

Study Of The High Altitude Proteaceae in the Western Cape of South Africa

13th September – 5th October 2015



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Abstract

This expedition was undertaken to study the habitat and growing conditions, as well as collect seed, of the high altitude Proteaceae in the Western Cape of South Africa, as the first stage of a longer term project which attempts to gain information on their horticultural needs, so as to increase people's confidence in growing them and hence facilitate their ex-situ conservation in the UK.

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Background

In 1809 Joseph Knight authored 'Horticultural essays. I. on the natural order Proteaceæ', published by William Savage of Covent Garden and intended to be the first in a series of similar publications. The book could not have been more highly anticipated or timely; protea cultivation was at the height of fashion in Europe. Yet the book caused controversy by pre-empting the publication of a paper by Robert Brown and due to personal conflicts between notable botanists of the day, Joseph Knight's book was relegated to the most inaccessible shelves.

Knight himself was head gardener to one George Hibbert, a man of great wealth. Hibbert's garden in Clapham was considered, by some, finer than Kew and housed a huge collection of plants from the Southern Hemisphere. Hibbert showed a particular interest in the flora of what was at the time New Holland and spared no expense in commissioning James Niven to scour this land for new and interesting species to add to his collection. Hibbert's particular passion was the *Proteaceae* and thus led Joseph Knight to being the first to propagate and flower these plants successfully here in the UK.

Alas, as fashions pass, the *Proteaceae* fell out of favour. New greenhouse design and modern horticultural practices didn't suit these plants and the botanical trailblazers of the time turned their attention to the plants of the tropics; *Proteaceae* it seems were relegated, like Knight's book.

The story of *Proteaceae* certainly didn't start in the days of Hibbert and Knight. Their history dates to the mid Cretaceous when proteaceous plants such as *Trioris africaensis*, known from fossilised pollen, had already evolved (Ward and Doyle, 1994). It is this fossil record and their significance to the early history of the Angiosperms that have led to a personal interest in the *Proteaceae*. Building our collection of these plants has enabled us to study their morphology and better understand the links between the genera and species, as well as their horticulture. We have found that, given free drainage and nutrient poor conditions, many are hardier to cold than initially expected.

Members of the *Proteaceae* are offered for sale here in the UK. More often than not these are *Grevillea* from Australia such as *G. rosmarinifolia*, *G. 'Canberra Gem'* or *G. lanigera 'Mt Tamboritha'*. *Lomatia spp.*, again from Australia but also from South America, are also sometimes offered and if lucky *Telopea spp.* or *Banksia spp.* may be available. The South African species are offered by a small number of specialist nurseries but often these are species little suited to cultivation anywhere other than the mildest counties of the UK; their provenance being of low altitude. It is our belief that, given the right provenance, we could find species that are more likely to cope with the conditions we face in our wet valley in North Wales.

Overview, Aims and Objectives

- Explore cold, high rainfall mountain areas, seeking those with a similar climate to the UK.
- Visit botanical gardens in the Western Cape, to gain further horticultural understanding.
- Collect Seed of species currently in cultivation in the UK, but from higher altitude as well as species not currently in cultivation in the UK.
- Analyse growing conditions; including climate, soil structure and composition.
- Record location, environment and altitude as well as what other species are growing nearby.
- Assist in data collection for botanical organisations within South Africa.
- Grow seed collected. Keep notes on the process and horticulture of resulting plants, providing this information to interested parties.

Itinerary

13/09/2015 – Flight To Cape Town

14/09/2015 – Kirstenbosch Botanic Gardens

15/09/2015 – Table Mountain: Skeleton Gorge, Maclears Beacon, Nursery Ravine

16/09/2015 – Stellenbosch Botanic Garden

17/09/2015 – Jonkershoek: Panorama Trail

18/09/2015 – Du Toits Kloof Pass & Karoo Desert Botanic Garden

19/09/2015 – Boosmansbos: Grootvadersbosch to Helderfontein

20/09/2015 – Boosmansbos: Grootberg

21/09/2015 – Boosmansbos: Helderfontein to Grootvadersbosch

22/09/2015 – Garden Route Botanic Gardens

23/09/2015 – Outeniqua: Cradock Peak

24/09/2015 – Swartberg Pass: Waboomsberg

25/09/2015 – Swartberg Pass: Bothashoek Trail

26/09/2015 – Robinson Pass: Kouma Trail

27/09/2015 – Seed Sorting

28/09/2015 – Garcia Pass: Kristalkloof

29/09/2015 – Harold Porter Botanic Garden, Robbie and Vicky Thomas' Garden

30/10/2015 – Hottentots Holland: Han Se Kop to Moordenaarskop

01/10/2015 – Hottentots Holland: Nuweberg to Landdrooskop via Sphinx

02/10/2015 – Hottentots Holland: Somerset Sneekop

03/10/2015 – Hottentots Holland: Landdrooskop to Nuweberg

04/10/2015 – Seed Sorting

05/10/2015 – Flight to Manchester

Gardens

Kirstenbosch National Botanical Gardens

After 14 hours, 3 excellent movies (thank-you Dame Helen Mirren) and absolutely no sleep, we stepped off the plane, late at night, into a country neither of us knew, our minds plagued by a life time of negative news reports. However, our concerns were quickly washed away by a most helpful taxi driver who whisked us off through Cape Town's suburbs to our hotel, seeing little of the city in which we had landed. For practicality, we had booked to stay at the Kirstenbosch Manor Guest House. Owned and run by SANBI (South Africa National Biodiversity Institute) the guest house was built in 1914 and is surrounded by SANBI's flagship national botanic gardens; Kirstenbosch.

Our arrival in the dark meant we had to wait until morning for the sound of cicadas to wake us and allow us to appreciate the beauty of our surroundings, with an incredible view over the gardens and down to Cape Town and the sea beyond. We would need to make the most of the two more nights we had as guests of Kirstenbosch, as this was going to be as comfortable as our trip would get.

Growing only native species (and a few historic non-native trees such as Oaks) Kirstenbosch is considered South Africa's most beautiful garden. Nestled into the Table Mountain hillside, its slope creates the ideal environment to grow a huge range of South Africa's native flora. We had hoped to wander around this garden in beautiful spring sunshine, but the rain gods had other ideas and what we got was described by one local as "Ghana weather".

We had arranged to meet up with our friend, and Kirstenbosch's wholesale nursery manager, Cherise Viljoen, for a tour of the garden and a look around the production nursery and *Proteaceae* propagation centre. A couple of years earlier Cherise had visited us in North Wales and been surprised to see *Protea cynaroides* in our garden, so far north of the equator. Waterproofs on, we walked down through the gardens to meet her, trying not to get distracted on the way by flora we could only describe as 'probably *Asteraceae*' or 'probably *Fabeaceae*' .

A couple of non-protea plants in particular stood out. *Laportia grossa*, a silver spotted native stinging nettle, was one that we took quite a shine to. It certainly packs more of a punch than our native British nettle and would really bring a tear to the eye! Another was *Oldenbergia grandis*, a huge woody member of the *Asteraceae* with large leathery leaves covered in a thick, white indumentum, and whose diminutive relative, *Oldenbergia paradoxa*, we would see in the wild a couple of weeks later.

The Cycad collection at Kirstenbosch is quite a sight to behold. Whilst we were there it housed a display of metal dinosaur sculptures, depicting the fact that Cycads have been on this planet for over 120 million years and were around during the time of the dinosaurs. Cycads are some of the worlds most threatened organisms and one plant on display at the garden highlights this fact more than most. *Encephalartos woodii* is extinct in the wild and the only plants left are clones of the original male plant. No female has ever been discovered, so this boy will live a lonely life, for ever more being reproduced from offsets at the base of his trunk.

Another ancient plant on show at Kirstenbosch that we had the opportunity to see was *Welwitschia mirabilis* from Namibia. The majority of the plants on show in the 'Botanical Society Conservatory' were quite young but behind the scenes we were able to see some much older specimens that were quite large in comparison.

There were also lots of *Proteaceae* at the garden and we spent some time honing our id skills in preparation for the field. Kirstenbosch holds a huge collection numbering over 200 species from across Southern Africa and has perfected the art of their propagation; it was quite an experience to be allowed access to their *Proteaceae* research and propagation facilities. Their techniques are actually very similar to our own but on a much larger scale.



Figure 1: *Leucospermum oleifolium* flowering at Kirstenbosch National Botanic Gardens

Whereas we use their formulation smoke paper, steeped in water, as a dormancy breaking mechanism, they pump smoke from a large fire into a sealed tent containing the seed. The compost they use is sand and bark based compost, similar to our own, and they keep the seedlings relatively moist at all times once they have germinated. The seedlings are pricked out at quite an early stage into litre nursery stock tubes and moved into the *Proteaceae* nursery area, once they have sufficient leaf. The main *Proteaceae* nursery is under a large shade net alongside their huge production greenhouses. Most of the stock here is grown from seed with only a small amount being produced from cuttings or by grafting. Many of the propagules are destined directly for the garden, where there is a constant process of renewal, or to other SANBI affiliated gardens. Others are sold by the garden's plant centre in order to encourage local people to garden with natives and to move away from the myriad array of non-native, invasive species.

Kirstenbosch, like the rest of the Western Cape, is beset by the problem of *Phytophthora cinnamomi*; a soil born root rot that has a particularly vicious impact on *Proteaceae*. In order to keep the gardens looking fresh and healthy there is an almost continuous programme of removal of infected plants and replacement with fresh, young, healthy specimens. We discussed at length this issue but came to little conclusion as to what could be done regarding it. We did however note that *Drymis winteri* is a known carrier of the disease, but does not succumb to its effects and is grown regularly in Cape Town's gardens. The practice of mulching with uncomposted, chipped, green plant material on the beds, from plants potentially carrying the disease, was also a risk.

Notable plants within the collection were large trees of *Protea rubropilosa*, a species we wouldn't see in the wild on this trip as it is native to Limpopo and Mpumalanga; a very impressive species that in one particular area grows at altitudes of up to 2400m that see annual snowfall.



Figure 2: *Protea rubropilosa* flowerhead at Kirstenbosch National Botanic Gardens

Leucospermum reflexum was in flower throughout the garden in both its yellow and red forms. The Rocket pincushion is native to the Cederberg mountain range, far north of the Cape Fold Mountains that we would visit, where it grows next to water courses at altitudes of between 1000m and 2000m. It is a species we already have seedlings of and intend on trailing for hardiness in the UK.

Leucadendron argenteum grows in dense stands through the upper most part of the garden, shining silver due to its thick coat of hairs, and whilst originally endemic to the Lions Head area, it has been widely planted throughout the peninsula, including around the base of Table Mountain. In the garden it has naturalised and is also spreading into the more natural areas of Fynbos that border the garden.

Many of the lower growing, creeping *Proteaceae* in genera such as *Serruria*, *Leucospermum* and *Diastella* were on show in the garden and were of great interest to us as these plants are generally never seen in cultivation in the Northern Hemisphere. We have come to realise that many of those South African species cultivated in Europe are done so out of their popularity for the cut flower industry for which these lower growing species are overlooked.

All in all our day at Kirstenbosch with Cherise was an education. It totally opened our eyes to the potential that the *Proteaceae* hold and brought a realisation that our methods of propagation, learned through endless research, trial and error, were not far from the mark set by Kirstenbosch.



Figure 3: Kirstenbosch Proteaceae Nursery (Top and Bottom Left) and Germination Beds (Bottom Right).

We ended our first day in Cape Town with a delicious Italian dinner joined by Cape Nature Botanist, Rupert Koopman, and his lovely and at the time heavily pregnant wife, Flo. Rupert has worked so hard to make this all possible for us, so an evening in his company digressed into lots of talk of how horticulture can help plant conservation in South Africa along with good advice for our expedition.

Stellenbosch University Botanical Garden

We would not have managed to get the permits we needed in order to collect seed whilst in South Africa without the help of Martin Smit, Curator of Stellenbosch University Botanic Gardens. A visit to the garden to meet Martin and to see one of South Africa's oldest botanic gardens was high on our list of priorities.

The history of the garden dates back to 1902, although it wasn't until 1925 that the first curator, Dr Hans Herre, was appointed. The garden is internationally acclaimed for having been the first garden to cultivate *Welwitschia mirrabilis*, in 1926, and still has one of the original plants he grew, which we were lucky enough to see. Whilst the garden is quite a traditional botanic garden, in that it grows plants from all over the world, it is home to some interesting collections of South African species including a huge collection of *Oxalis*, many South African bulbous species and a collection of native aquatic plants.

Whilst we were visiting the garden there was a team from Kirstenbosch helping to plant an area recently cleared of non-native, invasive, species with wholly native ones, in order to make the garden more accessible and visible to the main road that borders it. It was interesting to see the small size of the *Proteaceae* being planted. When we asked why they were planted so small, we were told that they settle in much better if they are able to develop a natural root system from an early age.

We arrived while Martin was heavily involved with this planting, so after introducing ourselves we went on to wander around the compact and very diverse garden. One of the features that stood out in particular was the shade house with its collection of tree ferns, as well as the lush vegetation around the café area of the garden. The winter temperature seen in Stellenbosch is seldom much lower than 6°C and the summer maximum is on average 26°C, so the garden is a good environment for the growth of warm temperate species. Another interesting feature of the garden are the beds bordering Neethling Street, which still correspond to the original 'order' bed layout of the teaching environment that the garden was originally used for.

We re-met with Martin and the Kirstenbosch team over lunch and followed this with a tour of the off show areas of the garden, including a look at the work being done on the taxonomy of South Africa's *Oxalis* species; only that week, 8 potentially new species had been brought into the collection. We also saw the propagation work for an endangered sundew, *Drosera regia*. This work was interesting to us as it was following a similar population genetics-based conservation principle to the one we wish to use with threatened *Proteaceae*.

The thing that stood out most from our visit was the number of threatened *Mimetes* species, known to be particularly difficult in cultivation, being offered for sale in the garden's retail nursery. A local company, Arnelia, have been taught how to graft *Mimetes* and are using this knowledge to make plants available to the general public. There is a push in South Africa, because of issues surrounding

non-native species, toward people gardening using native vegetation. On top of this, Arnelia are using some of the funds raised from sales of these threatened species to fund in-situ habitat conservation and restoration. We asked who to speak to regarding this work and were pointed in the direction of a man called Robbie Thomas who we organised to visit.



Figure 4: Australian *Macadamia* flowering at Stellenbosch University Botanical Gardens

Garden Route Botanical Garden and Southern Cape Herbarium

At the furthest east we would go and just before we headed up Craddock peak in the Outeniqua Mountains we called into the Garden Route Botanic Gardens. The gardens were officially opened in 1998 although there had been gardens and a nature reserve on the site since the 1800s. In 2001 the Southern Cape Herbarium, staffed by volunteers, amalgamated with the Garden Route Botanical Gardens Trust and the herbarium was rehoused in 2002 when the Moriarty Environmental Centre was bought and gifted to the garden.

As we walked up to the garden entrance we saw the flower display outside, with a wide array of *Proteaceae*. It was a similar display to that which we had seen at other gardens that we had visited and we remarked to one another that we wondered if the display had been done by the Botanical Society. This remark instantly caused a voice in the office nearby to exclaim 'No, it was done by the herbarium volunteers, we aren't a SANBI garden'. A head appeared out of the window and asked us who we were, as we knew about the plants in the display. We explained and were soon whisked through to the herbarium to meet Pricilla Burgoyne, the herbarium curator, and the herbarium volunteers who were cross-referencing and annotating the specimens. After a great many questions about our expedition and what we did in the UK we were sat down with hand lenses and a stack of herbarium sheets of the species we intended to look for the following day on Craddock Peak. We looked at the specific differences between *Leucadendron spissifolium* ssp. *spissifolium* and

Leucadendron spissifolium ssp. *fragrans*. We also saw a variety of sheets of *L. uliginosum* ssp. *uliginosum* and specimens of *Mimetes pauciflorus* amongst others.

The team at the herbarium were so pleased to help and assisted us by sharing localities of certain plants and distribution records of many others. Many of the volunteers are members of an initiative called CREW (Custodians of Rare and Endangered Wildflowers), which was set up so volunteers could monitor and record South Africa's threatened plants. Outramps is the CREW group that works in the Outeniqua Mountains and whose records on iSpot (an online biological surveying website) had allowed us to choose the most *Proteaceae* rich destinations to visit in the Western Cape.

The garden itself does not have overly many members of the *Proteaceae* amongst its collections but we did find some splendid plants of *Mimetes hirtus* in flower in a particularly wet area next to one of the large reservoirs. This species, known as the Marsh pagoda, is only found at low altitudes and grows in damp ground in peaty soils. It would certainly deal with Britain's wet but its hardiness is likely to be questionable.

The garden was certainly a pleasant place to be but is desperately short of the income that affiliation to an organisation like SANBI would potentially afford it and is well worth preserving not least because of the quality of its herbarium and the enthusiastic team that look after it.



Figure 5: The team at the Southern Cape Herbarium, Garden Route Botanical Gardens, with us in the middle



Figure 6: *Mimites hirtus* flowering in the Garden Route Botanical Gardens (Top) and herbarium specimens of *M. splendidus* (Bottom Left) and *M. chrysanthus* (Bottom right)

Harold Porter National Botanical Garden

Harold Porter Botanic Gardens, run by SANBI, sits at almost sea level, at the base of a valley that runs steeply into the Kogelberg Nature Reserve. The garden is particularly famous for the Red Disa orchids, *Disa uniflora*, which grow in this kloof. The garden is laid out into a range of different habitat types and also exhibits the ethnobotanical use of many of the plants found in South Africa. It was interesting for us to see the range of *Proteaceae* that grow at lower altitudes and in habitats we would not be visiting during our trip. Two of these habitats stood out for us in particular.

Limestone fynbos has a particularly threatened and unique flora all of its own and although *Proteaceae* are far from the dominant vegetation type in this environment, they do exist. *Proteaceae* are renowned for growing in acid soils, so it seemed a little strange to see them growing in such alkaline soils. There were protea species unique to the limestone fynbos on show, such as *Leucospermum patersonii* and *Leucadendron coniferum*, as well as species that will grow on both acid and alkaline soils. This ability, of some species to grow in a range of soil pH, is a characteristic that may prove to be valuable to plant breeding and subsequently horticulture.

Another habitat that particularly stood out was the critically threatened Renosterveld. Whilst not a habitat frequented by *Proteaceae*, it is one of the most biodiverse habitats on earth. It is estimated that a third of its species are endemic and many are bulbous. In fact there can be up to 1000 bulbous plants per meter squared of Renosterveld.

Both these habitats have been irrevocably transformed by man, with Renosterveld and Limestone fynbos under massive pressure from agriculture and invasive, non-native species as well as increased fires occurrence.



Figure 7: *Protea nitida* tree, amongst other *Proteaceae* at Harold Porter National Botanic Garden

Robbie and Vicky Thomas' Garden

Only a short distance from Harrold Porter is the garden of Robbie and Vicky Thomas. On entering the drive to their home you notice their garden is dominated by the tall spires of a whole assortment of *Mimetes*. The welcome we received from the couple was warm beyond our expectations and by the time we left we felt close as old friends. Robbie is a kindred spirit; a private individual passionate about conserving South Africa's threatened *Proteaceae* species through ex-situ cultivation. His mother had been propagator at Kirstenbosch, and was responsible for their success in cultivating *Welwitschia*.



Figure 8: *Mimetes* and *Orothamnus* at Robbie and Vicky Thomas' Garden

Robbie gave us a full tour of his garden and nursery facilities. He introduced us to plants we had not even hoped of seeing, such as the Marsh rose, *Orothamnus zeyheri*, and the Mace pagoda, *Mimetes stokoei*. The latter of which has been declared extinct twice since its discovery, by T P Stokoe, in 1922, only to rise again like a phoenix from the ashes of a particularly intense Fynbos fire that burned through the Kogelberg in 1999. In 2001 just a couple of years after this, Kogelberg Nature Reserve Manager - Mark Johns, discovered a small population of seedlings of *M. stokoei* growing again in the wild. With its fire led ecology now better understood and plants held in the capable hands of Robbie and others, there is hope that South Africa will stop this species becoming extinct for a third time. That said, with pressures from climate change and increased risk of low intensity fires, this possibility can never be ruled out. Robbie talked us through the process he uses for grafting *Mimetes* onto *Leucospermum*

conocarpadendron hybrid rootstocks and we discussed the possibilities of using a hardier species of *Leucospermum* as a suitable rootstock

for British cultivation; this is an area that we intend to work on in the future. The small nursery area, in which he raises plants from both cuttings and seed, is a very practical space where everything has a purpose and good reason. A secure lockable environment, safe from marauding baboons, the area contained shelves at a good height for working with row upon row of young grafts, seedlings and cuttings. One side of the area was taken up with a large number of seedlings of the critically endangered *Widdringtonia cedarbergensis* which Robbie is growing as part of a conservation breeding program. He grows many of his plants in white pots so as to avoid the detrimental effects of heat on their roots and certainly all his *Widdringtonia* seedlings were grown in such a manner. He took time in talking us through the phosphate free fertiliser mix and composts he uses, as well as the watering regime.



Figure 9: *Mimetes stokoei* (Left) and *Orothamnus zeyheri* (Right)

He introduced us to a rigid plastic seedling plug that can be reused easily and which we will be looking for a supplier of. He discussed with us dormancy breaking techniques for *Proteaceae* including the production of smoke water, removal of eliasomes (the waxy seed coat, eaten by ants, found on *Mimetes*, *Leucospermum* and other genera) by soaking in a Hydrogen peroxide solution and removal of seed coats through both abrasion and heat. We also discussed the hormone stimulation of side-shoots in order to encourage the growth of material for taking cuttings. Robbie's very practical approach is prevalent in all that he does and allows him to understand the precision needed in the techniques he uses intensely. Not all of his methods are suitable for British cultivation but some, like his refrigerator that has a day/night temperature gradient of 15°C, we will definitely put into practice in the germination of the seed we collected. Robbie's collection, passion and deep understanding of the plants in his care are contagious and were a highlight of the whole trip. He is driven by the conservation of South Africa's native plants and not scared of unusual ideas in order to reach his goal.

We left Robbie inspired to emulate just a little of what he had achieved and with plans for the future of our own interest in South African *Proteaceae*.



Figure 10: Top - holes for plugs to sit in. Bottom - Individual plug with seedling.

Areas Explored

Table Mountain

Table Mountain rises up behind Cape Town to 1085m; one of the Western Cape's most prominent landmarks, it forms just part of the Table Mountain National Park. South Africa's National Parks are managed by the South Africa National Parks Authority and a different set of permits are required in order to collect in these parks to those required for Cape Nature reserves. The complexity of the permit system and the short notice we had meant that we were unable to collect seed on Table Mountain but we did spend a full day hiking to its highest point, Maclear's Beacon, and back down to Kirstenbosch again. In doing so we were able to make some interesting observations of a species we are already growing in North Wales. It also allowed us to get a better understanding of the fynbos habitat that we would be working in for the rest of our trip.

Having started early on a misty and rather damp day we headed out of Kirstenbosch Botanic Gardens via the Contour Path at the top of the gardens which led us into the SANBI (South Africa National Biodiversity Institute) managed afrotemperate forest that clings to the cliffs and gorges of Table Mountain. This wet forest habitat is able to grow on the mountain due to the permanent moisture provided by the mountain's 'table cloth' of cloud. The summer is largely rain free, yet here on Table Mountain those mists remain throughout the dry season, keeping the air moisture levels high. These Orographic clouds are formed when a south easterly wind (known locally as a 'South Easter') pushes warm moisture laden air up the mountain into cooler air which causes the moisture to condense. The total annual rainfall for Table Mountain is around 1000mm but recent experiments suggest that the amount of water reaching the ground can be doubled as a result of the mist condensing on foliage. We experienced this phenomenon first hand toward the end of our trip when we saw the mist condensing on the fine hairs of the Cape Silver trees, *Leucadendron argenteum*, causing it to 'rain' just where each tree needed it.



Figure 11: *Leucadendron argenteum* in the mist

Skeleton gorge, the first south facing kloof of our trip, was a steep ascent which saw us sometimes scrambling over boulders in a stream and sometimes having to use ladders and fixed chains to scale steeper sections. The temperate forest habitat was largely free of *Proteaceae*, but other species such as *Knowltonia vesicaria* and *Anemone tenuifolia*, stood out. Occasionally the views opened out above the trees onto more open land and cliff face shelving where the Fynbos of the summit had managed to gain a foothold. These open areas were mostly dominated by *Restionaceae* and *Ericaceae* but were interspersed with *Proteaceae* in the form of the King Protea (*Protea cynaroides*), *Leucadendron xanthoconus* and the golden Peninsula Conebush (*Leucadendron strobalinum*). Seeing *Proteaceae* in this habitat was the first time we had confirmation of our idea that these plants can cope with much larger amounts of environmental moisture than is popularly believed.



Figure 12: *Leucadendron xanthoconus* at the top of Nursery Ravine

An hour or so, and a hard slog, later we reached the path to Maclear's Beacon, the summit cairn of Table Mountain. It was here that the forest habitat opened out into true Table Mountain Fynbos. Almost the first species we saw was more of the *L. strobalinum* that we had seen in the distance on cliff edges. Being able to see this species that we grow at home in North Wales in its natural habitat and in full flower was quite overwhelming. The bracts surrounding the cone like flower heads shone like beacons in the thick rolling mist, giving them the impression of patches of sunlight breaking through, as we walked to the summit.

The precipitation of the previous few days had literally turned the Fynbos into a wetland. The paths at times were a torrent of water and the peat soils and *Ericaceae* dominated habitat reminded us heavily of the Heather moorland of back home in Snowdonia. We found *Proteaceae* growing in areas of standing water alongside plants more often

associated with peat bog habitats such as Sundews (*Drosera sp.*). During the drier summer season plants such as the Sundews survive in a state of dormancy.

Our route to Maclear's beacon took us through large stands of the *L. strobalinum* and along the way we saw numerous plants of *P. cynaroides* and *P. speciosa*. It is worth noting that the peaty soils here on the top of Table Mountain sit directly on the top of eroded Table Mountain sandstone. Where the top soils had been washed away the paths were almost white due to the sandy gravel that had been left behind. Whilst on the day we visited the soils were saturated, I have no doubt that they drain freely, maintaining just enough moisture to stop them from drying out completely.

On reaching the highest point of Table mountain we found an environment not dissimilar to those we had seen in pictures of the Tepuis of Venezuela; a sandstone environment shrouded in mist and running with water. Again the main feature was the bright yellow bracts of the *Leucadendron strobalinum*. This plant produces rounded shrubs at most about 2 meters tall and 1.5 meters across. It is endemic to Table Mountain and is only found growing within a restricted range on it. This small area of distribution means it is classified as endangered on South Africa's red list of vascular plant species. The stands of these plants were thick and tall and in places starting to die back, presumably due to old age. The fynbos of the mountain had not been burned for many years and any fires that do start are put out quickly as this area is a significant tourist attraction.



Figure 13: *Leucadendron strobalinum* on Table Mountain

We worked our way across the Top Table and down into Echo valley, an area again dominated by *L. strobalinum*. From Echo valley we walked to the large reservoir that supplies the majority of Cape Town's water. Here we found large populations of invasive *Acacia* and *Hakea* growing in an area quite heavily impacted by man. The Fynbos vegetation was still a dominant feature but where the *Acacia* grew it was being heavily out competed. Alongside the small museum next to the dam we found plants of *Aloe plicatilis* growing. A native of South Africa but alien to Table Mountain, this large *Aloe* had obviously been planted. Alongside the *Aloe* we also found a plant of *Protea magnifica*, again not native to the mountain, so obviously planted.

As we walked back down the steep slopes of Nursery ravine we saw more evidence of human impact on the flora of the area. Oaks, beech and birch had been brought to South Africa and planted in these south facing kloofs as timber crops. The environment not too dissimilar to that of the UK they had taken well and naturalised amongst the native heaths and restios.

On the slopes down Nursery Ravine there were large populations of King protea thriving in the tumbling mists of The Table Cloth. These plants are obviously quite accustomed to being drenched. As we neared Kirstenbosch the flora increasingly became dominated by species such as Waboom (*Protea nitida*) which in places grew over the path creating a tunnel for us to walk through. It was here, on the side of the path, that we saw the largest *Massonia* plant we had ever seen. Its two leaves easily reached 45cm in length; a nice end to a very interesting day.



Figure 14: Vast stands of *Leucadendron strobalinum* near the reservoirs on Table Mountain

Langeberg

The long spine of the Langeberg mountains stretch from west to east, parallel to the southern coast of the Western Cape of South Africa for over 250km. Indeed their name, Langeberg, literally means 'Long Mountains'. They act as a barrier to moisture moving north from the Indian Ocean and keep the land to their north, the little Karoo, significantly drier than the coastal lowlands. The resulting clouds that are often found hugging the southern flanks of the highest peaks keeps these shadier slopes moist long after the surrounding land is dry and ready to burn. They are characterised by a gradual transition from a typically dry-summer Mediterranean climate in the west to a temperate one in the east, where it rains more evenly throughout the year. This has both allowed for the migration of species along their length and dictated a gradual change both within and between these species. As the environmental adaptations necessary for survival gradually change over the length of the Langeberg, a species' leaves can change size, shape and hue, to the point that some previously distinct species are now considered a continuous variation. Equally where distinct species from east and west have met, hybrids have inevitably formed and speciated. Sometimes the boundaries between species are well defined but promiscuity means that occasionally they are not. It is this variety which makes the Langeberg such an interesting and species rich mountain range, and is one of the principle reasons for our visit to this area.



Figure 15: The Langeberg from the road leading to Grootvadersbosch Nature Reserve

We focused our efforts in the Langeberg at Boosmansbos Wilderness Area and Garcia Nature Reserve. Both of these are found between the central and eastern parts of the range and come under the management of the team at the Grootvadersbosch Nature Reserve, led by Ian Allen. Although Grootvadersbosch, which acts as the gateway to the adjacent Boosmansbos, is well known for being one of the largest remaining tracts of Afrotropical Forest in South Africa, the high mountain fynbos covered slopes and summits of the wilderness area contained our desired target areas.

On arriving at the reserve offices, we were informed that a fire had swept through a large area, only weeks before our arrival, and that we might want to reconsider visiting these areas. This was indeed unfortunate, however we decided to stick with our plan, since the overnight hut had not burned and neither had some of the higher areas. Also, seeing the response of the land to fire would be interesting in itself. The smell of the burned landscape permeated our lungs during the long uphill walk-in of the first day. Specks of green regrowth were visible, piercing the charred vista. This was



Figure 16: The burnt slopes in Boosmansbos



Figure 17: *Blechnum tabulare* resprouting after the fire

mainly in the form of ferns *Blechnum tabulare* and *Todea barbara* in the wetter areas. The fire lily, *Cyrtanthus angustifolius*, also provided colourful and much needed interest along the way.

With no shelter from surrounding vegetation, the added weight of full packs and a fire damaged path to contend with, it was with much relief that we arrived at the 1100m ridge that prevented the fire spreading into the green and yellow valley to the north. This was truly a feast for the eyes after the monochrome view behind us. We were also now able to see the highest mountain in Boosmansbos and our goal for the following day. At 1637m, the lofty southern slopes of Grootberg filled us with anticipation. *Leucadendron eucalyptifolium* was prevalent in every direction now, along with many species of *Erica*. Traversing the sunny, north facing slopes of Repeater Kop, we encountered a handful of *Protea cynaroides* in bud, but once at the saddle, near the Helderfontein Hut, the vegetation became overwhelmingly dominated by a myriad species of *Proteaceae*. Trees of *Protea aurea* ssp. *aurea* formed a sparsely leaved canopy with carmine shuttlecock flowerheads held like jewels in their crown. It is interesting that although not in full flower when we observed them, of all those we did see at this location, none were white. Most plants in cultivation of this species are white, so it will be interesting to see if the seed collected here results in red flowers. Is this an environmental or genetically determined result? *Protea eximia* and *Protea grandiceps* were also found here along with the still prevalent *Leucadendron eucalyptifolium*. Very few flowers were seen of *Protea eximia* and none of *Protea grandiceps*, but seed was not hard to find, being conveniently held in the previous year's old flower heads.



Figure 18: Walking through dense stands of *Leucadendron eucalyptifolium*



Figure 19: Flowerhead of *Protea aurea* ssp. *aurea*



Figure 20: Seed head of *Protea aurea* ssp. *aurea*

Walking through this valley of proteas was a reward worth every uphill step, but our legs were tired and the hut remained elusive amongst this dense vegetation. A fork in the path led us down towards the sound of a rushing stream and eventually to a flat area with no proteas, but with two small stone huts, each with a corrugated metal roof, two closed windows and one stiff door. This first hut's door was opened with hesitation, not really knowing what was to be found inside. The dark interior revealed a single room with a raised wooden floor that had large gaps between the boards and a particularly foul smell. The second hut was similar but with a concrete floor and only smelt of stale air. So the window shutters were propped open, flooding the room with light and revealing some wall art by previous occupants of a floral and altogether quite charming nature. This room was to act as a base for the following day's exploration up Grootberg, and it served this purpose well, with ample floor space for us to lay out our sleeping mats and bags. Up to 12 people are allowed in the wilderness area on any given day, which would be quite a squeeze, however no other parties arrived.



Figure 21: Inside the Helderfontein Hut

Overnight the wind played a cacophonous chorus on the corrugations of the roof, resulting in little sleep. Still at least it had stayed dry. The puddle in the corner of the room was a stark reminder of a previous leak and the potential consequences of a downpour. As dawn began to fill the valley with a crisp golden glow, so we briefly retraced the final steps of the previous day, leaving our overnight equipment at the hut, in order to locate the path marked on the map which would lead us up Grootberg. There seemed to be no such path on the ground, between the dense, scratchy shrubs of *Leucadendron eucalyptifolium*, however the path was visible ascending the south facing slopes above us. We tried forging our own path in a likely direction, but were forced back, having been thoroughly scratched by the dense vegetation. Several shuttles along the main path caused us to notice a fallen shrub, which we investigated only to discover our desired path hidden behind it.

Frustrated that we had wasted precious time, we marched on at a good pace, only to be stopped in our tracks again, this time for a very good reason. The heart-shaped leaves of *Protea cordata* peering between the undergrowth atop snaking stems invited closer investigation and revealed ripe seed-heads. This collection represents a good chance of being cold hardy and was the first of many choice seed collections on what was a very successful day. Not knowing how high we would find each species growing, we decided to defer further seed collections to our descent. So up we walked, past many tempting side trips, to the summit ridge of Grootberg. We joined the ridge at 1550m and were greeted by the welcome site of *Protea cynaroides* on the south facing side of the ridge, in an exposed position (both for the plant and for ourselves), with both flower-heads coming into bud and seed-heads from last year. This was the highest we saw this species growing and will hopefully result in cold hardy progeny. Further along the ridge, this time on the flatter, north facing side, we found a handful of *Protea grandiceps* plants. Whereas the *Protea cynaroides* was looking healthy, with undamaged foliage, *Protea grandiceps* had many pockmarked leaves. Could this possibly be due to hail?



Figure 22: Damaged leaves and old flower-head of *Protea grandiceps*



Figure 23: The Helderfontein Hut with Grootberg behind

Continuing up the uppermost, north facing, now mainly grassy slopes of Grootberg, we approached the summit itself with caution, having noticed the steep south facing cliffs on the ascent and experiencing considerable and sustained northerly winds. Lying flat on the rocky ground, we inched our way towards the edge, peering into the seemingly bottomless gully below, before suddenly focusing on a mist of pink, feathery tails gently swaying among the grasses. Even though only a few photographs were available for us to see of the 'Medusa Spoon' before embarking on our expedition, there was no doubt in our minds that we were looking at none other than *Spatalla nubicola*; and not just one, but hundreds of plants. It occurred to us that they were not being blasted by the wind, as we were, so carefully we scrambled down to be amongst them. All at once it was calm. The population seemed to go on down the gully beyond the couple of hundred meters we could see. How many more plants were out of sight? Only use of a rope would grant access to find this out; a future visit perhaps? There were both flowers and a small amount of seed on the plants so we collected some seed and started back up the moist slope, only to be greeted by an even rarer find. *Leucadendron radiatum* was growing out of a small crack in the summit rocks, like a bonsai, sculpted by its surroundings. This endangered species is only found on a few of the highest summits in the Langeberg and its population size is decreasing. If we can demonstrate that the other collections of *Proteaceae* from Grootberg grow well for us, it would bode well for a possible future ex-situ backup population of this species as well. The path from Grootberg continues along the ridge towards another high mountain called Horingberg, however for us it was time to head back down to the Helderfontein Hut. There were still many interesting species we had chosen to walk past on the way up.



Figure 24: *Spatalla nubicola* in flower



Figure 25: The south facing summit slopes of Grootberg

The next key species we came to was *Protea scolopendriifolia*. This rhizomatous clump of hearts-tongue-fern like leaves bore no new or old flower heads and seemed altogether rather lonely, growing on the steep embankment above the path at 1450m; still good to see it in this area. The highest plant of *Protea aurea* ssp. *aurea* we found was also at just over 1400m. This is interesting since it is currently described as only growing as high as 800m in altitude. *Leucadendron spissifolium* and *Protea neriifolia* were also collected nearby.

Further along the path, above a watercourse, we found a species of *Spatalla* sprawling on its own and not looking like any of the more common members of this genus. It was confined to a couple of meters square and we could not tell if it was one plant or a few due to the mass of *Erica* and *Restio* that it was growing through. The ground was dripping with water and it had not rained for the two days we had been in the area. This plant likes it moist. We identified it as *Spatalla colorata*, and this was subsequently confirmed by the knowledgeable members of the South African iSpot community, as well as leading members of CREW who survey this area. Indeed there was up until this point no records of this species on iSpot and the last time it was seen by Outramps was in 1998. This species was in flower and represents a significant find.



Figure 26: *Spatalla colorata* growing through thick heather

Just when we thought we had seen enough on this spectacular day, we spotted the long shining leaves of *Leucadendron album*. The observation keyed out as this species but was definitely on the long leaved end of the spectrum. We really didn't expect to see this species here and indeed it was rare in the locality. We were to see many more of this species in the Swartberg Mountains, where they are quite common. As we arrived back at the hut the heavens opened.

Another night of wind related noise was followed by what turned out to be an exceedingly long walk out. We had been informed by staff at the reserve office that crossing the Duiwenhoks River would be difficult if we were to walk back via the Saagkuilkloof Trail, rather than the way we had walked in, particularly if it had rained. But we were keen to avoid traveling back through the burnt Leorklip Trail, both because we had seen it already and because there was a tricky rock step which we didn't want to down climb with big packs on. So the long way round it was, along the Saagkuilkloof trail, out to the road bridge, and then a road walk back to the car to finish. We didn't make any significant collections on the way down; both because of the lower altitude and due to the lack of available seed. We did however see the largest *Protea cynaroides* flower-head of the entire trip, with particularly dark red bracts, as well as *Mimetes cucullatus* in flower. Neither of these species had seed and were growing too low to be of much interest in this respect anyway. One collection we did make was of *Spatalla parilis*, the 'Spike Spoon'. It was growing in the dripping, wet, shady embankments above the path and was both coming into flower and had some seed. We found another population of *Protea aurea* ssp. *aurea* on the way out at a much lower altitude and these all had white flowers (in contrast to the ones we found higher up). The final road walk in the heat of the afternoon seemed to last forever. Luckily a passing pick-up truck picked us up and whisked us along the final few kilometres. Still bristling with all the things we had seen and learnt, we headed east towards the Southern Cape.

We visited the Langeberg again on the way back west, in order to explore the mountains north of the town of Riversdale, which form part of the Garcia Nature Reserve. Straddling either side of the Garcia Pass, these mountains are not as high as the ones we visited in Boosmansbos, but are home to some different and interesting species indeed. They are also conveniently close to the road. We had intended to explore both sides of the pass on separate days, however stormy weather enforced a rest day upon us and we were left with a decision as to which side to explore during the remaining fair weather day. The chance of reaching over 1300m on the Sleeping Beauty trail, west of the pass, was rejected in favour of the lower Kristalkloof Trail, east of the pass, both because it was shorter (we still had a long drive west to do later in the day) but mainly because it was said to contain a few species of *Leucospermum* interesting to us. The first of these, *Leucospermum mundii*, we came across within a hundred meters of leaving the car, among dense stands of *Leucadendron eucalyptifolium*. These shrub's upright stems had glaucous leaves with many nectaries and were topped by bunches of multiple flower-heads ranging in colour from yellow, through orange to red. Even though we were only just over 500m in altitude here, we tried looking for seed, but could not find any. We found more of this species along the gritty trail which headed up the valley in an easterly direction. We also came across many of the Arid Pincushion, *Leucospermum calligerum*, in the valley bottom. This was a very different plant; a small open sprawling shrub with many small leaves up its long branches and terminal pink flower-heads. A somewhat untidy plant, but with beautiful flowers none the less.



Figure 27: *Protea cynaroides* along the Saagkuilkloof trail



Figure 28: *Mimetes cucullatus*, along the Saagkuilkloof trail



Figure 29: *Leucospermum mundii* in Kristalkloof



Figure 30: *Leucospermum calligerum* in Kristalkloof

The species we were really looking for, *Leucospermum winteri*, would be higher up, apparently on summit ridges, 1100m to 1300m (Rebelo, 2001), between Garcia Pass and Gouritz River. As we headed up and over the saddle we went through much wetter ground filled with dense floriferous stands of *Protea neriifolia* and *Protea eximia*. There was also many *Erica* and *Berzelia*, or bobble-bushes, as we liked to call them. It was a misty grey day but the whole valley was a magical galaxy of psychedelic limes, yellows and cerise. A sparkingly showy avenue of *Spatalla parilis* lined the path and led us past one of the very few parasites of proteas, called *Mystropetalon thomii*. The red, corn-on-the-cob like inflorescence of this species was the only visible part of the parasite and was covered in tiny beetles. The saddle itself was at about 900m, so when we saw plants, which confused us between *Leucospermum mundii* and *Leucospermum winteri*, we made sure to take lots of photographs with which we could consult opinions of others. By the end of the day we were almost certain that the plants we saw were *Leucospermum mundii*, which would be near the top of its stated altitudinal range. The trail then descended towards the Kristalkloof Hut and we, needing to head back to the car, turned round at this point. We never did find plants of *Leucospermum winteri* in this area at all and have arrived at a somewhat of a question mark. We have not managed to find any record of this plant in its described altitudinal range, rather we have only seen records of it between 400m and 800m. This range also makes more sense, since it is believed that *L. winteri* is a hybrid of *L. mundii* and *L. calligerum* (Rebelo, 2001), both of which occur at altitudes lower than that described for *L. winteri*. We would be very interested to know of any records of this species in its described altitudinal range. On the way back to the car we came across the sweet smelling plants of *Serruria fasciflora* and a *Leucadendron eucalyptifolium* with vibrant red spots in the bracts surrounding its flower-heads. Altogether a short but stunning day was had in Kristalkloof, there is much more to explore here, not least the other side of the pass, to Sleeping Beauty. A return to this area later in the year would likely result in more available seed and better weather, so until next time, we bid the Langeberg farewell and sped off to the west.



Figure 31: *Mystropetalon thomii*, a protea parasite



Figure 32: *Spatalla parilis*



Figure 33: *Protea neriifolia* with the peak of Sleeping Beauty behind



Figure 34: The colourful path through Kristalkloof



Figure 35: Kristalkloof, east of the pass



Figure 36: *Protea eximia* in Kristalkloof



Figure 37: *Leucadendron eucalyptifolium* with red central bracts

Outeniqua

As the chain of mountains which form the Langeberg head east, they get closer to the coast and the climate changes to one where rain falls in relatively equal amounts throughout the year. It is at this point, roughly north of Mossel Bay and until the Keurbooms River, where they are called the Outeniqua Mountains. The lower elevations between the foothills and the coast have one of the mildest climates in the world and are cloaked in afrotemperate forest, which rarely burns due to high humidity. Higher up on the southern slopes, afrotemperate forest clings on in sheltered kloofs, but away from these, the dominant vegetation type becomes mountain fynbos. The northern slopes that descend to the Karoo see far less rain and become increasingly arid. Although the diversity of protea species is less than that further west, the fact that plants, high on the southern slopes, can see rain or sun any time of year might make them more likely to handle the infamous 'sunshine and showers' of the UK.

Above the city of George, the Outeniqua Nature Reserve, run by Cape Nature, contains the lofty Cradock Peak, which at 1578m is the highest in this range. George Peak is another high mountain close by that is linked to Cradock by a ridge, up which the main trail accessing both peaks goes. We met the reserve manager the day before we intended to explore these peaks, only to be informed that a large area to the west of the ridge had burned this year. Satisfied that it was safe to ascend and deciding that there was enough unburnt area for an exploration to be worthwhile, we got an early start, knowing that we had the most elevation gain and descent of any one day on our trip ahead. We arrived at the start of the Cradock and George Peaks Trail at dawn. It was cool, but walking up through the fern filled forest soon had us warmed up. Emerging into the fynbos at 500m, up we went, steeply at first, past the pale, hairy and shining leaves of *Leucadendron uliginosum* ssp. *uliginosum*. This was the only time we saw this species on the trail, though there were many more along the Outeniqua Pass the following day. The angle eased off slightly at 800m and before long we were walking along an airy ridge through a glorious elven forest of *Leucadendron conicum*, which was coming into flower. Higher still, at 1000m, we came across a large stand of *Mimetes pauciflorus* whose Olympic torch like flowers dotted the sky with beacons of orange. This vulnerable species is the eastern most member of the genus and one which we managed to collect seed of, though not without using a lot of time hunting out the older, darker, burnt orange flower-heads that held these.

At 1250m the ridge we were on met with the path between George Peak and Cradock Peak. It also marked the start of the burnt section of the mountain. There was a lot of visible green regrowth from grasses, sedges and restios, but as we continued to ascend the ridge towards Cradock Peak, we encountered lots of *Proteaceae* seedlings too, the most notable of which were of *Mimetes pauciflorus* growing at 1500m. If these plants can grow all the way up here, they are sure to handle frost. The craggy summit, although not burnt, was devoid of *Proteaceae*; was this due to lack of moisture perhaps? Either way the view was breath-taking. Looking along the ridge towards George Peak, we noticed some smoke rising from behind the mountain. Not wanting to be caught out in a fire, we decided to descend promptly, though not before quickly exploring the stream running steeply off the uppermost southern slopes and the unburnt vegetation either side of it. It was here that we collected seeds of *Leucadendron conicum*, at 1400m. Racing down the ridge, we only stopped once past the junction with the George Peak trail and back in unburnt vegetation. It was mid-afternoon and hungry for lunch, we found a suitable large flat rock to rest on. Looking over the south side of the ridge towards the city of George, we noticed a patch of what looked like a species

of Unispoon. The only *Spatalla* it could be this far east was *S. barbiger*, however its flower-heads were only 10mm long and the description says 20-40mm (Rebello 2001). Also, this species is known from altitudes of 400-620m and we found it at 1115m. We took many photos and have agreements from experts that our identification is correct and just goes to show the variability of species here. On the way down we thought we saw a large shrub of the endangered *Mimetes splendidus* in the distance, but the fynbos was too thick to get to it. Next time we are definitely bringing binoculars!



Figure 38: *Mimetes pauciflorus* on Cradock Peak

The other part of the Outeniquas that we visited was further west; on what is almost the boundary between these mountains and the Langeberg. The Robinson Pass crosses the mountains at a height of 800m and from here the Kouma Trail traverses the southern slopes of Ruitersbosch Nature Reserve, reaching a peak at 1200m. On our way back south and west from the Swartberg, we needed to pass this way anyway, so decided that a short out-and-back excursion along this path would provide a convenient second foray into the Outeniquas. It was a misty day, as we understand is often the case on this pass, but as luck would have it we managed to park the car directly adjacent to a large *Leucospermum cuneiforme*. Not seeing many of this genus on our travels, we were very excited to see it, even though it was neither in flower nor with seed. This warty stemmed, tree forming species should grow well in mild parts of the UK and can resprout should it be damaged by fire or frost. Along the initial, open section of the path we saw *Protea neriifolia* and *Protea cynaroides* as well as the resprouting *Leucadendron spissifolium*. The leaves of *Protea cynaroides* here were cordate and massive. As the path neared the wet, steep, south facing slopes, the mist enveloped us, making navigation of the now poorly defined path both difficult and hazardous. A species of fern from the genus *Gleichenia* swamped the surrounding vegetation here and where the



Figure 39: *Oldenburgia paradoxa* near Robinson Pass

path had been cleared, formed overhanging hedges, ready to push you down the slope as you squeezed pass them. Rounding a rocky bluff, we came across a hemispherical cushion of small, tightly crowded, leathery leaves with white felted undersides and white flower and seed heads poking out between them, growing on the cliff, out of a crack in the rock.

Oldenburgia paradoxa was not a plant we knew before seeing it here but it has certainly left a lasting memory. Scrambling up some steep, boulder strewn streams, we eventually reached a flatter section of path at an altitude of 1000m. It was here that we entered an area that had burnt a few years ago and in which *Aulax cancellata* was flowering, possibly for the first time. How fantastic to see this species again so far from where we first saw it, far to the west of here, in Jonkershoek. By this time it

was actually raining, and we still had to continue our drive to Riversdale, so back down the slippery path we went, passing a stand of *Mimetes pauciflorus* that we had not noticed on the up. This is probably as far west as this species is found and interestingly it was growing alongside *Mimetes cucullatus*.

The high mountains of the Southern Cape certainly have much to offer botanically, though we did notice the reduced prevalence of *Proteaceae* here, compared to areas further west. We did not manage to collect seed of *Leucospermum cuneiforme*, for which a visit later in the year would be needed, however being able to collect seeds of *Mimetes pauciflorus* was a highlight.

Swartberg

Of all the mountain ranges we visited in South Africa, the Swartberg is the most extreme; the highest, the driest, the coldest and the hottest. It is bounded on both the north and the south by the arid lands of the Great Karoo and Little Karoo respectively. During the summer, temperatures can soar to between 30 and 40 degrees Celsius; however during the winter frequent snow storms close the mountain passes to vehicular traffic. Sunlight levels are high and humidity is low. Consequently, the vegetation is distinctly different from the other more coastal mountain ranges we visited. Our first impression, having stepped out of the car at the summit of the Swartberg Pass, was that we were in a very different climate to both South Africa's coastal mountains which we had just left and also to our home in the mild west coast of the UK. This place was not mild, but it did get cold, and it was for this reason that we wanted to collect seed here. Was it possible that the plants from here would tolerate cold better and just deal with our cool summers? Or would they need that summer heat in order to thrive? We reached our highest point on the trip here, on the summit of Waboomburg, at just shy of 2000m in altitude. Would we find those high altitude specialists we were after here?

On approaching the mountain we were once again confronted with the aftermath of fire. Burnt remains of *Protea montana* were found as well as the skeletons of a few *Leucadendron dregei*. It seemed that the previous summer had affected many different mountain areas in the Western Cape, but we did not lose hope of finding some survivors. We headed for the rocky outcrops that often make good refuges for plants during a fire and lo and behold, survivors we found. At the top of a cliff and surrounded on all sides by large boulders was a creeping beauty. The prostrate mass of *Protea venusta* was unscathed and growing well. We saw another couple of plants of this species at the top of the same cliff that were not so well protected by rocks and which had been partly burned away from the cliff edge. Because they are only found at the tops of high mountains, populations of this endangered species are predicted to reduce significantly over the coming decades due to more frequent fires as a result of climate change (SANBI Red List justification). This species is actually in cultivation already, but it forms hybrids with other white water sugar bushes and provenance is often difficult to determine. Plants labelled as this species in cultivation are sometimes obviously hybrids due to their upright nature.

Another endangered species we found growing further away from the cliff edge but still among rocks was *Leucadendron dregei*. These cone-bush plants actually had many cones on them from previous years and in areas where they had been burned, seedlings were already growing. This species is another high altitude specialist suffering from similar population reductions as *Protea venusta*. One vulnerable species which we did collect seed of near the summit was *Protea montana*. This mat forming plant had not been burned and looked like a green carpet dotted with goblets for flower-heads at ground level. This rodent pollinated species is one that we have high hopes for being hardy in the UK and it was actually growing in depressions and seeps that water from surrounding areas would be channelled into. Though given the low rainfall in this area it certainly was not wet.

Continuing to boulder-hop around the slopes surrounding the summit, we stopped to catch our breath and gaze down the length of this mighty chain of folded mountains. We were now in a dip between the main peak and a shoulder just to the north of it, which dropped away to the west via a smooth triangular slab of rock, broken up by narrow cracks.



Figure 40: *Protea venusta* in a rocky fire safe spot overlooking the high peaks of the Swartberg



Figure 41: *Leucadendron dregei* with cones

Wanting to look more closely at what appeared to be the silhouette of a bonsai shrublet growing out of one of these cracks, we climbed up this slab for a short way, being careful to keep to the rock and avoid the vegetation. “its *Protea rupicola!*” we both exclaimed, containing our excitement in order to stay keep clinging on. We had not expected to find this plant so easily, although come to think of it, it was exactly where it is always described as being – growing out of the side of a cliff. The plants we saw had large seed-heads and flower-head buds coming on. This is another endangered high altitude species which is suffering population losses due to climate change (SANBI Red List) and we were very pleased to eventually find plants from seedling to mature on this rocky slab. Needless to say the fire had not touched them here. Historically, plants of this species have been grown in cultivation in South Africa but very few times and never to maturity. Pleased as punch, we trotted back down to the pass and continued to our overnight stay at the Ou Tol Hut, which compared to the Helderfontein Hut in Boosmansbos, was luxury. Similarly to that hut, we used it as a base for exploring the surrounding area.

The following day we started early, heading back up to the summit of the Swartberg Pass, this time turning east, along the trail which rides the crest formed by the highest peaks, towards the Bothashoek Hut. The fire which had engulfed much of Waboomsberg had also affected the south side of the pass itself and slightly east of it as well. The path went through alternating patches of burnt and unburnt vegetation, including *Protea punctata*. This species of white water sugarbush formed many small trees but did not occur much higher than the level of the pass and seemed to grow quite happily in some shady and damp areas. Also in the area, just east of the pass, was a handsome stand of *Leucadendron album* in a flat, open, sunny spot near the ridge itself. It was a joy to see so many plants in this population compared to that which we found in Boosmansbos. Full of pink, strawberry-like cones at various stages of ripening and with glaucous leaves, it was a wonderful sight to behold, even though the leaves were distinctly shorter than in Boosmansbos. We also passed several burnt shrubs of *Protea lorifolia*. This species was growing almost exclusively on the sunny side of the ridge and was actually a rather untidy plant when we did find an unburnt individual. At the first and second summits we reached, were plants of *Leucadendron dregei*. Never in high numbers and well placed in fire safe areas, we were pleasantly surprised to see the number of individuals that we did. At the top of the second summit (we think this is called Bothashoek Peak) we decided to head down the south facing ridge that descended below us. After a short while, we found a couple of small plants of *Protea rupicola*. How nice to see this species again, even though these were relatively young plants. But where were the parents? Further down, we saw what looked like a large mass of protea like leaves and large dark pink flowers on a rock pinnacle a little distance down the ridge. Scrambling towards the pinnacle, we came across another couple of plants of *Protea rupicola*, this time with a few old flower-heads. But what was the plant in flower up there? Climbing up to get a better look, we were rewarded with a sight neither of us shall forget. In the airy and lofty heights, a very large *Protea rupicola*, in full flower, basked in the midday sun. We stopped and admired this wonderful veteran for quite some time along with a rather splendid blue lizard below it. Feeling that we had gone down the ridge far enough and knowing we had to retrace our steps back to the hut, but still wanting to explore this superb habitat further, we traversed to the west facing side of the ridge in order to start heading back. On our return we found several other groups of *Protea rupicola*; this must be one of its strongholds.



Figure 42: *Protea rupicola* flowering at the top of a rocky outcrop



Figure 43: On the left, *Protea rupicola*. On the right, *Leucadendron album*

We arrived back at the hut in good time for a late afternoon exploration of the middle slopes and flats to the north of the pass and towards the dirt track which leads to 'Die Hell'. This area was between 1200m and 1400m, so still was high enough to see frosts, but not to the extent of the peaks and inevitably hotter in the summer. It would however benefit from water running off the peaks. We found a particularly beautiful, red-leaved plant of *Leucadendron salignum*, from which we collected seed, as well as from a group of the Spinning-top conebush, *Leucadendron rubrum* and the Groove-leaf sugarbush, *Protea canaliculata*. *Protea eximia* was everywhere here, interspersed with *P. repens* and *P. punctata*. The best find of the afternoon had to be *Paranomus dregei*, the scented sceptre. This was the first and only species of this genus that we found in South Africa. It was growing just above seasonal streams, in full flower, and true to its name it smelt richly of warm honey. Unfortunately we did not find seed, so this would definitely be a good reason to return to this area at a later time of the year. We have never seen plants of this species in cultivation (that is not to say they don't exist), and would be so pleased to see it cultivated in an area more accessible to the public, if only for them to appreciate the heavenly sent.

Another night at the hut was followed by a drive back down the south side of the pass, leaving the Swartberg behind us, though not before seeing large trees of *Protea nitida* as well as the Swartberg pincushion, *Leucospermum wittebergense*, flowering away with a dwarf chameleon beside it. The Swartberg is such a massive range that we barely scratched the surface of seeing all that grows here. In particular, we think that the mountains above Ladismith would be fruitful, not least to see the stately *Protea aristata*. Having said all that, these mountains felt almost too dry to contain plants that would cope with the high humidity in the UK. Only time will tell.



Figure 44: *Leucadendron salignum*



Figure 45: *Paranomus dregei*, the scented sceptre along the road to Dei Hell



Figure 46: *Protea eximia*

Hottentots Holland

The wettest place in South Africa is quoted as being somewhere between the head of the Jonkershoek Valley and the Dwarsberg Plateau, with values ranging from 2000mm to 3300mm per annum. This area straddles the Hottentots Holland and Jonkershoek Nature Reserves and forms part of the Boland mountain range. From Cape Town these steep mountains form a continuous and seemingly impenetrable barrier, their peaks not uncommonly capped with snow in the winter and often shrouded in clouds. They are also close enough to the coast to ensure moderate summertime maximum temperatures; having said that, 2015 was a year of extremes for the area. The end of summer saw temperatures soar, with strong winds fanning flames over vast areas, whilst the winter saw Jonkershoek Reserve Offices, which are at about 350m in altitude, down at -3C. A weather station at 1000m in altitude in these mountains has recorded a low of -7C over the past few years (climate data provided by Dr Andrew Turner, Cape Nature). The highest peaks here rise to over 1500m, so you would imagine that plants growing at these altitudes would handle -10C at least. We made three separate excursions into these mountains; once from the west via Jonkershoek, once from the east via Nuweberg and once from the south via Han Se Kop.

Having eaten an annoyingly early breakfast in Stellenbosch and driven the short distance to the reserve gates, we carefully navigated our way through the maze of forestry tracks that led through the impressive Jonkershoek Valley, which was living up to its name by being both wet and windy. The recent summer fires had burnt vast plantations of pine as well as most of the natural vegetation further up the valley, so it was heartening to see the charred trunks of *Protea nitida* resprouting and many seedlings carpeting the ground. Parking the car at the bridge by the hairpin bend that marked the start of the trail, we stared up at the dark, fast moving clouds, convincing ourselves that it couldn't be worse than the typical near freezing rain of our stomping ground in the mountains of Snowdonia. Indeed if you looked towards Stellenbosch, it was bright blue skies. Up the Panorama Trail we trudged, hood up and head down. We passed flowering *Erica cerinthoides* and a resprouting *Protea acaulos*, but mostly the view was that of skeletons with seedlings at their feet or sometimes burnt seed-heads. Our permit did not allow for collection of seed from burnt areas as it was too important for post fire regeneration.

Eventually we passed the burn line and in doing so entered dense fynbos dominated by *Protea neriifolia* at about 800m in altitude. Up above us were towering cliffs which, even had the sun shone, would have left us in the shade. This area reminded us a lot of the botanically fantastic cliff, Clogwyn Du'r Arddu, a short walk from our home in Snowdonia. These imposing black walls were dank and dark, dripping everywhere with waterfalls galore. As the path contoured the base of these cliffs, we came across a thick tongue-like, succulent leaf that we assumed had fallen from above. Looking up at the cliff at what it might be, we saw more of these leaves sprouting out of narrow ledges like the pages of an open book. Initially, the genus *Haemanthus* came to mind, however out of one clump sprouted a pink flower spike, much like that of an *Aloe*. We have subsequently identified this as *Aloe haemanthifolius*, a species which struggles in cultivation, probably because people grow it like an *Aloe*. On seeing it growing in the wild we would suggest a cool, shady location with plenty of water, on excellent drainage.



Figure 47: Burnt skeletons among green regrowth in Jonkershoek

A young stand of *Aulax cancellata* filled the space between the path and the cliff for a while, probably only in its second year flowering. This was then replaced by the endangered *Protea laticolor*. We didn't expect to see so many species of protea growing so close to the cliff itself, assuming that it would be too cold and wet. This was all very encouraging. We rounded a buttress of the cliff to be greeted by frigid gale force winds. Surprised at how cold we were both feeling, we took out the thermometer, which confirmed this fact. It was 6C, soaking wet, and hypothermia started to play on our minds. Luckily we had more warm layers with us, so on they went and on we went too. We were planning on reaching Victoria Peak but soon realised that if the weather was this bad here, then at over 1500m it would be quite dangerous. We reached a point on the trail at over 1000m, where the path overlooked another valley to the north. We briefly stopped here for a bite to eat, before starting to head back down the valley, making some great seed collections on the way. The first was a massive seed-head of *Protea cynaroides*, very near our lunch spot. Nearby, we collected cones of *Leucadendron spissifolium* ssp. *spissifolium* as well as a seed-head of *Protea grandiceps*. By this time some better weather seemed to be blowing through but it was now late in the day, so we enjoyed the many rainbows overhead glad to be down safe and sound.

The next time we explored this area was near the end of our trip, on an even stormier day. Having planned to walk in from Nuweberg, for three nights in the Landdrooskop Hut, we decided to change our plans and use this stormy day to explore the southern part of the Hottentots Holland Nature Reserve, deferring walking in to the hut until the following, fair weather, day. This was because we were able obtain permission from the Reserve Manager to drive along a remote and restricted road to an altitude of 950m, from where we could explore a mountain called Moordenaarskop (murderer's head) along part of the Old Boland Hiking Trail. We were aware that this area was particularly rich in *Proteaceae*, but were overwhelmed at the sheer beauty of this place, despite

atrocious weather. As we sat in the car, windscreen wipers on their fastest setting, attempting to build up the courage to step outside, the wind rocked the car with violent blows in this exposed location. Having put on many warm layers and waterproofs, we counted to three before stepping into the wind and rain. We left the car at the saddle where the road begins to spiral its way up the conical top of Han-Se-Kop. Walking in the opposite direction, we soon found the path which traversed northwards to an open, gently sloping hillside full of very special plants. The shining, silver, stocky platoon of *Mimetes argenteus* braced itself against the elements, the rain trapped like crystals between the hairy leaves. We had seen plants of this species the previous day in a garden setting, but seeing them in the wild was simply spectacular. Interested to know how cold it actually was, we got out the thermometer, which read 3C. If these plants see this temperature in the middle of spring then surely they see snow in the winter.



Figure 48: *Mimetes argenteus* in the Hottentots Holland Mountains

We also found plants of *Protea stokoei* in flower, a species for which we currently have a good number of seedlings growing at home, but which we would not be collecting due to it being endangered. Another handsome plant which we grow in our garden and which was in large numbers here, was *Leucadendron gandogerii*. Forming stout shrubs to 2m tall, we took the opportunity to collect some seed, although we were hoping to find plants much higher up too. At this point the path started meandering its way up a fairly steep, rocky slope, which was being blasted as if by water cannon. Reaching a flatter area higher up, we found plants of *Protea speciosa* and *Protea grandiceps* as well as the most stunning yellow heather growing around two waterfalls which we had to cross. We still have not managed to find a name for this heather, but it was truly beaming in the grey light. Also beaming was a population of *Leucospermum oleifolium*, its orange flowers sparkling. We actually managed to collect some seed from these plants, though how many will be viable remains to be seen. Collecting seed of *Leucospermum* is tricky. They don't produce many seeds per

flower-head and once ripe, the seed does not remain in the flower-head long. It is carted off by ants that eat the elaiosome and then dump the seed. We spent quite some time searching for seed here but had to stop because our hands went numb from the cold. At 1200m this was quite high for this species to be growing so hopefully we get some good germination. We decided to turn around at this point, being very cold and hoping that the following day's good weather would allow us to observe plants in less hostile conditions. On the way out we found a large population of the diminutive *Protea acaulos*, one of the rodent pollinated species, with ripe seed. Although growing at a lower altitude than we had hoped for, it seemed too good an opportunity to pass up.



Figure 49: *Protea stokoei* in the Hottentots Holland

The following morning the sun shone strongly as we drove to the Nuweberg Dam entrance of the Reserve. This area had obviously been gardened quite heavily, since there were many non-native plants in the vicinity. A large *Protea aristata* adorned the gate to the car park. Although this species is native to South Africa, it is not native to this Reserve and only grows in the Swartberg Mountains above Ladismith, an area we had not visited, so seeing it was great. Many Australian *Acacia*, *Hakea* and *Eucalyptus* had escaped into the surrounding pine plantations and there was evidence that a lot of work was being done to stop the pines themselves marching up the hill and into the more sensitive areas of natural fynbos. During the hot slog up the forestry tracks we came across *Serruria elongata*, growing on a bank next to a patch recently cleared of pines. We also carried on finding pine trees as we walked up the Sphinx Trail and entered the open fynbos, higher still. Wild plants obviously don't pay attention to land use policy.

The path traversed some impressively biodiverse land indeed; 6 genera of *Proteaceae* along a 50m stretch. Although we saw more *Mimetes argenteus* in Moordenaarskop, there was still a good population of them here, though some individuals had succumbed to *Phytophthora cinnamomi*. This is likely due to the number of boots, carrying infected soil, which walk this path. Even some of the living plants showed the first signs of this pathogen, which in time will no doubt change the biological composition of this ecosystem, as it is doing in other areas around the world. Australia has taken to the spraying of infected areas with a biodegradable, phosphite-based fungicide, in order to boost plants natural defences so as to help fight the infection (Australia: Dieback Working Group, 2009). Increased levels of phosphorus in the soil will however have its own detrimental impact on sensitive proteoid roots, so unfortunately a loss in biodiversity seems inevitable.

Protea speciosa usually has a brown beard, so we were pleased to be able to collect seed of an attractive white bearded variant, which occurs in the Hottentots Holland. We also found some seed of *Spatalla setacea*, but alongside this species was an altogether more beautiful spoon. *Spatalla longifolia*, with its upright, cylindrical, pointed flower-heads of pink and white, sitting upon a compact and dense shrub of long, soft needle like leaves, at the top of its altitudinal range, was the subject of many photos and we noted the co-ordinates down should we be able to collect seed of this species in the future. It was in full flower so a visit later in the season would be required should this be attempted.



Figure 50: *Spatalla longifolia* on the Sphinx Trail

On the other side of the path was a bank of numerous low, sprawling shrubs of *Diastella divaricata* ssp. *montana*, with their pale pink, powder-puff flowers dotted against small dark green and purple hued leaves. This was the first time we had seen this genus in the wild and were able to collect seed of it both here and higher up the following day, though not much and not without even more difficulty than *Leucospermum*. *Protea stokoei* was found here and at various points along the path to the Landdrooskop Hut. We can only imagine the delight of T.P. Stokoe upon gazing at its classy flowers whilst exploring these mountains. Had we stayed longer we would have liked to explore an area slightly to the south, known as Stokoe's Pass, which he was known to have walked. We went over a pass to find a healthy grove of *Protea lacticolor*, which we had not seen since Jonkershoek. Passing the junction to Stokoe's Pass, as well as the junction to Jonkershoek, which we would use the following day, we descended to a wet area full of restios at about 1000m. A smart boardwalk led us over this to the Landdrooskop Hut. With mountain views in all directions, we watched the sun set before lighting the fire inside and settling down for a night of ghostly, wind-related whirring.



Figure 51: The Landdroskops Hut with Somerset-Sneeukop in the background

Dawn broke, bright and breezy, and soon we were on the hoof again; back over the boardwalk to the junction, where we turned right, towards Jonkershoek. We went past more *Diastella* as well as *Serruria phyllicoides*, which were flowering well but without much in the way of seed. We were now at 1300m, where flowering was noticeably later. A very mature shrub of *Spatalla setacea*, in the shadow of a tall cliff was in full flower here and looking sublime at this lofty extremity of its distribution. Rounding this bluff to the west, up a scree slope, we then came to a shallower, east facing slope, where the vegetation became dominated by low growing grasses, sedges and restios. Young plants of *Protea grandiceps* dotted the landscape, though on closer inspection, we also found a population of a rhizomatous species of *Protea* in between them, possibly a snow-sugarbush. To know for sure, we used descriptions we had for these, along with pictures and distribution notes. The only snow-sugarbush it could be was *Protea scolopendriifolia*, but something didn't quite add up here. Firstly the stalks on the leaves were very small to non-existent and the description said that they could be between 1cm and 10cm. Secondly, the bracts surrounding the flowerhead were blunt and not pointed. But what else could it be? Maybe it wasn't a snow-protea at all. The only other species this could be was the critically endangered *Protea caespitosa*. Everything fitted apart from one thing; this was not a compact shrub with a trunk and interlocking branches (Rebello, 2001). Knowing that we would be coming back the same way, we decided to reserve judgement and carry on to our target for the day, the peak of Somerset-Sneeukop at 1590m. Continuing to traverse the east facing slope, we eventually came to a large population of *Protea laticolor* which stretched from just below the summit above us and plunged into the valley below. It was much larger than the populations we had seen elsewhere and contained plants of all ages, from mature, flowering trees, to young ones less than waste height. We estimated that there were about 5000 individuals above the path and uncountable numbers below. How good to see an endangered species doing so well at this altitude of over 1400m. We headed off the path at this point, scrambling up a steep scree slope, towards the summit. We then noticed that between the rocks, were more leaves of the rhizomatous *Protea* we had seen lower down. Lots of seedlings, lots of flowering sized plants. In fact there were so many of them, we were beginning to doubt our identification of *Protea caespitosa* altogether. Surely a species that is Critically Endangered wouldn't be in these great numbers. On returning to the UK, we consulted SANBI's red list to discover that the reasoning behind this species classification is due to fire related population fluctuations at a single known location, Kogelberg Peak. There are in fact multiple populations and variants of the bishop sugarbush on various peaks of the Boland Mountains. We wondered if the variant we saw was one without the trunk and interlocking branches, and that the description was for the variant on Kogelberg Peak.



Figure 52: *Protea caespitosa* near the summit of Somerset Sneekop

A steep, sopping wet slope led us to the summit. The views were immense, from Table Mountain, across False Bay to the Kogelberg. Looking down the ramparts of this sheer cliff we could see vast swathes of *Leucadendron* below us. Noticing that the *Leucadendron* also went a fair way up the less rocky side of the cliff, we decided to scramble across the summit ridge to meet them in order to find out what the highest growing member of the Proteaceae in the Hottentots Holland was. A male and a female *Leucadendron gandogeri* covered in yellow flower-heads stood proud at the top with a gift of seed available too.

The wind was picking up and we were acutely aware of a frontal weather system due to approach later that night, so we beat a hasty retreat back down the mountain, but not before being stalked by Baboons for a frightening few minutes! The wet walk out along the jeep track the following morning was fairly uneventful, although we did see some impressively large shrubs of *Protea magnifica* at quite low altitude. It almost seemed as though they had been planted on either side as an avenue. There was also something of *Protea laurifolia* about them; possibly a hybrid? A cape sugarbird landed on one of the large flower-heads as if it were a bird-table and proceeded to feed, with its bottom up and tail feathers waving in the wind. We could tell that we were nearly back at the car when we noticed the Australians again. A lot of work has been done to clear these invasive weeds, but we can't see how they could be eradicated without an awful lot more effort.

All in all the Hottentots Holland were fantastic; such diversity and beauty in a ruggedly harsh environment.



Figure 53: *Leucadendron gandogeri* near the summit of Somerset Sneekop



Figure 54: Cape sugarbird feeding and pollinating *Protea magnifica*

Cape Nature Permits

One of the most important aspects of our trip was that we wanted to collect seed of species of Proteaceae from high altitude mountain areas, which were always in nature reserves.

There is legal requirement to collect any seed from the wild in line with the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, an international agreement which aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way. Working within the bounds of this international legislation also requires collectors to work within the national laws of South Africa with regard to accessing and exporting any seed legally.

The permit issuing authority for the Western Cape is Cape Nature, although for National Parks the permit issuing authority is SANParks. We were lucky that we had one of Cape Nature's botanists, Rupert Koopman, guiding us through the process. I am not sure it would have been quite so easy a process had we not had the support of Rupert. Even so, whilst filling in the form was quite easy to do, some aspects of the process were not so. A requirement of the issuance of the permit was that we had a letter of support from a local scientific institution. We contacted both Kirstenbosch National Botanic Gardens and Stellenbosch University Botanical Gardens to gain their support for our permit. Kirstenbosch chose not to give their support, explaining that Joseph Knight's book, published in the early 1800's, had already described how to grow proteas in the UK. Martin Smit, curator of Stellenbosch University Botanical Gardens, however, was more than happy to support our permit application and our project as a whole.

The process of application and issuance of the permit took just over 5 months, however, one of the conditions of our permit was that we required written permission from each land owner or Reserve Manager in order to collect seeds on the property they own or manage. This was a much longer process, with some individuals being difficult to contact and others refusing to allow any seed collection (let alone research) to take place within their reserve. Others were purely too busy fighting fires and land disputes to have time to respond. We finally got the last of our reserve permissions on 24th August 2015. The first email regarding organising permits for this trip was sent on 7th August 2014, so the whole permit process took one year and 17 days.

Another aspect of collecting seed in South Africa was that we were required to have export permits for the seed. Once our scientific permit was in place, the export permit was issued quite quickly. There were a number of terms and conditions attached to our seed collecting permit, which can be found in Appendix II.

Personal Statements

Robbie Blackhall-Miles

At a personal level, this project has been one of realising a number of goals associated with the deep rooted conservation ethos within me. I have long believed that by studying plants in their natural habitat, we can gain an insight into their ecology and thus their cultural requirements. The Convention on Biological Diversity has been deemed difficult to work within for all but the largest of botanic institutions, so in succeeding to navigate the permits system in South Africa I hope that I have shown that access to wild genetic resources is not only for the largest of organisations. The regular communications between those in South Africa and I lasted over a year in order for this to succeed. In the field, my skills in botanical identification could handle most of what the Proteaceae could throw but were tested thoroughly with the peas and the daisies. That said, within a short period of time, I felt tuned in to the flora of the Cape and could see some of the ecological niches. This first stage of what will become a long term project has been successful in collecting seeds of species whose cultural requirements in the UK are currently considered challenging, if known at all. Having seen the plants we grow in their natural environment, I feel much more confident that we aren't too far from the mark with how we grow them, but that actually some of the perceptions of South Africa's Proteaceae in cultivation are quite far from the truth.



Figure 55: Robbie Blackhall-Miles

Ben Ram

Being a mathematician at heart, I decided that the best use of my efforts during the planning stage of the trip would be in the quantitative elements of this phase. This included analysing the climate of the Western Cape as well as compiling tables of species data by region in order to help decide which areas would be suitable to explore. I also managed the budget, which came in at 7% under that expected. I am a qualified Mountain Leader in the UK, so maps and navigation were my responsibility in the field. I feel that the areas we chose to visit had a good network of paths with which to explore them and that although navigation was not difficult, most often the vegetation determined the best route. We are spoilt in the UK by the quality of our Ordnance Survey maps, and it did take a while to get used to the South African maps, but they served their purpose well. If you look at the trip in numbers alone, in 3 weeks we visited 5 mountain ranges, each with their own flavour of the South African climate, made 115 separate observations of *Proteaceae*, with 55 distinct species, 30 of which we collected seed. I feel that the trip succeeded in its aims and look forward to analysing the results of growing the seeds in the years to come.



Figure 56: Ben Ram

Conclusion

Visiting the Western Cape of South Africa has opened our eyes to the vast diversity of flora in this fragile landscape, which is so dominated by the destruction and rejuvenation brought by fire. We observed many rare and interesting species and have gained a really great insight into the habitats in which they live. Ahead of us we now have the task of germinating and growing the seeds we collected. For some species we already have experience in this but for others it will certainly be a learning experience. In particular the genera *Spatalla* and *Diastella* come to mind as species which even in South Africa are grown from cuttings due to the difficulty of germinating seed. For *Mimetes* and *Leucospermum* we now have excellent instructions from Robbie Thomas (Duncan, G. 2013) and will be perfecting our technique with these. We also gained an insight into the varying cultural requirements of different species depending on where we saw them growing. It is certainly not the case of one rule for all with this spectacular family of plants and some generally accepted assumptions just don't hold true for all. Climate change and *Phytophthora* are major challenges that we saw being faced in South Africa, both in the wild and in cultivation. We can never retain the genetic diversity of a wild population in ex-situ cultivation, but what we can do is both have a backup in the form of seeds and be seasoned at growing them, should the unthinkable happen. Equally, allowing the general public to interact with threatened species, be it in botanic gardens or in their own back gardens, performs the task of capturing their willingness to care for nature. As a society, we have become increasingly detached from the natural world which surrounds us and gardening forms a link to that natural world that would otherwise not exist. Without this, wild species have little hope of being taken into consideration when human expansion encroaches on their homes. It is our hope that, in further understanding the cultivation of *Proteaceae* in the UK, we will be able to help demystify this family for our horticulturists, as well as increase awareness of the need to conserve them.

Future Plans and Recommendations

This report discusses the first stage in what we see to be an ongoing research project into the horticulture of *Proteaceae* in the UK. We will now be starting the task of sowing and growing the seed we collected and intend on producing a yearly update on how this is progressing.

We do have some recommendations for potential future tours of this nature. The time of year we chose was excellent to see some species in flower, particularly *Spatalla*; however that meant that seed was not available for some of these species or only from plants lower down. So, as much as this tour was very useful in identifying the locations of certain species, a future tour would be useful during the southern hemisphere summer, though then the process of identification could be more challenging. Due to bad weather, we failed to reach the summit of Victoria Peak in the Hottentots Holland. This was also the case for the Sleeping Beauty Trail in the Garcia Pass area in the Langeberg. We also had to cut our stay at the Landdroskop Hut short by a day due to bad weather, although we did explore Moordenaarskop that day instead. All these areas would definitely be worth exploring in the future, although again potentially in summer when weather would be more stable. We drove over the Du Toits Kloof Pass and feel that this area, the Limietberg Nature Reserve, would be good for future exploration, particularly the Wemmershoek Mountains and the ridge which includes Du Toits Kloof Peak and Goudini Sneekop. In Boosmansbos, we did not get a chance to explore the southern slopes of Repeater Kop, the peak directly south of the Helderfontein Hut. At 1500m this is

a high peak worth returning for, as is Horingberg. The question regarding the distribution of *Leucospermum winteri* is still unanswered for us, so further investigation of this would be desirable. It would also be interesting to see how the burnt areas we encountered will have recovered a few years down the line. One area that we did not get the chance to explore is the high areas of the Kogelberg. Having spoken to local people first-hand about this area, we understand that although these peaks are cool in summer, due to their proximity to the sea, they are also mostly frost-free, save for the small areas above 1000m which may get the occasional frost. This area contains the heart of diversity of the Cape Floral Kingdom and so is rightly guarded strongly by those mandated to do so. It also contains sensitive areas which are off limits to all but the most trusted of individuals. This culture has arisen partly due to the practicalities of exploring an area where every step could damage a plant or introduce *Phytophthora*, but also because of the actions of individuals who have failed to treat this pristine environment with the respect it deserves. It is often said that if you want to see what the Cape would have looked like before the arrival of Europeans, the Kogelberg is the closest you will get. It is for this reason that, if we were to return to South Africa, we would like to visit the areas of this reserve open to the public. We would also like to collaborate with local experts in order to find out how best to arrange an accompanied visit to some of the more sensitive areas in a way which limits the impact on the natural environment there. On the subject of limiting the spread of *Phytophthora* by humans, we would advise future tours to research the methods employed by countries around the world on this matter prior to visiting. A list of recently burned areas should also be investigated prior to a future visit. The help of reserve managers would probably be needed for this, but a very good place to start is <http://southernafrica.afis.co.za/> which is an online burn map. Lastly, we found that the knowledge and expertise of the members of CREW were second to none with respect to what grows where and whether it has been seen recently. We would encourage anyone heading to the Cape to enlist the help of these enthusiastic volunteers in gathering up to date information, as well as using iSpot. On this visit, we were only allowed to collect Non-endangered species. If our research finds that the seeds we collected grow well in the UK, we would be interested in obtaining permits to assist in the ex-situ conservation of neighbouring endangered species as well.

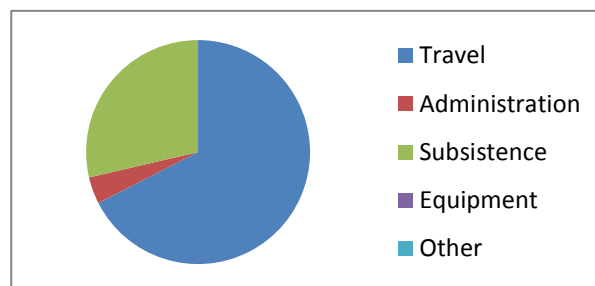
Budget Breakdown

As part of the expedition, bursaries were received amounting to £1500 from the RHS and £500 from the Scottish Rock Garden Society. The remaining cost was split equally among both members of the team.

Estimates

As part of planning for the expedition the following costs were estimated.

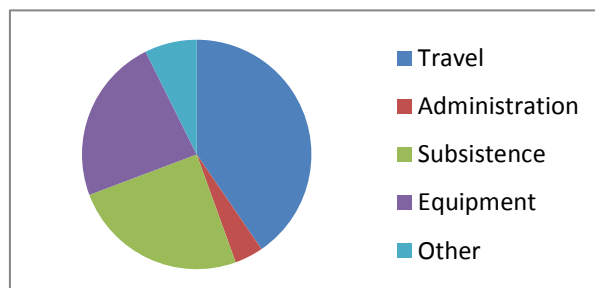
Travel	£2,980.72
Administration	£170.76
Subsistence	£1,265.00
Essential Equipment	0
Other	0
Total	£4416.48



Actual

The realised costs are detailed below.

Travel	£1,664.71
Administration	£166.51
Subsistence	£1,020.54
Essential Equipment	£962.26
Other	£302.78
Total	£4,116.80



Comparison

As is the case with expeditions such as this, some costs were overestimated and others underestimated. The largest oversight being the amount needed for essential equipment. Overall the expedition came in £300 under budget. This represents 7% less than had been expected and is partly due to a favourable exchange rate.

Signed:

Robert Blackhall-Miles: _____

Ben Ram: _____

Appendix I: Maps



Figure 57: Map of Western Cape with areas visited. 1: Table Mountain, 2: Hottentots Holland, 3: Boosmansbos, 4: Garcia Pass, 5: Robinson Pass, 6: Cradock Peak, 7: Swartberg Pass



Figure 58: Map of Robinson Pass



Figure 59: Map of Garcia Pass

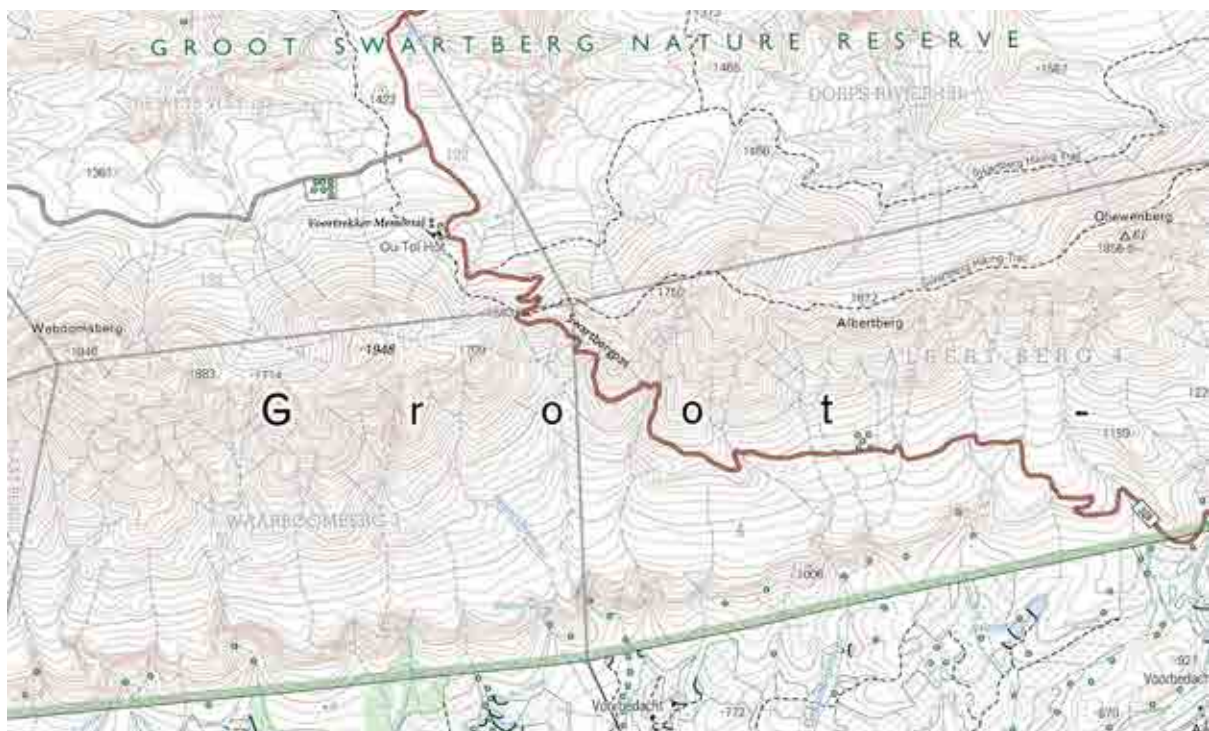


Figure 60: Map of Swartberg Pass

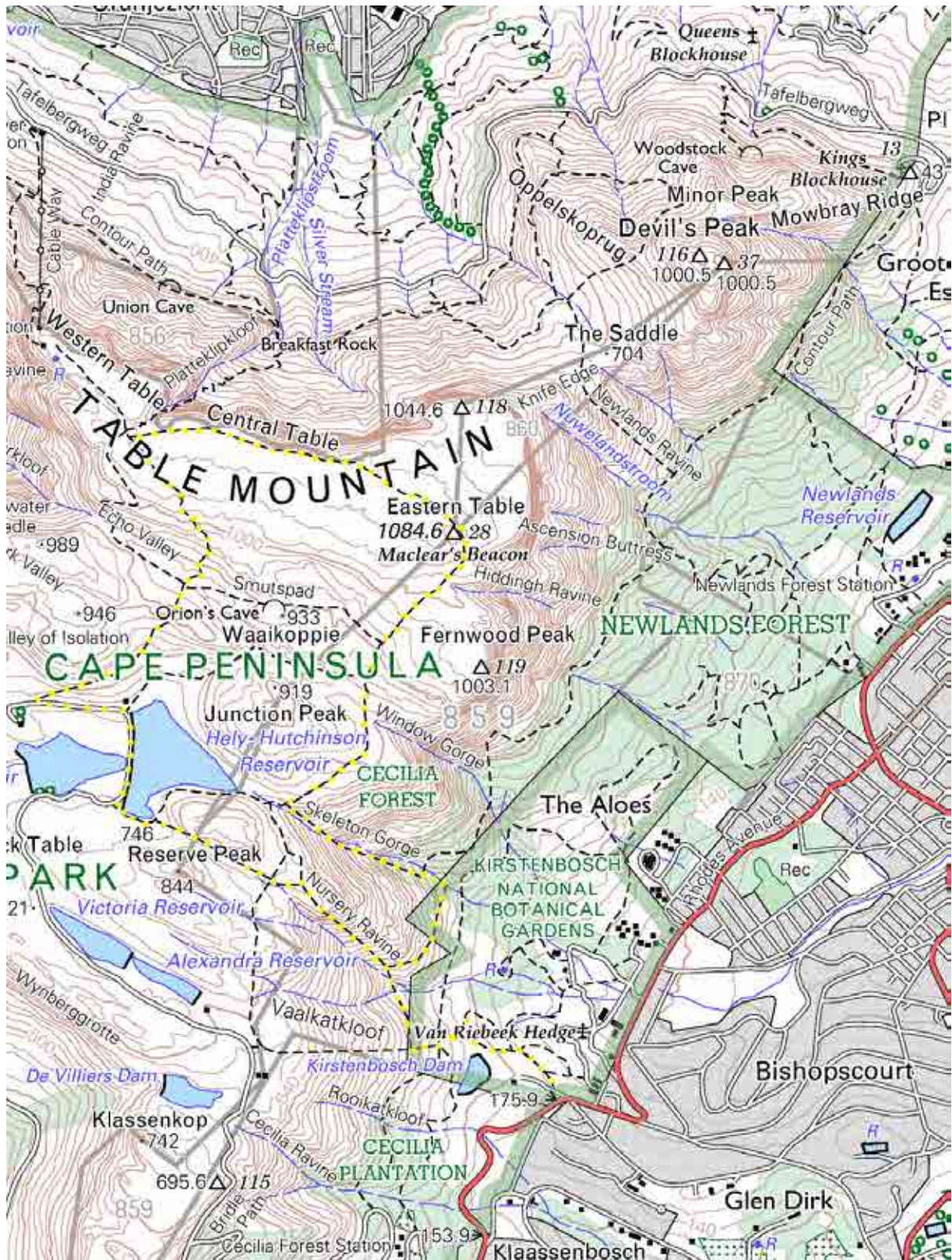


Figure 61: Map of Table Mountain

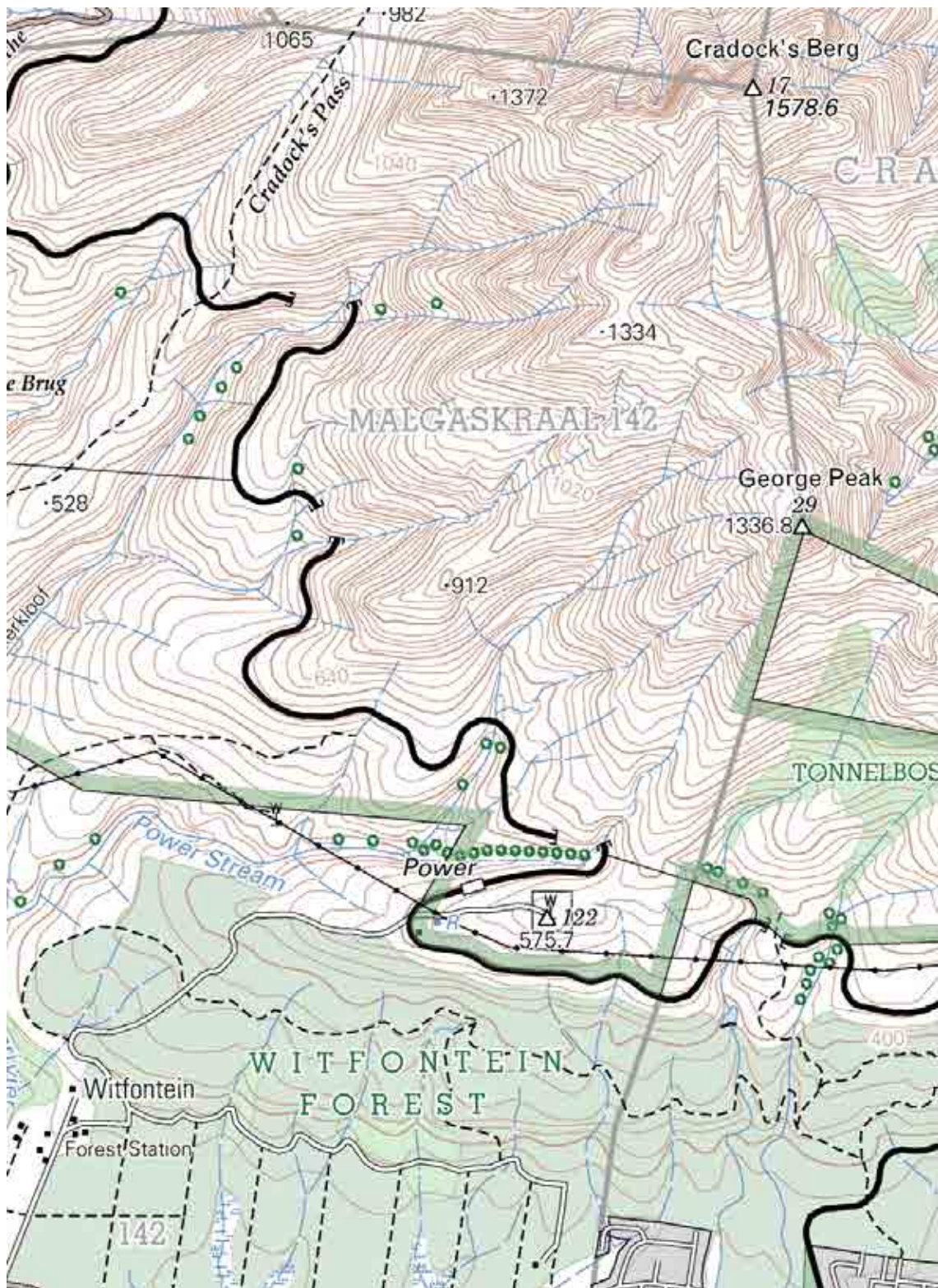


Figure 62: Map of Cradock Peak

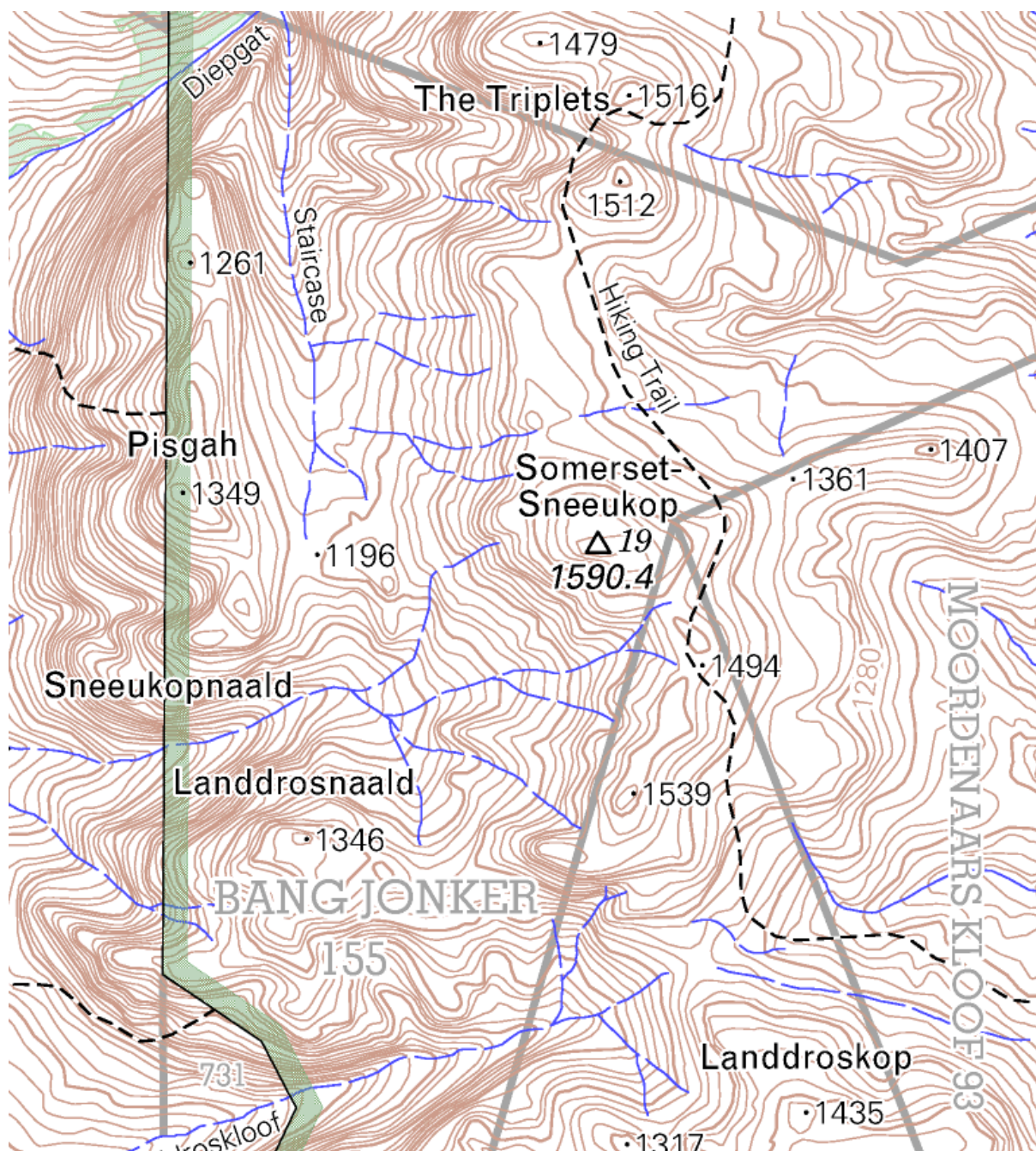


Figure 63: Map of Somerset Sneekop, Hottentots Holland

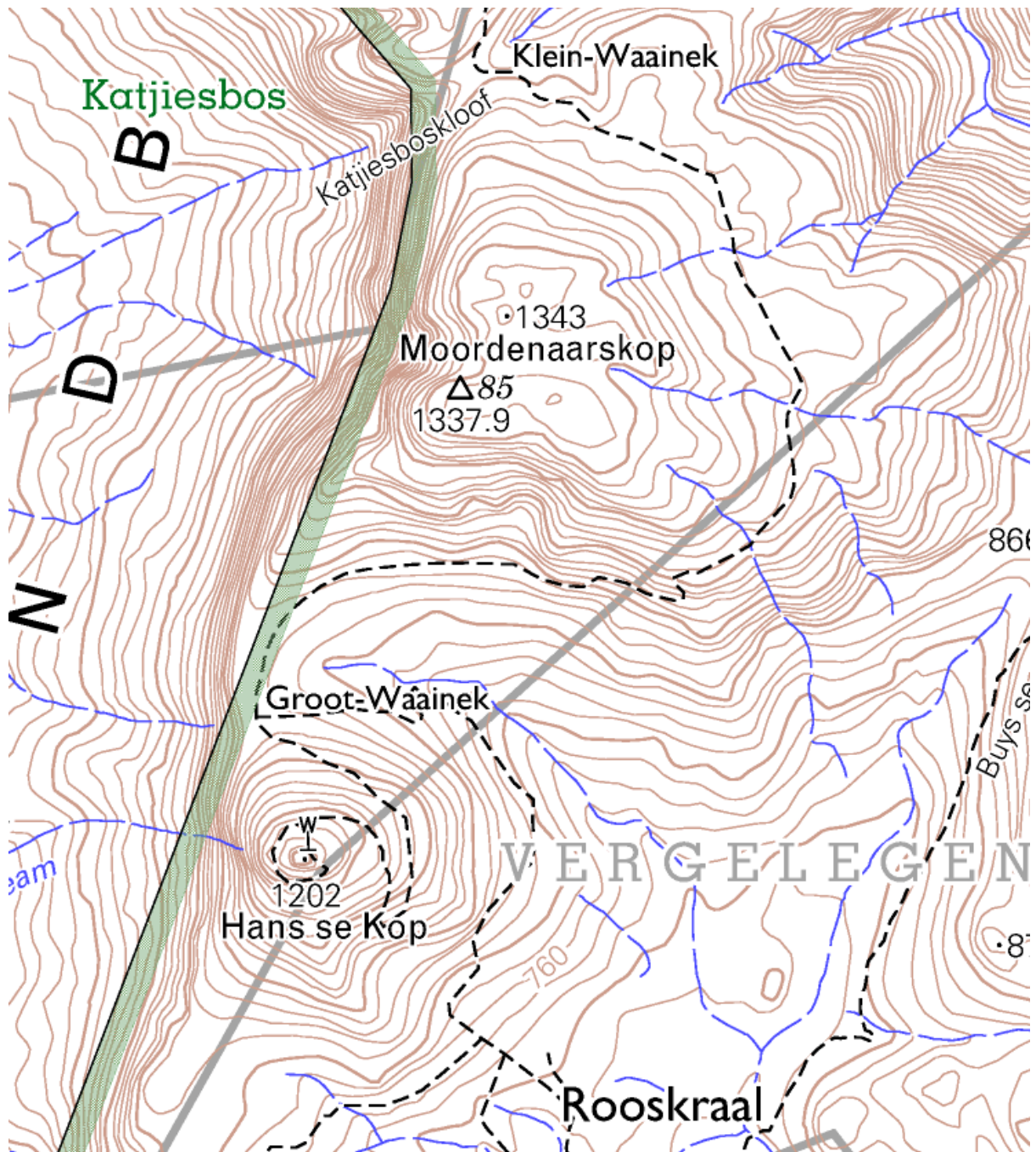


Figure 64: Map of Moordenaarskop, Hottentots Holland

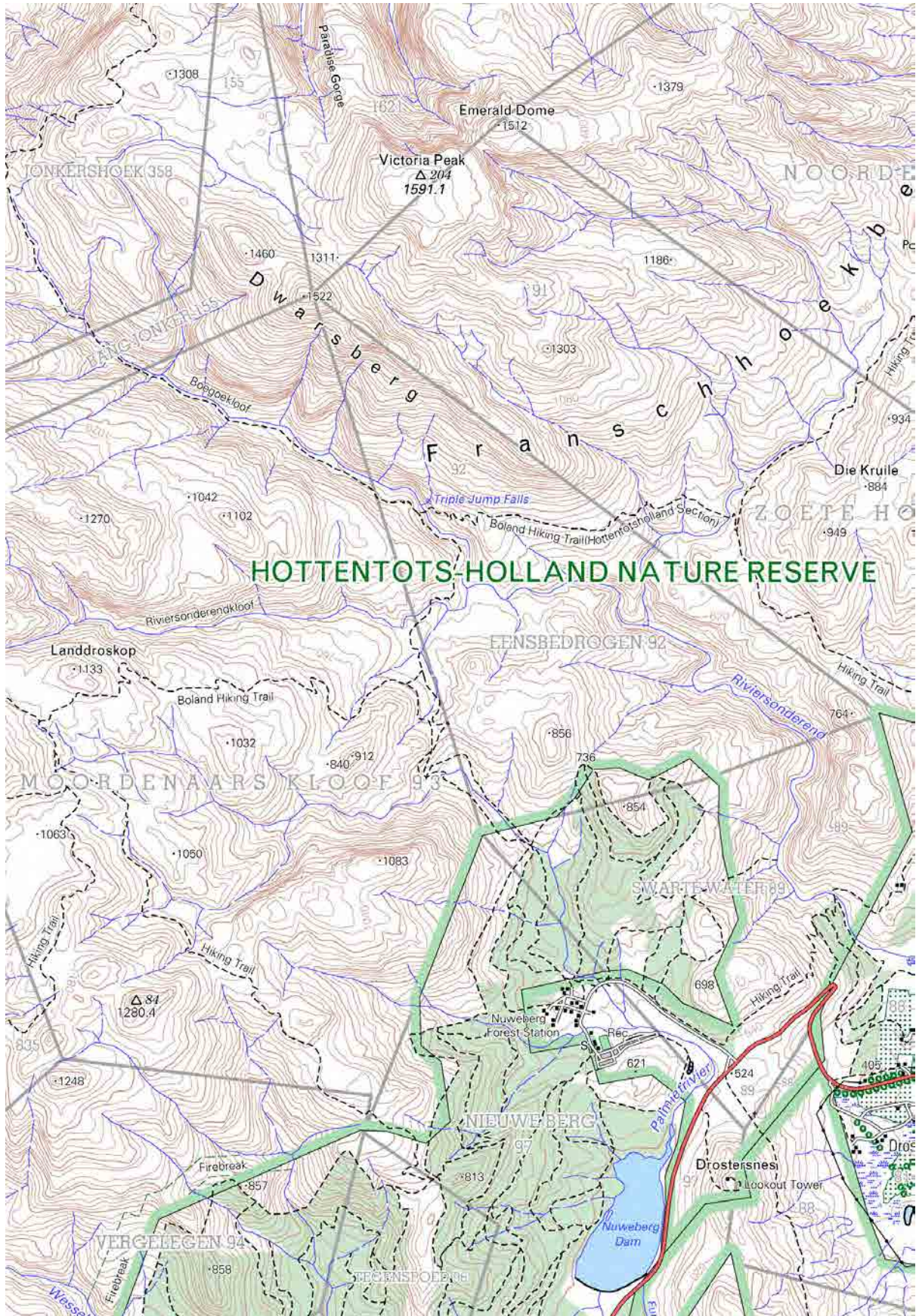


Figure 65: Map of Nuweberg to Victoria Peak, Hottentots Holland

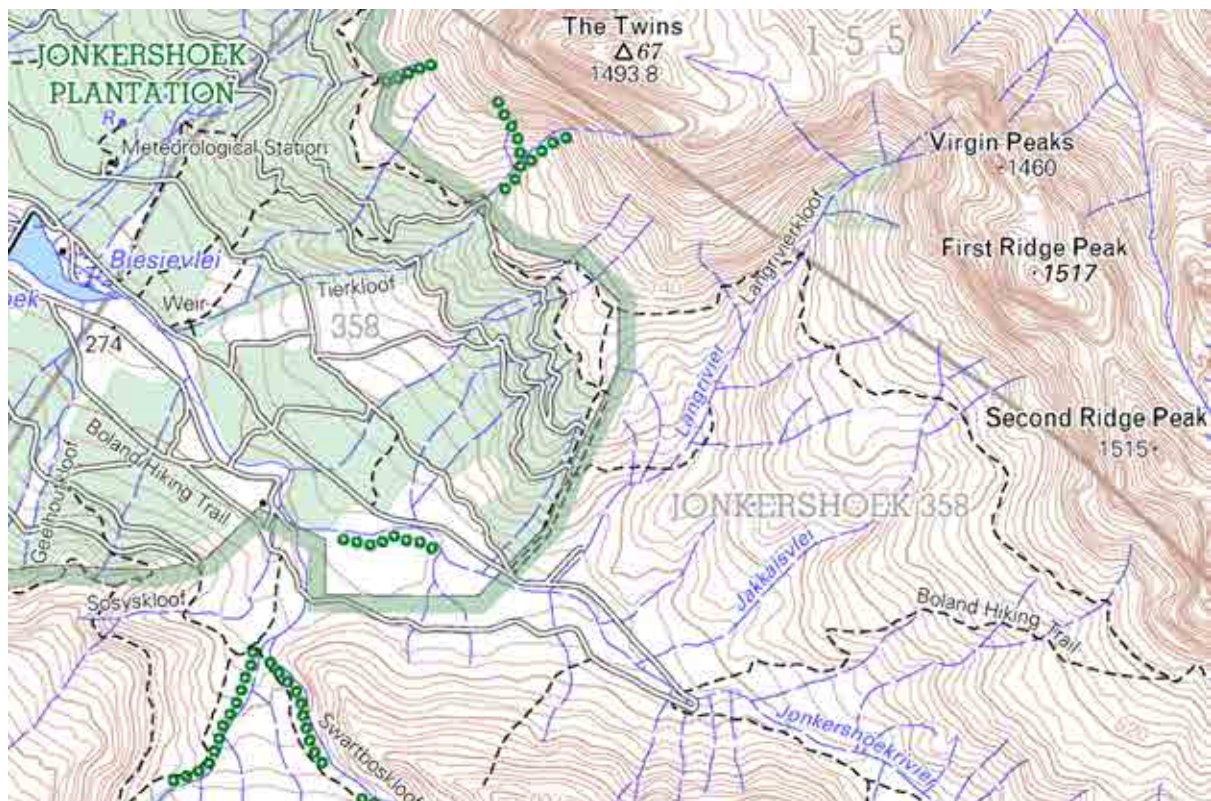


Figure 66: Map of Jonkershoek

Appendix II: Cape Nature Permits



postal Private Bag X29 Gatesville 7766
 physical PGI/NC Shared Services Center cnr Bosduif & Volstruis Streets Bridgetown 7764
 website www.capenature.co.za
 enquiries Carlo Arendorf
 telephone +27 21 403 0122 fax +27 85 556 7734
 email caarendorf@capenature.co.za
 reference 1/2/12/R
 date 15 April 2015

Mr. R. Blackhall-Miles
 Fossil Plants
 10 Goodman Street
 Llanberis
 Gwynedd
 LL55 4HL
 UNITED KINGDOM

Dear Mr. Blackhall-Miles

APPLICATION TO COLLECT FAUNA AND FLORA SPECIMENS FOR SCIENTIFIC RESEARCH PURPOSES


I refer to your application to collect fauna and flora specimens in the Western Cape Province.

Attached is permit No. **0028-AAA008-00196** dated **15/04/2015** to collect specimens in the Western Cape Province. Please take special note of the standard conditions attached to the permits. I specifically draw your attention to permit condition (i). **It is imperative that you make contact with the Reserve Manager BEFORE you intend collecting on any nature reserve, conservation area, wilderness area and / or state forest.** No deviation is allowed from the fore-mentioned conditions without the prior written approval of the Chief Executive Officer, Western Cape Nature Conservation Board.

Please also take note of the *pro forma* (copy attached), which must please be used when submitting your collection / distribution records to CapeNature as per the conditions to your permit. Please feel free to add columns for extra data to the *pro forma* but no columns should be deleted. This *pro forma* is also available electronically from CapeNature.

Should you have any queries please do not hesitate to contact this office.

Yours faithfully,


 ff CHIEF EXECUTIVE OFFICER

Western Cape Province

Telephone No: (027) 021 483 0000
 Email: permits.fax@capenature.co.za
 PGWC Shared Services Centre
 cnr Bosduif and Volstruis Streets
 Bridgetown
 7764



CapeNature

Facsimile No: (027)0865667734
 Internet: www.capenature.co.za
 Private Bag X29
 Gatesville
 7766

PERMIT TO

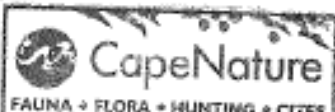
PLUCK FLORA PROTECTED AND UNPROTECTED FOR RESEARCH PURPOSES

(Issued in terms of the provisions of the Nature Cons. Ordinance 1974, (Ord 19 of 1974)Section 63(1)b & c)

Not Transferable

Holder			
Full Name	Mr. R Blackhall-Miles	Identity No.	528989441
Trade Name	Fossil Plants	Registration No.	AAA008-01531
Postal Address	10 Goodman Street Llanberis	Physical Address	NA
Suburb/Town	Gaynedd	Suburb/Town	NA
Province/State		Province/State	
Country	United Kingdom	Country	
Postal/Zip Code	LL55 4HL	Longitude	.0000
		Latitude	.0000

In terms of and to the provisions of the abovementioned Ordinance and the Regulations framed thereunder, the holder of this permit and people specified on the attached addendum is authorised to pluck the protected flora as specified below on the properties mentioned on attached addendum. See conditions on last page.

Details	
Permit/Licence No	0028-AAA008-00196
Expiry Date	31/12/2015
Date Issued	15/04/2015
Amount Paid	R 0.00
Reference	
File Code	1/2/2/1/2/B
Stamp:	

Description	Property
Organization	Fossil Plants
Person	Blackhall-Miles R Mr.
ID	528989441
Properties	Areas in the Western Cape
Physical Address	Areas in the Western Cape
District	N/A
Province/State	Western Cape
Country	South Africa
Longitude	.0000
Latitude	.0000

Species(Scientific Name)	Qty	Note
Bra.stellatifolium(Brabejum stellatifolium)	0	None
Dia.dvaricata(Diastella dvaricata)	0	None
Dia.thymelaecoides(Diastella thymelaecoides)	0	None
Leuca.album(Leucadendron album)	0	None
Leuca.comosum(Leucadendron comosum)	0	None
Leuca.conicum(Leucadendron conicum)	0	None
Leuca.daphnoides(Leucadendron daphnoides)	0	None
Leuca.dregel(Leucadendron dregel)	0	None
Leuca.eucalyptifolium(Leucadendron eucalyptifolium)	0	None
Leuca.gandogeni(Leucadendron gandogeni)	0	None
Leuca.graberrimum(Leucadendron graberrimum)	0	None
Leuca.gracile(Leucadendron gracile)	0	None
Leuca.laureolum(Leucadendron laureolum)	0	None
Leuca.microcephalum(Leucadendron microcephalum)	0	None
Leuca.osbornei(Leucadendron osbornei)	0	None
Leuca.platyspermum(Leucadendron platyspermum)	0	None
Leuca.radiatum(Leucadendron radiatum)	0	None
Leuca.rubrum(Leucadendron rubrum)	0	None
Leuca.salicifolium(Leucadendron salicifolium)	0	None
Leuca.salignum(Leucadendron salignum)	0	None
Leuca.spissifolium(Leucadendron spissifolium)	0	None
Leuca.strobilinum(Leucadendron strobilinum)	0	None
Leuca.uliginosum(Leucadendron uliginosum)	0	None
Leuco.cuneiform(Leucospermum cuneiform)	0	None
Leuco.fomosum(Leucospermum fomosum)	0	None
Leuco.gueinzi(Leucospermum gueinzi)	0	None
Leuco.lineare(Leucospermum lineare)	0	None
Leuco.mundii(Leucospermum mundii)	0	None
Leuco.oleifolium(Leucospermum oleifolium)	0	None
Leuco.secundifolium(Leucospermum secundifolium)	0	None
Leuco.totium(Leucospermum totium)	0	None
Leuco.winteri(Leucospermum winteri)	0	None
Mim.arboreus(Mimetes arboreus)	0	None
Mim.argenteus(Mimetes argenteus)	0	None
Mim.capitulatus(Mimetes capitulatus)	0	None
Mim.cucullatus(Mimetes cucullatus)	0	None
Mim.fimbriifolius(Mimetes fimbriifolius)	0	None
Mim.hottentoticus(Mimetes hottentoticus)	0	None
Mim.pauciflorus(Mimetes pauciflorus)	0	None
Mim.splendidus(Mimetes splendidus)	0	None
Par.adiantifolius(Paranomus adiantifolius)	0	None
Par.candicans(Paranomus candicans)	0	None
Par.capitatus(Paranomus capitatus)	0	None
Par.centaureoides(Paranomus centaureoides)	0	None
Par.dispersus(Paranomus dispersus)	0	None
Par.dregel(Paranomus dregel)	0	None
Par.esterhuyseniae(Paranomus esterhuyseniae)	0	None
Par.rodebergensis(Paranomus rodebergensis)	0	None
Pro.acaulis(Protea acaulis)	0	None
Pro.amplexicaulis(Protea amplexicaulis)	0	None
Pro.aristata(Protea aristata)	0	None
Pro.aurea(Protea aurea)	0	None
Pro.caespitosa(Protea caespitosa)	0	None
Pro.canaliculata(Protea canaliculata)	0	None
Pro.cordata(Protea cordata)	0	None
Pro.cynaroides(Protea cynaroides)	0	None
Pro.eximia(Protea eximia)	0	None
Pro.grandiceps(Protea grandiceps)	0	None
Pro.lacticolor(Protea lacticolor)	0	None
Pro.longifolia(Protea longifolia)	0	None
Pro.montana(Protea montana)	0	None
Pro.mundii(Protea mundii)	0	None
Pro.nana(Protea nana)	0	None
Pro.nerifolia(Protea nerifolia)	0	None
Pro.nitida(Protea nitida)	0	None
Pro.piscina(Protea piscina)	0	None
Pro.pityphylla(Protea pityphylla)	0	None
Pro.repens(Protea repens)	0	None
Pro.rupicola(Protea rupicola)	0	None

Pro.scabra(Protea scabra)	0	None
Pro.scolopendriifolia(Protea scolopendriifolia)	0	None
Pro.speciosa(Protea speciosa)	0	None
Pro.stokoei(Protea stokoei)	0	None
Pro.subulifolia(Protea subulifolia)	0	None
Pro.tenax(Protea tenax)	0	None
Pro.venusta(Protea venusta)	0	None
Pro.vogtsiae(Protea vogtsiae)	0	None
Pro.witzenbergiana(Protea witzenbergiana)	0	None
Ser.altiscapa(Semuria altiscapa)	0	None
Ser.dodii(Semuria dodii)	0	None
Ser.pedunculata(Semuria pedunculata)	0	None
Ser.phylloides(Semuria phylloides)	0	None
Ser.stellata(Semuria stellata)	0	None
Ser.viridifolia(Semuria viridifolia)	0	None
Ser.williamsii(Semuria williamsii)	0	None
Ser.zeyheri(Semuria zeyheri)	0	None
Sor.crassifolius(Sorocephalus crassifolius)	0	None
Sor.palustris(Sorocephalus palustris)	0	None
Spa.colorata(Spatalla colorata)	0	None
Spa.incurva(Spatalla incurva)	0	None
Spa.mollis(Spatalla mollis)	0	None
Spa.nubicola(Spatalla nubicola)	0	None
Spa.parilis(Spatalla parilis)	0	None
Spa.salsoloides(Spatalla salsoloides)	0	None
Spa.setacea(Spatalla setacea)	0	None
Spa.thyriflora(Spatalla thyriflora)	0	None

C. Arendorf

15/04/2015

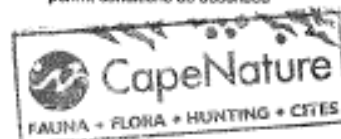
Issued by:
Carlo Arendorf

Approved on Behalf CEO
Western Cape Nature Conservation Board

Effective Date

Signature of Holder

I acknowledge, accept and understand fully the
permit conditions as described



Standard Conditions

1. The holder of this permit shall return it together with a return of the species flora and the number of each species which he plucked thereunder, to the Chief Executive Officer: Western Cape Nature Conservation Board, Private Bag X28, Gatesville, 7768, within fourteen days from the date of expiry thereof.
2. THIS PERMIT IS SUBJECT TO THE SPECIAL CONDITIONS:

Special Conditions

Robert Blackhall-Miles - 528989441
Ben Ram - 529370390

This permit is subject to the following special conditions:

- Most of the species listed in this permit are already available in the Proteaceae horticultural trade. The permit holder is urged to rather get in touch with these specialist growers (e.g. Arnelia Farms near Hopefield; Mr. Robbie Thomas at Betty's Bay; Kirstenbosch Botanical Gardens) to obtain seeds of the threatened species;
- No seeds of the species listed as Critically Endangered or Endangered may be collected. Large parts of the mountains where some of these species occur have recently burnt down and as a result it would not be possible to find seeds of these species as the seeds would have already been released in the field to regenerate;
- Data of all species collected must be captured on the SOB datasheet and submitted electronically to CapeNature for incorporation in the State of Biodiversity Database.
- The application is supported to collect seeds of the species listed as Vulnerable, Near threatened, Rare and Least concern (in the spreadsheet submitted with the application) as indicated below:
 - o 100 seeds of species listed as Vulnerable (VU);
 - o 200 seeds of the species listed as Near threatened (NT) and Rare
 - o 500 seeds of the species listed as Least concern (LC).

CONDITIONS APPLICABLE TO RESEARCHERS UNDERTAKING RESEARCH OR OTHER COLLECTING WORKS ON PROVINCIAL CONSERVATION AREAS AND / OR PRIVATELY OWNED LAND IN THE PROVINCE OF WESTERN CAPE:

1. THE MANAGER OF THE RELEVANT CONSERVATION AREA(S) (IF ANY) MUST BE INFORMED TIMEOUSLY BEFORE ANY CONSERVATION AREA IS ENTERED FOR COLLECTING OR RESEARCH PURPOSES AND THE MANAGER'S WRITTEN PERMISSION TO ENTER SUCH RESERVE MUST BE ACQUIRED BEFOREHAND. THIS PERMIT DOES NOT GRANT THE PERMIT HOLDER AUTOMATIC ACCESS TO ANY NATURE RESERVE, CONSERVATION AREA, WILDERNESS AREA AND / OR STATE FOREST. ANY OTHER / FURTHER CONDITIONS OR RESTRICTIONS THAT THE MANAGER MAY STIPULATE AT HIS / HER DISCRETION MUST ALSO BE ADHERED TO. THIS PERMIT MUST BE AVAILABLE TO BE SHOWN ON DEMAND.
2. The owner of any other land concerned (be it privately or publicly owned land) must give WRITTEN consent allowing the permit holder to enter said property to collect flora / fauna. This written permission must reflect the full name and address of the property owner (or of the person authorised to grant such permission), the full name and address of the person to whom the permission is granted and the number and species of the flora / fauna, the date or dates on which such flora / fauna may be picked / collected and the land in respect of which permission is granted. Copies of this written permission must be made available to The Western Cape Nature Conservation Board upon request.
3. Type-specimens of any newly described / discovered species or other taxon collected must be lodged with a recognised South African scientific institution / museum / herbarium (preferably within the Province of Western Cape) where such material will be available to other researchers. For every flora specimen collected on a Western Cape Nature Conservation Board nature reserve, one additional (extra) herbarium specimen must be forwarded to the Western Cape Nature Conservation Board Herbarium at Jonkershoek (c/o MJ Simpson, Private Bag X5014, Stellenbosch 7599).
4. A list of all collected specimens / material including the; species name, the number collected, the collection date and the precise locality of the collection must be submitted within 14 days from the date of expiry of your permit to The Chief Executive Officer: Western Cape Nature Conservation Board, Private Bag X29, Rondebosch, 7701
5. The maximum number of specimens per species specified in the permit (if at all) may not be exceeded without the prior permission of The Chief Executive Officer: Western Cape Nature Conservation Board.
6. For projects of more than one year's duration a progress report must be submitted to The Chief Executive Officer: Western Cape Nature Conservation Board before 31 December of each year.
7. One copy of all completed reports, publications, or articles (including books, videos, CDs, DVDs etc.) resulting from the project/collection must be submitted to The Chief Executive Officer: Western Cape Nature Conservation Board free of charge.
8. Should a report, publication, article or thesis arise from this project/collection, an acknowledgement to Western Cape Nature Conservation Board must be included.
9. The Forest Act 1984 (Act 122 of 1984) and regulations, the Nature Conservation Ordinance, 1974 (Ordinance 19 of 1974) and all regulations in terms of the Ordinance must be adhered to.
10. Should it be envisaged to export any material / specimens across the boundaries of the Western Cape Province, an export permit will be required in respect of certain species and a further application form will have to be completed. The permit holder must confirm with the Western Cape Nature Conservation Board whether an export permit is required BEFORE exporting any material / specimens from the Western Cape Province.
11. No species that appear on the Red Data List or species listed as endangered in terms of the Nature Conservation Ordinance, 1974 (Ordinance 19 of 1974) may be collected, except for those mentioned on the permit.
12. Unless otherwise specifically indicated in writing, no material or specimens collected with this permit or material or specimens bred or propagated, from material or specimens collected with this permit, may be donated, sold or used for any commercial and / or bioprospecting purpose by any party.

CHIEF EXECUTIVE OFFICER
WCNCB



Appendix III: Seeds Collected

Lodging Code	Locality Name	Altitude	Species	Red List status
BMR-15009	Jonkershoek	1084	<i>Protea cynaroides</i>	LC
BMR-15010	Jonkershoek	1084	<i>Leucadendron spissifolium</i> subsp <i>spissifolium</i>	LC
BMR-15011	Jonkershoek	1084	<i>Leucadendron spissifolium</i> subsp <i>spissifolium</i>	LC
BMR-15013	Jonkershoek	966	<i>Protea cynaroides</i>	LC
BMR-15014	Jonkershoek	969	<i>Leucadendron spissifolium</i> subsp <i>spissifolium</i>	LC
BMR-15015	Jonkershoek	971	<i>Protea neriifolia</i>	LC
BMR-15016	Jonkershoek	971	<i>Protea neriifolia</i>	LC
BMR-15020	Du Toits Kloof Pass	891	<i>Protea eximia</i>	LC
BMR-15021	Du Toits Kloof Pass	891	<i>Protea repens</i>	LC
BMR-15022	Du Toits Kloof Pass	891	<i>Leucadendron salicifolium</i>	LC
BMR-15023	Du Toits Kloof Pass	870	<i>Protea nitida</i>	LC
BMR-15024	Boosmansbos	1212	<i>Protea cordata</i>	LC
BMR-15026	Boosmansbos	1571	<i>Protea grandiceps</i>	NT
BMR-15027	Boosmansbos	1577	<i>Protea cynaroides</i>	LC
BMR-15028	Boosmansbos	1629	<i>Spatalla nubicola</i>	NT
BMR-15030	Boosmansbos	1547	<i>Leucadendron eucalyptifolium</i>	LC
BMR-15031	Boosmansbos	1455	<i>Protea grandiceps</i>	NT
BMR-15032	Boosmansbos	1424	<i>Protea aurea</i> subsp <i>aurea</i>	LC
BMR-15033	Boosmansbos	1422	<i>Leucadendron spissifolium</i> subsp <i>spissifolium</i>	LC
BMR-15036	Boosmansbos	1290	<i>Protea neriifolia</i>	LC
BMR-15038	Boosmansbos	1231	<i>Protea eximia</i>	LC
BMR-15039	Boosmansbos	1209	<i>Leucadendron eucalyptifolium</i>	LC
BMR-15040	Boosmansbos	808	<i>Spatalla parilis</i>	LC
BMR-15042	Cradock Peak	1464	<i>Leucadendron conicum</i>	NT
BMR-15043	Cradock Peak	1196	<i>Mimetes pauciflorus</i>	VU
BMR-15044	Cradock Peak	1464	<i>Protea cynaroides</i>	LC
BMR-15046	Cradock Peak	861	<i>Leucadendron uliginosum</i> subsp. <i>uliginosum</i>	LC
BMR-15047	Waboonsberg	1816	<i>Protea montana</i>	VU
BMR-15051	Waboonsberg	1929	<i>Protea montana</i>	VU
BMR-15056	Swartberg Pass	1587	<i>Leucadendron album</i>	LC
BMR-15057	Swartberg Pass	1396	<i>Leucadendron rubrum</i>	LC
BMR-15059	Swartberg Pass	1392	<i>Protea canaliculata</i>	LC
BMR-15060	Swartberg Pass	1359	<i>Leucadendron salignum</i>	LC
BMR-15063	Swartberg Pass	1440	<i>Protea repens</i>	LC
BMR-15064	Swartberg Pass	1332	<i>Paranomus dregei</i>	LC
BMR-15065	Swartberg Pass	1551	<i>Protea repens</i>	LC
BMR-15070	Swartberg Pass	1300	<i>Leucadendron spissifolium</i> subsp <i>fragrans</i>	LC
BMR-15075	Robertson Pass	896	<i>Leucadendron spissifolium</i> subsp <i>fragrans</i>	LC
BMR-15080	Kristalkloof	604	<i>Spatalla parilis</i>	LC
BMR-15082	Kristalkloof	796	<i>Spatalla parilis</i>	LC
BMR-15084	Kristalkloof	531	<i>Leucospermum mundii</i>	RARE
BMR-15090	Moordenaarskop	1167	<i>Leucadendron gandogeri</i>	LC
BMR-15091	Moordenaarskop	1214	<i>Leucospermum oleifolium</i>	LC

BMR-15092	Moordenaarskop	1122	Protea speciosa	LC
BMR-15094	Moordenaarskop	968	Leucadendron gandogeri	LC
BMR-15097	Moordenaarskop	988	Leucospermum oleifolium	LC
BMR-15098	Moordenaarskop	988	Spatalla setacea	LC
BMR-15099	Moordenaarskop	991	Leucadendron spissifolium subsp spissifolium	LC
BMR-15100	Moordenaarskop	540	Protea acaulos	LC
BMR-15101	Sphinx Trail	994	Spatalla setacea	LC
BMR-15108	Somerset Sneekop	1564	Leucadendron gandogeri	LC
BMR-15109	Somerset Sneekop	1558	Protea grandiceps	NT
BMR-15112	Somerset Sneekop	1330	Spatalla setacea	LC
BMR-15113	Somerset Sneekop	1207	Diastella divaricata subsp montana	VU
BMR-15114	Somerset Sneekop	1207	Protea speciosa	LC

The lodging codes are not contiguous because of some observations made with no seeds collected which we still recorded.

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