

Bald Head Island Conservancy Sea Turtle Protection Program 2022 Annual Report

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2022 Nesting Season Executive Summary

The 2022 sea turtle nesting season on Bald Head Island (BHI) was tremendously successful, including a record number of hatchlings making it to the ocean. The Bald Head Island Conservancy's (BHIC) Sea Turtle Protection Team (STPT) patrolled the beaches of BHI for 151 days/nights (22 dawn, 58 partial nights, and 71 full nights) during the 2022 nesting season and observed 148 nests, with the first being laid on 18 May and the last on 14 August. Additionally, the STPT observed 203 false crawls. Sixty-eight genetically distinct individual females were responsible for the 351 total nesting activities observed. Due to the proximity to the high tide line or an escarpment, 68 (45.9%) imperiled nests were relocated. For the second season in a row, a green sea turtle (*Chelonia mydas*) laid a nest on BHI, under a full moon while 50 beach-goers watched. We also saw the return of 4 legacy turtles - Claire, Sara, The Lovely Mrs. Bites, and Willine. The STPT applied two satellite tags this season. Willine and Sara were outfitted with the devices in collaboration with Florida Fish and Wildlife Commission's Sea Turtle Biologist, Dr. Simona Ceriani. These tags allow us to track the migration patterns and trends of these tagged individuals over time. The first hatching event was observed on 25 July, while the last two nests were excavated on 2 October, with an average incubation time for the 148 nests of 57 days. Approximately 16,377 eggs were laid on BHI beaches, producing a record number of hatchlings, estimated to be 13,157. Mean hatch success rate was 81.9%, while mean emerge success rate was 78.4%. For a third consecutive year, two predator exclusion cage (PEC) designs, MasterNet and welded wire, were installed to protect nests. Though coyotes were observed on BHI beaches in summer 2022, there were no successful nest depredation attempts. This was the first time in the past four years that BHI did not lose a single egg to coyote depredation. Four nests were lost to Hurricane Ian on 30 September, and fortunately, these were the only nests lost during the 2022 season. All sea turtle monitoring and sample collections were performed pursuant to North Carolina Wildlife Resources Commission Endangered Species Permit #22ST14.

Sea Turtle Protection Program Overview

The Bald Head Island Conservancy's (*BHIC*) Sea Turtle Protection Program (*STPP*) was established in 1983 in cooperation with the North Carolina Wildlife Resources Commission (*NCWRC*) and the National Marine Fisheries Service (*NMFS*). Unofficially, monitoring of nesting sea turtles, their respective nests, and hatchlings began in 1980 with a group of island residents. Considered by *NMFS* as an "index" and "saturation tagging" beach, *BHI* and the Conservancy are nationally recognized for their long-term sea turtle monitoring program. As a saturation tagging beach, the Conservancy's Sea Turtle Protection Team (*STPT*) monitors the beaches of *BHI* nightly from May to September. During nightly patrols, the *STPT*'s goal is to tag and identify every individual nesting turtle that comes ashore using a standardized data collection protocol. Nesting season begins with dawn patrols (*0600 – 0730 EDT*) on 1 May until the first nest is observed, after which full night patrols commence and continue through the middle of August. Nightly patrols for nesting mothers are conducted from 2100 - 0600 EDT and include the application of Inconel flipper tags (*began in 1991*), passive integrated transponder tags (*PIT; began in 2002*), and the collection of tissue biopsies (*began in 2002*) for genetic analysis and eggs for stable isotope analysis (*SIA; began in 2010*). These activities have produced an invaluable 35+ year dataset that allows the Conservancy's biologists and collaborators to track and conduct studies on the reproductive ecology, migration, and population trends of nesting loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*) and, Kemp's ridley (*Lepidochelys kempii*) sea turtles.

Nesting Activities: Caretta caretta & Chelonia mydas

**All data subject to change as 2 nests await genetic confirmation as of 12/31/2022.*

The 2022 sea turtle nesting season on Bald Head Island, North Carolina (BHI) was incredibly fruitful, thanks to minimal hurricane damage and no successful depredation activities. The Conservancy’s Sea Turtle Protection Team (STPT) observed 64 distinct nesting females while another 4 individuals were identified through genetic analysis. These 68 nesting females were responsible for 351 nesting activities: 148 nests and 203 false crawls (Figure 1). All but one nesting activity were determined to be by loggerhead (*Caretta caretta*) sea turtles. The remaining activity was a nest laid by a green (*Chelonia mydas*) sea turtle,

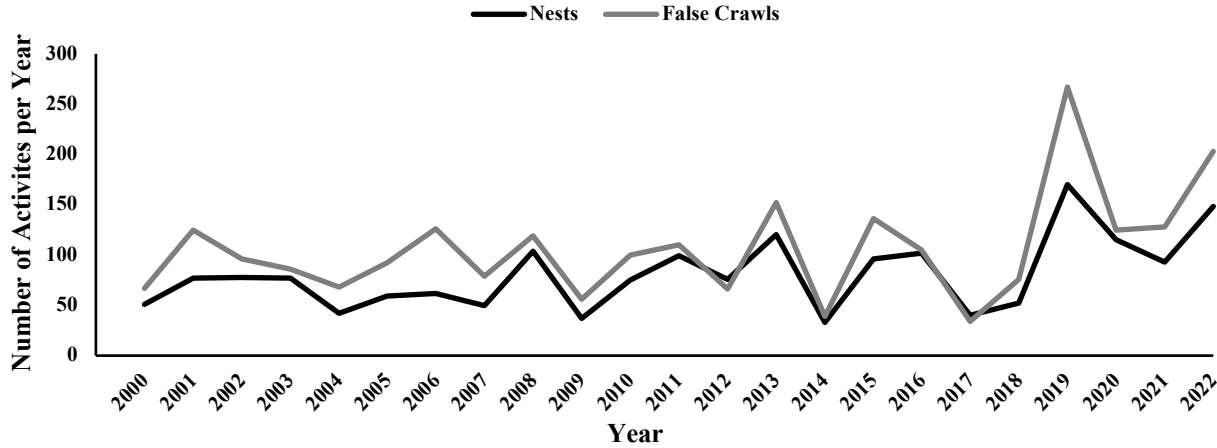


Figure 1. Bald Head Island nesting activities, 2000 – 2022.

the second in as many years. The 148 nests produced 13,157 hatchlings, a BHI record, with hatch and emergence success rates of 81.9% and 78.4%, respectively. Due to the proximity to the high tide line or an escarpment, 68 (45.9%) imperiled nests were relocated. All nesting activities were observed between 17 May and 14 August, with a temporal distribution consistent with the last four seasons where most nesting activities occurred in July (46.7%, Figure 2). Again, South Beach had the most nests (80) and false crawls (127; Figure 2). Of the remaining 68 nests, 62 were laid on East Beach and 6 on West Beach.

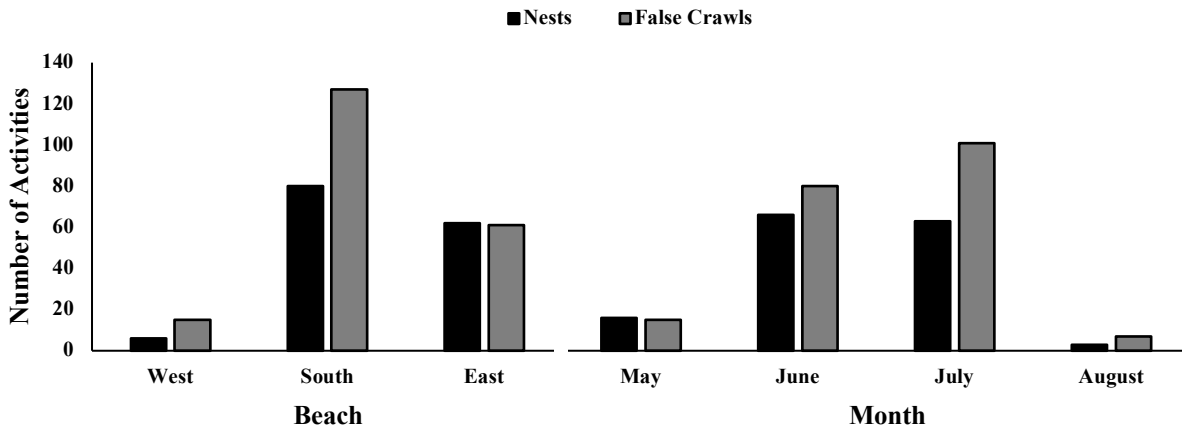


Figure 2. Temporal & Spatial distribution of Bald Head Island’s 2022 sea turtle nesting activities.

Nesting Females

Sixty-four individual nesting females were identified during night patrols by the STPT, and another four individuals were identified via genetic analysis: 67 loggerheads and 1 green. Of the 68 nesters identified, 34 (50 %; *Figure 3*) are thought to be neophyte loggerheads (*i.e.*, *no tags or genetics on record*), while 33 (48.5%) are known loggerhead re-migrants to BHI, and 1 (1.5%) green re-migrant. After further researching each individual’s tags and genetic code, it was determined that 27 of 68 nesting females were “vagabond” nesters (*Figure 3*), meaning that they have been identified nesting on other beaches along the southeastern seaboard. In addition to the 148 nests laid on BHI in 2022, 18 of the 27 vagabonds laid 28 other nests on neighboring beaches within North and South Carolina, producing an estimated 2,583 more hatchlings. Re-migrants laid an average of 2.7 ± 1.6 nests each (92 total) on BHI, while neophytes laid an average of 1.7

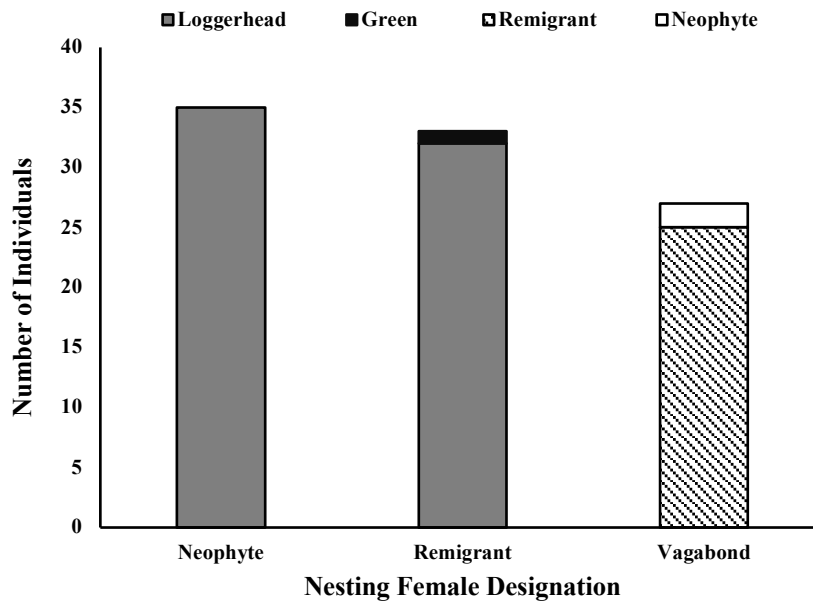


Figure 3. The number (numbers are subject to change upon genetic confirmation) of re-migrant, neophyte & vagabonds identified during the 2022 nesting season.

± 1.1 nests each (54 total) on BHI. Four Legacy turtles (*long-term remigrants to BHI*) returned to BHI for the 2022 season: Claire (4 BHI nests; 1 Fort Fisher nest), Sara (1 BHI nest; 3 Fort Fisher nests), The Lovely Mrs. Bites (4 BHI nests; 1 Fort Fisher nest), and Willine (6 BHI nests). The most prolific nester (*must have laid 4 BHI nests or more*) in 2022 was KXX265, a neophyte who laid 5 nests, resulting in 786 eggs that produced 669 hatchlings. The most successful nester in 2022 was The Lovely Mrs. Bites, a Legacy vagabond re-migrant who laid 5 nests (4 BHI nests; 1 Fort Fisher nest), resulting in 567 eggs that produced 550 hatchlings, equating to a 97% hatch success and a 96.6% emergence success. These data demonstrate that BHIC is not only protecting nesting turtles exclusive to BHI but also individuals associated with the larger Northern Recovery Unit (NRU) subpopulation of loggerhead sea turtles on the US East Coast.

There were 104 Inconel flipper tags and 32 PIT tags applied during the 2022 nesting season. Of the 104 flipper tags, 50 were applied to the left front flipper and 54 were applied to the right front flipper. In addition to recording and applying tags, standard carapace measurements were recorded for each individual at every

nest deposition, when possible. The mean curved notch-to-tip length of nesting loggerheads during the 2022 nesting season was 99.2 ± 4.9 cm (*range* = 108.3 – 83.9 cm; *n* = 53, *Table 1*). There was no significant difference between the measurements of re-migrants when compared to neophytes in all carapace measurement categories (*Table 1*).

	<i>CNT</i>	<i>CNN</i>	<i>CW</i>	<i>SNT</i>	<i>SNN</i>	<i>SW</i>
<i>All</i>	99.2	97.6	92.5	90.7	88.7	70.5
<i>Re-migrants</i>	99.8	98.2	93.1	90.8	88.7	70.8
<i>Neophytes</i>	98.6	97.0	91.8	90.5	88.7	70.2
<i>Green*</i>	111.7	111.7	102.5	-	-	-
<i>p-value</i>	0.42	0.43	0.33	0.80	0.98	0.50
<i>t-stat</i>	0.817	0.790	0.975	0.255	0.029	0.677

*Table 1. Season averages for standard carapace measurements (cm). CNT = curved notch-to-tip, CNN = curved notch-to-notch, CW = curved width, SNT = straight notch-to-tip, SNN = straight notch-to-notch, SW = straight width. * Not included in measurement statistics.*

Complete nest relocations were conducted on 68 nests (45.9%), with an estimated 7,670 eggs moved. Relocations were conducted within 30 minutes after the female exited the beach. BHI’s first nest hatched on 23 July with hatchings continuing throughout the fall, with the last nest hatching around 28 September. Incubation periods ranged from 50 to 70 days, with an average incubation period of 57 ± 3.9 days. One hundred and forty-four nests hatched, with the month of August having the most emergences (88), while the remaining nests emerged during the months of July (18), and September (35) or were lost to Hurricane Ian (4; 30 September) or were duds (3; *unknown cause of nest failure*). Multiple parameters of nest success were recorded during excavations (*Table 2*). Average hatch success was 81.9%, with an average emergence success of 78.4%, excluding nests lost to Hurricane Ian. The most loggerhead hatchlings ever recorded on BHI, 13,157, made it to the ocean this year. Unfortunately, the green nest was 1 of 4 lost to Hurricane Ian. There was no difference in the hatch or emergence success of relocated nests compared to *in situ* nests.

	<i>HE</i>	<i>UE</i>	<i>PE</i>	<i>LH</i>	<i>DH</i>	<i>TC</i>
<i>2022 Average</i>	91.3	17.9	0.9	2.2	1.8	110.6
<i>2022 Total</i>	13418	2632	141	318	261	16373
<i>Decadal Average (2011 - 2021)</i>	6665	2040	129	499	159	9156

Table 2. Nest inventory data. HE = hatched eggs, UE = unhatched eggs, PE = dead pipped eggs (partially emerged from eggshell), LH = live hatchlings, DH = dead hatchlings, TC = total clutch. The 2022 nest success statistics were above average in hatched eggs and total clutch count, but below average in unhatched eggs, pipped eggs, live hatchlings, and dead hatchlings.

Research, Presentations, & Collaborations

2022 Intern Projects

Ali Johnson – A Comparison of Hatchling Size and Mass on Emergence Order

Ashlyn Crain – Intra-seasonal Variation in Egg Size for Loggerhead Sea Turtles (*Caretta caretta*)

Eli Bradley & Grace Shay – Methodology for Analyzing Microplastic Abundance in Sediment

Jordyn Brown – Analyzing the Effects of Weather Patterns on Sea Turtle Nesting Behavior

Publications & Presentations

BHI Conservancy staff were lead or co-authors on two scientific posters & one oral presentation in 2022. While staff also collaborated on 3 graduate theses that were completed in 2022.

Hillbrand, P.A., Darrow, E.S., Jobe, S., Urbanek, R.E., & Abernathy, E., 2022. *Designing a Nest Cage for Coexistence: Living with a Non-Native Predator, Canis latran.* North Carolina Sea Turtle Permit Holders Meeting. March 11, 2022. Virtual Presentation.

Hillbrand, P.A., Darrow, E.S., Jobe, S., Urbanek, R.E., & Abernathy, E., 2022. *Living in Coexisting: A Novel Predator Exclusion Cage Design.* The International Sea Turtle Symposium. March 25-28, 2022. Virtual Poster Presentation.

Hillbrand, P.A., Darrow, E.S., 2022. *Resilience: Nest Success After Mid-Incubation Disturbances.* The International Sea Turtle Symposium. March 25-28, 2022. Virtual Poster Presentation.

Graduate Theses

Clavien, C., 2022. *Fighting Coastal Erosion: The Effects of Beach Nourishment on Nesting Sea Turtles on Bald Head Island, United States.* University College London, London, England.

Jobe, Seanna., 2022. *Predator exclusion cages as visual attractants to coyotes.* University of North Carolina Wilmington, Wilmington, North Carolina.

Lapinsky, Megan., 2022. *Modeling Potential Relocation Sites for Threatened Sea Turtle Nests on Bald Head Island using LiDAR Data.* University of North Carolina Wilmington, Wilmington, North Carolina.