SAVE OUR SEA TURTLES

Summary of Sea Turtle Nesting Activity 2014

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Front cover photo: Leatherback turtle (*Dermochelys coriacea*) ©Giancarlo Lalsingh

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For bibliography purposes, this document may be cited as:
Save Our Sea Turtles. 2015. Summary of Sea Turtle Nesting Activity 2014. M. Cazabon-Mannette. T. Clovis-Howie and G. Lalsingh (Editors). 49pp.

Summary of Sea Turtle Nesting Activity 2014

June 2015

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ACKNOWLEDGEMENTS

This report would not have been possible without the data collection efforts, guidance and dedication of SOS volunteers, partner organisations, Governmental agencies and personnel, communities, researchers, and private citizens throughout Trinidad and Tobago, the Wider Caribbean and beyond. SOS Tobago deeply appreciates and acknowledges their assistance, contributions and guidance.

- The Government of the Republic of Trinidad and Tobago (GORTT)
- The Tobago House of Assembly (THA) – Division of Agriculture, Marine Affairs, Marketing & the Environment; Division of Tourism & Marketing.
- Atlantic LNG Company of Trinidad and Tobago.
- BHP Billiton.
- Mr. Linford Beckles, Director, THA Dept. of Natural Resources and the Environment (DNRE).
- Ms. Angela Ramsey, Wildlife Unit, THA, DNRE.
- The Turtle Village Trust (TVT) and partner communities in Trinidad & Tobago.
- The Environmental Management Authority (EMA).
- Dr. Karen Eckert, Wider Caribbean Sea Turtle Conservation Network (WIDECAST), USA.
- Prof. Julia Horrocks, Barbados Sea Turtle Project/ WIDECAST Regional Tagging Centre, University of the West Indies, Cave Hill (Barbados).
- Michelle Cazabon-Mannette, The University of the West Indies, St. Augustine (Trinidad).
- Ryan Mannette.
- Chris Gleed-Owen, CGO Ecology, UK.
- Amphibian and Reptile Conservation Trust, UK.
- Amphibian and Reptile Groups, UK.
- Beth Allgood, International Fund for Animal Welfare
- Marianne S. Hosein.
- Mrs. Tanya Clovis-Howie, President, SOS Tobago and Mr. Skene Howie.
- Giancarlo Lalsingh, Programme Manager, SOS Tobago.
- SOS patrollers and volunteers, Anson Alfred, Derick Balfour, Jezrine Bovell, Daniel Brimacombe, Ghino Callender, Julie Sochan, Niamh Vaughan, and Kiel Williams.

We also wish to express our sincere thanks and gratitude to:

- Brand-It Limited.
- CEPEP – Mt. Irvine Back Bay, Grafton Beach and Turtle Beach.
- Communities and Fisherfolk of Black Rock, Pleasant Prospect and Plymouth.
- Discover Trinidad and Tobago – MEP Publishers.
- The Fishpot Restaurant.
- The Kariwak Village Hotel.
- The Magdalena Grand Beach Resort.
- North East Sea Turtles (NEST).
- Performance Distributors Limited.
- Pigeon Point Heritage Park.
- Plantation Beach Villas and Watersports.
- REX Resorts Turtle Beach Hotel.
- Shore Things Craft and Café.

- Tobago Tour Guide Association and its members.
- Tobago Chocolate Delights.
- TTSPCA Tobago Branch.

Anyone who has in any way contributed their time, experience and resources to sea turtle conservation in Trinidad and Tobago, and the wider Caribbean. **THANK YOU.**

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SUMMARY

Save Our Sea Turtles (SOS) has conducted regular community beach patrols since 2000 and a monitoring programme since 2005 in the Courland Bay area on the Caribbean coast of the island Tobago through the sanction and approval of the Tobago House of Assembly (THA) Department of Natural Resources and the Environment (DNRE). In 2014 nightly patrols were conducted from the 1st March to the 30th September, on three key index beaches in the Courland Bay area (known as the most important leatherback nesting beaches on the island) and at Lambeau (Magdalena Grand) beach (a beach on the Atlantic coast known for hawksbill nesting activity) from 1st May to the 30th November. Nesting turtles were tagged and data on nesting and hatching turtles were collected by SOS volunteers using standard data sheets.

A total of 558 nesting events were recorded in 2014 at Courland Bay and Lambeau (Magdalena Grand) within the survey period in 2014, including 375 leatherback nests and 74 hawksbill nests constructed. The bulk of leatherback nesting activity was recorded at Turtle Beach, concentrated in Zones 2 and 3, while the bulk of hawksbill activity was recorded at Lambeau (Magdalena Grand). 87 return leatherbacks, (tagged during a previous nesting season and/or at another beach not monitored by SOS Tobago) were detected, and 55 new individuals were tagged in 2014.

A greater proportion of hatching events were captured for hawksbills (89%) than for leatherbacks (24%). 152 nests were excavated. Hawksbills (n=66) laid an average 153 ± 30 yolked eggs, at a mean depth of 49 ± 5cm. Leatherbacks (n=86) laid an average 80 ± 18 yolked eggs, at a mean depth of 81 ± 9cm. Mean percent hatching success among excavated nests was higher for hawksbills (88%) than leatherbacks (61%), as expected. The recorded hatch success for leatherbacks in Tobago in 2014 is comparable to the in situ hatch success generally reported for the species: 45–65% (Eckert et al. 2012). 85% of excavated hawksbill clutches (56) and 100% of excavated leatherback clutches (86) were found to have signs of bacterial infestation. The proportion of eggs with bacteria ranged from 0 – 60% per clutch (mean 16 ± 13%). Leatherback nests had a higher incidence of infestation (22% ± 10%) than hawksbill nests (7% ± 12%).

Beachfront lighting caused the disorientation of nesting turtles (9%) and hatchlings (14% of nests), at Turtle Beach, Grafton and Lambeau (Magdalena Grand. The highest incidence of light disturbance and disorientation was recorded at Grafton Beach among both nesting turtles (20%) and hatchlings (36%).

5,113 persons were recorded visiting nesting beaches for the purpose of watching turtles nest and an additional 1,574 persons were recorded in 2014 watching turtle hatching events. Non-resident visitors made up 66% of all persons watching turtle nesting, representing an estimated value ranging from USD 84,150.00 – USD 134,640.00 (TTD 532,670.00 – TTD 852,271.00) based on typical tour fees that range from USD 25.00 - USD 40.00 per person.

The greatest challenges to conservation of the nesting population at the monitored beaches continue to be poorly managed beachfront lighting and large public events. While the harvest of sea turtles is now illegal in Trinidad and Tobago, and only a single unsuccessful hawksbill poaching attempt was recorded at the monitored beaches in 2014, poaching at nesting beaches and at sea also continues to be a major threat to conservation.

Effectively ensuring the conservation of sea turtles, their coastal and marine habitat is certainly within our reach with SOS' community based efforts and the collaboration of Governmental agencies, the private sector and the general public.

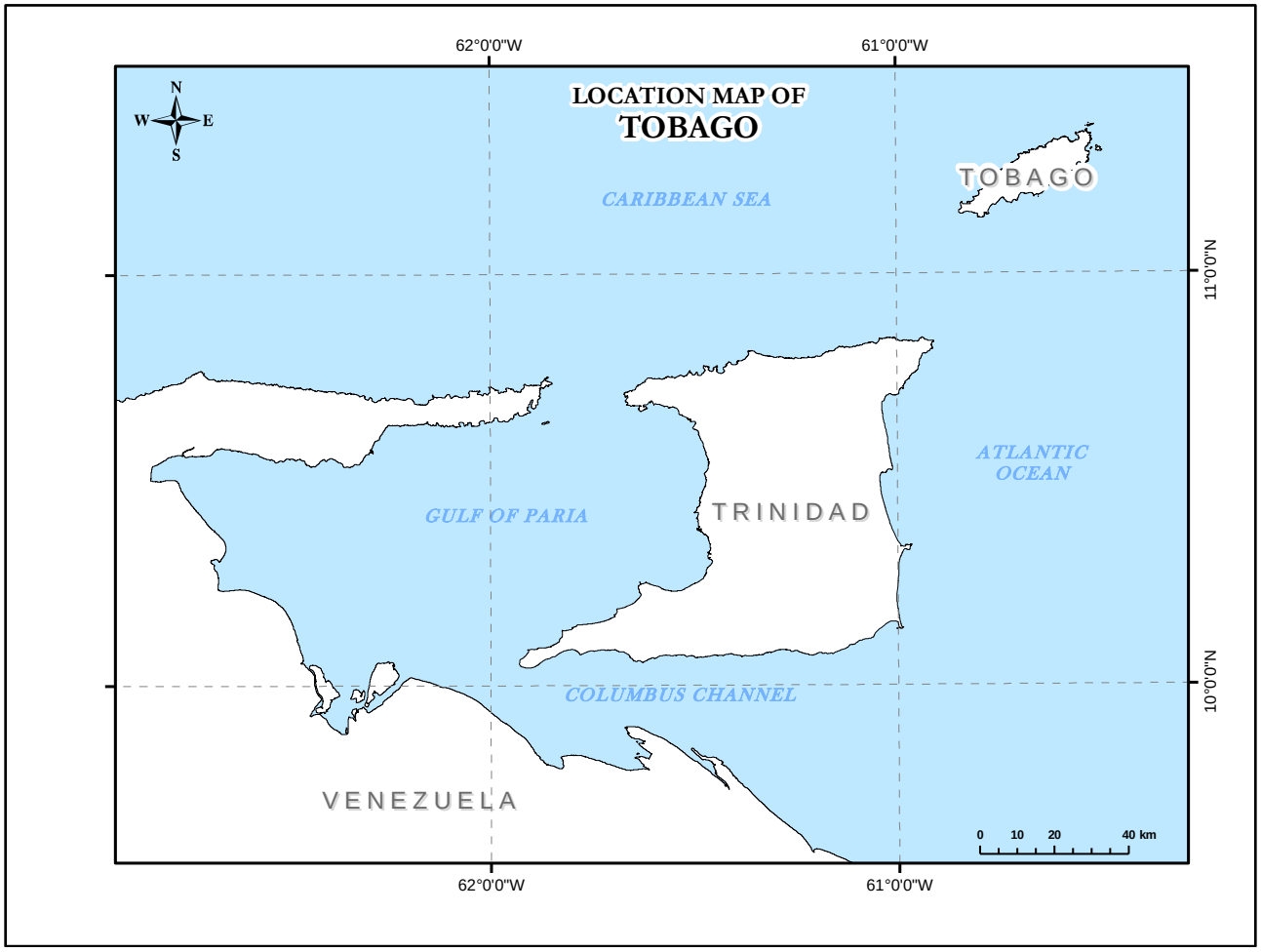
INTRODUCTION

TOBAGO

Tobago is the smaller (300 km²) of the two main islands that make up the Republic of Trinidad and Tobago (T&T). It is located in the southern Caribbean Sea (approximately 11° N, 60° W), approximately 30 km northeast of the larger island of Trinidad (4830 km^2) and southeast of Grenada (**Figure 1**).

Both islands are continental shelf rather than oceanic islands and have a diverse Neotropical fauna.

Figure 1: Map of Tobago



SEA TURTLES OF TOBAGO

The sea turtle fauna of T&T is one of the most diverse in the Caribbean. Five species, the leatherback (*Dermochelys coriacea)*; hawksbill (*Eretmochelys imbricata)*; green (*Chelonia mydas*); loggerhead (*Caretta caretta);* and olive ridley (*Lepidochelys olivacea*) have been recorded nesting on the twin islands' beaches and foraging in their coastal waters.

The leatherback turtle is the most numerous sea turtle species nesting in T&T. Nesting by the hawksbill turtle places a distant second, and, in order of abundance, nesting by green turtles, olive ridley and loggerhead ranges from occasional to rare (Dow et al 2007).

Leatherbacks are largely seasonal visitors, returning to our shores as sexually mature adults to breed and nest. In addition to seasonal nesting activity, hawksbill and green turtles of all sizes have been documented in seagrass and hardbottom habitat (including coral reefs) of Tobago year round (Cazabon-Mannette Unpubl. data and Cazabon-Mannette 2010), and are expected to reside in similar habitats in Trinidad.

Studies of mitochondrial DNA at rookeries provide strong evidence that female hawksbill, green and leatherback turtles return to their natal (birth) beach to nest (Meylan et al 1990; Bass et al 1996; Dutton et al 1999). Additionally, studies of mitochondrial DNA at foraging grounds have shown that members of hawksbill and green nesting populations overlap in regional feeding areas (Bowen et al. 1996; Diaz-Fernandez et al. 1999; Bowen et al. 2007; Browne, Horrocks, and Abreu-Grobois 2010; Lahanas et al. 1998; Velez-Zuazo et al. 2008; Luke et al. 2004; Bass and Witzell 2000 among others). Therefore, the foraging aggregations of greens and hawksbills that reside in the waters of T&T year round, are similarly expected to be distinct from the population of nesting females that visit our waters seasonally to breed, and be drawn from nesting beaches widely scattered across the region. Conversely, turtles that nest in T&T are seasonal visitors to our shores, and are expected to come from widely scattered foraging grounds, outside the territorial boundaries of the country. A recent study by Cazabon-Mannette (Unpubl. data) confirms this to be the case for hawksbill turtles in Tobago.

The Leatherback Turtle (*Dermochelys coriacea*)
IUCN Red List Status: Vulnerable
Global Population Trend: Decreasing

The IUCN Red List of Threatened Species is the most widely accepted method for assessing species status on a global scale (Eckert et al. 2012).

While the 2013 IUCN Red List Status assessment result of "Vulnerable" demonstrates that leatherbacks will not go extinct globally in the next generation, and represents an improvement from the previous assessment of "Critically Endangered" (Sarti Martinez 2000), the authors caution that "the global listing is not an appropriate representation of the conservation status of the biologically relevant subpopulations that make up the global leatherback population" (Wallace, Tiwari and Girondot 2013).

Wallace, Tiwari and Girondot (2013), report that currently, the Northwest Atlantic subpopulation—i.e. from Florida, USA throughout the Wider Caribbean (including T&T)—is large and increasing, while the Southeast Atlantic subpopulation—i.e. West Africa, especially Gabon—is the largest in the world. The significant declines of the East Pacific subpopulation (i.e., which nests along the Pacific coast of the Americas) and, to a slightly lesser extent, the West Pacific subpopulation (i.e., Malaysia, Indonesia, Papua New Guinea, Solomon Islands) over three generations were the main driver of the global decline result. Both of these subpopulations are

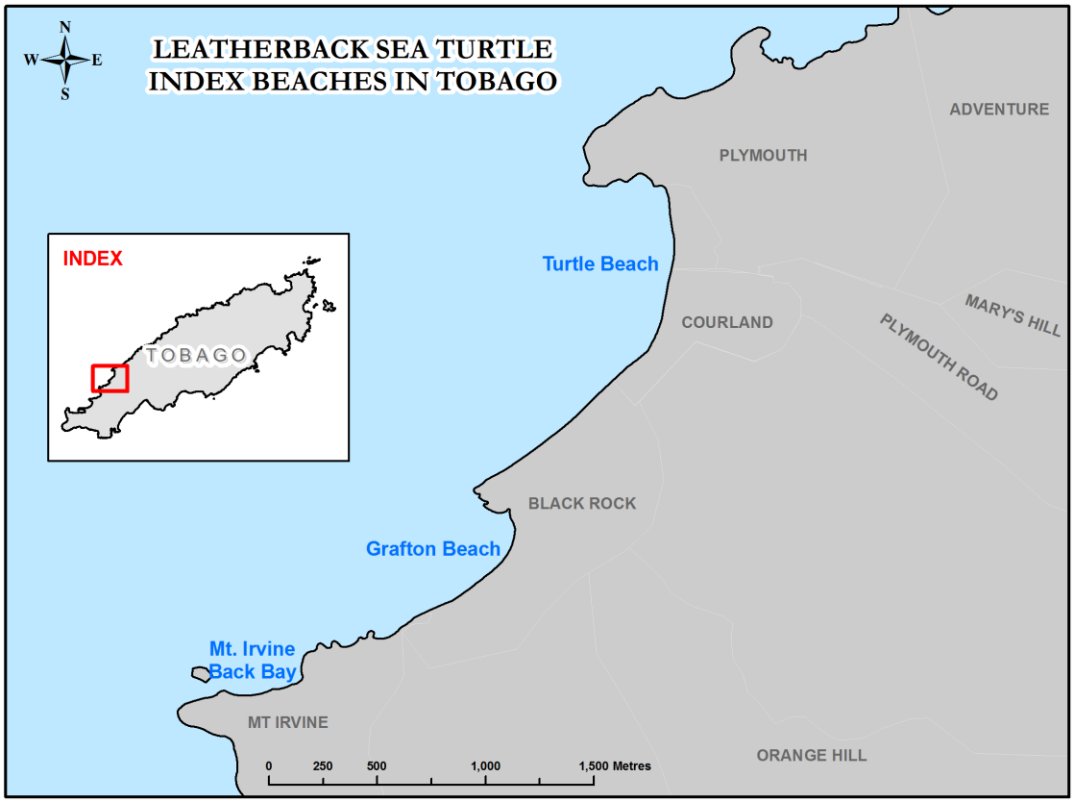
projected to decline further in coming decades. "The variation in conservation status among subpopulations warrants preference for subpopulation assessments over the global assessment when evaluating and describing the global conservation status of Leatherbacks" (Wallace, Tiwari and Girondot 2013).

Considering the precedent of the collapse of the historically large Pacific subpopulations, the authors go on to urge that "the persistence of significant threats in all regions warrants concern for the future viability of even the largest subpopulations." Further, "current efforts to protect Leatherbacks, their offspring, and their habitats must be maintained—or even augmented, where possible—to reverse declines in Pacific and Indian Ocean subpopulations and to sustain population growth in the Northwest Atlantic."

The leatherback population that nests on the east and northeast coasts of Trinidad, and on the smaller island of Tobago is one of the largest in the world. In the Atlantic, the largest leatherback colonies are located in French Guiana-Suriname, Gabon, and Trinidad (Eckert 2013). From current available data this species accounts for the majority of all known sea turtle nesting activity in T&T. Adult females nest in T&T largely between March and August each year (Forestry Division et al 2010; Eckert et al 2012).

The most important nesting sites in Trinidad are Matura Bay, Fishing Pond and Grande Riviere on the north and east coasts (Forestry Division et al 2010). In Tobago the most important nesting beaches are those located on the Caribbean coast at Turtle Beach, Grafton Beach and Mt. Irvine Back Bay (**Figure 2**). Low density nesting also occurs on other beaches and has been reported from both the Caribbean and Atlantic coasts (Forestry Division et al 2010).

Figure 2: Leatherback Sea Turtle Index Beaches in Tobago



Leatherbacks, like most other species of sea turtles, regularly migrate vast distances between foraging grounds and nesting beaches. Satellite tagging of leatherback turtles nesting in T&T shows that they migrate throughout the tropical and sub-tropical Atlantic (Eckert 2006) before returning to nesting beaches at remigration intervals of 2-5+ years (Forestry Division et al. 2010).
Leatherbacks show less breeding philopatry or site fidelity to nesting beaches than other sea turtles and sometimes use several beaches within a region to nest (Law et al. 2009). It is not uncommon to encounter turtles previously tagged at nesting beaches located on other Caribbean islands and the South American mainland nesting at index beaches in Tobago. Some of these locations include:

- Cipara Beach, Querepare Beach and Margarita Island, Venezuela.
- Levera Beach, Grenada.
- La Plaine Beach, Dominica W.I.
- Index beaches at Fishing Pond, Grande Riviere and Matura Beach, Trinidad.

Figure 3: Distribution of Multiple Nesting Sites used by Leatherback Turtles Recorded Nesting at Index Beaches in Tobago

© 2012 Google Earth

A complete synopsis on the biological data on the leatherback turtle, completed in 2012 is available online through the United States Fish and Wildlife Service (Eckert et al 2012).
http://digitalmedia.fws.gov/cdm/ref/collection/document/id/1519

The Hawksbill Turtle (*Eretmochelys imbricata*)
IUCN Red List Status: Critically Endangered
Global Population Trend: Decreasing

The hawksbill sea turtle has been one of the most persecuted of the world's sea turtles; hunted not only for its meat and eggs like other sea turtle species, it is further cursed by the beauty of its shell (SWOT Vol. III 2007-08). Historic and recent published and unpublished accounts indicate extensive subpopulation declines in all major ocean basins as a result of over-exploitation of adult females and eggs at nesting beaches, degradation of nesting habitats, take of juveniles and adults in foraging areas, incidental mortality relating to marine fisheries, and degradation of marine habitats (Mortimer and Donnelly 2008).

Hawksbill populations continue to decline in many parts of the world. The IUCN Red List Standards and Petitions Subcommittee in 2001 upheld the Critically Endangered listing of the hawksbill, based on ongoing and long-term global population declines in excess of 80% along with ongoing exploitation (Mortimer and Donnelly 2008). Unlike previous reviews of the status of the hawksbill, the present IUCN assessment is quantitative and provides a numerical basis for the global listing of the species as Critically Endangered (Mortimer and Donnelly 2008).

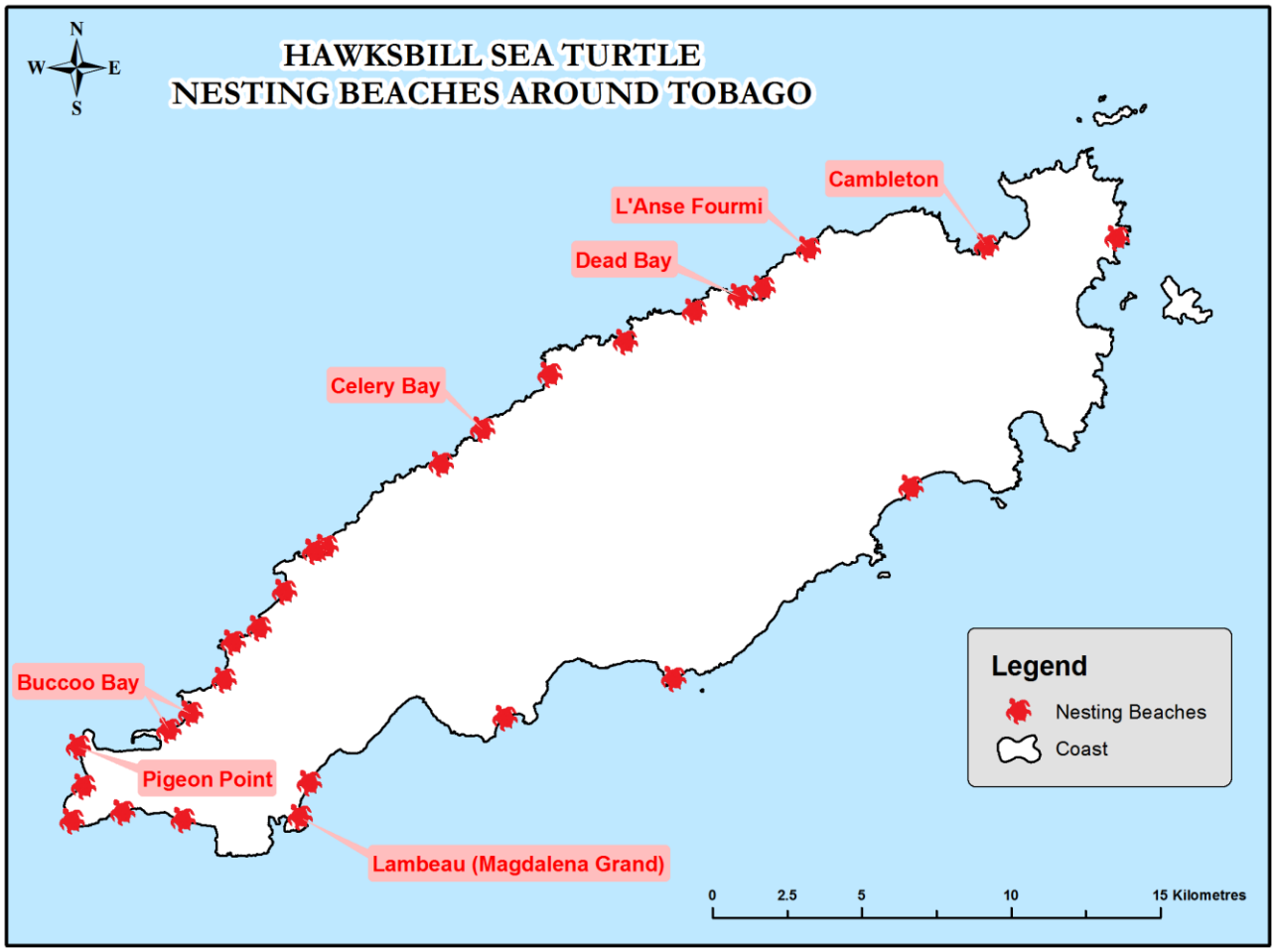
However, because much of the available data on global hawksbill populations come from protected sites, the actual rate of their decline is likely underestimated (SWOT Vol. III)

It is important to note that deficiencies in the surveillance of this species in Tobago do occur. Nesting sites for hawksbills (and other hard-shelled species of sea turtles) are often located on small inaccessible, isolated beaches, sometimes associated with shallow offshore reefs. This combination of factors makes monitoring of nesting by these species on a regular basis difficult. Surveys usually comprise track counts rather than actual encounters with turtles on nesting beaches. However, increased surveillance of additional nesting beaches is beginning to fill in the gaps in information.

Data collected in 2007 indicated that hawksbill nesting activity was primarily located in the northeast of Tobago (SOS Tobago. Unpubl. data). Greater surveillance of this species' nesting activity in subsequent years, has shown that the distribution of this species' nesting sites on the island of Tobago is geographically wider than previously known, with nesting activity taking place on numerous beaches scattered around the island (Figure 4**).** Most nesting sites were located along the Caribbean coastline.

Data collected in 2011 - 2012 shows that nesting sites in southwest Tobago are equally important nesting sites for hawksbill turtles; primarily those located at Buccoo Bay, Pigeon Point and Lambeau (Magdalena Grand), along with those located in the northeast such as Cambleton Bay, Celery Bay, Dead Bay, and L'Anse Fourmi. Monitoring and conservation initiatives at ALL these nesting sites will be vital to ensuring the long-term survival of the hawksbill turtle in Tobago.

Figure 4: Distribution of Hawksbill Sea Turtle Nesting Beaches Recorded in Tobago



The hawksbill turtle is a sponge-feeding specialist and it is expected that foraging hawksbills will be distributed throughout coral reefs and other hard bottom habitat in Trinidad and Tobago (STRAP 2010). Such habitat is abundant around Tobago, and the presence of hawksbills has been documented at dive sites throughout the island by Cazabon-Mannette (Unpubl. data and 2010). It is hypothesised that hawksbills provide important ecosystem services, in the form of limiting overgrowth of corals by sponges on reefs (Hill 1998).

The migratory patterns of the hawksbill turtles visiting T&T to forage and nest are less well known than the leatherback migratory patterns, but are currently being studied using mixed stock analysis (Cazabon-Mannette/UWI. Unpubl. data). Records from tagging studies indicate that hawksbills migrate from as far away as the Bahamas to nest on the island of Tobago (Bjorndal et al. 2008).

The Green Turtle (*Chelonia mydas*)
IUCN Red List Status: Endangered
Global Population Trend: Decreasing

Sometimes referred to as "The most valuable reptile in the world," green turtles are one of the most easily recognizable of all sea turtle.

SWOT Vol. VI states:

"Once viewed primarily as a resource to be exploited, green turtles are now the centerpiece of a global conservation movement. The more we have learned about the green turtle, the more our opinion of them and their value has changed, and continues to change today."

Historic and recent published accounts indicate extensive subpopulation declines of green turtles in all major ocean basins as a result of overexploitation of eggs and adult females at nesting beaches, and juveniles and adults in foraging areas for direct consumption. This use for consumption, above all else, has been the main factor in the green turtle's global decline. As a result, most nations now prohibit the practice (SWOT Vol. VI, 2010-11). Incidental mortality relating to marine fisheries and degradation of marine and nesting habitats have also contributed to the decline of this species, to a lesser extent.

Because many of the threats that have led to these declines are not reversible and have not yet ceased, it is evident that green turtles face a measurable risk of extinction (Seminoff 2004).

The extent to which green turtles historically nested in Tobago remains unclear. Reports of nesting today are anecdotal or sporadic at best and there is no current data available to support nesting in large numbers by this species on beaches throughout Tobago. The last known available report of green turtle nesting activity recorded by SOS was in 2007 on L'Anse Fourmi beach, where a single track was observed but not the actual animal. North East Sea Turtles (NEST) reported a nesting event in northeast Tobago in 2012 (Unpubl. data). While there are sporadic records of green turtle nesting, the lack of data available on this species' nesting activity collected over such a wide survey area would suggest that even if there still remains a small sub-population nesting in Tobago, it has declined to such low levels that their numbers may be too small to support a viable nesting population and may become locally extinct in the very near future.

Offshore studies of green turtles have documented juveniles and sub-adults foraging at coral reef and seagrass habitat year round (Cazabon-Mannette 2010 and Unpubl. data). As explained above, any green turtles nesting in Tobago represent a population of mature females distinct from those individuals found foraging around the island year round.

A comprehensive evaluation of green and other hard shelled species of sea turtles is needed to better ascertain their current status in T&T.

LEGAL STATUS OF SEA TURTLES IN TRINIDAD AND TOBAGO

In T&T sea turtles are currently legally protected under the Conservation of Wildlife Act (Chapter 67:01) 1963; the Protection of Turtle and Turtle Eggs Regulations (2011) of the Fisheries Act (Chapter 67:51); and most recently, the Environmentally Sensitive Species (ESS) Rules (2001) of the Environmental Management Act (Chapter 35:05) (Legal Notices Nos. 88, 89, 90, 91, 92 of 2014).

Prior to 1952 no national legislation regulated the harvest of sea turtles in T&T. With the implementation of the "Protection of Turtle and Turtle Eggs Regulations" in 1952 (under the Fisheries Act), persons were allowed to legally hunt all species of sea turtles (males, females, eggs, on land or at sea) from 1st October – 31st May annually (Bacon 1973).

In 1975 these regulations were amended to limit the length of the season (October – February). The amendment also stipulated that females may not be captured within any reef or within 1000 yards from the high water mark where there is no reef. Collection of eggs for consumption and sale were explicitly prohibited at all times of the year. However, these restrictions could not be imposed in practice due to the impossibility of identifying the sex of immature turtles externally, the difficulty of determining/verifying where a turtle was captured, and insufficient enforcement capacity (Gaskin 1998; Eckert and Herron 1998; Bräutigam and Eckert 2006; Burke et al 2008). The amended regulations also did not place any limits on the size or numbers of turtles caught, nor was there any census taken on the number of turtles caught annually (Bräutigam and Eckert 2006).

Between 1963 and 2011 turtles had an ambiguous legal status in T&T, being implicitly protected under the Conservation of Wildlife Act (at least on land), but subject to a legal fishery under the Fisheries Act, "Protection of Turtle and Turtle Eggs Regulations" (1952 and 1975).

After years of consistent lobbying by local and international conservation groups, this legal loophole was closed by a change to the Fisheries regulations in 2011 (Legal Notice No. 201 of 2011). The regulation now states: "No person shall, at any time, kill, harpoon, catch or otherwise take possession of any turtle, or purchase, sell, offer or expose for sale or cause to be sold or offered for sale any turtle or turtle meat" effectively implementing a year-round ban on hunting of ALL species of sea turtles, turtle eggs or associated products in Trinidad and Tobago. Anyone who contravenes the regulations is liable on summary conviction to a fine of only two thousand dollars and to imprisonment for six months under the Fisheries Act (1916). This is not an effective deterrent. It is also important to note that this amendment can be easily reversed through existing regulatory authority held by the line Minister responsible, as it is not a legally binding act passed by majority through the Houses of Parliament of Trinidad and Tobago.

The Environmental Management Authority of Trinidad and Tobago is responsible for co-ordinating Government policy in areas such as natural resource planning, identification of environmentally sensitive species and areas, and the development of the National Environmental Management Plan. There has recently been a renewed effort by the EMA working with various Government agencies and associated NGO and community stakeholders, to coordinate and implement the recommendations outlined in the STRAP. This includes, but is not limited to, the formation of a national sea turtle support network and designation of ALL sea turtles species that nest or inhabit the coastal waters of T&T as Environmentally Sensitive Species (ESS) under the ESS Rules (2001). The draft ESS notices for the five species of sea turtles were open for public comment in November 2013 and the legal notices (Nos. 88, 89, 90, 91, 92 of 2014) were signed on March 18th 2014. Under the EM Act, anyone who commits an act that adversely impacts on a designated "ESS" commits an offence and "is liable, on conviction on indictment, to a fine of one hundred thousand dollars and imprisonment for two years".

Despite this positive legislative step on the part of the GORTT and associated agencies, many restrictions with regard to enforcement of the laws of Trinidad and Tobago still remain. Without the active enforcement of new or existing legislation, sea turtles still continue to be harvested year-round, albeit illegally.

In addition to the legislation described above which directly protect sea turtles, there are two other relevant pieces of legislation. The three most important leatherback nesting beaches in Trinidad, a total of almost 20 km, have been declared as prohibited areas under the Forests (Prohibited Areas) Order (Forests Act Chapter 66:01).

A permit from the Wildlife Section is required to visit these beaches, and an accredited community tour guide must accompany permit holders. This legal protection together with a unique co-management system has been effective in reducing poaching at these beaches to essentially nil.

The Fisheries (Conservation of Marine Turtles) Regulations were implemented in 1997 and apply to all commercial shrimp trawlers that are registered or permitted to fish in T&T's territorial waters. The regulations require all trawl nets to be fitted with Turtle Excluder Devices (TEDs) to mitigate bycatch in this fishery.

There are currently no legislation or regulations that address the issue of beachfront lighting in Trinidad and Tobago and the issue is left either at the discretion of various private property holders and local or municipal corporations in charge of public lighting.

THREATS

Threats to various species and the specific actions necessary for the protection and recovery of sea turtles are described in the National Sea Turtle Recovery and Action Plan (STRAP) which was completed at the end of 2010 (Forestry Division et al. 2010).
http://www.widecast.org/Resources/Docs/STRAP_Trinidad_and_Tobago_2010.pdf

Exploitation

Direct exploitation has had a particularly significant impact on many turtle populations in the Caribbean. Turtles and their eggs have been exploited since time immemorial by virtually all Caribbean peoples (CITES). Turtle meat and eggs have provided a supplemental source of protein for subsistence fishing and coastal communities in the Caribbean (CITES). With the absence of nesting green turtles, the hawksbill has become the most targeted and caught species of sea turtle in Tobago on nesting beaches. The majority of these poaching incidents usually take place at night or in the early hours of the morning on secluded beaches located around Tobago (**Figure 5**).

Reports indicate that both green and hawksbill turtles continue to be harvested at sea despite the closure of the legal fishery in 2011.

Figure 5: Locations of Records and/or Reports of Poaching in Tobago.

Bycatch

Bycatch in gillnets has been identified as the largest cause of mortality to leatherbacks in T&T – more than all other causes combined (Eckert and Eckert 2005). Lee Lum (2006) estimated that more than 3,000 leatherbacks were caught by the gillnet fishery in Trinidad in 2000, and 1,000 of these drowned. The use of gill nets is as yet unregulated in T&T and the interaction with leatherback turtles during the breeding and nesting season continues to be a major concern although we have no current estimate of mortality from this fisheries interaction.

Coastal Development

Sea turtles must return to the land to lay their eggs, and many contemporary threats are associated with physical development and recreational activities on or near nesting beaches (Choi and Eckert 2009). In recent years, coastal areas adjacent to sea turtle nesting beaches around the world have become more developed. The built environment has changed significantly and the effect of the ever increasing level of lighting in these areas has become a particular concern. The reproductive success of marine turtles is greatly diminished when there are bright lights near to their nesting beaches (IUCN 2008).

Sea turtles use natural light at night to guide them back to the sea after nesting and are seriously affected by artificial lights (Horrocks et al. 2002), which are brighter than natural light cues. These lights cause disorientation of nesting females, leading them to spend extended periods of time navigating the beach before returning to the sea. Artificial lights also seriously affect hatchlings ability to orient and navigate towards the sea. With regard to this, Horrocks et al. (2002) state:

"Without intervention, their fate is to die in the heat of the next day's sun, to be crushed by vehicles on roads they have attempted to cross, or to be attacked and killed by crabs, cats, dogs and other predators. Despite best

efforts at mitigation, even when we manage to get hatchlings safely into the sea, we know that hatchling viability has become compromised."

'Seascape' views are highly valued within the hotel industry, and the vast majority of Caribbean hotels are located within the critically biodiverse and fragile coastal zone (IUCN 2012a). During the operational stage, tourism related developments have been shown to have significant impacts on sea turtles and their nesting beaches.

Many nesting sites at both index and non-index beaches are heavily developed with large hotels, villa properties, beach bars, coastal roads et cetera. Disorientation of nesting and hatching turtles by lights is documented annually at several beaches around Tobago, and the issue will be discussed further later in this report.

In addition to the impact of artificial lighting, development on beaches often creates unnatural cycles of erosion, through placement of permanent structures, removal of native vegetation (Choi and Eckert 2009) and improper drainage reducing potential nesting habitat and destruction of existing incubating nests.

The argument that turtles prevented from nesting in one location will simply go elsewhere to nest fails to provide a long term answer to the problem of shrinking habitat, and it ignores the fact that nesting site fidelity is a well-documented behaviour of sea turtles.

All or a combination of these problems are most noticeable on beaches located along the Caribbean coastline of Tobago where the majority of reported sea turtle nesting activity takes place and particularly at index beaches, with Turtle Beach being the most affected, followed by Grafton Beach and to a lesser extent Mt. Irvine Back Bay.

SOS TOBAGO

As part of a wider programme to address the rampant poaching activity that regularly took place on beaches in the Courland Bay Area and promote the recovery of sea turtles on the island of Tobago, Save Our Sea Turtles (SOS) was formed in 2000. SOS is a member of WIDECAST, a regional scientific network and partner organization to the United Nations Caribbean Environment Programme (UNEP); and a founding member of the Turtle Village Trust.

Regular community beach patrols (2000) and a monitoring programme (2005) through the sanction and approval of the Tobago House of Assembly (THA) Department of Natural Resources and the Environment (DNRE) were initiated by SOS with a mission to conserve local sea turtle populations, their coastal and marine habitats through community based initiatives in research, education, and eco-tourism.

The presence of a regular beach patrol, together with ongoing education and awareness campaigns since the year 2000 has dramatically reduced the incidence of poaching that was once evident on Turtle Beach, Grafton Beach and Mt. Irvine Back Bay which have been established as index nesting beaches.

Data is generally collected through nightly patrols and morning surveys of tracks on index nesting beaches in the Courland Bay area from March – September and at Lambeau (Magdalena Grand) beach (a beach known for hawksbill nesting activity) from May – November.

Nesting and hatching event data sheets are completed in the field by SOS volunteers (see **Appendix B** and **C**), and the results are compiled and disseminated through annual reports and publications.

Here we report a summary of our activities for the 2014 sea turtle nesting season on the island of Tobago.

METHODS

Data were derived principally from:

a) **Nightly patrols** conducted from 1st March to 30th September 2014, on three key index beaches in the Courland Bay area (known as the most important leatherback nesting beaches on the island) and at Lambeau (Magdalena Grand) beach (a beach known for hawksbill nesting activity) from 1st May to the 30th September. These beaches were patrolled at 30 minute intervals, between the hours of 8 p.m. to 4 a.m. to ensure that nesting turtles were encountered during an early stage of the laying process.

   When sea turtles were encountered, the beach, zone, landmark, date, time, weather, species and activity were recorded on a standard data sheet (**Appendix B**). Turtles that successfully excavated a nest chamber and deposited their eggs were measured (length and width of carapace in centimetres), checked for physical damage or distinct markings, their rear (leatherback) or front (hawksbill/green) flipper tags read and recorded, and passive-integrated transponder (PIT) tags scanned and recorded from each turtle's shoulder or neck area. If flipper or PIT tags were not present, patrollers would fit these to the turtle. .

   Patrollers would remain with the turtle for the duration of the laying process and confirm the nesting event outcome. The numbers of persons (tourists and resident visitors) present for the purpose of turtle watching were also recorded in addition to whether or not the turtle was disturbed by the presence or activities of persons and beachfront lighting.

b) **Morning surveys** conducted on Lambeau (Magdalena Grand) from 1st October to 31st December, between the hours of 4 a.m. to 6 a.m. Species identifications and assessment of nesting success after a turtle had already deposited eggs and returned to the sea were usually based on the surveyor's evaluation of features of sea turtle tracks and nests (e.g., track width, track configuration, size of the body pit etc.).

   Determination of a successful nesting event can be difficult especially in areas where nest densities are high or in situations where weather has erased the tracks left in the sand by the turtle. In the case where a turtle is observed after depositing eggs or a nest is observed on a morning walk, nesting success is estimated and not confirmed. We believe that errors in species identification do occur occasionally, particularly because of deterioration of the tracks (from weather, pedestrian or vehicular traffic) and surveyor inexperience, but we have no reason to believe that these errors are frequent enough to significantly affect the results of the survey.

c) **Hatching events** were recorded during night patrols (8pm-4am) or on morning walks (4am -6am), when hatchlings were observed leaving the nest, or when hatchling tracks were observed. The beach, zone, landmark, date, time, weather and species were recorded on a standard data sheet (**Appendix C**). Nests were also excavated post hatching and the number of hatched, unhatched and infertile eggs, along with live and dead hatchlings found in and out of the nest were recorded. Unhatched eggs were opened and visual inspection used to determine the developmental stage of the embryo and/or the reason the embryo/egg did not develop to full term. The depth of the excavated nest chamber was also recorded along with any signs of light disorientation and/or predation.

"Survey effort" is defined as the number of kilometres of beach that are regularly monitored for nesting activity for all species. We recognize that the number of kilometres of monitored beach is an imperfect measure of survey effort. However, some measure of survey effort is needed to interpret nesting totals.

Limitations of data presented in this report include:

1) Heterogeneous data-collection efforts and various levels of surveyor experience.

2) The survey effort is limited to four nesting beaches. Requests for information regarding nesting on other beaches in Tobago, should be directed to the THA DNRE and/or Turtle Village Trust.

Because of these limitations, the data presented must be interpreted cautiously and appropriately. Although the information may be useful in evaluating the relative importance of a particular nesting beach (presuming that it is monitored) as a site for sea turtle reproduction, due to the slow sexual maturity of sea turtles, we do not believe the data presented in this report alone are appropriate to evaluate long-term trends in population.

The nesting beaches patrolled in 2014 are described in **Table 1**.

Table 1: Nesting Beaches Patrolled in 2013

BEACH NAME	DESCRIPTION	LENGTH (km)
Turtle Beach	Located on the Caribbean coast of Tobago between the communities of Plymouth and Black Rock. High level of beach front development along its length including a 100+ room hotel, fisheries depot, private villas and residential properties	1.76
Grafton Beach	Located on the Caribbean coast of Tobago between the communities of Black Rock and Pleasant Prospect. High Level of beach front development including two 100+ room hotels, private villas, restaurants and coastal road.	0.92
Mt. Irvine Back Bay	Located on the Caribbean coast between the community of Pleasant Prospect and Mt. Irvine Beach. No coastal development present.	0.44
Lambeau Beach (Magdalena Hotel)	Located on the Atlantic coast adjacent to the Magdalena Grand Beach Resort. High level of beach front development, including 100+ room hotel.	0.25

RESULTS

NESTING ACTIVITY

A total of 558 nesting events were recorded in 2014 at Courland Bay and Lambeau (Magdalena Grand) within the survey period (**Table 2).** One additional leatherback nesting event was recorded at Rockly Bay, and 6 hawksbill nesting events were recorded at Sandy Point. One additional leatherback nest was recorded at Turtle Beach outside of the normal survey period (January). Four additional hawksbill nesting events were recorded at Lambeau outside of the normal survey period (December): one nest and three false crawls (**Table 3**). Approximately 80% of recorded nesting events were nests constructed (**Figure 6**). Nesting activity peaked in May for leatherbacks and July for hawksbills (**Table 3** and **Figure** 7).

Table 2: Number of Sea Turtle Nesting Events (All Species) Recorded per Beach, 2014

Beach	# Nests Constructed		# False Crawls		# Unknown Outcomes		Total	Total LBK	Total HWK	Survey Effort (km)	Survey Effort (time)
	LBK	HWK	LBK	HWK	LBK	HWK					
Grafton Beach	65	3	27	0	4	1	100	96	4	0.92	1st March – 30th September
Mt. Irvine Back Bay	33	2	3	1	6	0	45	42	3	0.44	
Turtle Beach	277	3	33	0	9	0	322	319	3	1.76	
Lambeau (Magdalena Grand)	0	66	1	21	0	3	91	1	90	0.25	1st May – 30th November
Total	**375**	**74**	**64**	**22**	**19**	**4**	**558**	**458**	**100**	**3.37**	

Nests Constructed – Confirmed Lay and Estimated Lay.
False Crawl – False crawl with or without body pit; no nest constructed.
Unknown Outcome – activity could not be determined with certainty.
LBK – Leatherback
HWK – Hawksbill

Figure 6: Percentage of Sea Turtle Activity Outcomes (All Species) Recorded on Beaches Surveyed, 2014

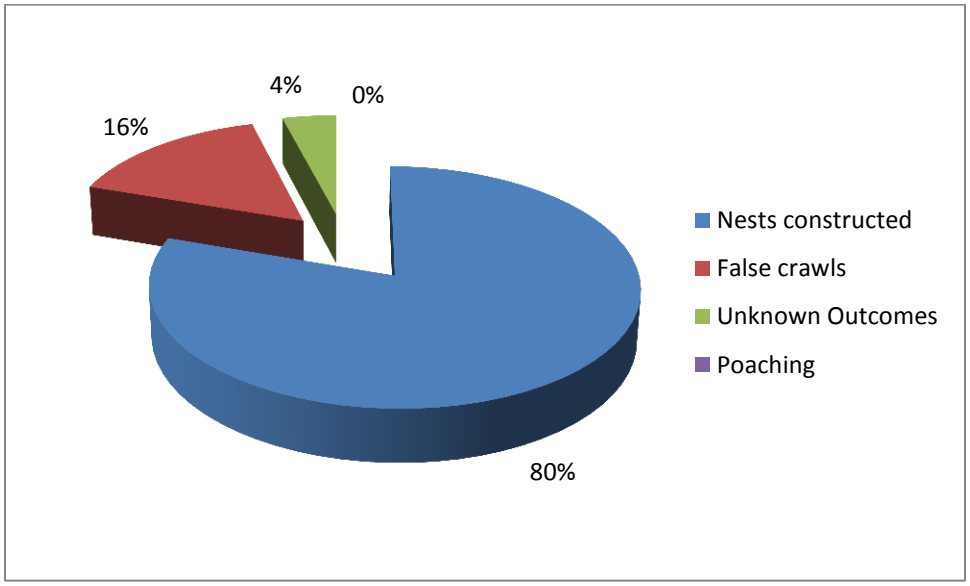
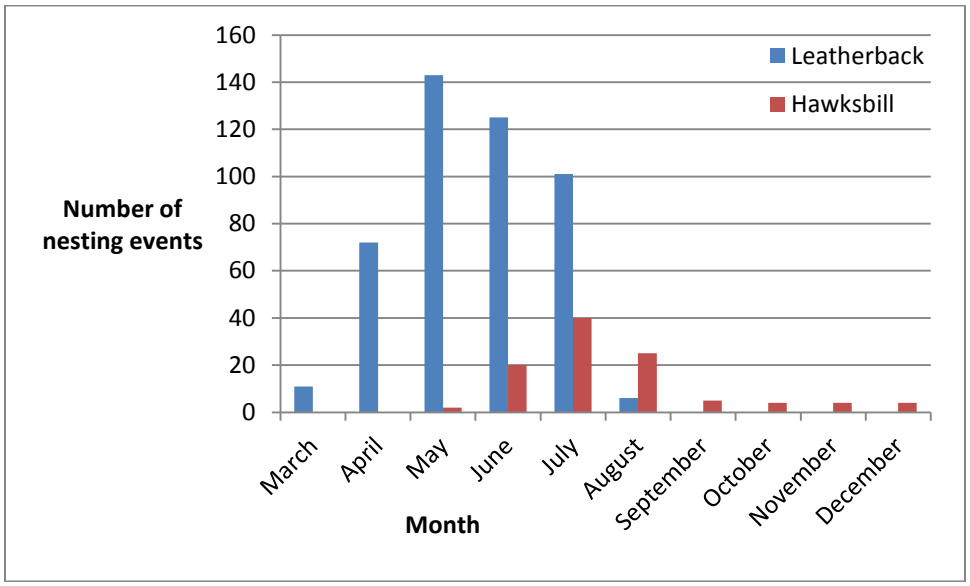


Table 3: Number of Sea Turtle Events Recorded on Beaches Surveyed per Month, 2014

Month	# Nests Constructed		# False Crawls		# Unknown Outcomes		Total	Total LBK	Total HWK
	LBK	HWK	LBK	HWK	LBK	HWK			
January*	1	0	0	0	0	0	1	1	0
March	7	0	1	0	3	0	11	11	0
April	59	0	9	0	4	0	72	72	0
May	105	2	34	0	4	0	145	143	2
June	111	14	12	5	2	1	145	125	20
July	89	29	7	9	5	2	141	101	40
August	4	18	1	6	1	1	31	6	25
September	0	5	0	0	0	0	5	0	5
October	0	3	0	1	0	0	4	0	4
November	0	3	0	1	0	0	4	0	4
December*	0	1	0	3	0	0	4	0	4
Total	**376**	**75**	**64**	**25**	**19**	**4**	**563**	**459**	**104**

* Outside of normal survey period

Figure 7: Total Sea Turtle Activity Recorded by Month, 2014



Species Representation

Leatherback nesting activity accounts for 81%, and hawksbill nesting activity accounts for 19% of all sea turtle nesting activity recorded on beaches surveyed by SOS during the 2014 nesting season (**Figure 8**). In 2014 there were no records of green turtle activity reported on beaches surveyed by SOS.

Turtle Beach accounted for 70% of all leatherback nesting activity (**Figure 9**). Lambeau (Magdalena Grand) accounted for 90% of all hawksbill turtle activity, with the remaining 10% of hawksbill activity taking place on the beaches in the Courland Bay area (Grafton Beach, Mt. Irvine Back Bay and Turtle Beach) (**Figure 10**).

Figure 8: Total Sea Turtle Activity Recorded by Species, 2014

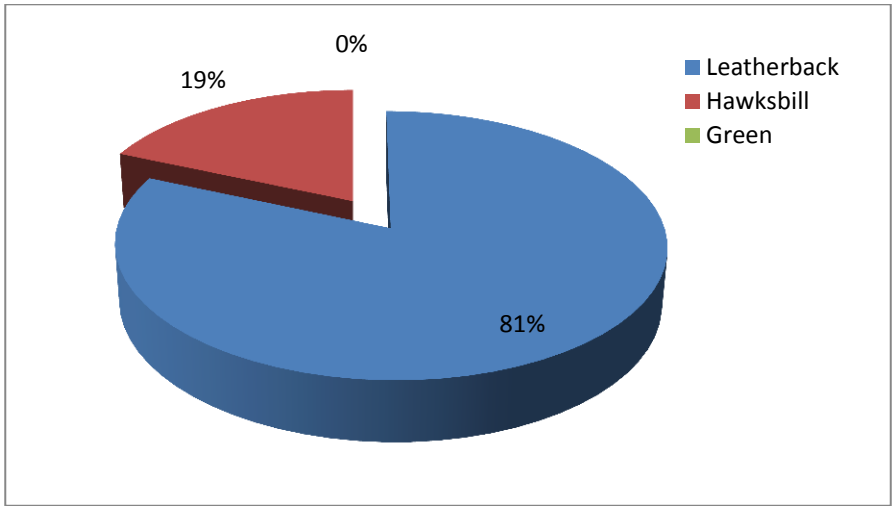


Figure 9: Percentage of Total Leatherback Activity Recorded at each Beach, 2014

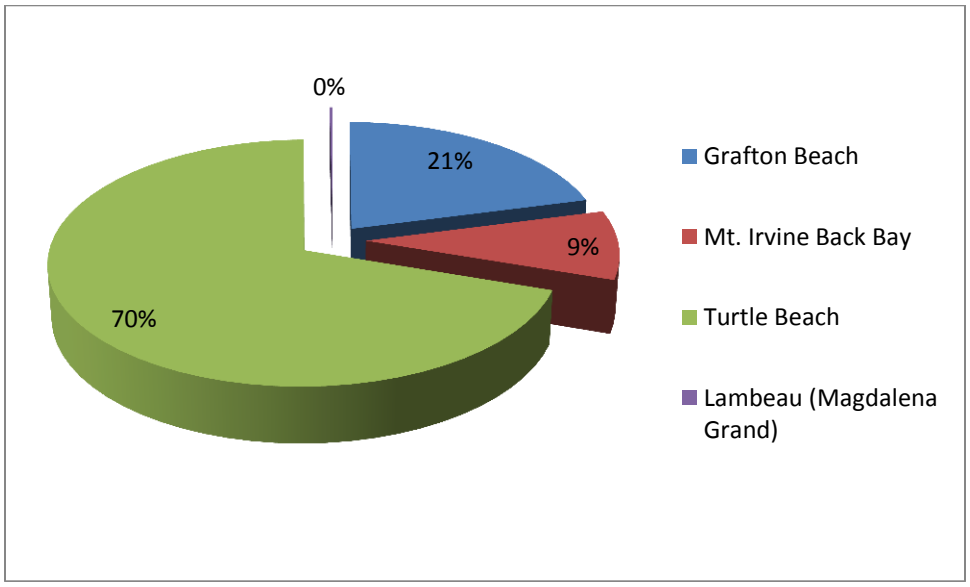
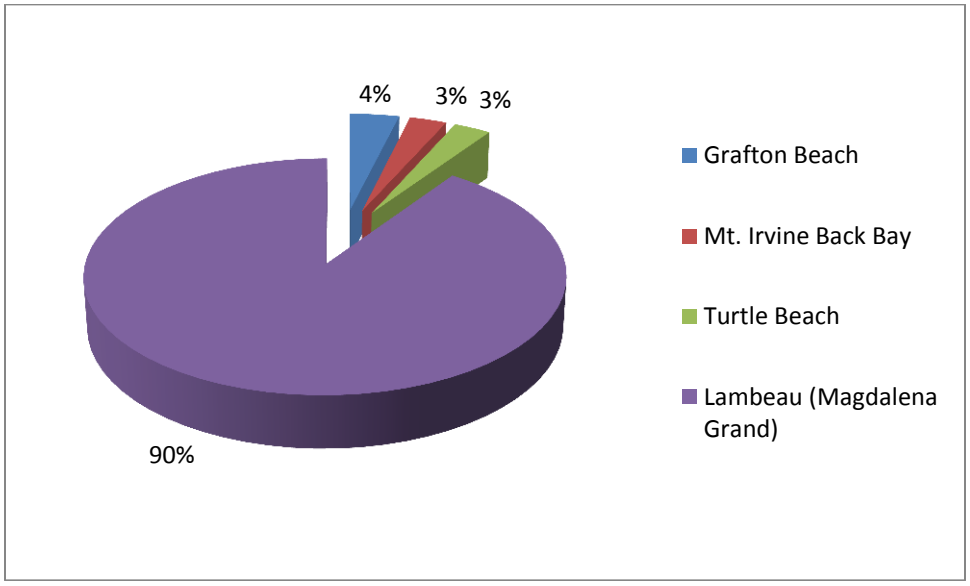


Figure 10: Percentage of Total Hawksbill Activity Recorded at each Beach, 2014



Distribution of nesting along each beach

Turtle nesting activity is not evenly distributed throughout each beach, but can be concentrated in certain areas. Mt. Irvine Back Bay, Turtle Beach and Grafton Beach are divided into various zones; **Figure 11** to **Figure 13** show the distribution of nesting throughout these zones. Nesting activity is concentrated with Zones 1 and 2 on Mt. Irvine Back Bay, and Zones 2 and 3 on Turtle Beach. Nesting activity is more evenly distributed throughout the three zones at Grafton Beach.

Figure 11: Distribution of turtle nesting activity by Zone at Mt. Irvine Back Bay

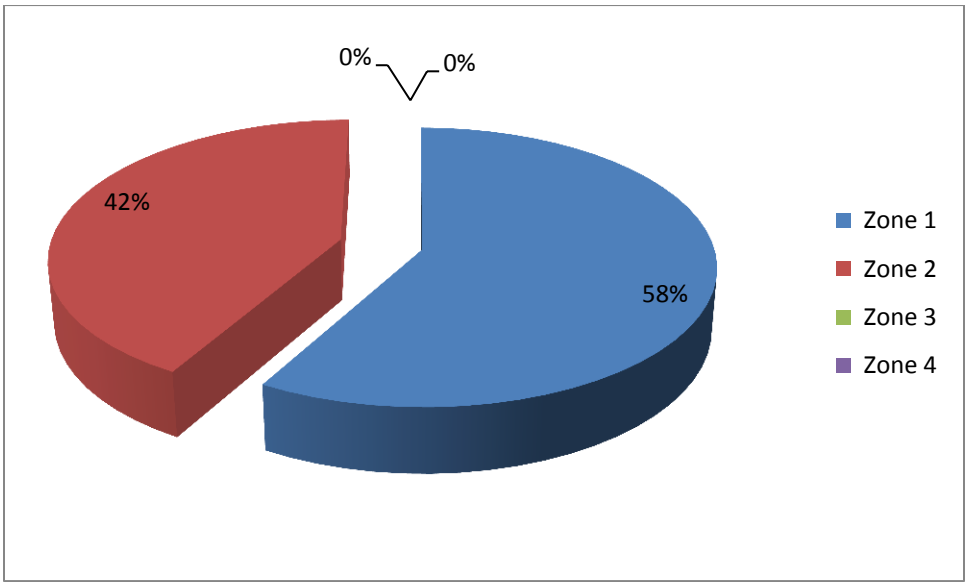


Figure 12: Distribution of turtle nesting activity by Zone at Turtle Beach

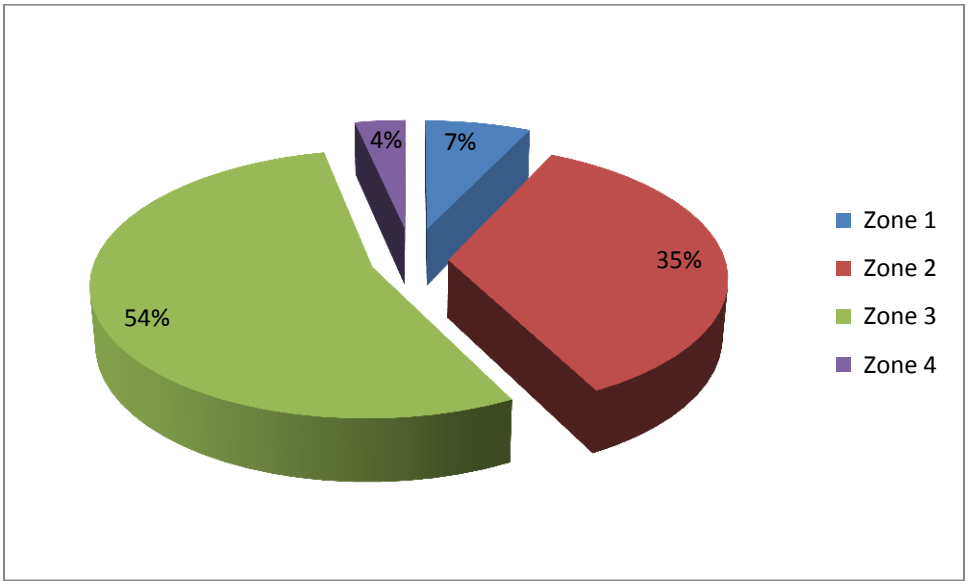
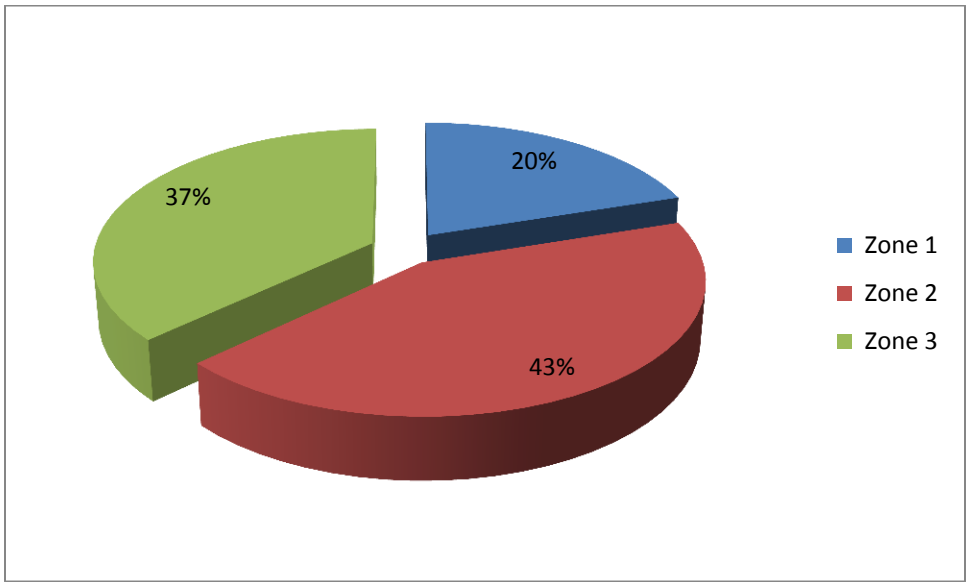


Figure 13: Distribution of turtle nesting activity by Zone at Grafton Beach



Tagging

A total of 142 individual leatherbacks were identified by their unique tags in 2014 (**Table 4**), including 55 new (39%) and 87 return (61%) leatherbacks. Only 20 individual hawksbills were identified by their unique tags, including 18 new (90%) and 2 return (10%).

Table 4: Number of 'New' and 'Return' Turtles Recorded, 2014.

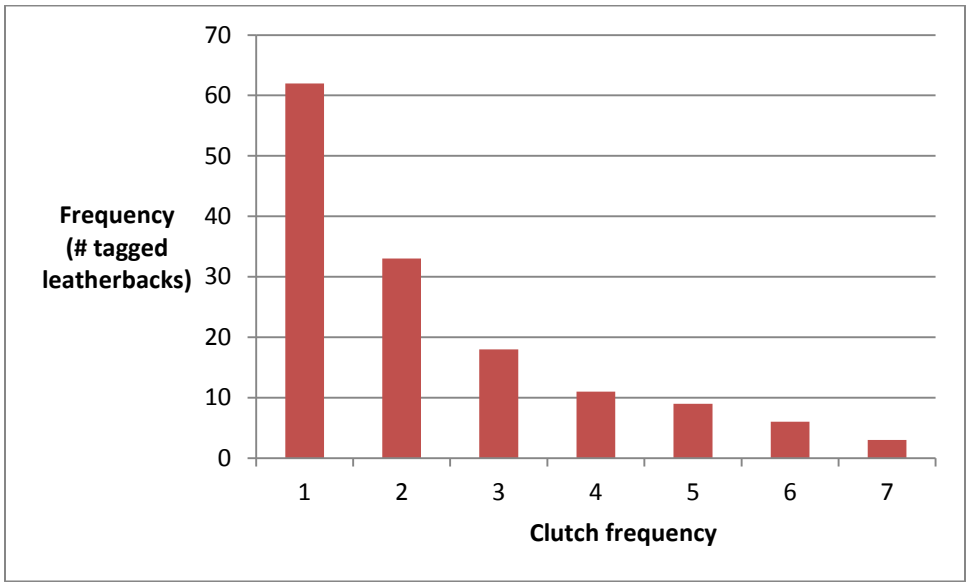
Leatherback		Hawksbill	
New	Return	New	Return
54	87	18	2

New - Turtle tagged and recorded nesting for the first time.

Return - Turtle tagged during a previous nesting season and/or at another beach not monitored by SOS Tobago.

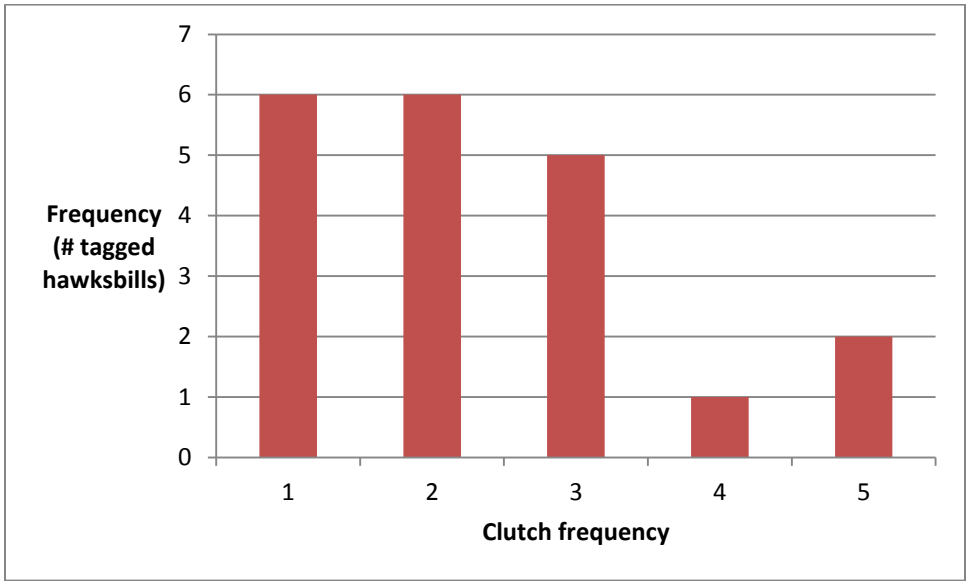
Together 328 nesting events (71% of 460 total) were recorded by 142 tagged leatherbacks in 2014, giving a mean clutch frequency of 2.31 clutches per year, compared to the global average of 5-7 (Eckert et al. 2012). **Figure 14** presents the observed clutch frequency recorded among tagged leatherbacks. The maximum observed clutch frequency was 7, recorded for three individuals. The observed clutch frequency and the number of nesting events recorded for leatherbacks without associated tag numbers (132) indicates that tags are not always applied or recorded, and some nesting leatherbacks escape detection.

Figure 14: Observed clutch frequency among tagged leatherbacks



Together 47 nesting events (45% of 104 total) were recorded by 20 tagged hawksbills in 2014, giving a mean clutch frequency of 2.35, compared with the expected average of 4 - 5 (Beggs, Horrocks, and Krueger 2007; Richardson, Bell, and Richardson 1999). The maximum observed clutch frequency was 5, recorded for two individuals. At Lambeau (Magdalena Grand) where more consistent beach coverage is reached throughout the hawksbill nesting season, 39 nesting events (58% of 67 total) were recorded by 16 tagged individuals, giving a mean clutch frequency of 2.63 at this beach. Like leatherbacks, the observed clutch frequency and the number of nesting events recorded without associated tag numbers (57) indicates that tags are not always applied or recorded, and some nesting hawksbills escape detection.

Figure 15: Observed clutch frequency among tagged hawksbills



HATCHING

Hatching Events

158 hatching events (67 hawksbill and 91 leatherback) were recorded in 2014, out of an estimated 450 nests constructed (**Table 5**). Some hatching events may escape detection as a result of rain, high tides, beach erosion and surveyor inexperience, and some nests may fail to hatch. The incubation period (calculated as the number of days from oviposition until the first hatchlings reached the beach surface) was 58 ± 3 days for hawksbills (n=64), and 62 ± 3 days for leatherbacks (n=38).

A greater proportion of hatching events were captured for hawksbills (89%) than for leatherbacks (24%). The capture of leatherback hatching events was lowest at Grafton Beach (18%). The proportion of hatching events captured for hawksbills was significantly lower at Mt. Irvine Back Bay (0%), Turtle Beach (0%) and Grafton Beach (33%) than Lambeau. However, caution should be used when interpreting the data since the sample size for hawksbill nesting at these beaches is small.

Table 5: Hatching events captured by beach in 2014

Beach	LBK			HWK		
	Hatching events	Nests constructed	% Hatching captured	Hatching events	Nests constructed	% Hatching captured
Grafton Beach	12	65	18	1	3	33
Mt. Irvine Back Bay	10	33	30	0	2	0
Turtle Beach	69	277	25	0	3	0
Lambeau (Magdalena Grand)	0	0	N/A	66	67	99
Total	**91**	**375**	**24**	**67**	**75**	**89**

The proportion of leatherback hatching events captured varied along the length of Turtle Beach (**Table 6**), with the greatest proportion recorded in Zone 4 (60%). However the nest success for Zones 1 and 4 should be interpreted with caution due to small sample sizes.

Table 6: Leatherback hatching events captured at Turtle Beach in 2014 by Zone

Beach Zone	Nests constructed	Hatching events	Nest success (%)
Zone 1	19	6	32
Zone 2	101	24	24
Zone 3	148	33	22
Zone 4	10	6	60

Eggs of both leatherback and hawksbill turtles have a period of approximately 60 days incubation, therefore when a graph of nests constructed and nests hatched per month is plotted (**Figure 16** and **Figure 17**), one would expect the two graphs to have a similar shape, with the number of nests hatched displaced to follow the nests constructed by about 2 months. **Figure 16** indicates that the proportion of hatching events captured was lower earlier in the season for leatherbacks (June). On the other hand the proportion of hatching events captured for hawksbills appears to be consistently high throughout the season (**Figure 17**).

Figure 16: Leatherback nests constructed and hatched by month in 2014

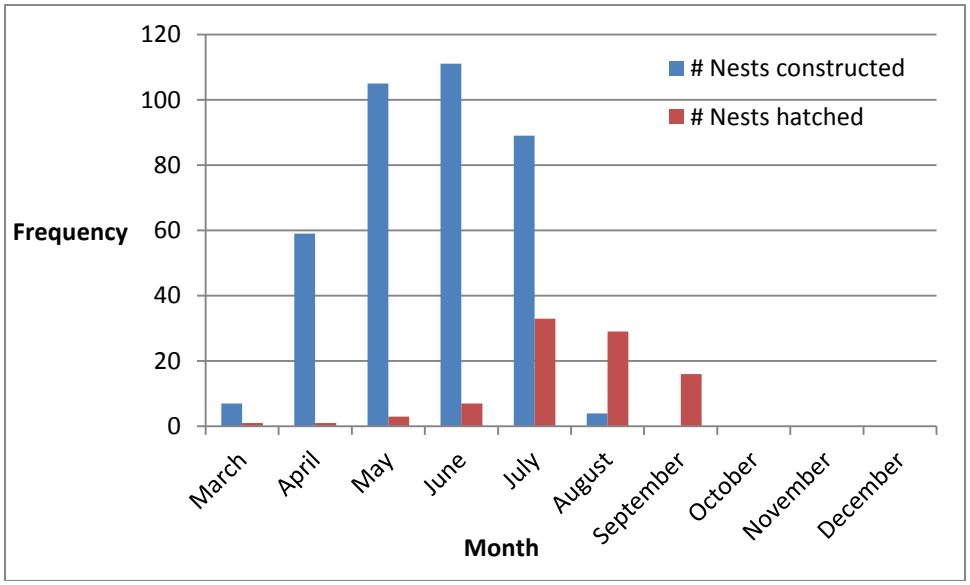
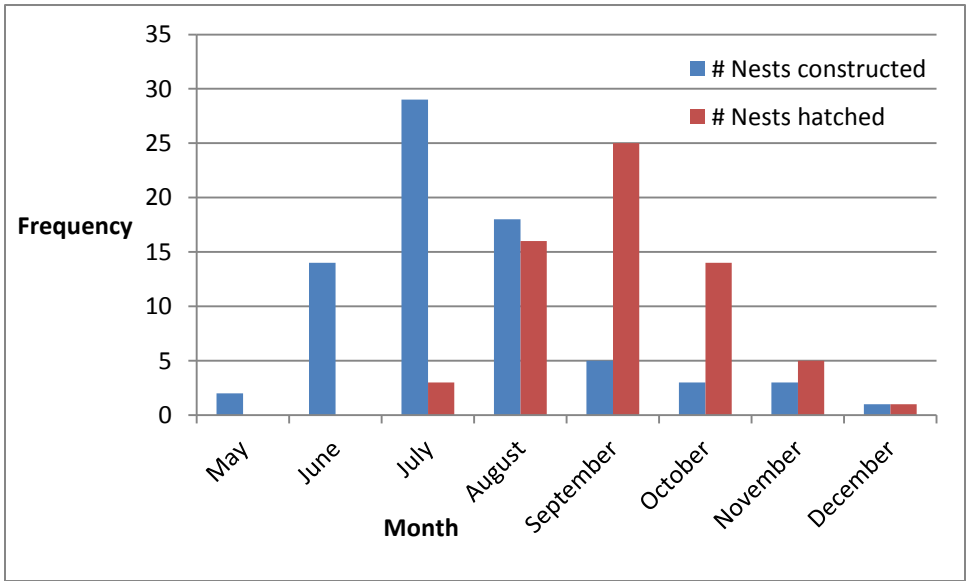


Figure 17: Hawksbill nests constructed and hatched by month in 2014



Nest Excavations

152 nests were excavated from an estimated 449 that were constructed. Hawksbills (n=66) laid an average 153 ± 30 yolked eggs, at a mean depth of 49 ± 5cm. Leatherbacks (n=86) laid an average 80 ± 18 yolked eggs, at a mean depth of 81 ± 9cm.

Hatch Success

The percent hatching success was estimated for each clutch that was excavated using the following formula: (hatched shells/total yolked eggs laid) x 100 (Eckert and Eckert 1990).

Percent hatching success among excavated nests was higher for hawksbills (88%) than leatherbacks (61%) (as expected – see Eckert et al. 2012), and among leatherbacks was highest at Grafton Beach (77%) (**Table 7**). The recorded hatch success for leatherbacks in Tobago in 2014 is comparable to the in situ hatch success generally reported for the species: 45–65% (Eckert et al. 2012). However, it is important to note that this data was captured from only 86 leatherback nest excavations; a small proportion of the estimated nests laid by leatherbacks in 2014.

Table 7: Percent hatch success recorded in 2014 among excavated nests

Species/Beach		# excavated nests	% hatch success (±SD)
Leatherback	Grafton Beach	11	77 ± 16
	Mt. Irvine Back Bay	8	62 ± 27
	Turtle Beach	67	58 ± 13
Hawksbill		63	88 ± 14
Total		148	73 ± 20

Percent hatch success for leatherbacks was generally consistent throughout the length of Turtle Beach (**Table 8**).

Table 8: Percent hatch success of leatherbacks at Turtle Beach, among excavated nests

Beach Zone	# excavated nests	% Hatch success (±SD)
Zone 1	6	61 ± 7
Zone 2	24	61 ± 14
Zone 3	31	58 ± 11
Zone 4	6	47 ± 21

Hatchling Production

The total output of hatchlings from the 152 completed excavations is estimated to be 13,027 based on the number of shells recorded (**Table 9**), including 8,853 hawksbills (primarily at Lambeau). This is considered a minimal estimate for the production of hatchlings from the surveyed beaches in Tobago, considering that many nests are unaccounted for.

Table 9: Hatchling production from surveyed beaches in 2014

Species/Beach		# excavated nests	Average hatchling output (per nest)	Total hatchling output
Leatherback	Grafton Beach	11	66	729
	Mt. Irvine Back Bay	8	58	463
	Turtle Beach	67	45	2,982
Hawksbill		66	134	8,853
Total		148	84	13,027

A total of 9,397 live hatchlings among these, were recovered and released by SOS (**Table 10**) from 126 nest excavations; 8,708 hawksbills from 67 excavations, and 689 leatherbacks from 59 excavations.

Table 10: Number of hatchlings recovered and released by SOS at each beach in 2014

Beach	# Hatchlings Released		
	LBK	HWK	Total
Grafton Beach	224	1	225
Mt. Irvine Back Bay	63	0	63
Turtle Beach	402	0	402
Lambeau (Magdalena Grand)	0	8,707	8,707
Total	**689**	**8,708**	**9,397**

Bacterial Infestation

85% of excavated hawksbill clutches (56) and 100% of excavated leatherback clutches (86) were found to have signs of bacterial infestation. The proportion of eggs with bacteria per clutch ranged from 0 – 60% (mean 16% ± 13%). Leatherback nests had a higher incidence of bacterial infestation (22% ± 10%) than hawksbill nests (7% ± 12%). Grafton Beach had the lowest incidence of bacterial infestation with a mean of 17% eggs per clutch. This corresponds to the marginally higher hatch success recorded for this beach.

Table 11: Incidence of bacterial infestation in turtle nests in 2014

Species/Beach		n	% of clutches with bacterial infestation	% of eggs with bacterial infestation per clutch (±SD)
Leatherback	Grafton Beach	11	100	17 ± 15
	Mt. Irvine Back Bay	8	100	20 ± 17
	Turtle Beach	67	100	23 ± 8
Hawksbill		66	85	7 ± 12
Total		152	93	16 ± 13

The incidence of bacterial infestation in leatherback nests was consistent along the length of Turtle Beach (**Table 12**).

Table 12: Incidence of bacterial infestation in leatherback nests at Turtle Beach

Beach Zone	n	% of eggs with bacterial infestation per clutch (±SD)
Zone 1	6	23 ± 4
Zone 2	24	23 ± 9
Zone 3	31	22 ± 8
Zone 4	6	26 ± 9

BEACHFRONT LIGHTING

During the 2014 nesting season 9% of nesting sea turtles were disturbed, disoriented or prevented from nesting as a result of beachfront lighting (**Figure 18**). When the data is looked at by beach, we see that Grafton Beach (20%) had the highest incidence of light disturbance and disorientation among nesting turtles in 2014 (**Table 13**).

Figure 18: Percentage of Nesting Sea Turtles Disoriented by Lights on Surveyed Beaches, 2014

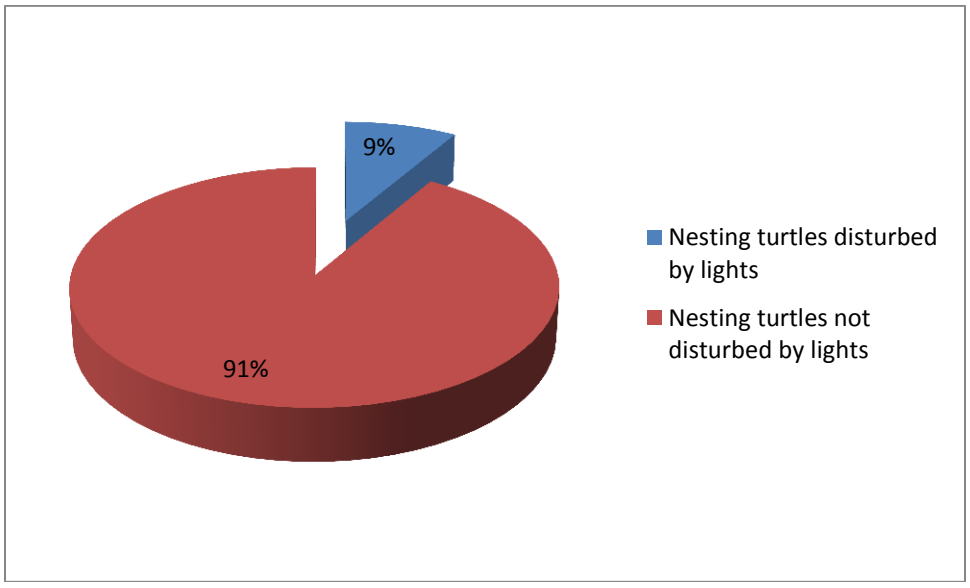


Table 13: Number of nesting turtles disturbed by lights at each beach, 2014

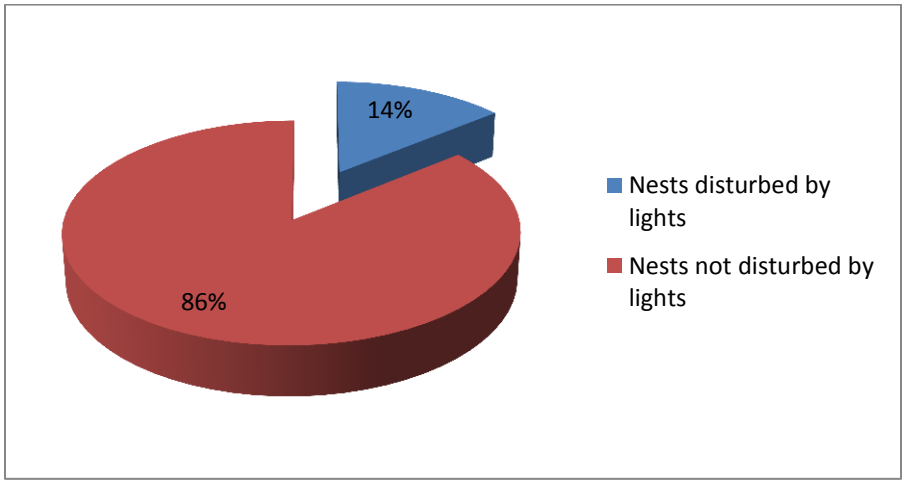
Beach	Nesting turtles disturbed by light	Nesting turtles not disturbed by light	% nesting turtles disturbed by light
Grafton Beach	20	79	20
Mt. Irvine Back Bay	0	45	0
Turtle Beach	22	301	7
Lambeau (Magdalena Grand)	6	89	6
Total	48	514	9

Disorientation of hatchlings (**Table 14** and **Figure 19**) was recorded for 22 out of the total recorded 156 hatching events (14%). Light disorientation had the greatest impact at Grafton Beach (36% of nests), followed by Turtle Beach (19%). A total of 655 hatchlings disoriented by light were rescued and released by SOS patrollers.

Table 14: Hatched nests disoriented by light, 2014

Beach	Total # Hatching Events Recorded	# hatched nests disoriented by light	% of nests disoriented by light
Grafton Beach	13	5	38
Mt. Irvine Back Bay	10	1	10
Turtle Beach	69	13	19
Lambeau (Magdalena Grand)	66	3	5
Total	**158**	**22**	**14**

Figure 19: Percentage of Nests Disoriented by Lights on Surveyed Beaches, 2014



DOG PREDATION
Four incidences of predation of hatchlings by dogs were recorded at Turtle Beach in 2014.

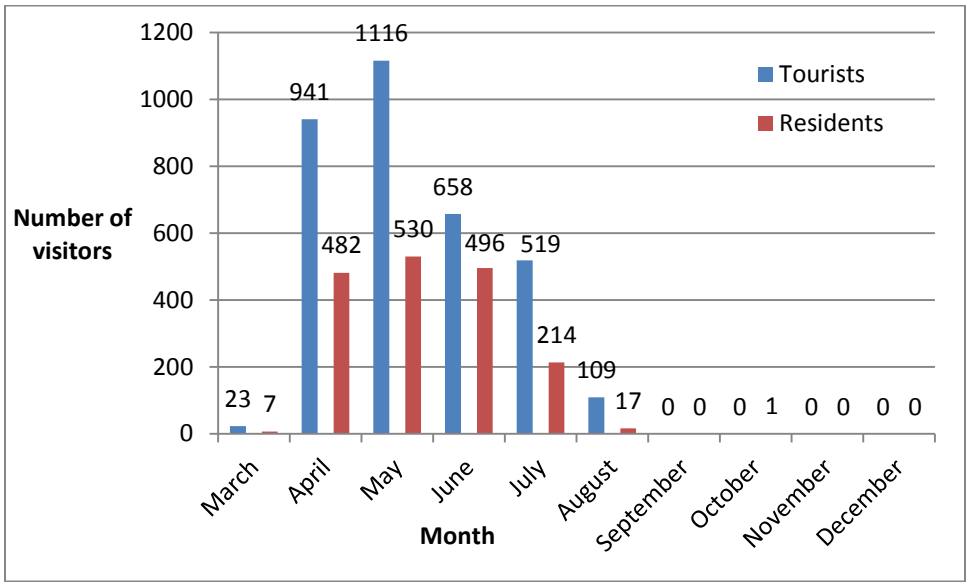
POACHING
In 2014 one attempted poaching incident was recorded at Grafton Beach. A live hawksbill was found overturned at the back of the beach and was safely released by the SOS patrol team.

TURTLE WATCHING
During 2014, there were 5,113 persons recorded turtle watching. When compared to the number of total visitors in 2013 (5,532), this represents a decrease of 8%.

The bulk of tourism-related income is derived from non-resident visitors which made up 3,366 (or 66%) of visitors recorded watching turtle nesting in 2014. This represents a decrease of 14% from 2013 (3,904).

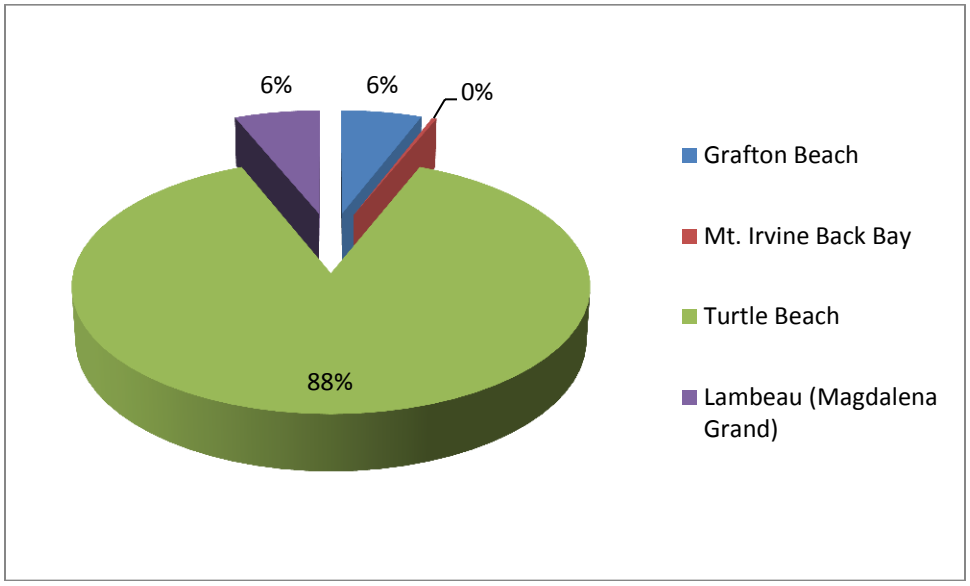
The month of May saw the highest number of visitors with 1,646 persons recorded taking part in watching turtle nesting and associated activities (**Figure 20**) – a 13% decrease from May 2013 (1,896).

Figure 20: Number of Persons Recorded Watching Turtle Nesting per Month, 2014



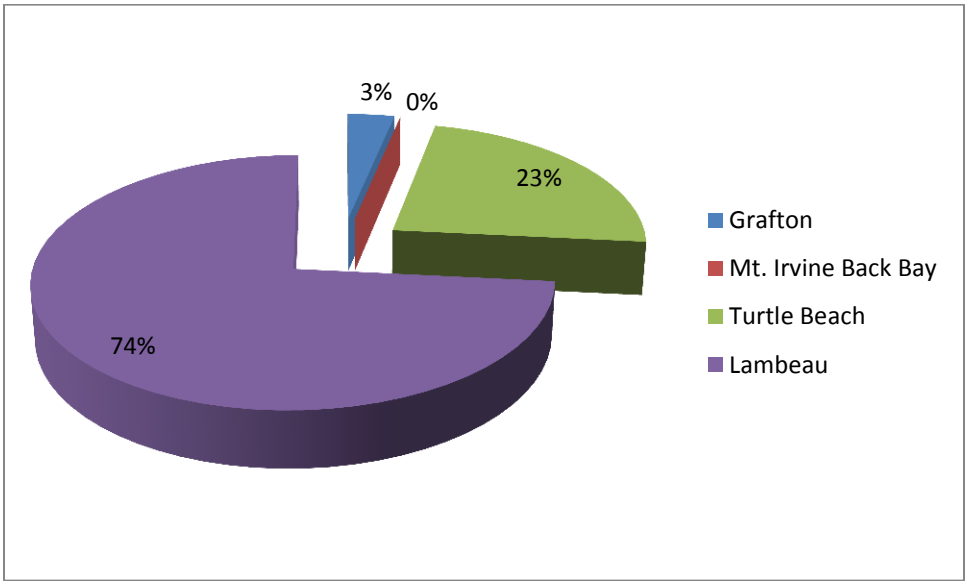
Turtle Beach had the highest number of visitors recorded watching turtle nesting for 2014 (**Figure 21**), with a total of 4,480 persons. This represents 88% of all visitors participating in watching turtle nesting.

Figure 21: Number of Persons Recorded Watching Turtle Nesting by Beach, 2014



An additional 1,741 persons were recorded in 2014 watching turtle hatching events. The majority of these visitors engaged in this activity at Lambeau (Magdalena Grand) and Turtle Beach (**Figure 22**).

Figure 22: Number of Persons Recorded Watching Turtle Hatching in 2014



DISCUSSION

POACHING

The presence of a regular beach patrol since 2005, together with ongoing education and awareness campaigns since 2000, has dramatically reduced the incidence of poaching that was once evident on Turtle Beach, Grafton Beach and Mt. Irvine Back Bay. In 2014 one attempted poaching incident was recorded at Grafton Beach. A live hawksbill was found overturned at the back of the beach and was safely released by the SOS patrol team.

Despite the successes in deterring or limiting the number of turtles being killed at these beaches, poaching of nesting turtles still continues unabated on many other beaches around Tobago where patrols are either less active or currently do not take place at this time. There is a marked increase in these incidences correlating to nesting beaches that are within close proximity to human habitation as turtles and eggs can be easily exploited particularly during peak nesting periods; and during the various village harvests which take place year round. These village harvests often emphasise the consumption of 'wild meat' and openly offer a selection of illegally obtained meats and wildlife products including sea turtles (STRAP, 2010).

Anecdotal reports indicate that poachers from Tobago may also be visiting beaches on the north coast of Trinidad to poach nesting turtles and eggs. Poachers take advantage of the fact that many nesting beaches have minimal or no regular beach patrols, due in part to the critical lack of resources and personnel that are needed by Government agency personnel and community conservation groups.

This makes it difficult at best to monitor multiple nesting sites or enforce laws that prevent poaching in the first place. Poachers take advantage of deficiencies in monitoring and enforcement capacity and in many instances the evidence of poaching left behind, shows that individuals participating in this illegal activity have significant amounts of time to kill and harvest sea turtles with little or no disturbance.

On beaches where there is sufficient monitoring of sea turtle nesting activity, poaching activities have become increasingly more sophisticated and clandestine with turtles physically being removed from nesting beaches to waiting vehicles and slaughtered at undisclosed locations to hide evidence of this illegal activity.

In the few instances where poachers have been discovered still in the act of killing or removing turtles, concerned members of the public or visitors to Tobago who attempt to intervene, report that they are threatened with physical violence (pers. observ.).

Harvest of sea turtles at sea continues despite the closure of the legal fishery in 2011, but the extent of the take is unknown. This harvest of turtles from Tobago's foraging grounds is expected to have regional impact due to the migratory patterns of greens and hawksbills, with individuals foraging around Tobago drawn from rookeries throughout the region.

While poaching directly undermines the efforts of local conservation groups, and the overall survival of sea turtles nesting in Tobago (and Trinidad), this illegal and gruesome activity also severely challenges Tobago's image as a tourism destination that promotes itself as "Clean, Green, Safe and Serene."

Word of mouth and visitor feedback through websites and social media, such as Trip Advisor, Facebook and Twitter play an increasingly important role in the decision making process for eco-savvy travelers in today's interconnected world. With an ever growing global environmental consciousness, travelers are choosing to go

to destinations that promote environmental stewardship and sustainable management of natural resources over those destinations that continue to promote environmentally damaging activities.

BEACHFRONT LIGHTING

It is difficult to isolate the single biggest threat to nesting turtles in the Courland bay area. Perhaps the most pervasive problem at this time is artificial lighting, and this is closely tied to the larger issue of coastal development.

There are no incidences of light disturbance on Mt. Irvine Back Bay as it presently remains in a relatively undeveloped natural state. However, light disturbance continues to negatively impact nesting and hatching turtles at Grafton Beach, Turtle Beach and Lambeau (Magdalena Grand) as it has done in previous years. At Grafton Beach this is mainly caused by street lights along the entire length of the adjacent and parallel Stonehaven Bay Road. On Turtle Beach the main cause of disorientation are security lights from the Rex Turtle Beach Hotel and fisheries depot. At the Magdalena Grand, security and pathway lighting cause serious disorientation particularly to newly hatched turtles emerging from the nest.

SOS patrollers and volunteers collected, rescued and released 655 hatchling turtles disoriented by lights during the 2014 season. This number is undoubtedly small compared to the unknown numbers of hatchlings disoriented and subsequently prevented from reaching the sea and died from predation, crushed by cars while attempting to cross roads or exhaustion.

Similar patterns of light disorientation of nesting and hatchling turtles are also seen at other non-index beaches located near to tourism related developments such as those located at Pigeon Point Heritage Park.

Beachfront lighting is often in place to address the issue of security for hotels, villa properties and pedestrians in the area. Tensions between tourism development and biodiversity conservation are inevitable, and careful and effective management is therefore critical. There is no need to compromise human safety and tourism development for sea turtle conservation efforts. The key to light management is not to prohibit light but to manage it to prevent or at least mitigate light disorientation of sea turtles.

Light management is the process of getting light where it is needed most and keeping light away from areas where it can do harm (Witherington et al, 2000).

There is currently no legislation or regulations that address the issue of beachfront lighting in Trinidad and Tobago and the issue is left either at the discretion of various private property holders and local or municipal corporations in charge of public lighting.

In the absence of national legislation and/or regional or municipal regulations, SOS recommends that property owners adjacent to sea turtle nesting sites act responsibly and implement the following basic guidelines year round, to mitigate light disorientation of both nesting and hatching sea turtles:

Turn off unnecessary beach lighting – this includes non essential lighting or decorative lighting that illuminates areas where there are no people or goods in need of safety.

Time use of lights – while permanent alterations to lighting are most effective, temporary seasonal alterations can also be effective, particularly during peak nesting and hatching periods.

Limit light duration – the shorter the time the light is on the smaller the effect on sea turtles (e.g. use of motion detectors).

Use good light control – this involves controlling the direction of light, allowing property owners to effectively illuminate their properties without affecting turtle nesting beaches.

Use light screens – sometimes it is difficult to remedy light at the source. One way to lessen this is the use of screens, either artificial (use of structures at / near the light source) or natural (decorative vegetation, landscaping along the beach itself).

Substitute light sources – even the best light-control techniques may allow some light to reach the beach. It may be beneficial to use light sources that emit wavelengths that least affect sea turtles. Studies show sea turtles are least affected by low wavelength red light. Substituting light sources should also be done in conjunction with good light management as all sources of light can be harmful to sea turtles.

SOS Tobago has actively worked with Rex Turtle Beach Hotel and Magdalena Grand Beach Resort to implement turtle friendly lighting solutions with limited success. Magdalena Grand has implemented some measures to reduce disorientation from light, but as reported, many nests continue to experience disorientation. Cooperation of the hotel staff has also been forthcoming and enables SOS Tobago to respond effectively to incidences of disorientation and reduce the mortality of hatchlings that can result.

A comprehensive list of publications detailing best practices for beachfront lighting and sea turtles are available for download free, through the WIDECAST website. http://www.widecast.org

1. Sea Turtle and Beachfront Lighting. An Interactive Workshop for Industry Professionals and Policy-Makers in Barbados.
http://www.widecast.org/Resources/Docs/Eckert_and_Horrocks_2002_Beachfront_Lighting_Workshop.pdf

2. IN THE SPOTLIGHT: An Assessment of Beachfront Lighting at Four Hotels in Barbados, with Recommendations for Reducing Threats to Sea Turtles.
http://www.widecast.org/Resources/Docs/Knowles_et_al_2009_Sea_Turtles_and_Lights_An_Assessment_of_Hotels_in_Barbados.pdf

3. Reducing Light Pollution In A Tourism-Based Economy, With Recommendations For A National Lighting Ordinance.
http://www.widecast.org/Resources/Docs/Lake_and_Eckert_2009_Sea_Turtle_Lighting_Policy_Anguilla_Case_Study.pdf

4. Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches.
http://www.widecast.org/Resources/Docs/Witherington_and_Martin_2003_Beachfront_Lighting_Manual_ENG.pdf

BEACH MANAGEMENT

In addition to the problem of beachfront lighting, there are several other issues related to coastal development and beach management.

Sand mining still occurs regularly at Turtle Beach, particularly in the area of the Black Rock heritage park. Persons engaged in this illegal activity, take advantage of the direct vehicular access to secluded areas of the beach through the park at night, on weekends and early morning when there is no recourse available to report these activities to the relevant authorities (THA DNRE).

The chronic removal of beach sand scars the terrain, accelerates erosion, and degrades or destroys stabilizing beach vegetation by extraction or saltwater inundation (Choi and Eckert 2009).

This activity if continued unchecked can lead to loss of vital beach habitats. The loss of sandy beaches not only reduces the reproductive success of sea turtles, but endangers beachfront property and has serious economic implications for locally vital industries such as fishing and tourism (Choi and Eckert 2009).

Obstructions, such as physical objects left on the beach at night (e.g., beach chairs, umbrellas, boats, fishing nets) can and do prevent sea turtles from finding suitable nesting habitat and fatally hinder hatchlings from finding their way to the sea. SOS works with the management of the Rex Turtle Beach Hotel and Magdalena Grand Beach Resort to ensure that all beach furniture and water sports equipment is removed nightly from the beach during the nesting season, so as to not hinder the nesting of female turtles or cause entrapment of hatchlings. This remains a problem on Grafton Beach.

Beach driving in recent times has become a serious problem on both Grafton and Turtle Beach, and coincides with the influx of visitors from Trinidad during the summer vacation.

Choi and Eckert (2009) states:

"…driving on beaches can seriously degrade the coastal environment by damaging beach vegetation, compacting sand, crushing incubating eggs, creating deep ruts and tire tracks that can trap hatchlings trying to reach the sea, and accelerating erosion (potentially resulting in the loss of nests to the sea). Vehicles can also strike and kill hatchlings crawling to the sea, or frighten females away from nesting. Hatchlings huddled just below the surface of the sand (waiting to emerge later in the evening, when the sun sets and the beach surface cools) are particularly vulnerable to being crushed by passing vehicles."

SOS has intervened directly and made numerous reports to the relevant authorities concerning this environmentally damaging practice, however by the time an intervention is made the damage to the nesting beach, incubating nests and hatchlings has already been done.

Harassment of nesting turtles and hatchlings on Turtle Beach and other nesting beaches continues to be a problem but with greater public awareness is on the decline. Over-eager tourists and other visitors are not always aware of appropriate turtle watching guidelines resulting in turtles being unnecessarily and inadvertently disturbed by noise, lights and camera flashes. This causes turtles to abandon nesting and retreat to the safety of the sea.

Similarly, hatchlings emerging from a nest at night are prevented from getting into the sea by beach hustlers and other unscrupulous persons who collect them and then charge tourists a fee, so that they can take pictures or

touch turtles. Many of these hatchlings die. Those that may be later rescued and released had undoubtedly had their chances of survival compromised.

The SOS patrol and volunteer presence working with enforcement agencies on nesting beaches, combined with education and awareness efforts for visitors, tour guides and hotels has helped to keep such activity to a minimum but individual incidents still occasionally occur. Greater support and communication is needed from all concerned stakeholders involved to completely eradicate this behavior.

Properly managed, moderate recreational use of nesting beaches during daylight hours probably does not pose any real threat to nesting turtles, incubating nests and hatchlings. However, large public events on Turtle Beach and to a lesser degree Grafton Beach and more recently on Mt. Irvine Back Bay seriously undermines the efforts of SOS and like-minded conservation groups to effectively conserve, protect and ensure the overall safety of sea turtles.

The use of the Black Rock Heritage Park for large scale public events during the turtle nesting season (March – September) continues to be of concern.

Since 2006, SOS has had to continuously mitigate the damage to the nesting beach adjacent to the Black Rock Heritage Park, caused by the annual Tobago Heritage Festival which coincides with the start of peak hatching season. The organisers of this event do seek guidance from both SOS and the THA DNRE on proper use of the beach and surrounding area, however during the actual event itself, there seems to be little or no control over the activities of persons participating in the event. This negates all efforts to prevent damage to the beach, incubating nests and hatchlings waiting to emerge.

In 2010 the annual Rainbow Cup Triathlon was moved from Grafton Beach to Turtle Beach at the Black Rock Heritage Park. Although Grafton Beach is also a nesting site for critically endangered sea turtles, the triathlon site there was held in an area of very low nesting density and damage to the nesting beach minimal. However the area of Turtle Beach directly adjacent to the Black Rock Heritage Park has a high density of sea turtle nests.

Organisers of both these events are given approval for use of the Black Rock Heritage Park adjacent to the nesting beach by relevant agencies for culture, tourism and natural resource management within the Tobago House Assembly.

These events are intended to attract the participation of both tourists and residents alike and probably do provide some short-term positive economic benefit. There has even been some suggestion that these events may “highlight” the plight of sea turtles in Tobago.

As stated in previous SOS reports (2008 -2013):

“…the damage caused to nesting sites, and subsequent negative effect on sea turtle conservation will lead to the loss of positive economic benefits provided by a stable nesting population of sea turtles at index beaches, and any generated by these events as well. Additionally, having such events during the peak of sea turtle nesting season on Tobago’s main nesting beach sets an unfortunate precedent in terms of acceptable ‘beach use’ and actually makes it more challenging to get buy-in from the general public on more turtle friendly behavior.”

SOS will continue to strongly advocate that large public outdoor events should be held at more suitable locations within communities adjacent to nesting beaches or at sites which have permanent facilities and

access to amenities needed and available for hosting such events year round and are better suited and equipped to do so.

Mt. Irvine Back Bay is currently accessible only to pedestrian traffic, and with the exception of any natural impacts, due to its undeveloped and secluded nature only suffers very limited damage from the above listed impacts. However the future of this untouched nesting site remains uncertain as the area adjacent to the beach has been designated for future large scale tourism development.

All of the activities mentioned above not only have a detrimental effect on sea turtle nesting but also the successful incubation and hatching of sea turtle nests on index beaches. Leatherbacks account for the majority of sea turtle activity on index beaches followed by the hawksbill. Leatherback nesting on index beaches accounts for most of this species' known recorded activity in Tobago.

Turtle Beach is a relatively large and stable beach and exhibits many of the desired characteristics that nesting leatherback turtles prefer so as to ensure a greater survival and successful hatching of nests. It has the highest known leatherback nesting density of all index and non-index beaches monitored in Tobago but subsequently only moderate hatching success. In 2012 and 2013 the measured nest and hatching success at Turtle Beach was low compared to Grafton and Mt. Irvine Back Bay (SOS Tobago 2012, 2014 and Theodorakou 2013), suggesting that external factors at this beach such as nest environment conditions (Garrett et al. 2010), which can be affected by the human related threats and other activities at Turtle Beach may be responsible. However in 2014 the leatherback nest and hatch success was found to be similar across all three beaches.

The average range for leatherback hatching success is 45 to 65% (Eckert et al. 2012). The 2014 data for Tobago gave an average hatch success of 61% ± 16% from excavated nests, but it must be cautioned that this is certainly an overestimate since only 85 were excavated and their contents documented, from an estimated 375 nests constructed.

Differences in hatching success along the length of Turtle Beach have been reported before in 2012 and 2013 (Theodorakou 2013 and SOS 2014), with a decrease when one moves from Zone 1 to Zone 4. In 2014, this change in hatch success was not observed. The hatch success for Zones 1, 2 and 3 were consistent (61%, 61% and 58% respectively), while Zone 4 was marginally lower (47%).

The threat posed by human activities to nesting turtles and their incubating nests at Turtle Beach, is cause for concern as this beach hosts a significant proportion of leatherback turtles in Tobago.

SOS along with concerned Government and community stakeholders have worked hard to reduce the illegal killing of a severely depleted sea turtle population, however we are now faced with the challenge of reducing the accidental destruction of incubating nests and killing of hatchlings that occurs as a consequence of poor beach management.

The World Wildlife Fund (WWF) states:

"Marine turtles appear to have the potential to reproduce abundantly: females can lay hundreds of eggs in one nesting season. But even under "natural" conditions, relatively few young turtles survive their first year of life …When humans harvest turtle eggs, disturb or degrade nesting beaches, the scales become tipped even more heavily against young turtles."

Hatchlings are the breeding adults of the future. It is estimated that only 1 in every 1,000 hatchlings will successfully make it to adulthood. If sea turtle nests continue to be negatively impacted on an annual basis, the resulting loss of nests and/or hatchlings combined with the natural and unnatural mortality of adult sea turtles will begin to outstrip the productivity of nesting beaches. This will lead to a declining number of nesting turtles and their eventual extinction in Tobago. It is clear that the continued and accelerated degradation and destruction of nesting habitat through recreational activities and beachfront development interferes with the vital process of sea turtle reproduction and can be expected to have serious adverse effects. These will only be further exacerbated by the rapid onset of global warming, its effects on climate change and eventual sea level rise, further destroying what little available nesting beaches remain.

If we do not address these issues of beach-use and coastal development, on both index and non-index beaches, years of community conservation efforts will be undermined and recovery of critically endangered sea turtles hindered. There is currently no mechanism in place to enforce compliance, however best practices and guidelines to minimize impacts on sea turtles, and the coastal and marine environment are well documented and available to ALL stakeholders. A manual detailing best practices for safeguarding sea turtle nesting beaches is available online via the WIDECAST website.
http://www.widecast.org/Resources/Docs/Choi_and_Eckert_2009_Safeguarding_Sea_Turtle_Nesting_Beaches.pdf

TOURISM & TURTLE WATCHING

Tourism plays a proportionately stronger role in the Caribbean region's Gross Domestic Product (GDP) and employment than in any other region of the world. For some of the smaller Caribbean economies, the proportion of GDP and employment derived from tourism can be as high as 70%.

In her contribution to the Tobago House of Assembly (THA) Budget debate in 2013, Secretary of Tourism and Transportation, Assemblyman Davidson-Celestine noted that tourism was responsible for 36.7% of Tobago's GDP and approximately 14,000 jobs (Anonymous 2013).

Tobago's tourism sector has seen a steady decline in visitor numbers, from a peak of over 85,000 international visitor arrivals in 2005, to just under 25,000 per annum in 2011 and 2012 (Tourism Development Company 2012 and Division of Tourism and Transportation 2008 – 2013). Despite the current bleak tourism outlook - compounded by the global financial crisis, recessions and slow economic recovery in many of Tobago's key visitor markets - the World Travel and Tourism Council (2014) projects small but steady increases in international visitor arrivals through 2024 and beyond.

The tourism industry, including the hospitality sector, depends strongly on healthy ecosystems, because those ecosystems - and the wildlife, habitats, landscapes and natural attractions that comprise them - are often the very thing that draws tourists to the destination in the first place (IUCN 2012b). Eco-tourism represents one of the fastest growing segments in the local tourism sector and is receiving more official attention, capitalizing on the country's rich biodiversity. This is evident by numerous images depicting scenes of natural settings and biodiversity (including sea turtles) in various marketing tools used by the Ministry of Tourism, the THA Division of Tourism and the Tourism Development Company.

In an exit survey conducted by the World Resources Institute in 2003, 40% of visitors found eco-tourism to be a significant factor in influencing their decision to visit Tobago (Burke et al. 2008). According to this study, tourist spending on reef recreation and other related expenditures is estimated at US$43.5 million for Tobago.

The most visible local community activity in the tourism process in Trinidad and Tobago is the protection of sea turtles and nesting beaches (Shand 2001). Tours to view the large, charismatic Leatherback turtles are common during the peak of the nesting season (May-July) in both Trinidad and Tobago. Tourists and residents alike visit nesting beaches at night to watch a 1000-pound female turtle haul herself up the beach, excavate a nest, lay over 100+ eggs, and finally find the energy to cover the nest and return to sea.

In Tobago, as many as 100 tourists per night, typically pay USD 25.00 – 40.00 (TTD 160.00 – 256.00) each, per tour, although the price can be much higher (Burke et al. 2008; Troëng and Drews 2004). Tourists do not pay specifically to view sea turtles during diving and snorkeling trips but seeing turtles surely adds value in the form of consumer surplus (Burke et al. 2008.) Current research being conducted at the University of the West Indies (Cazabon-Mannette/ UWI) is focused on divers' willingness to pay to view sea turtles, and seeks to infer the added value from seeing one or more turtles during a dive trip.

Burke et al (2008) states:

"If turtle viewing is common and is advertised, trip fees could be increased to capture this added value - which, with an estimated 10,000 divers and over 170,000 snorkel trips in Tobago (in 2006), could prove to be significant."

Turtle watching continues to be a popular activity among resident and foreign visitors alike, and provides significant financial benefit to tour operators and guides who offer turtle watching tours. Offered primarily to non-resident visitors, tours range in price from **USD 25.00 - USD 40.00 per person**. These tours operate at low cost, with most of the revenue being collected as profit, providing important and valuable income as it comes during the relatively slow tourist season of May-October (Burke et al. 2008).

Based on the number of non-resident visitors recorded turtle watching at index beaches in 2014 (3,366), this represents an estimated value ranging from **USD 84,150.00 – USD 134,640.00 (TTD 532,670.00 – TTD 852,271.00)** in potential revenue from turtle watching on index beaches that form part of the SOS nesting beach monitoring programme. Furthermore, an additional 1574 persons were recorded watching turtle hatching events (66% increase from 2013), and this may represent an additional potential source of revenue.

The presence of nesting and foraging turtles increases Tobago's ability to attract visitors and brings added value since many of these visitors also utilize accommodation, craft, entertainment, food, taxis, car rental, and other services from local communities, hotels, villas, guest houses and associated businesses adjacent to turtle nesting beaches, and throughout Tobago. In 2014 SOS, its partners and volunteers contributed **USD 27,568 (TTD 176,435.00)** directly to the local economy and communities directly adjacent to index beaches in the Courland Bay area.

NGOs and community groups play a critical role in advocating eco-tourism in T&T. Conservation groups such as SOS Tobago, Nature Seekers and others patrol and protect turtles and their nesting beaches. The Turtle Village Trust and its local community partners also lobby for the conservation of sea turtles, their coastal and marine habitats as a basis for sustainable eco-tourism and community development in Trinidad and Tobago.

Visitor feedback is much more positive when persons feel that they have witnessed or have been a part of an actual conservation effort rather than a mere "tour" with many people signing up to 'adopt a turtle' so as to be kept abreast of local conservation efforts even after they return to their home countries.

The tourism sector also has a vital role to play in contributing to sustainable eco-tourism. Hotel and resort planners and governmental agencies should consider the dynamics of ecosystems, their services and interconnectivity when developing new hotels and resorts, and take into account the impacts that the development(s) could have on all components of the ecosystems concerned (IUCN 2012b). There is also a need for some mechanism to ensure that existing hotels and resorts are compliant with new regulations that may arise as a consequence of new developments.

Until recently, sea turtles were once the object of both consumptive (hunting) and non-consumptive (viewing) human use in Trinidad and Tobago. Each type of use generated revenue within the local economy, but the two types had differing implications for future sea turtle populations, and therefore future use. A compilation of studies on consumptive and non-consumptive use of sea turtles in developing countries suggests that revenues from tourism (turtle watching, diving, snorkeling etc.) are usually much higher than those from consumption (harvesting, poaching etc.), and that the benefits have a wider distribution (Burke et al. 2008) throughout communities and the local economy. Therefore, the true direct and indirect economic benefits derived from turtle watching and other forms of non-consumptive use in both Trinidad and Tobago are undoubtedly an underestimate and far greater than any economic benefit derived from the harvest and sale of sea turtles and their products.

Sea turtles have the potential to contribute positively to satisfying human needs. Their conservation has already been shown to play a pivotal role in community development and similar positive gains can be made in the local tourism sector. Many villages, such as those at Buccoo, Bloody Bay, Castara, Charlotteville, Parlatuvier and Speyside could benefit from sea turtles as community-managed visitor attractions in conjunction with a properly managed monitoring programme, generating income for communities and community based projects, and greatly improving the tourism outlook for Tobago and the survival of critically endangered sea turtles.

RECOMMENDATIONS

In terms of policy and strategy for sustainable use, SOS sees one its core roles as advocating for policies that are mutually beneficial to sea turtles, the environment, communities and private sector stakeholders.

While we can only make recommendations, as mentioned in previous SOS reports (2008 -2013), we reiterate that the following guidelines be taken into consideration and implemented with the collaboration of ALL stakeholders.

- Implementation and enforcement of legislation for the conservation and management of sea turtles in T&T.

- An update of guidelines and/or legislation with regard to beachfront development leading to a comprehensive policy on coastal zone management by the GORTT and in particular as it relates to coastal and marine habitats as important sites of reproduction for critically endangered sea turtles and other forms of marine life.

- Designation of the most active nesting beaches in Tobago as prohibited areas during hours of darkness for the duration of the sea turtle nesting season and support given for a continued permanent community patrol presence, as has already been done on beaches in Trinidad (e.g. Grande Riviere, Matura.).

- Mt. Irvine Back Bay be left in its current undeveloped state and be designated an area of special scientific and natural heritage interest.

- Halt of all large outdoor public events on the most critical or sensitive turtle nesting beaches, in particular Turtle Beach, during the nesting season and that suitable facilities be provided for the hosting of these events.

- Organisers of smaller outdoor recreational activities, such as weddings and other gatherings that require infrastructure (tents, DJ music etc.), be required to apply for relevant permission from DNRE or EMA. Where these events are to take place adjacent to nesting beaches, we recommend these activities are limited to daylight or early evening hours (no later than 7 p.m.) on sea turtle nesting beaches, so as to not disturb nesting and hatchling turtles.

- Enforcement of Anti-Litter Laws along with the placement of sufficient garbage bins and regular collection of garbage on ALL beaches and coastal areas used recreationally by the public.

- ALL private and community stakeholders should ensure the removal of obstructions and or equipment (beach chairs, waters ports equipment, fishing nets) from nesting beaches at night during the sea turtle nesting season.

- A public ban on driving on ALL beaches in T&T and block vehicular access points to beaches – with the exception of emergency response and/or essential services (debris clearing, flood alleviation, ambulance, armed services etc.).

- GORTT and THA tourism agencies charged with marketing T&T as a tourism destination should not only highlight the natural wonders of the country but also include and supply information on environmental best practices and guidelines to tour operators and potential visitors before they arrive.

- Certification of Tour Operators and Tour Guides updated to include guidelines on how to conduct Turtle Tours that do not disturb nesting or hatchling turtles, instead of this just being an optional "add-on" to the basic training.

- Tour Operators and Tour Guides should provide the necessary information to their guests and visitors about how to behave on nesting beaches.

- The solutions that require the least amount of manipulation of sea turtles and their natural behaviour are certain to be the most successful and the most cost effective.

A full list of detailed and comprehensive solutions can be found within the National Sea Turtle Recovery Action Plan for the Republic of Trinidad and Tobago (Forestry Division et al. 2010).

CONCLUSION

Sea turtles have been living and thriving in the world's oceans for over 100 million years, but they are now in danger of extinction largely because of changes brought about by the actions of human beings.

Historically the minimum protective legislation provided by the GORTT and associated agencies, have negatively affected the long term survival of sea turtles that nest or inhabit the territorial waters of T&T. Positive steps have recently been taken by the GORTT to outlaw the harvest of sea turtles for consumption - a long standing tradition in T&T. However, the rampant illegal harvest (poaching) on nesting beaches and at sea in Tobago continues, and will continue to have an adverse effect on the local nesting and foraging aggregations, as well as those in other regional territories due to their migratory nature.

With the help and collaboration of DNRE, Turtle Village Trust and SOS, new community patrol efforts were launched in 2014 with 5 new groups participating in training activities with SOS and NEST This increased coverage of nesting beaches around the island will further deter poachers who target nesting turtles

The perceived unwillingness of many hotel and resort planners and governmental agencies to consider sea turtles during development and operation of new and existing hotel and resort facilities also continues to place pressure on an already endangered species population. The combination of poorly managed beachfront lighting and the use of beaches for large public events are a considerable threat to nesting turtles, incubating nests and hatchlings.

Over the past several decades community conservation efforts in partnership with various stakeholders, have slowed the steady march towards extinction which sea turtles now face. These efforts by a relatively small group of T&T's society have contributed directly to community development, balancing human needs while highlighting the many positive social, economic and ecological benefits of conserving critically endangered sea turtles as a natural living resource.

There needs to be a conscious move away from our present culture where natural resources are used in a manner that impacts the environment negatively while benefiting a select few within our society, to one that promotes good stewardship and positive benefits for our communities, the environment, and equity for ALL.

Governmental agencies (that hold the overall responsibility for natural resource management), the private sector and the general public ALL need to share this responsibility and lend support for community conservation efforts, particularly where these activities result in positive returns for ALL stakeholders.

Numerous factors continue to affect turtles at all stages of their life-history, but effectively ensuring the conservation of sea turtles, their coastal and marine habitat is certainly within our reach with the collaboration of all these stakeholders.

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APPENDIX A - TURTLE WATCHING GUIDELINES

1. Use of flashlights should be kept to a minimum, and only used when necessary, as these can scare off turtles emerging from the water and disorient nesting females and hatchlings.

2. Flashlights should preferably be equipped with a red photographic filter or red L.E.D. bulbs and only be used to highlight the laying process. Never shine a flashlight at or on a turtle's head.

3. As soon as a turtle has been sighted, quietly and slowly retreat to a distance of 15m (45 feet).

4. Be sure to stay behind the turtle at all times.

5. When a turtle has stopped digging, the SOS patrol, game warden, hotel security or trained guide will determine if the laying process has begun by approaching the turtle from behind.

6. During the laying process, SOS patrollers, game warden, hotel security or trained guide may record size, tag and observe the well being of turtle, and occasionally, if the situation permits, allow small groups of people to observe the laying process.

7. Groups should consist of no more than 10 - 15 persons at a time.

8. Flash photography is not permitted at anytime during the nesting process.

9. Be very careful where you walk when hatchlings are around - they are difficult to see at night and can be easily crushed.

10. If hatchlings are found, never place directly into the sea as this interferes with their natural imprinting process.

11. Never drive or use heavy equipment on nesting beaches as these may crush nests or prevent hatchlings from digging their way to the surface through nest compaction.

12. Remove any obstructions (sand castles, beach chairs, nets etc.) on the beach as these can prevent turtles from nesting and hatchlings from reaching the sea.

For full details of turtle watching guidelines or what to do in an emergency, please refer to the Sea Turtle Manual for Nesting Beach Hotels, Staff, Security and Tour Guides (Clovis, T. 2005). http://www.widecast.org/Resources/Docs/Clovis_2005_Tobago_Hotel_Turtle_Manual.pdf

APPENDIX B - SOS NESTING EVENT DATA SHEET

Female Seen by Patrol (circle one) YES NO

Date _____ Time Seen _____ Time Out _____

Species (circle one) LBK HWK GRN Other species (please specify) _____

Location (circle one) TB GR BB Other beach (please specify) _____

Zone (circle one) 1 2 3 4 GPS: N 11. W 60.

Landmark (please specify) _____

Weather (circle one) Clear Overcast Rain Stormy Unknown

Activity (circle one) Approach Body Pitting Digging Laying Covering

Camouflaging Leaving Gone Unknown Dead

Outcome (circle one) Confirmed Lay Estimated Lay False Crawl

False Crawl with Body Pit Poaching Dead Stranding Unknown

TAGS & MEASUREMENTS

Left Flipper Tag _____ NEW OLD

Left Flipper Tag _____ NEW OLD

Right Flipper Tag _____ NEW OLD

Right Flipper Tag _____ NEW OLD

PIT Tag _____ NEW OLD

PIT Tag _____ NEW OLD

CCL (N-N) (cm) _____ CCL (N-T) (CM) _____ CCW (cm) _____

Does carapace damage affect measurement? YES NO

NOTES (Injuries/ Parasites/ other)

OBSERVERS (Please print name in BLOCK LETTERS)

Head Patroller _____

Volunteers _____

_____

_____

_____

Tourists _____ Residents _____

Nest Relocation Date _____

Time collected _____

Time reburied _____

Location Name _____

Zone _____

Egg Count _____

GPS: N 11. W 60.

Turtle Disturbed by Lights (circle one) YES NO **Turtle Disturbed by People** (circle one) YES NO

APPENDIX C - SOS HATCHING EVENT DATA SHEET

Date Emerged | Time Emerged

Date Excavated | Time Excavated | Nest depth (cm)

Species (circle one) LBK HWK GRN Other species (please specify) _____

Location (circle one) TB GR BB Other beach (please specify) _____

Zone (circle one) 1 2 3 4 GPS: N 11. W 60.

Nesting Female Tags | Original Nest Date

Weather (circle one) Clear Overcast Rain Stormy Unknown

No. # Hatchlings

Dead in | Alive in

Dead out | Alive out

Total

Hatchlings Released

Date Released

Time Released

Released

Location

Nest Contents

Shells		Albino	
Pipped Dead		Predated	
Pipped Alive		Maggots/ Beetles	
Unpipped Dead		Fungus	
Unpipped Alive		Bacteria	
Undev/ Embryo		Yolkless	
Mid		Unknown	
Full		**TOTAL**	
Twins			

OBSERVERS

Head Patroller

Volunteers

Tourists | Residents

Hatchlings Disoriented by Lights (circle one)

YES NO

Notes/ Comments

Measurements

#	SCL	SCW	DPTH	WGHT
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

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