

Biodiversity Challenge Funds Projects Darwin Initiative, Illegal Wildlife Trade Challenge Fund, and Darwin Plus

Half Year Report

It is expected that this report will be a **maximum of 2-3 pages** in length.

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: 31st October 2024

Please note all projects that were active before 1 October 2024 are required to complete a Half Year Report.

Submit to: BCF-Reports@niras.com including your project ref in the subject line.

Project reference	<i>DPLUS184</i>
Project title	Mitigating the Impacts of Climate Change on Sea Turtle Populations
Country(ies)/territory(ies)	Cayman Islands
Lead Organisation	Cayman Islands Department of Environment
Partner(s)	University of Exeter
Project leader	Jane Hardwick and Joseph Roche Chaloner
Report date and number (e.g. HYR1)	October 2024 HYR2
Project website/blog/social media	@doecayman (Instagram), Cayman Islands Department of Environment (Facebook), doe.gov.ky (website)

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

Since April 2024, we have made good progress with the project. Our project team remains the same as appointed in Y1 (Activity 1.1).

From the 24th April to 16th May 2024, all project staff were present in the Cayman Islands to ensure everything was prepared for the second season of data collection. Formal project meetings were held at the Dept. of Environment during this period, on 25th, 26th April and 14th May.

The first project manuscript is almost complete, which explores the population trends and nesting phenology of green and loggerhead turtles in Cayman. This study used the DoE's long-term data to show a robust population recovery across the three islands (Grand Cayman, Little Cayman and Cayman Brac) and suggest that climate change, with rising sea surface temperatures (SST), may be linked to earlier nesting and a longer nesting season observed for sea turtles in the Cayman Islands. This paper will be submitted for publication by the end of

2024 and presented at the International Sea Turtle Symposium 2025 in Ghana (Activities 1.2, 4.4, 4.5).

Good progress is being made towards Activities 1.3, 1.4, 2.1, through the construction of Digital Terrain Models (DTMs) of nesting beaches at different times in the season. As of late October, 2024, there have been three drone flights and associated surveying for all four focus beaches.

- Green Turtle Nesting Beach: Sand Hole
 - Pre-season flight – May 29, 2024 – Digital Terrain Model (DTM) constructed
 - Post-storm flight - July 22, 2024 – DTM constructed (Hurricane Beryl)
 - Post-storm flight – October 4, 2024 (Tropical Storm Helene) – DTM pending
- Loggerhead Turtle Nesting Beach: Spotts Beach/Bat Cave Beach
 - Pre-season flight – June 19, 2024 – DTM constructed
 - Post-storm flight – July 17, 2024 – DTM constructed (Hurricane Beryl)
 - Post-storm flight – October 10, 2024 (Tropical Storm Helene) – DTM pending
- Both Species Nesting Beach: Seven Mile Beach North
 - Pre-season flight – May 29, 2024 – DTM constructed
 - Post-storm flight – July 22, 2024 – DTM constructed (Hurricane Beryl)
 - Post-storm flight – October 4, 2024 (Tropical Storm Helene) – DTM pending
- Both Species Nesting Beach: Bodden Town Beach
 - Pre-season flight – June 19, 2024 – DTM pending
 - Post-storm flight – July 17, 2024 – DTM pending (Hurricane Beryl)
 - Post-storm flight – October 10, 2024 (Tropical Storm Helene) – DTM pending

Identification of nesting locations that were most vulnerable to storm impacts over the last two seasons based on drone imagery of erosion coupled with nest failure data from excavations, is ongoing. The findings will be considered when updating nest management and relocation protocols (Activities 1.2 and 2.2).

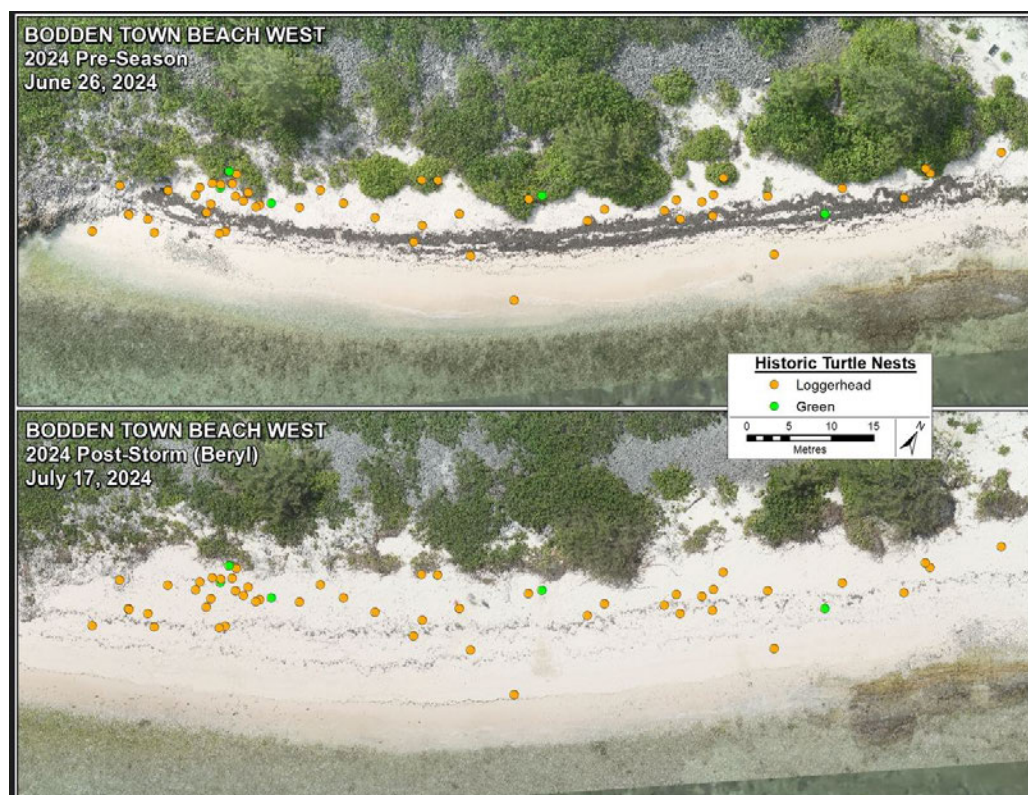


Figure 1. Drone imagery before and after Hurricane Beryl, shows vegetation loss due to high swells. Historic nest locations are shown for loggerhead (orange dots) and green turtles (green dots) turtles.

During the 2024 sea turtle nesting season there have been 655 nests recorded so far and we are on track to reach our target of temperature loggers deployed in nests. The number of temperature loggers deployed/retrieved until the end of October 2024 are: **56 in loggerhead nests** (51 retrieved and 5 lost due to Hurricane Beryl) and **60 deployed in green turtle nests** (34 retrieved, retrieval ongoing). With this season's data, we will have reached our target of temperature data from 100 nests over the two seasons (Activity 2.3).

In addition, we have continued to collect sand temperature at different beaches across the three islands at 41 control points, year round, and an additional 36 short-term control points, to maximise our understanding of beach-specific temperatures and shading.

Preliminary analyses has been carried out using data from 2023's *in-situ* nest temperature loggers and sand control loggers (Activities 1.4 and 2.3, 2.4, 2.5).

In-situ nest temperature data findings:

- High temperatures during the 2023 nesting season led to a heavily female-skewed predicted hatchling sex ratio, with initial data suggesting that 94% of green turtle and 83% of loggerhead turtle hatchlings were predicted to be female.
- The nest lay date did not have a significant effect on temperature during the thermosensitive period (TSP) or sex ratios for green turtles.
- In contrast to green turtles, early-season loggerhead nests appeared to be the primary contributors of male hatchlings, though nest temperature variability warrants further investigation to understand the thermal environment's role in climate resilience.
- For green turtles, no significant difference in TSP temperatures across different shading treatments (shaded, partially shaded and open) were found, suggesting that factors such as nest-site selection, distance to the water, depth, clutch size, and type of shade, may also play important roles in influencing incubation temperatures.
- For loggerheads, only one nest in the shaded treatment had temperature data, as most fell into the 'partially shaded' category, limiting the ability to make reliable comparisons across shading treatments.
- The classification of shade type was deemed an important data point and was added to the 2024 data collection by having photographs of each nest (Figure 1). The inclusion of this data will allow us to make more reliable estimates and to draw more definitive conclusions about the effects of shading on nest temperatures and sex ratios for both species.

Sand control data:

- Temperature variability across islands and treatments focusing on open-area treatment, showed sand temperatures at nest depth remained near or above the pivotal temperature (29.5°C) throughout the nesting season.
- Little Cayman had lower open-area temperatures, but higher shaded temperatures compared to other islands.
- Grand Cayman showed intermediate values, while the potential effect of Casuarina leaves on sand temperatures in Cayman Brac will be analysed further with 2024 data.
- Cooling events coincided with rainfall, as noted using data from the Cayman Islands National Weather Service (2023).

These preliminary results highlight the complexity of factors influencing incubation temperatures and predicted hatchling sex ratios. Data from the 2024 nesting season will help develop a more comprehensive understanding of these variables, key for designing conservation strategies addressing climate change and the long-term viability of sea turtle populations (Activities 2.2, 2.6 and 3.1).



Figure 2. Different types of shading on nesting beaches. Left: shading from cabana in Grand Cayman. Right: natural shading from vegetation in Cayman Brac.

Since April 2024, there have been 12 outreach activities. These include 2 public meetings/presentations, 1 radio interview, 1 magazine segment, 1 filming activity for a turtle documentary, 6 school group nest excavations and 1 school presentation. A further 4 school group excavation activities were scheduled, but cancelled due to inclement weather. Outreach events were held in both Grand Cayman (27th April 2024) with 65 attendees, and Little Cayman (8th May 2024) with 36 attendees, to present some of the previous year's findings; both meetings were very well received. An outreach event in Cayman Brac is scheduled for April 2025, as well as meetings with other key stakeholders.



Figure 3. School group turtle nest excavation

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.

In our 2023 data, we did not classify shade type, which was later found to likely impact the analysis as which some shaded nests showed warmer temperatures than unshaded; likely a factor of some shaded nests being protected from rain and the rain being a strong variable for nest cooling.

Vegetation type/shade type will be classified using pictures taken from each nest during the 2024 nesting season as part of data collection.

We had unexpected issues with some of the TinyTag temperature loggers as the batteries corroded over the winter where long term controls were left in the sand for an extended period of 6 months. TinyTag replaced these and sent service kits for us to change batteries of the rest, in the meantime, we had to be careful of the numbers of temperature loggers deployed. Overall, this did not impact our data collection, though we decided to shorten the length of time that controls are left before changing out, to avoid loss of data.

We had high storm activity in the 2024 nesting season which resulted in loss of 5 loggerhead nests with temperature loggers to storm surge/erosion and likely another 5-10 green turtle nests with temperature loggers (TBC). In addition, 5 control sand temperature loggers were also lost (and later replaced) in storms. Though nest loss is unfortunate, the data gathered from this season will be important for decisions regarding future management.

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

Discussed with NIRAS:

Yes/ **No**

Formal Change Request submitted:

Yes/ **No**

Received confirmation of change acceptance:

Yes/ **No**

Change Request reference if known: *If you submitted a financial Change Request, you can find the reference in the email from NIRAS confirming the outcome*

4a. Please confirm your actual spend in this financial year to date (i.e. from 1 April 2024 – 30 September 2024)

Actual spend: £ ██████████

4b. Do you currently expect to have any significant (e.g. more than £5,000) underspend in your budget for this financial year (ending 31 March 2025)?

Yes No Estimated underspend: N/A

4c. If you expect and underspend, then you should 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 to your project if necessary. Please DO NOT send these in the same email as your report.

NB: if you expect an underspend, do not claim anything more than you expect to spend this financial year.

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

N/A

6. Please use this section to respond to any feedback provided when your project was confirmed, or from your most recent annual report. If your project was subject to an Overseas Security and Justice Assistance assessment please use this space to comment on any changes to international human rights risks, and to address any additional mitigations outlined in your offer letters. Please provide the comment and then your response. If you have already provided a response, please confirm when.

The only feedback request was to report on the impacts of Hurricane Beryl (July 2024) in the next annual report and we plan to include a detailed assessment of the impacts then.

Checklist for submission

For New Projects (i.e. starting after 1st April 2024)	
Have you responded to any additional feedback (other than caveats) received in the letter you received to say your application was successful which requested response at HYR (including safeguarding points)? You should respond in section 6, annexes other requested materials as appropriate.	
If not already submitted, have you attached your risk register ?	
For Existing Projects (i.e. started before 1st April 2024)	
Have you responded to feedback from your latest Annual Report Review ? You should respond in section 6, annexes other requested materials as appropriate.	Y
For All Projects	
Include your project reference in the subject line of submission email.	Y
Submit to BCF-Reports@niras.com .	Y
Have you clearly highlighted any confidential information within the report that you do not wish to be shared on our website?	N/A
Have you reported against the most up to date information for your project ?	Y
Please ensure claim forms and other communications for your project are not included with this report.	Y