Research and Monitoring of Bonaire's Sea Turtles:

2013 Technical Report

Report prepared by Seth Stapleton Ph.D, Mabel Nava MSc., Sue Willis Ph.D, Nathaniel Miller M.A. & Bruce Brabec

To learn more, please contact:
Sea Turtle Conservation Bonaire
Mabel Nava, Manager
stcb@bonaireturtles.org
Phone: (+599) 717-2225
Turtle hotline: (+599) 780-0433
PO Box 492
Kralendijk, Bonaire
Dutch Caribbean

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Executive Summary

Sea Turtle Conservation Bonaire (STCB) was initiated in the early 1990s to protect the island's marine turtle populations. Our current research and monitoring efforts, which were standardized more than a decade ago, include monitoring important nesting beaches around Bonaire, conducting intensive in-water netting and snorkel surveys (capture-mark-recapture), and tracking post-breeding turtle migration using satellite telemetry. These techniques provide us with a better understanding of Bonaire sea turtles' breeding success, abundance, health, residency duration, habitat quality, growth rates, migratory paths, distant feeding grounds, and threats.

During the 2013 season, we observed 77 nests at our index beach on Klein Bonaire. Total hawksbill (54) and loggerhead (23) nests documented there were similar to numbers observed during recent years. Across Bonaire and Klein Bonaire, we observed four species crawling 231 times, including 126 confirmed or suspected nests. Because our coverage of the island was not complete and weather conditions can quickly obscure crawls, these nation-wide figures represent the minimum number of crawls and nests that occurred on Bonaire and Klein Bonaire during 2013. As in previous years, nesting activities peaked during June through August. Thirty-four green turtle nests and a single leatherback nest were recorded in northeastern Bonaire, whereas hawksbills and loggerheads primarily nested on Klein Bonaire and beaches of southern Bonaire.

We observed green turtles and hawksbills along the west coast of Bonaire, around Klein Bonaire, and adjacent to Lac during snorkel surveys. Green turtle sightings were particularly high near Lac, and netting surveys also suggested large aggregations of green turtles in shallow, sea grass foraging sites of Lac. Green turtles documented there were larger than individuals reported elsewhere in Bonaire.

Five green turtles tagged in 2003 and 2006 were reported in Nicaragua's sea turtle harvest, valuable data about sea turtle movements which complement our satellite tracking program. Unfortunately, incidences of fibropapillomatosis among green turtles were more widespread in 2013 than recent seasons.

In 2013, we tracked a post-nesting female hawksbill turtle using satellite telemetry from Bonaire to Honduras over a period of 85 days. The turtle passed through six national territorial waters, swimming over 5,000 km (3,000 mi) to reach a general area proven to be important foraging grounds for Bonaire breeding turtles.

We also outfitted a hawksbill with a datalogger to gather information on hawksbill habitat use and behaviors. The device, which collects GPS locations and depth information, was

retrieved in July, 2013. Preliminary results are consistent with previously deployed dataloggers, indicating regular movements in and out of Lac Bay.

Sadly, we recorded 18 turtles stranded during 2013, 12 of which were found dead or had to be euthanized.

We will be undertaking several new research initiatives in the year ahead, including using our tagging data to estimate the total population of sea turtles using Bonaire's waters (which will help to inform management policy) and to estimate the tremendous growth rates of green turtles in Lac, as well as reviewing our monitoring program to ensure that protocols are as efficient as possible.

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Background

Twenty-three years ago, STCB began monitoring the status of and threats to Bonaire's sea turtles, using the resulting knowledge to protect them. Comprehensive local laws, as well as international treaties, now protect sea turtles, their nests, and eggs from harvest and harassment. The community and tourism industry generally understand the importance of sea turtles to a healthy ecosystem and their value to an economy centered on dive tourism. And it is a rare resident or guest who is not captivated by encounters with these beautiful and threatened species.

In 2014, the conservation landscape has changed. Today, the most serious threats to Bonaire's sea turtles are not direct threats like poaching, or lack of support for sea turtle protection. Now the main threats are indirect; related to a rapidly increasing human population and the development that goes along with it. These indirect threats to sea turtles are also the major threats to Bonaire's rich ecosystems, biodiversity, and our own quality of life.

In this landscape, we no longer look at sea turtle conservation as a thing apart from society. To ensure a secure future for Bonaire's sea turtles, we must address the issues that threaten sea turtles, biodiversity and social well-being, because they are inter-related. Sea turtles can thrive only when their ecosystems are healthy and the human community thrives.

Conservation and applied research remain the core work of STCB, as is clear from our mission. Our work spans education and outreach, policy, and research and conservation. This technical report summarizes STCB's scientific findings from the 2013 season. STCB's research program is designed to better understand Bonaire's nesting and foraging populations, to contribute to the body of scientific knowledge in the greater Caribbean region, and to inform sound management policies on national and regional scales. Our work includes regular foot patrols of important nesting beaches to assess the volume of nesting activities, post-hatch nest excavations to estimate how many hatchlings are released from Bonaire's beaches annually, and extensive snorkel and netting surveys of key sea turtle foraging grounds.

Nesting Beach Surveys

Monitoring Bonaire's nesting beaches is an integral component of our research program. As in previous years, No Name Beach on Klein Bonaire served as the index beach for evaluating trends in abundance and species composition. We patrolled this beach at least three mornings per week, beginning in late April and continuing through November. During patrols, we documented all crawls, identified species, and recorded the outcome as a false crawl (unsuccessful nesting attempt; no eggs were laid), confirmed nest (eggs were sighted), or suspected nest (eggs were not observed, but site disturbance suggested that a nest was laid). We recorded 54 and 23 total (i.e., confirmed and suspected) hawksbill and loggerhead nests, respectively, on No Name Beach. The volume of nesting for both species was consistent with levels observed during 2012 (Figure 1).

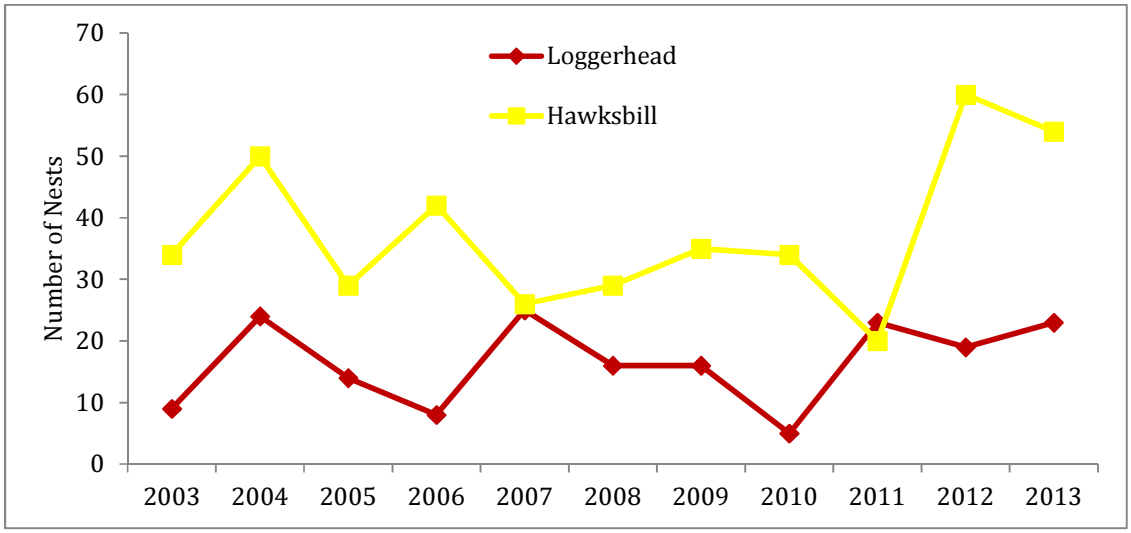

Figure 1. Historical nesting trends of loggerheads and hawksbills at No Name Beach on Klein Bonaire, which serves as the index site for nesting activities. Number of nests includes confirmed and suspected nests.

Although 2013 represents STCB's 11th year of intensive and standardized monitoring on Klein Bonaire, this is a relatively short time period from which to assess trends in our nesting populations. For example, sea turtles likely do not reach maturity for more than a decade. As such, turtles that hatched from Bonaire's beaches when monitoring was initiated in 2003 and 2004 will probably only return to nest in Bonaire in several years. Additionally, we note that because Bonaire's nesting populations are relatively small, significant fluctuations in nesting numbers between years are expected. Continued monitoring will enable us to better understand long-term trends and realize the impacts of our conservation efforts.

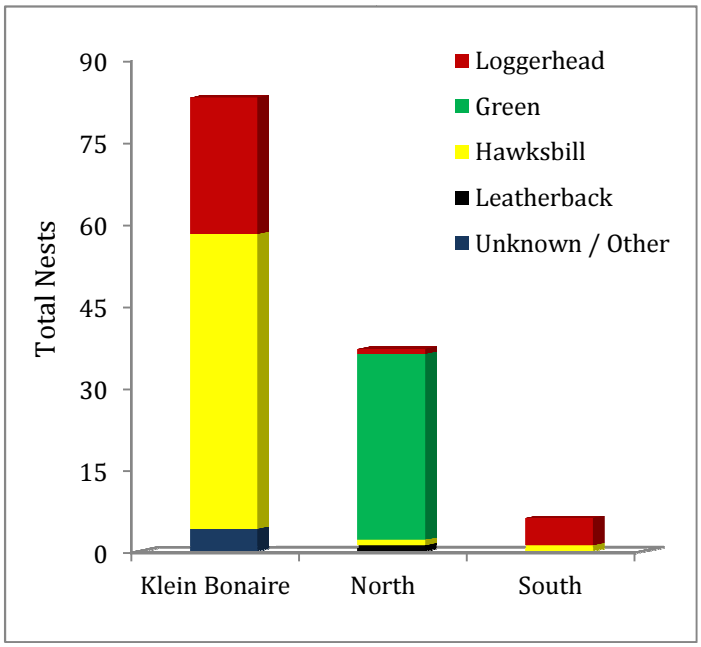

Figure 2. Total nests, categorized by geographic region, recorded during the 2013 research season. "North" and "South" denote general regions of mainland Bonaire.

Species composition differed significantly by site (Figures 2 and 3). Most loggerhead and virtually all hawksbill nesting occurred on Klein Bonaire, although both species also were observed nesting on mainland Bonaire. Green turtles, however, nested exclusively on Playa Chikitu in northeastern Bonaire. We also observed a single leatherback nest on Playa Chikitu.

On Klein Bonaire, hawksbill nesting was distributed across most of No Name Beach, whereas loggerhead nesting was concentrated in a 1 km stretch along the west-central portion of the beach (Figure 4). The far western reach of No Name Beach provides less suitable nesting habitat and was not used by either species.

Figure 3. Distribution of nests laid by green turtles (green), loggerheads (red), hawskbills (yellow), leatherbacks (black), and unknown species (blue) on Bonaire and Klein Bonaire during the 2013 research season.

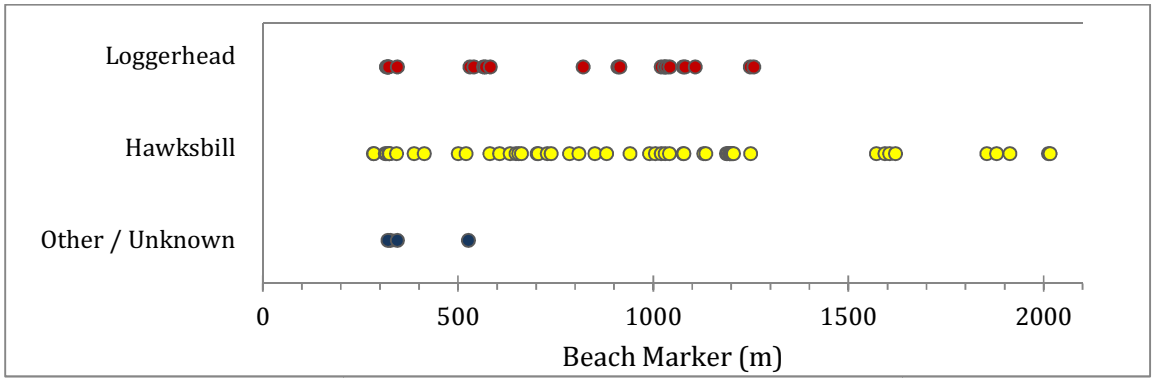

Figure 4. Distribution of nests laid at No Name Beach on Klein Bonaire during the 2013 season.

Total sea turtle nesting activities peaked during June – August (Figure 5). Nesting was first observed on Klein Bonaire during late April and continued through mid-November. Loggerheads nested relatively consistently during May – mid-August. Conversely, hawksbill activities peaked during June – August, although crawls were recorded from May – November. Green turtles exhibited a more defined nesting peak in July and August. Seasonality recorded in Bonaire during 2013 was consistent with nesting activities recorded in other regions of the Caribbean.

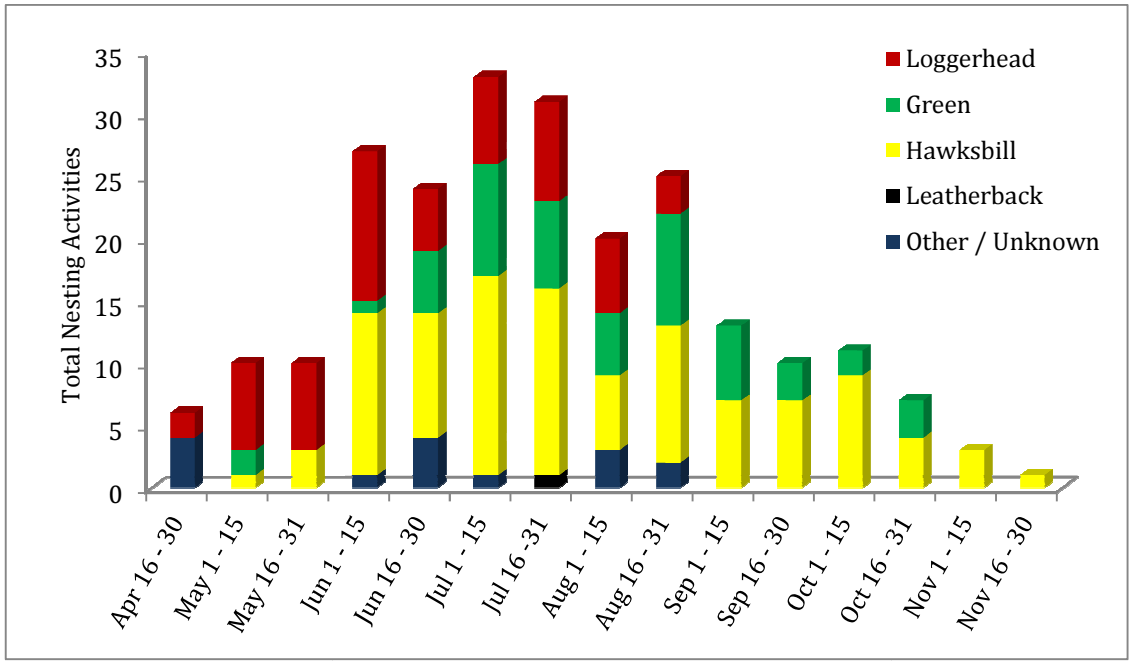

Figure 5. Seasonality of total nesting activities (nests and false crawls) recorded on Bonaire and Klein Bonaire during the 2013 research season, including nesting by a hybrid (loggerhead – hawksbill).

Evaluating reproductive success is another core element of our monitoring program. Estimated clutch sizes (number of eggs / nest) varied by species [loggerhead (mean: 119; Standard Deviation: 16.8); hawksbill (mean: 148; SD: 26); green (mean: 112; SD: 26.3); Figure 6]. Hatch success, defined as the percentage of total eggs per clutch that successfully hatch, was similar for all species with adequate sample sizes (loggerhead mean: 87%; hawksbill mean: 78%; green mean: 85%; Figure 7). Based on these data, we estimate that a total of about 9,335 turtles hatched from Klein Bonaire during 2013, including >2,700 loggerheads,>6,000 hawksbills, and about 450 hatchlings of unknown species. We also estimate that >3,800 turtles hatched on mainland Bonaire. We note that there was at least one infertile turtle, likely the loggerhead-hawksbill hybrid, nesting on Klein Bonaire in 2013, which reduced hatch success and per capita reproductive output.

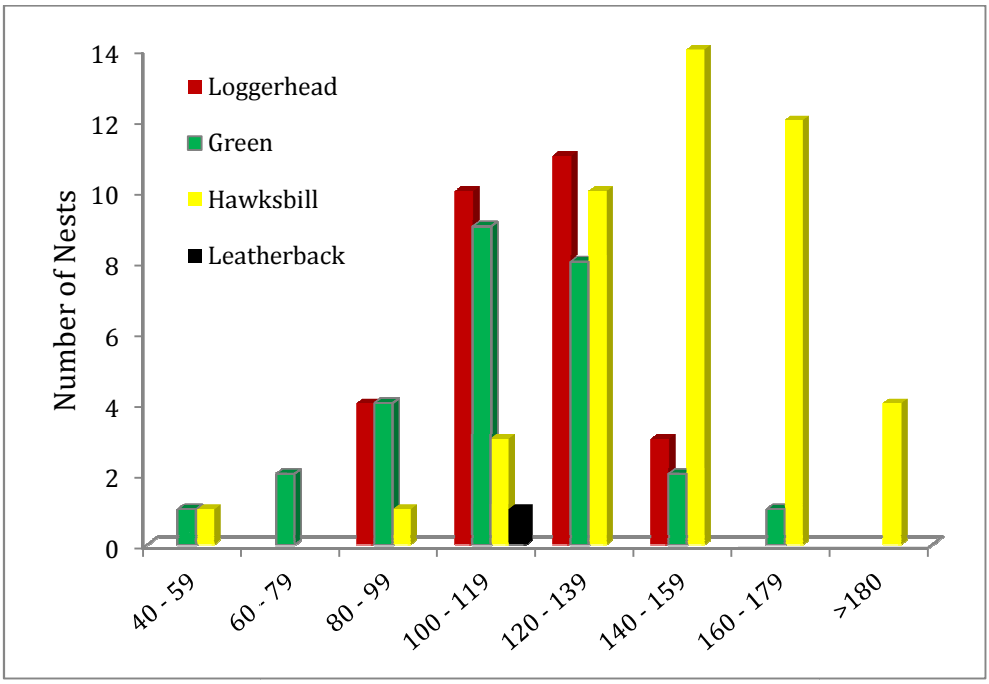

Figure 6. Clutch sizes of loggerhead, hawksbill, green, and leatherback nests recorded on Bonaire and Klein Bonaire during the 2013 research season.

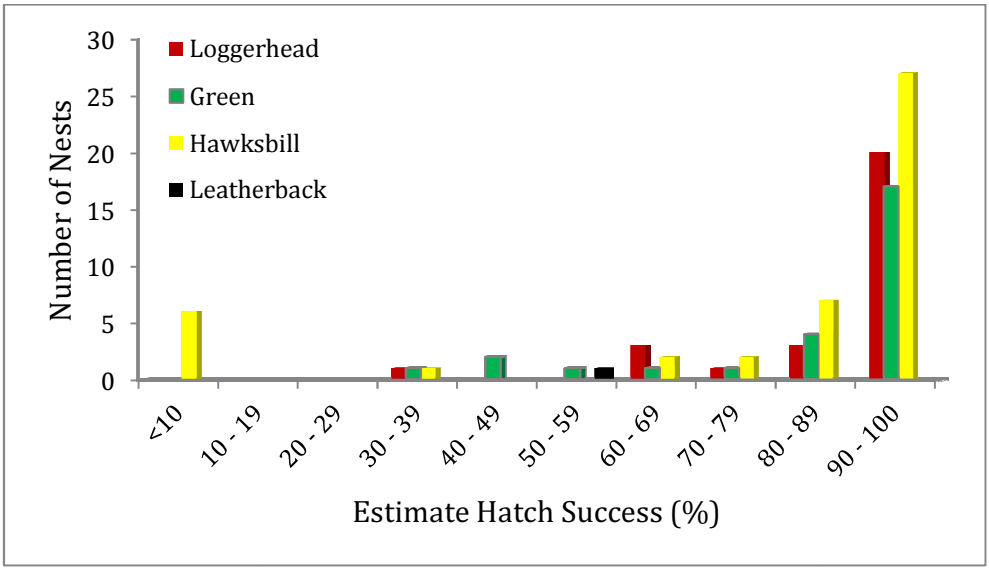

Figure 7. Estimated hatch success of loggerhead, hawksbill, green, and leatherback nests recorded on Bonaire and Klein Bonaire during the 2013 research season.

Foraging Ground Surveys

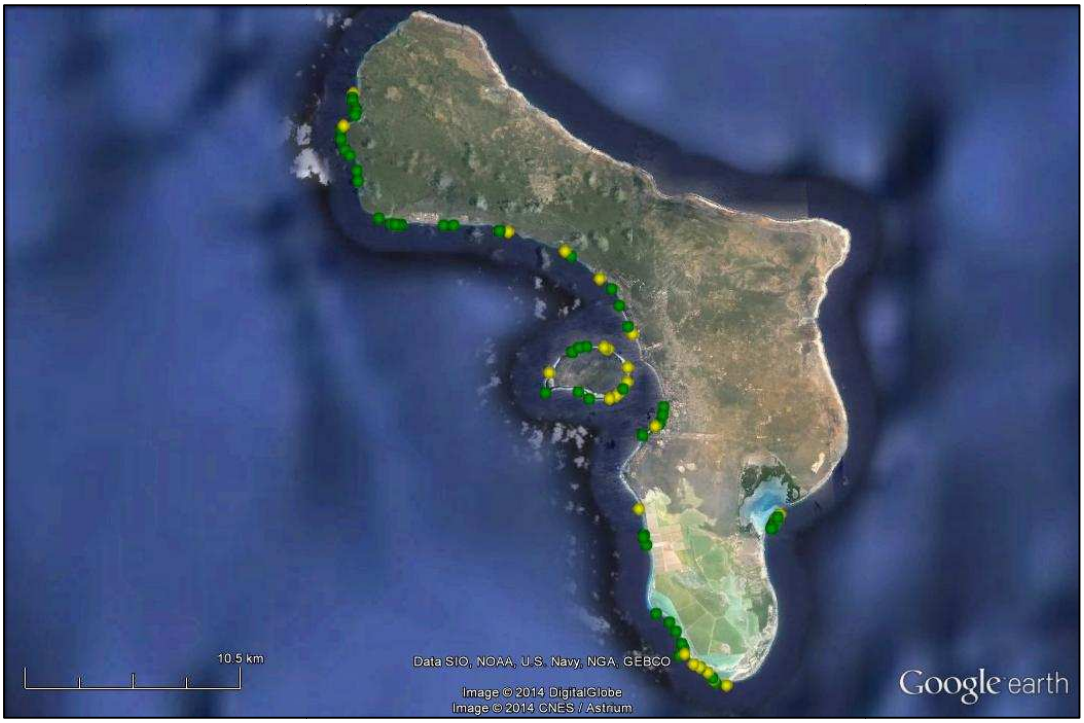

Figure 8. Green turtles (green) and hawksbills (yellow) tagged during snorkel surveys.

Although sea turtles spend virtually all of their lives in the oceans, most of what we know about them is based upon studies of nesting females and their eggs: researching sea turtles in the water can be very difficult, and in general, turtles are much more accessible on nesting beaches. However, STCB continues to operate a rigorous in-water research program to provide a more comprehensive picture of Bonaire's sea turtles.

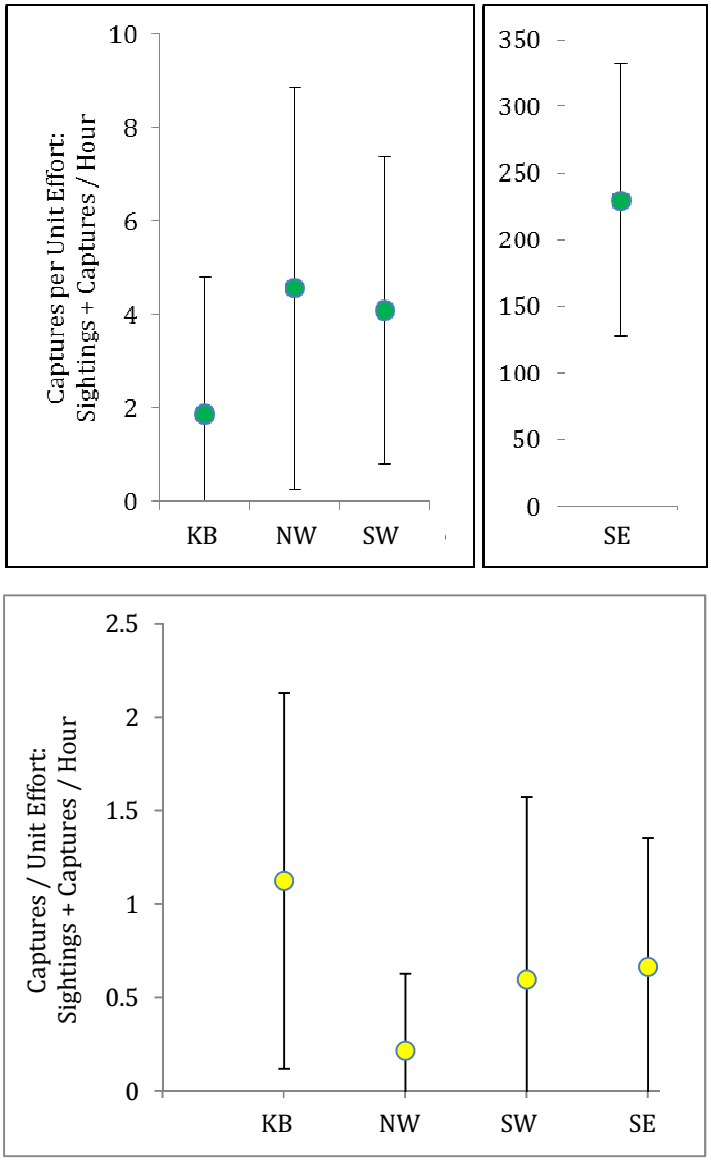

Figure 9. Captures per unit effort (total sightings and captures ± standard deviation) recorded during snorkel surveys for green turtles (green) and hawksbill turtles (yellow) in 2013, categorized by geographic region. KB: Klein Bonaire; NW: Northwestern Bonaire; SW: Southwestern Bonaire; SE: Southeastern Bonaire, outside Lac.

We conduct in-water research (capture-mark-recapture) with two techniques. First, we complete snorkel surveys extending along the entire west coast, around Klein Bonaire, and adjacent to Lac (Figure 8). During 2013, most snorkel surveys were completed during February – May, although additional transects were sampled in July and November. We sighted and captured green turtles throughout the sampled areas; similar to previous years, the highest concentrations of green turtles were recorded outside Lac (Figures 8, 9 and 10). A truly remarkable number of green turtles reside near the reefs bordering Lac. Although observed densities were much lower, hawksbills were widespread across Bonaire as well.

Netting, the second method we use to survey turtles in the water, is focused in Lac (Figure 10), although we also initiated less intensive netting in Lagoen in 2013. We concentrated our netting efforts in the north-central portion of Lac to improve capture rates. However, we also sampled other sites in Lac to

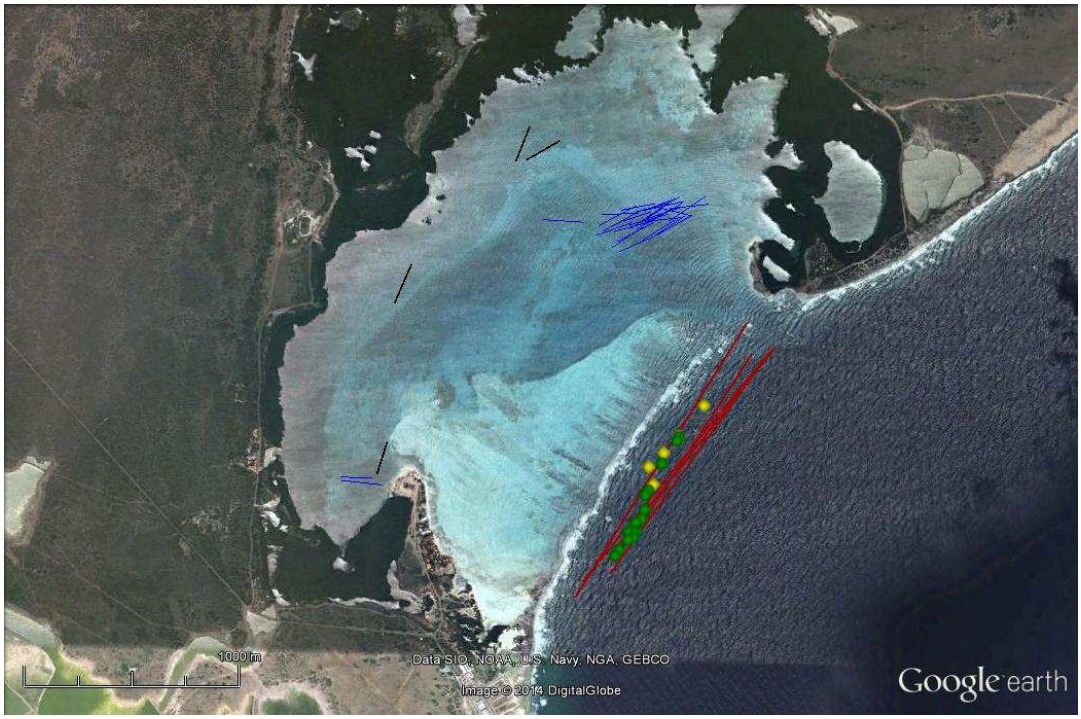

Figure 10. Locations of net sets (blue lines) at Lac in southeastern Bonaire to capture juvenile green and hawksbill turtles during the 2013 research season. Green turtles and hawksbills captured during snorkel surveys are indicated in green and yellow, respectively. Snorkel survey transects and Hawksbill Project (see *Hawksbill Project* below) net sets are denoted with red and black lines, respectively.

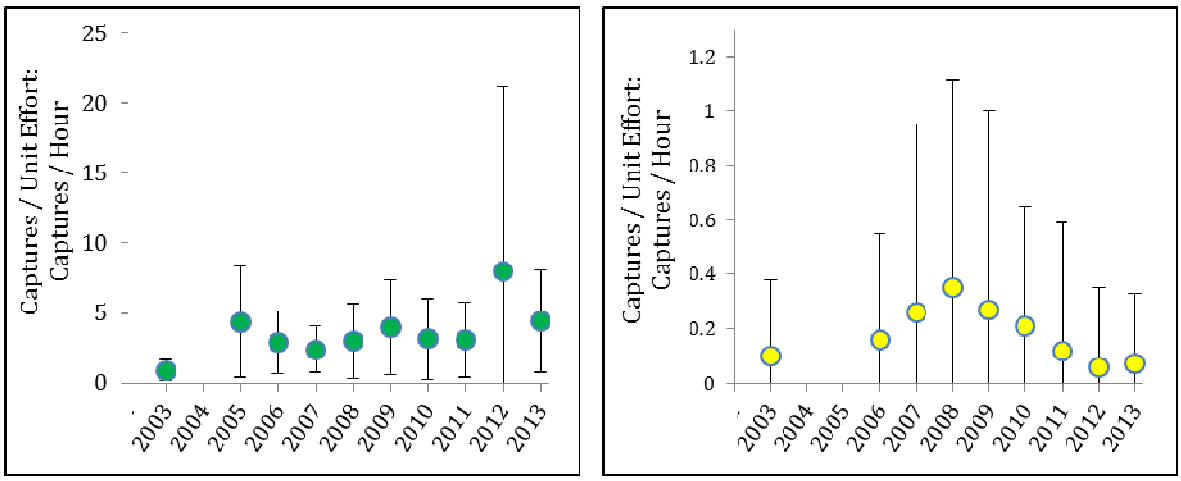

Figure 11. Captures per unit effort (total captures per hour ± standard deviation) recorded during net surveys for green turtles (green) and hawksbills (yellow) conducted at Lac in southeastern Bonaire, 2003 – 2013.

increase the probability of capturing hawksbills and to ensure that our sampling reflected the entire region. Similar to recent years, we documented much higher rates of capture for green turtles than hawksbills (Figure 11). Captures per unit effort for green turtles in 2013 were somewhat less than 2012, but this could be attributable to variability in the timing of our sampling. In 2012, we did not conduct net surveys in consecutive weeks, whereas we did sample in consecutive weeks during 2013.

As we have documented in previous years, green turtles captured in and near Lac were significantly larger than those captured in other regions of Bonaire during 2013 (Figure 12). We hypothesize that the foraging conditions in Lac provide an environment conducive to rapid growth, and our recapture data of green turtles suggest that they travel to Lac from elsewhere around Bonaire, but typically do not emigrate from Lac to other sites in Bonaire. Conversely, hawksbills observed in and adjacent to Lac were more similar in size to those observed elsewhere.

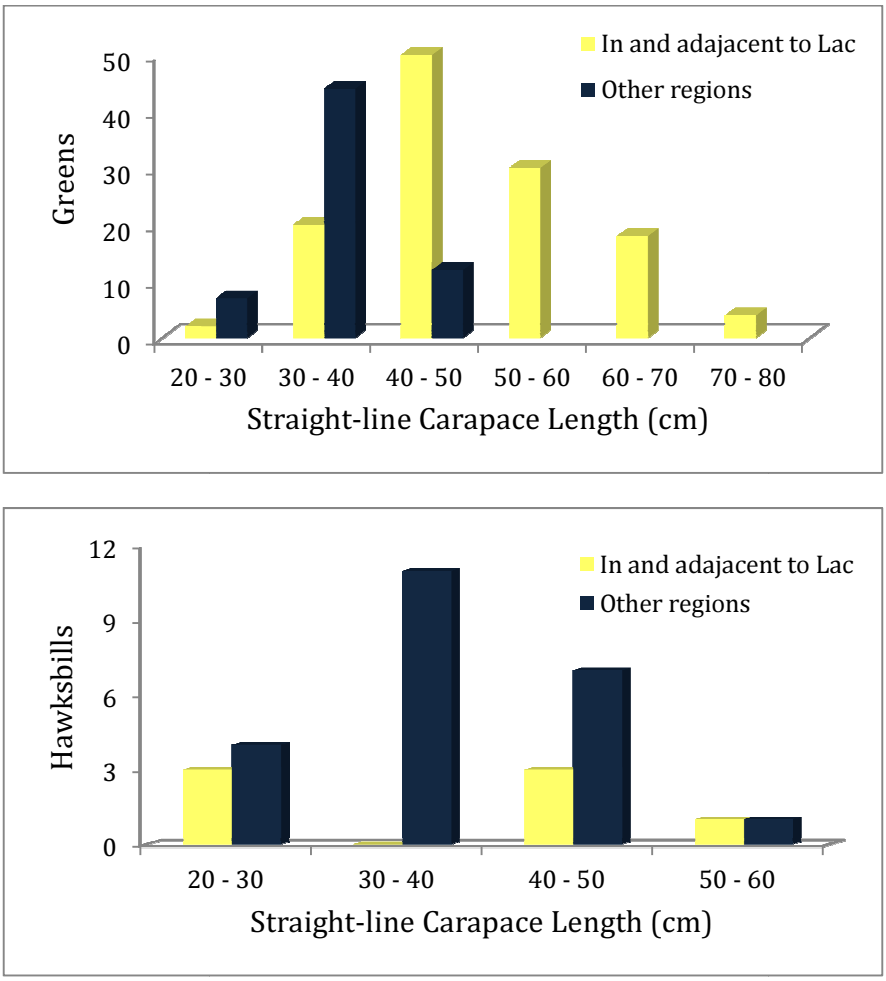

Figure 12. Size classes of green and hawksbill turtles captured in and around Lac in comparison to other locations around Bonaire and Klein Bonaire during the 2013 research season.

Prevalence of Disease

Fibropapillomatosis (FP) is a disease that primarily afflicts green turtles, characterized by tumors concentrated around soft skin tissues, the eyes, and the base of flippers. The tumors interfere with daily functions and eventually may result in death. During 2013, the proportion of green turtles captured in and near Lac with FP tumors reached nearly 30%, continuing a 3-year pattern of increasing prevalence (Figure 13). We hypothesize that the presence of the disease, which is transmitted among turtles, may be related to increased densities of green turtles around Bonaire, among other factors.

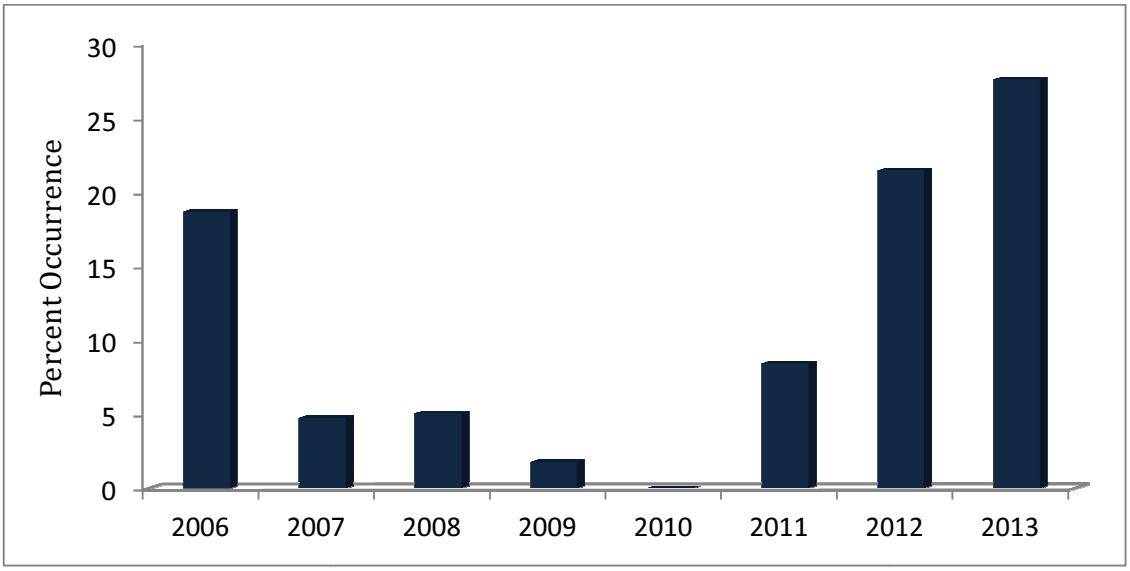

Figure 13. Occurrence of visible fibropapilloma tumors on green turtles captured in and near Lac, Bonaire during 2006 – 2013.

International Tag Returns

Tagging turtles allows us to track individuals over time, yielding valuable information about growth, population size, and residency in specific regions. Tagging also provides a means for researchers and fishermen elsewhere in the Caribbean to identify turtles when they are captured or observed. Sharing these data helps us to better understand where our foraging and nesting populations travel after leaving Bonaire.

Between September, 2012 and November, 2013, we received reports of five green turtles initially tagged in Bonaire that were subsequently harvested in Nicaragua. Two of these individuals were first tagged during 2003, and three were initially tagged during 2006. Carapace lengths at initial capture varied from ~40 cm to ~70 cm. Such tag returns, combined with the detailed information provided by our satellite tracking program,

improve our understanding of the regional movements of sea turtles. These data also highlight the need for continued international collaboration to ensure wise and sustainable management policies and conservation practices.

Satellite Tracking

In 2003, STCB launched a satellite-tracking program to identify the migratory pathways and foraging locations of Bonaire adult marine turtles. By attaching satellite transmitters to the carapaces of adult turtles, we are able to learn where Bonaire's breeding population reside and forage and how they travel to get there, deepening our understanding of our turtles and their potential threats.

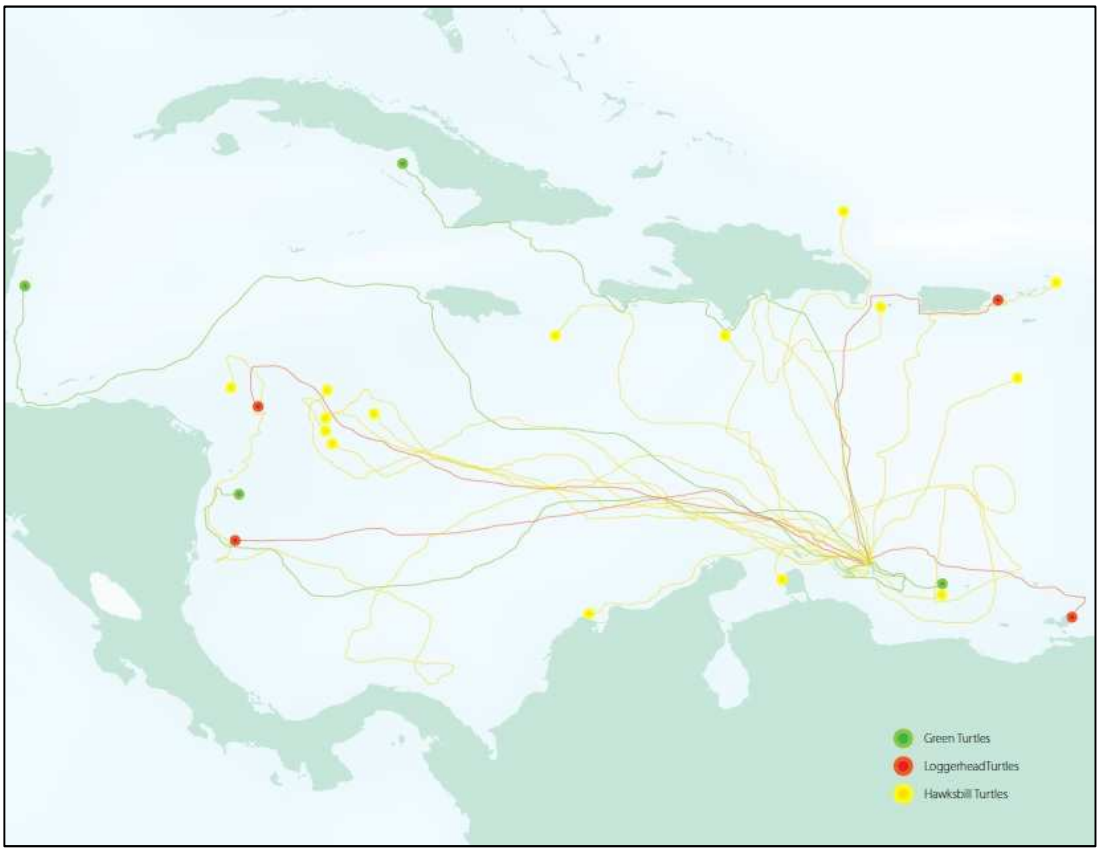

Figure 14: Sea Turtle Conservation Bonaire has satellite-tracked 24 marine turtles who have migrated west to the coastal waters of Nicaragua, Honduras, Colombia, Venezuela, and Mexico; north to Puerto Rico, the Dominican Republic, Cuba, Jamaica and the Virgin Islands; and east to Venezuela's Los Roques and Margarita islands.

On September 12th, 2013, a large female hawksbill named "Carolien" nested on Klein Bonaire. After nesting, Carolien was safely constrained in a wooden box while we attached a satellite transmitter device (sponsored by the Valley Foundation) onto her carapace.

Carolien departed Bonaire water's approximately 30 hours after laying her last nest of the season, heading west to spend three days in the coastal waters of Curaçao. She then continued west through Aruba's coastal waters into the open Caribbean Sea at a rapid pace; in the three days after departing Curaçao waters, Carolien averaged 170 km (105 mi) per day.

Carolien continued northwest until the 23rd of September, when she changed course and began swimming southwest towards Costa Rica. Over the following few days Carolien's trajectory turned more and more southerly until she reached the coastal waters of Panama on October 8th, becoming the first Bonaire-nesting turtle to be tracked to the country. Carolien spent 12 days in the relatively shallow waters of coastal Panama just outside of the Kuna Yala Archipelago.

Heading north on October 20th, Carolien looped across her previous path and reached coastal Nicaragua on November 4th. Less than 100 km (62 mi) from the coast, Carolien swam north along the coast eventually entering Honduras waters.

Figure 15: Carolien's complete migration lasted 85 days. She visited the marine territories of six countries, swimming over 5,000 km (3,000 mi) to reach a distance 1,600 km (1,000 mi) from Bonaire.

Eighty-five days after nesting on Bonaire, Carolien reached an area 135 km (84 mi) off the coast of mainland Honduras where she remained for three weeks before her transmitter ceased functioning, but long enough for us to conclude this is likely her home foraging grounds. This general area, where Honduran, Colombian and Nicaraguan waters converge, has proven to be of great importance to Bonaire's breeding turtles; 8 of the 24 tracked hawksbills have migrated here.

Hawksbill Project

To learn more about the behavioral patterns and habitat use of hawksbill turtles at Lac Bay, STCB performed abundance surveys and, with funding from IMARES Wageningen UR, deployed dataloggers on the carapaces of four hawksbills in 2012. Three dataloggers were retrieved by the end of 2012 and showed some valuable results. In January 2013, an additional hawksbill was fitted with a datalogger; that device was retrieved in July and is being analyzed now. A preliminary review of the data seems to confirm the patterns found with the other three turtles.

The dataloggers are programmed to record depth every 5 seconds and obtain GPS coordinates whenever the animal surfaces to breathe. The dataloggers recovered in 2012 yielded detailed data on hawksbill behavior in and around Lac Bay, revealing that these turtles regularly move in and out of the bay. When outside the bay, the animals adhere to a diurnal pattern of resting at night and activity during the day. When inside Lac, such a diurnal pattern is more difficult to perceive due to the shallow waters and limitations concerning depth resolution of the dataloggers, but it appears that similar activity patterns are maintained.

Hawksbills appear to reside inside Lac Bay and feed where dense sea grass beds are and near the mangroves, presumably eating organisms, such as sponges, associated with the sea grass stands and the mangrove roots. It remains unclear whether hawksbills actually enter the mangroves to any extent, since GPS signals are too weak there for the dataloggers to record. Moreover, it is known that hawksbills make frequent, short excursions to the surface to breathe in extreme shallows, but evidence for this behavior was not found on the dataloggers, possibly because the surface interval is too short for GPS signal acquisition.

Turtle Strandings

Stranded turtles are animals found dead, injured, or sick, or sometimes apparently healthy but in an unsuitable circumstance, such as entangled in debris along the shoreline. Strandings are reported to STCB directly via the Sea Turtle Hotline (780-0433).

In 2013 there were a total of 18 incidents reported (Table 1). Twelve of these 18 turtles were found dead or had to be euthanized due to severe illness. Two of the 12, both green turtles, showed indications that they had been butchered, suggesting that they were either poached for human consumption or had been consumed after accidental capture (by-catch).

Caribbean-wide, one of the biggest threats to sea turtles is the fishing industry and associated by-catch. Of the 18 strandings, 9 (50%) were related to fisheries, including

turtles trapped in unattended fishing nets and turtles seen with fishing hooks in their mouths. Five turtle deaths in 2013 were fisheries-related (42% of total deaths), three of which were critically endangered hawksbills. The remaining deaths were by natural causes (2), related to fibropapillomatosis (1), from unknown cause (2), and the two butchered green turtles as detailed above.

In 2013, the Turtle in Trouble (TIT) team of volunteers was created and a small assessment pool was established. The pool has allowed STCB to assess sick turtles in a suitable environment and will be a valuable facility for the future. Sadly, the two turtles that used the new pool in 2013 had to be euthanized.

One subadult loggerhead was freed from entanglement following stranding at Lagoen and was successfully released (Figure 16). Additionally, two live hawksbill post-hatchlings were washed up onshore around Lac Bay and successfully released back into the open seas on the west coast of Bonaire.

STCB is very grateful to volunteer Sjoukje Hiemstra for her help in conducting necropsies and with the data management of turtle strandings, and to Craig Dewey and Kathy Pound for housing the STCB rehabilitation pool.

Figure 16. Subadult loggerhead with mass of fishing debris attached to its right flipper.

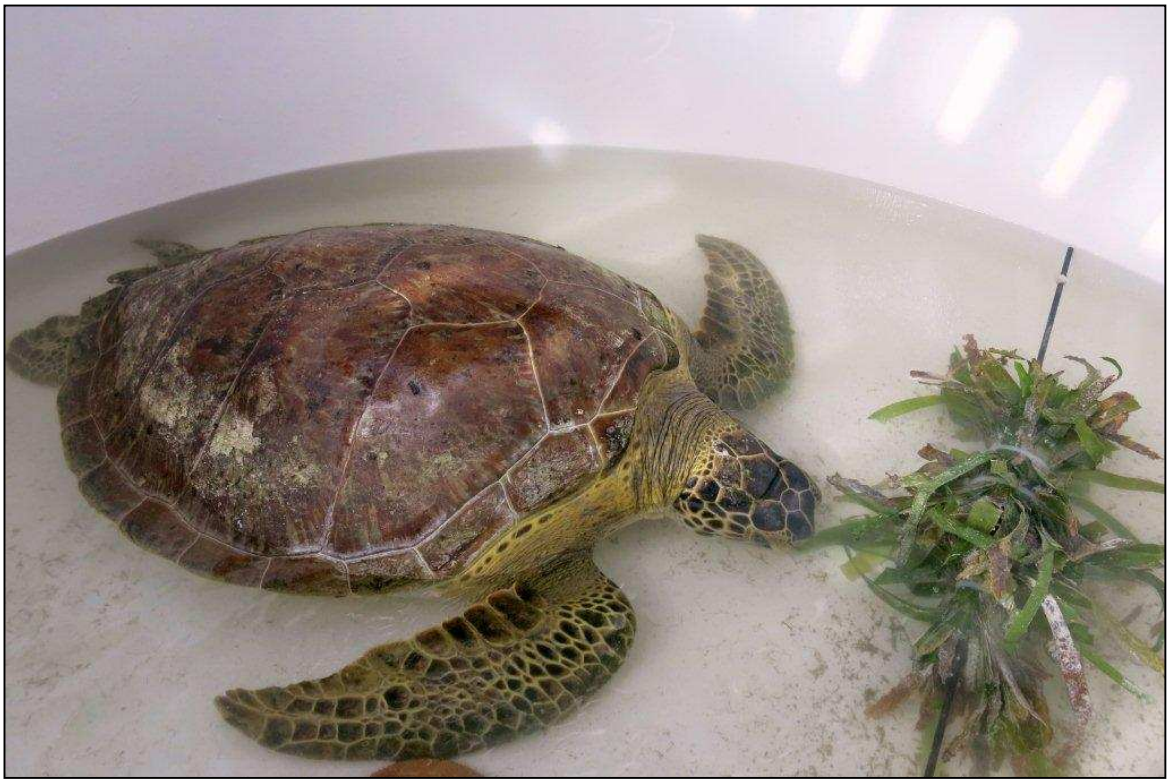

Figure 17. Green turtle in the new assessment/rehabilitation pool.

Figure 18. Hawksbill found dead with fishing hook in its jaw (left) and when it was first captured and tagged by STCB in 2006 (right).

Table 1. Sea turtle stranding incidents recorded on Bonaire and Klein Bonaire in 2013.

DATE	LOCATION	SPECIES	CARAPACE LENGTH	STATUS
3-Feb-13	Outer reef, Lac	Hawksbill	71.1cm	Dead adult Hawksbill turtle with fishing hook embedded in mouth recovered from the reef by STCB volunteer divers after being reported by East Coast Divers. Unable to conduct necropsy due to lack of resources. Likely death due to by-catch.
4-Feb-13	Lagoen	Loggerhead	63cm	Loggerhead subadult found stranded on the beach by Brian Strehlow who rang the hotline. Turtle was assessed by STCB staff to be in good condition so the entangled fishing line was removed from the flipper and the turtle was released immediately.
9-Feb-13	1000 Steps dive site	Green	Approx 35cm	Email received from Rita Svatos reporting turtle seen with hook in its mouth. STCB conducted a total of 7 surveys, using snorkelers and/or divers but turtle not found.
12-Feb-13	close to Plaza Resort	Green	not known	Skeletal remains found by Nancy Reuten close to Plaza Resort, adjacent to an osprey perch. Skeleton identified by Mabel as juvenile green turtle and kept as educational material. Cause of death unknown.
18-Mar-13	Lac	Green	57.3cm	Well-nourished green turtle with fibropapilloma found dead at Lac by Sabine Engel. Necropsy results were unclear but likely cause of death was that it had been caught in a net and suffocated.
21-Jun-13	South Pier	Hawksbill	33.5cm	David Ray reported seeing a decomposed small Hawksbill, with head and left flipper missing, floating very close to South Pier. Retrieved and examined by STCB staff but no ID tags found (though remains were badly decomposed). Possible cause of death entrapment in fishing line or strike by a ship.
5-Jul-13	Hato	Green	not known	Dog brought green turtle head back to his home in Hato. A picture was placed on Facebook and STCB notified by someone who saw the posting. Head desiccated and decomposed so difficult to ascertain cause of death but possibly the remains of a butchered turtle.
9-Jul-13	Tera Cora	Green	not known	Carapace and intestines found dumped by side of road in Tera Cora, reported to STINAPA by a walker. Distinct butchery marks on carapace.
16-Jul-13	18th Palm	Hawksbill	Adult	Diver Mirjam Jacobs took photo & video of adult Hawksbill with rope coming from mouth and reported it to STCB. Two surveys conducted but turtle not found.
8-Aug-13	Sorobon Beach Resort	Hawksbill	Approx. 6cm	Hatchling, found by Resort staff member, washed up alive on the beach at Sorobon Beach Resort. Hatchling collected and released on the west coast of Klein Bonaire by STCB volunteers Craig Dewey & Kathy Pound.
25-Aug-13	Wind Surf Place	Hawksbill	Approx. 6cm	Hatchling found washed up on shore by the Wind Surf Place and was brought to STCB by a STINAPA Ranger. Hatchling released on West Coast at nightfall.

DATE	LOCATION	SPECIES	CARAPACE LENGTH	STATUS
4-Oct-13	Outer reef, Lac	Green	57cm	Sick, emaciated green turtle was seen floating outside of Lac by East Coast Divers. Brought by them onto the boat and collected by volunteers & intern Tineke at Sorobon. Turtle's condition very poor and so taken to vet for examination and decision made to euthanize. Necropsy result found severe infection was cause of death.
9-Oct-13	Fisherman's Hut	Green	31.5cm	Small (approx. 2.5kg) green turtle found by STINAPA entangled in mas bango net which had been left unattended overnight by the fisherman's hut, south Bonaire. Death due to by-catch.
27-Oct-13	Salt Pier	Green	Juvenile	Email received from Heidi van den Tillaar reporting a green turtle in the shallows at Salt Pier with a fish hook in its beak. Also reported to hotline by staff at Dive Friends Bonaire. Snorkel survey conducted 29 Oct at Salt Pier with Mabel, Sue & Rob (volunteer). After about an hour we located a small green turtle with a hook on the right side of its mouth. We made several attempts to catch it but were unsuccessful so the hook has not been removed. However, the hook is small and at a place on its mouth that will not interfere with its feeding. In fact it looked well fed, even a little fat, and it was certainly mobile!
30-Oct-13	Baby Beach	Loggerhead	60cm	Live stranded Loggerhead seen by Beachkeepers Dymphie and Jo being carried by two young men towards their truck. Dymphie & Jo requested that they leave the turtle and then called STCB hotline. Turtle placed in the rehab pool. The turtle showed signs of neurological damage so rehabilitation was attempted after a full assessment in liaison with local vets under the direction of Terry Norton, specialist vet from Georgia Turtle Hospital. After several days when the turtle was showing no signs of improvement the turtle was euthanized. Necropsy showed cause of death to be severe infection.
21-Nov-13	Lagoen	Green	63cm	Live stranded Green turtle found on beach at Lagoen by dog walker. Rehydrated in a bath (100+ leeches removed by fresh water) then placed in the rehab pool. Turtle was very weak and didn't feed or defecate. X-ray was performed and large tumor-like growth seen clearly so the turtle was euthanized. Necropsy results were inconclusive.
14-Dec-13	Baby Beach	Green	55cm	Emaciated dead Green turtle found by Dymphi and Jo stranded at Baby Beach. Large fibropapillomas on eye & neck. Necropsy concluded death was likely caused by fibropapillomatosis leading to starvation.
15-Dec-13	Sorobon, Shrimp Farm	Hawksbill	66cm	Dead, tagged, stranded Hawksbill (ID 12-034) found by dog walkers. Necropsied but body condition had declined in freezer due to electrical failure so necropsy was difficult. Possible cause of death by-catch.

Research Initiatives

STCB collects a wealth of scientific data, and during the coming years we will be using this information to undertake a number of important initiatives.

1) We will use population analyses to estimate the number of turtles swimming in Bonaire's waters, including Lac. Turtles captured during snorkel surveys and netting will be critical to this project. The analyses also will provide information about residency times (i.e., how long turtles spend in Bonaire's waters before swimming to another site) and survival rates.

2) Green turtles that feed in Lac are believed to have among the highest growth rates in the Caribbean. Our analyses will quantify growth rates of turtles using Lac versus those turtles captured exclusively at other sites around Bonaire. These data will help us understand the importance of the Lac foraging aggregation and the amount of time Caribbean green turtles might take to reach maturity.

   Additionally, data collected from hawksbills captured in Bonaire are being compiled with information from Barbados, Puerto Rico, Nicaragua, Antigua, and other nations. This broad, regional study is investigating how hawksbill growth rates differ by size classes and geographic region.

3) STCB seeks new ways to improve research and monitoring efforts. With this initiative, we will review data gathered over the last decade, including the timing of surveys, to inform protocols for netting in Lac. Specifically, we want to ensure that our sampling is as efficient as possible and that our protocols are best able to address primary research questions.

4) A variety of techniques can be used to tag turtles, including metallic and plastic flipper tags and PIT (passive integrated transponder) tags, the same technology that is used to microchip dogs and cats for identification. Because the marine environment is particularly harsh, however, tags are occasionally lost. To ensure that our research program is as strong as possible and our scientific conclusions are sound, we need to understand what tagging techniques provide the best means to permanently mark a turtle and are most likely to be recorded by researchers or fishermen elsewhere. We will examine STCB's historical tagging data to examine how well different tags are retained and how our protocols might be improved.

Appendix I. 2013 Funders and Donors

STCB is a non-profit, non-governmental organization. We raise funds through conservation and research grants and contracts, merchandise sales and from individual and business donors.

Flagship Funder 2008 – 2016

Since 2008, WWF - Netherlands has been the flagship funder for STCB's sea turtle conservation work on Bonaire. The WWF-NL grant is administered through STINAPA Bonaire.

Major Funder

Dutch Ministry of Economic Affairs, Agriculture and Innovation (EL&I)

Platinum Funders/Donors

The Institute for Marine Resources and Ecosystem Studies in the Netherlands (IMARES)
Foundation to Preserve Klein Bonaire (FPKB)
Dutch Caribbean Nature Alliance (DCNA)
Stichting Nationale Parken Bonaire (STINAPA)
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Anonymous donors

Appendix II. 2013 Staff, Interns and Board(s) of Directors

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Dr Sue Willis, Program Assistant
Gielmon (Funchi) Egbreghts, Contractor Field Technician

Scientific Advisor
Dr Robert van Dam

Interns
Rene Vissia
Tineke van Bussel
Marijn van der Laan

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Guido Wiersma
Tom van Eijck, *Advisor, first field project coordinator (1993)*

Appendix III. 2013 STCB Partners, Supporters and Volunteers

International Partners
Wider Caribbean Sea Turtle Conservation Network (WIDECAST)
World Wildlife Fund Netherlands (WWF-NL)
Support Bonaire, Inc.

Regional Partners
Dutch Caribbean Nature Alliance (DCNA)
Nature Foundation St. Maarten
Parke Nacional Arikok (Aruba)
Saba Conservation Foundation
St. Eustatius National Parks Foundation
Turtugaruba

Local Partners
Bonaire Department of Environment and Natural Resources (DROB)
CIEE Research Station Bonaire
Echo Bonaire
Jong Bonaire
EZ Ministry of Economic Affairs
STINAPA Bonaire
- Bonaire National Marine Park
- Washington-Slagbaai National Park
- STINAPA Junior Rangers

Local Business Partners and Supporters
These businesses provide ongoing support to STCB programs and activities through the donation of in-kind materials and/or services:
Administratie kantoor Brandaris
Bonaire Marine Center BV
Bonaire Rent a Car
Bonaire East Coast Diving
BonPhoto & FLOW
Buddy Dive Resort
Bonaire Clock Design (BCD)
Cactus Blue
Captain Don's Habitat
Carib Inn (Bruce Bowker)
Caribe Car Rental

CARGILL Salt Bonaire
Dive Friends Bonaire
Div'Ocean
Harbour Village Marina
Kantika di Amor
KPMG
Mangrove Kayak Center
NetTech
Nos Consuelo
SELIBON
VanEp Kunneman Van Doorne
Wannadive Bonaire
Woodwind Snorkel Sail

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Craig Dewey & Kathy Pound
Fishing line project volunteers
Fulco de Vries
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Louise Holder
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Nat Miller
Nicole Chirino
Patrick Holian
Patti Dougherty
Ralph 'Moogie' Stewart
Richard Willis
Rick & Lila Nicholson
Rob Hulsbergen
Sjoukje Heimstra
SGB students

And to the many other volunteers who helped with our in-water sea turtle surveys: Marnie, Chip, Alex, John, Brenda, Michaela, Bryan, Irene, Patrick, Patrick, Tama, Alejandro, Augusto, Mirjam, Martijn, Candy, Barry, Julia, Mai, Amber, Maddie, Marijke, Erwin, Erik, Magriet, Amy, Milo, Chloe, Patrick, John, Lara, Alexis, Clive, Margot, Abby, and Tatiana.

Appendix IV. Ways to donate

You can help protect Bonaire's sea turtle populations by donating to STCB. We welcome – and depend on – the financial support of people like you. Whether it's $10, $100, or $10,000, whatever you give makes an important difference.

Online

Go to our website at www.bonaireturtles.org

Donate by mail

Make check payable to: Sea Turtle Conservation Bonaire
Then mail to:

STCB
PO Box 492
Kralendijk, Bonaire
Dutch Caribbean (Netherlands Antilles)

Donate by bank transfer

To make a donation locally on Bonaire:

Maduro & Curiel's Bank (Bonaire) N.V.
Account name: Sea Turtle Conservation Bonaire
Account number: 101.169.209

To make a donation from the USA:

Beneficiary: Sea Turtle Conservation Bonaire
Account number: 101.169.209
Beneficiary Bank: Maduro & Curiel's Bank (Bonaire) N.V.
Swift code: MCBKBQBN
Correspondent Bank: Standard Chartered Bank
ABA # 026002561
Swift Code: SCBLUS33

To make a donation from Europe:

Beneficiary: Sea Turtle Conservation Bonaire
Account number: 101.169.209
Beneficiary Bank: Maduro & Curiel's Bank (Bonaire) N.V.
Swift code: MCBKBQBN
Correspondent Bank for Euro: Rabo Bank Nederland
Swift Code: BBRUBEBB

To discuss other ideas for giving, please call STCB Manager, Mabel Nava, on +599-717-2225, or email us at stcb@bonaireturtles.org