

Population of Diamondback Terrapin (*Malaclemys terrapin*) in Taunton River Watershed Report

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Introduction

The Diamondback Terrapin (*Malaclemys terrapin*) is a brackish water turtle species found from Southeastern Massachusetts and Cape Cod south to Florida and west along the Gulf Coast to Corpus Christi, Texas. The Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*) is one of the seven subspecies that have been classified and inhabits Massachusetts as well as New York, Connecticut, New Jersey and Rhode Island (Brennessel 2007). This species is listed as Threatened under the Massachusetts Endangered Species Act (MassWildlife 2008). Diamondback terrapins inhabit shallow estuarine environments including bays, marshes and creeks. Females require nearby, open, sandy areas for nesting and will travel up to 0.5 km in search of suitable habitat. Lack of suitable nesting sites and increased habitat fragmentation results in more females needing to cross roads to access nesting areas. Loss of habitat coupled with increased road mortality of females continues to be the greatest threats to the conservation of this species (MassWildlife 2008).

Scope of Work

The healthiest and most well documented population of Northern Diamondback Terrapins in Massachusetts is on Cape Cod. However, additional, smaller populations occur along the southern part of the state. One of those populations is found in the watershed of the Taunton River. Starting from Bridgewater, MA, the Taunton River runs for over 40 miles with the last 18 considered to be tidal and is affected by saltwater intrusion and opens into Mount Hope Bay (SavetheTaunton.org n.d.). This study focused on two locations in the southwest part of the watershed, Assonet Bay and Broad Cove (Figures 8 & 9). Assonet Bay is a small, tidal, inland bay surrounded by the shores of Freetown and Berkley. A small freshwater river flows from Long Pond southwest into the Bay, which then connects with the Taunton River that flows into Mt. Hope Bay. Dominant vegetation surrounding the bay includes marsh grasses (*Spartina spp.*), Phragmites (*Phragmites spp.*) and lawn grasses from residential properties. The benthic substrate is composed of thick mud with no submerged vegetation. Broad Cove is a small, tidal, natural cove located on the border of Dighton and Somerset and is adjacent west of the Taunton River (DCR 2001). The same dominant vegetation found at Assonet Bay surrounds Broad Cove and a small channel connects the cove to the river. An old railroad bed is also located on the east side of the Cove near the channel. Nesting Diamondback terrapins at both sites have been documented, but no thorough studies have been conducted to estimate the size and structure of this/these population/s. The objectives of this multi-year study are to estimate the population size, age structure and sex ratio of Diamondback Terrapins in Lower Taunton River through Mark-Recapture. Results from these studies are critical in the future management and conservation of this threatened species in Assonet Bay as well as other populations in southern Massachusetts.

Methods

Protocols used in the 2018 survey, described below, were based on those employed during the previous two field seasons.

Trapping

Northern Diamondback Terrapins were captured using four trap types; (2) PVC Box Traps (custom built by Bristol County Agricultural High School Natural Resource Management Department), (2) modified metal box traps, (4) modified hoop traps, (1) modified recreational crab pot, and (1) basking trap. Simple adjustments were made to account for tidal fluctuations to ensure safe capture and no mortality. Polyethylene foam pool noodles were attached to the inside of the PVC Box Traps and Crab Pot and to the outside of the Metal Box Traps and Hoop Traps; allowing the trap to float with adequate air space for turtles to surface and breathe (Figures 1 -4). The traps were secured on one end using modified four-foot wooden stakes. Two holes were drilled into each wooden stake two feet apart and rope was attached along with a steel ring (Figure 5). A second rope was attached to the steel ring with a steel clip on the end that clipped the stake to the trap, allowing for two feet of vertical travel with the tides (Figure 6). When removing the trap from the water (i.e. to remove captured turtles, replace bait or repair holes), the rope securing the trap to the wooden stake was unclipped from the trap and clipped to the boat. This allowed for easy removal of the trap while anchoring the boat to the stakes. A new method for securing the traps was tested with the basking trap. A rope was tied to the basking trap and the other end was tied around a cement cinder block, with a hose running over the rope attached to the cinder block to prevent it from chafing (Figure 7). There was little movement of the cinder block and the rope stayed secure during the entire time the trap was set.

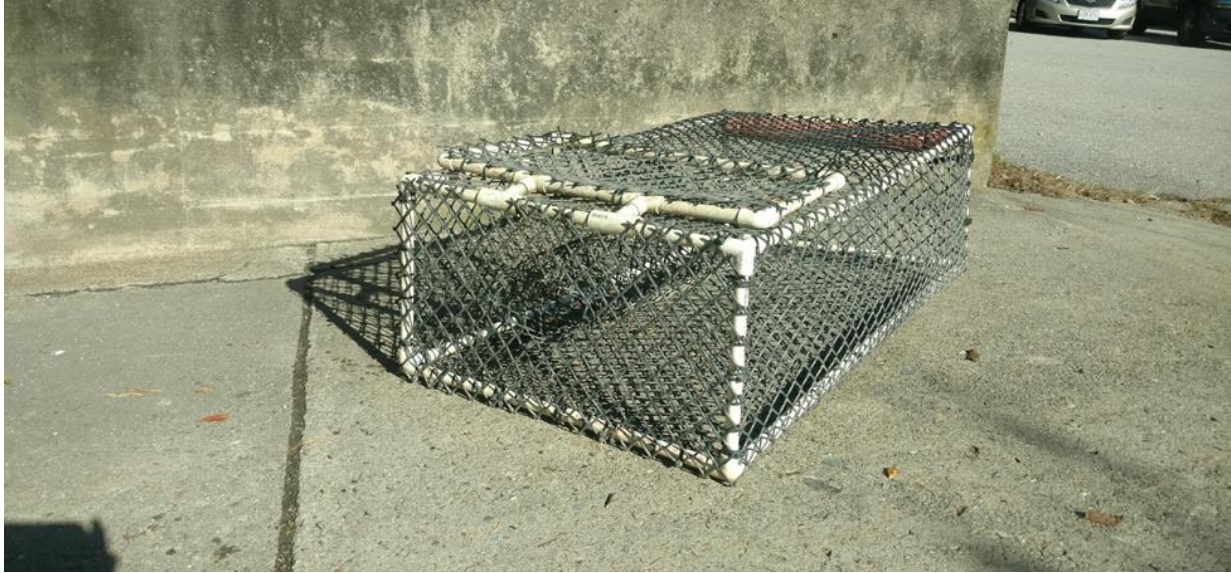


Figure 1. PVC trap (custom built by BCAHS NRM Department) with polyethylene foam pool noodle for trap floatation.



Figure 2. Modified metal box trap with polyethylene foam pool noodles for trap floatation.



Figure 3. Modified coated chicken wire crab pot with polyethylene foam pool noodle for trap floatation.



Figure 4. Modified Hoop Trap with polyethylene foam pool noodles for trap floatation.



Figure 5. PVC trap (left), metal box trap (right) as set



Figure 6. Modified stake allowing the trap to have 2 feet of vertical movement with the tides.



Figure 7. Basking Trap (Left), cement block with hose to prevent rope from chafing (Right).

Sampling Strategy

Trapping efforts from the 2016 and 2017 determined site selection for trap placement was severely restricted and, as a result, may have been biased due to the tidal activity of the bay. During the bi-monthly spring (low) tides, the majority of both Assonet Bay and Broad Cove are completely exposed mudflats. Turtle mortality due to heat exposure during extreme low tides (water level > 0.2 feet) was a serious concern. Both areas were carefully monitored through low tide and trap locations were chosen from areas that held some water throughout the tide cycle (see 2016 report).

Traps in Assonet Bay were set in the same general locations during the 2018 season. Trap placement ranged from 25-150 meters apart with the same method employed in Broad Cove. (See Figures 8 & 9). The trapping effort was conducted by kayak from May 15 to June 25 of the 2018 trapping effort in both Assonet Bay and Broad Cove. This limited the number of traps that could be set and increased the time spent traveling to, and checking, traps. During this time, five trap locations were set and checked daily in Assonet Bay and one trap location in Broad Cove. Daily use of the Bristol County Agricultural High School motor boat began on June 25 which significantly reduced the time spent traveling to and checking traps. As a result, four more traps were added in Assonet Bay and three added to Broad Cove (Figures 8 & 9).

Daily trapping in Assonet Bay began on May 15 and May 17 in Broad Cove and concluded in both locations on July 27, completing an 11 week trapping effort (Table 1 & Table 2). Trap effort was quantified by the following: 1 trap active from set day overnight into next day = 1 trap day. Therefore, 10 traps active from set day overnight into next day equals 10 trap days, if the traps were active overnight for 4 nights that would equal 40 trap days for that effort (Table 3 & Table 4).

If traps could not be checked within 24 hours, usually at the end of each week, all traps were closed by a hinged door or doors that were secured over the trap entrance by Velcro straps and could be re-opened the following week. This avoided the difficulty of having to remove and re-set traps every week. The traps were baited with sardine cans that were punctured allowing the oils to travel through the water. The bait was set and the beginning and removed at the end of each trap week while also replaced every 48 hours (typically Wednesdays) of each week.

Hand capture with dip net via kayak was conducted by Kaya from May 15 to July 24 before daily trapping was conducted by motor boat and typically lasted 1-2 hours. This occurred on days when no turtles were found in traps or after traps were baited on Mondays and Wednesdays. Hand Capture Attempts would not take place when weather conditions were too extreme or when turtles were found in traps.

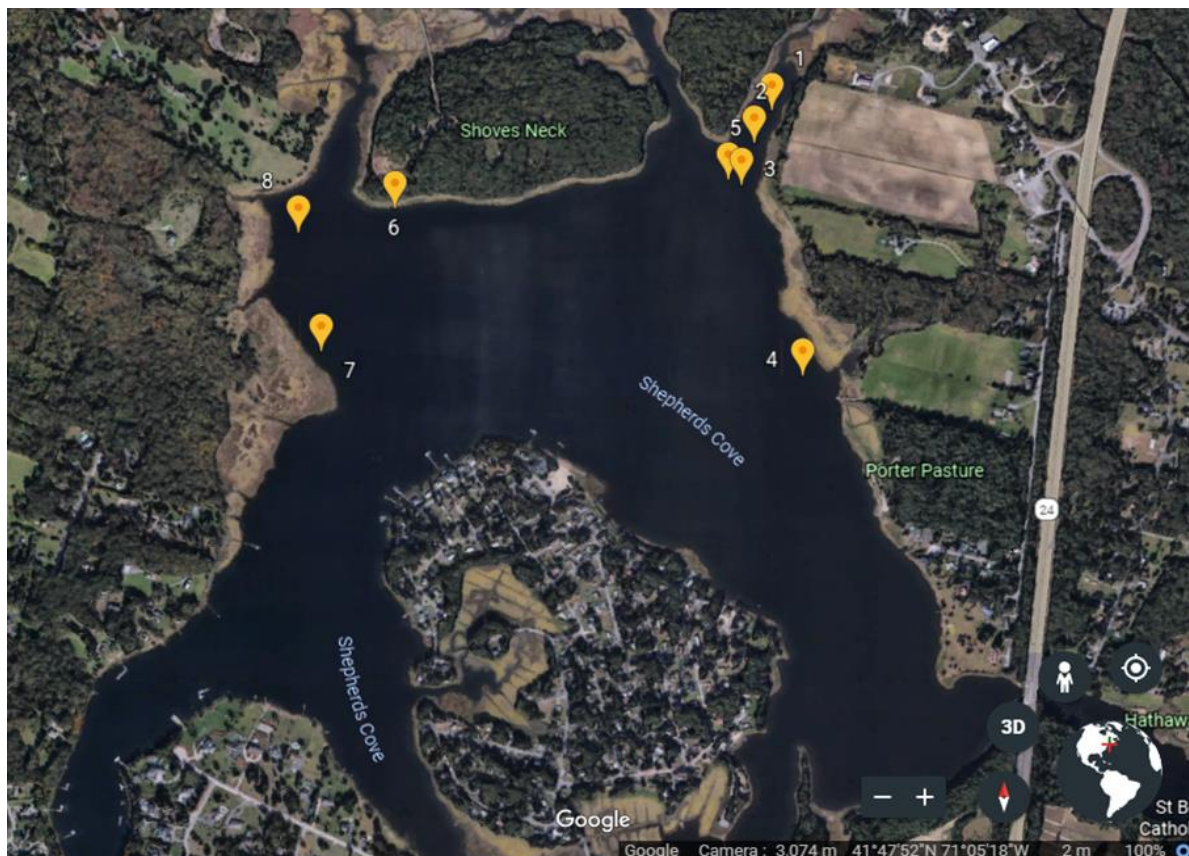


Figure 8. Map of all 2018 trap locations in Assonet Bay. Numbers indicate each trap location. (Google Earth Image 2018).

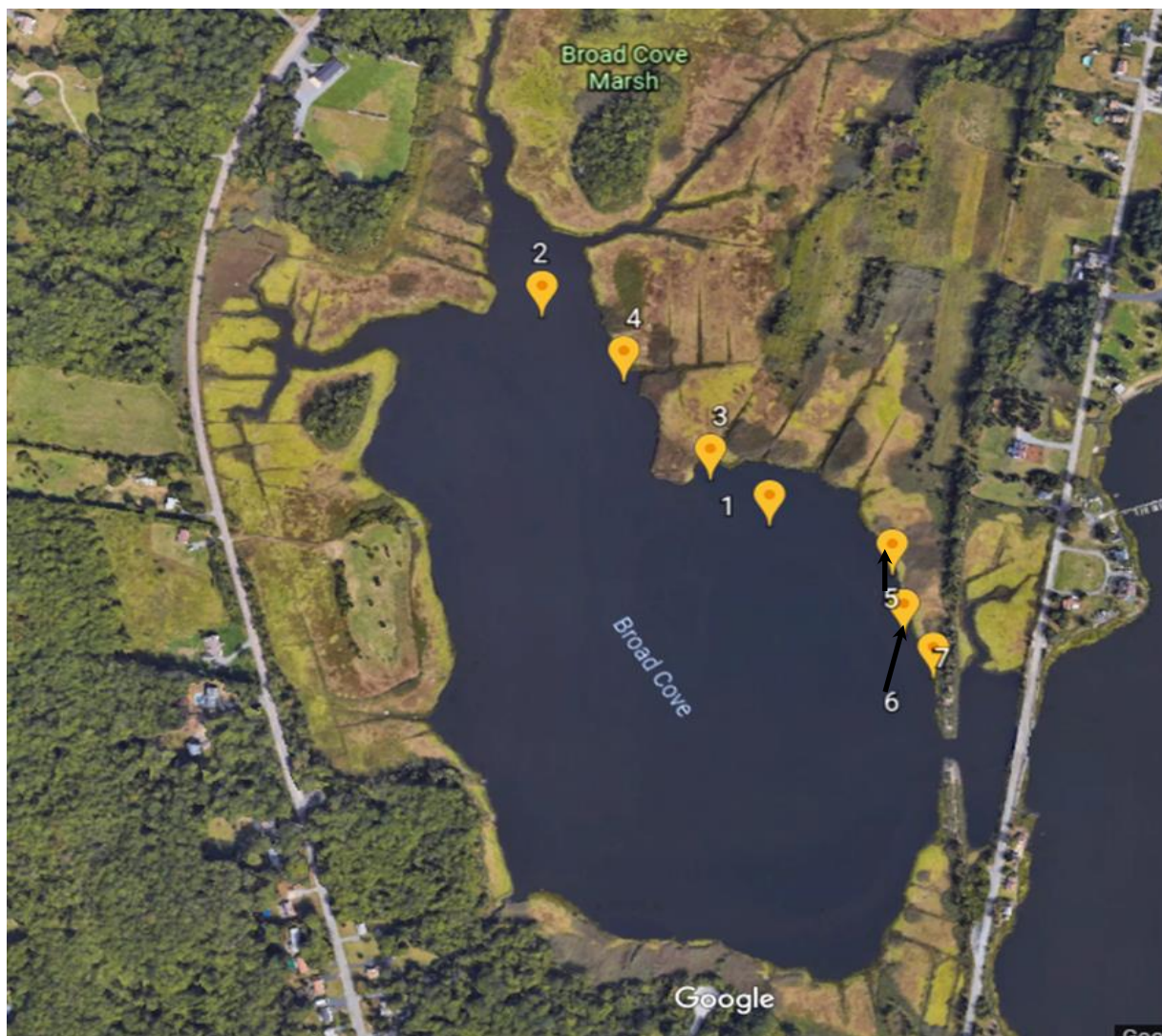


Figure 9. All 2018 trap locations in Broad Cove (Google Earth Image 2018).

Table 1. Trap specifications Assonet Bay

Location	Latitude	Longitude	Date Set	Date Pulled	Trap Type/s
1	41°48.379'	- 071°05.059'	15-May-18	27-Jul-18	PVC 1
2	41°48.339'	- 071°05.087'	15-May-18	25-Jul-18	Metal Box 1
3	41°48.286'	- 071°05.106'	15-May-18	29-May-18	Metal Box 2
4	41°48.053'	- 071°05.009'	17-May-18	26-Jun-18	PVC 2
5	41°48.294'	- 071°05.128'	30-May-18	27-Jul-18	Metal Box 2 (30-May-2018 to 27-June-2018) Hoop Trap 1 (27-June-2018 to 27-July-2018)
6	41°48.258'	- 071°05.663'	2-Jul-18	27-Jul-18	Basking Trap
7	41°48.083'	- 071°05.781'	4-Jul-18	27-Jul-18	Hoop 2
8	41°48.229'	- 071°05.818'	4-Jul-18	27-Jul-18	Hoop 3

Table 2 Trap Specifications Broad Cove

Location	Latitude	Longitude	Date Set	Date Pulled	Trap Type/s
1	N 41°47'35"	W 71°07'39"	17-May-18	25-May-18	Crab
2	N 41°47.711'	W -071°07.817'	25-May-18	14-Jun-18	Crab
3	N 41°47.612'	W -071°07.693'	14-Jun-18	27-Jul-18	Crab
4	N 41°47.671'	W -071°07.757'	27-Jun-18	27-Jul-18	Metal Box 2
5	N 41°47.554'	W -071°07.560'	2-Jul-18	27-Jul-18	PVC 2
6	N 41°47.490'	W -071°07.530'	4-Jul-18	9-Jul-18	Hoop 4
7	N 41°47.517'	W -071°07.552'	9-Jul-18	27-Jul-18	Hoop 4

Table 3. Trap effort by week Assonet Bay.

Trap Week Beginning	Trap Days
5/15/2018	14
21-May-2018	20
5/28/2018	19
4-June-2018	20
11-June-2018	20
18-June-2018	20
25-June-2018	18
2-July-2018	31
9-July-2018	35
16-July-2018	35
23-July-2018	35

Table 4. Trap effort by week Broad Cove.

Trap Week Beginning	Trap Days
17-May-2018	2
21-May-2018	5
28-May-2018	5
4-June-2018	5
11-June-2018	5
18-June-2018	5
25-June-2018	8
2-July-2018	18
9-July-2018	20
16-July-2018	20
23-July-2018	20

Processing and Data Collection

Since daily trapping was conducted by kayak from May 15 to June 22, all captured turtles were removed from the traps and taken to Bristol County Agricultural High School for processing during that time and then promptly released near site of capture. When daily use of the motor boat began on June 25, all captured turtles were processed in the motor boat on site. Measurements taken include maximum carapace length and width, maximum plastron length and width, maximum shell height and mass. All length measurements were recorded in millimeters and masses were recorded in grams. The minimum number of visible annuli was counted as a rough estimate of age. The annuli were counted on the carapace, as the plastron annuli were often not discernable. The sex of all turtles was recorded at first capture; any small turtles (i.e., < 150g) for which sex determination was which did not exhibit obvious male characteristics were recorded as “unknown.”

All new turtles captured received a PIT tag (Passive Integrated Transponder) in the proximal portion of the left, rear leg. The injection site was disinfected using 70% isopropyl alcohol and a sterile needle containing a sterile PIT tag. After the injection of the PIT tag, antibiotic liquid bandage was applied to the injection site. A “batch” notch was given to each PIT tagged turtle on the left femoral scute. Antibiotic ointment was applied to the notch and the animal was examined for any notable markings, deformities, scars and external parasites. Photos of the head, carapace and plastron were taken and the animal was released.

Additional data for capture sites included date, trap number, time the turtle(s) were removed from the trap, air and water temperature. Each datasheet contained a diagram of a carapace and plastron to mark any deformities, markings or scars observed on captured turtles. A PIT tag number field was missing from the datasheets and was written at the bottom of the datasheets and will be added to the datasheets for future studies.

Nest Protection

2018 was the first year that attempts to protect nests took place. The nesting areas identified in the 2017 report were found to be in continued use in 2018. Identified nests were covered by wire cloth which was kept on top of the nest by ground staples to prevent depredation along with flagging tape marked with the date each nest was found (Figure 10). Attempts to protect nests took place in two nesting areas. The first was the second nesting area cited in the 2017 report which is located on a residential property on North Hillside Street in Assonet (Figure 11). The homeowner is supportive of Diamondback Terrapin conservation and allowed us to access the property to monitor and protect nests as cited in the 2017 report. The homeowner also checked the nesting area daily and protected any new nest found along with alerting us of the new nest. The second nesting

area located in Assonet Bay was not protected because of lack of permission to enter the property (Figure 13).

The second protected nesting area was the historically known nesting that is adjacent to Broad Cove along an old railroad bed (Figure 12). The easiest way to access the area is by boat and it was checked while traps in Broad Cove were also checked, typically between 07:30-10:00.



Figure 10. Protected nest located at N. Hillside Street in Assonet.



Figure 11. Protected nest area, indicated by the yellow pointer, on North Hillside St. Assonet, MA (Google Earth Image 2018).

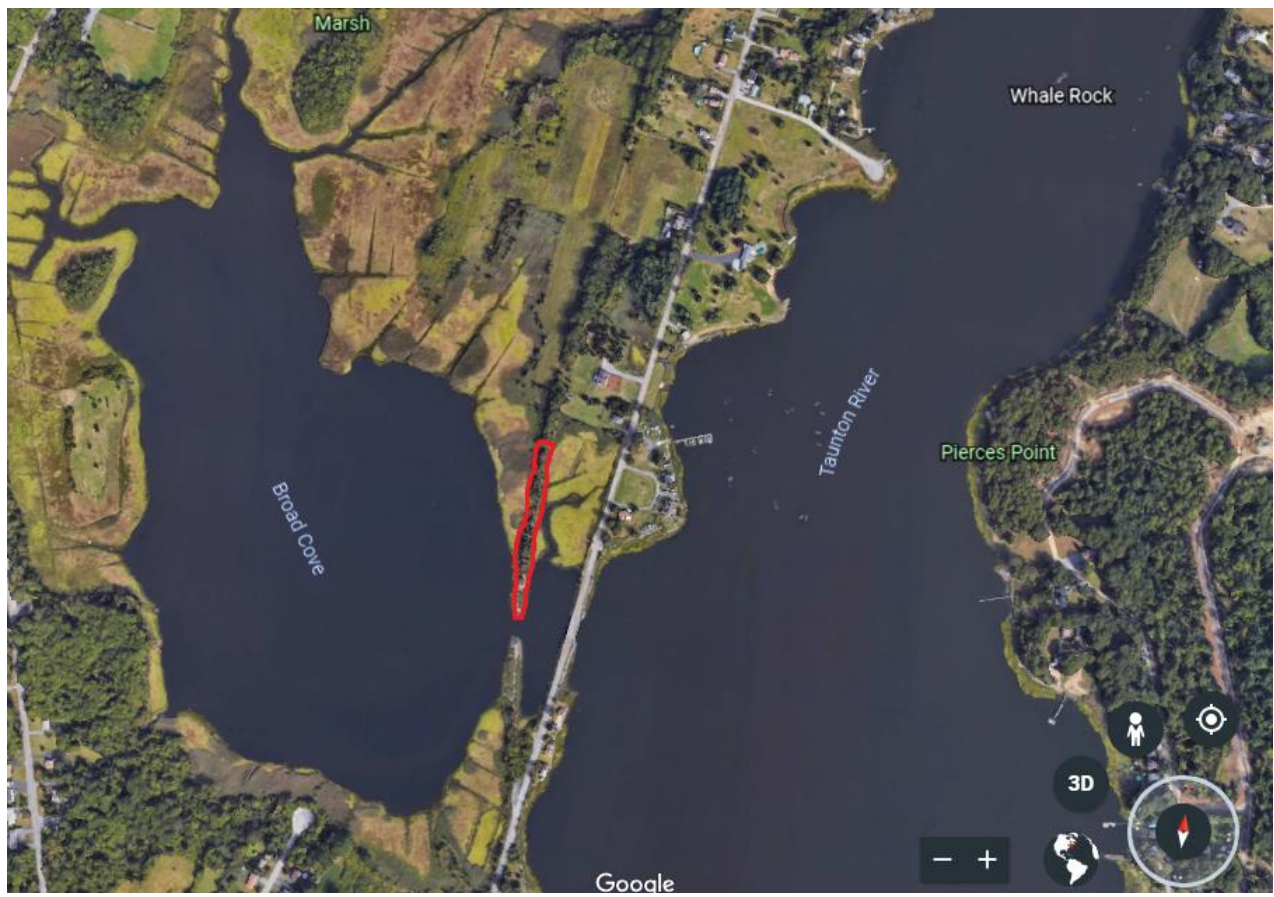


Figure 12. Protected nest area, indicated by the red polygon, area Broad Cove nest site (Google Earth Image 2018).



Figure 13. Assonet Bay south end nest site (Google Earth Image 2018).

Results

The 2018 trapping effort in Assonet Bay and Broad Cove was conducted for a total of 11 weeks, beginning on May 15 in Assonet Bay and May 17 in Broad Cove with efforts at both sites ending on July 27. Traps were set in Assonet Bay for a total of 54 days, resulting in 267 trap-days (Table 5). Broad Cove trapping effort totaled 113 trap-days (Table 6). Seven attempts to hand capture individuals via hand nets and kayak in Assonet Bay and one attempt in Broad Cove occurred from May 15 to June 21 for a total effort of approximately 9.5 hours with no terrapins captured.

In Assonet Bay 25 unique Northern Diamondback Terrapins were captured in traps, 18 females, 5 males and 1 unknown juvenile. Two unique Northern Diamondback Terrapins were captured in Broad Cove traps, 1 female and 1 unknown juvenile. Six females were caught at the North Hillside street nesting area with two gravid and two caught after they had nested. In Broad Cove two unique Terrapins were captured in traps, 1 female and 1 unknown. Two females were caught in the Broad Cove nesting area with both being gravid however one was not initially believed to be gravid but was found in the nesting area the following day. A dead female was also found floating in Broad Cove on June 18 with probable cause of death being struck with boat propeller. It was weighed, measured and will be sent to Mass. Fish and Wildlife along with coordinates of its location (Figure 17). In total, 35 unique live Northern Diamondback Terrapins were caught, marked and released during the 2018 study with no recaptures and addition with one dead adult female found (Appendix 1 & Figure 14).

Annuli counts ranged from 3 to 13 with the largest individuals being female (Figure 15). The smallest individual captured was a juvenile measuring 87mm (3.42 in) SCL and weighing 100g (0.22lb). The largest individual captured was an adult female measuring 232mm (9.13in) SCL and weighing 2170g (4.78lb). Another female measured 260mm (10.23in) SCL but this was an error by the recorder as all other measurements and weight are significantly less compared to the largest individual and the animal was released before the error could be corrected. (Appendix 1 & Figure 16).

Table 5. Assonet Bay trap effort including number of turtles captured per week

Trap Week Beginning	Trap Days	Turtles Captured
5/15/2018*	14	4
21-May-2018	20	4
5/28/2018**	19	2
4-June-2018	20	5
11-June-2018	20	0
18-June-2018	20	2
25-June-2018***	18	0
2-July-2018****	31	3
9-July-2018	35	1
16-July-2018	35	2
23-July-2018	35	2
Totals	267	25

Table 6. Broad Cove trap effort including number of turtles captured per week

Trap Week Beginning	Trap Days	Turtles Captured
17-May-2018	2	0
21-May-2018	5	0
28-May-2018	5	0
4-June-2018	5	0
11-June-2018	5	0
18-June-2018	5	0
25-June-2018*	8	0
2-July-2018**	18	1
9-July-2018	20	0
16-July-2018	20	1
23-July-2018	20	0
Totals	113	2

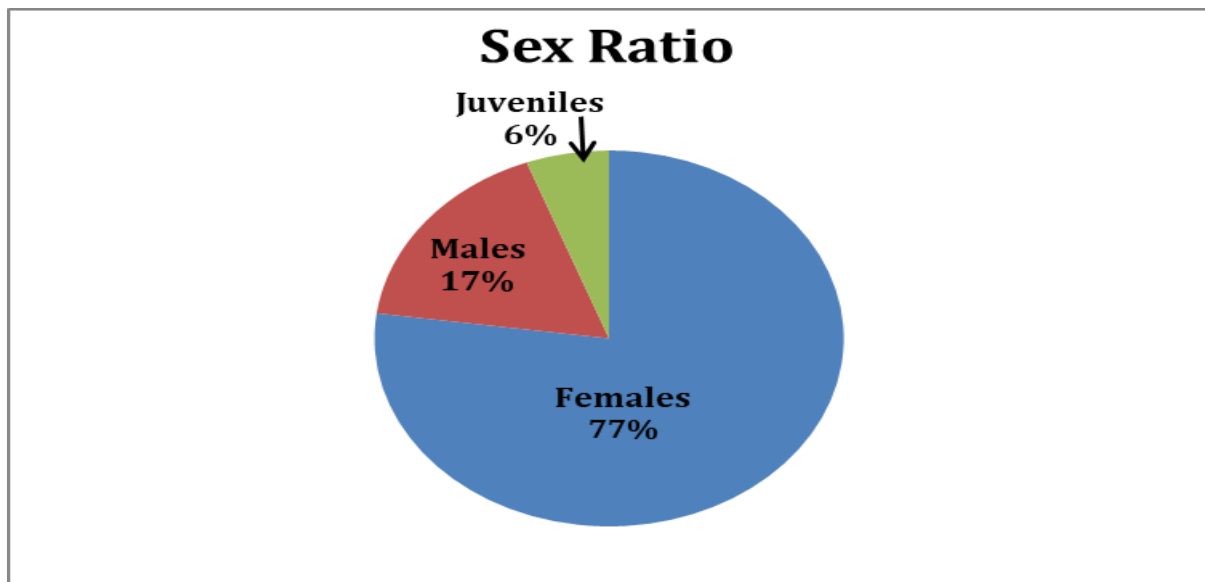


Figure 14. Sex ratio of all 2018 individuals captured (n=36) reported as a percentage

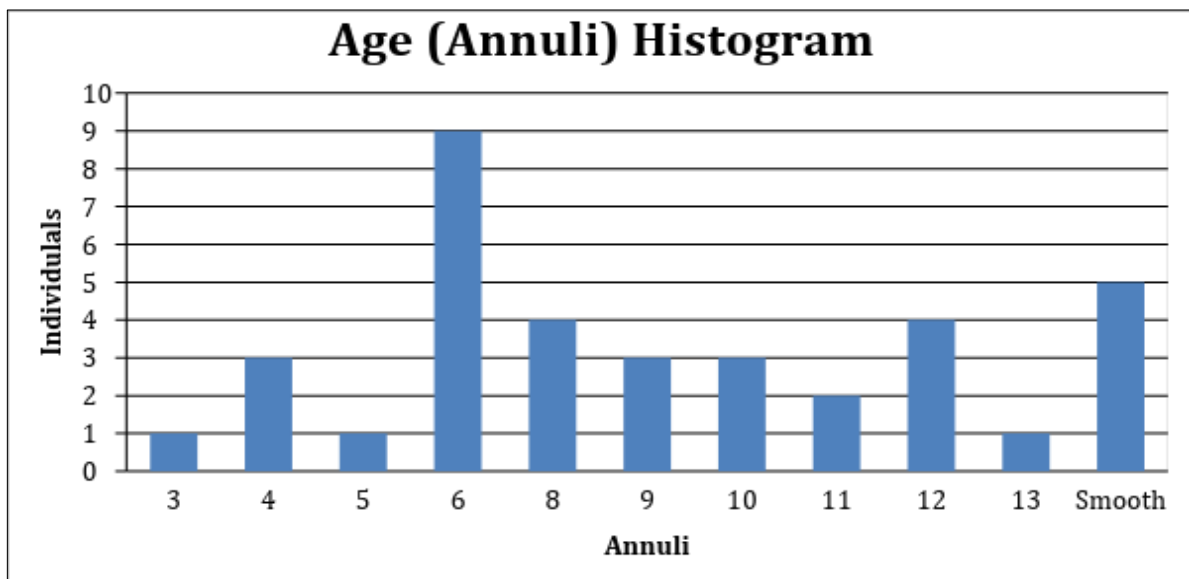


Figure 15. Number of plastral scute annuli counted for each 2018 individual (n=36). Smooth represents annuli in individuals that could not be counted.

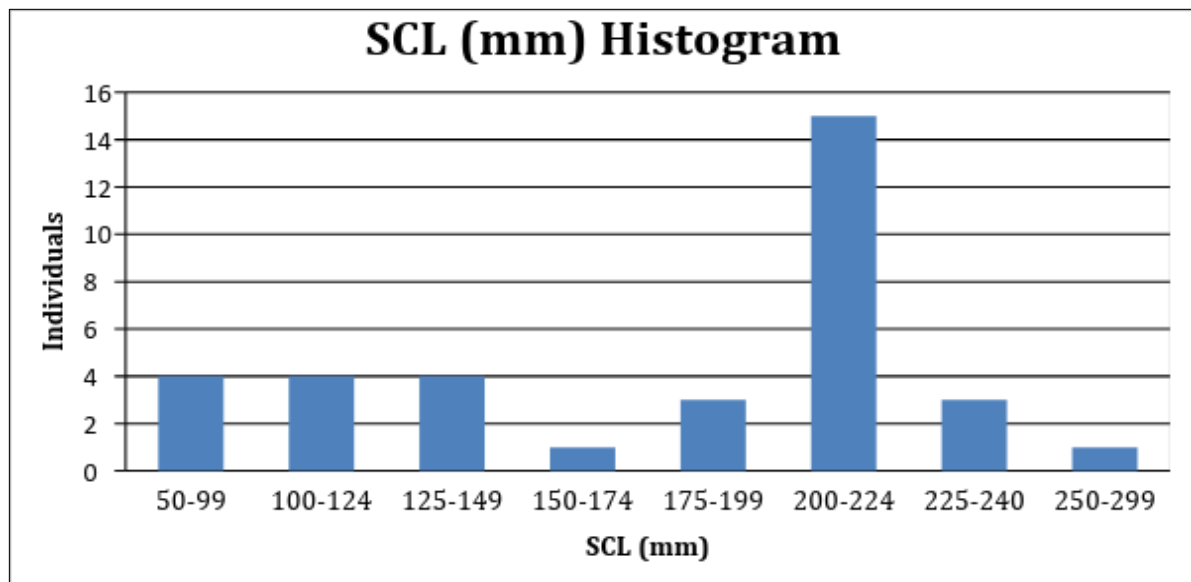


Figure 16. The Straight Carapace Length measurement for each 2018 individual (n=36) represented as a frequency distribution across each range.

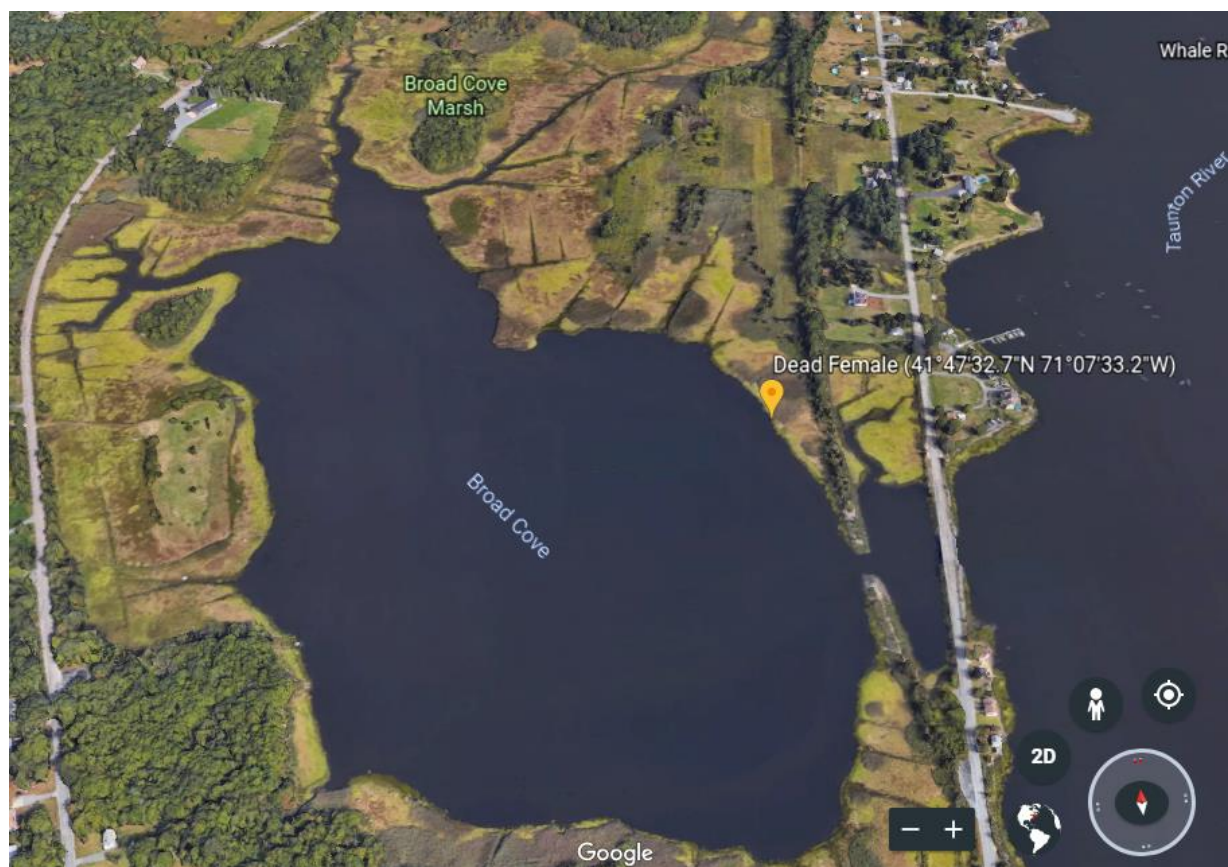


Figure 17. Location, indicated by the yellow pointer, and coordinates of dead female found on June 18 (Google Earth Image 2018).

Eight nests were protected during the 2018 study located at the North Hillside Street residential property, including one nest that was depredated after protection (Table 9 & Figure 18). This was due to limited number of ground staples securing the wire cloth, allowing for the nest predator to dig under the wire cloth. Eggs were also found in a loam pile on the North Hillside Street nesting area were collected and taken to Bristol County Agricultural High School for incubation. No nests were protected at the Broad Cove nesting area; however, a few eggs from depredated nests were collected and taken to Bristol County Agricultural High School for incubation. An active nest was also found in Broad Cove but no supplies to protect the nest had been brought so seven eggs (50%) were removed to be incubated. The remaining eggs were reburied; however, nest was found depredated the following day.

On August 29 2018, 13 hatchling Diamondback Terrapins were found at the North Hillside Street nesting area (Table 10 & Appendix 2). At this time, only nest number 7 remained undisturbed as two protected nests were depredated and the rest were dug up by the homeowner who found the hatchlings. The majority of the eggs from the dug up nests had been killed by plant roots and some hatchlings appeared too had been killed by sarcophagus flies. All live turtles were weighed, measured and 12 were released on the edge of the homeowners property as one died before the release. On September 11 2018, 24 hatchling Diamondback Terrapins were found in nest number 7 at the North Hillside Street nesting area (Table 10 & Appendix 3). Another hatchling was found on August 29 2018 from a Broad Cove clutch that was incubated (Appendix 2). It was weighed, measured and released at the edge of the Broad Cove salt marsh.

Table 9. Coordinates and dates of all protected nests. Includes nest depredated after protection.

Nest Number	Date Protected	Latitude	Longitude	Turtle Parent to Nest
1	19-Jun-18	N 41°47.631'	W 071°05.592'	
2	24-Jun-18	N 41°47.628'	W 071°05.588'	
3	29-Jun-18	N 41°47.629'	W 071°05.593'	42/7041
4	1-Jul-18	N 41°47.632'	W 071°05.581'	43/7042
5	5-Jul-18	N 41°47.631'	W 071°05.581'	

6	5-Jul-18	N 41°47.631'	W 071°05.579'	
7	6-Jul-18	N 41°47.625'	W 071°05.588'	
8	N/A	N 41°47.631'	W 071°05.592'	Believed to be protected on 5-July-18 but unmarked
9	N/A	N 41°47.626'	W 071°05.592'	Depredated after protection

Table 10. Number of hatchlings found at each nest

Nest Number	Date Protected	Latitude	Longitude	Number of Hatchlings
1	19-Jun-18	N 41°47.631'	W 071°05.592'	5
2	24-Jun-18	N 41°47.628'	W 071°05.588'	3
3	29-Jun-18	N 41°47.629'	W 071°05.593'	2
4	1-Jul-18	N 41°47.632'	W 071°05.581'	0/ Found Depredated on Aug-8-2018
5	5-Jul-18	N 41°47.631'	W 071°05.581'	0/ Found Depredated on Aug-8-2018
6	5-Jul-18	N 41°47.631'	W 071°05.579'	3
7	6-Jul-18	N 41°47.625'	W 071°05.588'	24
8	N/A	N 41°47.631'	W 071°05.592'	0
9	N/A	N 41°47.626'	W 071°05.592'	0/Depredated prior to Aug-8-2018
			Totals	37

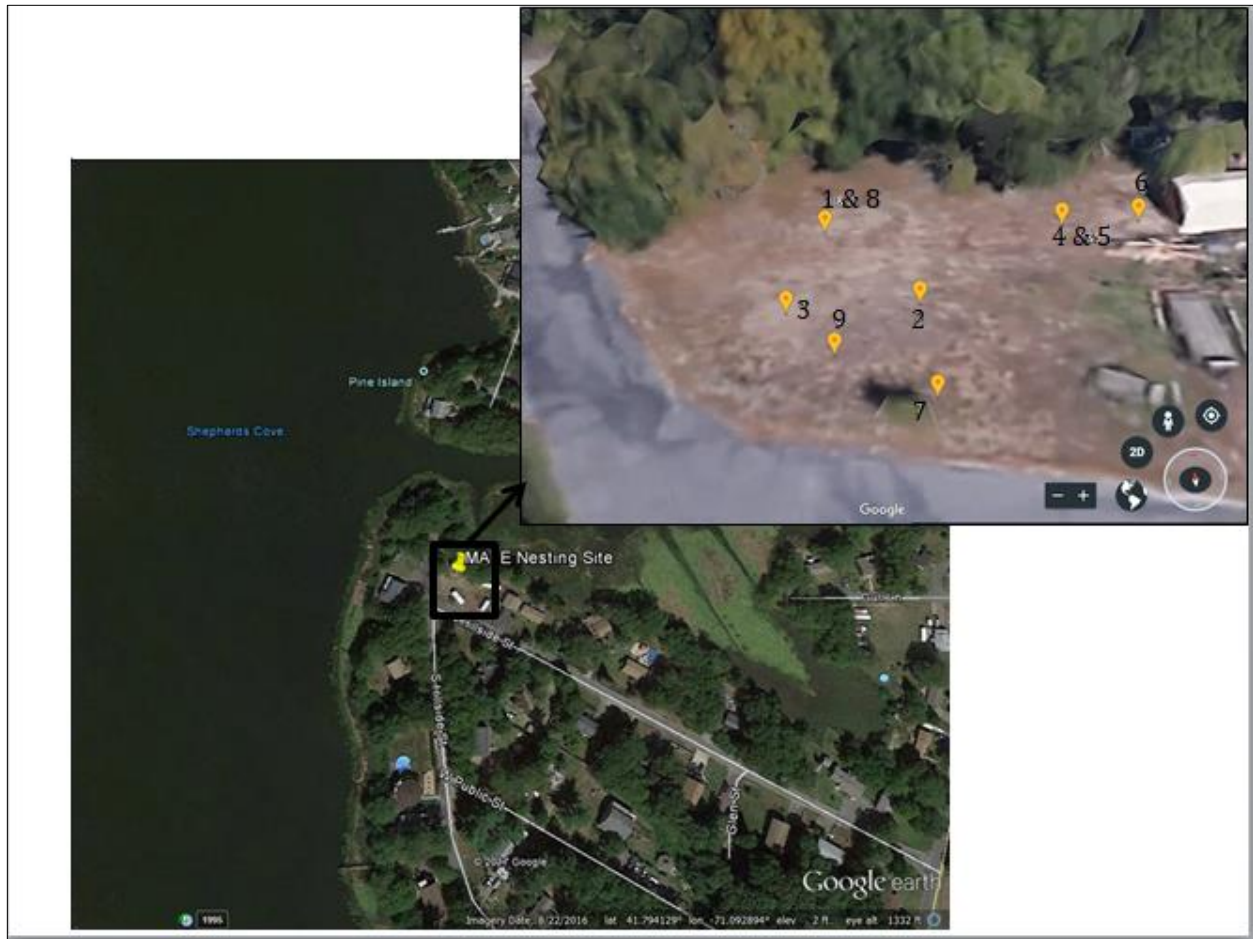


Figure 18. Map and location of all documented nest in 2018 at the North Hillside street nesting area (Google Earth Image 2016 &2018).

Discussion and Management Implications

With 57 unique individuals captured and just one recaptured individual in the first 3 years of the study, a population estimate can still not be statistically or confidently determined. The overall sex ratio from all three trapping efforts is heavily skewed towards females with 73.7 percent of all captures being female compared to 21.1 percent males and 5.3 percent juveniles. Trap placement along with captured nesting females all confounding factors that continue to affect the results and also suggest a potential trapping bias against juveniles and males. In efforts to target smaller individuals, carefully planned trapping and/or seining efforts in the shallow marsh habitats is worth testing. This would require either more frequent trap checks or trapping only when low tides are at cool times of day. The 2018 estimated age structure further supports there is, or was relatively recently, recruitment in the population. The results suggest there are two “tails” representing the youngest and oldest individuals captured during the effort (see Figure 15). The left “tail” offers some relief that terrapins in Assonet Bay have not yet become a “ghost population” of only old adults unable to replace themselves. The 2018 data represents a more bell curve distribution, though continues to be slightly skewed to larger and older individuals.

Limitations of the Results

The chief limitation for this study was the tidal activity within the bay. The limited amount of water during low tide severely restricted trap placement. For the 2018 study, a DJI Phantom 4 Pro. V2.0 drone was used to take aerial photographs of all the traps at low tide to determine if they had enough water to prevent turtles from overheating. This made trap checks a lot easier at low tide than previous studies but if traps were found without water, they could not be moved until higher tide. If there were turtles in the traps at this time, they would still face the risk of overheating. It is recommended to take aerial photographs of any new trapping areas at low tide before trap placement.

Another limitation to this study was the number of traps that could be checked and set by kayak. The time spent placing and traveling to trap locations was greatly increased when daily trapping was primarily conducted by kayak. Accessing Porter Pasture in Freetown for parking and boat launching to check Assonet Bay traps became difficult when public access in June became restricted and using Hathaway Park in Freetown increased the time paddling to traps by 10-15 minutes. Days with high wind speeds increased safety concerns and time spent paddling to traps. The primary limitation when daily trapping was conducted by kayak was that all captured turtles had to be transported to Bristol County Agricultural High School for processing. This put the individuals at risk when traveling via vehicle and unwanted public encounters when removed from and released back to the study area.

A third limitation to this study was using stakes to anchor the traps. This limitation was not as imperative when daily trapping was conducted by kayak when the ability to trap locations at lower tides was possible. This allowed the stake to be secured deeper into the ground to prevent them from becoming unanchored and easier when needed to be removed. When daily was conducted by motor boat, the trap locations could only be accessed at mid and higher tides which made it more difficult to secure new stakes into the ground. During this time, multiple stakes became unanchored and traps were found beached on the shore line. Also, because the motor boat was higher off the water than the kayak, when the rope became twisted around the stake, it was very difficult to unwind the rope. A new anchoring method using a cinder block with a rope tied from it to the basking trap was tested. The method worked well securing the basking trap with little to no movement detected. It is recommended that this anchoring method should be used for all traps during future studies

Recommendations for Future Study

It is highly recommended Assonet Bay continue to be sampled every season until the scope of this study can be reached. Trapping should continue begin in late spring especially within the small inlet creek on the northeast side of Assonet Bay as it is the only known breeding aggregation. 15 of the 27 individuals caught in traps where from two trap locations within the creek with 5 more from two locations just outside the mouth of the creek during the 2018 study. It is also recommended that all traps should be set via motor boat at the start of future trapping seasons.

Another recommendation is to expand nest protection to other nesting areas, particularly the Broad Cove nesting areas, while continuing to protect nests at the North Hillside street nesting area as the homeowner is still supportive of Terrapins. It's also recommended to use the North Hillside nesting area as a benchmark to begin checking and protecting other nesting areas when the homeowner reports nesting females on their property. It would be helpful to have volunteers to frequently check the Broad Cove nesting area for nesting females and to protect any new nests. Lastly, reaching out to the homeowner to use their property as a launching site to check trap locations in Assonet Bay by kayak and using their video surveillance system to count the number of nesting females and to find additional nests is recommended.

A final recommendation is to expand trapping efforts further up and down the Taunton River to determine population movements as well as comparing the salinity content up the river with the current study area to determine how much fresh water the Terrapin population tolerates. Another recommendation is to collaborate with surrounding Terrapin research organizations to create a central data base for all Terrapins captured to determine meta-population abundance

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Appendices

Appendix 1: Data collected from all captured terrapins during the 2018 study. N=36.

Terrapin	Notch	PIT	SCL (mm)	CW (mm)	PL (mm)	PW (mm)	SH (mm)	Mass (g)	Annuli	Sex	Niave	Date	Trap/Location
22	Batch	3D693D82DC	218	170	198	145	97	1900	smooth	F	Yes	18-May-2018	1 Assonet Bay
23	Batch	3D61D593D82C0	208	157	188	138	87	1350	12	F	Yes	18-May-2018	3 Assonet Bay
24	Batch	3D61D593D82BB	206	168	191	140	98	1700	smooth	F	Yes	18-May-2018	1 Assonet Bay
25	Batch	3D61D593D82C8	124	98	102	85	46	300	6	M	Yes	18-May-2018	1 Assonet Bay
26	Batch	3D61D593D82B2	187	144	169	122	78	1100	6	F	Yes	23-May-2018	2 Assonet bay
27	Batch	3D61D593D82FE	87	68	75	54	43	100	4	U	Yes	24-May-2018	1 Assonet Bay
28	Batch	3D61D593D82BF	99	79	84	66	45	200	4	M	Yes	25-May-2018	1 Assonet Bay
29	Batch	3D61D593D82FB	260	158	186	139	89	1600	8	F	Yes	25-May-2018	4 Assonet Bay
30	Batch	3D65D0730A	125	96	105	83	46	300	6	M	Yes	30-May-2018	1 Assonet Bay
31	Batch	3D60015D072F3	210	159	186	135	91	1355	12	F	Yes	31-May-2018	1 Assonet Bay
32	Batch	3D60015D072B1	97	81	85	68	44	180	5	F	Yes	6-Jun-2018	1 Assonet Bay
33	Batch	3D600187A91A3	225	170	206	146	98	1980	11	F	Yes	7-Jun-2018	1 Assonet Bay
34	Batch	3D600187A91B0	232	187	201	168	95	2170	smooth	F	Yes	7-Jun-2018	5 Assonet Bay
35	Batch	3D600187A91BB	110	93	99	78	50	261	6	F	Yes	8-Jun-2018	1 Assonet Bay
36	Batch	3D6001879E42B	211	169	200	143	96	1775	12	F	Yes	8-Jun-2018	1 Assonet Bay
37	Batch	3D600187A91A7	113	94	109	80	48	266	6	F	Yes	18-Jun-2018	1 Assonet Bay
38*	-	-	215	170	200	145	110	1822	11	F	Yes	18-Jun-2018	Dead in B.C.
39	Batch	3D6.00187A91B7	215	164	191	140	90	1433	10	F	Yes	19-Jun-2018	North Hillside N.A.
40	Batch	3D6.001879E432	209	163	191	140	86	1417	9	F	Yes	20-Jun-2018	5 Assonet Bay
41	Batch	3D6.00187A91BA	185	153	176	137	83	1220	10	F	Yes	21-Jun-2018	North Hillside N.A.
42	Batch	3D6.00187A91A8	211	167	193	144	88	1496	12	F	Yes	29-Jun-2018	North Hillside N.A.

43	Batch	3D6.001879E439	214	173	199	151	92	1615	8	F	Yes	2-Jul-2018	North Hillside N.A.
44	Batch	3D6.1D593D82C7	223	177	201	152	95	1769	smooth	F	Yes	3-Jul-2018	North Hillside N.A.
45	Batch	3D6.1D593D82DA	197	154	175	134	86	1195	13	F	Yes	3-Jul-2018	North Hillside N.A.
46	Batch	3D6.1D593D82ED	205	156	184	133	81	1200	9	F	Yes	4-Jul-2018	5 Assonet Bay
47	Batch	3D6.1D593D82D8	223	173	202	138	94	1700	smooth	F	Yes	4-Jul-2018	5 Assonet Bay
48	Batch	3D6.1D593D82DB	200	156	178	130	86	1200	10	F	Yes	5-Jul-2018	8 Assonet Bay
49	Batch	3D6.1D593D82B9	96	76	82	65	-	100	3	U	Yes	5-Jul-2018	3 Broad Cove
50	Batch	3D6.1D593D82AE	220	173	193	151	101	1700	9	F	Yes	11-Jul-2018	Broad Cove N.A.
51	Batch	3D6.1D593D82EE	131	107	112	91	49	300	6	M	Yes	12-Jul-2018	1 Assonet Bay
52	Batch	3D6.1D593D82F1	227	180	208	155	96	2000	8	F	Yes	12-Jul-2018	Broad Cove N.A.
53	Batch	3D6.1D593D82E7	142	112	128	94	58	400	6	F	Yes	17-Jul-2018	7 Assonet Bay
54	Batch	3D6.1D593D82CF	200	150	181	131	80	1200	8	F	Yes	19-Jul-2018	3 Broad Cove
55	Batch	3D6.1D593D82AF	151	114	124	99	65	600	6	M	Yes	20-Jul-2018	1 Assonet Bay
56	Batch	3D6.1D593D82AC	125	105	118	87	51	400	6	F	Yes	25-Jul-2018	1 Assonet Bay
57	Batch	3D6.1D593D82C4	120	66	101	80	47	250	4	M	Yes	25-Jul-2018	7 Assonet Bay

Appendix 2: Shell measurements, mass, and location of all hatchling turtles found on August 29 2018. *Died after processed.

Nest Area Location	Turtle Number	SCL (mm)	Mass (g)
Assonet Bay/North Hill Side Street	1*	19.0	4.01
Assonet Bay/North Hill Side Street	2	25.0	4.6
Assonet Bay/North Hill Side Street	3	31.0	7.29
Assonet Bay/North Hill Side Street	4	26.0	4.68
Assonet Bay/North Hill Side Street	5	26.5	5.19
Assonet Bay/North Hill Side Street	6	26.5	5.38
Assonet Bay/North Hill Side Street	7	24.0	4.27
Assonet Bay/North Hill Side Street	8	24.5	4.78
Assonet Bay/North Hill Side Street	9	25.0	5.01
Assonet Bay/North Hill Side Street	10	24.0	4.05
Assonet Bay/North Hill Side Street	11	27.0	5.46
Assonet Bay/North Hill Side Street	12	29.0	6.58
Assonet Bay/North Hill Side Street	13	26.0	5.79
Broad Cove/ Incubated at Bristol Aggie	14	26.0	5.29

Appendix 3: Shell measurements and mass of all hatchling turtles found in nest seven from Assonet Bay /North Hill Side Street on September 11 2018.

N=24	Mass (g)	SCL (mm)
1	5.50	27
2	5.27	26
3	5.64	27
4	6.30	28
5	5.29	28
6	5.49	26
7	5.43	27
8	5.85	27
9	6.23	28

10	5.55	26
11	4.49	27
12	6.12	28
13	4.94	25
14	5.99	25
15	5.05	24
16	5.78	27
17	5.87	27
18	5.38	26
19	5.98	27
20	5.68	24
21	6.04	27
22	5.52	27
23	5.62	26
24	5.91	28

Appendix 4: List of preparers (including field personnel) and their resumes/vitae

George Bancroft

Brian Bastarache

Aaron Caswell