Department for Environment Food & Rural Affairs

DARWIN INITIATIVE

Foreign & Commonwealth Office

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Darwin Plus: Overseas Territories Environment and Climate Fund

Final Report

Darwin Project Information

Project reference	DPLUS068
Project title	Building foundations to monitor and conserve Falklands marine forest habitats
Territory(ies)	Falkland Islands
Lead organisation	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–Jul 2019
Project leader name	Prof. Juliet Brodie
Project website/Twitter/blog etc.	
Report author(s) and date	Dr Rob Mrowicki & Prof. Juliet Brodie, 31st July 2019

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, with a three-month pause during September–December 2018) aimed 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. Species identification training was also provided to local managers and community members to build capacity for future ecological monitoring. In addition, a programme of outreach initiatives including school visits, youth group activity sessions, a public talk, radio and television interviews, and initiation of a citizen science project has raised public awareness of the socio-ecological importance of seaweeds and will enable community members to participate in future long-term surveys.

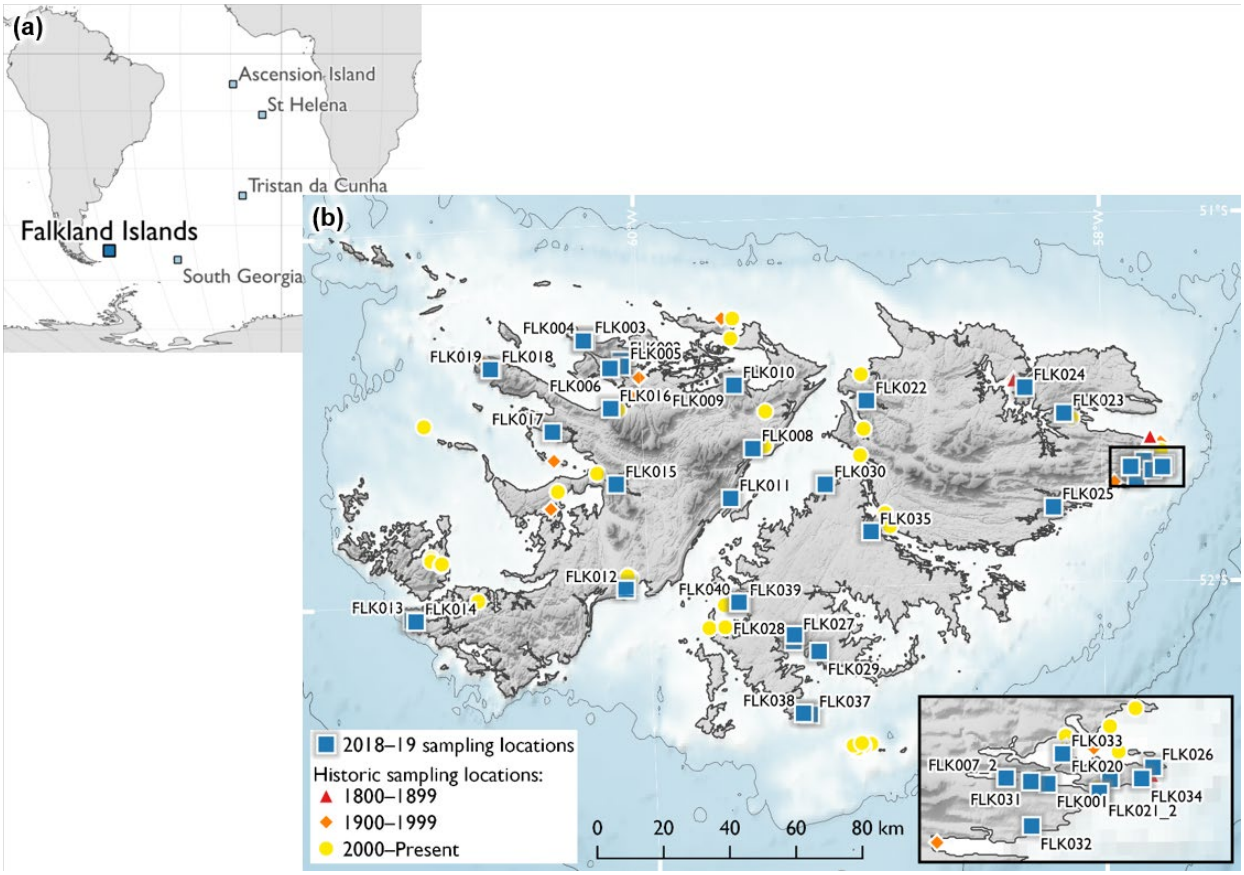

Figure 1. (a) Location of the Falkland Islands in relation to other UK Overseas Territories in the South Atlantic. (b) Sampling sites visited during both field expeditions of the project (January–February 2018 and February 2019), denoted by blue squares.

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, was the main Project Partner (PP), having developed this project in conjunction with Prof. Juliet Brodie, the Project Leader (PL). SAERI contributed £8,371 (core staff, local transport and laboratory costs) towards the project, and hosted the PL and Project Officer (PO) during the two field expeditions in January–February 2018 and February 2019. Data collected during this project will be hosted by the Information Management System and Geographical Information Systems (IMS-GIS) Data Centre, managed by SAERI, enabling integration with other biodiversity and conservation projects (e.g. coastal habitat mapping, fine scaling Marine Management Areas and natural capital assessment) and supporting future research. The SAERI data manager has also worked with the PL, PO and Falklands Conservation (see below) to develop a data recording app for the seaweed citizen science project.
- **Falkland Islands Government (FIG)** – in addition to the participation of a FIG representative within the steering group (see below), research licences were obtained from FIG prior to undertaking field sampling. As per the conditions of these licences, fieldwork reports were submitted to the FIG Environmental Officer following both field expeditions, and FIG will also be provided with any future reports based on data collected during these expeditions. Further, FIG has awarded an Environmental Studies grant to the NHM (including the PL and PO) for future policy-orientated seaweed research that follows on directly from this project. Additionally, the PL and PO have liaised with Michael Betts, the FIG Assistant Representative in the UK, to promote the project.
- **Falklands Conservation (FC)** – The PL and PO met with FC managers Esther Bertram and Andy Stanworth during the first field expedition to discuss potential support for a seaweed citizen science project. Since then, FC has become a key partner in the

development and implementation of the 'Falklands Big Seaweed Search', in collaboration with NHM and SAERI. In particular, outreach officer Mike Ford, coordinator of the youth 'Watch Group', engaged with the PL and PO to organise additional outreach events during the second field expedition. FC also provided access to seaweed specimens the Falkland Islands National Herbarium, which was an additional resource for seaweed diversity and distribution data.

- **Shallow Marine Surveys Group (SMSG)** – over a number of years, SMSG 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's director, Dr Paul Brewin, played an integral role in the evolution of the project through his participation in the steering group (see below). SMSG also supported the project directly by providing survey equipment during both field expeditions.
- **Local community members** – the PL and PO also engaged with a number of local community members during both field expeditions. This included the staff and pupils of Fox Bay primary school and Stanley Infant Junior School, and conservation 'Watch Group' members, who participated in activity sessions focussing on the importance of seaweeds. Members of the public attended a talk on Falklands seaweeds in Stanley, in addition to a guided shore walk followed by a seaweed ID workshop, and the citizen science project will enable continued involvement of community members in seaweed data collection. Radio and television interviews with the PL and PO were broadcast by Falklands Radio and FITV. Further, the PL and PO 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 expeditions, 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 and outreach events.

A **steering group** was formed at the outset of the project. It consisted 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 met at least quarterly as a means of monitoring and evaluation throughout the entire project, while ensuring that members were kept up to date on progress (see meeting minutes – Supplementary Document 1, Annex 6.2). More frequent (approximately monthly) meetings were held between the PL, PO and PP.

3 Project Achievements

3.1 Outputs

(For reference, see original Expected Outputs table.)

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

At the beginning of the project, seaweeds were poorly studied and inventoried in the Falkland Islands, and represented a critical knowledge gap in terms of the current Biodiversity Framework. In particular, seaweeds were not included in development and conservation planning, and there had been no assessment of the conservation status of seaweed species. This project has greatly enhanced baseline knowledge of seaweed biodiversity and distribution in the Falklands through cataloguing of existing museum specimens and molecular-assisted taxonomy of new specimens collected from throughout the islands.

The NHM Data Portal contained 562 records of Falklands seaweed herbarium specimens at the start of the project, representing 148 species. In addition to verifying these records, many of

which were incomplete and/or contained inaccurate information (taxonomy, locality, data, etc.), a further 867 undatabased specimens were located and catalogued, resulting in a new total of 1,429 databased specimens (see herbarium specimens list – Table S1, Annex 6.1).

During the two field expeditions, 1,490 new specimens were collected from 40 sampling sites around the Falklands (see FIG field reports – Supplementary Document 2, Annex 6.2), more than doubling the number of Falklands specimens in the NHM algal herbarium, now totalling 2,919. This is in addition to 163 specimens in the Falkland Islands National Herbarium, which were catalogued by the PL and PO during their second visit.

DNA was extracted from 540 specimens (see molecular biology specimen list – Table S2, Annex 6.1), of which 451 were selected for sequencing (either one or two genetic markers per specimen). These yielded 435 sequences, 380 of which were of sufficient quality for DNA barcoding and phylogenetic tree reconstruction (see molecular analysis results – Figure S1, Annex 6.1). Through molecular-assisted taxonomy, a comprehensive check-list of 253 species was produced (Supplementary Document 3, Annex 6.2), including 57 new records for the Falklands, representing a 22% increase in known seaweed diversity.

The resulting herbarium, field and molecular data are being prepared for submission to open access databases, but this is an ongoing process (see section 4 below). As stated in the previous annual report, it was not 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) before the end of the project, as this depends on the future implementation of such monitoring and development initiatives. Importantly, the wealth of baseline biodiversity data generated by this project has already been transformed into new tools for monitoring and managing the inshore marine environment of the Falklands, and FIG have provided additional support for a follow-on project to develop these tools further (see Output 2 below).

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

Although seaweeds were recognised as high biodiversity priority, the true extent of seaweed diversity in the Falklands (including the identification of endemics and non-natives) was unknown at the start of the project, and there was no comprehensive species inventory available. Further, there was no designation of marine protected areas founded upon robust biodiversity knowledge, including that of seaweeds.

The enhanced knowledge of seaweed diversity through this project has provided a foundation for the development of tools to assist in prioritising conservation action in the Falklands. This project has identified 9 possible non-native and 15 potentially endemic species (Tables 2 & 3 in Supplementary Document 3, Annex 6.2). The check-list also includes a number of potentially undescribed species, but further work is required to determine whether these species are new to science, or if they correspond to others described from elsewhere. Taxonomic journal articles are currently being prepared, including description of a new species of coralline algae (see manuscript – Supplementary Document 4, Annex 6.2), with other planned research papers on the diversity of important groups including the families Corallinaceae and Gigartinaceae (Rhodophyta) and green seaweeds (Chlorophyta; see associated phylogenetic trees – Figure S1, Annex 6.1), leading to a general treatise of seaweed taxonomy and biogeography in the South Atlantic.

Given the paucity of biodiversity data from this region, resolving the taxonomy of Falklands seaweeds is a considerable challenge – each new record must be verified through an exhaustive process of searching the relevant taxonomic literature and comparisons with existing specimens and molecular data (if available), which in turn may be named incorrectly. The most effective way to achieve this will be through collaboration with researchers specialising in different taxonomic groups. To strengthen this collaboration, the PL aims to organise a workshop on South Atlantic and Pacific seaweeds at the 12th International Phycological Congress in Chile, March 2021, using the results of this project as a framework for further taxonomic work.

As above, some of the other success indicators for this Output (i.e. use of results in policy documentation, enhanced conservation of species and habitats) may not be fully evaluated

Figure 2. Photos of outreach and training activities undertaken in the Falkland Islands during February 2019. (a) Presentation at Stanley Infant Junior School (IJS). (b) Activity session with Falklands Conservation Watch Group. (c) Guided shore visit with members of the public in Stanley. Seaweed pressing with (d) Watch Group members and (e) IJS Year 6 students. (f) ID workshop for scientists, managers and community members at the Stanley Chamber of Commerce.

until beyond the end of the project, for example, following the implementation of biodiversity monitoring programmes and action plans. However, this project has produced the necessary tools for accurately monitoring seaweed-dominated coastal habitats in the Falklands, including baseline data on seaweed distribution and a species ID guide for scientists and managers (see Output 3 below). The fact that this project aligns strongly with the Falkland Islands Biodiversity Framework, i.e. strategies relating to “research and knowledge gaps”, “awareness raising” and “biosecurity and invasive species”, ensures a clear pathway towards incorporation into future policy. Demonstrating this, FIG is directly supporting development of the outputs from this project through an Environmental Studies grant to the NHM, to use historical and contemporary seaweed distribution data to carry out Red Data List and Important Plant Area assessments for priority species and sites (see section 3.3 below).

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

Prior to the project, there was little capacity for identifying and monitoring seaweed biodiversity in the Falklands, including a lack of tools (e.g. ID guides) and training for scientists and managers, and no seaweed citizen science programmes for members of the public. Although the Falkland Islands National Herbarium (FINH), curated by FC, includes some seaweed specimens, the collection is limited and many specimens are unidentified.

Based on the baseline biodiversity and distribution data, a photographic identification guide to common seaweeds of the Falklands, covering >80 species (Supplementary Document 5, Annex 6.2), was developed and disseminated to scientists and environmental managers at SAERI, FC and FIG. While this document will be updated in light of changing taxonomy and analysis of new data, even in its current form it represents the major advance in seaweed biodiversity knowledge achieved through this project, and serves as a practical means of identifying previously unknown or cryptic species for future monitoring.

Local capacity building and public outreach comprised the main focus of the second visit to the Falklands in February 2019 (Figure 2), whereby the PL and PO provided training in seaweed identification to environmental researchers and managers at a half-day specimen ID and preservation workshop in Stanley (featuring the new species ID guide), which accompanied a

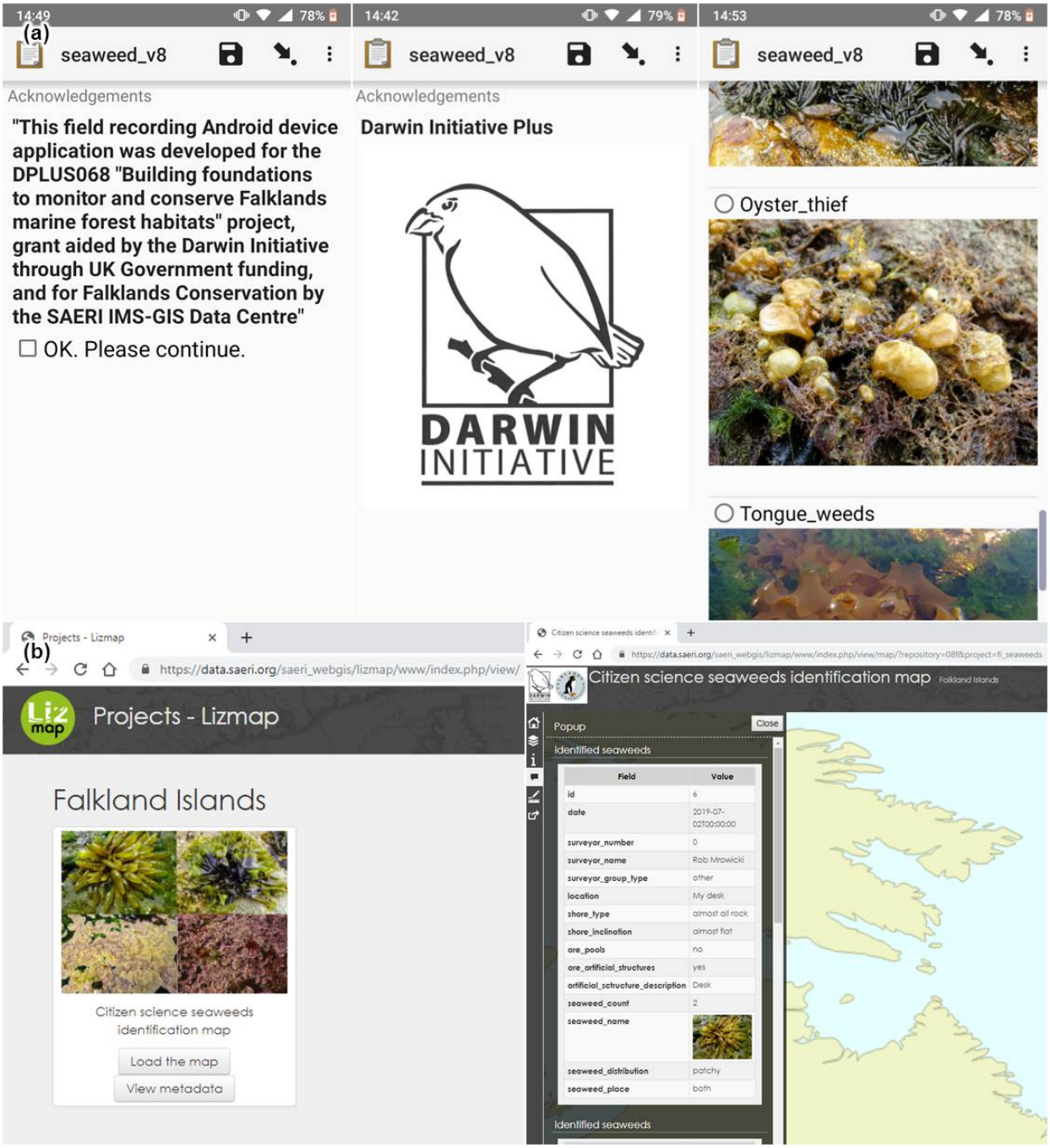

Figure 3. Screenshots of web interfaces developed by SAERI for collection and dissemination of data through the 'Falklands Big Seaweed Search' citizen science programme: (a) Android mobile data recording app and (b) WebGIS platform, hosted by the IMS-GIS Data Centre.

guided shore visit open to members of the public. The PL and PO also led seaweed activity sessions with Year 6 students at the Stanley Infant Junior School and with the FC Watch Group. These activities were publicised via interviews on Falklands Radio and Falkland Islands Television (see section 6 below), the main purpose of which was to promote the project and raise public awareness of the importance of Falklands seaweeds on a national scale.

A seaweeds citizen science project, the 'Falklands Big Seaweed Search', was initiated as a joint collaboration between NHM, FC and SAERI, modelled on the PL's successful UK Big Seaweed Search, enabling members of the public to record occurrences of 10 easily identifiable and ecologically significant species throughout the Falklands. SAERI have developed a data recording app and web interface specifically for the project, which are currently in testing phase (Figure 3).

During their second visit, the PL and PO identified and catalogued all 163 seaweed specimens in the FINH, and presented the information to FC. They are currently working closely with FC to

develop this local reference collection, which serves as another important tool for identifying and monitoring seaweed biodiversity in the Falklands. Having provided training in specimen ID and preservation, there is now sufficient local capacity for researchers and members of the public alike to collect new seaweed specimens and deposit them in the FINH.

3.2 Outcome

The intended Outcome was to "Provide tools to enable environmental management through habitat monitoring through filling a major gap in baseline knowledge of seaweed biodiversity, populating local information systems and providing training in species identification."

As detailed above (section 3.1), the project achieved a major advance in seaweed biodiversity knowledge through extensive field surveys and specimen collection, combined with molecular-assisted taxonomy and examination of historical material, filling a critical knowledge gap for the Falklands. The wealth of data generated by this project has exceeded initial expectations – while the process of assimilating and preparing it for submission to local and global databases is ongoing, this information will be made publicly available as additional evidence to support biodiversity action planning. Based on these data, specific tools to enable environmental management were developed, including an annotated species check-list and ID guide, which were previously unavailable for the Falklands. These tools provide a foundation for further work to enhance our understanding of seaweed biodiversity in the Falklands and further afield, which may then be fed back into environmental policy.

The project has enhanced local capacity in the Falklands for monitoring seaweed biodiversity via training in species identification and initiation of a citizen science project for long-term data collection that will be maintained far beyond the project's lifetime. There was a great deal of interest from stakeholders and the local community in the various outreach and training activities undertaken in the Falklands, which raised public awareness of the importance of seaweeds. That the people of the Falklands already have a strong connection with the natural environment, and a desire to protect it, has been apparent throughout, and certainly contributed to the enthusiasm with which this project has been received.

3.3 Long-term strategic outcome(s)

By advancing baseline knowledge of seaweed diversity in the Falklands, this project has directly addressed specific research priorities identified by the Falkland Islands Biodiversity Framework, which highlights the lack of "information on the intertidal and near shore coastal shallow marine environment" and states that seaweeds in particular "are not well inventoried or studied". Stakeholder members of the project Steering Group have commented that a great deal more is now known about Falklands seaweed biodiversity compared to the beginning of this project, and that this knowledge is vital for monitoring the coastal marine environment, of which seaweeds are such a dominant feature.

In recognition of the utility of this baseline biodiversity knowledge for biodiversity planning in the Falklands, FIG have awarded the PL and PO additional funding to take this project even further and develop new tools for prioritising species and sites for protection (see award letter – Supplementary Document 6, Annex 6.2). This project, entitled "Seaweeds through space and time: building tools for managing the Falkland Islands' unique coastal biodiversity", will involve georeferencing all Falklands NHM specimens and, for seaweeds, mapping historical change in species distributions and developing IUCN-like criteria to produce Red Data Lists and identify Important Plant Areas. Thus, there is a clear pathway by which the outputs of this project can be incorporated into environmental policy in the Falklands, in conjunction with evidence from other recent or ongoing marine conservation initiatives (e.g. coastal mapping and Marine Management Areas projects).

By making the most of the combined expertise and facilities offered by partner institutions and team members, the project maximised its value for money (see section 7.3 below).

4 Sustainability and Legacy

All outputs from this project are (or will be) publically available long-term through open access data repositories maintained by global scientific community (e.g. Annex 4).

Data (and metadata; see metadata forms – Supplementary Document 7, Annex 6.2) are currently being prepared for submission to the IMS-GIS Data Centre, SAERI's online public data repository for South Atlantic UKOTs. This includes species distributions and site occurrences, DNA sequence data and corresponding specimen details, and site and quadrat photographs. (A condition of the FIG research permit is that all resulting data are deposited in the IMS-GIS Data Centre.) Quadrat surveys followed standardised methods used by other researchers, e.g. Shallow Marine Surveys Group (SMSG), so that the resulting photographs could contribute to future analyses of benthic community structure across the Falklands.

Data from newly located Falklands specimens in the NHM algal herbarium, together with specimens collected during this project, will be transferred into the NHM's Emu database, records within which are searchable via the online NHM Data Portal. For records to be added to the database, they must be assigned a unique 'BM' number and labelled with a corresponding barcode – so far, this has been done for 315 specimens (Supplementary Table S1b). Specimen labelling and mounting is an ongoing process, undertaken by dedicated plant mounters at the NHM. Additionally, many of the new specimens from this project are still to be named, as the taxonomy of certain groups remains unresolved (in the field of phycology in general, as well as for this particular collection). While the incorporation of new material into the herbarium will continue beyond the end of the project, these specimens and their extracted DNA will be maintained in perpetuity at the NHM, whose core duty is to protect, develop and provide access to them. Together with anticipated future development of the local FINH reference collection, this constitutes an invaluable resource for temporal, spatial and genetic information for future biodiversity research.

Molecular sequence data will be catalogued and deposited in GenBank, a collection of all publicly available DNA sequences, and taxonomic and nomenclatural information will be available via AlgaeBase, a global species database for algae. Importantly, the species check-list (and associated lists of possible non-native and endemic species) provides a basic framework for future environmental monitoring and research, in the form of a usable document for scientists and policymakers. Species descriptions will also be added to a 'Marine Fauna and Flora of the Falkland Islands' web-based guide hosted by the NHM, currently featuring benthic polychaetes and crustaceans. Scientific papers (e.g. Supplementary Document 4, Annex 6.2), publication of which will continue after the end of the project, will be made open access through funding obtained from the NHM or other sources. Funding has already been made available for publication of the seaweeds ID guide, which will provide a permanent reference for scientists and managers in the Falklands.

An important legacy of the project is the citizen science programme, designed specifically to enable long-term data collection while maintaining public interest in seaweeds. For this, it was important to ensure that a range of methods for submitting data was available, including a mobile app, to make the programme as accessible for as many participants as possible.

FIG has already committed to supporting the development of the outputs of this project by awarding the PL and PO a grant from its Environmental Studies Budget to produce a framework for species- and site-based biodiversity assessment (see section 3.3 above). The data generated by this project also provides a foundation for future research on the diversity and distribution of seaweeds, not only in the Falklands but also further afield, in particular the molecular data, which will enable unique biogeographical comparisons across the South Atlantic and subantarctic regions. There is much scope to develop postgraduate and postdoctoral research projects to follow up on specific areas of research identified during the course of the project, such as taxonomy and ecology of particular seaweed groups.

Importantly, this project has also strengthened partnerships among individuals and organisations (NHM and SAERI), as well as fostering new ones (NHM and FC), which will persist well beyond its lifetime, facilitating future collaborative work aimed at understanding and protecting biodiversity in the Falklands and other UKOTs.

5 Lessons learned

The initial development of the project benefitted greatly from pre-existing relationships among PPs, resulting from previous discussions between the NHM and Falklands-based partners

relating to biodiversity science in South Atlantic UKOTs. Through support from these existing networks, we ensured that the project effectively built upon previous scientific work (including recent seaweed-related research in the Falklands coordinated by SAERI) while addressing local government environmental priorities, which were identified right from the very beginning.

Setting up a steering group (see section 2 above) was an effective means of keeping the project on track and sparking new ideas, 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) proved invaluable for troubleshooting some of the more technical tasks, for example, when certain taxonomic groups of seaweeds proved to be a challenge for extracting high quality DNA. In general, the project capitalised on the combined expertise of its partner institutions and individual team members to deliver its outcomes fully.

Project changes should always be anticipated – in this case, changes to the design (see section 5.1 below) supported, rather than impacted, delivery of outputs. Additionally, relatively small budget reallocations during the project, e.g. transfer of surplus staff funds to fieldwork and laboratory costs, greatly increased the amount of data generated, in light of unexpectedly high numbers of specimens collected during the first field expedition. Maintaining open communication with the Darwin administrative team was important for facilitating these changes, which ultimately enhanced the project.

The success of the field expeditions were 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. Similarly, organising and publicising outreach and training events relied upon local knowledge of SAERI support staff, in particular, liaising with key members of the local community.

Overall, the project outputs have exceeded expectations, and there is very little that we would do different if we were to do it again. However, given the extent and value of NHM resources with regards to biodiversity conservation in the UKOTs, including collections, expertise, etc., any future projects should ensure that these resources are fully mobilised e.g. through Memoranda of Understanding between partners, to maximise support for the project both during and beyond its lifetime. Having such agreements in place would strengthen collaborative networks and pave the way for future projects.

5.1 Monitoring and evaluation

In general, the PL was responsible for project M&E, which involved regular formal meetings between the PL and PO (weekly) and PP (monthly) to review project progress, with approximately quarterly meetings of the Steering Group (Supplementary Document 1, Annex 6.2). There was also ongoing informal M&E among all team members throughout the project. The PL and PO reviewed the project budget at regular intervals (most frequently towards the end of each financial year) with a dedicated administrative assistant in the NHM Research Coordination Office to ensure project spending was on track. During Falklands fieldwork, there was daily monitoring of weather and shore conditions to ensure safety, and plans were adjusted if necessary. Overall, this system of M&E, founded upon good communication among team members and key stakeholders, was highly effective, not only in terms of tracking project milestones, but also for generating discussion and developing new ideas to enhance project outputs – for example, novel outreach initiatives (e.g. seaweed postage stamps), ways of interfacing with ongoing projects (e.g. coastal mapping) and proposals for future projects.

The only significant major change to the project design was that the PO was seconded to Tristan da Cunha for three months (Sep–Nov 2018) as a consultant marine scientist for project DPLUS062, ‘Securing the future of the Tristan marine environment’, therefore the project was suspended for three months and the end date extended accordingly, with a proportionate

amount of funds transferred to the subsequent (2019/20) financial year. Work scheduled for Q4 2018 was simply moved into the following quarter, and the second field expedition to the Falklands still took place in Q1 2019, as planned. These changes had no impact on project progress, as the objectives were completed within the same overall time frame. In fact, the project benefitted from this opportunity to supplement specimens collected in the Falklands with new material from Tristan (as an 'in kind' contribution from the PO), not to mention enhanced collaborations among partner organisations and transfer of information between the two projects. Additionally, the PL continued to work on the Falklands project during the three month suspension as a contribution in kind.

5.2 Actions taken in response to annual report reviews

Feedback from the first annual report (April 2018) was addressed in the subsequent half-year report. Essentially, this questioned the 'sequential' approach of the project, i.e. focussing on the scientific objectives (seaweed distribution, diversity and taxonomy) first before addressing training and outreach objectives later, rather than running these two components in parallel from the start. During the first field expedition, while we did spend time meeting key stakeholders (e.g. project steering group members, Falklands Conservation managers) to discuss ideas for training and citizen science programmes, the primary objective was to conduct surveys and collect specimens from as many sites as possible throughout the Falklands, generating the necessary material and data for producing a comprehensive species inventory, which in turn provided a robust foundation for training and outreach activities (e.g. through development of a species ID guide). This approach, which was agreed upon by PPs and the steering group from the outset, proved to be successful in delivering project objectives.

6 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 expeditions, 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) at UK and overseas conferences, including a poster presentation at the British Phycological Society (BPS) 2018 meeting and oral presentations at the BPS and Phycological Society of America (PSA) 2019 meetings and 8th Operational Maritime Law conference (Supplementary Document 8, Annex 6.2). Presentations featuring project findings were given at the BPS seaweed ID course held at the Marine Biological Association and at a UKOTs student conference held at the NHM in 2018. News stories and articles about the project were published on the NHM website and in its Wild World magazine (Supplementary Document 9, Annex 6.2), and on the PL's research group website. Project-related posts on social media included links to the Darwin Initiative Twitter account and Darwin project website. The species ID guide and resources developed for outreach activities undertaken in the Falklands, including the public talk, ID workshop and citizen science project, acknowledge support from the Darwin Initiative. Interviews with the PL and PO were broadcast on Falklands Radio (FIRS; May 2018 and February 2019) and Falkland Islands Television (FITV; 11th–15th and 18th–22nd February 2019), which promoted the project and helped to raise public awareness of the importance of seaweeds on a national scale, and increasing uptake for the aforementioned outreach and training activities. In particular, the increased public interest in seaweeds has catalysed development of the 'Falklands Big Seaweed Search' citizen science project, in partnership with FC and SAERI, which will enable long-term collection of seaweed distribution data beyond the end of the project.

7 Finance and administration

7.1 Project expenditure

Project spend (indicative since last annual report	Grant (£)	Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
(a) 2018/19				
Staff costs				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items				
Others				
TOTAL (2018/19)				
Staff costs				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items				
Others				
TOTAL (2019/20)				

Staff employed (Name and position)	Cost 2018/19 (£)	Cost 2019/20 (£)
Rob Mrowicki (Project Officer)		
TOTAL		

Consultancy – description and breakdown of costs	Other items – cost (£)
N/A	
TOTAL	

Capital items – description	Capital items – cost (£)
N/A	
TOTAL	

Other items – description	Other items – cost 2018/19 (£)	Other items – cost 2019/20 (£)
Molecular biology DNA sequencing		
Molecular biology specimen preparation		
SAERI laboratory and field costs		
Publication costs		
TOTAL		

7.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
(a) Confirmed at application stage:	
NHM Core staff	
NHM Estates & Indirects	
SAERI Core staff	
SAERI Local transport & lab cost	
(b) Additional funds raised during project lifetime:	
NHM Departmental funding for PSA 2018 conference/field travel	
ZSL Research group funding for BPS 2019 conference travel	
Operational Maritime Law funding for 2019 conference travel	
TOTAL	

Source of funding for additional work after project lifetime	Total (£)
FIG Environmental Studies Budget award	
TOTAL	

7.3 Value for Money

More than half (51.7%) of the total project budget was provided in kind by NHM and SAERI, which represents excellent value for money. This consisted largely of time dedicated by researchers and technical staff with world-leading expertise in biodiversity science, specifically seaweed taxonomy and molecular biology. The availability of the NHM algal herbarium, an

unparalleled resource for studying past and present botanical diversity in the UKOTs, was key to development of a robust baseline for seaweed diversity. Having greatly enhanced the value of this resource for future research, the specimens collected during this project will now be preserved for perpetuity, in accordance with the core duty of the NHM.

Additional research group (ZSL) and departmental (NHM) funding provided in kind during the course of the project (£2,235.16; see section 7.2 above) supported conference travel for the PL and PO to promote the project and enabled the PO to participate in the second field expedition, which greatly enhanced the outreach and capacity building components.

This project also made the most of existing facilities and infrastructure for molecular biology (NHM) and data management (SAERI), purchase of capital items was unnecessary for completing project outputs. Aside from laboratory consumables (only 1% of the total budget), scientific equipment used during the project was ‘low-tech’ and inexpensive, maximising the amount of data generated per unit cost.

Overall, the project has yielded a large body of high quality data that will feed into conservation management in the Falklands, by addressing identified knowledge gaps and targeting specific FIG environmental priorities.

Annex 1 Project's full current logframe as presented in the application form (unless changes have been agreed)

Please insert your project's logframe (if your project has a logframe), including indicators, means of verification and assumptions. 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:			
Outcome:			
Outputs: **1**. Add more outputs as necessary	1.1 1.2 1.3 etc.	1.1 1.2 1.3	
2.	2.1 2.2	2.1 2.2	
3.	3.1	3.1	
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)			

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

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
Impact: Insert **agreed** project Impact statement		Report on any contribution towards positive impact on biodiversity or positive changes in the conditions of human communities associated with biodiversity e.g. steps towards sustainable use or equitable sharing of costs or benefits
Outcome Insert **agreed** project Outcome statement	Insert **agreed** Outcome level indicators	Report on progress towards achieving the project purpose, i.e. the sum of the outputs and assumptions
Output 1. Insert **agreed** Outputs with Activities relevant to that output in lines below	Insert **agreed** output level indicators)	Report general progress and appropriateness of indicators, and reference where evidence is provided e.g. *Evidence provided in section 3.2 of report and Annex X*
Activity 1.1 Insert activities relevant to this out put		Report completed or progress on activities that contribute toward achieving this Output
Activity 1.2. Etc.		
Output 2. Insert **agreed** Output	Insert **agreed** Output level indicators	Report general progress and appropriateness of indicator
Activity 2.1.		
Activity 2.2. Etc.		
Output 3. Etc.		

Annex 3 Standard Measures

Code	Description	Totals (plus additional detail as required)
Training Measures		
1	Number of (i) students from the UKOTs; and (ii) other students to receive training (including PhD, masters and other training and receiving a qualification or certificate)	
2	Number of (i) people in UKOTs; and (ii) other people receiving other forms of long-term (>1yr) training not leading to formal qualification	(i) N/A (ii) **1** – training in taxonomy and molecular biology for PO
3a	Number of (i) people in UKOTs; and (ii) other people receiving other forms of short-term education/training (i.e. not categories 1-5 above)	(i) **95** – 9 ID workshop delegates, >20 guide shore visit participants, 5 pupils/staff at Fox Bay primary school, 38 pupils/staff at Stanley IJS, 23 FC Watch Group members (ii) **4** – 2 UCL Masters students training in molecular biology with PO, 1 manuscript co-author training in species description, 1 volunteer herbarium assistant
3b	Number of training weeks (i) in UKOTs; (ii) outside UKOTs not leading to formal qualification	(i) **0.2** – 3 hrs guided shore visit, 3 hrs ID workshop (ii) N/A
4	Number of types of training materials produced. Were these materials made available for use by UKOTs?	**5** – ID guide, citizen science guide, data recording app instructions, herbarium specimens, presentation slides
5	Number of UKOT citizens who have increased capacity to manage natural resources as a result of the project	Difficult to quantify; 1 FIG Environmental Officer (steering group member) directly involved in natural resource management; SAERI, SMSG and FC scientists conducting monitoring surveys; members of the public involved in decision-making processes
Research Measures		
9	Number of species/habitat management plans/ strategies (or action plans) produced for/by Governments, public authorities or other implementing agencies in the UKOTs	
10	Number of formal documents produced to assist work in UKOTs related to species identification, classification and recording.	**4** – ID guide, species check-list, citizen science ID sheet, NHM Falklands 'scratchpad' ID webpage
11a	Number of papers published or accepted for publication in peer reviewed journals written by (i) UKOT authors; and (ii) other authors	
11b	Number of papers published or accepted for	

Code	Description	Totals (plus additional detail as required)
	publication elsewhere written by (i) UKOT authors; and (ii) other authors	
12b	Number of computer-based databases enhanced (containing species/genetic information). Were these databases made available for use by UKOTs?	**5** (open access for UKOTs) – NHM KEmu/Data Portal, SAERI IMS-GIS Data Centre, NCBI GenBank, Barcode of Life Data (BOLD) system, AlgaeBase
13a	Number of species reference collections established. Were these collections handed over to UKOTs?	
13b	Number of species reference collections enhanced. Were these collections handed over to UKOTs?	**2** – NHM collections, Falkland Islands National Herbarium
Dissemination Measures		
14a	Number of conferences/seminars/workshops/stakeholder meetings organised to present/disseminate findings from UKOT's Darwin project work	**12** – Falklands public talk, 7 steering group meetings, 2 Falklands Radio interviews, 2 FITV interviews
14b	Number of conferences/seminars/ workshops/stakeholder meetings attended at which findings from the Darwin Plus project work will be presented/ disseminated	**6** – 2 UK conferences, 2 international conferences, BPS seaweeds course, UKOTs student conference
Physical Measures		
20	Estimated value (£s) of physical assets handed over to UKOT(s)	
21	Number of permanent educational/training/research facilities or organisation established in UKOTs	**1** – citizen science programme
22	Number of permanent field plots established in UKOTs	**40** field sites
23	Value of resources raised from other sources (e.g., in addition to Darwin funding) for project work	

Annex 4 Publications

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Nationality of lead author	Nationality of institution of lead author	Gender of lead author	Publishers (name, city)	Available from (e.g. weblink, contact address, annex etc)
*Field report	*Report on field expedition (FIG Research Licence R01/2018)*, Brodie, J., Mrowicki, R. & Brickle, P. (2018)	UK	UK	Female	N/A	FIG Environmental Officer, Stanley, Falkland Islands Annex 6.2
*Field report	*Report on field expedition (FIG Research Licence 51/2018)*, Brodie, J., Mrowicki, R. & Brickle, P. (2019)	UK	UK	Female	N/A	FIG Environmental Officer, Stanley, Falkland Islands Annex 6.2
*Manuscript	*A check-list for seaweeds of the Falkland Islands*, Brodie, J. & Mrowicki, R. (2019)	UK	UK	Female	N/A	Juliet Brodie (Project Leader), NHM, London, UK Annex 6.2
*Manuscript	*Biodiversity of* Corallina *species from Tristan da Cunha and the Falkland Islands, including* C. chamberlainiae *sp. nov.: implications for South Atlantic biogeography,* Brodie, J., Melbourne, L., Mrowicki, R., Brickle, P., Russell, S. & Scott, S. (2019)	UK	UK	Female	N/A	Juliet Brodie (Project Leader), NHM, London, UK Annex 6.2
*Species ID guide	*Preliminary identification guide to the seaweeds of the Falkland Islands*, Brodie, J. & Mrowicki, R. (2019)	UK	UK	Female	N/A	Macroalgal research website Annex 6.2
*Web article	*To boldly go where no phycologist*	UK	UK	Female	N/A	NHM website

	has gone before, Pavid, K. (2018)					Annex 6.2
*Web article	*Falkland Islands marine forests: discovering biodiversity in the South Atlantic*, Mrowicki, R. (2018)	UK	UK	Male	N/A	Macroalgal research website Annex 6.2
*Newsletter article	*Protecting the rich seaweed biodiversity of Falkland Islands fantastic marine forests*, Brodie, J. & Mrowicki, R. (2019)	UK	UK	Female	N/A	Darwin newsletter Annex 6.2
Mobile app	*Citizen science seaweeds data recording form,* Marengo, I. (2019)	Italy	Falkland Islands	Female	N/A	SAERI Data Manager, Stanley, Falkland Islands SAERI data portal
WebGIS platform	*Citizen science seaweeds identification map,* Marengo, I. (2019)	Italy	Falkland Islands	Female	N/A	SAERI Data Manager, Stanley, Falkland Islands SAERI data portal
*Metadata	Metadata for field surveys, quadrat photographs and DNA sequences, Brodie, J. & Mrowicki, R. (2019)	UK	UK	Female	N/A	SAERI IMS-GIS Data Centre Annex 6.2

Annex 5 Darwin Contacts

Ref No	DPLUS068
Project Title	Building foundations to monitor and conserve Falklands marine forest habitats
Project Leader Details	
Name	Prof. Juliet Brodie
Role within Darwin Project	Project Leader
Address	
Phone	
Skype	
Email	
Partner 1	
Name	Dr Rob Mrowicki
Organisation	Natural History Museum (NHM)
Role within Darwin Project	Project Officer
Address	
Skype	
Email	
Partner 2	
Name	Dr Paul Brickle
Organisation	South Atlantic Environmental Research Institute (SAERI)
Role within Darwin Project	Project Partner
Address	
Skype	
Email	

Annex 6 Supplementary material (optional but encouraged as evidence of project achievement)

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. However, we would expect that most material will now be electronic.	
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.	