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## Darwin Plus: Overseas Territories Environment and Climate Fund

### Final Report

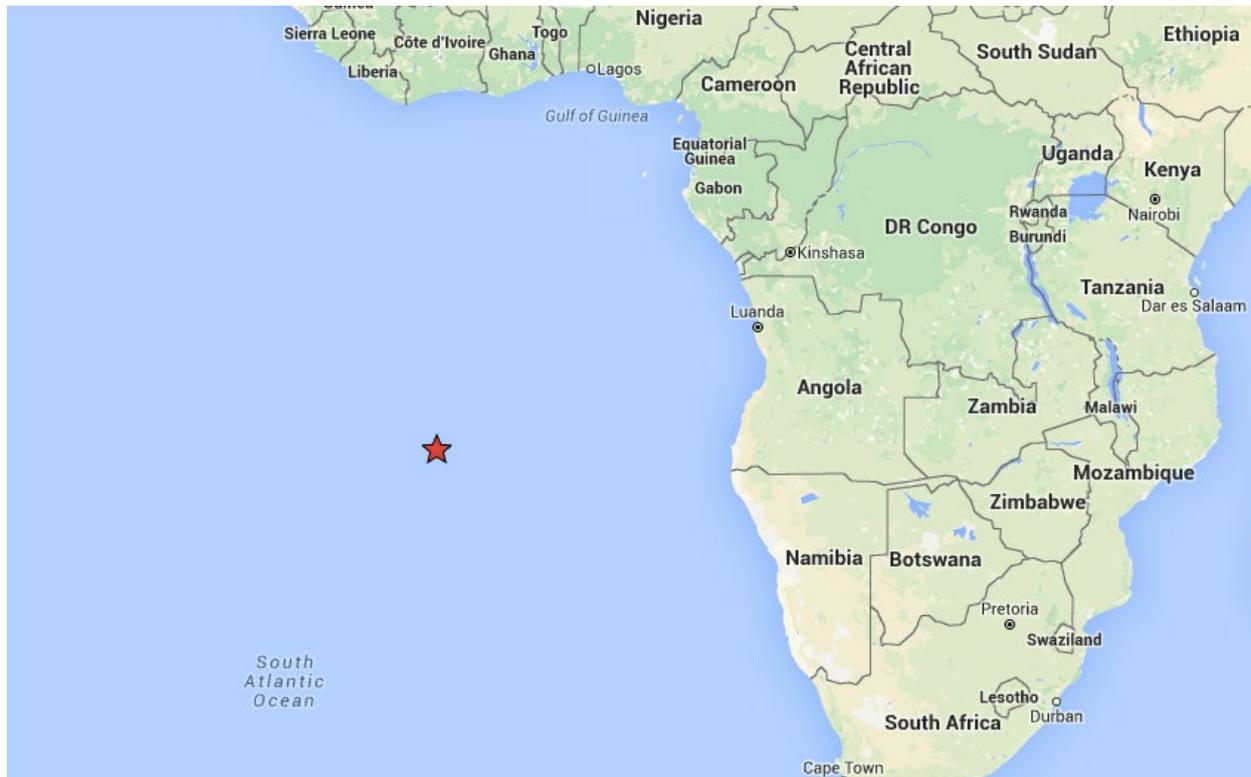
**Important note** To be completed with reference to the Reporting Guidance Notes for Project Leaders:  
it is expected that this report will be a maximum of 20 pages in length, excluding annexes

#### Darwin Project Information

Project reference	DPLUS037
Project title	Conserving the genetic diversity of St Helena's threatened endemic flora
Territory(ies)	St Helena
Contract holder Institution	Royal Botanic Gardens, Kew
Partner institutions	St Helena Environmental Management Division (St Helena Government)
Grant value	£69,247
Start/end date of project	1 April 2015 – 31 September 2017 (six month no cost extension to the project approved by Darwin)
Project leader name	Thomas Heller
Project website/Twitter/blog etc.	<a href="https://storify.com/KewUKOTs/conserving-the-genetic-diversity-of-st-helena-s-th">https://storify.com/KewUKOTs/conserving-the-genetic-diversity-of-st-helena-s-th</a> ; <a href="https://twitter.com/KewUKOTs">https://twitter.com/KewUKOTs</a>
Report author(s) and date	Thomas Heller, Marcella Corcoran, Vanessa Thomas-Williams

### 1 Project Overview

This project is focussed on the conservation of the threatened endemic flora of St Helena in the South Atlantic Ocean, an isolated island more than 1000 miles from the coasts of Angola and Namibia.



St Helena is home to 45 endemic higher plant species, many under severe threat of extinction, with at least ten with fewer than 100 plants remaining in the wild, and several more with fragmented, small or declining ranges. *Ex-situ* material (banked seeds, plants in cultivation) are an important resource for conservation activities in St Helena, being used as a source of plants for habitat restoration and species reintroductions, as well as providing long term security for genetic diversity where the outlook for individual wild populations is uncertain.

However, much of the local seed banking taking place had been driven by meeting the immediate production needs of environmental mitigation associated with the airport development. Existing facilities and skills were enough for efficient processing of smaller quantities of seeds and short-term storage only.

St Helena's endemic flora was inadequately represented in long-term storage, with several existing Millennium Seed Bank collections suffering low seed quantity and quality (poor germination rates, hybridisation), and some endemics not represented at all, either in-country or duplicated at the MSB. Though data on wild populations and *ex-situ* collections existed, these were stored in disparate, unconnected sources.

This project sought to improve the representation of the threatened endemics in *ex-situ* collections through a gap analysis of existing collections, capacity building in seed conservation and horticulture (training and equipment), and the targeted collecting and banking of seeds and spores of endemic plants.

## 2 Project Stakeholders/Partners

The Environmental Management Division (EMD) of the St Helena Government has responsibility for effective management of the environment on the island, including its plant life, and is therefore the principal stakeholder and partner in this project. Much of the capacity building and activities are focussed on the teams working within EMD. The project proposal was developed in direct collaboration between Kew and EMD from the outset.

The St Helena National Trust (SNT) and the Landscape and Ecology Mitigation Programme (LEMP) were also in-country stakeholders, with both working closely with EMD on plant conservation matters, particularly with respect to using *ex-situ* tools in supporting *in-situ* conservation activities.

Staff of EMD were the principal focus of the training delivered as part of the project, with two members of staff visiting Kew and Wakehurst Place in year 1. This was followed up with visits to St Helena by Kew staff, with participation in horticultural workshops extended to staff of SNT and LEMP.

One of the biggest challenges in engaging with project partners has been the physical isolation of St Helena, with the cost of travelling to the island prohibitively expensive. Beyond the planned training, remaining technical support has had to largely be by email.

This project has seen good interaction with other Darwin Initiative-funded projects in St Helena, with the propagation work undertaken by project officers working on DPLUS029 vital to being able to secure seed of five of the species occurring in the cloud forests of St Helena's central ridge, as anticipated in the original project application.

### **3 Project Achievements**

#### **3.1 Outputs**

##### **Output 1 Gap analysis and action plan**

This output, as set out in the application, consisted of: **1.1** A database of *ex-situ* collections and wild populations; **1.2** A list of species and populations identified for targeted collecting; and, **1.3** Inaccessible populations assessed using a drone.

Prior to the beginning of the project, relevant data could be found in a variety of places, e.g. Kew's Seed Bank Database, Kew's UKOTs BRAHMS database, EMD's database of seed collections, and survey data for wild populations, held in-country. There was no overall strategy or plan regarding targeting populations for sampling for *ex-situ* conservation, with the largest, most accessible populations being the focus of sampling efforts.

Numbers 1.1 and 1.2 above have been met successfully, with data now available to EMD staff in a single Access database (see for screenshot). The consolidated data was then mapped and used to undertake a gap analysis. The results, including a species-by-species summary of the current status and suggested priorities for future collecting outlined, are available here:.

1.3 has perhaps been the most problematic to meet, with a number of challenges to undertaking the assessments by quadcopter drone. Many localities on St Helena are challenging to access due to the difficult terrain, and are home to poorly-known, or indeed likely hitherto undiscovered populations of endemics. The use of a radio-controlled quadcopter is one solution to survey such areas, and a DJI Phantom drone was purchased for this purpose, and training was provided to EMD staff in Year 1. However, a combination of poor flying conditions, mobility of a key team-member, and the introduction of flying restrictions over large parts of the island, has prevented the full deployment of the drone during the project timeframe, other than a series of practice flights. Poor flying conditions were anticipated, though local advice indicated that good conditions are frequent enough to make its use feasible. However, the sharing of experience by colleagues operating a drone for surveying as part of DPLUS51 have been very helpful in improving the prospects of EMD deploying the drone successfully in the future, including paperwork required for permission to fly within restricted zones.

##### **Output 2 Capacity building: seed conservation and horticulture skills and equipment**

This output, as set out in the application, consisted of: **2.1** Two St Helena Government staff trained in advanced seed conservation techniques and propagation work; **2.2** Equipped with 'quadcopter' drone to monitor and assess difficult to access plants, resulting in high quality population data; and, **2.3**, Equipped with vacuum cleaner, seed aspirator and drying oven for collecting and processing of seed collections. All seed collections cleaned in-country to a high standard.

Prior to the project beginning, St Helena government staff had received some seed conservation training during a visit by Kew staff in 2009, but training in cleaning and banking

techniques was limited. In-country skills and experience had clearly advanced significantly in subsequent years, but the nature of requests for advice was a clear indication that more capacity building was in need. Horticultural skills were good, with teams led by experienced horticulturalists, though several team members had relatively little horticultural experience, or others with on-the-job training only. Government labs were equipped with simple drying equipment (silica gel drying chamber, sieves) and banking facilities (two refrigerators, foil bags and plastic clips), sufficient for processing and banking of relatively small quantities of seed, for short term storage.

As a result of the project, two members of EMD staff (Vanessa Thomas-Williams and Lourens Malan) have been trained in advanced seed conservation techniques at the Millennium Seed Bank in September 2015. Additionally, fourteen EMD, SNT and LEMP staff members were trained in horticultural skills during in-country workshops delivered by Marcella Corcoran. As evidence, see the timetable for UK-based training (, Marcella Corcoran's workshop and training report (feedback on changes following horticultural workshop from LEMP team (and EMD team ()), with some additional comments on progress as a result of training by Vanessa Thomas-Williams in a report from April 2017) and subsequent correspondence ().

Various items of equipment have been purchased to improve the effectiveness of seed banking in-country. These include: a constant-temperature heat sealer to seal foil-laminate bags, providing a more effective seal than plastic clips for the long-term storage of seeds; an Agriculex column seed cleaner, which will help to efficiently clean the seeds of many of St Helena's endemic plants, with less risk of damage to seeds than relying on sieves alone; a laboratory oven, primarily to recharge saturated silica gel (used to dry seeds), but also useful for sterilising soil and other tasks; a Gemini TinyTag datalogger with temperature and humidity probe for more accurately monitoring the moisture status of seeds; a Black & Decker portable battery-powered vacuum cleaner, to help collect seeds, especially wind dispersed seeds of *Commidendrum* and other Asteraceae. Examples of some of this equipment in use may be seen in reports by Thomas Heller and Vanessa Thomas-Williams

Though EMD has been equipped with a DJI Phantom quadcopter drone for surveying inaccessible populations, to date, deploying the drone has been met with difficulty, as described for Output 1, above.

### Output 3 *Ex-situ* collections

This output, as set out in the application, consisted of: **3.1** All endemics represented by at least one new high quality seed collection, including bankable ferns; **3.2** All collections with more than 500 seeds; where quantity not achieved, constraints identified and plans to overcome in place; and, **3.3** species where hybridisation likely collected under controlled conditions.

Prior to this project, there were 70 collections representing 27 endemic species banked at the MSB, and 368 wild origin collections representing 28 endemic species banked in St Helena. No attempts at banking spores of ferns from St Helena had been made. Of the collections at the MSB, 33 had fewer than 500 seeds. Collections of *Trochetiopsis*, *Wahlenbergia*, and *Commidendrum* at the MSB were not known to be made under controlled conditions or are from plants with a high risk of being the result of cross-pollination with related species. Indeed, plants grown from banked *Trochetiopsis* seed showed clear signs of hybridisation.

As a result of this project, 67 collections, representing of 31 of the 45 vascular plants endemic to St Helena have been banked, plus 38 collections of 5 species by staff working on DPLUS029. 11 species have been banked that were not previously represented in seed banks at all. Of the nine endemics that have not been banked, two (*Hymenophyllum capillaris* and *Lachanodes arborea*) are not expected to bank well, and so have not been targeted. The other 7 species not collected have been monitored throughout the project and have not produced sufficient seed to allow for a seed collection to be made.

Of those collections that have been counted at the MSB (20 collections), all but five are of more than 500 seeds or spores (taking into account a 50/50 split between the MSB and EMD portions). Those five small collections are a result of limited availability in the field, and are flagged for 'bulking up' through propagation of nursery plants. Many collections have yet to be shipped to the UK, and have therefore yet to be counted. These figures represent an

improvement on (pre-project) collections at the MSB, almost half of which are of fewer than 500 seeds.

Hybridisation has been identified as a risk among four genera of St Helena's endemics: *Commidendrum*, *Trochetiopsis*, *Wahlenbergia*, and *Berula*. All but one collection of these have been made from plants sufficiently remote from congeners that hybridisation is considered very unlikely, with the few collections made from cultivated plants, or field gene banks (*Commidendrum rotundifolium* and *Trochetiopsis* spp.) grown away from related species, a measure not taken with past collections of these species banked at the MSB. The one collection where the possibility of hybridisation has not been eliminated is *Berula bracteata*, with more distant populations not accessible during the course of this project.

The main challenge to successfully delivering this output has been the severe drought that St Helena suffered during the second year of the project. This has had a big impact on the availability of seeds in wild populations, with many species having their fertility limited during this time, with either poor flowering, or very poor seed set. Given that most of the target populations are smaller and more fragmented than those previously targeted for seed collecting, the drought has made a challenging task even more difficult. In light of this, the project was granted a six-month no-cost extension, to give more time for collecting once the drought had eased. This has been very worthwhile, with seeds of 22 species being collected during the extension period. Nevertheless, 7 of the endemics have yet to produce seed, though most have been observed in flower during the last month of the project, with seed expected to follow soon after.

### 3.2 Outcome

As set out in the original application, the three outputs were expected to contribute to the Outcome as follows:

**“Output 1 will ensure that collecting is done in a targeted manner and thus new *ex-situ* collections will be a valuable addition to those already existing, capturing a greater range of threatened genetic diversity”.** The gap analysis has proven to be a useful exercise in directing collecting efforts for this project. Combining data from a recent plant census with known *ex-situ* collections has been revealing. While it was known at the beginning of the project that EMD had amassed significant numbers of seed collections in their local seed bank, (of cultivated and wild origin), with very good coverage of the most well-known and largest populations, the gap analysis revealed that for many of the endemics, a number of sites have not previously been sampled (). These were treated as high priorities for targeted collecting because, although few of the species have been the subject of detailed genetic analysis, there is a strong likelihood that these isolated populations harbour genetic variation not present in 'core' populations. Of the 36 species collected during the course of this project (see [k](#) for a species by species summary of collections made for the project):

- 11 are species never before banked, either in-country or at the MSB, including endemic ferns
- 9 with populations sampled for the first time
- 2 species not previously duplicated at the MSB
- 6 with populations not previously duplicated at the MSB
- 4 with measures taken to reduce the likelihood of cross-pollination with related species
- 4 with remaining populations previously sampled, but existing collections were small

As explained in Sections 3.1 above, full deployment of the drone has not been possible. While it was expected that the drone would be a useful tool in monitoring difficult sites and potentially help to discover new populations of endemic plants, it has not prevented the project from achieving its intended outcome, with more than enough known gaps to fill during the course of the project. The equipment remains available to help ongoing surveying efforts on the island and inform conservation efforts.

**“Output 2 will ensure that conservation activities are carried out according to best practice during the lifetime of the project as well as building capacity for future conservation efforts”.**

Partners have given feedback attesting to the usefulness of the training given (in the UK and in St Helena, covering topics relating to horticulture and seed conservation), with some examples of highlights and some examples of resulting improvements and a report on horticultural activities at

With regard to horticultural capacity building, of particular note is the benefits gained by relatively new members of staff with comparatively little horticultural experience. Techniques deployed as a consequence have included trialling different mixtures of growing media, which have produced often dramatic differences in vigour; and the importance of structured monitoring and recording data, giving a basis on which to measure progress and improvements.

With regard to seed conservation, feedback has highlighted the value of being able to monitor seed moisture relations using a hygrometer and techniques to better manage drying collections. Partners have also provided evidence (of making good use of the supplied equipment, including the aspirator, used to separate seed material from debris, and the oven, used to recharge silica gel used to dry the seeds.

**“Output 3 will ensure that the genetic diversity of St Helena’s threatened flora is conserved for future generations and available for use in plant reintroductions, habitat restoration and research”.**

As detailed in previous sections, this project has resulted in the range of *ex-situ* collections being significantly improved, with several species never before having been available in conservation collections. Several others are now represented by collections sourced from populations not previously sampled, likely to represent genetic diversity not hitherto included in any propagation efforts. These collections are available for use in-country and many also available at the MSB in the UK. Collections made during the 6 month project extension have yet to be duplicated at the MSB, with both the airbridge between the UK and Ascension being out of service, as well as the Royal Mail Ship being in dry-dock for some of this time. Now that the airport on St Helena is operational, these collections can now be sent to the UK much more easily.

As indicated above, new collections of nine endemics haven’t been possible. Two of these are thought not to be appropriate for banking using conventional techniques, and alternative options need to be investigated as a priority. 7 of the endemics have yet to produce seed, though most have been observed in flower during the last month of the project, with seed expected to follow soon after.

Of particular interest are the spore collections made from endemic ferns, which have received little attention in *ex-situ* efforts in St Helena to date. These spores will form the basis of developing horticultural collections at Kew, and have highlighted the need for building capacity for culturing spores in-country, as has been achieved with success with ferns endemic to Ascension Island.

Plants of two species have already been propagated in EMD’s nurseries using material gathered as a result of this project (*Panicum joshuae* and *Bulbostylis neglecta*), and many more are expected to be used in conservation efforts in the future.

### **3.3 Long-term strategic outcome(s)**

St Helena’s National Environmental Management Plan (NEMP) 2012-2022 outlines 10 headline objectives. This project has contributed directly to two of these:

“B. Enhance implementation of the NEMP through participatory planning, knowledge management and capacity building.”: Use of the gap analysis is continuing to be of value in knowledge management and help identify priorities for conservation work. This project has included a significant element of capacity building through training.

“D. Safeguard St. Helena’s environment, both terrestrial and marine, for future generations through effective environmental management including through improving the status of biodiversity by safeguarding ecosystems, species and genetic diversity.”: Not only do banking seeds in long-term facilities safeguard remaining genetic diversity, the material is of vital importance in the success of propagation, species reintroductions and habitat restorations all of which are part of safeguarding St Helena’s environment.

The project has also contributed to commitments of the CBD, [Art.9](#) especially (*Ex-situ* conservation), but also [Art.12](#) (Research and training), [15](#) (Access to genetic resources), [17](#) (Exchange of information) and [18](#) (Technical and scientific cooperation); and directly to targets 8 (“At least 75 per cent of threatened plant species in ex situ collections...”), and 15 (“The number of trained people working with appropriate facilities sufficient according to national needs”) of the [GSPC](#) and [Aichi target 12](#) (“By 2020 the extinction of known threatened species has been prevented...”).

## 4 Sustainability and Legacy

The project has been designed to have a sustained legacy. The exercise to bring together various data sources and produce a gap analysis will help our partners with planning conservation activities beyond the lifetime of the project. Likewise, the capacity building (training and equipment) enabled by this project will improve the management of seed and horticultural collections, improving seed viability and longevity, as well as the success and efficiency of propagation work. The resulting improvement in *ex-situ* collections themselves is intended to have a long-term legacy, in that it is specifically intended to prevent further loss of genetic diversity from what remains of the endemic plant species, diversity which is key to their long-term survival.

Project staff in St Helena who have benefitted from training are all core staff and, employee turnover notwithstanding, remain employed by EMD and other stakeholders, making use of skills, and passing these on to colleagues.

## 5 Lessons learned

One of the biggest challenges in engaging with project partners has been the physical isolation of St Helena, with the expense of travelling to the island prohibitively expensive. Beyond the planned training, remaining technical support has had to largely be by email.

If the project were to be repeated, it would have been good to have other members of EMD come to the UK for the horticultural training, though this of course would have had cost implications. Conversely, the programme of in-country training had the advantage that more people could participate in the training, meaning that each approach has brought different benefits to the project.

More support and training in the use of the drone may have been beneficial, giving more confidence in deploying it in difficult conditions.

The gap analysis combined with field work has also worked well, revealing both the extent of existing seed collections and the nature of the populations not sampled. Indeed, while the results of the gap analysis have been used to direct targeted collecting, it has presented unanticipated challenges to overcome. Firstly, the degree to which many of the unsampled populations are not familiar to EMD staff. With little experience of using handheld GPS units, it is difficult to translate data on target populations into information that collecting teams can easily use to locate obscure populations, and required extra support. Secondly, the field work undertaken to date to locate target populations has shown the extent to which some plants really are inaccessible, only visible, but not reached safely. Thirdly, many of the ‘gaps’ are represented in the field by populations of just a few individuals, making it especially difficult to obtain reasonable numbers of seeds (i.e. collections of more than 500 seeds), where limits to collecting levels need to be carefully adhered to. Nevertheless, sampling these populations is still important, in view of the genetic diversity they may harbour.

The drought has been a significant limitation to the project, but there is little to be done to overcome this, though the granting of an extension was greatly appreciated, and very worthwhile.

## 5.1 Monitoring and evaluation

The first activity of this project to be completed was the data consolidation and gap analysis undertaken for Output 1. These provide a key baseline by which the ongoing collecting (Output 3) can be monitored, by the extent to which new collections fit the priorities identified. Partner feedback and reporting has given some indication of the effectiveness of the capacity building provided, with a follow-up questionnaire giving additional insights into which aspects of capacity building have been particularly worthwhile, and where future work may be beneficial. Examples can be found in the reports and feedback presented in Section 3.2, above.

## 5.2 Actions taken in response to annual report reviews

**“Is it possible to ensure that other staff members are trained to fly the drone?”** Due to the isolation of St Helena, it has not been possible to arrange for professional training of other staff members in operating the drone. However, the sharing of experience by colleagues operating a drone for surveying as part of DPLUS51 have been very helpful in improving the prospects of EMD deploying the drone successfully in the future.

**“Are there plans for Kew staff to visit during the remaining period?”** A combination of the cost of travelling to St Helena, the UK-Ascension airbridge and Royal Mail Ship being out of service, as well as the delay in the operation of the St Helena airport have meant that additional visits by Kew staff has not been possible. Neither would it have represented especially good value for money, with the capacity to undertake the remaining activities (other than operating the drone) not likely to benefit significantly from another visit.

**“What plans are in place to ensure that all seed destined for the MSB is dispatched and over what time period?”** For similar reasons given above, uncertainty over transport to and from the island has made shipping precious seed material risky. For this reason, shipping has been delayed until the airport is operational. Now that this is the case, seed can be dispatched to the UK without further delay.

**“To support M&E, a more structured questionnaire will be developed to help partners monitor and evaluate methods employed. This should be included with the Final Report.”** A more structured questionnaire was developed, results available here:

## 6 Darwin Identity

The Darwin Initiative has been identified as the funder wherever possible, including during presentations and in the EMD newsletter (with the Darwin logo used in both), the Samara newsletter, as well as frequently on our Twitter feed. The project has a clear identity among conservation activities on the island, with this being the only active project that Kew is working on in St Helena at this time. However, we have also been keen to emphasize its relevance to wider efforts to conserve the St Helenian flora. With other Darwin Plus projects underway in St Helena, the Darwin Initiative enjoys a good level of understanding, and is widely recognised as an extremely important supporter of conservation on the island.

Kew staff highlighted the work done during visits to the UK by EMD staff, and during visits to St Helena (<https://storify.com/KewUKOTs/conserving-the-genetic-diversity-of-st-helena-s-th>)

Thomas Heller gave a presentation on the project during his visit to St Helena in February 2016, open to the public, as well separately to the Legislative Council.

The project was also publicised through the ENRD newsletter (), EMD Newsletter (), and issue 32 of Samara, the newsletter of the Millennium Seed Bank Partnership

## 7 Finance and administration

### 7.1 Project expenditure

Project spend (indicative) since last annual report	2017/18 Grant (£)	2017/18 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs	0			
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items				
Others				
<b>TOTAL</b>	0			

Staff employed (Name and position)	Cost (£)
EMD Species team (Vanessa Thomas-Williams, Neil Henry, Stefan Leo, Gurrance Leo, Glenville Thomas, Darrell Leo, Karen Williams)	
<b>TOTAL</b>	

### 7.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
Royal Botanic Gardens, Kew	
<b>TOTAL</b>	

### 7.3 Value for Money

This project has represented good value for money, with the work not likely to have been undertaken otherwise, but with the impact on the outlook for many of St Helena's threatened plants high.

Significant savings were made during the first year of the project in UK-based training, whereby staff from St Helena were able to participate in the Seed Conservation Techniques course, the running of which was funded through other sources, avoiding the cost of individual training fees originally budgeted.

**Annex 1** Project's original (or most recently approved) logframe (if your project has a logframe), including indicators, means of verification and assumptions. N.B. Insert your full logframe. If your logframe has changed since your application and was approved by a Change Request the newest approved version should be inserted here, otherwise insert the Stage 2 logframe. If your application's logframe is presented in a different format in your application, please transpose into the below template. Please feel free to contact [Darwin-Projects@itsi.co.uk](mailto:Darwin-Projects@itsi.co.uk) if you have any questions regarding this.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p><b>Impact:</b> The genetic diversity of St Helena's threatened endemic flora secured as high quality seed collections in long-term storage, representative of wild populations. Capabilities of conservation staff in St Helena to monitor wild plants and manage <i>ex-situ</i> collections improved.</p>			
<p><b>Outcome:</b></p> <p>Output 1 will ensure that collecting is done in a targeted manner and thus new <i>ex-situ</i> collections will be a valuable addition to those already existing, capturing a greater range of threatened genetic diversity.</p> <p>Output 2 will ensure that conservation activities are carried out according to best practice during the lifetime of the project as well as building capacity for future conservation efforts.</p> <p>Output 3 will ensure that the genetic diversity of St Helena's threatened flora is conserved for future generations and available for use in plant reintroductions, habitat restoration and research.</p>	<p>[Outcome-level indicators not part of original application]</p> <p>Collections made for the project fill gaps identified in the gap analysis.</p> <p>Partners reporting improved results in managing horticultural <i>ex-situ</i> collections.</p> <p>Quality of banked seed collections high.</p> <p>All St Helena endemics with a range of seed collections banked in-country and duplicated at the MSB. Ferns with spores stored at the MSB.</p>	<p>Data for new collections available.</p> <p>Partners reports from nursery activities.</p> <p>Processing results from MSB database.</p> <p>Data for new collections available.</p> <p>Partner reports from nursery activities.</p>	

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<b>Outputs:</b> <b>1. Gap analysis and action plan</b>	1.1 Database of <i>ex-situ</i> collections (seed and living collections) and wild populations accessible in St Helena and Kew. 1.2 List of species and populations identified for targeted collecting. 1.3. Poorly known/inaccessible populations assessed using 'quadcopter' drone and data recorded.	1.1 Database accessible in St Helena and Kew. 1.2 Targeting lists. 1.3. Reports, publicity, e.g. newspaper reports, blogs.	Risk: Quadcopter is damaged or lost in inaccessible location
<b>2. Capacity building: seed conservation and horticulture skills and equipment</b>	2.1 Two St Helena Government staff trained in advanced seed conservation techniques and propagation work. 2.2 Equipped with 'quadcopter' drone to monitor and assess difficult to access plants, resulting in high quality population data. 2.3 Equipped with vacuum cleaner, seed aspirator and drying oven for collecting and processing of seed collections. All seed collections cleaned in-country to a high standard.	2.1 Training reports, feedback from MSB staff. 2.2 Database with population data. Habitat and population images. 2.3 Kew's Seed Bank Database, with details of seed quality and cleaning undertaken.	
<b>3. <i>Ex-situ</i> collections</b>	3.1 All endemics represented by at least one new high quality seed collection, including bankable ferns. 3.2 All collections with more than 500 seeds. Where quantity not achieved constraints identified and plans to overcome in place.	3.1 Training reports, feedback from MSB staff. 3.2 Database with population data. Habitat and population images. 3.3 Kew's Seed Bank Database, with details of seed quality and cleaning	Risks: Unusual seasonal weather results in poor seed production. Injury due to difficult terrain.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
	3.3 Species where hybridisation likely collected under controlled conditions.	undertaken.	
<p><b>Activities</b> (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)</p> <p>1.1 Data sources from Kew and St Helena assembled, standardised and compiled.</p> <p>1.2 Priority lists and collecting plans drawn up for all endemic species.</p> <p>1.3 Key populations and remote locations surveyed by drone.</p> <p>2.1 Staff from St Helena to visit Wakehurst Place for seed conservation and horticultural training.</p> <p>2.2 Staff from Kew to visit St Helena to deliver in-country training and collecting and horticultural support.</p> <p>2.3 Procure equipment and ship to St Helena.</p> <p>3.1 Monitor target populations for availability of seed.</p> <p>3.2 Make seed collections, with associated data and voucher specimens (either herbarium specimens or photos, as appropriate to vulnerability of target populations).</p> <p>3.3 Dry and clean seed collections, using internationally approved protocols.</p> <p>3.4 Seal and bank seed collections in local seed bank.</p> <p>3.5 Ship duplicate seed collections to MSB.</p>			

## Annex 2 Report of progress and achievements against final project logframe for the life of the project (if your project has a logframe)

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
<p><b>Impact:</b></p> <p><b>The genetic diversity of St Helena’s threatened endemic flora secured as high quality seed collections in long-term storage, representative of wild populations. Capabilities of conservation staff in St Helena to monitor wild plants and manage <i>ex-situ</i> collections improved.</b></p>		<p>This project has made significant contribution to the capacity of conservation staff in St Helena to manage <i>ex-situ</i> collections, with skills and equipment for working with banked seeds and propagating plants improved. The range of <i>ex-situ</i> collections available for undertaking reintroductions and habitat restoration has also been improved, with high quality collections of more species and populations banked and ready to be incorporated into propagation programmes. Given that the future of St Helena’s endemics relies so heavily on such work, the impact this project makes to the success of <i>ex-situ</i> conservation is important.</p>
<p><b>Outcome</b></p> <p>Output 1 will ensure that collecting is done in a targeted manner and thus new <i>ex-situ</i> collections will be a valuable addition to those already existing, capturing a greater range of threatened genetic diversity.</p> <p>Output 2 will ensure that conservation activities are carried out according to best practice during the lifetime of the project as well as building capacity for future conservation efforts.</p> <p>Output 3 will ensure that the genetic diversity of St Helena’s threatened flora is conserved for future generations and available for use in plant reintroductions, habitat restoration and research.</p>	<p>[Outcome-level indicators not part of original application]</p> <p>Collections made for the project fill gaps identified in the gap analysis.</p> <p>Partners reporting improved results in managing horticultural <i>ex-situ</i> collections.</p> <p>Quality of banked seed collections high.</p> <p>All St Helena endemics with a range of seed collections banked in-country and duplicated at the MSB. Ferns with spores stored at the MSB.</p>	<p>The collecting undertaken for the project has been highly targeted, with all collections helping to fill in identified gaps in <i>ex-situ</i> collections, either as species never before banked, populations not previously sampled for <i>ex-situ</i> conservation, or species or populations not previously represented in MSB accessions.</p> <p>Partners have given feedback attesting to the usefulness of the training given (both in seed conservation and horticulture), with particular highlights, and some examples of resulting improvements.</p> <p>Initial processing data from the MSB suggest good collections in terms of quantity. Where small collections have been reported, the constraints are clearly beyond the control of the collectors (e.g. very small populations, high proportions of empty seeds produced).</p> <p>The representation of St Helena’s endemics in <i>ex-situ</i> collections has been significantly improved through this project, with 36 of 45 endemics having new collections filling identified gaps. Of the nine species not collected, two (<i>Hymenophyllum</i> and <i>Lachanodes</i>) require further research into appropriate</p>

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
		<i>ex-situ</i> conservation; four are represented by pre-existing collections, but would nevertheless benefit from further sampling; three ferns remain without banked spores and will be addressed through future collecting.
<b>Output 1.</b> Gap analysis and action plan	1.1 Database of <i>ex-situ</i> collections (seed and living collections) and wild populations accessible in St Helena and Kew. 1.2 List of species and populations identified for targeted collecting. 1.3. Poorly known/inaccessible populations assessed using 'quadcopter' drone and data recorded.	Good progress was made towards this output, with data on <i>ex-situ</i> and wild populations assembled, and used to undertake a gap analysis. Deployment of the drone was not possible during the course of the project, which would otherwise have enabled useful additional data to be gathered on the status of wild populations. See section 3.1 for further information.  A screenshot of the <i>ex-situ</i> collections database can be seen here:
Activity 1.1 Data sources from Kew and St Helena assembled, standardised and compiled.		Data sources from Kew and St Helena have been assembled, standardised and compiled in a BRAHMS database. These data include, from Kew, seed collections banked at the Millennium Seed Bank (70 records), accessions from the Horticultural collections (45), and herbarium records (779). From EMD, data on seed collections held locally (813), as well as comprehensive records of wild populations from survey data (2591) have been included. As data on nursery accessions at EMD or other local agencies is not currently kept, these have not been included, but would be an important addition to data management to help monitoring of <i>ex-situ</i> collections in the future.  These data have been made available to staff of EMD as Microsoft Access tables and are being kept alongside EMD's existing database of locally held seed collections.
Activity 1.2. Priority lists and collecting plans drawn up for all endemic species.		Priority lists and collecting plans have been prepared in the form of a gap analysis report, drawing on data from Activity 1.1. This includes, for each of St Helena's endemic flowering plants and ferns: a summary of <i>ex-situ</i> collections held at Kew (with notes on quality and quantity of seeds) and EMD (seed only); and a dot map showing all known wild localities on St Helena along with collection localities for all wild-provenance <i>ex-situ</i> material;

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
		a summary of priority localities for future collections.
Activity 1.3 Key populations and remote locations surveyed by drone.		A DJI Phantom quadcopter drone has been purchased and a number of test flights have been made in St Helena. However, a combination of poor flying conditions, mobility of a key team-member, and the introduction of flying restrictions over large parts of the island, has prevented the full deployment of the drone during the project timeframe.
<b>Output 2.</b> Capacity building: seed conservation and horticulture skills and equipment	2.1 Two St Helena Government staff trained in advanced seed conservation techniques and propagation work. 2.2 Equipped with 'quadcopter' drone to monitor and assess difficult to access plants, resulting in high quality population data. 2.3 Equipped with vacuum cleaner, seed aspirator and drying oven for collecting and processing of seed collections. All seed collections cleaned in-country to a high standard.	Good progress was made towards this output, with two St Helena Government staff trained in advanced seed conservation techniques and propagation work, with an additional 14 St Helena-based staff participating in horticultural training workshops in-country. EMD are now equipped with a quadcopter drone. Though no population data has been gathered during the course of the project, staff are in apposition to be able to use the equipment to monitor difficult sites in the future. EMD are also now equipped with a variety of equipment to improve the efficiency of processing and banking seeds.
Activity 2.1. Staff from St Helena to visit Wakehurst Place for seed conservation and horticultural training.		Vanessa Thomas-Williams and Lourens Malan visited the UK 23 <sup>rd</sup> September – 9 <sup>th</sup> October 2015, to share experiences with horticultural staff at Kew and Wakehurst Place, and participate in a training course in Seed Conservation Techniques at the Millennium Seed Bank.
Activity 2.2. Staff from Kew to visit St Helena to deliver in-country training and collecting and horticultural support.		Thomas Heller visited St Helena 6 <sup>th</sup> – 21 <sup>st</sup> February, to deliver in-country training and collecting support to staff with EMD's conservation nursery team. Additional training in seed conservation techniques was provided, as well as support in field work. Marcella Corcoran visited St Helena immediately after this, being on the island 26 <sup>th</sup> February – 12 <sup>th</sup> March. Marcella delivered a training programme to a large audience of staff working on the propagation of endemic plants,

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
		including participants from EMD, St Helena National Trust, and the St Helena Landscape and Ecology Mitigation Programme.
Activity 2.3 Procure equipment and ship to St Helena.		Various items of equipment have been purchased to improve the effectiveness of seed banking in-country. These include: a constant-temperature heat sealer to seal foil-laminate bags, providing a more effective seal than plastic clips for the long-term storage of seeds; an Agriculex column seed cleaner, which will help to efficiently clean the seeds of many of St Helena's endemic plants, with less risk of damage to seeds than relying on sieves alone; a DJI Phantom quadcopter drone; a laboratory oven, primarily to recharge saturated silica gel (used to dry seeds), but also useful for sterilising soil and other tasks; a Gemini TinyTag datalogger with temperature and humidity probe for more accurately monitoring the moisture status of seeds; a Black & Decker portable battery-powered vacuum cleaner, to help collect seeds, especially, wind dispersed seeds of <i>Commidendrum</i> and other Asteraceae.
<b>Output 3.</b> <i>Ex-situ</i> collections	3.1 All endemics represented by at least one new high quality seed collection, including bankable ferns. 3.2 All collections with more than 500 seeds. Where quantity not achieved constraints identified and plans to overcome in place. 3.3 Species where hybridisation likely collected under controlled conditions	36 of St Helena's 45 endemic vascular plant endemics now represented by new collections, including 10 of 13 endemic ferns. Of the 9 endemics not banked during the course of the project, 2 are thought to be unsuitable for conventional banking, and 7 failed to produce seed as a result of prolonged drought, though many were observed in flower in the latter weeks of the project. Of those collections that have been counted at the MSB (20 collections), all but five are of more than 500 seeds or spores (taking into account a 50/50 split between the MSB and EMD portions). Those five small collections are a result of limited availability in the field, and are flagged for 'bulking up' through propagation of nursery plants. Several collections have yet to be shipped to the UK, and have therefore yet to be counted. These figures represent an improvement on existing collections at the MSB, almost half of which are of fewer than 500 seeds. Hybridisation has been identified as a risk among four genera of St Helena's endemics: <i>Commidendrum</i> , <i>Trochetiopsis</i> , <i>Wahlenbergia</i> , and <i>Berula</i> . All but one collection of these have been made from plants sufficiently remote from congeners that hybridisation is considered unlikely, with the few collections

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
		made from cultivated plants, or field gene banks ( <i>Commidendrum rotundifolium</i> and <i>Trochetiopsis</i> spp.), grown away from related species, a measure not taken with past collections of these species banked at the MSB.
Activity 3.1 Monitor target populations for availability of seed.		Monitoring target populations has continued throughout the course of the project, with populations EMD team were unfamiliar with have been located. A number of populations are difficult or impossible to access.
Activity 3.2 Make seed collections, with associated data and voucher specimens.		105 seed collections have been made for the project, all with associated data. Due to the vulnerability of the populations sampled, vouchers have not been collected, and good familiarity with all the species concerned means that the field identifications are accepted by the MSB.
Activity 3.3 Dry and clean seed collections, using internationally approved protocols.		All collections have been dried using a silica gel drum-dryer, and cleaned, using a combination of hand-sorting, sieving, and Agriculex aspirator, where appropriate, and moisture levels monitored using a TinyTag hygrometer probe.
Activity 3.4 Seal and bank seed collections in local seed bank.		When sufficiently dry, all seed collections are sealed in tri-laminate foil bags using a heat-sealer, and stored in a fridge with EMD. Collections of spores are not duplicated in-country, as they are best stored in liquid-nitrogen, a facility not available in St Helena.
Activity 3.5 Ship duplicate seed collections to MSB.		47 collections have been duplicated at the MSB to date. Uncertainty over transport to and from the island has made shipping precious seed material risky in the last month of the project. For this reason, shipping has been delayed until the airport is operational. Now that this is the case, seed can be dispatched to the UK without further delay.

## Annex 3 Standard Measures

Code	Description	Totals (plus additional detail as required)
<b>Training Measures</b>		
1	Number of (i) students from the UKOTs; and (ii) other students to receive training (including PhD, masters and other training and receiving a qualification or certificate)	(i) 2 staff from UKOTs attended Kew's Seed Conservation Techniques course
2	Number of (i) people in UKOTs; and (ii) other people receiving other forms of long-term (>1yr) training not leading to formal qualification	
3a	Number of (i) people in UKOTs; and (ii) other people receiving other forms of short-term education/training (i.e. not categories 1-5 above)	(i) 14 staff from UKOTs attending in-country propagation workshop
3b	Number of training weeks (i) in UKOTs; (ii) outside UKOTs not leading to formal qualification	
4	Number of types of training materials produced. Were these materials made available for use by UKOTs?	
5	Number of UKOT citizens who have increased capacity to manage natural resources as a result of the project	16
<b>Research Measures</b>		
9	Number of species/habitat management plans/strategies (or action plans) produced for/by Governments, public authorities or other implementing agencies in the UKOTs	
10	Number of formal documents produced to assist work in UKOTs related to species identification, classification and recording.	
11a	Number of papers published or accepted for publication in peer reviewed journals written by (i) UKOT authors; and (ii) other authors	
11b	Number of papers published or accepted for publication elsewhere written by (i) UKOT authors; and (ii) other authors	
12b	Number of computer-based databases enhanced (containing species/genetic information). Were these databases made available for use by UKOTs?	1, made available to St Helena Government
13a	Number of species reference collections established. Were these collections handed over to UKOTs?	
13b	Number of species reference collections enhanced. Were these collections handed over	St Helena Government seed bank enhanced

<b>Code</b>	<b>Description</b>	<b>Totals (plus additional detail as required)</b>
	to UKOTs?	
<b>Dissemination Measures</b>		
14a	Number of conferences/seminars/workshops/stakeholder meetings organised to present/disseminate findings from UKOT's Darwin project work	
14b	Number of conferences/seminars/workshops/stakeholder meetings attended at which findings from the Darwin Plus project work will be presented/ disseminated	
<b>Physical Measures</b>		
20	Estimated value (£s) of physical assets handed over to UKOT(s)	£
21	Number of permanent educational/training/research facilities or organisation established in UKOTs	
22	Number of permanent field plots established in UKOTs	
23	Value of resources raised from other sources (e.g., in addition to Darwin funding) for project work	

## Annex 4 Publications

Provide full details of all publications and material that can be publicly accessed, e.g. title, name of publisher, contact details. Mark (\*) all publications and other material that you have included with this report

Type *	Detail	Nationality of lead author	Nationality of institution of lead author	Gender of lead author	Publishers	Available from
(e.g. journals, manual, CDs)	(title, author, year)				(name, city)	(e.g. weblink, contact address, annex etc)

## Annex 5 Darwin Contacts

<b>Ref No</b>	DPLUS037
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