Darwin Plus:
Overseas Territories Environment and Climate Fund

Final Report

Important note *To be completed with reference to the Reporting Guidance Notes for Project Leaders: it is expected that this report will be a maximum of 20 pages in length, excluding annexes*

Darwin Project Information

Project reference	DPLUS 053
Project title	Project Pinnamin: conserving northern rockhopper penguins on Tristan da Cunha
Territory(ies)	Tristan da Cunha
Contract holder Institution	RSPB
Partner institutions	Tristan da Cunha Conservation Department, British Antarctic Survey, Royal Zoological Society of Scotland, South African Department of Environmental Affairs
Grant value	£199,069
Start/end date of project	April 2016-March 2018
Project leader name	Andy Schofield
Project website/Twitter/blog etc.	http://www.rzss.org.uk/conservation/our-projects/project-search/field-work/project-pinnamin-conserving-northern-rockhopper-penguins-on-tristan-da-cunha/
Report author(s) and date	Alex Bond, Antje Steinfurth, Norman Ratcliffe; April 2018

1 Project Overview

Northern rockhopper penguins *Eudyptes moseleyi* are globally Endangered due to historic and ongoing population declines. Monitoring showed that after a period of stability numbers have started to decline rapidly again. Around 80% of the world population breed on the UKOT of Tristan da Cunha. The causes of decline and factors limiting population size are poorly understood, although factors operating in the marine environment (including climate change, oil pollution and bycatch) are suspected causes. However, knowledge of marine distribution and habitat requirements are inadequate to identify limiting factors or recognise significant areas requiring protection. This project aimed to: (1) initiate low-effort monitoring of population dynamics and their drivers which will diagnose declines and inform conservation action; (2) track birds to qualify marine habitat preference and recognise marine Important Bird Areas (mIBAs); (3) strengthen capacity for research, monitoring and data management on Tristan; (4) produce a new species action plan that will identify key conservation measures required to protect northern rockhopper penguins globally.

2 Project Stakeholders/Partners

Stakeholders were invited to sit on the project's Steering Group, which met on 26 May 2016 to discuss the fieldwork phase of the project, on 19 April 2017 to discuss the initial results, the species action plan workshop, and plans for fieldwork in 2017 (see Annex 6 for meeting minutes where this was discussed), and 5 March 2018 to discuss the results (Annex 7), and make plans for wrapping up the project. After every meeting, minutes were circulated to all stakeholders for comments and further feedback. Stakeholders were also consulted throughout the project on larger issues, such as the removal of Output 2, and invited to comment on half-year and annual reports.

The most significant challenge has been coordinating this diverse, and often busy, group across several time zones, but this has been overcome, at least in part, by forward planning and advance notice of meeting dates and agendas and facilitating easy participation via virtual meeting rooms.

The project's partners have been in regular email communication about progress against the outputs, indicators, and means of verification.

3 Project Achievements

3.1 Outputs

Output 1: Implementation of annual automated monitoring of penguin survival and breeding success

We successfully completed field work on Nightingale Island in 2016 and 2017. Field work in 2017 was added to the project in order to carry out maintenance on the automated monitoring PIT reader systems and download first year's data (Output 1), retrieve and redeploy GLS devices (Output 3), as well as to deliver training to the TCD staff and enable us to further engage with the island community (Output 4) successfully.

Two automated PIT readers were set up on each of the main pathways penguins use to commute between the sea and their colonies on Nightingale in September 2016. 300 adults and 100 chicks were implanted with PIT tags in the breeding season 2016/17, and 130 adults in 2017/18.

The readers operated with little maintenance from September 2016 to at least January 2018 (the date they were last checked). Birds used one pathway more often and more consistently than the other, so the reader on the favoured path should be maintained at the expense of the other if necessary.

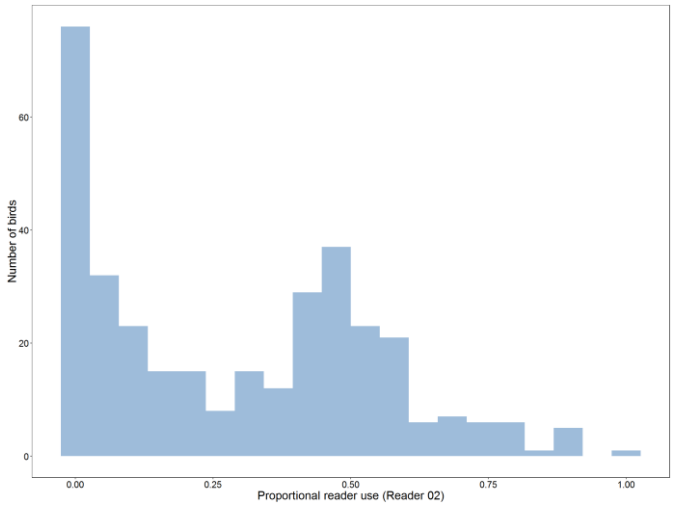

Figure 1 – Proportion of crossings detected by Reader 2 for each individual.

Birds from the largest colony and a small satellite colony showed identical crossing patterns, confirming colonies in different locations on Nightingale use the pathways to and from the sea in a similar manner.

We tested the PIT system using eight time-lapse cameras, each of which took photographs of 4-5 nests every hour for the entire breeding season. Both members of the pair at each nest were marked with PIT tags. Photographs were examined during the brood-guard period to establish the times of arrivals and departures of females at the nest, which were then compared to recorded crossings of the PIT antennae. The image series yielded 433 recognisable arrivals or departures by 36 females. The PIT antennae successfully detected 98.8% of these crossings, demonstrating that it provides a reliable record of movements in and out of the colony.

Crossing patterns conformed to the expected seasonal patterns: arrivals in Aug, high crossing rates during chick rearing in Oct-Dec, a month-long absence during pre-moult in late Jan-early Feb, subsequent arrival for moult and a long absence during winter migration from Apr to Aug.

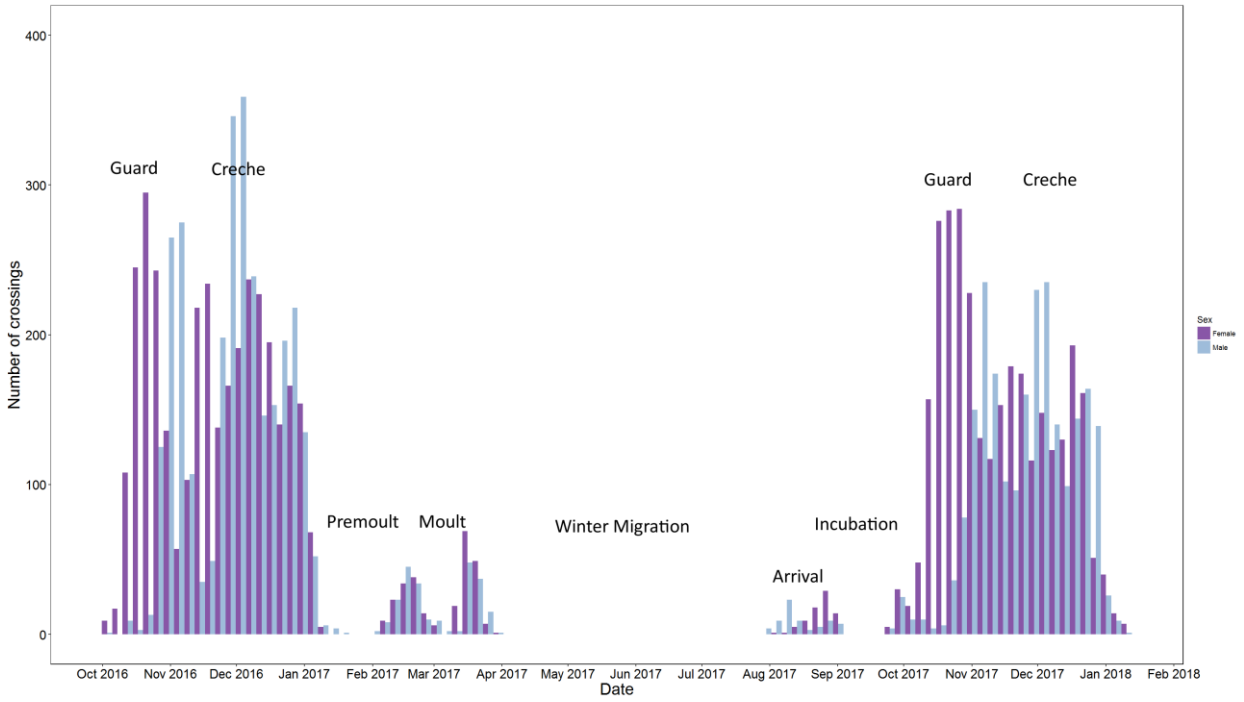

Figure 2 – Number of crossings by sex showing seasonal attendance patterns.

The PIT system yielded valuable data on survival of different age classes, which are the first estimates for the species in the Tristan archipelago. Of the chicks tagged shortly after crèche, 73% crossed the antenna to fledge. Dispersal of chicks away from the nest makes estimating survival during this period extremely difficult using conventional mark recapture studies, but the PIT system achieved this easily.

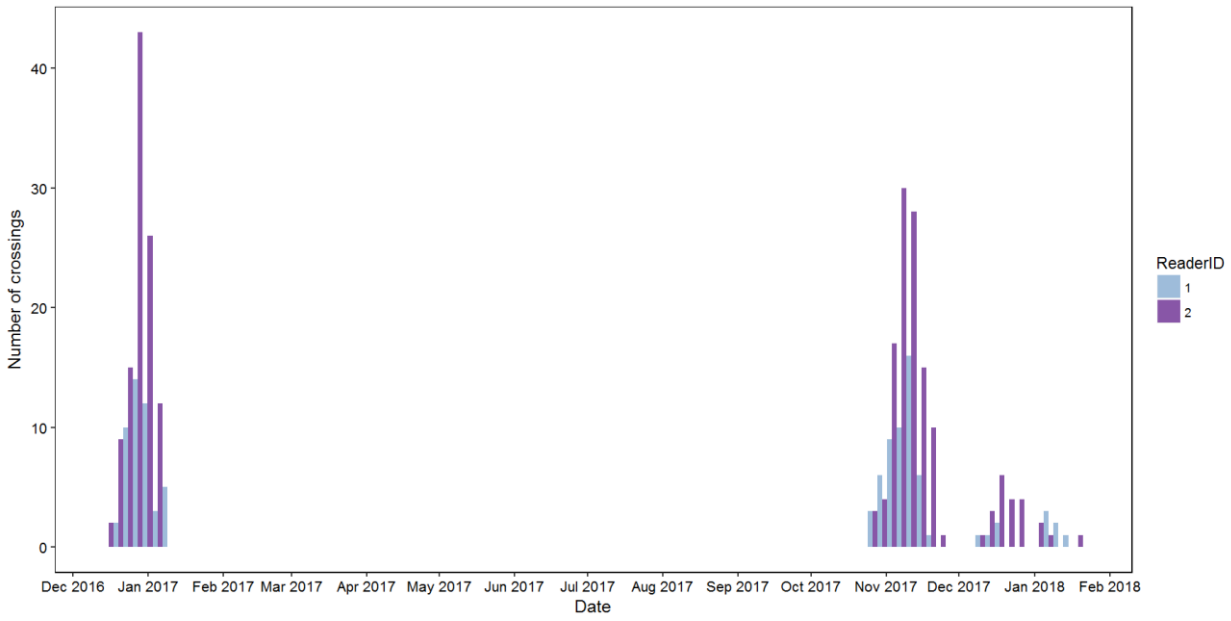

Figure 3 – Patterns of crossings by chick departures (Dec-Jan 2017), and first return (Nov 2017-Feb 2018).

Surprisingly, 21.7% of the birds that were detected leaving Nightingale in Dec 2016 were detected as first-year birds in Nov-Dec 2017. This is a high return rate compared to macaroni penguins in South Georgia (~7%; Horswill et al. 2014 J Anim Ecol 83: 1057-1067). This represents a minimum estimate of first year survival rate as further birds will return as 2+ year olds. The survival of adults from 2016/17 to 2017/18 was 88.0%, which is similar to that of other species of *Eudyptes* penguins, and we could not detect any difference between sexes. Again, this is a minimum value as some birds may have survived but not visited the colony in 2017/18 and may be detected in future years.

We investigated whether crossing patterns can be used to infer breeding success, based on the assumption that if birds do not have chicks to feed they will visit the colony less frequently. To establish survival by conventional means for comparison, 150 nests were marked and their fates determined by visiting them to record their contents at 1-5 day intervals until chicks crèched. Nest survival data showed 64% of nests raised a chick from the middle of incubation to the start of the crèche stage. Unfortunately, only two nests failed in front of the cameras (both during incubation), while one was never laid in. Such small sample sizes preclude statistical analysis, but the mean number of crossings by females during the core brood-guard period at 31 successful nests was 17 while females at empty nests only crossed one or two times. It therefore seems plausible that crossing patterns during brood might be used to detect failures during incubation, although this requires further testing with larger sample sizes. Failures during brood-guard are likely to be more difficult to detect, since females may make multiple crossings prior to them failing and become indistinguishable from successful birds.

This component of the project has been a great success. The system is proving highly reliable and low-maintenance, and is already yielding high quality data on penguin survival, phenology and behaviour for very little effort, even when the island is uninhabited. It's real value will be realised over the long-term as further years of data are collected, and this forms a key part of the project's legacy. This legacy has been safeguarded by ordering a complete spare PIT system with the end-of-project underspend. This means that if one of the units fails, it can be immediately replaced, so that data collection can continue while the faulty unit is sent away for repairs.

Prior to Project Pinnamin, there were no demographic data aside form breeding success for northern rockhopper penguins, whereas we now have two years of data and low-effort systems in place to capture return rates and calculate survival estimates, which are crucial to identifying the life history stage driving population declines.

Output 3: Marine Important Bird Areas and habitat preference identified

3.1 and 3.2 Tracking data collation, analysis and mapping

Data collected during project Pinnamin have made an invaluable contribution to the northern rockhopper tracking data base (Table 1). Tracking data obtained in 2016 and 2017 successfully augmented and complemented existing data sets, which enabled us to gain a much better and indeed a more comprehensive picture of foraging areas particularly for penguins breeding on Nightingale Island, in regards to the incubation, crèche and overwinter stages where data had been sparse to that date. Furthermore the project provided first tracking data for penguins breeding on Inaccessible Island.

Island (Global Population)	Stage	Year	Sex	Number of deployments	Number of tracks	Device Type
Inaccessible (~16 %)	Guard	2016	Female	6	7	Nanofix
Nightingale (~ 10 %)	Incubation	2012	Male	4	4	CatTraq
		2013	Male	7	7	CatTraq
		2016	Male	10	10	Nanofix
		2012	Female	3	3	CatTraq
		2013	Female	2	2	CatTraq
		2016	Female	10	10	Nanofix
	Guard	2012	Female	9	14	CatTraq/Fastloc
		2013	Female	13	18	CatTraq/Fastloc
		2016	Female	22	72	Nanofix
	Crèche	2012	Male	2	2	CatTraq/Fastloc
		2013	Male	2	2	CatTraq/Fastloc
		2016	Male	7	20	Nanofix
		2013	Female	2	2	CatTraq/Fastloc
		2016	Female	9	11	Nanofix
	Overwinter	2016	Male	14	14	MigrateTech
		2016	Female	13	13	MigrateTech
Gough (~ 16-32 %)	Incubation	2012	Male	6	6	GPS
		2012	Female	1	1	GPS
		2013	Female	3	3	GPS
	Guard	2012	Female	12	17	CatTraq/Fastloc
		2013	Female	11	15	CatTraq/Fastloc
	Overwinter	2011	Male	6	6	BAS
		2011	Female	3	3	BAS
		2011	Unknown	5	5	BAS
		2012	Male	10	10	BAS
		2012	Female	4	4	BAS
		2012	Unknown	2	2	BAS
		2013	Male	11	11	BAS

Table 1 - Summary of tracking data used to identify important areas for the northern rockhopper penguin in the South Atlantic Ocean. Numbers in red indicate data contributed by Project Pinnamin. GPS – Global Positioning System, GLS – Global Location Sensor (geolocator).

We used Linear Mixed Effects models to compare the three trip parameters foraging distance, foraging path length and trip duration between breeding stages and islands. However, only tracking data collected during the guard stages (only females) for Nightingale and Gough islands provided sufficient numbers for inter-annual comparison and hence to allow assessment of consistency of at-sea distribution among years and islands, which is important for understanding the importance of sites over time. Potential differences between sexes were not considered due to small sample sizes, but sex was included as a random effect.
At-sea distributions of core foraging areas were characterised for each phase by computing 50 and 95% utilisation distributions (UDs) of pooled locations from years (expect for guard).
The spatial overlap between the different life-cycle stages, islands and years (during guard) were characterized using the Bhattacharyya's affinity index (Fieberg and Kochanny 2005 J Wildl Manag 69: 1346-1359). This method returns the volume of intersection as a proportion of the 100% UD ranging from 0 (no overlap) to 1 (complete overlap).

In total, 294 tracks were analysed to characterise at-sea distribution during the breeding and non-breeding periods of northern rockhopper penguins (Table 1, 2).

Island	Stage	Year	Trip duration (hours)	Mean Max foraging range (km)	Total distance travelled (km)
Inaccessible	Guard	2016	37.3 ± 20.1	44.2	99.6 ± 50.2
Nightingale	Incubation	2012/13/16	384.7 ± 175.8	362.1 ± 142.4	849.9 ± 352.2
	Guard	2012/13/16	32.0 ± 16.6	34.2 ± 1.2	85.0 ± 45.5
	Crèche	2012/13/16	33.6 ± 19.5	32.1 ± 9.9	78.8 ± 43.5
Gough	Incubation	2012/13	461.2 ± 157.6	361.3 ± 260.1	863.7 ± 436.8
	Guard	2012/13	24.6 ± 10.7	25.6 ± 0.1	60.2 ± 33.2

Table 2 – Trip characteristics (mean ± SD) of northern rockhopper penguins in the South Atlantic during different stages of their annual cycle.

Penguins displayed discrete spatial distributions during the breeding season describing a pattern that was further matched by their foraging behaviour in the over-wintering season. While birds from Nightingale showed high variability in foraging locations during incubation and over-winter migration and dispersed widely across the South Atlantic Ocean, those from Gough Island displayed strong directionality, travelling south/southeast to the Subantarctic Front (incubation; Figure 4).

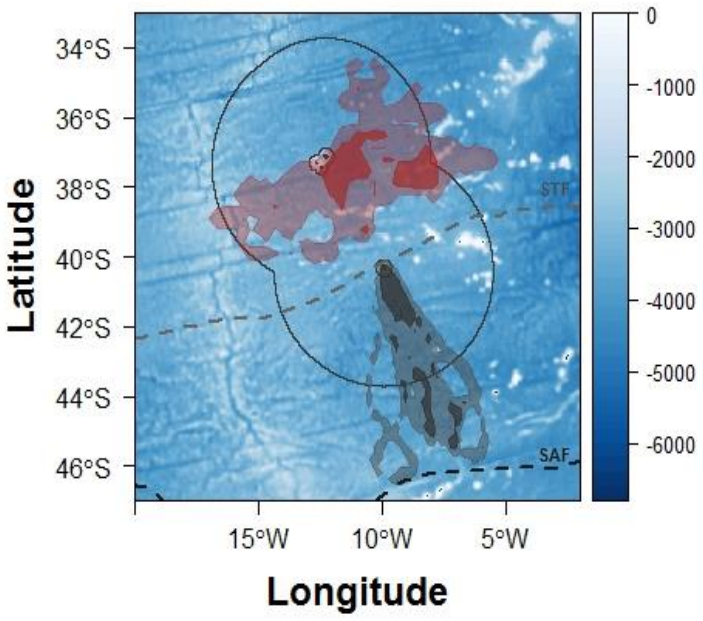

Figure 4 – Northern rockhopper penguin 50% and 95% utilization densities during incubation stage at Nightingale (in light and dark red) and Gough islands (in in light and dark grey) plotted on bathymetry map. Data pooled for years and sex. The grey line indicates the 200nm Exclusive Fishing Zone (EFZ). The grey dotted lines show locations of the Sub-Tropical Front (STF) and the Subantarctic Front (SAF).

During chick-rearing, when penguins are constraint by the rate at which food must be delivered to the nest they become limited in their foraging range and hence rely on a predictable food resource close to their colony (Table 2) which was mirrored in the reduced foraging ranges of 35 and 25 km for Nightingale and Gough islands, respectively (Figure 5 and 6).

The at-sea distribution of core foraging areas was similar between years with an overlap index BA > 0.38 and > 0.81 for 50% and 95% utilisation distribution, respectively.

Our results further showed that trip metrics foraging duration, maximum distance and foraging path length were only affected significantly by island but not by year (linear mixed effects model, all $p > 0.05$) with foraging effort (defined by the three trip metrics) higher on Nightingale than on Gough Island.

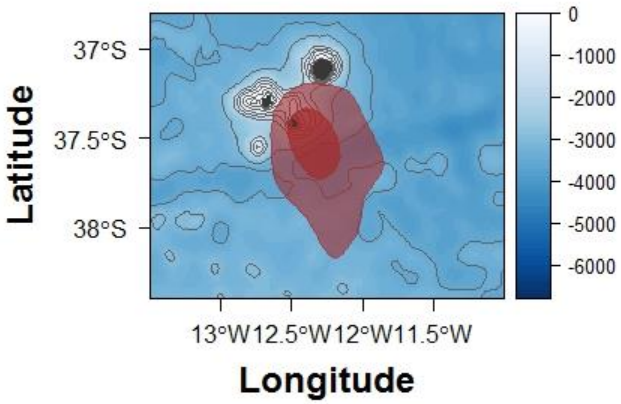

Figure 5 – Northern rockhopper penguin 50% and 95% utilization density in light and dark red respectively during guard stage at Nightingale Island. Data pooled for 2012/13, 2013/14 and 2016/17 plotted on bathymetry map.

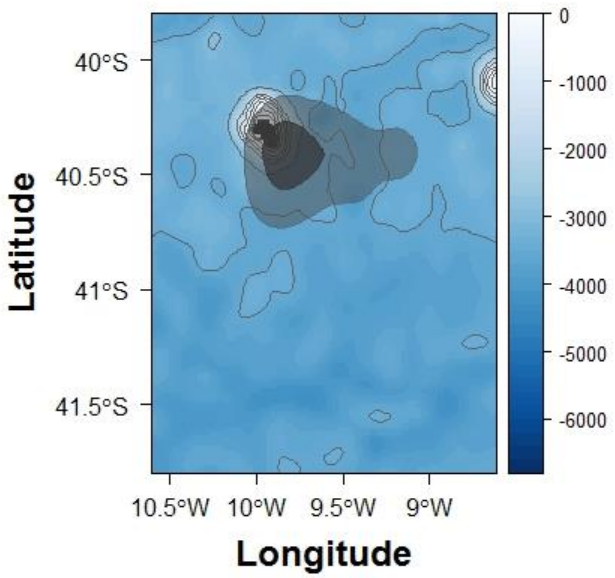

Figure 6 - Northern rockhopper penguin 50% and 95% utilization densities in light and dark grey respectively during guard stage at Gough Island in 2012/13 and 2013/14 plotted on bathymetry map.

During the crèche stage on Nightingale, GPS tracking revealed that the birds, both females and males, were alternating between two classes of foraging trips (Figure 7 and 8) with short foraging trips indicating chick provisioning trips while long trips suggesting self-feeding trips and were therefore treated separately for analysis.

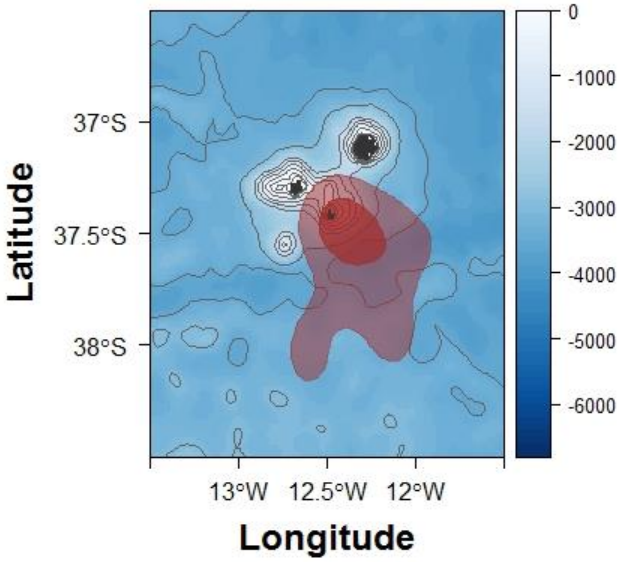

Figure 7 - Northern rockhopper penguin 50% and 95% utilization densities in light and dark red respectively during crèche stage at Nightingale Island pooled for 2012/13, 2013/14 and 2016/17 indicating chick provisioning trips plotted on bathymetry map.

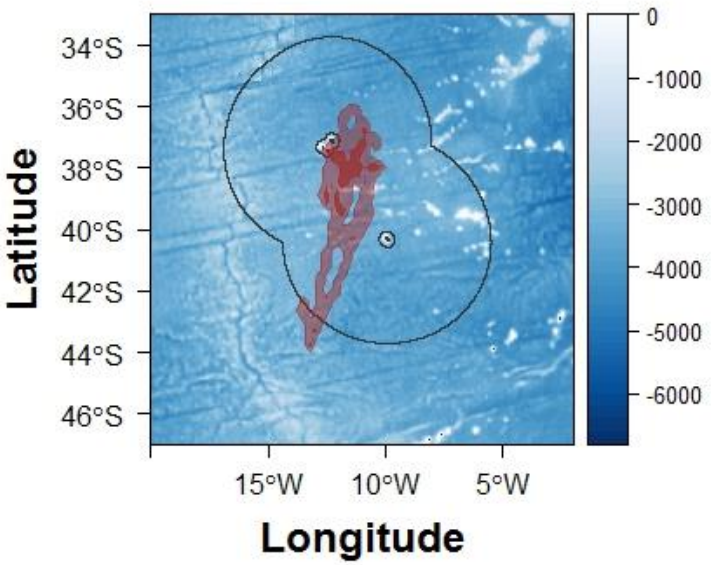

Figure 8 - Northern rockhopper penguin 50% and 95% utilization densities in light and dark red respectively during crèche stage at Nightingale Island pooled for 2012/13, 2013/14 and 2016/17 indicating long self-feeding trips plotted on bathymetry map. The grey line indicates the 200 nm Exclusive Fishing Zone (EFZ).

Project Pinnamin produced the first tracking data from Inaccessible Island during the brood-guard period. This showed that birds from the largest colony on Inaccessible Island, Salt Beach, exhibited little overlap with those from Nightingale Island (Figure 9).

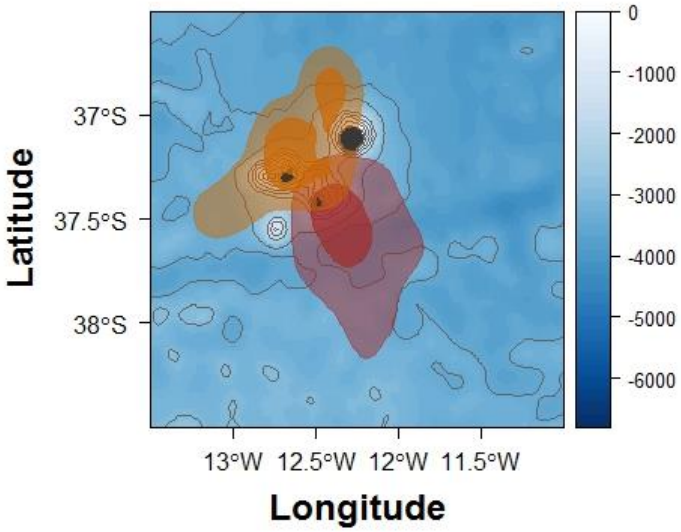

Figure 9 – Northern rockhopper penguin 50% and 95% utilization densities during guard stage at Nightingale (in light and dark red) and Inaccessible islands (in light and dark orange). Data for Nightingale Island pooled for 2012/13, 2013/14 and 2016/17.

3.3. Identification of marine important bird areas (mIBAs) for each season

To identify key foraging areas for the northern rockhopper penguin in the South Atlantic all tracking data collected by GPS devices were analysed considering each year, island and stage (Table 1) applying the procedures and criteria developed by BirdLife International to define marine Important Bird Areas (mIBA; Lascelles et al. 2016 Divers Distrib 22: 422-431).

Foraging areas during incubation for birds from both Nightingale and Gough islands currently do not meet the criteria to be classified as mIBAs. The reason for lower representativeness to some degree, is based on the trip length (i.e., the further birds travel the greater the potential for distributions to spread and hence overlap of individual trips tend to decline). In addition, the higher variability in penguin foraging areas on Nightingale, and the small sample size from Gough might have further contributed to the lower representativeness.

During the guard stage on Nightingale and Gough, birds used the same areas consistently enough that they could be classified as a mIBA (Figures 10 and 11).

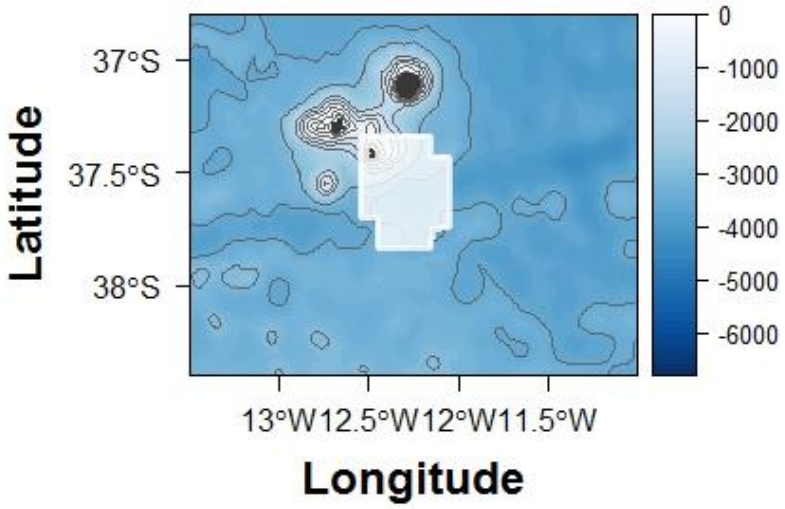

Figure 10 – Identified mIBA (white square) during guard on Nightingale Island plotted on bathymetry map.

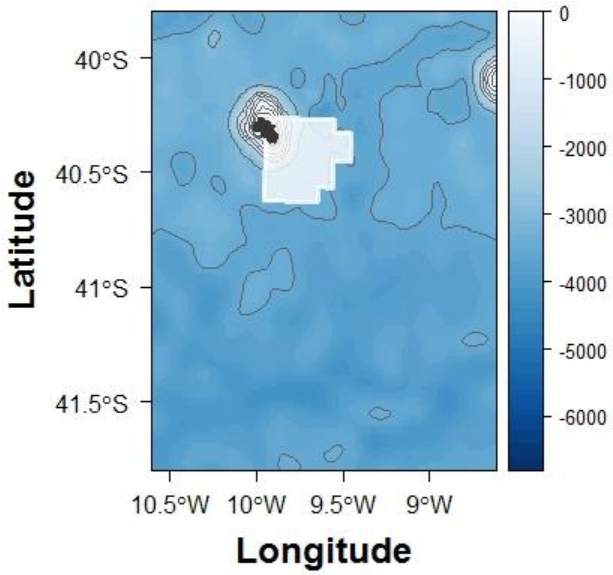

Figure 11 - Identified mIBA (white square) during the guard on Gough Island plotted on bathymetry map.

Data for the short crèche trips, pooled for all three years, proved suitable to define mIBA boundaries and showed high overlap with the areas identified during guard (UDOI, Figure 12). This shows that this area remains important throughout the chick-rearing period.

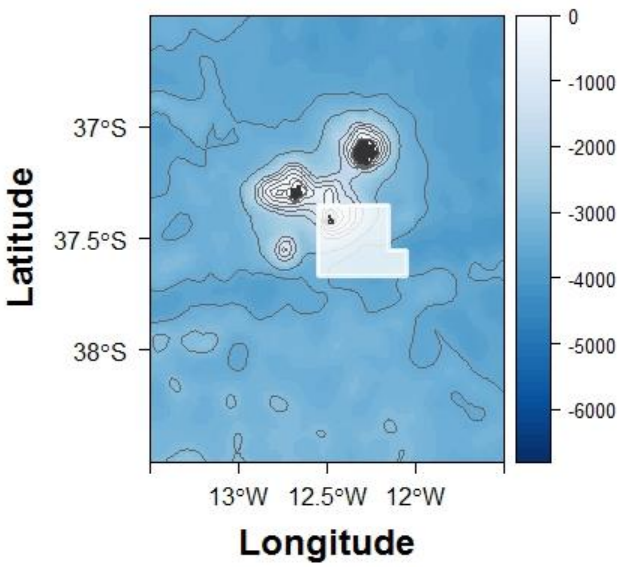

Figure 12 - Identified mIBA (white square) during the crèche on Nightingale Island plotted on bathymetry map.

Given the recommended threshold of 9 tracks to identify key foraging areas, the data set for Inaccessible did not fulfil the requirements to be included in this analysis. However, the limited spatial overlap between at-sea areas (Figure 9) illustrate that separate mIBAs are necessary to protect birds breeding at colonies on Inaccessible Island as they show low use of the mIBA for neighbouring Nightingale Island.

Although we originally anticipated conducting habitat preference modelling, this was not achieved for two reasons:

1) Given the compilation of a comprehensive data set this magnitude (including new and existing data sets) the time for processing and analysis took longer than expected and less time was available due to a second field season being added to the work programme.

2) The main reason for habitat modelling was to identify important areas around colonies that lack tracking data. Based on our results, as the data were only representative during chick rearing, and at this stage distance from colony is the overwhelmingly important variable, we decided to apply the foraging radius approach, one of the standard methodologies used to identify marine IBAs (Soanes et al. 2016 Biol Conserv 196: 69-79), for other northern rockhopper colonies in the islands that hold important numbers of the species i.e. following the KBA criterion A for EN species, sites holding more than 0.5% of the world population. We applied the mean maximum distance of 34 km from Nightingale to Inaccessible, Middle and Tristan da Cunha islands and used 25 km for colonies on Gough Island, (Figure 13 and 14).

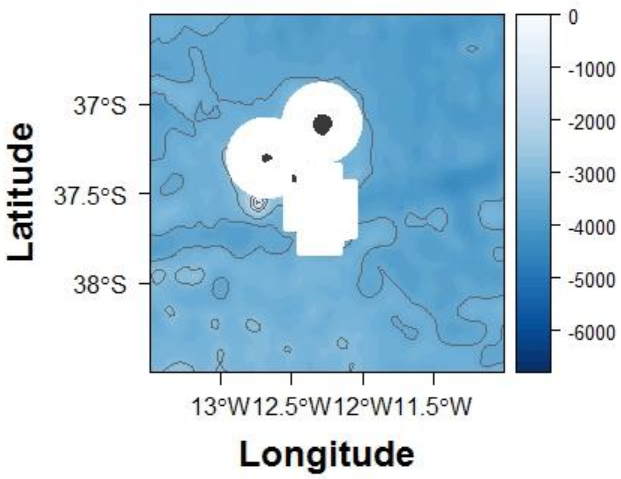

Figure 13 – Identified mIBA (white area) during chick-rearing on Nightingale Island plotted on bathymetry map. A radius of 34 km was applied around the un-tracked colonies.

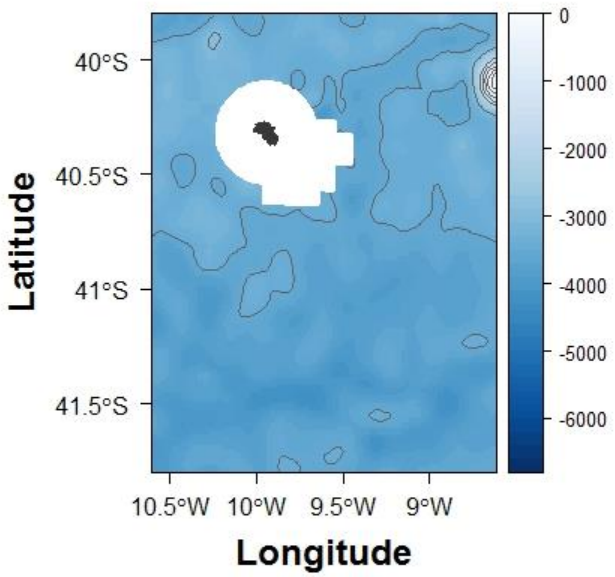

Figure 14 – Identified mIBA (white area) during chick-rearing on Gough Island plotted on bathymetry map. Given the distribution of penguin colonies around the whole island, a radius of 25 km was applied to the island instead of each colony.

Output 4: Capacity of TC in fieldwork and data management strengthened; data shared globally

Two members of the Tristan da Cunha Conservation Department and two other members of the "Darwin Team" were successfully trained in the deployment of PIT tag devices and data retrieval. This has been incorporated into their annual workplan going forward to ensure the legacy of the project continues.

Training in data management was not achieved because of the short period of time Tristan Conservation Department staff were available in the UK, and the lack of dedicated resource to fund courses with defined learning objectives. We will address this shortfall by taking all the tracking data and GIS projects to Tristan in 2018. Dr Norman Ratcliffe will provide a short

course in plotting tracking data in ArcGIS and leave electronic tutorials so Tristan Conservation staff can provide themselves with refresher courses.

Tracking data have been made available on Birdlife International's Seabird Tracking Database (www.seabidtracking.org), and copies of data, reports, and analyses will be delivered to Tristan da Cunha in September 2018.

Furthermore, given the poor internet connection in the islands all software, manuals, GIS tutorials as well as educational material for the school will be compiled on external hard drives and where possible as hard copies and sent to Tristan with Norman Ratcliffe in September 2018.

Output 5: Formulation and dissemination of key project findings to scientific, conservation, and public audiences.

Conservation audiences

In 2016, members of Project Pinnamin updated the northern rockhopper penguin species assessment for the IUCN Red List, which also served as a fundamental document for the species action plan.

The Species Action plan was hosted by our project partner the Royal Zoological Society of Scotland (RZSS), held on 25-26 October 2017 at the Edinburgh Zoo, and attended by key researchers and managers, including Trevor Glass from Tristan da Cunha, representatives of the Tristan da Cunha Government, RSPB, BAS, RZSS, CEFAS, Birdlife International, and other institutions and organisations (Figure 16, Annex 8). Members of Project Pinnamin also attended the Tristan da Cunha Blue Belt workshop at the Foreign and Commonwealth Office in London, on 27 July 2017, where penguin tracking data were presented and their implications for marine spatial planning.

FIGURE 16. Workshop participants at the Royal Zoological Society of Scotland on 25th October are: Katrine Herian (Tristan Conservation Department), Simon Morley (BAS), Georgia Robson, Centre for Environment, Fisheries and Aquaculture Science (CEFAS), Chris Carnegy (Tristan da Cunha's UK representative), Helen Senn (RZSS), David Mallon (facilitator), Clare Stringer (RSPB), Antje Steinfurth (RSPB), Sarah Robinson (RZSS), Trevor Glass (Head of Tristan da Cunha Conservation Department, Norman Ratcliffe (BAS). Not pictured: Alex Bond and Susana Requena (RSPB), Maria Dias (BirdLife International), Nina Dehnhard (University of Antwerp), Annette Scheffer (Marine Stewardship Council).

The overarching objective was to develop research and conservation actions for the northern rockhopper penguin so that populations in the Atlantic and Indian Ocean populations can be safeguarded into the future.

One significant challenge was the absence of participants from the French Southern Territories, who were unavailable because of prior commitments to fieldwork. To compensate for their absence, a second (mini-) meeting was held on 18 January 2018 held at the Anglia Ruskin University in Cambridge, UK to accommodate the participation of our French colleague including written feedback, which has proved invaluable for the completion of the Species Action plan.

The action plan is now at a third draft stage following three rounds of comments by workshop participants and stakeholders. The aim is to produce a finalised plan (including French translation) later in the summer. This has been delayed somewhat because of our desire to include as many research outputs from Project Pinnamin as possible, and to allow adequate time for feedback from the diverse array of stakeholders.

The IUCN's Penguin Specialist Group Steering Committee has plans to include a review of the action plan at their meeting held on 1-3 May. At this meeting they are looking into the update of the status of several species of penguins and hence they would like to include our

recommendations on the northern rockhopper penguin, and have provisionally agreed to endorse the action plan.

The previous action plan covered both northern and southern rockhopper penguins, and was produced in 2008. The action plan we produced will guide future research and monitoring of northern rockhopper penguins through to 2027.

As an outcome of the UK government's Blue Belt programme, and as a joined initiative, the tracking data for northern rockhopper penguins will also contribute to a wider analysis of all seabird tracking data from Tristan da Cunha to recognise important hotspots for seabirds within the Tristan EFZ, led by the RSPB.

Scientific audiences

A paper on recognition of marine IBAs for northern rockhopper penguins is drafted and will be submitted to Marine Policy by August 2018.

Analysis and publication of the PIT tag data will need to await collection of further years of data and we anticipate a paper being published on northern rockhopper penguin demography by 2023.

Data obtained during Project Pinnamin will further contribute to the study on the effect of latitude and colony size on the breeding biology of the northern rockhoppers in the South Atlantic Ocean. This paper is in an advanced stage and we anticipate this to be submitted in June 2018.

The results of Project Pinnamin have also been presented at numerous scientific meetings and conferences, detailed in the logical framework below (Annex 2, Output 5).

Public audiences

Project outputs have been shared extensively with members of the Tristan da Cunha community, through public talks, visits to St Mary's School, and publication in the Tristan da Cunha Association Newsletter and website (for a detailed list, see Annex 2, Output 5). This has raised the profile of northern rockhopper penguins on the island.

The Edinburgh Zoo produced two short videos (the CAT's trailer video and a film that children in Edinburgh had made) to help initiate the Tristan da Cunha Conservation Action Team (CAT) at St Mary's School in partnership with the CAT at the Edinburgh Zoo. The RZSS further provided the 'Food web game and Threats lesson' with cards and synopsis for the Primary age class and a penguin synopsis for the Nursery age class. These were delivered to Tristan da Cunha in January 2018 by Katrine Herian, the Tristan da Cunha Policy Officer.

3.2 Outcome

Diagnosis of limiting factors upon populations and recognition of important foraging areas at sea will inform future management actions. Design of sustainable egg harvests will allow continuation of cultural tradition

We had four measurable indicators for the outcome. We laid the groundwork for collection of adequate data for the identification of limiting factors on population size (0.1), and if this is maintained, then this target of recognizing these limitations and applying mitigation measures within 10 years is achievable.

Important foraging areas have been identified (0.2), and the results of this project are being fed into the UK government's Blue Belt initiative, which seeks to identify and designate a regime of marine protection in Tristan da Cunha's territorial waters. Of all the seabird tracking data used for this work, that of northern rockhopper penguins is the most comprehensive.

The third indicator (Population decline halted & reversed in next 20 year; 0.3) again will not be known until sometime in the future, though the mechanisms for doing so will rely on the data collected and analysis completed, stemming from outcome 0.1 and 0.2.

The final indicator (0.4; a sustainable egg harvest) was removed from the project in 2016 with agreement from the Darwin Initiative.

Taken together, the project achieved its aims in laying the groundwork for successful outcomes to be measured in the future if the infrastructure can be maintained.

3.3 Long-term strategic outcome(s)

Project Pinnamin has benefited the Tristan da Cunha Government's aspirations for marine protection within its Exclusive Fishing Zone under the UK Government's Blue Belt Initiative. Consequently, the distribution of northern rockhopper penguins at sea will have a more rigorous approach to spatial protection and management, which is critical as it is the only non-flying seabird and using data from volant species as a proxy would not be appropriate.

The project also provided impetus for further collaborating research projects. A BAS ODA project is currently underway and aims to conduct research into the sustainable use of marine sustainable resources in Tristan and their resilience to climate change. This will include elements relating to harvested species or those of cultural importance, including lobster, finfish and seabirds. BAS involvement with Project Pinnamin was fundamental to building the partnerships and local knowledge necessary to win support for this project. Project Pinnamin has also forged links with a new EU BEST-funded project at CNRS, France, which aims to examine population and foraging ecology of northern rockhopper penguins, among other seabirds, on Amsterdam and St Paul in the Indian Ocean. Members of Project Pinnamin will participate in steering group meetings of the EU BEST project so that data and findings can be shared. These islands are the only other breeding localities for the species in the world, making the research and conservation effort a truly global one.

The production of a species action plan will also set the agenda for conservation, research, and management of northern rockhopper penguins for the next decade, feeding into the Tristan da Cunha Biodiversity Action Plan, and Gough & Inaccessible Islands World Heritage Site Management Plans.

4 Sustainability and Legacy

The project team has worked closely with the Tristan Conservation Department and there is a strong commitment from all project partners to continue monitoring northern rockhopper penguins, and further research after the end of the Darwin project in 2018. An explicit goal of the project is to establish data collection methods that are low effort and high return (e.g., automated systems), and increase the capacity for Tristan Conservation Department staff to undertake regular monitoring as part of their annual work programme. This has been achieved (see Indicators 1.1, 4.1, and 4.2). Maintenance of the PIT tag gateway and future data collection has been incorporated into the annual workplan of the Tristan Conservation Department and replacement parts have been provided ensuring the legacy of Project Pinnamin continues for years to come.

In partnership with the Foreign and Commonwealth Office, the Centre for Environment, Fisheries and Aquaculture Science, the Royal Society for the Protection of Birds and the Marine Management Organisation the tracking data from the project are also being incorporated into the marine spatial planning of the Tristan da Cunha government and Foreign and Commonwealth Office, with the ultimate aim of establishing a regime of marine protection in the Tristan da Cunha Exclusive Economic Zone by 2020. The report on the workshop is available on https://www.gov.uk/government/publications/the-blue-belt-programme.

Tristan da Cunha Conservation Department staff will continue in post, including the continuation of annual monitoring of northern rockhopper penguins. Recruited RSPB staff member (Antje Steinfurth) has used the expertise gained during Project Pinnamin to tackle similar challenges in the RSPB's Gough Island Restoration Programme, namely data management, community engagement and staff training.

Project Pinnamin added invaluable information to the northern rockhopper penguin tracking database by complementing much-needed information on space use during the stages incubation, crèche and over-winter on Nightingale Island and provided information during chick-rearing on Inaccessible Island.

The GPS devices purchased in Project Pinnamin were brought back to the UK for servicing, but will be returned to Tristan in Sep 2018. The GLS tags that were retrieved and redeployed in 2017 will be recovered in 2018, downloaded and left on Tristan. The TC staff are fully trained in the management and deployment of these tags and so are empowered to conduct their own penguin tracking studies in the future.

Lastly, the species action plan created as part of Project Pinnamin will drive the conservation, management, and research agenda for northern rockhopper penguins for the next decade, and consequently influence site management plans on Tristan da Cunha, and on the French Southern Territories.

5 Lessons learned

We had few technical issues in the first year of the project, and the challenges we faced were largely outside our control (e.g., requirements for TCD staff to be present on Tristan rather than Nightingale). The reliance on remote-downloading GPS devices on Inaccessible was the only feasible option, but returned relatively little data. Investigations into reasons why data downloading was impaired revealed two possible explanations 1) the short commute distance i.e. time between sea and colony combined with the set interval for data downloading attempts did not allow enough time for data being transmitted and 2) transmission rate between tags and the base station was likely lowered by the dense, wet tussac grass *Spartina arundinacea* under which birds breed. While 1) could have been likely compensated by a smaller interval between downloading attempts, this would have inevitably lowered the battery life and might have created another problem. The shielding effect of the tussac could not have been predicted.

Overall, the greatest challenge was fulfilling the data management and ArcGIS mapping training element for TC staff. The time spent in the UK by Trevor Glass was too short, and quickly became filled with numerous activities and meetings, while time of UK staff ashore in the settlement on Tristan was too short owing to shipping schedules. The training goals were also not sufficiently specific, and were not suitably budgeted. Professional courses, including bespoke courses delivered by those with training experience, though more expensive, would have been more likely to achieve this goal. This could be accomplished through a separate project focusing solely on technical skills and training. However, this shortfall will be at least partially compensated by provision of a short training course with accompanying electronic tutorials by Norman Ratcliffe during his visit in Sep 2018 under the aegis of the BAS ODA project and Pinnamin legacy work.

5.1 Monitoring and evaluation

The project had two significant changes: 1) the removal of Output 2 on egg harvesting, and 2) the addition of a second field season. The M&E system we had in place, with a core group of project partners, and broader Steering Committee was useful and enabled us to make reactive decisions, but also seek broader feedback in a formalized way, and provide regular updates to stakeholders. The size and composition of the Steering Committee, however, often made scheduling annual meetings challenging, with members in 5 countries or territories spanning 3 time zones.

5.2 Actions taken in response to annual report reviews

Increase strength of evidence by referring to materials in annex documentation and clearly referencing this in the main body of the AR.

We thank the reviewer for this comment. While we included agendas and minutes of meetings as annexes in the AR, they could be better incorporated into the main text. In the case of HYR3, the decision to add an additional field season is reflected in minutes of a steering group meeting, which we can append to AR2.

The project has developed indicators which are demonstrated in its logframe. Some of these indicators would benefit from being more measureable, in order to reflect the numbers and statistics being put forward in the AR.

Many of our indicators are measured as yes/no, rather than with specific numbers (e.g., Indicator 1.1: PIT tags deployed & data logged), with specifics provided in the Means of Verification (e.g., 1.1: 400 birds (300 adults and 100 chicks) tagged in the first year). In some cases (e.g., Means of Verification 3.3) the number will not be known until the analysis is complete.

The reviewer suggests the project develop new indicators in the instance an activity will not be considered final by the end of the project, or has been altered/changed path/amended.

The Indicators related to Output 2 have been removed. We did not have any additional changes to the Indicators or Outputs for the duration of the project.

6 Darwin Identity

The Darwin Initiative logo has been used at local events held on Tristan, as in previous Darwin-funded work, and in the profile on the tristandc.com website. It also features on the RZSS project website, and has been identified in several blog and twitter posts, conference and meeting presentations (e.g., Oiled Wildlife Care Network blog post, World Seabird Twitter Conference 2017), the British Ornithologists' Union conference, and Tristan da Cunha Association meeting; see logical framework Output 5 for links and metrics). The Darwin Initiative will be credited for funding the study in the acknowledgements sections of all scientific papers.

The Darwin Initiative support is a separate project with a clear identity on Tristan. There is a good understanding of Darwin on Tristan. The population of Tristan is very small (less than 300 people) and there have already been several successful projects leading to increased capacity on Tristan for conservation work. As in the past, the pool of workers available for conservation work is still referred to as "the Darwin team" and one of the boats used for conservation work is known as the "Darwin Express". Project Pinnamin contributes to this long-standing relationship on Tristan da Cunha with the Darwin Initiative.

7 Finance and administration

7.1 Project expenditure

We have not yet received all financial information from project partners, so a complete detail of expenditure will follow in the expense claim for the fourth quarter of the project.

7.2 Value for Money

We believe Project Pinnamin was good value for money. In addition to the project outputs, most of which were achieved successfully, the project has a significant legacy enabling future work (e.g., the ongoing use of the PIT tag system, and the species action plan), and has been able

to provide considerable data and input to larger marine protection programmes in Tristan da Cunha through the Blue Belt initiative.

Annex 1 **Project's original (or most recently approved) logframe (if your project has a logframe), including indicators, means of verification and assumptions. N.B. Insert your full logframe. If your logframe has changed since your application and was approved by a Change Request the newest approved version should be inserted here, otherwise insert the Stage 2 logframe. 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: Northern rockhopper penguin population declines are halted then reversed in response to evidence-based management of limiting factors both at their colonies and at sea whilst allowing sustainable harvesting of eggs (Max 30 words)			
Outcome: (Max 30 words) Diagnosis of limiting factors upon populations and recognition of important foraging areas at sea will inform future management actions. Design of sustainable egg harvests will allow continuation of cultural tradition.	0.1 Limiting factors on population size are recognised and mitigating measures are recommended within next 10 years 0.2 Important foraging areas at sea are recognised and afforded appropriate protection within the next 5 years 0.3 Population decline is halted then reversed within the next 20 years 0.4 Sustainable egg harvests are opened allowing islanders to continue traditional practice within the next two years	0.1 Publication of population model that diagnoses population declines and tests mitigation measures in an applied journal 0.2 mIBAs for northern rockhoppers recognised by BirdLife. Tristan administration recognises these as MPAs with appropriate management prescriptions 0.3 Annual monitoring of numbers detects a halt in the population decline followed by a steady recovery to previous levels 0.4 Islanders are able to harvest eggs sustainably and have an evidence-base to justify this to concerned conservationists	Limiting factors identified are amenable to management and marine protection is effective and enforceable Egg harvests can be carried out sustainably
Outputs: **1**. Implementation of annual automated monitoring of penguin survival and breeding success	1.1 PIT sensor equipment installed on the two main penguin highways. Birds PIT tagged and attendance/ survival logged annually	1.1 Equipment installed and maintained on Nightingale. 200 birds tagged in first year and c. 40 tagged annually afterwards to maintain sample size in face of mortality. Attendance data collected from PIT sensor annually.	PIT tag equipment will reliably record bird attendance to allow survival to be estimated and breeding success to be inferred. PIT tag studies of penguins elsewhere have been successful, but nonetheless time-lapse cameras will be used to test this assumption

			independently in the first year of study.
2. Opening of a sustainable egg harvest	2.1 Islanders are allowed to take rockhopper eggs according to management regulations 2.2 No adverse effects of these harvests on productivity or breeding success are detectable	2.1 Annual record of number of eggs taken maintained by TC 2.2. Annual monitoring shows no changes in breeding success or trends that could be ascribed to egg collecting. If so harvest closed or altered adaptively.	This assumes that the research finds an approach to harvesting that is sustainable. If not, TC will have evidence to explain to islanders why egg harvests cannot be re-opened.
3. Marine Important Bird Areas and habitat preference identified	3.1. Data collected to fill all significant gaps in current knowledge 3.2. Data analyses and complete maps of at-sea distribution are produced 3.3. Distribution maps are subject to mIBA criteria and mIBAs are delineated for Northern Rockhoppers to replace their current provisional mIBA that is based on a generic foraging radius of 40km.Discussions about MPA management of these initiated with Tristan authorities.	3.1. An updated and complete tracking database 3.2 Processed and mapped tracking data 3.3 mIBAs for northern rockhopper penguins are identified and added to the BirdLife mIBA gazetteer.	Recovery rates of equipped birds are sufficient to provide data needed. Access to Inaccessible Island possible given sea conditions. We have budgeted for a large number of loggers to allow for anticipated losses, and have a large time-window to await suitable conditions for landings on Inaccessible.
4. Capacity of TC in fieldwork and data management strengthened; data shared globally	4.1. TC staff trained in use of PIT tagging, use and maintenance of PIT sensor units and deployment of tracking devices 4.2 TC staff trained in data management and mapping so local databases can be updated and used for conservation 4.3. Data are shared globally though BirdLife, RSPB and BAS online databases.	4.1 TC staff can use equipment and carry out field procedures without supervision 4.2 TC staff competent in coding, archiving and retrieving information from on-island databases. 4.3 Data are available to conservationists and researchers around the world via websites	None
5. Formulation and dissemination of key project findings to scientific,	5.1 Workshop held at Edinburgh Zoo attended by stakeholders and experts involved with northern rockhopper	5.1 Workshop held and attended by key people	Key people will attend workshop. We will pay expenses and give ample advance

conservation and public audiences	research and conservation 5.2 Species action plan written, approved by all workshop attendees and published online. 5.3 Two scientific papers written and published open access 5.4. Findings promoted to general public via RZSS publicity programme and BAS/RSPB press releases	5.2 Species action plan written, approved and published 5.3 Two scientific papers published in reputable journals with open access and on NERC Open Research Archive 5.4 Press releases made, exhibits at Edinburgh Zoo created and educational materials provided to schools, talks and meetings on Tristan	notice to maximise attendance Data are of sufficient quality and interest to merit publication. Based on experience this assumption is likely to be met. Press releases and education materials are of sufficient interest to be used by the media and schools. Uptake by the media can be unpredictable depending on competing global news stories.

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)

1.1 Organise fieldwork logistics (order equipment, ship it to Tristan, organise field team T&S etc.)
1.2 Initiate and maintain annual survival and productivity monitoring programme
2.1 Experimentally remove eggs from nests and monitor success of these and control nests
2.2 Analyse data and use simulation models to determine methods and levels of harvesting that minimise impact on breeding success
2.3 Draw up guidance for an open harvest under supervision of TC, with continued monitoring to adapt design
3.1 Collect further tracking data to fill key season/site gaps in the current datasets
3.2 Model new and existing tracking data to determine distribution and habitat preference
3.3 Subject marine distribution data to BirdLife International criteria to identify mIBAs
4.1 Provide training to TC staff in novel fieldwork methods
4.2 Collate all data and share among partners,
4.3. Develop user-friendly data systems on Tristan and train TC in their use
4.4 Upload data to BirdLife, BAS and RSPB online databases
5.1 Host workshop at RZSS to agree action plan with stakeholders
5.2 Write action plan based on workshop proceedings: publish and circulate
5.3 Publish scientific papers and develop policy, management, outreach and educational materials

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: Northern rockhopper penguin population declines are halted then reversed in response to evidence-based management of limiting factors both at their colonies and at sea whilst allowing sustainable harvesting of eggs		The project has made important contributions to conservation and the community on Tristan. The tracking data have been contributed to the Blue Belt initiative, which is a major marine protected area initiative operating within UK territorial waters and across all of the overseas territories. This will be important for the sustainable management of marine resources and biodiversity in Tristan for decades to come. The project also improved understanding of factors affecting northern rockhopper penguin demography, which will guide further conservation action over the coming 10 years. As an interim, a detailed species action plan has been written which has assembled all current knowledge and, in consultation with stakeholders, has identified key actions for conservation. Northern rockhopper penguins are an iconic species on Tristan da Cunha, and our project has helped to raise the profile of the species on the island and that of the island globally via our multifaceted dissemination and outreach programme. Capacity for Tristan Conservation staff to continue this work has been built though provision of new equipment and specialist training. The project has been a springboard for further projects that extend the scope to marine sustainable use and climate change in Tristan waters, and comparative ecological studies between the Atlantic the Indian Ocean northern rockhopper penguin populations.
	0.1 Limiting factors on population size are recognised and mitigating measures are recommended within next 10 years 0.2 Important foraging areas at sea are recognised and afforded appropriate protection within the next 5 years 0.3 Population decline is halted then reversed within the next 20 years 0.4 Sustainable egg harvests are opened allowing islanders to continue traditional practice within	The groundwork for the first three indicators is in place and achieved the goals set out in the 2-year time-frame of this project. The fourth was removed along with Output 2.

	the next two years	
Output 1. Implementation of annual automated monitoring of penguin survival and breeding success	PIT sensor equipment installed on the two main penguin highways. Birds PIT tagged and attendance/ survival logged annually	This aspect of the project has been a great success. The PIT readers have been set up and birds marked, and a huge amount of data on behaviour (foraging trip frequency) and demography (survival, breeding success) of relevance to conservation is being generated in return for very little effort. Maintenance of readers and further PIT tagging will improve understanding of limiting factors on the population and forms a key component of Project Pinnamin's legacy.
Activity 1.1 Equipment installed and maintained on Nightingale. 200 birds tagged in first year and c. 40 tagged annually afterwards to maintain sample size in face of mortality. Attendance data collected from PIT sensor annually Assumptions tested: PIT tag equipment will reliably record bird attendance to allow survival to be estimated and breeding success to be inferred. PIT tag studies of penguins elsewhere have been successful, but nonetheless time-lapse cameras will be used to test this assumption independently in the first year of study		Two automated PIT readers have been set up on Nightingale and 300 adults and 100 chicks were PIT tagged in 2016 and a further 130 adults in 2017. This exceeds the targets set in the proposal and provides additional precision in survival estimates. The readers are collecting attendance and demography data annually with little maintenance. The time-lapse cameras showed that the PIT tag equipment reliably records 98.8% of transits into and out of the colony. Survival of adults has been estimated for the first time between 2016 and 2017. The number of crossings by females during brood-guard may allow breeding success to be inferred, but small sample sizes of failed nests in the study prevent development of predictive models and further validation is needed. See Section 3: Output 1 for full details.
Output 2. Opening of a sustainable egg harvest	2.1 Islanders are allowed to take rockhopper eggs according to management regulations 2.2 No adverse effects of these harvests on productivity or breeding success are detectable	This activity was removed with the approval of the Darwin Initiative.
Activity 2.1. Experimentally remove eggs from nests and monitor success of these and control nests		This activity was removed with the approval of the Darwin Initiative.
Activity 2.2. Analyse data and use simulation models to determine methods and levels of harvesting that minimise impact on breeding success.		This activity was removed with the approval of the Darwin Initiative.
Activity 2.3. Draw up guidance for an open harvest under supervision of TC, with continued monitoring to adapt design		This activity was removed with the approval of the Darwin Initiative.

Output 3. Marine Important Bird Areas and habitat preference identified	3.1. Data collected to fill all significant gaps in current knowledge 3.2. Data analyses and complete maps of at-sea distribution are produced 3.3. Distribution maps are subject to mIBA criteria and mIBAs are delineated for Northern Rockhoppers to replace their current provisional mIBA that is based on a generic foraging radius of 40km. Discussions about MPA management of these initiated with Tristan authorities.	This aspect of the project has been a great success. We have obtained new tracking data to improve the quality of data and fill key spatial and seasonal gaps. All previous tracking data have been collated and included in analyses. We have generated detailed maps of distribution of birds around tracked colonies, and modelled maximum foraging ranges to develop island-specific foraging radii around colonies for which no tracking data are available. This has resulted in comprehensive maps of bird distribution during the key chick rearing period, which have been subjected to the BirdLife mIBA criteria and are being added to the mIBA gazetteer. These are being integrated into marine spatial planning within the Tristan EEZ via the UK Blue Belt initiative.
Activities 3.1. An updated and complete tracking database		Data collected during project Pinnamin have made an invaluable contribution to our knowledge of the northern rockhopper penguin spatial distributions. Tracking data obtained in 2016 and 2017 successfully augmented and complemented existing data sets, which enabled us to gain a much better and indeed a more comprehensive picture of foraging areas particularly for penguins breeding on Nightingale Island, in regards to the incubation, crèche and overwinter stages where data had been sparse to that date. Furthermore the project provided first tracking data for penguins breeding on Inaccessible Island.
3.2 Processed and mapped tracking data		Between 2011 until 2016 data were collected from three different islands, which host approximately 60 % of the global population of northern rockhopper penguins. These data been processed and mapped, with analyses presented in this report. Foraging ranges from these three islands have been analysed to provide island-specific radii estimates for colonies on each island for which tracking data are unavailable to provide complete distribution maps (see Section 3 of the main report).
3.3 mIBAs for northern rockhopper penguins are identified and added to the BirdLife mIBA gazetteer.		Marine Important Bird and Biodiversity Areas for the northern rockhopper penguin in the South Atlantic have been identified and will be added to the BirdLife mIBA gazetteer by May 2018.
Assumption tested: Recovery rates of equipped birds are sufficient to provide data needed. Access to Inaccessible Island possible given sea conditions. We have budgeted for a large number of loggers to allow for anticipated losses, and have a large time-window to await suitable conditions for landings on		All assumptions were met. A sufficient sample of complete tracks was collected from Nightingale during all stages of the season, including incubation, brood guard, crèche, and winter migration. These filled gaps or improved the quality of previously obtained tracking data. We were able to access Inaccessible Island to deploy the remote download GPS devices along with the base station during brood guard and to recover the base station with data at the end of the season. Losses of devices on Nightingale was relatively low (although all were lost on Inaccessible, as anticipated) and equipment will be given to TC to continue tracking work beyond the lifetime of the

Inaccessible.		project.
Output 4. Capacity of TC in fieldwork and data management strengthened; data shared globally	4.1. TC staff trained in use of PIT tagging, use and maintenance of PIT sensor units and deployment of tracking devices 4.2 TC staff trained in data management and mapping so local databases can be updated and used for conservation 4.3. Data are shared globally though BirdLife, RSPB and BAS online databases.	The project achieved most of the objectives in capacity building on Tristan through a programme of training in novel field techniques and use of new equipment. We have also shared the data globally through various online portals.
4.1 TC staff can use equipment and carry out field procedures without supervision		Two TC staff and an additional two members of the "Darwin Team" were successfully trained in the PIT tag setup, including maintenance of reader station and sensor units and deployment of PIT tags. They were also trained in management of the various tracking devices and how to attach these to birds. Tracking devices, PIT tags and spare parts for the PIT equipment will be taken to Tristan in September 2018 so that the work of Pinnamin can continue into the future, ensuring the project's legacy. The GPS devices purchased in Project Pinnamin were brought back to the UK for servicing, but will be returned to Tristan in Sep 2018. The GLS tags that were retrieved and redeployed in 2017 will be recovered in 2018, downloaded and left on Tristan. TC staff are fully trained in the management and deployment of these tags and so are empowered to conduct their own penguin tracking studies in the future.
4.2 TC staff competent in coding, archiving and retrieving information from on-island databases.		Two TC staff and an additional two members of the "Darwin Team" were successfully trained to recover data from the PIT tag readers. Training of TC staff in data management and mapping was not achieved. This was owing to durations of visits of fieldworkers in Edinburgh being too brief due to shipping schedules, and Trevor Glass being engaged in higher priority Blue Belt meetings during his visit to the UK. The RSPB and BAS partners will pursue this objective under future training initiatives.
4.3 Data are available to conservationists and researchers around the world via websites		Data have been made globally available on the penguin node of BirdLife's Tracking Ocean Wanderers database (www.seabidtracking.org) and the BAS Polar Data Centre (https://www.bas.ac.uk/data/uk-pdc/).

Output 5. Formulation and dissemination of key project findings to scientific, conservation and public audiences	5.1 Workshop held at Edinburgh Zoo attended by stakeholders and experts involved with northern rockhopper research and conservation 5.2 Species action plan written, approved by all workshop attendees and published online. 5.3 Two scientific papers written and published open access 5.4. Findings promoted to general public via RZSS publicity programme and BAS/RSPB press releases	The species action plan workshop was held on 25-26 October hosted by RZSS in Edinburgh, with 16 participants (see Annex 8 for agenda and participants). A second mini species action plan meeting was held on 18 January 2018 at the Anglia Ruskin University in Cambridge, UK between project partners from RSPB, BAS and RZSS and Charly Bost, the lead on penguin research for the French Southern Territories. A third draft of the species action plan was circulated to the workshop attendees for comments on 8 March 2018, with a request for comments by 9 April 2018. Following this, the action plan will be translated into French, and distributed to participants and stakeholders, scheduled for late summer 2018. Members of the Project Pinnamin team also attended the Tristan Blue Belt workshop at the RSPB's headquarters at the Lodge 24 – 25 July 2017 and at the FCO, London, on 27 July 2017, where penguin tracking data were presented and their implications for marine spatial planning, in the context of data for other key species, were discussed with a wide range of scientists and stakeholders. Project Pinnamin will contribute data to at least four peer-reviewed manuscripts in the next 12 months (for details, see Section 3.1, Output 5): • Recognition of marine IBAs for northern rockhopper penguins • Analysis of all seabird tracking data from Tristan da Cunha to recognise important hotspots for seabirds within the Tristan EFZ. • Foraging trip patterns of pairs during crèche by birds equipped with both GLS and PIT tags. • Effect of latitude and colony size on the breeding biology of the northern rockhoppers in the South Atlantic Ocean. The project produced four blogs for the RZSS, OWCN, and RSPB websites: • http://www.rzss.org.uk/conservation/our-projects/project-search/field-work/project-pinnamin-conserving-northern-rockhopper-penguins-on-tristan-da-cunha/ • http://www.rzss.org.uk/news/article/13761/project-pinnamin-update---gone-rockhopping/

		• https://owcnblog.wordpress.com/2017/03/16/tristan-da-cunha-oil-spill-six-years-after/ • http://ww2.rspb.org.uk/community/ourwork/b/biodiversity/archive/2017/11/23/studying-penguins-on-one-of-the-remotest-islands-in-the-world.aspx The project produced two articles for the Tristan da Cunha Association Newsletter: • http://www.tristandc.com/assoc/newsletter-2017-02.php • http://www.tristandc.com/assoc/newsletter-2018-02.php The project produced and article for the Darwin Newsletter in February 2018 http://www.darwininitiative.org.uk/publications/newsletter), and popular press articles in YOURS (circulation over 260,000) and First News women and kids magazines (circulation over 80,000), respectively. Public presentations included one aboard the SA Agulhas II in September 2017 (ca. 100 attendees), and as an invited speaker at the Tristan da Cunha Association meeting in Southampton on 7 April 2018. School presentations were given to different age classes at St Mary's School on Tristan in September 2017, reaching ca. 20 students (80% of the student body) and 5 teachers, and meetings were held with the island's administrator (2 meetings with 5 attendees in total). Furthermore, meetings with the schoolteachers and Trevor Glass were held to initiate the Tristan 'Conservation Action Team' (CAT) as a combined effort between the island's education and conservation department in partnership with the CATs at the Edinburgh Zoo. Scientific presentations were made at the 2nd World Seabird Twitter Conference (April 2017), RSPB's Annual Science Meeting (November 2017), and British Ornithologists' Union annual conference (27-29 March 2018).
Assumptions tested: Key people will attend workshop. We will pay expenses and give ample advance notice to maximise attendance Data are of sufficient quality and interest to merit publication. Based on experience this assumption is likely to be met. Press releases and education materials are of sufficient interest to be used by the media and schools. Uptake by the media can be unpredictable depending on competing global news stories.		All assumptions met. Key people involved in Tristan attended the workshop in Edinburgh. Engagement with co-workers in France was achieved by organising a second smaller workshop in Cambridge where the documents from the Edinburgh meeting were reviewed. The data collected are of a high quality and will be of interest to readers involved in marine spatial planning, marine ecology and ornithology. At ca. 4 scientific papers will be published in peer reviewed journals.

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)	(i) 0 (ii) 0
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) 0 (ii) 0
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) 5 (ii) 1
3b	Number of training weeks (i) in UKOTs; (ii) outside UKOTs not leading to formal qualification	(i) 2 (ii) 0
4	Number of types of training materials produced. Were these materials made available for use by UKOTs?	5
5	Number of UKOT citizens who have increased capacity to manage natural resources as a result of the project	3
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	1
10	Number of formal documents produced to assist work in UKOTs related to species identification, classification and recording.	0
11a	Number of papers published or accepted for publication in peer reviewed journals written by (i) UKOT authors; and (ii) other authors	(i) 0 (ii) 0
11b	Number of papers published or accepted for publication elsewhere written by (i) UKOT authors; and (ii) other authors	(i) 0 (ii) 0
12b	Number of computer-based databases enhanced (containing species/genetic information). Were these databases made available for use by UKOTs?	0
13a	Number of species reference collections established. Were these collections handed over to UKOTs?	0
13b	Number of species reference collections enhanced. Were these collections handed over	0

Code	Description	Totals (plus additional detail as required)
	to UKOTs?	
Dissemination Measures		
14a	Number of conferences/seminars/workshops/stakeholder meetings organised to present/disseminate findings from UKOT's Darwin project work	Steering Group meetings: 3 Species Action Plan workshops: 2
14b	Number of conferences/seminars/ workshops/stakeholder meetings attended at which findings from the Darwin Plus project work will be presented/ disseminated	8
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	0
22	Number of permanent field plots established in UKOTs	0
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)

Annex 5 Darwin Contacts

Ref No	DPLUS 053
Project Title	Project Pinnamin: conserving northern rockhopper penguins on Tristan da Cunha
Project Leader Details	
Name	Alex Bond (to 31 Oct 2017); Andy Schofield (1 Nov 2017-31 March 2018)
Role within Darwin Project	Project Leader
Address	
Phone	
Fax/Skype	
Email	
Partner 1	
Name	Trevor Glass
Organisation	Tristan da Cunha Conservation Department
Role within Darwin Project	Project Partner
Address	
Fax/Skype	
Email	
Partner 2	
Name	Norman Ratcliffe
Organisation	British Antarctic Survey
Role within Darwin Project	Project Partner
Address	
Fax/Skype	
Email	
Partner 3	
Name	Antje Steinfurth
Organisation	RSPB
Role within Darwin Project	Project Partner
Address	
Fax/Skype	
Email	
Partner 4	
Name	Sarah Robinson (to 30 Nov 2017) / Helen Senn (1 Dec 2017-31 March 2018)
Organisation	Royal Zoological Society of Scotland

Role within Darwin Project	Project Partner
Address	
Fax/Skype	
Email	
Partner 5	
Name	Azwianewi Makhado
Organisation	South African Department of Environmental Affairs
Role within Darwin Project	
Address	
Fax/Skype	
Email	