Biodiversity Challenge Funds Projects
Darwin Initiative, Illegal Wildlife Trade Challenge Fund, and Darwin Plus
Half Year Report

Note: If there is any confidential information within the report that you do not wish to be shared on our website, please ensure you clearly highlight this.

Submission Deadline: 31st October 2023

Project reference	DPLUS157
Project title	Managing the pathogens threatening St Helena's biodiversity and food security
Country(ies)/territory(ies)	St Helena
Lead partner	CABI
Partner(s)	St Helena Research Institute (SHRI), Environment, Natural Resources and Planning Directorate (ENRP)
Project leader	*Rob Reeder*
Report date and number (e.g. HYR1)	*25/10/23; HYR3*
Project website/blog/social media	*https://blog.cabi.org/2021/09/27/cabi-to-work-in-partnership-to-help-protect-st-helenas-biodiversity-and-enhance-its-agriculture/*

Outline progress over the last 6 months (April – Sept) against the agreed project implementation timetable (if your project has started less than 6 months ago, please report on the period since start up to end September).

Although we are not looking for specific reporting against your indicators, please use this opportunity to consider the appropriateness of your M&E systems (are your indicators still relevant, can you report against any Standard Indicators, do your assumptions still hold true?). The guidance can be found on the resources page of the relevant fund website.

The first two quarters of the year covered the winter season on St Helena, a time when there are fewer opportunities for conducting field-based and other onsite activities. Subsequently, no visits from the UK to St Helena took place during this period. However, sampling of soils and diseased plants by the team based on St Helena continued. A total of 86 isolates were sent to the lab-facilities in the UK for analysis. These were received on three occasions between April and September 2023. Data from these samples largely complement the results from the previous field survey conducted by the team in October/November 2023, and covered in the annual report.

Field sampling in the peaks national park has become more restricted due to measures put in place to limit further spread of plant diseases. These restrictions were put in place by the St Helena Government in April 2023, under the authority of the Environmental Protection Ordinance (issued in 2016) the new regulations were instigated based largely on the recommendations made through our project. **See SHG statement here.**

The dieback of trees on the island and restricted access to the peaks is impacting other project activities on the island, particularly those related to the Cloud Forest Project. To improve communications and address these challenges, a task-force was formed that includes the CABI project team. The task force convenes regularly through virtual meetings, with the sessions being chaired by the Cloud Forest Project. A further collaborative meeting took place when

Kirstie Ellis and Shayla Ellick (both RSPB/) visited the CABI team on the 19th May 2023, to discuss ways of coordinating the ongoing research projects on St Helena.

In addition to the taskforce meetings, five project team meetings were held between April and September 2023. The project also benefitted from inputs from Rebecca Cairns-Wicks, who serves as the project coordinator for activities on St Helena. Rebecca Cairns-Wicks visited CABI at Egham in September 2023 and during a two day workshop a detailed work-plan covering the next six months was developed.

Due to the urgency to identify the causal agents behind the tree dieback on St Helena, Defra has now supplied additional funding complementary to DPLUS157. This new funding is to support inoculation experiments using the putative pathogens collected during the project and to survey the distribution of these pathogens using the LAMP genie system.

The third field site visit by the CABI team (Phil Taylor, Jayne Crozier and the PhD student Amy Webster) commenced on the 12th of October and is ongoing until the 6th of November. This visit focuses on providing further training on plant disease management to stakeholders on St Helena. Additionally, the team will be engaged in isolating pathogens from further diseased endemic trees. This work aims to gain deeper insights into the host range of the pathogens and to facilitate the setting up of testing facilities for an inoculation experiment scheduled for January/February 2024.

Other activities between April and October were:

- Processing of pathogen samples from the second field survey and subsequent three batches collected by the St Helena based team.
- Developing methods on St Helena to produce diseases free tree seedlings for inoculation experiments.
- Preparation of the next field site survey, which has just started at the writing of this report (October/November 2023) including setting up a training programme and developing tailored training materials.
- Developing the experimental protocol for pathogenicity testing of isolated pathogens from the endemic tree species at Egham
- Providing advice to ENRP on the construction of a shade house testing facility, which will allow the safe undertaking of inoculation experiments in St Helena in January 2024.
- Providing remote training and materials for the culturing and export of samples to CABI. This included advice on the preparation of selective media on island.
- Sequencing, by the PhD student, of single isolates of *Ilyonectria* and *Phytophthora*, to start building reference genomes for each of the candidate pathogens
- Analysis of 10 months of monitoring data, relating to the 12 monitored black cabbage trees, undertaken by the PhD student.
- Two applications submitted to SHG requesting access to the Peaks restricted sites for monitoring of the 12 monitored black cabbage trees and pathogen sampling.

<u>Progress on specific activities to be covered in Q1-Q2 of Year 3:</u>

1.2 Cataloguing of pathogens and associated vectors including the ones recorded during the project. This activity will be based on excel and is an ongoing process. The catalogue will remain open for further additions beyond the termination of the project.

First drafts of the database including the results from the literature search and records collected during the first two visits have already been provided as annexes to the previous annual reports. Adding to this database is an ongoing process and more records will be added during the lifetime of the project. A new development is the creation of an Access database, produced by the project team based on St Helena. This database has been created to hold additional ecological details regarding all pathogen samples taken from endemic plant species.

2.1.2 Second on site survey for tree pathogens by BIFoR Phd student

This was originally scheduled for Q2 of year 2. However, due to the slow growth of seedlings from the endemic trees, a change request was submitted to delay this visit into the next project year. The visit is currently under way (October 2023, with the student Amy Webster having left the UK on the 12th of October.

The assessment of marked endemic trees selected by Amy Webster for her studies and the collection of a range of abiotic parameters is continuing on St Helena but had to be scaled down significantly due to the newly imposed access restrictions to the peaks national park.

2.1.3 & 2.2.3 Processing of samples and development of assessment report

A range of plant pathogens collected during the first two site surveys have already been isolated and identified during the first half of this project year. In addition, a number of isolates sent by the team in St Helena are in the process of molecular identification.

Amongst the more interesting results, was the isolation of *Phytophthora* (c.f. *P. kelmanii*) from a seedling of the endemic Whitewood (*Petrobium arboretum*), grown at the tree nursery in Scotland, St Helena. This finding highlights two crucial points.

First, there is a pressing need to improve the production facilities at Scotland, to enable the cultivation of disease-free seedlings. Second, it indicates that the environmental conditions in Scotland are conducive for the infection of tree seedlings. This finding is particularly significant as a new facility is planned to be built at Scotland for the inoculation experiments.

Amy Webster has been working at Egham to extract DNA from two of the most interesting isolates, one *Phytophthora* and one *Ilyonectria*. These isolates have been sequenced using PacBio, Nanopore and Illuimna sequencing platforms and are currently being used to carry out de novo assembly. This analysis will provide a high-quality reference genome which will be used for designing specific primers (both LAMP and qPCR) for detection of these pathogens in the field, as well as future molecular experiments.

Whilst on the island, it is planned for Amy to collect soil samples from around the 12 monitored black cabbage trees for DNA extraction and molecular analysis. Next Generation Sequencing will be used to confirm the presence or absence of potential pathogen(s) in the soil. Additionally, she will be sampling for *Phytophthora* from the George Benjamin Arboretum, where a range of endemic tree species are known to be affected by this pathogen. These isolates will be combined with additional isolates collected by the St Helena team post visit and form the basis of a phylogenetics study. This study aims to provide insight into the diversity of *Phytophthora* on the island in relation to its geographical distribution and its association with endemic tree species. If an insufficient number of isolates are obtained for a thorough phylogenetics study, soil samples will be used to measure microbiome diversity.

As outlined above, the processing of samples has become a continuous process. This has been made possible by the training received by the team on St Helena, which allows them to independently collect and isolate samples, sending them at regular intervals to the UK for identification. Finalised identifications continue to be added into the growing database, and updates will be included in the annual reports.

3*.1 Action plan to mitigate identified threats in all assessed sectors developed jointly with and made available to all stakeholders*

The development of the action plan is intertwined with the training activities to prepare stakeholders for a more sustainable crop management. In a first step we have developed targeted training modules initially focusing on diagnostics.

Plans for the second set of training activities have been drawn up and the visit by the CABI team to conduct these workshops are currently ongoing. As part of this, two project team members will conduct a series of training events over a two-week period in October (see preliminary training plan below).

The highest urgency with regards to future actions plans lies undoubtedly with the rescue of the surviving endemic trees and future conservation efforts for these and any associated species. Therefore in 2023 we shifted the focus on developing action plans towards these goals. To do

this efficiently, we joined forces with the cloud forest project and have outlined the development of two separate action plans regarding the production of disease-free seedlings at the nurseries at Scotland and for future conservation work, stabilising and restoring tree populations in situ within the peaks national park.

OCTOBER 2023

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rmers work- op	24 Lab work/field visits Evening session Farmers	25 Forestry & conservation training/ workshop	26 Forestry & conservation training/ workshop	27 Summing up	28	29 Phil depart
	31					

4.1.1 *Development of training material based on action plan*

Training material based on recommendations developed through the assessments of plant health problems concerning commercial crops have been developed and are currently used in the ongoing training workshops focusing on diseases management.

4.1.2 *3 workshops held on St Helena to train relevant stakeholders in diagnosis of diseases and best practice for efficient control*.

Training workshops on diagnosis have already been completed in 2023 and the ongoing workshops in October/November 2023 will focus on best practice for disease management.

4.1.3 Student and community engagement through trial plot at Prince Andrews School; ongoing supervision onsite by SHRI and ENRD

This has already been partially covered in 2022 and further engagement with pupils and staff of the school is planned for October/November 2023.

4.3 First onsite training of at least 6 staff in using improved diagnostic facilities & online tools; established Plantwise test applied before and after training to measure the increase in knowledge by an increase in the score on the two tests in Q4 Y1; further onsite supervision of trained staff during follow on CABI team visits Q2 Y2, Q4 Y2 and Q1 Y4

Setting up of the lab at ENRD has now been completed and isolation and culturing of pathogens is an ongoing activity in the lab. Several online sessions to supervise isolating and

culturing have been conducted since. This has enabled the team on St Helena to culture a high number of isolates and to send pure cultures to the UK for identification.

5.1 Implementation of treatment measures starting during Y3 Q2

The main problem of commercial crop production on St Helena has been in relation to tomato production in polytunnels, which lacked the implementation of a range of phytosanitary measures to prevent the proliferation of plant pathogens such as *Pythium* and root attacking bacterial pathogens. A range of recommendations has been issued to the growers and these have been implemented. These recommendations will reduce disease pressure and hence losses to disease however, it is too early to report on outcomes. In field crop production does not appear to suffer from the usual disease found in other areas of the world, the major limitation on crop production here appears to be insect pests.

Other activities:

We also dealt with the reviewers' comments to the last annual report and action points were put in place to respond to them. This mainly includes an update to the indicators in the log frame making them smarter. Updated indicators had already been submitted last year to the Darwin Initiative along with our previous HYR. However, the reviewer could not access this document and has asked to submit updated indicators in form of a change request (which was not requested previously). We will therefore submit a change request with updated indicators shortly.

2. Give details of any notable problems or unexpected developments/lessons learnt that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.

One essential part of the project involves confirming that any potential pathogens isolated from endemic trees are the causal agents of the observed tree death. This is done experimentally by infecting seedlings with these potential pathogens according to Koch's postulates. The rarity of these endemic species means that there are limited genetic resources for these experiments. The production of test plants from seed is taking longer than expected although we have addressed this problem already in the previous project year. In addition to the slow germination and growth rate, we have ironically been hampered by maintaining them disease free. A lengthy restructuring of nursery equipment and procedures has been necessary. This was initiated at the earliest possible point and seedling production is still ongoing. To expedite the testing, additional funding has been secured through a separate Defra grant. The grant provides funding for the construction of a new shade house testing facility, required for the safe conduct of inoculation experiments and additional on island surveys using the LAMP genie. Despite the additional funding further delays have been experienced due to the requirement for planning permission for the test facility. Initially it was thought this was not required as the new building was replacing an existing poly tunnel.

In addition, delays have been experienced in obtaining permissions from the St Helenian authorities to;

- allow, microorganisms isolated from St Helena to be re-imported (for inoculation experiments).
- access to the endemic trees in the wild for further sampling.
- inoculate seedlings in the test nursery.

At the beginning of 2023 we anticipated conducting the inoculation experiments in October/November. This has now to be shifted to January-March 2024. However, we believe the project is still on track to achieve its objectives and no other significant problems have been identified.

3. Have any of these issues been discussed with NIRAS and if so, have changes been made to the original agreement?	
Discussed with NIRAS:	~~Yes~~/No
Formal Change Request submitted:	~~Yes~~/No
Received confirmation of change acceptance	~~Yes~~/No
Change request reference if known:	

4a. Please confirm your actual spend in this financial year to date (i.e. from 1 April 2023 – 30 September 2023)

Actual spend: [redacted]

4b. Do you currently expect to have any significant (e.g. more than £5,000) underspend in your budget for this financial year (ending 31 March 2024)?

Yes ☐ **No** x☐ Estimated underspend: £ 0

4c. If yes, then you need to consider your project budget needs carefully. Please remember that any funds agreed for this financial year are only available to the project in this financial year.

If you anticipate a significant underspend because of justifiable changes within the project, please submit a re-budget Change Request as soon as possible. There is no guarantee that Defra will agree a re-budget so please ensure you have enough time to make appropriate changes if necessary. Please DO NOT send these in the same email as your report.

NB: if you expect an underspend, do not claim anything more than you expect to spend this financial year.

5. Are there any other issues you wish to raise relating to the project or to BCF management, monitoring, or financial procedures?

If you are a new project and you received feedback comments that requested a response, or if your Annual Report Review asked you to provide a response with your next half year report, please attach your response to this document.

All new projects (excluding Darwin Plus Fellowships and IWT Challenge Fund Evidence projects) should submit their Risk Register with this report if they have not already done so.

Please note: Any planned modifications to your project schedule/workplan can be discussed in this report but should also be raised with NIRAS through a Change Request. Please DO NOT send these in the same email.

Please send your **completed report by email** to BCF-Reports@niras.com. The report should be between 2-3 pages maximum. **Please state your project reference number, followed by the specific fund in the header of your email message e.g. Subject: 29-001 Darwin Initiative Half Year Report**