BERMUDA TURTLE PROJECT

Annual Report for 2016

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The Bermuda Turtle Project (BTP) continued in its 49th year in 2016, committed to the goal of promoting the conservation of marine turtles through research and education. BTP is a joint project of the Bermuda Aquarium, Museum and Zoo (BAMZ) and the Sea Turtle Conservancy (STC). Project activities during 2016 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 the Bermuda sea turtle aggregations was carried out for 10 days during August 2016 by Jennifer Gray (BTP Bermuda Director), Robert Hardy (FL Fish & Wildlife Conservation Commission), Drs. Peter and Anne Meylan (BTP Principal Investigators), Dr. Gaelle Roth (Veterinary Affiliate, BAMZ), Patrick Talbot (Curator, BAMZ), Ian Walker (Principal Curator, 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 Owen Chisnall as first mate. The catch boat, *Chevron*, was captained by Jennifer Gray, with Patrick Talbot or Chris Flook as first mate. A second catch boat, *Vee Be Gone*, was used for sites where large numbers of turtles had been captured in previous years. This additional vessel was captained by Robert Chandler with Ian Walker, Ryan Tacklyn or Owen Chisnall as first mate.

Sampling with the 1,300 ft entrapment net was conducted 8—18 August 2016. A total of 225 green turtle (*Chelonia mydas*) net captures were made at 14 sites around the island. The captured green turtles ranged in size from 23.6 to 67.1 cm straight carapace length (SCL) (see study site map and sampling log below). One additional green turtle and one hawksbill were captured by hand during the course.

Sampling locations for the Bermuda Turtle Project in 2016.

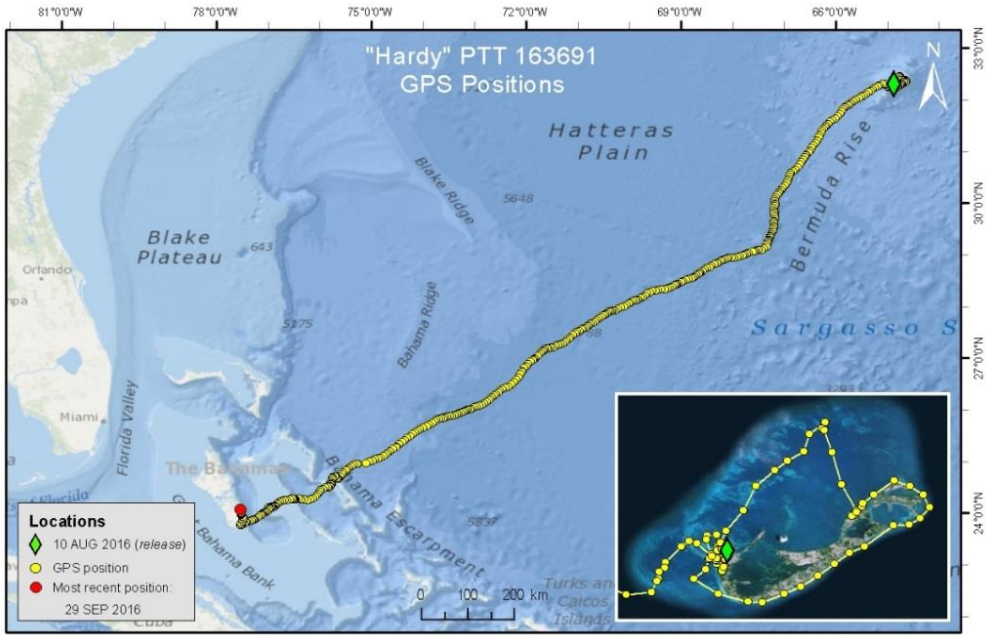
Net Sampling Log for Bermuda Turtle Project 2016

Date	Sample No.	Location	Set No.	Latitude	Longitude	Bottom Temp (^{O}C)	# of Turtles	Depth (ft.)
8/8/16	693	Baileys Bay	1	32.35046	64.72408	27.0	20	9.2
8/9/16	694	Vixen	1	32.30707	64.88688	29.0	0	8.5
8/9/16	695	Wreck Hill	2	32.27853	64.88564	28.0	4	7.5
8/9/16	696	Cowground Flat	3	32.31531	64.86932	28.0	2	7.9
8/10/16	697	Somerset Long Bay	1	32.30621	64.87438	28.0	25	11.0
8/11/16	698	Somerset Long Bay	1	32.30473	64.87202	27.5	54	5.1
8/12/16	699	Grotto Bay	1	32.35401	64.70927	28.0	0	7.3
8/15/16	700	Tudor Hill	1	32.27593	64.88441	27.5	0	5.1
8/15/16	701	Somerset Long Bay	2	32.30523	64.87524	29.0	37	9.6
8/16/16	702	Fort St. Catherine	1	32.38848	64.67233	28.0	0	8.5
8/16/16	703	Cocoa Bay	2	32.36570	64.66068	29.0	1	3.5
8/16/16	704	Emily's Bay	3	32.37013	64.67192		0	5.8
8/17/16	705	Blue Hole	1	32.34830	64.70767	29.0	33	6.1
8/17/16	706	Walsingham Bay	2	32.34399	64.70718	30.0	29	4.1
8/18/16	707	Anne's Bay	1	32.35578	64.65885	29.0	6	7.2
8/18/16	708	Long Bay	2	32.35127	64.65459	28.0	14	12.9
Total # of Captures for 2016 thru Sample 708							**225**	
Total # of Captures Since 1992							**4451**	

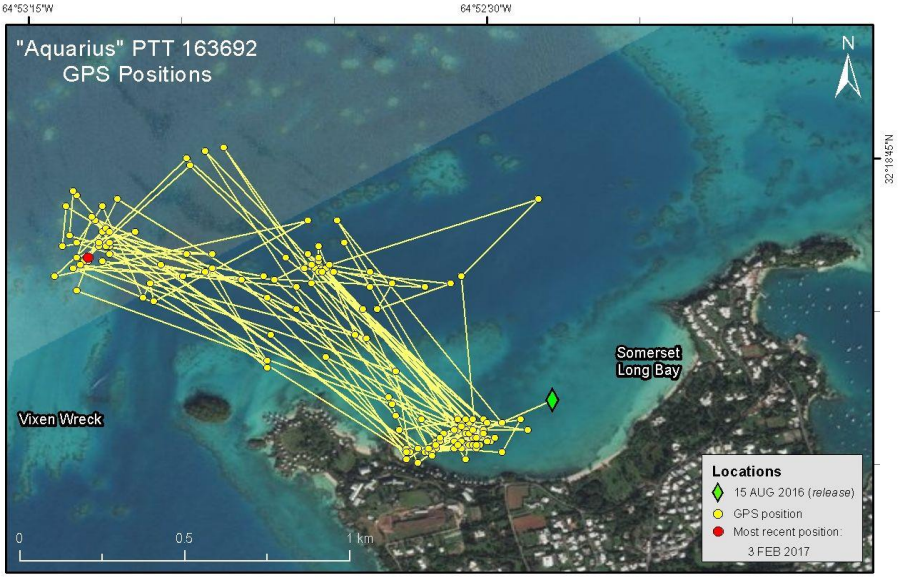
All turtles captured in the entrapment net in 2016 were judged to be immature based on previously established shell and tail size criteria. They were tagged, biometric data were collected, and then, the turtles were released at or near the capture site. Blood samples or skin biopsies were obtained from a sample of the animals for genetic analysis to study nesting beach origins of Bermuda green turtles, and for hormone analyses to establish gender and sex ratio.

Of the 225 green turtle net captures, 75 (33%) were recaptures of animals tagged in previous years. This compares with 30% in 2015, 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. As has been typical in the past, nearly all recaptures occurred on the same grass bed on which the animals were first tagged. No turtles captured in 2016 exhibited signs of the disease fibropapillomatosis.

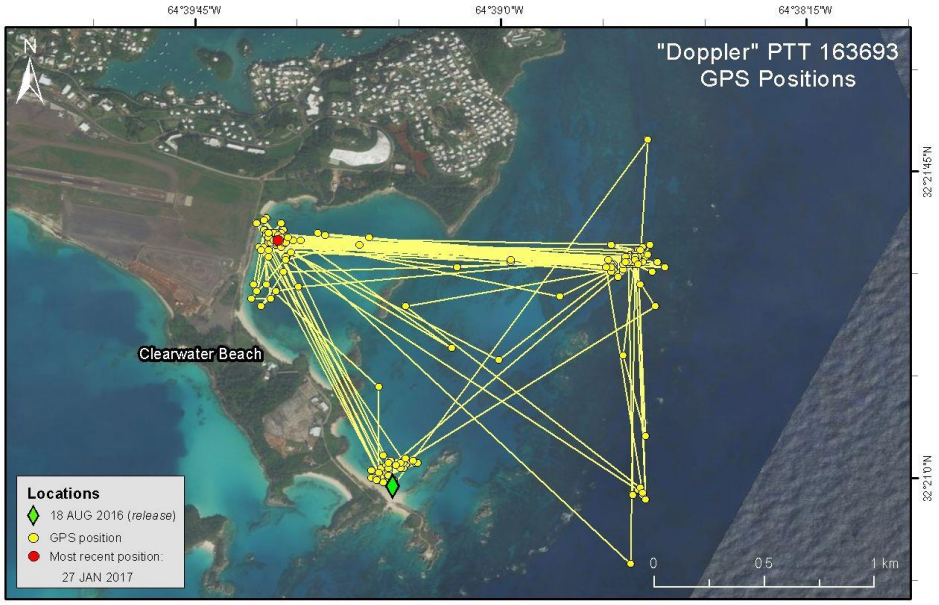
Three satellite transmitters were deployed on turtles captured with the net during 2016. The first (MM991/PTT 163691) was attached to a 67.1 cm turtle captured at Somerset Long Bay on 10 August. The first capture of this turtle, nicknamed "Hardy", was at this same site on 14 August 2013. After satellite tag attachment, the turtle remained near Somerset until 21 August when it began traveling clockwise around the Bermuda Platform, stopping briefly near Margaret's Bay on 26 August, a place where it also spent time just after being released. After a few hours, Hardy moved westward, leaving the platform on 27 August. Once within deeper waters of the North Atlantic, Hardy's travel rate increased to about 2.4 km/hr. It traveled WSW for nearly 1 month (see map below), until arriving at Cat Island, Bahamas, on 21 September Hardy traveled across the mixture of shallow platform and deep waters between the Bahamas islands for 8 days. The final position was recorded on 29 September from the southeastern end of Andros Island. Hardy still appeared to be migrating when this final transmission was received. The cause of the cessation of transmissions is unknown. However, after nearly two months of silence, this transmitter began reporting again on 27 November. All of the transmissions were centered on a single house in a remote village on the southeastern side of Andros Island. With help from many people, including staff of the Bahamas National Trust and the Bahamas Tourism department, the transmitter was recovered and much additional data retrieved after its return to Florida. Depth sensors on the unit show that the transmitter was submerged during the 2 months that it did not transmit



A second transmitter was deployed on a 58.5 cm green turtle nicknamed “Aquarius” (MM1376/PTT163692) that was captured at Somerset Long Bay on 15 August 2016. Her first capture was at this same site on 19 August 2015. Aquarius appears to spend early morning and evening hours on the grass beds of Somerset Long Bay. This individual spends the middle part of the day and nights at a location about 600 m northeast of Somerset Long Bay that is slightly deeper, 5-7 m depth. During late October, Aquarius moved about 500 m west to a location north of the Vixen grass bed. During November and December, the turtle was diving deeper and regularly spending time at 10 – 12 m depths. It is possible that this is Aquarius’ overwintering site.



A third transmitter was deployed on “Doppler” (M4679/PTT163693), a 57.1 cm male green turtle captured at Long Bay near Clearwater on 18 August 2016. Doppler has been captured at Long Bay a total of 7 times since 2006. He appears to use the grass beds near Long Bay and the area near Clearwater Beach where we also set the net. This is an interesting case and may be the first example of tracking an animal that regularly transits between two of our study sites. During mid-day and nighttime hours, Doppler uses an offshore reef site that is due east of Clearwater Bay.



The three satellite transmitters deployed on net-captured green turtles in 2016 were funded by RenaissanceRe, XL Catlin Bermuda and the Bermuda Turtle Project Fund. Funding from the Dr. Neil Burnie Foundation contributed to a transmitter that was attached to a rehabilitated loggerhead turtle ("Daisy") by the aquarium's Wildlife Rehabilitation Centre.

Because of increasing enrollments in the sciences at Eckerd College, genetics classes are now offered fall and spring and we were able to use this resource to get a larger number of genetics sampled processed than in past years. A total of 95 samples were successfully sequenced and assigned to a specific "long" haplotype. Among the samples, 11 different haplotypes were identified, a few of which we have rarely encountered previously. Samples included 29 from turtles that had been selected for a growth study in which we anticipate being able to detect any variation in growth rate related to genotype. An additional 8 samples were from turtles that were selected after being recaptured at a foreign feeding ground; 3 were samples from turtles that had been tagged with a satellite transmitter. The remainder was selected at random.

Two international tag returns of green turtles tagged in Bermuda were received during 2016. Both turtles were recaptured in Nicaragua and presumably killed. One of these turtles had originally been seen in Bermuda in 1999 and 2002; the other was seen once, in 2004. Tag returns provide important information about the destinations and 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 20th time from 7 – 19 August 2016. The course is sponsored by the Bermuda Aquarium, Museum and Zoo and the Sea Turtle Conservancy, and is provided free-of-charge thanks to donor support. The two-week course consisted of lectures, class discussions of assigned readings, a necropsy session, and ten days of field work aboard the *RV Endurance*. The students learned to capture immature green turtles using the entrapment net and searched for hawksbills on reefs. 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, and Robert Hardy. Dr. Gaelle Roth, Associate Veterinarian of the Bermuda Aquarium Museum and Zoo, presented a lecture on sea turtle diseases and necropsy methodologies and led the necropsy session. This year's course participants were drawn from Anguilla, Bermuda, Brazil, Colombia, Italy and the United States. The students came from a number of backgrounds, including universities and natural resource agencies in the Caribbean region and beyond.

As part of the course, students conducted necropsies of 16 dead turtles that had been collected and frozen by the Bermuda Sea Turtle Stranding and Salvage Network (BAMZ) during the previous year. Veterinarian 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.

Participants, instructors, and *R.V. Endurance* crew for the 2016 sampling session of the Bermuda Turtle Project. The class included one Bermudian and eight international students representing Anguilla, Brazil, Colombia, Italy, and the United States.

Over the twenty years during which the Sea Turtle Biology and Conservation course has been offered, it has served 187 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, Italy, 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.

In 2016, BTP data 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 were published in Bjorndal et al. 2016, Somatic growth dynamics of West Atlantic hawksbill sea turtles: a spatio-temporal perspective. *Ecosphere* 7(5):1-14. During 2016, BAMZ registrar, Barbara Outerbridge, and Drs. Peter and Anne Meylan worked with Armando Santos (Fundação Pró-TAMAR) and others on a manuscript describing long-distance migrations of hawksbills originally tagged in Brazil. One of the recaptures was made in Bermuda. Growth data for Bermuda green turtles (845 growth intervals) were contributed to a regional analysis by Karen Bjorndal. Alan Bolten and others that has been submitted for publication in *Global Change Biology*.

A total of 1,349 volunteer hours were donated to the Bermuda Turtle Project by 27 volunteers in 2016. The volunteers included local and international students, BZS-BAMZ volunteers, STC staff and visitors, and other members of the community.

Environmental education goals of the project were furthered by several presentations in 2016. In August, Robert Hardy gave a public lecture at the aquarium entitled *An Ecosystem Adrift & the 'Lost Years'.* Jennifer Gray presented *The Sea Turtles of Bermuda* to the Bermuda High School, the Bermuda National Trust environmental camp, The America's Cup Community Outreach Team, and Soft Ball Team Japan, as well as a public lecture, *Bermuda's Sea Turtles: The Island's Role in Global Sea Turtle Conservation.*

In response to conservation management questions, Jennifer presented a summary of research findings to the Marine Resource Board (MRB) prepared by the BTP team, including informative data prepared by Drs. Peter and Anne Meylan and Robert Hardy. BTP presented a request to the Marine Resource Board in October that Somerset Long Bay be protected as a sea turtle and eco- tourism sanctuary.

In local news, the BTP was featured in Bernews in April, May, June, July, September, and October, and the Royal Gazette in April, June, July and three times in October. The Project featured in The Daily Observer, Antigua - *Bermuda Hailed for Turtle Conservation Role.* A BTP video featuring the course was posted on Vimeo by Bermudian 2016 course participant Lulu Hedstrom. The Bermuda Underwater Exploration Institute hosted three separate showings of *Ocean Vet: Episode 5, The Bermuda Turtle Project* all of which were sold out.

Information about the Bermuda Turtle Project is available at http://www.conserveturtles.org/bermuda/ which is maintained by the Sea Turtle Conservancy. During 2016, this site received 2,719 unique visitors who accounted for 5,319 page views. In addition, there were 4,564 page visits of satellite-tracked turtles from 2016 and previous years. BTP has increased its social media presence through Facebook at https://www.facebook.com/Bermudaseaturtles/. In 2016, the page reached 5,773 people and had 1,002 'likes' from 45 countries.

The outcomes of the Bermuda Turtle project in 2016 were made possible by generous support from the Atlantic Conservation Partnership, the Bermuda Zoological Society, Chevron International Bermuda, the Clay Frick Foundation, Florida Fish and Wildlife Conservation Commission, Global Indemnity Insurance and the Sea Turtle Conservancy.