

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	DPLUS068
Project title	Building foundations to monitor and conserve Falklands marine forest habitats
Territory(ies)	Falkland Islands
Contract holder institution	Natural History Museum (NHM), London, UK
Partner institutions	South Atlantic Environmental Research Institute (SAERI), Stanley, Falkland Islands
Grant value	£99,999
Start/end date of project	Oct 2017–Mar 2019
Reporting period (e.g., Apr 2017–Mar 2018) and number (e.g., AR 1,2)	Oct 2017–Mar 2018, AR 1
Project leader name	Prof. Juliet Brodie
Project website/blog/Twitter	(Website under construction)
Report author(s) and date	Dr Robert Mrowicki & Prof. Juliet Brodie, 30 th April 2018

1. Project overview

In the Falkland Islands, a UK Overseas Territory in the southwest Atlantic (Figure 1), seaweeds are a vital natural resource. These ‘marine forests’ contribute substantially to primary productivity and harbour unique biodiversity, in addition to offering coastal protection and providing spawning habitat for commercially important squid populations. Despite their substantial ecological and economic importance, seaweeds remain poorly studied in the Falklands. In the face of emerging threats from oil exploration, commercial fishing, invasive species and climate change, there is a need for improved baseline knowledge of seaweed communities to facilitate effective monitoring and management of the Falklands marine environment. In particular, the diversity and distribution of seaweeds has been identified as a critical knowledge gap for the Falkland Islands Biodiversity Framework 2016–2030, which underpins all Biodiversity Action Planning for the Falklands.

This 18-month project (having commenced October 2017) aims to fill gaps in our knowledge of the diversity and distribution of seaweeds in the Falklands by (1) examining species occurrences in historic and contemporary herbarium collections, (2) conducting additional field surveys and specimen collections throughout the Falklands, and (3) using molecular techniques for species identification and to determine endemic and non-native species. Historical and contemporary species occurrence data, which will be made available through data repositories, will be used to map spatial and temporal variation in species diversity. Species identification training will also be provided to local managers to build capacity for future

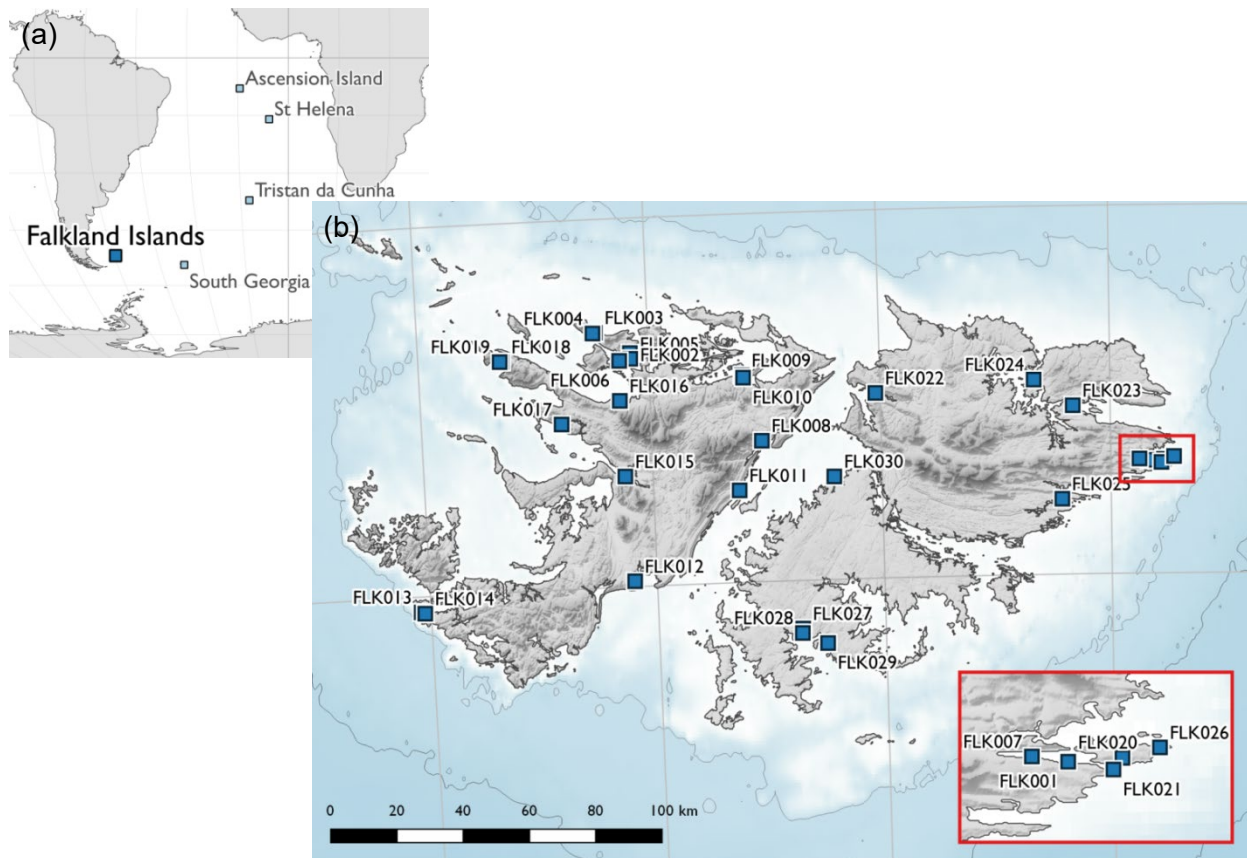


Figure 1. (a) Location of the Falkland Islands in relation to other UK Overseas Territories in the South Atlantic. (b) Sampling sites visited during the first field expedition of the project (January–February 2018).

ecological monitoring. In addition, outreach initiatives will raise public awareness of the socio-ecological importance of seaweeds and enable community members to participate in future long-term surveys.

2. Project stakeholders/partners

In addition to the Natural History Museum (NHM), the key stakeholders and their involvement with the project can be summarised as follows:

- **South Atlantic Environmental Research Institute (SAERI)** – the director of SAERI, Dr Paul Brickle, is the main Project Partner (PP), having developed this project in conjunction with Prof. Juliet Brodie, the Project Leader (PL). SAERI has contributed £8,371 (core staff, local transport and laboratory costs) towards the project, and hosted the PL and Project Officer (PO) during the main field expedition during January and February 2018 (see section 3.1). Data collected during this project will be hosted by the Information Management System and Geographical Information Systems (IMS-GIS) Data Centre, managed by SAERI, while integrating with other ongoing biodiversity and conservation projects, such as the [‘Gap Project’](#) and others relating to Marine Spatial Planning.
- **Falkland Islands Government (FIG)** – in addition to the participation of a FIG representative within the steering group (see below), a research licence was obtained from FIG prior to undertaking field sampling. A condition of the licence is that a report on the fieldwork must be submitted to the FIG Environmental Officer within three months of the expedition, in addition to all subsequent reports on research undertaken. Further, the PL and PO have liaised with Michael Betts, the FIG Assistant Representative in the UK, to promote the project.
- **Shallow Marine Surveys Group (MSG)** – over a number of years, MSG has conducted ecological surveys in the shallow waters surrounding the Falkland Islands and other South

Atlantic territories, accumulating a vast amount of baseline data documenting the diversity and distribution of marine species. In addition to contributing to this dataset, this project will inform future surveys and improve data analyses by facilitating the identification of seaweed species. SMSG supported the project directly by providing field survey equipment during the recent expedition.

- **Falklands Conservation (FC)** – although the main aim of the initial field expedition was intensive seaweed sampling (the second visit to the Falklands, planned for January 2019, will focus more on local capacity building and public awareness raising), the PL and PO arranged a meeting with management representatives of FC, as coordinators of citizen science programmes and curators of the Falkland Islands National Herbarium, which houses a number of (undatabased) seaweed specimens.
- **Local community members** – the PL and PO also engaged with a number of local community members during the field expedition. Notably, this included the staff and pupils of Fox Bay primary school, who participated in a ‘hands on’ demonstration of seaweed pressing. Further, they met one of the descendants of botanist Ellinor Frances Vallentin (whose early 20th century seaweed specimens from West Falkland form a significant part of the NHM algal herbarium collections), who represents an important cultural link with the current project. Finally, during all stages of the expedition, the PL and PO interacted with people with an active interest in biodiversity and conservation, in particular, local scientists, landowners and guides, who provided critical support for fieldwork.

As stated in the project proposal, a **steering group** was formed at the outset of the project. It consists of the following representatives of local stakeholder organisations in addition to the PL, PO and PP: Denise Blake (Environmental Officer, FIG), Dr David Blockley (Marine Ecologist, SAERI – replaced in March 2018 by Neil Golding [Coastal Mapping Project Manager, SAERI] following the completion of David Blockley’s contract), Dr Paul Brewin (Director, SMSG) and Tara Pelembe (Deputy Director – Innovation, SAERI). It was decided by the group that the PL should be the chair. The group meets at least quarterly as a means of monitoring and evaluation, while ensuring that members are kept up to date on project progress. More frequent (approximately monthly) meetings are held between the PL, PO and PP.

3. Project Progress

3.1 Progress in carrying out project Activities

(For reference, see original project implementation timetable.)

1. Major advance in baseline knowledge of seaweed biodiversity and distribution in shallow marine waters

A Project Steering Group consisting largely of local scientists, representing a range of organisations, was set up at the start of the project (Activity 1.1; see Section 2). The first three meetings were held on 4th January (via Skype), 12th February (at SAERI) and 27th March 2018 (via Skype; see meeting minutes – Annex 3). Continuing quarterly meetings throughout the project, including progress reports by the PL and PO, will serve as an important means of monitoring and evaluation (see section 4).

Locating and databasing seaweed specimens in existing museum collections (Activity 1.2) is an ongoing activity. Of the estimated 1,700 specimens (representing around 200 species) from the Falkland Islands in the NHM algal herbarium, 578 have been catalogued electronically, with an additional 261 specimens located since the start of the project (see herbarium specimen list – Annex 4, Table 1). Although this activity was planned to be completed prior to the first field expedition, progress has been slower than expected owing to the size of the collection (approximately 20,000 specimens), the entirety of which must be searched for undatabased Falklands material. However, it has proven useful to undertake this activity alongside the sorting and identification of new specimens collected during this project, with which the NHM senior algal curator, Jo Wilbraham, is providing vital specialist support.

A four-week field expedition (Activity 1.3) was undertaken by the PL and PO between 17th January and 14th February 2018 to survey the diversity and distribution of intertidal seaweeds across the Falkland Islands, during which 1,093 specimens were collected from 30 sampling sites (Figure 1b; see site and specimen lists – Annex 4, Tables 2 and 3). These specimens will be incorporated into the NHM herbarium following species-level identification, employing the use of molecular data via DNA barcoding and phylogenetic reconstruction. In addition to reference photos of species encountered during the expedition, quadrat photos were taken along transects to enable quantification of seaweed species abundances at 13 sites (Annex 4, Table 2).

Following the successful extraction of DNA from 234 specimens, suitable genetic markers have already been sequenced for 183 specimens (Activity 1.4), representing a range of red, brown and green seaweeds (see molecular laboratory specimen list – Annex 4, Table 4). DNA sequences will be obtained from an additional 250–300 representative specimens over the following three months, using modified techniques for particular taxa identified as being problematic. To fulfil these objectives, the PO has received training in methods for the extraction, amplification and sequencing of genetic material (November–December 2017) from Stephen Russell, NHM molecular laboratory manager, and attended a NERC-funded development skills course on the analysis of molecular data (February 2018) taught by NHM staff.

In addition to the primary aim of obtaining a comprehensive sample of seaweeds from a range of intertidal sites, it was possible for the PL and PO to meet with local community members (Activity 1.5; see section 2) during the expedition.

2. Capacity for effective seaweed monitoring based on up to date seaweed biodiversity and distribution

Information obtained from the examination of historical and new specimens, combined with the further generation and analysis of molecular data (Activity 2.1), will form the basis of species inventories and distribution maps (Activities 2.3 & 2.4), enabling levels of endemism, the extent of non-native species introductions and relationships with other South Atlantic seaweed floras to be assessed (Activity 2.2). As such, these activities will comprise much of the work undertaken during the next six months of the project. Importantly, key results (including an overall seaweed species inventory for the Falkland Islands; see preliminary species list – Annex 5) will be published as articles in peer-reviewed scientific journals (Activity 2.5).

3. Capacity developed in seaweed identification and monitoring; awareness raised of the seaweed resource and its value

The activities listed under Output 3 will comprise the latter stages of the project. An identification guide to common seaweed species (Activity 3.1) will be produced following the determination of species and assimilation of biodiversity and distribution data (i.e. Outputs 1 & 2). Local capacity building and public outreach will comprise the main focus of the second visit to the Falkland Islands in January 2019 (Activity 3.2), whereby the PL and PO will provide training to local scientists and interested community members in seaweed identification (Activities 3.3 & 3.4), and initiate a citizen science project (Activity 3.5). The latter will be developed in conjunction with local stakeholder organisations (FC and SAERI).

In terms of outreach, the PL and PO attended the British Phycological Society 66th annual meeting at Southend-on-Sea, UK (8th–11th January 2018), at which the PO presented a poster outlining the objectives of the current project, highlighting the role of both partner institutions and the support from the Darwin Initiative (Annex 6).

3.2 Progress towards project Outputs

1. Major advance in baseline knowledge of seaweed biodiversity and distribution in shallow marine waters

In the Falkland Islands, seaweeds have been poorly studied and inventoried, and represent a critical knowledge gap in terms of the current biodiversity framework. In particular, seaweeds have not been included in development and conservation planning, and there has been no assessment of the conservation status of seaweed species. This project, still in its early stages

in terms of producing Outputs, is already enhancing baseline knowledge of seaweed biodiversity and distribution in the Falklands. These data will be operationalised via population of open access databases (i.e. the NHM data portal and the SAERI-hosted South Atlantic IMS-GIS data centre), generation of species conservation assessments (e.g. seaweeds Red List) and building capacity for future monitoring of shallow marine habitats. It should be noted that a condition of the research licence granted by FIG is that all data and associated metadata arising from this project (including herbarium data, species lists, occurrence data, photographs, molecular data, etc.) are deposited in the IMS-GIS data centre within 12 months of the initial field expedition. Finally, it may not be possible to evaluate some of the success indicators for this Output (namely, the use of data as a tool in effective monitoring of seaweeds and for addressing development and conservation plans) until the end of the project. This depends on the future implementation of such monitoring and development initiatives.

This Output depends on accurate taxonomy and identification of seaweed species, which in turn are based on the ongoing examination of historical and current specimens and analysis of molecular data. Thus, there has been substantial progress towards this Output in terms of cataloguing existing specimens and enhancing contemporary collections (i.e. the foundation for the development of such tools). Further, molecular data have been obtained for a considerable proportion of specimens collected during the recent field expedition (Annex 4, Table 3). It is already apparent that these new data will greatly advance our knowledge about seaweed biodiversity of the Falkland Islands— early results reveal hidden diversity and suggest connectivity with other South Atlantic territories. A preliminary species checklist, including over 180 species, has been produced (Annex 5). This list will be revised and updated during the course of the project as more data are analysed (and the number of species is expected to increase greatly), with species distribution maps to follow.

2. Capacity for effective seaweed monitoring based on up to date seaweed biodiversity and distribution

The extent of seaweed biodiversity in the Falkland Islands (including the proportion of endemics and status of non-native species) is unknown, and there is no comprehensive species inventory available. The work completed so far has emphasised the enormity of this knowledge gap and, while resolving the taxonomy and diversity of Falklands seaweeds remains a substantial task, this project is clearly addressing these issues. As stated previously, cataloguing of existing collections and identification of species are underway, but the large number of new specimens (and survey data) collected during the recent field expedition (Annex 4, Tables 2 and 3) will form the basis for documenting current seaweed biodiversity, including classification of endemics and non-native species, and potentially descriptions of new species (published in peer-reviewed scientific literature, where relevant). Thus, much progress has been made towards this goal, with data analyses ongoing.

Naturally, as for Output 1, some of the success indicators (i.e. use of results in policy to enhance conservation of species and habitats) will perhaps not be evaluated until the end of the project, or later, for example, following the implementation of biodiversity monitoring programmes and action plans. However, under the Falkland Islands biodiversity framework, 'research and knowledge gaps' and 'awareness raising' are the proposed strategies in response to cross cutting challenges, while strategies relating to 'biosecurity and invasive species' are listed as high priority – the strong alignment of the project with these strategies ensures a clear pathway towards fulfilment of the Outputs.

3. Capacity developed in seaweed identification and monitoring; awareness raised of the seaweed resource and its value

As stated previously, the project will shift its focus more towards Output 3 during the latter stages. Here, it will address the current lack of capacity and resources for the identification of seaweeds in the Falklands, particularly in terms of training local scientists and engagement with community members. For example, there is currently no seaweed-based citizen science initiative. Although the Falkland Islands National Herbarium (curated by FC) includes some seaweeds specimens, the collection is limited and many specimens are unidentified, which reflects the lack of species knowledge and identification tools.

Following the surveys and sampling undertaken during the field expedition, there is sufficient information (combined with *in situ* species photographs) to create an identification guide to

common seaweeds, which may then be used as the basis of a citizen science project. In turn, specimens collected by members of the public and local scientists may be deposited in the National Herbarium. The PL leads a seaweed-based citizen science scheme in the UK (the '[Big Seaweed Search](#)'), which provides a useful model for the development of a similar initiative in the Falklands, with potential support from FC (see section 2). Local workshops and training sessions will be held during the second visit to the Falklands, planned for January 2019, after which feedback from attendees, along with subsequent levels of participation and uptake of the identification guide, will support the success indicators for this output.

3.3 Progress towards the project Outcome

Although this project is still at a relatively early stage, substantial progress has been made towards filling gaps in baseline knowledge of seaweed biodiversity in the Falkland Islands (via collection and analysis of new specimens, and acquisition of data from existing collections). Ongoing analyses have already generated data that will be deposited in open access information systems. Further, these activities are forming the basis for training in species identification and capacity building in terms of monitoring biodiversity.

In the absence of a log frame, specific indicators for the project Outcome have not been defined; however, the Outputs and their respective indicators of success, which are addressed in section 3.2, closely reflect the overall Outcome. As stated previously, it may not be possible to evaluate some of these indicators until the end of the project, after the proposed 'tools' are put into practice. Otherwise, based on current progress, it seems very likely that the project Outcome will be achieved, although owing to the nature of the project, the outputs (and their indicators) will be addressed concurrently towards the end, rather than sequentially throughout the project duration.

3.4 Monitoring of assumptions

The identified risks are addressed in turn:

1. **Staff unavailable** – not applicable, as project staff have been appointed. The PO named in the original project proposal (Dr Alexandra Mystikou) was unavailable, having obtained employment between the submission and outcome of the application. A suitable PO, Dr Rob Mrowicki (a marine ecologist with considerable experience working in the South Atlantic UKOTs, including the Falklands), was subsequently recruited prior to the start of the project.
2. **Weather prevents completion of fieldwork** – although delayed by three days owing to cancellation of the outgoing flight, good weather enabled the PL and PO to complete the main field expedition, whereby the number of sites visited (30) and specimens collected (>1,000) exceeded initial expectations. The second visit to the Falklands will incorporate little (if any) fieldwork, but there is still the potential for travel disruption caused by adverse weather conditions. By undertaking the trip during the austral summer, as planned, the likelihood of this risk remains low, and the potential impact on the project can be minimised by keeping travel dates flexible.
3. **Species biodiversity work problematic for certain seaweed groups** – molecular tools are critical for resolving seaweed taxonomy and characterising cryptic diversity, together with morphological characteristics. So far, molecular analyses have been largely successful (out of 234 specimens selected from a wide range of taxa, 183 samples have been processed for sequencing – Annex 4, Table 4). As expected, some taxa have proved more problematic than others in terms of extraction and amplification of DNA via standard methods; importantly, the results of this initial work will enable methods to be refined accordingly. The anticipated impact on the project remains low, and may be minimised through collaboration with experts (i.e. NHM algal curator and molecular laboratory manager and other external colleagues), in addition to focussing on those taxa that are the most ecologically important.
4. **Limited engagement in training** – this risk and its potential impact on the project are still relevant. Raising public awareness is crucial for minimising this risk, requiring support from local stakeholders. This will be achieved largely through the organisations represented on

the project steering group, but also through engagement with FC and interested members of the public, with whom the PL and PO have already had very positive interactions.

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

This project relates directly to the Falkland Islands Biodiversity Framework 2015–30, which identifies seaweed biodiversity as a key knowledge gap. Thus, through this framework, the project outputs will contribute to long-term Strategies and Action Plans for the Falkland Islands environment. As detailed above, the progress made during the first six months of the project has laid the foundations for achieving these specific objectives.

The work contributes directly to other current Darwin-funded projects in the Falklands, such as coastal mapping ([DPLUS065](#)). Importantly, the tools generated by this project are also relevant for conservation objectives of other South Atlantic UKOTs, which overlap in terms of marine biodiversity, and which are all encompassed by the UK Government's [Blue Belt](#) manifesto commitment. Use of the IMS-GIS data centre will ensure that data are available across all territories.

4. Monitoring and evaluation

The project steering group (see section 2) has quarterly meetings (including the PL, PO and PP) to evaluate progress and establish milestones and actions (see meeting minutes – Annex 3). The PL, PO and PP meet at least monthly, while the PL and PO have frequent meetings and informal discussions relating to the project. This way, the PO is able to provide (at least weekly) updates to the PL on the number of herbarium specimens databased or samples processed in the molecular laboratory. Additionally, project finances are administered in-house through the NHM Research Coordination Office, allowing the PL and PO to track the budget closely.

During the first phase of the project, there was considerable focus on planning and implementing the field expedition, the success of which can be attributed largely to discussions and feedback among all team members. Although an online management system (including project documents, analyses, etc.) was not implemented at the start of the project, this is something that may prove useful during subsequent phases of the project as data continue to accumulate and outputs are delivered. For example, this may take the form of a dynamic, more detailed version of the project implementation timetable, including specific activities, milestones, links with policy, etc. Further, the dissemination of more detailed progress reports to steering group members (in addition to regular meetings and informal discussions) might be useful in generating additional feedback and strengthening M&E.

5. Lessons learnt

From the progress made during the early stages of this project, it is clear that setting up a steering group (see section 2) has been an effective means of keeping the project on track, while facilitating the direct involvement of local stakeholders with the project itself. This is a key recommendation for other projects, along with ensuring regular communication among core team members (in this case, the PL, PO and PP) and continually reviewing the project implementation timetable. Further, specialist support (from the molecular biologist and algal curator) has already proved invaluable for troubleshooting some of the more technical tasks, and will be especially important during the next project phase.

The success of the field expedition is largely a result of local staff assisting with planning and logistics, which would be extremely difficult to undertake without sound local knowledge. Most notably, it was only possible to access key sampling sites in West Falkland by using local drivers with off-road driving experience and knowledge of particular routes. Therefore, when working in unfamiliar territories, the assistance of 'people on the ground' is critical. It was also essential for the participants to remain flexible in the face of changing conditions and to adjust

plans accordingly – for example, some planned survey sites could not be accessed safely, and so suitable alternatives had to be found.

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

N/A

7. Other comments on progress not covered elsewhere

While the design of the project itself has not been altered substantially during the first six months (see section 3), there have been some developments in terms of its wider contribution to other related projects. For example, the possibility of using the species distribution data generated by this project (e.g. via quadrat photographs) in the ongoing Darwin-funded coastal mapping project at SAERI has been discussed with Neil Golding, through recent steering group meetings (Annex 3). Also, it is becoming increasingly clear that the results of this project will inform other biodiversity research conducted across the South Atlantic and further afield, particularly studies of global taxonomy and biogeography of particular taxa – with much scope for the extension of this work, for example, to assess the role of seaweed diversity in marine ecosystem functioning in other connected Overseas Territories. It is also apparent that resolving seaweed taxonomy (the foundation of this further research) in this region will be a substantial task, which may be seen as an additional risk to the current project; however, this emphasises the importance of the project and its contribution to biodiversity science and conservation – not only for the South Atlantic, but also globally.

8. Sustainability and legacy

There is already awareness of the project among relevant local stakeholder organisations in the Falkland Islands (e.g. those included in the steering group). Further, the PL and PO interacted with a range of local community members during the field expedition (see section 2), while promoting the work and helping to increase public interest. For example, the PL and PO were able to provide information about seaweeds to interested landowners and guides who occasionally accompanied them in the field. Otherwise, formal species identification training and other activities related to capacity building are planned for later in the project – including the publication of a seaweed ID guide.

As stated above, data resulting from the project will be deposited in local repositories and made freely available, both locally and internationally, to support long-term environmental monitoring and contribute towards conservation and management (including the potential designation of Marine Protected Areas). The seaweed specimens obtained and preserved during the project will be housed in the algal herbarium at the NHM, whose core duty is to maintain, develop and provide access to its collections. This project will also assist in the development of the Falklands National Herbarium through training in seaweed identification and preservation. Thus, a main legacy of the project will be the continued incorporation of new seaweed specimens into herbaria, together with associated data. These preserved specimens, as physical records of species at particular times and locations, will constitute an invaluable resource for future biodiversity distribution research and genetic studies.

While the project aims to gather important baseline information on seaweed diversity and distribution in the Falkland Islands, it will also help to identify priority areas for future research. This may support applications for additional funding to provide study opportunities for other scientists (e.g. postgraduate students, postdoctoral researchers).

9. Darwin identity

Since 1993, SAERI and FC have been involved in [a large number](#) of successful Darwin-funded projects in the Falkland Islands – through the many links between these and other stakeholder organisations, and with members of the public, there is broad familiarity with the Darwin Initiative across the local community. During the field expedition, the PL and PO described the current work as a distinct project during their interactions with local guides and landowners, who knew of the Darwin Initiative and some of the other projects that it has supported.

At the NHM (whose researchers have led [numerous](#) Darwin projects over the years), staff are also aware of Darwin funding opportunities, and the breadth of work supported by the scheme.

In terms of the current project, the Darwin Initiative has been publicised (including use of the logo) by a conference poster presentation (Annex 6); further, there will be a NHM-hosted project website (currently under construction), which will include blog posts about the recent field expedition and ongoing research activities. Project-related posts on social media have included links to the Darwin Initiative Twitter account and [Darwin project website](#). The PL will also be giving presentations about the project at an upcoming seaweed identification course at the Marine Biological Association in Plymouth, UK, during May 2018 and at the 72nd Phycological Society of America annual meeting in Vancouver, Canada, during July–August 2018.

10. Project Expenditure

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

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.	✓
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.	-
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.	✓
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.	-
Have you involved your partners in preparation of the report and named the main contributors	✓
Have you completed the Project Expenditure table fully?	✓
Do not include claim forms or other communications with this report.	