THE BERMUDA TURTLE PROJECT

Executive Summary

The Bermuda Turtle Project conducted its 28th annual In-Water Course on the Biology and Conservation of Sea Turtles from 10–22 August 2025. Field sampling conducted over eight days resulted in the capture and study of 63 sea turtles at 16 sites around Bermuda. Health assessments, diet analysis, environmental monitoring, and satellite telemetry were conducted to better understand the ecology of Bermuda's juvenile green turtle aggregation. Results suggest continued changes in turtle movement patterns and site fidelity, likely linked to the ongoing decline of seagrass habitats across the Bermuda Platform. The project also supported stranding response, rehabilitation efforts, and public outreach while providing hands-on training to ten students from around the world.

The Bermuda Turtle Project

Annual Report for 2025

Dr. Daniel Evans, Jennifer Gray, Dr. Rick Herren, Dr. Costanza Manes, Barbara Outerbridge, Dr. Gaëlle Roth

2025 Field Season Highlights

- **63 sea turtles captured** during the August field season
  62 Green turtles (*Chelonia mydas*) and 1 Hawksbill (*Eretmochelys imbricata*)
- **17 net sets conducted at 16 sites** around Bermuda
- **22% recapture rate**, one of the lowest recorded in the past five years
- **Two satellite transmitters deployed**
  Green turtles “Stella” and “Sydney”
- **Two international tag returns**
  Nicaragua (33-year return) and Trinidad (first confirmed rookery connection)
- **Health assessments conducted on 34 green turtles**
- **Diet analysis performed on 14 turtles**, identifying manatee grass (*Syringodium filiforme*) and shoal grass (*Halodule wrightii*)
- **Environmental monitoring conducted at all sampling sites**, measuring temperature, salinity, dissolved oxygen, pH, and other parameters
- **21 turtle strandings recorded in Bermuda during 2025**
- **11 necropsies conducted as part of participant training**
- **969 volunteer hours contributed by course participants**
- Students from **9 countries** participated in the 28th BTP In-Water Course

Derick Hernandez bringing a juvenile green turtle to the catch boat.

Introduction

The Bermuda Turtle Project (BTP) is a collaborative initiative between the Bermuda Zoological Society (BZS) and the Sea Turtle Conservancy (STC) dedicated to promoting the conservation of marine turtles in Bermuda through research, education, and public outreach.

In 2025, the BTP hosted its **28th In-Water Course on the Biology and Conservation of Sea Turtles**, held from 10–20 August, and was attended by students from Bermuda and around the world. The course included field and laboratory research, necropsy training, discussions of assigned scientific literature, environmental monitoring, and public outreach through a lecture and media engagement. Thanks to generous donor support, the course continues to be offered free of charge to participants.

The annual sampling of Bermuda's green turtle aggregation was conducted over eight field days between 11 and 20 August 2025 using the entrapment net method. Field operations were suspended on August 16 and 17 due to the passage of Hurricane Erin near Bermuda.
The field team included Dr. Rick Herren and Dr. Costanza Manes (STC) and Jennifer Gray, Dr. Gaëlle Roth, and Barbara Outerbridge (BTP). The BZS research vessel *RV Endurance* served as the primary research platform and was captained by Nigel Pollard, with Alexis Ingham as first mate. The catch boat Chevron was captained by Kate Cooper.

During field operations, students were trained to capture green turtles using the entrapment net and gained extensive hands-on experience collecting biological data from turtles once they were brought aboard the research vessel. Ten participants in 2025 represented **Bermuda, Canada, Ghana, Guyana, Haiti, Mexico, Puerto Rico, Turks and Caicos, and the United States**.

STC team members provided a curated reading list and facilitated discussions of key scientific papers throughout the course. These discussions focused on fundamental topics in sea turtle biology as well as the major threats facing sea turtle populations globally.

The team discussing papers from the reading list on board Endurance.

Field Sampling and Capture Results

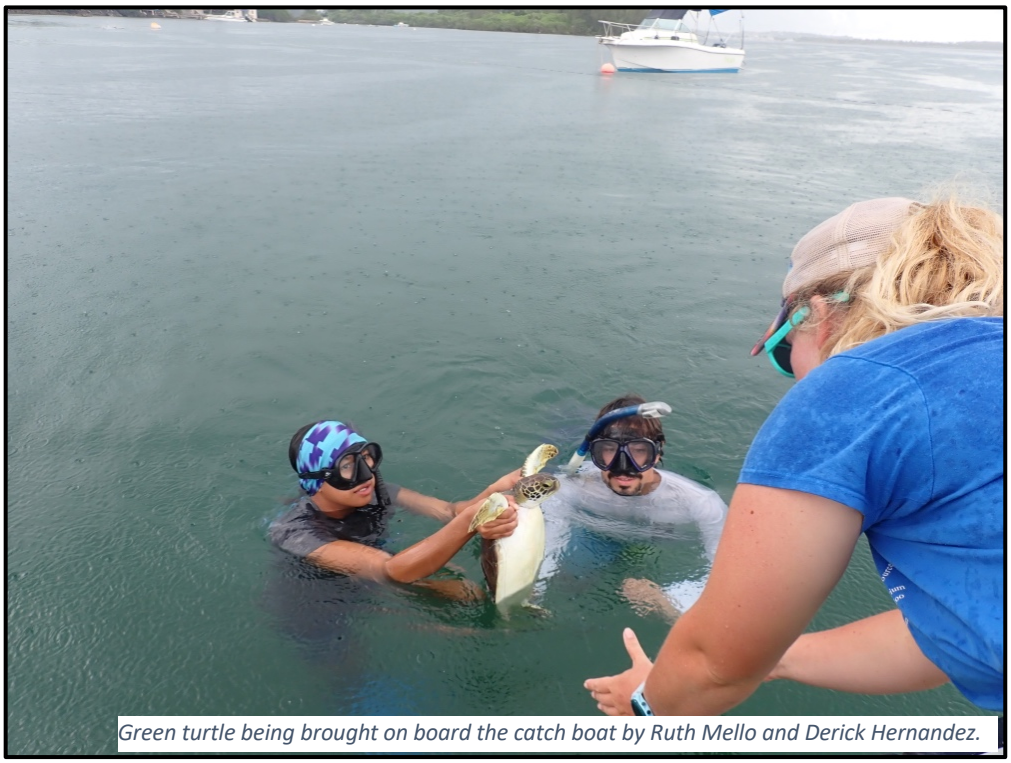
During the August field season, **62 green turtles (*Chelonia mydas*)** and **one hawksbill turtle (*Eretmochelys imbricata*)** were captured during 17 net sets at 16 sites around Bermuda (see Sampling Log). In addition, the BTP processed and released a rehabilitated green turtle from the Wildlife Rehabilitation Centre (WRC) that had previously been caught on fishing line.
Captured green turtles ranged in size from 26.1 to 59.8 cm straight carapace length (SCLmin).
Compared with 2024, when 38 green turtles were captured during 15 sets at 14 sites over 6.5 sampling days, the total number of turtles captured in 2025 was higher, while the average carapace length remained similar:

Year	Turtles caught	Mean SCLmin
2024	38	36.4 ± 8.9 cm
2025	62	36.4 ± 8.1 cm

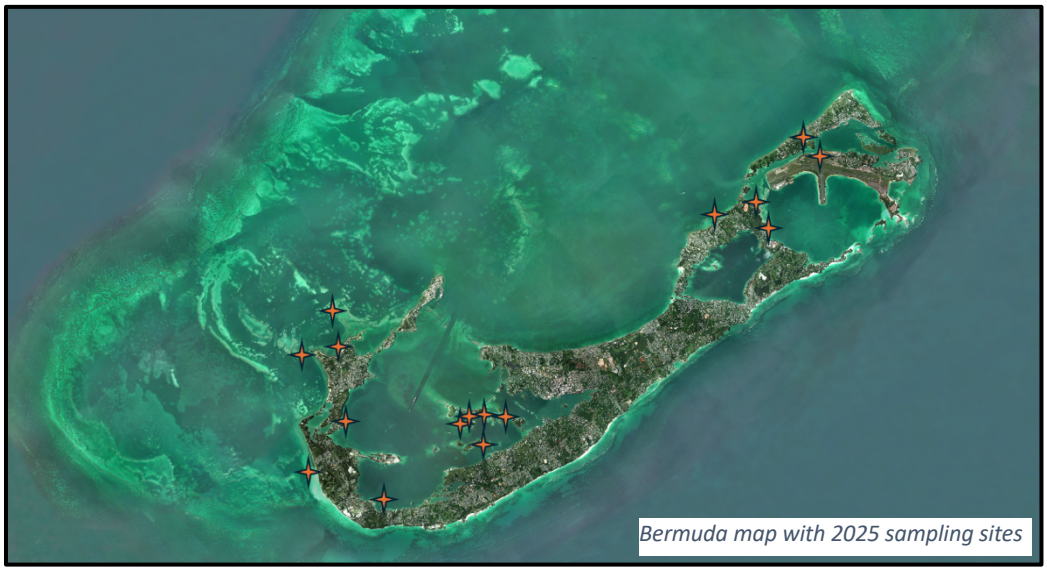
All turtles captured in 2025 were classified as immature, based on previously established carapace and tail size criteria.
Each turtle underwent a standard work-up aboard the research vessel before release at or near its capture site. Procedures included:

- Flipper tagging and PIT tagging
- Morphometric measurements
- Individual ID pictures
- Tissue sampling

Samples collected included blood, or skin when blood could not be obtained. Whole blood is used for genetic analysis to determine nesting beach origins, and plasma is used for hormone analysis to determine the sex of the turtle.



Green turtle being brought on board the catch boat by Ruth Mello and Derick Hernandez.



Bermuda map with 2025 sampling sites

Sampling Log for Annual Bermuda Turtle Project 2025

Date	Location	Set No.	Latitude	Longitude	Bottom Temp (° C)	No. of Turtles	Depth (ft.)
11-Aug-25	Bailey's Bay	1	32.35015	-64.72426	30.00	0	6.6
11-Aug-25	Blue Hole	2	32.34911	-64.70783	30.00	1	8.1
12-Aug-25	Vixen	1	32.30711	-64.88803	30.00	0	8.6
12-Aug-25	Tudor Hill	2	32.27216	-64.88279	30.00	0	7.9
12-Aug-25	Cowground	3	32.31783	-64.86980	30.00	0	10.2
13-Aug-25	Frank's Bay	1	32.25416	-64.85717	30.00	7	9.6
13-Aug-25	Darrell's Island	2	32.27528	-64.81805	30.00	6	10.6
14-Aug-25	Stocks Harbour	1	32.37036	-64.68985	30.00	12	12.5
14-Aug-25	Grotto Bay	2	32.35426	-64.71014	30.05	0	9.7
15-Aug-25	Mullet Bay	1	32.37506	-64.69061	30.00	8	9.5
15-Aug-25	Mullet Bay	2	32.37446	-64.69296	30.50	10	3.9
18-Aug-25	Paradise Lakes	1	32.28560	-64.82085	30.50	7	9.0
18-Aug-25	Marshall's Island	2	32.28497	-64.81050	30.10	2	6.2
19-Aug-25	Hospital Bay	1	32.31262	-64.84529	30.00	4	8.2
19-Aug-25	Somerset Long Bay	2	32.30435	-64.87571	30.00	0	6.6
20-Aug-25	Marshall's Island South	1	32.28400	-64.81142	30.50	1	6.9
20-Aug-25	Iota Island	2	32.28495	-64.82253	31.00	5	13.4

Total # of Captures for 2025: 63

Total # of Captures since 1992: 5,414

Costanza Manes and Francklin Barbier tagging a juvenile green turtle.

Alex Malpas taking ID pictures of a juvenile, green turtle.

Health Assessments

In addition to the standard work-up, the research team conducted health assessments on 34 green turtles. The purpose of these assessments is to establish baseline health parameters and detect potential changes in the nutritional condition of Bermuda's green turtle aggregation, including those that may result from the continued decline of healthy seagrass habitats.

A health assessment was also conducted on the captured hawksbill turtle and the green turtle from the Wildlife Rehabilitation Centre (WRC).

Small volumes of blood and plasma were analyzed using handheld and desktop blood analyzers to measure standard blood chemistry parameters and venous blood gas values. Overall, results were within expected ranges for juvenile green turtles.

The team also manually measured:

- Packed cell volume (PCV) – the percentage of red blood cells in whole blood
- Total plasma protein – sum of all circulating proteins

Most turtles had PCV and plasma protein levels within the expected ranges for juvenile green turtles.

For the first time this year, the health assessment also included a lipid panel, measuring cholesterol levels and associated blood lipid values. In addition, morphometric measurements were used to calculate a body condition index for each turtle.

No turtles captured during the 2025 field season exhibited signs of fibropapillomatosis, a disease characterised by tumor growths, affecting sea turtles in many regions.

Dorcas Antwi holding a green turtle for work up.

Francklin Barbier processing the blood samples.

Diet Analysis

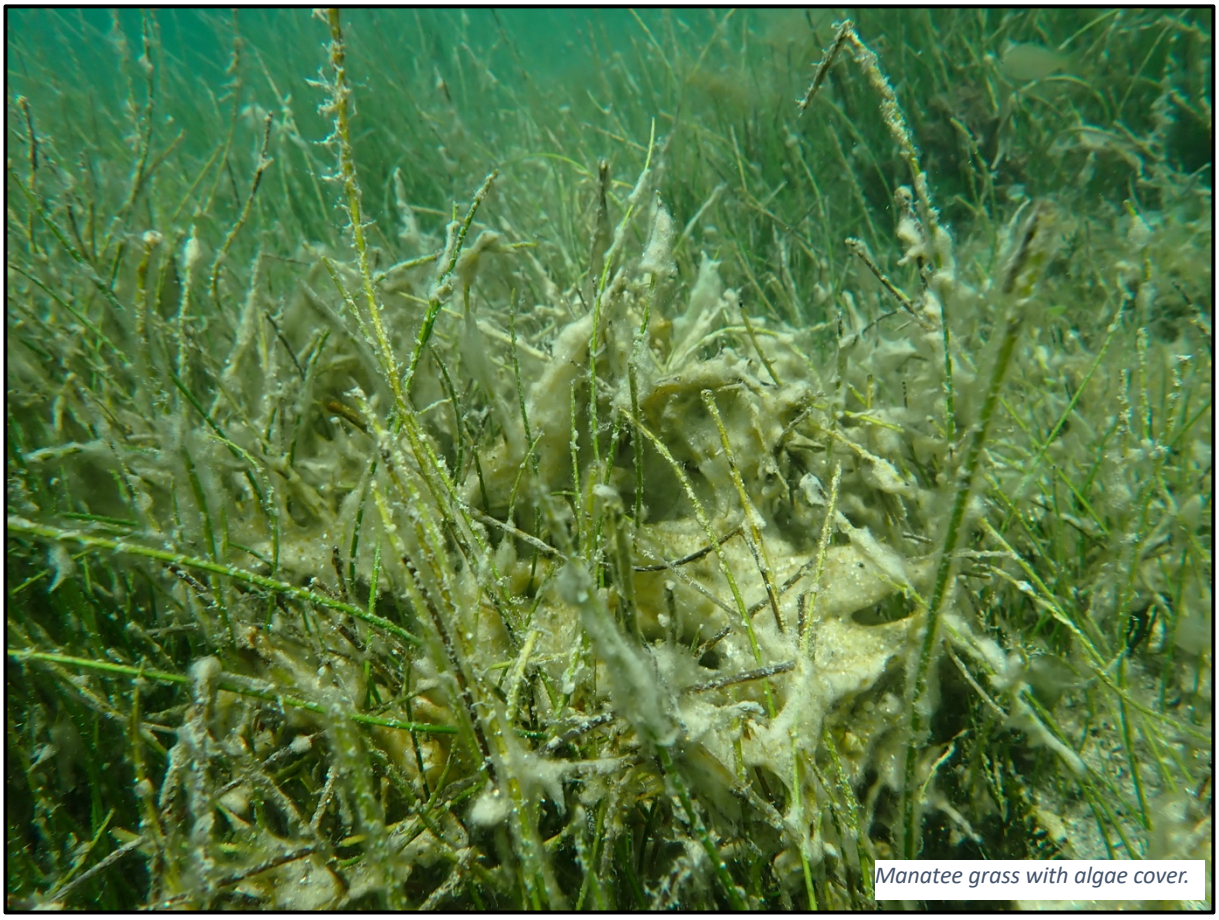
To identify recently ingested food items, the research team performed esophageal lavages on 14 green turtles. This technique is commonly used to determine the primary diet of sea turtles and is particularly important in Bermuda given the widespread decline of turtle grass (*Thalassia testudinum*).

The lavage procedure uses a veterinary stomach tube and a double-action pump to flush out and collect the contents of the mouth and esophagus with fresh seawater. The contents will undergo detailed laboratory analysis.

Preliminary examination of the samples indicated that most contained a mixture of:

- **manatee grass (*Syringodium filiforme*)**, and
- **shoal grass (*Halodule wrightii*)**

These seagrass species are common in Bermuda's inshore bays and sheltered areas, where the majority of green turtles were captured during the 2025 field season.



Manatee grass with algae cover.

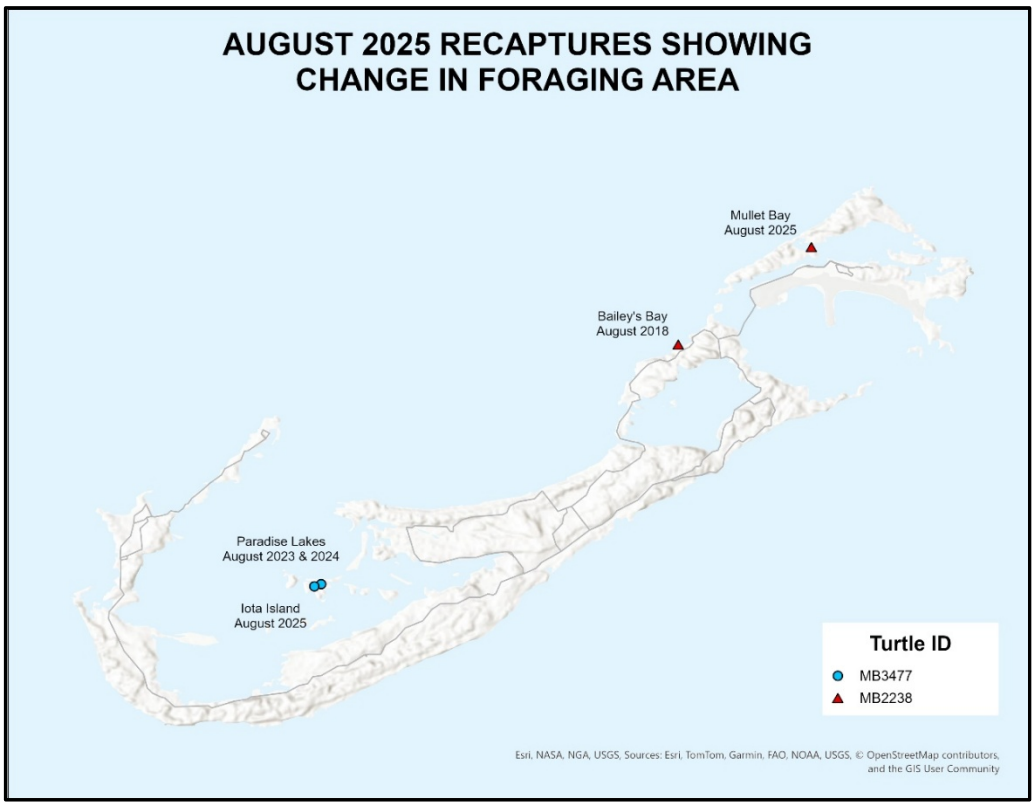
Recapture Data

Of the 63 turtles captured in August, 14 were recaptures of previously tagged individuals. Two of these turtles were captured at sites different from their most recent capture location.
The recapture rate for 2025 was 22%, one of the lowest recorded during the past five sampling years.

Year	Recapture Rate %
2025	22
2024	28
2023	40
2022	23
2021	22

This marks the third consecutive year of declining recapture rates, reaching the same low level previously observed in 2021.
The continued decline of seagrass—particularly turtle grass (*Thalassia testudinum*), the preferred food of green turtles—may help explain this pattern. Only three of the 17 net sets conducted in 2025 had turtle grass recorded as the dominant seagrass species.
The declining site fidelity observed in recent years suggests that, as seagrass habitats disappear across the Bermuda Platform, green turtles may be:

- moving more frequently between feeding areas, and/or
- emigrating from Bermuda earlier in their juvenile life stage in search of food.

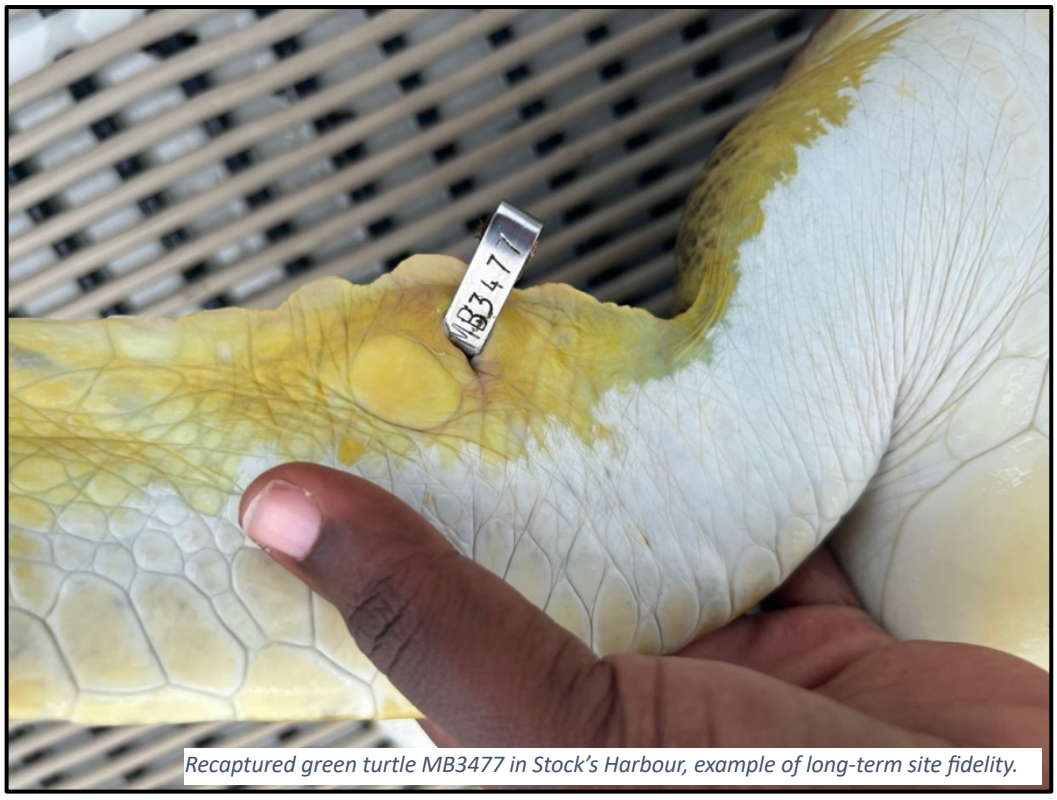


Notable Recaptures

During the August sampling session, the Bermuda Turtle Project recorded two notable recaptures of green turtles that have been captured in multiple consecutive years.

The first turtle, bearing primary flipper tag F8318, was captured in Stocks Harbour. This individual was first captured at the same location in August 2022 and has been recaptured at Stocks Harbour every year since, indicating strong site fidelity to this area.

The second turtle, bearing flipper tag MB3477, was captured at Iota Island, a new sampling site for the project. This individual has now been captured for three consecutive years, receiving a health assessment each time. In the previous two years, however, the turtle had been captured at Paradise Lakes, suggesting some movement between nearby habitats.



Recaptured green turtle MB3477 in Stock's Harbour, example of long-term site fidelity.

Environmental Monitoring

During the 2025 field season, the team introduced a handheld YSI Pro Plus Water Quality Meter to support environmental monitoring at sampling sites.
The instrument consists of a handheld display unit connected by cable to multiple probes, each designed to measure a specific water quality parameter. Using this device, the team recorded the following variables at each sampling location:

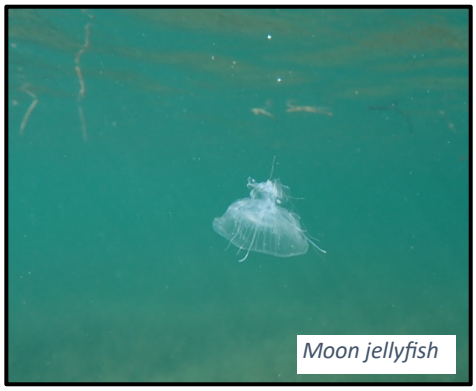
YSI Pro Plus Meter

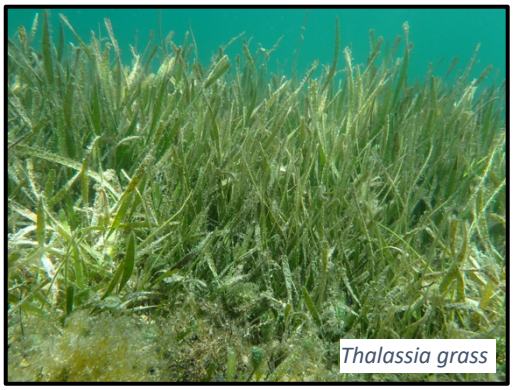
- Water temperature
- Barometric pressure
- Dissolved oxygen (DO)
- Specific conductance (PSC)
- Salinity
- pH

Collecting these environmental measurements provides valuable information on the current condition of Bermuda's marine habitats and can help detect potential natural or human-driven changes in the physical and chemical oceanography of the Bermuda Platform.

Habitat Observations

At each sampling site, the team recorded marine animal and plant species observed during the net set. Whenever possible, these observations were documented photographically.
These images and observations are shared with the Bermuda Department of Environment and Natural Resources to contribute to ongoing monitoring of Bermuda's marine biodiversity.


Moon jellyfish


Thalassia grass


Anemone

Satellite Tracking

With support from the Milnell Foundation, two satellite transmitters were deployed during the 2025 field season.

The first transmitter was attached to a green turtle captured at Darrell's Island on August 13th. This turtle measured 41.1 cm straight carapace length (SCLmin) and was nicknamed "**Stella**" (flipper tag CCA037). Satellite telemetry showed that Stella has remained in the waters surrounding Darrell's Island.

The second transmitter was deployed on a green turtle captured at Mullet Bay on August 15th. This individual measured 48.2 cm SCLmin and was nicknamed "**Sydney**" (flipper tag CCA051). Sydney remained primarily within the Mullet Bay area, moving in and out of the bay at varying times.

Movement patterns observed in turtles satellite-tagged in Bermuda since 2021 appear to differ from those documented in earlier studies. Recent tracking data suggest little distinction between feeding and resting areas, whereas turtles tagged prior to 2021 typically showed clear movement between distinct feeding and resting habitats (Hardy et al., 2023).

Stella

Sydney

International Tag Returns

Two international tag returns from green turtles originally tagged in Bermuda were reported in 2025. One turtle, originally tagged in 1992, was captured by fishermen in Nicaragua. This represents a **33-year tag return interval**, the longest recorded in the history of the Bermuda Turtle Project.

A second turtle, originally tagged in 2008, was found nesting in Trinidad. This is the first documented tag return linking Trinidad to the Bermuda juvenile turtle aggregation, confirming Trinidad as a rookery contributing turtles to Bermuda's developmental habitat.

Coordination of tag return information is managed by the Archie Carr Center for Sea Turtle Research at the University of Florida.

© Kyle Mitchell, Trinidad and Tobago

Genetic Analysis

During 2025, genetics classes at Eckerd College in Florida analyzed eight genetic samples collected from turtles in Bermuda.

Long mitochondrial DNA haplotypes were successfully sequenced for six green turtles, while two analyses were unsuccessful. Four of the successfully sequenced turtles were associated with tag returns from Nicaragua, Venezuela, Florida, and Trinidad, while the remaining two samples were collected from turtles observed on nesting beaches.

Analysis showed that the turtle nesting in Trinidad possessed the haplotype CmA5.1, which is common on nesting beaches in the eastern Caribbean and is dominant in turtle aggregations originating from Aves, Suriname, and French Guiana.

No hawksbill samples were analyzed during 2025. However, results from previous years examining hawksbill connectivity in the western Atlantic are expected to be published in a peer-reviewed scientific journal in the near future.

Stranding Response and Rehabilitation

The Bermuda Turtle Project continues to work closely with the Bermuda Aquarium, Museum and Zoo (BAMZ) Wildlife Rehabilitation Centre (WRC) by providing equipment, flipper tags, and assistance with the Sea Turtle Stranding Hotline and stranding response.
During 2025, a total of 21 stranded turtles were recorded:

- **18 green turtles**
- **2 hawksbill turtles**
- **1 loggerhead turtle**

One stranded green turtle had previously been captured by the BTP.
Ten turtles stranded alive, all of which were green turtles. One turtle had previously been admitted to the rehabilitation centre but died shortly after readmission. Another turtle was hooked on fishing gear and was successfully treated and released during the August field course.
The remaining eight turtles were found in apparently good physical condition but were comatose. Fecal analysis revealed the presence of nematocysts, indicating ingestion of large quantities of jellyfish or zoanthids. Two of these turtles were released in early December, and the remaining individuals have continued to improve under rehabilitation.
The remaining stranded turtles were found dead.
During the August sampling session, one green turtle captured in the entrapment net was discovered to have a fishing hook embedded in the muscle of its front flipper. The hook was successfully removed by the research team prior to the standard work-up and release.
In addition, two turtles that had undergone rehabilitation during 2024—one hawksbill and one loggerhead—were successfully released back into the wild during 2025.

A green turtle with an embedded fishing hook.

Necropsy Training

As part of the annual course, students conducted necropsies on 11 sea turtles collected by the Bermuda Sea Turtle Stranding and Salvage Network (BAMZ).
Prior to the session, participants attended a lecture and a demonstration covering sea turtle anatomy and necropsy procedures. The session provides hands-on training while allowing students to observe common mortality factors affecting sea turtles.
Of the turtles examined:

- 10 were green turtles
- 1 was a hawksbill turtle

The sex ratio of necropsied turtles was 70% female and 30% male.
Observed causes or indicators of mortality included:

- Boat strike lesions (2 green turtles)
- Fishing line entanglement (1 green turtle)

None of the turtles contained macroplastics, and none had previously been captured by the Bermuda Turtle Project. Five green turtles had visible internal parasites.

Outreach and Education

Public engagement remains an important component of the Bermuda Turtle Project's mission. Educational opportunities often occur informally when the research team interacts with members of the community during field activities.
To recognize the generous support of project donors, David Godfrey, Executive Director of the Sea Turtle Conservancy, organized a VIP Day during the field course. This event allowed project sponsors to observe research activities, meet the research team and course participants, and assist with turtle releases.
The BTP also collaborates with several organizations to support environmental education initiatives. These efforts include participation in activities organized by Bermuda Girlguiding, including their marine symposium and field programs.
In August, the Bermuda Zoological Society hosted a public lecture on green turtle fibropapillomatosis, presented by Dr. Costanza Manes (STC).
The BTP also participated in the annual meeting of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) held in St. Kitts and Nevis, contributing to discussions on regional sea turtle conservation.
Additional outreach efforts included:

- promoting World Ocean Day through local radio
- presenting sea turtle conservation lectures at BAMZ
- organizing a beach clean-up at Somerset Long Bay with cruise ship staff

David Godfrey (STC) with VIP guests releasing a green turtle.

Student Participation

Students participating in the annual field course play an essential role in the Bermuda Turtle Project's research activities.
During the 2025 course, participants contributed approximately **969 volunteer hours** over the two-week period. These hours included safety training, discussion of the procedure manual, scientific presentations, fieldwork, laboratory activities, necropsy training, equipment maintenance and clean-up.
Participants in 2025 were:

- Alex Malpas (Bermuda)
- Alyssa Fesset (USA)
- Arona Bender (Guyana)
- Brandon Lee (Canada)
- Derick Hernández (Puerto Rico)
- Dorcas Antwi (Ghana)
- Francklin Barbier (Haiti)
- Oshin Whyte (Turks and Caicos)
- Ruth Mello-Cann (Bermuda)
- Yonel Jimenez (Mexico)

The project extends special thanks to **project volunteers and host families** who provided accommodation and transportation for international participants.

The BTP team 2025.

Project Contact Information and Support

Information about the Bermuda Turtle Project is available at:
https://bermudaturtleproject.org

The project also continues to expand its outreach through social media via its Facebook page and Instagram page.
The work of the Bermuda Turtle Project in **2025** was made possible through generous support from:

- Atlantic Conservation Partnership
- Bermuda Zoological Society
- Helen Clay Frick Foundation
- Milnell Foundation, Stella and Eden
- Sea Turtle Conservancy

Additional **in-kind support** was provided by:

- Eckerd College
- Florida Fish and Wildlife Conservation Commission