BERMUDA TURTLE PROJECT

Annual Report for 2014

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The Bermuda Turtle Project (BTP) continued in its 46th year in 2014, committed to the goal of promoting the conservation of marine turtles through research and education. Project activities during 2014 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 8 days in 2014 by Drs. Peter and Anne Meylan (BTP Principal Investigators), Jennifer Gray (BTP Coordinator), Dr. Emma Harrison (Sea Turtle Conservancy STC), staff members (Bermuda Aquarium, Museum and Zoo BAMZ; the Bermuda Zoological Society BZS; Florida Fish and Wildlife Conservation Commission), students in the annual Sea Turtle Biology and Conservation course; and numerous other volunteers. Camilla Stringer and Barbara Outerbridge (BAMZ) organized course logistics. The BZS research vessel, *RV Endurance*, served as the main vessel for the sampling session and was captained by Nigel Pollard. The catch boat, *Chevron,* was crewed by Jennifer Gray, Cameron Bridgewater and Camilla Stringer.

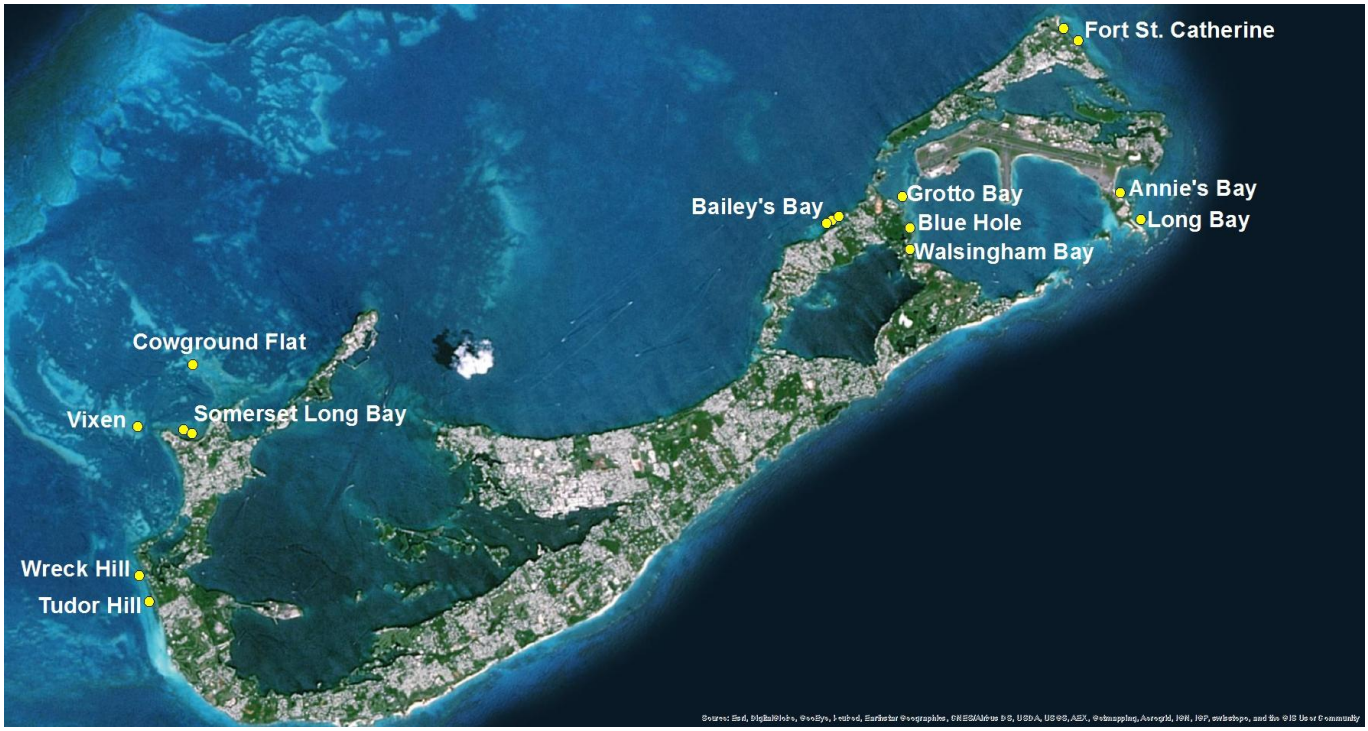
Field work for the Bermuda Turtle Project depends on the use of *RV Endurance*.

The sampling session using the entrapment net was conducted 4—15 August 2015. A total of 181 green turtle (*Chelonia mydas*) captures were made at 12 sites around the island. The captured green turtles

ranged in size from 25.5 to 66.8 cm straight carapace length (SCL) (see study site map and sampling log below).

All turtles captured in the entrapment net in 2014 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.

Of the 181 green turtle captures, 62 (34%) were recaptures of animals tagged in previous years. This compares with 22% in 2012 and 32% in 2013. 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 2014 exhibited signs of the disease fibropapillomatosis.

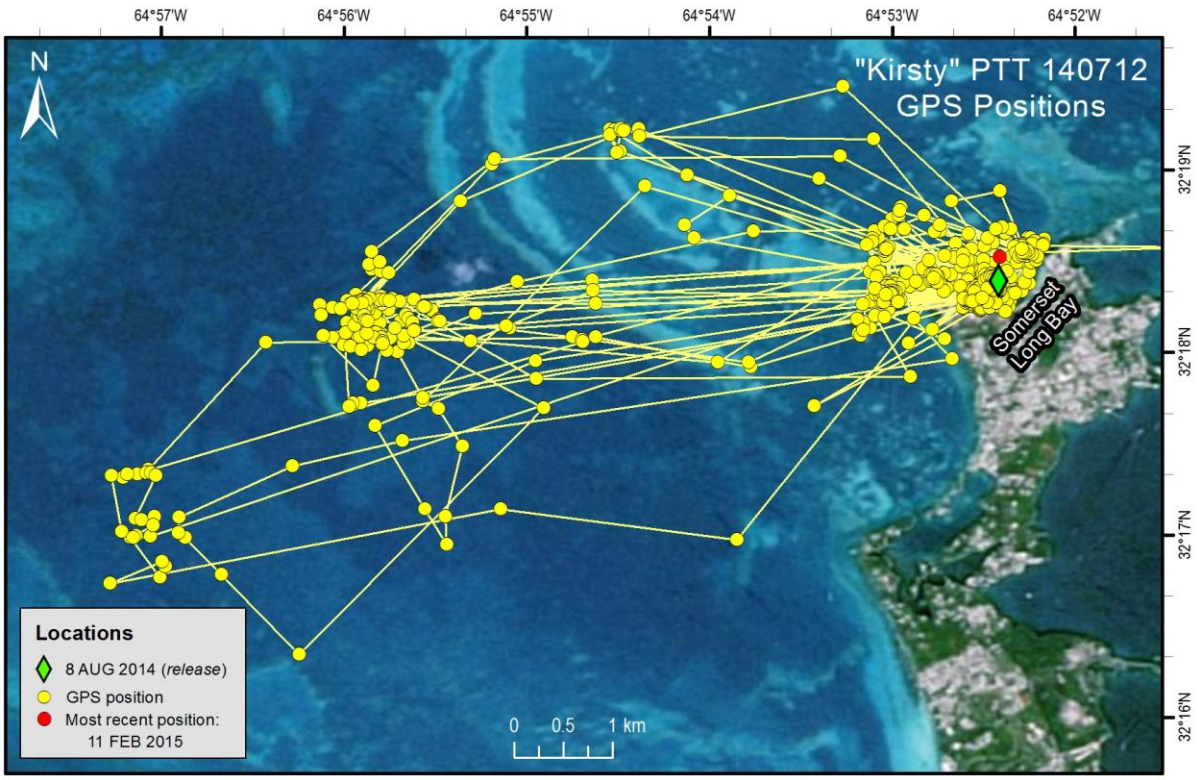


Sampling locations for the Bermuda Turtle Project in 2014.

Two GPS-enabled satellite transmitters were deployed on immature green turtles during the August sampling session. One of the purposes of the satellite tracking experiments was to determine how faithful turtles are to the sites where they are captured. The first BTP transmitter was attached at Somerset Long Bay on 8 August 2014, to a 66.8 cm SCL green turtle ("Kirsty", PTT 140712, MM1233) that had not been previously captured by the project. During the months following deployment of the transmitter, Kirsty has shuttled between positions in Somerset Long Bay and two locations located off the west end of the island but still on the Bermuda Platform (see map below). As of February 2015, satellite transmissions from this turtle were still being received.

Net Sampling Log for Bermuda Turtle Project 2014

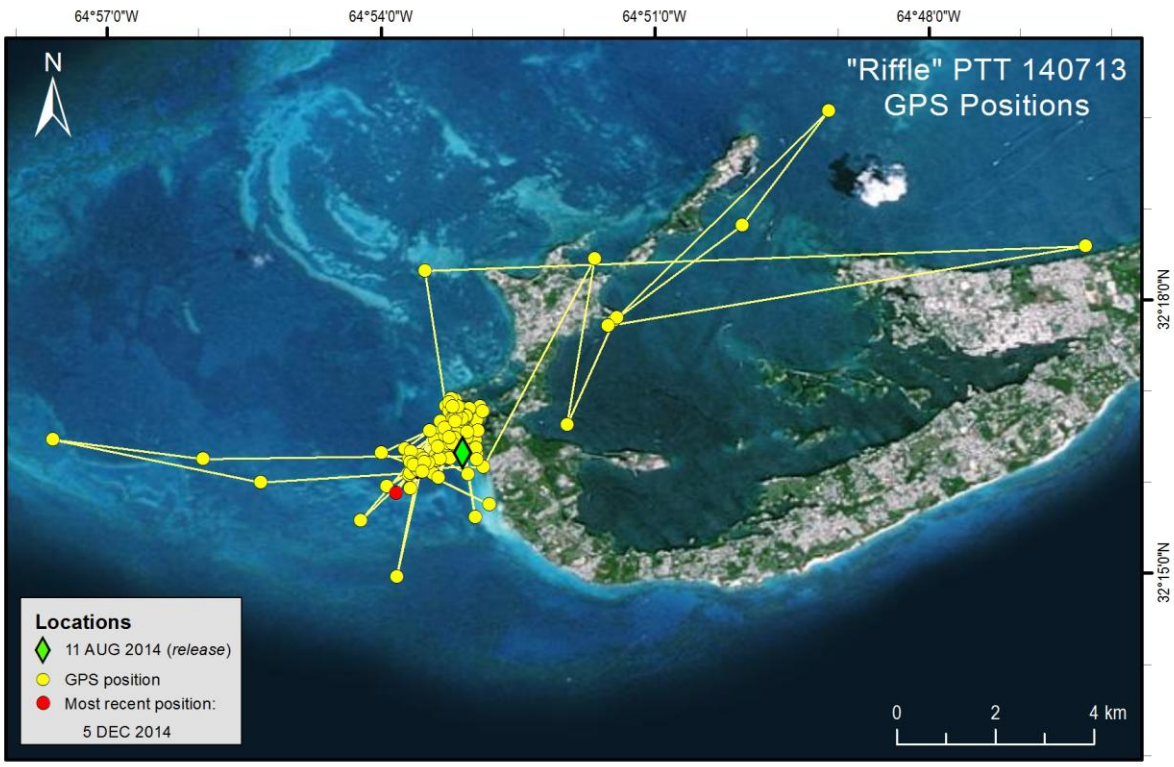
Date	Sample No.	Location	Set No.	Latitude	Longitude	Bottom Temp (^{O}C)	# of Turtles	Depth (ft)
8/4/14	663	Bailey's Bay	1	32.34972	64.72583	28.0	9	6.5
8/5/14	664	Bailey's Bay	1	32.35046	64.72422	27.0	10	5.6
8/5/14	665	Bailey's Bay	2	32.34906	64.72697	27.0	7	11.7
8/6/14	666	Blue Hole	1	32.34842	64.70751	29.0	25	7.8
8/7/14	667	Walsingham Bay	1	32.34425	64.70745	29.0	14	10.5
8/7/14	668	Grotto Bay	2	32.35452	64.70945	26.1	18	9.0
8/8/14	669	Somerset Long Bay	1	32.30610	64.87600	27.0	15	7.2
8/8/14	670	Somerset Long Bay	2	32.30540	64.87396	27.0	17	18.3
8/11/14	671	Wreck Hill	1	32.27713	64.88561	28.0	13	8.6
8/11/14	672	Tudor Hill	2	32.27202	64.88324	28.0	4	5.9
8/12/14	673	Vixen	1	32.30661	64.88660	28.0	1	12.1
8/12/14	674	Cowground Flat	2	32.31895	64.87408	26.5	0	9.2
8/14/14	675	Fort St. Catherine	1	32.38833	64.67249	28.0	9	10.1
8/14/14	676	Fort St. Catherine	2	32.38595	64.66913	26.0	8	13.4
8/15/14	677	Annie's Bay	1	32.35608	64.65877	27.0	17	6.9
8/15/14	678	Long Bay	2	32.35081	64.65391	27.0	14	16.0
Total # of Captures for 2014 thru Sample 678							**181**	
Total # of Captures Since 1992							**3937**	



Satellite track of an immature green turtle (*Chelonia mydas*), "Kirsty", released at Somerset Long Bay in August 2014.

The second transmitter was deployed on a 63.9 cm SCL green turtle on 11 August 2014 at Wreck Hill. This turtle ("Riffle", PTT140713, M3774) had originally been tagged in 2001 at nearby Tudor Hill. This turtle spent a lot of time in the following months at the site where she had recently been captured, but she shuttled regularly between this site and a nearby area in deeper water to the southwest. This transmitter has provided fewer and less frequent GPS locations than the other unit that was deployed during 2014. However, it was still transmitting Argos locations and other data as of February 2015.

In 2014, students from Eckerd College (P. Meylan's home institution) generated 35 DNA sequences assignable to 11 different haplotypes from genetic samples collected from Bermuda green turtles. This brings the total of green turtles from Bermuda for which a genotype is known to about 330. The basic pattern of contributions from multiple nesting beaches still holds but the sample is now large enough to see shifts in the contributions over time. It appears that there may be a relative increase in turtles from Mexico and Florida relative to Costa Rica. This shift may simply reflect the increasing numbers of nesting females in Mexico, and especially in Florida. We are now also able to confirm that there is a small but regular contribution to the Bermuda green turtle aggregation from Cuba.



Satellite track of an immature green turtle (*Chelonia mydas*), "Riffle", released at Wreck Hill in August 2014.

Data on Bermuda hawksbill genetics added significantly to a paper presented by Peter, Anne and collaborators from Mexico and Gainesville at the International Sea Turtle Symposium in New Orleans in April 2014. The paper, "High genetic diversity in an important recovering sea turtle population: Results of a large-scale genetic study of hawksbills on the Caribbean coast of Panama," gave us an opportunity to elaborate on the developmental migrations of hawksbills hatched on beaches in Panama. Conservation work in Panama is producing large numbers of hatchlings, and some of them are coming to Bermuda to grow up! We only know this because of the long-term sampling that has gone on by BTP for many years which allowed us to show that approximately 10% of the immature hawksbills growing up in Bermuda come all the way from Panama.

BTP data also contributed to a second paper presented at the International Sea Turtle Symposium in New Orleans. P. & A. Meylan are collaborating with researchers at the NMFS/NOAA SW Fisheries Science Center and the College of Charleston 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. Blood samples from Bermuda turtles whose gender had been verified in Bermuda via laparoscopy, and had been assayed with RIA, were used to ground-truth and compare the results of the new method. The big advantage of the ELISA method is that it does not require the use of radioactive substances, so the analyses can be carried out more easily and by more laboratories. Further collaboration will involve NOAA and the College of Charleston concurrently running large sets of blood samples from Bermuda green turtles using the two methods.

Participants from the 2014 course retrieve the net after a set has been completed.

Six international tag returns of green turtles tagged in Bermuda were received during 2014. All turtles were recaptured in Nicaragua (and all presumably killed). At least five were reported to have been captured with turtle nets. These turtles had originally been tagged in Bermuda in 1992, 1997, 1999, 2002 and 2003. 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 18th time from 4 – 15 August 2014. The two-week course consisted of lectures, class discussions of assigned readings, a necropsy session, and eight 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, 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 Bermuda, Costa Rica, Cuba, Mexico, Mozambique, and Turkey. The students came from a number of backgrounds, including universities and natural resource agencies in the Caribbean region and beyond.

Participants of the 2014 sampling session of the Bermuda Turtle Project. The class included five Bermudian and five international students representing Costa Rica, Cuba, Mexico, Mozambique and Turkey.

As part of the course, students conducted necropsies of 11 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.

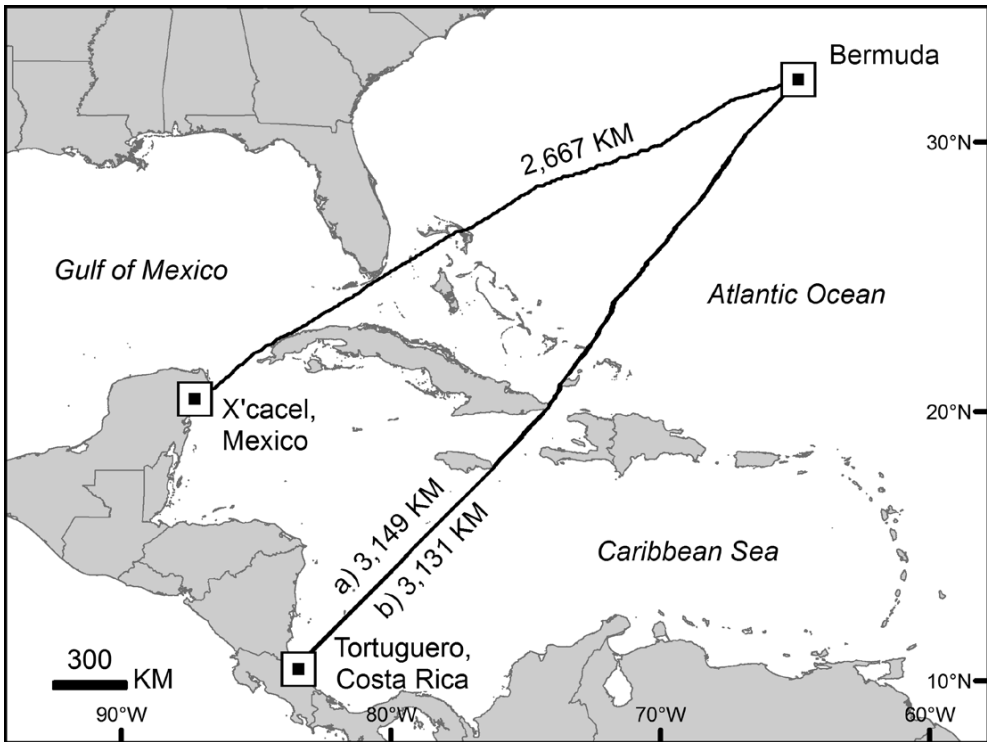
Over the eighteen years during which the Sea Turtle Biology and Conservation course has been offered, it has served 167 students from around the world. Participants have been drawn from Anguilla, Antigua, Argentina, Aruba, Belize, Bermuda, Bonaire, Brazil, the British Virgin Islands, Canada, the Cayman 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 2014 course participants came from Chevron International, the Sea Turtle Conservancy, RenaissanceRe, the Atlantic Conservation Partnership, the Wardman family, and the Bermuda Zoological Society. Gass Productions supported the purchase of the two satellite transmitters that were deployed.

"Ocean Vet" filming. Top left, Dr. Neil Burnie discusses procedures on board *RV Endurance*; Top right, remote-controlled drone is prepared for aerial shots of net deployment and turtle captures; Bottom left, Neil examines a green turtle for PIT tag; Bottom right, Robert Hardy and Neil make final preparations for release of turtle with a satellite transmitter.

During summer 2014, the BTP worked with Gass Productions and Dr. Neal Burnie to collect the footage needed to produce a sea turtle episode for the "Ocean Vet" series. The Gass Production crew spent one entire day and several partial days filming the green turtle sampling and other aspects of BTP work. The crew took footage at the Aquarium, on the deck of *Endurance*, in the water, and from a drone, that will all help to tell the story of sea turtles in Bermuda. The story line will likely contrast the potential of having a healthy green turtle aggregation on the Bermuda Platform with some case histories that exemplify the issues that sea turtles face in Bermuda waters. This was a great opportunity for students to observe and partake in public outreach and to have additional opportunities to work with veterinarians with marine experience.

Many former course participants update us on their work during the year. This year the achievements of two stand out, in particular. Marco Garcia (2007) has completed his Ph.D. in Venezuela, and was awarded a Fulbright Fellowship to work on sea turtles at the University of Florida with Dr. Karen Bjorndal. Catalina Vasquez Carrillo (2013), a graduate student at the University of Miami, sent us an excellent report on a pilot study she has established as part of her Ph.D. research in which she will study green turtles in developmental habitat on the Guajira Peninsula in her native Colombia.

During 2014, a manuscript by BTP and international collaborators was published documenting the cases of three green turtles that were originally tagged in Bermuda and subsequently observed on nesting beaches in Mexico and Costa Rica. The article is available at http://www.seaturtle.org/mtn/PDF/MTN141.pdf , pp 15-17. The turtle found on the beach in Mexico was seen a total of 25 times in 2006, 2008 and 2010 and had not been seen in Bermuda for 13.5 years. The turtles found in Costa Rica were both seen only once subsequent to leaving Bermuda, and had last been seen in Bermuda 13.9 and 17.4 years prior. These records provide information bearing on the ecological geography of the Bermuda green turtle foraging aggregation. They also provide rare empirical data that may help ground truth theoretical estimates of age at first reproduction, a critical demographic parameter.



The shortest distances by water (avoiding land) travelled by three green turtles tagged in Bermuda and subsequently observed on nesting beaches in the Caribbean.

A total of 850 volunteer hours were donated to the Bermuda Turtle Project in 2014. The volunteers included local and international students, BZS-BAMZ volunteers, Sea Turtle Conservancy staff and visitors, and other members of the community.

Information about the Bermuda Turtle Project is available at http://www.conserveturtles.org/bermuda/ which is maintained by the Sea Turtle Conservancy. During 2014, this site received 2,599 unique visitors from 64 countries.