

# *Workshop Outcomes: End-User Needs Assessment & Action Plan*

**Table 3: Workshop Outcomes: End-User Needs Assessment & Action plan, including Information and Service Requirements – Descriptions, Recommendations, And Priorities (End-User & Stakeholder Perspective), Practical Implications and Cost Assessment, and the response of the NBI**

INFORMATION / SERVICE REQUIREMENTS	CURRENT SITUATION	DESCRIPTION OF PRODUCT/SERVICE NEEDED & RECOMMENDATIONS
1. Annually updated, correct name lists	Hard copy every > 5 years; No electronic/ Internet version	<p>Up-to-date, correct name lists for the entire FSA (Flora of Southern Africa) region—and later on for the whole of Africa—should be made available in both hard copy format and electronically on the Internet. The hard copy should be updated annually, while the electronic version should be updated continually. The name lists should contain, in addition to the old and new names, the following information:</p> <ul style="list-style-type: none"> <li>• reason for name change</li> <li>• nomenclature and taxonomy</li> <li>• the date, and</li> <li>• the source of the new name.</li> </ul> <p>The list should be in the format of the so-called “Black Book” of Arnold &amp; De Wet (1993)</p>
2. Correct, up-to-date, standardised species lists	PRECIS species lists available for grid-areas. These lists are often incomplete.	<p>Correct, up-to-date, standardised species lists should be made available in both hard copy format and electronically on the Internet. Species lists should be available for grid-areas, provinces, countries, and for the entire FSA region. Both basic and “added value” species lists should be made available. Basic species lists should contain genus, species and family names; while “added value” species lists should also indicate the following:</p> <ul style="list-style-type: none"> <li>• endemic species</li> <li>• red data species</li> <li>• alien species</li> <li>• invasive species / weeds</li> <li>• conservation status</li> <li>• economical important species</li> <li>• medicinal plants</li> </ul> <p>Grid species lists should indicate under-collected areas and under-collected taxa that may be found in the grid. Information such as the collectors’ name &amp; number, locality data, flowering/fruitletting times and flower colour may also be included. An annual list of new species discovered/described during the preceding year should also be compiled and made available.</p>

**Prerequisites and Assumptions (as applicable to Requirements no.’s 1 & 2):**

- Appropriate, priority-driven research projects are in place and funded.
- Electronic networking facilities exist, including those required to access the Internet and institutional Intranets.
- Region adequately sampled, and herbarium well stocked and representative of the flora of the region.

PRACTICAL IMPLICATIONS	FINANCIAL IMPLICATIONS		THE NBI's RESPONSE
	ITEMS	PROJECTED COSTS	
<ul style="list-style-type: none"> <li>• Web access needed</li> <li>• Web page management needed</li> <li>• Editorial quality control needed</li> <li>• IT people (expertise) needed</li> <li>• Hardware/Software must be developed/bought</li> </ul>	<p>Staff (1 @ R70 000 p.a. for 5 years)</p> <p>IT Staff (1 @ R70 000 p.a. for 6 months)</p> <p>2 Computers &amp; associated hardware @ R16 000 per set</p>	<p>US \$ 35 000</p> <p>US \$ 3 500</p> <p>US \$ 3 200</p>	<p>Though the NBI already produces a name list covering the FSA region, this publication is only produced infrequently, having appeared last in 1993. To produce an annually up-dated list will require the services of at least one extra staff member to continually monitor taxonomic literature and update the name list, as well as one Information Technology staff member for web page management.</p>
<ul style="list-style-type: none"> <li>• Web access needed</li> <li>• Web page management needed</li> <li>• Editorial quality control needed</li> <li>• IT people (expertise) needed</li> <li>• Hardware/Software must be developed/bought</li> </ul>	<p>Staff (1 @ R70 000 p.a. for 5 years)</p> <p>IT Staff (1 @ R70 000 p.a. for 6 months)</p> <p>2 Computers &amp; associated hardware @ R16 000 per set</p>	<p>US \$ 35 000</p> <p>US \$ 3 500</p> <p>US \$ 3 200</p>	<p>The compilation of complete species lists for southern Africa is of the highest priority to the NBI. Indeed, one of the strategic objectives that the NBI placed for itself for the period 2001 to 2006 is to develop and compile a <i>Concise Flora</i> (an annotated checklist) for southern Africa, and to have published this book in the NBI's <i>Strelitzia</i> series by December 2003. However, to produce an "added value" species list, and to publish the <i>Concise Flora</i> on the Internet in addition to hard copy will require extra funds and possibly extra staff.</p>

- Library well stocked with appropriate book and journal titles.
- Equipment, such as microscopes, serviceable; and adequately skilled staff available.
- Trained staff appointed.
- Mechanisms exist to provide in-service training.



**Table 3: (continued).**

INFORMATION / SERVICE REQUIREMENTS	CURRENT SITUATION	DESCRIPTION OF PRODUCT/SERVICE NEEDED & RECOMMENDATIONS
<p>3. An Integrated Botanical Information System</p>	<p>Currently there is no web-based or CD-ROM system, except for the very limited PRECIS, available</p>	<p>A web-based / CD-ROM database should be developed and implemented. It should be centralised at the NBI, and include a literature database with journal details. One of the sub-products should be a practical, easy-to-use online "Quick Identification Guide", which should include the following:</p> <ul style="list-style-type: none"> <li>• digital images (photo's) to help with identification</li> <li>• scientific name and synonyms</li> <li>• distribution</li> <li>• specimen image (best &amp; type specimen)</li> <li>• some literature on the taxon</li> </ul> <p>The database should be searchable. It is recommended that the system be built up in stages—starting with a species list. It should include all the data that was included in the "Big Black Book" (Arnold &amp; De Wet 1993), <i>plus</i>:</p> <ul style="list-style-type: none"> <li>• scientific names, synonyms, common names</li> <li>• distribution data and distribution maps on various scales (local, national, regional, global)</li> <li>• local abundance</li> <li>• growth and life forms</li> <li>• conservation status (latest assessed &amp; accepted status)</li> <li>• endemism (FSA / provincial)—endemic species as well as centres of endemism</li> <li>• habitat and habitat requirements</li> <li>• phenological data (including flower colour, plant height, habit, flowering time, etc.)</li> <li>• economical importance and uses</li> <li>• interactions with fauna</li> <li>• alien plants</li> <li>• invasive plants</li> <li>• medicinal, toxic and edible plants</li> <li>• information on the genus—e.g. number of species and common attributes</li> <li>• information on the family—e.g. number of genera/species and common attributes</li> <li>• the current expert on any group of plants</li> <li>• botanical art and photo's</li> <li>• species per vegetation types (e.g. biome, veld type)</li> <li>• floristic information</li> <li>• plant descriptions</li> <li>• phylogenetic (evolutionary relationships)</li> </ul>

**Prerequisites and Assumptions (as applicable to Requirement no. 3):**

- Appropriate programming skills available.
- Equipment to scan specimens to high resolution available.
- Staff trained to select high-quality specimens to be used in electronic quick guide.
- Staff able to derive information from specimens and literature for database.

**' A quick-guide on the Web will empower the people to identify the easier stuff themselves, which will free up time for the specialists to do the specialist identifications '**

*—Comment made during the final discussion of the workshop*

PRACTICAL IMPLICATIONS	FINANCIAL IMPLICATIONS THE		NBI's RESPONSE
	ITEMS	PROJECTED COSTS	
<ul style="list-style-type: none"> <li>• Database development and integration</li> <li>• Web interface development</li> <li>• Web server infrastructure</li> <li>• Better communication between herbaria and stakeholders</li> <li>• Scanning hardware &amp; storage space</li> <li>• Consolidate available data</li> <li>• Extensive collaboration</li> <li>• Reformatting current data</li> <li>• Increase staff / outsource</li> </ul>	IT Staff (2 @ R70 000 p.a. for 2 years)	US \$ 28 000	<p>The development and implementation of an Integrated Botanical Information System is probably the most obvious and dire, and at the same time, the most cost intensive need expressed at this workshop. The development of any such a comprehensive information system (and not just an electronic one) will require an enormous amount of input:</p> <ul style="list-style-type: none"> <li>• Firstly: the information required for such an information system to be at all relevant must be generated somewhere, and intensive taxonomic research is the only way in which to do this. Coupled with the fact that funding for taxonomic research is on the decline, is the practical problem that there are too few trained taxonomists to do this research in any reasonable length of time. There is, after all, still a lot yet unknown about the immense southern African flora.</li> <li>• Secondly: the infrastructure to implement and run such an extensive information system does not yet exist. This does not only include the technical aspects (such as computer hardware and software), but also the technical and administrative staff. For such an intensive exercise as running such an information system, not only data-capturers, but also database developers and a web page designer and manager are needed.</li> </ul>
	Scientific staff (5 @ R70 000 p.a. for 5 years)	US \$ 175 000	
	Five annual/ biennial meetings @ R30 000 per meeting	US \$ 15 000	
	7 computers & associated hardware @ R16 000 per set	US \$ 11 200	

- Digital images are available for all taxa
- All taxa adequately sampled (across region and all seasons; and specimens in the herbarium).
- Appropriate, priority driven research projects are in place and funded
- Library well-stocked with appropriate book and journal titles
- Data capturing staff available.



**Table 3: (continued).**

INFORMATION / SERVICE REQUIREMENTS	CURRENT SITUATION	DESCRIPTION OF PRODUCT/SERVICE NEEDED & RECOMMENDATIONS
4. Expansion of herbarium collections.	Current activity	<p>More collection trips should be organised and coordinated by the NBI to expand the collections of all herbaria, so that a more complete representation of the southern African flora can be obtained. These collection trips should focus on under-collected areas and under-collected taxa. Not only herbaria, but also conservation agencies and amateur botanist societies should be involved in this national collecting effort / botanical survey. Amateur botanists and conservators should be trained in correct and ethical plant collecting practices. Collecting permits should be made more easily available to researchers and approved amateurs. Joint collection trips should be organised, and an annual meeting on the progress of the collection effort should be held (perhaps during an already established annual event such as the SAAB meeting each January).</p>
5. Plant identification	Current activity but limited and dispersed	<p>The service should be maintained, but the turnover time should be improved, and the backlog should be addressed. A differential (tiered) sliding scale for handling fee should be implemented, with more IDs: lower fee per ID, and a discretionary free ID if the client contribute significantly in terms of new species / under collected areas. It is recommended that strict specimen requirements should be done away with, but a similar sliding scale in terms of fee structure can also be implemented for specimen quality, so that less is paid for a better specimen, and more for a poor specimen (which would require more effort and time to identify). It is recommended that retired expertise still be used for plant identification purposes. Uncertainty about identity should be indicated. Smaller herbaria / tertiary institutions where expert knowledge on subjects such as pollen, bark, epidermal characters, wood, molecular data etc. reside, should be involved in identification efforts. Personal access to herbarium is sometimes necessary and should be allowed.</p>
6. Access to library and information about new literature		<p>Information about new literature (books, journal articles applicable to southern African flora) should be made available on the Web. Older literature is often very important in taxonomy, and not available on the Web. The Mary Gunn Library has many valuable old books. It is suggested that the Mary Gunn place all its older literature (which commercial organisations will not put on the Web) on a CD ROM / the Web so that other taxonomists can also have access to the material.</p>

**Prerequisites and Assumptions (as applicable to Requirement no. 4):**

- Sufficient space in herbarium cabinets
- Support staff appointed to process new acquisitions
- Vehicles for fieldwork serviceable and available
- Equipment such as plant presses available and usable

PRACTICAL IMPLICATIONS	FINANCIAL IMPLICATIONS		THE NBI'S RESPONSE
	ITEMS	PROJECTED COSTS	
<ul style="list-style-type: none"> <li>Manpower needed</li> <li>More floor space &amp; cupboards needed</li> <li>Processing extra specimens (more curating staff)</li> <li>Coordinator of trips</li> <li>Dedicated staff, vehicles, fieldwork</li> <li>Training &amp; guidance for local collectors</li> <li>Ethics</li> </ul>	Vehicles (two 4X4's) Running costs  Staff (5 + 1 @ R70 000 p.a. for 5 years)  20 Cabinets @ R3 200 per cabinet  Floor space  Training of collectors	US \$ 42 000  US \$ 12 000 p.a.  US \$ 210 000  US \$ 6 400  US \$ 150 000  US \$ 3 000	The National Herbarium actively tries to supplement and increase its collections by organising collection trips with the target objective of collecting under-collected species and in under-collected areas. To target under-collected areas, a computerised map—compiled from PRECIS data—giving an indication of how many species have already been collected per grid helps to target areas for collection trips. Fieldwork (collection trips) are also carried out for research and bioprospecting purposes, and for the Millennium seedbank project.
<ul style="list-style-type: none"> <li>Staff &amp; expertise</li> <li>Increase taxonomic capacity</li> <li>Increase data-capturing capacity</li> <li>Increased administration</li> <li>Possibility of increased identifications</li> <li>Possibility of identification problems if specimen quality lower</li> <li>Digitising current collections</li> <li>Commercial potential: forestry, importers etc.</li> </ul>	Scientific staff (5 @ R80 000 p.a.)  Curating staff (5 @ R60 000 p.a.)	US \$ 40 000 p.a.  US \$ 30 000 p.a.	Although this is a current activity of most herbaria, the only comprehensive service of this nature is offered by the NBI. However, to further improve and expand this service it is imperative that additional trained staff skilled in plant family characters be appointed. As a further possibility, herbarium staff of smaller and/or tertiary educational institutions could work closely with PRE staff in sorting and identifying submitted material. This could be done in those cases where the staff from non-NBI herbaria have expertise in specific groups.
<ul style="list-style-type: none"> <li>More library admin</li> <li>Computers</li> <li>Web access</li> <li>Floor space &amp; shelves</li> </ul>	One 5/8 staff @ R30 000 p.a.  Floor space  Shelves (10 m @ R1 000 / meter)	US \$ 2 500 p.a.  US \$ 150 000  US \$ 1 000	The Mary Gunn Library of the NBI holds the largest collection of historical and current botanical book and journal titles in Africa (Anonymous 1997). This library provides an irreplaceable service to southern African biologists, amongst other things through free access and a photocopy service at cost. The library is committed to maintaining and, where possible, expanding its services.

**Prerequisites and Assumptions (as applicable to Requirement no. 5):**

- Trained and skilled staff able to do determinations
- Appropriate literature available
- Herbarium adequately stocked and fully representative of the flora of the region

**Prerequisites and Assumptions (as applicable to Requirement no. 6):**

- Library holdings accessioned and accessible
- Scanning equipment serviceable and available
- Comprehensive journal subscription



**Table 3: (continued).**

INFORMATION / SERVICE REQUIREMENTS	CURRENT SITUATION	DESCRIPTION OF PRODUCT/SERVICE NEEDED & RECOMMENDATIONS
7. Training of taxonomists	Current activity, but training is ad hoc and in-house	It is recommended that this service be maintained and expanded, and that it should furthermore also be offered to smaller herbaria
<p>To enable taxonomists to perform their duties (e.g. plant identification), it is imperative that they are involved in research aimed at improving the knowledge of priority plant groups.</p> <p>The ultimate products generated from this scientific endeavour could be any or a combination of:</p> <ul style="list-style-type: none"> <li>• Taxonomic Notes: A brief communication of a taxonomic or nomenclatural nature</li> <li>• Checklist: List of taxa for a specific geographical area, without descriptions</li> <li>• Synopsis: List of taxa, with very abbreviated diagnostic statements</li> <li>• Flora: Taxonomic treatment of the plants of a defined geographical area</li> <li>• Conspectus: Outline of a revision, listing all taxa, synonyms, sometimes with short diagnoses, often with a brief mention of geographical range of each taxon</li> <li>• Revision: Less comprehensive than a monograph, with a complete synonymy, short descriptions or diagnoses; geographical scope often restricted</li> <li>• Monograph: Comprehensive account (including identification key) of all taxonomic data relating to a group, usually on a world-wide scale.</li> </ul> <p>{from: Meyer <i>et al.</i> 1997.}</p>		
8. Training of data-captors	Ad hoc, in-house activity	It is recommended that this service be maintained and expanded, and furthermore also offered to smaller herbaria
9. General training	Current training focus on taxonomists	The training of parataxonomists, traditional healers, and other similar parties should be formalised and supplemented with extensive literature courses to further empower these stakeholders.
10. Herbarium management system	Mini PRECIS limited to archival , cataloguing & labeling	Much needed management functions that should be added to this system include: determination lists, checklists, accession register, lists of names, cupboard lists, list for permit granting bodies and loans lists. It is further recommended that existing alternatives for the current system should be investigated. The potential for the system and the possibility for outsourcing the designing of the system should also be investigated and considered. A taxonomic database for herbarium staff should include data such as names, distributions, images, photographs, line drawings and literature references.

**Prerequisites and Assumptions (as applicable to Requirement no. 7):**

- Experienced & qualified scientists available to do training
- Facilities such as serviceable microscopes with training extensions etc. available.
- Classroom and training facilities available

**Prerequisites and Assumptions (as applicable to Requirement no. 8):**

- Appropriate software developed and available
- Computers available
- Classroom and training facilities available

PRACTICAL IMPLICATIONS	FINANCIAL IMPLICATIONS		THE NBI'S RESPONSE
	ITEMS	PROJECTED COSTS	
<ul style="list-style-type: none"> <li>• More man-power</li> <li>• Liase with tertiary education institutions</li> </ul>	Training coordinator (1 @ R70 000 p.a.)	US \$ 7 000 p.a.	The employment of skilled, professional taxonomists, able to confidently do plant identifications and having those qualities necessary to do plant taxonomic research, is imperative for the National Herbarium if it is to adequately fulfill its role in society, and to deliver those products and services that its customers require. The training of these taxonomists is therefore of the utmost importance. Primary training is, however, the responsibility of tertiary education institutions. The National Botanical Institute (and especially the National Herbarium) can and does, however, provide <i>further</i> in-service training and guidance to newly qualified young taxonomists. The NBI may, however, aid in appropriating funding for the training of new taxonomists.
<ul style="list-style-type: none"> <li>• Device training</li> <li>• In-service training</li> <li>• Support smaller herbaria</li> </ul>	5 computers & associated hardware @ R16 000 per set  One course for staff from other herbaria	US \$ 8 000  US \$ 3 000	The training of data-capturers in the use of application-specific software (such as a botanical database) is of obvious necessity, and the NBI will continue to do in-service training. Depending on the interest, the NBI may offer an occasional (maybe annual) training course to employees of other, smaller, herbaria.
<ul style="list-style-type: none"> <li>• Compile guides</li> <li>• Lecturers</li> <li>• Course material</li> </ul>	Course @ US \$ 3 000 per course	US \$ 3 000 p.a.	Depending on the interest, the NBI may offer an occasional training course to these stakeholder-groups.
<ul style="list-style-type: none"> <li>• Improved efficiency at all herbaria</li> <li>• Software programming and purchase</li> <li>• Training</li> <li>• Consultation with stakeholders in setting up</li> <li>• Identifying a coordinator</li> <li>• Cost of upgrading</li> </ul>	IT Staff (1 @ R70 000 p.a. for 1 year)  Training course	US \$ 7 000  US \$ 1 500	Depending on the capacity of the Data Management Section, the NBI may be able to expand the existing management system of PRECIS.

**Prerequisites and Assumptions (as applicable to Requirement no. 9):**

- Adequate & appropriate course material available
- Skilled and qualified lecturing staff available
- Classroom and training facilities available

**Prerequisites and Assumptions (as applicable to Requirement no. 10):**

- Adequate computer hardware available
- Skilled software developers/programmers available



## Summary of Financial Implications of Prerequisites and Assumptions

*The items/facts listed as footnotes to Table 1 can be consolidated and summarised as follows (See Smith et al. (1999: 39–41) for a detailed breakdown of financial implications. Note that this report covered 32 South African herbaria):*

**Table 4. Financial implications of prerequisites and assumptions.**

ITEM	COST
Library and literature	Variable
Research	US \$ 100 000
Computers, printers, scanning equipment etc.	US \$ 111 195
Laboratory equipment (microscopes etc.)	US \$ 479 360
Scientific staff	US \$ 1 000 000
Information technology staff	US \$ 100 000
Curation, technical support staff	US \$ 200 000
Data capturing staff	US \$ 80 000
Vehicles for fieldwork	This report (Table 3)
Floor space, lecture room facilities, store space	Variable



*Ferraria schaeferi* (Photo: G. Owen-Smith)

# The Position Of The National Botanical Institute

## Introduction

In 1989, the National Botanical Institute was formed by the amalgamation of the Botanical Research Institute and the National Botanical Gardens of South Africa. It is an official body in the department of Environmental Affairs and Tourism, and operates from seven directorates. The Research and Scientific Services Directorate (RSSD), is responsible for herbarium and data management, systematics research, conservation, ecology, ethnobotany, libraries and publication, and the NBI Website. The Gardens and Horticultural Services Directorate manages and maintains the network of eight National Botanical Gardens in South Africa. The Directorate of Environmental Education Services is responsible for distributing information on South African flora to the various sectors of the community that the NBI serves, and offers garden-based and Outreach greening educational programmes, as well as teacher training. The Biodiversity Policy and Action Planning Services Directorate is responsible for policy development and research, strategic programmes and projects, and liaison with the Government. The

Human Resources Services Directorate deals with the development of the human resource base of the NBI, including recruitment, performance management, labour relations, employment equity and training. Financial Services deals with the budget of the NBI, the salaries of the employees, financial statements, external auditing and risk management. Marketing and Communication Services is responsible for visitor services, commercialisation, internal and external communications, media relations, tourism development and branding and imaging of the NBI. Research activities in the Institute, which focus on the systematics, ecology, conservation, ethnobotany and horticulture of indigenous plants of the region, are of national and international significance.

The NBI is the single largest botanical research institution in South and southern Africa, and employs the largest number of botanists, including taxonomists, ecologists, conservation biologists and ethnobotanists in the country. The NBI (and especially the RSSD of the NBI, including the National

Herbarium) is the ultimate provider of botanical information and services. Though many other herbaria and botanical research institutes exist (e.g. University herbaria and botany departments, and agricultural research institutions), which can also act as providers, none are as well staffed and well equipped as the NBI, nor have access to as many herbarium specimens and other sources of botanical raw data. These other institutes can act as either providers of botanical information and services, or as end-users when they turn to the NBI's herbaria for information and services they are not able to attain or provide themselves. It was therefore deemed necessary for the NBI to specifically respond to the requests of the stakeholders and end-users of botanical information in terms of what information products and services the NBI plans to provide and improve upon during the next five years. In part, this chapter tries to outline and provide a summary of these strategic and key focal points of the NBI. For more detail the Corporate Strategic Plan of the NBI for the period 2001 – 2006 may be consulted.



## Vision and Mission

### *Vision*

To contribute significantly to an improved quality of life for all South Africans within a dynamic organisational environment, through promoting the conservation and sustainable use of our indigenous plant life.

### *Mission*

To promote the sustainable use, conservation, appreciation and enjoyment of the exceptionally rich plant life of South Africa, for the benefit of all its people.



## Box 8: THE MISSION WILL BE ACHIEVED THROUGH:

- A network of gardens: developing and maintaining a network of National Botanical Gardens for the curation of living plant collections
- Horticultural development: developing the horticultural potential of southern African plants
- Promoting the value and sustainable use of indigenous plants: fostering an understanding of the socio-economic and ecological value of southern Africa's indigenous plant life
- Environmental awareness and education: promoting a wide appreciation of our plant life through the production of educational and interpretive materials and the hosting of symposia, exhibitions, workshops and training courses
- Outreach: ensuring ready access by all South Africans to the knowledge, experience and facilities of the NBI
- Scientific research: undertaking and communicating relevant research to ensure effective documentation, management, and conservation of southern Africa's plant life in a changing environment
- Documenting plant biodiversity: developing and maintaining a network of herbaria, where the botanical diversity data of the entire flora of southern Africa is accessible for research, planning and information purposes
- Information management: developing an information base of computerised data, libraries and archives for the storage and dissemination of information about southern African plant life
- Professional training: contributing to the in-service training of the next generation of professional horticulturists, scientists and educators
- Marketing and commercialisation: establishing an active marketing, promotion and commercialisation programme for the NBI, and generating funding for project development
- Networking: developing working partnerships with government, non-governmental and private sector bodies, both nationally and internationally
- Staff development: empowering NBI staff members to reach their maximum potential through the acquisition of relevant skills and knowledge in a climate favouring innovation and excellence
- Attracting people from all communities to our gardens.

{from the Corporate Strategic Plan of the NBI for the period 2001 – 2006}

## Challenges faced by the NBI in a Stakeholder Society

Some of the important challenges facing herbaria in general, including those of the RSSD of the NBI, are facilitating easy access to data kept in the various corporate databases, such as PRECIS (National Herbarium, Pretoria (PRE) Computerised Information System). In particular, the four major challenges facing herbaria and their research and service-delivery units, including information technology units, have been identified as:

- **Relevance to** the various local, national and regional **communities served** by the herbaria
- Deliverance of **globally competitive** products
- Maintenance and improvement of the **quality of its** various published and electronic **products**
- Consumer-driven **service delivery** through activities aimed at appropriate information dissemination

These issues have supported and driven initiatives aimed at instituting programmes and projects that deliver end products of exceptional quality. It is indeed critically important to bear these measures in mind when setting priorities based on sound and defensible criteria for the first few years of the new millennium. A lack of relevance and quality and the impact of globalisation on its activities will inevitably lead to the generation of poor or unwanted products and the concomitant demise of many of the incentives for herbaria.

To address many of these challenges, the herbaria of the NBI have already put a number of measures in place. For example, a number of major funding initiatives, such as the very successful regional SABONET project and the co-funded Medbase and Vegmap, and the collaborative

Bioprospecting, Antimalarials and Millennium Seedbank initiatives, are currently being pursued. This is in line with the NBI's commitment to participate increasingly and effectively in high-profile locally, regionally and internationally relevant environmental issues.

From a staff development perspective the NBI, including its herbaria, is promoting a climate of lifelong learning through relevant Adult Basic Education and Training (ABET) programmes and applicable tertiary training programmes for staff, particularly those from previously disadvantaged communities. The increased academic capacity available through these programmes will assist the herbaria in achieving a more flexible, student-orientated staff complement competent to adjust to the challenges placed on the NBI by the demands that will

face environmentalists in the next few years. Development programmes are therefore particularly aimed at empowering staff to rise to the challenges of the new millennium.

In its various initiatives, the NBI aims to optimally apply technical and information technological advances so as to remain an innovative regional and continental leader through continual renewal and strategic focus. An anticipated move into the arena of electronic product development over the next few years will provide the impetus for developing new, appropriate products based on a phased delivery model that provides for regular quality control checks.

In the drive to remain locally relevant and globally competitive through the maintenance and improvement of product and staff

quality, a key factor will be the formation of winning alliances with strategically important partners in the field of environmental science. A concomitant renewal of the procedures in place to ensure quality and customer satisfaction is being implemented and will further enhance the ability of the NBI's herbaria to rise to the challenges ahead. These and other corporate interventions confirm that the NBI's strategic planning process, initiated in the early 1990s as part of establishing its successive and highly effective Corporate Strategic Plans (CSPs), positioned the Institute timeously and accurately for the future. However, embarking on these exercises also emphasises that change is, and will be for some time to come, the name of the survival game. The NBI indeed realised that it would have to change in order to survive and grow in the rapidly changing

South African and global context. Throughout these renewal exercises aimed at establishing the appropriate directions for the herbaria of the NBI, acceptance of the dual criteria of "locally relevant" and "globally competitive" was and will be of paramount importance.

These criteria certainly hold true for all aspects of programme and project content, implementation, quality and quantity. At the same time the NBI will increasingly be seeking a firmer and definite market-orientated approach aimed at attracting appropriate levels of grant and outside funding. However, central to all of these will be efforts to deliver quality products, to impart focus to its various research initiatives through regular review mechanisms and, wherever possible, to apply innovation to ensure mainstream relevance.

## Strategic Focus Areas of the NBI

Some of the strategic focus areas that will receive attention in the herbaria of the NBI in 2002 and further on are:

- Updating the *List of southern African plants: names and distribution* by adding biological and/or ecological information, and transforming it into a *Concise Flora of southern Africa*
- Promoting staff diversity, as part of the NBI's corporate Employment Equity Plan
- Increasing collaboration with relevant stakeholders
- Establishing local and international partnerships, especially those with fiscal benefits for the projects
- Building local and global profiles that will enhance its image through ensuring that only high-quality products are initiated from and delivered by the herbaria, and indeed the Research and Scientific Services Directorate
- Developing the existing staff performance management system to achieve objectives-

driven output from a motivated and dedicated personnel corps


- Allocating financial and other resources to centres and units based on delivery of key outputs

Being a global role-player and still remaining locally relevant requires an exceptional level of efficient, effective and high-quality service delivery, regardless of which market is being targeted through the Institute's varied research endeavours. As part of the process of continually revitalising and improving its research initiatives to ensure that it can perform its functions, the importance of strategic alliances with like-minded, output-driven institutions is currently being actively pursued by the NBI. For example, as a recognised leader in the sphere of southern African and African botanical research, the NBI is the leading agency of the highly successful SABONET Regional Capacity-building Project and recently secured funding to host,

with Malawi, the first-ever Global Taxonomy Initiative Regional Workshop for Africa (Klopper *et al* 2001). The strengths of such regional networks and partnerships are that they are mutually beneficial to all participants and invariably lead to an enhancement of the quality of the products and services delivered. At the same time they position the NBI's herbaria well to interpret and act on international realities and enhances its ability to be a provider of relevant and appropriate botanical information that can feed into the regional and international biodiversity knowledge-base.

Further, success drives success. The recent collaborative completion of the milestone *Seed plants of southern Africa: families and genera* (Leistner 2000) is a case in point. Shortly after its launch, the SABONET Steering Committee called for an expansion of the concept to the other five countries (Angola, Zambia, Zimbabwe, Malawi and Mozambique) that were





not covered in this product. The NBI responded immediately and the expanded concept is currently being developed, and the aim is to complete it in 2002. The vision to be regionally relevant is therefore not a destination in itself: it must be driven by a desire and commitment to provide continually improved products and services. Only then can organisational growth and success be guaranteed. This drive will invariably lead to the NBI becoming a competitive

world leader, because it necessitates embracing excellence through internal and external assessment of products and structures, based on clearly defined objectives. Such a vision can be accomplished by:

- Cementing and improving the NBI's broad botanical knowledge base
- Participating in national, regional and international botanical development programmes

- Establishing multiple strategies with appropriate partners
- Developing and strengthening the NBI's competitive edge by adding value to our products

To be in a position to attract funding and so become part of the world biodiversity economy, high-quality but affordable products must be offered, driven by predictable governance and output, and by exceptional productivity.

## Selected Initiatives and Focal Areas of Herbaria of the NBI earmarked for Attention from 2002 to 2005

### 1. A comprehensive information base on the taxonomy and diversity of the southern African flora

This activity will be driven through researching and regularly publishing scientific and popular papers and books on priority taxa and selected aspects of the flora. These will include studies and publications on families such as the Proteaceae, Asteraceae, Euphorbiaceae and Ericaceae, and life forms such as the rich bulb flora. As far as possible, the activity will be funded through sourcing external funding, for example through the Global Taxonomy Initiative (GTI)

### 2. Regional Floras: unlocking the floristic wealth of priority and neglected areas of South Africa

#### • *Flora of Namaqualand*

This is a corporately supported project involving the Western Cape Nature Conservation Board, all Compton Herbarium staff and some contributors from other NBI herbaria. At present there is no regional Flora for Namaqualand—an arid winter-rainfall area comprising the north-western part of South Africa's Succulent Karoo Biome. Present estimates indicate that the flora consists of some

3 000 species of vascular plants. It is visualised that the style and format would follow the pattern set in *Cape plants. A conspectus of the Cape flora of South Africa* by Goldblatt & Manning (2000), complementing the latter work. Keys to the families and genera will be provided, with synoptic keys to the species and brief, diagnostic species descriptions. There is a long-standing need for a Flora of Namaqualand, especially in view of the seasonal importance of the area for ecotourism and environmental impact assessments of mining activities.

#### • *Flora of the Eastern Cape*

The project will be managed from the National Herbarium in Pretoria, but co-workers from the other NBI herbaria and local universities will be involved through an envisaged multi-stakeholder workshop. The project will have high relevance as it will also support existing environmental initiatives such as the Sub-tropical Thicket Ecosystem Planning (STEP), the Greater Addo Initiative and the NBI's Conservation Farming Programme.

The possibility of procuring funding for this project through the Global Taxonomy Initiative (GTI) of the Convention on Biodiversity (CBD) will be investigated. The fact that there is no Flora available

for this phytogeographically important area, offers numerous opportunities for collaborative capacity-building projects given that two Historically Black Universities (HBUs) (University of Transkei and University of Fort Hare) and several other universities (Rhodes University and University of Port Elizabeth) are situated in the Eastern Cape.

### 3. Molecules to the rescue: the DNA Laboratory

The Leslie Hill Molecular Systematics Laboratory, recently established at the Kirstenbosch Research Centre (KRC), became operational during the first quarter of 2001. As currently equipped, it can undertake projects aimed at constructing phylogenies at generic and species level. After undergoing in-house training, specialist researchers in plant systematics currently on the NBI staff (all herbaria) will be extending their studies on families in which a high degree of personal expertise has been built up, for example the Mesembryanthemaceae, Iridaceae, Campanulaceae, Amaryllidaceae, Proteaceae, Hypoxidaceae, Restionaceae and Thymelaeaceae. This will enable them to work out evolutionary relationships within these and other important plant families. Opportunities will be de-

veloped for collaborative work with scientists in the Conservation Biology Unit of the KRC.

AFLP (Amplified Fragment Length Polymorphism) studies at population level would be an obvious extension of the DNA laboratory's work. These DNA fingerprinting techniques will be of enormous importance in conservation studies but will require additional capital expenditure for equipment, software and chemicals.

#### **4. Systematics made easy for the masses: popular taxonomic publications**

The NBI's herbaria house an enormous wealth of information on the southern African flora. This information can provide a framework for making meaningful contributions to the country's implementation of the international environmental Conventions to which the government has become party. Computerised data sets can be accessed through PRECIS, while non-computerised information is available in print and through staff expertise. It is the aim of all herbarium workers to make this information available to the wider public, nature enthusiasts and governing bodies in user-friendly, relevant and useful packages. In addition to more scientific publications, glamorous and sensational topics will be identified to create awareness of and interest in the southern African flora.

Therefore, making plant systematics information more available to the public through well-illustrated,

popular publications is a continuing goal of taxonomists in all herbaria, including the National, Compton and Natal Herbaria of the NBI. In the past, such publications have been very successful, especially in the case of horticulturally important plant groups. Prospective contributions would be:

- The biology of South African bulbous plants.
- A synopsis of fire-lilies/ifa-falilies (*Cyrtanthus*), an important and interesting bulbous plant genus.
- A review of the South African genera of the ethnobotanically important, but currently taxonomically complicated Hyacinthaceae (see Pfosser & Speta 1999; Stedje 2001).
- Bulbous plants of the Cape winter-rainfall area.
- Ferns of the Cape Peninsula (a colour field guide particularly aimed at visitors to the Cape Peninsula National Park and surrounding areas).

#### **5. Southern African Botanical Diversity Network (SABONET)**

SABONET is a successful regional botanical capacity-building project involving the ten southern African countries, namely Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. The project has been running since 1998, with its closure scheduled for the end of March 2002, but at current levels of expenditure, this date is sure to be extended. Activities planned for the next few months include the publication of more than 10 further


numbers in the *SABONET Report Series* and various trimesterly editions of *SABONET News* regional expeditions to under-collected southern African regions, approximately seven regional courses on computerisation of herbaria, herbarium management and botanical garden development, post-graduate fellowships to SABONET staff, appointment of contract personnel in participating institutions, computer support, and a number of Steering Committee Meetings. All of these activities have been approved by the successful Mid-term Review, which was held in January/February 2001.

There has been a long-standing need to develop a strong core of professional botanists, taxonomists, horticulturists and plant diversity specialists within the ten countries of southern Africa to inventory, monitor, evaluate and conserve the botanical diversity of the region. Through the SABONET project this vision is being fulfilled on a continual basis.

#### **6. Service for Environmental Conservation of Biodiversity and for Sustainable Development (SECOSUD)**

This project covers the entire Southern Africa Development Community (SADC) region. The NBI will benefit from this Italian-funded project through the training of a research officer in GIS techniques. The project will work closely with the countries participating in the SABONET project.





**Collections** of the National Herbarium were expanded by the addition of almost **75 000 specimens** in the five years prior to 2000 through own collecting, gifts and exchanges. The collecting efforts of PRE staff are either **project-based** or aimed at the **study** of the **plant diversity** of one or more **poorly known** areas.

### **7. Global Taxonomy Initiative**

The Convention on Biological Diversity (CBD), which was ratified by the South African government on 2 November 1995, recognises that many countries do not have adequate taxonomy resources or environmental information to manage and conserve their biological diversity. The recognition of this so-called taxonomic impediment has given rise to the formulation of the concept of a Global Taxonomy Initiative (GTI) aimed at promoting a concerted effort among international funding agencies, national and sub-national governments, and non-government bodies to address this unsatisfactory situation. Furthermore, the taxonomic community globally sees an urgent need for capacity-building and infrastructure renewal if taxonomy is to keep up with the demand for up-to-date information on species. The role of the GTI is to help countries to implement the Convention. It is anticipated that over the next few years the NBI will be actively pursuing funding made available through the Global Environment Facility (GEF), facilitated by the GTI, to fast-track the execution of priority taxonomy projects.

### **8. Comprehensive botanical information on the floristic wealth of southern Africa: a Concise Flora for the subcontinent**

This project and its eventual publication would be the next phase in a series of approximations towards a complete Flora for south-

ern Africa. Information for this project has been gathered during 2001, continuing in 2002, and will involve all staff at all NBI herbaria, in consultation with other specialists. The project aims to provide the status of all southern African plant names (in current use or as synonyms) and will include references to literature, distribution, plant height, habit, and life strategy of each taxon. It is foreseen that this publication will follow in the footsteps of its predecessor (the so-called "Black Book"; Arnold & De Wet 1993) and become the most useful reference work on the southern African flora. Compilation of this flora will be facilitated through interrogation of the PRECIS system.

### **9. The National Herbarium**

The National Herbarium (PRE) is known world-wide as one of the best-curated collections of its kind. To have achieved and to maintain this status, new interpretations of existing taxonomic hypotheses are regularly incorporated from the literature, and care is taken to reflect the current taxonomic status in the PRECIS database. Computerisation of the non-southern African PRE specimens is active through the SABONET and SECOSUD projects.

Research on selected southern African plant families covers a wide spectrum and is directed to assess new methods of providing improved and practical classification and identification systems. Most research targets specific plant families, although broadly conceived plant groups such as

water plants and trees also have priority.

The National Herbarium also provides the infrastructure from where national and international projects such as consortium-based bioprospecting and Kew Millennium Seedbank and SABONET activities can be implemented.

### **10. Red Data Lists**

Over the past few years, the production of southern African Red Data Lists for plants has gained a renewed impetus, partly as a result of the Regional Networking and Capacity Building Initiative for Southern Africa (NETCAB)—Phase II of the World Conservation Union's Regional Office for Southern Africa (IUCN-ROSA) funding of the red-listing activities carried out as part of the SABONET project. In South Africa this activity will be a priority for some years to come, amongst others things because of the exceptional size of the flora. This initiative will be carried forward in the NBI collaboratively through the National, Natal and Compton Herbaria, the Gardens Directorate and the Conservation Biology and Ecology Sections, and increasingly through the Biodiversity Policy and Planning Directorate. The procurement of sufficient external funding will be pivotal to the success of the project.

### **11. The plants of Africa**

The NBI, in partnership with staff of the Geneva Botanical Garden, Switzerland, will be compiling and publishing, electronically and in hard copy, through SABONET, a

checklist of all the plants of sub-Saharan Africa. This major achievement will make available the first-ever comprehensive list of all the plants of the continent.

## 12. PRECIS (National Herbarium, Pretoria, (PRE) Computerised Information System)

PRECIS is the largest computerised botanical information system in Africa. Originally designed to store information covering the collections in the National Herbarium and now numbering over 780 000 records, the system has been expanded in recent years in order to include information about plant taxa (families, genera and species). PRECIS comprises a number of different satellite databases developed to run on PCs as well as the main server-based

centralised database into which all data from the satellite databases are being consolidated. Besides collection-based herbarium and garden records information, PRECIS also houses information on African plant names, southern African place names, as well as ecological, descriptive, horticultural and medicinal use information on selected plant species.

The Data Management team plays a very important role not only in the NBI and South Africa, but the entire SADC region. The Data Management group now provides botanical information and various IT and databasing services to a wide spectrum of end-users. Over the next five years, PRECIS information will therefore continue to be used in a broad range of local and international research initiatives.

## 13. The conservation, promotion and development of traditionally used indigenous plants.

This activity will be achieved through providing the scientific botanical basis for sustainable plant use practices and will inform the establishment of plant-use by display gardens in the NBGs.

Participation in appropriate and ethical bioprospecting-initiatives will enable the selective dissemination of information useful in the development of industries that are built on indigenous plants. MEDBASE, a component database of PRECIS, will be populated with accessible, public domain, ethnobotanical information that will be released to stakeholders.



## Conclusion and Epilogue

**Excellence in activities** is required to make a difference in the international arena, while **high-quality service** is a prerequisite for impacting on local communities. To pay much more than just lip service to achieve both of these drivers means prioritising activities and identifying and alleviating bottlenecks. Only by doing this can herbaria become and stay relevant, and indeed indispensable, to their stakeholder communities.

As far as becoming, or at best staying, relevant is concerned, it is important that we as taxonomists begin to make an increasing impact on the world in which we live through analysing the data that we are so good at keeping and generating. But first things first. Let us first unlock the collections-based information that we are custodians of. In this regard the words of celebrated botanist Dr Inga Hedberg of Sweden invariably come to mind: "Think big, start small, act now." By doing this, a herbarium can and will impact on the national knowledge economy of any country.

On a continental scale it is imperative that we as Africans join hands to demonstrate to the world what this immensely rich continent is able to achieve. This must be done, if for no other reason, because foreign aid to the continent seems to be on the decline. A report published in *Engineering News* (Anonymous 2001) is especially pertinent in this regard. It is here quoted verbatim:

"Aid to sub-Saharan Africa fell from \$32 a head in 1990 to only \$19 in 1998. Aid levels in 1999, for example, were \$10.8-billion, compared to \$17.9-billion in 1992, when development assistance to sub-Saharan Africa reached its highest-ever levels."

Herbaria, world-wide but more so in emerging economies, are facing

threats at present. More specifically, institutional funding has declined over a very short time and the global economic downturn is sure to impact first on those areas perceived by authorities to be non-essential, resulting in a further deterioration in the quality of products and services. African countries have the additional challenges of comparative inexperience in raising capital for infrastructure and consumptive expenditure and, perhaps most severely, weakening local currencies.

Many people, even taxonomists, do not realise the immensely detrimental impact of currency drift on herbaria. For example, journal subscriptions and book acquisitions are often denominated in US\$ while in-country earnings on products and services are in local currencies. And a library can exist without a herbarium, but not a herbarium without a library (Stuessy & Stuckey 1997). Still, against this hard-reality background, herbaria must develop and maintain their commitments to their stakeholders and end-users. This includes, necessarily, developing new, demand-driven products, improved service standards, increased staff training (in-service and academic) and greater relevance to the communities that we serve. Clearly, it is expected of herbaria to manage, effectively and efficiently, all of these difficult tasks. Above all, herbaria as is the case with most other science institutions, must contrive major cost savings.

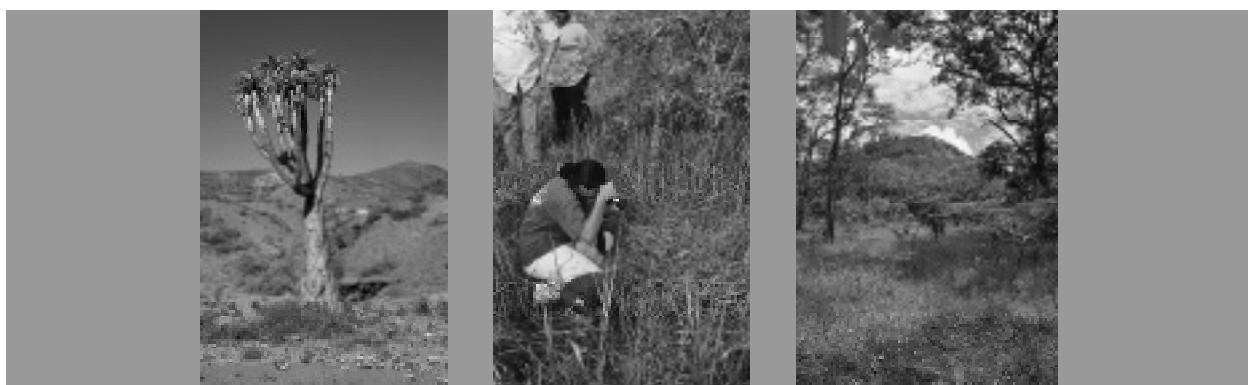
Fortunately, in most countries in the subcontinent there is a national herbarium, or at least a herbarium that can act on behalf of other herbaria. These herbaria must carry the flag for national collections-based activities. These major institutions will necessarily be under close public scrutiny, and this should of course be welcomed and encouraged because it makes

for good corporate governance of the institution and engenders pride amongst the staff that work and serve there.

The new currency of the 21<sup>st</sup> century is knowledge (which of course nowadays translates into power under most circumstances) and this is where herbaria must consolidate and build on their strengths, so that a critical mass of staff can be involved in **protecting, maintaining, adding value to, disseminating** and above all, **SHARING** appropriate collections-based information. In this regard it is therefore imperative that herbarium staff should strongly focus their activities on the core business of their units. These could typically be research, databasing and product generation. Such focus will also lead to increased effectiveness, in terms of both product and staff-cost analyses and service delivery to stakeholders. In the light of this recommendation, it is important that herbaria should fully align the activities of their staff with their stated corporate strategies, which should be achievable and understandable. Essentially therefore, herbaria should visibly make a difference to the realities of the world they serve, by responding to stakeholder needs. But the aim throughout should be to strive for excellence. Because, ultimately this is what herbaria, like other institutions, will be assessed on. Put simply, have you and your staff brought merit to the world you serve? And are you competitive in the new global economy? Although aiming towards this may require re-engineering policies and procedures and recasting goals, the alternative is too ghastly to contemplate: the massive cost of having a white elephant (read herbarium) that no-one needs, wants or, worst of all, understands.

**“...one should be very careful of trying to predict the future with too much of an adamant attitude, because the scene changes so fast and, furthermore, in the modern world the science can change so dramatically that it requires one to undergo a major mental attitude shift...”**

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The Global Network for Taxonomy

<http://www.bionet-intl.org/html/whatsnew/newsletters/newsletters.htm>

Integrated Taxonomic Information System

<http://www.itis.usda.gov/>

Species 2000

<http://www.sp2000.org>

The World Wide Herbarium

<http://www.cs.utexas.edu/users/srost/study/project/>



The erect form of *Juttadinteria deserticola* (Photo: G. Williamson)

# 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 under-collected areas. The programme produces a newsletter, *SABONET News* and a series of occasional publications, the *Southern African Botanical Diversity Network Report* of which this publication is part.

SABONET is co-funded by:

- The United States Agency for International Development (USAID/World Conservation Union—Regional Office for southern Africa (IUCN-ROSA))
- The Global Environment Facility (GEF)/United Nations Development Programme (UNDP)

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