

BERMUDA TURTLE PROJECT

Annual Report for 2019

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The Bermuda Turtle Project (BTP) continued in 2019, committed to the goal of promoting the conservation of marine turtles through research and education. BTP is a joint project of the Bermuda Zoological Society (BZS) and the Sea Turtle Conservancy (STC). Project activities during 2019 included field and laboratory research, training of international and local students, and public education via presentations, the media, and the Bermuda Turtle Project webpage.



Course student, Wandre Smith, from Turks and Caicos Islands signaling the catch boat *Chevron* of a green turtle capture.

Sampling of the Bermuda green turtle aggregation was carried out for 9 days during August 2019 by Jennifer Gray (BTP Bermuda Director), Drs. Peter and Anne Meylan (BTP Principal Investigators), Dr. Gaëlle Roth (Veterinary Affiliate, Bermuda Aquarium, Museum and Zoo - BAMZ), Dr. Dan Evans (Research Biologist, Sea Turtle Conservancy), Rick Herren (Research Biologist, Sea Turtle Conservancy), Patrick Talbot (Curator, BAMZ), Barbara Outerbridge (Registrar, BAMZ), students in the annual Sea Turtle Biology and Conservation course, and numerous other volunteers. Camilla Stringer (BZS) assisted with course administration. The BZS research vessel, *RV Endurance*, served as the main vessel for the sampling session and was captained by Nigel Pollard, with Emily Andrew as first mate. The catch boat, *Chevron*, was captained by Jennifer Gray, with Jorge Sanchez or Patrick Talbot as first mate. A second catch boat, *Vee Be Gone*, captained by Robert Chandler, was used for sites where large numbers of turtles had been captured in previous years.

Sampling with the 1406 ft. entrapment net was conducted 13—23 August 2019. A total of 186 green turtle (*Chelonia mydas*) captures were made with the net at 17 sites around the island; three additional green turtles were captured by hand. The net-captured green turtles ranged in size from 24.6 to 62.5 cm straight carapace length (SCL) (see sampling log below).

Sampling Log for Bermuda Turtle Project 2019

Date	Sample No.	Location	Set No.	Latitude	Longitude	Bottom Temp (° C)	No. of Turtles	Depth (ft.)
08/13/2019	744	Baileys Bay	1	32.3493	64.72594	27.5	4	6.4
08/13/2019	745	Baileys Bay	2			28	3	5.2
08/14/2019	746	Walsingham Bay	1	32.34417	64.70741	28	2	7.1
08/14/2019	747	Blue Hole	2	32.34873	64.70787	28	1	5.1
08/14/2019	748	Grotto Bay	3	32.35495	64.70933	28.5	1	6.2
08/15/2019	749	Dockyard Camber West	1	32.31963	64.84042	28	8	11.7
08/15/2019	750	Grey's Bridge	2	32.31198	64.84901	28	12	9
08/16/2019	751	Methelin Bay	1	32.30304	64.87982	28	28	7.4
08/19/2019	752	King Charles Hole	1	32.29828	64.87679	29	20	8.9
08/19/2019	753	Vixen	2	32.30743	64.88732	29	0	9
08/20/2019	754	Somerset Long Bay	1	32.30444	64.87494	29	22	8.9
08/20/2019	755	Cowground	2	32.31708	64.86909	28	1	9.1
08/21/2019	756	Wreck Hill	1	32.27875	64.88599	29.2	1	8.5
08/21/2019	757	Tudor Hill	2	32.27139	64.88242	29	0	7.1
08/21/2019	758	Paradise Lakes	3	32.28574	64.82104	30	12	11.9
08/22/2019	759	Cobbler's Island	1	32.30746	64.8187	29	6	12.8
08/22/2019	760	Hawkins East Bay	2	32.28552	64.82693	28.5	22	11.9
08/23/2019	761	Annie's Bay	1	32.35572	64.65896	28.5	43	6.3

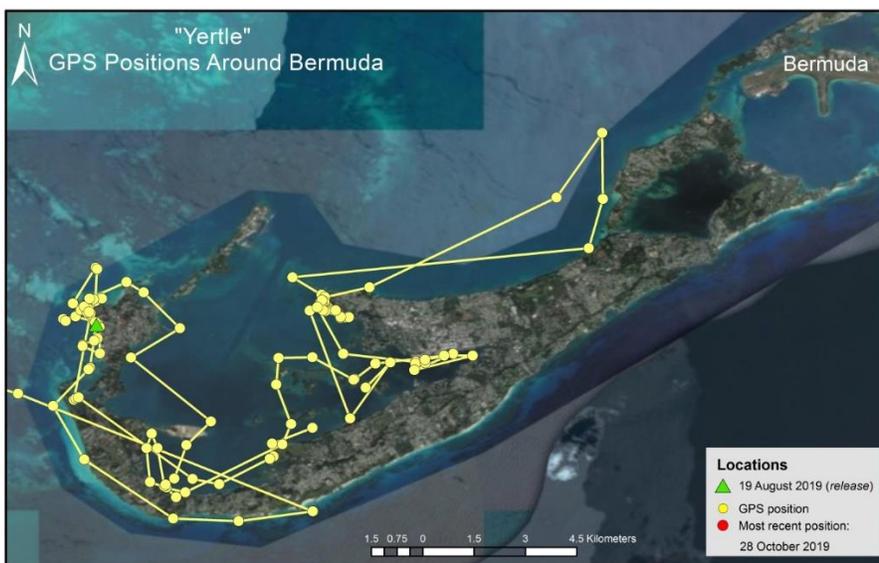
All turtles captured in the entrapment net in 2019 were judged to be immature based on previously established shell and tail size criteria. The turtles were tagged and biometric data were collected before they were released at or near their capture site. Blood samples or skin biopsies were obtained as needed for genetic analysis to study nesting beach origins of Bermuda green turtles, for hormone analyses to establish gender and sex ratio, and for stable isotope analysis.



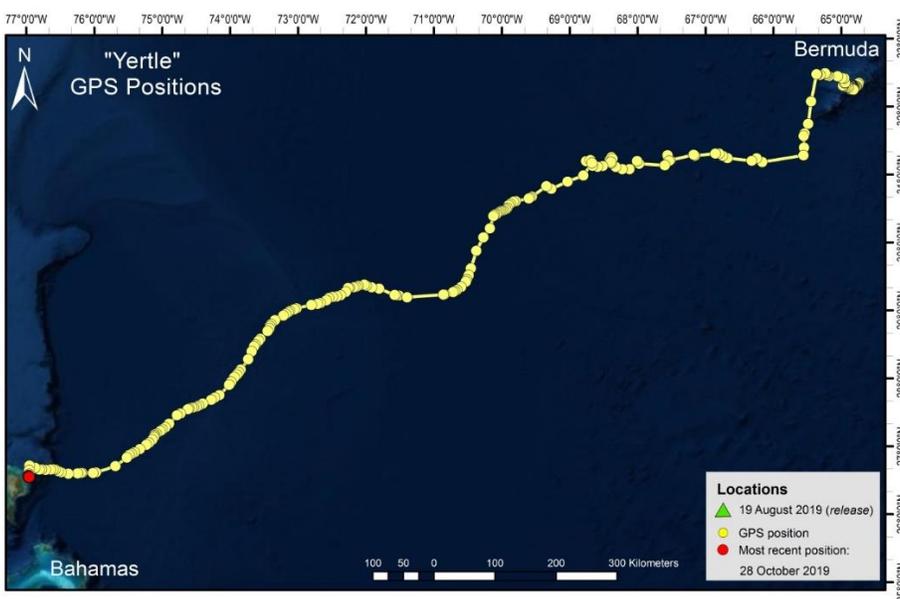
Evelyn Marichal, from Cuba, receives training on correct measurement technique from Dr. Gaëlle Roth using a small green turtle onboard *RV Endurance*.

Of the 186 green turtle net captures, 64 (34%) were recaptures of animals tagged in previous years. This compares with 37% in 2018 and 34% in 2017. The recapture rate is greatly affected by the extent to which the exact same sites are sampled as in previous years. Most recaptures occurred on the same grass bed on which the animals were first tagged. No turtles captured in 2019 exhibited external signs of the disease fibropapillomatosis.

Two satellite transmitters were deployed during 2019. The first was deployed on a green turtle captured with the net at King Charles' Hole on 19 August 2019. The transmitter (PTT 182194) was attached to a 54.7 cm SCL turtle nicknamed “Yertle” that was originally captured in 2012 at Somerset Long Bay. Since satellite attachment in August, this individual spent its initial time moving between the original capture site and the Great Sound. On 13 September 2019, Yertle moved off the Bermuda Platform and began a long-distance migration to the southwest, reaching the northeastern islands of the Bahamas on 22 October 2019. This transmitter stopped sending signals on 28 October 2019 in the waters around Marsh Harbor, Abaco Islands, Bahamas.

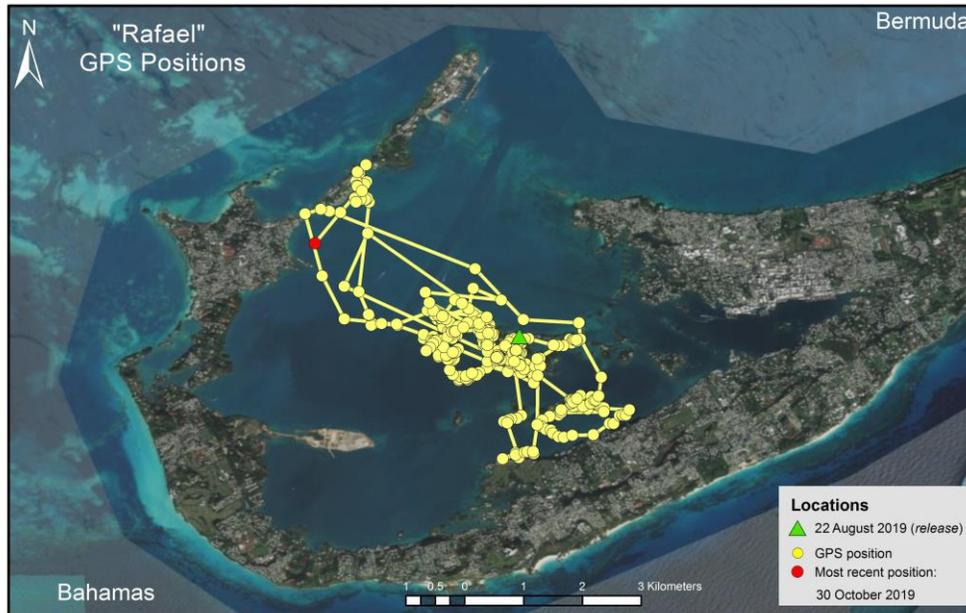


Track of Yertle, PTT 182194, 19 August through 13 September 2019 (Bermuda portion of track).



Track of Yertle, PTT 182194, 13 September through 28 October 2019, showing travel from Bermuda to the Bahamas.

A second transmitter (PTT 182195) was deployed at Hawkins' Bay on 22 August 2019 on a 55.9 cm SCL green turtle nicknamed "Rafael." This turtle was originally captured at Tucker's Town in 2005. All recorded positions were within the Great Sound, primarily around Hawkins' Island and Long Island, with occasional forays into other parts of the sound. This transmitter stopped transmitting data on 30 October 2019, with the last location near Watford Bridge.



Track of Rafael, PTT 182195, through 30 October 2019

During 2019, genetics classes at Eckerd College obtained DNA sequences for 61 different green turtles and 11 different hawksbills from Bermuda. Among the green turtles we identified seven different haplotypes. Most of the green turtle samples were taken between 1991 and 1994 and are important to our understanding of the genetic make-up of the Bermuda foraging aggregation 30 or more years ago. Among these sequences were also five from stranded turtles for which a humerus was collected for an aging study. Among the 11 hawksbills sequenced we found four haplotypes, two common ones and two very rare ones. One of the rare ones is known only from Panama, the other is known only from Brazil. The latter helps corroborate a paper coauthored by BTP team members this year that suggests that at least a few hawksbills from Brazil grow up in Bermuda.

Jeff Schwenter, South Carolina Department of Natural Resources, continued laboratory analyses of hormones of Bermuda green turtles for determination of gender. Results were received in 2019 for samples collected in 2015 and 2016. Analyses of sex ratios of the Bermuda green turtle foraging aggregation over time continued with help from Dr. Brett Tornwall, a statistician formerly with the Florida Fish and Wildlife Conservation Commission, and Dr. David Owens, emeritus faculty of the College of Charleston. Collaborations continued in 2019 with Dr. Larisa Avens, NOAA, on a skeletochronology-based study of age and growth of green turtles; on green turtle diet with Dr. Karen Bjorndal, UF; and on ontogenetic changes in diet using stable isotope analyses with Dr. Simona Ceriani.

Two international tag returns of green turtles originally tagged in Bermuda were received during 2019. Both involved green turtles that were tagged as immatures in Bermuda and then subsequently seen on a distant nesting beach, one in Florida, at the Archie Carr National Wildlife Refuge, Melbourne, FL; and a second in Cancún, Mexico. The turtle observed in Florida (MB37/MM358) had been tagged by BTP nearly 25 years prior at a size of 58.9 cm straight carapace length. The turtle observed nesting in Mexico

(MB518/MM714) had been tagged by BTP at a size of 63.5 cm in 1999, 20 years prior. Tag returns provide important information about the life history of green turtles, destinations, and fates of turtles after they leave Bermuda waters. Coordination of both tag returns was handled by the Archie Carr Center for Sea Turtle Research.



Green turtle (MB37/MM358) tagged in Bermuda on 17 August 1994 and found nesting on the east coast of Florida in the Archie Carr National Wildlife Refuge on 14 August 2019. (Photo Credit: Jim Stevenson)

The Bermuda Turtle Project offered its International Course on the Biology and Conservation of Sea Turtles for the 23rd time from 11-23 August 2019. The course is offered by the Bermuda Zoological Society and the Sea Turtle Conservancy and is provided free-of-charge thanks to donor support. The two-week course consists 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 the 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 Dr. Gaëlle Roth, along with Dr. Dan Evans (for the second year) and Rick Herren from STC. This year's course participants were drawn from Argentina, Bermuda, Cuba, Mexico, Portugal, Turks & Caicos Islands and the United States. The students came from a number of backgrounds, including universities and natural resource agencies in the Caribbean region and beyond.

During the necropsy session, students conducted necropsies of 10 green turtles that had been collected by the Bermuda Sea Turtle Stranding and Salvage Network (BAMZ). Veterinarian, Dr. Gaëlle Roth, performed a detailed demonstration necropsy at the beginning of the session, and then assisted students as they conducted necropsies themselves. In addition to providing an opportunity to learn basic anatomy of sea turtles and an introduction to necropsy techniques, this session enables participants to learn first-hand about some of the mortality factors for sea turtles, such as entanglement in monofilament line, ingestion



Course teachers, students, volunteers, and *RV Endurance* crew at the final dinner at the Bermuda Aquarium, 2019.

of hooks used in various fisheries, disease, and watercraft collisions. Samples collected during the BTP course necropsy session and during other necropsies performed by Dr. Gaëlle Roth throughout the year are being used by collaborators for multiple purposes, including genetic identification, diet and feeding biology, and age-at-recruitment. In total, 21 turtles were necropsied at BAMZ in 2019 and all were green turtles.

Over the twenty-three years during which the Sea Turtle Biology and Conservation course has been offered, it has served 216 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, France, 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.

A manuscript describing long-distance migrations and growth rates of hawksbills originally tagged in Brazil was published in 2019 which included a recapture that was made in Bermuda. Armando Santos from Brazil was the lead author; Barb Outerbridge, A. Meylan and P. Meylan were among the co-authors. The article was published in *Chelonian Conservation and Biology* 18(1):75-81. A short manuscript documenting the recapture of a green turtle originally tagged in Bermuda and subsequently found cold-stunned in Texas has been submitted to *Herpetological Review*; A. Meylan, P. Meylan, J. Gray and R. Hardy are among the coauthors from BTP. P. Meylan, A. Meylan and J. Gray are also coauthors on a submitted manuscript describing the sources (including Bermuda) and movements of marine turtles in the Gulf of Venezuela; the lead author is Hector Barrios from Venezuela.

A total of 1,287 volunteer hours were donated to the Bermuda Turtle Project by 16 volunteers in 2019. The volunteers included local and international students, BZS-BAMZ volunteers, and other members of the community. We are especially grateful for the hours contributed by team member and veterinarian, Dr. Gaëlle Roth, Robert Chandler who captained the second catch boat, and Debbie Boyer who produces outreach materials for the project.

Jennifer Gray gave project presentations in 2019 at the Bermuda Institute of Ocean Sciences (BIOS) and the Bermuda High School. During the sampling session in August, Rick Herren gave a lecture at BAMZ titled, “Green Sea Turtle Demographics and Habitat Use in Florida's Nearshore Waters.” The lecture presented an overview of Rick’s PhD research on the demographics and habitat use of juvenile green sea turtles in the northeastern Gulf of Mexico and summarized what we know and don't know about the lives of juvenile green sea turtles in Florida. These presentations are intended to further the environmental education goals of the project.

Dr. Gaëlle Roth represented BTP and gave a presentation at the Florida Keys Sea Turtle Workshop in Marathon, Florida. This meeting gathers professionals from all over the world who work in the medical treatment, rehabilitation, and captive care of sea turtles and provides a forum to share ideas, procedures, cases and techniques.

BTP continues to work closely with the Bermuda Aquarium Museum and Zoo Wildlife Rehabilitation Center providing support, equipment, tags and assistance responding to the Sea Turtle Stranding Hotline and stranding events. The Wildlife Rehabilitation Center received a total of 86 sea turtles in 2019, including 2 loggerhead turtles, 3 hawksbill turtles and 81 green turtles.

Information about the Bermuda Turtle Project is available at <https://www.conserveturtles.org/bermuda/> which is maintained by the Sea Turtle Conservancy. During 2019, the BTP website received 3,185 unique visitors who accounted for 5,628 page views. In addition, there were 29,935 page visits of Bermuda satellite-tracked turtles from 2014-2019. BTP continues to increase its social media presence through Facebook at <https://www.facebook.com/Bermudaseaturtles/>.

The outcomes of the Bermuda Turtle Project in 2019 were made possible by generous support from the Atlantic Conservation Partnership, the Bermuda Zoological Society, the Helen Clay Frick Foundation, Eckerd College, Florida Fish and Wildlife Conservation Commission, and the Sea Turtle Conservancy. Renaissance Re and AXA XI kindly supported the satellite tracking.



Course student, Samantha Dill from Bermuda, releasing a green turtle from *RV Endurance*, 2019.