

Bald Head Island Conservancy 2016 Sea Turtle Nesting Report

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Summary

The first nest of the 2016 Bald Head Island sea turtle nesting season was laid on May 11, with the last nest laid on August 30. BHI had 102 nests (all loggerhead), 44 of which were relocated to safer areas of the beach to increase their potential for success. Documented false crawls totaled 105 during 2016. Nests hatched from July 19 to September 25 with incubation times of successful nests averaging 52 ± 5 days. Data from BHI Conservancy tagging efforts suggest that returning mothers are larger and more likely to lay multiple nests than new mothers. The average hatching success rate was 76% (i.e., turtles that escaped eggshells), while the average emergence success rate was 67% (i.e., hatchlings that emerged from nest without assistance). In total, 8152 hatchlings made it to the ocean in 2016. Hatching success did not differ significantly between nests laid on South Beach vs. East Beach, nor between nests that were relocated vs. those that incubated in-situ. Throughout the 2016 summer, more than 6000 people experienced and learned about sea turtle conservation through the BHI Conservancy's Turtle Walks, Patrol Ride-Alongs, and Nest Excavations.

Nesting Distribution

The 2016 Bald Head Island sea turtle nesting season began on May 11 with the final nest laid on August 30 (111 days). In total, 207 nesting attempts occurred with 102 resulting in nests, all of which were loggerhead (*Caretta caretta*) sea turtles. The majority of the nests were laid in June and July, with only a few being laid in either May or August (Figure 1). Of the 102 nests, 62 nests were laid on South Beach (accesses

11-36), 36 nests were laid on East Beach (accesses 39-42), and 4 nests were laid on West Beach (access 1-9).

Nest Relocations

Nest relocation was required for 44 of the 102 nests (total of 3425 eggs). Relocations were performed within the first six hours of nest incubation to avoid negative impacts to egg development. Of the 44 relocated nests, 18 were moved due to their proximity to heavily eroded beach escarpments. An additional 15 nests were relocated due to narrow beach conditions and the concern for tidal inundation and future erosion. Areas of Bald Head Island with particularly narrow nesting areas include West Beach, the southern side of the Shoals (access 36-39), and northern sections of East Beach (north of access 42). Relocation was required for 10 nests because the original site was located below the mean high tide line. Lastly, 1 nest was moved because it was directly in front of a public beach access pathway.

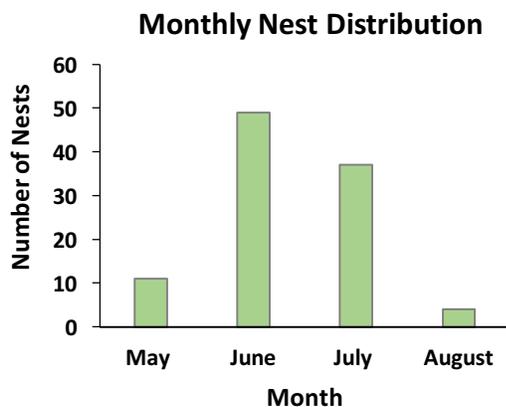


Figure 1. Distribution of nests laid in each month throughout the 2016 nesting season.

Nearly all nest relocations were completed on the same stretch of beach where the nest was originally laid (Figure 2).

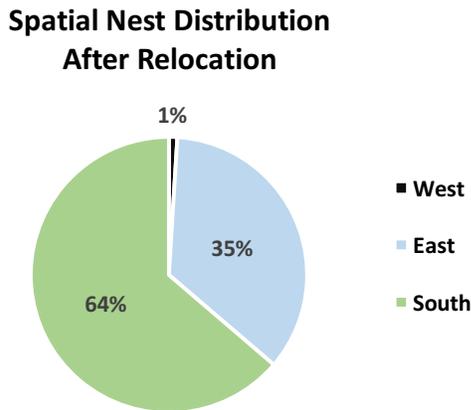


Figure 2. Distribution of nest incubation locations on Bald Head Island beaches during 2016.

Nesting Mothers

BHI Conservancy staff observed 79 of the 102 nesting events. However, during 10 of these events, the turtle was returning to the water and could not be tagged, or in some cases, checked for prior tags. Thus, tag information was collected during 69 nesting events, facilitating identification of most of the island's 2016 nesting population.

Based on tag information, 34 unique females nested on Bald Head Island during 2016. Of these 34 individuals, 16 had previously been tagged and thus had nested on Bald Head Island in previous years. Of these 16 returning turtles, 11 laid multiple nests while 5 produced only a single nest (Figure 3). BHI Conservancy staff was able to tag 18 new individuals in 2016 with the presumption that these females had not nested on Bald Head Island in previous years (caveat accepted that based on 20 years of data, only $80 \pm 5\%$ of nesting events are observed). Only 6 of the 18 newly tagged turtles nested more than once, with 12 of the new turtles producing a single nest (Figure 3). Although identification data is not available for every nesting female, returning individuals do appear more likely to lay multiple nests compared with females

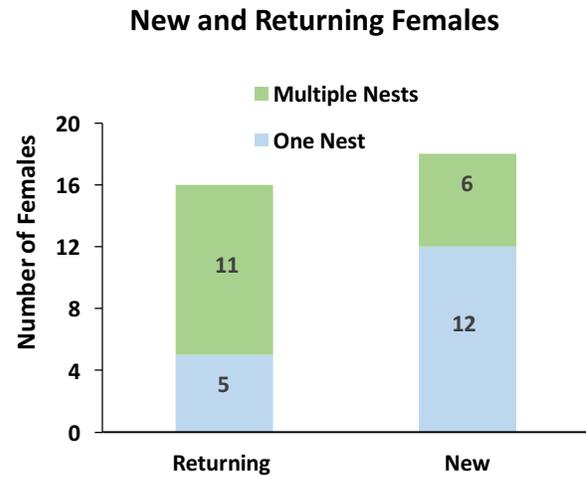


Figure 3. Distribution of returning and new nesting females and their nest laying frequency during 2016.

that are new to nesting on Bald Head Island. For individuals that nested more than once, the average time between nest laying was 16 ± 6 days.

In total, previously tagged females laid 42 of the 102 nests, while newly tagged individuals produced 27. No female identification information is available for the remaining 33 nests. To collect more detailed genetic information on Bald Head Island's nesting turtle population, a single egg was collected from each nest. Dr. Brian Shamblin at the University of Georgia will analyze the DNA signature of the eggs to verify the maternity of each nest. Results from these DNA analyses will be available later in 2017.

Standard carapace measurements were collected during the nesting process, utilizing both calipers for straight measurements and soft measuring tape for curved measurements (Table 1). Carapace measurements provide a means to calculate growth rates of individuals that routinely return to Bald Head Island to nest. In 2016, returning mothers were significantly larger ($p < 0.001$) than new individuals for all carapace measurements, with the exception of straight width (SW; $p = 0.107$).

	CNT	CNN	CW	SNT	SNN	SW
Ret.	105.5	103.8	97.0	95.0	94.4	74.5
New	96.0	94.0	90.3	89.0	86.0	72.2

Table 1. Comparison of average turtle carapace measurements (cm) for returning and new turtles. 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.

False Crawls

There were 105 documented false crawls on Bald Head Island in 2016. False crawls include all cases where a female emerges onto the beach but ultimately returns to the ocean without laying a nest. False crawls can occur for a number of reasons (e.g., lights, noise, beach hindrances); however, it is sometimes difficult to determine a specific cause.

The monthly distribution of false crawls was similar to the monthly distribution of nests laid, with the majority occurring in June and July (Figure 4). BHI Conservancy staff directly observed 45 of the 105 documented false crawls, although tag information was only collected on 17 occasions. The percentage of observed false crawls was likely low due to the event's short duration. However, in the absence of direct observation, false crawls can still be accurately documented due to clearly noticeable and specific disturbances in the sand caused by the turtle's crawl.

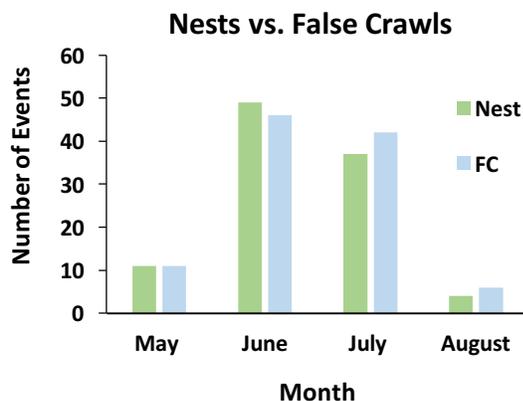


Figure 4. Monthly distribution and comparison of nests laid and false crawls.

For the 17 false crawl events in which tag information was collected, 13 unique individuals were observed. One individual was documented to have false crawled three times within a 2-day period before laying a nest. Another false crawled twice within a 2-day period, returning for another crawl 1.5 months later. These individuals, as well as 6 others, later returned to Bald Head Island to produce nests, including 3 individuals that returned on the same night as their crawl. Five of the 13 individuals were not documented to have returned to nest. It is possible that these turtles either nested unobserved or chose to nest on a different beach.

Nest Hatchings

Nest hatching on Bald Head Island began on July 19, with the majority (52%) of nests hatching in August. There were 3 nests that had unknown hatch dates. One of these undocumented hatchings occurred during a 3-day period of rainy weather, making it difficult to determine the exact hatch date. Another undocumented hatching came from an initially undetected nest that, due to erosion, became exposed only after it had hatched. The third undocumented nest hatching may have occurred during Hurricane Matthew, although the final status of the nest is unknown. Seven nests failed to hatch in 2016. Of these, 3 were inundated by hurricane washover, 3 failed for unknown reasons, and 1 was exposed to persistent cold temperatures during incubation (nest was not laid until late August). Of the successful nests, incubation times ranged from 46 to 69 days, with an average incubation time of 52 ± 5 days.

Nest Excavations

Nest excavations were conducted 72 hours after a nest hatched, or 80 days after a nest was laid (if not hatched). The number of hatched eggs (HE) and unhatched eggs (UH) were counted during each excavation, as well as live hatchlings (LH) and dead hatchlings (DE) present in the egg chamber.

	HE	UH	LH	DH	PE
Total	8386	2147	798	234	409
Avg	84	21	8	2	4

Table 2. Total number of eggs and hatchlings discovered in specific condition during 2016 excavations, as well as the average number in each condition per nest.

Pipped eggs (PE), in which the hatchling started to emerge from the eggshell but died during the process, were also counted (Table 2). The average hatch success rate (hatchlings escaping eggshells) was 76%, while the average emergence success rate (hatchlings leaving nest without human assistance) was 67%. After accounting for hatchlings retrieved and released during nest excavations, 8152 hatchlings made it to the ocean from Bald Head Island nests.

As mentioned previously, 64% of the nests in 2016 incubated on South Beach and 35% incubated on East Beach. The average hatching success for South Beach nests was 76%, while the average for East Beach was 75%. A Mann-Whitney U-Test confirmed that average hatching success rates for South and East Beaches were not significantly different ($p = 0.545$; Figure 5).

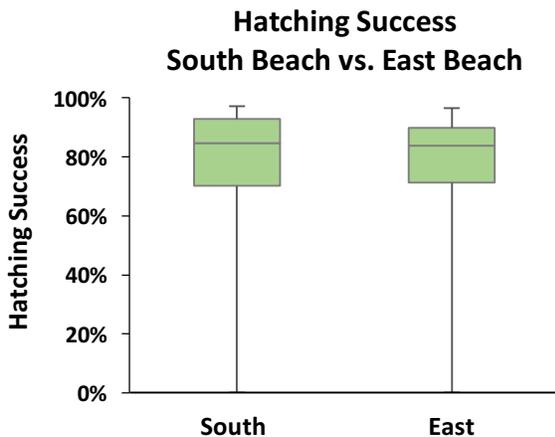


Figure 5. Results of Mann-Whitney U-Test showing no significant difference between hatching success on South Beach and East Beach (df=64, df=37, $p=0.545$).

Hatching success rates were also compared for nests that were relocated and those that were left to incubate in-situ. Results from this Mann-Whitney U-test showed that the average hatching success

rate for relocated nests was not statistically different from the average hatching success rate of in-situ nests ($p = 0.802$; Figure 6).

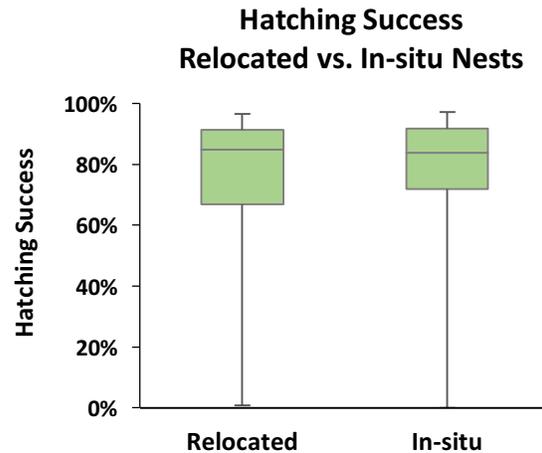


Figure 6. Results of Mann-Whitney U-Test showing no significant difference between hatching success of relocated and in-situ nests (df=44, df=57, $p=0.802$).

Educating the Public

A critical facet of the BHI Conservancy's successful Sea Turtle Protection Program is public education. This includes educating BHI visitors about threats to sea turtle survival and the specific techniques utilized by BHI Conservancy staff to protect these endangered species. By far the largest public education events are nest excavations, which were attended by nearly 5000 people in 2016. An additional 1600 visitors participated in BHI Conservancy programs such as Turtle Walks and Ride-Alongs. Informal education occurs through communications at the Conservancy's information desk, showings of the movie 'Sea Turtle: The Incredible Journey', and casual conversations between visitors and BHI Conservancy staff on BHI beaches. Only through awareness and collective efforts between BHI visitors and BHI Conservancy staff and volunteers can the population of the island's sea turtles be protected for years to come.