

## **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*

### **Darwin Plus Project Information**

Project reference	DPLUS062
Project title	Securing the future of the Tristan marine environment
Territory(ies)	Tristan da Cunha
Lead organisation	Royal Society for the Protection of Birds (RSPB)
Partner institutions	Tristan Fisheries Department
Grant value	£248,117
Start/end date of project	April 2018 – March 2021
Reporting period (e.g., Apr 2018-Mar 2019) and number (e.g., AR 1,2)	Apr 2018–Mar 2019 (AR1)
Project leadername	Andy Schofield
Project website/blog/Twitter	<a href="http://www.tristandc.com">www.tristandc.com</a>
Report author(s) and date	James Glass, Rob Mrowicki and Andy Schofield June 2019

## 1. Project overview

Tristan da Cunha is the world's most remote inhabited island, located almost halfway between South America and South Africa at a latitude of approximately 37.6 degrees South (see map below). Gough Island lies some 350 km to the south-east of Tristan at approximately 40 degrees south. The archipelago comprising four main islands in the south Atlantic (**Figure 1**), is highly dependent on a healthy marine environment to support its MSC-certified rock lobster fishery, which provides 80-90% of the population's income, enabling it to be self-sustaining. The marine life of the islands is also of high conservation importance, for the conservation of marine wildlife, particularly seabirds, seals and cetaceans which are important for developing tourism. However, the marine life and fishery are highly vulnerable to climate change, with the key kelp forest potentially disappearing if seawater temperatures increase. The high reliance on the lobster fishery makes it crucial for islanders that it is managed sustainably, and that the probable effects of threats from invasive introduced species and climate change are assessed in order to plan for the future. Previous Darwin projects (most recently, DPLUS005) have substantially enhanced local capacity for marine research and response to change through an increased knowledge base and training of islanders and identified ways of improving data collection for fisheries management.



**Figure 1.** Tristan da Cunha is the world's most remote inhabited island, located almost half-way between South America and South Africa at a latitude of approximately 37.6 degrees South. Gough Island lies some 350 km to the south-east of Tristan at approximately 40 degrees South.

This project aims to consolidate and build on this established base by further training for islanders in fisheries data acquisition and processing, including experience for the Head of Fisheries in a relevant country with sustainable lobster fisheries and established MPAs. The project also aims to fill gaps in knowledge of inshore biota, including the status of potentially invasive species, essential to underpin MPA decisions.

## **2. Project stakeholders/partners**

The key stakeholders of this project are:

From the beginning, the Tristan da Cunha Government (particularly the Fisheries Department) has been integrally involved in its implementation. The development of this project was based on a need to answer questions about the lobster fishery that the previous Darwin Project started, especially the highly vulnerability of the Lobster Fishery to Climate change. The Tristan government was involved in decision-making and are fully support of this project and identified specific needs to be addressed.

**Tristan Community**, the people of Tristan da Cunha, whose livelihoods depend on the health of the marine environment, and who will therefore benefit from sustainable management initiatives (e.g. Blue Belt programme) towards which this project is contributing directly;

**Fisheries Department**, The Fisheries Department as the main project partner have been in frequent discussions regarding the planning, implementing and reviewing all the work carried out. In addition, the staff attended fishing committee meetings and worked closely with the Island Administration. There is regular contact between the UK and Tristan-based teams, and staff appointed to the project by the RSPB has been recruited with input from Tristan.

**RSPB**, Is committed to facilitating support within the Tristan da Cunha island group to both the terrestrial and marine ecosystems. RSPB has been involved within Tristan for over 15 years and will continue to support conservation work on the islands and work in partnership with all government departments to secure a lasting legacy for the future of Tristan.

**Ovenstones Pty**, the fisheries concession holder, are extremely supportive of the project and provided facilities onboard their lobster fishing vessel Geo Searcher to carry out the Lobster Tagging trails this season.

**CEFAS and MMO**, although not project partners both organisations are contributing to some related issues and objectives under the BlueBelt programme.

A number of scientists who have worked on previous Darwin projects and have an interest in the Tristan marine environment have also provided specialist advice and support.

## **3. Project Progress**

### **3.1 Progress in carrying out project Activities**

During September–November 2018, consultant marine biologist Rob Mrowicki (current Project Officer for project DPLUS068, 'Falkland's marine forests') visited Tristan to assist Fisheries Department staff in achieving project objectives, as outlined below. The primary aim of this 10-week visit was to train staff and establish methods for the respective monitoring activities, while collecting the first round of survey data, to provide a basis for continued work over the subsequent months. During this period, however, weather and sea conditions were worse than usual for this time of year, and boat-based fieldwork was restricted to a total of eight days.

## **1. Tristan da Cunha has greater local capacity to manage its marine resources sustainably**

Study trip - Overseas Trip to the USA to visit a Lobster Fishery within an MPA (Activity 1.1). The Director of Fisheries stayed and observed/worked at the Marine Science Institute at the University of California (UCSB) between 24<sup>th</sup> June - 19<sup>th</sup> July 2017 (before the project was extended due to the project partner being off island on medical treatment), under the supervision of Jenn Caselle- Marine Biologist who was part of the Nat Geo Pristine Seas team that visited Tristan earlier in the year. During his time there he had several meetings with scientist involved in managing MPA's, as well as taking boat trips and speaking to those involved in the fishing industry. Report (Overseas Trip to the USA to visit a Lobster Fishery within an MPA and other Fisheries Organisations in the UK and South Africa)

The feedback James had from Jennifer Bone who was responsible for James Schedule was that the people who he had meetings with were overall very impressed with what they learned about the management of Tristan's lobster fishery. Meetings with Julia Coates and her team from The California Department of Fish and Wildlife (CDFW) who is responsible for the stock assessment and management measures for the spiny lobster, were particularly interested as they had a lot in common with the Tristan fishery, such as a harvest control rule (HCR) for lobster. The HCR serves as the foundation for managing the fishery in the future as well as the primary mechanism to prevent, detect, and recover from overfishing. The HCR is a type of adaptive management framework that identifies potential conservation problems and prescribes appropriate management responses. However, it was interesting for James to find out that no fishery observers had been on any of the lobster boats in Santa Barbara to collect size composition and other data, and that everything was done shore based.

Overall the trip was a real eye opener, especially James visit to the UN, on World Oceans Day 2017, to hear about how much plastic enter the sea and the damage it causes. Since arriving back at Tristan extra conditions have been incorporated in to the fishing licences for example waste management (if waste not incinerated on-board then it must be returning all rubbish to South Africa), gear restrictions (number of hooks and line weighting, and observer monitoring (last two years 100% observer coverage on deck and factory on longline vessel)(Activity 1.1).

Fisheries Observer Training is planned in Cape Town during the 2019/20 financial year. The proposed training will be on Demersal Longline, Demersal trawl vessels and possibly other fishery sectors operating regionally off Tristan da Cunha and within the relevant RFMOs. The training program will be tailored to emphasise the Tristan da Cunha Fisheries observer requirements as well as International Observer protocol. Phase one will entail theoretical training in a classroom environment using Power Point presentations, videos and simulated practical exercises. Phase two will cover computer literacy, data field description and on-board data capture which are essential components for observer training in the Pelagic Longline fishery. Practical training on-board a commercial vessel and fish identification exercises would be conducted on board a stationary vessel off-loading in port. The advantage of this would be that learners gain a practical "hands on" experience with relevant fishing gear as well as visually comprehending the vessel layout and the electronic equipment that is used for navigation and fish location.

To comply with "international safety standards for merchant seaman and fishermen" to embark onboard any commercial fishing vessel, observers are required to undertake a number of STCW95 certified safety training courses. This year, three Tristan fisheries observers, including the Director of Fisheries, have undergone Personal Safety Training in Cape Town and the UK (Activity1.2; see course certificates in Annex 3).

Three fisheries staff members (out of a possible four) were generally available to participate regularly in survey and monitoring activities. During Rob's visit, Islanders were trained in methods for collecting and preserving plankton, deploying baited underwater cameras, sampling inshore fish populations, conducting dive surveys and kelp habitat mapping. This also included procedures for recording and processing data and, for one islander, an introduction to data analysis using R and QGIS. (Activities 1.3 & 1.5). One islander is currently in the UK has had training at CEFAS on creation of an integrated database for storing/querying fisheries and marine environmental data, and all related metadata (Activity 1.6).

There is currently only one islander with the necessary diving qualifications and experience to participate in underwater surveys, whereas during the previous Darwin marine project (DPLUS005) there were two. This islander received additional training and experience by undertaking surveys with the visiting marine biologist (Activity 1.4; see below). A number of other islanders are qualified to at least a basic level but are either unavailable and/or would require further training (or, at minimum, a refresher course) to become sufficiently competent scientific divers. Given the limited duration of the visit, combined with a lack of opportunities for diving due to poor weather, this training could not be undertaken, and survey work had to take priority.

## **2. The monitoring of the lobster fishery is improved through research and the introduction of new technology**

Tristan Fisheries Department has acquired new fishing activity monitoring technology, which will be deployed on local boats during the upcoming fishing season and will be using to improve accuracy of fishing effort data, essential for sustainable fisheries management. (Activity 2.1). An *ex situ* experiment to determine the effects of tagging on adult lobster growth and mortality (Activity 2.2) was undertaken by Tristan fisheries observers on board the MV Geo Searcher during Nov 2018 and Jan 2019 (see Annex 4 for report). This study indicated that tag loss rates may be increased by the presence of finfish in the natural environment.

## **3. Critical information on Tristan Rock Lobster *Jasus tristani* life history and ecology is used to improve long-term monitoring and management of stocks**

(Fisheries have not been very successful in the past with puerulus collectors, however this season we are going to give it a final try inshore using the design they used in California to see if it will work in our environment. Activities 3.2& 3.3)

Regular plankton sampling has been introduced as a potential means of monitoring the abundance of lobster phyllosoma larvae within inshore waters (Activity 3.2), although its primary application is to collect baseline data on the dynamics of zooplankton communities as indicators of changing conditions (Activity 5.4; see below). A single lobster phyllosoma larva was observed in a plankton sample collected from Petrel Bay, Nightingale island on October 1<sup>st</sup>. Repeated sampling at multiple sites and times of year (especially during/after the main lobster spawning season) will be necessary to determine if this sampling method has the ability to detect variability in larval abundance.

As part of DPLUS005, research was conducted into the abundance and diversity of invertebrate fauna inhabiting algal turfs, as an important food source for juvenile lobsters in shallow intertidal habitats. Additional specimens were collected during the current project and sent to experts at the Natural History Museum to enable more accurate identification of these fauna (Activity 3.4). Since the start of the project, researchers at the University of Cape Town conducted a detailed study of the diet of 540 adult lobsters from Tristan,

Nightingale and Inaccessible islands (addressing Activity 3.5), which revealed significant differences in diet among all three islands, as well as variation according to depth and size class, despite considerable dietary overlap between populations of this generalist consumer<sup>1</sup>.

It has not yet been possible to acquire a suitable camera or underwater GoPro housing for obtaining footage from deeper water habitats (to 100 m depth) that may serve as important foraging areas for lobsters (Activities 3.6 and 6.3). However, suitable equipment has been sourced and has just arrived at Tristan, so will be used during the 2019/20 summer.

#### **4. The status of invasive marine species and their potential impacts on native ecosystems are determined, and monitoring protocols established**

Two South American silver porgy (*Diplodus argenteus*), caught during winter 2018, provided the first samples used to obtain data on population structure, reproductive cycles and diet of this non-native species in Tristan waters (Activities 4.1 & 4.3). These were processed together with six five fingers (*Acantholatris monodactylus*) caught via spear fishing in the harbour during Rob's visit. These samples were analysed by CEFAS (Annex 5). Having been trained in otolith, gonad and gut contents extraction, and the Tristan fisheries staff will continue collecting samples to generate a dataset of sufficient size and temporal extent. The most efficient means of obtaining regular fish samples has yet to be determined, although combining spear fishing with hook and line methods is likely to be the best approach. Samples may also be supplemented with incidental catches from the recreational fishery.

For the purposes of monitoring the distribution and relative abundances of fish species, including the porgy, a total of 29 Baited Remote Underwater Video (BRUV) surveys were carried out at eight locations across Tristan, Nightingale and Inaccessible islands between July and December 2018. (Activities 4.2 & 4.3). Via this survey method, the presence of adult porgy at Nightingale was confirmed for the first time, at Petrel Bay (approximately 1 km from the wreck of the MV Oliva) on 1<sup>st</sup> October. Porgy were also detected at Trypot, the site of the 2006 rig stranding.

The Oliva wreck at Nightingale island remains a potential source of non-native marine species, such as the Mediterranean mussel (*Mytilus galloprovincialis*), a small population of which was previously discovered inhabiting the wreck and subsequently removed. Conditions are rarely suitable for shore surveys or diving at the wreck site itself, making it difficult to perform repeat surveys. Settlement panels were deployed at the subtidal monitoring site at Nightingale, approximately 2 km from the wreck, in November 2018 to check for the establishment of sessile non-native species (Activity 4.5). Additional sets of panels were to be deployed at two sites on Tristan island (outside the harbour breakwater and at Trypot), but this was prevented by poor weather conditions during Rob's visit. However, a subtidal survey was conducted at Trypot in October (Activity 5.3; see below), during which no sessile non-native species were detected.

#### **5. Habitat and species distributions are mapped and monitored to assess potential effects of climate change**

A simple boat-based method of mapping giant kelp (*Macrocystis pyrifera*) by plotting GPS waypoints has been established, and used by Fisheries staff to map sections of kelp forest at Gough and Nightingale islands (Activity 5.2). A limitation of this method is that it requires very calm surface conditions with little underwater current, otherwise subsurface kelp fronds may not be visible. Continued kelp mapping via this method, combined with other fieldwork, will provide a baseline for detecting significant shifts in kelp forest extent and for ground-truthing other, more sophisticated approaches involving remote sensing. Additionally, a

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<sup>1</sup> Jones, L.D.S. (2018) *Diet of the Tristan rock lobster Jasustristani following the 2011 soya spill at Nightingale Island*. MSc Thesis, University of Cape Town. 55 pp.

method for measuring different aspects of kelp growth and condition<sup>2</sup> was trialled at Nightingale and will be extended across different sites and times of year during this season.

During Rob's visit, subtidal monitoring surveys were conducted at six sites (five at Tristan, one at Nightingale), including one site that was designated previously as a long-term monitoring site (see DPLUS005 final report). The survey protocol has been improved to align closely with methods used in other South Atlantic UKOTs and to provide more robust quantitative species abundance data (Activity 5.3). These data will also complement baseline data collected during other recent surveys, such as the 2017 National Geographic Pristine Seas expedition<sup>3</sup>. Additionally, repeat intertidal monitoring surveys (implemented during DPLUS005) were conducted at Runaway Beach, Tristan in November, to enable interannual comparisons.

A total of 12 inshore plankton samples were collected in the vicinity of the same six sites and from 1 additional sites at Inaccessible islands, all of which have been partially analysed to determine relative abundances for main taxonomic groups (Activity 5.4). The specialised plankton team at CEFAS is currently undertaking a more detailed analysis of these samples. Repeated sampling will be required to assess seasonal and spatial changes in plankton community structure, particularly given the high variability among individual samples. Collection of long-term sea surface temperature data (Activity 5.5; ongoing since DPLUS005) is being achieved using subtidal temperature loggers deployed at monitoring sites at Tristan, and Nightingale islands. Data were downloaded from the logger at Nightingale during survey dives in November.

## **6. Tristan da Cunha has greater local capacity to prepare for large scale Marine Protected Area Management**

As described above for Activity 1.1, the Director of Fisheries undertook a successful study visit to a lobster fishery within an MPA (Activity 6.1). Collation of existing data, from current and previous projects, to identify inshore biodiversity hotspots (Activity 6.2) will be addressed in the final year of the project, following an additional round of marine survey work during summer 2019/20. As mentioned above (Activity 3.6), this will include a first investigation of deeper water biota using a specialised underwater camera (Activity 6.3). Committee and Council Meetings have been held discussing MPA options on island and the director has met with CEFAS and MMO in UK (6.4).

### **3.2 Progress towards project Outputs**

1. Local capacity for marine resource management
- (2. Lobster fishery monitoring)
3. *Jasustristani* life history and ecology
4. Invasive marine species monitoring
5. Habitat and species distribution mapping
- (6. Local capacity for large-scale MPA management)

**Covered in the above text**

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<sup>2</sup> After Hepburn, C.D., *et al.* (2007) Exposure to waves enhances the growth rate and nitrogen status of the giant kelp *Macrocystispyrifera*. *Mar. Ecol. Prog. Ser.* 339: 99–108.

<sup>3</sup>ref

### **3.3 Progress towards the project Outcome**

Due the complications at the start of the project activities are at an early start, and progress towards the project outcome is limited. However, the active engagement of the government of Tristan da Cunha, as demonstrated by their involvement in the recruiting process and adapting activities shows the government's willingness to better understand and manage their marine resources in the long term.

### **3.4 Monitoring of assumptions**

There have been no changes in the earlier identified risks and assumptions and they all still hold true. Tristan da Cunha is an incredibly challenging location and environment to work and has very limited access which can impinge on the project greatly. These risks are mitigated against as much as possible but are often out of any control.

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

The project is still at an early stage and so there have been no achievements to date, but the development of the MPA due to be implemented in 2020, of which this project has helped to inform will contribute to output 5 & 6 and the long term secure future for Tristan's marine environment.

## **4. Monitoring and evaluation**

- A major change in project design occurred as a result of one of the main project partners having to go off island for several months on medical treatment. Also, one of the main qualified fisheries biologists for the first fieldwork season who knew the project design had to pull out because of taking a full-time position job. Because of this the installing of fishing activity monitoring technology on the powerboats operating at Tristan to estimate the fishing effort on the local fishing boats had to be postpone and will take place this coming season
- All this meant that the project had to be rescheduled and an extension of one year was asked to be added to the project.

## **5. Lessons learnt**

Tristan being the remotest inhabited island group in the world brings specific challenges to project management. Although this project benefitted from the experience of previous Darwin projects on Tristan, project managers were still aware of the major challenges.

In particular, appointing staff suited to work on Tristan, transport to and from the island, and poor internet are continuing challenges through this early start of this project.

On the plus side, having equipment provided by previous Darwin projects, and dedicated Tristanian Fisheries Department staff with assistance from the fishing company were enormous benefits.

Broader issues;

- In future I would ensure that I had more than one external researcher that knew the project design, so that if he/she was unable to continue the project it would not jeopardise the success of the project or delay its implementation.



- It is important for external researchers to have enough time on island to build momentum and knowledge.
- Finally, the logistical challenges faced at the start of this project emphasise how difficult it can be to adhere to project timescales on an extremely remote island, where weather and transport restrictions can quickly set you back months.
- Time is critical, and it is also critical to build in a substantial amount of contingency for this. External researchers suddenly not being available to visit Tristan, fisheries staff off island or weather can suddenly have real impacts on the project timelines; This is also difficult as it then immediately has a knock-on effect to financial management as it is very easy with somewhere so remote to suddenly need large changes to carry over funds due to long delays.

**It must be said that Darwin have been unbelievably understanding and accommodating in all the issues that we have had over the project period and their flexibility in extending the project by a year will help us get back on track this summer.**

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

Not applicable.

#### **7. Other comments on progress not covered elsewhere**

- The project has only been operating in the field for one summer season, so methods are still being developed. A lot of time has been dedicated to considering and trialling monitoring methods as they must be simple enough for the local team to undertake as from end of the project without, or with minimal, outside assistance but robust enough to allow effective measurement of change.
- There was two major setbacks encountered by the project 1) was when one of the main project partners left to take up other duties. This left the project having to find and recruitment another suitably qualified fisheries scientist, and to get them to Tristan for the start of the summer, this was accomplished although it was roughly two months later than hoped for.
- 2) Due to a very late start of the lobster season at Tristan because of a Fishermen's and Process workers strike, the Lobster tagging trial had to be carried out on the vessel instead of at the factory. After discussions amongst the project partners, it was decided that due to the implementation of Blue Belt some objectives would change due some of the objectives being carried out by CEFAS and the MMO. A Change Request was asked for and the project has been extended for an additional year, although it is not anticipated to have any impact on the project's overall budget.

#### **8. Sustainability and legacy**

Although the Darwin project has only been in operation for just over a year there is a strong awareness in the Tristan community of the project and the work being conducted as part of it. During the first year, Fisheries staff attended presentations about the project and it has been explained at Fisheries Council Committee meetings.

The RSPB team has been working closely with the Fisheries Department on-island, and there is a strong commitment to continuing the work after Darwin funding ends in 2021

The supply of a RIB vessel, the *Jasus tristani* (the Latin name for the Tristan spiny lobster) during the last Darwin Marine project has made a huge difference to this project, making the Fisheries Department more independent.

Tristan is so small that limitations in equipment and numbers of people are real restrictions in terms of carrying out basic work such as monitoring.

This extra boat has significantly assisted the Fisheries Department in monitoring the fishery and carrying out the project objectives. It has already saved the Fisheries Department in boat hire fees, and now stands in as a support boat whilst the Fishery Patrol vessel is being refitted off island.

The legacy of this project will continue to give social, economic, ecological and technical benefits as these projects results will underpin future conservation and fisheries management plans.

## 9. Darwin identity

- The Darwin Initiative logo is used on any events held on Tristan, like on species identification training presentations and in the profile on the [tristandc.com](http://tristandc.com) website. The Darwin Initiative support is a separate project with a clear identity on Tristan.
- There is a good understanding of Darwin on Tristan, although there are only two government departments (Fisheries and Conservation) with a clear understanding of the programme, many members of the community are employed part-time, and so have a great understanding of Darwin. The population of Tristan is very small (currently 243) and there have already been three successful projects leading to increased capacity on Tristan for conservation/fisheries work.

## 10. Project Expenditure

Full financial report is submitted separately as the Q4 claim.

**Table 1: Project expenditure during the reporting period (1 April 2018 – 31 March 2019)**

Project spend (indicative) in this financial year	2018/19 D+ Grant (£)	2018/19 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)				
<b>TOTAL</b>				

## Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2018-2019–if appropriate

Project summary	Measurable Indicators	Progress and Achievements April 2018 – March 2019	Actions required/planned for next period
<p><b>Impact:</b></p> <p>The marine environment is managed to sustain local livelihoods, while conserving biodiversity and natural resources, and monitoring for potential effects of invasive species, climate change and other anthropogenic impacts.</p>			
<p><b>Outcome:</b> Strengthened local capacity for sustainable management of marine resources underpins decisions on fisheries diversification and MPAs, and informs an enhanced understanding of impacts of invasive marine species and climate change.</p>			
<p><b>Output 1. Improved local capacity</b></p> <p>1.1 Study trip to a country managing a sustainable rock lobster fishery (possibly Tasmania) and with MPAs, for Director of Fisheries and researcher.</p> <p>1.2 Fisheries observer training in Cape Town for 3 islanders, on fishing methods for species other than rock lobsters.</p> <p>1.3. Continued training for islanders in fisheries data gathering, processing and use for fisheries modelling.</p> <p>1.4 Further training and dive experience for 3 islanders on Tristan.</p> <p>1.5. Continued and expanded training and involvement in marine survey methods for 5 islanders, including recording, identification, data processing etc</p>		<p>1.1 The Director of Fisheries and Project partner RSPB visited an MPA and the Marine Science Institute at the University of California.</p> <p>1.2 Two Fisheries observers have had PST training in South Africa, and one observer in UK (certificates Annex 3).</p> <p>1.3, Data handling and requisition training given to two fisheries staff</p>	<p>1.1 Objective completed no further action. The trip experience has proved invaluable and will feed in to the future Tristan MPA (2020).</p> <p>1.2 One observer schedule to go to South Africa for training July- August 2019.</p> <p>1.3 Data handling and requisition training will be given to fisheries staff</p>

	<p>at CEFAS UK under Bluebelt (report Data Management Guidance 28<sup>th</sup> February 2019).).</p> <p>1.4 One islander received additional training and experience by undertaking surveys with the visiting marine biologist Nov-Dec 2019.</p> <p>1.5 Identification training on the most common groups of animals and seaweeds was given to Fisheries staff during the scientist visit Nov-Dec 2019.</p>	<p>during the visit of CEFAS researcher to Tristan August-October 2019, and again by another two marine biologist during their visit to Tristan November 2019-March 2020.</p> <p>1.4 Dive training and dive experience will be given to islanders on Tristan, during the visit of two marine biologist to Tristan during November 2019 - March 2020.</p> <p>1.5 Training on surveys will be given to Fisheries staff, during the visit of two marine biologist to Tristan during November 2019 - March 2020.</p>
<p><b>Output 2. Improved fisheries monitoring</b></p> <p>2.1. Procure and install fishing activity monitoring technology on local Tristan fishing boats to improve accuracy of fishing effort data, essential for sustainable fisheries management.</p> <p>2.2. Construction of holding tank facility on Tristan. Experiments to determine the effects of various tags and tagging methods on the lobsters to reduce mortality and tag loss.</p>	<p>2.1 Due to delay of the fisheries monitoring technology equipment arriving at Tristan no work was carried out on the fishing vessels this season.</p> <p>2.2 The construction of a holding tank facility on Tristan was removed from the project. A tag mortality study was carried out on the vessel Geo Searcher during November 2018 and January (Annex 4).</p>	<p>2.1 Procurement and installation of monitoring technology on local the Tristan fishing boats will occur during November 2019 – March 2020.</p> <p>2.2 The tag mortality study, will continue on the vessel Geo Searcher between September 2019 – April 2020 (as long as there is quota to be caught) and again between September 2020 – April 2021.</p>

<p><b>Output 3. Improved information base on Tristan lobster life history and ecology</b></p> <p>3.1. Sample lobster pueruli larvae using pueruli traps, in-water surveys and plankton hauls to improve understanding of seasonal/annual abundance and to inform modelling</p> <p>3.2. Assess Pueruli habitat preferences through underwater searches; traps with different materials.</p> <p>3.3. Continue assessment of juvenile lobster/fish food supply through surveying smaller biota of different habitats, depths, types of seaweed cover through analysis of turf samples.</p> <p>3.4. Assess dietary requirements of adult lobsters through further gut content analysis and recording of night time foraging behaviour.</p> <p>3.5. Acquire basic data on under-recorded habitats, particularly life on the deeper seabed at 30-100m (depths affected by the lobster fishery), and on cobble/pebbles (probably an important refuge habitat for larval lobsters and adults feeding)</p>	<p>3.1 &amp; 3.2 Inshore plankton samples collected, and analyse by the specialised plankton team at CEFAS UK (Annex 5).</p> <p>3.3 &amp; 3.4 Research was conducted into the abundance and diversity of invertebrate fauna inhabiting algal turfs, specimens were collected during the summer and sent to experts at the Natural History Museum to enable more accurate identification of these fauna. (Activity 3.4).</p> <p>3.4 &amp; 3.5 Since the start of the project, researchers at the University of Cape Town conducted a detailed study of the diet of 540 adult lobsters from the Tristan group (<sup>1</sup> Jones, L.D.S. (2018) <i>Diet of the Tristan rock lobster Jasustristani following the 2011 soya spill at Nightingale Island</i>. MSc Thesis, University of Cape Town. 55 pp).</p>	<p>3.1 Plankton hauls will continue whenever the fisheries RIB does research trips to sea, throughout the project.</p> <p>3.2 &amp; 3.3 Pueruli habitat sampling to continue November 2019 – March 2020.</p> <p>3.4 Dietary requirements of adult lobsters completed. no further action. Night time foraging behaviour to be conducted between November 2019 – March 2020.</p> <p>3.5 Camera work (BRUV) work will continue throughout the duration of the project.</p>
<p><b>Output 4. Invasive non-native species impacts</b></p> <p>4.1. Study reproductive state and diet of the invasive porgy fish through trapping (gill and/or seine netting) and dissection of large sample.</p> <p>4.2. Surveys to assess current geographical distribution of invasive porgy across Tristan main island, and presence/absence at Nightingale and Inaccessible.</p>	<p>4.1 &amp; 4.3). The first samples of South American silver porgy (<i>Diplodus argenteus</i>), caught during winter 2018, provided the first data on population structure, reproductive cycles and diet of this</p>	<p>4.1 4 Samples have been collected and await analyses, on-going throughout the project.</p>

<p>4.3. Surveys of porgy abundance/distribution at selected sites; assess population structure (sizes, sex ratios), reproductive cycles (gonad visual inspection and preservation for later histological analysis) and dietary overlap with native species e.g. fivefinger (gut contents analysis); establish regular sampling protocols</p> <p>4.4 Surveys to look for new settlement of invasive mussels <i>Mytilus galloprovincialis</i> from the wreck of the <i>Oliva</i> in 2011, both shore and subtidal, at Nightingale</p> <p>4.5. Surveys to continue checking for establishment of invertebrates from the rig stranding in 2006, especially at sites near Trypot; implement checks on hulls of yachts visiting Tristan; install PVC settlement tiles at a number of accessible sites (monitor using underwater photography).</p>	<p>non-native species in Tristan waters.</p> <p>4.2 &amp; 4.3). During this period a total of 29 Baited Remote Underwater Video (BRUV) surveys were carried out at eight locations across Tristan, Nightingale and Inaccessible islands between July and December 2018, monitoring the distribution and relative abundances of fish species, including the porgy.</p> <p>4.4 Settlement panels were deployed at the subtidal monitoring site at Nightingale, approximately 2 km from the wreck (where a small population of Mediterranean mussel (<i>Mytilus galloprovincialis</i>), was previously discovered), in November 2018 to check for the establishment of sessile non-native species.</p> <p>4.5 Panels were to be deployed at Trypot), but was prevented by poor weather conditions, however a subtidal survey was conducted at Trypot in October during which no sessile non-native species were detected.</p>	<p>4.2 &amp; 4.3 Surveys will continue throughout the project to assess the current geographical distribution of invasive porgy at the Tristan group.</p> <p>4.4 Dive surveys are planned at the wreck of the <i>Oliva</i> during the visit of the two marine biologist to Tristan during November 2019 - March 2020 (summer).</p> <p>4.5 Checking for the establishment of invertebrates from the rig stranding in 2006, at Trypot; will continue during the visit of the two marine biologist to Tristan during November 2019 - March 2020 (summer).</p>
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<p><b>Output 5. Climate change impacts</b></p> <p>5.1. Map habitats using existing and new survey data</p> <p>5.2. Establish methods for mapping giant kelp cover and assessing biomass; tracking changes in response to local- and large-scale environmental stressors.</p> <p>Establish methods and sites for assessing kelp growth and condition (possible early indicators of stress), and seasonal changes</p> <p>5.3. Expand long-term climate change impact monitoring sites using methods developed in other South Atlantic UKOTs</p> <p>5.4. Study seasonal/annual changes in plankton ecology/populations through regular hauls, record abundance and composition, preserve. (see also 3.2). Look at possible differences between Tristan &amp; Nightingale, especially in summer when Subtropical Front possibly present.</p> <p>5.5 Continued collection of long-term sea surface temperature data and collection of data from subtidal data loggers.</p>	<p>5.1 &amp; 5.2 Mapping of giant kelp (<i>Macrocystispyrifera</i>) by plotting GPS waypoints has been established. A long-term monitoring of kelp extent via satellite images and ground truthing is also being developed as a long term monitoring tool.</p> <p>5.3 A survey protocol has been developed with methods used in other South Atlantic UKOTs, and is on-going.</p> <p>5.4 A total of 12 inshore plankton samples were collected, all of which were partially analysed, before being sent to CEFAS (Annex 5).</p> <p>5.5 Data on the sea surface temperature continues to be collected through the use of subtidal temperature loggers deployed at Tristan, Nightingale and Gough islands.</p>	<p>5.1&amp; 5.2 Habitat mapping and assessing kelp growth of giant kelp (<i>Macrocystis pyrifera</i>) will continue during the visit of the two marine biologist November 2019 - March 2020 (summer). To be repeated throughout the project,</p> <p>5.3 &amp; 5.4 Underwater photographic survey transects, and plankton hauls will continue during the visit of the two marine biologist November 2019 - March 2020 (summer). To be repeated throughout the project and into the future.</p> <p>5.5 Dives to retrieve data from the sea surface temperature loggers will continue throughout the project and into the future.</p>
<p><b>Output 6. Towards MPA establishment</b></p> <p>6.1. Fact-finding visit for Director of Fisheries to another country with appropriate MPAs and fisheries, to establish how they may be managed together. The trip will also include time in the UK meeting with relevant organisations and individuals.</p>	<p>6.1 Director of Fisheries visited a lobster fishery within a MPA (2017),</p> <p>(output 1.1) attended MPA workshop in UK. Meetings in London with CEFAS and MMO to</p>	<p>6.1 &amp; 6.4 Meetings will be held in September 2019 on Tristan to discuss MPA options.</p>

<p>6.2. Map and collate existing data to identify biodiversity hotspots.</p> <p>6.3. Acquire data on the biota of deeper water. A comprehensive survey of the seabed in waters below 30m is beyond the scope of this project, but preliminary information will be recorded using GoPro cameras in underwater housings depth-rated to 1,500m.</p> <p>6.4. Hold workshops/meetings on/off Tristan as appropriate to discuss MPA establishment at Tristan, aims and mechanisms.</p>	<p>discuss MPA options during May 2019.</p> <p>6.2 As part of Bluebelt BAS has made three visits to Tristan collecting data, and RSPB has collated existing data and identify biodiversity hotspots (Seals, Birds etc) within Tristan's EEZ report currently being compile for Island Council to help them determine what MPA they would like. Biodiversity hot spot report (In Press, Requena,S et al) Will be attached as an annex once published hopefully by mid-year report.</p> <p>6.3 No survey work has been done to date of the seabed below 30m. Due to not having deep water housing.</p> <p>6.4 Discussed MPA options at the 349<sup>th</sup> Island Could meeting on the 10<sup>th</sup> July 2019, feedback to UK organisations.</p>	<p>6.2 Objective completed by RSPB, report due late 2019.</p> <p>6.3 A deep water housing has been purchased and has arrived at Tristan and will be used during the 2019/20 summer, and throughout the project.</p>
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**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](mailto:Darwin-Projects@ltsi.co.uk) if you have any questions regarding this.*

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p><b>Impact:</b> (Max 30 words)</p> <p>The marine environment is managed to sustain local livelihoods, while conserving biodiversity and natural resources, and monitoring for potential effects of invasive species, climate change and other anthropogenic impacts.</p>			
<p><b>Outcome:</b> (Max 30 words)</p> <p>Strengthened local capacity for sustainable management of marine resources underpins decisions on fisheries diversification and MPA’s and informs an enhanced understanding of impacts of invasive marine species and climate change.</p>	<p>0.1 Local managers making better-informed decisions regarding long-term sustainability and diversification of the lobster fishery and protection of Tristan’s marine zone.</p> <p>0.2 Local staff continue collecting robust data to informs fisheries management and to monitor changes in marine ecosystems</p> <p>0.3 The impacts of new invasive species and climate change on Tristan’s marine ecosystems and lobster fishery are quantified and monitored;</p> <p>0.4. Current marine management plans are refined and prioritised based on relative importance of future impacts and implemented by TdC Government in annual work planning.</p> <p>0.5 Appropriate levels of protection for Tristan’s marine zone are defined, based on robust scientific data and stakeholder/expert consultation</p>	<p>0.1 Refined fisheries quotas and methods are refined, MSC accreditation.</p> <p>0.2 Existing fisheries and marine environmental datasets, annual scientific monitoring reports submitted to TdC Government</p> <p>0.3 Annual reports and/or peer-reviewed journal articles on status of invasive species and responses of native species to environmental change;</p> <p>0.4 Updated management plan(s), TDC annual work plans</p> <p>0.5 Species/habitat distribution ‘hotspot maps in management plans.</p> <p>0.5 Workshops/conferences led by local managers and stakeholders, in consultation with experts; report detailing recommendations for MPA</p>	<p>Capacity is retained on island (either by people staying or training being shared).</p>

Outputs			
<p>1. Tristan da Cunha has greater local capacity to manage its marine resources sustainably</p>	<p>1.1 Fisheries Manager on TdC and fisheries specialist post-holder use international learning to update Tristan da Cunha Lobster Management Plan.</p> <p>1.2. Three TdC fisheries observers trained in other fishing techniques appropriate to fisheries diversification at Tristan to allow for proper monitoring control and enforcement of all fishing activities in the Tristan Maritime Zone.</p> <p>1.3. Further training for islanders in fisheries data collection and processing.</p> <p>1.4. Three islanders undergo further dive training and experience on-island.</p> <p>1.5. Five islanders trained in new survey techniques, demonstrate ability to collect monitoring data of sufficient standard.</p> <p>1.6. An integrated database is established for storing/querying fisheries and marine environmental data, and all related metadata.</p>	<p>1.1. Trip 'diary' and thoughts/conclusions written up by participant(s). Lobster management Plan</p> <p>1.2. Course certification by training organisation in Cape Town.</p> <p>1.3. Report from trainer(s).</p> <p>1.4. Diving logbooks updated, qualification certificates/cards, training report.</p> <p>1.5 Training reports, individual performance reports, informal assessment by researchers and supervisors, data sheets completed.</p> <p>1.6. Database established, and islanders able to interrogate.</p>	<p>Appropriate country willing to host fisheries/MPA study trip and external organisations agree to host fisheries staff members for extended periods of time.</p> <p>New additional observers/surveyors are available and willing to undertake training.</p> <p>Suitably qualified and experienced personnel can be recruited to conduct training.</p> <p>Capacity building is retained on island (either by people staying or training being shared)</p>
<p>2. The monitoring and modelling of the lobster fishery is improved through research and the introduction of new technology.</p>	<p>2.1. The estimation of fishing effort on Tristan is improved by procuring and installing fishing activity monitoring technology on the powerboats operating at Tristan.</p> <p>2.2. The impact of tagging Tristan lobsters is reduced by undertaking an extended study of tagged lobster in captivity</p>	<p>2.1 Operational data loggers and trap tags installed on all Tristan fishing vessels. Data used for improved fisheries management and stock assessment.</p> <p>2.2 Lobster holding facility built; lobster tagging study report and peer-reviewed journal article; tagging methods adjusted</p>	<p>Suitably qualified and experienced researchers can be recruited</p> <p>Fishers willing to cooperate with new technology trials</p> <p>Lobster holding facility can be built on-island, or suitable facility identified in Cape Town. <b>(Removed from Project)</b></p>
<p>3. Critical information on</p>	<p>3.1. Lobster larval abundance in inshore and</p>	<p>3.1 Lobster data sheets, preserved</p>	<p>Suitably qualified and experienced</p>

<p>rock lobster life history and ecology is used to improve long-term monitoring and management of stocks.</p>	<p>offshore waters is determined by plankton net hauls</p> <p>3.2. Methods for monitoring lobster larval settlement developed</p> <p>3.3. Information obtained on distribution and habitat preferences of lobster, kelp and other key species.</p>	<p>samples, reports, species distribution maps, published papers</p> <p>3.2 Standard Operating Procedures (SOP) document</p> <p>3.3 Survey forms, photographs, survey reports, species distribution maps, published papers. Data being used to inform stock management.</p>	<p>researchers can be recruited</p> <p>Weather conditions allow survey and monitoring work</p> <p>Access to a suitable platform for offshore sampling is available</p>
<p>4. The status of invasive marine species and their potential impacts on native ecosystems are determined, and monitoring protocols established.</p>	<p>4.1. Surveys of distribution and abundance of South American silver porgy at Tristan, and for presence at Nightingale and Inaccessible.</p> <p>4.2. At least 100 porgy sampled for diet and reproductive analysis.</p> <p>4.3. Information gathered on porgy population structure and dynamics by monitoring regularly at selected sites.</p> <p>4.4. Surveys for presence of non-native benthic invertebrates, especially in the harbour, the vicinity of Trypot (rig stranding) and Nightingale (<i>Oliva</i> wreck).</p> <p>4.5. Settlement panels for detecting non-native benthic invertebrates deployed for period of project.</p>	<p>4.1 and 4.2. Porgy data sheets, photographs, preserved samples, species distribution maps, survey reports, peer-reviewed paper on distribution/biology.</p> <p>4.3 Survey reports, photographs.</p> <p>4.4 Survey reports, photographs, dive logs.</p> <p>4.5. Report of results, list of settled invertebrate species (native and non-native), SOPs.</p>	<p>Weather conditions allow survey and monitoring work.</p>
<p>5. Habitat and species distributions are mapped and monitored to assess potential effects of climate change</p>	<p>5.1. Habitat mapping methods researched, trialled and established.</p> <p>5.2. Baseline data on kelp biomass, condition and growth rates collected at representative inshore sites.</p> <p>5.3. Number of subtidal monitoring sites increased to six, encompassing multiple islands and habitat types.</p> <p>5.4. Inshore and offshore plankton samples from at</p>	<p>5.1 Research reports, survey reports, inshore habitat and species maps, SOPs.</p> <p>5.2 Data sheets, photographs, survey reports, ground-truthed kelp habitat. maps</p> <p>5.3 SOPs, long-term survey schedule, evidence of training in monitoring techniques (see output 1).</p> <p>5.4 Preserved plankton samples, species lists</p>	<p>Suitably qualified and experienced researchers can be recruited.</p> <p>Weather conditions allow survey and monitoring work.</p> <p>Access to a suitable platform for offshore sampling is available.</p>

	<p>least two different seasons collected and analysed.</p> <p>5.5. Additional data loggers deployed in the subtidal.</p>	<p>and photographs, report on plankton composition.</p> <p>5.5. Data retrieved from loggers.</p>	
<p>6. Tristan da Cunha has greater local capacity to prepare for large scale Marine Protected Area Management</p>	<p>6.1. Fisheries Manager on TdC visits an appropriate MPA with diverse zonation scheme, and on return develops report on conditions for the development of an MPA for Tristan da Cunha with training management team and stakeholders.</p> <p>6.2. Biodiversity 'hotspots' identified through mapping of habitats and species from survey data, to facilitate MPA planning.</p> <p>6.3. Data acquired on biota of deeper water and other data-deficient habitats.</p> <p>6.4. Workshops and/or phone conferences held on/off island as appropriate to discuss MPA establishment at Tristan.</p>	<p>6.1. Trip 'diary' and thoughts/conclusions written up by participant(s), Tristan da Cunha MPA report.</p> <p>6.2. Report on biodiversity mapping and MPA recommendations.</p> <p>6.3. Deep water survey results and report on gap-filling habitat/species surveys.</p> <p>6.4. MPA Workshop reports.</p>	<p>Appropriate country willing to host fisheries/MPA study trip.</p>

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