Darwin Plus:
Overseas Territories Environment and Climate Fund
Annual Report

To be completed with reference to the "Project Reporting Information Note" (https://dplus.darwininitiative.org.uk/resources/information-notes/).

It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

Submission Deadline: 30th April 2022

Darwin Plus Project Information

Project reference	DPLUS133
Project title	Streamlining Ascension Island's Marine Turtle Monitoring Programme for Long-Term Sustainability
Territory(ies)	Ascension Island
Lead partner	University of Exeter
Project partner(s)	Ascension Island Government Conservation & Fisheries Directorate
Darwin Plus grant value	£58,798
Start/end dates of project	1st August 2021 – 30th November 2022
Reporting period (e.g. Apr 2021-Mar 2022) and number (e.g. Annual Report 1, 2)	Annual Report 1 (August 2021 - March 2022)
Project Leader name	Dr Sam Weber
Project website/blog/social media	
Report author(s) and date	Sam Weber (28th April 2022)

1. Project summary

Ascension Island supports the second largest nesting population of endangered green turtles in the Atlantic Ocean and the largest nesting colony of any marine turtle species in the UKOTs. The population has been monitored using standard methods since the 1970s which has documented its dramatic recovery from historical exploitation. As one of the longest-running initiatives of its kind, data from the Ascension Island Marine Turtle Monitoring Programme (AIMTMP) is used extensively for regional and global status assessments of this species. However, with exponential increases in numbers of nesting turtles in recent years, existing monitoring loads are becoming increasingly unsustainable for the local Government. Without action, there is a risk that monitoring will cease or be downgraded, with unknown implications for data veracity. In this project, we aim to streamline the AIMTMP to ensure its continuity whilst operating within local capacity constraints. To achieve this, a combination of simulation-based modelling and innovative statistical methods will be used to develop monitoring protocols that offer the best compromise between efficiency and power to detect future trends. In parallel, the project will also review new technologies that have the potential to deliver a step change in terms of automation and efficiency over longer timescales.

2. Project stakeholders/partners

This project was developed as a collaboration between the University of Exeter and Ascension Island Government Conservation and Fisheries Department in response to a pressing need to streamline Ascension's current marine turtle monitoring programme. Ascension Island Government identified the problem and worked with University of Exeter researchers to design a project that addressed local needs. AIG have provided up-to-date monitoring data for analysis by UoE researchers and have been sent the results of the long-term trend analysis in Annex 3 (Output 1), which were shared with the Ascension public at the 2022 Ascension Island Marine Festival. The festival was held at the Long Beach Turtle Ponds – the epicentre of the historic turtle harvest on Ascension Island – which is an apt location for presenting evidence that the population is now approaching a full recovery. The results of the updated trend analysis have also been deposited into the State of the World's Turtles (SWOTs) online repository where they will be available to external stakeholders compiling regional and global status assessments.

3. Project progress

Many of the activities originally planned for Year 1 (Y1) have now been postponed to Year 2 (Y2) following a change request approved by the Darwin Secretariat in January 2022. The change was necessitated by the project leader and principal analyst at the University of Exeter moving to a permanent teaching position in October 2021 (Y1Q3), forcing them to reduce their time commitment to this project (see Section 8). Delays in recruitment meant that a replacement was not in post until the end of the Y1 reporting period (March 2022). As such, this report primarily summarises progress made during the 2-month period from 1st August – 1st October 2021.

3.1 Progress in carrying out project Activities

1.1 *Reanalyse all existing marine turtle monitoring data for Ascension Island using Bayesian state-space models.*

This analysis is now complete. All green turtle monitoring data collected between 1978 – 2021 have been re-analysed using a novel Bayesian statistical model to generate an updated population trend (Annex 3). The results suggest that population growth has slowed over the past decade, with numbers of nesting females not having increased significantly since around 2012. Interestingly, nest numbers appear to be stabilising at a level that is very close to the minimum estimated population size prior to human settlement of the Island in 1822, suggesting that this once-depleted stock may be approaching a full recovery. If the green turtle population is indeed approaching carrying capacity this also has implications for future monitoring, as it implies that effort will not continue to increase exponentially, as had been feared. There is still a need to rationalize the current sampling design and utilise available staff time more efficiently, but these results suggest that the existing monitoring method will at least remain feasible while longer-term technology-driven options are explored.

1.2 *Prepare an updated status assessment for the Ascension Island Green Turtle for publication in the peer-reviewed literature.*

Results of Output 1.1 have been deposited in the *State of the World's Turtles* (SWoT) online database (www.seaturtlestatus.org/) and are currently being prepared for publication. At the time of writing the dataset was going through the quality control audit at SWoT and is expected to appear in the online portal shortly.

2.1 *Using the current population estimate as a starting point, simulate future marine turtle nesting data assuming a range of long-term trends.*

The basic code tools needed to generate simulated nesting data have been written, but the results of these simulations are not currently ready to be shared. In particular, further work is needed to properly reproduce the strong and highly correlated inter-annual variability (temporal autocorrelation) in nesting numbers which is apparent in the observed monitoring data (Annex 3). This natural variability has a substantial bearing on our ability to detect trends so it is important that simulated datasets are able to capture it.

2.2 *Assess the power of alternative sampling regimes to detect simulated trends using Bayesian state-space models.*

This activity is not scheduled until Year 2; however, some initial simulations have been carried out to assess how varying monitoring frequency and design affects the accuracy and precision of total nest counts estimated for individual nesting beaches. The next phase of the analysis will focus on integrating the results of these simulations across multiple nesting beaches and years to assess how different monitoring designs affect our ability to detect simulated trends from Activity 2.1

2.3 *Carry out a cost-benefit analysis of alternative monitoring protocols by comparing statistical power versus person-hours required to implement them.*

Not scheduled until Year 2, pending the results of simulation-based modelling (Activities 2.1-2.2).

2.4 *Gather data on person hours currently expended on green turtle monitoring under the existing protocol at different points in the nesting season.*

Monitoring effort (person-hours spent) is currently being estimated by AIG Conservation & Fisheries Department as part of ongoing marine turtle monitoring work. Effort data will be used to parameterise a cost-benefit analysis of alternative monitoring protocols.

2.5 *Report methodology used for streamlining the Ascension Island Marine Turtle Monitoring Programme for publication in the peer-reviewed literature.*

Not scheduled until Year 2; however, we have begun assembling statistical code for analysing and simulating marine turtle monitoring data into a collection of R programming tools - called '*MoniTool*' - that will allow researchers to replicate approaches developed during the project for other sites. *MoniTool* will be beta tested by researchers in the University of Exeter's marine turtle research group and ultimately made available through the GitHub code repository to support findings published in the peer-reviewed literature.

3.1 – 3.3. Not scheduled until Year 2, pending the results of the streamlining analysis.

3.2 Progress towards project Outputs

Output 1. *The status of the Ascension Island green turtle nesting population is updated and population estimates are made widely available.*

This output has been completed as planned. The entire 45-year green turtle monitoring dataset has been reanalysed using novel statistical methods to update the previous status assessment completed in 2012 (Annex 3). The results of the analysis have been deposited in the State of the World's Turtles online database (https://www.seaturtlestatus.org/) and shared locally on Ascension Island at the 2022 Marine Festival (see Section 2).

Output 2. *The efficiency of alternative monitoring protocols is evaluated through simulation-based modelling.*

The majority of activities contributing towards this output are not scheduled until Y2; however, some progress has been made on developing the code tools needed for simulating marine turtle nesting data and comparing alternative monitoring designs (see Section 3.1). Monitoring effort data for parameterising cost-benefit analyses is also currently being collected by partners in AIG. Based on the results of these initial tests we are confident that, with some methodological refinements, we will be able to fully achieve our goal of identifying a monitoring design that optimises the trade-off between effort expended and statistical power to detect trends.

Output 3. *Novel technologies that may one day supplement or replace existing monitoring methods are reviewed and assessed for suitability and field readiness.*

Activities contributing to this output are not scheduled to commence until Year 2 and we have no progress to summarise for the current reporting period.

3.3 Progress towards the project Outcome

Due to the change in employment status of the Project Manager and delays in recruiting a replacement, the project is still at a relatively early stage of delivery. Nevertheless, progress to date has been consistent with the indicators in the revised log-frame approved by the Darwin Secretariat (Annexes 1 & 2) and we are confident that the project will achieve its intended outcome by the end of Year 2. Despite early setbacks, Output 1 has been fully achieved and has provided a long overdue update on the status of the globally-important Ascension Island green turtle population, which was last assessed in 2012. Much of the groundwork for Output 2 has also been laid (see Sections 3.2 – 3.3), which, along with the updated trend from Output 1, provides the starting point for simulations aimed at streamlining future monitoring. Partners in Ascension Island Government have remained engaged in the project during its early phases, including supplying supporting data, and are primed to review revised monitoring protocols developed in Year 2. Adoption of a revised monitoring protocol by AIG and publication of the method in the peer-reviewed literature will ultimately be the best indicators that the project has achieved its intended outcome, as set out in the original logframe.

3.4 Monitoring of assumptions

0.1 *Assumes that a reduced monitoring protocol can be identified that achieves an acceptable level of statistical power.*

Comments: This assumption cannot be evaluated until the results of the simulation-based modelling are available.

2.1 *Assumes that Bayesian population models applied in other taxa are compatible with green turtle nesting data from Ascension Island.*

Comments: Although several modelling outputs are yet to be completed, this assumption has so far held. The project has been aided in this regard by access to code from an in-press publication led by another research team at the University of Exeter, which specifically applied Bayesian population models to marine turtle monitoring data collected at another site. These code tools have been adapted and extended as part of the current project and have proven to be highly flexible and robust for our purposes.

3.2 Assumes that there is sufficient engagement [in a planned monitoring workshop] from the marine turtle research community and that invited participants can attend remotely.

Comments: The monitoring workshop is not planned until Year 2 and invites have yet to be sent, so it is not yet possible to test this assumption. Early expressions of interest were obtained during the project planning phase so we assume that this remains true.

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

The project is still at too early a stage to demonstrate tangible benefits for biodiversity conservation in the UKOTs. However, the ultimate objective that the project is working towards – ensuring the long-term sustainability of a flagship biodiversity monitoring programme – will make a lasting contribution to conservation management on Ascension Island. Assuming that a streamlined protocol can be developed, Ascension Island Government will be able to divert limited resources into practical conservation action while continuing to fulfil its monitoring commitments under multilateral environmental agreements, such as the Convention on Biological Diversity (e.g. "*7(b) Monitor, through sampling and other techniques, the components of biological diversity*…"). The updated status assessment for the Ascension Island green turtle completed in Y1 in itself represents a considerable achievement which contributes to AIG's commitments to monitor and report on the state of nature. For example, the green turtle is listed on Appendix I and II of CITES which commits signatories to undertake "5 a) periodic review of the conservation status of the migratory species concerned…".

5. OPTIONAL: Consideration of gender equality issues

This project does not raise or address any specific gender equality issues.

6. Monitoring and evaluation

The project has a simple structure, consisting of two partners, a small number of well-defined outputs and a clear pathway to impact which has greatly simplified the M&E process. Following an agreed reorganisation of the project logframe and implementation timetable, the majority of work in Y1 has focussed on the re-analysis of the long-term monitoring dataset by lead partners at the University of Exeter (Output 1). M&E during this phase has primarily consisted of internal validation of model outputs by the UoE team to ensure their robustness prior to sharing with local partners and global data repositories. The indicators for Output 1 are clear and have been largely achieved, pending the publication of the update trend in the peer-reviewed literature. This Output is also a necessary starting point for simulating future scenarios, so its completion marks an important milestone. As revised monitoring protocols are developed and assessed in Year 2, M&E will shift towards a two-way exchange between data collectors in AIG and analysts at UoE to ensure that final outputs meet local needs. One impact of the changes to the project implementation timetable is that there will be no opportunity to field test the revised monitoring protocol at a time when turtles are nesting. This had originally been proposed as a key method by which to evaluate project benefits. However, following discussion with partners in AIG we believe that it will be possible to estimate the labour savings that will achieved by a streamlined protocol without the need to gather an entire season of monitoring effort data.

7. Lessons learnt

Most of the key learning outcomes from the project depend upon the completion and publication of the results and methodologies of the streamlining analysis. However, an important message that has been reinforced during Year 1 is that the core problem of 'how much to monitor?' is a common dilemma facing natural resource managers in many countries. Since commencing work, we have been in contact with another marine turtle conservation project in West Africa seeking advice on how to best to organise their monitoring efforts with the resources available to them. Given this wider interest, we are currently exploring options for developing a set of software tools that will allow approaches developed in this project to be replicated in other locations and study systems (see Activity 2.5). This would help broaden the impact of the project beyond the specific challenges posed by green turtle monitoring at Ascension Island.

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

N/A (this is the first annual report for this project).

9. Other comments on progress not covered elsewhere

As briefly outlined in Section 3, the project experienced some unavoidable setbacks in Y1 due to the change in employment status of University of Exeter Project Manager and lead analyst, Dr Sam Weber. In October 2021 (Y1Q3), Dr Weber was appointed to a permanent teaching position at the University and was forced to considerably reduce his time commitment on this project. The Darwin Secretariat were notified of the change and approved the appointment of a replacement, along with the postponement of a number of planned activities into a Y2 extension. Delays in recruitment due to a lack of suitable applicants in the first round meant that a replacement was not in post until March 2022 (Y1Q4), further adding to. Dr Weber's replacement, Dr Liliana Colman, has worked extensively on marine turtles in the South Atlantic and will assume many of Dr Weber's responsibilities on this project. As Dr Colman's line manager, Dr Weber will retain overall oversight for the project and will continue to lead some of the more technical modelling aspects which he had been developing prior to his change in contract status.

10. Sustainability and legacy

The project's original exit strategy remains valid and achievable. The streamlined protocol developed through the project will form the basis for all future marine turtle monitoring on Ascension Island, ensuring the continuity of this important dataset as it adapts to shifting priorities and resource constraints in the Territory. While it is not possible to predict how local capacity might change in the longer-term, by rationalising the Ascension Island Marine Turtle Monitoring Programme and demonstrating efficiency in achieving its monitoring objectives, the project aims to maintain support for the programme through future changes in leadership at AIG. As briefly discussed in Section 3, we are also planning to make a collection of software tools available which will allow future studies at Ascension Island and other locations to more easily replicate the analytical approaches developed. This was not part of the original project plan, but will help to secure the legacy of the work and widen the impact beyond our specific study system

11. Darwin identity

Work in year 1 has been predominantly analytical in nature and has not yet produced any public domain outputs where Darwin funding can be acknowledged. The SWOT database where updated population estimates have been deposited does not credit funding sources, which often vary over the lifespan of a monitoring programme. As the project moves into a reporting phase in Year 2 there will be more opportunities for promoting the Darwin brand and its contribution to this project.

12. Impact of COVID-19 on project delivery

This project is primarily desk-based and has not been affected by the COVID pandemic to the same extent as those requiring extensive international travel. Overspill of work commitments from national lockdowns earlier in 2021 has had a minor impact on the workloads of the project team; however these have been secondary compared to the disruption caused by the change in employment of the Project Leader and the recruitment of a qualified replacement (see Section 9).

13. Safeguarding

Please tick this box if any safeguarding violations have occurred during this financial year. ☐

No safeguarding issues or substantial changes to institutional safeguarding policies have arisen during Y1. Both partners continue to operate rigorous safeguarding policies as described in the project proposal.

14. Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2021 – 31 March 2022)

Project spend (indicative) in this financial year	2021/22 D+ Grant (£)	2021/22 Total actual D+ Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs	[redacted]	[redacted]	[redacted]	Underspend on salary for Project Leader following change in employment status in Y1Q3 and appointment of a replacement on a lower salary spine point. A change request to move some salary for Dr Weber's replacement to Y2 was approved.
Consultancy costs				
Overhead Costs	[redacted]	[redacted]	[redacted]	As for staff costs
Travel and subsistence	[redacted]	[redacted]	[redacted]	Travel for project interns to Ascension Island cost less than anticipated due to COVID-related disruptions to scheduled civilian flights and chartered replacements.
Operating Costs				
Capital items				
Others (Please specify)				
TOTAL	[redacted]	[redacted]		

Checklist for submission

	Check
Different reporting templates have different questions, and it is important you use the correct one. Have you checked you have used the **correct template** (checking fund, type of report (i.e. Annual or Final), and year) and **deleted the blue guidance text** before submission?	X
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	X
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	
Have you included means of verification? You should not submit every project document, but the main outputs and a selection of the others would strengthen the report.	X
Do you have hard copies of material you need to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	
Have you involved your partners in preparation of the report and named the main contributors* *The principal partner in Ascension Island Government was away on annual leave at the time of writing and was not available to comment on the submitted version. However, the majority of the work undertaken in Y1 has been led by the University of Exeter so we are confident that the report presents an accurate summary of progress to date. AIG have seen and provided feedback on results summarised herein and a copy of the report has been provided to them for reference.	
Have you completed the Project Expenditure table fully?	X
Do not include claim forms or other communications with this report.	