Final Evaluation Report

Your Details	
Full Name	Jaime Restrepo
Project Title	Post-Nesting Migration Evaluation and Foraging Areas Identification of Green Turtle (*Chelonia mydas*) nesting at Tortuguero, Costa Rica
Application ID	39662-1
Date of this Report	03-01-2024

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Evaluating the post-nesting migration for green turtles nesting at Tortuguero, Costa Rica.				We successfully deployed four satellite tags on nesting green turtles marked at the southern end of Tortuguero National Park at the end of the nesting season (Photo 1).
Characterizing the migratory behaviour of green turtles traveling back to foraging areas.				We evaluated the time expended by green turtles in the inter-nesting areas around Tortuguero and followed their migration back to foraging grounds around the Caribbean Sea.
Identify Foraging areas supporting Tortuguero's green turtle nesting population.				Tagged turtles dispersed throughout the Caribbean Sea, each going to different foraging areas in Belize, Mexico, and Nicaragua (Photo 2).

Photo 1. Post-nesting green turtle equipped with satellite transmitter, Tortuguero, Costa Rica. September 2023.

2. Describe the three most important outcomes of your project.

a) We calculated the area used by green turtles between different egg laying events. The inter-nesting area used by females nesting at Tortuguero was estimated using the locations provided by the satellite tags deployed on four female green turtles nesting at Tortuguero in September 2023.

b) We were able to describe the routes taken by green turtles migrating from their breeding site at Tortuguero, Costa Rica, to various foraging areas around the Caribbean Sea.

c) We identify different foraging grounds for green turtles migrating from Tortuguero, Costa Rica (Photo 2). For each turtle we calculated the area used to forage in the coastal waters of countries like Mexico, Belize, and Nicaragua.

Photo 2. foraging grounds for green turtles migrating from Tortuguero, Costa Rica. coastal waters of countries like Mexico, Belize, and Nicaragua.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

Fortunately, with the experience of the team on the field and the expertise in the tagging process, fieldwork turned out as expected, tagging the four nesting turtles on two consecutive nights. To date, two turtles are still transmitting their location and we can monitor their movement near the Yucatan peninsula in Mexico and around the Miskito Keys in Nicaragua. Unfortunately, the other two turtles stopped transmitting after spending several weeks in their respective foraging areas in Nicaragua and Belize. This limited the volume in information and accuracy on the estimation of foraging ranges for these two individuals. Regardless, we were able to monitor the foraging behaviour of these turtles for several weeks and we are certain of their foraging destinations.

4. Describe the involvement of local communities and how they have benefitted from the project.

The Sea Turtle Conservancy (STC) has been working hand to hand with the local community of Tortuguero for over 60 years. The involvement of local junior research

assistants has brought the community and the researchers together to work on the conservation of sea turtles nesting at Tortuguero. The best example of this is the involvement of Keithlyn Rankin in the organisation. Keithlyn started volunteering with STC at the age of 12 ; now, after graduating from university with a degree in marine biology, Keithlyn works as assistant coordinator in the field station at Tortuguero and her involvement in this project helped things to run smoothly on the field. Keithlyn was involved in the logistic planning of the field excursions and was hands-on involved in the deployment of the satellite tags (Photo 3).

Photo 3. Keithlyn Rankin, Assistant Coordinator Sea Turtle Conservancy processing a green sea turtle to be equipped with a satellite tag. Tortuguero, costa Rica. September 2023.

5. Are there any plans to continue this work?

This project has shown that green turtles nesting at Tortuguero, Costa Rica disperse throughout the Caribbean Sea. Though this is a very small sample of the population, we can see different foraging destinations being used by these turtles. We aim to continue monitoring the migratory patterns and connectivity between breeding and foraging areas for green turtles nesting at Tortuguero. Using different emerging analytical techniques, we will expand on the sample size of turtles monitored at Tortuguero so we can infer contributions from various foraging areas to Tortuguero's nesting population. Stable isotopes analysis is a technique that allows to link animals to specific feeding areas based on the concentration values of certain elements assimilated through the food web. Using the tracked turtles as sentinels, we will be able to compare the stable isotopes values from the know foraging areas with samples from nesting turtles at Tortuguero beach to determine their foraging origins.

6. How do you plan to share the results of your work with others?

Results obtained from this project were included in the 1st year's progress review for my PhD programme at The University of Queensland (Photo 4). Also, they will be included in any peer reviewed publication analysing the movement of these turtles, which is the aim of the second chapter in my PhD thesis proposal. Furthermore, I have been accepted to present an oral exposition of the partial results of my research in the upcoming International Sea Turtle Symposium (ISTS), which will be held in Pattaya, Thailand between the 24th and 29th March 2024.

Photo 4. Jaime Restrepo's progress review presentation, The University of Queensland, November 2023.

7. Looking ahead, what do you feel are the important next steps?

To assess connectivity between nesting and foraging areas for this population, we will investigate the analysis of stable isotopes from tissue samples collected from nesting turtles at Tortuguero rookery. Using the turtles equipped with satellite transmitters as sentinels, we will match stable isotope values for carbon and nitrogen with the respective foraging areas determined by satellite telemetry. Based on the distribution of these turtles we will collaborate with sea turtle conservation organisations around the Caribbean to obtain tissue samples from turtles feeding in the detected foraging areas. The isotopic values of these areas will be compared with samples taken from nesting green turtles at Tortuguero National Park, so we will be able to estimate the contribution of diverse foraging areas to this, the second largest nesting population of green turtles in the world. Compared to satellite telemetry, stable isotopes analysis is a much more cost-effective technique, which allows us to increase our sample size by hundreds of individuals and have a better representation of the whole nesting population. The combination of the satellite telemetry and stable isotopes analysis will provide us with information that will contribute to characterise the green turtle's dynamics around the Caribbean Sea.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

During the progress review presentation at The University of Queensland, The Rufford Foundation was properly acknowledged and presented as a great facilitator to the development of my research, monitoring the migratory behaviour o green turtles nesting at Tortuguero, Cota Rica (Photo 5). Similarly, The Rufford Foundation will be acknowledged in any further presentation exposing these results and peer reviewed publications resulting from this research as well as in the final thesis manuscript for my PhD candidature.

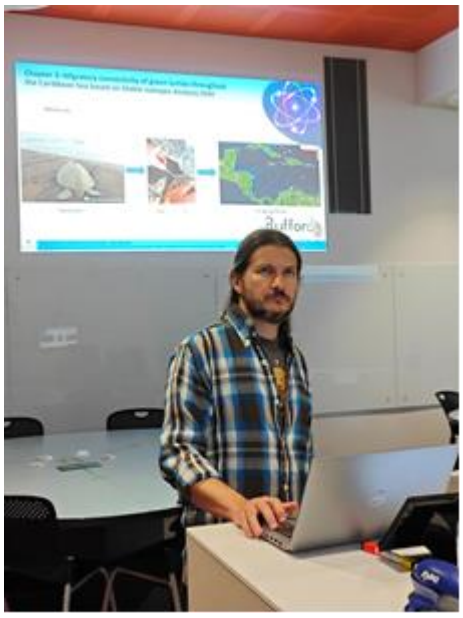

Photo 5. Jaime Restrepo's progress review presentation, The University of Queensland, November 2023.

9. Provide a full list of all the members of your team and their role in the project.

Name	Organization	Participation Role
Jaime Restrepo	The University of Queensland	Lead Researcher and project coordinator
Dr. Daniel Evans	Sea Turtle Conservancy	Senior Research Biologist and Satellite tag expert
Raúl García-Varela	Sea Turtle Conservancy	Field coordinator and experienced sea turtle researcher, Raúl was of great support on the field allowing us to work simultaneously, making the process more efficient.
Ismael López	Sea Turtle Conservancy	Local staff for Tortuguero research station. Ismael was essential on the field, he served as skipper, guide, and support for teams on the beach.
Keithlyn Ranking	Sea Turtle Conservancy	Assistant Coordinator and local researcher. Keithlyn helped with the logistics on the field, also, she was part of the field crew in charge of retaining, processing, and tagging sea turtles on the beach at Tortuguero National Park (Photo 3).
Carlos Calagua	Sea Turtle Conservancy	Field Research Coordinator, Carlos oversaw preparations before going into the field, he also was part of the field crew in charge of retaining, processing, and tagging sea turtles on the beach at Tortuguero National Park (Photo 6).

10. Any other comments?

The green turtle nesting population at Tortuguero, Costa Rica is currently in decline. Therefore, acquiring new knowledge about the migratory connectivity for this population is vital to inform conservation strategies in the region. Green turtle nesting females from Tortuguero seem to cross several territorial boundaries during their breeding migration, which makes the protection of this population a multi-national, complex matter, considering the different policies and cultural background for the various nations in the Caribbean. This project is the first approach to shed light on the connections among different nations throughout the migration of green turtles. Thus, the continuation and expansion of this research could be instrumental to the protection of this endangered population across the region.

We are very grateful for the support granted by The Rufford Foundation for the implementation of this project, and thanks to this support, we keep learning about the migration patterns of this population. We anticipate that this data will be instrumental in future conservation measures to protect green turtles in the region.

Photo 6. Research team (Jaime Restrepo -Left- and Carlos Calagua -Right-,) releasing green turtle equipped with satellite transmitter after completing oviposition at Tortuguero rookery. September 2023.