

**The Rufford Small Grants Foundation - RSG
Partial report for project:**

**Genetic diversity and structure, Mixed Stock Analysis, and migratory
patterns of hawksbill turtles (*Eretmochelys imbricata*) feeding around
northeast Brazil**

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Project description

Of all sea turtle species, hawksbill turtles (*Eretmochelys imbricata*) have suffered the longest and most intense exploitation. Besides threats inherent to all species (egg and meat consumption, habitat degradation and loss, bycatch in fisheries, among others), hawksbills are also a high-value commercial and cultural icon due to their patterned carapace. The drastic population decline suffered by this species has rendered it a 'critically endangered' classification in the World Conservation Union Red List (IUCN Red List) and in Appendix I of the Convention for the International Trade of Endangered Species of Fauna and Flora (CITES). In this context, genetic studies emerge as important tools for understanding connectivity, structure and migrations of endangered populations, providing the knowledge necessary for determining adequate management strategies for the conservation of species. In Brazil, large gaps exist in the knowledge of juvenile hawksbill turtles, and we propose to decrease that gap by verifying the genetic characteristics of feeding aggregations of these animals at the northeastern and southern portions of the country. We will describe the occurrence of hawksbills at the areas through visual census, tagging and biometrics; characterize and compare DNA sequences in terms of composition and diversity; verify genetic structure between areas, determining distinct units; estimate natal origins of animals; analyze surface ocean drifters for improving natal origin estimates and developing migration hypothesis; and collaborate with other conservation projects and managers of protected areas for improving management strategies.

Project progress

Field expeditions

Abrolhos National Marine Park (Bahia state): we performed three expeditions to this amazing archipelago, filled with coral reefs and thriving with life and biodiversity. During these expeditions we were able to capture and collect samples from 65 immature hawksbill turtles, ranging from the small size of 24.5cm curved carapace length (CCC) up to a maximum of 63cm CCC. All animals were released immediately following sampling. See Figure 1 for pictures of methods.

In over 80 hours of diving, we also observed many interesting behaviours, such as cleaning stations with fish, feeding on zoanthids that colonize the borders of crevices in the reef, and a lot of resting under rocks (Figure 2). Through photo-identification in dives, we observed fidelity to the area of at least 9 months (time elapsed from first to last expedition).

São Pedro and São Paulo Archipelago (Rio Grande do Norte state): we performed two expeditions to this remote oceanic island (over 1000km from the northeastern coast of Brazil), a bundle of rocks that aggregates an amazing amount of marine species including sharks, dolphins, manta rays, reef fish, and sea turtles. In over 30 hours of diving performed at the area, we were able to collect samples from only 12 immature hawksbills. This small number of samples is due mainly to the difficulty

in capturing turtles because of the large depths around the archipelago and the rough sea conditions, with lots of waves and strong currents. We did however record some interesting characteristics. Hawksbill turtles at this archipelago were larger than the ones at Abrolhos, with one captured animal measuring 75cm CCC and weighing over 50kg. Also, animals fed mainly on *Palythoa cariborium* and sponges, and presented cleaning relations with the endemic fish *Stegastes sanctipauli*. Through photo-id, we observed fidelity of at least eight months to the area. See Figure 3 for photos of the area.

Arvoredo Marine Biological Reserve (Santa Catarina state): this biodiverse rocky reef was sampled during six expeditions (225 hours of diving) for project “Conservation Genetics and Migratory Patterns of Sea Turtles in Southern Brazil”, which also received financial support from RSG. We had previously collected only five hawksbill turtle samples at the Arvoredo Reserve, since the occurrence of this species at the area is relatively rare because of lower water temperature. Recently we performed one additional expedition, but encountered and sampled only one hawksbill turtle over one week of diving, and will therefore perform another expedition in an attempt to collect more samples. Although we observed few hawksbills at the area, we registered cleaning relations with juvenile angelfish *Pomacanthus paru*, feeding on *Palythoa*, and an interesting hosting relation with a small crab. The observed hawksbills were in a general manner small, ranging from 30 to 41.5cm CCC. See Figure 4 for photos at Arvoredo Island.

Samples from partners

We established partnerships with NGOs in order to increase the range and number of hawksbill turtle samples. We had already established partnership with Núcleo de Educação e Monitoramento Ambiental (NEMA) and Centro de Recuperação de Animais Marinhos (CRAM), and the current number of hawksbill samples from Cassino Beach (Rio Grande do Sul state) amounts to 17. Samples from the northern coast of Bahia state ($n = 57$) and the coast of Ceará state ($n = 27$) were supplied through partnership with Project Tamar-ICMBio, totalizing six feeding areas and 184 hawksbill samples (Figure 5).

Laboratory and data analyses

Due to several setbacks throughout the project (performance of additional expeditions for sampling, problems with laboratory equipment, among others), we are behind on the initial established timeframe. We are currently finishing DNA extractions and Polymerase Chain Reactions (for amplification of the mitochondrial DNA control region that will be analyzed) of collected samples. After this phase, we will send samples for sequencing and obtain haplotype sequences for analysis of genetic diversity, population structure, and natal origins. Determination of the role of ocean currents in shaping distribution of hawksbill turtles in Brazil will be performed in partnership with the University of Western Australia's Ocean's Institute along with M.Sc. Júlia Wiener Reisser and Dr. Charitha Pattiaratchi. This

will be done by evaluating surface drifter trajectories available through the Global Drifter Program (aoml.noaa.gov/phod/dac/index.php) and analyzing virtual drifters obtained through a particle tracking code forced by velocity fields generated by global ocean models. The trajectories of real and virtual drifters that pass next to major hawksbill turtle nesting areas (defined as areas with over 100 females nesting annually; these data will be previously compiled from literature) in the Atlantic Ocean will be accompanied for verification of dispersal patterns, and compared to the genetic analysis of population structure and natal origins in order to obtain a biophysical model of connectivity between feeding and reproductive populations of hawksbill turtles in the Atlantic.

Although we are behind on our timeframe, we have achieved a very satisfactory number of samples from a variety of feeding areas, and are confident that the next phase of the project will lead to important results that will provide essential information for the conservation of hawksbill turtles in Brazil.