Succulent Collection

This collection can be found on the rockery areas of the garden. The family *Aloeaceae* is represented by 17 indigenous species, for example, *Aloe arborescens*, *A. buchananii*, *A. buttneri*, *A. cameronii*, *A. canii*, *A. christianii*, *A. cryptopoda*, *A. duckeri*, *A. excelsa*, *A. greatheadii*, *A. mawii*, *A. menyharthii*, *A. myrianthii*, *A. mzimbana*, *A. nultii*, *A. swynnertonii*, and *A. zebrina* (Figure 3). More than 50 indigenous and exotic *Aloe* species were collected from the southern region and are cultivated, with most flowering in winter and spring; a few species flower in summer. Unfortunately, some species suffer from bacterial and fungal infections during the wet season. Succulent and xerophytic species belonging to *Euphorbiaceae*, *Cactaceae*, *Agavaceae*, *Amaryllidaceae* and *Crassulaceae* are also cultivated.

Grass Collection

Four years ago, 23 grass species were introduced in the garden. Exotic grass species have also been planted, including *Vetiveria zizanioides*, *Pennisetum purpureum* and *Hyparrhenia* sp. Two indigenous bamboos—*Oreobambusa buchwaldii* and *Oxytenanthera*



Figure 2. Part of the cycad collection in the Zomba garden.

abyssinica—and three exotic bamboo species—*Bambusa glaucescens*, *Bambusa vulgaris*, and *Dendrocalamus strictus*—are among the living grass collection. Although the grasses do not produce colourful flowers, this is one of the most attractive areas in the garden (Figure 4).

Wildflower Collection

Eleven wildflower species have so far been collected for cultivation. These are *Crinum macowanii*, *Dissotis princeps*, *Helichrysum nitens*, *Plectranthus pubescens*, *Costus spectabilis*, *Vernonia natalensis*, *Erythrocephalum zambezi-anum*, *Streptocarpus goetzei*, *Pyrrosia schimperiana*, *Aneilema johnstonii*, and *Impatiens eryaleia*. These flower all the year round if watered regularly.

Economic Plant Collection

Zomba Botanic Garden has concentrated on the collection and propagation of wild fruits, for example *Uapaca kirkiana*, *Azanza garckeana*, *Tamarindus indica*, and *Terminalia catappa*. Wild vegetables, such as *Bidens pilosa*, *Gynandropsis gynandra*, and *Amaranthus* sp. are also displayed.



Figure 3. A view of the *Aloe* collection at Zomba Botanic Garden

Herbaceous Collection

Herbaceous plants include annuals, perennials, and ornamental plants that are cultivated for their colourful flowers. This collection is for both commercial purposes and display and includes herbaceous perennials such as *Salvia splendens*, *Chrysanthemum* spp., *Lobelia* spp., *Bulbine caulescens* and *Tulbaghia violacea*.

Tree and Shrub Collection

This is a representative collection of Malawian and introduced trees of this part of Africa. Emphasis is placed on the *ex situ* conservation of plants which are threatened and rare, as well as those with horticultural uses and wood products. The garden also has a collection of palms.

Other Collections

The Zomba Botanic Garden nursery contains indigenous and exotic tree seedlings, ornamentals, and medicinal plants. The tree seedlings are sold or supplied to the public to encourage community participation. Ornamental plant species are sold for landscaping to generate funds for the botanic gardens (Figure 5).

Lilongwe Botanic Garden

Lilongwe Botanic Garden is the second largest of the three gardens with a total area of 130.68 hectares. It is situated in the heart of Lilongwe City in the central region of Malawi. The garden experiences a warm climate, receiving an annual rainfall of 2 000 mm, and is dominated by *Combretum* and *Acacia*. The garden was initially planted with *Gmelina arborea* trees in the 1970s, which are being uprooted in stages to encourage the growth of indigenous trees and shrubs and allow introduction of other species. Over 200 species grow naturally in the garden; some 100 species have been introduced.

Aloe Collection

This is a collection representing indigenous aloes of Malawi collected from drier parts of the central region of the country, including *Aloe*



Figure 4. Some of the grasses growing in the Grass Collection of the Zomba garden.

cameronii and *Aloe chabaudii*. Regular field trips are undertaken to increase the aloe collection.

Bulb Collection

Bulbous plants from the central region are collected and cultivated in the garden. Only four species are under cultivation: *Albuccaria* sp., *Tacca* sp., *Anthericum* sp. and *Boophane disticha*. These species produce colourful flowers in winter and summer.

Economic Plant Collection

The Lilongwe Garden includes a large area of orchard crops. Over 20 species are under cultivation here. Visitors also come to the orchard to see and learn more about the different species and varieties of fruit crops. Both tropical and temperate fruit species are on display, including mangoes, peaches, avocados, guavas, macadamias, apples, papaws, and granadillas. There is also a 0.5 ha vegetable garden where cabbage, mustard, tomatoes, onions, eggplants, and green maize are cultivated. The produce is sold to generate income for the botanic garden.

Herbaceous Collection

Herbaceous plants include annuals, perennials, and ornamental plants that are cultivated for their colourful flowers. This collection is for both commercial purposes and display and includes herbaceous perennials such as *Salvia splendens*, *Chrysanthemum* spp., *Lobelia* spp., *Bulbine caulescens* and *Tulbaghia violacea*.

Tree and Shrub Collection

This collection represents the indigenous trees of the drier *Combretum*



Figure 5. The Zomba Botanic Garden nursery contains indigenous and exotic tree seedlings, ornamentals, and medicinal plants.



Figure 6. A terrestrial orchid growing naturally in the Mzuzu Botanic Garden.

tum-Acacia woodlands of the central region. The collection serves as material for display, research, and education. In addition, 100 tree species have been introduced to Lilongwe, including representatives of the Combretaceae, Caesalpiniaceae, Euphorbiaceae, Ebenaceae, Mimosaceae, Papilionaceae, and Rhamnaceae.

Other Collections

The Lilongwe Garden nursery contains indigenous and exotic tree seedlings, ornamentals, and medicinal plants, which are sold or given free to communities. Ornamental plant species are sold for landscaping and decoration purposes.

Mzuzu Botanic Garden

Mzuzu Botanic Garden covers a total area of 478 ha. It is situated in the city of Mzuzu in the northern region. The garden experiences cool temperatures and receives an annual rainfall of 3 000 mm. It is dominated by evergreen tree species such as *Syzygium* sp., *Uapaca kirkiana*, and *Brachystegia taxifolia*. Most of the garden is managed as

a nature reserve and only a small portion has been landscaped.

Herbaceous Collection

Herbaceous plants include annuals, perennials, and ornamental plants that are cultivated for their colourful flowers. This collection is for both commercial purposes and display and includes herbaceous perennials such as *Salvia splendens*, *Chrysanthemum* spp., *Lobelia* spp., *Bulbine caulescens* and *Tulbaghia violacea*.

Terrestrial Orchid Collection

Over ten terrestrial orchids grow naturally in the garden, including *Disa* sp., *Eulophia* sp., *Platycoryne mediocris*, *Satyrium buchananii*, and *Biophytum* sp. (Figure 6).

Grass Collection

Many indigenous grass species grow naturally in Mzuzu Botanic Garden. Some of the species are used in construction work in the garden, for example, thatching. The surrounding communities are allowed to cut the grass for personal use. Some dominant grass species are *Andropogon eucomus*, *Cymbopogon densiflorus*, *Eragrotis racemosa*, *Imperata cylindrica*,

Panicum sp., *Tristachya* sp., and *Sporobolus* sp. (Figure 7).

Tree and Shrub Collection

In situ conservation has made the botanic garden rich in evergreen trees such as *Syzygium*, *Uapaca*, and *Brachystegia*. *Newtonia buchananii* and *Khaya anthotheca* have been introduced along the river. These plants serve as material for display, research and education.

Maintenance of the Collections

The plant collections in Zomba, Lilongwe, and Mzuzu Botanic Gardens are a valuable resource. Time and money are put into training staff members to maintain these collections. The programme of work and maintenance cultural practices are documented, so that these are accessible to others who may want to use them. Our gardens are for posterity. 🏡

—Lloyd Nkoloma
Zomba Botanic Garden
MALAWI
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Figure 7. At Mzuzu Botanic Garden, the surrounding communities are allowed to utilise the grass for thatching.



The National Botanic Garden of Zimbabwe

The National Botanic Garden of Zimbabwe is the main *ex situ* indigenous plant conservation centre in the country. The botanic garden falls under the National Herbarium and Botanic Garden, an institute of the Department of Research and Extension Services, Ministry of Lands, Agriculture and Rural Resettlement. The 67 ha garden is located about 4 km north of the Harare City Centre within the suburb of Alexandra Park. It receives a wide spectrum of visitors that includes student groups, tourists, and researchers.

The Botanic Garden's layout (Figure 1) makes it conveniently suited for educational, research, and recreational purposes, while at the same time serving the purpose of conserving the indigenous flora of Zimbabwe. The greater part of the garden is dedicated to the Zimbabwean flora, housing approximately 80% of the indigenous woody plant species of the country.

The garden is divided into the following sections:

- The Zimbabwean Section is arranged according to ecological zones.
- The Systematic Collections comprise selected taxa from the continent.
- The Exotic Sections of the garden hold tropical plant collections arranged according to their areas of origin.
- The African Savanna Woodland Section is a collection of plants from the African savanna areas (with the exclusion of Zimbabwe).
- Collections of succulents from Africa and the New World comprise the Succulent Sections. Plants from arid zones of southern Africa constitute the Desert House Collection.
- The Economic Section is a collection of plants economic importance from the world over.
- A collection of herbs used by people for various purposes makes up the Herb Garden.
- Forest plants from the African continent make up the African Forest Section, and forest plants from South Africa comprise the South African Rainforest Collection.
- The Ornamental Collection surrounds the Herbarium building.

Zimbabwean Section

The Zimbabwean Section comprises collections of plants arranged to depict the main vegetation types of Zimbabwe.

Natural Miombo Woodland

This collection consists of the natural vegetation of the area as it was prior to the development of the garden. Mature specimens of musasa *Brachystegia spiciformis* and munhondo *Julbernardia globiflora*, the dominant species of the Zimbabwean Miombo grow in this section of the garden.

Open Miombo Woodland/ Highveld Savanna

This is a collection of trees commonly occurring in the highveld area. The common genera in this type of woodland are *Brachystegia* and *Julbernardia*. Prominent species in this collection are musasa *Brachystegia spiciformis* mountain

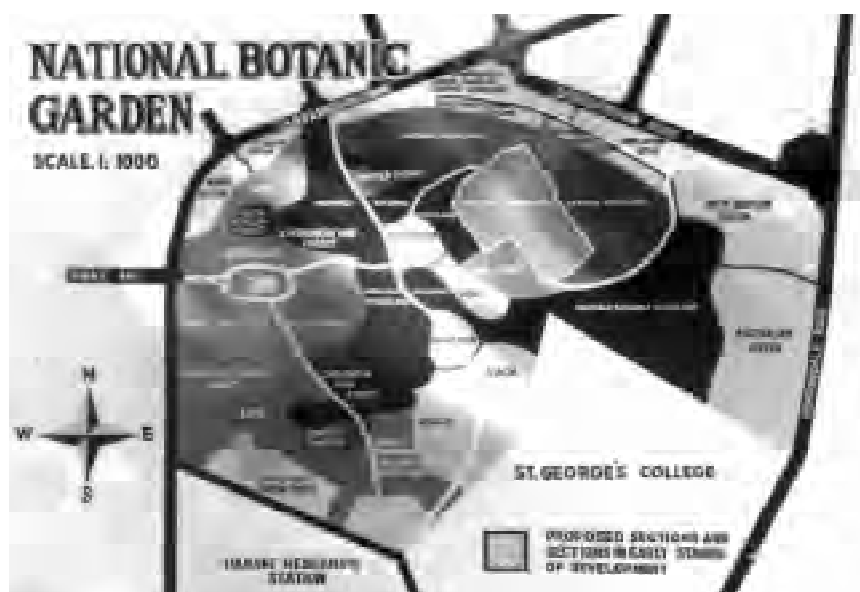


Figure 1. Map of the National Botanical Garden of Zimbabwe.

acacia *B. glaucescens*, munhondo *Julbernardia globiflora*, and muwanga *Pericopsis angolensis* (Figure 2).

Highveld Riverine

This is a collection of plants from the riverine areas in the highveld. Growing in this collection are willow rhus *Rhus lancea*, Natal milk plum *Englerophytum magalis-montanum*, wild olive *Olea europea* subsp. *africana*, and river combretum *Combretum erythro-phyllum*.

Lowveld Zambezi Valley

Contained in this collection are plants from the hot, semi-arid Zambezi Valley area in the north of the country. Zambezi teak *Baikiaea plurijuga*, manketti-nut *Schinziophyton rautanenii* tick tree *Sterculia africana*, jesse bush (Combretaceae-dominated thickets), false mopanes *Guibortia coleosperma* and *G. conjugata*, and torch-wood *Balanites maughamii* grow here.

Lowveld Save-Limpopo Valley

This is a collection of plants from the hot semi-arid Save-Limpopo Valley area in the south of the country. The species composition of this

vegetation is very similar to that of the Zambezi Valley area. Of note here is a fine specimen of the baobab *Adansonia digitata* (Figure 4), as well as tamboti *Spirostachys africana* and mopane *Colophospermum mopane*.

Lowveld Riverine

This collection is of plants from the riverine areas of the lowveld. Trees growing in this collection include ilala palm *Hyphaene petersiana*, natal mahogany *Trichilia emetica*, and ebony *Diospyros mespiliformis*.

Low Altitude Rainforest

This forest is modelled on the Haron-Makurupini Forest in the Eastern Highlands of Zimbabwe. Striking species in this section include giant red mahogany *Khaya anthotheca*, forest ordeal tree *Erythrophloeum suaveolens*, and mujajaira *Newtonia buchananii*.

Medium Altitude Rainforest

Modelled on the Chirinda Forest, this collection contains almost all the tree species from that area. The forest fever tree *Anthocleista grandiflora*, brown-berry fluted milk wood *Chrysophyllum gorungosum*, and the massive strangler fig *Ficus roko* are grown here.

High Altitude Rainforest

This rainforest is modelled to depict the montane vegetation of the Eastern Highlands. An artificial mountain stream cascades through a small valley flanked with forest ferns. Some of the trees in this area are the emergent forest albizia *Albizia schimperana*, the parasol tree *Polyscias fulva*, and yellow-wood *Podocarpus latifolia*.

Forest Margins

This collection comprises plants from the margins of forests in the Eastern Highlands area. Prominent species in this area include muranga *Warburgia salutaris*, bivia *Bivia jalbertii*, pink dombeya *Dombeya burgessiae*, and the rare northern mountain bamboo *Oreobambos buchwaldii*.

The Lake

Aquatic and marginal plants grow in and around this artificial lake, including water lilies *Nymphaea nouchali*, bulrushes *Typha capensis*, and the Okavango water fig *Ficus verruculosa* (Figure 5).

Systematic Section

Combretaceae

This section is devoted to all the Combretaceae genera from southern tropical Africa: *Combretum*, *Terminalia*, *Pteleopsis*, and *Meistemon*. Included are some Zimbabwean species, such as mususu *Terminalia sericea*, soft-leaved combretum *Combretum molle*, and lead-wood *Combretum imberbe*.

Acacia

This collection contains *Acacia* species from Zimbabwe and adjacent countries. Plants growing in this section and occurring in Zimbabwe include fever acacia *Acacia xanthophloea*, Nyanga flat-top *Acacia abyssinica*, and camel thorn *Acacia erioloba*.



Figure 2. The Highveld Savanna.
(Photo: A. Mapaura)

Ficus

Growing in this section is a collection of fig species from the African continent. The following figs that occur in Zimbabwe are also included: Zambezi rapids fig *Ficus cyathistipula*, strangler fig *Ficus thonningii*, and lowveld fig *Ficus stuhlmanii*.

Brachystegia

This section is devoted to the Zimbabwean *Brachystegia* species, including *Brachystegia spiciformis* B. boehmii, and *B. glaucescens*.

Exotic Section

This section contains collections of trees from tropical areas with climatic conditions that are similar to our own.

Asian Collection

Of note amongst the plants growing in this collection are Burma teak *Tectonia grandis*, Indian terminalia *Terminalia bellerica*, and yellow flame tree *Peltophorum pterocarpum*.

Australian Collection

Species to be found in this collection include the cajeput tree *Melaleuca quinquenervia*, the eucalypt *Eucalyptus toreliana*, and the Australian flame tree *Brachychiton aceriformis*.

South American Collection

South American trees in this section include the leopard tree

Caesalpinia ferea, *Tabebuia impetiginosa*, *Erythrina fulcula*, and monkey-puzzle *Araucaria angustifolia*.

African Savanna Woodland

Growing in this section is a collection of trees and shrubs from East, West, and southern Africa, excluding Zimbabwe. The section features pink jacaranda *Stereospermum kunthianum* and Zambian albizia *Albizia coriaria*

African Rainforest

This is a collection of forest plants from the African continent. Occurring in this section are burttavya *Burttavya nyassica*, feverberry *Croton megalocarpus* and the African flame tree *Spathodea campanulata*.

South African Rainforest

Growing in this area are bastard umzimbeet *Milletia sutherlandii* mountain cedar *Widdringtonia nodiflora*, Natal strelitzia *Strelitzia nicolai*, and wild pear *Harpephyllum caffrum*

Succulent Section

African Succulent Collection

This is a collection of succulents from the African continent. Striking species grown in this collection include the Sabi star *Adenium multiflorum*, milk-woods *Euphorbia* spp., and the Madagascan alluaudia *Alluaudia procera*.

New World Succulents

This collection comprises mainly cacti from central and South America, including prickly pears *Opuntia* spp., golden barrel *Echinocactus grusonii*, and peruvian apple *Cereus peruvianus*

Desert House

This unique stone-walled greenhouse with a louvered north-facing glass roof holds plants from the arid areas of southern Africa

(Figure 4). The main collection is from Namibia and the winter rainfall areas of South Africa, as well as some specimens from the Karoo. Plants from the arid areas of Zimbabwe are also grown here. Plants include stone plants *Lithops* spp., welwitschia *Welwitschia mirabilis* halfmens *Pachypodium namaquanum*, and various species of *Aloe*, *Euphorbia*, and *Commiphora*.

Economic Section

This collection comprises plants of commercial value, including tea *Camelia sinensis*, coffee *Coffea arabica*, and the Brazilian rubber tree *Havea brasiliensis*.

Herb Garden

Culinary, medicinal, cosmetic, and insect-repellent herbs feature in this collection. The majority are of exotic origin, including aloe vera *Aloe barbadensis*, ginger *Zingiber officinale*, and thyme *Thymus* spp. The herb garden also contains a growing collection of indigenous herbs.



Figure 3. A baobab specimen in the Lowveld Save-Limpopo Valley area. (Photo: A. Mapaura)

The Ornamental Collection

The ornamental collection graces our herbarium surrounds, garden entrances, and car park. This collection contains garden ornamentals from around the world, for example, flamboyant *Delonix regia*, purple glory-bush *Tibouchina granulosa* royal palm *Roystonea oleracea*, the silk-cotton tree *Chorisia speciosa*, pandanus palm *Pandanus utilis*, and the dragon tree *Draceana draco*.

Garden Maintenance

An intensive maintenance plan has been established for all the garden collections, with staff being assigned to the various sections to carry out routine maintenance activities. Three horticulturists who are responsible for the different sections, manage the garden. Allen Micho is responsible for the nursery area and propagates plants for maintaining and expanding the garden collection, and for selling to the public. Esther Makombe is in charge of the ornamental sections around the restaurant, education centre, herbarium, car park, and garden entrances. Andrew Mangwarara is in charge of general garden maintenance activities like mowing the lawns and pruning the trees. 🌿

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Figure 4. Inside the Desert House. (Photo: A. Mapaura)



Figure 5. The Botanic Garden Lake. (Photo: S. Siebert)

GTI Africa Regional Workshop

The Global Taxonomy Initiative (GTI) Africa Regional Workshop was held at the Kirstenbosch National Botanical Garden, Cape Town, South Africa, from 27 February to 1 March 2001. The workshop was hosted by the National Botanical Institute of South Africa and the National Herbarium and Botanic Gardens of Malawi, under the auspices of the Convention on Biological Diversity (CBD), with funding from the Swedish International Development Co-operation Agency (SIDA). Following the workshop some delegates embarked on a four-day field trip to places of interest in the Cape Floral Kingdom and adjacent arid areas of the southern and western Cape.

The workshop was attended by 43 delegates, representing 32 countries (23 African) and 36 institutions or organisations. Of these, 21 delegates from African countries were sponsored by SIDA. No less than 13 delegates from Northern institutions attended the workshop. This provided an excellent opportunity to forge and strengthen links for North-South collaboration. Many existing links amongst African delegates were renewed and others initiated during the workshop.

Important aspects discussed during the workshop included

- What is the GTI? Provisions, operational strategies, Plan of Work, principles and potential

co-funders.

- Strategy, workplan and networks.
- Genetic resources and benefit sharing.
- Taxonomic needs assessments: what do we know?
- African GTI projects—possible topics and how to proceed.
- Responsibilities of countries eager to participate in the GTI.

Several important decisions were made during the workshop and this led to the compilation of the *Kirstenbosch Declaration*. The following is an extract from this document:

The participants at the African Regional meeting held at Kirsten-



The Global Taxonomy Initiative (GTI) Africa Regional Workshop was held at the Kirstenbosch National Botanical Garden, Cape Town, South Africa, and was attended by 43 delegates representing 32 countries.

bosch National Botanical Garden, Cape Town, South Africa, 27 February to 1 March 2001, (representing twenty-three African and nine other countries) recommend that

- The COP assures core funding exists for a GTI Programme Officer at the CBD Secretariat.
- Parties designate GTI National Focal Points and participate in the development of regional networks as rapidly as possible, in accordance with COP decision V/9.
- Parties establish and strengthen national and regional centres of excellence in taxonomy as rapidly as possible, in accordance with COP decision IV/1/D.
- Parties support and expand the taxonomic needs assessment initiated as part of this workshop.
- Parties support and expand current national and regional taxonomic capacity building initiatives.
- Parties support existing African national and regional networks that promote the implementation of the GTI, for example, SABONET, AETFAT, BOZONET, and WAFRINET, SAFRINET and EAFRINET of BioNET-INTERNATIONAL.
- Parties promote and support South-South and North-South partnerships where these contribute to GTI objectives for Africa.
- The CBD Secretariat disseminates GTI information in appropriate media and languages, bearing in mind that many countries lack adequate access to the World Wide Web.
- Parties and donors facilitate and provide funds for GTI activities, as acknowledged by COP decision IV/1/D.
- The Executive Secretary of the CBD and the GEF together provide clear instructions on the relationship between GEF and GTI, including ways and means of simplifying the funding of GTI activities.

A final report summarising the discussions and decisions from the GTI Africa Regional workshop is currently being compiled and will be distributed to all interested parties. 📄

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“What is lacking and needed now is a concerted effort, comparable to the Human Genome Project (HGP), to complete a global biodiversity survey—pole to pole, whales to bacteria, and in a reasonably short period of time.”

(E.O. Wilson in *Science* 289, 29 September 2000)

Plant Genetic Resource Centre

During a recent visit to SABONET-Zambia (10–13 December 2000) SABONET representatives travelled to the headquarters of the SADC Plant Genetic Resource Centre (SPGRC) at the Chalimbana Research Station, approximately 25 km east of Lusaka. The SPGRC was set up to promote and coordinate the regional network that manages plant genetic resources in the SADC region. The 86 ha SPGRC complex houses Administrative and Financial Sections, a Technical Section, the Genebank for long and short-term seed storage, and facilities for seed drying, packaging and handling. A herbarium is also planned. Land has been set aside for regeneration and multiplication of germplasm.

The SPGRC was established in 1988, and a board consisting of members from each participating country governs it. The SPGRC is an autonomous regional organisation under the aegis of the Southern African Centre for Co-operation in Agricultural Research and Training (SACCAR), the Sector Coordinating Unit for Agricultural Research and Training in SADC. As a SADC initiative, the SPGRC board comprises members from the following participating SADC countries: Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

The goal of the SPGRC is to promote and coordinate a regional network of plant genetic resources. In the long run these activities will contribute to raising the standard of living and welfare of people in the SADC region. The activities of the network are the collection, conservation, documentation, evalua-

tion and utilisation of regional plant germplasm.

Technical Procedures

Representative seed samples of populations of indigenous and introduced economically important food plant species are collected throughout the SADC region. The seed is cleaned and any broken or foreign seeds are removed from the sample before the drying process. Samples are maintained as active collections at National Plant Genetic Resource Centres, base collections at the SPGRC and a safety base collection outside the region. Collections are conserved by storing the genebank samples at low temperatures of about -20°C. Duplicate samples are kept under permanent frost outside the region as a backup against unforeseen circumstances. Herbarium specimens are made of the parent material of the seed collection for future identification and comparison of different genetic

lines, but more specifically for locality and usage information. Field genebanks are also established to conserve collections by planting clones of economically important food crops in small plots.

In situ conservation promotes the preservation of genetic resources of wild crops and wild relatives of successful domestic crops that are of importance in agricultural food production. This is achieved through improved management of these resources in protected areas and on farmers' fields. On-farm conservation aims to contribute to plant genetic resource conservation while improving the livelihood of smallholder farmers.

Action Plan

Certain major functions have been identified within the SPGRC to meet its objectives:

- Hold, maintain and manage the long-term Base Collection of the SADC Member States.



Mr Brian Chirwa (SPGRC Senior Programmes Officer) in front of the SPGRC Institutional Complex at Chalimbana Research Station, Zambia.
(Photo: Stefan Siebert)

- Arrange and provide for the collection of germplasm to be safely duplicated in a Safety-Base Collection.
- Develop, maintain and manage the regional central accession and inventory databases for *ex situ* and *in situ* indigenous plant genetic resources of the region.
- Coordinate the inventorying, collection, characterisation, evaluation, rejuvenation and multiplication of indigenous plant genetic resources of the SADC countries.
- Coordinate the introduction, evaluation and documentation of introduced exotic plant genetic resource materials in the SADC countries.
- Maintain and manage a medium and long-term storage of exotic plant genetic resource materials as deemed of common interest to SADC Member States.
- Keep records in a regional central database of introduced exotic material for SADC countries.
- Issue catalogues of plant genetic resource material available at the SPGRC.
- Publish a SADC Plant Genetic Resources Newsletter with particular attention to the role of plant genetic resource management in the solving of relevant problems in plant breeding and in seed and crop production.

Outputs

The SPGRC aims to train a team of highly skilled regional specialists in plant genetic resource management, to develop national plant ge-



Mr Trevor Arnold (SABONET IT), Mr Mnyenyembe (SPGRC Senior Programmes Officer), and Dr Patrick Phiri (University of Zambia) discuss the databasing of results obtained from the SPGRC's field genebank at Chalimbana Research Station. (Photo: Stefan Siebert)

netic resource management programmes, and to prevent loss of plant genetic resources of the region through collection and conservation efforts. The SPGRC has contributed significantly to capacity building in plant genetic resources in the SADC region through long-term (MSc) and short hands-on courses. This capacity will enable National Plant Genetic Resource Centres (NPGRCs) to multiply and regenerate the desired quantity of seed for storage in genebanks and use in the improvement of crops. Samples of these collections will be available for small plot multiplication to record their agronomic and morphological characters. Plants in each plot are characterised and the

samples evaluated. All relevant information is documented in the SPGRC Documentation and Information System (SDIS) that has been installed at all NPGRCs to enhance the use and exchange of information. 📄

—Stefan Siebert

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Access to Genetic Resources and Benefit Sharing

The Convention on Biological Diversity (CBD), which entered into force on 29 December 1993, is an international treaty and an institutional framework for the continual development of legal, policy and scientific initiatives on biological diversity.

The scope is global and covers all the components of biological diversity, from ecosystems and habitats, species and communities to genomes and genes. The Convention deals with *in situ* and *ex situ* conservation of biological diversity, sustainable use of biodiversity and benefit sharing.

Up to December 2000, 179 governments and the European Union have ratified the Convention. To help these parties to fulfil their obligations to conserve biodiversity and use components in a sustainable way, the CBD sets out responsibilities for

- Monitoring and identification of biodiversity.
- Environmental impact assessments.
- National strategies, plans or programmes to conserve and use the components of biological diversity.
- Integrating biodiversity policy into relevant sectoral or cross-sectoral programmes and policies.

The obligations introduced by the CBD, in terms of access and benefit sharing are the following:

- States have sovereign rights over biological resources and consequent authority of national governments to determine access to genetic resources.
- Such access is subject to Parties' prior informed consent on mutually agreed terms that promote fair and equitable sharing of benefits.

The CBD tries to strike a balance between the authority of the state to regulate access to genetic resources on the one hand, and its obligation to facilitate access to genetic resources for environmentally sound reasons and not to impose restrictions that run counter to the CBD, on the other.

Preserved Specimens

Genetic resources may be considered to refer to any materials of plant, animal, fungal, microbial or other origin containing functional units of heredity of actual or potential value. This can be both living and preserved materials such as herbarium specimens.

National legislation is free to determine the precise scope of regulated genetic resources. However, herbarium specimens should be managed as genetic resources for the following reasons:

- Some access laws and draft laws appear to cover preserved specimens such as herbarium specimens, for example, the Andean Pact and the Philippines Executive Order.
- What constitutes a 'functional unit of heredity' is a matter of interpretation and may change as science and technologies develop.
- The CBD definition of genetic resources covers 'potential' as well as 'actual' value. Many preserved specimens do contain functional units of heredity so access to genetic resources applies.
- From a practical curatorial point of view, it is likely to be simpler to transfer all preserved specimens in the same manner as other specimens.

Implications for Curators

Preserved plant specimens may be acquired from other institutions—receipt of specimens from *ex situ* conditions (for example, from other collections) does not involve access to genetic resources. This reduces the curatorial burden to get prior informed consent from the country of origin for each transaction, but assurance should be obtained from the provider that the material was both acquired and supplied legally. The terms of acquisition should also be clarified.

When plant material is collected for the preparation of specimens for use in herbaria, such collected specimens contain 'functional units of heredity' and therefore an *in situ* collection involves access to genetic resources.

Loan specimens are likely to be sent out under cover of documents containing terms and conditions that require the recipient not to damage or destroy specimens, whereas gifts are mostly accompanied by a letter. When herbarium specimens are sent or received on loan or as gifts, a clause explicitly requiring the recipient not to commercialise the specimens plus any other requirements should be added to the relevant documentation.

Benefit Sharing

Laws and agreements in several countries mean that obligations to share benefits often extend to derivatives of genetic resources—progeny or chemical extracts.

Article 8(j) encourages equitable sharing of benefits arising from the utilisation of knowledge, innovations, and practices of indigenous and local communities embodying

traditional lifestyles that are relevant to the conservation and sustainable use of biological diversity. The CBD seeks to encourage traditional use of biodiversity and recognises the value of knowledge and

information associated with genetic resources. However, if prior informed consent should be obtained from indigenous and local communities, landowners, and farmers, sharing benefits could be relevant

when collecting and publishing ethnobotanical information that does not involve access to actual genetic material.

The following regions, states, and provinces already regulate access to genetic resources to ensure benefit sharing:

- Andean Pact (Bolivia, Colombia, Ecuador, Peru and Venezuela)
- Australia (States of Western Australia and Queensland)
- Brazil (States of Acre and Amapá)
- Cameroon
- Costa Rica
- Republic of Korea
- Malaysia (State of Sarawak)
- Mexico
- Philippines

Elements for mutually agreed terms for effective participation and co-operation in scientific research and development and benefit sharing could include the following:

- Access to *ex situ* facilities of genetic resources and databases.
- Access to taxonomic, ecological, horticultural and other information and data.
- Co-authorship of publications.
- Collaboration in education and training.
- Collaboration in scientific research and development programmes.
- Fee per sample collected or otherwise acquired.
- Joint ownership of patents and other relevant forms of IPR.
- Joint ventures.
- Licence fee in case of commercialisation.
- Participation in product development.
- Providing means for a fund at the local, national, regional, or multilateral level.
- Regular reporting on the state of relevant scientific research and development on genetic resources.
- Transfer of knowledge and technology, in particular relating to use of genetic resources including biotechnology, or relevant to conservation and sustainable utilisation of biological diversity.

Summary of Provisions in the CBD

Genetic resources, local and indigenous communities, and benefit-sharing

Art. 8 (j)	Promote the wider application of the knowledge, innovations and practices of indigenous and local communities with their approval and involvement and encourage the equitable sharing of the benefits arising from the utilisation of the knowledge, innovation.
Art. 15.1	Sovereign rights of States over their natural resources; the authority of national governments to determine access to genetic resources.
Art. 15.2	Endeavour to create conditions to facilitate access to genetic resources for environmentally sound uses by other Contracting Parties and not to impose restrictions that run counter to the objectives of the CBD.
Art. 15.3	Articles 15, 16 and 19 only apply to genetic resources acquired "in accordance with this Convention", i.e. not to those obtained prior to its entry into force or from non-parties.
Art. 15.4	Access, where granted, to be on mutually agreed terms and subject to the provisions of Article 15.
Art. 15.5	Access to genetic resources to be subject to prior informed consent of the Contracting Party providing such resources, unless otherwise determined by that Party.
Art. 15.6	Endeavour to develop and carry out scientific research based on genetic resources provided by other Contracting Parties with the full participation of, and where possible in, such Contracting Parties.
Art. 15.7	Take legislative, administrative, or policy measures, as appropriate,...with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilisation of genetic resources with the Contracting Party providing such resources. Such sharing to be upon mutually agreed terms.
Art. 16.3	Access to and transfer of technology using genetic resources to countries providing the genetic resources.
Art. 19.1	Effective participation by providers of genetic resources in biotechnological research on the genetic resources they provide.
Art. 19.2	Priority access on a fair and equitable basis by countries (especially developing countries) providing genetic resources to the results and benefits arising from biotechnologies based on them. Such access to be on mutually agreed terms.

Working within the CBD

If collections are to be of value to science and conservation, institutions must be able to maintain and improve them. Institutions may find themselves disadvantaged if they do not implement access and benefit sharing.

Many institutions collect genetic resources worldwide and supply them to research institutions, government departments, and universities, as well as seed, pharmaceutical, and biotechnology companies, for the development of new medicines, crops and other products.

The CBD provides institutions with the legal framework within which they can obtain, exchange, and supply specimens; it also gives them the opportunity to raise their profile and attract funding. A clear and transparent policy can help institutions maintain their reputation.

Drawing up a Policy

Policies should honour the letter and spirit of the CBD, the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), and laws relating to access and benefit sharing, including those relating to traditional knowledge.

Prior informed consent needs to be obtained when genetic resources are acquired; a full explanation of how the genetic resources will be acquired and used should be pro-

vided. When genetic resources are acquired from *in situ* conditions, prior informed consent from the government of the country of origin and any other relevant stakeholders must be obtained and should be in accordance to applicable law and best practice. However, if genetic resources are acquired from *ex situ* collections, such as botanic gardens or genebanks, prior informed consent should be obtained from the body governing the *ex situ* collection and any additional consents required by that body. Available documentation on acquired *ex situ* sources, such as collections, commercial sources, or individuals must be evaluated and, where necessary, appropriate steps should be taken to ensure that the genetic resources were acquired in accordance with applicable law and best practice.

Genetic resources and their derivatives should be used and supplied according to terms and conditions that are consistent with those under which they were acquired. A transparent policy must be prepared on the commercialisation (including plant sales) of genetic resources and their derivatives acquired before or since the CBD entered into force.

Written agreements need to be used when genetic resources and derivatives are acquired and supplied. The terms and conditions under which the genetic resources may be acquired, used, and supplied, and the resulting shared benefits should be stated clearly.

Benefits that arise from the use of genetic resources and their derivatives should be shared fairly and equitably with the country of origin and other stakeholders. The benefits include non-monetary, and, in the case of commercialisation, also monetary benefits. Benefits arising from the use of genetic resources acquired prior to the entry into force of the CBD should be shared, as far as possible, in the same manner as for those acquired thereafter.

Curation of genetic resources is of utmost importance. This enables institutions to comply with the principles of a policy. All records and mechanisms used for the following should be maintained:

- Terms and conditions under which genetic resources are acquired.
- Use in the participating institution and benefits arising from that use.
- Supply to third parties, including the terms and conditions of supply.

Institutions must prepare, adopt and communicate an institutional policy that sets out how they will implement the above mentioned principles. 🏠

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SABONET's Students

To build southern Africa's botanical capacity, SABONET provides support to postgraduate students who show commitment to SABONET goals and objectives. Thirteen individuals hold SABONET scholarships for the 2001 academic year. 📖

SABONET Students

Individuals who hold SABONET scholarships for 2001

Ms Georgina Neto	Angola	M.Sc.	Lisbon, Portugal
Mr Mbaki Muzila	Botswana	B.Sc. Hons.	University of the Free State
Ms Bokang Theko	Lesotho	B.Sc. Hons.	University of the Free State
Ms Lerato Kose	Lesotho	M.Sc.	University of Stellenbosch
Ms Elizabeth Mwafongo	Malawi	M.Sc.	University of Cape Town
Mr Mphamba Kumwenda	Malawi	B.Sc. Hons.	University of Stellenbosch
Mr Dickson Kamundi	Malawi	B.Sc. Hons.	University of the Witwatersrand
Ms Esmeralda Claassen	Namibia	B.Tech. (Part-time)	Cape Town Technikon
Ms Patricia Craven	Namibia	M.Sc. (Part-time)	University of Stellenbosch
Mr Solomon Nkoana	South Africa	M.Sc.	University of Pretoria
Ms Angela Gono	Zambia	B.Sc. Hons.	University of the Witwatersrand
Mr Kunda Changwe	Zambia	M.Sc.	University of the Witwatersrand
Mr Phelex Manyanga	Zimbabwe	M.Sc.	University of Cape Town



SAAB Conference Abstracts

The 27th Annual Conference of the South African Association of Botanists was held at the Rand Afrikaans University, Johannesburg, in January 2001. We publish the abstracts of the keynote address and presentations by SABONET-affiliated researchers here.

Plenary Speaker

At the SAAB conference we were fortunate enough to be addressed by one of the world leaders in ethnobotany and phytochemistry, Prof. Dr Ermias Dagne from Ethiopia. Not only was his presentation inspiring to young African botanists, it also emphasized Africa's rich botanical treasures.

Prof. Dr Dagne is an organic chemist by training. His main research is in the area of natural products chemistry, in particular the isolation and characterisation of bioactive compounds. He is also interested in

chemotaxonomy—this approach has proved fruitful in the study of the chemistry and taxonomy of *Aloe* and related genera.

In the course of his research work, he has taken part in several plant collection expeditions and has deposited numerous plant voucher specimens at national herbaria. He grows several hundred species of plants in an arboretum developed at the Faculty of Science. He has also established a medicinal plant garden, where over 100 indigenous aromatic and medicinal plant species are grown.

Prof. Dr Dagne heads an active research group comprising several research associates, MSc, and PhD students. He has published over 75 scientific papers in peer-reviewed journals. He has participated in many prestigious local and international conferences, and has delivered several plenary lectures.

Ethnobotany and Phytochemistry of Some Unique Plants of Ethiopia

Ermias Dagne

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Our research group has for several years been engaged in the study of the chemistry and biology of higher plants and fungi of Ethiopia. Ethiopia's diverse topography provides habitats for approximately 7 000 higher plant species with a rich endemic flora possessing diverse therapeutic and other uses. Medicinal plants are readily available at local markets, where they are customarily sold side by side with spices and other food items. At the top of the list of unique plants of Ethiopia one finds the leaves of the stimulant khat *Catha edulis* (Celastraceae), berries of the molluscicide endod *Phytolacca dodecandra* (Phytolaccaceae), flowers of the anthelmintic kosso *Hagenia abyssinica* (Rosaceae), stem bark of the anti-tumour bissana *Croton macrostachys* (Euphorbiaceae), roots of the analgesic dingetegna *Taverniera abyssinica* (Leguminosae), rhizomes of the fumigant kebericho *Echinops kebericho* (Compositae), aerial parts of the cough medicine tossign *Thymus schimperi* (Labiatae), leaves of the anti-dysenteric attuch *Verbena officinalis* (Verbenaceae), the seeds of the staple food teff *Eragrostis tef*, the rhizomes of the fermented food kocho *Ensete ventricosum*, and the leaves of the beverage additive gesho *Rhamnus prinoides*. One should also add to this list other widely known plants and plant products that originate from Ethiopia such as coffee *Coffea arabica*, frankincense *Boswellia* sp., and myrrh *Commiphora myrrha*.

Documenting Diversity: Computerisation at Natal Herbarium

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Natal Herbarium is a regional herbarium focusing on KwaZulu-Natal and the eastern region of southern Africa, including Mozambique, Swaziland, Malawi, and Zambia. This region has extreme vegetation types, ranging from coastal to alpine vegetation. In addition, many species are endemic to the region. The duo W.T. Gerrard (?–ca 1866) and M.J. Mcken (1823–72) started collecting in KwaZulu-Natal areas in the 1860s. Their specimens represent the beginnings of the Natal Herbarium. The herbarium specimens at Natal Herbarium are being computerized to ensure that the herbarium's rich botanical knowledge is not lost. Computerisation started in the early 1990s when *A field guide to wild flowers of KwaZulu-Natal and the eastern region* by Elsa Pooley was being compiled. This project was initially funded by the Natal Flora Publications Trust. Subsequently, Natal Herbarium was used as a guinea pig for the SABONET-sponsored computerisation of herbaria within southern Africa. The first SABONET officer was appointed at Natal Herbarium in 1998 and the second in 1999. A large part of their time is spent computerising herbarium collections. Computerisation of specimens already in the herbarium (existing specimens) and those

that are continuously being collected (new specimens) will enable easy access of this knowledge especially to researchers and conservationists.

Systematics of *Merxmuellera*: the Key to Resolving the Relationships of the Danthonieae (Poaceae)

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The tribe Danthonieae, soon to become a formal subfamily, has been the subject of many investigations at both the molecular and morphological level. DNA sequence data sets have contributed towards our understanding of both the generic compositions of the tribe, and relationships within and between the tribe and other grasses. All molecular studies have indicated that the African genus *Merxmuellera* is highly polyphyletic, and that this genus needs urgent taxonomic attention. Morphological and leaf anatomical data also corroborate these molecular results. *Merxmuellera* comprises 17 African and two Madagascan species. This study expands on existing molecular (rbcL, rpoC2 and ITS) and morphological data sets and attempts to resolve the relationships of the African species of the genus. Results of analyses of the data sets, both separately and in combination, indicate that *M. papposa* and *M. rangei* are more closely related to Centropodia and the subfamily Chloridoideae than to the Danthonieae. The remaining species of the genus are either part of a paraphyletic grade at the base of the Danthonieae, or included in a clade previously termed the "Rytidosperma clade", which includes Australasian genera such as *Rytidosperma*, *Austrodanthonia*, *Thonandia* and *Joycea*, as well as the African *Karroochloa*, *Schismus*, and *Tribolium*.

Floristics of the Dunbar Serpentine Site and Phytogeographic Affinities of Serpentine Endemics

Kunda Changwe*¹ & K. Balkwill¹

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The Dunbar serpentine outcrop has a flora comprising 254 taxa (species and below) in 172 genera and 63 families. Dunbar has more species than other studied serpentine sites in the Barberton Greenstone Belt (BGB). The genus *Senecio* is the most speciose genus in the BGB. The level of species endemism at Dunbar is 2.0%. Most of the serpentine endemics in the BGB show phytogeographic affinities with the Sudano-Zambezian Region. Six modified-Whittaker plots, three on serpentine and three on non-serpentine soils, were sampled. Sorenson's index was 0.312, indicating low similarity in species between serpentine and non-serpentine sites (beta diversity) at Dunbar, as at other sites in the BGB. Alpha diversity (using the Shannon-Wiener index) for the serpentine was 2.631 ± 0.130 and for the non-serpentine was 2.886 ± 0.130 . However, Student's t-test showed no significant difference in alpha diversity

between the two habitats. There was also no significant difference in species richness between serpentine and non-serpentine sites. Total species showed negative correlations with total nickel, altitude and serpentine outcrop size (area) for six sites in the BGB. Endemic taxa showed no correlation with environmental variables.

Developing a Greater Understanding of the Flora of the Nyika Plateau, Malawi/Zambia

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Collaborative plant collecting expeditions under-collected areas of southern Africa are one of SABONET's project activities. The first such regional collaborative expedition was to the Nyika Plateau (Malawi/Zambia)—the largest montane complex in south-central Africa—in March–April 2000. This paper presents a brief history of botanical exploration of the Nyika, and discusses the progress that has been made through the SABONET Project towards developing an inventory of the Nyika flora, as well as highlighting aspects relating to the plant diversity,

endemism and phytogeography of the area. Assessments made of the endemic and near-endemic plants using the new IUCN Red Data Categories (1994) are also presented. Opportunities for further collaborative research on the Nyika are proposed.

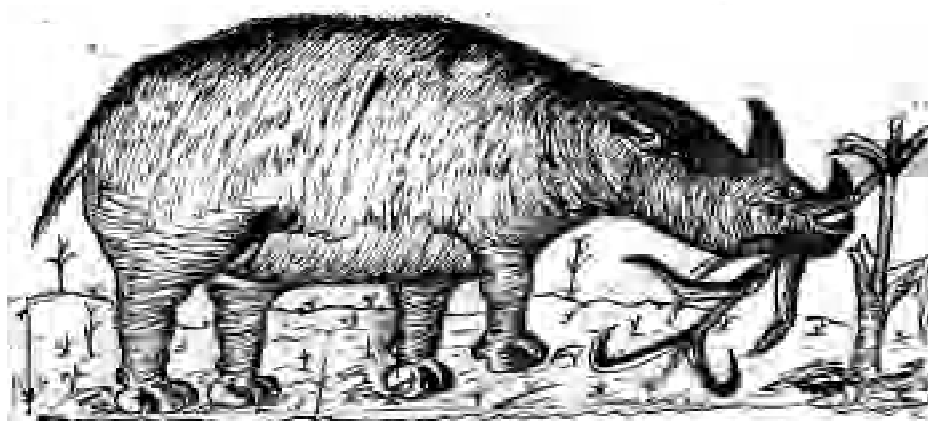
Threatened Plant Realities in the Southern African Region: Some New Preliminary Findings

Janice Golding

Red Data List Regional Coordinator

SABONET, c/o National Botanical Institute, Private Bag X101, Pretoria, 0001, South Africa

National plant Red Data Lists are nearing completion for ten southern African countries under the auspices of SABONET. The countries are Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. Red List species numbers in South Africa remain the highest recorded for the region. However, figures have substantially increased more than three-fold in Malawi, Mozambique, Zambia and Zimbabwe, bringing the proportion of each country's threatened flora to similar levels as those of South Africa, namely *ca* 10.5%. This is partially a result of modified Red List methodologies and the impacts of human-induced threatening processes driving species losses. Revised comparative statistics are presented, as well as new, tentative data of endemic species for the countries north of the Kunene, Okavango and Limpopo river systems. Top-priority supra-specific taxa that require urgent conservation efforts are identified, and the scope to secure their protection is discussed. 🌿



HERBIVORE DUNG CONSISTS MAINLY OF MIXTURE OF UNDIGESTED PLANT REMAINS. THESE FACTORS MAKE IT POSSIBLE FOR BETTER GROWTH OF RARE SAPROPHYTIC FUNGII SPECIES e.g. STROPHARIA SPP. NOTE THAT FAUNA PLAY VITAL ROLE IN BOTANY DIVERSITY. THEREFORE CONSERVATION IS VERY IMPORTANT NOT TO LOOSE SUCH RARE SPECIES WHICH CAN GROW ONLY IN DUNGS OF SUCH THREATENED ANIMALS e.g. Rhinos.

by E.S. Kathumba
NHBG, MALAWI

Edwin Kathumba, NHBG, Malawi

Where Have All the Flowers Gone?

Chikanda, the tubers of terrestrial orchids, are a traditional food of the Bemba and related tribes of northeastern Zambia, northern Malawi, and Katanga Province of the DRC. The pounded tubers are mixed with pounded groundnuts and cooked to make a cake, known as "African polony". With the decline of the economies of Zambia and neighbouring countries, people can no longer afford to buy chicken or eggs, and have increasingly turned to cheaper foods. The impoverished rural communities have responded by supplying the ever growing urban demand for traditional foods and medicines. The demand for *chikanda* has now expanded to include Zambia's Southern Province and towns such as Livingstone, where previously it was not used. Moreover, the urban Zambian middle class has developed a taste for African polony.

Recently we toured the source areas of *chikanda* in northeastern Zambia. We also questioned the traders at Lusaka's Soweto Market about the various types of *chikanda* tubers and their source areas. We found, to our surprise, that much of the *chikanda* is now coming from the southern highlands of Tanzania, since the preferred species are now scarce in the traditional source areas.

One of us (GMK) obtained a grant from SARIPS (Southern African Institute for Policy Studies, based in Harare) to carry out the preliminary survey. A network of collaborators has been established to col-

lect information from local sources, and during 2001 we hope to expand the work of surveying the harvesting and trade of *chikanda*. Links have also been established with counterparts working on the problem in Tanzania and Malawi.

Identifying the *chikanda* species is fraught with problems. The taxonomic identification of orchids is based on the flowers, and little attention has been given to the tubers and other vegetative parts. The harvesters, on the other hand, identify the plants by the dried above-ground material that remains at the end of the growing season before the fires sweep through the dambos or, in a few species, by the new sprouts at the start of the growing season. Thus, showing photographs of the flowers to the harvesters mostly drew blanks, and we realised that we would need to know much more about the biology and morphology of the plants if we were going to succeed in identifying the tubers.

What we found during our survey was that while species formerly harvested are now depleted, other species are increasing used, and we suspect that about 30 species are now being harvested. For these we have about 80 vernacular names in several languages.

The most important habitats of *chikanda* are the seeps of the higher altitudes, and the areas of annual rainfall in excess of 1 200mm. Within the dambo grasslands they are mostly found in peat bogs, which are permanently wet, but

never subjected to more than superficial flooding. In such areas a dozen or more species of orchids may be flowering simultaneously. Yet the harvesters can recognise the *chikanda* species. Tubers of inferior quality, known as *mbwelenge* to the traders and marketeers, are difficult to distinguish from the better quality, and inexperienced traders may be tricked into buying the inferior tubers at a price which they cannot recover.

The best quality *chikanda* undoubtedly belongs to the genera *Disa* and *Satyrion*, but we know that species of *Brachycorythis* and *Habenaria* are also used. Originally harvesting was confined to the wetlands, but increasingly people are using the upland species as well, although these are never as abundant and more difficult to find.

By the end of 2001 we hope to be able to list the *chikanda* species with reasonable certainty, and to put forward plans for their conservation and possible domestication. 🌱

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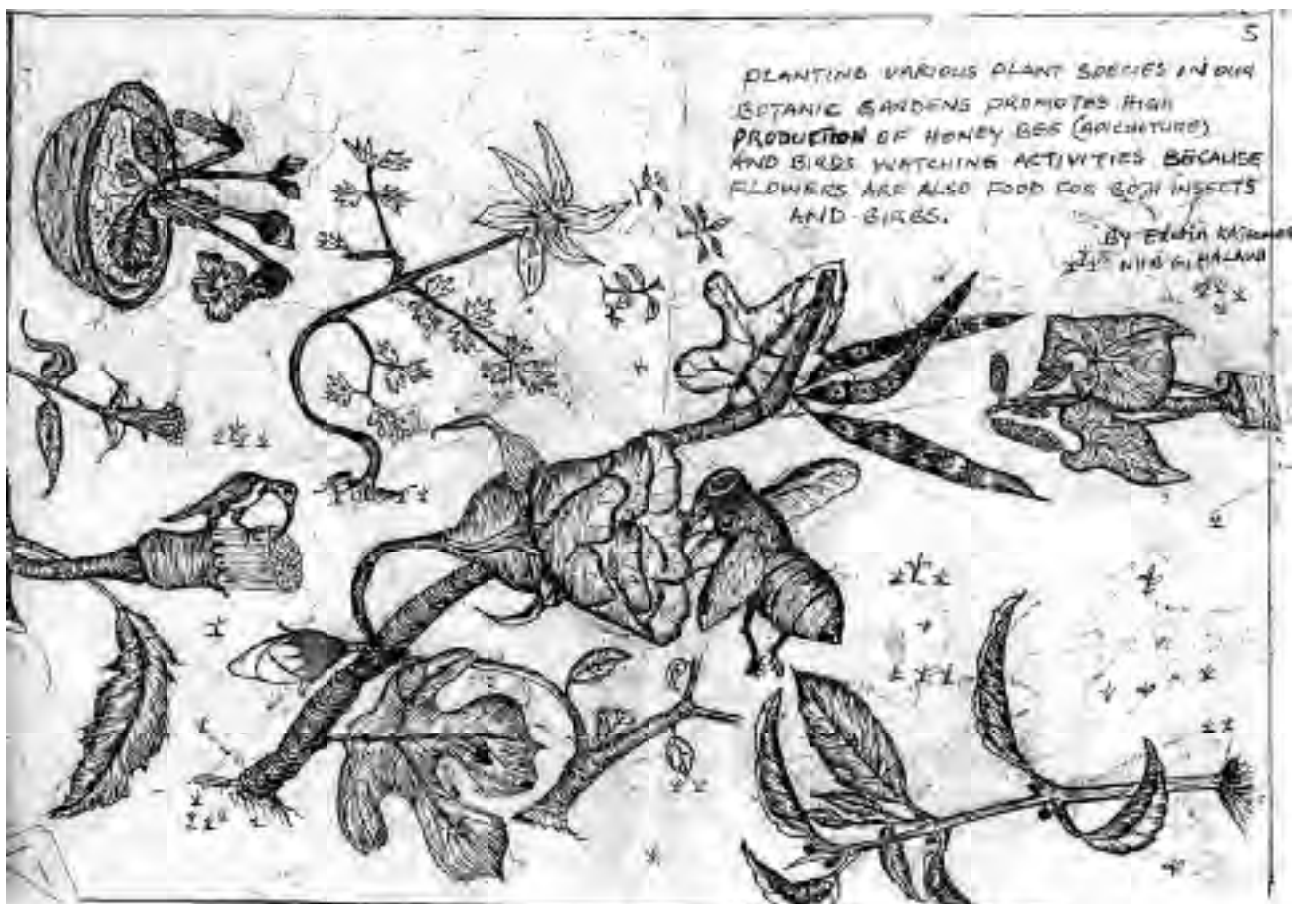
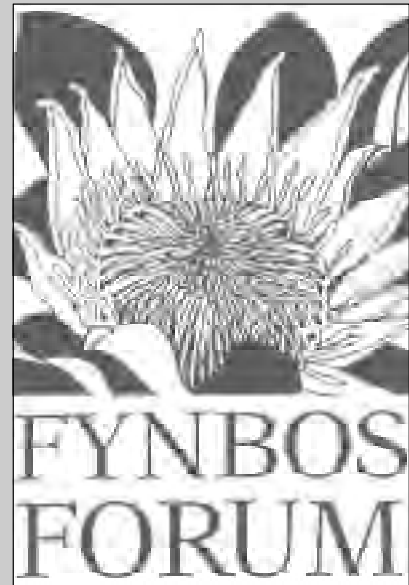
The Fynbos Forum will be holding its annual conference at Calitzdorp Spa, Calitzdorp, Southern Cape from 1–3 August 2001. The theme of the conference will be "Celebrating our Successes".

Two field trips are planned:

- Animal management in dry fynbos: Gamkaberg Nature Reserve
- Gouritz Megareserve: "Flora and cooperative conservation"

For further information, please contact

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The National Herbarium of Namibia (WIND)

History

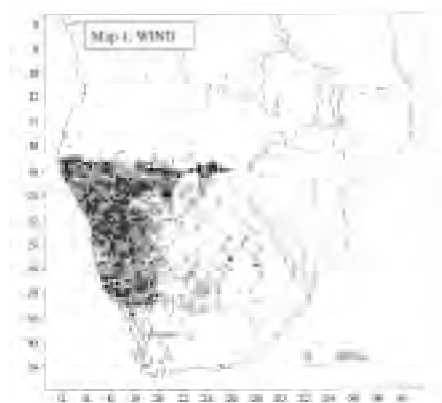
Tuesday 28 April 1953 was the day that saw Namibia move from botanical outer darkness to the enlightenment that (as we all know) only a National Herbarium can bring. It was on that red-letter day that discussions between Prof. Dr H. Walter of the Hohenheim University, Germany, and Dr J.S. Watt, director of Agriculture of South West Africa, resulted in the establishment of what was to become WIND, the National Herbarium of Namibia.

A donation of over 1 000 sheets from Prof. Dr Walter provided an embryonic collection, which the late Willi Giess worked on once a week, travelling to Windhoek from his farm 50 km away. His pioneering work made an enormous con-

tribution to Namibian botany; his benevolent spirit still pervades WIND as we work with his immaculate specimens, labels and notes.

In 1957 Giess was permanently employed as the curator of the herbarium, until he retired in 1975 and Mike Müller became the new curator. At this time WIND occupied the meanest of its many past premises: the "camel stables"—a lowly locality close to where our new building now stands. It was during this time that *Prodromus einer Flora von Südwestafrika*, our bible and shelter in the taxonomic storm, was published.

The period from 1985 to 1987 were unsettled ones for WIND. Mike Müller spent 1985 and 1986 at Stellenbosch University, working on his Ph.D. In addition to bringing back his doctorate to WIND, he also brought Gillian Maggs, who succeeded him as curator. WIND was closed from 1986 to 1988 and the staff was spread far and wide in temporary premises in Windhoek. The entire collection was packed up and sent to the hell of the old State Hospital cellars, where over-zealous watering of the nearby ever-to-be-cursed lawns caused seep-



Distribution map showing the number of computerised specimens in WIND. Grey cells represent grid squares with 1-24 computerised specimens; black cells represent grid squares with 25+ computerised specimens. WIND staff members have already computerised more than 88% of their collection: 65 017 specimens out of total holdings of 73 278 specimens.



Hard at work identifying specimens at WIND. From left to right: Sonja Loots, Sabine Austaller, and Esmeralda Klaassen.

age through the walls, damaging part of the collection, including almost all the Zygophyllaceae.

1989 saw the staff and the collection settled into somewhat rough-and-ready prefab buildings sited where the National Botanical Research Institute (NBRI) is now. This was a vast improvement, but it did not last long. In 1993 the staff was scattered again and the collection

packed up once more, this time to make way for the construction activities that gave us the NBRI as it is today. For those of us who have only worked in the wonderful new building, the whole history of the herbarium seems like one's worst nightmares come true. The fact that most of the collection survived is a tribute to the dedication and persistence of both the professional and the technical staff involved.

WIND Today

Today WIND houses over 73 000 sheets. The present collection consists largely of Namibian material. Space constraints and the fact that large tracts of Namibia are very undercollected restrict us to the flora of Namibia and just beyond our borders. Collectors such as Giess, Volk, Bleissner, De Winter and Müller are all well represented. What we perhaps lack is a greater representation of the older historic Namibian material collected by the likes of Dinter, Range, Story, Fleck, Rautanen and Schinz. Any donations/exchanges would be gratefully received.

At present the WIND staff consists of three researchers, two technicians, and two technical assistants. As WIND is the only functional herbarium in the country, fieldwork and the demand for plant



The National Botanical Research Institute building in Windhoek (right). WIND is one of four sections at the NBRI—the others are the National Plant Genetic Resources Centre, the Ecology section and the National Botanic Garden. The NBRI falls under the Ministry of Agriculture, Water and Rural Development. (Photo: C.K. Willis)

identifications keeps us pretty busy, with precious little time left for research. Curation of the collection takes up a large proportion of staff time as well. Nevertheless we feel that we have made excellent progress since we moved into the new building in May 1996. SABONET has played an important role, assisting us with training and equipment, and we would certainly not be where we are today without the help of this programme.

Staff Members

Patricia Craven, Senior Researcher

- Plant inventory of Namibia
- Namibian phytogeography
- Petalidium

Coleen Mannheimer, Curator

- Mesembryanthemaceae

Silke Bartsch, Researcher

- Crassulaceae
- Malvaceae

Esmeralda Klaassen, Senior Technician

- Database Manager
- Asteraceae
- Aquatic plants

Marianne Uiras, Technician

- Fabaceae

Belinda Polster, Senior Technical Assistant

Helvi Haufiku, Technical Assistant

—Coleen Mannheimer
WIND, Namibia

E-mail: manfam@iafrica.com.na

See also the obituary of Willi Giess on page 44 of this issue.



A close-up of the National Herbarium section. (Photo: C.K. Willis)



The section of the NBRI building that houses the National Herbarium. (Photo: C.K. Willis)

Obituary

Heinrich Johann Wilhelm Giess (1910–2000)



Willi Giess at work in the SWA Herbarium. (Photo: SA Panorama, September 1969)

Heinrich Johann Wilhelm (or as he was known to most, Willi) Giess was born on 21 February 1910 in Frankfurt-am-Main, Germany, the elder of two brothers. His parents were Wilhelm and Lilly Giess; his father was a banker in Frankfurt.

When he was six years old, Willi started his ten years of schooling at the Adlerflucht Realschule. A year after completing school, the family immigrated to South West Africa (present Namibia), where the 16-year-old Willi started doing volunteer work on farms. He later studied at the Agricultural College of Neudamm from 1928 to 1929.

In 1931, Willi Giess fell ill with Malta Fever and was sent to Germany to recuperate; he stayed until 1933. During this time, he studied at the Karakul sheep breeding division of the Animal Breeding Institute of the University of Halle under Prof. Dr R. Fröhlich. He completed his training as Technical Advisor for

Karakul Breeding and was able to apply this new skill as manager on a local karakul farm upon his return to South West Africa.

After four successful years, he was able to purchase his own farm, Dornfontein Süd. This development work was interrupted when he was interned for six years during World War II. He used the time to study botany, a long-time interest, at the “Andalusia Camp University” under Prof. Otto Volk, who was also at the camp. After his release, he started working at the University of Stellenbosch, collecting plant specimens within the Cape Floristic Region, until he was allowed to return to his own farm in December 1946.

Encouraged by Prof. Dr Heinrich Walter of the Hohenheim Technical University, Giess started the State Herbarium on a part-time basis in 1953, parallel to his farming activities. After four years, the herbarium was taken over by the Division of Agriculture of the South West African Administration, and Willi Giess was employed as full-time curator. In this capacity, he taught plant sciences at Neudamm Agricultural College, including the presentation of practicals. He held the post of curator until his retirement in 1975, but continued to work at the herbarium until February 1980. He again assisted with curation from April 1985 to January 1986, in order to give his successor, Dr M.A.N. Müller, the opportunity to complete his Ph.D. degree.

Willi Giess made an enormous contribution to the collection of herbarium material in the S.W.A. Herbarium (now the National Herbarium of Namibia). Of the approximately 73 000 specimens in the

present-day collection, 18 570 specimens were collected by him personally, often with other scientists like Volk, Van Vuuren, De Winter, and in collaboration with Merxmüller. These specimens were all collected in triplicate, often even in quadruplicate. Anybody who has ever collected seriously for a herbarium will appreciate the amount of work involved in such a collection. Even today, the Giess specimens, with their carefully typed or hand-written data labels, are often the best and neatest to be found in the collection of the National Herbarium of Namibia.

In honour of Prof. Dr Kurt Dinter, Willi Giess published the first issue of the journal *Dinteria* on the 100th anniversary of Dinter’s birthday in November 1968 under the auspices of the South West Africa Scientific Society. This journal was under his editorship until 1991 (Number 21); after retiring, he continued to give



Willi Giess with the third edition of his *Preliminary Vegetation Map of Namibia*, 19 March 2000. (Photo: Namibia Scientific Society)

support in an advisory capacity. One edition of *Dinteria* achieved the rather unusual feat of being reprinted three times: because of the great public demand for *Dinteria* 4, featuring the *Preliminary Vegetation Map of South West Africa* (also compiled by Willi Giess), this volume was reprinted in 1978 and 1998.

Forty-five publications originated from his pen. He also contributed to numerous other publications. The crowning glory of his work was the publication of the *Bibliography of South West African Botany* in 1989. Amongst his publications are several new taxon descriptions:

- *Zygophyllum schreiberianum* Merxm. & Giess
- *Sphaeranthus wattii* Giess ex Merxm.
- *Aloe argenticauda* Merxm. & Giess
- *Aloe dewinteri* Giess
- *Aloe namibensis* Giess
- *Aristida dewinteri* Giess
- *Tridentea marientalensis* (Nel) L.C. Leach subsp. *albipilosa* (Giess) L.C. Leach

He became well known across the borders of the country for his

wealth of knowledge. He received the following acknowledgements and honours:

- On 1 July 1964 he became Correspondent of the Naturhistorisches Museum of Vienna.
- In 1968 the Royal Academy of Sciences in Stockholm honoured him with the great Lineé Medal in silver.
- During the 200th anniversary year of the birth of Alexander von Humboldt, he was given a commemorative volume on the life of Humboldt by the consul of the Federal Republic of Germany in honour of his achievements in the field of botany.
- During the stay of Prof. Dr Merxmüller, Director of the Institute for Systematic Botany and the Botanic Garden of Munich, to collect material for his *Prodrum einer Flora von Südwestafrika*, Giess assisted him to such an extent, that the Bavarian Academy of Science honoured him with the Bene Merenti Medal.
- In 1980 he received the Academy Medal in gold from the South African Academy of Sciences and Arts for his extraordinary achievements, and he was made

a corresponding member of the Academy.

- In 1998 the Windhoek Municipality honoured Willi Giess by naming a street in Klein Windhoek after him.

Various scientists also honoured him by naming plants after him:

- *Isoetes giessii* Launert
- *Aizoon giessii* Friedrich
- *Salsola giessii* Botsch.
- *Crassula ausensis* Hutchinson subsp. *giessii* (Friedrich) Toelken
- *Indigofera giessii* A. Schreib.
- *Zygophyllum giessii* (Merxm.) A. Schreib.
- *Euphorbia giessii* L.C. Leach
- *Commiphora giessii* J.J.A. van der Walt
- *Heliotropium giessii* Friedr. Holz.
- *Jamesbrittenia giessii* Hilliard
- *Petalidium giessii* P.G. Mey.
- *Eriocephalus giessii* M.A.N. Müller (ined.)
- *Senecio giessii* Merxm.
- *Lachenalia giessii* W.F. Barker
- *Stipagrostis giessii* Kers

As a farmer in Andalusia, he learnt that knowledge of grasses and herbs enables one to evaluate the condition of pastures and in this way maintain and improve them.

Through his work at the State Herbarium, he opened the way for many farmers to get to know and evaluate their own grazing. What a service he provided to the country and its people!

Willi Giess died on 28 September 2000 in Swakopmund. It is with sadness that we have to say farewell to our friend, colleague and mentor. 🙏

—Herta Kolberg
& Ben Strohbach
National Botanical Research
Institute
Private Bag 13184
Windhoek



A sketch by Willi Giess of *Harpagophytum procumbens*, drawn during internship in Andalusia in 1942.

This obituary was reprinted with permission from the authors. It was first published in Dinteria No. 26:147–150, November 2000.

The *Paper Chase*

The object of this column is to keep an eye open for literature which SABONET users may find useful. This will mostly be new publications, but may well include older information in answer to questions such as "what's the best key to ...". It is neither possible nor desirable that the flow of such information should be one-way, from Pretoria outwards, so would readers please feel free to submit notes and useful information to the address at the end of this column.

The citation of an item here does not imply any guarantee of its contents or even its existence; very often the compiler has not seen the documents referred to.

New Books Received in the Mary Gunn Library

■ A checklist of the algal flora of the east African Great Lakes. C. Cocquyt. National Botanic Garden of Belgium, Meise, 1993.

■ A taxonomic revision of *Lachnaea* L. (Thymelaeaceae). J.B.P. Beyers. Ph.D. thesis, University of Pretoria, 2000.

■ African Plants: biodiversity, taxonomy and uses: proceedings of the 1997 AETFAT Congress, Harare, Zimbabwe. Royal Botanic Gardens, Kew, 1999.

■ America's vanishing flora. M. Yurlina (ed). Center for Plant Conservation, St. Louis, 2000.

■ Biogeography: an ecological and evolutionary approach. 6th edition. C.B. Cox. Blackwell Science, London, 1998.

■ Describing species: practical taxonomic procedure for biologists. J.E. Winston. Columbia University Press, New York, 1999.

■ Field guide to the Proteas of the West Coast. T. Rebelo. National Botanical Institute, Cape Town, 1999.

■ Flora Neotropica Monograph 79. Bactris (Palmae). A. Henderson. New York Botanical Garden, New York, 2000.

■ Flora Neotropica Monograph 81. Buddlejaceae. E. Norman. New York Botanical Garden, New York, 2000.

■ Flora Neotropica Monograph 82. Opiliaceae. P. Hiepko. New York Botanical Garden, New York, 2000.

■ Guidelines for management of orthodox seeds. G.D. Wieland. Center for Plant Conservation, St. Louis, 1995.

■ Invasive species in the Pacific: A technical review and draft regional strategy. G. Sherley (ed). South Pacific Regional Environment Program, Samoa, 2000.

■ Pharmacognosy: phytochemistry: medicinal plants. J. Bruneton. Intercept, Hampshire, 1999.

■ The new Oxford book of food plants. J.C. Vaughan. Oxford University Press, Oxford, 1997.

■ The world of *Haworthias*. Volume 2. Breuer, I. 2000. Breuer, Niederzier.

■ Toxic plants: dangerous to humans and animals. J. Bruneton. Intercept, Hampshire, 1999.

■ Transkei forest survey. K.H. Cooper. Wildlife Society of southern Africa, Durban, 1992.

■ Wetland plants of Oregon and Washington. Guard, B.J. 1995. Lone Pine Publishing, Canada.

■ Wildflowers of Saudi Arabia. Collenette, S. 1999. National Commission for Wildlife Conservation and Development, Kingdom of Saudi Arabia.

■ Wildflowers of southern Western Australia. M.G. Corrick & B.A. Fuhrer. The Five Mile Press, Australia, 1996.

Recently Published Papers

Aloe 37(2&3) (2000)

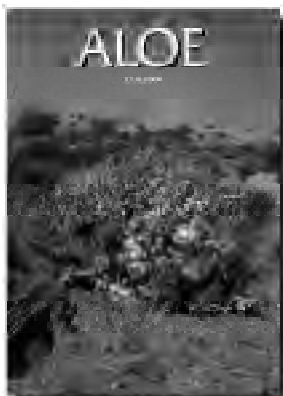
■ Rare succulents of the Western and Eastern Cape Provinces of South Africa. G. Marx. Pages 24-25.

■ The succulent flora of pebble fields, with emphasis on the Little Karoo and the Knersvlakte. R. Frandsen. Pages 26-27.

■ A unique desert garden in the winter rainfall area of South Africa. I. Oliver. Pages 28-30.

■ Exploring Africa for succulent plants. L.E. Newton. Page 31.

■ The succulents of Northern Bushmanland: their distribution and implications for conservation. P. Desmet. Pages 32-35.



■ The aloes of Malawi. S. Lane. Pages 36-37.

■ Frithia - up close and personal. P.M. Burgoyne, S. Krynauw & G.F. Smith. Pages 38-42.

■ Time to take stock. D. Court. Pages 43-45.

■ Systematic and evolutionary significance of morphology in the Mesembryanthemaceae: interactive database and illustrated atlas for identification. P. Chesselet, G.F. Smith & A.E. Van Wyk. Pages 46-51.

■ Very 'vary-ability' in *Haworthia*. M.B. Bayer. Pages 52-53.

■ Zambian Euphorbias. G. Williamson. Pages 54-55.

■ *Crassula perfoliata* and its garden hybrids. G.D. Rowley. Pages 56-57.

■ The Agavaceae. B. Kemble. Pages 58-59.

Aloe 37(4) (2000)

■ New combinations in the genus *Orbea*. P.V. Bruyns. Pages 72-76.

■ South African and Namibian succulents on the edge: the cliff face home. E. van Jaarsveld & A.E. van Wyk. Pages 77-79.

■ Notes on important plant localities in the Richtersveld National Park. G. Williamson. Pages 80-82.

■ Notes on the vegetation and climate of the Richtersveld National Park. G. Williamson. Pages 83-87.

■ The habit and peculiar inflorescence of *Ottosonderia monticola* (Sond.) L.Bolus, Mesembryanthemaceae. P. Chesselet, G.F. Smith & A.E. Van Wyk. Pages 88-90.

■ *Aloe chabaudii* var. *mlanjeana*. S. Lane. Page 91.

Annals of the Missouri Botanical Garden 87(4) (2000)

■ A phylogenetic analysis of *Dicoma* Cass. and related genera (Asteraceae: Cichorioideae: Mustisieae) based on morphological and anatomic characters. S. Ortiz. Pages 459-481.

■ Adaptive radiation of pollination mechanisms in *Ixia* (Iridaceae: Crocoideae). P. Goldblatt, P. Bernhardt and J.C. Manning. Pages 564-577.

Austral Ecology 25 (2000)

■ Conservation biology of the succulent shrub, *Euphorbia barnardii*, a serpentine endemic of the Northern Province, South Africa. L. Knowles & E.T.F. Witkowski. Pages 241-252.

■ Climbing asparagus, *Asparagus scandens* Thunb.: a South African in your forest patch. S.M. Timmins & V. Reid. Pages 533-538.

Climbing asparagus, endemic to the Western Cape of South Africa, is invading the understorey of lowland broad-leaved and secondary forest remnants in the northern half of New Zealand and in the last decade has been recognised as a weed of conservation concern.

BioScience 50(7) (2000)

■ Conserving wildlife in Africa: integrated conservation and development projects and beyond. W.D. Newmark & J.L. Hough. Pages 585-592.

BioScience 50(10) (2000)

■ Quantifying Biodiversity: Experience with parataxonomists and digital photography in Papua New Guinea and Guyana. Y. Basset, V. Novotny, S.E. Miller & R. Pyle. Pages 899-908.

Biodiversity and Conservation 9 (2000)

■ Postmodernism and African conservation science. C.A.M. Attwell & F.P.D. Cotterill. Pages 559-577.

■ The use of specimen-label databases for conservation purposes. J.M. Soberon, J.B. Llorente & L. Onate. Pages 1441-1466.

■ A simple system for monitoring biodiversity in protected areas of a developing country. F. Danielsen, D.S. Balete, M.K. Poulsen, M. Enghoff, C.M. Nozawa & A.E. Jensen. Pages 1671-1705.

Biological Conservation 96 (2000)

■ A simple population viability analysis of the Critically Endangered *Euphorbia clivicola* R.A. Dyer under four management scenarios. M.F. Pfab & E.T.F. Witkowski. Pages 263-270.

■ Effectiveness of using vascular plants to select reserves for bryophytes and lichens. E.J. Pharo, A.J. Beattie, R.L. Pressey. Pages 371-378.





Bulletin of the Natural History Museum of London (Botany) 30(2) (November 2000)

- The genus *Polystichum* (Dryopteridaceae) in Africa. J.P. Roux. Pages 33-79.

Cimbebasia 9 (2000)

- The flora of the Brandberg, Namibia. P. Craven & D. Craven. Pages 49-67.

Conservation Biology 14(3) (August 2000)

- Creating academically and practically trained graduate students. D.W. Inouye & J.M. Dietz. Pages 858-875.



Conservation Biology 14(5) (October 2000)

- Should we use pesticides to conserve rare plants? P. Lesica & H.E. Atthowe. Pages 1549-1550.
- Exclusion of natural enemies as a tool in managing rare plant species. S.M. Louda & R.L. Bevell. Pages 1551-1552.

Conservation Biology 14(6) (December 2000)

- Roads, development and conservation in the Congo Basin. D. Wilkie, E. Shaw, F. Rotberg, G. Morelli & P. Auzel. Pages 1614-1622.
- Conservation in a region of political instability: Bwindi Impenetrable Forest, Uganda. A. Hamilton, A. Cunningham, D. Byarugaba & F. Kayanja. Pages 1722-1725.
- Indicator taxa, rapid biodiversity assessment, and nestedness in an endangered ecosystem. J.T. Kerr, A. Sugar & L. Packer. Pages 1726-1734.
- Application of conservation biology research to management. D.J. Flaspohler, B.R. Bub & B.A. Kaplin. Pages 1898-1902.

Curtis's Botanical Magazine 18(1) (2001)

- *Lachenalia elegans* var. *flava*. G. Duncan. Pages 18-22.
- *Crassula tetragona* subsp. *acutifolia*. G.F. Smith, E.M.A. Steyn & A.E. van Wyk. Pages 23-27.

Ecological Applications 10(6) (2000)

- Using a dynamic landscape model for planning the management of alien plant invasions. S.I. Higgins, D.M. Richardson & R.M. Cowling. Pages 1833-1848.
- Remote sensing of vegetation, plant species richness and regional biodiversity hotspots. W. Gould. Pages 1861-1870.

Economic Botany 54(3) (2000)

- Differential utilization and ethnobotany of trees in Kitulanghalo Forest Reserve and surrounding communal lands, Eastern Tanzania. E.J. Luoga, E.T.F. Witkowski & K. Balkwill. Pages 328-343.



Environmental Management 26 (2000)

- Developing multiple species conservation reserves and habitat conservation plans. D.C. Pearson. Pages S1.

Journal of the Torrey Botanical Society 127(4) (2000)

- ITS sequence evidence for the disjunct distribution between Virginia and Missouri of the narrow endemic *Helenium virginicum* (Asteraceae). M.C. Simurda & J.S. Knox. Pages 316-323.

Journal of Zoology 251 (2000)

- Climate, vegetation and predictable gradients in mammal species richness in southern Africa. P. Andrews & E.M. O'Brien. Pages 205-231.

Nature 405(6785) (2000)

- Following Africa's lead in setting priorities. G.A.B. da Fonseca, A. Balmford, C. Bibby, L. Boitani et al. Pages 393-394.

Nordic Journal of Botany 20(3) (2000)

- Revision of the genus *Genlisea* (Lentibulariaceae) in Africa and Madagascar with notes on ecology and phytogeography. E. Fischer, S. Porembski & W. Barthlott. Pages 291-318.
- A new species of *Dicoma* (Asteraceae-Mutisieae) from Swaziland. S. Ortiz & I. Pulgar. Pages 347-351.

Oikos 91 (2000)

- Plant diversity increases resistance to invasion in the absence of covarying extrinsic factors. S. Naeem, J.M.H. Knops, D. Tilman, K.M. Howe, T. Kennedy & S. Gale. Pages 97-108.

Oryx 34(2) (2000)

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—Christopher Willis, Stefan Siebert
& Marthina Mössmer



Regional News Update



News from Malawi

Honours Course at the University of Cape Town

The Honours course started on 24 January 2000 with taught courses such as Biostatistics, Philosophy of Science, computer packages, and photography courses. In addition to these general courses, each student had to choose two modules. My first module dealt with plant ecology, which consisted of essays, mini-seminars and discussion groups. In the second module, we dealt with plant systematics, which also consisted of assignments, discussion groups, mini-seminars, and essays. Both modules were concluded with a seminar. At the same time I had to do two projects.

In the first project I looked at the population ecology of *Aloe plicatilis* (Liliaceae) in relation to baboon and fire damage. It was conducted un-

der the supervision of Prof. J. Midgely. It was important to do this study because this species suffers extensive damage from veld fires and baboons. The simulation showed that this species would go extinct if these two factors are not checked.

My second project was a morphological study of *Schizaea pectinata* (Schizaeaceae). This study was aimed at finding out whether plants from winter and summer rainfall areas consisted of two distinct groups, as apparent morphological differences are visible between the groups. This project was carried out under the supervision of Dr J.P. Roux of Compton Herbarium. The results showed that the species could not be further split into the two groups; it should rather be grouped as one species that probably shows continuous variation in response to environmental conditions.

At the end of the year, we wrote three exam papers and wrapped up the course with a final seminar on

the 24 November 2000, which was presented in front of external examiners and the whole department. I enjoyed this particular seminar, as I knew it was the last one, and I had gained confidence from previous departmental seminars.

It was a tough year with a lot of work, making sleep a luxury. Nevertheless, I gained a lot from my postgraduate studies. I am very grateful to all lecturers and staff of the Botany Department at UCT for their support, my supervisors Dr Koos Roux and Prof. Jeremy Midgely, and Prof. Peter Linder for his criticism and help during the entire course. Many thanks to the SABONET project supporting me financially. 📧

—Elizabeth Mwafongo

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News from Mozambique

We are pleased to announce that the NETCAB programme has awarded a fellowship to Samira Izidine, SABONET Research Officer, to attend a two-month course at the Centro de Botânica, Instituto de Investigação Científica Tropical, Lisbon, Portugal. 📧



Samira Izidine, at the Grass Identification Course held in Zimbabwe in 1999. (Photo: M. Mössmer)



News from Namibia

Time has flown since the last edition of *SABONET News*. We have not been into the field yet this year, as rains have been very late, but we will be doing some short trips targeting specific taxa soon. In May we will be doing comprehensive collecting in several quarter-degree squares of the Omaheke region in the central eastern region of Namibia. This area is severely undercollected, a situation that we hope to reverse this year.

SABONET activities over the last few months have been concentrated around data cleaning and batch-checking. With our trainee back from UCT, the workload has been spread and good progress is being made. We spent quite a while rearranging the monocot hall after receiving ten new herbarium cabinets. Although we ordered from the same firm as last time, the cabinets were slightly higher than the previous batch! The difference was small, but sufficient to prevent us from putting them under a counter that was supposed to go over them. Lesson Learned: specify if you want something with certain dimensions. Obviously a herbarium cabinet is not a herbarium cabinet....

It was our pleasure to host the SABONET Steering Committee Meeting and the Mid-Term Review in Windhoek during February. This gave us an opportunity to share our pleasure in the progress we have made with the help of what we consider to be the most successful collaborative project ever for WIND. We hope that all our visitors enjoyed their time in Namibia.

A few very busy months lie ahead, with the Red Data List and several other publications nearing completion, and the Poaceae Checklist getting started. We will be hard at work on these in the hope that SABONET will receive recognition for its achievements and find funding for another phase. 🍷

—Coleen Mannheimer



Rare Plants Rediscovered in the Northern Cape



Erich van Wyk and Paul Smith (foreground) enjoying lunch.

A recent trip was made to the Northern Cape by Erich van Wyk (NBI, Pretoria), Paul Smith (Royal Botanic Gardens, Kew) and Priscilla Burgoyne (NBI, Pretoria) as part of the NBI/Millennium Seed Bank (MSB) collaboration. The primary objective of the expedition was to collect seeds for the MSB,

mainly from the family Mesembryanthemaceae. The secondary goal was to collect any good seeding species endemic to the region. Mesembs were targeted, as the area is well known for the numerous endemic mesembs, which were in full seed at that time of the year. As an expert on these taxa, Priscilla was co-opted for this purpose. The field trip was a great success in terms of numbers of species and seed collected, despite the unusually hot weather (45°C in the shade on the shadeless Knersvlakte!). Seed of 72 species was collected, including 46 mesembs.

Of greater botanical interest was the rediscovery of two long-lost plant populations. The first was *Dioscorea elephantipes* (L'Hérit.) Engl. (Dioscoreaceae), a spectacular shrubby climber up to 1.5 m high with a huge caudex reaching a diameter of up to 0.75 m, mainly exposed above ground. Its reticulated skin resembles that of an elephant, hence the specific name. Owing to its unusual appearance, this attractive plant has been overcollected and is now threat-

ened in the wild. It has not been seen near Komaggas since 1954. Using rough directions provided by Johan Hurter (NBI, Lowveld National Botanical Garden), our team spent a whole day searching for this elusive species, with no success. Finally, on the point of giving up, we asked a local shepherd, who



Dioscorea plants found near Komaggas showing the unusual caudex surface texture.

immediately recognised the plant we were looking for, and directed us to a very healthy population. On a steep mountainside, we found approximately 1 000 plants concentrated on a scree slope. Although there was no seed, we were able to thoroughly document the location, size and ecology of the population.

Our second interesting find was *Cylindrophyllum hallii* L. Bolus (Mesembryanthemaceae) on a plateau near Loeriesfontein. This plant is of great interest as its sister species all come from the Little Karoo. In notes accompanying the original description, the collector H. Hall stated that only about 200 plants were seen. We followed telephoned instructions from Johan du Toit, an amateur succulent enthusiast from George, who directed us to the site

of this single known population. The population has not been documented or collected since 1960, and we were very excited to find it. Only about 219 (see box) living plants were left, with clear signs of predation. We saw many dead plants, possibly victims of drought or utilisation by animals. Fortunately, seed was in ample supply and we were able to collect capsules from some 85 plants very safely, taking less than 5% of what was available. This is exactly the kind of species that needs ex situ conservation—down to only one known wild population, severely threatened at the site and a candidate for Red Data listing. The germination protocol for this species will now be worked out to ensure that if the remaining population should die out, seed and the methodology would

be available for its reintroduction.

Other exciting finds include flowering specimens of *Haemanthus unifolius* found together with the *Dioscorea* near Komaggas. *Ruschia sandbergensis* was found at the Messelpad Pass, southwest of Springbok. Seed collections were made of two Namaqualand endemics, namely *Psilocaulon foliosum* and *Enarganthe octonaria*. The latter is a monotypic genus found only in the Richtersveld and northern Namaqualand. 🌱

Paul Smith would like to thank the British Airways Assisting Conservation Programme, which enabled him to participate in this expedition.

—Paul Smith, Priscilla Burgoyne & Erich van Wyk

Cylindrophyllum hallii

Total number of plants: ca 374

Juveniles: 31 (8%)

Adults: 188 (50%)

Dead: 155 (42%)

Percentage of plants flowering in the last flowering season: 2–3%

Predated or damaged plants: 98%

Threats to habitat: Soil erosion due to natural weathering. Possible trampling if area is overgrazed.

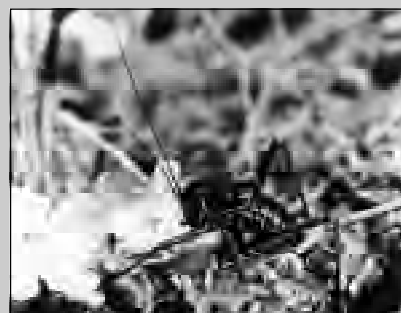
Threats to taxon: Eaten and trampled by animals—not clear which species, but possibilities include *Aethomys namaquensis* (Namaqualand Rock Mouse), which has a colony close by; armoured ground crickets (subfamily Heterodinae of the Tettigonidae), the remains of which were found in the area; and *Papio ursinus* (baboons), the dung of which was found in the area. Drought.

Associated vegetation: *Stomatium* sp., *Ruschia centrocapsula*, *Barleria* sp., *Hereroa hesperantha*, and *Zygophyllum retrofractum*.

Red Data List Status : Not included in the List.



Cylindrophyllum hallii in habitat.



Armoured ground cricket. (From: Skaife, *African Insect Life*)



News from Swaziland

For the first time our small library has been arranged according to a recognised system—we have adopted the Dewey Decimal Classification System. From our small collection of less than 300 books, we hope the library will grow in the coming years. We are eagerly awaiting the delivery of a

book consignment kindly donated by SABONET, which includes a selection of NBI publications and all volumes of *Bothalia* published to date.

The three computers at SDNH are now linked, thanks to the tireless efforts of Trevor Arnold and Franco Alberts. This means the SABONET specimen database and plant use database designed for SECOSUD can be accessed from three workstations. Contrary to prior speculations, the network has not

given us any serious problems. Computerisation of herbarium specimens is progressing well.

Compared to twelve months ago, the Swaziland National Herbarium has become a better working place. Staffing levels have improved drastically with the official return of the National Herbarium Curator, Gideon Dlamini, and recruitment of a SABONET Research Officer, Christopher Tshabalala. Our limited working space has been filled to capacity. 📖

—Titus S. Dlamini



News from Zambia

Computerisation

The University of Zambia Herbarium has already encoded 3 100 specimens, mainly species of the Poaceae and a few species of genera in the Fabaceae. Currently the data is not well refined, as most of the specimen records did not have grid references, enhanced by the problem of the Computer Acces-

sion String (CAS) numbers. However, maps will be bought to help sort out the grid reference problem for a number of localities.

Dr Phiri has suggested that I embark on a mopping-up operation involving insertion of the CAS numbers on specimen sheets and inclusion of grid references in the Database. The other members of staff will forge ahead to encode new specimens taking into account the inclusion of grid references and CAS numbers as advised by Trevor Arnold.

Backing up was also a problem despite having the equipment for making backups. However, my participation in the recent Database Management course held in Pretoria and the subsequent visit to Lusaka made by Trevor Arnold, Stefan Siebert, and Franco Alberts in December 2000, has led to the end of the backup blues. We are now able to make daily backups using the Iomega Zip Drive. We have enough diskettes for each day of work. Besides the Zip Drive backup, we also make weekly backups on Colorado tapes.

We were experiencing serious hardware problems at the University Herbarium (UZL) until Trevor and Franco came to our rescue and sorted them out. These problems ranged from wrong hardware settings by suppliers to lack of appropriate hardware support software, compounded by incompatible main boards. We managed to get replacements of main boards accompanied with appropriate support software from our Lusaka service provider. Everything was repaired, including the installation of a network for a set of three computers using Windows 98. Our computers are now running perfectly. In order to consolidate the smooth operation of our computer network, I have also attended a short course in Networking.

The speed of computerisation has been hampered by lack of person-



The University of Zambia fourth-year Botany class at the Chirundu Fossil Monument Site, Siavonga District, Zambezi Valley, Zambia. Standing third from left is Angela Gono, SABONET Herbarium Research Officer—on hand to guide the students on the field trip. (Photo: Patrick Phiri)

nel specifically recruited for data capturing. The current staff members doing the work have other primary duties. From our experience, if one person can do 1 000 specimens per month, two will be encoding 6% of our current specimens (30 000) in the herbarium in a month. This means that by February 2002 all the current existing specimens will have been computerised, and with three computers the process may be enhanced. However, the Kitwe and Mfuwe herbarium specimens are still un-

touched. The two institutions do not have computers for data encoding.

Despite the problems that have not yet been solved, we are trying to utilise every minute and all our new knowledge to have our data computerised and preserved. With computerisation as a priority, the first thing we will embark on is data sharing. We want to collaborate with the other herbaria that have not yet started computerisation. We have managed to install the data-

base on the Mount Makulu Herbarium computer. This will be followed by arrangements to provide in-service training to new approaches devised and introduced by the Database Management Section of the National Botanical Institute, Pretoria. 📖

—Annaniah Sakala
Herbarium Technical & IT Officer
UZL Herbarium
Lusaka, Zambia

Conservation Education Centre

The Luangwa Integrated Rural Development Project (LIRDP) has initiated a number of multipurpose developments in the Lupande Game Management Area (GMA). This NORAD-supported project has assisted in the building or renovation of schools, clinics, and roads, as well as developing agricultural and forestry programmes. The objective has been to instil a sense of pride and ownership of wildlife in the local people. LIRDP has recently been transformed into a Unit of the Zambia Wildlife Authority called South Luangwa Area Management Unit (SLAMU) to provide continuity in the realisation of sustainable conservation of wildlife. SLAMU has constructed a complex of offices for the Project's Headquarters at Chinzombo Wildlife Research Station, where the Mfuwe Herbarium is located. NORAD should be commended for having devel-

oped a tangible wildlife conservation management nucleus—a model that can later be extended to other National Parks in the country.

A British couple, Stephen and Anna Tolan, have introduced another dimension to conservation programmes in the Luangwa Valley. Under the Chipembele Education Trust, the Tolans have built the Conservation Education Centre in the Luapande GMA located at their new residence (13°12'S, 37°42'E) midway between Chinzombo and Nyamaluma Wildlife Training Institute. The Centre will provide such facilities as a library, illustrations embracing topography, geology and wildlife of the Luangwa Valley. They plan to run education programmes for the children to be drawn from the Lupande GMA. Their aim is to sensitize the children, at their tender ages, to appreciate the importance of wildlife to Zambia's tourism industry. Such

goals are similar to programmes that are run by the Education Unit of the National Botanical Institute at Kirstenbosch Botanical Garden, where children from various residential areas of Cape Town are brought to the Gardens using the Institute's fleet of buses. If children of the Lupande GMA grow up to love their wildlife, it is hoped that future generations will constitute formidable vanguards that will effectively reinforce the conservation of wildlife in the South



Ashed Makukula, Patrick Phiri, and the JICA volunteer examine a living specimen of the epiphytic fern *Platyserium elephantotis* on the bank of Chowo River, Luangwa Valley, Zambia. (Photo: Stephen Tolan)

Luangwa National Park. The Tolans have initiated a noble programme for the people of the Luangwa Valley. The Centre needs local and international support to help develop the infrastructure (electricity, water, educational aids, equipment, books, etc.) essential in the management of Environmental Education.

Rare Epiphytic Fern

Towards the end of December 2000 I spent a few days working in the



The conservation school recently built by Stephen and Anna Tolan. (Photo: Patrick Phiri)



Lathe-turned wooden containers made from the heartwood of *Colophospermum mopane*, a dominant species of the modern vegetation at the Chirundu Fossil Monument Site. (Photo: Patrick Phiri)

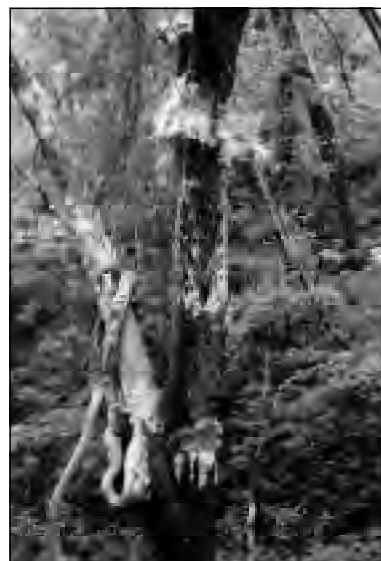
Mfuwe Herbarium at Chinzombo Wildlife Research Station, outside the South Luangwa National Park. At about the same time, Stephen Tolan of the Chipembele Education Trust told Ashed Makukula that he had seen a rare plant along the Chowo River, a tributary of the Luangwa River. When Ashed asked me to help identify the plant, I suggested that we go and see the plant *in situ*.

On 27 December 2000, a search team for the rare plant was arranged; it comprised Stephen Tolan, a Japanese (JICA) Volunteer Biologist attached to Chinzombo Wildlife Research Station, Ashed Makukula and myself. The JICA Officer provided the four-wheel-drive vehicle. The search for the rare plant followed the Lion Hunt-

ers' track that winds along the Chowo River. The vehicle was parked after driving through the wild terrain for about 4 km. The last stretch of about 3 km, heading towards the Chindeni Hills, was covered by walking through a mosaic of mopane, riparian and miombo woodlands. Although this area is lion-infested, the JICA Volunteer Biologist and I felt very secure in the company of the alert, experienced, and capable hands of Stephen and Ashed, both of whom carried guns for our personal protection.

It was a tiring walk. The path traversed thicket formations fringing the Chowo banks as the river meanders through the steep slopes of the Chindeni Hills. A yellow-flowered shrub, *Bauhinia tomentosa* L. appeared to be a co-dominant species in this thicket. (Incidentally, *B. tomentosa*, which is a plant of potential horticultural value, has also been recorded on the Zambian sector of the middle Zambezi Valley. It is a low altitude species; the distribution range extends to KwaZulu-Natal in South Africa, Mozambique, Zimbabwe and East Africa.)

When we had almost lost hope of ever finding the plant, Stephen breathed a sigh of relief. He announced that we had arrived at the site where he found the strange



A close-up of *Platycerium elephantotis* sharing a niche with a liane on a riparian tree, Luangwa Valley, Zambia. (Photo: Patrick Phiri)

plant—it was an epiphyte fern clothing the barks of the riparian trees along the Chowo River (13°15'18"S, 31°42'53"E). On closer examination, I could identify the plant as *Platycerium elephantotis* Schweinf., belonging to the pteridophyte family Polypodiaceae. This fern, also known to grow on rock surfaces (lithophytic), is characterized by possession of dimorphic leaves (fronds). In Zambia *P. elephantotis* has been recorded in Solwezi (North-Western Province) and Nchelenge near Lake Mweru (Luapula Province). In the Luangwa Valley the late Prof. Jan Kornas recorded the species at Chibembe, further upstream of the Luangwa. This finding is the first record in the Lupande Game Management Area near Mfuwe. Herbarium specimens were collected (Phiri 4370) and Mr. Makukula has reported that a living specimen planted at Chinzombo Research Station is doing fine. A revisit to the Chindeni Hills, which forms a remnant topographic range featuring within the floor of the central Luangwa Valley, could certainly yield more new records for the Luangwa Valley. 📌

—Dr P.S.M. Phiri
Curator
UZL Herbarium
Lusaka, Zambia



Two gymnospermous fossil tree trunks at the Chirundu Fossil Monument Site, maintained by the National Heritage and Monument Commission, Zambia. (Photo: Patrick Phiri)

Southern African Botanists' E-mail Addresses

The following list includes the e-mail addresses of staff working in some of the national/university herbaria, botany departments, botanical gardens, and biodiversity programmes of southern Africa. Thanks to all those who have sent their e-mail addresses to the editors for inclusion in this list.

PLEASE NOTE that this list gets updated every issue of our newsletter. In order to avoid frustration and possible disappointment, our readers are advised to use the most recent list available. Some of the addresses listed in previous editions of the newsletter may no longer be relevant.

SPECIAL APPEAL: Should you be aware of any changes to one or more of the addresses listed below, or would like to be added to the list, please notify Stefan Siebert, at stefan@nbipre.nbi.ac.za so that the list can be updated on a regular basis.

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NOTE: Additional South African botanists' e-mail addresses can be accessed on the internet at the following address:

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The web page entitled "Southern African Botanists' addresses" was prepared by Peter Phillipson, Rhodes University and the Selmar Schonland Herbarium, Grahamstown, with thanks to Nigel Barker and Les Powrie.

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Botanists Working on Southern African Plant Taxa

This section lists e-mail addresses of a few of the botanists living outside southern Africa that are working with southern African plant taxa. If you would like to be included in this list, please notify one of the editors together with the names of the families/taxa you are working on.

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**In the July 2001 edition
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National Herbarium, Zimbabwe

Living Collections:
Witwatersrand National Botanical
Garden, South Africa,
and Botswana National Botanical
Garden

Computer viruses

About SABONET

This publication is a product of the Southern African Botanical Diversity Network (SABONET), a programme aimed at strengthening the level of botanical expertise, expanding and improving herbarium and botanic garden collections, and fostering closer collaborative links among botanists in the southern African subcontinent.

The main objective of SABONET is to develop a strong core of professional botanists, taxonomists, horticulturists and plant diversity specialists within the ten countries of southern Africa (Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe). This core group will be competent to inventory, monitor, evaluate, and conserve the botanical diversity of the region in the face of specific development challenges, and to respond to the technical and scientific needs of the Convention on Biological Diversity.

To enhance the human resource capacity and infrastructure available in the region, SABONET offers training courses, workshops and collaborative expeditions in undercollected areas. The programme also produces a series of occasional publications, the *Southern African Botanical Diversity Network Report Series*.

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