BERMUDA TURTLE PROJECT

Annual Report for 2015

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The Bermuda Turtle Project (BTP) continued in its 47th year in 2015, committed to the goal of promoting the conservation of marine turtles through research and education. Project activities during 2015 included field and laboratory research, training of international and local students, and public education via presentations, the media, and the Bermuda Turtle Project webpage.

Sampling of sea turtle populations using a large (2,000 ft.) entrapment net was carried out on 9 days in 2015 by Drs. Peter and Anne Meylan (BTP Principal Investigators), Jennifer Gray (BTP Coordinator), Patrick Talbot (Curator, BAMZ), Dr. Emma Harrison (Sea Turtle Conservancy STC), Robert Hardy (FL Fish & Wildlife Conservation Commission), Dr. Gaelle Roth (veterinary affiliate, Bermuda Aquarium, Museum and Zoo BAMZ), students in the annual Sea Turtle Biology and Conservation course; and numerous other volunteers. Camilla Stringer (Bermuda Zoological Society BBZS) and Barbara Outerbridge (BAMZ) assisted with course logistics. The BZS research vessel, *RV Endurance*, served as the main vessel for the sampling session and was captained by Nigel Pollard, with Anthony Amyoony as first mate. The catch boat, *Chevron*, was captained by Jennifer Gray, and crewed by Cameron Bridgewater or Patrick Talbot.

Immature green turtles (*Chelonia mydas*) captured with an entrapment net as part of the field work for the Bermuda Turtle Project, August 2015.

The sampling session using the entrapment net was conducted 10—21 August 2015. A total of 289 green turtle (*Chelonia mydas*) captures were made at 10 sites around the island. This was a record number of captures for the August sampling session. The captured green turtles ranged in size from 23.5 to 67.1 cm straight carapace length (SCL) (see study site map and sampling log below).

All turtles captured in the entrapment net in 2015 were judged to be immature based on previously established criteria. They were tagged, biometric data were collected, and then, the turtles were released at or near the capture site. Blood samples or skin biopsies were obtained from a sample of the animals for genetic analysis to study nesting beach origins of Bermuda green turtles, and hormone analyses to establish gender and sex ratio.

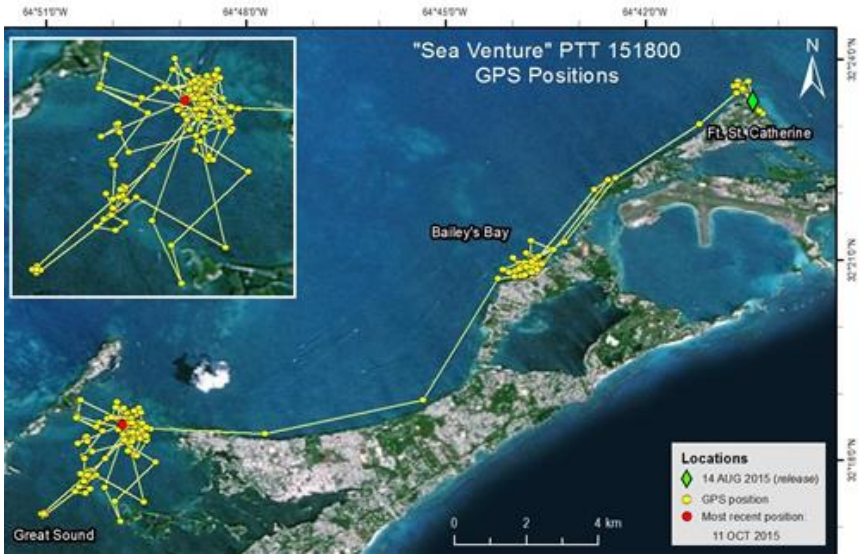
Of the 289 green turtle captures, 88 (30%) were recaptures of animals tagged in previous years. This compares with 32% in 2013 and 34% in 2014. The recapture rate is greatly affected by the extent to which the exact same sites are sampled as in previous years. No turtles captured in 2015 exhibited signs of the disease fibropapillomatosis.

Another record in 2015 was a 15-yr recapture of an immature green turtle. The turtle was tagged at the Vixen in 2000 and not seen again until she was captured at nearby Somerset Long Bay in August 2015. As has been typical in the past, nearly all recaptures occurred on the same grass bed on which the animals were first tagged. One of our recaptures was from the BAMZ Wildlife Rehabilitation Center. It was rescued from the Tynes Bay incinerator in August of 2012 and released later at Bailey Bay. Three years later it was captured at the same site where BAMZ released it, looking healthy and having grown 3 cm...a testimony to the good work of the BAMZ team.

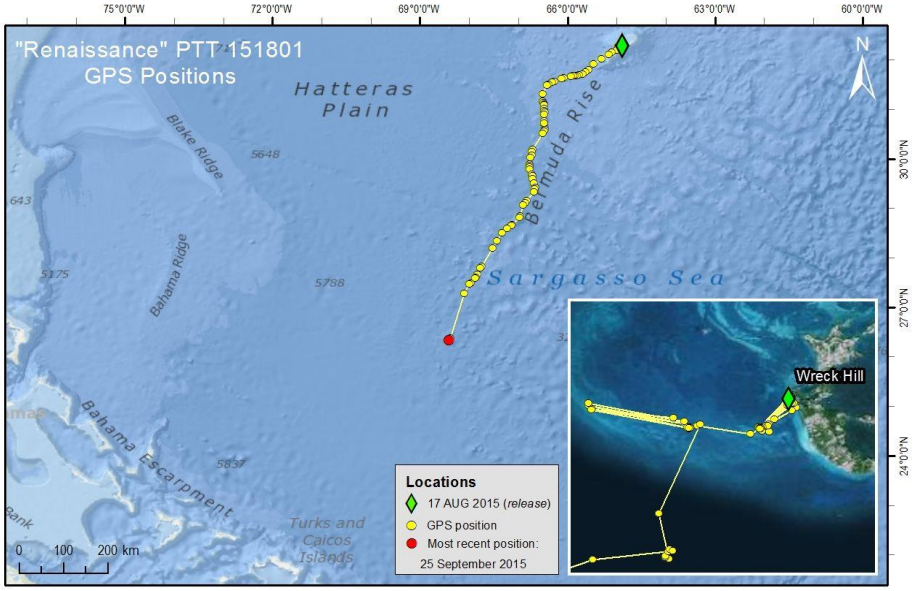
Sampling locations for the Bermuda Turtle Project in 2015.

Net Sampling Log for Bermuda Turtle Project 2015

Date	Sample No.	Location	Set No.	Latitude	Longitude	Bottom Temp (^{O}C)	# of Turtles	Depth (ft.)
8/10/15	679	Bailey's Bay	1	32.35057	64.72390	27.5	11	6.3
8/10/15	680	Bailey's Bay	2	32.34959	64.72578	28.0	22	6.8
8/11/15	681	Somerset Long Bay	1	32.30729	64.47170	27.0	49	6.6
8/12/15	682	Blue Hole	1	32.34932	64.70744	28.5	24	7.6
8/13/15	683	Wreck Hill	1	32.27755	64.88544	26.2	6	6.6
8/13/15	684	Vixen	2	32.30738	64.88738	26.2	1	7.1
8/14/15	685	Fort St. Catherine	1	32.38890	64.67270	29.0	18	10.3
8/17/15	686	Wreck Hill	1	32.27802	64.88554	28.0	1	8.0
8/17/15	687	Tudor Hill	2	32.27555	64.88424	28.5	11	7.6
8/17/15	688	Tudor Hill	3	32.27363	64.88358	28.5	13	5.6
8/19/15	689	Cowground Flat	1	32.31697	64.86929	25.6	6	10.7
8/19/15	690	Somerset Long Bay	2	32.30588	64.87479	27.5	57	13.4
8/20/15	691	Annie's Bay	1	32.35699	64.66032	26.5	23	6.4
8/21/15	692	Walsingham Bay	1	32.34517	64.70719	27.5	47	6.6
Total # of Captures for 2015 thru Sample 692							**289**	
Total # of Captures Since 1992							**4226**	

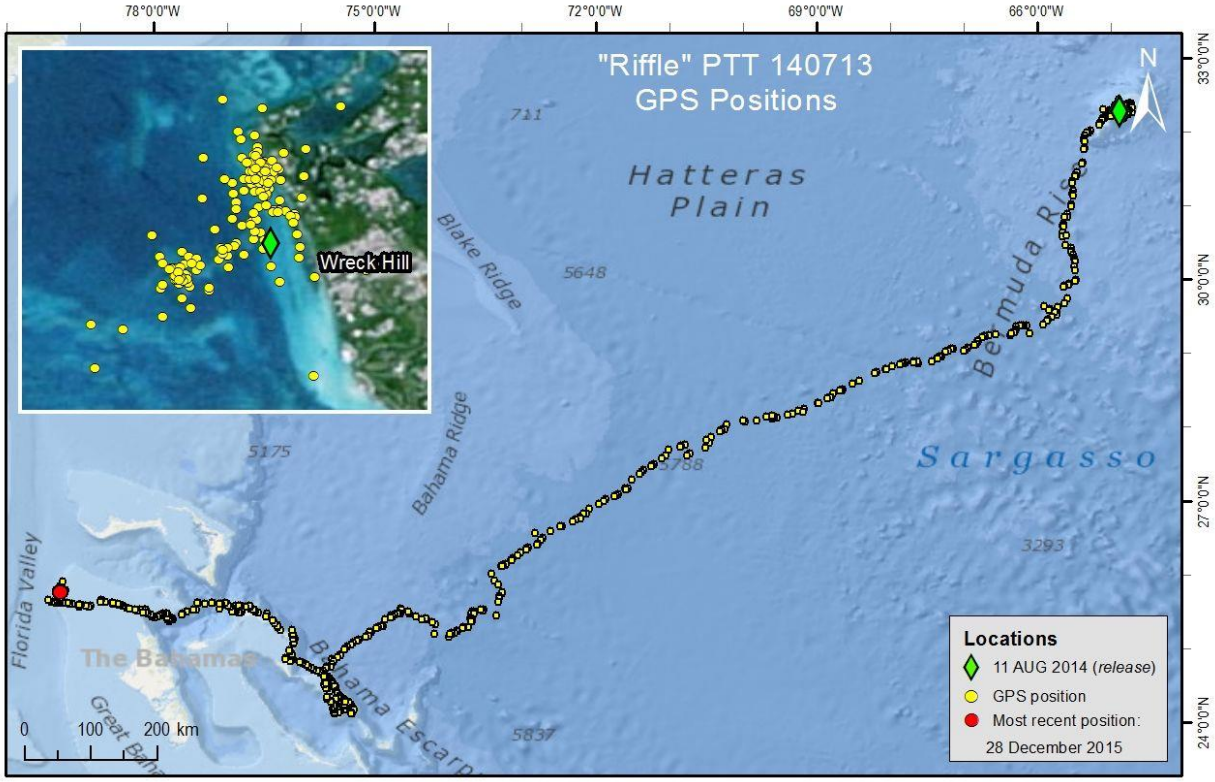


Two satellite transmitters were deployed during 2015, one off of the eastern end and another off of the western end of the island. The first was deployed on a 61.0 cm turtle captured at Ft. St. Catherine on 14 August. This was the first capture of this turtle, nicknamed "Sea Venture." Sea Venture departed Ft. St. Catherine on 16 August, just two days after being captured. This turtle traveled to Bailey's Bay and remained there until 31 August. Sea Venture spent time in the shallow seagrass flats on the western side of Bailey's Bay not far from another of our primary study sites. From Bailey's Bay, she traveled to the Great Sound and established a residence area on the eastern edge of the ship channel near the entrance to the Great Sound. The last report from Sea Venture came on 10 October from within the Great Sound.



The second transmitter was deployed on a 66.6 cm turtle that was captured at Wreck Hill off of the western end of Bermuda. This turtle, nicknamed "Renaissance", remained near the Wreck Hill study site until 4 September. During that time, Renaissance exhibited daily shuttling behavior from the seagrass beds to nearby reefs. On 4 September, Renaissance traveled to the outer reefs and spent three days shuttling east and west, across a 4 km (length) section of reef. On 7 September the turtle left the platform, paused offshore for one day, and then began southward travel along the Bermuda Rise. The final report

from Renaissance's transmitter came on 24 September from deep waters of the Sargasso Sea, approximately 600 km north of the Turks and Caicos Islands.



One of the turtles equipped with a satellite transmitter in August 2014 continued to transmit until 28 December 2015. This turtle ("Riffle", PTT140713, M3774) had originally been tagged in 2001 at nearby Tudor Hill. She spent most of the following months at the site where she had recently been captured, shuttling regularly between this site and a nearby area in deeper water to the southwest. A little more than a year after being released with the transmitter, Riffle departed Bermuda on a 2698 km migration, arriving on Grand Bahama Bank on 12 October 2015, and eventually continued swimming to the western end of the bank, nearest Florida, arriving there 6 days later. Transmissions continued until the end of December. It is not known whether she continued residing here or moved on to a different habitat in the Bahamas or elsewhere.

As has been the case for more than a decade, students from Eckerd College's Genetics and Molecular Biology classes did a two-week lab on conservation genetics of sea turtles during spring 2015 using the samples from the BTP. This year the students generated 34 DNA sequences assignable to 13 different haplotypes from Bermuda green turtle samples. Each year that the classes use BTP samples, there are always a few samples that need additional attention in order to get a usable genetics sequence. During summer 2015, Eckerd student Tess DeSerisy made an effort to get the target sequence from 17 samples that had not worked previously. She was able to get a complete, long control region sequence from 13 of the 17 samples bringing the total number of sample analyzed for the year to 47. One remarkable result is that three of the 47 samples are a rare genotype from the southern Atlantic. The presence of this genotype (CMA-8.1) suggests that green turtle are coming all the way from Brazil, Ascension Island, or Guinea Bissau (in West Africa) to grow up in Bermuda.

Student Jobe Bryer (U.K.) and Robert Hardy (BTP course instructor) prepare to release an immature green turtle with a satellite tag attached to the turtle's back.

Four international tag returns of green turtles tagged in Bermuda were received during 2015. All turtles were recaptured in Nicaragua (and all presumably killed). These turtles had originally been tagged in Bermuda in 1994, 1997, 1998, and 2000. Tag returns provide important information about the fate of turtles after they leave Bermuda waters. Coordination of tag returns and payment of rewards were provided by the Archie Carr Center for Sea Turtle Research and the Sea Turtle Conservancy, respectively. The Nicaraguan tag recoveries were received via researchers, Dr. Cynthia Lagueux and Dr. Cathi Campbell.

The Bermuda Turtle Project offered its International Course on the Biology and Conservation of Sea Turtles for the 19th time from 9 – 21 August 2015. The two-week course consisted of lectures, class discussions of assigned readings, a necropsy session, and nine days of field work aboard the *RV Endurance.* The students learned to capture immature green turtles using the entrapment net. They also gained extensive practical experience in collecting data from the turtles once they were captured and brought on board the research vessel. The course was taught by Drs. Peter and Anne Meylan, Jennifer Gray, Dr. Emma Harrison and Robert Hardy. Dr. Ian Walker, Principal Curator of the Bermuda Aquarium, presented a lecture on sea turtle diseases and necropsy methodologies. This year's course participants were drawn from Aruba, Belgium, Bermuda, Colombia, Panama, U.K. and Uruguay. The students came from a number of backgrounds, including universities and natural resource agencies in the Caribbean region and beyond.

Participants of the 2015 sampling session of the Bermuda Turtle Project. The class included three Bermudian and seven international students representing Aruba, Belgium, Colombia, Panama, and Uruguay.

As part of the course, students conducted necropsies of 18 dead turtles that had been collected and frozen by the Bermuda Sea Turtle Stranding and Salvage Network (BAMZ) during the previous year. Veterinarians Dr. Ian Walker and Dr. Gaelle Roth performed a detailed necropsy at the beginning of the session, and then helped the student teams as they conducted necropsies themselves. In addition to providing an opportunity to learn basic anatomy of sea turtles, the necropsy session enables participants to learn first-hand about some of the mortality factors for sea turtles, such as entanglement in monofilament line, ingestion of hooks used in various fishing activities, disease and boat collisions.

Over the eighteen years during which the Sea Turtle Biology and Conservation course has been offered, it has served 177 students from around the world. Participants have been drawn from Anguilla, Antigua, Argentina, Aruba, Belgium, Belize, Bermuda, Bonaire, Brazil, the British Virgin Islands, Canada, the Cayman Islands, Colombia, Costa Rica, Cuba, El Salvador, Grenada, Guatemala, India, Jamaica, Mexico, Mozambique, the Netherlands, Nicaragua, Panama, Peru, Portugal, St. Kitts/Nevis, Saint Lucia, Saint Maarten, Saint Vincent, Spain, Trinidad and Tobago, Turkey, the Turks and Caicos Islands, the United Kingdom, the United States, Uruguay, and Venezuela. The course is sponsored by the Bermuda Aquarium, Museum and Zoo and the Sea Turtle Conservancy, and is provided free-of-charge. Funding to support travel and lodging for the 2015 course participants came from the Atlantic Conservation Partnership, Chevron International, and the Bermuda Zoological Society.

During 2015, BTP data from studies of sea turtle sex ratios in Bermuda contributed to a new publication by Allen et al. entitled, First Assessment of the Sex Ratio for an East Pacific Green Sea Turtle Foraging Aggregation: Validation and Application of a Testosterone ELISA. PL0S ONE 10(10): e0138861. Bermuda green turtle hormone samples and gender-determinations based on laparoscopy were used to help test and refine a new sex determination methodology that uses ELISA assays rather than RIA assays to determine the gender of a turtle. BTP data also contributed to a region-wide study of growth rates of the hawksbill turtle (*Eretmochelys imbricata*). In the most comprehensive study to date of growth rates of hawksbills in the West Atlantic, data were analyzed for 24 sites between 1980 and 2013. Results are in press in Bjorndal et al. 2016. Somatic growth dynamics of West Atlantic hawksbill sea turtles: a spatio-temporal perspective. Ecosphere, volume 7. BAMZ registrar, Barbara Outerbridge, was a coauthor on a poster presented at the recent International Sea Turtle Symposium in Lima, Peru, describing the recapture in Bermuda of an immature hawksbill turtle that was originally tagged in Brazil. The poster, entitled, Movements of Brazilian hawksbill turtles revealed by flipper tags, was authored by Armando Santos of Fundação Pro-Tamar.

During the August field session, hatchling green turtles were discovered by a member of the public on Buildings Bay Beach. This represents the first record of green turtle nesting in Bermuda in almost 100 years. BTP leaders joined the BAMZ team on the beach which was crisscrossed with tiny turtle tracks suggesting a high level of disorientation by the hatchlings. Eleven live hatchlings were found in long grass along the base of a wall at the back of the beach and were released into the sea. Three hatchlings found dead were taken to the BAMZ Natural History Museum where Dr. Peter Meylan took samples for genetic assessment and initiated the preservation process for museum specimens. Initial genetic results from the hatchling sample, processed by the University of Georgia, confirmed the haplotype as one that is very common throughout the Caribbean including Aves Island, Costa Rica, Cuba, Mexico and Florida. Additional tests may further refine the results but it is unlikely an isolated match will be identified. Regardless of the origin of the nesting female in Bermuda in 2015, it is exciting to consider future possibilities for green turtle nesting on Bermuda shores.

BTP is a joint project of the Bermuda Aquarium, Museum and Zoo and the Sea Turtle Conservancy. The Wardman family kindly provided assistance with lodging in 2015. The two satellite transmitters were funded by RenaissanceRe and the Bermuda Turtle Project Fund.

Information about the Bermuda Turtle Project is available at http://www.conserveturtles.org/bermuda/ which is maintained by the Sea Turtle Conservancy. During 2015, this site received 2,994 unique visitors from 70 countries. In addition, there were 8,750 page visits of four satellite-tracked turtles (originally tagged in 2014 and 2015).