

Darwin Plus: Overseas Territories Environment and Climate Fund Annual Report

Important note *To be completed with reference to the Reporting Guidance Notes for Project Leaders:
it is expected that this report will be about 10 pages in length, excluding annexes*

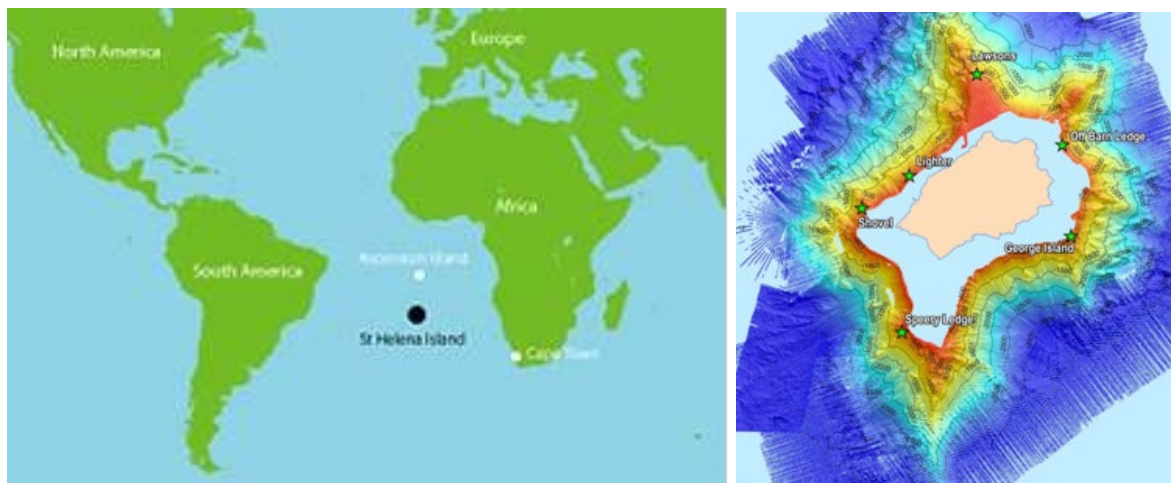
Submission Deadline: 30th April 2018

Darwin Plus Project Information

Project reference	DPlus070
Project title	Oceanographic influences on the St Helena pelagic ecosystem
Territory(ies)	St Helena
Contract holder institution	Environment and Natural Resources Directorate (ENRD), St Helena Government (SHG)
Partner institutions	British Antarctic Survey (BAS) South Atlantic Environmental Research Institute (SAERI)
Grant value	£247,232
Start/end date of project	July 2017 to December 2019
Reporting period (e.g., Apr 2017-Mar 2018) and number (e.g., AR 1,2)	July 2017 to April 2018 AR1
Project leader name	Annalea Beard
Project website/blog/Twitter	http://www.sainthelena.gov.sh/marine-division/ https://www.facebook.com/sthelenaconservation/
Report author(s) and date	Alison Small 27/04/2018

1. Project overview

St Helena is an isolated oceanic island in the South Atlantic. The island, together with two major seamounts in the 200 nm maritime zone, provides oases in an otherwise oligotrophic region. These oases attract globally important megafauna, such as whale sharks, humpback whales and migratory tunas, whilst the island itself is home to a range of breeding seabirds.



To date research has been undertaken on the whale sharks, seabirds and tunas, but little has been done to investigate the pelagic ecosystem that supports them or understand the role of the island and seamounts in enhancing productivity.

As part of the blue-belt initiative, St Helena declared a Category VI Sustainable use Marine Protected Area (MPA) in the entire maritime zone in early 2017. A key-part of ensuring sustainability is to understand the pelagic ecosystem and how seasonal or long-term changes in that system will impact the abundance and distribution of the whale sharks and fish on which the economy of the island depends.

The project aims to deliver key baseline data on the pelagic ecosystem around St Helena needed for gauging future change and effective fisheries and marine management. Fishing is an important recreational and commercial activity on St Helena, so evidence-based decision-making will contribute significantly towards sustainable local economic development.

2. Project stakeholders/partners

Dplus070 has two project partners: British Antarctic Survey (BAS) and the South Atlantic Environmental Research Institute (SAERI) and one independent consultant. Since the project commenced there has been regular correspondence with all project partners regarding areas of work covering outcomes they are involved in. Through this project partners have been directly involved in planning and decision making over the course of the project. Additionally, through group monitoring and evaluation meetings, all project partners have been given the chance to discuss their views on project progress and future direction.

British Antarctic Survey: BAS were directly involved in deciding what remote sensing products were needed to investigate oceanographic variability over time around St Helena, sourcing delivering historical data to St Helena as well as monthly updates to these time series as they become available. BAS has been involved in developing the methodology for Conductivity Temperature Depth probe (CTD) deployment as well as the seabird methodology. BAS have been further involved in Dplus070 through their 'Food security in the South Atlantic Islands' project, see below (page 3).

South Atlantic Environmental Research Institute: SAERI provide data management support. They were directly involved with creating an Access database to store project data and are developing metadata practices and providing GIS training and support for the project duration.

Independent consultant (Rachael Shreeve): The independent consultant has been involved in all aspects of work relating to zooplankton sampling, from procurement of equipment, sampling

methodology, sample preservation and analysis and staff training. Two weeks have been spent on the island by the independent consultant from April 13th 2018 to April 28th 2018 to deliver training in these aspects.

The following stakeholders, departments and organisations have been involved in the project so far;

- *ENRD directorate*: Project updates have been submitted to the monthly ENRD newsletter in February 2018, March 2018 and April 2018 to keep the wider directorate informed of on-going work.
- *ENRD Environmental Management Division (EMD)*: EMD work with Dplus070 to ensure safe handling of equipment and chemical waste. They have been part of developing Material Safety Data Sheets and risk assessments and have advised on Personal Protective Equipment (PPE) and improving laboratory safety.
- *Marine Tourism*: Dplus070 worked with Tourism on Marine Awareness Week 2018 to increase awareness relating to the project. Two staff members from Tourism helped design the logo and handled promotion for the event. Two boat operators who run marine tourism businesses are directly involved in project surveys (bait fish and CTD). Boat operators have helped to develop survey methods that are appropriate for their vessels.
- *Fishing industry*: Fishermen are involved in the project by helping with project work in CTD surveys, zooplankton surveys and bait fishing. Additionally, one local boat crewmen who works on Dplus070 CTD surveys joined a visiting survey ship (the RRS James Clark Ross) for seven days as part of the SHG contingent to immerse him in pelagic science, increase his interest and understanding of oceanographic measurements and to start conversations about his experience after he returned.
- *Policy makers*: a presentation was given to seven councillors to introduce the project, what the project is aiming to achieve and how that information will be useful for marine management.
- *Local and international NGOs*: St Helena National Trust (SHNT) has been involved with the project through marine awareness week and through survey work. One staff member helped with marine awareness week, working closely with Dplus070 for seven days. Another SHNT staff member spent one morning assisting sampling a bait fish catch.
- *BAS 'Food and economic security in the South Atlantic Islands' project and Centre of Environment, Fisheries and Aquaculture Science (CEFAS) 'Blue Belt' project*: Both projects worked together to fund eight days of research in St Helena waters on board the Royal Research Ship James Clark Ross (JCR) in April 2018. Both projects worked with Dplus070 to focus their sampling strategy to compliment the work being done by Dplus070 or to directly tie in to the Dplus070 project outcome. For example, CTD casts were completed at the same six locations that Dplus070 samples every month.

The main challenge with stakeholders is finding time to meet and work together that is suitable for all, especially given the unique logistical challenges presented by the island. This is a particular challenge as sea conditions effect Dplus070 scheduling as well as multiple stakeholders and are subject to change at short notice. For example, when the sea is calm, fishermen may choose to take advantage of the weather to spend multiple days at Bonaparte seamount, and are thus unable to work on Dplus070 surveys.

Lessons learnt during this reporting period are that having a high degree of flexibility in scheduling and being willing to work unusual hours and in uncomfortable sea conditions, as long as it is safe to do so, mean that this challenge is well managed.

Supporting evidence is provided in Annex 3.

3. Project Progress

Project commenced in July 2017. It should be noted that the first 2 months were spent procuring equipment and recruiting the Project Officer (Alison Small) who arrived on island in mid-October, when work on all project activities began. Previous to this only work towards output 4, activity 4.1 (bait fish sampling) had commenced. Progress towards all other project activities represents 6 months of work. A change request was submitted and approved to extend project to December 2019 because of this (see Annex 3).

3.1 Progress in carrying out project Activities

1.1 St Helena staff will be trained to operate the CTD and to undertake basic analysis of oceanographic data (satellite and CTD).

A guide has been written and made publicly available on the SHG shared network for the Valeport mini CTD which explains how to program, deploy, download data and generally maintain the CTD. Simple maintenance, including checking programming and changing the battery has been completed by three SHG staff members. A user guide has been produced for the Secchi disk which is also on the SHG shared network. These are aimed at novices and are usable by any new staff member coming into the Marine section. Log sheets have been produced for metadata recording in the field. Three staff members have received training in the field using the CTD and Secchi and a survey has been led by one of the newly trained staff members. Further field training is planned as monthly sampling continues. In addition to this, three SHG staff members and one stakeholder (a local fisherman and crewman for the CTD sampling work) spent 7 days on board the RRS James Clark Ross which undertook oceanographic surveys around the island. During this time staff shadowed scientists and had CTD measurements explained in detail to them to further their understanding.

1.2 St Helena staff will be trained to undertake plankton trawls and to identify and quantify catches.

A user guide for the simple zooplankton nets has been produced and made available on the SHG shared network. It explains what equipment to take for zooplankton sampling, how to deploy the kit and how to handle and preserve the samples. It is designed for novices and will be usable by any new staff member coming in to the department. The zooplankton nets have been successfully deployed on two sampling trips (in March and April 2018 - a total of 12 hauls) during which time three marine section staff received practical experience.

Zooplankton identification skills have been taught to four staff members. This included tests for zooplankton identification and abundance counts which were checked by the independent consultant and microscope handling skills. Feedback was given after training sessions by the independent consultant to SHG staff to clarify any errors made and highlight strengths and weaknesses. Staff have also been taught how to use the Folsom plankton splitter to take subsamples and a guide for using the equipment has been produced for reference and new staff members. Hours of training are being logged by the project officer and are being checked by the independent consultant.

2.1 Remote sensing data will be acquired and analysed to investigate the role of St Helena and the seamounts in influencing physical and biological oceanography.

Remote sensing products have been acquired. These include time series of sea surface temperature, chlorophyll-a (chl-a) concentration, sea surface salinity and sea surface height anomaly. The historical data to present was downloaded by BAS and delivered to St Helena on a memory stick as the data set was too large to be downloaded on island due to the limited bandwidth. This bandwidth limitation has caused other issues on the project when working with large datasets. Monthly updates to these time series are downloaded by BAS and delivered to St Helena through a shared DropBox folder. Currently a plan for analysing these data within the software and bandwidth limitations of SHG are being developed.

2.2 CTD monthly sampling programme established and continues throughout the project.

There was a delay in commencement of monthly sampling using the CTD due to a delay in hiring the project officer who leads on this. The project officer arrived on island in mid-October 2017 and sampling commenced in December 2017. The delay between the project officer arriving and CTD sampling commencing was due to the tender process needing to be completed for hiring a boat for this work. Monthly sampling occurred on schedule for December, January and February. A survey was completed in March 2018 but the Valeport CTD equipment failed and didn't record any data. Its programming and housing were checked on island and no obvious faults could be detected. The Valeport CTD has been sent back to Valeport customer services and is currently being assessed for repair.

While the JCR was in St Helena waters, per request, CTD casts were done at Dplus070 sample stations. These data have been shared with SHG and can be used for the monthly project data for April 2018. CEFAS was approached about purchasing an additional Valeport CTD (same model) for SHG as part of their funding to assist Overseas Territories (OT), which was subsequently approved.

It is possible that May's sampling will be missed as the CEFAS funded CTD is unlikely to arrive in time. The original CTD will be repaired if possible, and replaced if not, and sent back to SHG so that there are two functional CTDs on island in order to prevent this situation from happening again.

Consecutive sampling for the duration of the project will not be possible, however every month should be sampled by project completion as sampling will take place over 20 months. This should allow for the objective of the sampling to still be successfully met.

2.3 CTD data will be analysed to ground truth remote sensed data and to determine seasonal and spatial variability in the depth of the mixed layer and water mass properties.

This is scheduled for year 2 of the project but has been started already. Preliminary data has been plotted to check cast profiles. Code has been written in R to process cast data and calculate useful parameters (such as mixed layer depth). This has been successfully tested using example cast data in Valeport formats. The next step is to test it using Valeport data files.

As a back up to this system, an Excel 4 macro has also been acquired which can do the same processing. This has been tested with example cast data and will be tested using Dplus070 files. This is to ensure that there is a backup method to analyse CTD data which can be used by new staff coming into the department if the original R code is altered or corrupted and cannot be corrected.

3.1 Zooplankton samples will be collected from 3 locations on a monthly basis (for 18 months).

There was a delay in commencing zooplankton sampling due to the zooplankton nets not arriving on island until February 2018 (despite being ordered in May 2017). Sampling commenced in March 2018 and, to date, 2 months of samples have been collected from three stations. At each station two nets, with different mesh sizes, are deployed to capture the spectra of mesopelagic zooplankton. A change request form was submitted and approved to extend the project end date to December 2019 in order to complete the full period of sampling and to have time for sample analysis.

In April 2018 deployment methods were observed by the independent consultant to ensure validity of methodology. Due to only being able to sample during daylight hours, combined with the large vertical migrations which zooplankton can undertake, a further check on validity of sampling was undertaken. While on board the JCR, night hauls were done to 200m to compare zooplankton composition as well as one daylight haul to equal depth of SHG samples. Samples can be compared to check that organisms being captured by SHG sampling protocol are comparable to those captured by BAS standardised protocol and that the biodiversity seen in night samples, when zooplankton migrate to the surface to feed, are captured by the daylight sampling.

The laboratory is now properly stocked for zooplankton identification work and risk mitigation in place for hazardous chemicals, which was not available previously. These include risk assessments, PPE (respirators, gloves, goggles and lab coats), safety information sheets, a spill kit and a waste disposal protocol.

3.2. Zooplankton guide prepared to help analyse plankton samples and fish stomach contents.

Completed - Literature has been purchased to aid in zooplankton identification. In addition to these resources a simple key has been developed to easily guide novices to the correct taxonomic group through simple zooplankton features.

This key has been printed and mounted for ease of use and contains lots of images which were requested in feedback against previous versions of the final guide. There is the scope to easily expand the guide if new species/groups are identified in later samples. A type collection of zooplankton specimens from St Helena has been created for reference to aid identification.

3.3 Zooplankton samples will be identified (focussing on most abundant species) and quantified to look at seasonal and spatial patterns.

In total, 12 zooplankton samples have been collected (2 samples from three stations each month, for two months). All 12 of these samples have been subsampled, identified and quantified. These samples have also all been counted by the independent consultant and will be kept to be used as an identification test for new staff members starting identification later in the year. As a quality control two SHG staff members will count each half of the final subsample split in the Folsom splitter.

Zooplankton abundance counts between SHG staff members were different by <5%. If counts differ widely between the two staff the same sample will be recounted together using a microscope camera with on-screen display in order to determine where the variance in original counts occurred.

4.1 Sampling programme for bait-fish established with 200 fish sampled for length, sex and stage each month and stomachs retained from 50 fish per month.

The baitfish sampling programme has been established and commenced in August 2017. There was some initial concern that the fishermen would not be willing to hand over bait during certain periods when the bait is scarce, to mitigate this the work was put out to tender, which delayed the commencement of sampling by 1 month from the start of the project.

A subset of otoliths are collected from the fish each month which will be sent to CEFAS, UK, for analysis. Some gonadal samples have been collected and preserved in formalin for histological analysis at CEFAS in Lowestoft to resolve any uncertainty in gender identification of small individuals. Stomachs are weighed and retained from at least 50 fish per month.

Under-sampling of some species has been an issue. The same fishing effort is put in every month but some quotas are not always reached. A bait aggregation device has been deployed to try mitigate this. This under-sampling may be related to currently unknown seasonality in baitfish abundance (which this project aims to investigate).

4.2 Stomach contents identified using knowledge gained from plankton sampling and using plankton guide.

Initially, stomachs were frozen for later analysis of contents as information about the zooplankton populations were needed but unknown. Analysis of stomach contents commenced in April 2018 after the zooplankton guide was completed. Two staff members have been given training by the independent consultant on how to best categorise the stomach contents in relation to the zooplankton populations and recording sheets have been created. To date 60 stomachs have been analysed.

6.1a Deployment of 20 GPS loggers on breeding MPS and BRNs on Egg Island over two seasons.

This has been completed for one season in December 2017 for the breeding Brown Noddies (BRN) and the Madeiran Storm Petrels (MSP) during their "hot" season (October-March). In total, 13 GPS loggers were deployed onto MSP's and 7 GPS loggers were deployed onto BRN's.

6.1b Retrieval of GPS loggers, download and analysis of data to produce maps of at sea distribution and range from St Helena.

Retrieval success of loggers from the December 2017 season was 92% for MSP and 86% for BRN. In total 12 of the 13 GPS loggers deployed onto MSP's were retrieved. Of the 7 GPS loggers deployed onto BRN's 6 were retrieved.

Brown Noddie loggers proved very difficult to retrieve once deployed as the birds became much more wary of humans in the area after being handled once. Data has been downloaded and maps of foraging paths produced.

6.1c Upload tracking data online to appropriate database

All GPS tracking data retrieved has been uploaded onto "Movebank" a freely accessible online data repository (www.datarepository.movebank.org).

6.2a Collection and identification of prey items in regurgitates. Creation of a regurgitate catalogue for samples collected.

Ten instances of spontaneous regurgitates were collected from the December 2017 season for BRN which were identified and weighed. There was no occurrence of spontaneous regurgitation from any MSP.

6.2b Collate prey species list and overall diet composition for each seabird species and publish online.

Prey species were identified where possible, from the December 2017 season and data compiled into a prey list. The taxonomic level has been kept more generalised as it was not possible to identify contents to a species level. As further seasons regurgitates are analysed this list will be added to before being published at the end of the project.

6.4 Compile results and formulate into journal article suitable for publication in a peer reviewed journal.

This is planned for year 2 of the project but the data from the December 2017 season for both BRN and MSP has been submitted for peer review to the Journal of Marine Policy as part of a wider study into patterns of space use by breeding seabirds (Oppel *et al*, 2018, 'Spatial scales of marine conservation management for breeding seabirds').

7.1 Database and GIS system established to support all project data.

An Access database was completed in February 2018 by SAERI to support all project data as there was an immediate need for a way to manage the data. There is also the aspiration to move the data over to QGIS/other GIS based system for geospatial viewing however this is less urgent and also proves problematic when hosted on the SHG system. Collaboration between the project officer and SAERI on the Access database is ongoing in order to incorporate fields for zooplankton taxonomic groups and bait fish stomach contents as needed.

8.2 Plain English pamphlets and presentations prepared to inform St Helena stakeholders, public, schoolchildren and visitors about the importance of the marine system to the island.

This is planned for year 2 of the project. However, this education and information around this has already begun as oceanography, lower trophic levels of the pelagic ecosystem and ecosystem management approaches are a new concept for many of the project stakeholders. This will help to facilitate the dissemination of project outputs in year two.

A presentation was given in August and another in November 2017 to 7 council members who are involved in approving marine management policies. The aim of this was to provide an overview of the project, set out its goals, and (where necessary) provide more detail..

In addition, marine awareness week was run in March 2018 with the theme '*Our invisible ocean: from plankton to plastics*'. This was focused on the pelagic ecosystem, food web interactions and lower trophic levels. This included an A0 poster in plain English titled 'Plankton: the ocean drifters', two school work books aimed at primary and secondary school children which were handed out to all schools, interactive food web activities, 'fun plankton facts' on EMD's Facebook page and two radio interviews on the local radio stations.

Activities 2.4, 3.4, 4.3, 4.4, 5.1, 5.2, 6.3, 7.2, 7.3 and 8.1 are planned for year 2 of Dplus070.

Supporting evidence for project activities is provided in Annex 3, including evidence from previous sections. .

3.2 Progress towards project Outputs

Output 1: Capacity building, with ENRD staff trained in oceanographic data collection methods, plankton sampling and data analysis.

Before Dplus070 commenced no staff member could use the Valeport CTD or zooplankton nets.

Four staff members can now programme, maintain, deploy and download data from the CTD and user guides are complete for any new staff members or reference. One newly trained staff member has successfully led on a CTD survey. Three staff members have had practical

experience deploying the zooplankton nets and handling samples. Four staff members have received zooplankton identification training and can identify zooplankton samples to a taxonomically useful level. This outcome is on track to be completed well within schedule.

Means of verification are being measured by the Project Officer logging training hours, by checking independently collected data and observing during independent surveys. Oceanographic data is sent to BAS for checking and advice. This is supposed to be verified by BAS logging training hours but this is not realistic due to the rapidity in which schedules can change and the remoteness of the location. When sea conditions change schedules and training times change at the last minute – this would be extremely difficult to keep track of remotely.

Another output indicator is that as part of training process, SHG staff will undertake plankton ID tests and that sub-sets of subsequent samples will be checked by the consultant. This has been completed and worked well for objectively assessing SHG identification skills. Samples with known zooplankton biodiversity and abundance have been retained so that new staff members can be assessed by the same criteria.

Output 2: Characterisation of seasonal patterns in physical and biological oceanography and the role of the island / seamounts in enhancing productivity.

Before Dplus070 there was no remotely sensed oceanographic data available to SHG.

Time series of remotely sensed data for sea surface temperature, sea surface salinity, sea surface height anomaly and chl-a concentration have been acquired for historical data and a system for receiving monthly updates is in place via a shared folder between BAS and SHG on DropBox. Software to analyse satellite data has been sourced (Octave and Rstudio) but analysis has not started.

Monthly CTD sampling started in December 2017 but equipment failure means one month of CTD sampling has been missed. The kit has been sent away for repair and is now with the manufacturer. In the meantime JCR data will be used to fill the data gap for April 2018. It is possible May 2018 will be missed if a CTD cannot be delivered in time. A back up CTD has been funded by CEFAS through their OT assistance budget stream to prevent this situation occurring again.

This outcome is achievable by the end of the project. Although possibly two months of CTD data will be missing from the 20 months of sampling, the sampling period is long enough to cover the missed months from 2018 during 2019. Additionally, the missed months are not consecutive as JCR data can be used for April 2018, which decreases the time period of unknown water column structure. Seasonality in oceans typically occurs on timescales greater than 1 month, thus the missing data should not negatively impact progress toward the project output.

Satellite data processing is behind schedule due to IT limitations and understaffing on the project on Island. The project officer was hired 4 months after the project had started and the fieldworker and data clerk role remained unfilled for 6 months. Additional staff have been brought in to the project (after approval of a change request form to split the aforementioned role into two, due to no suitable candidate applying to the original role) and suitable software sourced.

Measurable indicators for this output are to make a report available on SHG / project website and to submit a paper to a peer review journal for publication. These are indicators which can only be achieved at the summation of the project. There are no defined indicators to measure progress until then. Progress against the project activities has been used to monitor progress to this output.

Output 3: Characterisation of seasonal patterns in zooplankton abundance and biodiversity

Before Dplus070 there was no knowledge of the zooplankton community present in St Helena waters and no capacity to sample these organisms.

Equipment and skills have been introduced to SHG to allow this. Zooplankton sampling started in March 2018 and robust methodology developed and validated. Zooplankton samples have been identified and counted for these months to quantify abundance and biodiversity. Sampling will continue for another 16 months. This outcome is running 6 months behind the original timeline due to the previously explained equipment delays. A change request was approved to extend the project timeline and this outcome is now on track to be completed.

Measurable indicators are to create a St Helena zooplankton guide (completed), to write a report on zooplankton diversity and abundance to be published on SHG website and a zooplankton seasonality paper prepared for peer-review journal. The last two indicators cannot be achieved until the end of the sampling period but progress towards them can be made and reported against as sampling continues.

Output 4: Seasonal abundance, life history and feeding ecology of bait fish established.

Before Dplus070 bait fish species had not been studied.

Knowledge of baitfish seasonality and life history was only known through the catches of local fishermen and little information recorded. Sampling of 5 bait fish species began in August 2017 and has continued monthly. Length, weight, sex and maturity are recorded, a subset of otoliths are extracted and 50 stomachs retained and weighed and then frozen until further analysis. Stomach content analysis started in April 2018.

The bait fish sampling programme is one month behind schedule but the 18 months of sampling will be completed within the project timeframe. Stomach content analysis has a backlog to clear and a work plan is being developed to make sure staff have the hours to do this. If there are not enough staff to complete the necessary hours then a subsample of the stomachs will be analysed instead, making sure the number analysed produces a sample size large enough to be scientifically valid. This outcome is still achievable within the duration of the project. Dplus070 aims to achieve this outcome with the originally proposed sample size but will be monitoring sample processing times in case a change request is needed to be submitted to achieve the outcome with a smaller sample size if necessary.

Measurable indicators are a sampling programme established and data / stomachs collected and analysed (started in August 2017, ongoing), a report on baitfish ecology published on SHG website and a paper submitted to peer-reviewed journal. The last two indicators cannot be achieved until the end of the project but progress toward them can be reported against as sampling continues.

Output 6: Foraging ecology of two seabird species established and analysed with oceanographic data.

Before Dplus070 the foraging behaviour and space use of BRN and MSP on St Helena had not been studied.

One breeding season for BRN and MSP has been completed in December 2017 (for details see above: section 3.1, activity 6.1, page 6). Additionally, 20 GLS loggers were deployed on BRN during this time. Diet composition data were collected from ten spontaneous regurgitations from BRN with subsequent identification of contents. There were no spontaneous regurgitations by MSP.

This output is on target to be achieved for BRN by the end of the project. Regurgitate data for the MSP may not be possible as there have been no instances of this yet to date. However, their patterns of space use and foraging regions in relation to the oceanographic features within St Helena's EEZ can still be investigated, although their diet composition cannot be determined.

Measurable indicators are: 40 GPS loggers and 20 GLS loggers deployed on breeding MSP and BRNs through two seasons on Egg Island; diet compositions and important prey constituents identified; and analysis of foraging ecology data in relation to oceanographic parameters and authoritative scientific paper published. Means of verification of these are the retrieval of GPS loggers and the production of maps of at sea distribution and foraging range of breeding MSP and BRNs. This has been done for the December 2017 season.

Verification is also through the spatial data being added to global seabird tracking datasets online (completed for the December 2017 season), the production of a prey species list (partially complete after one season) and pie charts of diet compositions published online (not complete), as well as the publication of an article in a peer reviewed journal (this can be reported against as sampling continues).

Output 7: Database linked to GIS established for collation of oceanographic and biodiversity data.

A database to store project data has been created in Access with the view to moving it into a GIS based system as SHG and SAERI develop a better understanding of how to make that work with

the current IT setup on St Helena. A staff member from SAERI is visiting St Helena in May 2018 and has allocated some time to further progress in this regard.

This output can be achieved by the end of the project but how it will be achieved is still to be decided. A GIS based database may not be possible with the IT limitations of SHG but there is the option to host the GIS system on the SAERI server or other remote server.

Measurable indicators for this output are that a database and GIS system are established and made publicly available. This has been partially achieved as a database has been established.

Output 5 and Output 8 are not scheduled until year 2 of Dplus070.

Supporting evidence for project outputs is provided in Annex 3, including evidence from previous sections.

3.3 Progress towards the project Outcome

Outcome: Establish a basic understanding of the seasonal operation of the pelagic ecosystem that underpins St Helena's fisheries and tourism industries and evaluate how oceanography influences that system.

The baseline condition is that oceanographic variability around St Helena has not been investigated and SHG had no capacity to undertake this before Dplus070.

Knowledge of the operation of the pelagic ecosystem came from local people who use the ocean and fisheries science to support the commercially profitable organisms such as whale sharks and tuna species. The foundations of the system, which Dplus070 heavily focuses on were not understood or quantified.

Collection and collation of data across the project activities is producing information which, when combined, will produce a clear description of the basic operation of the pelagic ecosystem. Although commencement of sampling was delayed and staggered due to not having staff in place or equipment on island, the data can still be used meet the project outcome. Sampling and data collection is now progressing on a monthly basis for all project areas which are scheduled to be undertaken in year 1. The exception to this is the *in situ* CTD sampling which has stopped due to equipment failure. A mitigation plan has been implemented to ensure this does not prevent the project from delivering its activities, outputs and outcome.

Measurable indicators specific to the project outcome are; St Helena's population, particularly fishing and marine sector, understand the significance of the ocean system that surrounds the island and that management of the St Helena maritime zone utilises the greater understanding of the pelagic ecosystem developed in the project. These indicators are not easily delivered against on year 1 of the project.

A better measurement of achievement to the project outcome is the summation of progress against the project activities as this project is complex and contains many elements and different strands of research. In particular the progress toward Activity 8.1, and associated evidence, which has been focused on increasing understanding of what the pelagic ecosystem is and why the pelagic ecosystem as a whole is important to a variety of stakeholders.

3.4 Monitoring of assumptions

Previously identified assumptions/risks and development to date:

- Output 1: delivering training/measurable indicators for capacity building were based on the assumption that travel arrangements for BAS staff and consultants can be organised for appropriate time. Travel arrangements for the consultant were successfully organised and training given in person.

No arrangements were made for BAS staff to visit St Helena in year one of Dplus070 although a conversation has been had about sending SHG staff to the UK or BAS staff coming out in year 2 of the project. In the meantime, advice and oceanographic support has been through regular emails and skype calls. Data has been shared over DropBox and local staff time spent on

capacity building is being recorded by the Project Officer and progress measured against the activities.

- Output 2: a key assumption was that the CTD has no technical issues as equipment failure could take a while to repair / replace. To try to mitigate this risk strict adherence to the deployment protocol and equipment maintenance was applied. Despite this, equipment failure occurred. This risk had been discussed in January 2017 between the Project Officer and a visiting scientist from CEFAS. A discussion was had about the possibility of CEFAS purchasing a backup Valeport CTD through their OT fund. This option was being investigated when the equipment failure happened. After the equipment failure CEFAS was approached with a more urgent request and the purchase was approved. Going forward there will be two Valeport CTDs (subject to the original being successfully repaired) on the island for Dplus070 to better cope with equipment failure.

- Output 4: It was assumed the fishermen would assist with sample collection. This was considered a high risk assumption by staff at the beginning of the project as they were not certain that fishermen would be willing to hand over bait during periods where bait was scarce. To ensure bait for sampling, the work was put out to tender and a contract signed with a single stakeholder to deliver bait fish through a pre-agreed minimum fishing effort per month (3 bait trips).

- Output 5: a long term monitoring programme will depend on SHG being willing to fund it. This will depend on the strength of the cost/benefit argument that Dplus070 will need to develop as the project continues.

- Output 6: an identified risk was that GPS loggers would fail to be retrieved from the seabirds. Only a few loggers were deployed at first in December to see if they could be retrieved and what level of effort was required to retrieve them. Once there was some confidence the loggers could be retrieved the rest were deployed. MSP were retrieved quickly and extremely successfully. BRN required a higher level of effort to retrieve but rates were still high.

Risk mitigation is through increased staff effort in retrieval. Another assumption for output 6 was that both species would regurgitate prey freely. This was viable for BRN but has not been viable for MSP. Foraging ecology can still be assessed for this species through space use in relation to oceanographic features but diet cannot be inferred.

- Output 7: Appropriate web-based infrastructure to support a public GIS system would be needed. This is not currently the case on island but this can be achieved through remote hosting of the database if necessary.

- Output 8: The original risk was that this will be the final part of the project and potentially require input from scientists after the end of the funded period to finalise papers. This is still a risk that has extended to submission of the final report for the project. The project has been extended to December 2019 but not all roles will remain filled until this time.

The consultant's contract ends in June 2019 and the Project Officers contract ends in October 2019. The ability to commit to project needs beyond the length of contracts cannot be guaranteed and should not be depended on for successful on-time submission of the project final report.

Newly identified risks and mitigation strategies:

- Output 2: cloud cover affecting chl-a satellite imagery. The presence of cloud cover prevents satellite imagery being used to estimate chl-a concentration through remote sensing. To mitigate against the daily variation in cloud cover and loss of data, monthly composite images will be used. This will integrate over changes in phytoplankton biomass on scales of less than a month but will provide a basic understanding of the season cycles in phytoplankton biomass when analysed over multiple years.

- Output 3: a loss of power to the laboratory freezer for an extended period of time would result in the loss of bait fish stomach samples as there is no backup generator. However, as long as the power outage was noticed and monitored, the samples could be transferred into ethanol to prevent degradation. This is not ideal due to space and equipment limitations which is why samples are currently frozen.

3.5 Project support to environmental and/or climate outcomes in the UKOTs

At present, there has not been significant data output for the project to contribute to strategic long-term outcomes, however;

- Remote sensing data to describe oceanographic variability around St Helena over time has been acquired under a suitable licence so that the St Helena Government can use it.
- There have been 2 presentations to seven of the councillors about the project; to introduce the project and to further explain the outputs and how they may be able to support government work and the marine management plan.

4. Monitoring and evaluation

This has been covered in other sections (see section 2, 3.1 and 3.2).

The project finances have been managed through both departmental and corporate finances, and following lessons learnt from previous projects, a new system of cost codes that cover both Darwin Plus and SHG requirements have been implemented.

Quarterly monitoring and evaluation meetings were planned to discuss progress against project outputs, areas of concern and directions of the project over the next quarter. The first quarterly meeting was missed due to delayed recruitment. The second quarterly meeting went ahead as planned via a conference Skype call. All project partners were present except for the independent consultant who was in transit to St Helena on the JCR at the time and was therefore unable to join.

Monitoring and evaluation is primarily the responsibility of SHG as they are in the best position to review overall progress against the log frame and to monitor the relevance of outputs to the outcome within the context of St Helena's marine management needs.

Supporting evidence in Annex 3.

5. Lessons learnt

One of the biggest lessons learnt is that project staff should be in place at the beginning of projects and that all roles on the project should be filled if possible. Recruitment delays meant that work activities did not progress to the original schedule. It is best to recruit in good time before the project starts. This lesson from Dplu070 has already been applied to SHGs next Darwin project (Dplus077) as the recruitment process has already been started (<http://www.sainthelena.gov.sh/vacancies/>).

Another lesson learnt is that sampling using new methods and equipment does not work well if scheduled to start straight away at the beginning of the project. Equipment needs should be thought out as fully as possible during project development and there should be time written in at the beginning of the project to source necessary equipment and develop deployment methodology that is appropriate for the conditions, especially given the unique logistical challenges the island presents.

An unforeseen challenge has been delivering information between international institutes due to limited internet capabilities on Island and a 5mb limit on SHG emails. The workaround solution to this has been to pass data and files via secure file sharing sites. How data is managed between international Institutes should be considered in the formulation of future projects.

6. Actions taken in response to previous reviews (if applicable)

Not applicable - this is the first annual report for Dplus070.

7. Other comments on progress not covered elsewhere

Something that was not originally considered when the project began was the potential to collect data on microplastic and marine debris. Microplastic items have been found in every zooplankton sample that has been analysed. These range from small shard like fragments to monofilaments. Additionally, plastic pieces have been found in the bait fish stomachs. This included a large piece of polystyrene that accounted for approximately 50% of the stomach content. Small plastic pieces were also observed to have been used by a Brown Noddie breeding on Egg Island to create its nest site.

Data recording sheets had to be developed for zooplankton abundance counts and bait fish stomach content analysis as part of the original project. Incorporating recording plastic items into these became necessary. Recording this data takes little additional time and requires no alteration of current methodology. If these data are to be included in Dplus070 reporting some time will need to be spent on analysing the data.

Supporting evidence in Annex 3.

8. Sustainability and legacy

The project has started to build capacity on island to monitor key oceanographic and biological variables which underpin the St Helena pelagic ecosystem on which several economically important industries depend. The results of the project in year 2 will determine the most appropriate legacy of the project going forward and solidify and build on the skills which have started to be taught to SHG staff in year 1 of the project.

Due to the new concepts being introduced by the project, Dplus070 has started outreach and education in order to facilitate dissemination of project results in year 2. These activities have been described in Section 3.1, Activity 8.2 (page 7). In addition to these, a radio interview to introduce the project and the Project Officer was given in October 2017 along with a corresponding newspaper article. Facebook updates are used to maintain interest in project activities. The independent consultant gave a radio interview at the end of her time on the island to further promote Dplus070.

A stakeholder who helps with CTD surveying work was also invited on board the JCR to be immersed in oceanography and zooplankton sampling to further his understanding and increase his interest. A vocal and friendly member of the fishing community was chosen as he was best placed to spread information on his return. All stakeholders show continued interest in the outputs of the project.

Dplus070 has hosted two work experience students (aged 17) for one week in December 2017 and two weeks in January 2018. The students were from Prince Andrews School (the only secondary school on the island) and were introduced to the project and helped with fieldwork and laboratory work (a CTD survey and bait fish sampling).

An article was submitted to the Darwin quarterly newsletter and was featured on page 7 of the February 2018 issue 'Life Below Water'.

Due to the project delays, coupled with ongoing staff and departmental restructuring changes within SHG it is uncertain at this stage as to the most suitable exit strategy.

9. Darwin identity

Previous Darwin projects have raised awareness on St Helena and so governmental staff, stakeholders, councillors and local population are familiar with its remit.

The Darwin logo was used on all presentations, on Marine Awareness Week materials, on ENRD newsletters, in newspaper articles and on user guides produced during project work. Dplus070

submitted an article to the Darwin quarterly newsletter in January 2018 titled ‘Understanding the pelagic ecosystem supporting St Helena’s fisheries and marine tourism’ which was accepted.

Locally the project is being consistently referred to as ‘The Darwin pelagic project’ when talking to stakeholders, such as fishermen and during radio interviews. When posting Facebook updates for the project the hashtags ‘#DarwinPlus’ ‘#DarwinInitiative’ and ‘#StHelena’ are used.

A presentation was given by the project lead at the Diverse Islands Environmental conference which was hosted on St Helena from 29th to the 10th of January 2018. This included a breakdown of the funding sources (Darwin Initiative was acknowledged as the largest funder and the logo used), and covered previous Darwin funded work and current Dplus070 project work. The audience was an international assemblage of researchers, scientists, conservation workers and interested citizens (both national and international).

The contract holder institution has had a new Darwin Plus project (Dplus077) funded which is due to start in September 2018. As part of Dplus070’s article in the February 2018 ENRD newsletter this new project was introduced and the Darwin Initiative named as the funding body.

Supporting evidence in Annex 3.

10. Project Expenditure

To be completed upon receipt of final finances from Corporate Finance.

Table 1: Project expenditure during the reporting period (1 April 2017 – 31 March 2018)

Project spend (indicative in this financial year	2017/18 D+ Grant (£)	2017/18 Total actual D+ Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items				
Others (Please specify)				
TOTAL				

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2017-2018 – if appropriate

Project summary	Measurable Indicators	Progress and Achievements April 2017 - March 2018	Actions required/planned for next period
<p>Impact</p> <p>The St Helena marine ecosystem is sustainably managed, supporting key fishing and marine tourism industries.</p>			
<p>Outcome</p> <p>Establish a basic understanding of the seasonal operation of pelagic ecosystem that underpins St Helena's fisheries and tourism industries and evaluate how oceanography influences that system.</p>	<p>0.1. St Helena's population, particularly fishing and marine sector, understand the significance of the ocean system that surrounds the island.</p> <p>0.2. Management of the St Helena maritime zone utilises the greater understanding of the pelagic ecosystem developed in the project.</p>	<p>0.1. On-going. An education campaign has been started to increase understanding of the pelagic ecosystem and its importance as well as to simply introduce new concepts.</p> <p>0.2 Year 2.</p>	<p>Monthly fieldwork (CTD, zooplankton, and baitfish) and remote sensing products will continue to be collected.</p> <p>Samples should be analysed and quantified with good data management.</p> <p>Project results will be conveyed to St Helena's population within the context of the pelagic ecosystem introduced during the education campaign.</p>
<p>Output 1. Capacity building, with ENRD staff trained in oceanographic data collection methods, plankton sampling and data analysis.</p>	<p>1.1 St Helena staff able to operate CTD, and undertake basic data analysis independently</p> <p>1.2 St Helena staff able to identify key plankton species in plankton samples and fish diets.</p>	<p>1.1. Partially complete. Staff can operate, program and maintain the CTD. A system has been designed for automated data processing but to date has only been tested with example data.</p> <p>1.2. Completed.</p> <p>Indicators still valid.</p> <p>Evidence provided in section 3.1 and 3.2 of report and Annex 3</p>	
<p>Activity 1.1 St Helena staff will be trained to operate the CTD and to undertake basic analysis of oceanographic data (satellite and CTD).</p>		<p>On-going. Four Marine Section staff can operate and use the CTD and user guides have been written for new staff members so skills can be retained long term.</p>	
<p>Activity 1.2 St Helena staff will be trained to undertake plankton trawls and to identify and quantify catches.</p>		<p>Completed.</p>	

Output 2. Characterisation of seasonal patterns in physical and biological oceanography and the role of the island / seamounts in enhancing productivity.	2.1. Report published on SHG website 2.2. Paper published in peer review journal	2.1 Ongoing. Data to meet this outcome is being collected. 2.2 Year 2 This indicator is valid but cannot be achieved until the end of the project. Evidence provided in section 3.1 and 3.2 of report and Annex 3
Activity 2.1. Remote sensed data will be acquired and analysed to investigate the role of St Helena and the seamounts in influencing physical and biological oceanography.		On-going. Historical data to present has been sourced and downloaded with monthly updates being downloaded by BAS and shared with SHG through a shared DropBox folder. Software suitable for analysing data has been sourced.
Activity 2.2. CTD monthly sampling programme established and continues throughout the project.		On-going. CTD monthly sampling programme commenced in December 2017. Equipment failure meant March 2018 data was lost. April 2018 data has been sourced from JCR research work. A strategy has been implemented to get a functional CTD to St Helena in good time and to prevent recurrence of this situation if equipment fails in the future.
Activity 2.3. CTD data will be analysed to ground truth remote sensed data and to determine seasonal and spatial variability in the depth of the mixed layer and water mass properties.		On-going. Software and code written to process CTD data which passed initial tests on example profiles.
Activity 2.4. Oceanographic data will be summarised in a report for SHG and stakeholders and a paper prepared for submission to peer-review journal.		Year 2.
Output 3. Characterisation of seasonal patterns in zooplankton abundance and biodiversity	3.1. St Helena zooplankton guide prepared. 3.2. Report on zooplankton diversity and abundance published on SHG website 3.3. Zooplankton seasonality paper prepared for peer-review journal.	3.1 Completed. 3.2 Year 2 3.3 Year 2 Indicators still valid. Evidence provided in section 3.1 and 3.2 of report and Annex 3
Activity 3.1. Zooplankton samples will be collected from 3 locations on a monthly basis (for 18 months).		On-going. Equipment delays to St Helena meant the monthly sampling programme started in March 2018. Deployment methods have been observed and approved by independent consultant. Sampling will continue until August 2019.
Activity 3.2. Zooplankton guide prepared to help analyse plankton samples and fish stomach contents.		Completed.
Activity 3.3. Zooplankton samples will be identified (focusing on most abundant species) and quantified to look at seasonal and spatial patterns.		On-going. Biodiversity and abundance has been quantified for all samples to date and will continue as monthly sampling progresses.
Activity 3.4. Zooplankton analysed in relation to oceanographic data and report and paper prepared.		Year 2.

<p>Output 4. Seasonal abundance, life history and feeding ecology of bait fish established.</p>	<p>4.1 Sampling programme established and data / stomachs collected and analysed.</p> <p>4.2 Report on baitfish ecology published on SHG website.</p> <p>4.3. Paper submitted to peer-reviewed journal.</p>	<p>4.1 On-going. Monthly sampling programme established since August 2017 and will continue as project progresses.</p> <p>4.2 Year 2.</p> <p>4.3 Year 2.</p> <p>Indicators are still valid.</p> <p>Evidence provided in section 3.1 and 3.2 of report and Annex 3</p>
<p>Activity 4.1 Sampling programme for bait-fish (Decpaterus spp., mackerel and scad) established with 200 fish sampled for length, sex and stage each month and stomachs retained from 50 fish per month.</p>		<p>On-going. Monthly bait fish sampling programme established since August 2017. The 1 month delay between the project starting and the bait fish programme commencing was caused by putting the work out to tender.</p>
<p>Activity 4.2 Stomach contents identified using knowledge gained from plankton sampling and using plankton guide.</p>		<p>On-going. Stomach content analysis began in April 2018 with 60 stomachs analysed to date. Delay in beginning analysis of stomach contents was caused by a lack of data about zooplankton biodiversity due to equipment necessary for this analysis not arriving on the island until February 2018.</p>
<p>Activity 4.3. Inter-specific, seasonal and ontogenetic patterns in the diet investigated and linked to food availability.</p>		<p>Year 2.</p>
<p>Activity 4.4. Report and paper prepared on bait-fish ecology.</p>		<p>Year 2.</p>
<p>Output 5. Long-term oceanographic and plankton monitoring programme established..</p>	<p>5.1. Long-term sampling programme manual prepared for implementation at the end of this project.</p>	<p>Year 2.</p> <p>Indicators are still valid.</p>
<p>Activity 5.1. Oceanographic and plankton sampling programme reviewed to determine appropriate long-term monitoring programme.</p>		<p>Year 2.</p>
<p>Activity 5.2. Long-term monitoring programme designed and established.</p>		<p>Year 2.</p>
<p>Output 6. Foraging ecology of two seabird species established and analysed with oceanographic data</p>	<p>6.1 40 GPS loggers and 20 GLS loggers deployed on breeding MSP and BRNs through two seasons on Egg Island</p> <p>6.2 Diet compositions and, important prey constituents identified.</p> <p>6.3 Analysis of foraging ecology data in relation to oceanographic parameters and authoritative scientific paper published</p>	<p>6.1 On-going. One season of work has been completed with 20 GPS loggers deployed (18 retrieved) and 20 GLS loggers deployed on MSP and BRN breeding on Egg island.</p> <p>6.2 On-going. Ten BRN regurgitates collected, identified and a species list compiled. No instances of MSP spontaneous regurgitation were recorded in the first season.</p> <p>6.3 Year 2.</p> <p>Indicators still valid.</p>

		Evidence provided in section 3.1 and 3.2 of report and Annex 3
6.1a Deployment of 20 GPS loggers on breeding MPS and BRNs on Egg Island over two seasons.		On-going. Completed for one season in December 2017, 13 GPS loggers deployed on MSP and 7 loggers deployed on BRN. 20 GLS loggers deployed on BRN.
6.1b Retrieval of GPS loggers, download and analysis of data to produce maps of at sea distribution and range from St Helena.		On-going. 12 GPS loggers retrieved from MSP and 6 GPS loggers retrieved from BRN. Data downloaded and maps produced for December 2017 season.
6.1c Upload tracking data online to appropriate database		On-going. Completed for December 2017 season with data uploaded to "Movebank" a freely accessible online data repository (www.datarepository.movebank.org).
6.2a Collection and identification of prey items in regurgitates. Creation of a regurgitate catalogue for samples collected.		On-going. Ten spontaneous regurgitates were collected from BRM during December 2017. Contents were identified. No instances of spontaneous regurgitation occurred in MSP.
6.2b Collate prey species list and overall diet composition for each seabird species and publish online.		On-going. Prey species list started for BRN from December 2017 sampling. This will continue as project progresses.
6.3 Compare and analyse spatial data with oceanographic parameters to identify level of significance.		Year 2.
6.4 Compile results and formulate into journal article suitable for publication in a peer reviewed journal.		Year 2. However December 2017 data has been included in a paper submitted to JMPO, currently under review (Oppel <i>et al</i> , 2018, 'Spatial scales of marine conservation management for breeding seabirds').
Output 7. Database linked to GIS established for collation of oceanographic and biodiversity data.	7.1. Database and GIS established and made publicly available.	Database has been established and planning is occurring to transfer data to a GIS system and to make it publically available by the end of the project. Indicators are still valid. Evidence provided in section 3.1 and 3.2 of report and Annex 3
Activity 7.1. Database and GIS system established to support all project data.		On-going. Access database established to contain all project data which can be adapted as new species and functional groups are identified as sampling continues and is designed to be easily transferred into a GIS system.
Activity 7.2. Database and GIS made publicly available on completion of project.		Year 2.
Activity 7.3. Data submitted to appropriate recipients (e.g. CTD Data to British Oceanographic Data Centre).		Year 2.

<p>Output 8. Summary of seasonal patterns in the St Helena pelagic ecosystem prepared to inform review of Marine Management Plan and MPA</p>	<p>8.1. Summary report provided to SHG and paper prepared for peer-reviewed journal.</p> <p>8.2 Documented public talks, newspaper articles, plus pamphlet produced.</p>	<p>8.1 Year 2.</p> <p>8.2. Project has been mentioned in 2 radio interviews and one newspaper article, 2 presentations to councillors, 8 Facebook posts and was the focus of Marine awareness week (including interactive activities, work booklets for primary and secondary schools and an A0 poster). Proactive education campaign of stakeholders on the importance of the pelagic ecosystem will make dissemination of project results easier in year 2.</p> <p>Indicators are still valid.</p> <p>Evidence provided in section 3.1 and 3.2 of report and Annex 3</p>
<p>Activity 8.1. A summary report will be prepared for SHG and for publication to bring together all aspects of the project and help inform marine management decisions. This will help inform the first review of the St Helena Marine Management Plan and MPA.</p>	<p>Year 2.</p>	
<p>Activity 8.2. Plain English pamphlets and presentations prepared to inform St Helena stakeholders, public, schoolchildren and visitors about the importance of the marine system to the island.</p>	<p>Year 2. But see output 8.2 progress.</p>	

Annex 2: Project's full current logframe as presented in the application form (unless changes have been agreed) - if appropriate

N.B. 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@ltsi.co.uk if you have any questions regarding this.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact: The St Helena marine ecosystem is sustainably managed, supporting key fishing and marine tourism industries.			
Outcome: Establish a basic understanding of the seasonal operation of pelagic ecosystem that underpins St Helena's fisheries and tourism industries and evaluate how oceanography influences that system.	0.1 St Helena's population, particularly fishing and marine sector, understand the significance of the ocean system that surrounds the island. 0.2 Management of the St Helena maritime zone utilises the greater understanding of the pelagic ecosystem developed in the project.	0.1 Records of newspaper articles, radio interviews, talks and presentations. 0.2 Revised Marine Management Plan includes consideration of pelagic system, with direct reference to this project.	
Outputs: 1. Capacity building, with ENRD staff trained in oceanographic data collection methods, plankton sampling and data analysis.	1.1 St Helena staff able to operate CTD, and undertake basic data analysis independently 1.2 St Helena staff able to identify key plankton species in plankton samples and fish diets.	1.1. SHG staff training hours logged by BAS staff and independently collected data cross-checked. 1.2. As part of training process, SHG staff will undertake plankton ID tests. Sub-set of subsequent samples will be checked by consultant.	1.1 Travel arrangements for BAS staff and consultants can be organised for appropriate time.
2. Characterisation of seasonal patterns in physical and biological oceanography and the role of the island / seamounts in enhancing productivity.	2.1. Report published on SHG website 2.2. Paper published in peer review journal	2.1. Report available on SHG / project website. 2.2. Paper submitted to peer review journal; paper published.	2.1. CTD has no technical issues. As equipment failure (e.g. CTD) could take a while to repair / replace.

<p>3. Characterisation of seasonal patterns in zooplankton abundance and biodiversity</p>	<p>3.1. St Helena zooplankton guide prepared.</p> <p>3.2. Report on zooplankton diversity and abundance published on SHG website</p> <p>3.3. Zooplankton seasonality paper prepared for peer-review journal.</p>	<p>3.1. Guide to be available via SHG and project websites.</p> <p>3.2. Report published on SHG and project websites.</p> <p>3.3. Paper submitted to journal; paper published</p>	
<p>4. Seasonal abundance, life history and feeding ecology of bait fish established.</p>	<p>4.1 Sampling programme established and data / stomachs collected and analysed.</p> <p>4.2 Report on baitfish ecology published on SHG website.</p> <p>4.3. Paper submitted to peer-reviewed journal.</p>	<p>4.1. Project meetings to verify status of sampling programme and ensure it is up to data.</p> <p>4.2. Report available on SHG and project websites.</p> <p>4.3 Paper submitted to journal; paper published</p>	<p>4.1 Fishermen assist with sample collection.</p>
<p>5. Long-term oceanographic and plankton monitoring programme established.</p>	<p>5.1. Long-term sampling programme manual prepared for implementation at the end of this project.</p>	<p>5.1. Sampling programme approved by ENRD and protocol published on website.</p>	<p>5.1. SHG are willing to fund / support monitoring programme.</p>
<p>6. Foraging ecology of two seabird species established and analysed with oceanographic data</p>	<p>6.1 40 GPS loggers and 20 GLS loggers deployed on breeding MSP and BRNs through two seasons on Egg Island</p> <p>6.2 Diet compositions and, important prey constituents identified.</p> <p>6.3 Analysis of foraging ecology data in relation to oceanographic parameters and authoritative scientific paper published</p>	<p>6.1 GPS loggers retrieved and maps produced and published online of at sea distribution and foraging range of breeding MSP and BRNs</p> <p>Spatial data added to global seabird tracking datasets online.</p> <p>6.2 Prey species list and pie charts of diet compositions published online.</p> <p>6.3 Publication of article in a peer reviewed journal</p>	<p>6.1. GPS loggers will be retained and retrieved from the seabirds.</p> <p>6.2. Both species will regurgitate prey freely.</p>
<p>7. Database linked to GIS established for collation of oceanographic and biodiversity data.</p>	<p>7.1. Database and GIS established and made publicly available.</p>	<p>7.1 Database available via website for public access.</p>	<p>7.1. Appropriate web-based infrastructure to support public GIS and database.</p>
<p>8. Summary of seasonal patterns in the St Helena pelagic ecosystem prepared to inform review of Marine Management Plan and MPA</p>	<p>8.1. Summary report provided to SHG and paper prepared for peer-reviewed journal.</p>	<p>8.1. Report to SHG for inclusion in review of Marine Management Plan.</p>	<p>8.1. This will be final part of the project and potentially require input from scientists after the end of the funded period to finalise paper.</p>

	8.2 Documented public talks, newspaper articles, plus pamphlet produced.	8.2. Paper prepared for peer-review journal.	
<p>Activities (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. St Helena staff will be trained to operate the CTD and to undertake basic analysis of oceanographic data (satellite and CTD).</p> <p>1.2. St Helena staff will be trained to undertake plankton trawls and to identify and quantify catches.</p> <p>2.1. Remote sensed data will be acquired and analysed to investigate the role of St Helena and the seamounts in influencing physical and biological oceanography.</p> <p>2.2. CTD monthly sampling programme established and continues throughout the project.</p> <p>2.3. CTD data will be analysed to ground truth remote sensed data and to determine seasonal and spatial variability in the depth of the mixed layer and water mass properties.</p> <p>2.4. Oceanographic data will be summarised in a report for SHG and stakeholders and a paper prepared for submission to peer-review journal.</p> <p>3.1. Zooplankton samples will be collected from 3 locations on a monthly basis (for 18 months).</p> <p>3.2. Zooplankton guide prepared to help analyse plankton samples and fish stomach contents.</p> <p>3.2. Zooplankton samples will be identified (focussing on most abundant species) and quantified to look at seasonal and spatial patterns.</p> <p>3.3. Zooplankton analysed in relation to oceanographic data and report and paper prepared.</p> <p>4.1. Sampling programme for bait-fish established with 200 fish sampled for length, sex and stage each month and stomachs retained from 50 fish per month.</p> <p>4.2. Stomach contents identified using knowledge gained from plankton sampling and using plankton guide.</p> <p>4.3. Inter-specific, seasonal and ontogenetic patterns in the diet investigated and linked to food availability.</p> <p>4.4. Report and paper prepared on bait-fish ecology.</p> <p>5.1. Oceanographic and plankton sampling programme reviewed to determine appropriate long-term monitoring programme.</p> <p>5.2. Long-term monitoring programme designed and established.</p> <p>6.1a Deployment of 20 GPS loggers on breeding MPS and BRNs on Egg Island over two seasons.</p> <p>6.1b Retrieval of GPS loggers, download and analysis of data to produce maps of at sea distribution and range from St Helena.</p> <p>6.1c Upload tracking data online to appropriate database</p> <p>6.2a Collection and identification of prey items in regurgitates. Creation of a regurgitate catalogue for samples collected.</p> <p>6.2b Collate prey species list and overall diet composition for each seabird species and publish online.</p> <p>6.3. Compare and analyse spatial data with oceanographic parameters to identify level of significance.</p> <p>6.4. Compile results and formulate into journal article suitable for publication in a peer reviewed journal.</p>			

7.1. Database and GIS system established to support all project data.

7.2. Database and GIS made publicly available on completion of project.

7.3. Data submitted to appropriate recipients (e.g. CTD Data to British Oceanographic Data Centre).

8.1. A summary report will be prepared for SHG and for publication to bring together all aspects of the project and help inform marine management decisions. This will help inform the first review of the St Helena Marine Management Plan and MPA.

8.2. Plain English pamphlets and presentations prepared to inform St Helena stakeholders, public, schoolchildren and visitors about the importance of the marine system to the island.

Annex 3 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

Supporting documents have been uploaded to DropBox and may be accessed here: https://www.dropbox.com/sh/6gk89um9p761d1i/AAAq6zdF_Hvvdr2fnLyJl6fza?dl=0

If material is listed as confidential it is not suitable for release to the public domain at this time.

No.	Confidential	Filename	Description
1	Yes	1_Skype meeting notes_28112017_CEFAS_BAS_satellites	Skype meeting summary regarding remote sensing products between BAS and SHG. Other meeting notes available on request.
2	Yes	2_Darwin Plus 070 Monitoring and Evaluation 260318	Meeting summary of Monitoring and Evaluation conference skype call.
3	No	3_ENRD newsletter_Feb2018	A newsletter article submitted to ENRD monthly newsletter. 2 others available on request.
4	No	4_Formaldehyde risk assessment and safe handling guide	Risk assessment and safe handling guide developed by SHG with EMD waste management services for safe use of formaldehyde containing chemicals
5	No	5_Formaldehyde MSDS	Material safety datasheet for formaldehyde.
6	No	6_Marine Awareness Week_plankton poster	A0 poster created for Marine Awareness week (March 2018) introducing Dplus070 concepts.
7	No	7_Photos from a zooplankton survey	Photos of fishermen and Dplus070 staff undertaking a zooplankton survey.
8	Yes	8_JCRphotos_1	Photos of stakeholder for Dplus070 who also joined the JCR research cruise.
9	No	9_ENRC DPLUS070_Nov16_2017	Presentation given to councillors to simply introduce the project and its founding concepts.
10	Yes	10_Volunteerform_SHNT	Volunteer consent form from NT stakeholder who joined Dplus070 for fieldwork.
11	No	11_CTD recording sheet	Metadata sheet for CTD fieldwork. Sheets for zooplankton and Secchi disk measurements also available on request.
12	No	12_Valeport MiniCTD User Guide	User guide written for the Valeport miniCTD for current and new staff at SHG. Similar user guides have been written for the Secchi disk and Simple Zooplankton nets, available on request.
13	No	13_ZooplanktonCountTestResults	Results from a zooplankton abundance count, checked by independent consultant.

14	Yes	14_StHelenaPlanktonGuide	Full PowerPoint version of zooplankton guide.
15	No	15_training_in_zooplankton	Photo of SHG staff member practicing identification skills with mounted user guide on boards in front of him.
16	No	16_ZooplanktonSheets	Zooplankton count recording sheets.
17	No	17_ZooplanktonSampleAnalysis	Guide to analyse zooplankton samples and use Folsom splitter.
18	Yes	18_File listing for St Helena datasets	Metadata information for remote sensing products
19	Yes	19_communications_returning_CTD_for_repair	Copies of emails confirming miniCTD was returned to Valeport for repair and received
20	Yes	20_preliminary plot of raw CTD data	A preliminary plot of raw CTD data taken from a down cast for an initially look, no quality checking done.
21	No	21_Photos from bait fish sampling	A selection of photos from bait fish sampling
22	Yes	22_EggIsland_WorkSchedule _December2017	Work schedule for December 2017 Egg Island season, including work experience students
23	Yes	23_MSP_Seabird_trip_summaries_from GPS loggers	Summary of downloaded data for MSP from December 2017. Same available for BRN on request.
24	Yes	24_Map_MSP_GPSdata	Map of MSP foraging pattern from GPS logger, others available on request.
25	Yes	25_Oppeletal2018_abstract	Abstract of submitted manuscript which included MSP and BRN data from Dplus070. Full paper available on request.
26	No	26_St Helena Pelagic Database	Information sent by SAERI for using the database they produced for Dplus070
27	No	27_Rachael_Interview (SAINT FM)	Recording of radio interview given by consultant Rachael Shreeve during visit in April 2018
28	No	28_example_facebook_posts	Examples of two Facebook posts in relation to Dplus070 and one post related to Marine Awareness Week
29	No	29_change-request_Project_Lead	First change request for Dplus070 to change project lead. Approved.
30	No	30_change-request-form-2017_Dplus070 final	Second change request form to extend end date of project and split a job role into two part time positions. Approved.

31	No	31_plastic	Images of plastic observed in zooplankton hauls and bait fish stomach contents
32	No	32_microplastic_recording_zooplankton_nets	Recording sheet for plastic debris from zooplankton nets

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	Yes
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	No
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Yes
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	No
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	No*
Do not include claim forms or other communications with this report.	

*waiting on final report from corporate finance.