The Bermuda Turtle Project

Annual Report for 2024

Candice Kieck releasing a tagged, juvenile green turtle.

Dr. Daniel Evans

Jennifer Gray

Richard Herren

Dr. Gaëlle Roth

The Bermuda Turtle Project (BTP) is committed to the goal of promoting the conservation of marine turtles in Bermuda through research and education and is a joint research project of the Bermuda Zoological Society (BZS, based in Bermuda) and the Sea Turtle Conservancy (STC, based in Florida, USA).

Projects activities during 2024 included field and laboratory research, and educational outreach via different media outlets and public interactions. In August, the BTP carried out its 27th international in-water sea turtle conservation course.

The BTP team consists of scientific directors Dr. Daniel Evans and Richard Herren from STC, co-directors Jennifer Gray and Dr. Gaëlle Roth, and registrar Barbara Outerbridge. Dr. Gaëlle Roth is also the project's veterinarian. Dr. Peter Meylan and Dr. Anne Meylan both serve as scientific advisors.

This report is dedicated to summarizing the activities performed by the BTP during 2024.

Sampling session August 2024

The Bermuda Turtle Project offered its 27th In-Water Course on the Biology and Conservation of Sea Turtles to international and Bermudian students August 11-24, 2024. The two-week course consists of lectures, class discussions of assigned readings, a necropsy session, and ten days of field work aboard the research vessel Endurance. The course is offered each year by the Bermuda Zoological Society and the Sea Turtle Conservancy and is provided free-of-charge thanks to donor support. This major effort supports the education goal of our mission and builds conservation capacity in the regions where sea turtles come from.

The students mastered capturing 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.

This year students came from Bermuda, Columbia, Mexico, South Africa, UK and the USA. David Godfrey, STC's Executive Director, also joined the team.

Research Vessel Endurance

Nigel Pollard captained the Endurance, with Miguel Mejías as the first mate.

The catch boat, Chevron, was captained by Kate Cooper or Patrick Talbot with Jennifer Gray and Gaëlle Roth as first mates. Snorkeling assistance was provided by 8 students in the BTP In-Water Course as well as veterinarian and volunteer Ruskin Cave.

Sampling effort

Only 6.5 days were available to sample as fieldwork was interrupted by the landfall of Hurricane Ernesto in Bermuda on August 17th. The team had to prepare and safely store equipment and boats. Post hurricane, the water clarity was very poor for a few days, which prevented the sampling. A total of 38 green turtles (Chelonia mydas) were captured by the entrapment net, in 15 sets at 14 sites around the island.

Animals ranged in size from 25.4 to 65.8cm straight carapace length (SCLmin; see sampling log below). All turtles were judged to be immature based on previously established shell and tail size criteria. They were tagged, biometric data, blood and tissue samples were collected, before the turtles were released at or near their capture site. Blood samples or skin biopsies were obtained for genetic analysis to study nesting beach origins of Bermuda green turtles, for hormone analyses to establish sex, and for stable isotope analyses which can help scientists in understanding source links and process information in marine food webs.

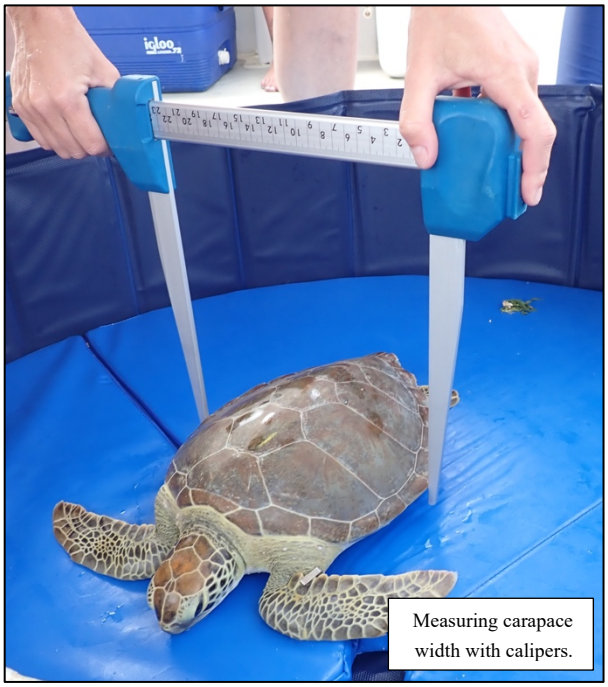
By comparison, in 2023 74 green turtles and one hawksbill turtle were caught in 18 sets at 17 sites, and the overall average green turtle carapace length ranged from 24.0 to 60.2cm SCLmin.

Two green turtles on board Endurance

Health Assessment

The research team randomly selected 28 juvenile green turtles to be included in the health assessments in August 2024. Captured turtles were brought on board for a standard work up and small amounts of their blood sample were passed through handheld and desktop blood analyzers to document their chemical blood parameters and blood gas values. Additionally, we were able to manually measure the packed cell volume (PCV) of all 28 turtles. All PCV values were within the normal range for juvenile green turtles, meaning they had a normal percentage of red blood cells in circulation to transport oxygen. The lowest PCV was 18% and the highest was 36%. We were also able to measure the total protein in the plasma with a handheld refractometer for all 28 turtles. Total protein levels were all within normal range, with the lowest total protein level measuring 2.50 g/dL and the highest being 5.40 g/dL.

In 2024, lactate was again included in the chemistry panel. However, we were only able to obtain lactate values for 23 turtles. The results varied significantly for green turtles, with the lowest measurement at 2.72 mmol/L and the highest at 19.98 mmol/L. Mean lactate was 13.24 mmol/L. This wide range could be caused by the muscular and energetic wear caused by the capture method. No turtles captured in 2024 exhibited signs of the disease fibropapillomatosis which is prevalent in many other jurisdictions.



Measuring carapace width with calipers.

The BTP research team lavaged the esophagus of 12 captured green turtles during the sampling session. This procedure flushes out the contents of the esophagus with sea water, and is a unique way to identify recently ingested items and determine the primary food source. This is important to observe, especially in the wake of widespread loss of turtle seagrass (Thalassia testudinum). These samples will undergo a detailed microscopic analysis. Preliminary examination of the samples revealed that almost all of them contained a mix of manatee grass (Syringodium filiforme) and shoal grass (Halodule wrightii).

A unique capture during the August sampling session was a large, green turtle presenting multiple linear lesions across the carapace. The lesions were covered by scar tissue, a sign of healing. This turtle had a SCLmin of 65.8cm and was the largest of our sampling in 2024 (it was also the largest green turtle captured since 2016 when the largest turtle was 67.1cm SCLmin).

Green turtle with lesions on carapace.

Sampling log

Of the 38 turtles captured, 27 turtles were first captures and 11 turtles (29%) were recaptures. In 2023 the recapture rate was 40%, the highest of the most recent five years of sampling (23% in 2022, 22% in 2021, 34% in 2019, 37% in 2018; no sampling was done in 2020).

Capture Date	Capture Location	Set number	Latitude	Longitude	Bottom Temp (degrees C)	Number of turtles
12 Aug 2024	Bailey's Bay	1	32.35038	-64.72408	30	0
12 Aug 2024	Fort St. Catherine	2	32.38643	-64.66974	30	0
12 Aug 2024	Annie's Bay	3	32.35578	-64.65835	30	0
13 Aug 2024	Frank's Bay	1	32.2538	-64.85671	30	3
13 Aug 2024	Frank's Bay	2	32.25491	-64.85692	30	3
19 Aug 2024	Hospital Bay	1	32.31258	-64.84499	30	1
20 Aug 2024	Blue Hole	1	32.34856	-64.70795	28	2
20 Aug 2024	Stocks Harbour	2	32.37038	-64.69009	29	13
21 Aug 2024	Marshall's Island North	1	32.28454	-64.81056	28.5	3
21 Aug 2024	Paradise Lakes	2	32.28555	-64.82071	29	5

22 Aug 2024	Hawkin's Island	1	32.28516	-64.82703	29.5	1
22 Aug 2024	Darrells Island South	2	32.27524	-64.8183	30	6
23 Aug 2024	Cow ground Flats	1			28.5	0
23 Aug 2024	Vixen	2	32.30973	-64.89159	28.5	1
23 Aug 2024	Tudor Hill	3			28	0

Satellite Transmitters

Two satellite transmitters were deployed during 2024. The first was deployed on a green turtle nicknamed RC, which was captured within the net in Stock's Harbour, and measured 49.8cm SCLmin. RC had previously been satellite tagged in 2023 when it was captured in the same location and measured 48.8cm SCLmin at that time. The first satellite tag tracked RC for 285 days, but unfortunately the second transmitter failed after 19 days.

The second turtle that received a satellite tag in 2024 was nicknamed Karma. This turtle was captured at the Vixen, measuring 53.9cm SCLmin and was tracked for 53 days. Karma had previously been captured in 2018 in Methelin Bay.

Dr. Daniel Evans (STC), Eduardo Calderon (Mexico) and Candice Kieck (South Africa) ready to release Karma with a satellite transmitter attached to the shell.

International Tag returns

A total of 5 long distance tag returns (sea turtles tagged in Bermuda and found across the ocean after a migration) were reported to BTP.

A Bermuda green turtle (MB158/MM252) that was tagged at Cow Ground Flat in August 1996 was seen nesting on Juno Beach, Florida in July 2024. She measured 64.7 cm SCL and weighed 44 kg at the time BTP captured her. Her curved carapace length when nesting was 109.2 cm.

This is a 28-year-old tag return! With this recapture, we now have nesting records by Bermuda tagged green turtles in north, central and south coast of Florida.

Three green turtles were caught by fishers in Nicaragua in 2024. These turtles were initially tagged by BTP in 1996, 1998 and 1999, making them 28-, 26- and 25-year-old long distance tag returns.

A fifth tag return was a male, green turtle captured by a fisher in Venezuela. It was originally tagged in Bermuda in 2007 (33cm SCL) and seen two more times in Bermuda, in 2010 and 2015.

Genetics

During the spring semester of 2024, students at Eckerd College analysed samples of 8 Bermuda green turtles during their genetics classes. The green turtles were captured in Bermuda between 1988-2013, and two of them were 2023 long distance tag returns from Nicaragua. Unfortunately, further lab work during the fall was disrupted by two hurricanes that hit Florida.

Eckerd College is currently working on a new methodology to be able to analyse old genetic samples from Bermuda turtles saved on Fast Technology Analysis (FTA) cards.

Participant Dara Balter is a junior at Eckerd College in Florida and is majoring in marine biology. During the Genetics and Molecular Biology class, she analysed migration patterns of turtles using the genetic samples collected previously by BTP. During the 2024 BTP course, Dara was able to learn how to take samples for laboratory analysis.

Dara Balter, from USA

Necropsy

The course included a sea turtle necropsy presentation and a necropsy demonstration by Dr. Gaëlle Roth. The deceased turtle was a juvenile green turtle that was found dead at the Royal Yacht Club in Bermuda in April 2024. It had been kept frozen for the scheduled necropsy during the course. The carapace had signs of severe trauma, suggesting a boat strike. The necropsy confirmed the turtle was female.

Outside of the in water sampling session, 7 necropsies were performed during 2024, 6 were juvenile green turtles and 1 was a juvenile, male hawksbill turtle. Of the 6 green turtles, two were male and four were female. Four green turtles had obvious signs of anthropogenic causes of mortality, either fishing line entanglement or trauma. The hawksbill turtle had both trauma and fishing line entanglement.

Samples collected during necropsies performed by Dr. Gaëlle Roth throughout the year are being used by collaborators for multiple purposes, including genetic identification, diet and feeding biology, determination of age-at-recruitment and identification of threats to sea turtles in Bermuda.

Wildlife Rehabilitation Center

BTP continues to work closely with the Bermuda Aquarium Museum and Zoo Wildlife Rehabilitation Centre (WRC) providing support, equipment, and tags, and helping with response to the Sea Turtle Stranding Hotline. The WRC recorded 27 strandings in 2024 of which 19 were dead on arrival (DOA). Four green turtles passed away shortly after being admitted.

SPECIES	Total	DOA	Alive on arrival	Released
Green Turtles (*Cm*)	22	16	6	2 (4 died shortly after admission)
Loggerhead Turtles (*Cc*)	2	1	1	In rehab
Hawksbill Turtles (*Ei*)	3	2	1	In rehab
TOTAL	**27**	**19**	**8**	**2**

Warwick Students visiting the turtle rehabilitation

Public outreach and education:

The BTP embraces all opportunities to engage and interact with the public. This happens during fieldwork, during the collection of stranded turtles, rehabilitation and during releases of rehabilitated turtles.

In August, Rick Herren and Dr. Gaëlle Roth gave a BZS illustrated lecture "Health Assessments and Growth Rates of Green Turtles in Bermuda's Waters". The presentation focused on the methods to study the health of these marine reptiles, and how comparisons to other similar turtle aggregations can help understand what is happening to them in a changing environment.

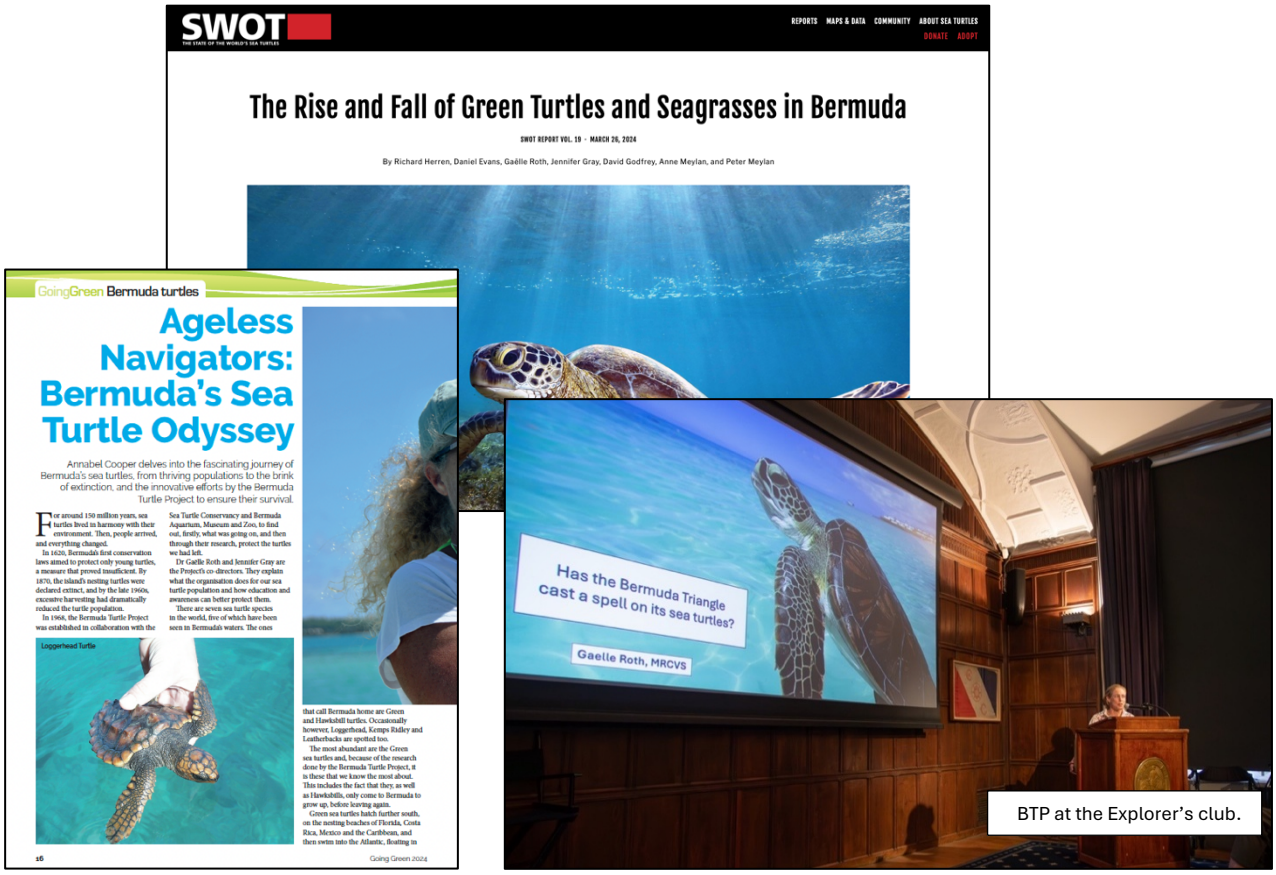
Captain Nigel releasing a turtle with visiting family.

Presentation for Saltus primary School.

Educational presentations were given by the BTP at four schools throughout the year (Warwick Academy, the Bermuda High School, Somersfield and Saltus).

An article was published in March, in the State of the Worlds Sea Turtles (SWOT) Report to bring attention to the drastic changes Bermuda has seen in its sea turtle aggregation in the previous 4 years. *https://www.seaturtlestatus.org/articles/2024/2/13/the-rise-and-fall-of-green-turtles-and-seagrasses-in-bermuda*

In April the BTP was featured in the 17th edition of the Going Green Magazine highlighting the history of its research, new challenges turtles face and scientific questions to be studied.



BTP at the Explorer's club.

In November, Gaëlle represented the BTP as part of the Sea Stories, a day organized by the Explorer's club in NYC, focused on exploration and conservation of marine life.

In the latest Praeger Review, John Davenport MRIA explores the long history of exploitation of sea turtles by humans, and how pressure on turtle populations has increased dramatically during the Anthropocene. The publication, SEA TURTLES IN THE ANTHROPOCENE, cited Bermuda data and illustrations.

The Sea Turtle Conservancy's In-Water Sea Turtle Sighting app lets you add information about turtles you spot while out on the water. Users in the Bermuda marine environment can help BTP in their conservation efforts by downloading the app and logging sea turtle sightings.

THANK YOU

The work of the Bermuda Turtle Project in 2024 was made possible by generous support from the Atlantic Conservation Partnership, the Bermuda Zoological Society, the Helen Clay Frick Foundation, and the Sea Turtle Conservancy; in-kind support was received from Eckerd College and the Archie Carr Center for Sea Turtle Research.

Participants in the annual course assisted the team in collecting valuable data and our work would not be possible without their involvement. In 2024, 8 participants volunteered approximately 630 hours over 2 weeks, and this includes the safety briefing, presentations, lecture, sampling, laboratory work and the necropsy session.

Special gratitude is offered to our volunteers and host families who provided support, accommodations and transportation to international participants.

Thank you to participants Georgia Small (UK), Camila Reyes Rincon (Colombia), Candice Kieck (South Africa), Dara Balter (USA), Eduardo Calderon (Mexico), Georgia Lombardy (USA), Jaime Baker (UK), Jayden Parker (Bermuda) for their hard work and dedication.

BTP 2024 team