MONA AND MONITO ISLAND, PUERTO RICO

MARINE TURTLE RESEARCH PROJECT

Hawksbill Nest Monitoring 2022 Report

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INTRODUCTION

Uninhabited Mona Island is a Natural Reserve administered by the Department of Natural and Environmental Resources of Puerto Rico (DNER). The island, located midway between Puerto Rico and Hispaniola in the Mona Passage, has 17 sandy beaches totaling approximately 7.1 linear km and corresponding to 20 named beaches or beach sections (Figure 1). Three marine turtle species are known to nest on Mona, in order of decreasing importance: the hawksbill turtle (*Eretmochelys imbricata*), green turtle (*Chelonia mydas*) and the leatherback turtle (*Dermochelys coriacea*).

Marine turtle nesting activity on Mona Island was first systematically examined in 1974 (Thurston, 1975), then a decade later followed up by surveys that varied in methods and survey durations. We began monitoring turtle nesting activity in 1994, covering a larger proportion of the peak hawksbill nesting season, and in 2003 implemented nesting index methodology to further enhance replicability of the hawksbill monitoring effort.

Hawksbill turtles are responsible for about 95% of the nests laid on Mona Island. Nest numbers in recent years indicate that Mona Island's hawksbill population continues to be the largest under U.S. jurisdiction, and the second largest rookery in the Caribbean region, after Barbados. Although the island's status as a Natural Reserve protects its hawksbill nesting areas from the greatest threat facing this species worldwide, namely coastal development, significant other threats remain and our monitoring effort further addresses these.

The principal objective of the proposed monitoring effort on Mona Island's beaches is to determine trends in the hawksbill population size over time. Secondary study objectives are to (1) measure nest productivity (number of hatchlings produced), (2) monitor the effectiveness of the pig exclusion fencing and act on pig predation threats to nests, (3) identify any other emerging threats to marine turtles or their nests, (4) deter nest and turtle poaching through the frequent presence of survey personnel on the nesting beaches.

NESTING BEACH SURVEYS - *METHODS*

Monitoring surveys of the 20 named Mona nesting beaches are conducted from around late July to early December, encompassing the index nesting period which runs from September 1 through October 31st. Occasionally we are able to visit the island outside of the regular survey season and any nesting activity is noted but not included in the reported season nest counts. Surveys consist of walking the beaches and examining any turtle activity encountered, generally during the morning. Upon first arrival to the island for the season, an initial "sweep survey" is conducted, whereby all existing nesting activities are noted but not included in the final survey result. From then on, whenever fresh adult turtle tracks are found, we determine and record for each activity whether a nest was laid ("nest") or not ("false crawls"). Since this requires some expertise, any novice observers were trained and tested extensively before allowing them to make such determinations independently. Nests are marked with biodegradable flagging tape labeled with the observation date affixed to nearby vegetation or to a stake

set proximately in the sand. Turtle tracks are then crossed perpendicularly by dragging a foot through the sand as another precaution to ensure activities are not double counted (figure 2, right).

Figure 1. Location of nesting beaches used by marine turtles at Mona Island.

Figure 2. Left, nest marked with biodegradable flagging. Right, a “crossed” turtle track, Indicating that it has been counted.

The frequency of the beach surveys varies by beach location and monitoring period. The more inaccessible beaches are visited once weekly, whereas the nearby beaches are walked at least every other day and during the 2-month index nesting period every day. Bad weather can prevent us from visiting beaches as scheduled, however a best effort is made to ensure that as little information as possible on nesting activity is lost due to such conditions.

Assessments of reproductive success are conducted by examining recently hatched nests, typically encountered after finding hatchling tracks. Hatched nests are dug up, unless significant a number of hatchlings remain near the surface, and the contents quantified. Overhead vegetation type, whether the nest was laid in sand or contained earth, and the presence of flagging tape and date marked thereon, are noted. Nest contents are categorized by: (1) completely hatched eggs (empty eggshells), (2) non- or incompletely-hatched eggs (eggshells with organic content), (3) dead hatchlings, and (4) live hatchlings. Nest productivity, defined as the proportion of live hatchlings produced, and because some live hatchlings may remain present in the nest upon revision while an unknown number of these might have emerged on their own without intervention, we use both upper (**P+**) and lower (**P-**) productivity limits as estimators of nest productivity as follows:

P+ represents the successful emergence of all live hatchlings found in the nest and is calculated from

P+ = (number of eggshells - dead hatchlings) / total number of eggs in the nest

P- represents the unsuccessful emergence of all live hatchlings found in the nest and is calculated using

P- = (number of eggshells - dead hatchlings - live hatchlings) / total number of eggs in the nest

Actual nest productivity under natural conditions (without intervention) should lie between **P+** and **P-**.

Because of the way we find nests for which productivity is measured (from hatchling tracks), a potential bias is introduced, as completely unproductive nests would typically not be included. To correct for this, a subset of around 40 randomly chosen (but accessible) hawksbill nests is marked using distinct flagging tape to track nest fate from laying to hatching (or loss). The exact location of these nests is confirmed when laid, marked, and then watched for signs of hatching in due time. After ~65 days the nest is dug up if it has not hatched by then to determine nest productivity. Often completely unsuccessful nests are those that were affected by storm swells and/or washed away. This nest fate data is used to correct overall measured nest productivity.

Night-time beach patrols to intercept nesting turtles for tagging are performed as time permits, but are not a priority activity. Turtles are carefully approached and only tagged and measured while laying eggs. If untagged, Inconel or monel tags are applied on both front flippers through the first (ventral) trailing-edge scute. Measurements taken include over-the-curve carapace length and width. Any unusual characteristics of a turtle, such as a missing flipper, are noted.

For the monitoring period from 13 July to 20 December 2022, we counted a total of 1189 hawksbill nests, plus 878 "false crawls". During the same time period, 67 green turtle nests and 28 "false crawls" were recorded on Mona Island. The index survey of hawksbill nests laid in the most accessible beaches during September and October reached 403 nests and 338 "false crawls", with the caveat that these numbers represent an underestimate, due to the evacuation of survey personnel for hurricane Fiona.

Surveys of the Mona Island beaches were severely impacted by the passage of hurricane Fiona directly over the island on September 18, 2022 (figure 3). Survey personnel were evacuated on September 16th and could not return until October 11th, resulting in a significant loss of nest count data during the traditional peak of the hawksbill nesting season.

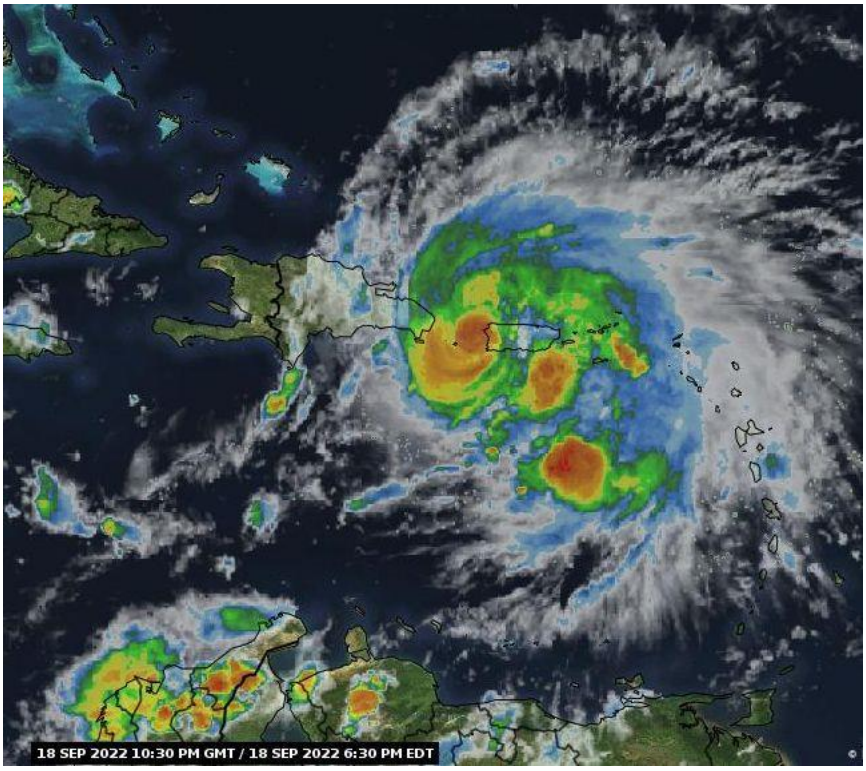

Figure 3. Hurricane Fiona over Mona Island on September 18, 2022.

The trend in nesting numbers of hawksbills appears to be on a rebound after a decline that started with the record number of nests recorded on Mona Island in 2014 (figure 4).Overall population size is stable or growing for these long-lived animals, especially as compared to the results from surveys conducted in the early 1990's and before (figure 4).

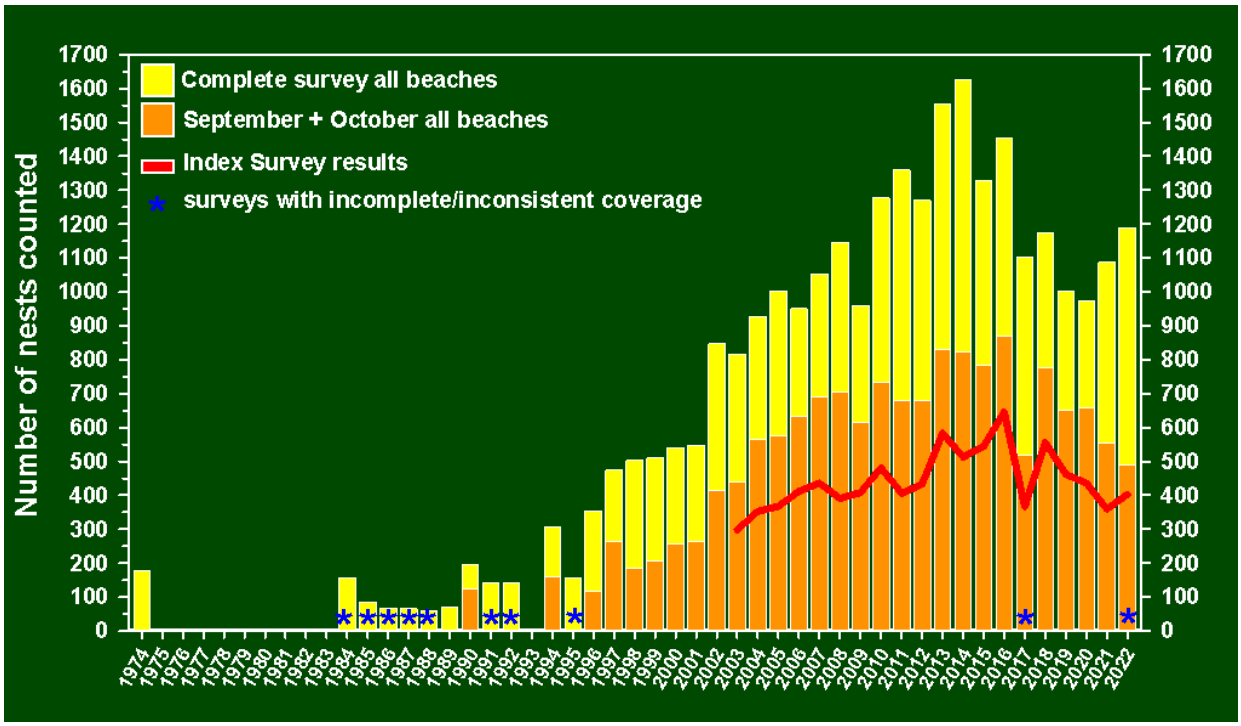

Figure 4. Trend in the number of hawksbill turtle nests encountered on Mona Island during surveys conducted from 1974 to 2022).

Figure 5 illustrates the proportion of nests laid on the nesting beaches of Mona Island and the resulting nest densities (nests per linear km of beach). The small "pocket" beaches from U-1 to U-8 continue to see the highest relative level of use by nesting hawksbills and may achieve the highest hawksbill nest density observed in the Caribbean for the species.

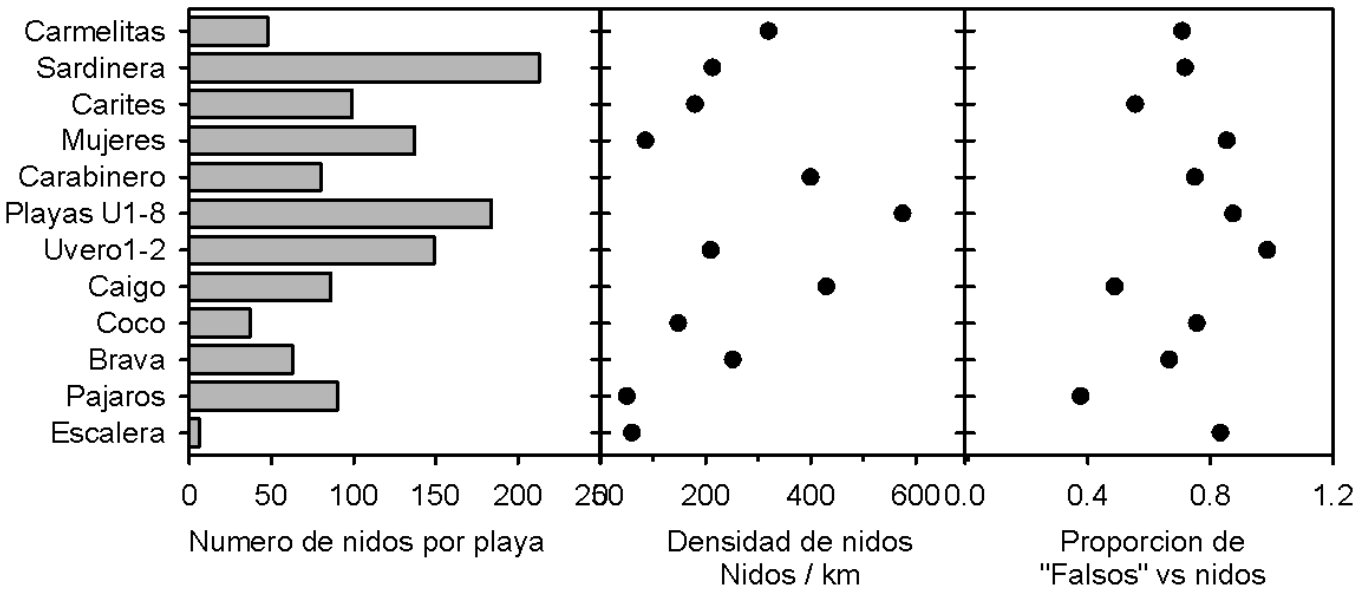

Figure 5. Hawksbill nesting activity at Mona Island by beach, beach group, or beach sections, with the resulting nesting density and crawl success ratio.

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In addition to the nests recorded laid during the regular survey periods, we also find hatched nests that are not flagged and evidently had been laid before surveys started. Hawksbills are nesting on Mona to some extent year-round and on account of the unflagged nests encountered and occasional visits to the beaches outside of the regular surveys, we estimate the total number of hawksbill nests is estimated for 2022 to be 20% higher than those observed directly. This includes loss-of-data due to the evacuation of survey personnel for hurricane Fiona.

The overall average measured hawksbill nest size is 143 eggs and overall average nest productivity was around 81%. The nest fate study (nests marked for monitoring from the time of laying through hatching), indicated that nests that were lost or were unproductive in their entirety is estimated at 9.6%. Most such nest loss is due to washout caused by wave action from passing storms eroding the beach (see example, figure 6). Some nest destruction is occurring due the high density of nesting activity on some beaches, leading to turtles digging up existing nests, particularly the digging activities of green turtles.

Figure 6. Hawksbill nest washed out by wave action from a passing storm. This is currently the leading cause of nest loss on Mona Island.

Feral pigs have historically caused major losses of turtle nests on Mona Island, however the pig exclusion fencing erected around 1989 and enhanced in following years have limited their impact, although some pigs do inhabit or are able to visit the protected area. During the report period, no incidentes of potential turtle nest predation by feral pigs was observed. However, pigs continue to enter

the fenced area, principally through the airport entrance, and it is essential that they are removed on an ongoing basis. This strategy has been successful so far, but requires continued vigilance and the ability to react quickly to any nest predation occurrences.

Twenty-five individual adult female hawksbills were encountered and tagged mostly at night on the nesting beaches. All turtles had been tagged previously by our teams on or around Mona Island, one as early as the year 2000. No adult turtles originally tagged by us on the Mona nesting beaches were reported as seen elsewhere for the study period.