

Chapter **13**

The Millennium Seed Bank Project in South Africa:

a review



Paul P. Smith

Seed, Conservation Department, Royal Botanic Gardens, Kew, Wakehurst Place, Ardingly, West Sussex RH17 6TN, UK

Erich van Wyk

The National Herbarium, Pretoria, Private Bag X101, Pretoria 0001, South Africa.

Summary

The Millennium Seed Bank Project (MSBP) International Programme is a nine year global conservation programme (2001–2010), conceived, developed and managed by the Seed Conservation Department at the Royal Botanic Gardens (RBG), Kew. The two principal aims of the Programme are to:

- Collect and conserve 10% of the world's seed-bearing flora (some 24,000 species), principally from the drylands, by the year 2010.
- Develop bilateral research, training and capacity-building relationships world-wide in order to support and to advance the seed conservation effort.

This paper reviews the inception and development of the Millennium Seed Bank Project at the National Botanical Institute in South Africa. The Project began in 2000, and over the past year has developed a successful collecting programme, centred around rare and threatened species. This collecting programme is reviewed through case studies which illustrate the process, from species targeting to seed banking and propagation. Future plans for expanding and improving the collection programme are presented.

Introduction

The Millennium Seed Bank Project (MSBP) International Programme is a nine year global conservation programme (2001–2010), conceived, developed and managed by the Seed Conservation Department at the Royal Botanic Gardens (RBG), Kew. The two principal aims of the Programme are to:

- Collect and conserve 10% of the world's seed-bearing flora (some 24,000 species), principally from the drylands, by the year 2010.
- Develop bilateral research, training and capacity-building relationships worldwide in order to support and to advance the seed conservation effort.

An integral element of the collecting programme is the collaboration with partner institutions all around the world. These partnerships have as their basis the precepts of the Convention on Biological Diversity (UNEP, 1992), in which resources and responsibility are shared equitably by all parties through technology transfer, benefit sharing and capacity building. The MSBP currently (year 2001) has formal links with seed banks and botanical institutions in the USA, South Africa, Western Australia, Madagascar, Egypt, Lebanon, Jordan, Burkina Faso, Namibia and Kenya, and is in the process of developing partnerships in many other countries throughout the world.

This paper reviews the development of the collecting programme of the Millennium Seed Bank Project (MSBP) by RBG Kew and the National Botanical Institute in South Africa. It presents case studies of collecting strategies, and then goes on to chart the progress of the collecting programme in South Africa in its first year of operation. Finally, future plans for expanding and improving the collection programme are presented.

Project Background and Development

The Seed Conservation Department at the Royal Botanic Gardens, Kew has had an informal collaboration with the National Botanical Institute in South Africa since 1996, but with the development of the Millennium Seed Bank Project, it was decided to formalise this arrangement. In 1999, Erich van Wyk was employed by the National Botanical Institute as Project manager under the direction of Dr Maureen Wolfson, Deputy Director of Research, NBI Pretoria. As part of his initiation to the project, Mr van Wyk visited the UK in October–December 1999. During this visit, he attended part of the Conservation and Utilisation of Plant Genetic Resources training course held at the University of Birmingham and also had the opportunity to experience the day-to-day activities of Kew's Seed Conservation Department at Wakehurst Place.

Dr Paul Smith was appointed International Co-ordinator for the MSBP in southern Africa and Madagascar in February 2000. The first quarter of 2000 saw great progress made towards compiling the Material Access and Benefit Sharing Agreement document and Project Plan, which would form the basis of the collaboration. This was partly due to the valuable input from provincial conservation authorities through the Biological Diversity Working Group under the chairmanship of the Chief Director of Biological Diversity, Department of Environmental Affairs and Tourism. After discussions between all parties, the official Material Access and Benefit Sharing Agreement was co-signed by Prof. B.J. Huntley, Chief Executive of the National Botanical Institute and Prof. P.R. Crane, Director of the Royal Botanic Gardens, Kew on 24 May 2000. The agreement is valid for five years (2000–2005), after which it may be extended for a further five years with mutual consent.

The next important milestone was the purchase of the Project vehicle, a 4 wheel drive Toyota Raider, in October 2000, through funding from the Millennium Seed Bank Project budget. This enabled the seed collecting programme in South Africa to operate fully. In November 2000, Dr Wolfson represented the NBI at the official opening of the Millennium Seed Bank, at Wakehurst Place, which was performed by HRH Prince Charles on 20 November 2000.

Finally, in February 2001, Mr Peter Gavhi was appointed as trainee botanist to accompany Erich van Wyk on collecting expeditions, and help with the day to day running of the Project.

The Collecting Programme

Much of the first year of the collecting programme has been spent in developing a collecting rationale. Following national conservation objectives, the programme has concentrated on rare and threatened species. Target areas have mainly included threatened habitats, areas of high biodiversity and areas of high endemism. Collecting from these areas is carried out during optimal collecting periods, determined by consulting available material in herbaria, the PRECIS (Pretoria Computerized Information System) database and relevant literature. Collecting from species with a known phenology assures the high quality of the seed and has helped maintain a high accession rate of seed collections. Information on threatened species has come from South Africa's Red Data List (Hilton-Taylor, 1996; but currently being updated), local expertise and regional reports or action plans. About 70% of the South African flora is endemic, and many of these species are rare. Information on endemic species has been collated from the PRECIS database, Flora of Southern Africa, other publications and local expertise. The third category of plant prioritised by the MSBP in South Africa are those species with a known potential human value, which are not cultivated in agriculture and horticulture. These species have important implications for sustainable development, and are generally not conserved by other programmes. In many cases they are at risk from over-utilisation, and therefore fall into the rare or threatened species categories.

Of equal importance to the development of a scientific rationale for the collecting programme has been the contacts established through a network of experts with local knowledge of plant species, many of whom have accompanied the MSBP seed collectors on expeditions. The MSBP team in South Africa has worked hard to forge these alliances with both the academic and the conservation communities across a range of institutions from universities to NGOs to nature conservation authorities (see Acknowledgements).

Case Study 1: Veloren Vallei Nature Reserve, Mpumalanga

In general, the MSBP collecting programme in South Africa has concentrated on unprotected areas. However, many species within reserves and national parks are vulnerable, particularly local endemics. Threats which transcend protected area boundaries include invasive alien species, climate change, natural and man-made disasters, and human over-exploitation.

One such vulnerable species is *Watsonia occulta*, a local endemic of the Mpumalanga escarpment. This species was brought to our notice by Franz Krige, the warden of Veloren Vallei Nature Reserve near Lydenburg in Mpumalanga Province. Through close communication, Franz was able to keep Erich van Wyk informed about the phenology of this plant, and when it

began to seed, he suggested that the MSBP come and collect it. Erich responded by mounting an expedition to Veloren Vallei and, with Franz's help the MSBP team were able to collect the *Watsonia* and a number of other species, including *Eucomis vandermerwei*, another Mpumalanga escarpment endemic. The detailed population data collected for all the species from which seed was taken was subsequently given to the Mpumalanga Nature Conservation authorities.

This example illustrates the importance of local knowledge and a local presence. Franz Krige was able to telephone us when the seed was ready to collect, obviating the necessity for a reconnaissance survey based on herbarium phenology data. This saved the project time and money. In addition, Franz's local knowledge meant that he could direct the MSBP field team straight to the population, which otherwise would have been difficult to find and identify. The MSBP is working hard to develop a network of local collaborators like Franz, particularly amongst the nature conservation authorities, who are best placed to give us advice on what to collect, and where and when to collect it.

Case Study 2: The Northern Cape

This second case study illustrates the value of plant identification skills on a collecting expedition. In February 2001, a two week expedition was mounted to the Northern Cape (Smith *et al.*, 2001). An important component of the endemic flora of the Northern Cape is the family *Mesembryanthemaceae*, of which there are about 1,800 species in South Africa, mainly concentrated in the Northern and Western Cape provinces. In order to target and collect rare and threatened *Mesembryanthemaceae*, Priscilla Burgoyne, an expert in this family based at the National Herbarium in Pretoria, was invited to participate in the expedition. Thanks to Priscilla's enthusiastic support, 46 species of *Mesembryanthemaceae* were collected. All but one of these was endemic to South Africa. Perhaps the most threatened of all of the species collected was *Cylindrophyllum hallii* L. Bolus, known only from a single remote site. This population had not been documented or collected since 1960, and the team were very excited to find it. Only about 220 living plants were left, and there were clear signs of predation. The collectors saw many dead plants, possibly victims of drought, disease or utilisation by animals. Fortunately, seed was in ample supply and a safe collection of capsules was made from some 85 plants, taking less than 5% of what was available. This is exactly the kind of species that needs *ex situ* conservation – down to only one known wild population, severely threatened at the site and a candidate for Red Data listing. The germination and propagation protocols for this species have since been established at Kew, and more than 100 plants grown on for repatriation back to South Africa. Seed and information are now available should the Northern Cape Conservation authorities wish to reintroduce this species into the wild.

A second interesting find on this expedition was a population of *Dioscorea elephantipes* (L'Hérit.) Engl., not seen since 1954, although no seed was collected from this population. The plants were tracked down with the help of telephoned instructions and a description from Johan Hurter, an expert in the *Dioscoreaceae* based at the Lowveld Botanical Garden in Nelspruit. The team also enlisted the help of a local shepherd, who knew the plant because of its abortifacient effects on his ewes.

This example illustrates the importance of plant identification skills in the field. There is no point in targeting species for collection if you can't recognise them in the field. To this end, the MSBP is developing numerous contacts amongst the taxonomic community in South Africa to encourage people with plant identification skills to participate in the project and contribute their knowledge.

Achievements of the Collecting Programme for the Year 2000

The seed collecting carried out in the year 2000 was achieved through 10 different collecting trips in four provinces. A total of 141 collections were made. Of these, approximately 58 species have a known potential human value, 20 species are endemic to Southern Africa and 10 species appear on the Red Data List for South Africa (Hilton-Taylor, 1996). This brought the total number of target species to 78, which represents approximately 55% of the total number of species collected during the year (these statistics do not include the taxa which have not yet been identified to species level). A total of 97 new species were collected for the Millennium Seed Bank, and the collections:new species ratio was 1.51.

In addition to the collections made above, a special event stood out in the year 2000. During the last week of August 2000, Erich van Wyk and Johan Hurter were investigating new seed sources in a remote part of the Northern Province (van Wyk and Hurter, 2000). This area is known as Venda and through the years it has yielded several surprising discoveries of generally more tropical plant taxa and narrow endemics. The third day of the collecting trip was spent on the northern slopes of the Soutpansberg. After collecting the endemic species *Combretum vendae*, and then *Albizia adianthifolia*, the MSBP team decided to investigate an unexplored turn-off. Suddenly, after about 5 km, the vegetation started changing, becoming more mesic in nature. As they came over a slight rise they saw, in full spring colours, a valley of thousands of *Brachystegia spiciformis*. Until this point, *B. spiciformis* had been conspicuous by its absence from South Africa. Many people have tried to locate this tree in the past, but all without success. This discovery is a most significant find, extending the distribution range of *B. spiciformis* southwards across the arid Limpopo valley. This event also helped bring the MSBP to the attention of the botanical community in South Africa and, we hope, will encourage botanists to participate in our programme.

Future Plans

In 2001 the MSB Project in South Africa aimed to collect 300 new species. Up to May 2001, 136 species had been collected, of which 66% were target species. Through improved targeting and plant identification in the field, it is hoped that the collections:new species ratio will come down, thus maximising the number of new collections being accessioned into the Millennium Seed Bank. In order to do this, it will be necessary to expand the network of experts throughout the country, and encourage increased involvement of taxonomic specialists in the collecting activities. Greater co-operation is being sought from the South African Nature Conservancies, particularly with regard to the targeting and collecting activities. In order to plan these activities more efficiently, a Geographical Information System for the South African programme is being developed, with applications in targeting and record keeping. A final aim is to add a technical trainee to the team to help with the field work.

Acknowledgements

The MSBP would like to thank the following individuals and organisations for their assistance: Tony Abbot, Marileen Badenhorst, Karin Behr, Hugo Bezuidenhout, Botanical Society of South Africa, Philip Botha, Paul Bothma, Rudi Britz, Dr. Neville Brown, Priscilla Burgoyne, Community of Muswodi - Venda, Eastern Cape Environmental Affairs, Johan Filmalter, Willem Froneman, Gauteng Nature Conservation, Albie Gotze, Dr. K Haman, Harold Porter Botanical Garden, Deon Hignet, Anthony Hitchcock, Johan Hurter, Miss S.M. Hughes, Kirstenbosch Botanical Garden, Robert Klein, Frans Krige, Kwazulu-Natal Nature Conservation, Annelize le Roux, Mervyn Lotter, Lowveld Botanical Garden, Mashiane Mothogwane, Kristal Maze, Jean Meyer, Mpumalanga Nature Conservation, Kevin Naicker, National Botanical Institute, Lizane Nel, Mathew Norval, Northern Cape Nature Conservation, Northern Province (Limpopo Province) Environmental Affairs, Alice Notten, Michele Phab, Mnr. J. Pienaar, Elsabe Powell, South Africa National Parks, Stan Rodgers, Helga Rosch, Dirk Rossouw, Terry Trinder-Smith, Gerhard Strydom, Tommy Steyn, Blackie Swart, Bernhard van Lente, Drucilla van Schalkwyk, Prof A.E. van Wyk, Prof. B-E. van Wyk, Western Cape Nature Conservation, Mnr. Buys Wiese, Christopher Whitehouse, Alex Wood.

References

- Hilton-Taylor, C. (1996). *Red data list of Southern African plants*. *Strelitzia* **4**. National Botanical Institute, Pretoria, South Africa.
- Smith, P.P., Burgoyne, P. and van Wyk, E. (2001). Rare plants rediscovered in the Northern Cape. *SABONET News* **6** No. **1**: 51–52.
- UNEP. (1992). *Convention on Biological Diversity: text and annexes*. Interim Secretariat for the Convention on Biological Diversity, Châtelaine, Switzerland.
- Van Wyk, E. and Hurter, J. (2000). *Brachystegia spiciformis*: an exciting discovery. *SABONET News* **5** No. **3**: 170–172.

