

## Biodiversity Challenge Funds Projects Darwin Initiative, Illegal Wildlife Trade Challenge Fund, and Darwin Plus Half Year Report

*Note: If there is any confidential information within the report that you do not wish to be shared on our website, please ensure you clearly highlight this.*

**Submission Deadline: 31<sup>st</sup> October 2022**

<b>Project reference</b>	DPLUS113
<b>Project title</b>	CRACAB – Climate Resilience and Conservation of Ascension’s Biodiversity
<b>Country(ies)/territory(ies)</b>	Ascension Island
<b>Lead partner</b>	Ascension Island Government Conservation & Fisheries Directorate (AIGCFD)
<b>Partner(s)</b>	University of Exeter (UoE); French Institute for Agricultural Research (INRA)
<b>Project leader</b>	Dr Diane Baum
<b>Report date and number (e.g. HYR1)</b>	HYR3
<b>Project website/blog/social media</b>	<a href="http://www.ascension-climate.org">www.ascension-climate.org</a>

**1. Outline progress over the last 6 months (April – Sept) against the agreed project implementation timetable (if your project has started less than 6 months ago, please report on the period since start up to end September).**

**Output 1.1 *Creation of climate model for Ascension capable of predicting temperature and rainfall changes with measured degree of certainty.***

Collaborators at the University of East Anglia’s Climate Research Unit have completed an interim report describing projected future changes in annual and seasonal air temperature and precipitation at Ascension Island based on the IPCC’s Interactive Climate Atlas. The analysis shows a clear warming trend of about 1.3 C by mid-century (2040-2060) compared to a 1980-2010 baseline under an intermediate emissions scenario. Changes in precipitation are much more unpredictable due to a lack of agreement between climate models, although there is moderate confidence of more arid conditions during some seasons. Work is now underway on generating monthly projections using CRU’s ClimGen tool which will build on the historic time series of temperature and precipitation at Ascension Island completed in Y2.

**Output 1.2 *Production of map showing climatic zones on Ascension based on altitude, aspect and distance from sea***

As described in Annual Report 2, the spatial coverage of available meteorological data has proved insufficient to generate a comprehensive map of climatic zonation. As a compromise, once Output 1.1 is completed we intend to generate altitude-specific climate projections that will capture warming trends across Ascension’s major terrestrial biomes.

**Output 1.3 *Creation of oceanographic model for Ascension EEZ produced predicting future changes in current and upwelling systems.***

Oceanographic modelling has now been completed by consultants from Plymouth Marine Laboratory and a final report has been submitted to Ascension Island Government. The report develops long-term projections for nine key biophysical variables under three representative

emission scenarios, as well as modelling future changes in regional ocean circulation. Headline findings from the analysis are that the Ascension Island Marine Protected Area is projected to become warmer, more saline, more acidic and less productive by 2050 under all emissions scenarios, but with more extreme responses in scenarios associated with the stronger emission of greenhouse gasses. The Atlantic Equatorial Undercurrent, which plays a key role in regulating the regional oceanography Ascension Island, is also projected to weaken, helping to reinforce these trends. A manuscript describing the analysis and findings is currently being prepared for submission to a peer-reviewed journal.

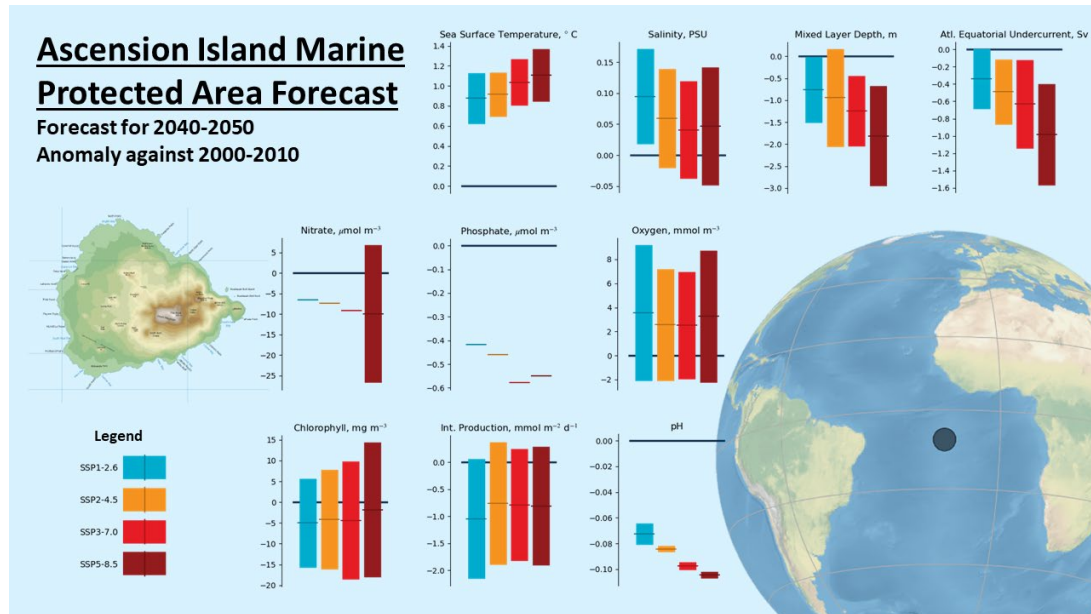


Figure 1. Infographic summarizing predicted changes in ocean biogeochemistry and circulation around Ascension Island between 2000-2010 and 2040-2050 under four climate change scenarios.

**Output 2.1 Production of response curves relating temperature to green turtle sex ratios, and soil moisture content to stress levels in an endemic plant species (*Euphorbia organoides*) from experimental data.**

Researchers from the University of Exeter have now finished analysing temperature profiles from 225 green turtle clutches laid on Ascension’s three main nesting beaches over a 14-year period and established a statistical relationship between air temperature and nest temperature (see Figure 2). This relationship will now be combined with long-term air temperature forecasts from Output 1.1 and temperature response curves completed during Y2 to generate projections for future green turtle reproductive output on Ascension Island.

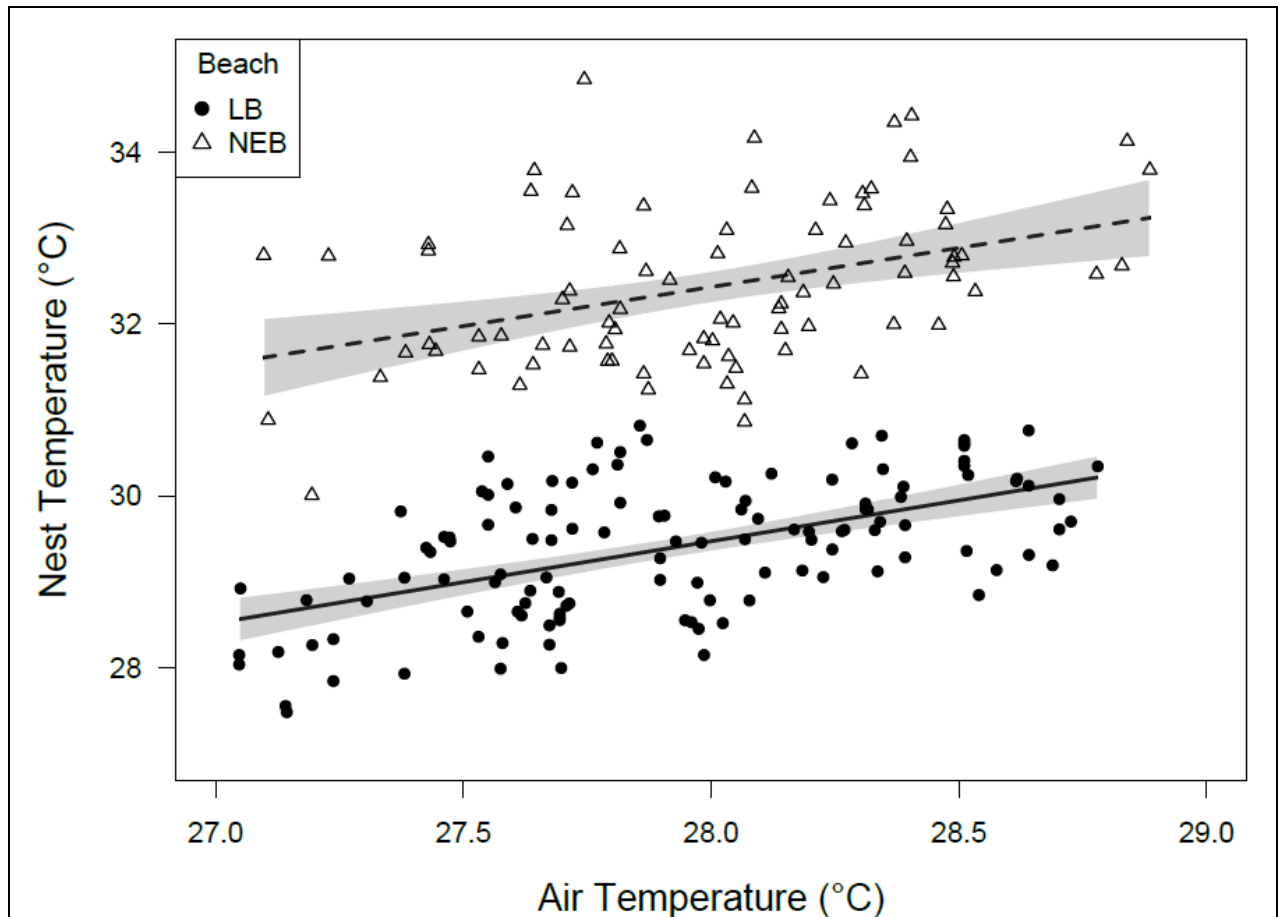


Figure 2. Relationship between ambient air temperature and mean incubation temperatures measured in green turtle nests on two beaches at Ascension Island.

**Due to COVID travel restrictions, it has not been possible for INRA to visit Ascension and undertake cavitation measurements on wild *Euphorbia* plants to quantify drought stress. An alternative approach is being developed whereby *Euphorbia* will be grown from seed in France under different watering regimes and cavitation rates measured on these plants. A change request covering this will be submitted shortly.**

## 2.2. Digital terrain maps of turtle nesting beaches produced.

No further progress has made on this output during the reporting period. The analyst that is preparing the digital elevation models is currently working pro bono and is having to fit project activities around full-time employment. However, this output was nearly complete at the end of Y2 and we still expect to be able to present final results by the end Y3.

## 2.3 Production of maps predicting future availability of turtle nesting habitat produced from swell height data collected adjacent to turtle nesting beaches combined with output 2.2

Swell height data from buoys have proven difficult to incorporate into sea level rise models due to: 1) the lack of a practical way to measure how swell height maps to the height above sea level of the wave impacted zone on beaches, and; 2) that reliable projections of future swell height and frequency of storms are not available for Ascension. Our estimates of changes in the extent of green turtle nesting habitat will therefore be based purely on mean sea level rise ('bath tub model'), following the approach taken by previous studies.

## 2.4 Analysis of correlation between seabird productivity and ocean state variables completed and used to assess feasibility of using seabirds as indicators of ocean health.

No additional progress has been made on this Output during the reporting period. The analyst who replaced original University of Exeter lead researcher Dr Sam Weber in Q1Y3 has been

familiarising herself with the data and modelling techniques for projecting climate change impacts on marine turtle success (Output 2.1) and will resume work on Output 2.4 in Q3Y4 once the turtle analyses are complete.

### **3.1 Trials of turtle nest shading, endemic plant shading and fog-catching irrigation systems carried out**

Experimental trials of turtle nest shading have now been completed and results are currently being analysed to assess the effectiveness of this approach as a climate change mitigation strategy. Between February and July 2022 (Y2Q4 – Y3Q1) a total of 85 green turtle clutches were experimentally translocated to shaded or unshaded enclosures constructed on two of the Island's key turtle nesting beaches. Temperature loggers were placed in the centre of each clutch to measure thermal conditions in shaded and unshaded nests and the nests were then excavated post-hatching to determine survival rates. Data are currently being analysed by researchers at the University of Exeter with a final report expected by the end of Y3Q3.



Artificial shading of endemic plant restoration sites has also continued during the reporting period and is generating promising results. Shade netting wind breaks have proven to be effective in protecting *E. organoides* from wind damage at two restoration sites. Shade netting covers have also been placed over individual *E. organoides* planted out at one of the more arid restoration sites and the condition of all of these individuals remains good.

Fog-catching irrigation systems have been constructed at several sites in Green Mountain National Park to provide supplemental water for small populations of threatened endemic plants growing in marginal habitat. Precipitation gauges placed next to the irrigation system have shown that the fog catcher method results in significantly higher water capture rates than standard rainfall harvesting systems. It remains too early to assess what impact the increase in water runoff has had on target species. However, monitoring of abundance and distribution of endemic *Sporobolus* grass is ongoing.

### **3.3 Sites on Ascension that have suitable climate conditions for *Euphorbia organoides* identified. Transplant nursery grown stock to these areas and monitor success.**

A total of 93 nursery grown *Euphorbia* were translocated to three different restoration areas during the reporting period spanning a range of climatic conditions. Approximately a third of these succumbed to damage by invasive pests and had to be replaced. However, endemic plant censuses carried out in May and September 2022 detected > 1500 seedlings at the highest elevation site, likely aided by prolonged periods of heavy rainfall. A small number of seedlings were also detected at the mid-altitude site. This supports the hypothesis that rainfall and soil moisture is currently the main constraint on recruitment of this species in arid, low-lying areas. A third coastal restoration area has now been fenced and nursery stock is being hardened off for planting. This site will be used for 'pulse irrigation' experiments to assess whether focussed, intense periods of watering are sufficient to enable seedling establishment in more arid sites.

### **4.2 Public meetings held on Ascension to initially outline the objectives of the project and later to showcase results of the project and illustrate climate scenarios for the island**

A final public meeting will be held during Q4 of Y3 to present the combined findings of project activities to stakeholders.

#### **4.3 Creation of animated films of future scenarios as visual tools for stakeholder engagement**

Creation of animated films is awaiting the completion of Output 2.2 and 2.3.

#### **4.4 Presentation of results at international conference to showcase how Ascension is addressing a major threat to its biodiversity**

Results from the project are due to be presented in a dedicated session at the fifth International Marine Protected Areas Congress (IMPAC5) to be held in Vancouver, Canada in February 2023 (Q4Y3). This output is taking place later than planned due to conference dates being postponed several times over COVID concerns. A proposal for an oral presentation has been accepted by the conference organisers and will focus on climate change impacts and adaptation in the Ascension Island MPA.

### **2. Give details of any notable problems or unexpected developments/lessons learnt that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.**

As detailed in a previous project report, the original project manager and lead research partner from the University of Exeter has had to significantly reduce his time commitment to this project after moving to a permanent faculty position. A replacement has been appointed but it has understandably taken them time to familiarise themselves with the project, datasets and methods involved. We are therefore slightly behind where we had planned to be at this stage on several outputs that Dr Weber was responsible for. We intend to submit a change request to Darwin shortly to propose that projected salary and travel underspend for Y3 is used to recruit some additional short-term support to help finalise these remaining outputs.

Due to COVID travel restrictions and subsequent work backlogs, it will not be possible for INRA scientists to visit Ascension as originally planned. An alternative means of measuring cavitation rates in Euphorbia that does not require a visit to Ascension is being developed and a change request will be submitted.

### **3. Have any of these issues been discussed with NIRAS-LTS International and if so, have changes been made to the original agreement?**

Discussed with NIRAS-LTS: Yes

Formal Change Request submitted: No

Received confirmation of change acceptance No

Change request reference if known:

#### **4a. Do you currently expect to have any significant (e.g. more than £5,000) underspend in your budget for this year?**

Yes  No  Estimated underspend: ██████████

**4b. If yes, then you need to consider your project budget needs carefully.** Please remember that any funds agreed for this financial year are only available to the project in this financial year.

**If you anticipate a significant underspend because of justifiable changes within the project, please submit a re-budget Change Request as soon as possible. There is no guarantee that Defra will agree a re-budget so please ensure you have enough time to**

make appropriate changes if necessary. **Please DO NOT send these in the same email as your report.**

**5. Are there any other issues you wish to raise relating to the project or to BCF management, monitoring, or financial procedures?**

**If you are a new project and you received feedback comments that requested a response (including the submission of your risk register), or if your Annual Report Review asked you to provide a response with your next half year report, please attach your response to this document.**

**Please note: Any planned modifications to your project schedule/workplan can be discussed in this report but **should also** be raised with NIRAS-LTS International through a Change Request. **Please DO NOT send these in the same email.****

Please send your **completed report by email** to [BCF-Reports@niras.com](mailto:BCF-Reports@niras.com). The report should be between 2-3 pages maximum. **Please state your project reference number, followed by the specific fund in the header of your email message e.g. Subject: 29-001 Darwin Initiative Half Year Report**