SABONET news

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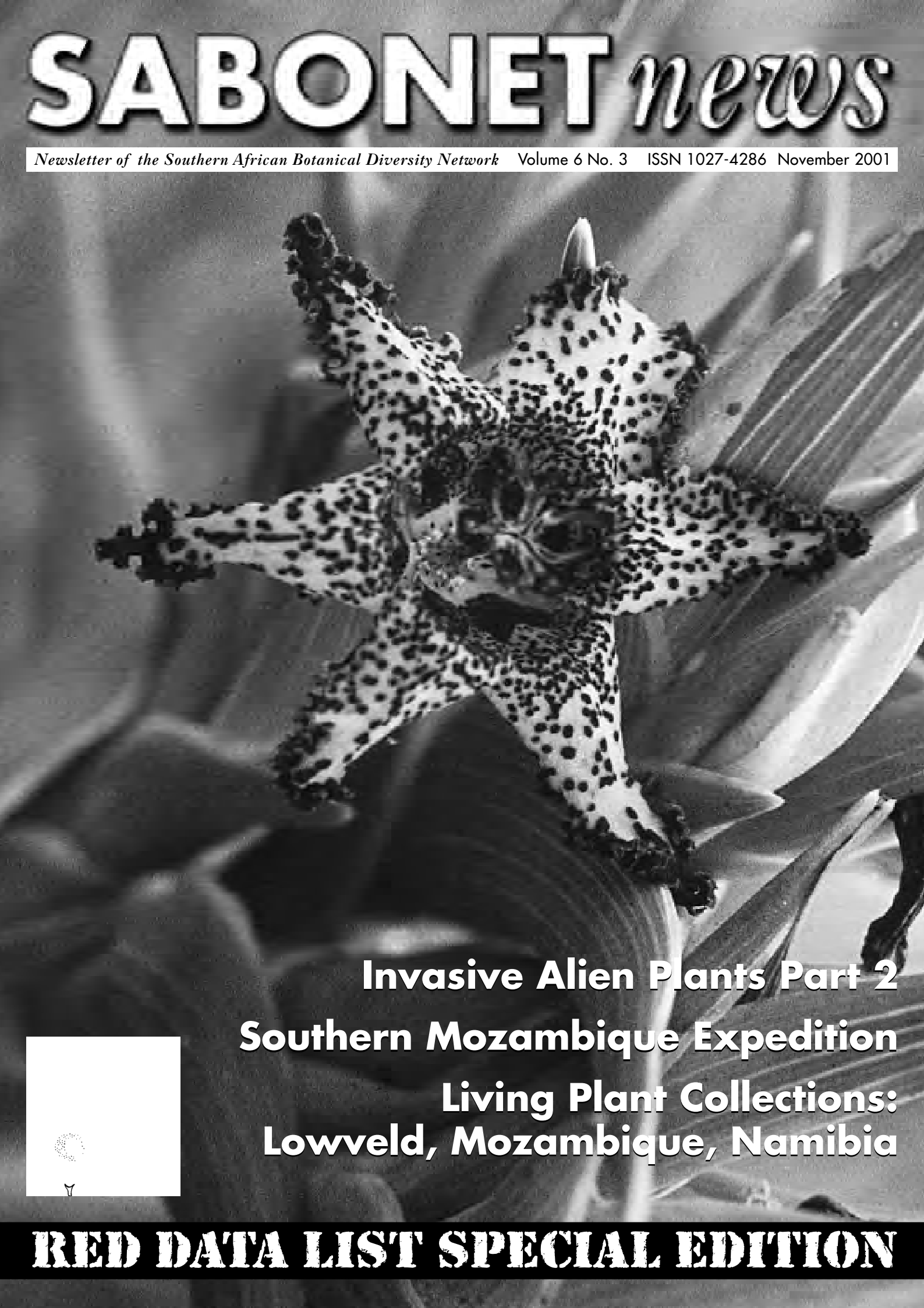
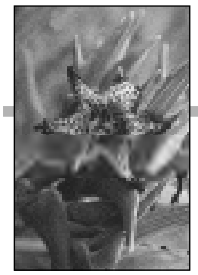


Invasive Alien Plants Part 2

Southern Mozambique Expedition

Living Plant Collections: Lowveld, Mozambique, Namibia

RED DATA LIST SPECIAL EDITION



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***Ferraria schaeferi*, a vulnerable Namibian near-endemic.**
(Photo: G. Owen-Smith)

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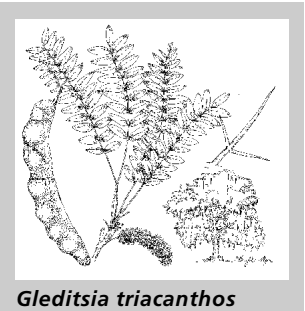

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EDITORS: STEFAN SIEBERT & MARTHINA MÖSSMER
GUEST EDITOR: JANICE GOLDING

Once again we have reached a milestone in the history of *SABONET News*—our fifth birthday! The first issue was published in August 1996 and consisted of only eight pages! Although the newsletter is much more comprehensive now, we still aim to provide a publication that keeps botanists world-wide informed about botanical capacity-building activities in the southern African region. We strive to keep the articles informative, interesting, and useful to our readers. Thanks to all of those who have contributed to the newsletter over the past five years.

To celebrate the successful conclusion of the NETCAB-sponsored Southern African Red Data List (RDL) Programme, this issue concentrates on Plant Red Data Lists: eleven articles deal with issues ranging from the role of botanical gardens in the conservation of threatened plants, charcoal production in Malawi, Data Deficient taxa, and threatened plant policies, to the Swaziland Flora Protection Bill. Special *Paper Chase* and *From the Web* sections offer interesting reads, websites, and announcements related to threatened species. We also present a sneak preview of the final RDL publication (*SABONET Report* No. 14) on page 186. This is the first regional Red Data List for Africa and is indeed a milestone for the continent!

Interested people can learn more about the upcoming SABONET Southern Mozambique Expedition, planned for 24 November–12 December 2001 (page 196). We hope that the expedition will contribute substantially towards capacity building in the southern African region and strengthen the local conservation initiatives in Mozambique.

In addition, this issue includes all our regular items—*Profile, Living Collections, From the Web, The Paper Chase*, and *Regional News*. Lesley Henderson has written a second instalment in our new series on invasive alien plants, this time dealing with the Fabaceae (page 192). We also have a wealth of book reviews in this issue, starting on page 223.

We hope you enjoy your SABONET Red Data List 2002 calendar included with this issue!

—Stefan Siebert , Marthina Mössmer & Janice Golding

SABONET News
Newsletter of the Southern African Botanical Diversity Network

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See Instructions to Authors on page 156.

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letters to the editors

editors@sabonet.org

Mozambique Expedition

I am looking forward to the outcome of the next SABONET Plant Collecting Expedition to southern Mozambique. I lived in Malawi for a long time, but was never able to cross the border because of the war. I have always been intrigued with the composition of the forest flora of Mt Namuli (I think it is also called Serro do Gurué), Mt Chiperone and others that are visible in clear weather from Mt Mulanje and Mt Mangoche. I suspect that such collecting as has occurred on these mountains, has been rather sporadic and limited to the middle of the previous century. It would be interesting to know if, in particular, *Canthium*(=*Pyrostria*) *chapmanii* and *Rawsonia burtt-davyi*, presently regarded as Mt Mulanje endemics, do or do not occur on one or other of those nearby Mozambican mountains. Likewise *Podocarpus henkelii* and *Pleurostylia capensis*. These taxa are cited in *The Evergreen Forest Flora of Malawi* that was recently published by the Royal Botanical Gardens, Kew. I therefore suggest, if it is possible, to include these mountains in the expedition.

—Jim Chapman
Koromiko Crescent
R.D.I., Lyttelton
New Zealand

The SABONET Regional Expedition to southern Mozambique will focus on the coastline north of Ponta do Ouro, Maputo Elephant Reserve and Licuati Forest Reserve. Unfortunately there will be no time to explore the mountains mentioned in your letter. However we would like to suggest that SABONET-Mozambique should consider these mountains when planning for their national collecting expeditions in 2002. (Eds)

Caesalps in Cultivation

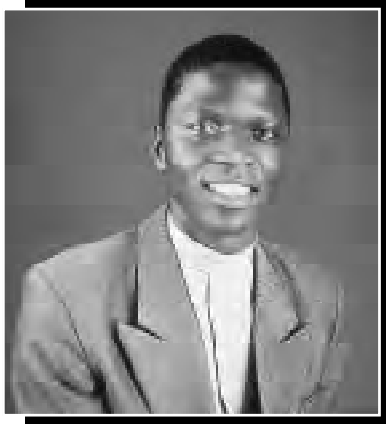
I read your article on the SABGN Discussion Group (SABONET News 6(2): 111) with interest and would like to add the following comments about growing *Brachystegia* and *Julbernardia*. I have grown *Brachystegia spiciformis* and *B. taxifolia* from seed in Lusaka, but the success rate is low. So far I have not succeeded in growing any of the higher-rainfall species in Lusaka, and nor has the Zimbabwe National Botanic Garden with seed I have supplied from Zambia. Growing these trees out of their home range appears to be difficult. Like other deep-rooting species they don't take kindly to nursery pots, but seedlings can be transplanted from the wild in February. Seed germinates readily in seedbeds, but should be mulched with coarse sand to keep the stem free of mud splash. Small saplings may apparently die off in a drought year only to spring back to life again the next season. I have not grown *Julbernardia globiflora*, but the small patch on our Lusaka smallholding has extended significantly during the past 15 years, even invading fallow land. Seedlings of these trees may be extremely abundant, sometimes numbering several per square meter in good woodland. Since only a few survive more than a year or two, the poor success rate found in cultivation is not unnatural.

—Mike Bingham
Zambia
mbingham@zamnet.zm

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. If you want to submit scanned images with your article, scan them at 300 dpi and save as TIF or JPEG files.
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 January 2002. Late submissions will not be included.**

Profile



Ezekeil Gwinyai Kwembeya

Ezekeil Kwembeya was born on 18 November 1972 in Mutare, Zimbabwe. He grew up in Rimuka Township, Kadoma, and attended Tafadzwa Primary School. From there he went to Rimuka High School and obtained his Cambridge 'O' Level Certificate in 1989. He was awarded a Lion's Club scholarship to attend Jameson High School, where he obtained his Cambridge 'A' Level Certificate in 1991. In 1992, he enrolled for a BSc Degree at the University of Zimbabwe. During the end-of-year vacation in 1993, he worked as a Research Assistant at the University Kariba Research Station where he did gut content analysis of *Limnothrissa miodon* in Lake Kariba. He completed his first degree in December 1994, majoring in biology and geography.

It was during this time that he developed a keen interest in botany. He enrolled for the Special Honours degree in 1995, in which he majored in botany and ecology. He did a research project entitled "The physiological and morphological effects of 2-4-D herbicide on early seedling growth of *Cucurbita pepo*". After graduating, Ezekiel was immediately employed as an 'A' level geography teacher at Christ Ministries College, Harare, in 1996. His consistent interest and passion for botany led him to do voluntary work at the National Herbarium of Zimbabwe whenever he was free.

In November 1996, he was employed as a Research Officer at the National Herbarium (SRGH) under the SABONET project. In early 1997, he earned himself a permanent post as a Research Officer. In November 1997, he attended the SABONET Pteridophyte Identification Course in Zomba, Malawi, which sparked off his interest in pteridophytes, as well as opening up a lot of networking opportunities. In 1998 he co-authored *A Checklist of Zimbabwean Vernacular Plant Names* with Ratidzayi Takawira.

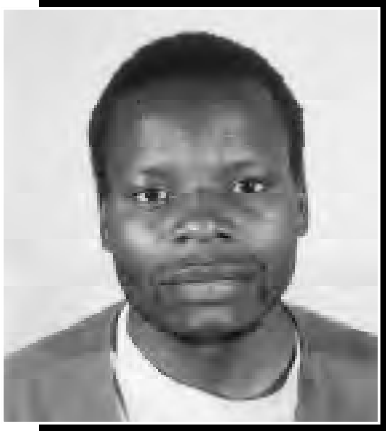
He was awarded a SABONET scholarship to study for a Masters degree in Systematics and Biodiversity Sciences at the University of Cape Town (UCT). The title of his project was "Studies in the *Dryopteris inaequalis* complex". He completed his coursework in February 2000 and was awarded the degree in December 2000. Ezekeil feels the time he spent at UCT provided him with a sound knowledge of scientific methodology, which will enable him to do meaningful research work in botany.

Upon returning to Zimbabwe in February 2000, Ezekeil was promoted to the position of Curator of the National Botanic Garden of Zimbabwe. He was also appointed a committee member of the SABONET National Working Group. In January 2001, he became curator of the National Herbarium (SRGH), a position he still holds. The recently held SABONET Herbarium Managers' Course provided him with valuable tools to use in his job at SRGH. He greatly appreciates the opportunities that the SABONET programme has offered him.

Earlier this year, he attended the Tropical Bryology and Lichenology Training Course in Nairobi, Kenya. This has seen his research interests expanding to include all the cryptogams. He would like to focus on the importance and conservation of Tropical African cryptogamic biodiversity.

Ezekeil is a born-again Christian who strives to live according to the dictates of the Scriptures. In his spare time, he enjoys travelling, reading, and listening to music.

Profile



Anthony Mapaura

Anthony Mapaura was born on 13 August 1969 in Marondera, a small town about 80 km southeast of Harare in Zimbabwe. This is where he grew up and went to school. He started his education at Tapfuma Primary School and then went to Rakodzi and Marondera High Schools where he obtained his 'O' and 'A' level certificates.

In 1991, after leaving Marondera High School, Anthony worked briefly as a teacher of General Science and Mathematics at Marondera Commercial College. In June 1991 he left his home town to take up the post of Technical Assistant at the National Herbarium and Botanic Garden (SRGH) in Harare. He started his career at the entry level, doing small but essential herbarium tasks like making specimen covers, preparing specimens for mounting, and filing specimens. He moved on to more demanding tasks like plant identification, curation, and environmental education.

In 1994, Anthony enrolled at the Harare Polytechnic for a two-year diploma in Biological Technology, which he did part-time; he graduated in 1995. Whilst studying at the Polytechnic and working at the herbarium, Anthony also attended various professional training courses. This allowed him to progress academically and professionally to the level of Research Technician.

Anthony has always been fascinated by electronic gadgets at work. He was introduced to computers around 1995 and is now the Database Manager at SRGH. He has attended three SABONET Database courses on herbarium specimen databases, one of them as a demonstrator. Recently he completed a course on computer installation and maintenance. As a Database Manager, Anthony is responsible for managing the database of the National Herbarium and that of the Botanic Garden, training other staff members in the use of these databases and providing the in-house maintenance of the computers.

Anthony's role as the database manager for SRGH has meant that he was closely associated with SABONET from its inception. He has also attended other SABONET courses such as the Grass Identification Course, Miombo Woodland Course, Herbarium Management and Plant Conservation Course, and Management of Seed Germplasm.

The benefits from the training courses, his pleasant personality, and the fact that he is a hard worker, have seen him coordinate two very important SABONET outputs for Zimbabwe—*The Checklist of Vascular Plants* and the *Red Data List*. Anthony has also been involved in a number of projects within and outside Zimbabwe. These include the Famine Food Plants of Maccosa and Tambara in Mozambique and the Zambezi Wetland Project.

His hobbies include visiting new places, spotting wildlife, watching videos, and finding out more about computers. His dream is of a world where humans will live in harmony with their environment.

Anthony is married to Caroline and is a father of two—Valentine, a boy, and Tanaka Michelle, a girl.

*VIII*th Latin American Botanical Congress

The VIIIth Latin American Botanical Congress will be held at the Convention Center, Cartagena de Indias, Colombia, from 13 to18 October 2002. The congress is being organized by the Latin American Botanical Association (Asociación Latinoamericana de Botánica—ALB), the Colombian Botanical Association and the National University of Colombia, with financial support from the Latin American Botanical Network (RLB). The first circular has already been distributed via the Internet.

The congress continues a tradition that started in México City in 1972; we will be celebrating 30 years since the very successful 1st Latin American Botanical Congress. The Organizing Committee is inviting the international botanical community to participate actively in this important gathering. Previous Latin American Congresses have attracted between 700 and 1 500 participants. Many colleagues will remember that the 4th Latin American Congress was held in the city of Medellín, Colombia, back in 1986.

For additional information please contact the Organizing Committee at the following e-mail address:
congrbot@ciencias.unal.edu.co

—Enrique Forero
Organizing Committee
eforero@ciencias.unal.edu.co

Tribute to

Paseka Mafa

Paseka Mafa, attached to the Roma Herbarium at the National University of Lesotho (NUL), died tragically in a car accident in Lesotho on 28 July 2001 at the age of 27. Paseka was one of the first young botanists to be attached to the SABONET Programme when it began in 1996. This tragic accident brought a premature end to the life of one of southern Africa's most talented and promising young botanists who had been involved in the regional capacity building project and whose professional career was just starting in Lesotho.

Paseka Petrose Mafa was born in Lesotho on 12 April 1974. He attended St Agnes High School in TeyaTeyaneng from 1987 to 1991. From January to June 1992 Paseka attended a Lesotho Science Pre-Entry Course in Maseru with resultant recommendation for entrance to the National University of Lesotho in Roma (NUL). Between 1992 and 1996 Paseka successfully completed a BSc degree in Biology and Chemistry at NUL. His positions of responsibility in the university included being Secretary for Maintenance Services in the Student Representative Council from 1994 to 1995 and representing Chemistry students in the Executive Committee of the Science Society at NUL between 1994 and 1996. Paseka also worked for the Lesotho Highlands Development Authority's Environment Division during the winter of 1994 (May to July). This involved collecting monthly outpatient data from all the health centres, clinics and hospitals within the Katse Dam catchment area. His interests included soccer, reading, singing and hiking.

Paseka joined the SABONET project in 1996 and was one of the participants of the first SABONET Regional Herbarium Management Course held in November 1996. He was privileged to have Prof. Chamarajanagar Nagendran as a mentor, close colleague, and friend at NUL between 1997 and 1998. Paseka continued to participate in several other SABONET courses held during 1997 and 1998: two database courses, fern identification (Malawi, November 1997), grass identification (Lesotho, December 1997), aquatic plant identification (Botswana, March/April 1998) and a threatened plants course (South Africa, June 1998). Paseka certainly took SABONET's philosophy of "learning by doing" to heart, always keen to volunteer for tasks and enthusiastically participating in activities associated with the various training courses. He was always prepared to go the extra mile when required.

In September 1998 the SABONET Steering Committee approved support for several students to study for postgraduate degrees at southern African universities; Paseka was one of the first to be supported in this way. He successfully completed his BSc(Hons) in Botany at the University of Cape Town in 1999, and his MSc (Systematics and Biodiversity Science) at the same university the following year. Paseka returned to Lesotho after two years full-time study in Cape Town in 2001. He was set to continue his already significant contribution towards the study and documentation of Lesotho's flora, using all the skills and knowledge he had learnt during his two years of study, when his life ended so tragically.

I shall always remember Paseka as a hard-working, friendly, generous, talented, enthusiastic and committed person, who always lived life to the full. He was always willing to help others, wherever he could. For example, he spent a few days with Patrick Phiri (Zambia) at NUL in December 1997, sharing his knowledge and experience of working with the PRECIS Specimen Database. In 1998, he also spent a week in Gaborone, Botswana, assisting staff of the National Herbarium with databasing their collections. Paseka, before leaving for his two years of study at the University of Cape Town, was personally responsible for computerising ca 6 000 herbarium specimens (nearly half the total collection) at the Roma Herbarium in Lesotho. Paseka was also a regular contributor to *SABONET News* in providing the region with information on project-associated activities in Lesotho.

In the few years that Paseka was involved in the SABONET Project, he made friends wherever he went within the southern African region. Paseka will be sadly missed by all those who had the privilege of meeting and getting to know one of southern Africa's most committed and talented young botanists. On behalf of all those members of the greater SABONET family around southern Africa, I would like to offer Paseka's family and close friends my sincerest condolences for their great loss and the grief they are experiencing at this time. Paseka will be sorely missed by all those who knew him and who knew what he had contributed to southern African botany.

We mourn the loss of Paseka, a man whose career was just unfolding and who was at the prime of his life.

—Christopher Willis
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South Africa
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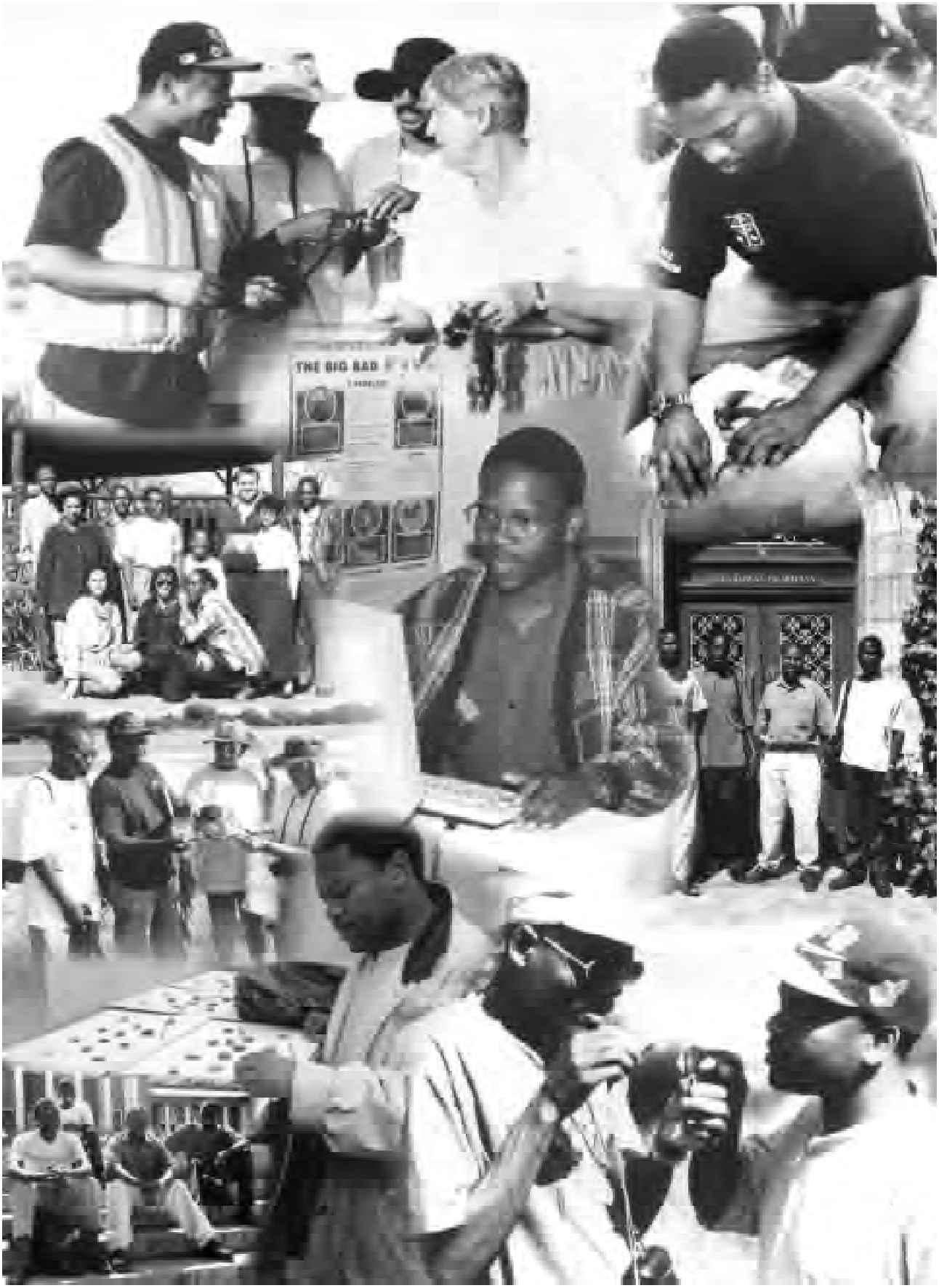


(Collage by Sandra Turck, Graphic Design Services, National Botanical Institute, Pretoria.)

I am sorry to hear of the untimely death of Paseka. Having attended several SABONET courses with him I got to know him as a fun-loving, cheerful and enthusiastic person, to mention but a few characters of his personality. To his mourning family and friends I would like to offer the following words of comfort.

Sorrow Helps Our Souls to Grow

There's a lot of comfort in the thought
That sorrow, grief, and woe
Are sent into our lives sometimes
To help our souls to grow
For through the depths of sorrow
Comes understanding love,
And peace and truth and comfort
Are sent from GOD ABOVE

Helen Steiner Rice

Paseka will be sorely missed by the friends he made through the SABONET Project.

—Esmerialda Klaassen
National Botanical
Research Institute
Namibia

I'm very sorry to hear of Paseka's death. I remember him well from the Zomba fern identification course and really enjoyed his cheerful personality and sharp mind. Not only have we lost a young fern supporter but a valuable botanist from southern Africa. Go well, Paseka.

—John Burrows
Buffelskloof Private
Nature Reserve
Lydenburg

The tragic and untimely death of Paseka Mafa came to me as a great shock. I heard of his passing way only a week after he died. I spent just over two years with him walking the same paths, experiencing many pressures together and enjoying many breakthroughs and successes together. We always encouraged each other to press on. Paseka was always a friend to talk to and derive strength from when the academic pressure was heavy. His great sense of humour was always an antidote for the common stresses of student life.

I noticed in him a tremendous build up of academic ability and enthusiasm during the two years we trained together. We shared many future research collaboration aspirations. Alas, these can no longer be fulfilled.

Personally, I feel a great loss of a wonderful colleague, friend and budding botanist who also held tremendous promise for his country in the field of systematic botany and biodiversity science. I shall greatly miss him. I pray for solace and peace of mind to all his family members and friends.

May his soul rest in peace.

—David Chuba
University of Zambia
Herbarium (UZL)
Lusaka

I was terribly disturbed by the tragic death of our colleague Paseka Mafa. I met Paseka soon after the inception of the SABONET Project when we attended the SABONET Pteridophyte Identification Course in November 1997 in Zomba, Malawi. His jovial and friendly personality won him a lot of friends among the participants.

We had the wonderful privilege in 1998 to meet again in Cape Town as the first group of SABONET-sponsored postgraduate students. Together with David Chuba and Claid Mujaju, we became a well-knit family, ready to fly the SABONET flag high. Paseka contributed immensely to our happy stay in Cape Town. He would use his personal car to get us to and from Upper Campus when the shuttle service had closed down.

He was always a positive, humorous, result-oriented young man who was committed to the development of botany in Lesotho in particular and the region at large.

Paseka will be remembered for his enormous contributions to the SABONET programme in terms of the work he did both in Lesotho and the region.

—Ezekeil Kwembeya
National Herbarium (SRGH)
Harare
Zimbabwe

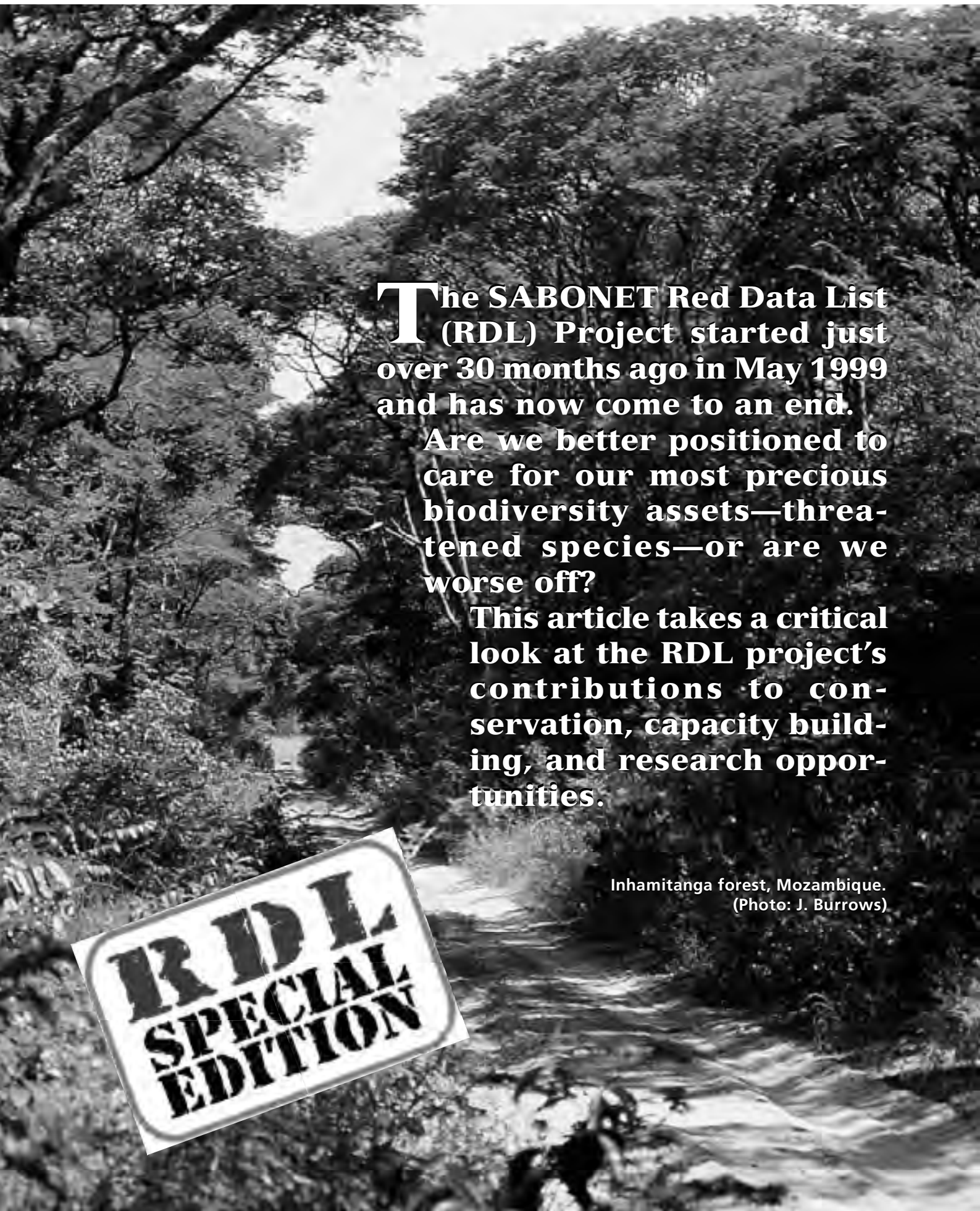
I was saddened by the news that Paseka had passed away in a tragic car accident in Roma. I met Paseka at the first SABONET Herbarium Management Course in Pretoria in 1996. He was always friendly and cheerful and we immediately became friends. I last heard from him in April this year when he sent me an e-mail to inform me that he had successfully completed his Masters at the University of Cape Town. He indicated that he was looking forward to the SABONET Mozambique expedition planned for November 2001. The thought of having him on the expedition was exciting, as his contribution would have been very useful to the southern African countries, particularly Mozambique. Unfortunately, this can no longer happen.

Southern Africa has lost one of its greatest young botanists. Go well Paseka!

—Samira Izidine
INIA Herbarium (LMA)
Maputo
Mozambique

Red Data Lists in Southern Africa

Past, Present, and Future



The SABONET Red Data List (RDL) Project started just over 30 months ago in May 1999 and has now come to an end.

Are we better positioned to care for our most precious biodiversity assets—threatened species—or are we worse off?

This article takes a critical look at the RDL project's contributions to conservation, capacity building, and research opportunities.

Inhamitanga forest, Mozambique.
(Photo: J. Burrows)

RDL
SPECIAL
EDITION

Collectively, the ten countries of southern Africa (Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe) contain 30 000–32 000 plant species in an area covering more than 6 million km^2 (Morat & Lowry 1997; *Flora Zambesiaca* volumes). Some 46% of the world's known succulents, which are highly desirable collector's items, occur in the south-westernmost parts of southern Africa, making it the world's richest arid area (Smith *et al.* 1997). Furthermore, the world's smallest and most diverse plant kingdom, the Cape Floristic Kingdom, is also found here (Cowling & Hilton-Taylor 1997).

Yet many countries in southern Africa are poorly equipped with resources and expertise to monitor and evaluate this great natural heritage for the benefit of future generations (Müller 1994; Huntley et al. 1998).

Indeed, many plant species, known and unknown, are being lost in southern Africa. In a region plagued with political and land tenure vagaries, the future of this botanical heritage and the ecological processes that sustain it, is fraught with uncertainty (Attwell & Cotterill 2000). Systems to monitor the status and trends of biodiversity can play an important role in minimising excessive species losses, and Red Data Lists are at the forefront of these monitoring systems.

RDLs are capable of evaluating the extinction risks of all kinds of species based on biological criteria that are exclusive of social, economic, and political considerations. RDLs do not take into account whether or not species are utilised or whether they are high-profile species; they do not discriminate against species that are little known or poorly studied. Evaluating the extinction status of species using apolitical approaches is an objective, and hence a sophisticated, method for encouraging conservation buy-in from diverse agenda groups.

For this reason, the World Conservation Union's Regional Office, based in Harare (IUCN-ROSA, Zimbabwe), commissioned SABONET to compile plant Red Data Lists for its ten member countries. This task started in May 1999, using the IUCN Categories and Criteria of the IUCN-Species Survival Commission (IUCN 1994).

History of RDLs in Southern Africa

The SABONET RDL is not the first account of threatened species produced for the region. South Africa's Ecosystems Programme, under the auspices of the Council for Scientific and Industrial Research (CSIR), was the first body in Africa to adopt concepts of species extinction and threat. The Threatened Plants Programme was launched in 1974. Six years later, Hall *et al.* (1980) published the first list of threatened plants for southern Africa (Namibia, Lesotho, Swaziland, South Africa, and Botswana) through the Ecosystems Programme. The publication included 1 195 taxa. In 1985, Hall and Veldhuis published a Plant Red Data Book restricted to the Fynbos and Karoo biomes of South Africa (*ca* 17% of the land surface area). Although the study area was much smaller than that of the previous publication, 1 808 taxa were identified. Several additional lists were compiled; then, after a long dormant spell, a comprehensive RDL of southern African plants for five countries was published in 1996 (Hilton-Taylor 1996a, 1996b, 1997). It was a marked improvement on previous publications, as 4 149 plants were identified over the same area that had been studied by Hall *et al.* (1980), and these were more objectively categorised.

Compiling the SABONET RDL

Many SABONET-member countries are still in the process of compiling baseline information in the form of national flora checklists. Only South Africa (Arnold & De Wet 1993) and Namibia (Craven 1999 and subsequent changes and additions) have, to date, completed checklists. The absence of a national checklist is a serious obstacle when it comes to compiling a Red Data List (RDL) as there is no logical reference point for species occurrences in a country or the taxonomic identity of the species in question. Thus, the next best reference point is Flora volumes.

The SABONET-RDL Project relied heavily on *Flora Zambesiaca* (ed. G.V. Pope) as a surrogate for estimating distribution ranges and scarcity. Flora volumes were found to be of limited value for RDL compilation in Malawi, Mozambique, Zambia, and Zimbabwe. This limitation sparked a series of recommendations being drawn up regarding the format of Flora volumes so that Floras would be more useful for Red Listing and other conservation-related purposes (Golding & Smith 2001).

The responsibility for threatened plant conservation usually falls squarely on the shoulders of statutory bodies involved in biodiversity and protected area management. At least, this is usually the case in countries that have national checklists and reliable ecological data. Since SABONET is a regional network of herbaria, the RDL project has mainly concentrated on herbaria as focal institutions during its operations. At the same time, throughout the world, and certainly in southern Africa, herbaria are the power-houses for compiling Flora volumes. Therefore, by default, many herbaria in southern Africa have become the focal institutions for RDL compilation. Further to this, although southern African herbaria are the compilers of RDLs, they are generally not the end-users of RDLs. End-users are people

Disa walleri.
(Photo: G. Williamson)

and institutions who use information products. The end-users of RDLs are researchers, conservation and resource manangers, decision-makers and politicians. Therefore, southern African herbaria have a very clear niche area in relation to threatened plant conservation (see Golding 2001).

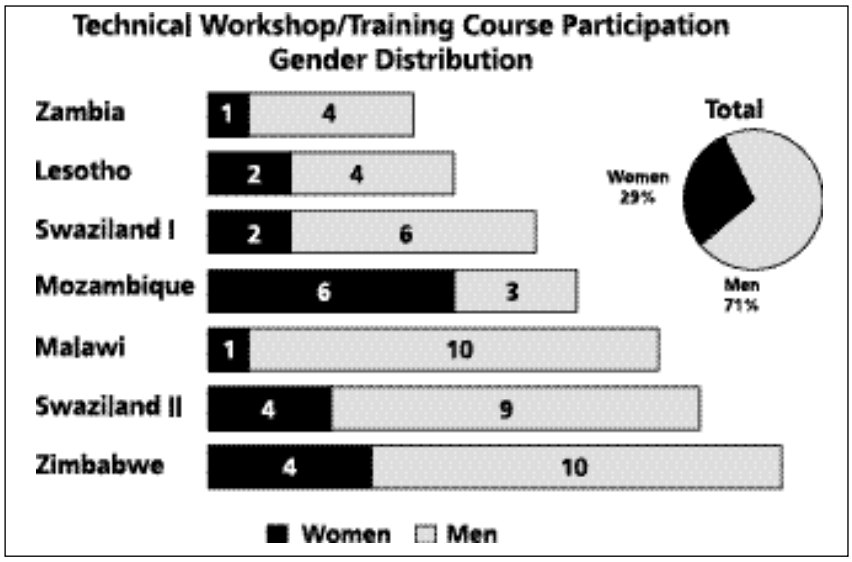
Has the SABONET RDL Achieved its Targets?

The planning of most large projects is usually summarised in a Logical Framework Matrix, commonly called a logframe. Logframes contain information that links the activities required to meet stated objectives, to various outputs. The main objectives for the SABONET-RDL project were to

- Increase the competence and knowledge base surrounding Red Data Lists and related concepts
- Increase networking and collaboration regarding threatened plant issues
- Publish the Red Data List in accordance with the guidelines set by the IUCN/Species Survival Commission

I explore each of these objectives in the following sections. (For a more detailed breakdown of the objectives, see the SABONET RDL logframe on page 165.)

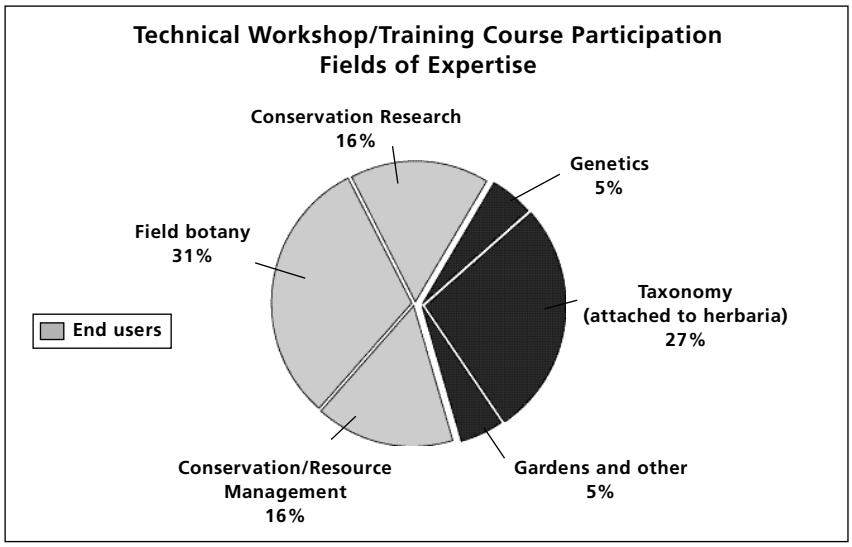
***Ficus muelleriana*, one of the rarest Moraceae. (Photo: J. Burrows)**



Training and Knowledge Sharing

Prior to the SABONET RDL, the only RDL accounts for countries beyond the Limpopo River (the *Flora Zambesiaca* region) were compiled during the last four years by the World Conservation Union (IUCN) (Walter & Gillett 1998; Hilton-Taylor 2000a) and the World Conservation Monitoring Centre (Oldfield *et al.* 1998). The SABONET member countries in the south have a relatively longer history of Red Listing. Clearly, the starting points for the SABONET RDLs were not the same in the different countries. To address this issue, working sessions that consisted of a training course component and a technical workshop component were held in a number of countries.

The purpose of the training courses was to provide insights on the use of the IUCN RDL system of categories and criteria (IUCN 1994), as well as the application methods of this system at national and subnational levels. It was important that participants understand RDL concepts and that they left working sessions with the potential to be involved in future RDL initiatives. The technical workshops brought together plant specialists (taxonomists, field ecologists, and so forth) and end-users to assign RDL statuses to species and to get consensus on these assessments. For the first time, field observations, ecological aspects, threats, and taxonomic information were all taken into account to make well-founded RDL assessments. These participatory sessions yielded more robust, multi-dimensional assessments than previous accounts, which generally relied exclusively on her-



Logframe

SABONET Red Data List logframe

Output	Monitoring Mechanism	Means of Verification
1. Increased competence in RDL assessments	Output 1.1	Output 1.1
1.1 **Trained** RDL compilers from the SABONET member countries	*Analysis of training figures kept in a database; analysis of evaluation sheets filled in by trainees. Analyses reflected in relevant SABONET and NETCAB reports.*	*Number of trainees (include gender ratios; country ratios; year-by-year increments). Proportion of trainees testifying that training was adequate.*
1.2 **Contributions** made to national RDLs by trainees	Output 1.2 *Inventorying the type of contributions made by trainees to RDL publications. Inventorying the number of nationals making RDL assessment contributions versus the number of non-nationals. Assess web site browsing frequencies; note any information requests. Analyses reflected in relevant SABONET and NETCAB reports.*	Output 1.2 *Number of requests, citations & acknowledgements (a combination of quantitative and qualitative data). Number and type of contributions. Number of hits on web site; information requests.*
1.3 **Collaboration** amongst the network members and other stakeholders	Output 1.3 *Inventorying the type of RDL-related collaborative work. Analyses reflected in relevant SABONET and NETCAB reports.*	Output 1.3 *Number and type of RDL-related collaborative work. Number of hits on web site; information requests.*
2. Increased networking regarding threatened plant issues	Output 2.1	Output 2.1
2.1 **Increased knowledge and awareness** of threatened plant issues amongst network members	*Inventorying when & who uses and requests RDL information, and for what purpose. Analyses reflected in relevant SABONET and NETCAB reports.*	*Number and nature of information requests (quantitative & qualitative).*
2.2 **Functional network** in place (eg. list-server, web site, discussion forums, publication dissemination)	Output 2.2 *Assess web site browsing frequencies; note information requests, partici pation at RDL discussion forums, articles, etc. Analyses reflected in relevant SABONET and NETCAB reports.*	Output 2.2 *Number of hits on web site; list-server contributions; information requests; number of contributions at RDL discussion forums.*
3. Documentation of the threatened status of the flora of the SABONET member countries	Output 3.1	Output 3.1
3.1 National level **contributions** towards the compilation of RDLs	*Note the number of nationals making a contribution towards the compilation of the RDL.*	*Number of nationals making a contribution towards the compilation of the RDL.*
3.2 RDL **published**	Output 3.2 *Qualitative standards of the publication are met (accurate nomenclature, accurate assessments) as per peer reviewers who are not directly attached to the Project.*	Output 3.2 *Publication meets standards set by SABONET Report Series and IUCN-Species Survival Commission (Red List Authority).*

RDL Species

Comparison with the number of plant RDL species from previous publications

Country	Walter & Gillett 1998	Hilton-Taylor 2000a	SABONET RDL
Angola	30	25	0
Botswana	7	3	42
Lesotho	25	0	90
Malawi	61	18	268
Mozambique	89	68	236
Namibia	75	12	1 598
South Africa	2 215	72	949*
Swaziland	42	8	306
Zambia	12	11	504
Zimbabwe	100	22	506

* in continuation

barium specimen information.

Interestingly, 71% of the participants were men. The explanation for this is the historical legacy that men have traditionally been the holders of botanical knowledge (specialists). The situation of gender imbalances is certainly not unique to southern Africa. However, through SABONET's other initiatives, this historical phenomenon is becoming more equalised through, for example, various training courses and university fellowships (see Siebert *et al.* 2001).

RDL end-users (conservation and resource managers, researchers, and field botanists) constituted 62% of the training course/technical workshop participants. End-users formed part of the process and were involved in tailor-making a product for their purposes.

Contributions to Conservation and Research

For the last forty years, RDLs have been recognised the world over as being important for conservation. Ferrar (1989) was one of the first to outline the benefits of RDLs for conservation in southern Africa. Generally, RDLs have the following benefits:

- Improve resource planning
- Add impetus to threatened species/habitat conservation
- Add more (commercial) value to indigenous resources
- Extend a greater degree of (legal) protection on natural assets against exploitative extraction.

Yet, many countries in southern Africa still seem to view RDLs as an impediment to development rather than a complementary strategy for development. How has SABONET contributed to developing RDL information?

The *Southern African Plant Red Data List,* to be published in the *SABONET Report Series*(Golding, in press), contains more than 4 300 records of plant taxa. There is a substantial increase in plant species in the SABONET RDL compared to Hilton-Taylor (2000a) and Walter & Gillett (1998). For example, the number of taxa on the RDL for Zambia is at least 33 times higher than on previous RDLs. This increase is similarly reflected in the Namibian RDL and those of most of the other countries.

In total contrast is Angola, where more than 25 years of civil war have made botanical work extremely difficult. Existing RDL information for Angola is patchy and outdated and provided no information for RDL compilers. This scant level of information is evident in previous RDLs; for example, out of a list of 30 taxa for Angola, 26 represented the genus *Euphorbia* and more than 65% of these were categorised as *Indeterminate*(Walter & Gillett 1998). In addition, the SABONET RDL for South Africa is preliminary and only 20–25% complete; it should be used in conjunction with previous RDL accounts.

The disparity around the varying number of plant species represented on RDLs is due to the availability, quality, and coverage of data. More poorly known species, those known only from type collections or from type localities, range-restricted species, and endemics have been included on the SABONET RDL. Species that are known or suspected to be overutilised and that were omitted from previous publications, were evaluated and have now also been included.

Compilers

Compilers and authors of the SABONET Red Data List

Angola	E. Costa, A. Dombo & G. Neto
Botswana	M. Setshogo & B. Hargreaves
Lesotho	S. Talukdar
Malawi	G. Msekandiana & E. Mlangeni
Mozambique	S. Izidine & S. Bandeira
Namibia	P. Craven & S. Loots
South Africa	J.E. Victor
Swaziland	T.S. Dlamini & G. Dlamini
Zambia	M.G. Bingham & P.P. Smith
Zimbabwe	A. Mapaura & J. Timberlake

Red List compilers have access to different sets of information, which sometimes leads to drastic variation in the numbers of species on RDLs. This may create some uncertainty or confusion, and may pose a setback in instances when conservation action is urgently required. End-users are most affected by what may be perceived as ambiguous sets of information. The IUCN/Species Survival Commission, the proponents of RDLs, recommend that RDL compilers work more closely with designated IUCN authorities (Red List authorities) who can endorse *bona fide* RDL compilations (see Hilton-Taylor 2000b).

Milestones

For the first time in southern Africa, RDLs were largely compiled by country nationals. Technical support was provided by SABONET in consultation with the IUCN/Species Survival Commission. Over and above the participation of individuals at the technical workshops/training courses, the RDL was refined mainly by taxonomists; the contributions of staff at Kew Herbarium (K) and the National Herbarium in South Africa (PRE) are gratefully acknowledged. Information about field observations and threatening processes were sourced from the SABONET member countries and was subsequently taxonomically refined mainly outside these countries. In this way, the compilation of the RDL was a well-supported partnership at the local, regional, and international level. The entire process from start to finish took place over a 30-month period with many lessons learnt along the way.

Some RDL Statistics

With more than 4 300 species assessed over 30 months, an average of 143 species were assessed every month; this is equivalent to seven species assessments per working day (Monday to Friday)! Without a volunteer network in place, this achievement would not have been possible.

In terms of finances and value for money, the RDL status for one species was determined for every US$3 spent at a technical workshop/training course. US$230 per person was spent on training at these working sessions (including travel, food, and accommodation costs). These figures clearly show that the SABONET RDL was a low-budget project (note that the figures are average costs). A substantially larger proportion of the funding was channelled into the publication of the List.

The Future

***Boophane disticha*, common outside Lesotho, but heavily utilised for medicinal purposes. (Photo: J. Golding)**

Threatened species and ecosystems and extinctions lie close to the heart of conservation. Until RDL concepts become firmly entrenched within countries' developmental agendas, conservation efforts will be seen to ignore people issues, and efforts for retaining threatened species for the benefit of future generations will come to little. Compiling future RDLs for southern Africa will confront us with many challenges, including the following:

- Studies relating to plant collection, field monitoring, and taxonomy should be continued and expanded.
- The latest IUCN 2001 RDL system of categories and criteria (IUCN 2001) should be applied.
- Efforts should be shifted towards forging stronger working links with the IUCN/Species Survival Commission and other international and regional organisations for continuous updates of information for coping with rare and threatened species.
- Ongoing cross-border collaborative work in countries of the region should be encouraged.

With the successful completion of the SABONET RDL Project, southern African herbaria are better positioned than ever before to become more involved in integrated efforts for threatened plant species conservation.

Additional contributions to the SABONET Red Data List were received from the following persons who were unable to attend the working sessions:

C. Archer, R. Archer, J. Beyers, D. Bridson, C.L. Bredenkamp, P. Burgoyne, J. Burrows, S. Carter-Holmes, T. Cope, P. Cribb, A. Ellert, M. Ellert, N. Govender, D. Goyder, S.A. Hammer, P.P.J. Herman, C. Hilton-Taylor, P. Hoffman, P.J.H. Hurter, H. Kolberg, S. Krynaw, H. Kurzweil, I. la Croix, B. Liltved, H.P. Linder, M. Lotter, C. Mannheimer, L. Matos, L.B. Mwasumbi, D. Parry, A. Paton, R. Peckover, M. Pfab, P.B. Phillipson, D. Plowes, G.V. Pope, A. Radcliffe-Smith, B. Schrire, D. Simpson, Y. Singh, G.F. Smith, D. Snijman, A. Strugnell, T. Trinder-Smith, C. Turlton, F. Venter, K. Vollesen, W.G. Welman, C. Whitehouse, G. Williamson & P. Wilkin.

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ARNOLD, T.H. & DE WET, C. (eds.) 1993. *Plants of southern Africa: names and distribution*. National Botanical Institute.

ATTWELL, C.A.M. & COTTERILL, F.P.D. 2000. Postmodernism and African conservation science. *Biodiversity and Conservation* 9: 559-577.

COWLING, R.M. & HILTON-TAYLOR, C. 1994. Patterns of plant diversity and endemism in southern Africa: an overview. In: B.J. Huntley (ed.), Botanical diversity in southern Africa,

Strelitzia 1: 31–52. National Botanical Institute, Pretoria, South Africa.

CRAVEN, P. (ed.) 1999. A checklist of Namibian plant species. *Southern African Botanical Network Report Series* No. 7 SABONET, Windhoek, Namibia.

FERRAR, A.A. 1989. The role of Red Data Books in conserving biodiversity. In: Huntley, B.J. (ed.) *Biotic diversity in southern Africa: concepts and conservation*. 136-147. Oxford University Press, Cape Town.

GOLDING, J.S. 2001. Southern African herbaria and Red Data Lists. *Taxon* 50(1): 593-602.

GOLDING J.S. (ed.) Southern African Plant Red Data Lists. *Southern African Botanical Diversity NetworkReport Series* No.14. SABONET, Pretoria. (In press)

GOLDING, J.S. & SMITH, P.P. 2001. A 13-point flora strategy to meet conservation challenges. *Taxon* 50(1): 593-602.

HALL, A.V. & VELDHUIS, H.A. 1985. South African Red Data Book Plants —Fynbos and Karoo Biomes. *South African National Scientific Programmes Report* 117: 1-160. Foundation for Research Development, Pretoria.

HALL, A.V., DE WINTER, M., DE WINTER, B. & VAN OOSTERHOUT, S.A.M. 1980. Threatened plants of southern Africa. *South African National Scientific Programmes Report* 45. 241 pp.

HILTON-TAYLOR, C. 1996a. Red Data List of southern African plants. *Strelitzia* 4. National Botanical Institute, Pretoria 117 pp.

HILTON-TAYLOR, C. 1996b. Red Data List of southern African plants. 1. Corrections and additions. *Bothalia* 26(2): 177-182.

HILTON-TAYLOR, C. 1997. Red Data List of southern African plants. 2. Corrections and additions. *Bothalia* 27(2): 195-209.

HILTON-TAYLOR, C. (compiler) 2000a. *2000 IUCN Red List of Threatened Species*. IUCN, Gland, Switzerland and Cambridge, UK. xviii + 61 pp.

HILTON-TAYLOR, C. 2000b. The IUCN/SSC Red List Program: Toward the 2000 IUCN Red List of Threatened Species. *Species* 33: 21-29.

HUNTLEY, B.J., MATOS, E.M., AYE, T.T., NERMARK, U., NAGENDRAN, C.R., SEYANI, J.H., DA SILVA, M.A.C., IZIDINE, S., MAGGS, G.L., MANNHEIMER, C., KUBIRSKE, R., SMITH, G.F., KOEKEMOER, M., DLAMINI, G.M., PHIRI, P.S.M., NOBANDA, N. & WILLIS, C.K. 1998. Inventory, evaluation and monitoring of botanical diversity in southern Africa: a regional capacity and institution building network (SABONET). *Southern African Botanical Diversity Network Report* No. 4. SABONET, Pretoria, South Africa. 73 pp.

IUCN 1994. *IUCN Red List categories*. Prepared by the Species Survival Commission. IUCN, Gland, Switzerland. 21 pp.

IUCN 2001. *IUCN Red List categories: Version 3.1*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

MORAT, P. & LOWRY, P.P. II. 1997. Floristic richness in the Africa-Madagascar region: a brief history and perspective. *Adansonia* 19(1): 101-115.

MÜLLER, T. 1994. The role a botanical institute can play in the conservation of the terrestrial biodiversity in a developing country. *Biodiversity and Conservation* 3: 116-125

OLDFIELD, S., LUSTY, C. & MacKINVEN, A. 1998. *The world list of threatened trees*. World Conservation Press, Cambridge, United Kingdom. 649 pp.

SIEBERT, S., MÖSSMER, M., RUKAZHANGA-NOKO, N. & HAASBROEK, C. 2001. Has SABONET developed the regional botanical expertise it promised? *SABONET News* 6(2): 74-83.

SMITH, G.F., VAN JAARSVELD, E.J., ARNOLD, T., STEFFENS, F., DIXON, R.D. & RETIEF, J.A. (eds) 1997. *List of southern African succulent plants*. Umdaus Press, Pretoria, South Africa. 175 pp.

WALTER, S.K. & GILLETT, H.J. (eds) 1998. *1997 IUCN Red List of threatened plants*. Compiled by the World Conservation Monitoring Centre. IUCN, Gland (Switzerland) and Cambridge (United Kingdom). ixiv + 862 pp.

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Mwinilunga, local centre of diversity and endemism,

RDL SPECIAL EDITION

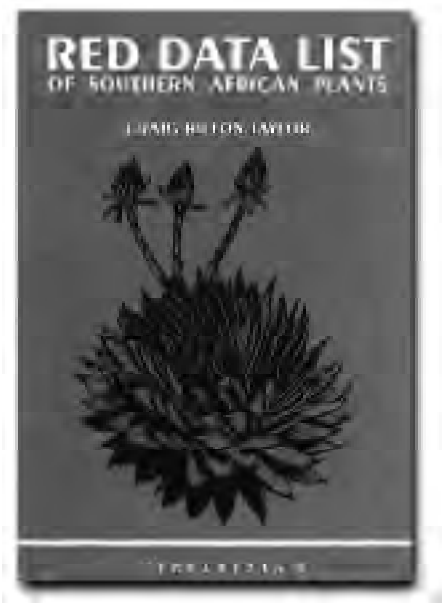
Plant Red Data Books
and the National Botanical Institute

South Africa has a strong recent history of producing Red Data Books (RDBs). Work on most of these was initiated in the 1970s after the first fairly reliable predictions and extrapolations on tropical forest depletion had been published. These works were strongly supported by the Council for Scientific and Industrial Research (CSIR), and later the Foundation for Research Development (FRD), through the *South African National Scientific Programmes Report* series. The 1980s saw a massive output in this field for most of the biological groups, ranging from plants (Hall *et al*. 1980) to microfauna and terrestrial mammals. In the case of plants, herbarium records played an important role in predicting a reliable status of threat. These works represented very good first approximations of information and were aimed at informing the process of conserving threatened taxa. Not surprisingly, the first generation of RDBs was very soon out of print, indicating that end-users were finding them useful.

A geographically somewhat more restricted second round of refining the RDB for plants was done by Hall and Veldhuis (1985) for the Cape and Karoo floras; this publication also went out of print rapidly. Shortly thereafter, in 1989, the National Botanical Institute (NBI) of South Africa came into being, following the amalgamation of the National Botanic Gardens of South Africa and the Botanical Research Institute. Through the effective consolidation of these organisations the stage was set for revitalising the well-established process of producing plant RDBs. In 1996 the NBI published a very good third approximation (Hilton-Taylor 1996), which five years later is still the standard reference for determining the threatened status of the flora of southern Africa. At the same time that the NBI published this RDB, the criteria for allocating a threatened status were extensively revised, making some of the older RDBs somewhat less than useful. The process of revising and refining the criteria has been ongoing.

As part of the process of co-financing some of activities of SABONET, the Networking and Capacity Building Programme for Southern Africa (NETCAB) of the southern African office of the World Conservation Union (IUCN-ROSA) supported the production of an RDB for plants for all ten SABONET countries. With the initiation and execution of this project over the past few years, this first-ever plant RDB for the subcontinent will again take its rightful place on the shelves of all biologists, environmentalists, and planners working in the region. The NBI, as SABONET's implementing agency, was once again closely associated with the production of this RDB.

Through these initiatives it is clear that the NBI has established itself as an African leader in producing plant RDBs. It is anticipated that the Institute will continue to play this pivotal role in producing future updates of this indispensable source of information on the conservation biology of our magnificent flora.



Craig Hilton-Taylor's *Red Data List of southern African plants*, published by the NBI in 1996.

RDBs are not an end in themselves: they represent the necessary starting points for adequate planning and consolidation of research and monitoring efforts in conservation science. It is imperative that threat identification and alleviation be performed rapidly and effectively. We also need accurate taxonomies reflecting the true identity and circumscription of threatened taxa—predictive classifications supported by user-friendly identification tools are necessary items to ensure the adequate documentation of threatened taxa. The publication of the SABONET RDL should therefore lead in a new phase of interdisciplinary, integrative conservation biology.

HALL, A.V., DE WINTER, M., DE WINTER, B. & OOSTERHOUT, S.A.M. 1980. Threatened plants of Southern Africa. *South African National Scientific Programmes Report* 45: 1-244. Council for Scientific and Industrial Research, Pretoria.

HALL, A.V. & VELDHUIS, H.A. 1985. South African Red Data Book Plants - Fynbos and Karoo Biomes. *South African National Scientific Programmes Report* 117: 1-160. Foundation for Research Development, Pretoria.

HILTON-TAYLOR, C. 1996. Red Data List of southern African plants. *Strelitzia* 4: 1-117. National Botanical Institute, Pretoria.

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Mozambique RDL Workshop— Implementation and Dissemination

1° Seminário Nacional para a Definição de Acções e Estratégias de Disseminação e Implementação do Plant Red Data List (Lista Vermelha de Plantas) de Moçambique

If one looks at examples from around the world, so often Red Data Lists (RDLs) are compiled but rarely used to strengthen grassroots conservation. Can RDLs be used as a mechanism to integrate a stronger conservation dimension into socio-economic development agendas in southern Africa? A workshop in Mozambique (29–31 August 2001) held at the Kaya Kwanga Complex addressed this question. The workshop was conducted entirely in Portuguese with *ad hoc* translation for the benefit of English speakers present.

The core objective for holding the workshop was to explore 'entry points' for the integration of threatened species and ecosystem concepts into existing conservation policy areas and legislation. The workshop was jointly hosted by SABONET, INIA, and IUCN-Mozambique. INIA (Instituto Nacional de Investigaçào Agronómica) is the host institution for SABONET-Mozambique, and the IUCN Offices are focal institutions for RDLs. Dr Isilda Nhantumbo, the Country Coordinator for IUCN-Mozambique, was the facilitator of the workshop. More than 40 participants represented the Mozambique NGO and public sectors.

The Deputy Minister of Agriculture, Fransisco Magáia, who arrived with an entourage of television and newspaper reporters, opened the workshop. Dr Calisto Bias, the recently-appointed Director of INIA, welcomed all present and expressed appreciation to SABONET for its contribution to the study of the flora of Mozambique.

Various presentations by invited speakers took place on the first day of the workshop. On the second day, the participants were divided into six working groups with the following themes:

- Environmental Impact Assessment (EIA) Reporting (group leader: Dr Felicidade Munguambe)
- State of Environment (SOE) Reporting (group leader: Dr Everisto Baquete)
- Incorporation of baseline data (Red Data Lists) into biodiversity 'value' criteria (group leader: Ms Carla Ruas)
- Cross-border movement of natural resources (group leader: Mr Sansão Bonito)
- *In situ* and *ex situ* conservation (group leader: Dr Salamaõ Bandeira)
- Legal Framework and enforcement (group leaders: Dr André Silva and Dr George Chicué)

The six working groups discussed strategies for incorporating RDL concepts into various policy areas of each theme. Best practice principles and workable solutions were discussed through a SWOT Analysis (Strengths, Weaknesses, Objectives and Threats). Each working group then presented the SWOT Analysis to the rest of the workshop participants.

Working Group Tasks

- Review existing biodiversity resource economics policies and legislation, and the existing *status quo*.
- Examine gaps in biodiversity resource economics policies and legislation.
- Explore the way in which RDL concepts and threatened (plant) species and habitats can be integrated into the existing policies and legislation.
- Identify possible difficulties in implementing biodiversity resource economics policies and legislation that incorporate issues surrounding RDL concepts.
- Suggest actions.

The ideas and recommendations made this workshop extremely successful and will be reported on in the next issue of *SABONET News*. Samira Izidine, the National Coordinator of the SABONET-RDL in Mozambique, is taking responsibility for the publication of the workshop proceedings. The Deputy Minister of Environment, Jaõa Carilho, closed the workshop.

Example: Incorporating baseline data (Red Data Lists) into biodiversity 'value' criteria

Rationale: The economic value of biodiversity is based on financial parameters principally determined by market costs. However, the economic value of biodiversity resources should also be determined in terms of rarity, endangerment, endemicity, and regeneration ability of species (sustainability). Usually, these biological factors are taken into account for wildlife and marine resources, but this is seldom the case for plant resources. For example, the economic value of indigenous timber trees is based only on the quality of wood and not whether the tree is rare, whether the tree is endemic to Mozambique, whether it is on the RDL, whether it is listed on CITES, and whether the tree has a good regeneration ability. According to best practice principles, these criteria should be taken into consideration when determining the economic value of indigenous timber trees. The valuation classification of non-timber products, such as medicinal plants, also needs to be reflected upon. Solutions such as a review of the existing classification system, reviewing the permit system, as well as certification of products should also be examined. In summary, additional criteria other than market costs should be used to determine the economic value of species.

IUCN
The World Conservation Union

Em Moçambique

Extinção de espécies vegetais vai afectar população rural

Three articles about the workshop have appeared in the main national newspaper; there were also two radio slots in Mozambique, one in Zimbabwe, and coverage on Television Portugal, which is broadcast to Portuguese-speaking countries around the world. This was a great opportunity to make the general public and politicians aware of threatened species, ecosystems, and RDLs. Similar initiatives should be taking place throughout the southern African region, if not to bring about immediate conservation results, then at least to disseminate the key findings of RDLs.

We wish to thank IUCN-Mozambique, particularly Dr Isilda Nhantumbo and Mr Köeti Seródio, and the various SABONET structures in Mozambique, too many to name here, for making this workshop possible. We would also like to thank Dr Calane da Silva (Coordinator: SABONET-Mozambique) and Dr Calisto Bias (Director: INIA) for their assistance and support. The presence of both the Deputy Ministers did much for the profile of the Workshop—thank you. Last but not least, we are grateful to Nyasha Rhukazanga-Noko and Raquel Matsinhe for their superb administrative and logistical planning without which this workshop would have been unmanageable.

Workshop participants. Pictured in the foreground is Mr Calane da Silva, the SABONET-Mozambique National Coordinator.

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Devido à falta de coordenação entre entidades

Perdem-se espécies valiosas de plantas

RDL SPECIAL EDITION

A AUSÊNCIA de coordenação entre as autoridades, nomeadamente do Ministério da Agricultura e Desenvolvimento Rural, Indústria e Comércio e até As Alfândegas, faz com que o país esteja a perder muitos recursos florestais valiosos, alguns dos quais pela via formal e outros, incluindo as plantas medicinais, por via informal. É assim que está em vista a criação no país de um Comité Nacional de Espécies Ameaçadas, com a missão de coordenar e dinamizar programas conducentes a assegurar a preservação de plantas em perigo de extinção.

A prevalência desta situação, segundo especialistas nesta matéria, poderá afectar algumas espécies em perigo de extinção, o que necessitam de acções urgentes de conservação.

Os participantes ao primeiro Seminário Nacional para Definição da Lista Vermelha de Plantas, que ontem terminou em Maputo, destacaram como uma das grandes prioridades a necessidade de o país possuir de planos holísticos para programas práticos que visam garantir a preservação das espécies em perigo de extinção. Sobre esta questão e ao encerrar o referido encontro João Carrilho, Vice-Ministro da Agricultura e Desenvolvimento Rural, chamou a atenção para a necessidade de os referidos programas assegurarem a contínua utilização dos recursos, mas de forma sustentável.

O programa da Lista Vermelha de Plantas já tem em Moçambique um total de 548 espécies ilistadas, das quais 144 são endémicas e mais de 20 encontram-se fortemente ameaçadas de extinção. O desaparecimento dessas plantas poderá ter reflexos negativos para cerca de 80 por cento da população moçambicana, que, segundo especialistas, delas dependem para fins alimentares, medicinais e até para a ornamentação.

João Carrilho disse que daqui para diante vai ser exigido um maior esforço de coordenação entre as várias instituições afins para que a Lista Vermelha de Plantas seja, de facto, um instrumento para se desencadearem acções na utilização dos recursos sem os degradar, mas também harmonizá-los para não prejudicar os aspectos económicos relacionados com o uso de determinadas espécies vegetais. No seu entender, a implementação das decisões do encontro ontem terminado irá contribuir para garantir que a diversidade florística seja preservada e que a população moçambicana possa usar esses recursos para sempre. A Lista Vermelha de Plantas em Moçambique deverá ser divulgada este mês.

Entretanto, sem avançar números, Isilda Nhantumbo, coordenadora do Programa da União Mundial para Natureza (IUCN) disse que o tráfico de espécies vegetais em Moçambique é uma realidade. Afirmou que em quase toda a fronteira oeste que separa Moçambique dos países vizinhos existe uma grande transição de plantas medicinais, frutos silvestres e outros recursos que escapam ao sistema de controlo das entidades competentes.

"Sabemos que a Direcção Nacional de Florestas tem a responsabilidade de estabelecer cotas das várias espécies que estão contidas em várias categorias, desde as preciosas, de primeira ou de segunda, que normalmente são exportadas. O que acontece é que, por falta de articulação, mesmo que uma cota seja dada, por exemplo, ao Ministério do Comércio, que autoriza a exportação, não há informação precisa sobre as espécies. Eles categorizam as espécies madeireiras como apenas madeira serrada ou como toros ou ainda como coníferas, mas não há a descrição exacta do tipo de espécies. Dever-se-ia referir, por exemplo, que é Umbila que está a ser ameaçada e a quantidade que saiu é esta ou aquela, pois só assim é que poderemos determinar a implementação das medidas que serão adoptadas para controlar a sua exportação", explicou Isilda Nhantumbo.

A fonte acrescentou que para a concretização do plano de lançamento do Comité Nacional de Espécies Ameaçadas, já foi criada uma comissão "ad hoc", constituída por elementos da Universidade Eduardo Mondlane, Direcção Nacional para as Áreas de Conservação, Ministério da Coordenação da Acção Ambiental, Indústria e Comércio, bem como da União Mundial para a Natureza. Este organismo deverá, num prazo máximo de duas semanas, iniciar os trabalhos preparatórios para a constituição do referido comité.

Uma outra decisão tomada pelo seminário de Maputo prende-se com a necessidade da disseminação da Lista Vermelha de Plantas e de se começar a discutir, envolvendo as entidades que terão de tomar medidas para a implementação da conservação, o que deverá ser feito ao nível regional do Governo, das províncias e até dos distritos, sobretudo nas comunidades, que têm um papel bastante importante no controlo da exploração das espécies.

Participaram no encontro de Maputo representantes da Rede Diversificada de Botânica da África Austral (SABONET), da IUCN, MADER, MICOA, entre outras entidades do Estado e privadas.

A Lista Vermelha de Plantas é um programa regional que, para além de Moçambique, envolve também países como a África do Sul, Angola, Botswana, Lesotho, Malawi, Namíbia, Swazilândia, Zâmbia e Zimbabwe.

Para conter extinção de plantas

África Austral necessita de políticas de preservação

A COORDENADORA regional do programa de elaboração da Lista Vermelha de Plantas, Janice Golding, disse ontem em Maputo que os governos da África Austral necessitam de alocar mais recursos financeiros para a capacitação do pessoal e criação de políticas capazes de fazer valer a implementação de medidas de preservação mais adequadas, bem como aumentar o conhecimento sobre as espécies ameaçadas na região. Em Moçambique, primeiro país a passar à segunda fase de implementação do projecto denominado "Lista Vermelha de Plantas", calcula-se que mais de 20 espécies estão fortemente ameaçadas de extinção, o que a acontecer, poderá afectar cerca de 80 por cento da população moçambicana que delas depende para fins alimentares, medicinais e até para a ornamentação.

"Na região austral de África estima-se que cerca de 144 espécies estejam fortemente ameaçadas. Falando à margem do seminário regional sobre a Lista Vermelha de Plantas, que hoje termina em Maputo, Janice Golding considerou que, no geral, perto de 18 por cento da população desta região do continente africano vai se ressentir dos graves problemas a serem criados pelo desaparecimento dessas plantas, cuja ocorrência é em áreas da África do Sul, Moçambique, Angola, Botswana, Lesotho, Malawi, Namíbia, Swazilândia, Zâmbia e Zimbabwe.

"Estamos, ao nível África Austral, no âmbito da SADC, um projecto sobre a Biodiversidade e que está em implementação. Sentimos que há uma necessidade urgente de se incorporarem as espécies em políticas de preservação de espécies fortemente ameaçadas", afirmou.

A coordenadora regional do programa Lista Vermelha de Plantas indicou que a África do Sul é o maior país em matéria de capacidade de pessoal que neste momento trabalha na área. "Mesmo da presença desses especialistas, temos informações de que há certas espécies que já desapareceram por completo. O fenómeno acontece noutros países da região, porque estes cadastros bastante desactualizados, só foram elaborados no tempo colonial, e, como consequência, o que existe são suspeitas de que algumas plantas possam ter desaparecido", sublinhou a fonte.

Frisou que a seguir a Moçambique, África do Sul será o segundo país da região a passar para a implementação de acções que visam a conservação das plantas ameaçadas, com a realização de um encontro nacional sobre a matéria, previsto para o próximo mês. "Neste momento, todos os países, exceptuando Angola, já deram o primeiro passo para a compilação da lista", disse.

Em Moçambique a publicação da Lista Vermelha de Plantas ameaçadas está igualmente marcada para o próximo mês. Actualmente encontram-se alistadas 548 plantas, das quais 144 são consideradas endémicas.

É objectivo principal do seminário que hoje termina em Maputo estudar possibilidades e pontos de entrada para a incorporação do conceito Lista Vermelha de Plantas de Moçambique nas políticas de conservação. Os participantes, que representam várias entidades do Estado e outras agremiações regionais ligadas à conservação ambiental, realizam discussões sobre a avaliação de impactos ambientais; estudo e gestão ambiental; incorporação dos dados base (lista vermelha de plantas); valor da biodiversidade; e movimento transfronteiriço dos recursos florestais e quadro legal de sua fiscalização.

Gauteng Red Data Plant Policy for Environmental Impact Evaluations

RDL SPECIAL EDITION

Although it is the smallest province in South Africa, an estimated 16.8% of the South African population lives in Gauteng; the province has the highest population density (an estimated 365 persons per km^2) and the highest urbanisation levels (100%) in the country. Consequently, the biodiversity in Gauteng is highly threatened by industrialisation, mining, agriculture, and especially urbanisation, the latter owing to the current high demands for the provision of land and basic services to alleviate poor living conditions. At least 56% of the 25 Red Data (RD) plant species that are endemic or near-endemic to the province are assigned to either the *Critically Endangered* or *Endangered* IUCN Red Data categories. It is expected that this will increase once more information on the eight *Data Deficient* species is available.

In South Africa, impacts on the environment brought about by development are managed through compulsory environmental impact assessments (EIAs) required in terms of sections 21, 22 and 26 of the Environment Conservation Act of 1989. The Gauteng Department of Agriculture, Conservation, Environment and Land Affairs has recently completed a draft policy to assist with the evaluation of EIAs that concern RD plant species. Publication of this draft policy, inviting comments from interested and affected parties, is imminent.

Essentially the policy is based on a provincial priority-ranking scheme that ranks RD plant species from the highest priority species in the province to the lowest. RD plant species are grouped into provincial priority groupings as follows:

- Species endemic to Gauteng—A1 priority grouping
- Species endemic to Gauteng and one other province or southern African country—A2 priority grouping
- Species endemic to Gauteng and

Gauteng

Red Data plant species in Gauteng with provincial rankings and provincial priority ratings

Species	Provincial Ranking	Priority
Khadia beswickii	1	A1
Delosperma macellum	2	A1
Ceropegia decidua subsp. *pretoriensis*	3	A1
Delosperma purpureum	4	A1
Delosperma gautengense	5	A1
Holothrix micrantha	6	A1
Cineraria longipes	7	A1
Lotononis adpressa subsp. *leptantha*	8	A1
Melolobium subspicatum	9	A1
Habenaria mossii	10	A1
Delosperma vogtsii	11	A1
Delosperma knox-daviesii	12	A1
Delosperma framesii	12	A1
Dicoma pretoriensis	12	A1
Agrostis eriantha var. *planifolia*	12	A1
Harveya anisodonta	13	A1
Delosperma davyi	14	A1
Encephalartos middelburgensis	15	A2
Eulophia coddii	16	A2
Aloe peglerae	17	A2
Frithia pulchra	18	A2
Frithia humilis	19	A2
Nerine gracilis	20	A2
Lepidium mossii	21	A2
Delosperma leendertziae	22	A2
Cleome conrathii	23	A3
Brachystelma discoideum	24	A3
Trachyandra erythrorrhiza	25	A3
Holothrix randii	26	B
Cucumis humifructus	27	B
Eulophia leachii	28	B

two or more other provinces in South Africa or countries in southern Africa—A3 priority grouping
- Species not endemic to southern Africa—B

The policy contains two flow charts that indicate the process to follow when an environmental assessment falls within and outside an urban area, respectively. Three sets of guideline rules are included—rules for the *in situ* conservation of RD plant species within and outside urban areas, rules for the protection of suitable habitat within and outside urban areas, and rules for searching neighbouring sites.

Policy Principles

- In compliance with the Convention on Biological Diversity and Goal 1 of the White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity, the Gauteng provincial government is obliged to ensure that the RD plant species of the province are conserved.

- Species endemic to the province of Gauteng must be afforded maximum protection, as they occur nowhere else in the world.

- It is imperative that all populations of RD plant species are protected as conservation of only one population essentially ignores genetic diversity.

- *In situ* conservation is preferable to *ex situ* conservation.

- It is imperative that ecological processes maintaining RD plant populations are protected.

- It is vital that pollinators active within RD plant populations are conserved.

- Translocation of a RD plant population is an unacceptable conservation measure since the translocated species may have undesirable ecological effects on new habitats; translocation may result in rapid changes in the species itself, and translocations are expensive and rarely successful.

- Rural parts of the province should be protected from insensitive developments and urban sprawl or encroachment should be discouraged.

- RD plant species historically recorded on a site, but not located during searches within recorded flowering seasons, may be dormant due to unfavourable environmental conditions.

- Suitable habitat adjacent to known RD plant populations has a high probability of being colonised.

- A buffer zone extending from the edge of a RD plant population is required for protection against edge effects. A thorough survey of ecological literature indicated that edge effects extend anywhere between 20 m and 1 000 m into an area. Discussions with various ecological experts revealed that larger buffer zones are desirable; however, buffer zones of 200 m from the population edge could be regarded as an adequate minimum compromise for grassland systems.

Main Implications

- All known RD plant populations must be conserved *in situ* and protected with buffer zones of at least 200 m within urban areas and, depending on species priority grouping, between 300 m and 600 m outside urban areas.

- *In situ* protection should involve fencing off developments, providing for connectivity with adjacent natural vegetation, the compilation and implementation of ecological management plans, restrictions on the use of non-indigenous species within development landscaping, and the provision of resources for important pollinators.

- Suitably qualified specialists are to search development sites for all RD plant species recorded from neighbouring farms and from farms on which the development is proposed. Searches for inconspicuous species and species with high provincial priority (A1 species) must take place during recorded flowering seasons.

- When searches fail to locate historically recorded high priority RD species (all A1 species and narrowly distributed A2, A3 and B species) and a suitably qualified specialist concludes that the species may still occur on the site in a dormant or inconspicuous state owing to unfavourable environmental conditions, suitable habitat must be protected and managed ecologically as a natural open space.

If you would like to provide comments on this policy, please contact Michèle Pfab (contact details below). We would also be most grateful to hear from you if you have any information on the localities of any RD plant species in Gauteng or you know of any other plant species that warrants RD status.

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RDL SPECIAL EDITION

Swaziland Flora Protection Bill

Efforts to protect threatened plants in Swaziland date back to 1952, when the Government passed the Flora Protection Act, with no more than 50 taxa declared as "protected flora" and given the same level of protection. It was not until the mid-1990s that the process to update this legislation began. Through a process of consultation within botanical institutions in the country, more taxa were included in the schedule of protected plants and given various IUCN categories. Thi work culminated in the gazetting and advertising in the local media of the Flora Protection Bill towards the end of 2000.

The Bill has recently been approved by parliament and will become an Act as soon as the head of state signs it. The Bill is intended to replace the Flora Protection Act of 1952, and will provide more effective protection of plants. It should also help curb the adverse effects of deforestation, degradation, and depletion of indigenous plants owing to uncontrolled access and utilisation of plant and forest resources. A total of 206 taxa—0.6% of the country's flora—is now given protection in the Bill. This development coincides with the compilation of a Red Data List (RDL) for the country, through the support of the SABONET Project. Although the Flora Protection Bill does not cover all the RDL plants, it mentions at least 40%. The Bill also takes care of cross-border issues by prohibiting unauthorised trade in indigenous flora, especially protected flora. The term "protected flora" includes plants listed in the schedules appended to the Bill, plants listed in CITES, and all plants listed in RDLs for southern Africa.

The Flora Protection Bill contains the following broad items or provisions:

Definitions of terms used in the Bill, such as protected flora, indigenous flora, endemic flora, flora reserves, special habitat, etc.

Establishment of flora reserves, botanic gardens and protection of special habitats Under this heading the Bill authorises the minister responsible for flora protection to proclaim certain areas of land in the country as flora reserves, botanic gardens, or special habitats for the preservation of ecologically or economically valuable plants. Furthermore, sections 8(1)–(3) prohibit illegal entry into the flora reserves, botanic gardens and special habitats without a permit from the Minister.

A subset of the participants at the Swaziland Red Data List Workshop held in September 2000. Starting at the back, from left to right: B. Dlamini, J. Culverwell, R. Boycott, T. Dlamini, L. Dobson, P. Masson, N. Dlamini, K. Roques. (Photo: J.S. Golding)

Inclusion of plants in a schedule and unlawful picking of protected flora This clause gives the Minister responsible for flora protection the authority to keep a schedule of protected plants and the right to amend these schedules by including or excluding plants. The protected plants cited in the schedule may not be picked from the wild unless the minister or an authorised officer issues a permit, except in cases stated in clause 18 of the Bill.

Permits to pluck, cut, or uproot protected indigenous flora and prohibition of sale and export In the Bill, the harvesting of indigenous plant resources, such as the African Potato and Umvangati, for the purpose of sale or export is strictly prohibited. However, the Bill controls export of protected plant species to attain sustainable use by requiring that a permit be sought from the Minister of Agriculture and Cooperatives. Similarly, Section 15 states that persons wishing to collect protected plants for the purpose of research and scientific purposes are required to apply for a permit to do so, lest they are charged for contravening the provisions of this Bill. Under section 11 of the Bill, the minister may cancel the permit if a permit holder does not comply with the conditions of the permit.

Search for protected flora The Flora Protection Act gives power to law enforcement agencies, such as the police, customs officers, public officers, and officers empowered by the Swaziland Environmental Authority, to enter any land, premises, or vehicle to search for protected flora.

Registration of protected flora Section 12(3) of the Bill obliges the owner of land where protected

flora is cultivated to register such flora; failure to comply with this provision is punishable by law.

Environmental Impact Assessment (EIA) Section 16 of the Bill requires that EIA studies should include a detailed account of indigenous plants that are likely to be adversely affected by a development project. The EIA report should state the location, total land area, distance, and a list of the species to be affected, as well as their categories in the schedule of protected flora. Further, the project owner is obliged to ensure that proper mitigation measures are followed in accordance with the Swaziland Environmental Authority Act of 1992 and the environmental guidelines and regulations of 1996, 1999 and 2000. *Bona fide* Swazi Rural Dwellers are, however, exempted from the restrictions imposed by the Bill. They are free to collect and process plants outside flora reserves for their personal and domestic use, but not sale or delivery to any other person pursuant to any cause whatsoever, provided that this is done within the traditional structures governing such areas.

Prohibition of sale of indigenous plants and cross-border trade Trade in any plant listed in the Red Data List of Southern African Plants is prohibited under this Bill.

The Flora Protection Bill should be read together with other Environmental Acts such as the Swaziland Environmental Authority Act No 15 of 1992, Plant Protection Act No. 10 of 1959, and the Grass Fires Act No. 44 of 1955. It repeals the Flora Protection Act No. 45 of 1952. In cases where there is a conflict with any other legislation on matters pertaining to flora, the Flora Protection Bill has precedence over other legislation. It is appended with various schedules, including schedules of protected flora, application forms for permits to collect, sell, and export protected plants, as well as registration forms for protected plants under cultivation.

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RDL SPECIAL EDITION

Red Data Listing *in Lesotho*

The Red Data (RD) listing concept states the degree of threat to individual taxa in their wild habitat at local and global levels. RD listing has for a long time been the domain of academics. It therefore did not make sense to poorer countries where survival is of the utmost importance. However, the ratification of the Convention on Biological Diversity (CBD) obliged countries to adopt measures aimed at sustainable use of biological resources. The CBD acted as a driving force for good management of biological resources in countries that are parties to the Convention, for example, the formulation of policies and action plans, review of legislative frameworks, public participation campaigns, and implementation of conservation programmes. Lesotho, like the rest of the world, is still grappling with the provisions of the Convention, and in this regard, RD listing provides some of the indicators required for monitoring the status of the country's biological resources.

A pristine area in the Leribe District, Lesotho. (Photo: Tau Mahlelebe)

RD listing has been used extensively in Lesotho's State of the Environment Report (SOER) 1997, particularly in the Biodiversity chapter. Both the local and global conservation status of plant and animal species were reported. The report showed that some plant species, for example, *Smodingium argutum,* are already extinct in Lesotho, while others, for example, *Aloe polyphylla,* are endangered at both local and global levels. However, it was also shown that *S. argutum* was not even threatened at a global level. As a response to this problem, one would expect that government would look into the possibility of re-introducing the species.

According to Hilton-Taylor (1996, cited in Chakela 1999), during the period 1980 to 1995, the number of rare plant species in Lesotho increased from three to 21, vulnerable taxa from two to eight, and endangered taxa from none to two; during the same period, one taxon became extinct. This indicates pressure on biodiversity.

At the policy level, RD listing has also been used in the formulation of Lesotho's National Strategy on Biological Diversity: Conservation and Sustainable Use (National Environment Secretariat 2000).

RD listing has—and will continue having—a significant impact on biodiversity conservation policies and programmes that are being implemented locally. One of the notable developments is the Maloti–Drakensberg Transfrontier Conservation and Development Project, sponsored by the Global Environment Facility (GEF), which is intended to conserve the unique Afro-Alpine Zone between Lesotho and South Africa. The region has a high level of diversity and endemism. The justification for the project

makes reference to the occurrence of RD species within the area.

Other conservation projects include

- Conservation of mountain biodiversity in Southern Lesotho.
- Establishment of a botanical garden at Katse by the Lesotho Highlands Development Authority (LHDA), using plants rescued from the Katse and Mohale Reservoirs.
- As part of its campaign against over-exploitation of RD species, LHDA has developed posters showing that the use of such species is prohibited.

Since the Afro-Alpine biome of Lesotho is now in the spotlight thanks to the Maloti–Drakensberg-Transfrontier Project, the country's rich flora has now been revealed to the international community. A side-effect of this new prominence is biopiracy, which has the potential of adversely impacting on biodiversity in the country. The use of RD listing in assessing the status of different species would help Government to effect some conservation measures:

- More stringent legislative measures controlling the use of listed species, especially those that are threatened or endangered
- Accelerating initiatives such as *ex situ* propagation
- Reintroduction of locally extinct species should be considered.

Lesotho is yet to revise the proclamation (Legal Notice No. 36 of 1969) that protects historical monuments and relics, fauna and flora, to ensure that additional RD species are included. However, laws alone are not sufficient to deal with deteriorating biodiversity; Hayward, Schiller & Fowler (1999) have indicated that the Endangered Species Act of 1973 has not effectively protected the endangered species in the United States of America. The failure of the Act can be attributed to it being a command and control approach (a stick) rather than providing a carrot—incentives—to go with it.

RD listing is a wake-up call to governments and challenges them to come up with interventions aimed at salvaging species that appear in RD Lists. Indicators are essential tools for effective State of the Environment reporting, and RD listing provides such indicators, for example, degree of threat, vulnerability, rarity, extinction, and so on.

RD listing is a vital tool for decision-making. However, its usefulness depends on the extent to which governments and their partners are willing to make use of the information provided, to devise action plans, policies, and programmes that would help to curb the loss of biodiversity. As previously stated such interventions entail a review of legislation, *ex situ* and *in situ* breeding, establishment of botanical gardens and protected areas, and extensive awareness raising. It is therefore incumbent upon the Lesotho Government to report on progress made, or the threat status of different species in their next State of the Environment Report in 2002. The State of the Environment Report should be viewed as the barometer used to show the effectiveness of all the interventions that have been put in place. Since RD listing provides the required indicators, it goes without saying that it will continue to form an important part of the State of the Environment reporting process.

CHAKELA, K.Q (ed.) 1999. *State of the Environment Report, 1997.* National Environment Secretariat (NES), Maseru.

NATIONAL ENVIRONMENT SECRETARIAT. 2000. *National Strategy on Lesotho's biological diversity: conservation and sustainable use.* National Environment Secretariat (NES), Maseru.

HAYWARD, S., SCHILLER, E. & FOWLER, E. 1999. *1999 index of leading environmental indicators.* Pacific Research Institute for Public Policy, San Francisco, California.

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Marine Fishes: Are IUCN Red List Criteria Adequate?

The Red Data (RD) listing of plants and animals into categories of vulnerability has been with us for decades. This technique, developed by the IUCN, has not only proven to be a powerful tool in halting the extinction of some species, but has also created a significant mechanism to heighten public awareness of species survival issues. However, the criteria used to allocate species to the various categories were primarily developed for terrestrial species. In the case of marine animals, especially fishes, the criteria have not been very useful. Fishes are highly mobile, difficult to see, and often have unique life history characteristics that have a direct bearing on their survival capacity. While no marine fishes have ever been reported extinct, nearly two thirds of the world's major fisheries are in a seriously depleted state. Only 4.2% of the global RD listed species are marine, despite their great species diversity and value to humans. In fact, while marine fishes may not face immediate threats of extinction, in most cases their conservation continues to be a failure.

This problem was recognised by WWF and IUCN in a joint 1996 expert workshop in London. This group sought to identify specific shortcomings in RD-listing criteria for marine fishes and thence to develop guidelines for improving their classification. A summary of their conclusions, partly modified, is presented here.

Current IUCN Criteria

- *The risk of extinction* is poorly quantified, especially in the context of growth and reproductive rates.
- *Wide-ranging* depleted species are often not redlisted.
- *Declining populations* may in fact be well managed and secure.
- *Generation time* of fishes is often reduced with exploitation as mean size drops.
- Defining the proportion of *mature animals* is not always relevant in fishes.
- Polygon of absolute *Extent of Occurrence* is not useful in a large ocean.
- *Range size* is not useful as it is often too large and thus misleading.
- *Area of Occupancy* may ignore critical habitat types.
- Changes in *depth range* may not correspond with overall range.
- Threshold levels of *reproductive output* may fluctuate, especially in sex changing species.
- Exploited populations may have fewer *mature cohorts* to buffer against stochastic events.

Possible Solutions

- Improve understanding of species' life history and include relevant features as a weighting. This remains a problem and new criteria still need to be developed.
- Greater recognition of fisheries management systems.
- Use generation time derived from unexploited state.
- Apply spawner biomass per recruit techniques as percentage of virgin stock.
- Rely more on percentage decline in area of occurrence.

Guidelines for Improving Fish Classification

A summary of the conclusions of the joint expert workshop

Current IUCN Criteria	Possible Solutions for Application to Marine Fish
The risk of extinction is poorly quantified, especially in context of growth and reproductive rates.	Improve understanding of species' life history and include relevant features as a weighting.
Wide-ranging depleted species are often not redlisted.	This remains a problem and new criteria still need to be developed.
Declining populations may in fact be well managed and secure.	Greater recognition of fisheries management systems.
Generation time of fishes is often reduced with exploitation as mean size drops.	Use generation time derived from unexploited state.
Defining the proportion of **mature animals** is not always relevant in fishes.	Apply spawner biomass per recruit techniques as % of virgin stock.
Polygon of absolute **Extent of Occurrence** is not useful in a large ocean.	Rely more on % of decline in Extent of Occurrence.
Range size is not useful as it is often too large and thus misleading	Rather use % Area of Occupancy.
Area of Occupancy may ignore critical habitat types.	Include habitat specificity in occupancy criteria.
Changes in **depth range** may not correspond with overall range.	Consider fish in 3-D space and incorporate depth range.
Threshold levels of **reproductive output** may fluctuate, especially in sex changing species.	Consider reproductive behaviour, sex change, site fidelity, aggregations etc.
Exploited populations may have fewer *mature cohorts* to buffer against stochastic events.	Incorporate changes in age at maturity.

- Rather use percentage area of occupancy.
- Include habitat specificity in occupancy criteria.
- Consider fish in three-dimensional space and incorporate depth range.
- Consider reproductive behaviour, sex change, site fidelity, and aggregations.
- Incorporate changes in age at maturity.

The South African Red List of marine fishes has many anomalies. There are, however, good opportunities, technical capacity, and a willingness to improve this situation. A closer relationship between RD listing of marine fishes and the fisheries management strategies of the South African Marine Living Resources Act should be considered.

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Evaluating Data Deficient Taxa Against IUCN Criterion B

RDL SPECIAL EDITION

Many plant species on the eastern seaboard of southern Africa are habitat-specific. This is not surprising when one considers how varied the environmental attributes are; for example, rainfall varies from 500 to 2 000 mm per year, altitude from 0 to 3 300 m a.s.l; most geological groups of Africa are represented; steep mountain ranges and valley systems dissect the landscape; the influence of the sea, fire, and frost are wide-ranging. Put these and many others together and one has the potential for an exceptionally large number of distinct habitats—this is illustrated by the large number of documented bioclimatic groups in KwaZulu-Natal (South Africa), a total of 590.

If you know the geographical extent of a taxon's habitat and can evaluate the level of human-induced degradation of the habitat, you can apply IUCN Red List criterion B. This enables you to re-assess candidate threatened taxa and *Data Deficient* species for which there is no population data.

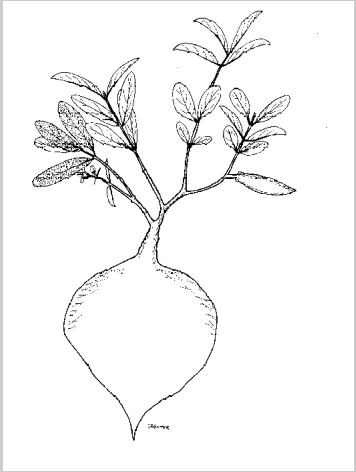
Example

Raphionacme elsana is currently listed as *Data Deficient*. We have no estimate of the number of individuals or trends in the population and can therefore not apply criterion C, D, or E. Generation period is not known and therefore use of criterion A is restricted. Applying the IUCN 2001 criteria (version 3.1), it rates as Vulnerable B1a,b(iii)—a higher threat status than *Data Deficient*.

The geographic extent of the original habitat is 900 km^2 (10 x 90 km). The Extent of Occurrence (EOO) is 600 km^2; however, we are not aware of enough locations of individuals to estimate the EOO (only six locations are known). Our only option is to use the geographical extent of the original habitat as the EOO, i.e. 900 km^2. (It cannot be greater than this because the taxon is assumed to not extend outside its habitat.) The limit for qualifying as *Vulnerable* is 20 000 km^2 and as *Endangered* is 5 000 km^2.

The population is estimated to be severely fragmented and this is inferred from habitat information (criterion B1a) as follows. Of the 900 km^2, 10% or 90 km is not suitable habitat, because many strips of dense riverine forest cross the area. Of the 810 km^2, that is suitable, approximately 90% has been transformed to cultivated lands, homesteads, and severely overgrazed

Raphionacme elsana is a geophytic herb up to 400 mm tall with a large underground stem (Venter & Verhoeven 1987). It is known from the eastern foothills of the Lebombo Mountains between Jozini and Ndumu in the Maputaland region of South Africa. It grows in open woodland of a mixed *Acacia* savanna and occurs in the moister parts of Acocks veld type Arid Lowveld, between 150–250 m a.s.l. (Scott-Shaw 1999). It could range into Mozambique and Swaziland; however, the soil type and rainfall is probably out of its range there.



***Raphionacme elsana*. (This line drawing by J. Venter is reproduced here with permission from the *South African Journal of Botany*.)**

and deforested woodland with very little or no prospect of sustaining subpopulations of *Raphionacme elsana*. The remaining suitable habitat of approximately 81 km² is widely fragmented across the 900 km² because the farms in the area are small and numerous.

How does one make these estimates? At least three options are possible and should enable one to reach similar estimates:

- Local knowledge gained from living in the area or travelling into it frequently.
- Use of aerial photographs, a geological map and a vegetation map to plot out the areas mentioned above and measured with a grid marked on transparent paper.
- Use of digital maps and Geographic Information Systems (GIS) software, such as IDRISI or ArcView, to model the distribution of suitable habitat and then quantify its decline by overlaying a current landcover layer.

Criterion B1b(iii) which quantifies continuing decline in area, extent and quality of the habitat, is met using the same estimates used above.

When we applied RAMAS Red List version 2.0.0.7 software, *Raphionacme elsana* rated as *Endangered*. Why should it not qualify as *Endangered*? Although the population is severely fragmented (potentially up to 81 isolated subpopulations at a km² scale on each of the estimated 81 fragments of suitable habitat), they are probably still close enough to allow genetic exchange.

Other Examples

Pelargonium tongense is a species with a similar profile to *Raphionacme elsana*. Its habitat is riverine forest and sand forest mainly to the east of the Pongolo River. The EOO is 800 km². It is known from at least ten extant locations, but the population is estimated to be severely fragmented. There is observed (and inferred) continuing decline in area, extent, and quality of the habitat for the same reasons as for *Raphionacme elsana*. Its revised assessment should be *Vulnerable* B1a,b(iii).

Encephalartos ngoyanus also has a similar profile. However, its habitat is deciduous forest and open woodland in rocky sites on the Lebombo Mountains between Mkhuze Game Reserve and Ingwavuma town. An outlier subpopulation occurs near Ngoye Forest—more than 100 km to the south. At a 4 km² scale the Area of Occupancy (AOO) is estimated to be 40 km² and ten extant subpopulations remain. There is observed (and inferred) continuing decline in AOO, area, extent and quality of the habitat, and number of locations. Its revised assessment should be *Vulnerable* B2a,b(ii,iii,iv).

Both *Encephalartos ngoyanus* and *Pelargonium tongense* could also possibly extend into Mozambique and Swaziland.

IUCN 2001. *IUCN Red List Categories: Version 3.1*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

SCOTT-SHAW C.R. 1999. Rare and Threatened Plants of KwaZulu-Natal and neighbouring regions. KwaZulu-Natal Nature Conservation Service, Pietermaritzburg.

VENTER, H.J.T. & VERHOEVEN, R.L. 1987. *Raphionacme elsana* (Periplocaceae), a new species from Natal, South Africa. *South African Journal of Botany* 53,2: 177-179.

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Big trees are felled for charcoal production.

Historically, Malawi's forests occupy 3.6 million ha, of which 97% is indigenous forest, mostly miombo woodlands (Malawi Government 1994). The total forest cover of Mwanza District in southern Malawi is approximately 231 025 ha (Anonymous 1993). There are two gazetted Forest Reserves in Mwanza, namely Tsamba and Thambani. Tsamba covers 3 237 ha and Thambani 10 670 ha; about 94% of the forest cover in Mwanza District is under customary land tenure.

In 1998, Mwanza District had a population of 138 015 (statistics supplied by the Malawi Government). People practice subsistence agriculture and cultivate mainly maize and potatoes for food, and tangerines and cotton for sale on local markets. Like most Malawians, the people of Mwanza live below the poverty line, and rely on forest resources to survive. Rural communities in Mwanza rely on forests as a source of vegetables, fruit (e.g. *Flacourtia indica* and *Ximenia caffra*), and mushrooms to supplement their diet; forests also provide fodder and building poles. The forests are also a source of firewood and charcoal; indeed, Mwanza District is considered to be

The Impact of Charcoal Production on the Miombo Woodlands of Mwanza District, Southern Malawi

Logs ready to be burnt. (Photo: National Herbarium, Malawi)

Curing the charcoal in a furnace. (Photo: National Herbarium, Malawi)

the main charcoal producer in southern Malawi.

This study was done to assess the impact of charcoal production on the vegetation of miombo woodlands of Mwanza. Charcoal producers were interviewed using a questionnaire designed to collect information on the process of charcoal production and the species used. Transect walks in forests where charcoal is produced were used to confirm the identity of tree species and to assess vegetation damage caused by charcoal production.

Preliminary results showed that 12 species, half of which are in the legume family, are preferred in charcoal production. Eight other species are used when those preferred become rare in the area. About 30 mature trees from 10 to 20 m in height produce 50–60 bags of charcoal—over 100 trees are lost monthly through charcoal production. The study showed that the process of charcoal making is very destructive since it involves felling of all big trees and curing in a furnace. In addition, the fire destroys all vegetation in and around the furnace. Most of the charcoal production is done in forest, on customary land. This suggests that although charcoal production is illegal, there is no legal provision to stop charcoal producers harvesting from customary land forest. The Government is at the moment encouraging formation of village forest bylaws to prevent deforestation due to charcoal production. This approach is likely to be ineffective as long as there are no alternative sources of income and no cheaper sources of energy for urban people.

This study has shown that the miombo woodlands of Mwanza are threatened due to non-sustainable charcoal production. In order to come up with conservation measures, we propose to conduct more research to determine the regeneration capacity of deforested areas, quantify the forest under threat, and document other species being destroyed during charcoal production.

Charcoal Production

Most preferred species

Sclerocarya birrea (Anacardiaceae)
Diplorhynchus condylocarpon (Apocynaceae)
Brachystegia boehmii (Caesalpinioideace)
Julbernardia globiflora (Caesalpinioideace)
Combretum imberbe (Combretaceae)
Combretum molle (Combretaceae)
Diospyros kirkii (Ebenaceae)
Acacia nigrescens (Mimosoideae)
Lonchocarpus capassa (Papilionoideae)
Pterocarpus angolensis (Papilionoideae)
Pterocarpus rotundifolius (Papilionoideae)
Kirkia acuminata (Simaroubaceae)

Charcoal Production

Less preferred species

Ozoroa reticulata (Anacardiaceae)
Bauhinia petersiana (Caesalpinioideae)
Tamarindus indica (Caesalpinioideae)
Combretum fragrans (Combretaceae)
Terminalia stenostachya (Combretaceae)
Pseudolachnostylis maprouneifolia (Euphorbiaceae)
Strychnos innocua (Loganiaceae)
Dalbergia nyasae (Papilionoideae)

This survey was undertaken using SABONET funds. I am grateful to Dr Augustine Chikuni for encouraging me to write this report and to the charcoal producers who willingly responded to my questionnaire.

ANONYMOUS. 1993. *Forest resources, mapping and biomass assessment for Malawi*. Satellitbild, Kirona, Sweden and Department of Forestry, Lilongwe, Malawi.

MALAWI GOVERNMENT. 1994. *National Environmental Action Plan, Volume 1*. Department of Research and Environmental Affairs, Malawi.

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The end product: charcoal. (Photo: National Herbarium, Malawi)

Charcoal burners sell bags of charcoal along the Mwanza road. (Photo: National Herbarium, Malawi)

Cape Conservation Unit Strategic Plan 2001–2005

The Botanical Society of South Africa has recently published the Cape Conservation Unit Strategic Plan for the period 2001–2005 in the form of a full-colour brochure.

The CCU concentrates exclusively on conservation issues in the Greater Cape Floral Kingdom. This 200 000 km² area comprises habitats of exceptional local and international significance, spanning two internationally recognised biodiversity hotspots—the Cape Fynbos and the Succulent Karoo—as well as Bushmanland and the Thicket Biome. The biodiversity hotspots are identified on the basis of exceptional biodiversity and degree of threat.

The Greater Cape Floral Kingdom contains more than 12 000 plant species, 80% of which are endemic, and it is home to approximately 2 300 Red Data Book plant species, all of which are threatened by human impacts. Paramount among these rapidly escalating threats are alien plant invasions, land transformation (mainly for agriculture), mining, urbanization and increasing demand for very limited water resources.

The CCU recognises that urgent attention be given to priority areas that possess outstanding conservation value and which are especially vulnerable to threats.

The brochure is available from the Botanical Society of South Africa, Private Bag X10, Claremont 7735, South Africa; fax: (27) 21 761 5983; botsocsa@gen.co.za.

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Threatened Plants *and* Southern African Botanical Gardens

***Freylinia visseri*—Endangered. (Photo: Kirstenbosch NBG Slide Collection)**

Botha and colleagues (2000) define a botanical garden as "an institution where plants are grown and displayed for the purpose of research, conservation, education, and recreation in order to promote an understanding, love, and appreciation of the diversity of plant life". Botanical gardens have been involved, with varying degrees of success, with *ex situ* plant conservation efforts around the world, and specifically in southern Africa, for many years. Two recent publications have served to strengthen efforts of southern African botanical gardens in this area: the *International Agenda for Botanic Gardens in Conservation* (Wyse Jackson & Sutherland 2000) and *Action Plan for Southern African Botanical Gardens* (Willis & Turner 2001) clearly identify *ex situ* conservation of wild plants and the development of integrated threatened plant programmes as a central and unique role of botanical gardens. As noted in the IUCN's draft *Ex Situ* Conservation Policy (IUCN 2001), the use of *ex situ* conservation is likely to become more important as species are increasingly threatened in the wild.

At a regional workshop held in Pretoria National Botanical Garden in March 2001—attended by representatives from 18 southern African botanical gardens—an action plan for cooperation amongst southern Africa's botanical gardens was developed, with the overall vision being that each garden will have an indigenous threatened plants programme in place by 2004. In response to a request from southern African botanical gardens at this workshop, Botanic Gardens Conservation International (BGCI) staff agreed to prepare guidelines for developing threatened plant programmes in botanical gardens.

Botanical gardens cannot ensure the conservation of threatened plants on their own. They need to develop and strengthen genuine partnerships. The *Botanic Gardens Conservation Strategy* (1989) states that

> The purpose of *ex situ* conservation is to provide protective custody. It is justifiable only as part of an overall conservation strategy to ensure that species ultimately survive in the wild. Its role should be seen as a means to an end, not an end in itself: as a source of material for reintroduction into damaged habitats and to enhance populations as part of ecosystem management, for selecting material introduction into the nursery trade, local agriculture, amenity planting and local forestry....

To ensure the conservation of threatened plants, clearly identified programmes must be developed, including partners from government departments, conservation agencies, NGOs, landowners, local communities, private enterprise, and universities, as well as from other botanical gardens and research institutions. Cooperation should not only be sought at a local or national level, but also at a regional and international level (particularly between gardens in developing and developed countries of the world). The recent initiation by BGCI of the Worldwide Checklist of Plants in Cultivation in Botanic Gardens is timely, and should go a long way towards promoting international collaboration and sharing of resources. It also forces southern Africa's botanical garden staff to determine exactly which threatened plant taxa are currently in cultivation. In practice, both *ex situ* and *in situ* conservation methods should be regarded as mutually reinforcing and complementary approaches.

Within the National Botanical Institute (NBI), the development of threatened plant programmes provides one of the few areas that really require coordination and meaningful and effective cross-directorate collaboration between plant taxonomists, biodiversity policy experts, plant red data list coordinators, horticulturists, ethnobotanists, plant ecologists, interpretation officers, and environmental education staff. The development of an integrated threatened plants programme within the NBI is important if we are to be effective and succeed in our plant conservation efforts. In the Gardens Directorate, where our botanical gardens serve as the primary interface between the NBI and the public, we need to be efficient, effective, and learn from past experiences. Experience has also taught us that we require continuance or maintenance programmes for specific collections to ensure their

***Moraea neopavonia*—Vulnerable. (Photo: Kirstenbosch NBG Slide Collection)**

***Encephalartos woodii*—Extinct in the wild. (Photo: Kirstenbosch NBG Slide Collection)**

sustainability in cultivation and to have garden curators and management committed to the cultivation of particular threatened plant taxa.

The cultivation of threatened plants in southern African botanical gardens is certainly not a new concept. Kirstenbosch National Botanical Garden has been cultivating threatened fynbos taxa for many decades. The question one must ask, however, is how effective these programmes have been. How many of the threatened plants that we have in cultivation have been reintroduced successfully to the wild? What is the current status of these plants? We need to prioritise taxa, work closely with other interested and affected parties, and document our successes and our failures. Often, the failures are as important as the successes, as they give us the opportunity to learn from our mistakes, and improve our programmes for the benefit of the plant taxon concerned. It is also important to focus attention on one or a few threatened plant taxa, rather than try to deal with too many different taxa simultaneously, lowering the chances of successful propagation and eventual reintroduction to the wild. It is an unfortunate reality that many threatened plant taxa in southern Africa will never be cultivated in our botanical gardens. This is mainly due to the lack of capacity in the gardens, both human and infrastructural. We have to accept that it is not feasible and practical to cultivate the thousands of threatened plant taxa listed in the region's forthcoming Plant Red Data List. The possible storage of seeds of southern African threatened plant taxa in the Millennium Seed Bank (UK) should therefore be urgently pursued.

Southern African botanical gardens also need to advertise and market their efforts in *ex situ* plant conservation much more widely and aggressively than has been the case to date. The programmes also provide an opportunity to educate and raise awareness amongst the visiting public, supporters, and donors, as well as motivate for additional financial support for conservation efforts.

The *International Agenda for Botanic Gardens in Conservation* has identified 19 action points for botanic gardens involved with *ex situ* conservation programmes, as well as actions that networking organisations should take. These include the dissemination of information on effective *ex situ* conservation techniques, procedures, and priorities to help build capacity and standards of *ex situ* conservation in the region.

SABONET, the pioneer regional capacity building programme in southern Africa, has also committed itself to supporting threatened plant programmes in southern Africa's botanical gardens participating in the programme.

***Serruria florida*—Vulnerable. (Photo: Kirstenbosch NBG Slide Collection)**

This support includes the following:

- Technical workshops to discuss proposed threatened plant programmes
- The establishment of a regional monitoring team to evaluate threatened plant programmes in southern African botanical gardens
- Funding for the implementation of threatened plant programmes
- Support of staff exchanges between botanical gardens linked to the threatened plant programmes developed within the region

As we enter a new phase in the development of threatened plant programmes within southern African botanical gardens, let us reflect upon and study past practices, successes, and failures, and work together to ensure the *in situ* expansion and evolution of targeted threatened plant taxa—we require well-planned actions, enhanced documentation systems, regular assessments and monitoring of the *ex situ* conservation programmes.

BOTHA, D.J., WILLIS, C.K. & WINTER, J.H.S. 2000. Southern African Botanical Gardens Needs Assessment. *Southern African Botanical Diversity Network Report* No. 11. SABONET, Pretoria.

IUCN. 2001. *Draft (March 2001) IUCN Policy on the Management of ex situ populations for conservation* http://www.iucn.org/themes/ssc/memonly/exsitu.html.

IUCN-BGCS & WWF. 1989. *The Botanic Gardens Conservation Strategy*. IUCN Botanic Gardens Conservation Secretariat, Kew Richmond UK and WWF and IUCN Gland, Switzerland.

WILLIS, C.K. & TURNER, S. (eds) 2001. Action Plan for southern African botanical gardens. *Southern African Botanical Diversity Network Report* No. 12. SABONET, Pretoria.

WYSE JACKSON, P.S. & SUTHERLAND, L.A. 2000. *International Agenda for Botanic Gardens in Conservation*. Botanic Gardens Conservation International, U.K.

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The Role of Horticulture in Threatened Species Conservation

FSA Ethnomedicinal Taxa in Focus

From a First World perspective, Maunder *et al.* (1993) of Kew stated that "*ex situ* species conservation in highly diverse areas such as Zaire would constitute an obscene abuse of resources when the priorities should be sustainable development and protected area creation." To many southern Africans, Zaire seems far off—a tropical world apart. Yet how different really is southern Africa to Zaire in terms of botanical diversity, and the commitment, political will, and capacity to conserve this medley of life?

The *Flora of southern Africa*(FSA) region boasts not only a flora of approximately 24 500 plant taxa (Arnold & De Wet 1993), but also the Fynbos, one of only six Floral Kingdoms of the world. Although of roughly equal area to the FSA region, Zaire has far fewer Red Data Listed (RDListed) taxa than southern Africa (though this perhaps reflects less assessment attention), and a lower number of endemic vascular taxa (29% compared to 80%). Per unit area, southern Africa has 1.76 times the species diversity of Zaire (Cowling & Hilton-Taylor 1994). Whilst a reasonably large proportion of southern Africa's land surface has been "conserved" (Greyling & Huntley 1984), our understanding of ecology, phytogeography and patterns of endemism is constantly improving (Cowling & Hilton-Taylor 1994); this requires of us to periodically reassess the location and addition of protected *in situ* conservation sites. Development in our region is presently unsustainable, with direct negative consequences for the flora (Hilton-Taylor 1996) and indirect (direct?) consequences for humans (Davis & Wynberg 1996). At a time when the FSA flora is being actively bioprospected (for example, Gericke & Van Wyk, WO9746234-A1)—clear recognition of its economic value—higher plants are disappearing at an alarming rate; up to 1997, 62 taxa are known to have become extinct (Hilton-Taylor 1997).

Muthi in the Hot Seat

The unsustainable demand for ethnomedicinal or *muthi* plants is growing (Cunningham 1988; Mander 1998), leading to local extinctions (Crouch & Symmonds 2000) and increasing pressure on remaining wild stocks. This is evidenced not only in the character of interprovincial (Smith & Crouch 1999) and international trade (Marshall 1998), but by increasingly vocal demands for access to resources situated within the existing protected area network. Mander (1998) estimated that nearly 20 000 tonnes of plant materials are consumed annually in South Africa alone; such is the burden on popular species that nine of the top ten *muthi* plants traded in KwaZulu-Natal are now RDListed (Scott-Shaw 1999). Besides the impact of traditional usage, many other human-linked factors have contributed towards degradation of our plant genetic resources. A number of these have been detailed by Macdonald (1989), who after taking stock of human beings' negative role concluded that "the inevitable conflict between the demand for human use and requirements of natural ecosystems serves to illustrate the fundamental need to limit the growth of the human population if there is to be any long-term chance of conserving southern Africa's rich natural heritage."

In recent years, various positive moves (both preventative and restorative) have been made towards the promotion of sustainable development in South Africa. The institution of legal requirements for environmental impact assessments (EIAs) and the Department of Water Affairs and Forestry's "Working for Water" activities are two commendable examples. However, an integrated national or provincial approach to the conservation of medicinal plants has not been implemented or apparently even accepted in principle—and this in a nation where one third of all medical care is provided by the (plant-reliant) traditional health care sector (Mander 1998). Despite this deficiency, various independent socially and financially-motivated ac-

Traditional healers receiving basic horticultural training at the Silverglen Medicinal Plant Nursery in Durban. (Photo: Neil Crouch)

tivities are in evidence. Examples include a number of entrepreneurial ventures that have recently been established to grow a few select taxa for the trade and to further develop these into new marketable products. However, in the absence of effective cross-departmental action coupled to civil involvement, the majority of the *muthi* plant trade in southern Africa looks set to remain an agent of germplasm erosion rather than providing a mechanism for sustained utilisation, economic empowerment, and job creation.

Against this background, can South Africans justify sparing scarce resources for *ex situ* conservation efforts? *Should* horticulture even consider playing a role in conserving threatened species?

Horticulture as Part of an Integrated Strategy

The effective conservation of plant germplasm requires an integrated strategy: the interaction of various technologies, sciences, communities, institutions, and policies. These include the proclamation, creation and maintenance of reserves, environmental education, sustainable use promotion, law enforcement, taxonomy (basic knowledge of biodiversity), landscape restoration, botanic gardens, and seed and field genebanking. Horticulturists, as growers with some ecological skills, are well positioned to contribute to these last four endeavors in particular (Symmonds & Mattson 2001). Indeed, the vital role of botanic gardens has been recognised (FAO 1996), especially in view of the CBD obligations of ratifying countries, including South Africa (Wyse Jackson 1997). Both *in situ* and *ex situ* approaches may necessarily be involved in plant germplasm conservation programmes. These include

- Plant population/ecosystem restoration
- The reintroduction of lost taxa
- Genebanking
- The creation of alternative supplies to alleviate pressure on residual wild stocks. This would include commercial or subsidised cultivation, as has long been mooted (Gerstner 1946)!
- The horticultural promotion of specific threatened taxa. Such promotion may be at the specialist grower level (for example, succulent asclepiads, orchids), or through broader amenity horticulture of such showy species such as clivias.

All of these programmes require large numbers of propagated individuals, and hence depend upon horticultural skills and activities. When successfully implemented, such programmes promote germplasm preservation, albeit at a substantial cost. Plant reintroductions, for example, do not come cheap or easy (Akeroyd 1995). Despite this, conservation contributions are today clearly on the agenda of many of the world's botanic gardens (Wyse Jackson & Sutherland 2000).

Cheap, easy, and relevant. Low-technology propagation of *Bowiea volubilis* from bulb scales. (Photo: Neil Crouch)

Allocation of Horticultural Resources

Propagation may be achieved through sexual (seeding), traditional vegetative (grafting, division, cuttings, air layering, budding, etc.), or micropropagation routes. There are two extremes of approach to propagation: high technology (for example, micropropagation and heated cutting-bed facilities), and transferable low-level technologies (practicable in resource-poor regions, for example, water-wise approaches). Intermediate technologies (for example, shade-house facilities) fall between the two. A forthcoming publication (Arnold *et al.* 2001) reveals that 3 689 ethnomedicinal taxa have been reported from southern Africa; 156 of these are RDListed, and some 700 are known in the *muthi* trade. With such a large socio-economically important set of plants to consider for species recovery programmes, can South Africa afford investment in high technology approaches to propagation? If so, when is it appropriate to do so? Tissue culture as a means of mass-producing (usually clonal) plants has been used in South Africa, ostensibly to promote the conservation of particular subjects. The case of *Bowiea volubilis* serves as a good example of a fairly widespread yet threatened ethnomedicinal plant (Bircher *et al.* 1998) being adopted by micropropagators. Published accounts reporting on plantlet production include those by Jha & Sen (1985), Cook *et al.* (1988), Van Staden *et al.* (1991) and Hannweg *et al.* (1996). This array of protocols either reflects poor allocation of limited research resources, or the smart investment in various optimised micropropagation systems that sit on ice until they one day becoming serviceable. The usefulness of such protocols comes to pass when expensive (perhaps subsidised) commercial production is feasible. One example of this is the current attempt by the Greater Durban Metropolitan Council to produce, through micropropagation, large numbers of threatened medicinal taxa for a range of market participants. However, such a challenge is not a light one in a market where cheap plants (even RDListed ones) are still available, harvested from the wild with no production costs incurred by the gatherer. In the case of *Bowiea*, whether expen-

Basic tools for the job. Skills and technology transfer should be at an appropriate level. (Photo: Neil Crouch)

sive tissue culture should ever have been undertaken is questionable, given its ease of propagation by a variety of traditional (intermediate and even low technology) means (Symmonds *et al.* 1997). This less costly route should arguably have first been more thoroughly explored.

If, after determining that traditional propagation methods are problematic for a species, micropropagation may be deemed suitable (Fay 1994, 1996; Wellens 1998). This would include cases where taxa are RDListed or possess commercial potential. Even then, micropropagation should only be considered if

- Extremely limited mother stock is available (for example, one seed).
- Superior chemotypes or phenotypes have been identified.
- Taxa are CITES listed; sterile *in vitro* material limits the documentation required for international transfers.
- Seed is set only after many years (for example, *Ocotea bullata*).
- Little or no seed is set (for example, *Siphonochilus aethiopicus*).
- Recalcitrant seeds (desiccation-sensitive seeds which are difficult to store) are produced.
- The seeds are usually parasitised.
- Species are recognised as unsustainably utilised and so likely to become RDListed.

When selecting RDListed taxa as micropropagation subjects, cognisance should be taken of the reasons for their initial listing at a particular status. One Critically Endangered (CR) taxon may be substantially closer to extinction than the next and so demand priority! The new IUCN Red List categories, and the explicit allocations thereof (IUCN 1994) should facilitate this selection process.

What is Your Market?

Whether through tissue culture or more traditional methods, all plants produced by propagators should have a definite ready market, the supply of which supports genetic resource conservation. The market may take the form of reintroduction programmes, botanic garden plantings, poverty alleviation projects, or an alternative supply source for the traditional herb trade.

As specialist growers, horticulturists often find themselves the collectors and recipients of seeds of taxa of conservation concern. In cases where these propagules are recalcitrant (for example, *Warburgia salutaris*), the best method of maintaining taxa for long periods is presently in the form of cultivated plants, an obvious role for botanic gardens, arboreta, or specialist nurseries (Symmonds & Crouch 2000). Seeds that tolerate severe desiccation and can be stored dry (orthodox seeds) are easier and less costly to genebank, although careful management is still required. Practical recommendations for the management of orthodox seeds have been published (Wieland 1993), as have realistic approaches to the establishment and management of *ex situ* living collections (Leadlay & Greene 1998).

For the greatest conservation impact, the findings of horticultural research need to be broadly disseminated. (Photo: Neil Crouch)

One of the most important contributions to be made by horticulturists relates to the transfer of appropriate propagation and cultivation skills to traditional healers, empowering them to grow *muthi* in their challenging home environments (Crouch & Hutchings 1999). This home cultivation concept evidently has deep historical roots (Smith 1895; Schapera 1953). The most significant horticultural training contribution made to date has been by the Silverglen Medicinal Plant Nursery in Durban (Nichols 1990; Symmonds 1998), which has also developed and jointly published several propagation protocols. Whenever possible, technology should be transferred to traditional practitioners in the vernacular (for example, Mander *et al.* 1999) and only then when the advice is practicable.

Obscene Perspectives

Does the support of conservation-horticulture really represent an 'obscene abuse' of limited resources?

I believe that horticulture has a role to play in the conservation of the FSA flora, through varied, sensible, and adaptive contributions. Until *in situ* preservation of germplasm is inviolably guaranteed and enforced, the neglect of *ex situ* conservation in southern Africa would arguably be imprudent.

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AKEROYD, J. 1995. How to reintroduce a plant successfully. *Plant Talk* 2: 14-15.

ARNOLD, T.H. & DE WET, B.C. 1993. Plants of southern Africa: names and distribution. *Memoirs of the Botanical Survey of South Africa* No. 62. NBI, Pretoria.

ARNOLD, T.H., PRENTICE, C.A., HAWKER, L.C., SNYMAN, E.E.,

TOMALIN, M., CROUCH, N.R. & POTTAS-BIRCHER, C. 2001. Medicinal and magical plants of southern Africa: an annotated checklist. *Strelitzia 12*. NBI, Pretoria. (in press).

BIRCHER, C., PRENTICE, C., CROUCH, N. & SYMMONDS, R. 1998. Conservation concerns for *Bowiea volubilis*, an unusually succulent member of the Hyacinthaceae. *Herbertia* 53: 81-89.

COOK, E.L., CUNNINGHAM. A. & VAN STADEN, J. 1988. The tissue culture of an exploited Zulu medicinal plant, *Bowiea volubilis*. *South African Journal of Botany* 54(5): 509-510.

COWLING, R.M. & HILTON-TAYLOR, C. 1994. Patterns of plant diversity and endemism in southern Africa: an overview. In: Huntley, B.J. (ed.). Botanical diversity in southern Africa. *Strelitzia* 1. NBI, Pretoria.

CROUCH, N.R. & HUTCHINGS, A. 1999. Zulu healer muthi gardens: inspiration for botanic gardens displays and community outreach projects. *Proceedings of the 5th International Botanic Gardens Conservation Congress*. [http://www.nbi.ac.za].

CROUCH, N.R. & SYMMONDS, R. 2000. Relocalising the "Inanda" locality of John Medley Wood. *SABONET News* 5(2): 97-100.

CUNNINGHAM, A.B. 1988. *An investigation of the herbal medicinal trade in Natal/KwaZulu*. INR Investigational Report 29, Pietermaritzburg.

DAVIS, G. & WYNBERG, R. 1996. *Indigenous plant resources in South Africa*. Land and Agricultural Policy Centre Policy Paper 21, Johannesburg.

FAO. 1996. *Global plan of action for the conservation and sustainable utilisation of plant genetic resources for food and agriculture and the Leipzig Declaration adopted by the International Technical Conference on Plant Genetic Resources, 1996*. FAO of the UN, Rome.

FAY, M.F. 1994. In what situations is *in vitro* culture appropriate to plant conservation? *Biodiversity and Conservation* 3: 176-183.

FAY, M. 1996. Micropropagation as a tool in plant conservation. *Plant Talk* 4: 22-23.

GERICKE, N.P. & VAN WYK, B.-E. *World Patent WO9746234A1*: Pharmaceutical compositions containing mesembrine and related compounds. 1997. http://www.patents.ibm.com/details?pn=WO09746234A1.

GERSTNER, J. 1946. Some factors affecting the perpetuation of our indigenous silva. *Journal of the South African Forestry Association* 13: 4-11.

GREYLING, T. & HUNTLEY, B.J. 1984. Directory of southern African conservation areas. *SANSP Report* No. 98. CSIR, Pretoria.

HANNWEG, K., WATT, M.P. & BERJAK, P. 1996. A simple method for the micropropagation of *Bowiea volubilis* from inflorescence explants. *Botanical Bulletin of Academie Sinica* 37: 213-218.

HILTON-TAYLOR, C. 1996. Red Data List of southern African plants. *Strelitzia* 4. NBI, Pretoria.

HILTON-TAYLOR, C. 1997. Red Data List of southern African plants. 2. Corrections and additions. *Bothalia* 27(2): 195-209.

IUCN. 1994. *IUCN Red List Categories*. IUCN, Gland, Switzerland.

JHA, S. & SEN, S. 1985. Regeneration and rapid multiplication of *Bowiea volubilis* Harv. in tissue culture. *Plant Cell Reports* 4: 12-14.

LEADLAY, E. & GREENE, J. (eds) 1998 *The Darwin technical manual for botanic gardens*. BGCI, London.

MACDONALD, I.A.W. 1989. Man's role in changing the face of southern Africa. In: Huntley, B.J. (ed.), *Biotic diversity in southern Africa. Concepts and conservation*. Oxford University Press, Cape Town.

MANDER, M. 1998. *Marketing of indigenous medicinal plants in South Africa. A case study in KwaZulu-Natal*. FAO of the UN, Rome.

MANDER, M., MANDER, J., CROUCH, N., MCKEAN, S. & NICHOLS, G. 1999. *Ukutshala nokwazi imithi yokwelapha*. Catchment Action Series. Share-Net, Howick. [Zulu translation of the booklet *Growing and knowing muthi plants*].

MARSHALL, N.T. 1998. *Searching for a cure: conservation of medicinal wildlife resources in East and southern Africa*. TRAFFIC International, Cambridge.

MAUNDER, M., FAY, M.F. & UPSON, T.N. 1993. *Ex situ* and *in situ* approaches to plant conservation: two distinct options or complementary points on the conservation spectrum? In: Groves, M., Read, M. & Thomas, B.A. (eds), *Species endangered by trade—a role for horticulture?* Fauna and Flora Preservation Society, London.

NICHOLS, G.R. 1990. Making the medicine plants renewable: a conservation strategy in the Durban City Parks Department. *Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 23a: S.25-30.

SCHAPERA, I. 1953. *The Tswana. Ethnographic survey of Africa, southern Africa, Part 3*. International African Institute, London.

SCOTT-SHAW, R. 1999. *Rare and threatened plants of KwaZulu-Natal and neighbouring regions*. KZNNCS, Pietermaritzburg.

SMITH, A. 1895. *A contribution to South African materia medica* Juta, Cape Town.

SMITH, G.F. & CROUCH, N.R. 1999. Mesembs in the *muthi* market: *Lithops leslei* as an ethnomedicinal plant. *British Cactus and Succulent Journal* 17(3): 133-137.

SYMMONDS, R. 1998. Conservation through propagation. *Roots* 16: 31-33.

SYMMONDS, R., BIRCHER, C. & CROUCH, N. 1997. Bulb scaling and seed success with *Bowiea volubilis*. *PlantLife* 17: 25-26.

SYMMONDS, R. & CROUCH, N. 2000. Propagating the Pepper-bark tree (*Warburgia salutaris*) - the Silverglen experience. *PlantLife* 22: 24-26.

SYMMONDS, R. & MATTSON, M. 2001. Tomorrow's horticulture. Ecological and social dimensions. *Urban Green File* May/June: 45, 47-48.

VAN STADEN, J., ELMER-ENGLISH, C.W. & FINNIE, J.F. 1991. Physiological and anatomical aspects related to *in vitro* shoot initiation in *Bowiea volubilis*. *South African Journal of Botany* 57(6): 352-355.

WELLENS, R. 1998. *Tissue culture techniques as tools for conservation methods of rare plant material. In vitro propagation of haworthias* (Unpublished).

WIELAND, G.D. 1993. *Guidelines for the management of orthodox seeds* Centre for Plant Conservation, St. Louis.

WYSE JACKSON, P.S. 1997. Botanic gardens and the Convention on Biological Diversity. *Botanic Gardens Conservation News* 2(8): 26-30.

WYSE JACKSON, P.S. & SUTHERLAND, L.A. 2000. *International agenda for botanic gardens in conservation*. BGCI, UK.

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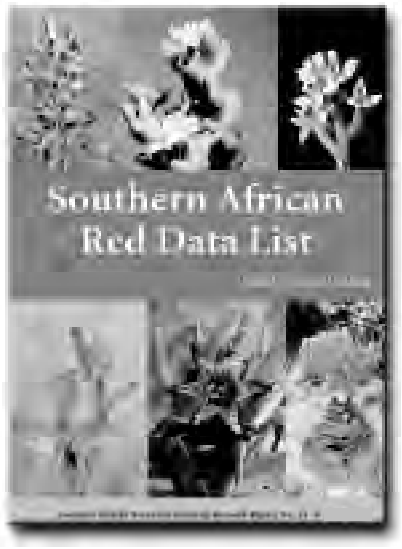
RDL SPECIAL EDITION

Sneak Preview

Southern African Red Data List



The long-awaited SABONET *Southern African Red Data List*—started in May 1999—is due to be published before the end of this year. The World Conservation Union's Regional Office, based in Harare (IUCN-ROSA, Zimbabwe), commissioned SABONET to compile plant Red Data Lists for its ten member countries.

The foreword was written by Craig Hilton-Taylor, who compiled the SABONET RDL's forerunner, the *Red Data List of southern African plants*, in 1996. Craig is currently the Red List Programme Officer for the IUCN/Species Survival Commission in Cambridge (United Kingdom).

A regional overview by Janice Golding, SABONET's RDL Coordinator and editor of the *Southern African Red Data List*, gives the reader background information and summarises the results for the entire region.

Each country's RDL forms a separate chapter of the book, starting with a fact sheet and an overview, followed by the country's red-listed taxa. The fact sheet lists relevant country statistics and summarises the RDL taxon numbers. Each chapter is identified by a colour-coded bar on the edge of the page, making it easy to find any particular country at a glance.

The list of taxa that follows the overview is arranged into three sections: EXTINCT & THREATENED, LOWER RISK, and DATA DEFICIENT. The EXTINCT & THREATENED section contains all *Extinct, Critically Endangered, Threatened,* and *Vulnerable* taxa. The LOWER RISK section comprises all taxa that were rated *Lower Risk,* with both *Near Threatened* and *Least Concern* subcriteria. The DATA DEFICIENT section contains all taxa with *Data Deficient* ratings. IUCN 1994 categories were used for all assessments. A handy concise guide to the IUCN categories and subcriteria is found on the inside front cover, making it easy for non-specialists to decipher the IUCN assessments of plants in the lists.

The book contains information on approximately 4 300 taxa. For ease of use, the taxa are arranged alphabetically under families, which are also arranged alphabetically within each section. Under each taxon name—in addition to the IUCN assessment—the endemism, threats, and distribution of the taxon are given. In most cases, there are also additional notes on the taxon.

A detailed index lists all families and species that are found in the book. Appendices include the 1994 and 2001 IUCN Red List Categories in both English and Portuguese, as well as the IUCN Guidelines for National Application of IUCN Categories.

The *Southern African Red Data List* will be published as part of the *SABONET Report Series* and will be distributed free of charge to interested persons. A CD with the complete Red Data List Database will also be available. **If you are interested in ordering the book and/or CD, send an email message to reddatalist@sabonet.org, including the phrase "Red Data List Order" in the subject line, and your name and mailing address in the body of the message. Alternatively, you can send a fax with the same information to (27) 12 804-5979, or write to Red Data List Orders, SABONET, National Botanical Institute, Private Bag X101, Pretoria 0001, South Africa.**

—Marthina Mössmer
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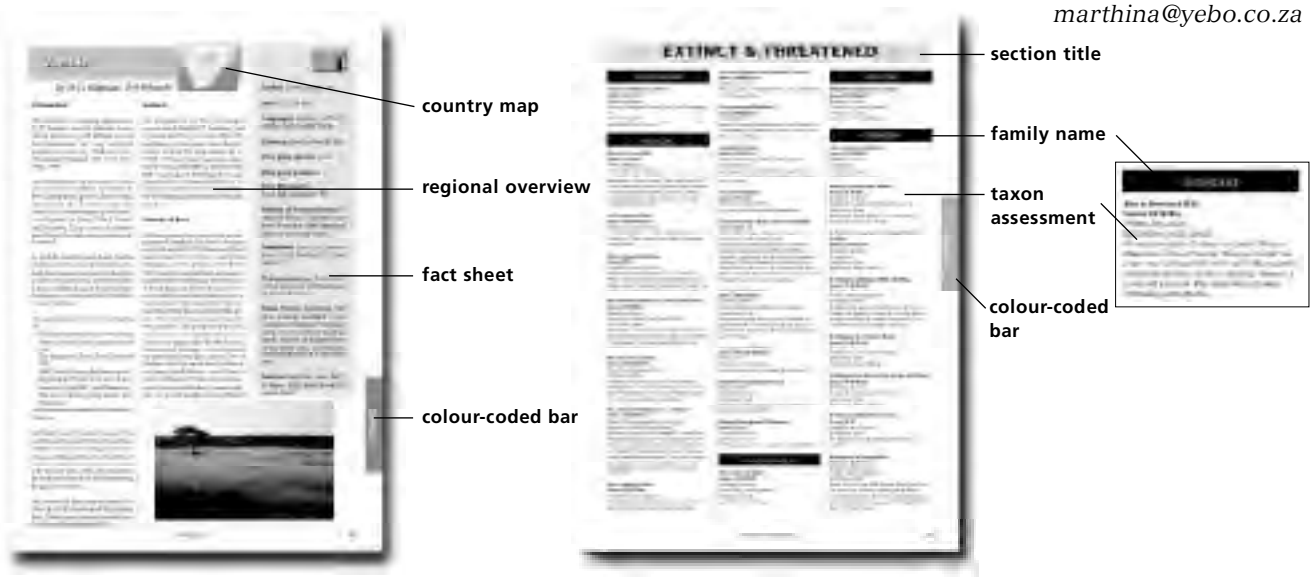

The Global Taxonomy Initiative:
Documenting the Biodiversity of Africa
Proceedings of the GTI Africa Regional Workshop

The Global Taxonomy Initiative (GTI) Africa Regional Workshop was held at the Kirstenbosch National Botanical Garden, Claremont, Cape Town, South Africa, during February–March 2001. We are pleased to announce that the proceedings of this workshop have been published as part of the National Botanical Institute's *Strelitzia* series.

Preparations for the GTI Africa Regional Workshop included a comprehensive taxonomic needs assessment as part of efforts to survey the needs of African taxonomic institutions in a global context. Results from this needs assessment form an integral part of the final report.

This extensive document (about 430 pages) is bilingual (English and French) to make its important contents more accessible to the many French-speaking people in Africa and other developing countries of the world. We are also considering making it available electronically. We will announce this in the first *SABONET News* of 2002.

The Proceedings will be distributed free of charge to all delegates and certain other institutions. Other interested persons or institutions can order a copy of the document at a nominal price.

For further information and to order copies please contact:

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Now it is up to you to make the GTI work for the benefit of all taxonomists and systematists!

—Ronell Klopper
GTI Africa Regional Workshop
Co-ordinator
National Botanical Institute
Private Bag X101
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—Gideon Smith
Office of the Research and Scientific Services Director
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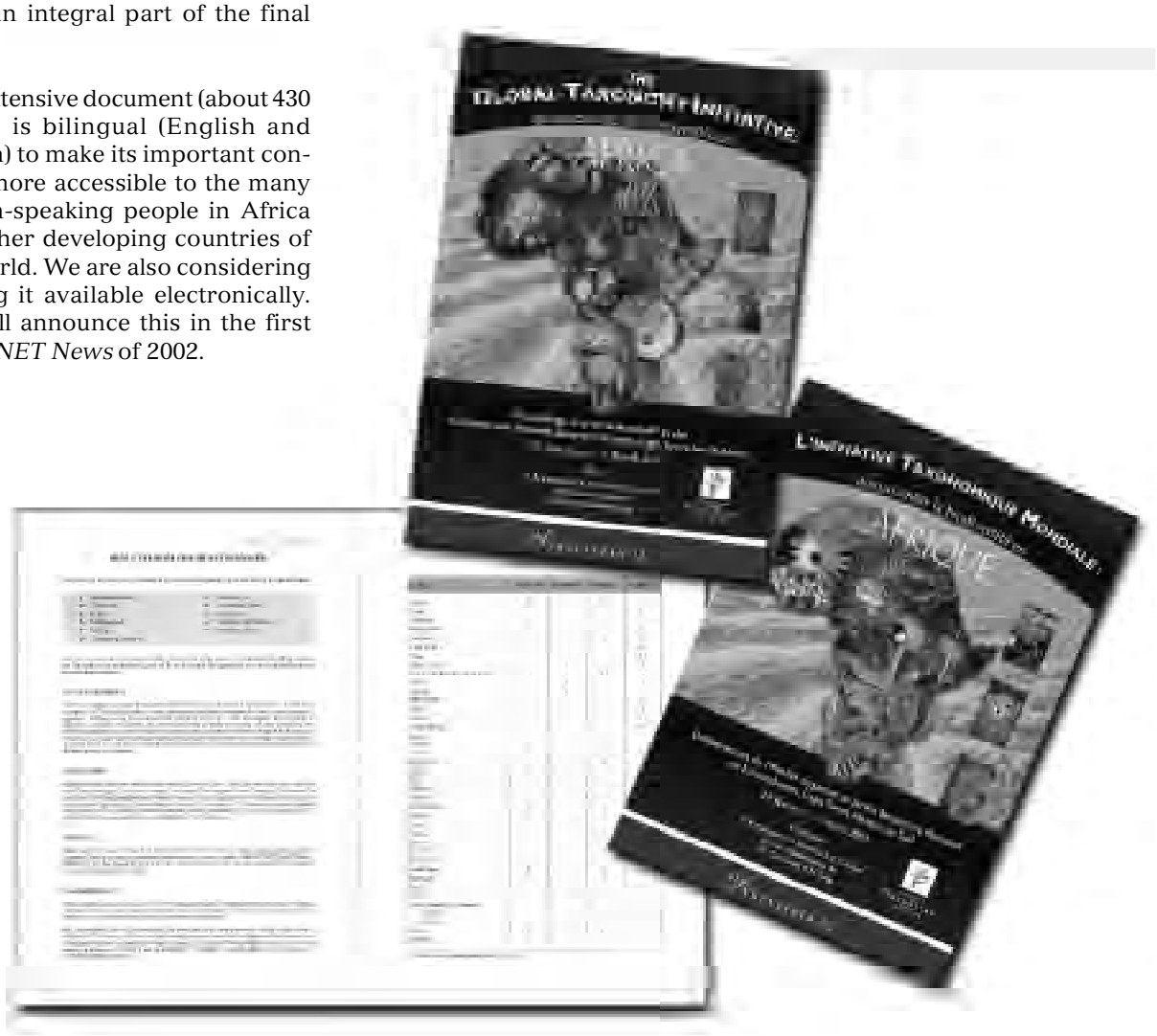
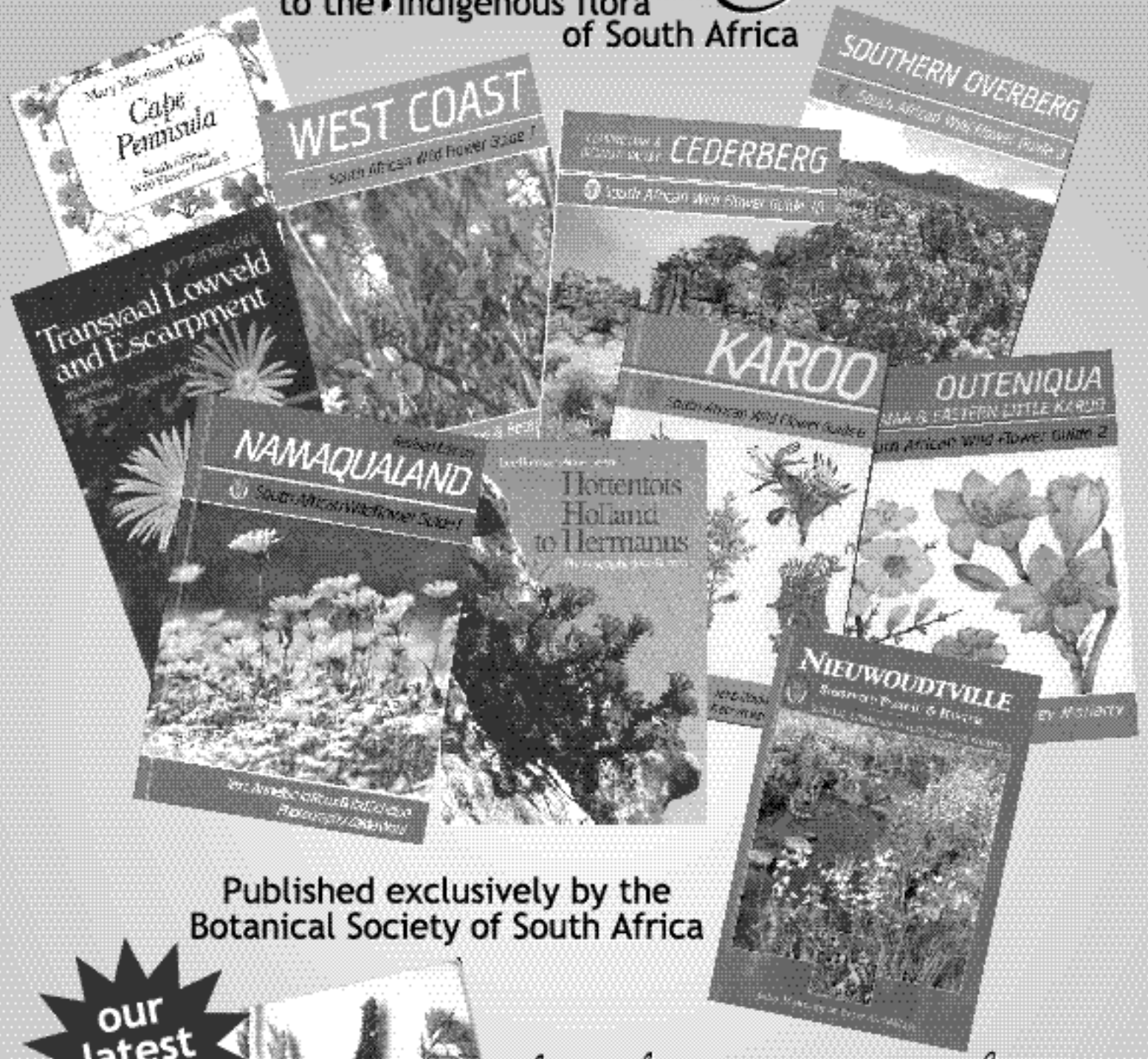


Wild Flower Guides

to the indigenous flora of South Africa



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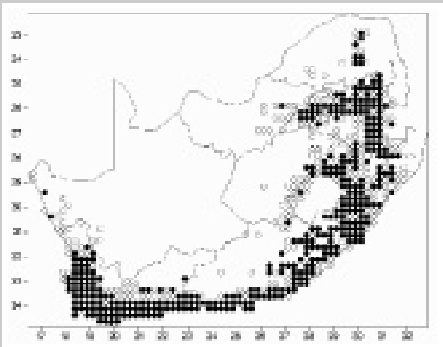
Die meeste titels is ook in Afrikaans verkrygbaar

invasive alien plants in

Part 2: The Legumes (Fabaceae)



Map showing the distribution of alien invasive acacias in South Africa. Bold dots indicate where they are abundant, forming stands.

Thirty-six (18%) of the 198 species listed as declared plants in South Africa belong to the Fabaceae or legume family. These plants are all invasive and regarded as harmful to the natural resources of South Africa. Legislation concerning their control, cultivation and trade are contained in the Conservation of Agricultural Resources Act, Act 43 of 1983, amended in 2001. (See Appendix for species list.)

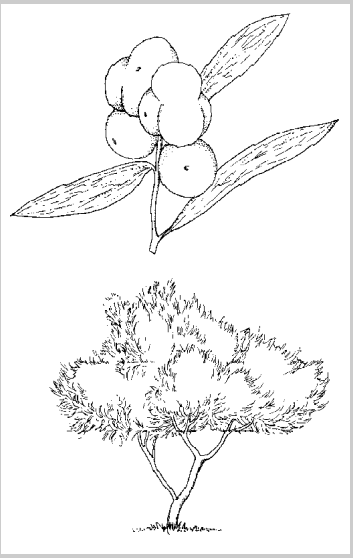
Acacias

The acacias are the most numerous with 13 listed species. All are from Australia and with one exception, *A. paradoxa,* differ from African acacias in having no spines or thorns. They can be divided into two distinct groups, one with bipinnate leaves and the other with phyllodes. A phyllode appears to be a simple, undivided leaf but is actually a leaf-like petiole with no blade. All the listed alien acacias are evergreen, whereas most of the indigenous species are deciduous. The alien acacias account for a very large proportion of all plant invasion in South Africa. They are important invaders of all the major vegetation types, except for those in the arid interior, where other leguminous invaders—mainly *Prosopis* species—take over.

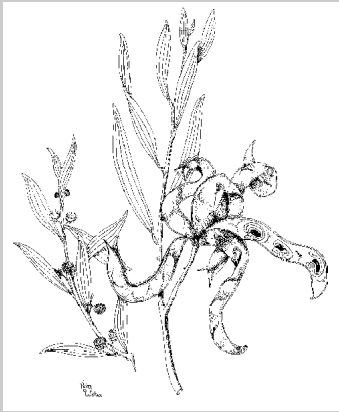
The most widespread and abundant acacias are *Acacia mearnsii,* black wattle, *A. cyclops,* red eye/rooikrans and *A. saligna,* Port Jackson. Black wattle has invaded the widest range of vegetation types in South Africa and is the most widespread riverine invader; it occurs almost continuously from Louis Trichardt in the Northern Province down the eastern seaboard to Cape Town, a distance of about 2 500 km.

Rooikrans stretches along the entire coastline from Port Nolloth in the north-west to beyond East London in the east, a distance exceeding 2 000 km. Port Jackson stretches along the Cape coastline from Saldanha Bay in the west to the Kei River in the east. Port Jackson and Rooikrans are important invaders of fynbos vegetation. Successful biological control of Port Jackson, using an introduced gall-forming rust fungus, has greatly reduced the densities of populations and in the long term should provide complete control of this invader.

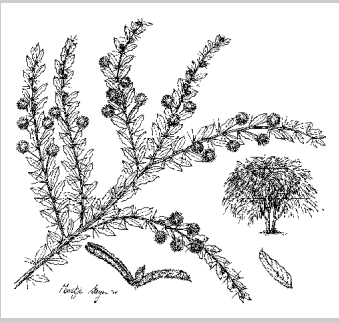
Acacia dealbata, silver wattle, and *A. decurrens,* green wattle, are most abundant in the grassland regions from the Eastern Cape northwards. *A. longifolia,* long-leaved wattle, and *A. melanoxylon,* blackwood, are most abundant along the Cape coastal belt stretching from Cape Town to Port Elizabeth; they also extend northwards



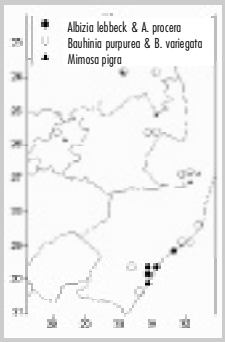
***Acacia longifolia* galls**



Acacia cyclops



Acacia paradoxa



as far as the Northern Province. Long-leaved wattle is an important invader of fynbos, whereas blackwood is an important forest invader. *A. pycnantha*, golden wattle, is an invader of fynbos, mainly in the Western Cape. Gall-forming wasps, introduced for the biocontrol of long-leaved and golden wattles, have become well established, reducing flowering and seed-production.

Species of fairly minor importance, but becoming increasingly invasive, are *A. baileyana,* Bailey's wattle, *A. podalyriifolia,* pearl acacia, *A. implexa,* screw-pod wattle, and *A. elata,* pepper tree wattle. None of these species have been planted on a grand scale in plantations, but only as garden ornamentals or windbreaks. Pepper tree wattle is mainly naturalised in the Western Cape where it is encroaching on fynbos and forest. Bailey's wattle and pearl acacia are spreading wherever they have been planted. Screw-pod wattle is invading watercourses and fynbos in the Western Cape. *Acacia paradoxa,* kangaroo thorn, is a thorny shrub only known from Devil's Peak on Table Mountain. It is listed under the Australian Noxious Weeds Act which is an indication of its weed potential in South Africa.

Other Genera

Albizia lebbeck and *A. procera,* lebbeck and false lebbeck, are invasive in the warm and humid coastal belt around Durban. They are of tropical Asian origin and are large, spreading trees up to 15 m tall.

Alhagi maurorum, camel thorn bush, is a thorny, almost leafless bush, invading agricultural crop lands and river banks in the dry interior of South Africa.

Bauhinia purpurea and *B. variegata,* butterfly orchid and orchid trees, are Asian trees invading the subtropical and tropical savanna regions. They are popular ornamentals, flowering and seeding prolifically.

Caesalpinia decapetala, Mauritius or Mysore thorn (after Mysore Province in India), is a very tough and spiny, scrambling shrub or climber, forming dense thickets. It invades forest margins, plantations and watercourses. Of tropical Asian origin, it is restricted to the subtropical and tropical eastern seaboard and adjacent interior of South Africa.

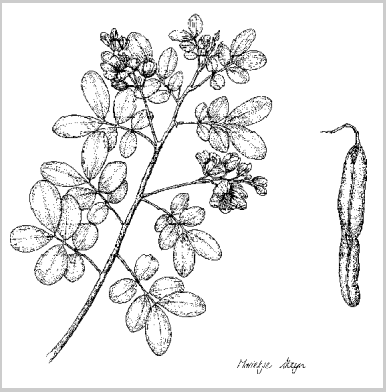
Cytisus monspessulanus(Genista monspessulana), Montpellier broom, is a Mediterranean shrub, invading fynbos on Table Mountain. *Cytisus scoparius (Genista scoparia),* Scotch broom, is an almost leafless shrub with bright yellow flowers, mainly invading grassland and forest margins on the lower slopes of the Drakensberg mountains in KwaZulu-Natal.

Gleditsia triacanthos, honey locust, is a large, spreading tree, armed with formidable three-branched spines. It is of North American origin. It has been cultivated for its edible pods, honey production, shade and for donga reclamation. Now it is invading river banks, drainage lines and other moist sites in the interior of South Africa.

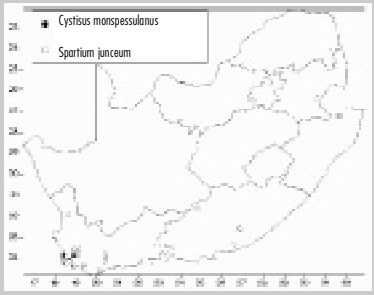
Leucaena leucocephala, leucaena or giant wattle, possibly of Mexican origin, invades mainly the subtropical coastal belt of KwaZulu-Natal and lowveld of Mpumalanga. It is also a highly valued plant for fodder and woodlots.

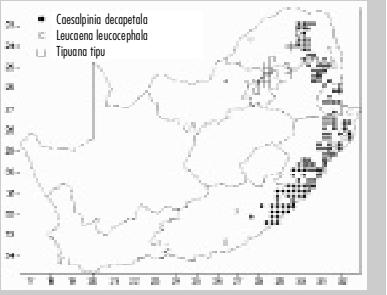
Mimosa pigra, giant sensitive plant,

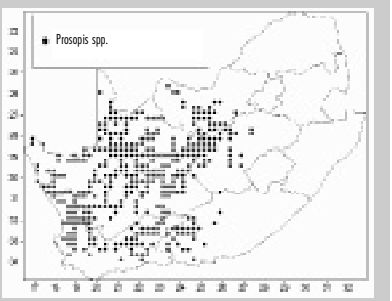
Gleditsia triacanthos

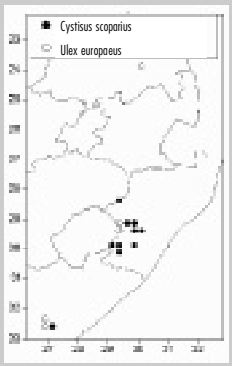


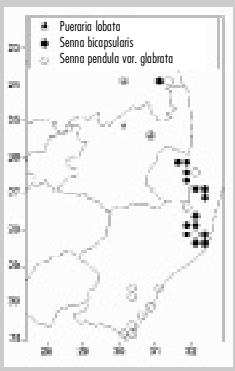
Senna bicapsularis

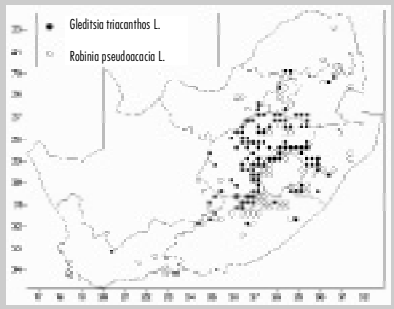


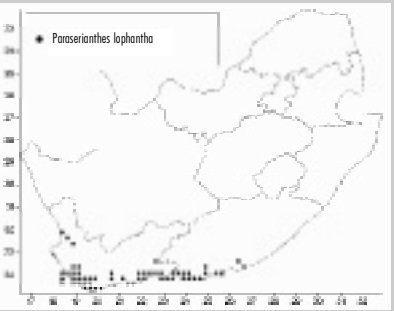


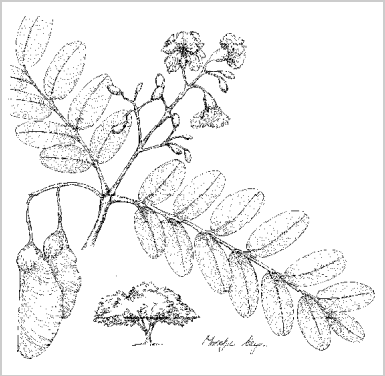












Tipuana tipu

is believed to be of tropical American origin, but is now pantropical. It has long been known in the Ndumu area of KwaZulu-Natal, where it appears not to be a problem; it is, however, invasive and has caused much concern further north at Tzaneen along the Letaba River. This species has invaded extensive tracts of floodplains in Australia.

Paraserianthes lophantha, stink bean, is an Australian tree that has invaded moist sites in forest and fynbos in the Western and Eastern Cape. It resembles a large-leaved black wattle.

Prosopis spp., mesquite, introduced from the southwestern USA and Mexico, have invaded the arid interior of South Africa. Their preferred habitat is drainage lines and river banks, which are the most fertile sites in these regions. They are cultivated for shade, firewood, and for their pods, which are fed to livestock. However, dense thickets not only produce fewer pods but also prevent access to livestock. Biocontrol using seed-feeding bruchid beetles has the potential to greatly reduce the development of further infestations.

Pueraria lobata, Kudzu vine, is a vigorous, long-running vine, that can reach heights of 18 m. It invades forest margins and river banks. So far it is only known from a few sites in Mpumalanga and Northern Province.

Robinia pseudoacacia, black locust, is a North American thorny tree that forms dense suckering thickets, particularly along watercourses.

Senna bicapsularis (Cassia bicapsularis) and *Senna pendula* var. *glabrata (Cassia coluteoides)* are rambling ornamental shrubs or climbers from South America. They are invasive in the subtropical and tropical savanna regions, particularly along watercourses. *Senna didymobotrya (Cassia didymobotrya),* peanut butter cassia, is indigenous to central Africa. It has been widely planted in southern Africa as an ornamental and hedge plant, particularly around animal kraals. It is poisonous.

Sesbania punicea, red sesbania, is an ornamental South American shrub or small tree that has invaded watercourses throughout South Africa, except in the arid interior. A very successful biocontrol programme, using three species of introduced beetles, is effectively maintaining this species at population levels that are no longer problematic.

Spartium junceum, Spanish broom, is invading urban open space, wasteland, and fynbos in the Western Cape. It is an almost leafless shrub or small tree with bright yellow flowers. A native plant of the Mediterranean, it is now invading a similar climatic region at the tip of Africa.

Tipuana tipu, tipuana, is a large, spreading South American tree that is invading watercourses in the savanna regions.

Next Instalment

The next article in this series will deal with the Asteraceae (daisy family). There are some very important invaders in this group, including *Chromolaena odorata* (triffid weed) a very serious conservation weed in moist savanna, and a real threat to biodiversity; a close relative, pom-pom weed, *Campuloclinium macrocephalum*, invades grassland; *Parthenium*, a potentially disastrous agricultural weed, causes severe allergic dermatitis and asthma.

HENDERSON, L. 2001. *Alien weeds and invasive plants*. Plant Protection Research Institute Handbook No. 12. Agricultural Research Council, Pretoria.

OLCKERS, T & HILL, M.P. 1999. Biological control of weeds in South Africa (1990–1998). *African Entomology Memoir* No. 1.

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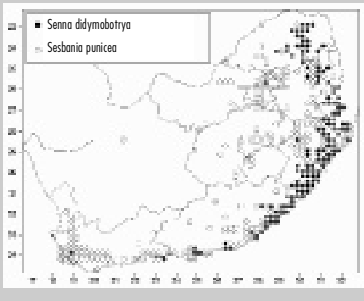


List of Declared Plants Belonging to the Fabaceae in South Africa

N.B. The regulations concerning categories 1, 2 and 3 are briefly summarised here. To avoid any misunderstanding, readers should consult the full regulations given in the Government Gazette, Vol. 429, No. 22166 of 30 March 2001 or Henderson (2001).

Category 1: Prohibited; must be controlled, or eradicated where possible.

Acacia dealbata (only in Western Cape)
Acacia implexa
Acacia longifolia
Acacia paradoxa (A. armata)
Acacia pycnantha
Albizia lebbeck
Albizia procera
Alhagi maurorum
Caesalpinia decapetala
Cytisus monspessulanus (Genista monspessulana)
Cytisus scoparius (Genista scoparia)
Leucaena leucocephala (only in Western Cape)
Paraserianthes lophantha
Pueraria lobata
Sesbania punicea
Spartium junceum
Ulex europaeus

Category 2: Allowed only in demarcated areas under controlled conditions; prohibited within 30 m of the 1:50-year flood line of watercourses or wetlands.

Acacia cyclops
Acacia dealbata (excluding Western Cape)
Acacia decurrens
Acacia melanoxylon
Acacia saligna
Gleditsia triacanthos
Leucaena leucocephala (excluding Western Cape)
Prosopis glandulosa var. *torreyana*
Prosopis velutina
Robinia pseudoacacia

Category 3 : No further planting or trade of propagative material allowed; existing plants may remain but must be prevented from spreading; prohibited within 30 m of the 1:50-year flood line of watercourses or wetlands.

Acacia baileyana
Acacia elata
Acacia podalyriifolia
Bauhinia purpurea
Bauhinia variegata
Mimosa pigra
Senna bicapsularis (Cassia bicapsularis)
Senna didymobotrya (Cassia didymobotrya)
Senna pendula var. *glabrata (Cassia coluteoides)*
Tipuana tipu

Lesley Henderson's new book, *Alien weeds and invasive plants*, will be reviewed in the next issue of *SABONET News*.

SABONET *Herbarium Managers Course*

At the Tenth SABONET Steer-a ing Committee meeting, held in February 2001, it was decided that a course should be developed for senior herbarium staff. Subsequently, the first senior management course for participating SABONET herbaria was held at the Pretoria National Herbarium, South Africa, from 13 to 24 August 2001. Ms Marinda Koekemoer, the curator of the National Herbarium, was our host. The course was organised by the SABONET Regional Office and attended by 11 herbarium curators and senior managers from ten herbaria in the region. All ten participating SABONET countries were represented.

(continued on p. 198)

The course participants of the SABONET Herbarium Managers Course. (Photo: Adela Romanowski)
BACK: Mr Ezekeil Kwembeya (Zimbabwe), Ms Silke Bartsch (Namibia), Mr David Chuba (Zambia), Ms Teresa Martins (Angola), Mr Kevin Naicker (South Africa)
FRONT: Ms Marinda Koekemoer (Resource person, NBI), Ms Nozipo Nobanda (Zimbabwe), Mr Alfred Ngwenya (South Africa), Ms Gladys Msekandiana (Malawi), Ms Queen Turner (Botswana), Mr Stefan Siebert (SABONET), Ms Puleng Matebesi (Lesotho)
ABSENT: Mr Titus Dlamini (Swaziland), Ms Samira Izidine (Mozambique)

Announcing the Southern Mozambique Expedition

24 November–12 December 2001

Thirty southern African botanists will be heading to Maputaland in November 2001, as part of the Project's second regional botanical expedition. Participants from all ten participating SABONET countries will be represented. They will spend 19 days in southern Mozambique to collect plant specimens from this unique floristic region.

Centre of Plant Endemism

Maputaland, the southern part of the southeastern African coastal plain, is a world-renowned centre of plant endemism (Van Wyk 1994, 1996) and is a region of great scenic beauty and rich biodiversity. It stretches across the coastal plain of southern Mozambique and northern KwaZulu-Natal in South Africa. Several conservation areas have been proclaimed in the region, including the Greater St Lucia Wetland Park (a World Heritage Site), Tembe Elephant Park, Maputo Elephant Reserve, Licuati Forest Reserve, Mkuzi Game Reserve, and Kosi Bay Coastal Forest Reserve. Current initiatives for establishing a trans-frontier conservation area (or "Peace Park") between northern KwaZulu-Natal and southern Mozambique are underway, striving to link Tembe Elephant Park with some of the Mozambique parks and conservation areas. As a consequence of this transfrontier initiative, there are a number of national parks in both northern KwaZulu-Natal and southern Mozambique with plans to form a conservation area from Inhaca Island to Cape Vidal (Anonymous 2000).

In 1994, southern Mozambique and the northern part of KwaZulu-Natal were recognised by WWF/IUCN as a Centre of Plant Endemism—the Maputaland Centre (Davis *et al.* 1994). High levels of endemism were highlighted, spread across virtually the whole taxonomic spectrum and involving both plants and animals. (An endemic is a plant or animal more or less confined to a particular area or substrate.) The Maputaland region is also of exceptional biogeographical interest because of the sharp transformation of both plants and animals in the region (Poynton 1961; Bruton & Cooper 1980). The area also abounds in insect life, which at this stage is not well explored. Maputaland is at the southern end of the tropics in Africa where many organisms reach the southernmost limit of their range.

Maputaland is recognised as a WWF/IUCN Centre of Plant Diversity (Davis *et al.* 1994), because it is

- Species rich, even though the number of species is not accurately known
- Known to contain a large number of endemic species
- Known to contain important plants that are of value to humans
- Known to contain a diverse range of habitats
- Known to contain a significant proportion of species adapted to special edaphic conditions
- Threatened or under imminent threat of large-scale devastation
- Known to harbour a biota experiencing active evolution (speciation), with many endemic taxa relatively new (neoendemics)

The objectives of recognising Centres of Plant Diversity are to (Davis *et al.* 1994)

- Identify which areas around the world, if conserved, would safeguard the greatest number of plant species
- Document the many benefits, economic and scientific, that conservation of those areas would bring to society
- Outline a strategy for the conservation of selected areas

Aims and Objectives

Management of conservation areas in Maputaland requires more knowledge of the plant diversity and biological intricacies of the region. The SABONET expedition aims to provide baseline floristic data for the Licuati Forest Reserve and Maputaland Elephant Reserve in southern Mozambique. Regional and local experts will assess the area's floristic richness and levels of endemism.

Exploitation

The coastal dunes of southern Mozambique, like the ones in KwaZulu-Natal, are rich in heavy metals. The mining of these dunes is a controversial environmental issue. It is of major concern that there is increasing pressure to utilise the coastal dune zone for mining, as well as forestry and tourism. Most of the coastline from Richards Bay, South Africa, to the south of Maputo Bay, Mozambique, is protected in the form of government and private land. In Mozambique the situation is changing, with foreign companies showing great interest in the establishment of hotels, tourist resorts, and mineral mines on coastal dunes.

Probably the most important scientific finding of the various Environmental Impact Assessments conducted for dune mining in the past is that, although certain aspects of the dunes have been studied in detail, overall it is quite clear that they are not well understood from a geological, geomorphological, hydrological, and ecological point of view (Anonymous 2000). SABONET cannot study whole dune systems, but

Map courtesy of Braam van Wyk, University of Pretoria.

we can focus attention on the area's rich flora and rare and endangered species.

Benefits

In Mozambique there is a lack of basic data within the field of biodiversity and conservation, and basic assessments of the local flora of southern Mozambique will benefit the region. At the moment it is a disadvantage that there is insufficient floristic data that can serve as a background for the establishment of proper management plans and monitoring of development activities. The ways in which a regional expedition enhances the capacity of local conservation organisations were emphasised during the SABONET Nyika Expedition (Willis *et al.* 2000) and will surely have the same effect in Mozambique.

We hope that this SABONET regional expedition along the Maputaland coast in southern Mozambique will contribute substantially towards capacity building in the southern African region and the strengthening of local conservation initiatives in Mozambique.

John and Sandie Burrows (Buffelskloof Private Nature Reserve), Mervyn Lotter (Mpumalanga Parks Board) and Christopher Willis (National Botanical Institute) are thanked for assisting us during the two reconnaissance visits to the study area.

ANONYMOUS. 2000. Biodiversity in coastal Maputaland (northern KwaZulu-Natal and the southern part of Mozambique): links between geology and ecology. Biodiversity and sand dune mobility in the coastal zone in Maputaland, NUFU PROJECT 16/98, University co-operation on nature conservation and management. http://inqua.nlh.no/maputa/mapproj.html.

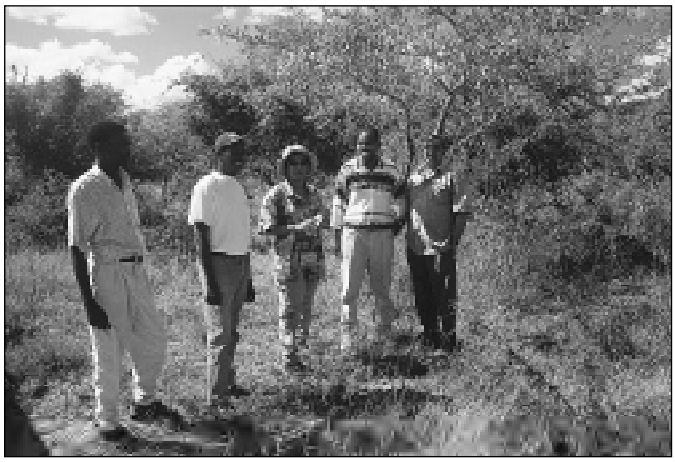
BRUTON, M.N. & COOPER, K.H. (eds.) 1980. Studies on the ecology of Maputaland. Rhodes University and Wildlife Society of South Africa, Grahamstown & Durban.

DAVIS, S.D., HEYWOOD, V.H. & HAMILTON, A.C. 1994. Centres of Plant Diversity: A guide and strategy for their conservation. IUCN Publications Unit, Cambridge.

POYNTON, J.C. 1961. Biogeography of south-east Africa. *Nature* 189: 801-803.

The broad objective of this regional expedition is to gather additional data on the botanical diversity of southern Mozambique for use in future projects by local botanical institutions, which are related to initiatives such as transfrontier parks, medicinal plant management, ecotourism, and rural development. The baseline data will be of immense value to the end-users of taxonomic information.

The logistic team at the Milibangalale camp site in Maputo Elephant Reserve on the coast of southern Mozambique. (Photo: Stefan Siebert)



The Mozambique contingent in the inland Licuati Forest Reserve, southern Mozambique. (Photo: Stefan Siebert)

Data Deficient Species

SABONET Southern Mozambique Expedition members should keep an eye open for the following *Data Deficient* species during the trip:

Aspidoglossum defficile
Aspidoglossum delagoense
Brachystelma varhmeijeri
Caralluma ubomboensis
Ceropegia arenaria
Encephalartos aplanatus
Helichrysum silvaticum
Helichrysum tongaense
Hemizygia ramosa
Orbea paradoxa
Orbeopsis gerstneri
Pachycarpus lebomboensis
Polystachya zuluensis
Rhus kwazuluana

—Rob Scott-Shaw

VAN WYK, A.E. 1994. Maputaland-Pondoland Region. In: Davis, S.D., Heywood, V.H. & Hamilton, A.C. (eds.) *Centres of plant Diversity, a Guide and Strategy for their Conservation, Volume 1*. Information Press, Oxford. pp. 227-235.

VAN WYK, A.E. 1996. Biodiversity of the Maputaland Centre. In: Van der Maesen,–L.J.G., Van der Burgt, X.M. & Van Medenbach de Rooy, J.M. (eds.) *The biodiversity of African Plants*. Kluwer Academic Publishers, Dordrecht. pp. 198-207.

WILLIS, C.K., BURROWS, J.E. & WINTER, P. 2000. SABONET Nyika Expedition 2000. *SABONET News* 5: 5-14.

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—Calane da Silva & Samira Izidine
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depbotan@depbotan.uem.mz

SABONET *Herbarium Managers Course*

(continued from p. 195)

Ms Marinda Koekemoer presented a large part of this two-week course, focussing primarily on various aspects related to *Human Resource Management* and *Curatorial Activities* in herbaria. She was assisted by Ms Rose Clark and Ms Carla Willis from the CSIR, who presented modules on *Strategic Planning*, *Business Plans* and *Human Resource and Project Management*. Mr Thulani Mabaso from UNDP-South Africa explained the *Logical Framework Approach* and the *Reporting Process* to the participants. SABONET was represented by Ms Carina Haasbroek, who presented a module on *Costing and Budgeting*. Ms Estelle Potgieter from the Mary Gunn Library, in collaboration with Dr Hugh Glen, presented a short course on the *Management of Literature Collections*. The Data Management Section of the NBI, led by Mr Trevor Arnold, gave a one-day course on *Database Management* in herbaria. Prof. Gideon Smith, NBI's Director of Research, gave two presentations, namely *Botany in the 21st Century* and *What about the Garden?*

The course participants were pleased with the course content and structure, and the feedback was very positive. We are looking forward to implementing this new course as part of future SABONET initiatives.

—Stefan Siebert & Marinda Koekemoer

11th SABONET Steering Committee Meeting

The 11th SABONET Steering Committee (SSC) and Third Tripartite Review meetings were held at Lancers' Inn in Maseru, Lesotho, on 20 and 21 September 2001. Mr Moretloa Polaki and Ms Puleng Matebesi from the National University of Lesotho in Roma were our hosts. Mr Polaki is the alternate National Coordinator for SABONET-Lesotho and Ms Matebesi is the SABONET Research Officer for Lesotho.

Prof. Brian Huntley, chairperson of the SSC, and the National Coordinators of all ten participating countries attended the meetings. The following 12 individuals also attended:

- Dr Alan Rodgers of UNDP-GEF, Arusha, Tanzania
- Ms Jane Malephane, National Environment Secretariat, Maseru, Lesotho
- Mr Nchemo Maile, Forestry Directorate, Maseru, Lesotho
- Ms Janette Worm and Ms Palesa Henson, UNDP-Lesotho, Maseru
- Ms Federica Battista, UNDP-South Africa, Pretoria
- Mr Trevor Arnold, SABONET IT Centre, Pretoria, South Africa
- Mr Christopher Willis, National Botanical Institute, Pretoria, South Africa
- Mr Ernest Misomali, Southern Africa Biodiversity Support Programme, Malawi
- Ms Janice Golding, Ms Carina Haasbroek, and Ms Nyasha Rukazhanga-Noko, SABONET Regional Office

Various issues on the comprehensive agenda were discussed at the SSC meeting on 20 September 2001; these included postgraduate support for 2002, computerisation, national plant checklists, the RDL, SABONET staff in participating herbaria and botanical gardens, remaining training courses, and the implementation of the internship initiative. The Exit Strategy of the Project was also discussed, as the official closing date of the Project is 31 March 2002 (funds will allow the Project to continue until 31 December 2002).

SABONET's Third Tripartite Review (TPR) meeting was held on 21 September 2001 and chaired by Dr Alan Rodgers. The Annual Programme/Project Report was used as a basis for discussion. The following are four of the ten decisions* taken by the TPR:

- Decision 2: The Third Tripartite Review requests project management to develop guidelines for end-user/stakeholder workshops, internships, and other project activities.
- Decision 4: The Third Tripartite Review requests project management to review and regularly monitor progress made towards implementation of the Mid-Term Review recommendations.
- Decision 8: The Third Tripartite Review endorses the proposal for an Exit Strategy to be developed for the project.
- Decision 9: The Third Tripartite Review encourages the development of a Concept Document for a follow-on regional project. This should address the integration of taxonomy and conservation activities.

On the afternoon of 21 September 2001, the delegates travelled into the Maluti Mountains. Mr Polaki led the way and took us over two passes, one of which is named "God Help Me!" We were joined by two renowned botanists who know the flora of Lesotho extremely well—Dr Sumitra Talukdar and Mr David May. They kept us well informed of the flora as we travelled. The excursion ended at Mohale Dam, the second dam of the Lesotho Highland Water Scheme.

This was yet another successful and productive SSC meeting and we thank all the delegates who attended.

—Stefan Siebert & Moretloa Polaki

**Combined recommendations of the 11th SSC and 3rd TPR meetings are available from the SABONET Regional Office on request (stefan@nbipre.nbi.ac.za).*

The committee members and interested parties who attended the 11th SABONET Steering Committee meeting. (Photo: Stefan Siebert)

The SABONET Steering Committee members enduring very cold weather during an interesting and informative afternoon excursion to Mohale Dam. (Photo: Stefan Siebert)

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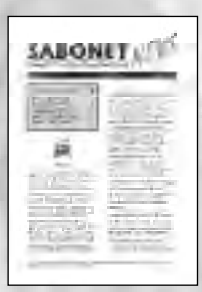

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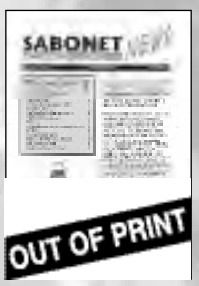

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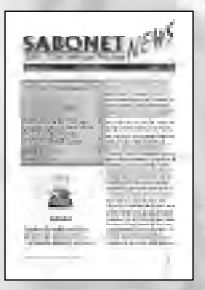

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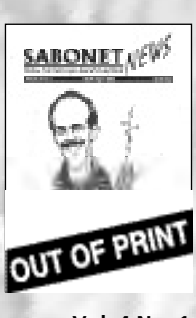

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The National Botanical Garden of Namibia

***Aloe dichotoma*, *ex situ*.**
(Photo: Coleen Mannheimer)

The National Botanic Garden of Namibia is situated in Windhoek and is the only botanic garden in the country. It is one of the four sections of the National Botanical Research Institute (NBRI) under the Ministry of Agriculture, Water and Rural Development. The land where the garden is being developed was donated to the Government of Namibia by the city council of Windhoek in October 1969. It was proclaimed as a game reserve under Section 28 of the Nature Conservation Ordinance 31 of 1967, and earmarked to be developed as a Nature Garden.

In the early 1970s the then Department of Nature Conservation constructed self-guided trails, an irrigation system, and a water feature comprising a dam and cemented water canals. Constraints on financial resources resulted in the termination of this development and vandalism subsequently destroyed most of what had been achieved. In July 1992 negotiations on the development of the garden were initiated between the Ministry of Environment and Tourism and the Ministry of Agriculture, Water and Rural Development. In February 1993 the NBRI obtained the right to develop the land into a botanic garden, on the condition that the area remained a proclaimed nature reserve and that a steering committee between the two Ministries was established.

The objectives of the National Botanic Garden of Namibia are to

- Serve as a floral conservation area.
- Serve as an outdoor environmental education facility, educating the public on our natural resources, our Namibian flora and nature awareness in general.
- Provide a study area for the flora of Namibia and its ecology, especially the vegetation in and around Windhoek.
- Serve as a training centre, where field workers, extension personnel, students, and researchers may gain practical experience in survey techniques and plant identifications.
- Provide a supportive service for research projects, through conservation, regeneration, and cultivation.
- Serve as a recreational area and a tourist attraction.

Ex Situ Conservation

In the1970s, *Euphorbia virosa*from the Semi-Desert and Savanna Transition, *Pachypodium lealii* from the Mopane Savanna (also found in Mountain Savanna and Karstveld), *Aloe dichotoma* from the Dwarf Shrub Savanna in the south of the country, *Aloe dewinteri*, *Aloe striata* subsp. *karasbergensis,* and several other species were planted in the

***Pachypodium lealii*, *ex situ*.**
(Photo: Coleen Mannheimer)

The National Botanical Garden workforce. (Photo: NBRI)

The Desert Section of the Display House. (Photo: NBRI)

garden. Some of these plants are of high conservation value as they are protected endemic and threatened species. *Ex situ* plant propagation of these species also serve as a display for educating the public in plant conservation.

In Situ Conservation

About 99% of the vegetation in the garden is natural. Emphasis is placed on the plants in their natural environment rather than artificial landscaping of the garden. Although there are different vegetation types in the country that need representation in the garden, only plants from the Highland Savanna where the garden is situated will largely be introduced, since the garden environment is not suitable to plants from other regions. To date 106 plant species have been recorded in the garden, which boasts one of the densest stands of *Aloe littoralis*. These provide a wonderful display of flowers during April and May.

***Aloe hereroensis* var. *lutea* in garden, *ex situ*. (Photo: NBRI)**

Nursery Collections

At present the nursery accommodates plants, mostly succulents, relocated from the Skorpion Zinc Mine area (Burke 1999). This was a collaborative effort by the NBRI and Reunion Mining. Propagation trials have been conducted to find suitable methods for replanting the rescued species at the mining site during rehabilitation efforts. Some of these include *Euphorbia melanohydrata*, *Lavrania* spp., *Stapelia* spp., *Conophytum pageae*, *Tylecodon buchholzianus*, *Crassula cotyledonis*, *Crassula subacaulis* subsp. *erosula*, *Adromischus alstonii*, *Quaqua acutiloba*, *Dracophilus proximus* and *Ebracteola derenbergia*. Most of the specimens in the nursery are mesembs and crassulas. Also found in the nursery are specimens of *Aloe zebrina*, *Aloe dewinteri*, *Euphorbia kaokoensis* and *Cyphostemma uter*.

The Display House

The Display House consists of two sections, the Tropical Section and the Desert Section; the Tropical Section is still under development. The Desert Section is divided into winter rainfall and summer rainfall areas and is landscaped to represent the rock outcrops, sandy plains, and gravel plains of the Namib Desert. Succulent plants such as *Ebracteola derenbergia* (a southern Namib endemic), *Sansevieria* sp., *Euphorbia* sp., *Bulbine* sp. and *Sarcocaulon patersonii* (bushman's candle) are displayed in the Desert Section. The purpose of the Display House is to introduce the public, students, and learners to the plants found in the Namib Desert, as well as their natural habitats. With the Display House we hope to promote the sustainable use and conservation of our natural plant resources.

Future Plans

Many improvements and changes are planned for the garden. The layout of the Desert Section in the Display House will be enhanced by raising the beds to improve plant viewing. The Tropical Section has to be planned to accommodate plants from the northeast (subtropical area) of the country. The living plant collections (LPC) in the nursery will be sorted out and plants grouped according to their families; all data will be entered in the LPC record book. Space will be created in the nursery for a Threatened Plants Programme planned by the Southern African Botanical Gardens Network and implemented by the gardens in the region.

Despite the vulnerability of succulents to the rock hyrax found in the garden, a succulent area is planned where, amongst others, *Cyphostemma uter*, *Tylecodon racemosus*, *Hoodia parviflora* and *Aloe* species will be planted. Visitors will be able to observe the succulent plant diversity of Namibia and will be encouraged to appreciate the role of both *ex situ* and *in situ* conservation.

***Aloe litorallis, in situ*.**
(Photo: Coleen Mannheimer)

BURKE, A. 1999. Sting in the tail. *SABONET News* 4(1): 37–39.

—Tobias Angula
National Botanic Garden of Namibia
National Botanical Research Institute
nbri@mweb.com.na

Lowveld National Botanical Garden

The Lowveld National Botanical Garden, one of the National Botanical Institute's network of eight South African botanical gardens, is situated in Nelspruit, the capital of Mpumalanga Province, South Africa. The garden is within one and a half hour's drive from Maputo, two hours drive from Mbabane and about three hours drive from Gauteng.

The garden strives to represent the flora of southern Africa's subtropical areas to the public, with an emphasis on woody taxa. Various inputs in the past 30 years have resulted in the garden, arguably, now containing the world's largest collection of African tree and cycad taxa.

This large fever tree (*Acacia xanthophloea*) grows in the centre of the garden. (Photo: J. Onderstal)

The garden has three major customers that it services, that of fellow NBI staff, the general public and researchers from other institutions. A firm belief in delivering quality service to its customer base has made this one of the most esteemed botanical gardens in South Africa and also increasingly worldwide.

History

The garden originated in 1969 with grants of land from the Nelspruit Town Council as well as from the large farming enterprise, H.L. Hall & Sons, a gift which totalled 159 hectares.

Relief and Climate

The garden straddles the Crocodile River, which has carved a 1 km long, 50 metre deep gorge through a dolerite intrusion in the prevailing Nelspruit Granite's. This has resulted in spectacular cascades where the river drops into the gorge and where the smaller Nels River joins the Crocodile River. Both areas offer the visitor spectacular views during floods and the rainy seasons.

The climate is sub-tropical with average daily temperatures of 26–35°C in summer and 18–24°C in winter. The occasional cold snap can however lower temperatures to below 10°C or even as low as -1°C in low-lying areas near the rivers. Four distinct seasons are experienced with autumn (April–May) and spring (September–October) being the mildest and most pleasant. Rain falls mainly in spring and late summer, with a long-term average of 750 mm.

Natural Areas

The natural area of the garden consists of about 134 ha and is of cardinal importance in the ecology of the Crocodile River system. A myriad of vegetation types can be found, from dense riverine forest, semi-arid bushland and deep sand veld to stunted alpine-like vegetation on near bare granite domes.

Some 590 plant taxa have been recorded as occurring within the natural areas. These include stately *Breonardia salicina* in riverine situations to the Resurrection Bush (*Myrothamnus flabellifolius*) on bare granite outcrops. Most of the vegetation is however dominated

Visitors enjoying a walk in the garden. (Photo: R. Britz)

by closed to open woodland with *Combretum collinum* subsp. *suluense* being the dominant tree.

Garden Layout

The developed garden consists of about 25 ha and can be divided into taxonomic, thematic and *ex situ* conservation areas. Taxonomic areas are based on collections at the family level and form the framework of the garden's layout. Due to climatic constraints, certain taxonomic collections are also situated in certain thematic areas, for example, ferns in the South African forest area.

As far as possible, thematic areas are chosen for exceptionally high diversity or exceptionally low diversity. Thus one can move from a rain forest with exceptionally high diversity to mopane veld with very low diversity. Thematic areas are also chosen to represent certain Centres of Endemism in South Africa and range from Licuati and Pondoland Sandstone Forests to Sekhukhuneland Arid Bushveld.

Taxonomic Collections

Taxonomic collections are chosen for their largely woody component, the emphasis being on low maintenance of the areas. These areas also play a major role in many research projects by outside institutions, conducting research on phytochemicals and plant pathogens. The large cycad collection is also used as a training area for nature conservation and other law enforcement agencies combating illegal activities in the multi-billion dollar plant industry.

Some 54 taxonomic groupings containing some 700 accessioned species are discretely situated in the garden, often one in the other or close to related families. Most notable collections include the Arecaceae, Bignoniaceae, Combretaceae, Cycadaceae, Ebenaceae, Euphorbiaceae, Fabaceae, Malvaceae, Moraceae, Myrtaceae, Sapindaceae, Sapotaceae, Sterculiaceae and Zamiaceae.

Landscaping in these areas represent somewhat of a challenge and a Raunkerian system is followed giving an excellent layered outlay. Thus shrubs and herbs of the same family are preferably used to augment these collections or else a different family (mainly Acanthaceae) consisting of mainly shrubs and herbs are used to augment beds.

Thematic Areas

Thematic areas are areas in which the environment is actively manipulated to attain a certain theme. For example, the African Rain Forest area receives an additional 1 500 mm of "rain" in the form of large overhead irrigation towers, thus also giving the visitor the climatic effect of being in a high rainfall area.

Thematic areas are mainly chosen for their aesthetic effect on the public as well as for the potential to contain one or more taxonomic areas or parts thereof. Thus the arid bushveld area would contain a representative collection of *Commiphora* species so as to entrance the visitor with shapes and textures.

Ex Situ Conservation Areas

About 5 ha of the developed garden has been closed to the public for the establishment of population-based South African cycad gene banks. Here 50–100 individuals of a taxon have been planted as an *ex situ* conservation measure.

Gene banks are based on seed collected from a known wild source and then cultivated at the garden. Already many of the gene banks are coming into seed production. Seed produced from these gene banks are cultivated by the commercial nursery and sold to the public. It is hoped that providing affordable cycad seedlings to the public could alleviate some of the pressures on wild cycad populations.

Herbarium and Library

The garden also houses its own, well-curated herbarium (acronym GLOW), which contains specimens of all the plant taxa occurring in the natural areas. The herbarium also houses a further 7 000 specimens,

Cycad seedlings for sale in the commercial nursery. (Photo: W. Froneman)

The Crocodile River Cascade. (Photo: R. Britz)

mainly from the garden's immediate vicinity. Most notable collections include those of Ernst van Jaarsveld, Elise Buitendag, and Johan Kluge. The herbarium is actively used for plant identifications by several institutions and the garden staff.

The garden's library on plant related matters is well known to the general public and actively used by garden staff as reference collection. Subjects range from general horticulture, school and university text books to regional floras. Several periodicals and journals are also available to garden staff.

Commercial Nursery

The large plant collection of the garden also produces a large amount of seed and cuttings. These are propagated in the commercial nursery and offered for sale to the public and other nurseries. This often results in many rare and interesting plants being available to the public.

The nursery is also actively involved with greening projects in local communities, providing plants at nominal charge to NGOs and during environmental theme days.

The Future

At the moment the garden is relatively young, many of the thematic areas still need many years to attain any significant status and most of the taxonomic areas need to be consolidated. Most plantings have only occurred in the past 15 years and it is thus difficult to visualise the garden beyond an individual's life span or tenureship. What is however clear is that the Lowveld National Botanical Garden, courtesy of its dedicated staff is one of Africa's best botanical destinations, now and in the future.

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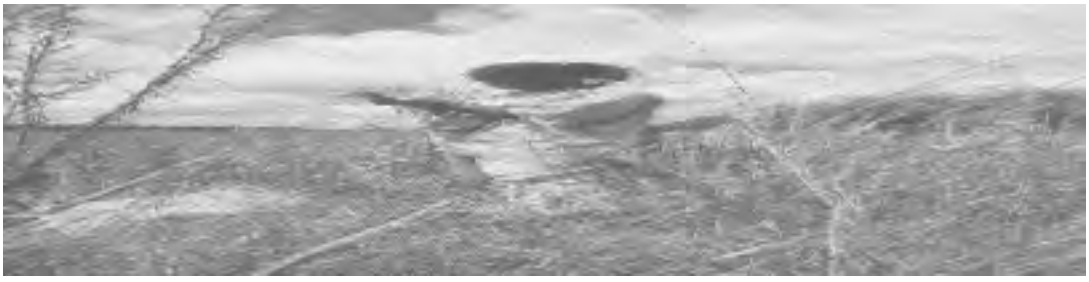
A view of the swamp forest section in the African Rainforest. (Photo: J. Onderstal)



Further Notes on *South Africa's* Brachystegia spiciformis

In the December 2000 edition of *SABONET News* (Vol. 5 No. 3), Erich van Wyk and Johan Hurter announced their exciting discovery of the deciduous *Brachystegia spiciformis* ('msasa', the most widespread species of *Brachystegia* occurring in miombo woodlands) growing naturally in the northeastern Soutpansberg of South Africa. This discovery extended the taxon's distribution range southwards across the Limpopo Valley—previously regarded as a barrier—into South Africa. This was the first time *B. spiciformis* had been recorded growing in South Africa, although evidence of this taxon being in South Africa was previously obtained from pollen records dating back to 19 000 years BP from near Naboomspruit.

Exell and Wild in the early 1960s speculated about the reasons for the southern distributional limit of *B. spiciformis* being halted at the Limpopo. These varied from (a) lower temperatures and increasing severity of frosts in South Africa, (b) that the species is in the progress of migrating southwards and is only temporarily stopped at the so-called barrier (Limpopo Valley), to (c) some other climatic or edaphic factor. They also mentioned that "it is difficult to decide between these alternatives" (Exell & Wild 1961–62). Wild (1968) also suggested that "the southern limit to the distribution of *B. spiciformis* may therefore be due to a real impediment or barrier or may merely be a transitional limit reached in time and so be merely imaginary".

A further note of Hurter and Van Wyk's discovery was published in *Bothalia* 31(1) in May 2001. This article included a brief note on understorey taxa and taxa dominating the surrounding vegetation.

Centre of Plant Diversity and Endemism

The discovery of *Brachystegia spiciformis* in the northeastern Sout-pansberg—described by Hahn (1997) as "one of southern Africa's most unique and understudied mountain ranges"—reaffirms the importance of the Soutpansberg mountain range as a Centre of Plant Diversity and Endemism in South Africa. It is host to some 3 000 plant taxa, of which about 45 are endemic. Of these, 50% are succulents (Van Wyk & Smith 2001). Several plant taxa widespread in neighbouring Zimbabwe, Mozambique, and other south-central African countries, occur in South Africa only as isolated populations in different parts of the Soutpansberg. These taxa include *Millettia stuhlmannii* (*muangaila*, Fabaceae), *Oxytenanthera abyssinica* (*musunu*, Poaceae), *Aloe excelsa* (Asphodelaceae), *Brackenridgea zanguebarica* (*mutavhatsindi*, Ochnaceae), *Bolbitis heudelotii* (Lomariopsidaceae), *Cyperus cyperoides* subsp. *flavus* (=*Mariscus cylindristachyus*, C. Archer, pers. comm., Cyperaceae), and *Trilepisium madagascariense* (Moraceae). No Soutpansberg plant endemic has so far been recorded within the *Brachystegia* population. Further fieldwork in the area could, however, indicate otherwise. There are probably many more as yet undiscovered unique botanical jewels waiting to be discovered on the Soutpansberg by dedicated and curious southern African botanists.

Typical habitat of *Brachystegia spiciformis* growing in the northeastern Soutpansberg, Northern Province, South Africa. (Photo: Christopher Willis)

***Senecio barbertonicus* (Asteraceae) in habitat in the understorey of the *Brachystegia spiciformis* population. (Photo: Christopher Willis)**

Associated Plants

During a brief visit to the site on 8 August 2001, we recorded plant taxa associated with 'mutsiwa' (tshivenda). The list is by no means exhaustive and features mainly the more visible and commonly occurring plant taxa in the area.

The succulent shrub *Senecio barbertonicus* is one of the more common shrubs growing with *B. spiciformis*. With its beautifully rounded canopy and yellow capitula produced in spring, *Senecio barbertonicus* is an increasingly popular garden subject.

Typical miombo woodland with a more northern distribution is generally not known to contain large numbers of succulents. It therefore came as somewhat of a surprise that at least 16 species of indigenous succulent plants, representing nine flowering plant families, were recorded for the *Brachystegia* population in the Soutpansberg.

The succulent life forms encountered at the locality were

Unanswered Questions

As may be expected from a recent discovery, very little is currently known about the *Brachystegia* woodland in the Soutpansberg. The following questions still need to be answered:

- How did the brachystegias get to their current location in the Soutpansberg?
- How far, if at all, does the population extend beyond its currently known boundary?
- How large is the population of *Brachystegia spiciformis* in the Soutpansberg?
- What are the socio-economic and biophysical factors and dynamics associated with the plant population?
- What is the biological status of the population? Is the number of individuals increasing, decreasing or stable?
- What life history stage(s) have the greatest effect on population growth?
- What are the biological causes of variation in those life history stages that have a major demographic impact?
- Are the trees being used by local human communities? If so, for what purposes, and are the human impacts on the trees sustainable?
- What threats are being faced by the plant population?
- How can the population be protected whilst at the same time also benefitting the local communities?
- Like their counterparts in other parts of south-central Africa, are the trees ectomycorrhizal?
- What impact does fire have on the population? What is the 'normal' fire cycle?
- Is recruitment taking place in the population?
- Should long-term monitoring of the population be implemented? If so, by whom?
- What impact will increased access to, and public awareness of, the population have on its long-term survival?
- The local Vhavenda communities have lived together with the *Brachystegia* population for hundreds of years. Will this continue into the future? What are the determining factors?
- What are the present patterns of land use in the area, and what are their environmental, historical, and socio-economic determinants?
- At what rate are the patterns of land use changing, and why?
- What are the key ecological processes sustaining production in the population and how are these being affected by current and envisaged land use in the area?
- What are the consequences of current and planned or predicted land use changes in the area?
- What is the real and potential impact of exotic weeds on the population?
- What role could the Miombo Network and local universities (such as the University of Venda and the University of the North), in association with other institutions, play in attempting to answer some or all of the above questions?

Succulents
Taxa found in association with *B. spiciformis*

APOCYNACEAE	*Sarcostemma viminale*
ASPHODELACEAE	*Aloe aculeata*
ASTERACEAE	*Senecio barbertonicus*
	Senecio tamoides
CACTACEAE	**Opuntia ficus-indica* (spiny and spineless forms)
COMMELINACEAE	*Cyanotis lapidosa*
CRASSULACEAE	*Crassula lanceolata*
	Kalanchoe lanceolata
	Kalanchoe rotundifolia
	Kalanchoe sexangularis
DRACAENACEAE	*Sansevieria aethiopica*
	Sansevieria hyacinthoides
EUPHORBIACEAE	*Euphorbia confinalis* subsp. *confinalis*
	Euphorbia ingens
	Euphorbia tirucalli
PORTULACACEAE	*Portulaca kermesina*
VITACEAE	*Cissus quadrangularis*

more or less equally distributed between leaf and stem succulents, although it is widely recognised that the more subtropical eastern parts of South Africa are host to more stem than leaf succulents. Predictably, but rather disturbingly, the bird-dispersed exotic cactus, *Opuntia ficus-indica*, was very much in evidence at the locality. Around human settlements in the area, the sisal plant *Agave sisalana* (a noxious weed), and even specimens of the Madagascan *Kalanchoe beharensis* were very commonly cultivated.

Sincere thanks to John and Sandie Burrows (Buffelskloof Private Nature Reserve) and Clare Archer (National Herbarium) for advice and comments on an earlier version of this manuscript.

EXELL, A.W. & WILD, H. 1961-62. A statistical analysis of a sample of the *Flora zambesiaca*. *Kirkia* 2: 108-130.

HAHN, N. 1994. *Tree list of the Soutpansberg*. Fantique Publishers, Pretoria.

***Euphorbia confinalis* subsp. *confinalis* (Euphorbiaceae) growing in the same area as the *Brachystegia spiciformis*. (Photo: Christopher Willis)**

HAHN, N. 1997. Plant diversity statistics of the Soutpansberg. *SABONET News* 2(3): 106-108.

HURTER, P.J.H. & VAN WYK, E. 2001. First distribution record for *Brachystegia spiciformis* (Caesalpinioideae) in South Africa. *Bothalia* 31(1): 43-44.

MABOGO, D.E.N. 1990. *The ethnobotany of the Vhavenda* Unpublished MSc thesis. University of Pretoria, Pretoria.

VAN WYK, A.E. & SMITH, G.F. 2001 (In press). Regions of floristic endemism in southern Africa. A review with emphasis on succulents. Umdaus Press, Pretoria.

VAN WYK, E. & HURTER, J. 2000. *Brachystegia spiciformis*: an exciting discovery. *SABONET News* 5(3): 170-172.

WILD, H. 1968. Phytogeography in south central Africa. *Kirkia* 6(2): 197-222.

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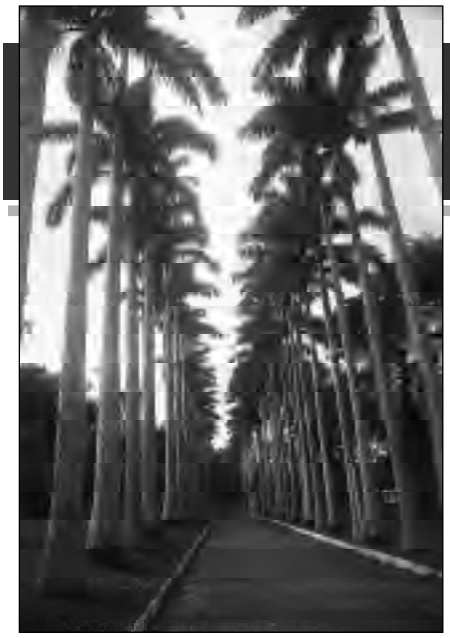
Non-succulents
Taxa found in association with *B. spiciformis*

ANACARDIACEAE	*Rhus magalismontana* subsp. *coddii*
ANNONACEAE	*Artabotrys brachypetalus*
	Hexalobus monopetalus
	Xylopia odoratissima
APOCYNACEAE	*Tabernaemontana elegans*
BIGNONIACEAE	*Tecoma (=Tecomaria) capensis*
CELASTRACEAE	*Gymnosporia rubra*
CHRYSOBALANACEAE	*Parinari curatellifolia*
COMBRETACEAE	*Combretum collinum* subsp. *gazense*
EUPHORBIACEAE	*Bridelia mollis*
	**Ricinus communis*
FABACEAE	*Acacia schweinfurthii* var. *schweinfurthii*
	Bauhinia galpinii
	Erythrina lysistemon
	Peltophorum africanum
GENTIANACEAE	*Anthocleista grandiflora*
MORACEAE	*Ficus glumosa*
	Ficus sansibarica subsp. *sansibarica*
	Ficus sur
MYRTACEAE	*Syzygium cordatum*
	Syzygium guineense
	Syzygium owariense
OLACACEAE	*Ximenia caffra* var. *caffra*
OLEACEAE	*Schrebera argyrotricha*
ORCHIDACEAE	*Ansellia africana*
	Cyrtorchis praetermissa subsp. *praetermissa*
RHAMNACEAE	*Berchemia discolor*
	Ziziphus mucronata
RUBIACEAE	*Coddia rudis*
	Lagynias dryadum
	Leptactina delagoensis subsp. *delagoensis*
	Oxyanthus speciosus subsp. *stenocarpus*
	Plectroniella armata
RUTACEAE	*Zanthoxylum capense*
	Zanthoxylum leprieurii
SAPOTACEAE	*Englerophytum magalismontanum*
SOLANACEAE	*Solanum aculeastrum*
STRYCHNACEAE	*Strychnos madagascariensis*
	Strychnos pungens
TILIACEAE	*Grewia flavescens*

Ferns
Taxa found in association with *B. spiciformis*

ADIANTACEAE	*Cheilanthus viridis* var. *glauca*
ASPLENIACEAE	*Asplenium schelpei*



Palm trees lining the main road into the Aburi Botanic Gardens, Ghana. (Photo: Christopher Willis)

African Botanic Gardens Congress for 2002

From 11 to 15 June 2001, a small group of African botanic garden staff met with Ms Fiona Dennis of Botanic Gardens Conservation International in Aburi Botanic Gardens, Ghana. The purpose of this meeting was to discuss a proposed African Botanic Gardens Congress for 2002 and move a step closer towards developing an African Botanic Garden Network. This followed on from earlier meetings that had been held by African participants attending the World Botanic Gardens Congress in Asheville, North Carolina, USA, in June 2000.

The meeting in Ghana was hosted and chaired by Mr Owusu-Afriyie, former Curator of Aburi Botanic Gardens, but currently serving as Director: Department of Parks and Gardens in Ghana. An opening ceremony (attended by the Regional Deputy Minister: Eastern Region, various members of the media and university staff) was held on the morning of Tuesday 12 June, whereafter discussions took place concerning the planned African Botanic Gardens Congress in 2002. Countries represented at this historic meeting included Cameroon (Limbe Botanic Garden), Ghana (Aburi Botanic Gardens, University of Ghana Botanic Gardens, University of Cape Coast and Kwame Nkrumah University of Science and Technology Botanic Gardens), Togo (Department of the Environment), South Africa (National Botanical Institute and Durban Botanic Gardens), and the UK (BGCI).

Outcomes

The following decisions were taken at the meeting:

- Date for the proposed African Botanic Gardens Congress: 25–30 November 2002.
- The venue is still to be decided. The congress will be held in Cameroon or South Africa.
- The theme for the Congress, as agreed by African representatives at the World Botanic Gardens Congress in 2000, is 'Partnerships and Linkages'.

Funding for representatives from African botanic gardens to attend the Congress will need to be sought.

Goal

To produce a comprehensive and effective programme for the conservation of Africa's threatened endemic plants.

Objectives of Congress

The proposed African Botanic Gardens Congress has the following objectives:

- To create a contemporary database of African botanic gardens.
- To undertake a comprehensive assessment of the common needs of African botanic gardens.
- To identify ways to address these needs.
- To determine the structure of and support required for an African Botanic Garden Network and its Secretariat.
- To adopt the universally applauded *International Agenda for Botanic Gardens in Conservation,* BGCI 2000.
- To review and adopt a draft constitution for the African Botanic Garden Network.
- To produce an Action Plan for the conservation of Africa's threatened endemic flora.
- To publish the Proceedings of the Congress.

Needs Assessment

SABONET published the *Southern African Botanical Gardens Needs Assessment* in November 2000 (Botha, Willis & Winter 2000). At the Ghana meeting it was felt that a similar assessment, using the same questionnaire, should be conducted for botanical gardens in the rest of Africa. In March 2001 the questionnaire used to produce the *Southern African Botanical Gardens Needs Assessment* was sent to Mr Christopher Fominyam (Limbe Botanic Garden, Cameroon) to proceed with the Needs Assessment of botanic gardens in the rest of Africa. Representatives from Togo agreed to coordinate the Needs Assessment process for French-speaking countries in Africa and surrounding islands. It was agreed that SABONET would send out the same questionnaire to those few southern African botanical gardens not included in the initial survey. These include the following gardens: Johannesburg Botanic Gardens, Caledon Wildflower Garden, Manie van der Schijff Botanic Garden, Garden Route Botanical Garden, Potchefstroom University for CHE Botanical Garden (South Africa), Ewanrigg Botanical Garden, and Vumba Botanical Garden (Zimbabwe).

The results of this survey should be received and broadly analysed by Regional Coordinators and submitted to Chris Fominyam by the end of December 2001.

For ease of management and fundraising, it was decided to make certain individuals responsible for coordinating the Needs Assessment and fundraising activities in the different parts of Africa and surrounding islands. Each region of Africa was allocated a certain number of participants to attend

the Congress. These regions include the surrounding oceanic islands that have botanic gardens. It is expected that the various Regional Coordinators will facilitate the process of sourcing these funds required for the participation of botanical garden staff from the individual regions of the continent and surrounding islands. The estimated cost per African participant at the Congress is USD1 500.

Allowance has been made for an additional 50 Congress delegates from outside Africa, including other botanic garden network representatives, funding agencies and gardens with special interest in Africa.

It should also be noted that regional meetings of botanical gardens will take place during the Congress. A draft programme for the meeting was prepared by the Steering Committee, to be finalised by the Congress Secretariat, as soon as the venue has been determined.

Regional Coordination

It was agreed to group the regional African representation by country as follows:

West Africa

Coordinators: George Owusu-Afriyie, Gnagnako Tchêtikè, and Kotchikpa Okoumassou
Number of participants: 25
Countries: Senegal, The Gambia, Liberia, Côte d'Ivoire, Ghana, Nigeria, Benin, Togo, Mali, Burkina Faso, Guinea-Bissau, Niger, Sierra Leone, Mauritania.

Southern Africa

Coordinators: Christopher Willis and Christopher Dalzell
Number of participants: 30
Countries: South Africa, Namibia, Mozambique, Botswana, Malawi, Zambia, Zimbabwe, Swaziland, Lesotho, Angola

Eastern Africa

Coordinator: William Wambugu
Number of participants: 15
Countries: Kenya, Tanzania and Zanzibar, Uganda, Burundi, Rwanda, Comoros, Mauritius, Seychelles, Madagascar, Réunion

Central Africa

Coordinator: Christopher Fominyam
Number of participants: 15
Countries: Cameroon, Gabon, Congo, Democratic Republic of Congo, Central African Republic, Chad, São Tomé and Príncipe, Equatorial Guinea (Fernando Po)

North Africa

Coordinator: Mohammed Rejdali
Number of participants: 15
Countries: Morocco, Western Sahara, Tunisia, Algeria, Libya, Egypt, Sudan, Ethiopia, Djibouti, Eritrea, Somalia

International

Coordinator: Fiona Dennis (BGCI)
Number of participants: 50 (80% self-funded)
Countries: USA, Europe, Australia, major funding bodies, corporate bodies

The Way Forward

We have certainly come a long way since the World Botanic Gardens Congress was held in the USA in 2000. Since June 2000, three issues of the newly developed *African Botanic Garden Network Bulletin* have been produced, with the fourth issue currently in praparation. Our sincere thanks go to Fiona Dennis of BGCI and Mark Mattson of Durban Botanic Gardens for their contributions and efforts in editing these. It is anticipated that the Congress Secretariat will edit the two issues of the Bulletin scheduled for 2002. Anyone wanting to be including in the electronic mailing list to receive the *African Botanic Garden Network Bulletin* should contact Mark Mattson at the following e-mail address: markm@prcsu.durban.gov.za.

Some of the participants attending the African Botanic Garden Network planning meeting held in Aburi Botanic Gardens, Ghana, from 11–15 June 2001. From left to right: Christopher Willis (South Africa), Kotchikpa Okoumassou (Togo), Christopher Fominyam (Cameroon), George Owusu-Afriyie (Ghana), Gnagnako Tchêtikè (Togo) and Christopher Dalzell (South Africa). (Photo: Fiona Dennis)

The meeting held in Ghana in June 2001 took Africans one step closer towards establishing an African Botanic Garden Network. The next important step towards holding an African Botanic Gardens Congress in November 2002 is to finalise the venue for the Congress. This should be known by November 2001. It is then up to African botanic garden representatives to source their own funds to attend the Congress. In the interim, a Needs Assessment of Africa's botanic gardens should be conducted and analysed by assigned Regional Coordinators.

The prospect of organising and holding a major continental Congress in the relatively short space of 12 months will be extremely challenging for the Congress Secretariat and organisers concerned, and they will require all the support they can get. Readers will be kept informed of developments in this regard. This initiative of bringing together Africa's botanic gardens is also very timely, coinciding within a period of a month with the establishment of the African Union and the launch of the 'New African Initiative', which was unanimously adopted by African Heads of State attending the Lusaka Summit, Zambia, on 11 July 2001.

Let us all work hard towards making the African Botanic Garden Network a reality.

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Index Herbariorum Update

The Herbarium of the Harold Porter National Botanical Garden, Betty's Bay

Two editions of the southern African *Index herbariorum* have appeared since the inception of the SABONET project. The first, published as number two in the project *Report Series*, came out in 1997 and covered the herbaria of nine participating countries (excluding South Africa) fairly comprehensively (Smith & Willis 1997). The information largely lacking for South African herbaria, and some of the other countries, was extensively updated in the second edition of the *Index*, published as number eight in the series (Smith & Willis 1999).

However, as is the case with most catalogues of herbaria, they are only as up-to-date as far as information on the most recently established collection is available. One can therefore expect that such indices will grow or contract with time, as new herbaria are started and some are closed or amalgamated with other herbaria.

During a recent visit to the Harold Porter National Botanical Garden in Betty's Bay, South Africa, we realised that the not-so-new herbarium of this garden with its spectacular mountain fynbos vegetation requires registration and an acronym. Staff and some visitors use the herbarium extensively. The herbarium also benefits from the efforts of a volunteer worker, Caroline Joubert, who assists the garden staff with the maintenance and expansion of the collection.

The information as submitted to Dr Pat Holmgren of the New York Botanical Garden is given here in the format used in Smith & Willis (1999). It should serve as a permanent record of the registration of this herbarium, the youngest of South Africa's registered preserved collections:

BETTY'S BAY (GHPG): Herbarium, Harold Porter National Botanical Garden,

P.O. Box 35, Betty's Bay 7141, Western Cape Province, South Africa

Physical address: Herbarium, Harold Porter National Botanical Garden, Corner of Clarence Drive (R44) and Broadwith Road, Betty's Bay, Western Cape Province, South Africa

Telephone: [27] 28/ 272 9311

Fax: [27] 28/ 272 9333

E-mail address: haroldpnbg@intekom.co.za
(use name of officer in subject field)

Web site address: http://www.nbi.ac.za

Status: Statutory body (National Botanical Institute) within the national Department of Environmental Affairs and Tourism

Foundation: *ca* 1961

Number of specimens: 2 240

Important collections: C.M. Behr, W. Ebersohn, J.A. Forrester, C.E. Joubert, L. Mostert, P.A. Palmer

Incorporated herbarium: None

Officer-in-charge & correspondent Cathrina (Karin) M. Behr, 1958 (Horticultural potential of fynbos; garden management)

Curator~Garden: See Officer-in-charge

Associated staff: Jane A. Forrester, 1952 (Horticulturist responsible for garden development, collections and maintenance; garden landscaping)

Caroline E. Joubert, 1938 (Volunteer responsible for herbarium collections and maintenance; Ericaceae; Restionaceae)

Associated garden: Harold Porter National Botanical Garden

Exchange available: None

Wanted: Flora of Coastal Fynbos; Strandveld of the southern part of the southwestern Cape; Forest trees, shrubs and ferns of the southwestern Cape

Remarks: Specimens collected mainly from the Overstrand Municipal area, from Kogelbaai to Gansbaai. This herbarium serves as a reference collection for plant identification.

Compilation date: 30 March 2001

BOTHA, D.J., WILLIS, C.K. & WINTER, J.H.S. 2000. Southern African Botanical Gardens Needs Assessment. *Southern African Botanical Diversity Network Report* No. 11. SABONET, Pretoria, South Africa. 156 pp.

EBERSOHN, W.C. 1976. Die Harold Porter Tuin. *Veld & Flora* 62(4): 32.

NORTON, J. 1994. Between the mountains and the sea: the Harold Porter National Botanical Garden. *Veld &*

Flora 80(3): 84–87.
PORTER, O.M. 1960. Harold Porter Botanic Reserve. *Journal of the Botanical Society of South Africa* 46: 20.
SMITH, G.F. & WILLIS, C.K. (eds) 1997. Index herbariorum: southern African supplement. *Southern African Botanical Diversity Network Report* No. 2: 1–55. SABONET, Pretoria.
SMITH, G.F. & WILLIS, C.K. 1999. Index herbariorum: southern African supplement. Second edition. *Southern African Botanical Diversity Network Report* No. 8: 1–181. SABONET, Pretoria.

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The building that houses the Harold Porter National Botanical Garden Herbarium (GHPG), National Botanical Institute, Betty's Bay, South Africa. (Photo: Karin Behr)

RDL SPECIAL EDITION

from the web

In this special edition of From the Web, we bring you a number of websites dedicated to threatened plants and Red Data Lists.

SABONET

www.sabonet.org/reddatalist/index.html

The SABONET site presents the most up-to-date information regarding threatened plants in the southern African region.

IUCN/Species Survival Commission

www.iucn.org

The IUCN/Species Survival Commission presents the latest policies and paradigms regarding threatened species and Red Data Lists. The site offers interesting literature, global databases and news from around the world.

Swedish Threatened Species Unit

www.dha.slu.se/home.htm

The Swedish Threatened Species Unit is one of the world leaders in developing Red Data List concepts to improve RDLs' utility as a conservation and policy tool.

Australian Threatened Species Network

nccnsw.org.au/member/tsn/

The Australian Threatened Species Network is an extensive national programme that can serve as an excellent model for saving species. This site offers interesting examples of community-based initiatives in preventing species extinctions.

CITES

www.iucn.org/themes/ssc/programs/cites/cites.htm

The 7th edition of CITES: A Conservation Tool is now available on the web in English, French, and Spanish. Prepared for the 12th Meeting of the Conference of the Parties to CITES to be held on 3-15 April 2002 in Chile. This booklet provides a single document to guide the Parties and others through the Convention's articles and resolutions governing the submission, presentation, and adoption of proposals to amend the Appendices. A limited number of hard copies is available from the SSC Wildlife Trade Programme, 219c Huntingdon Road, Cambridge UK CB3 ODL, tel.: 44-1223-277966; fax: 44-1223-277845, e-mail: tradeprog@ssc-uk.org.

(For an alternative viewpoint on CITES, see Hutton, H. & Dickson, B. 2000. *Endangered Species, Threatened Convention: the past, present and future of CITES*. Earthscan Publications, London, UK. 202 pp.)

Third Student Conference on Conservation Science

www.zoo.cam.ac.uk/sccs

You might know of conservation students who would be interested in attending the Third Student Conference on Conservation Science to be held from 25 to 27 March 2002 at Cambridge University. The 2001 conference attracted 170 postgraduate students from 38 countries, as well as conservation practitioners from 25 NGOs and agencies. Special speakers for the 2002 meeting include Prof. Lord (Robert) May (Oxford), Prof. William Bond (Cape Town), Dr Cristiàn Samper (Smithsonian Tropical Research Institute) and Dr Russ Mittermeier (Conservation International). The meeting is sponsored by Cambridge University, Conservation International, RSPB and English Nature. The cost (once there) is student-friendly: the conference fee is £30 (including tea, coffee and the three evening events), and accommodation plus breakfast in a Cambridge college is £10 per night. Local students can direct outsiders to cheap food sources. However, recognizing that other costs can be a burden, assistance is available. Further information can be found on the website or by e-mail sccs@zoo.cam.ac.uk. The application form should be filled in by 1 November 2001. Abstracts of talks or posters should also be delivered by this date, but are not requirements for attendance.

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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.

Mary Gunn Library: Books and Theses

▮ The floristics of the Dunbar Valley Serpentine Site, Songimvelo Game Reserve, South Africa. K. Changwe. 2000. B.Sc.(Hons.), University of the Witwatersrand.

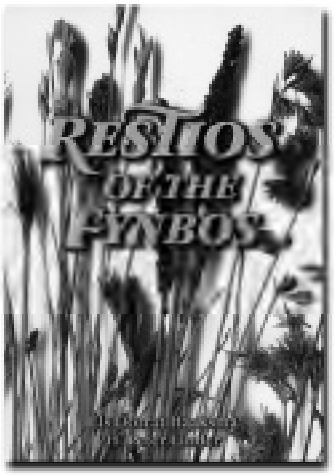
▮ Species limits in *Cannomois virgata* complex (Restionaceae). C. Mujaju. 2000. M.Sc. thesis, University of Cape Town.

▮ Methods of audience research for museums with living collections. G.L. Stauffer. 1993. M.S. thesis, University of Delaware.

Mary Gunn Library: New Books

▮ Gaston, K.J. & Spicer, J.S. 1998. *Biodiversity: an introduction*. Blackwell Science, Oxford. Paperback, 175 x 245 mm, x + 113 pages, ISBN 0-632-04953-7. Price GB£10.99.

As the title says, this is an introduction rather than "all you ever wanted to know...", but for an introduction it packs a remarkable amount of information into a very small space. And there are numerous references to publications that, between them all, probably do contain just about all that most scientists (and politicians and managers too) would want to know about the subject. A remarkable feature of a topic that can be so vague as to sound like no more than another political buzzword, is the stress on quantitative data and how to quantify the concepts involved. There are useful chapters on the value (not only monetary, to the delight of this column) of biodiversity, and a brief and therefore intelligible description of the contents and structure of the Convention on Biological Diversity.

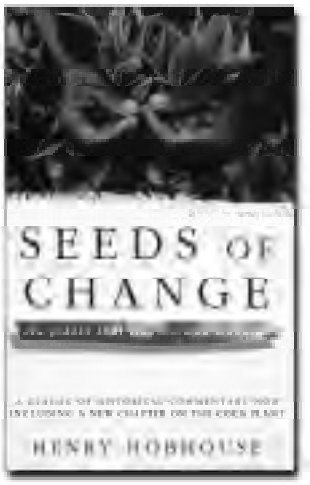


▮ Haaksma, E.D. & Linder, H.P. 2000. *Restios of the Fynbos* Botanical Society, Cape Town. Plastic binding, 150 x 210 mm, xii + 188 pages, ISBN 1-874999-21-X. Price ZAR159.00.

However overexposed to fynbos one feels, this book is worth a second glance for the illustrations at least. Most of these are photographs of living material in the style of the Dorling Kindersley *Eyewitness Guide* series, with a high degree of clarity and sharpness.

▮ Hickey, M. & King, C. 2000. *The Cambridge illustrated glossary of botanical terms* Cambridge University Press, Cambridge. A4, xii + 208 pages. Paperback ISBN 0 521 79401 3, GB£18.95; hard cover ISBN 0 521 79080 8, GB£52.50

This book is the subject of extensive reviews by H. Beentje (*Kew Bulletin* 52: 505-507) and O.A. Leistner (*Bothalia*, in press), to which interested readers are referred.

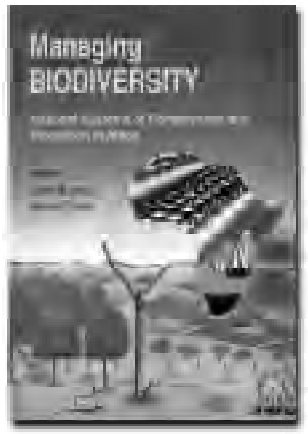


▮ Hobhouse, H. 1999. *Seeds of change: six plants that transformed mankind* Papermac, London. Paperback, 135 x 220 mm, xvi + 381 pages, ISBN 0 333 73628 1. Price GB£12.00.

First published in 1985 as *Five plants that transformed mankind*, this book now has a chapter on the interaction between humanity and coca. The other plants are quinine, sugar, tea, cotton, and potatoes. The book looks most interesting, and I am looking forward to reading it attentively.

▮ Lesotho Government, National Environment Secretariat. 2000. *Biological diversity in Lesotho: a country study* NES, Maseru. Paperback, 175 x 245 mm, x + 142 pages, ISBN 99911-633-5-2. Price unknown.

At first sight the presence of only 26 pages (18%) on indigenous plants in a book of 142 pages may seem to reinforce the perception that the species most likely to be conserved and written about are cuddly ones with round furry faces and big soft eyes (note the absence of any mention of rarity or ecological importance in these priorities). A closer inspection, however, reveals 40 pages (28%) on threats to biodiversity, capacity, legal aspects, research, and economic value of diversity, 16 pages of references (11%), five pages (3.5%) of index and, wondrous to behold, three pages (2%) on



rare cultivars of crop plants. So the cuddlies, including rare races of domestic animals (which need protection despite the frequency with which they are overlooked), are restricted to under 27% of the text, which seems fair. The text is informative, the references are exhaustive, the pictures are well chosen ... but the whole important package is let down by the printing, with some pages hardly inked at all, and most of the colour printed out of register.

❚ Mugabe, J. & Clark, N. (eds) 1998. *Managing biodiversity: national systems of conservation and innovation in Africa* ACTS, Nairobi. Paperback, 150 x 210 mm, vii + 279 pages, ISBN 9966-41-097-X. Price US$20.00.

The core of this book comprises nine chapters on different aspects of conservation, sustainable development, intellectual property rights, technology transfer, and their impact on biodiversity in a number of African states. An introduction and a conclusion round out the package. As this book seems to be aimed more at politicians and managers than scientists, there is much emphasis on the mechanisms by which various countries (mainly in East Africa) implement the Convention on Biological Diversity (CBD). It is interesting that the CBD seems implicitly to recognise plant breeders' rights, and hence the existence of plant breeders and the need for horticultural taxonomy.

❚ Nordenstam, B., El-Ghazaly, G. & Kassas, M. (eds) 2000. *Plant systematics for the 21st century* Portland Press, London. Hardcover, 175 x 245 mm, xiii + 318 pages, ISBN 1 85578 135 2. Price GB£75.00.

Most of the papers in this volume form the record of a Wenner-Gren symposium celebrating the centenaries of V. Täckholm and G. Erdtmann, held in Stockholm in 1998, but a few are from a symposium celebrating Dr Täckholm's centenary held in Cairo in February 1998. The first groups of papers, therefore, celebrate and give biographical details of the eminent taxonomist and palynologist respectively. After this there are sections on systematics today and tomorrow, palynology and syatematics, aspects of Egyptian botany, and integration of data from different fields of biology. All contain important papers that are well worth reading.

Milestone Red Data List Publications

❚ Gärdenfors, U., Rodríguez, J.P., Hilton-Taylor, C., Hyslop, C., Mace, G., Molur, S. & Poss, S. 1999. Draft Guidelines for the application of IUCN Red List criteria at national and regional levels. *Species* 31-32: 58–70.

❚ Gärdenfors, U., Hilton-Taylor, C. Mace, G.M. & Rodríguez, J.P. 2001. The application of IUCN Red List Criteria at regional levels. *Conservation Biology* 15 (5): 1206–1212.

❚ Gigon, A., Langenauer, R., Meier, C. & Nievergelt, B. 2000. Blue Lists of threatened species with stabilised or increasing abundance: a new instrument for conservation. *Conservation Biology* 14(2): 402–413.

❚ Golding, J.S. 2000. Southern African herbaria and Red Data Lists. *Taxon* 50(1): 593–602.

❚ Golding, J.S. & Smith, P.P. 2000. A 13-point flora strategy to meet conservation challenges. *Taxon* 50(1): 593–602.

❚ Hutton, H. & Dickson, B. 2000. *Endangered Species, Threatened Convention: the past, present and future of CITES*. Earthscan Publications, London, UK. 202 pp.

This book presents an alternative viewpoint on CITES.

❚ IUCN 1994. *IUCN Red List categories*.Prepared by the Species Survival Commission. IUCN, Gland, Switzerland. 21 pp.

❚ IUCN 2001. *IUCN Red List Categories: Version 3.1*.Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

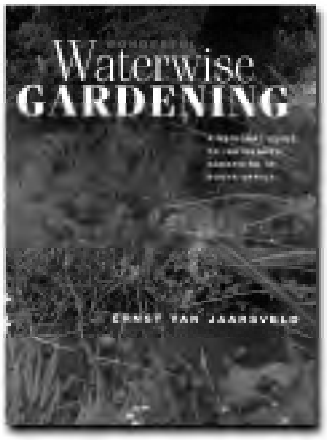
❚ Mittermeier, R., Myers, N., Gil, P.R. & Mittermeier, C.G. 2000. *Hotspots: Earth's biologically richest and most endangered terrestrial ecoregions*.Conservation International, USA.

❚ Primack, R. 1998. Monitoring rare plants. *Plant Talk* 15: 29–32.

❚ Wood, A., Stedman-Edwards, P. & Mang, J. (eds.) 2000. *The root causes of biodiversity loss*.WWF-International. Earthscan Publications, UK. 399 pp.

▮ Soulé, M.E. & Kohm, K.A. (eds) 1989. *Research priorities for conservation biology*. Island Press, Washington DC. Paperback, 150 x 230 mm, xii + 97 pages, ISBN 0-933280-99-8. Price ZAR39.99.

Street-corner Italians seeing a beautiful lady who has passed the first flush of youth are said to express their appreciation with the phrase *Vecchia, ma ancora bella!*[Old, but still beautiful] Much the same could be said of this book; the priorities were set over ten years ago, but until the research is done and published, the need for the answers is, if anything, more pressing now than when the book was published.



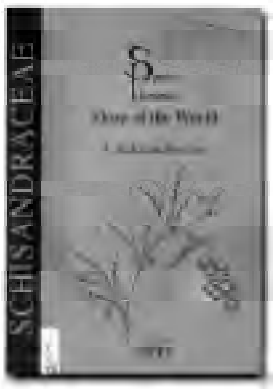
▮ Van Jaarsveld, E. 2000. *Wonderful waterwise gardening*. Tafelberg, Cape Town. Hardback, A4, 144 pages, ISBN 0 624 037840 8. Price ZAR180.00.

Ernst's latest offering is a slender book on how best to use indigenous plants for gardening in southern Africa. There are numerous glossy drop-dead-gorgeous pictures of indigenous plants, separated by helpful information on how to use them, what grows where, and how to achieve a garden that is beautiful and not demanding of infinite maintenance. Full marks on the realisation that there is more to one's weekend than endless raking-up leaves, and that for much of South Africa, the Cape flora is every bit as alien as that of Australia or North America.

Mary Gunn Library: New Parts of Ongoing Floras

▮ Two fascicles of the *Species Plantarum* Project, namely
4. Schisandraceae, by R.M.K. Saunders (2001).
5. Prioniaceae, by S.L. Munro, J. Kirschner & H.P. Linder (2001).

▮ Three fascicles of the *Flora of Ecuador*, namely
64: 132 Loasaceae by M. Wiegend (2000).
65: 102 Polygalaceae by B. Eriksen, B. Ståhl & C. Persson (2000).
66: 6–10: Ophioglossaceae, Osmundaceae, Plagiogyraceae and Schizaeaceae by B. Øllegaard, Marattiaceae by H. Tuomisto & C. Moran, and Gleicheniaceae by E. Øllegaard Andersen & B. Øllegaard (2001).



▮ Two fascicles of the *Flore des Mascareignes*, namely
136–148 Myoporacées — Hydnoracées by various authors (1994).
149–152 Aristolochiacées — Monimiacées by various authors (1998).

▮ One fascicle of *Flora Neotropica*, namely
80: Vitaceae: Ampelocissus, Ampelopsis, Cissus by J.A. Lombardi (2000).

▮ One fascicle of *Flore du Cambodge, du Laos et du Viêtnam*, namely
30: Leguminosae — Papilionaceae — Millettieae by Phan Kê Lôc & J.E. Vidal (2001).

▮ One volume of *Flora Malesiana*, namely
15: Nepenthaceae, by M. Cheek & M. Jebb (2001).

Recently Published Papers

Adansonia 23(1) (2001)

▮ A synoptic review of *Romulea* (Iridaceae: Crocoideae) in sub-Saharan Africa, the Arab Peninsula and Socotra including new species, biological notes, and a new infrageneric classification. J.C. Manning & P. Goldblatt. Pages 59–108.

African Geographic 9(7) (2001)

▮ Hope for nature's greatest treasures. Conservation International advocates concentrating on 25 biodiversity hotspots around the world. R. Mittermeier & C. Mittermeier. Pages 30–37.

▮ Ukhahlamba! South Africa's Drakensberg and Lesotho's Maloti Mountains are now the latest candidate to become a Transfrontier Conservation Area. Anonymous. Pages 38–53.

African Journal of Ecology 39(2) (2001)

▮ Growth features of *Acacia tortilis* and *Acacia xanthophloea* seedlings and their response to cyclic soil drought stress. D.O. Otieno, J.I. Kinyamario & T.O. Omenda. Pages 126–132.

▮ Vegetation dynamics of coastal sand dunes near Malindi, Kenya. W.M. Musila, J.I. Kinyamario & P.D. Jungerius. Pages 170–177.

▮ The effects of fire and grazing pressure on vegetation cover and small mammal populations in the Maasai Mara National Reserve. V. Salvatori, F. Egunyu, A.K. Skidmore et al. Pages 200–204.

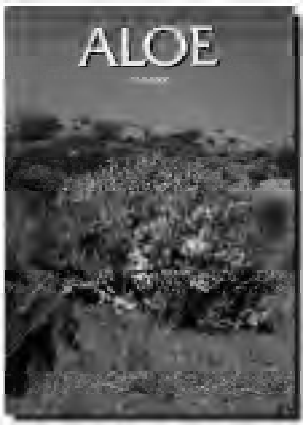
▮ The impact of *Azolla filiculoides* Lam. on animal biodiversity in streams in Zimbabwe. B. Gratwicke & B.E. Marshall. Pages 216–218.

African Wildlife 55(3,4) (2001)

▮ Natural control of alien species. Introduction of biological control for invasive aliens. F. Impson. Pages 8–11.

▮ Reversing the rivers. Development of the Lesotho Highlands Water Project. J. Ledger. Pages 6–11.

▮ Blind leap of faith. A new phase in bioprospecting in South Africa. G. Henne & S. Fakir. Pages 12–15.



Aloe 38(1,2) (2001)

▮ The genus *Delosperma* in Gauteng—I. A new species in the white-flowered group: *Delosperma gautengense* H.E.K. Hartmann. H.E.K. Hartmann. Page 4–7.

▮ The genus *Delosperma* in Gauteng—II. A new species in the group with purple flowers: *Delosperma purpureum* H.E.K. Hartmann. H.E.K. Hartmann. Pages 9–12.

▮ *Crassula perfoliata* pedigree chart. G. Rowley. Page 8.

▮ A new combination in *Antimima* N.E.Br. (Mesembryanthemaceae). P. Chesselet. Page 17.

▮ Conservation: a delicate conversation. G. Marx. Pages 22–24.

▮ A new tribal classification for the Mesembryanthemaceae Fenzl based on characters of the floral nectary. P. Chesselet, G.F. Smith & A.E. van Wyk. Pages 25–28.

▮ *Crassula badspoortense* Van Jaarsveld, a new species from the Western Cape Province. E. van Jaarsveld & A.E. van Wyk. Pages 29–30.

▮ *Haworthia rossouwii* V.Poelln. and the demise of *H. serrata* Bayer. B. Bayer. Pages 31–36.

▮ Notes on the *Faucaria* from the forest: *Faucaria nemorosa* L.Bolus ex L.E.Groen. T. Dold & S. Hammer. Pages 37–38.

▮ The ghost trees of Etosha—*Moringa ovalifolia* Dinter & A.Berger. R. Frandsen. Page 46.

Ambio 30(1,2) (2001)

▮ Determining landscape function and ecosystem dynamics: contribution to ecological restoration in the southern Namib Desert. A. Burke. Pages 29–36.

▮ Demarcating coastal vegetation buffers with multicriteria evaluation and GIS at Saldanha Bay, South Africa. J.H. van der Merwe & G. Lohrentz. Pages 89–95.

Annals of the Missouri Botanical Garden 88 (2001)

▮ The genus *Hypoxis* (Hypoxidaceae) in Central Africa. J. Wiland-Szymaska. Pages 302–350.

Biodiversity and Conservation 10 (2001)

▮ The under-financing of protected areas in the Congo Basin: so many parks and so little willingness-to-pay. D.S. Wilkie, J.F. Carpenter & Q. Zhang. Pages 691–709.

▮ Validation of cryopreservation protocols for plant germplasm conservation: a pilot study using *Ribes* L. B.M. Reed, D. Dumet, J.M. Denoma & E.E. Benson. Pages 939–949.

▮ Diversity and use of palms in Zahamena, eastern Madagascar. A. Byg & H. Balslev. Pages 951–970.

▮ The effect of civil war on Rwanda's bean seed systems and unusual bean diversity. L. Sperling. Pages 989–1009.

▮ Human density as an influence on species/area relationships: double jeopardy for small African reserves. A.H. Harcourt, S.A. Parks & R. Woodroffe. Pages 1011–1026.

▮ Priority areas for the conservation of subtropical indigenous forest in southern Africa: a case study from KwaZulu-Natal. H.A.C. Eeley, M.J. Lawes & B. Reyers. Pages 1221–1246.

▮ Representation of natural vegetation in protected areas: capturing the geographic range. J.M. Scott, M. Murray, R.G. Wright, B. Csuti, P. Morgan & R.L. Pressey. Pages 1297–1301.

Biological Conservation 98,99,100 (2001)

▮ Conservation requirements of an exploited wildflower: modelling the effects of plant age, growing conditions and harvesting intensity. B.B. Lamont, R. Marsula, N.J. Emright & E.T.F. Witkowski. Pages 157–168.

▮ Conservation biology of the Pyrenean larkspur (*Delphinium montanum*): a case of conflict of plant versus animal conservation? J. Simon, M. Bosch, J. Molero & C. Blanché. Pages 305–314.

▮ Development of a dragonfly awareness trail in an African botanical garden. A.N. Suh & M.J. Samways. Pages 345–353.

BioScience 51(2) (2001)

▮ A special issue on global movement of invasive plants and fungi. A.Y. Rossman. Pages 93–94.

▮ Horticulture as a pathway of invasive plant introductions in the United States. S.H. Reichard & P. White. Pages 103–113.

British Cactus and Succulent Journal 19(2) (2001)

▮ A visit to the southern Richtersveld. E. Harris. Pages 58–63.

▮ Succulent nurseries of South Africa Part I: Obesa, a jewel in Graaff-Reinet. G. Smith. Pages 70–73.

Conservation Biology 15(2,3) (2001)

▮ Evaluating the effectiveness of corridors: a genetic approach. S.G. Mech & J.G. Hallett. Pages 467–474.

▮ The scientific foundations of habitat conservation plans: a quantitative assessment. E.K. Harding, E.E. Crone, B.D. Elderd *et al*. Pages 488–500.

▮ Moving scientific review beyond academia. E. Fleishman. Pages 547–549.

▮ A method for setting the size of plant conservation target areas. M.A. Burgman, H.P. Possingham, A.J.J. Lynch *et al.* Pages 603–616.

▮ Evaluation of museum collection data for use in biodiversity assessment. W.F. Ponder, G.A. Carter, P. Flemons & R.R. Chapman. Pages 648–657.

▮ Cultural values: a forgotten strategy for building community support for protected areas in Africa. M. Infield. Pages 800–802.

Diversity and Distributions 7 (2001)

▮ Priority areas for the conservation of South African vegetation: a coarse-filter approach. B. Reyers, D.H.K. Fairbanks, A.S. van Jaarsveld & M. Thompson. Pages 79–95.

Economic Botany 55(1) (2001)

▮ Prospects for sustainable use and development of wild food plants in Ethiopia. Z. Asfaw & Mesfin Tadesse. Pages 47–62.

Environmental Conservation 28(2) (2001)

▮ Tourism revenue-sharing around national parks in Western Uganda: early efforts to identify and reward local communities. K. Archabald & L. Naughton-Treves. Pages 135–149.

▮ Temporal changes in woody-plant use and the *ekwar* indigenous tree management system along Turkwel River, Kenya. J. Stave, G. Oba & N.C. Stenseth. Pages 150–159.

Environmental Impact Assessment Review 21(3) (2001)

▮ Multi-actor information system for integrated coastal zone management. M.J. Schouten, J.S. Timmermans, G.E.G. Beroggi & W.J.A.M. Douven. Pages 271–290.

Journal of Applied Ecology 38(2) (2001)

▮ Grasslands, grazing and biodiversity. A.R. Watkinson & S.J. Ormerod. Pages 233–237.

▮ A plant trait analysis of responses to grazing in a long-term experiment. J.M. Bullock, J. Franklin, M.J. Stevenson et al. Pages 253–267.

▮ Grassland invasions: effects of manipulations of climate and management. J.M. Buckland, K. Thompson, J.G. Hodgson & J.P. Grime. Pages 301–309.

Journal of Biogeography 28 (2001)

▮ Plant diversity and endemism in sub-Saharan tropical Africa. H.P. Linder. Pages 169–182.

▮ Scale and species richness: towards a general hierarchical theory of species diversity. R.J. Whittaker. K.J. Willis & R. Field. Pages 453–470.

▮ The biogeographic regions reconsidered. C.B. Cox. Pages 511–523.

Journal of Vegetation Science 12(1) (2001)

▮ Classification and ordination of plant communities of the Naukluft Mountains, Namibia. A. Burke. Pages 53–60.

Kew Bulletin 56(2) (2001)

▮ *Hemizygia stalmansii* (Labiatae), a new species from Mpumalanga, South Africa and Swaziland. A. Paton & K. Balkwill. Pages 491–496.

Kirkia 17(2) (2000)

▮ Notes on the grass subtribe Sorghinae (Poaceae: Andropogoneae) in the *Flora Zambesiaca* area. M.P. Setshogo. Pages 127–145.

▮ A new variety of *Platycoryne* (Orchidaceae) from Zimbabwe. W. Fiebeck. Page 146.

▮ A natural orchid hybrid from Zimbabwe. W. Fiebeck & S. Mavi. Pages 147–149.

▮ Notes on *Drimiopsis* Lindl. (Hyacinthaceae) of the *Flora Zambesiaca* area. S. Kativu. Pages 150–152.

▮ A floristic classification of shoreline vegetation around Lake Kariba, Zimbabwe. L. Mhlanga & I. Mapaure. Pages 153–170.

▮ A preliminary checklist of flowering plants of islands in Lake Kariba, Zimbabwe. L. Mhlanga & I. Mapaure. Pages 171–188.

▮ Patterns of elephant damage to *Colophospermum mopane* on selected islands in Lake Kariba. L. Mhlanga & I. Mapaure. Pages 189–198.

▮ Conifers in Zimbabwe. L.J. Mullin. Pages 199–218.

▮ Vernacular names of Zimbabwean fungi: preliminary checklist. G.D. Pierce & C. Sharp. Pages 219–228.

Koedoe 44(1) (2001)

▮ A reconnaissance botanical survey of the Lower Orange River (Blouputs to Onseepkans) in the Northern Cape, South Africa. H. Bezuidenhout & C.L. Jardine. Pages 1–8.

▮ The estimation of herbage yields under fire and grazing treatments in the Mountain Zebra National Park. J. de Klerk, L.R. Brown, H. Bezuidenhout & G. Castley. Pages 9–16.

- The identification and description of the management units of the Goegap Nature Reserve. H. Rösch. Pages 17–30.

- A brief history of Kafue National Park, Zambia. H.K. Mwima. Pages 57–72.

- Conservation business: sustaining Africa's future. I.P. Sonnekus & G.J. Breytenbach. Pages 105–124.

Molecular Ecology 10(7) (2001)

- Population structure in the endangered Mauna Loa silversword, *Argyroxiphium kauense* (Asteraceae), and its bearing on reintroduction. E.A. Friar, D.L. Boose, T. Ladoux, E.H. Roalson & R.H. Robichaux. Pages 1657–1663.

Namibia Scientific Society 49 (2001)

- Vegetation survey of Namibia. B. Strohbach. Pages 93–124.

- Vegetation degradation of Namibia. B. Strohbach. Pages 127–156.

Novon 11(1) (2001)

- A new species of *Commelina* (Commelinaceae) from Tanzania. R.B. Faden & M.H. Alford. Pages 16–21.

- New names in African Celastraceae and Rutaceae. R.E. Gereau. Pages 43–44.

Oryx 35(3) (2001)

- If community conservation is the answer in Africa, what is the question? W.M. Adams & D. Hulme. Pages 193–200.

Plant Growth Regulators 33(1) (2001)

- Micropropagation of the endangered *Aloe polyphylla*. A.L. Abrie & J. van Staden. Pages 19–23.

PlantLife 24 (April 2001)

- Amaryllidaceae: specialists of the underworld. D.A. Snijman. Pages 5–9.

- Amateur herbaria in South Africa: No. 9. The Kap River Reserve Herbarium, Port Alfred, Eastern Cape. T. Dold. Page 13.

- Blue squill in the red: *Scilla natalensis* as a conservation charge. E. Douwes, N.R. Crouch & R. Symmonds. Pages 14–18.

- Indigenous plants as indoor subjects. G. Nichols. Pages 19–20.

- Introduction to bryology in southern Africa 9. Moss distribution patterns. J. van Rooy. Pages 21–24.

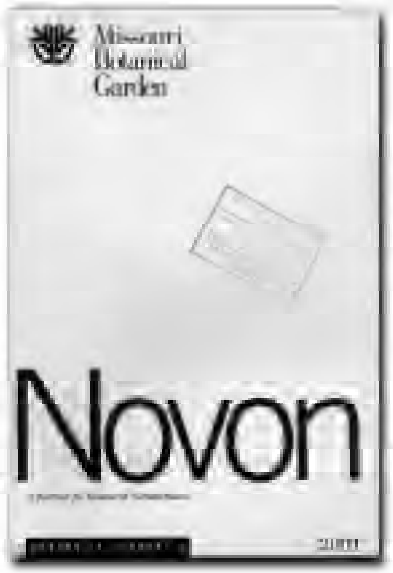
- Notes on the Tree of the Year 2001: *Celtis mildbraedii* Natal White Stinkwood, uzinhlu (Z). R. Boon & R. Symmonds. Pages 30–32.

- A new distribution record for KwaZulu-Natal: *Plectranthus pentheri* (Gürke) Van Jaarsv. & T.J. Edwards. A. Hankey. Page 33.

Plant Talk 25 (July 2001)

- Botanical illustration in colour. R. Wise. Pages 21–25.

- Floras in retrospect and for the future. D. Frodin. Pages 36–39.



Restoration Ecology 9(2) (2001)

- Restoration ecology: repairing the Earth's ecosystems in the new millennium. R.J. Hobbs & J.A. Harris. Pages 239–246.

- *Scientific Journal of the West-African Association of Botanists* 0(1) (2001) (*Revue Scientifique de L'Association des Botanistes de L'Afrique de L'Ouest*)

- Some structural and floristic aspects of Bossematie Forest in the east of Côte D'Ivoire. A. Bakayoko, N.F. Kouame, F.H. Tra Bi & D. Traore. Pages 7–20.

- The woody flora of Dindefello Area, southeastern Senegal. A. Goudiaby, A.T. Ba & B. Sambou. Pages 21–34.

- Specific characters for the identification at young plant stage of Senegalese weed species of the genus *Corchorus* L. (Tiliaceae). M.S. Mbaye, K. Noba, R.S. Sarr et al. Pages 35–42.

- Anatomical study of *Terminalia* (Combretaceae) species collected from eastern Burkina Faso. A. Thiombiano, J. Millogo-Rasolodimby & S. Guinko. Pages 43–52.

- Effects of water extracts of common plants on the seed germination of weeds in Senegal. I. Fall & A. Tidiane Ba. Pages 53–62.

- Anacardiaceae therapeutic power related to their metabolites—particularly their high levels of tannins. A. Sereme, J. Millogo-Rasolodimby, M. Kouda-Bonafos et al. Pages 63–72.

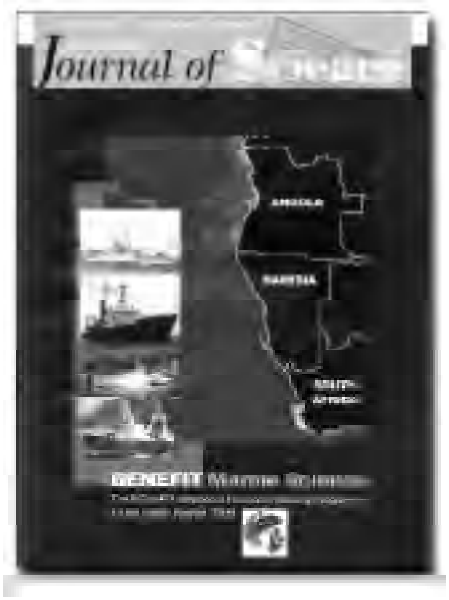
- Ethnobotanical survey about contraception and women's barrenness therapy among the Krobou people (Côte D'Ivoire). K. N'Guessan, L. Ake Assi & D. Traore. Pages 73–82.

- Pollen availability for honeybees in the western region of Burkina Faso. M. Sawadogo, S. Guinko, J. Millogo-Rasolodimby & W. Guenda. Pages 83–92.

Science 291(5513) (2001)

▮ No easy answers for biodiversity in Africa. G. Vogel. Pages 2529–2530.

▮ Conservation conflicts across Africa. A. Balmford, J.L. Moore, T. Brooks et al. Pages 2616–2619.



Southern African Forestry Journal 191 (2001)

▮ Valuing South Africa's savannas: methodological issues. A. Ballance, C.M. Shackleton, S.E. Shackleton *et al.* Pages 43–51.

South African Journal of Science 97(5,6) (2001)

▮ Radiocarbon adjustments to the dendrochronology of a yellowwood tree. J.C. Vogel, A. Fuls & E. Visser. Pages 164–166.

▮ Museum natural science and the NRF: crisis times for practitioners of fundamental biodiversity science. D.G. Herbert. Pages 168–171.

▮ Comparison of extent and transformation of South Africa's woodland biome from two national databases. M.W. Thompson, E.R. Vink, D.H.K. Fairbanks et al. Pages 179–182.

Systematic Botany 26(1,2) (2001)

▮ Phylogeny and biogeography of the Arbutoidea (Ericaceae): implications for the Madrean-Tethyan hypothesis. L.C. Hileman, M.C. Vasey & V.T. Parker. Pages 131–143.

▮ The evolution of Araliaceae: a phylogenetic analysis based on ITS sequences of nuclear ribosomal DNA. J. Wen, G.M. Plunkett, A.D. Mitchell & S.J. Wagstaff. Pages 144–167.

▮ Patterns of embryological and biochemical evolution in the Asterids. D.C. Albach, P.S. Soltis & D.E. Soltis. Pages 242–262.

▮ Phylogeny and biogeography of the *Ormocarpum* group (Fabaceae): a new genus *Zygocarpum* from the Horn of Africa region. M. Thulin & M. Lavin. Pages 299–317.

▮ What has happened to descriptive systematics? What would make it thrive? L.R. Landrum. Pages 438–442.

Veld & Flora 87(2,3) (2001)

▮ Golden wattle loses its lustre. Biological control of Australian acacias in South Africa. J. Hoffmann. Page 58.

▮ Spectacular rewarding *Scadoxus*. Easy to grow, easy on the eye. G. Duncan. Pages 60–63.

▮ *Boophane haemanthoides* The enigmatic gifbol from the Cederberg. B. Low. Pages 64–66.

▮ SABONET Nyika Expedition 2000. Plant collecting in northern Malawi and Zambia. H. Kurzweil & C. Willis. Pages 67–71.

▮ *Ipomoea bisavium*. The re-discovery of an indigenous morning glory. M. Welman. Pages 72–73.

▮ Baviaanskloof. A conservation jewel in the Eastern Cape. A. Boshoff, R. Cowling & G. Kerley. Pages 74–77.

▮ Mopane-veld. Traditional uses for this most African of trees. M. Potgieter, J. Madzibane, L. Mashabane & D. Wessels. Pages 78–79.

▮ Little sacs full of surprises. Looking at some indigenous fungi. A. Wood. Pages 83–85.

▮ *Chasmanthe*. Notes on their cultivation and propagation. G. Duncan. Pages 108–111.

▮ Climbers' friends and relatives. *Cliffortia*—an intriguing member of the rose family. C. Whitehouse. Pages 112–115.

▮ *Streptocarpus formosus* Grow them indoors and out. L. van der Walt. Pages 116–117.

▮ Lobelias in South Africa. From the ever popular garden lobelia to the near-extinct wimmerellas. C.N. Cupido & F. Conrad. Pages 118–119.

▮ *Nerine frithii*. A graceful nerine from up north. C. Craib. Pages 124–125.

▮ An unusual dwarf *Ornithogalum* from the North West Province. C. Craib. Page 126.

▮ *Tylecodon cacalioides* and a long-proboscid horse-fly. R. Gess. Page 127.

▮ *Pearsonia callistoma*. Endemism on dolomite-derived soils. G.J. Campbell-Young & K. Balkwill. Pages 128–129.

▮ The nettle. Not all nasty, the nettle has some surprising attributes. G. Blom. Pages 130–131.

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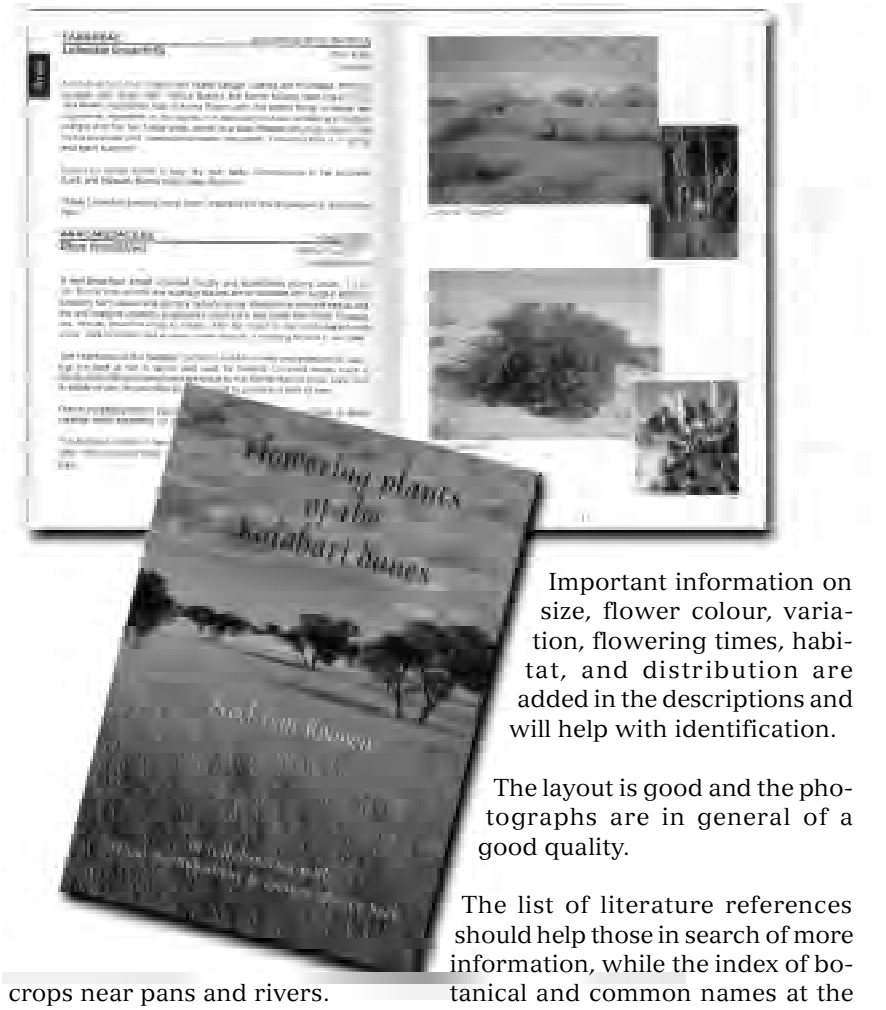
book review

Flowering Plants of the Kalahari Dunes

Noel van Rooyen, in collaboration with Hugo Bezuidenhout and Emmerentia de Kock.
Published by Ecotrust.
ISBN 0-620-27376-3.
English and Afrikaans. 216 pp.
Soft cover, 210 x 150 mm.
Price: ZAR95.00



The author of *Flowering plants of the Kalahari dunes* states that the Kalahari sands extend over some 2.5 million km+ of the interior of central southern Africa. The Kalahari dune veld is but a small part in the southwestern corner of this vast expanse and includes the extensive sheet of aeolian sand of southwestern Botswana, together with the adjacent areas of Namibia and South Africa. Since the proclamation of the Kalagadi Transfrontier Park, even more tourists are visiting this unique area to experience the remoteness and wilderness which is so characteristic of the Kalahari.

Who better than Noel van Rooyen to publish this long-awaited field guide illustrating 236 plant species, of the more than 600 species recorded in the area? This book is the result of many years of intensive research by Van Rooyen together with the staff and students of the Department of Botany and the Center of Wildlife Management at the University of Pretoria.

As an introduction to the description and illustration of plants, the author briefly touches on the conservation, geology, climate, vegetation types, life forms, alien plants, diversity, rarity, and endemism of the area. To assist the user of the field guide in recognising the main habitat types referred to in the description of the plants, the habitats are more comprehensively described. The habitats are dune crests, grassy plains, open to dense tree savanna of the dunes and plains, dune valleys, pans and rivers, and edges of and calcrete outcrops near pans and rivers.

The short introduction on how to use the book helps the reader to identify the 236 common and conspicuous species for the area, as well as a few of the rare and endemic species. The primary method of identifying a species is by means of photographs. Many of the photographs show the habit of the species and a close-up of the leaves, flowers, or fruit. To simplify the identification of the plants, the species have been arranged in groups according to their growth form, for example, trees, shrubs, grasses, bulbs, prostate creepers, and so on. Within each growth form, the plant families have been arranged in an order that reflects their relationship with each other. As far as possible, English and Afrikaans common names have been included.

Important information on size, flower colour, variation, flowering times, habitat, and distribution are added in the descriptions and will help with identification.

The layout is good and the photographs are in general of a good quality.

The list of literature references should help those in search of more information, while the index of botanical and common names at the end of the guide will help the user to search for a species already known.

This field guide is recommended to all those interested in the Kalahari and its plants.

The English edition, as well as the Afrikaans edition *Blomplante van die Kalahari duineveld*, is available at ZAR95.00 (RSA postage included) from Noel van Rooyen, 272 Thatchers Fields, 0081, Lynnwood, Pretoria, South Africa (Tel./Fax (27) 12 3489043).

—Guillaume Theron
Sunnyside
Pretoria
South Africa

book review

Water Plants of Namibia, an Identification Manual

Nicholas Clarke and
Esmerialda Klaassen.
Occasional Contributions No. 2
National Botanical Research
Institute, Windhoek, Namibia.
ISBN 0-86976-520-5.
185 pp. Soft cover, 295 x 210 mm.

Congratulations to Namibia on publishing the first field guide to water plants in the SABONET region. It is extremely rewarding to see a country that is striving to fulfil the ideals of the RAMSAR Convention compiling an inventory of the plant diversity of its wetlands.

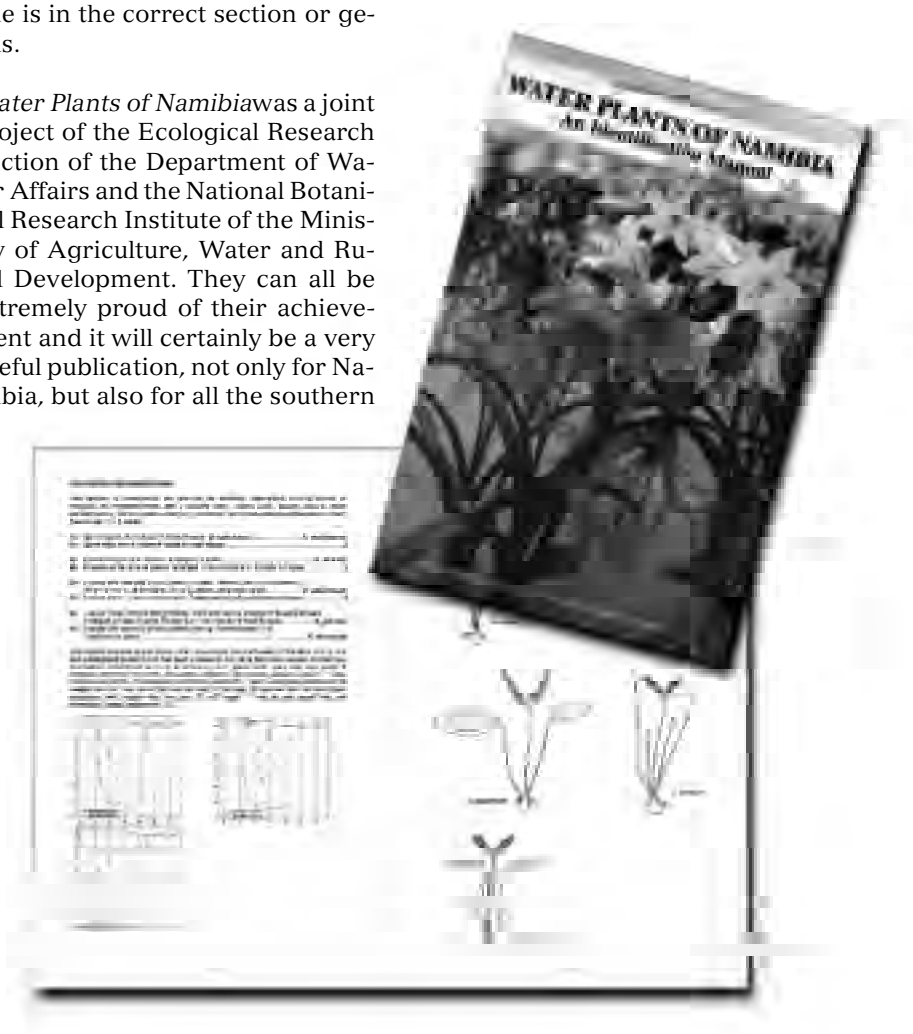
The front cover depicts *Crinum paludosum*. It is bright and attractive, enticing one to pick up the book and delve into the intricacies of water plants. While working with water plants one's hands are forever wet and muddy and therefore the front and back covers have, very sensibly, been laminated so that the book will not easily become damaged.

Water Plants of Namibia includes all the major groups of wetland plants except the Poaceae and Cyperaceae. Although the Cyperaceae have been published in a separate publication (Clarke & Mannheimer 1999), it would, however, have been convenient if they had been included in this publication as well. Namibia lies in the Savanna region of Africa where grasses are one of the most dominant groups and play a very important role in wetlands. Their exclusion could no doubt result in frustration amongst field workers.

In the introductory pages, endemic water plants are discussed and the number considered endemic to Namibia is given as nine species. Unfortunately, one of the most unusual and most rare water plants, *Dintera pterocaulis,* which is endemic to Namibia, is not mentioned at all.

The first key divides the water plants into different sections, using morphological and ecological characters. The keys in each section refer to different genera and the page where a genus occurs in the book is given. However, some of these keys need further refinement. Under each genus heading there is a brief description and a key to the relevant species in Namibia, followed by brief geographical and habitat descriptions, as well as distribution maps. On the opposite page to all the keys there are diagrammatic sketches of the plants. These are impressionistic sketches to direct one to the correct groups, so it is essential to read the dimensions that occur in the keys. On the whole, this is extremely helpful, as one can see immediately whether one is in the correct section or genus.

Water Plants of Namibia was a joint project of the Ecological Research Section of the Department of Water Affairs and the National Botanical Research Institute of the Ministry of Agriculture, Water and Rural Development. They can all be extremely proud of their achievement and it will certainly be a very useful publication, not only for Namibia, but also for all the southern African countries. It is hoped that other countries will be encouraged to produce a similar guide for their wetlands.



CLARKE, N. & MANNHEIMER, C. 1999. Cyperaceae of Namibia, an illustrated key. *Occasional Contributions* No. 1. National Botanical Research Institute, Windhoek, Namibia. 96 pp.

—René Glen
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book review

Trees and Shrubs of the Etosha National Park

C. Berry & B. Loutit. 2000.
Namibia Scientific Society,
Windhoek.
Paperback, A5, 164 pages.
ISBN 99916-40-17-7.
Price unknown.

This is what one feels a basic tree guide ought to look like. The essentials are there, even if it would have been nice to have a key to the species included as well, and there are few frills. After the customary formalities, the book starts with short descriptions of the nine major vegetation types of the Etosha National Park. In the back of the book is a fold-out map indicating where each vegetation type is to be found in the park. Maybe for the next edition the publishers could be persuaded to find a rich sponsor to pay for this map to be redrawn and printed in colour, with an indication of where the camps and at least the main roads are. However, the descriptions of the vegetation include notes on where each type can be seen, and what trees and shrubs are to be found there.

Then follow 49 double-page spreads, each detailing a different tree or shrub. On the left-hand-side is a beautiful drawing of a leafy, fruiting or flowering twig of the species discussed, with a habit sketch, usually enlivened with a picture of characteristic scenery or an animal which eats the plant, in the background. Where necessary, there are additional details; thus the main picture of *Dichrostachys cinerea* is a flowering twig, but the characteristic fruits are also illustrated. In addition to the National Tree List number and scientific name, the text for each species gives the family name and vernacular names in Afrikaans, English, German and Herero. The descriptions include notes on habit, distribution, bark, thorns, leaves, flowers, and fruit. There is also a section of general notes for each tree, where one may find what eats it, what species are similar, and other points of interest. Where two or more illustrated species are similar enough to be confusing, such as the four species of *Grewia* and several look-alike pairs of *Acacia*, there are tabular keys to aid identification.

The arrangement is alphabetical, but suggests (to this reviewer's delight) that the layout of the Tree Society's venerable (1964) guide to Witwatersrand trees still has a place.

Bringing up the rear are lists of trees identified in the rest camps, where one can examine them at close range. The introduction does mention that Etosha has the sensible "stay in your car and don't touch" rule, but omits to mention that transgressors may not have the luxury of choosing whether to answer to an irate game ranger or a hungry member of the Big Five for their misdeed. So it is gratifying to have a list of what can be safely examined at close range. There are also indexes by scientific and common names, a list of references, an illustrated glossary and scale, 14 delightful watercolour paintings of trees reproduced in full colour, and a checklist of all plant species recorded to date from Etosha.

It would be both pleasant and fitting to end this review by saying that surely every visitor to Etosha, or better the other ecotourist operations in the northern half of Namibia (and, for that matter, Botswana and the Northern Province of South Africa), will find this book essential. That one cannot honestly do so is a reflection more on the intelligence of the tourists one sees than on the producers of this book. Readers of *SABONET News* would certainly refer to it often, but would the bod who was uncontrollably excited at seeing "TEN LIONS!!!!!" know what to make of it? I doubt it. Those of us who feel that when you have seen one sleepy lion you've seen them all, and they would not be there without the herbivores and the trees, will love this book. So we need to go out and educate the Big Five brigade that without the small and cuddlies there are no Big Five, and the cuddlies need the trees, which are anyway fascinating in their own right. Well done to Mesdames Berry and Loutit on a splendid start in this direction.

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book review

Bring Nature Back to Your Garden (Western Edition)

Charles and Julia Botha.
Published by the Wildlife and Environment Society of South Africa.
ISBN 1-874975-07-8.
English.
243pp. Soft cover, 240 x 170 mm.
Price: ZAR75.40 (including postage and packaging)

Bring nature back to your garden is not just another gardening book. A wonderful sense of humour and a way with words are the trademarks of the authors, who put ecology into perspective in a fun way for city gardeners not used to happily dealing with the intricacies of nature in their backyard!

This edition of the best-selling *Bring nature back to your garden* covers the western part of South Africa with its unique vegetation and animals. Pests (and predators) are brought to life, as fascinating and sometimes gruesome details about their lifestyles are revealed. Insects are an important food source for many creatures. Poisoning them leads to poorer ecosystems less able to support our many species of wildlife, especially birds, frogs, and lizards. Every gardener should have a copy of this book to hand, and should consult it regularly before automatically, and in auto-pilot, resorting to the nearest poison for an instant cure to garden problems. Poisoning kills both pests and predators. Predators breed more slowly. With none around to exercise control there is, in fact, a population explosion of pests. This chapter is enough to convince anyone—people are encouraged to attract natural predators to their gardens to help deal with the problem. Balance and tolerance are advised in order that each component can live in harmony with its neighbours and dependants. Practising sound environmental principles in their own backyards will create a healthy ecosystem that benefits people positively and will allow future generations of South Africans to inherit a sound, rich, and diverse landscape, rather than a bleak and barren one.

The book provides some basic rules on gardening, explains why it should preferably be indigenous and goes on to explain how to convert from an exotic to an indigenous garden. The chapter on butterflies and moths differentiates between the two, and reminds the reader that one cannot have butterflies without caterpillars! The chapter on birds explains how to 'plant indigenous' to attract large numbers of desirable birds to the garden and gives tips on nesting requirements, artificial feeding and bird baths. Useful tips for creating an ecologically balanced pond are provided together with a set of suitable plants. A few species of undesirable birds (mainly exotics) are also dealt with. Short chapters highlight fungi, orchids, and fynbos. Detailed descriptions of suitable trees and shrubs follow and include some uses of the plants, both to man and beast, highlighting the interactions and interdependence of all. Creepers and climbers, groundcovers, herbaceous plants, and bulbs are dealt with in the same manner. Lists of plants suitable for specialised areas and purposes follow, and a useful "who to contact for what" guide makes it easy for readers to track down anyone from a Conservation Official to a bird specialist or nursery.

A few of the more common plant invaders are dealt with in some detail and it is made quite clear why we don't need them around! Individual landowners and local authorities are encouraged to act speedily—"every stitch in time saves nine thousand". Poisonous plants are highlighted, creating an awareness of their dangers; authorities are warned not to plant them in public areas.

Eve Gibbs's cartoons and sketches provide a lovely touch of humour and help to make the book a pleasure to read and use.

All in all, a wonderful book, packed with interesting information, that no one who professes to be interested in the bush, field-guiding, gardening, or conservation should be without.

Bring nature back to your garden is available from selected bookstores and Wildlife Society shops as well as by mail order from the Wildlife Society, 100 Brand Road, Durban 4001, South Africa. All profits, including royalties, go to the Wildlife Society, and, therefore, to conservation.

—Pitta Joffe
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book review

Plants + People: An Exhibition of Items from the Economic Botany Collections

P. Griggs, H.D.V. Prendergast & N. Rumball
(no date)
Royal Botanic Gardens, Kew.
ISBN 1 84246 008 0.
Paperback, 210 x 255 mm, 64 pages.

The Economic Botany collection at Kew was founded by Sir William Hooker in 1841, making it essentially contemporary with the herbarium. From 1846 this collection was housed in an old fruit store, now used as the School of Horticulture, but the collections soon outgrew the available space. In 1855 Decimus Burton was commissioned to design a proper museum to house the ever-expanding collection and a site was chosen across the lake from the Palm House, which must surely be Burton's most beautiful structure. Museum No. 1 opened in 1857 and for over a century the displays hardly changed in character. Eventually the building was fully restored and the exhibits renewed; the result was opened on 26 May 1998, and this book is the catalogue of the new and much improved exhibition. Some old items remain, such as a walking stick made of sugar cane, donated by Sir Joseph Banks (1743–1820), but the majority of the items described in this catalogue are of relatively recent origin. Indeed, a whole section (Growing Collections) is devoted to recent acquisitions. Other sections include Fabulous Fabrics, Getting in a Lather (which turns out, surprisingly, to concern mainly toothbrushes and toothpaste, not only soap), Healing Plants, Highs and Lows (drugs), Pick-me-up Plants (tea, coffee etc.), Sugar and Spice, Taking our Pulses (legumes), Eating for Energy and many others. The selection is wide, and covers essentially all imaginable plant uses and not a few bizarre ones. Each section is illustrated with excellent colour photographs of a few of the items mentioned and every page is a visual feast. Among the more unusual items illustrated are a lace collar made from *Asclepias* fibre, a bowler hat made of cork, a box made of cloves (the buds, not the wood) and a shirt made of pineapple fibre.

Who would buy this beautiful book? Apart from visitors to Museum No. 1 and those who retain a sentimental attachment to Kew after having studied there, I cannot think of anyone who would find it essential to their well-being. But it is an excellent example of how documents of its kind should be prepared and presented.

—Hugh Glen
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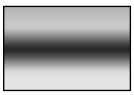
Regional News Update



News from Botswana

At last we are connected!

Just as the project is coming to an end, GAB has at last been "connected". One may ask why it has taken us so long to install the facility; the simple answer would be "bureaucracy". It has indeed taken us this long because of the links the Herbarium has with Government—we are a Government Institution and have to follow certain rules, we can't just do things on our own, but have to do things through what we call "communication channels", which entail a lot of consultations, some of which can be very costly.

However, we are grateful that we are now able to communicate with the world from our office and no longer have to interrupt Dr Setshogo during his lectures to check our mail—his computer was in danger of being overworked! So friends and colleagues, from all over the world, we can now be reached electronically. Our email address is gabherbarium@botsnet.bw. (Please include the name of the person you are writing to in the subject line.)

We also have a new officer at the herbarium: Badumedi Matsetse is working as Herbarium Technical Officer. We welcome her as SABONET Member. She is currently receiving in-house training on the computer database.

Computerisation is going well: 2 650 specimens have already been encoded. We have also completed encoding the Poaceae, with a final total of 1 213 specimens. Thank you to Nikaya Govender for the time she spent in Botswana helping us to encode the grasses.

—Monicah Kabelo
Herbarium Assistant
Botswana National Herbarium
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See News from South Africa *for more about Nikaya Govender's internship in Botswana.*

News from Lesotho

From February to November 2000 I studied towards a B.Sc. (Hons) (Botany) degree at the University of Stellenbosch. The course comprised a research project and four modules—Biostatistics, Philosophy of Science, Ecology, and Systematics. These modules were presented in the form of lectures, seminars, assignments, tests, and exams. Biostatistics dealt with computer packages used for analysing biological data, many of which were helpful in my research project. Philosophy dealt with central concepts and ethical problems in the practice of science. Ecology focused on vegetation description and analysis, as well as reproductive biology. Systematics centered on taxonomy, phylogeny, and evolution.

My research project, entitled "Systematic assessment of the different colour forms of *Oxalis obtusa*", was conducted under the supervision of Dr L. Dreyer and Dr E. Marais. Colour form variation has been used to subdivide *Oxalis* species into subspecific ranks, but its systematic significance in *O. obtusa* was not clear. My results showed that colour form has no systematic significance in *O. obtusa*, but indicated a possibility of ecotypes.

I gained a great deal of knowledge from this course and acquired many skills, including communication and research skills. I am grateful to my supervisors, lecturers, and staff of the Botany Department at the University of Stellenbosch for their support and guidance. I am indebted to Mr Chris Willis and the SABONET Project for financial support, without which my studies would not have been possible. LONG LIVE SABONET!

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News from South Africa

For about three years the National Botanical Institute in Pretoria has run a bussing program as part of our outreach to the surrounding community. In this programme, children from formerly underprivileged schools are brought to the NBI for a morning of fresh air and instruction in why plants are important and how to care for them. Over a period of two weeks each spring (September) we host 60 to 90 children from each of up to a dozen schools (totalling some 600 to 1 000 children). In the herbarium, we decided that there could be nothing quite as boring as having a group of talking heads waffling at the children, and so we arranged hands-on activities, introduced by a very short pantomime—often the first time these children have seen live theatre.

The Fairy Godmother in action during the NBI bussing programme.

Once Kinny Mmakola volunteered last year to join us, it took the organisers of the bussing programme pantomime little time to recognise that we had a star looking for the right part, and so this year's production (loosely based on Cinderella) exploited Kinny's kind and motherly nature to the full. No wonder she became our automatic choice for Fairy Godmother. Her hard work in drilling us in the song-and-dance routine certainly showed; at last we have someone who can get four actors and an indefinite number of technical crew together on stage at least looking as if they have all heard the same words at least once before!

(Kinny is a SABONET Data Entry Clerk at the Pretoria National Herbarium, contracted to encode the tropical African legume (bean family) specimens.)

—Hugh Glen & Kinny Mmakola
National Herbarium
Pretoria

Report Back from Botswana Internship

Between May and August this year, I spent four weeks in Botswana. I was given the wonderful opportunity of working at the herbaria and assisting with students training on the PRECIS Specimen Database. The time was divided into two visits, each of which was two weeks long. During each of these visits I spent the initial week at the University of Botswana Herbarium (UCBG) and the second week at the National Herbarium (GAB).

Mbaki Muzila (UCBG) and Monicah Kabelo (GAB) had both attended SABONET Database courses. However, Mbaki is currently studying towards an Honours degree at the University of the Free State. Monicah has many tasks around the herbarium and this leaves little time for data capturing. In light of this, SABONET-Botswana has employed two students on a contract basis to encode the Poaceae specimens.

The first visit, in late May to early June, entailed the training of one student at each institute and computerising Poaceae specimens. The student at UCBG was Ronald Samaxa. He was highly motivated and quickly learnt how to capture data and back up his database. Abednico Macheme, the student at GAB, was equally motivated. He had already started work on the database with the help of Monicah and only needed to polish his data capturing skills. At the end of the second week, Monicah and I went over some reports on the Specimen Database and how to run simple queries using a "Reports Database".

Both herbaria benefited tremendously from the students, as they did their utmost to speed up the data capturing process. By my next visit, which was in late July to early August, GAB had completed the Poaceae and UCBG had only new Poaceae specimens left to encode (specimens that had not yet been mounted)!

The next step after computerising the Poaceae was to make sure that they were properly georeferenced. This is a difficult, time-consuming task, but with the help of Gerald Pope's "Collecting localities in the Flora Zambesiaca area", it turned out to be very enjoyable. It was also an educational experience for me, as I am now familiar with many of the collecting localities in Botswana (even though my pronunciation is not always correct). I learnt that the most widely collected area in Botswana is the Okavango Delta (Ngamiland). The Delta extends over most of the degree squares 1922 and 1923 and comprises perennial channels and swamps, islands, and seasonally inundated floodplain (Pope & Pope 1998). Many of the specimens from this area were collected by the legendary Peter Smith. With reference to the grass collection, much of the other vast expanses of the country remain undercollected.

By the last day we had completed all the georeferencing and were really pleased with ourselves. This left time to create a few database queries at GAB so that "clean-ups" can be made to their database.

To summarise, the total number of specimens encoded at UCBG was 1 006, of which 667 belong to the Poaceae. At GAB a total of 2 427 specimens, of which 1 209 belonged to the Poaceae, were encoded. My contribution was 390 specimens for the two institutions. I acquired a vast knowledge of the beautiful country and met many wonderful people. I also gained by being able to visit a few of the localities I had been georeferencing!

Thank you to SABONET for providing me with this unique opportunity. I am extremely grateful to Dr Moffat Setshogo (SABONET Botswana), Dr Bruce Hargreaves (Head of the Botswana Natural History Museum), Mrs Queen Turner (Head of Herbarium Section) and Mr Jimmy Mashonja (Head of Entomology Section) for all their assistance during my stay. A big

Ronald Samaxa (UCBG), Monicah Kabelo (GAB), Jacob Phiri (UCBG) and Abednico Macheme (GAB); outside the building that houses the National Herbarium. Ronald is holding a copy of the invaluable reference book. (Photo: Nikaya Govender)

'thank you' also to Jacob Phiri, Monicah Kabelo, Ronald Samaxa, Abednico Macheme and the rest of the staff at the Natural History Museum.

POPE, G.V. & POPE, D.G. 1998. *Flora Zambesiaca*—Collecting localities in the *Flora Zambesiaca* area. Royal Botanic Gardens, Kew.

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Internship

Recently, internships were made part of the University of Natal's BSc Honours programme. Four interns were offered to the Durban Botanic Gardens (DBG) for six weeks. (Un)fortunately, the DBG could not host the fifth intern—this created an opportunity for the Natal Herbarium to become involved. Charleen Rupnarain spent 18 June–3 August at the Natal Herbarium, encoding specimens of the tribes Orchideae and Diseae in the family Orchidaceae. During this period, she encoded 698 specimens. In her article below she shares her experience and illustrates the knowledge she gained from the assignment.

—Yashica Singh

My Kingdom for an Orchid

There are many myths and legends surrounding orchids; for example, the spotted leaves of *Dactylorhiza* were believed to be marks of blood that fell from the Cross (Griffiths 1995). In the Middle Ages in Europe, people believed that orchids grew in spots where cattle, sheep, and horses had mated. As the legend goes, Orchid was the son of a nymph and a satyr, a creature with insatiable passion. At a festival of Bacchus, the drunk Orchid attacked a priestess and the enraged crowd leapt upon him and tore him limb from limb. His father begged the Gods to be merciful and they took pity on him. They changed Orchid into a flower with his father's lascivious nature. From this, people believed that eating the roots of an orchid acted as an aphrodisiac (Eng Soon 1980).

The word "orchid" is derived from "orchis" (Greek for testis). Theophrastus (370–285 BC) made this association when he noticed the similarity between the bulbs of Mediterranean orchids and the mammalian testes. Carl Linnaeus kept the word in his *Species Plantarum*, which was the origin of binomial classification (Eng Soon 1980).

Wild orchids will thrive in almost any undisturbed place that can support plant life. Despite this, they are actually quite rare plants. This is because of the high degree to which they are affected by environmental change. Another reason limiting their abundance is their difficulty in reproducing. Orchids produce thousands of seeds per capsule but these seeds do not contain any storage or nutrient tissue. They will only germinate when an association with a specific fungus is made (Eng Soon 1980). Habitat destruction—forestry, pollution, farming, plantations, industry, and general urbanization—has also resulted in restricted or decreased numbers of orchids. Many orchids, such as *Bonatea saundersiae*, *Cynorchis compacta,* and *Disa zuluensis*, are now afforded protection by the CITES II Convention and efforts are being made to increase their declining numbers (Scott-Shaw 1999), including micropropagation in labs to build up seedling reserves.

***Schizochilus flexosum* (Tribe Orchideae) with delicate drooping inflorescences, occurs in moist rocky grasslands. (Photo: Yashica Singh)**

The Orchidaceae comprises 22 000–25 000 species and is the largest angiosperm family. In South Africa there are 466 species of orchids in 52 genera, of which 302 species in eight genera are endemic. Linder and Kurzweil (1999) have recorded that the Western Cape has the largest number of species and the greatest diversity of orchids. The only orchid species that has been introduced to South Africa is *Gastrodia sesamoides* (Linder and Kurzeil 1999).

Orchids are divided into two groups based on the number of anthers. The subfamily Orchidoideae belongs to the monandrous orchids—they have one functional stamen. The subfamily is then divided into tribes on the basis of a number of characters such as vegetative features, floral features, and habitat (Burns-Balagh and Funk 1986). Most of the South African orchids belong to this subfamily. Members of the Orchideae tribe have an erect or suberect anther; the lip is frequently spurred, whereas the median sepal is not; the petals are not stalked and often are not lobed, but they are never fimbriate. On the other hand, members of the Diseae tribe have an anther that is horizontally reflexed, or if the anther is erect, the median sepal is spurred and the petals are fimbriate with a long claw (Linder and Kurzweil 1999).

Like other families, the genera making up the Orchidaceae have had their names changed many times after revisions. New genera have been described; some have been excluded and their species put into pre-existing genera. This process is continual as new information comes into being and systematists employ new scientific methods, for example, comparison of nucleotides. For instance, *Monadenia* and *Herschelia* are now included in the genus *Disa* and what is now the genus *Corycium* was once viewed as part of the genus *Pterygodium*.

During my internship at the Natal Herbarium, I encoded the specimens of the tribes Orchideae and Diseae. The records from the data captured showed that KwaZulu-Natal had the largest number of species (52 Orchideae species and 74 Diseae species) followed by the Eastern Cape (29 Orchideae species

***Disa woodii* of the tribe Diseae. (Photo: Wally Menne)**

and 61 Diseae species). The tribes Orchideae and Diseae are found mainly in soil in grasslands, on slopes, in marshy areas, forests, and on cliffs. They have rarely been recorded in dry conditions. I found the most ardent orchid collectors to be F.R.R. Schlechter, H.J. Thode, S.P. Bester, J.M. Wylie, R. Williams, J. Medley-Wood and A.G.H. Rudatis. The collector that made the largest contribution to the herbarium's collection of Orchideae and Diseae is Medley-Wood who collected over 130 specimens.

South African orchids are not very popular for cultivation because their flowers tend to be small and unappealing to horticulturalists. The large-flowered species from Tropical America and Asia are generally preferred (Linder and Kurzweil 1999). Despite this, South African orchids have a lot to offer to a garden. The flowers of *Stenoglottis* may be small but they bloom during summer and autumn when few orchids can be found in flower (Stewart 1989). Having a plant such as this, along with other spring-flowering orchids, would result in a garden blooming all year round. The best know orchid in the commercial world is perhaps *Vanilla*, a very primitive orchid dating back 120 million years ago (Leroy-Terquem and Parisot 1993). The *Vanilla* fruit are the source of the well-known flavouring. In South Africa, orchids are used as food, aphrodisiacs, fertility charms, poison, medicine, and as talismans by superstitious people.

Orchid "fever" hit Europe in the 19th century, resulting in orchids being sold at ridiculously high prices at auction houses; one orchid was sold for 100 times the average salary of a domestic worker (Leroy-Terquem and Parisot 1993). Orchids have been the hobby of heads of royalty and have had praise heaped upon their beauty and mysteriousness by poets and authors. Today their magic is still present—enjoying their loveliness is not restricted to the lucky few anymore, but is open to anybody who cares to indulge in them. No longer need I give up my kingdom for an orchid!

BURNS-BALAGH, P. & FUNK, V.A. 1986. A phylogenetic analysis of the Orchidaceae. *Smithsonian Contributions to Botany* 61. Smithsonian Institution Press, Washington.

ENG SOON, T. 1980. *Asian orchids*. Times Books International, Singapore.

GRIFFITHS, M. 1995. In: J. Stewart & M. Griffiths (eds), *Manual of orchids*. Macmillan Reference Books, London.

HUNT, P.F. 1990. *The orchids: the wild species*. W.H. Smith Publishers Inc., New York.

LEROY-TERQUEM, G. & PARISOT, J. 1993. *Orchids: care and cultivation*. Cassell Publishers Ltd, London.

LINDER, H.P. & KURZWEIL, H. 1999. *Orchids of southern Africa* A.A. Balkema, Rotterdam, Brookfield, Netherlands.

SCOTT-SHAW, R. 1999. *Rare and threatened plants of KZN and neighbouring regions* Pietermaritzburg, KZN Nature Conservation Service.

STEWART, J. 1989. The genus *Stenoglottis*. *The Kew Magazine* 6, 1 (February 1989).

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News from Mozambique

Georgina Neto (Angola) with her supervisor Dr Maria de Luz, working at LISC Herbarium on her MSc thesis.

Samira Izidine (Mozambique) with her supervisor Dr Cristina Duarte, working at LISC Herbarium on the *Flora of Mozambique* (Cornaceae and Begoniaceae).

The University of Natal Botanical Garden

A Living Educational Facility

Figure 1. The entrance to the University of Natal Botanical Garden on the Pietermaritzburg campus. (Photo: O. Grace)

The traditional role of botanical gardens as a living documentation of flora is being challenged by the increasing need for conservation education. While the historical faculty for botanical research is continued in modern botanical gardens, emphasis on public leisure is now surpassed by the importance of public awareness regarding the conservation of the earth's flora. The urgency of plant conservation, as well as promotion of these values in communities, has added new dimensions to the function of botanical gardens. A successful botanical garden is therefore one in which visitors are offered an enjoyable and informative experience, besides providing a facility for academics. The University of Natal's Botanical Garden on the Pietermaritzburg campus in KwaZulu-Natal, despite its comparatively small area, is one garden that is playing important roles in research and education to meet these requirements.

History

The need for a botanical garden at the University arose as a result of increasing research momentum in the conservation and micro-propagation of indigenous plants, conducted in the former Department of Botany. Research and environmental education are recognised as principal functions of botanical gardens (Botha *et al.* 2000), and the University of Natal Botanical Garden was established in these capacities. The garden was aimed primarily at the enhancement of botanical research at the University. Of importance equal to its role in research, was the aim to provide a living educational tool for students and local communities. Integral to these objectives was the conservation of genetic diversity through plant propagation.

Plans for a botanical garden were conceived in the early 1980s, and in 1983, following completion of a new complex for the Botany and Zoology departments, a section of the lawns in front of them were earmarked for the purpose. The Department of Botany Botanical Garden project was fully initiated in 1987, financed by the University and supplementary funding from private research grants secured by Head of Department Professor Johannes van Staden. Initial developments were accomplished over a ten-year period, and in 1999, extensions to the garden were approved, bringing the grounds to approximately 3 ha. In the same year, the garden was renamed the University of Natal Botanical Garden, to coincide with restructuring within the University and the establishment of the Research Centre for Plant Growth and Development (RCPGD) (Figure 1).

Plant Collections and Facilities

To serve all spheres of botanical research and education undertaken at the University, the garden includes both indigenous and exotic plant species. Approximately 500 labelled specimens in beds exemplify the diversity of species propagated in the garden. It has been designed to include several plant collections, such as cycads and ferns, and replicated ecosystems within 'feature' gardens. These include a small carnivorous plant garden with a *Sphagnum* peat bog, a pond garden, and the popular evolutionary garden of

Figure 2. The indigenous medicinal garden plays an important role in ethnobotanical research and education at the University of Natal. (Photo: O. Grace)

primitive plants, 'dinosaur footprints' and fossils. Specimens held at the University of Natal Bews Herbarium, associated with the School of Botany and Zoology, complement living collections in the garden.

The specialised indigenous medicinal garden was developed to service increasing ethnobotanical research and teaching conducted at the University (Figure 2). As many species are used for a variety of purposes besides medicine, the recently established economic garden and arboretum will augment the existing collection. These collections focus on conservation priority species, notably those with potential for small-scale agriculture. Similarly, the arboretum will include threatened indigenous trees and grassland species.

The medicinal garden clearly illustrates how a living plant collection fulfils many roles in teaching and research: it provides a reference for identification of commonly used plants, serves as a testing ground for successfully propagated species, and a source of material needed for laboratory investigations. Staff and students of Ethno-Economic Botany courses run by the School of Botany and Zoology use it extensively. Furthermore, the medicinal garden provides an important collaborative link between traditional health care practitioners and academics.

In addition to outdoor facilities, the Oxalis, Gesneriad, Succulent, Bromeliad and Orchid collections are housed in climate-regulated greenhouses. Various other greenhouses accommodate specialised growing conditions, such as high light intensity or humidity, and a system for hardening-off micropropagated plants. Research material is largely held in these greenhouses, while indoor and bedding plants are kept in shade houses. A well-equipped garden laboratory is used for so-called 'dirty' laboratory work. The entire garden complex comprises seventeen houses with an area of approximately 1 700 m^2 (Figure 3).

Management Policy

A University Committee, comprising representatives of the RCPGD, School of Botany and Zoology, Campus Administration, and Estates divisions, manages the University of Natal Botanical Garden. Immediate management responsibilities are met by Professor Johannes van Staden, Chair of Botany and Director of the Research Centre, horticulturalist Mr Colin Hills and technical staff member Mr Martin Hampton. Four gardeners are responsible for maintenance; more than one staff member per hectare represents an impressive staff compared to many other botanical gardens in southern Africa, where lack of funds inhibit sufficient staffing (Botha *et al.* 2000).

Figure 3. Facilities in the garden complex include several climate-regulated greenhouses for plant collections and cultivated research material. (Photo: O. Grace)

In line with University policy, the botanical garden is managed and maintained according to environmentally sound principles and emphasis is placed on inexpensive practices. The use of chemicals is avoided, all compost is produced *in situ,* growth media are prepared in the potting shed, guinea fowl are kept as natural pesticides, and there is no direct water output from the garden. The entire garden is irrigated; plans are in place to complete the conversion of remaining beds to automatic systems. All water features are run on wastewater collected and piped to the garden from RCPGD distillation units and incubators. Ponds were designed to preclude overspill of aquatic plants grown for research and teaching programmes (Figure 4). Outflow is directed through a series of traps into a settling pond, thereby preventing contamination of the natural watercourse that runs at the periphery of the garden. Besides diverse plant species, the garden is a habitat for wildlife, such as mongoose, leguaans and other reptiles, and an expansive variety of bird species.

Research and Education

The University of Natal Botanical Garden is in every endeavour a 'working' garden, providing excellent facilities for academic research, teaching, and public education. Formal infrastructure such as greenhouses and the garden laboratory are primarily used for research, while the informal facilities are used more frequently for teaching, both *in situ* and in supplying material for practical classes. These services are provided to the broader plant science community at the University, including disciplines in agronomy, botany, horticulture and zoology. The garden is open, with permission, to all members of the University and public. Among the many regular visitors are interested members of the public, horticultural societies and gardening clubs from throughout KwaZulu-Natal,

Figure 4: Water features are run exclusively on recycled wastewater, and a settling pond prevents aquatic plants from entering the garden's natural watercourse. (Photo: O. Grace)

Figure 5. Information signboards are placed throughout the garden, facilitating self-guided educational visits. (Photo: O. Grace)

school groups, academics and students from this and other tertiary institutions. The garden plays an important role within the contexts of both academic and community education.

Informative signboards are placed along paths traversing the garden and an information kiosk at the entrance allows self-guided educational visits (Figure 5). Owing to the expense of formal labelling, a unique numerical database system has been implemented, according to which specimens are numbered and further information accessed electronically (Figure 6). This inventory system corresponds to the need for modern data management in botanical gardens (Botha *et al.* 2000).

Plant Conservation

The role of this botanical garden as a source of genetic material for the conservation of threatened plants is fulfilled by a dynamic approach to plant sharing. Specimens are purchased and exchanged with other establishments, established from micropropagated material, or secured on field collecting trips by botanists from the School of Botany and Zoology and RCPGD. Indeed, many specimens in the garden are the result of research undertaken by academics in the University. Research conducted at many botanical gardens remains largely unpublished and inaccessible (Botha *et al.* 2000). Owing to the academic nature of research conducted at the University, results are placed in the public domain as a matter of course.

Conclusion

The history of this botanical garden has proved that development and improvement is ongoing; projects are continuous to improve the quality of service provided to the academic and public community. Plans for the future include improvements to the already impressive infrastructure, guided trails, further planting, and completion of the recent extensions. The Committee upholds an open-door policy on input from users of the garden. Experts from the University and horticultural communities work closely in achieving such goals. Because botanical gardens must attract visitors and offer an enjoyable learning experience, the garden is landscaped to provide aesthetic yet practical access to all collections.

The University of Natal Botanical Garden is an outstanding example of a living educational facility fulfilling the three principal functions of a botanical garden in the new millennium: research, education and conservation.

Figure 6. Plant specimens are labelled according to a numerical system, and information accessed via an electronic database. (Photo: O. Grace)

BOTHA, D.J., WILLIS, C.K. & WINTER, J.H.S. 2000. Southern African Botanical Gardens Needs Assessment. *Southern African Botanical Diversity Network Report 11.* SABONET, South Africa. ISBN 1-919795-54-5.

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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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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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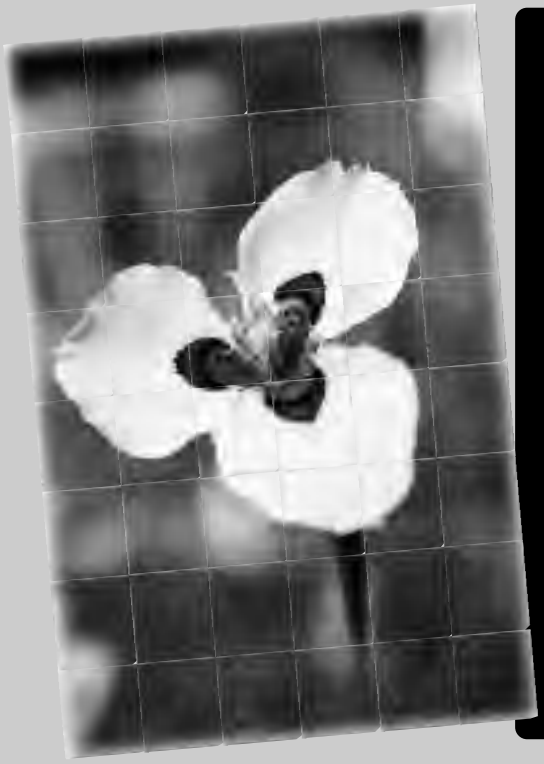

In the March 2002 edition of SABONET News...

Southern Mozambique Expedition

Profiles:
Esmerialda Klaassen & Coleen Mannheimer (Namibia)

Living Collections:
Free State NBG, Durban Botanic Garden (South Africa)

Herbaria:
Malawi (MAL), Zambia (UZL)

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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