Research and Monitoring Report 2012

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WIDECAST
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Sea Turtle Conservation Bonaire proudly presents its 2012 Bonaire Sea Turtle Research and Monitoring Report.

In this report you will read about the methods and results of our sea turtle research and monitoring activities, which include nesting beach monitoring, foraging ground surveys, turtle migration tracking, and responding to reports of turtle strandings. With our nesting beach monitoring, we track turtle nesting activity, determine nest size and productivity, and estimate the number of hatchlings produced. With our foraging ground surveys we capture, tag, measure and photograph individual turtles and establish catch-per-unit-effort measures of turtle abundance. We inspect the turtles for signs of illness or injury, including fibropapillomatosis. Our recapture of previously tagged turtles provides valuable insight into turtle residency duration, home range, growth rates, and habitat quality. With satellite telemetry, we are able to identify the migration paths and distant feeding grounds used by our breeding and nesting turtles. Our follow-up on reports of turtle strandings has resulted in the occasional rescue of sea turtles and has helped us to identify threats and take actions to mitigate problems.

New research was started in 2012 with funding from IMARES (the Institute for Marine Resources and Ecosystem Studies in the Netherlands). Using abundance surveys and deploying dataloggers we began to study the foraging use of Lac by hawksbill turtles. The results so far demonstrate that these turtles regularly move in and out of the bay, and indicate that this area is an important turtle foraging area for not only green but hawksbill turtles as well. This continuing research will be helpful in strengthening our case for the importance of protecting Lac.

We use the information gathered in our research and monitoring activities to identify and implement conservation, education, and advocacy efforts needed to ensure protection of Bonaire's sea turtles. We also use sea turtle conservation as a focal point to drive and stimulate general conservation awareness and efforts. For information about these other important activities of STCB, please visit our website at: http://www.bonaireturtles.org/.

Our important work could not be completed without significant financial support. We would like to acknowledge our flagship funder: World Wildlife Fund -Netherlands (WWF-NL), and our other major funders: the Dutch Ministry of Economic Affairs, Agriculture and Innovation (EL&I) and the Dutch Caribbean Nature Alliance (DCNA).

We are also thankful to our many other individual, foundation, and business donors (Appendix III), to STCB staff and board members (Appendix IV), and the many government and business partners, and dedicated volunteers that assisted us (see Appendix V). We especially would like to thank STINAPA-Bonaire for their continuing collaboration and support.

We extend our thanks and acknowledgement to Dr. Robert van Dam, our scientific advisor, who oversaw STCB's research efforts and contributed substantially to the production of this report.

We hope you find this report informative and that it encourages your interest in, and support for, the sea turtles of Bonaire.

Research

Nesting Beach Monitoring

All known suitable nesting beaches of Bonaire and Klein Bonaire were surveyed periodically for sea turtle nesting activity during 2012, with emphasis on the most actively used nesting area around "No Name" beach on Klein Bonaire. No Name beach is Bonaire's index beach for measuring annual fluctuations in nesting activity and was visited at least twice weekly from May to November. The number of turtle nests reported is a best estimate and includes some turtle activities judged to be nests by experts but where eggs could not be confirmed present.

The turtle nesting season began in 2012 on May 12th, when a fresh loggerhead nest was discovered near the "Fisherman's Hut" along the Southwest coast of Bonaire. Shortly afterwards, on May 14th, a hawksbill crawl was discovered at No Name beach that turned out to be a nest. The last nest for loggerheads was found on August 10th at No Name beach, whereas hawksbills were very active for nearly eight months, until the last nest of the season was found at No Name on January 7th 2013. Green turtles were active nesting at several beaches in the period from July 30th through October 7th.

For 2012, a total of 19 loggerhead, 60 hawksbill and 3 green turtle nests were recorded at No Name beach, with July showing the greatest nesting activity combined for all three species (Figure 1). Nesting for loggerheads peaked in June, whereas solid activity for hawksbills was recorded in the months from July through October. Three green turtle nests were laid on No Name beach during July and August, possibly by the same individual.

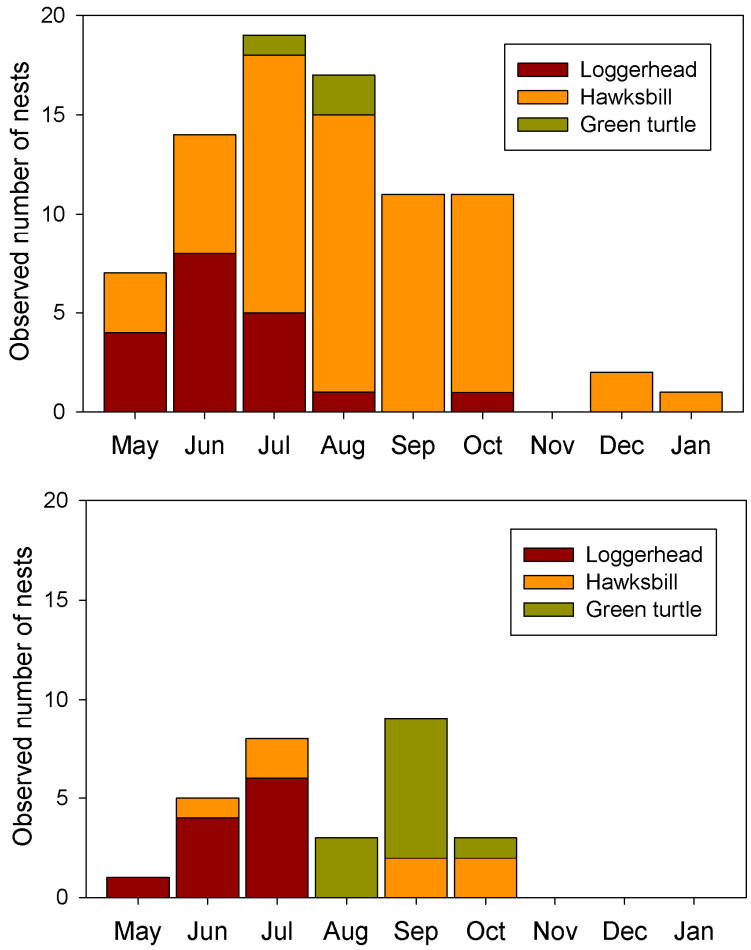

Figure 1. Temporal distribution of nests laid by loggerhead and hawksbill turtles at No Name beach, Klein Bonaire (top) and the beaches of Bonaire (bottom) during 2012 (and including January 2013).

Figure 2. Distribution of hawksbill and loggerhead nests encountered in 2012 along No Name beach, Klein Bonaire.

Hawksbill and loggerhead nests at No Name were laid fairly continuously along the nearly 2km long beach, whereas the three green turtle nests were clustered around the sandiest area and amidst the dunes (Figure 2).

The ten-year trend in nesting activity for the three species most commonly encountered nesting is illustrated in Figure 3. The year 2012 marked a significant upturn in the number of hawksbill nests at No Name beach, setting a new record of 60 nests. Loggerhead and green turtle nesting are both at lower -but perhaps stable- levels, although year-to-year variation in these species can be substantial as seen also at other Caribbean and western Atlantic rookeries.

On the island of Bonaire, nesting activity by loggerhead and hawksbill turtles during 2012 occurred primarily along the southwest coast (11 loggerhead, one hawksbill and 7 green turtle nests), at Donkey-Te Amo-Plaza Resort beaches (5 hawksbill nests), Playa Chikitu (4 green turtle nests), and at Washikemba (1 hawksbill nest).

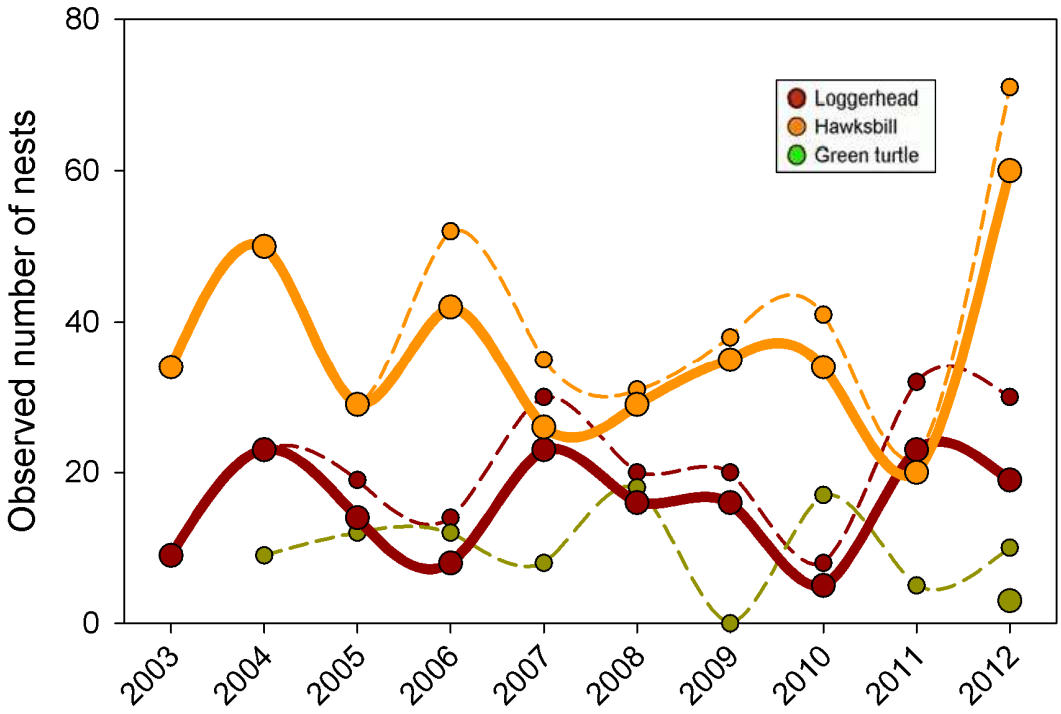

Figure 3. Trend in nest numbers by species at No Name Beach, Klein Bonaire (solid lines) and totals for all Bonaire and Klein Bonaire nesting beaches (dashed lines).

Nesting size and productivity were measured through nest revisions shortly after hatching. Revision of 18 loggerhead nests at No Name beach yielded an average nest size of 133.5 eggs (range 86 – 195) and the nests had an average hatching success of 84.7%. Fifty-four hawksbill nests examined at No Name beach contained on average 151.3 eggs (range 77 – 208) and had a mean hatch success of 81.2%. The three green turtle nests at No Name had a mean nest size of 123.3 eggs (range 80 – 151) and a mean hatch success of 78.9%. These green turtle nests are the first recorded for No Name beach since STCB began comprehensive coverage in 2003.

The estimated number of hatchlings produced at the index beach of Klein Bonaire during 2012 can be calculated from the total number of nests, average nest size and average hatching rate. The 19 loggerhead, 60 hawksbill and 3 green turtle nests laid

along No Name resulted in approximately 2148 loggerhead, 7371 hawksbill and 292 green turtle live hatchlings emerging from their nests. Trends in the estimated loggerhead, hawksbill and green turtle hatchling production at No Name beach are illustrated in Figure 4.

Revision of ten loggerhead nests on beaches along the southwest coast of Bonaire yielded an average nest size of 137.9 eggs (range 115 – 164) and an average hatching success of 56.8%. Seven green turtle nests averaged 114.4 eggs (range 92- 131) and a mean hatching success of 25.8% Low nest productivity at these low-elevation beaches is likely due to seawater occasionally smothering nests that were laid in close proximity to the waterline.

At Playa Chikitu, Washington Park, four green turtle nests were laid during 2012. Revision of these green turtle nests yielded an average nest size of 97.5 eggs (range 92 – 105) and a hatching success of 70.3%. An estimated 274 green turtle hatchlings emerged from the Playa Chikitu nests.

One hawksbill nest (116 eggs) was laid at Washikemba in June but was washed out during a storm surge.

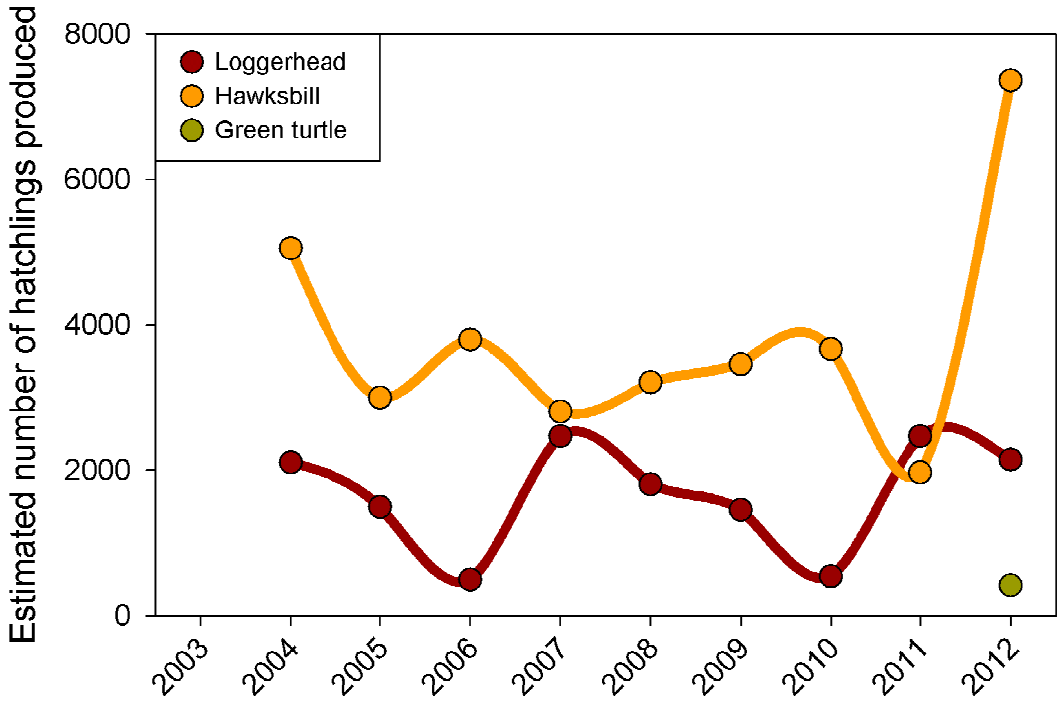

Figure 4. Trend in live hatchling production estimates for loggerhead, hawksbill and green turtles at No Name Beach, Klein Bonaire.

Foraging Ground Surveys

Foraging ground surveys were conducted by snorkeling along the entire west coast of Bonaire, circumnavigating Klein Bonaire, and in front of Lac Bay (Figure 5, Table 1). In addition, turtle surveys using the netting technique were performed inside Lac Bay. The purpose of these snorkeling surveys is to tag, sample, measure and photograph individual turtles, and to establish catch-per-unit-effort measures of turtle abundance.

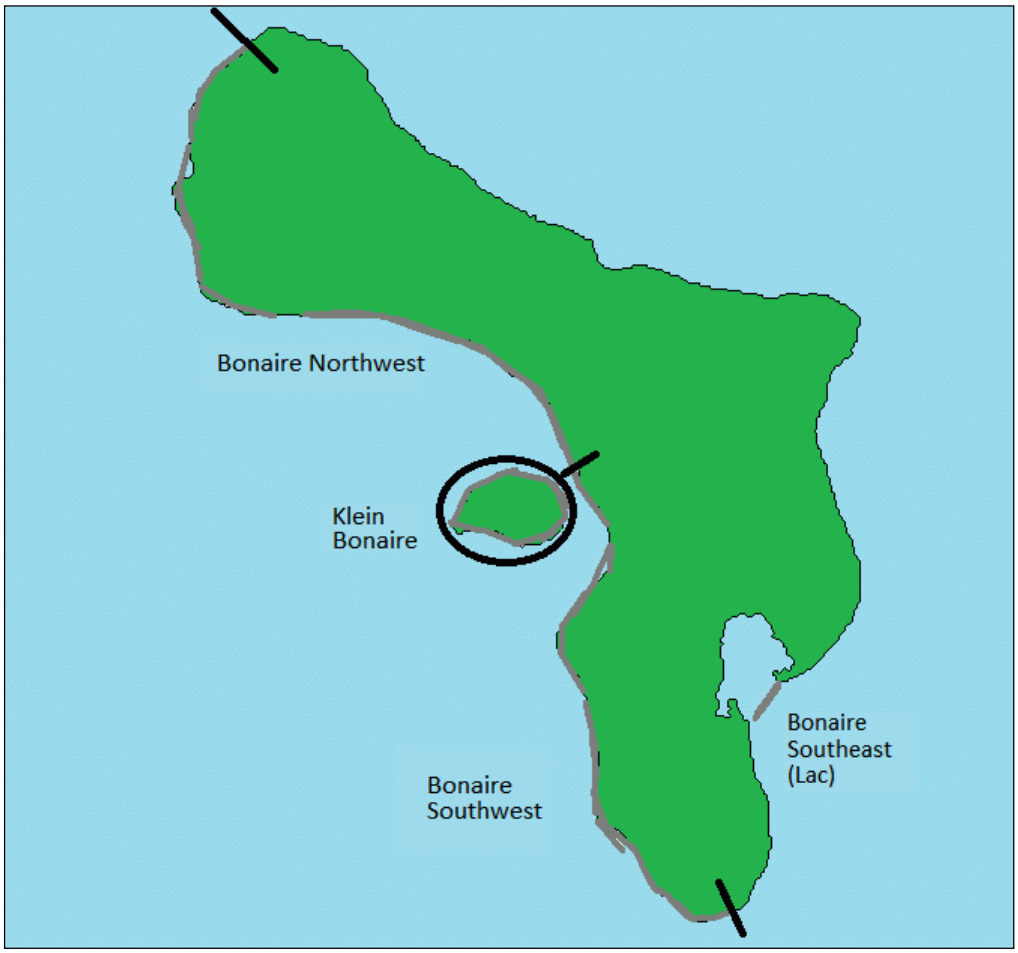

Figure 5. Sectors of coastal areas of Bonaire and Klein Bonaire covered during the 2012 in-water snorkeling surveys. Survey tracks are marked in gray (lines connect survey begin and endpoints, but do not necessarily indicate the precise survey tracks).

Table 1. In-water snorkeling survey effort in hours by sector from 2003 to 2012.

	Total survey hours			
	Klein Bonaire	Bonaire Northwest	Bonaire Southwest	Bonaire Southeast
2003	25.9			
2005	24.5			
2006	17.5	38.7	23.9	14.3
2007	13.2	25.2	20.2	9.9
2008	11.2	18.5	13.7	4.8
2009	8.4	24.0	15.5	4.7
2010	19.9	28.2	18.7	1.4
2011	12.1	32.3	24.9	4.8
2012	12.2	30.3	21.5	5.9

From 2010 to 2012, juvenile green turtle abundance appeared to increase in all areas with the exception of Klein Bonaire which has experienced a steady decline (Figure 6). However, on the reef outside of Lac Bay green turtle numbers reached record high levels (Figure 7), with up to 200 individuals counted in ~1 hr surveys there. These green turtles are associated with the Lac Bay sea grass pasture foraging grounds.

With the exception of the Lac Bay animals, the green turtles encountered during snorkeling surveys are mostly immature smaller than 40 cm straight carapace length (SCL, see Figure 11). Locations with particularly high green turtle abundance (other than Lac Bay) include Ebo's Reef at Klein Bonaire (associated with the sea grass beds in the shallow lagoon there), the stretch from Playa Frans through the west end of Washington Park, and sectors of the southwest coast of Bonaire (Figure 8).

Hawksbill turtles occur in lower numbers and densities than green turtles throughout Bonaire and Klein Bonaire and, after declining, their abundance in 2012 appears to have stabilized in the surveyed areas (Figures 6 and 7). Similarly as for green turtles, but occurring in a much lower aggregation density but on average in greater body size (Figure 11), immature hawksbill turtles are found on the reefs adjacent to Lac Bay, and these animals also move inside the bay for foraging (see below). Other areas of relatively high hawksbill abundance are Ebo's Reef (Klein Bonaire) and the southwest tip of Bonaire (Figure 9).

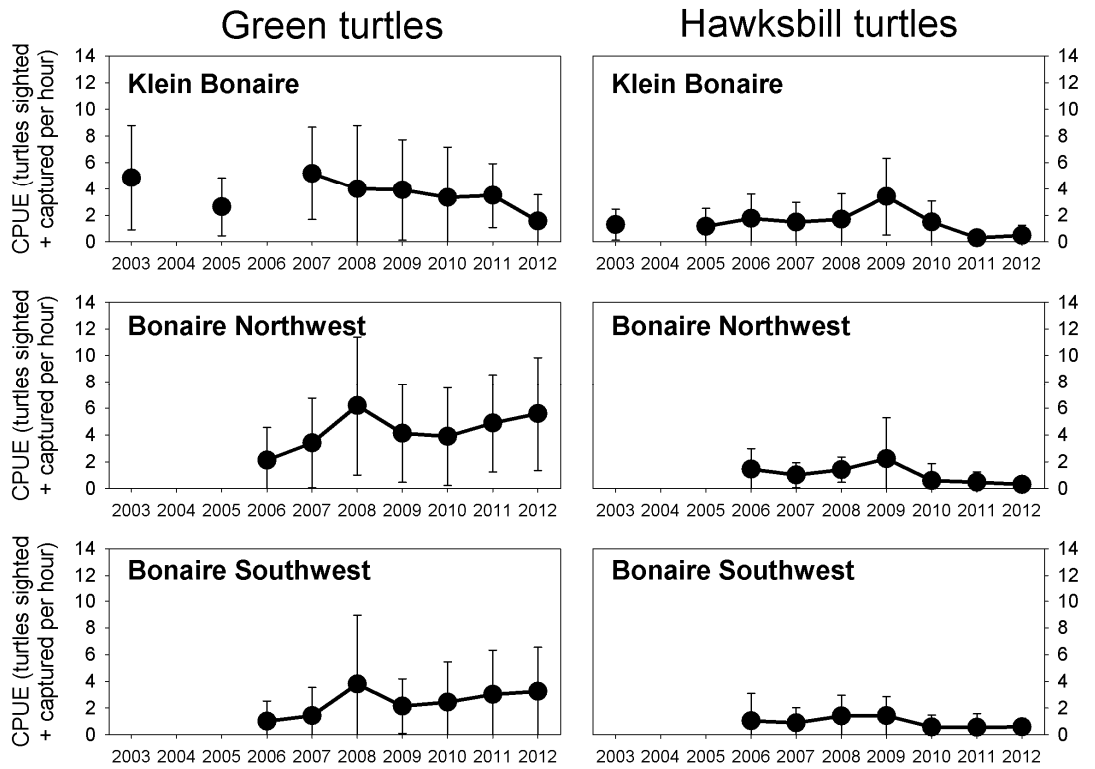

Figure 6. Comparison of 2003-2012 "catch-per-unit-effort" survey results by sector around Klein Bonaire and Bonaire (data prior to 2006 is not available for all areas).

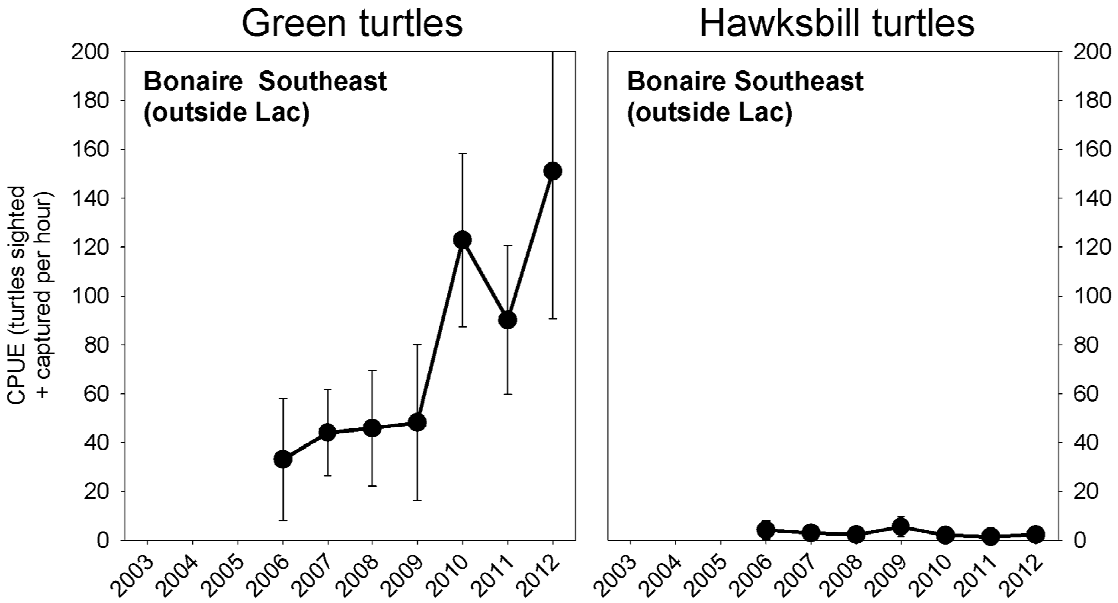

Figure 7. Comparison of "catch-per-unit-effort" survey results 2006-2012 outside Lac on Bonaire's southeast coast.

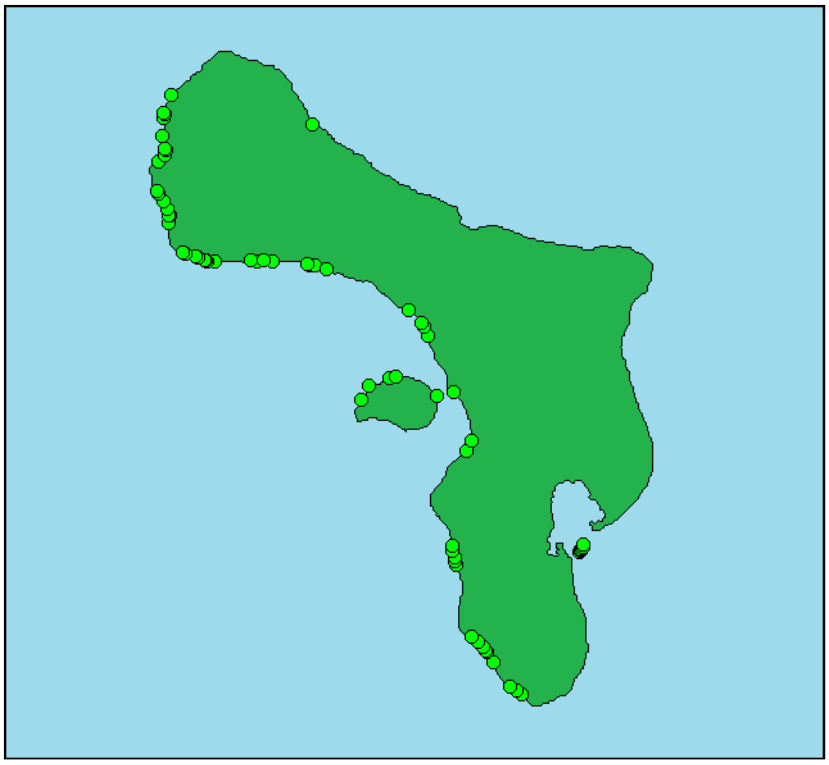

Figure 8. Locations where green turtles were captured during the 2012 snorkeling surveys around Bonaire and Klein Bonaire.

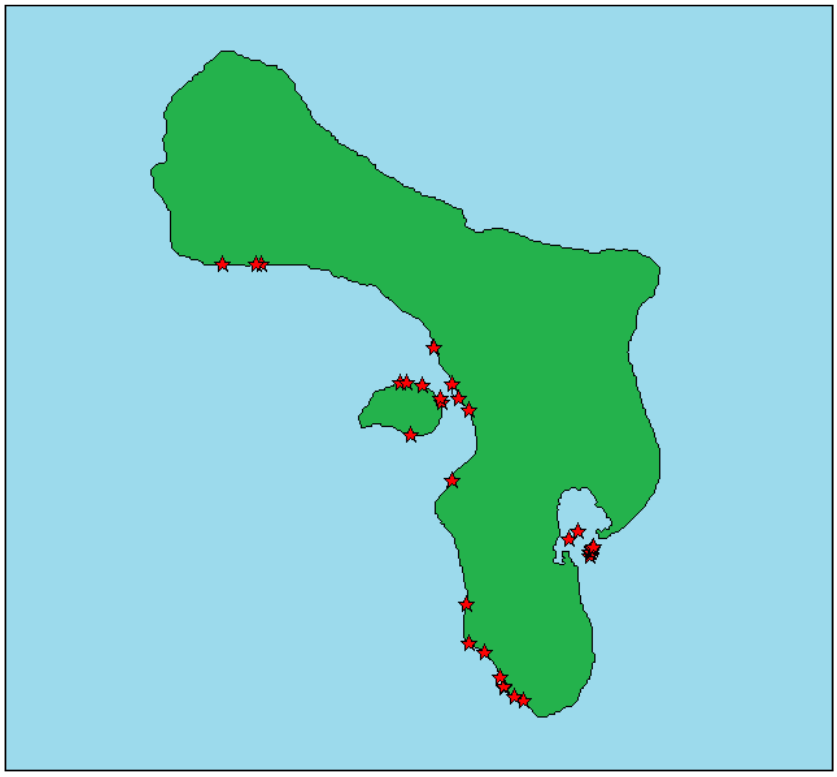

Figure 9. Locations where hawksbills were captured during the 2012 snorkeling surveys around Bonaire and Klein Bonaire.

Netting capture surveys were conducted at Lac Bay periodically throughout 2012. A total of 149 green turtles and 9 hawksbills were caught during these surveys. Figure 10 indicates the netting locations, aimed at areas with highest green turtle abundance as determined by observing turtles surfacing to breathe. Table 2 shows the abundances measured for both species through captures per hour of netting time ("net soak time"). Green turtles are vastly more abundant than hawksbills within Lac and their numbers appear to be increasing. During several net sets, a large number (>6) of turtles was caught so quickly that the decision was taken to retrieve the net early, to avoid catching an overwhelming number of animals. In contrast, hawksbill abundance at Lac appears to be slightly declining and their net-capture rate is the lowest measured since 2003 (Table 2).

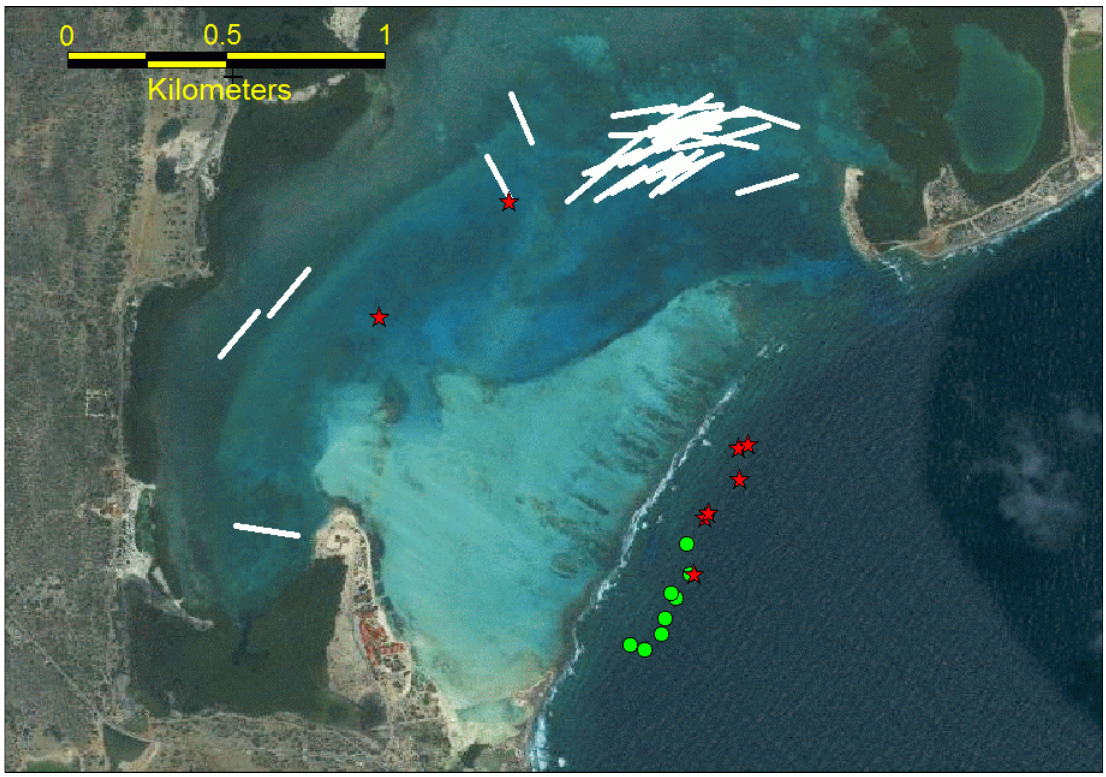

Figure 10. Netting locations for 2012 inside Lac Bay (white bars indicate net location and orientation), and locations of hand-captured green turtles (green circles) and hawksbills (red stars) mainly on the fringing reef outside Lac Bay.

Table 2. Inter-annual comparison of catch-per-unit-effort results for netting surveys conducted at Lac Bay.

	Number of netting sessions	Total netting hours ("net soak time")	Green turtle catches/hour	Hawksbill catches/hour
2003	16	17.9	0.88 ± 0.76	0.10 ± 0.28
2005	13	8.9	4.38 ± 3.97	no data
2006	40	32.9	2.90 ± 2.25	0.16 ± 0.39
2007	33	30.0	2.42 ± 1.67	0.26 ± 0.69
2008	37	24.8	3.00 ± 2.66	0.35 ± 0.76
2009	41	32.0	3.98 ± 3.42	0.27 ± 0.73
2010	48	39.0	3.14 ± 2.90	0.21 ± 0.44
2011	35	26.8	3.10 ± 2.67	0.12 ± 0.47
2012	40	24.1	8.0 ± 13.20	0.06 ± 0.29

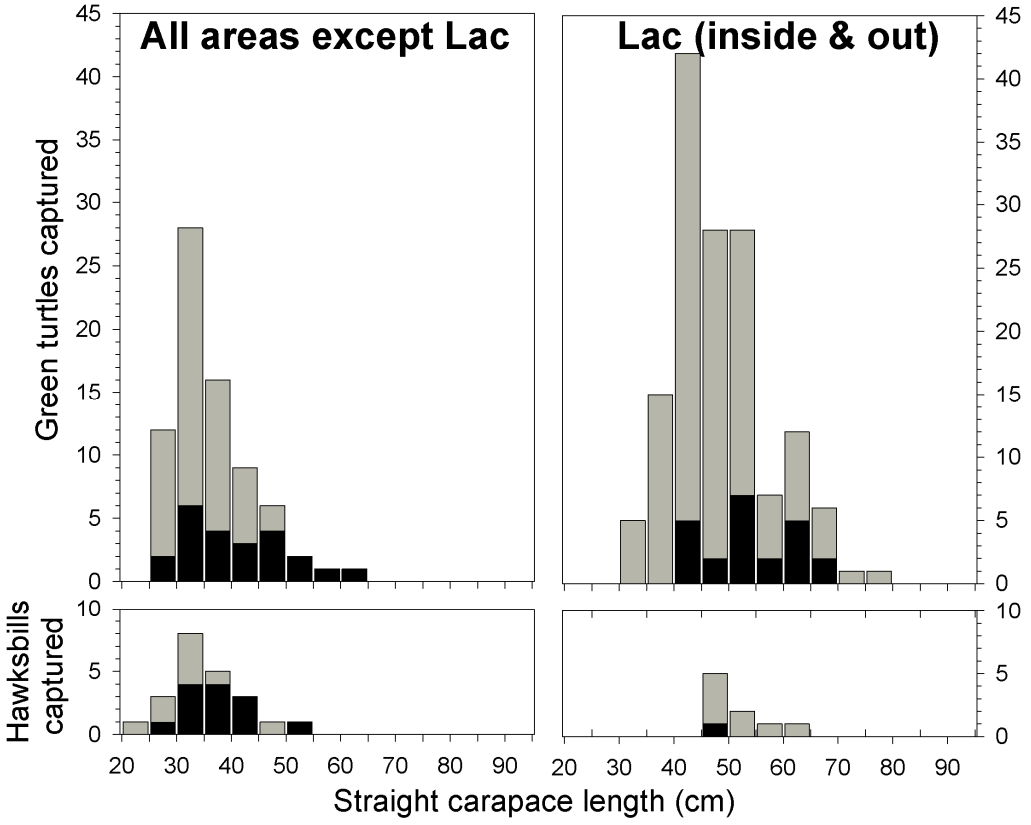

Figure 11. Size distribution of hawksbill and green turtles captured, tagged and measured during 2012. Black bars indicate recapture of turtles tagged in previous years.

Combined, the snorkeling and netting surveys yielded a record total of 221 individual green turtles and 31 hawksbills captured, of which 46 green turtles and 14 hawksbills were recaptures of turtles marked by us from previous years (Figure 11).
Recapture profiles provide indications of the residency durations by species and habitat location (Figure 12). Too few hawksbill turtles were recaptured to detect any trends, but green turtles at Lac Bay appear to remain longer in that habitat than elsewhere around Bonaire and Klein Bonaire. Juvenile green turtles from areas other than Lac are mostly transient, remaining in place for very few years unless they move to Lac Bay. Older and larger green turtles from Lac are probably underrepresented in the data due to our reduced ability to catch these powerful and fast-swimming animals.

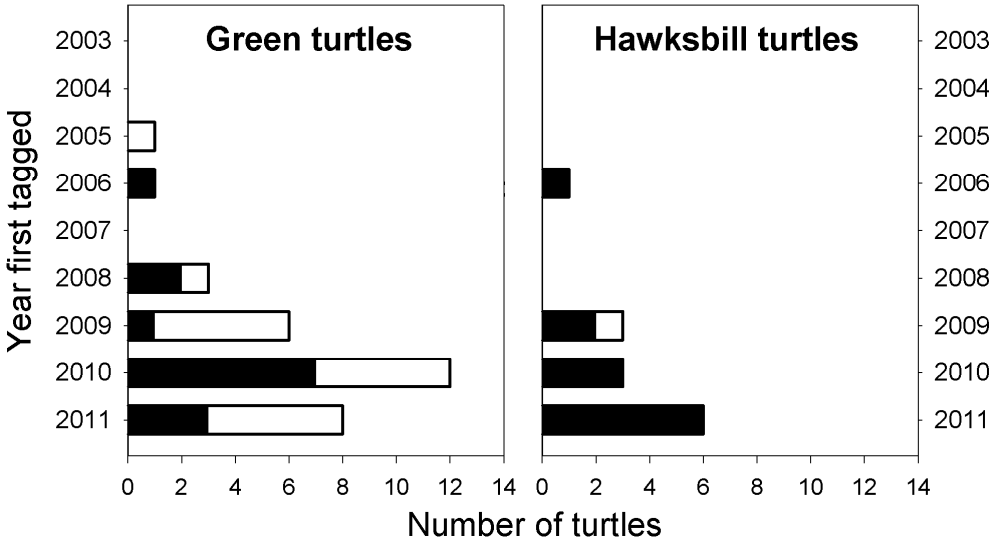

Figure 12. Distribution by year of initial tagging of recaptured turtles encountered during 2012. White-filled bars indicate turtles recaptured at Lac Bay, black bars for turtles elsewhere

A clue as to what happens to juvenile hawksbills as they grow up and then "disappear" from Bonaire's reefs comes from two sighting reports: the first from Curacao in January 2012 and the other from Aruba in September. At Curacao, divers filmed a juvenile hawksbill swimming along the reef and reported their find to STCB. Due to the unusual deformity of its carapace, this turtle was instantly recognizable as being an animal first caught and tagged off "Playa" in 2003 and where it resided for many years (Figure 13). This hawksbill is now estimated to measure about 60cm SCL, and the habitat shift it made by moving to Curacao is thought to be typical for hawksbills approaching maturity.

Figure 13. Hawksbill 03-036 on initial tagging on February 4th 2003 (left) and as sighted by divers on a reef at Curacao (January 2012).

From Aruba (via Turtugaruba) came a sighting report of a tagged hawksbill on Arashi reef (north western end of the island). Through the WIDECAST Marine Turtle Tagging Centre, this turtle was identified as tagged by us on Bonaire. It turns out to be hawksbill 07-025, first captured and tagged in 2007 at Nukove and then measuring 26.6 cm SCL. In 2008 the animal was recaptured at Nukove and in little over a year it had grown to 32.0 cm SCL (Figure 14), indicating a relatively high growth rate. Thereafter it was not encountered again during in-water surveys around Bonaire and remains unknown when this turtle moved to Aruba.

Figure 14. Hawksbill 07-025 recaptured at Nukove, Bonaire, on March 12th 2008 (left) and as sighted by divers on Arashi reef, Aruba (September 2012).

Presence of disease

Fibropapillomatosis (FP) occurs in green turtles at Lac Bay and all animals captured there are examined for the presence of external tumors. Many of the 149 green turtles examined during the netting session in 2012 exhibited evidence of obvious tumors, typically wart-like protrusions most often around the neck and eyes (Figure 15). The occurrence of fibropapillomatosis in the Lac Bay green turtles has fluctuated strongly over the years (Table 3), and for unknown reasons the rate of FP occurrence has risen sharply during 2012.

Figure 15. Fibropapilloma tumors on green turtle 12-236 captured at Lac Bay on December 3rd.

Table 3. Number of green turtles captured in Lac by survey period and occurrence of visible tumors.

Year	Month	Green turtles	w/FP	Occurrence %
2003	March	14	0	0
2004	March	20	0	0
2005	March	46	8	17.4
2006	March	56	13	23.2
2006	November	37	7	18.9
2007	March	50	8	16.0
2007	November	49	0	0
2008	April-May	55	9	16.4
2008	October-November	48	1	2.1
2008	October-November	48	1	2.1
2009	March-April	44	0	0
2009	November	68	3	4.4
2010	May	79	0	0
2010	December	54	0	0
2011	May	54	1	1.9
2011	October	36	5	13.9
2012	**all sessions**	**149**	**31**	**20.8**

Lac Bay hawksbill project

The Lac Bay lagoon covers an area of about 7 km^2 and contains a variety of habitat types such mangrove stands, seagrass beds and coral reefs. Due to its diversity value and vulnerability, the area has been designated as a legally protected Ramsar site. Mangrove forests and seagrass pastures are vulnerable and valuable habitats, providing important ecological and economic components of coastal ecosystems. They provide habitat for fish and shellfish and nursery areas to the larger ocean, and perform important physical functions of filtering coastal waters, dissipating wave energy and anchoring sediments. Seagrass pastures at Lac occur in proximity to, and are ecologically linked with, coral reefs, mangroves, and salt marshes. Seagrasses are the primary food of green sea turtles, an endangered and charismatic species of substantial public interest. Seagrasses are subject to many threats, both anthropogenic and natural. Runoff of nutrients and sediments from human activities on land has major impacts in the coastal regions where seagrasses thrive; these indirect human impacts, while difficult to measure, are probably the greatest threat to seagrasses worldwide. Both nutrient and sediment loading affect water clarity; seagrasses' relatively high light requirements make them vulnerable to decreases in light penetration of coastal waters.

In an attempt to learn more about the behavioral patterns and habitat use of hawksbills at Lac Bay, abundance surveys and datalogger deployments were carried out in 2012. Two types of surveys were performed to capture turtles for data logger deployment and retrieval: netting surveys inside the bay and snorkeling surveys on the reef outside Lac. These same surveys are part of our ongoing monitoring of green turtles in Lac Bay and were used as one of the means to find hawksbills in the bay. Two hawksbills turtles were caught using a 200 m long by 5 m high sections of wide-meshed tangle net deployed at fixed locations for an average of 40-minute periods and a total soak time of 27.1 hours during 2012. All deployed nets were continuously monitored by a minimum of five snorkelers and a total of 40 volunteers assisted STCB staff during these surveys. Two additional hawksbills were captured and recaptured during our snorkeling surveys outside the bay. These surveys were conducted by snorkeling and/or with the aid of SCUBA, with 2 to 4 people swimming parallel to the coast and followed by a boat. Sighted turtles on reef sites were identified by species and approximate size, and turtles were captured by hand. Approximately 7 hours of surveys were performed with the help of 27 volunteers assisting STCB staff during these surveys.

Figure 16. STCB staff searching for datalogger turtles with the sonic receiver.

Datalogger deployments and retrievals

Instruments used for this study are Mk10-F Fast-GPS Tag (Wildlife Computers, Redmond, U.S.A.) dataloggers, which combined with a sonic tag are attached to the turtle using epoxy at the top of the carapace. The dataloggers are programmed to record depth every 5 seconds and to attempt to obtain Fast-GPS fixes whenever the animal surfaces (surfacings are detected by the "saltwater switch", or conductivity sensor, on the instrument). Sonic tags are uniquely coded for identification and were cross-referenced with the STINAPA conch research project (Sabine Engel) to avoid code duplications, since they are deploying similar tags on conch within Lac Bay.

Dataloggers were placed on four turtles during 2012 and three have since been re-captured yielding displacement and dive data. Two turtles were initially caught by hand on the reef outside of Lac and the other two were caught in the tangle-net deployed in seagrass areas inside the bay. Capture locations were recorded by handheld GPS and then the animals were brought by boat to shore for processing, which includes measurement, flipper tag application and datalogger attachment. For attachment, the turtle's carapace topmost vertebral scute was prepared by scraping it clean of algae and sanding with coarse (#80) sandpaper. The datalogger/sonic tag package was then affixed using marine putty epoxy, followed by the application of two lateral strips of resined fiberglass tape. Once instrumented, all animals were released as close as possible to the location of capture.

Figure 17. First datalogger deployment at Lac Bay, on turtle 12-034 measuring 53.0 cm SCL, released on 21 February 2012.

Turtle ID	SCL (cm)	Mass kg)	Release date	Retrieval date	Days at large
12-034	53.0	24.5	21-Feb-12	27-Jul-12	157
12-128	57.7	24.2	10-Apr-12	24-Jul-12	105
12-162	62.3	27.5	6-Jun-12		
12-229	47.6	13.9	12-Oct-12	30-Nov-12	48

Table 4. Datalogger deployments and retrievals on juvenile hawksbill turtles at Lac Bay.

Attempts to find instrumented turtles were made as often as boat access allowed. Typically, a wide sweep was made first along the center of the bay, then closer to the mangrove fringe, stopping every 100m or so to deploy the hydrophone and listen for the sonic tags in all directions and the required frequencies (Figure 16). In addition to our own efforts, the STINAPA conch project frequently passed along ID and location information of sonic tags belonging to turtles that were heard by them, which was very valuable because of their more continuous presence in Lac.

To date (January 2013), three instrumented hawksbill turtles have been recaptured (Table 4), yielding detailed information on displacement and diving behavior. The first unit recovered, from turtle 12-128, partially malfunctioned and only yielded data for the first 12 days of the 105 day at-large period (the device was later replaced by the manufacturer). The remaining two dataloggers did provide full datasets for the duration of their deployments.

Figure 18. Second datalogger deployment at Lac Bay, on turtle 12-128 measuring 57.7 cm SCL, released near the White Hole dive buoy on 10 April 2012.

Figure 19. Recapture of turtle 12-128 and retrieval of the second datalogger, inside Lac Bay on 24 July 2012. This turtle was now carrying fishing line wrapped around its head and flippers and without intervention would very likely have perished.

Turtle behavior from datalogger readings

The three recovered dataloggers yielded detailed data on turtle behavior, including periodic GPS locations and continuous dive depths recorded at 5 second intervals. The behavioral record for all three hawksbills reveals 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 limited depth resolution (0.5m) of the dataloggers, but it appears that a similar pattern is maintained.

While inside Lac, turtles appear to reside and feed on the dense seagrass and near the mangroves, presumably eating organisms such as sponges associated with the seagrass stands and the mangrove roots. Although the GPS data did not indicated incursions into the mangrove forest itself, it is likely that the GPS signals are too weak there for the dataloggers to record, so it remains unknown whether the turtles enter the mangroves to any extent. Also, in extreme shallows, hawksbills make frequent-but-short excursions to the surface to breathe; possibly too short for GPS signal acquisition.

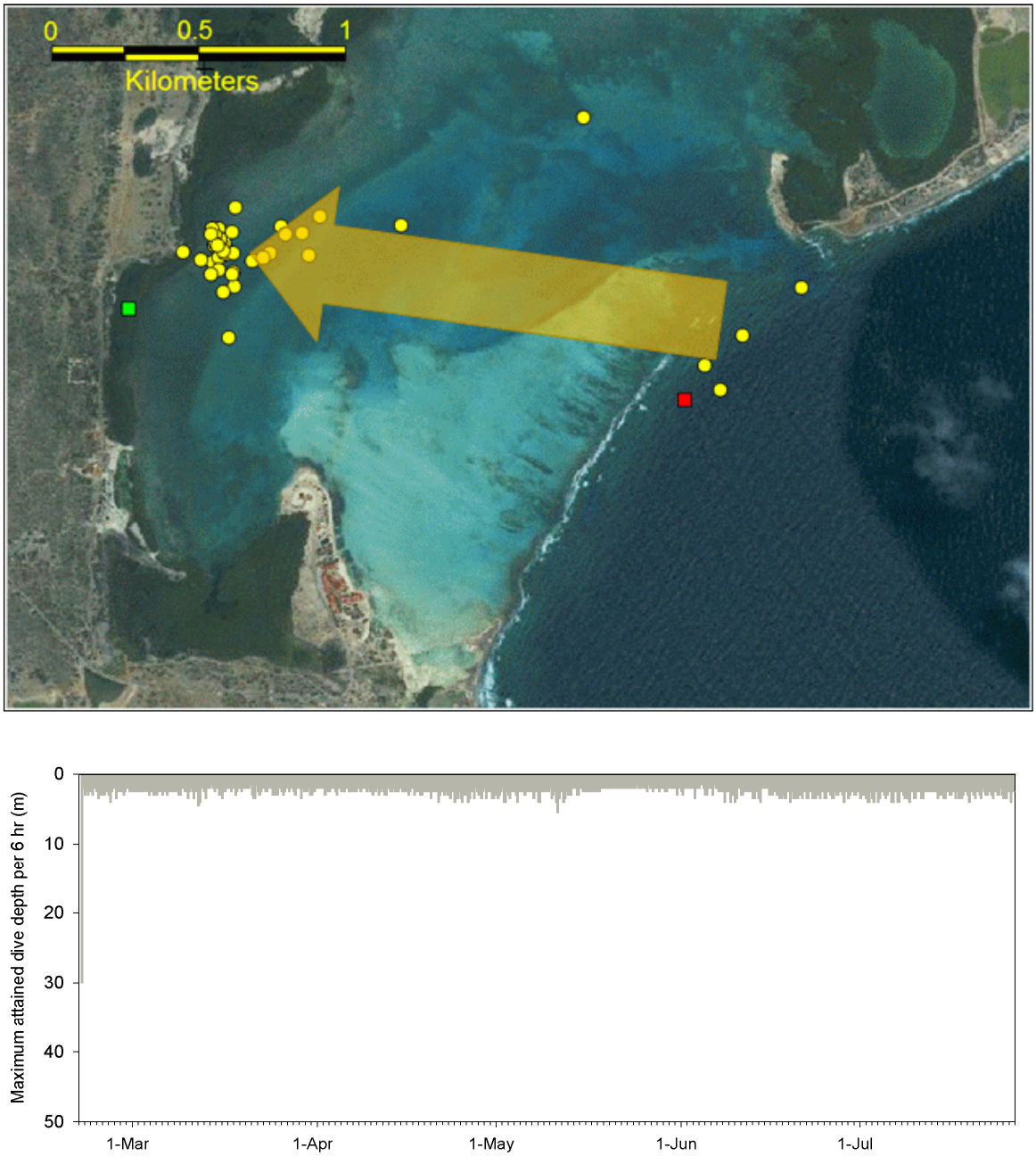

Figure 20. Locations and overview of the dive profile recorded for hawksbill 12-034. This turtle was originally caught on the reef outside Lac, but moved into the bay one day after release, where it apparently remained in a very shallow area until recaptured 6 months later (red square is original capture location, green square is recapture location).

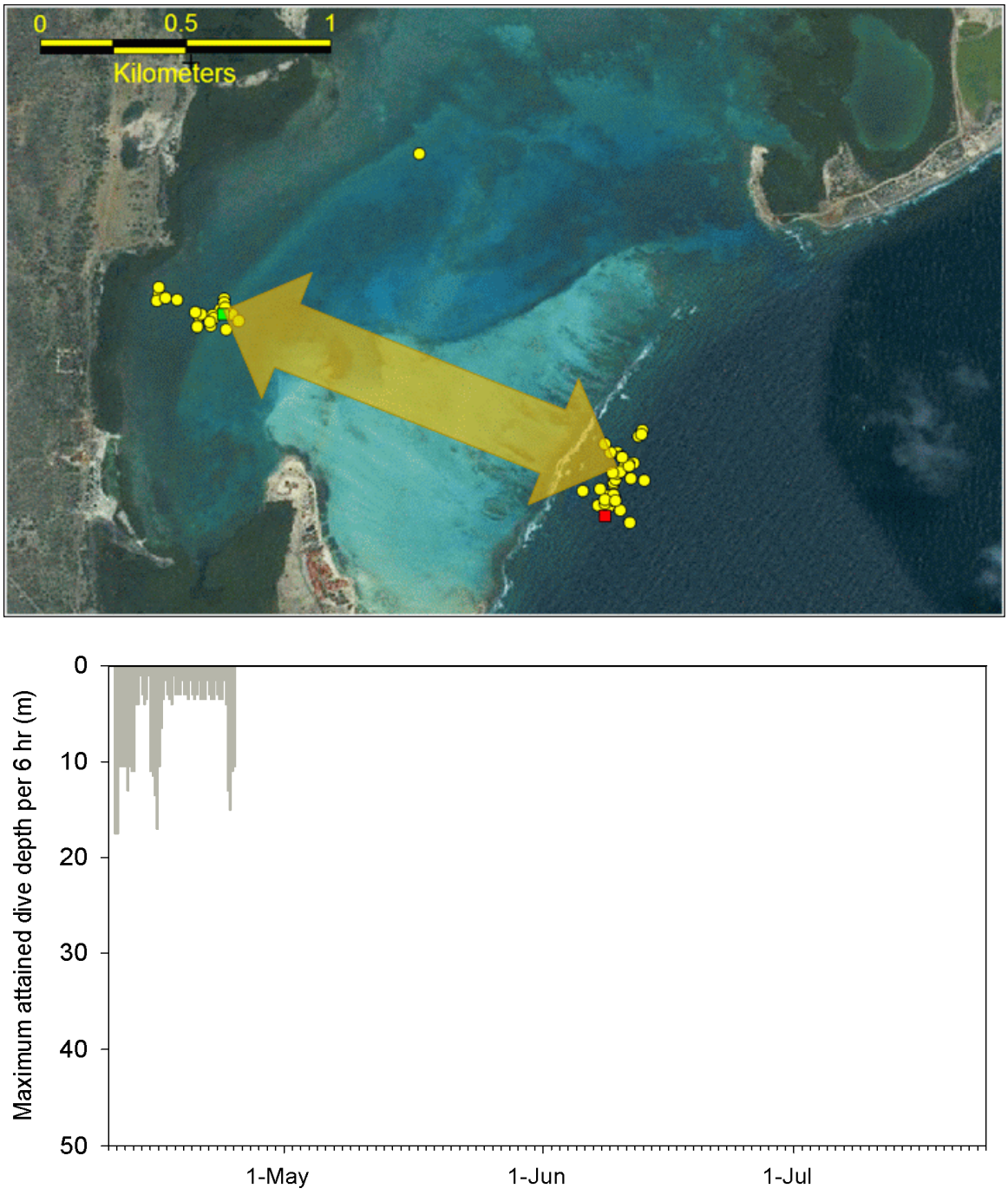

Figure 21. Locations and overview of the dive profile recorded for hawksbill 12-128. The datalogger on this turtle stopped recording after 12 days, however during that time the animal moved into the Bay three times (red square is original capture location, green square is recapture location).

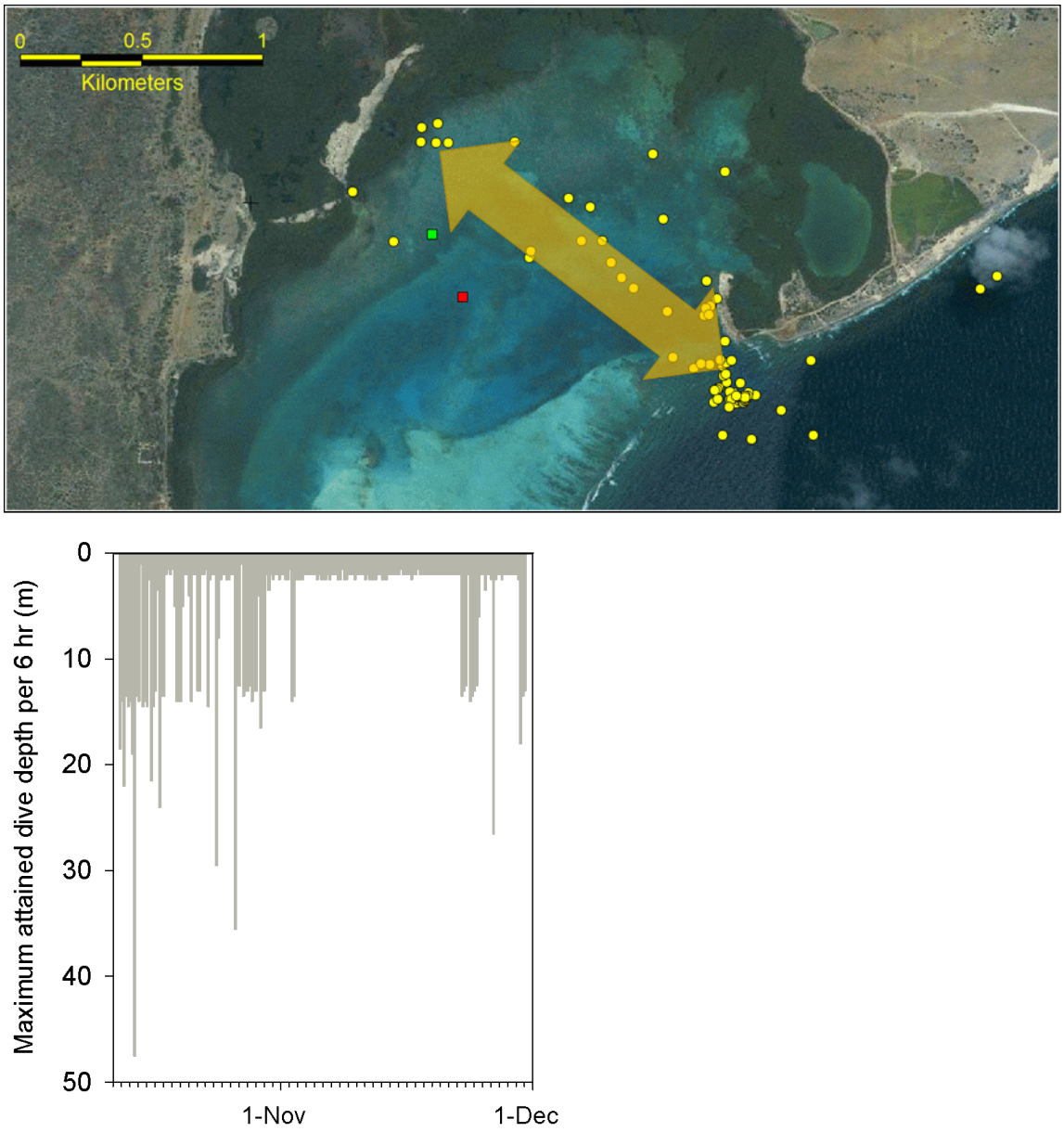

Figure 22. Locations and overview of the dive profile recorded for hawksbill 12-229. This turtle frequently moved in and out of the bay via the channel near Cai (red square is original capture location, green square is recapture location).

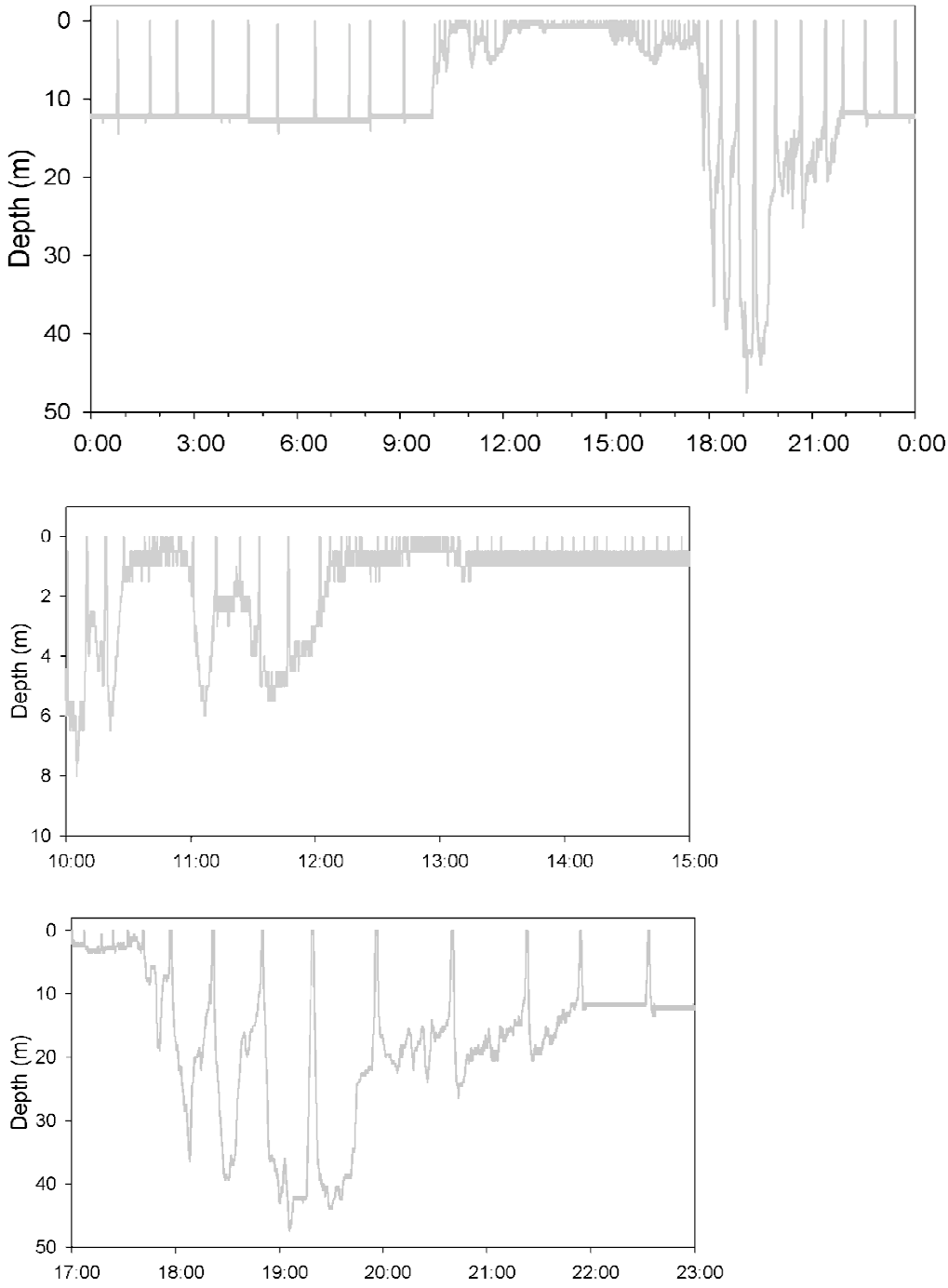

Figure 23. Highlighted dive profiles of hawksbill 12-229 during 14 October 2012 (top, full day), when the animal commuted into the bay (middle) and made the deepest recorded dive of this study, just after exiting the bay through the channel at Cai, to 48 meters depth (bottom).

Figure 24. Border between red mangrove stands and seagrass beds in Lac Bay, and habitat for juvenile hawksbills. Sponges and other organisms heavily encrust the mangrove roots.

Lac Bay hawksbill demographic parameters

Hawksbill turtles have been caught by us at Lac Bay, mostly as a result of "bycatch" while using the tangle-net for capturing green turtles, but also during targeted capture efforts on the reef outside of Lac. Since 2003, some 72 individual turtles have been captured, measured and tagged there. Figure 25 illustrates the size range of hawksbills inhabiting Lac, as compared to those found elsewhere around Bonaire. Hawksbills utilizing Lac are almost exclusively immatures and tend to be larger than non-adults found on other reefs of Bonaire (Figure 25; hawksbills smaller than 60 cm SCL are considered immatures). The size range of Lac hawksbills is also very similar to that reported by Bjorndal & Bolten (2010) for their seagrass study area at Union Creek Reserve, Great Inagua, Bahamas (Figure 26).

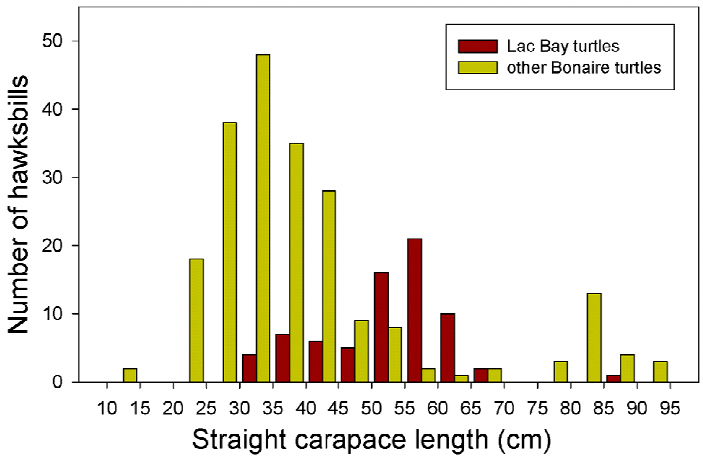

Figure 25. Difference in size-distribution between hawksbills found at Lac Bay (n=72) and elsewhere around Bonaire (n=214).

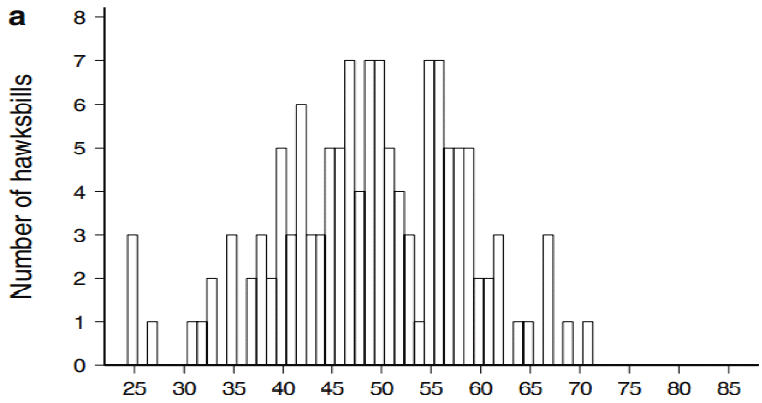

Figure 26. Size distribution of hawksbills inhabiting seagrass pastures at Union Creek Reserve, Great Inagua, Bahamas reported by Bjorndal & Bolten (2010).

Somatic growth rates are an indicator of marine turtle habitat productivity and are likely related to foraging efficiency and food quality. Periodic recaptures of twenty-three individual hawksbills associated with Lac yielded growth increment information (and compared to 71 non-Lac-resident turtles). For Lac Bay hawksbills, growth rates appear high in comparison with hawksbills in other Bonaire habitats (Figure 27, carapace length growth tends to slow as the animals become larger). Growth at Lac appears similar to that reported for hawksbills in seagrass habitat at Union Creek Reserve (Figure 28) and comparable to that of hawksbills at Monito Island, another high productivity habitat in the Caribbean where larger hawksbills are abundant (Figure 29).

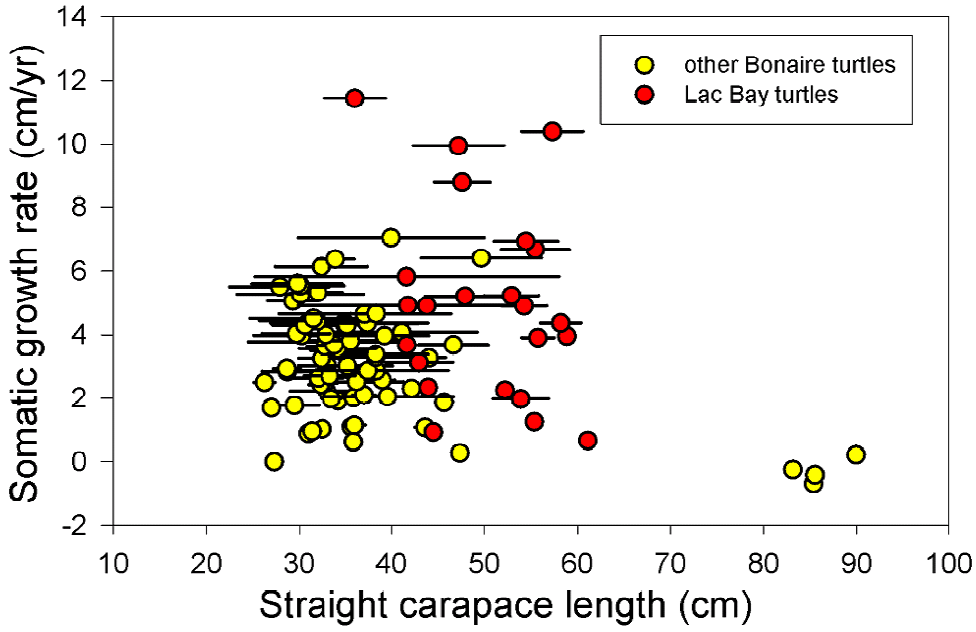

Figure 27. Comparison of mean growth rates for hawksbill turtles residing at Lac Bay and elsewhere around Bonaire. Horizontal lines indicate the size range over which the growth interval was recorded.

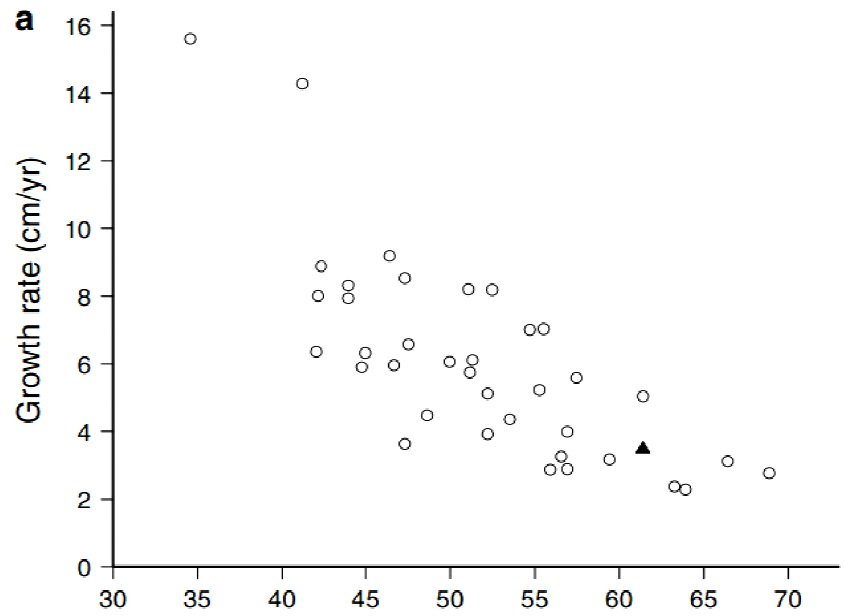

Figure 28. Mean growth rates of hawksbills inhabiting seagrass pastures at Union Creek Reserve, Great Inagua, Bahamas reported by Bjorndal & Bolten (2010).

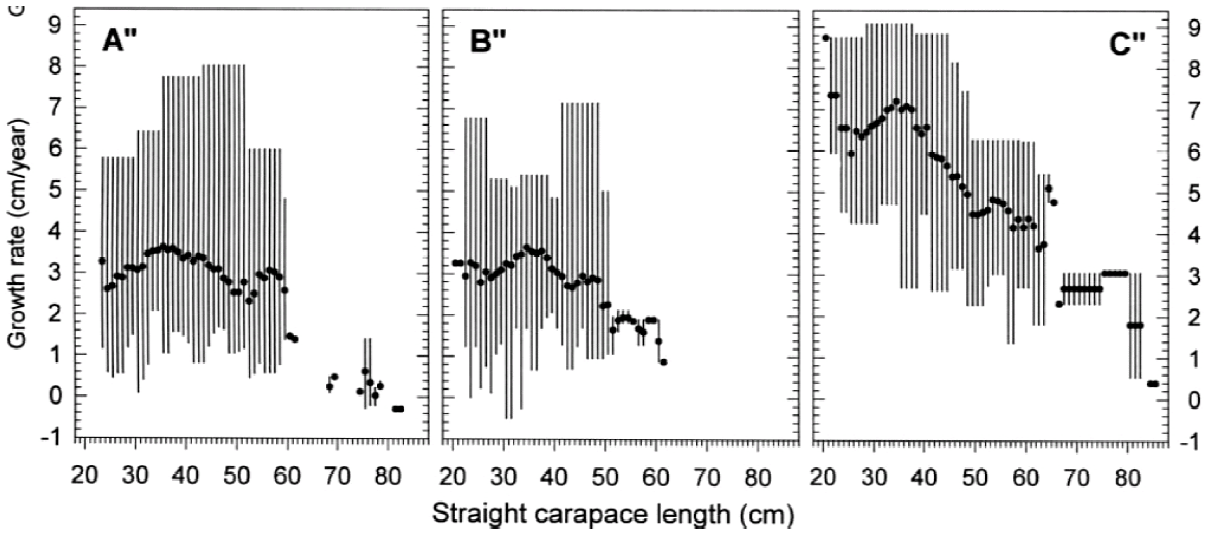

Figure 29. Mean growth rates of hawksbills inhabiting Mona Island coral reefs (A''), Mona Island cliff walls (B") and Monito Island cliff walls (C"), from Diez & Van Dam (2002).

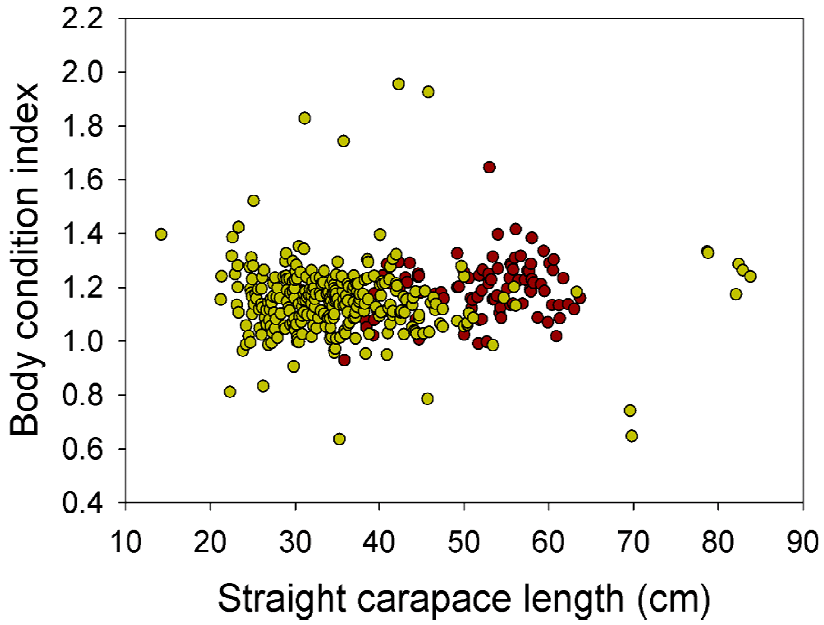

Figure 30. Comparison of body-condition index for hawksbill turtles residing at Lac Bay (red dots) and elsewhere around Bonaire (yellow dots).

The "body condition index" is another attempt at measuring the status of turtle health, also known as the "relative fatness index" and is simply calculated from body mass and SCL through: $BCI = 10^4 \cdot (\text{body mass})/SCL^3$ in kg/cm^3. Figure 30 compares BCI's for Lac and other Bonaire hawksbills. Mean BCI's are slightly higher for Lac animals (1.19 kg/cm^3 at Lac vs 1.15 kg/cm^3 at other sites), but not significantly different, meaning hawksbills at Lac are on average not significantly heavier (in relation to their size) than hawksbills at other sites around Bonaire. Diez and Van Dam (2002) report BCI values of 1.16 (Mona reef), 1.18 (Mona cliff wall), and 1.24 (Monito) for their three study sites in Puerto Rico. The mean BCI value for hawksbills in Union Creek Reserve, Bahamas (mean=1.17, SD=0.08, N=45), are very similar to the values reported for Lac hawksbills.

Our results indicate that the Lac Bay habitat complex, consisting of its fringing reef, seagrass pastures and mangrove forest, support a healthy and productive hawksbill aggregation. Somatic growth rates for hawksbills are high and the condition index of hawksbills at Lac fall within the range of hawksbill aggregations at other sites in the Caribbean. Growth rates of hawksbills at Lac measure in the upper range of rates reported for other Caribbean hawksbill aggregations. Although seagrass habitats may not be as common a habitat for hawksbills as coral reefs and other hard-bottom habitats, sea-grass pastures may become more important, and can support equivalent productivity, for hawksbills if coral reefs continue to decline.

Satellite Tracking

In order to add to our knowledge about the foraging and migratory habits of sea turtles that come to Bonaire to mate and nest, we continued our satellite-tracking program in 2012 by tracking a large adult green sea turtle. This turtle, which we named Anneke is the 23rd sea turtle that we have tracked by satellite since 2003 when our program began (see Figure 31).

After the nesting season, adult male and female sea turtles return to their resident foraging grounds. With satellite transmitters, we are able to learn where these turtles live outside of the nesting season and which routes are taken to return to those sites where they forage.

It is likely that these turtles were born on Bonaire many years ago, yet now live all around the Caribbean. From our tracking program, we know that our adult turtles can live as far as 2,500 kilometers away and as close as the Los Roques Archipelago, some 150 kilometers to the east.

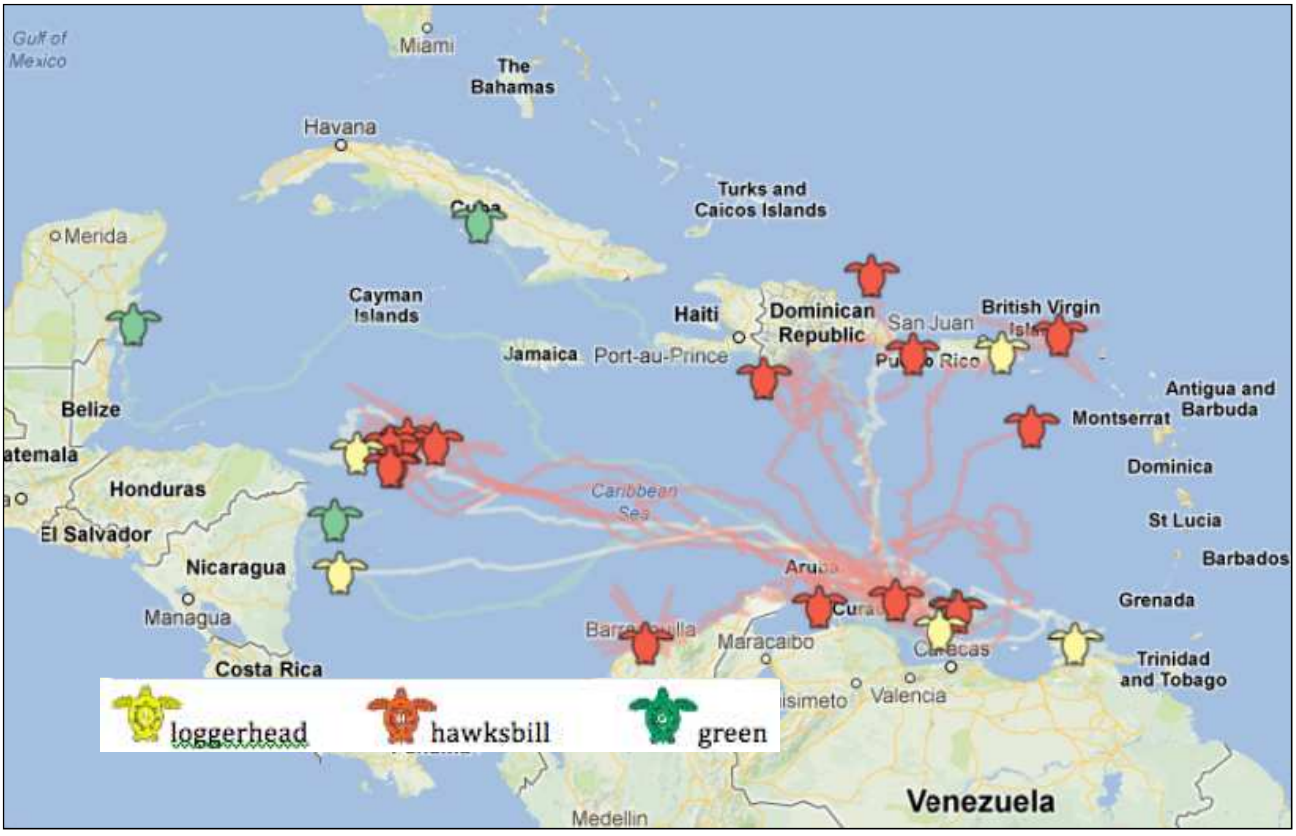

Figure 31. 23 Bonaire nesting sea turtles have been tracked by STCB since 2003

We have tracked sea turtle migrations from Bonaire west to the coastal waters of Nicaragua, Honduras and Colombia; northwest to Mexico and Cuba, north to Puerto Rico, the Dominican Republic and the Virgin Islands; and east to Venezuela's Los Roques Archipelago. These countries are range states of Bonaire's breeding sea turtles; regions where our turtles spend portions of their lives.

At 2:00 am on the 8th of October of 2012 Anneke, a green sea turtle with a straight carapace length of 103 cm was fitted with a Wildlife Computers model SPOT5 transmitter after she had laid her fourth and final nest on Playa Chikitu, a beach in the Washington Slagbaai National Park. Anneke departed immediately to the north (Figure 32).

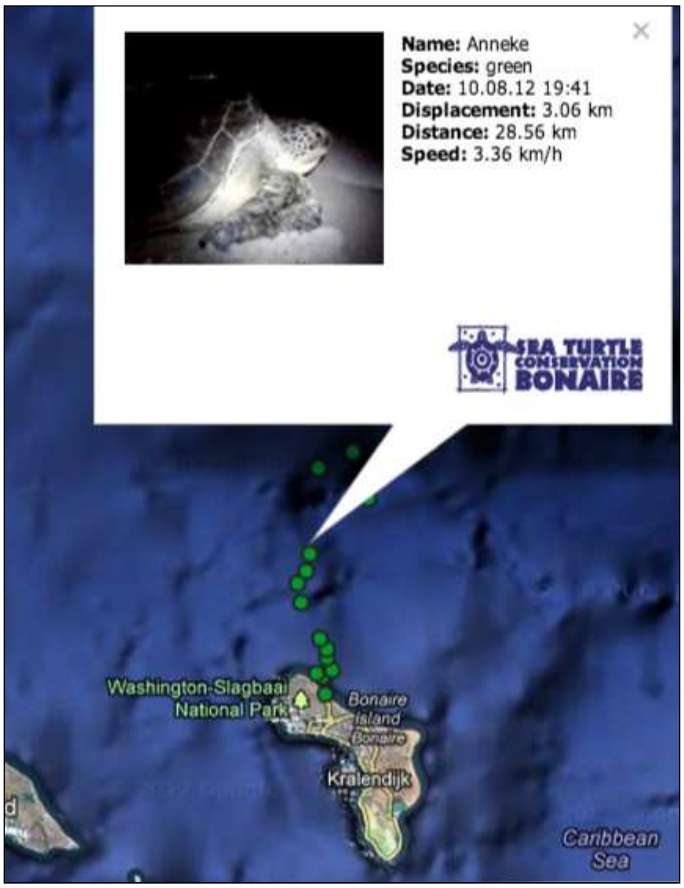

Figure 32. Anneke the green sea turtle departed Bonaire immediately, swimming rapidly north. She covered 135 km in her first 24 hours of migration.

Swimming across the Caribbean Sea, Anneke arrived to Dominican Republic waters in just six days, traveling 750 km. Anneke's initial stage of migration was quite similar to the hawksbill, Jklynn, tracked in 2011 (Figure 33). Jklynn crossed the Caribbean in 13 days and her Wildlife Computers model SPOT5 transmitter was still sending a signal over a year later when Anneke arrived relatively close by, just 142 km to the east.

Figure 33. Jklynn (in orange) and Anneke (in Green) on October 15th 2012.

Anneke's migration was not complete however as she continued west along the coast of Haiti eventually heading into Cuban waters. Anneke arrived to her foraging grounds on the 7th of December, 61 days and nearly 2,500 km from her nesting site on Bonaire (Figure 34).

Figure 34. Location signals from Anneke 8th of October – 12th of November 2012

Anneke's feeding grounds lie in the proximities of well-known archipelago, Jardines de la Reina, a highly diverse and healthy marine ecosystem. Interestingly, Anneke passed through Jardines de la Reina, slowing down significantly on 9th – 12th of November. She continued, however, to the west an additional 500 km along Cuba's southern coast nearly reaching Isla de la Juventud. Instead of staying there or con-

tinuing her way to the west Anneke turned back and returned to the area of Jardines de la Reina where she was tracked from 9th of December 2012 to 21st of January 2013 when her transmitter ceased to send signals (Figure 35).

Figure 35. Location signals from Anneke 9th of November – 9th of December 2012

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 to the Sea Turtle Hotline (780 0433).

During 2012 we had 21 stranded turtles that we acted upon (Table 5). Thirteen (13) animals were found dead, and out of these thirteen dead turtles one was clearly poached for human consumption; four were killed by waste fishing gear (2 hawksbills and 2 green turtles); one large male hawksbill had signs of a head injury possibly caused by a windsurf board; and seven died of unknown causes.

Three turtles were freed from entanglement in fishing lines and then released. One of these was an olive ridley sea turtle, a rare visitor to Bonaire's coastline (Figure 36). A sick green turtle captured during netting surveys was taken for veterinary examination, re-hydrated and released. In addition, four live hawksbill post-hatchlings were rescued during 2012 in unsuitable mangrove areas around Lac Bay and successfully released back into the open seas on the west coast of Bonaire.

Figure 36. Stranded Olive Ridley with line attached (left) and following release (right)

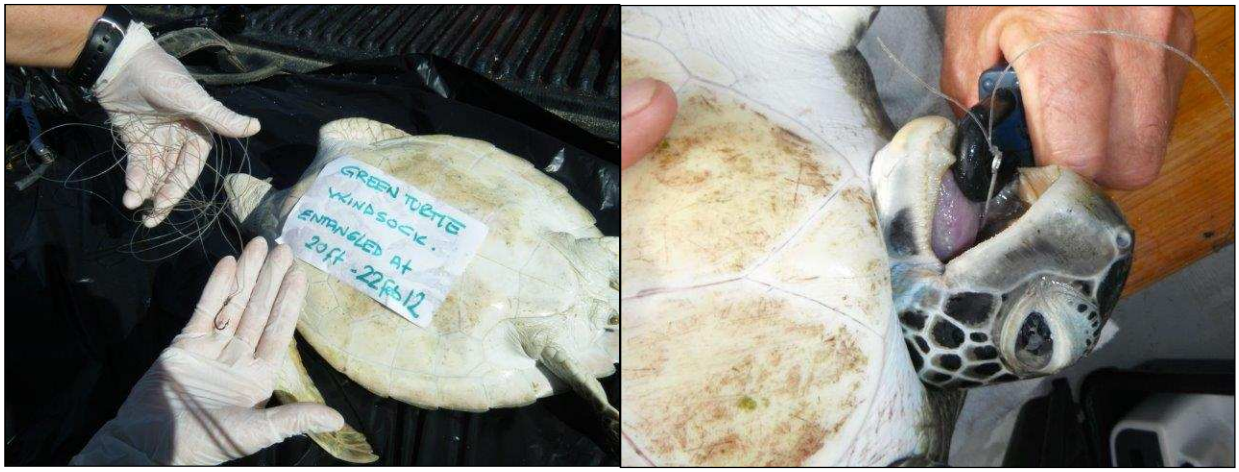

Figure 37. Green turtles entangled in fishing line during 2012

Table 5. Sea turtle stranding incidents recorded for Bonaire and Klein Bonaire in 2012

DATE	LOCATION	SPECIES	SIZE – Curved carapace length	STATUS
9-Jan-12	Kontiki	Hawksbill	6.7cm	3-4 month healthy post-hatchling found in unsuitable habitat in the mangroves. Released in open waters on west coast
25-Jan-12	Outer reef, Lac Bay	Green	52.2 cm	Diver found dead turtle found wedged under the reef. Necropsy performed and findings consistent with drowning but wounds to axilla and rear flipper were unexplainable
27-Jan-12	Port Bonaire	Green	51.6 cm	Divers reported seeing a turtle with fishing line coming from its mouth. They had cut some of the line away. STCB caught the turtle, removed the hook and released it after tagging (Figure 37)
13-Feb-12	Kontiki	Hawksbill	6 cm	1-2 month post-hatchling found in unsuitable habitat in the mangroves. Released in open waters on west coast by volunteers
21-Feb-12	Town Pier	Hawksbill	Approx 40 cm	Decomposed hawksbill with tags [BBH095] found entangled in fish line at Town Pier. Tags retrieved by Asko.
22-Feb-12	Sorobon	Hawksbill	7 cm	4-5 month post-hatchling found at Sorobon. Released in open waters on west coast
25-Feb-12	Windsock	Green	Approx. 35 cm	Small green turtle found dead at Windsock dive site with fish line coming from its mouth. Examination indicated probable cause of death was entrapment leading to drowning (Figure 37)
3-Mar-12	Lac Bay	Hawksbill	75 cm	Decomposed hawksbill found washed up on the shore. No obvious sign of trauma. Cause of death unknown
12-Mar-12	Lac Bay	Green	Approx. 45 cm	Decomposed turtle found in channel by Bas Toll, close where poached turtle was found in 2011. Evidence seen of butchery therefore likely it was killed for consumption
3-Apr-12	Baby Beach, Sorobon	Hawksbill	73.8 cm	Large male hawksbill stranded on beach with obvious signs of trauma. Turtle was taken to vet for x-ray and examination. Findings were inconclusive so turtle was kept overnight but his condition deteriorated and he died the following day. Necropsy was performed and evidence of head wound found, possibly from windsurf board/boat strike
12-May-12	Baby Beach	Hawksbill	60 cm+	Large hawksbill stranded on beach with huge mass of plastic strapping and net attached to it, found by tourists. Tourists and locals Martijn & Monique freed the turtle and it returned to the sea
20-May-12	Sorobon	Green	Approx.45 cm	Decomposed juvenile washed up at Sorobon, full of maggots. Remains collected by STCB but decomposition too extreme for necropsy, so cause of death unknown
5-Jun-12	No Name Beach	Hawksbill	Approx. 35 cm	Dead hawksbill found on beach by tourists. Cause of death not yet established as awaiting necropsy
26-Jun-12	Alice in Wonderland	Unknown	Approx. 45 cm	Divers reported seeing a dead turtle while diving. Not recovered despite several searches
2-Jul-12	Lagoen	Olive Ridley	70 cm	Adult Olive Ridley found entangled in ropes by Funchi. Disentangled and kept overnight in tank for assessment and re-hydration. Released after tagging (WH7570) on west coast
2-Aug-12	Baby Beach, Sorobon	Green	56.2 cm	Dead turtle found close to the Shrimp Farm. Small fibropapilloma tumors on right eye and left shoulder but no other external signs of trauma so cause of death unknown

DATE	LOCATION	SPECIES	SIZE – Curved carapace length	STATUS
27-Aug-12	Mangroves, Lac Bay	Green	75 cm	Dead turtle found drifting close to mangroves. Collected by boat and examined externally. No signs of trauma so cause of death unknown
30-Aug-12	Town Pier	Hawksbill	35-40 cm	Decomposed hawksbill found by diver hanging from discarded new fishing line in which it had become entangled at Town Pier
20-Nov-12	Mangroves, Lac Bay	Hawksbill	7cm	Healthy post-hatchling found swimming in unsuitable habitat in the mangroves. Released in open waters on west coast
7-Dec-12	Lac Bay	Green	Approx. 45 cm	Sick turtle caught during STCB netting survey. Taken to vet for x-ray but nothing seen. Re-hydrated in fresh water overnight and feeding attempted but unsuccessful. Released following day at Lac Bay
9-Dec-12	Captain Don's Reef, Klein Bonaire	Green	Approx. 70 cm	Dead turtle found by divers caught in a large mass of fishing line on the reef at Klein Bonaire. Retrieved the turtle with the help of STINAPA. Cause of death was entanglement in longlines

Appendix I. List of turtles encountered during 2012.

Green turtles

Date capture	Tag left	Tag right	PIT	Turtle ID	Location	SCL (cm)	Weight (kg)
25-Jan-12			151850105A	12-003	Petries Pillar	43.7	11.0
25-Jan-12			151846597A	12-004	Sabadeco	44.1	11.0
30-Jan-12			151852771A	12-005	18 Palms	48.9	14.8
30-Jan-12			151849430A	12-006	Calabas Reef	36.8	7.3
1-Feb-12			151348387A	10-046	Karpata	44.6	13.9
1-Feb-12			151852615A	12-008	Karpata	35.3	6.0
1-Feb-12			151850465A	12-009	Karpata	47.3	15.1
1-Feb-12			151850657A	12-010	Karpata	35.6	6.1
1-Feb-12			151848007A	12-011	Karpata	31.9	4.5
3-Feb-12			151853113A	12-014	Sampler	35.6	5.6
6-Feb-12	Missing	BBG249	151848503A	08-056	Jerry's sponges	42.7	9.4
10-Feb-12			151932685A	12-018	Karpata	37.3	6.4
10-Feb-12			151851062A	11-035	Karpata	31.8	4.2
10-Feb-12			151347124A	10-019	Reserve	32.6	4.4
13-Feb-12			151848602A	12-021	Reserve	29.0	3.5
13-Feb-12			151347246A	10-022	Reserve	31.1	3.8
13-Feb-12			151846227A	12-025	Reserve	29.2	3.4
15-Feb-12			151851642A	12-026	Bopec N	38.9	8.9
15-Feb-12			151848425A	12-027	Bopec N	31.9	5.2
15-Feb-12			151850101A	12-028	Bopec N	31.3	5.2
21-Feb-12			151848107A	12-029	Lac	41.3	9.5
21-Feb-12			151847364A	12-030	Lac	44.0	12.4
21-Feb-12			151852450A	12-031	Lac	40.9	8.5
21-Feb-12			151853035A	12-032	Lac	46.0	14.0
21-Feb-12	BBH323	BBH324		12-033	Lac	51.2	18.8
22-Feb-12	BBH327		51850737A	11-085	Lac	50.5	16.0
22-Feb-12	BBH181	BBH180		10-165	Lac	57.7	25.2
22-Feb-12			151853513A	10-205	Lac	51.8	19.0
22-Feb-12			151524214A	12-039	Lac	50.7	18.0
22-Feb-12			151853437A	12-040	Lac	41.3	9.5
22-Feb-12			151850050A	12-041	Lac	40.7	8.1
22-Feb-12			151848555A	12-042	Lac	45.7	13.0
22-Feb-12			151846344A	12-043	Lac	41.9	8.5
23-Feb-12	BBH257	BBH256		11-088	Lac	61.4	31
23-Feb-12	BBH275	BBH274		11-112	Lac	61.7	33.5
23-Feb-12	BBH242	BBH241		11-075	Lac	69.9	48.0
23-Feb-12			151850012A	12-047	Lac	34.5	5.2
23-Feb-12			151853496A	12-048	Lac	41.7	9.4
23-Feb-12			151851142A	12-049	Lac	49.7	16.0
23-Feb-12			151848515A	12-050	Lac	36.8	6.3
23-Feb-12			151852257A	12-051	Lac	34.9	5.9
23-Feb-12			151848712A	12-052	Lac	38.7	7.2
23-Feb-12			151852273A	12-053	Lac	45.1	12.0
23-Feb-12			151849622A	12-054	Lac	47.2	13.0
23-Feb-12			151849193A	12-055	Lac	36.8	6.2
24-Feb-12	BBH340	BBH339		12-056	Lac	51.1	18.0
24-Feb-12			151853716A	12-057	Lac	45.4	13.6
24-Feb-12			151853541A	12-058	Lac	48.8	15.0
24-Feb-12			151347674A	09-233	Lac	54.5	20.0
24-Feb-12			151853214A	12-060	Lac	34.7	5.2

Green turtles (continued)

Date capture	Tag left	Tag right	PIT	Turtle ID	Location	SCL (cm)	Weight (kg)
24-Feb-12			151934335A	12-061	Lac	40.8	11.0
24-Feb-12	BBH342	BBH341		12-063	Lac	51.3	19.7
24-Feb-12			151846583A	12-064	Lac	47.5	16.4
25-Feb-12	BBH344	BBH343		12-065	Lac	52.0	19.0
25-Feb-12			151853747A	12-066	Lac	41.9	11.0
25-Feb-12			151848295A	12-067	Lac	41.8	9.3
25-Feb-12			149982723	12-068	Lac	42.0	10.7
25-Feb-12			149986332	12-069	Lac	39.2	8.9
25-Feb-12			149974836	12-070	Lac	43.5	12.5
25-Feb-12			153659258	12-071	Lac	48.8	18.5
29-Feb-12			153661518	12-072	Carels Hill	40.3	9.9
29-Feb-12			153661221	12-073	Mi Dushi	30.6	4.0
29-Feb-12			153670239	12-074	Knife	42.7	13.0
7-Mar-12			149983523	12-077	Salt Pier	27.9	2.6
7-Mar-12			153662193	12-078	Jeannie's Glory	30.9	3.6
7-Mar-12			149983179	12-079	Jeannie's Glory	36.1	7.1
7-Mar-12			153677879	12-080	Jeannie's Glory	32.5	5.0
12-Mar-12			153670553	12-083	Red Beryl	36.9	7.3
12-Mar-12			149975185	12-084	Margate Bay	31.9	4.5
14-Mar-12			149975383	12-086	Sweet Dreams	28.0	2.8
14-Mar-12			149983240	12-089	Atlantis	39.1	9.1
14-Mar-12			149990530	12-090	Margate Bay	29.2	4.0
19-Mar-12			150001180	12-093	Playa Frans	27.4	2.5
19-Mar-12			153669805	12-094	Nukove	36.9	6.8
19-Mar-12			149982990	12-095	Nukove	33.0	4.8
19-Mar-12			150015762	12-096	Nukove	33.0	5.0
19-Mar-12			153663896	12-097	Nukove	32.0	4.1
19-Mar-12			151846286A	12-098	Nukove	30.3	3.6
21-Mar-12			134729222A	08-028	Playa Frans	37.5	6.9
21-Mar-12			149982740	12-100	Playa Frans	32.7	4.9
21-Mar-12			163691779	12-101	Slagbaai	32.2	4.8
21-Mar-12			151850344A	11-044	Slagbaai	31.3	4.1
23-Mar-12			151848282A	11-045	Slagbaai	25.5	3.6
23-Mar-12			149981392	12-104	Slagbaai	38.9	7.0
23-Mar-12			150016349	12-105	Slagbaai	33.9	5.6
23-Mar-12			153661679	12-106	Wayaka 3	33.3	4.9
23-Mar-12			151532734A	10-082	Wayaka 1	39.4	7.9
23-Mar-12	WH5882	WH5881	133733263A	09-045	Playa Benge	32.8	4.3
26-Mar-12			149972826	12-109	Andreas II	36.5	7.1
26-Mar-12	WH7438	BBH349	151537633A	10-069	Oil Slick Leap (	38.5	6.0
28-Mar-12			163683576	12-111	Rappel	33.0	5.0
28-Mar-12			153672380	12-113	Bopec N	33.3	4.5
28-Mar-12			151347712A	10-052	Bopec N	29.0	3.1
28-Mar-12			149975399	12-115	Candyland	33.9	5.5
28-Mar-12			150016050	12-116	Candyland	31.9	4.5
28-Mar-12			149982766	12-117	Candyland N	34.2	5.1
28-Mar-12			149982699	12-118	Candyland N	29.7	3.5
30-Mar-12			151348305A	10-055	Jeannie's Glory	38.7	9.0
30-Mar-12			153675666	12-120	Jeannie's Glory	44.9	13.1
2-Apr-12			153677014	12-122	Something Spe	41.9	11.6

Green turtles (continued)

Date capture	Tag left	Tag right	PIT	Turtle ID	Location	SCL (cm)	Weight (kg)
4-Apr-12			149987566	12-124	Atlantis	26.8	2.6
4-Apr-12	Lost	BX1358	153658861	06-001	Red Slave	43.1	12.2
23-Apr-12			149990327	12-130	Red Slave	30.6	4.5
23-Apr-12			153667805	12-131	Margate Bay	31.3	5.0
28-Apr-12			134736324A	09-011	Lac	40.9	11.0
28-Apr-12			153670335	12-134	Lac	45.5	15.6
28-Apr-12			149987622	12-135	Lac	38.0	8.9
28-Apr-12			149982767	12-136	Lac	40.7	9.6
2-may-12			150016365	12-137	Playa Funchi	32.8	5.1
2-may-12			153663688	12-138	Playa Funchi	27.3	2.9
2-may-12			150016351	12-139	Playa Funchi	25.6	2.1
4-Jun-12	WH7491	BBH328		12-140	Lac	70.5	56.0
4-Jun-12			149973756	12-142	Lac	39.8	9.0
4-Jun-12			153678776	12-143	Lac	51.6	17.5
4-Jun-12			153667846	12-144	Lac	42.5	10.0
4-Jun-12			149975135	12-145	Lac	46.1	12.5
4-Jun-12			149985740	12-146	Lac	44.3	10.0
4-Jun-12			153663804	12-147	Lac	39.2	8.1
4-Jun-12			153672465	12-148	Lac (Pui-Pui)	41.7	9.0
4-Jun-12			153661893	12-149	Lac	55.4	22.0
4-Jun-12	BBH330	BBH329		12-150	Lac	53.1	20.5
5-Jun-12	BBH332	BBH331		12-151	Lac	51.1	16.9
5-Jun-12	BBH333	BBH334		12-152	Lac	52.1	18.0
5-Jun-12			153673806	12-153	Lac	46.1	12.5
5-Jun-12	BBH337	BBH336		12-154	Lac	69.1	43.0
5-Jun-12			153669445	12-155	Lac	40.7	8.0
5-Jun-12	BBH352	BBH353		12-156	Lac	56.4	23.6
5-Jun-12	BBH354	BBH355		12-157	Lac	52.1	18.5
5-Jun-12			153652308	12-158	Lac	40.4	8.0
5-Jun-12			153670003	12-159	Lac	75.0	60.0
6-Jun-12			153670735	12-160	Lac	40.7	8.5
6-Jun-12	BBH350		151524214A	10-202	Lac	52.2	forgot
7-Jun-12	BBH357	BBH358		12-163	Lac	52.9	18.1
7-Jun-12			153659332	12-164	Lac	43.8	10.2
7-Jun-12			153662272	12-165	Lac	48.7	15.0
7-Jun-12			151348010A	09-192	Lac	47.9	14.0
7-Jun-12			151523044A	10-154	Lac	50.8	19.0
7-Jun-12			153661491	12-169	Lac	46.5	14.0
7-Jun-12	BBH360	BBG359		12-170	Lac	65.1	35.0
7-Jun-12			153675043	12-171	Lac	40.9	9.0
7-Jun-12			153662388	12-172	Lac	36.7	6.5
7-Jun-12			151533184A	10-200	Lac	48.9	14.8
7-Jun-12	BBH369	BBH370		12-174	Lac	51.8	18.5
7-Jun-12	BBH372	BBH371		12-175	Lac	57.0	26
7-Jun-12			150016026	12-176	Lac	43.3	11
8-Jun-12			149975538	12-178	Lac	39.5	7
8-Jun-12			149987338	12-179	Lac	45.8	11.2
8-Jun-12			149983014	12-180	Lac	44.7	11
8-Jun-12			153678768	12-181	Lac	47.4	13.2
8-Jun-12	BBH374	BBH373		12-182	Lac	53.7	21

Green turtles (continued)

Date capture	Tag left	Tag right	PIT	Turtle ID	Location	SCL (cm)	Weight (kg)
8-Jun-12			153672672	12-183	Lac	40.4	8
8-Jun-12	BBH375	BBH376		12-184	Lac	51.5	17.1
8-Jun-12			153683906	12-185	Lac	37.5	6.2
8-Jun-12			153687240	12-186	Lac	47.6	14.8
8-Jun-12			153687352	12-187	Lac	67.6	44.5
22-Jul-12			153659398	12-190	Lac		21.0
22-Jul-12			163658741	12-191	Lac		13
22-Jul-12			149975134	12-192	Lac		12.0
22-Jul-12			149975375	12-193	Lac		24.0
22-Jul-12			153653442	12-194	Lac		10.0
22-Jul-12		BBH283	149973753	12-195	Lac		22.0
22-Jul-12	BBH281	BBH282		12-196	Lac		35.0
18-Sep-12			153684631	12-200	Lac	40.8	7.5
18-Sep-12			149985932	12-201	Lac	41.0	8.5
18-Sep-12			149975428	12-202	Lac	44.3	11
18-Sep-12			163659988	12-203	Lac	47.6	14.8
18-Sep-12			153672628	12-204	Lac	42.0	8.5
18-Sep-12			153652999	12-205	Lac	44.6	12.5
18-Sep-12	BBH364	BBH363		12-206	Lac	64.1	35
20-Sep-12			153672938	12-207	Lac	52.9	20
20-Sep-12			153687021	12-208	Lac	61.3	30
20-Sep-12			163677461	12-209	Lac	42.6	10
20-Sep-12			149975454	12-210	Lac	31.3	3.8
22-Sep-12	WH7572	WH7571		12-212	Lac	61.0	32
22-Sep-12			149974732	12-213	Lac	45.7	14
22-Sep-12			149975200	12-214	Lac	50.8	17.5
22-Sep-12			153670078	12-215	Lac	41.3	9
22-Sep-12			153652136	12-216	Lac	50.0	16.2
26-Sep-12			153661128	12-217	Lac	46.3	13
26-Sep-12			153659345	12-218	Lac	39.6	7
26-Sep-12	BBH377	BBH284		12-219	Lac	51.3	18.2
26-Sep-12			149980129	12-220	Lac	44.8	10.1
26-Sep-12	WH7565	WH7501		12-221	Lac	56.4	28
28-Sep-12			163694957	12-222	Lac	40.3	8.7
28-Sep-12	WH7507	BBH290		11-121	Lac	48.6	14.5
7-Oct-12	WH8065	WH8068		12-225	Playa Chikitu	100.0	150+
12-Oct-12			149987648	12-226	Lac	49.1	15.2
12-Oct-12	BBH361	BX1346		05-088	Lac	58.6	27.5
12-Oct-12			153671463	12-228	Lac	56.5	37
3-Dec-12			153672647	12-231	Lac	44.5	10.5
3-Dec-12			153669855	12-232	Lac	42.2	9.5
3-Dec-12			149978110	12-233	Lac	38.7	7.8
3-Dec-12			153678023	12-234	Lac	39.4	8.5
3-Dec-12	WH7569	WH7568		12-235	Lac	65.6	38
3-Dec-12			149979966	12-236	Lac	61.8	33
3-Dec-12	WH7573	WH7571		12-237	Lac	58.0	24.5
3-Dec-12	WH7567	WH7566		12-238	Outside Lac	60.7	32
3-Dec-12	BBH069	BBH068		09-191	Outside Lac	62.3	36
4-Dec-12			150017312	12-240	Lac	36.3	6.5
4-Dec-12			149972732	12-241	Lac	44.1	10

Green turtles (continued)

Date capture	Tag left	Tag right	PIT	Turtle ID	Location	SCL (cm)	Weight (kg)
4-Dec-12	BBH366	BBH365		12-242	Lac	51.2	19
4-Dec-12			163671568	12-243	Lac	46.5	12.5
4-Dec-12			150016591	12-244	Outside Lac	45.0	12.5
4-Dec-12			150017067	12-246	Outside Lac	67.3	43
4-Dec-12	WH7563	WH8099		12-247	Outside Lac	60.0	29
4-Dec-12	BBH093	BBH092		09-234	Outside Lac	61.6	33.5
4-Dec-12	missing	BBG274		08-092	Outside Lac	64.6	37
4-Dec-12			151348395A	09-206	Outside Lac	53.7	20.5
6-Dec-12	BBH378	BBH368		12-251	Lac	54.0	22
6-Dec-12			149980175	12-252	Lac	54.7	21
6-Dec-12			149982663	12-253	Lac	40.6	8.5
6-Dec-12			153660838	12-254	Sorobon	37.2	6.5
6-Dec-12			149973923	12-255	Sorobon	32.6	4.9
7-Dec-12			153659155	12-256	Lac	47.1	12.5
7-Dec-12			149987523	12-257	Lac	44.7	11.8
7-Dec-12			149979688	12-258	Lac	63.9	37.5
7-Dec-12			1499905597	12-259	Lac	45.1	12.5

Hawksbill turtles

Date capture	Tag left	Tag right	PIT	Turtle ID	Location	SCL (cm)	Weight (kg)
23-Jan-12	WH7485	WH7486	151347341A	10-009	Playa Lechi	38.6	6.9
23-Jan-12	WH7481	WH7480		10-001	Buddy Dive	37.3	6.8
3-Feb-12	WH7417	WH7416	134935232A	09-132	Sampler	41.3	7.7
3-Feb-12			151853463A	12-013	Sampler	34.4	5.0
6-Feb-12			151850526A	11-056	Jerry's sponges	33.4	4.7
6-Feb-12			151852554A	12-017	Jerry's sponges	31.6	3.7
13-Feb-12			151852471A	11-021	Reserve	31.6	4.0
13-Feb-12			151852103A	12-024	Reserve	21.3	1.2
21-Feb-12	WH7503	BBH325		12-034	Outside Lac	53.0	24.5
21-Feb-12	WH7515	BBH326		12-035	Outside Lac	47.3	12.5
24-Feb-12	WH7506	BBH338		12-062	Lac	49.2	15.8
5-Mar-12	WH7426	WH7427		10-014	Bon Aventura	36.4	5.9
9-Mar-12	WH7504	BBH345		12-081	Bachelor's Bea	38.6	7.1
12-Mar-12	WH7511	BBH346		12-082	Torrie's Reef	49.7	15.7
12-Mar-12	WH7514	BBH347	151847285A	11-004	White Slave	36.5	6.2
14-Mar-12	WH7520	WH7519	151846677A	11-030	Sweet Dreams	33.3	5.0
14-Mar-12	WH1014	BBH348		06-003	Sweet Dreams	41.4	8.9
14-Mar-12	WH5886	BBG162		09-048	Margate Bay	50.7	17.0
16-Mar-12	WH7513	WH7512	151853345A	11-007	Petries Pillar	28.1	2.5
28-Mar-12	WH7518	WH7517	149985996	12-112	Bopec	28.2	2.6
2-Apr-12	WH7510	WH7509	151850406A	11-011	Something Spe	30.8	3.8
4-Apr-12	WH7522	WH7523	149982680	12-123	Fisherman's Hu	27.8	2.5
4-Apr-12	WH7524	WH7525	149975278	12-127	Sweet Dreams	31.7	3.8
10-Apr-12	WH8067	WH8063		12-128	Outside Lac	57.7	24.2
11-Apr-12	BBH006	WH8053	134515113A	09-121	Outside Lac	45.0	10.5
6-Jun-12	WH7495	BBH356		12-162	Lac	62.3	27.5
27-Jul-12	WH7575	WH7574		12-197	Mangroves nr Sorobon		7.5

Hawksbill turtles (continued)

Date capture	Tag left	Tag right	PIT	Turtle ID	Location	SCL (cm)	Weight (kg)
12-Oct-12	WH7425	WH8069		12-229	Lac	47.6	13.9
13-Oct-12	WH7554	BBH362		12-230	Outside Lac	53.3	19
4-Dec-12	WH8011	BBH367		12-245	Outside Lac	49.3	15.5

Olive Ridley turtle

Date capture	Tag left	Tag right	PIT	Turtle ID	Location	SCL (cm)	Weight (kg)
2-Jul-12	WH7570			12-188	Lagoen	73.3	~25

Appendix II. List of turtle nests observed on Klein Bonaire during 2012.

Activity number	Location stake	Observation date	Species
1	1070	16-May	Ei
2	2040	18-May	Cc
3	430	27-May	Ei
4	384	30-May	Cc
5	320	30-May	Cc
6	1246.8	30-May	Cc
8	902	28-May	Ei
9	977	4-Jun	Cc
10	428	11-Jun	Cc
11	820	13-Jun	Ei
12	819	13-Jun	Ei
14	1355	13-Jun	Cc
15	480	15-Jun	Cc
16	420	15-Jun	Ei
18	1148	15-Jun	Cc
19	320	20-Jun	Ei
20	1140	25-Jun	Cc
21	2041	22-Jun	Ei
22	862	29-Jun	Ei
23	733	27-Jun	Cc
24	1082	27-Jun	Cc
25	354	2-Jul	Ei
26	725	2-Jul	Ei
27	1765	2-Jul	Ei
29	1820	6-Jul	Ei
30	537	9-Jul	Ei
31	479	9-Jul	Ei
32	1006	9-Jul	Cc
33	1120	9-Jul	Cc
34	956	11-Jul	Cc
35	540	14-Jul	Ei
36	1140	14-Jul	Ei
41	322	18-Jul	Ei
44	252	20-Jul	Ei
46	1029	20-Jul	Cc
48	405	27-Jul	Ei
49	511	30-Jul	Cm
50	957.5	30-Jul	Cc
51	1608	30-Jul	Ei
52	1610	30-Jul	Ei

During 2012 a total of 19 loggerhead (Cc), 60 hawksbill (Ei) and 3 green turtle (Cm) nests were encountered on Klein Bonaire.

List of turtle nests observed on Klein Bonaire during 2012 (continued)

Activity number	Location stake	Observation date	Species
55	1076	6-Aug	Ei
56	1118	6-Aug	Ei
57	512	10-Aug	Cm
58	372	10-Aug	Ei
59	1107	10-Aug	Cc
60	1638	13-Aug	Ei
61	711	15-Aug	Ei
62	1673	15-Aug	Ei
63	987	17-Aug	Ei
64	974	20-Aug	Ei
65	1106	20-Aug	Ei
66	1992	20-Aug	Ei
67	998	22-Aug	Ei
68	714	24-Aug	Cm
69	1979	24-Aug	Ei
70	1447	27-Aug	Ei
71	1178	29-Aug	Ei
72	720	3-Sep	Ei
74	430	1-Oct	Cc
76	1280	5-Sep	Ei
77	517	7-Sep	Ei
78	1000	7-Sep	Ei
79	1857	14-Jul	Ei
81	868	12-Sep	Ei
82	1300	12-Sep	Ei
84	606	19-Sep	Ei
85	2015	19-Sep	Ei
86	1197	21-Sep	Ei
87	373	24-Sep	Ei
88	930	1-Oct	Ei
89	679	3-Oct	Ei
91	1249	5-Oct	Ei
92	1033	8-Oct	Ei
93	578	15-Oct	Ei
94	744	17-Oct	Ei
95	1191	17-Oct	Ei
96	504	19-Oct	Ei
97	770	22-Oct	Ei
98	606	29-Oct	Ei
99	1196	7-Dec	Ei
100	813	22-Dec	Ei
101	710	7-Jan	Ei

List of turtle nests observed on other Bonaire beaches during 2012.

Fisherman's Hut	12-May	Cc
Fisherman's Hut - 50 m South	7-Jun	Cc
Sweet dreams, 20 m N of exit marker	12-Jun	Cc
Fisherman's Hut	20-Jun	Cc
Sweet dreams	25-Jun	Cc
Washikemba Beach	26-Jun	Ei
Fisherman's Hut	1-Jul	Ei
Fisherman's Hut	2-Jul	Cc
Sweet Dreams	9-Jul	Cc
Memorial, 37m south of memorial	15-Jul	Cc
Te Amo	20-Jul	Ei
Sweet Dreams, 84m N of sweet dreams	21-Jul	Cc
68 J.Abraham Boulevard	24-Jul	Cc
15m N of Memorial	26-Jul	Cc
Memorial, South of Fisherman's Hut	7-Aug	Cm
20m south of Memorial	17-Aug	Cm
24.4m South of Monument	28-Aug	Cm
Sweet dreams	3-Sep	Cm
Playa Chikitu	4-Sep	Cm
9.8m south of memorial	7-Sep	Cm
150m south of Vista Blue	7-Sep	Cm
Plaza Resort	12-Sep	Ei
Playa Chikitu	14-Sep	Cm
76m south of memorial	18-Sep	Cm
Playa Chikitu	26-Sep	Cm
Plaza Resort	29-Sep	Ei
Playa Chikitu	7-Oct	Cm
Donkey Beach	10-Oct	Ei
Donkey Beach	25-Oct	Ei

During 2012 a total of 11 loggerhead (Cc), 7 hawksbill (Ei), and 11 green (Cm) turtle nests were encountered on the beaches of Bonaire.

Appendix III. 2012 Funders and Donors

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

Flagship Funder 2008 – 2014

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 Funders
Dutch Ministry of Economic Affairs (EZ)
Dutch Caribbean Nature Alliance (DCNA)
IMARES (the Institute for Marine Resources and Ecosystem Studies in the Netherlands

Platinum Donors
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Dr Sue Willis, *Program Assistant*
Gielmon Egbreghts, *Contractor Field Technician*
Tina Lindeken*, Contractor Field Technician*

Scientific Advisor

Dr Robert van Dam

Interns

Lisette Mekkes, Applied Biology. Hasdenbosch, 's-Hertogenbosch
Jenny Cheetham, Masters program,Marine Environmental Management. University of York, UK.:

> Research report entitled 'The impacts of sea-level rise on the index nesting beach on Klein Bonaire for three species of Sea Turtle' (Cheetham, 2012) available http://www.bonaireturtles.org/explore/publications

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Appendix V. 2012 STCB Partners, Supporters and Volunteers

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

Regional Partners

Dutch Caribbean Nature Alliance (DCNA)
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Saba Conservation Foundation
St. Eustatius National Parks Foundation
Turtugaruba

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Bonaire Department of Environment and Natural Resources (DROB)
CIEE Research Station Bonaire
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STINAPA Bonaire
    Bonaire National Marine Park
    Washington-Slagbaai National Park

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These businesses provide ongoing support to STCB programs and activities through the donation of in-kind materials and/or services:

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Fishing line project volunteers
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And to the many volunteers who helped with our in-water sea turtle surveys: Patrick, Hettie, Maggie, Patti, Tina, Rick, Lila, Patrik and Maria, Gerda, Kathleen, Richard, Martijn, Rob, Gigi and Tom, Laura, Janine, Claire, Fabian, Kim, Nancy, CIEE students, Elly, Robert, Ralph (Moogie), Hans and Fred.

Appendix VI. 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 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

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Account number: 101.169.209
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To discuss other ideas for giving, please call STCB Manager, Mabel Nava, on +599-717-2225, or email us at stcb@bonaireturtles.org