

ROYAL BOTANIC GARDENS, KEW

Succulent Southern Africa.

Travel Scholarship

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Report for the Merlin Trust.

A Trip to South Africa to gain a greater understanding of cultivating succulents and see them in their natural habitat.

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Merlin Trust Report – Succulent South Africa.

I would like to thank the Merlin trust and Kew Guild for funding my trip to South Africa to study succulent cultivation and see them in their natural habitat. As well as everyone at RBG Kew who supported my trip and the people I in South Africa who shared their knowledge time and expertise.



Figure 1 Kirstenbosch Botanical Gardens - P. Rees RBG Kew

August 2011 I flew out from Heathrow to Cape Town. I spent my first 3 days at Kirstenbosch Botanical Garden. Adam Harrower kindly met me and showed me around the garden. Although I went to look at succulents it is hard to ignore the Fynbos, bulbs and the other entire South African flora around you. The Garden is situated on the side of Table Mountain which gives the site the most amazing back drop. On arrival I was taken to the succulent conservatory which is an array of succulents from all over the country arrangement into zones according to where they grow. The house is not the biggest of glasshouses but it is well set out with paths leading up to different levels. The centre of the house is has a large *Adansonia digitata* which by wild plants is dwarfed but glasshouse standards is really impressive. Although I had a good idea of how varied the species were, just how rich the succulent flora was still an inspiring surprise. Cliff dwelling species of Aloe and other genus hang from a wall and the balcony.



Figure 2: Succulent Conservatory at Kirstenbosch - P. Rees RBG Kew

These cliff dwelling species have created a lot of interest amongst botanists, as due to the difficulty of studying and exploring the cliffs little work has been done on these habitats. I was informed that recent trips to these locations almost always reveals several new species. The reality of how diverse the succulent flora was and how little was known about it only became apparent when shown the behind the scenes succulent nursery where I was shown a number of plants which I was told 'we not sure what it is and it is more than likely a new species.' On asking why this was I was informed that it was mainly due to the remoteness of some areas and relatively small ranges of some of these species. A large majority of the land in succulent areas of South Africa is owned by farmers who themselves are unaware of the species growing on their land and often have species yet to be described which may not be found outside of their property boundaries. This highlighted the importance of studying the flora and trying to learn what we have so species are not lost to land use before we even know they are there.

The nursery area to my surprise was fairly well shaded which made sense when seeing the plants in the wild as many species grow in rock crevices and at the base of large shrubs whereby not receiving full sun. The house was open on all sides with shade netting to allow air movement through the house which was important for their cultivation. During the winter the sides are closed up with polyurethane plastic to keep the house frost free. The benches all have a mesh top on which the plants are placed on, this was done to improve drainage and allow air movement through the plants. The plants are arranged by rainfall regions in order make watering the collection easier. This was primarily due to the relatively unskilled labour working in the gardens at lower levels.

The *Welwitschia* collection was long established with healthy mature specimens. They often prove difficult to cultivate elsewhere. I was informed that they don't respond well to transplanting so plants are sown insitu in deep sandy red soil, sourced from the Knersvlakkte. The soil is somewhat like that of plaster sand which is free draining but with small particles therefore holding a fair amount of available water as well as a small percentage of clay. The plants are very susceptible to fungal problems especially when establishing, so seedlings are treated with a fungicide. It was also suggested that there was a micorrhizal association and soil in the new *Welwitschia* display had been drenched with micorrhiza. The display house is fitted with ceiling fans in order to encourage air movement, with side vents which can be closed during winter. The benches are also heated with cables. It was also mentioned that although they come from arid regions they don't like to dry out and should be watered frequently to ensure the soil stays moist.



Figure 3: Left Old *Welwitschia* display



Figure 4: Right New *Welwitschia* display

I was fortunate to be able to work with the succulent collection at Kirstenbosch, in order to understand how they grow these species. I was involved in re-potting some of the *Stapilad* collection. The collection is potted into square plastic pots. They use plastic because of the hot summer clay pots dry out too quickly meaning the collection has to be watered more frequently. A layer of stone is placed at the bottom of each pot and the plants are then potted in a mix of 50% fine sifted compost and 50% sharp sand. After the plants have been potted they are left dry for a few days before they are watered with a fungicide. This is true of most succulents as it give the plant time to seal any root damage, whereby minimizing fungal attacks.

I then visited Cape Point Nursery which is a small retail nursery who grew a fair amount of winter rainfall succulent species for the local trade. The resources available were fairly limited but the maintained a healthy plant collection. They used a mix of 1 part course grit, 1 part fine sand, 1 part sifted compost and 1 part red sand (a local sand in the Karoo which is similar to plaster sand being very fine with small clay content).

While in the Cape I was able to hike in the Silvermine Nature Reserve where I saw *Protea*, *Leucadendron*, *Pelargonium*, *Drosera* and an array of bulbs. The reserve is so name because of a prospector thinking there was silver in the area, but never found it. The area is part of the Table Mountain National Park and was rich with Cape Flora.



Figure 5: Silvermine Nature Reserve- P. Rees RBG Kew



Figure 6: Silvermine Nature Reserve - P. Rees RBG Kew

I then met up with Peter Bryuns from the University of Cape Town who showed me his *Euphorbia* and Asclepiadaceae collection and shared his experiences of growing these plants. He had been researching Asclepiadaceae and as a result developed a method of hand pollination which involves removing the pollinia with forceps, cutting a hole in the side of the flower exposing the stigmatic surface and spreading the pollen. This is all pain painstakingly done under microscope. Unfortunately due to the lack of Asclepiadaceae flowers in his collection I was not able to see it done in practice. His current work on *Euphorbia* is looking at the relationships amongst the species at a taxonomic and genetic level. His collection was potted in a mix of 'red sand' with 20% sifted compost.

My trip then took me up the west coast stopping at Ramskop Flower Garden and Nature Reserve. The garden contains over 350 plant species from the Namaqualand. The main garden is largely cultivated forming a honey pot of plant species that could be found in the floral area, whereas the surrounds of the reserve is left as the natural vegetation of the area. It was a good place to visit before going out into the field as a large amount of species located in a small area meant one can get an idea of what you will find and make identification easier as most of the plants in the cultivated area are well labelled.



Figure 7: Ramskop Flower Garden - Paul Rees RBG Kew

From there I went on to the Kokkerboom Nursery to meet up with Buys Wiese and Brink vd Merwe. Buys Wiese has spent a life time developing the nursery and helping conserve the succulent flora of the area.

The nursery is the largest succulent nursery in the country, with an impressive collection of a variety of succulents. The driveway on entering the property is lined with *Aloe dichotoma* 3-4 m tall which were planted by Buys 50 years ago when he started the nursery. I was shown the collection

and shown how they grow the species, what mediums they use and how they process plants and seeds for the export market. They grow a large proportion of the plants from seed. This is done by mixing the seed with a powdered fungicide and then with a fine white sand. The trays are filled with a layer of sharp sand followed by a layer of coir vermiculite mix with a thin layer of sand on top. The seed is then sown evenly in the tray and covered with a layer of vermiculite. The tray is placed in the shaded propagation house where the seeds are kept moist but not damp until they germinate, after which they are watered less frequently. They are left in the trays for 2-3 years after which they are ready to be planted out into the sand beds to develop. When large enough to sell they are either sold bare root or potted into a mix of equal parts loam, sand and sifted compost.

Next stop was northwards to Quaggaskop in the Knersvlakte. The name directly translated means gnashing plan, which is believed to be in reference to the harsh nature of the area. The 48,500 hectare region contains an estimated 1324 plant species of which 266 are endemic to the area. The landscape is very dry and exposed with very little growing other than succulents. The wind when I was there was blowing a gale, which meant my teeth were gnashing making the name quite fitting. The wind clarified why at Kirstenbosch placed so much importance on air movement through the collections. The area made up of gently undulating hills with low growing succulents as far as the eye can see. The ground in places is covered with quartz gravel. Within the gravel one finds *Argyrodema* species and *Oophytum*. The gravel proves important for the survival of the plants, acting as sun protection by reflecting light, it helps retain soil moisture and more importantly acting as a soil stabilizer against the strong winds which the area experiences. Areas where the gravel is not present has a contracting vegetation of more shrubby species such as *Ruschia*, these species seem to stabilize the soil around their base and collect it as the wind dumps particles as it blows through the foliage. The resulting landscape is a series of mole hill like mounds scattered across the plains. The Salt River runs through the area carving landscape into mars like landforms. The river gets its name due to its high salt content which is said to be higher than that of the Dead Sea.



Figure 8: *Oophytum* in the Knersvlakte - P. Rees RBG Kew



Figure 9: Salt River catchment area - P. Rees RBG Kew

I then took a trip up the van Rhyn's Pass to see the *Aloe dichotoma* forest 25 km out of Nieuwoudtville. Once over the pass the Doring River begins which leads to the 100m high Nieuwoudtville falls, the impressive gouge caved into the landscape has large colony of *Aloe perfoliata* precariously clinging to the cliff face. The forest is situated on the north facing slope of a hill with an estimated 7000 specimens, some of which are over 250 years old. The forest is the southernmost limit of the species range. The slopes are scattered with specimens large and small. The under story plants was fairly sparse with low shrubby species. But in between were hundred of seedlings of annual Livingston daisy which I could only imagine the sight it would be when they all came into flower. They were only growing on these slopes with none visible on the nearby hills, the flat area at the base of the hill had been clearly used for agriculture in the past and more than likely had specimens growing on it which were removed to make way for crops.



Figure 10 Aloe perfoliata growing on cliff P. Rees RBG Kew



Figure 11: Aloe dichotoma forest P. Rees RBG Kew



Figure 12 Aloe dichotoma forest P. Rees RBG Kew

From there I headed towards the West Coast National Park in the Namaqualand to see the spring flowers. The park has large areas of salt marsh produced by the Langebaan lagoon; the marshes appeared to be painted with abstract strokes of green, red and grey. The colour was made up of 4 species: *Juncus*, *Spartina*, *Sarcocornia* and *Chenolea*, the later three being succulent which may seem strange considering they growing in water, but when considering they are succulent due to the lack of available water or rather available fresh water. Due to the salt content, diffusion gradients makes the uptake of water extremely difficult for plants in these environments, so succulence helps them conserve as much as possible.



Figure 13: Salt water marsh Langebaan lagoon - P. Rees RBG Kew

Within the park is the privately owned flower reserve which is only open for a short period of the year. On entering a seemingly snow covered hill slowly comes into view, however as one gets close it becomes apparent that it is not snow in the desert but flowers. The area becomes a painted carpet of flowers as far as the eye can see. Sweeps of yellow, orange and blue all tied together with a sea of white. Namaqualand daisy (*Dimorphoteca*) is the dominant species with *Oxalis* and contributing. The flowers are highly dependent on good winter rains in order to put on this spectacle; fortunately for me the rains had been good this year.

The plains of flowers are filled with a variety of wild animals grazing and laying in amongst the flowers. Tortoises are quite common and taking full advantage of the abundance of food feeding to their hearts content on the array of flowers.



Figure 14 P. Rees RBG Kew



Figure 15: Dimorphotheca in the West Coast flower reserve - P. Rees RBG Kew

The Karoo Botanic Garden was the next point of call. This is only a short drive from Cape Town. The gardens hold an impressive collection of succulent flora from all over the country the beds of cultivated flora are on a mound with pathways snaking through. The garden is divided into geographic areas, such as the Knersvlakte, Nama Karoo, Richtersveld and so on. As one walks through you move through these different succulent habitats and are made aware of what could be found in this part of the country. The cultivated area, although small by most botanic garden standards, falls within a larger area of natural Karoo vegetation. Through which one could spend hours on end strolling the long walks up the hills through fantastic vegetation and amazing views.



Figure 16: Karoo National Botanical Garden - P. Rees RBG Kew



Figure 17: Karoo National Botanical Garden - P. Rees RBG Kew

My trip then took me inland to Johannesburg from where I headed across to the Lowveld and the Kruger Park. It was the transition between the Highveld and the Lowveld which was of interest. As one comes down through the escarpment the landscape becomes mountainous with steep cliffs valleys and gorges. The slopes of the distant hills become scattered *Aloe ferox* too many to count. It was said that these hills were used by the Zulu people to fool their enemy into thinking they were outnumbered as from a distance one would find it impossible to tell aloe from Zulu. Hills of species such as *Euphorbia ingens*, *Euphorbia cooperi* alongside the road cropped up every now and then. The cliffs contained numerous succulent species but were inaccessible without rock climbing gear.



Figure 18: *Euphorbia cooperi* P. Rees RBG Kew



Figure 19 *Aloe ferox* P. Rees RBG Kew

Passing through the hills the landscape changed again and became flat once more and became dominated by grasses and Acacia. Succulents became scarce besides the odd planted ones when travelling through towns. On turning a corner the largest succulent I saw came into view - *Adansonia digitata*, so massive it was hard to believe. The area surrounding it was mostly cultivated and more than likely would have been cleared if it was not as big as it was.



Figure 20: *Adansonia digitata* - P. Rees RBG Kew

My next point of call was the Walter Sisulu botanical garden. The garden is situated in a gorge with an impressive waterfall. The cliff is home to a pair of breeding black eagles which ride the thermal drafts near the falls. The garden has a large succulent collection with species from all over the country. On arrival the wild area of the garden had been control burnt with smoke still rising out of the ashes. Walking up the rocky mountainous paths it everything is black with leafless evergreen trees and shrubs which survived due to their bark. Out of the black ash desert succulents start becoming apparently obvious with little to no damage. *Aloe greatheadii*, *Cotyledon* and *Crassula* and *Kalanchoe* all seemed to have survived the blasé with little harm. One would assume that due to the fleshy nature of the leaves they would have boiled to death or at least died back to the crown, but in fact due to the material burning around them means that the fires are not that intense and tend to move through the area fairly rapidly resulting in the fleshy leaves being unharmed.

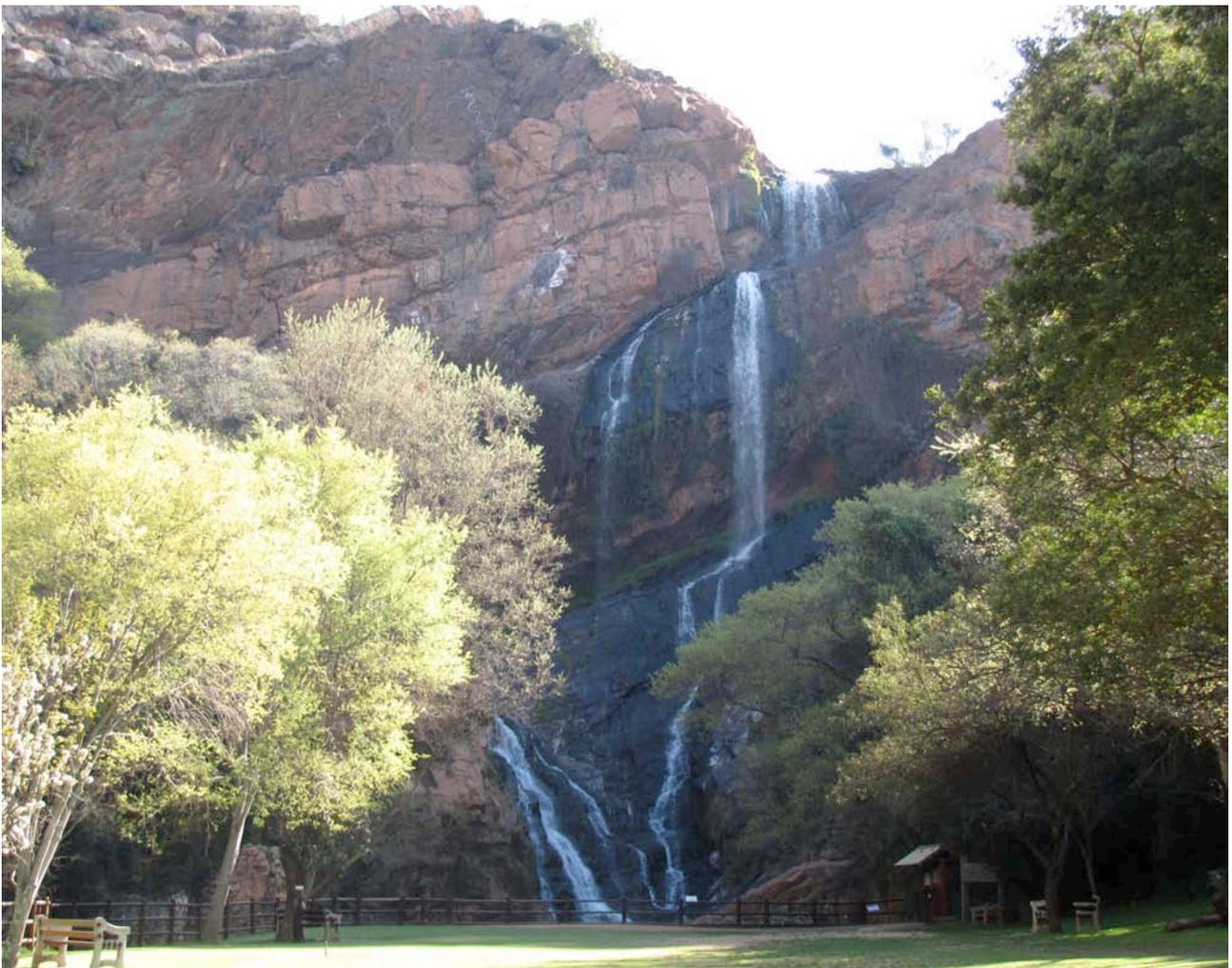


Figure 21: Waterfall at Walter Sisulu Botanical Garden - P. Rees RBG Kew



Figure 22: Left Aloe sp. after fire - P. Rees RBG Kew

Figure 23: Right Kalanchoe thyrsiflora after fire - P Rees RBG Kew



Figure 24: The succulent section of Walter Sisulu Botanical Garden P. Rees RBG Kew

My last visit was to Gariep-Plants succulent nursery in Pretoria. The nursery supplies a large amount of plants to the international market. *Haworthia*'s are the biggest sellers and as a result they have a large collection of species. Kotie Retief kindly showed me around the propagation units giving an insight to how they cultivate their succulents. They were trialling a new *Haworthia* medium of equal parts pine bark, quartz sand and perlite. Where they usually used their general mix which is: fine sand, grit and fine bark. Do to the large demand for *Haworthia*'s in order to supply the market they rely on tissue cultured plants rather than seed which can be less reliable. The plants are cultured from cells taken from the unopened flower buds.



Figure 25: Haworthia cultivation at Gariep Plants - P. Rees RBG Kew

South Africa's succulent flora is extremely diverse and interesting with many untold secrets to learn. The beauty of these landscapes is unforgettable. I gained a greater understanding of this fascinating group of plants through seeing how they were treated in cultivation and seeing them growing naturally. The contacts I made are invaluable. I returned to the UK a better more informed horticulturist as a result of this fantastic trip.

P. Rees 30/10/11



Figure 26 Adenium multiflorum P. Rees RBG Kew

Figure 27 Euphorbia horrida P. Rees RBG Kew



Figure 28: Anacampseros papyracea P. Rees RBG Kew

Figure 29: Crassula columnaris P. Rees RBG Kew



Figure 30: Opening fruiting bodies P. Rees RBG Kew



Figure 31: Tylecodon reticulata with dried inflorescence as protection from grazers P. Rees RBG Kew