

An Assessment of Leatherback Sea Turtle Population Trends at Matura Beach, Trinidad (2006 - 2017)



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Introduction

The southern Caribbean island of Trinidad supports nesting by one of the largest colonies of leatherback sea turtles (*Dermochelys coriacea*) in the Western Atlantic Ocean (Dow et al. 2007), as well as globally (TEWG 2007). A preliminary analysis of leatherback population size and status for Trinidad (Eckert 2013) concluded that the island's nesting population increased throughout the 1990's at an estimated 5% per year. That upward trend reversed in 2006, however, and thereafter indicated "a rapid and continuous decline" (Eckert 2013). The impetus behind the decline is unknown, but given that professionally trained community-based conservation groups have been successfully safe-guarding gravid females since the 1990's, fisheries interactions in nearshore waters (estimated to exceed 1,000 gravid females per year, summarized in Eckert and Eckert 2015), may have played a significant role.

Following decades of calls for full protection to sea turtles nation-wide (summarized in Forestry Division et al. 2010), Minister Moonilal announced a total ban on the hunting of sea turtles in Trinidad and Tobago in 2011. Now, in light of a proposal by the U.S. National Marine Fisheries Service "to identify the Northwest Atlantic subpopulation of the leatherback turtle as a Distinct Population Segment (DPS) and list it as Threatened [vs the current listing of Endangered] under the U.S. Endangered Species Act", we are concerned that lowering the protection of this species on its foraging grounds will have negative consequences for conservation efforts in Trinidad.

With this in mind, the objective of this report is to update Eckert (2013) and extend the nesting trend analysis through 2017.

Location

Trinidad is located in the southern Caribbean Sea (Figure 1), and is the larger island in the federated state of Trinidad and Tobago. The island provides nesting habitat for one of the largest breeding populations of leatherback turtles in the world, and, along with the Guianas complex, is the most significant source of recruitment into the Northwest Atlantic Regional Management Unit (cf. Wallace et al. 2010, see Figure 2).



Figure 1. Trinidad and Tobago is located at the southern terminus of the Eastern Caribbean archipelago, at latitude 10°2' to 11°12' N and 60°30' to 61°56' W. Source: <https://www.google.com/maps>

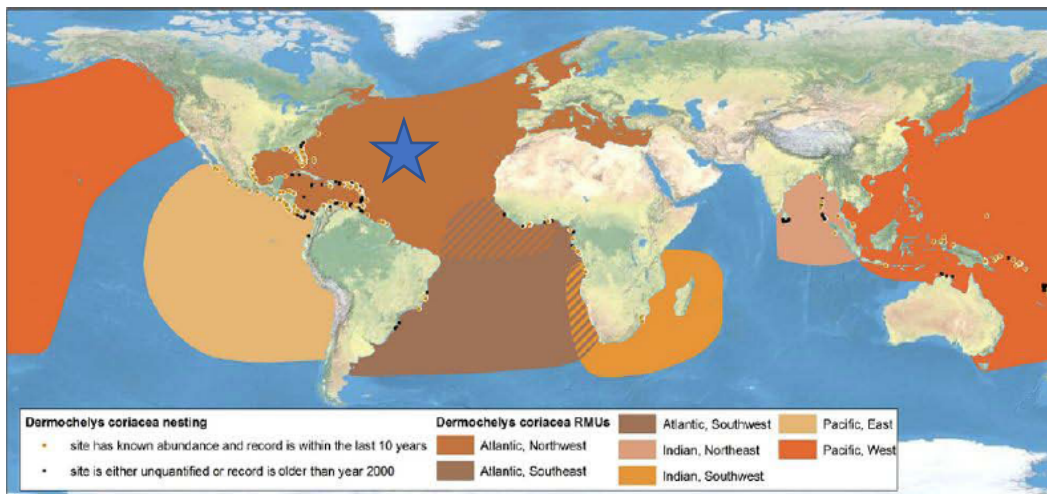


Figure 2. Geographic boundaries of Regional Management Units (RMU) for sea turtles, including the Northwest Atlantic RMU (denoted by the blue star) embracing the Wider Caribbean Region north to Newfoundland and east as far north as the Barents Sea. Source: Wallace et al. 2010

Methods

Trinidad supports two nesting concentrations of leatherback turtles: Grande Riviere (north coast: “TT12” in Dow et al. 2007, see Figure 3) and Matura, including Fishing Pond (east coast: “TT19” and “TT20” in Dow et al. 2007, see Figure 3).

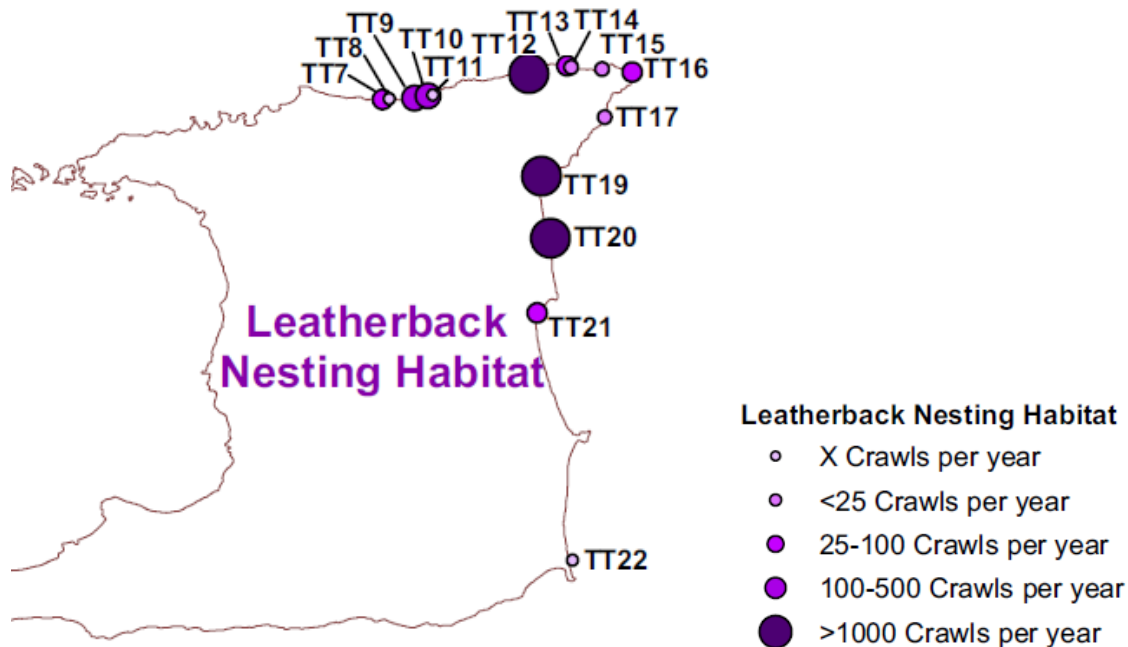


Figure 3. Nesting activity by leatherback sea turtles in Trinidad, West Indies, showing the location of the island’s most significant nesting grounds. Source: Dow et al. (2007)

For the purposes of beach patrol and record-keeping, nesting near the east coast community of Matura is comprised of three primary areas; namely (north to south), Rincon section, Orosco section (together indicated as “TT19”, Dow et al. 2007), and Fishing Pond (“TT20”, Dow et al. 2007) (Figure 3). Rincon and Orosco are divided by the Matura River. Orosco and Fishing Pond are divided by the Oropuche River. Nesting turtles move freely among these three areas and are considered a single nesting colony. In contrast, there is little inter-nesting movement between these beaches and Grande Riviere (“TT12”) on the north coast. Matura and Grande Riviere each support approximately half of all leatherback turtle nesting in Trinidad, with smaller colonies contributing <5% of nesting activity (Eckert 2013).

For this assessment, all nesting data collected between 2006 and 2017 are included. Data consist of body pit locations recorded during morning foot surveys of the Rincon and Orosco sections (8.3 km) of Matura Beach. Fishing Pond (3.9 km) has not been consistently surveyed since 2013 and data from this nesting area are excluded; however, data prior to 2013, as well as irregular surveys since that time, provide sufficient information to confirm that nesting trends documented at Rincon and Orosco do not differ significantly from that of the Fishing Pond section of the colony. Grande Riviere data will be analyzed under separate cover.

Body pits are used as a proxy for nesting because research at Matura confirms that 97% of all body pits result in successful egg deposition (Eckert 2013) and body pits remain visible for days to weeks after the nesting event. Each morning after sunrise, trained foot patrollers walk the length of Rincon and Orosco and record the location of each body pit using a Garmin Etrex GPS receiver. Only body pits fresh from the previous night are counted. Accuracy of the locations is to +/- 3 m. Locations of body pits are downloaded from each GPS, imported into a GIS program (MapInfo), and aberrant locations (representing accidentally logged waypoints on the GPS receiver) removed. Locations are then imported into an Excel spreadsheet for analysis.

Starting in 2006, standardized morning body pit counts began in the Orosco section. The same methodology commenced in the Rincon section in 2009. Standardized annual survey methodology called for these daily surveys to commence on 1 March and continue to 31 August (183 days) each year, but logistical obstacles or delays in funding meant that surveys often began later than 1 March and/or ended before August 31. Moreover, financial shortfalls in some years led to the census occurring on alternate days (vs daily). As a result, data were collected for a total of 119 to 183 days each year.

During the first three years (2006-2008), censuses were only conducted on the Orosco section of Matura Beach. To facilitate the comparison of annual body pit tallies, we determined the average proportion of total body pits deposited in Orosco each year between 2009 and 2017

(avg=65.6%, std=3.6%), and then used that proportional value to estimate the total number of body pits deposited in Rincon during the years (2006-2008) that Rincon was not patrolled.

To fill in for missed days at the start and end of the season, we averaged the total number of body pits laid each day across years during which both Rincon and Orosco were patrolled (i.e., 2008-2017) and we used those averages to fill in missed days at the beginning of the season if patrolling began later than 1 March that year, and/or to fill in missed days at the end of the season if patrolling ended prior to 31 August that year. Because the tail ends of the season receive a relatively few number of body pits, the addition of body pits according to the method just described resulted in relatively minor changes (avg=3.7%, range 0-12.7%) to the annual tallies.

Finally, for years in which the survey was conducted every other day, patrollers were instructed to record the location of body pits that were up to two days old. In field tests we found that an experienced patroller could consistently distinguish between body pits that were one, two and three days old, thus assuring us that morning counts conducted on alternating days did not compromise the final tally.

Results

Leatherback turtle nesting in Trinidad is largely confined to the north and eastern coasts (Figure 3), concentrated in roughly equal numbers at Grande Riviere (north coast) and Matura (east coast).

Starting in 2006, standardized morning body pit counts began on the Rincon and Orosco sections of Matura and were recorded daily for a total of 119 to 183 days each year. These data were then standardized to 183 days using methods described in the previous section. The resulting annual body pit counts for Matura Beach (Rincon and Orosco sections) range from 4,790 to 19,109 (Table 1) and describe a population declining at 4.7% annually (Figure 4).

Table 1 - Start and end dates, number of survey days, and estimated total number of leatherback turtle body pits created on Matura Beach, Trinidad, between 2006 and 2017.

Year	Start Date	End Date	# Patrol Days	Estimated Total Number of Body Pits
2006	4/6/06	8/1/06	119	7237
2007	3/1/07	8/31/07	183	19109
2008	3/3/08	7/8/08	127	8933
2009	3/18/09	8/12/09	147	5008
2010	4/9/10	8/17/10	130	10729
2011	3/4/11	8/23/11	172	7838
2012	3/28/12	8/31/12	156	4766
2013	3/12/13	8/22/13	163	4932
2014	3/7/14	8/29/14	175	11462
2015	3/4/15	8/31/15	180	7273
2016	3/1/16	8/27/16	179	9908
2017	3/1/17	8/31/17	183	5805
<i>Average</i>			159.5	8583.31
<i>Standard deviation</i>			22.45	3851.94

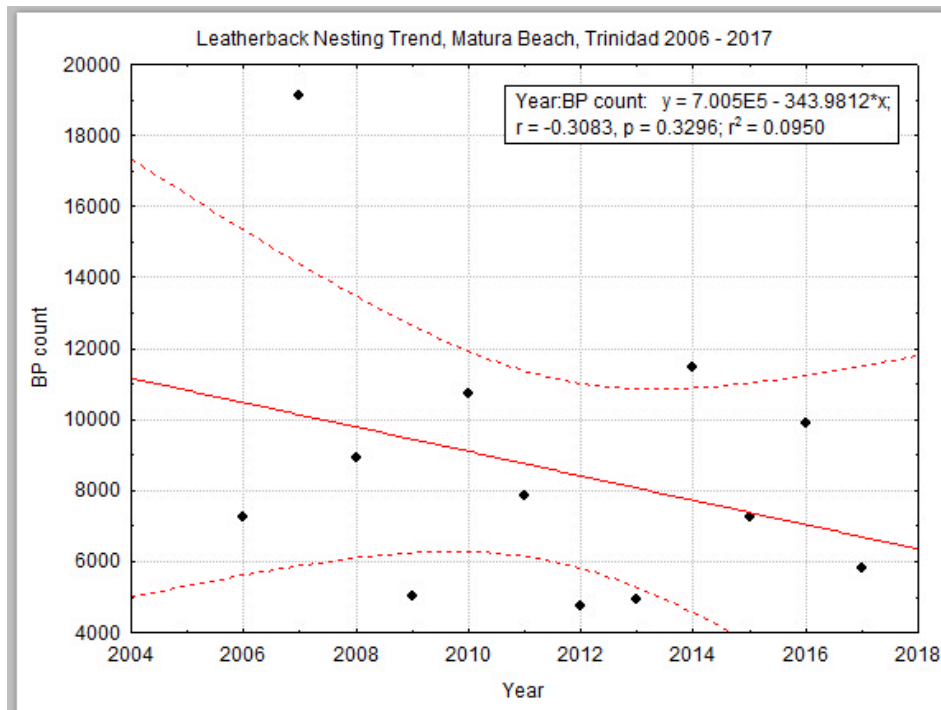


Figure 4 – Total number of leatherback sea turtle body pits each year created on the Rincon and Orosco sections of Matura Beach between 2006 and 2017. 2007 reflects an unusually strong nesting presence Caribbean-wide that year (WIDECAST, unpubl. data). The solid red-line represents a linear regression while the curved red lines are the 95% CI.

Discussion

Trinidad supports nesting by one of the largest colonies of leatherback turtles in the world (TEWG 2007). Dow et al. (2007) mapped all known nesting beaches in the Wider Caribbean Region, including Brazil: 470 sites in all. They reported only 10 colonies (2% of the total) with more than 1,000 crawls (successful and unsuccessful nesting emergences combined, the equivalent of perhaps 100 individual turtles) per year, mostly clustered in the southern latitudes (Trinidad, Suriname, French Guiana, Panama) and four additional sites (Guyana, Suriname, Costa Rica, USVI) with 500-1,000 crawls per year. Dow et al. (2007) reported that 58% of all known nesting beaches supported very small colonies (<25 crawls per year). With this in mind, recruitment out of Trinidad into the North Atlantic Regional Management Unit (cf. Wallace et al. 2010) is critical to the survival of this species in the Atlantic Ocean.

A census of leatherback turtle nesting activities between 2006 and 2017 for the Rincon and Orosco sections of Matura Beach, Trinidad, recorded an annual tally of 4,709 to 19,109 “body pits” (the first stage of a successful sea turtle nesting sequence). The average number of body pits tallied each year was 8,583, 97% of which, on average, result in successful egg-laying (Eckert 2013). An evaluation of the trend presented by these data shows that the index population nesting at Matura Beach is declining by 4.7% annually.

The “outlier” data point in 2007, when nesting was nearly double the annual average, is retained for this analysis. This is not an aberrant data point. Similarly high nesting abundance was recorded elsewhere in the insular Caribbean that year; e.g., Sandy Point National Wildlife Refuge, St. Croix (Garner et al. 2017); Dominica, where “confirmed nests recorded in 2007 represent a more than 6-fold increase over the number of confirmed nests recorded in 2006, the nesting season in which the most nests were previously recorded” (Stapleton and Eckert 2007); and Levera National Park, Grenada (Ocean Spirits, unpubl. data¹).

¹ <http://www.oceanspirits.org/research-and-monitoring/>

This updated assessment of the nesting trend data for Matura reinforces the conclusions of Eckert (2013) that this population, while presenting the “normal” pattern of fluctuation common to sea turtle nesting data, has been in a steady decline for more than a decade. It is unfortunate that we have no comparable nesting data prior to 2006. As reported by Eckert (2013) and others (Girondot et al. 2007, Garner et al. 2017), nesting by the Northwest Atlantic Regional population of leatherbacks increased during the 1990’s but stagnated in the early 2000’s. Whether the population at Matura was larger prior to 2006 would be of significant aid in developing a true picture of the vitality of this population over generational time scales (leatherbacks mature at 24.5-29 years of age, see Avens et al. 2009).

Because leatherbacks are highly migratory at all life stages, the species’ home range, which includes nesting (Dow et al. 2007) and foraging (e.g., Eckert 2006) grounds, as well as the migration corridors that connect them, is coincident with the entirety of the Northwest Atlantic Regional Management Unit (cf. Wallace et al. 2010). Threats operating in any one area of the RMU affect the stability of the population throughout its range, meaning that the survival of “Trinidad’s leatherbacks” is continually at risk from regional (e.g., bycatch) and global (e.g., climate change) threat factors, as well as local- and national-scale mortality due to fisheries interactions, poaching, coastal development, etc.

As nesting trends are currently the primary tool used for monitoring sea turtle population status, continued vigilance and commitment to the conservation and management of these animals (including the use of standardized nesting beach data collection combined with analysis of the linkages between nest abundance and population size) is a priority for Government and civil society in Trinidad.

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