



Escambia County

2022 Marine Turtle Nest Monitoring Report



Mark Nicholas, Marine Environmental Program Manager

ABSTRACT

In 2022, there were 31 loggerhead (*Caretta caretta*) nests, and 1 leatherback nest (*Dermochelys coriacea*) nest on Pensacola Beach (PB). There was also a total of 8 loggerhead false crawls. There were 7 loggerhead nests recorded on Perdido Key (PK) along with 5 loggerhead false crawls. The leatherback nest was the third on record of that species within Escambia County and only the second to hatch. The mean hatch success for all nests on Pensacola Beach, was 61.6% while mean emergence success was 58.9%. Mean hatch success for all nests on Perdido Key, was 65.8%, and mean emergence success was 99%. There were no nests deposited below the Most Recent High Tide Line (MRHTL) on PB or PK, so 0 nests were relocated, in compliance with FWC guidelines. No tropical systems affected nests this season, but high tides on full moons did flood several nests. This led to failures or poor hatch rates for those nests. Artificial lighting negatively affected 65% of applicable Pensacola Beach nests (n = 15 of 23); several nests were not applicable due to the absence of viable offspring (0% hatch success) or due to weather obscuring the tracks. PK had 100% of the nests disorient (n = 4 of 4). The 2022 season was the most successful hatchling production season since 2016. A total of 35 marine turtle strandings were documented throughout 2022 in Escambia County (17 loggerhead, 8 alive, 2 green, 1 alive and 16 Kemp's ridley, 11 alive). There were 20 live turtle rescues either from the PB fishing pier, in the surf or via lifeguards who captured 2 distressed turtles just offshore between Casino Reef and the PB fishing pier. Fishery related entanglements with turtles are increasing at the PB fishing pier.

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Page 28 Figure 26: Photograph. Loggerhead became entangled in fishing line on August 6, 2022 on Pensacola Pier and was rescued by the fishermen/pier staff and was transported to Gulfarium by Escambia County sea turtle volunteer. A new larger net was purchased to aid in the capture of larger turtles.

Page 29 Table 1: 2022 Pensacola Beach marine turtle nesting data summary.

Page 30 Table 2: 2022 Perdido Key marine turtle nesting data summary.

INTRODUCTION

The Pensacola Beach area of Santa Rosa Island encompasses approximately 8.1 miles of Northwest Florida's gulf coast, providing nesting habitat suitable to marine turtles. For the 2022 season, Pensacola Beach was covered under FWC permit #032A. Historically, loggerhead (*Caretta caretta*; CC), green (*Chelonia mydas*; CM) and Kemp's ridley (*Lepidochelys kempii*; LK) have nested on Pensacola Beach. A fourth species was added in 2022 when a leatherback (*Dermochelys coriacea*) nested on May 24, 2022. Pensacola Beach has averaged 14.9 nests per season (SD \pm 8.9) since annual surveys began, with 2022 exhibiting a nest count of 32 (Fig. 1).

The Perdido Key area is 6 miles in length and is utilized by loggerhead turtles. Historically this area was patrolled by the FL State Park personnel, until the 2018 season. For the 2022 season, Escambia lands on Perdido Key were covered under FWC permit #202. Historically, loggerhead (*Caretta caretta*; CC) and Kemp's ridley (*Lepidochelys kempii*; LK) have nested on Perdido Key. Perdido Key has averaged 8.6 nests per season (SD \pm 4.3) since 2009, with 2022 exhibiting a nest count of 7. (Fig. 2).

In general, marine turtle nesting in Florida has been increasing for several years. (Fig 3 & 4).

Volunteers are used extensively in this documentation and monitoring effort. These volunteers are greatly appreciated, and the program could not complete its mission without the effort of this group of people.

METHODS

Survey Area

The Pensacola Beach turtle patrol is delineated on the west end by the Fort Pickens area of Gulf Islands National Seashore (GUIS) and on the east end by the Santa Rosa area of GUIS. The PB patrol utilized a UTV beginning between 0500 – 0600 hours, or first light, and lasting 2-3 hours.

The PB morning patrols began at boardwalk 22C located immediately east of White Sands condos, advanced to the designated eastern limit, and then progressed west to complete the survey at Park West.

Perdido Key is delineated on the west end by the Florida-Alabama state line. The east end is the boundary with the GUIS Perdido Key Area. A center 2-mile portion is Florida State Park land and nesting data is handled by the state park staff. Perdido Key utilized two UTV's this season, one going east and one going west. This was done to complete patrols earlier to allow beach vendors to begin set up chairs and umbrellas earlier.

Crawl Identification and Data Collection

Daily morning patrols were conducted between 01 May and 16 September 2022 on Pensacola Beach and Perdido Key patrols ended on August 30. Patrols were completed by permitted staff and volunteers.

During a collaborative pre-season meeting, it was decided to continue asking chair and umbrella vendors to wait for group texts to arrive from the daily patrol after one pass cleared an area of beach. Texts were sent from the Hilton, Portofino and Park West. Texting was also utilized on Perdido Key.

Data was collected for each nesting and non-nesting emergence event (i.e. false crawl) on nest survey field sheets. This data was then entered into an excel database for storage and analysis. Nest numbers were denoted numerically following the sequence in which they were discovered, e.g. the first nest laid on Pensacola Beach was denoted as 'PB01' while the second nest encountered by patrol on Perdido Key was denoted as 'PK02', with a W for the western side and an E for the eastern side; PK02W and PK02E. Data collected for each emergence included species, incident type (nest or false crawl), distance of the body pit to both the water line and the vegetation lines, whether the nest was relocated, distances from the egg cavity to the nest sign and reference stakes, whether a predator screen was deployed and date if applicable, and location defined as 1) proximity to notable landmarks such as boardwalks and 2) GPS positioning of all nests at the clutch location. GPS positions were also taken for false crawls. Crawls that contained loops, meandered parallel to the shoreline greater than 100 feet, and/or or traveled inland post-nesting were indicative of disorientation. Maps containing point data for each nest were generated using Google Earth. A diagram was also illustrated for each emergence event. Daily logs were filled out to document survey completion.

Nest Marking and Monitoring

After nests were located, nests were marked with a sign, a square enclosure, and two reference stakes. Nest relocation for conservation purposes did not occur on PB nor on PK during the 2022 season due to no opportunistic encounters of nests laid below the Most Recent High Water Line (MRHWL).

Nests were monitored throughout the incubation period and checked daily by morning patrol for evidence of predation, over wash, erosion, and other disturbances. Additionally, nests were monitored for signs of hatching during morning surveys beginning day 50-55 of the incubation period to determine the precise duration of incubation, and to gather data on hatchling emergence, predation, and to document disorientation events. Visual emergence signs include a collapse or depression over the egg cavity and a cluster of small, approximately 2" wide tracks radiating from the nest site.

Nighttime nest monitoring (spot checking) was conducted for the 2022 season. This was completed on FWC permit # 272 for PB and # 273 for PK. This work is conducted to mitigate for the effect of light pollution which confuses hatchlings upon emergence and causes them to go inland towards the brighter horizon.

Assessments

Nests were assessed 72 hours after the initial hatching event. Nests that were flooded and where emergence signs were not evident were assessed at day 80 of the incubation period. During assessment, nests were excavated and the number of hatched (defined as an intact shell greater than 50%), unhatched and pipped eggs was recorded, along with the number of live and dead hatchlings found in the nest at the time of excavation (Appendix B). Unhatched eggs were opened, and the presence or absence of development was noted. All contents were reburied in the nest chamber. Any hatchlings alive in the nest were released to crawl into the Gulf of Mexico (hereafter referred to as the Gulf) prior to 0900 if ≤ 10 hatchlings were present. In the event > 10 hatchlings were located in the nest during assessment they were either 1) held in a container with 1" of moist sand and kept in a cool, dark place until released that night, or 2) reburied with nest contents and allowed an additional 48 – 72 hours to emerge prior to assessment.

Analyses

Beach success, reproductive success and productivity were determined for the 2022 season. Beach success was defined as the proportion of nests to all emergences:

$$\text{Beach Success \%} = \text{Nests} / (\text{Nests} + \text{False Crawls})$$

Mean hatch and emergence success rates were calculated for assessed nests as follows:

$$\text{Mean Hatch Success \%} = \text{Total \# Hatched Eggs All Nests} / \text{Total \# Eggs Laid All Nests}$$

$$\text{Mean Emergence Success \%} = \text{Total \# Emerged Hatchlings All Nests} / \text{Total \# Eggs Laid All Nests}$$

RESULTS AND DISCUSSION

Crawl Activity and Beach Success

Nesting occurred between 11 May and 2 August on PB and between 5 June and 25 July for PK. The 2022 season witnessed 32 nests and 13 false crawls on Pensacola Beach (Fig. 5). This yielded a beach success of 75% compared to the 23-year average beach success of 65% (Fig. 7; Fig 9). One leatherback turtle nested on PB. The remaining nesting and non-nesting emergences were identified as loggerheads. There were 3 nests this season on the University of West Florida (UWF) property, nests PB3, Pb23 and PB24.

The 2022 season witnessed 7 nests and 5 false crawls on Perdido Key (Fig. 6). This yielded a beach success of 58% (Fig. 8; Fig 10.) All nesting activity were loggerheads.

All 39 nests In Escambia County remained *in situ* upon initial location.

Missed Nests

No unknown or “missed” nests, defined as a nest unidentified on patrol the morning after deposition but located some time during incubation or hatch, were documented this season.

Reproductive Success

In 2022, a total of 31 loggerhead nests and 1 leatherback nest were laid on Pensacola Beach and monitored throughout incubation. The average length of incubation on PB was 65 days (n = 23), with the shortest incubation period observed at 57 days for PB12. The longest incubation length was for PB3 at 78 days.

Two nests were lost to erosion and assigned the “114” egg value that FWC recommends, resulting in an average clutch size of 96 eggs, ranging from 63- 128 (Table 1). Of the 32 monitored nests, 29 were assessed and nests PB13 and PB18 were completely lost to erosion. PB24 was lost to erosion after it had hatched and before it was assessed.

In 2022, a total of 7 loggerhead nests occurred on PK. The average clutch size was 107 eggs, ranging from 88 to 126 (Table 2).

Mean hatch success for PB was 61.5% and PK was 65.8%. This was an increase over previous seasons that was well received (Fig. 11; Fig. 12). The total number of hatchlings witnessed entering the Gulf from PB was approximately 1374. (Figure 13) PK had 270 hatchlings witnessed entering the Gulf.

Hatching success can be related to the location of the nests on the beach. Nests laid lower on the beach, typically have lower success rates (Fig.14). Nests laid in positions that are prone to flooding, have been impacted by storms regularly for the last few seasons and have seen a significant decline in hatching success. Seasons that had lower tropical activity, typically witnessed higher success rates of nests: such as 2000, 2002 and 2022. Other seasons that had high success rates, had a large percentage of nests relocated higher on the beach above lines of swash impacts from tropical storms, such as 2006, 2009, 2013 and 2016. The 2022 hatch success rate was the highest since 2016. (Fig.11).

Undeveloped Nests

Pensacola Beach nests 5, 16 and 30 had high numbers of undeveloped eggs. These nests were not impacted by high water events from the Gulf. Nests that have 40 or more undeveloped eggs are included in this data set. PK had one nest with a large number of undeveloped eggs this year.

Nests readily fail due to flooding from storms and then typically have developed embryos inside the eggs upon the nest assessment. We have been monitoring for nests that showed no apparent development in the eggs. These eggs when opened, contained no blood or tissue. We realize that early development could have ceased with the tissue dissolving before the eggs were opened. However, we are now tracking nests that are either infertile, or fail in development at very early stages, and are thus eggs that appear undeveloped at assessment (Fig. 15).

Effects of Erosion, Inundation and Tropical Weather

Direct impact of tides on several incubating nests this season may be due to a high number of low beach nests. Zero nests were located below the MRHTL so zero nests were relocated higher on the beach this season.

15 of 32 nests on PB experienced tidal impacts to include erosion, repeated wash over and/or inundation. Of these 15 impacted nests, 2 experienced total loss of the eggs. (Table 1).

In total, 6 of 7 nests on PK experienced tidal impacts to include erosion, repeated wash over and/or inundation. Of these 4 impacted nests, 1 experienced total loss of the eggs. (Table 2).

Predation

Complete or partial predation of marine turtle nests did not occur in 2022. While egg and hatchling predation by ghost crabs was only observed at nests, it is likely greater loss occurred that was not observed and can be attributed to ghost crabs. Burrows were noted in close proximity to a couple of the nest sites, however, sub-surface loss cannot be accurately confirmed. Data sheets include field notes regarding ghost crab activity. Missing eggs/hatchlings could be attributed to either unknown predation events or heavy rain that may have washed out tracks from daytime and nighttime rainfall emergencies.

Nest Relocations

In 2022 the average distance of nests on PB to the water line was 54 feet (SD \pm 29.8 feet). For PK it was 30 feet (SD \pm 9.8 feet). Variance was high for both locations. No nests were relocated upon initial discovery during 2022 due to guidelines outlined in the FWC Marine Turtle Handbook stating only nests deposited seaward of the MRHTL are candidates for relocation (FWC 2016). In early August, FWC did give permission to relocate any nest laid below 10 feet from the high tide line, however nesting ended on August 2nd.

Light Pollution and Disorientation

Hatchling disorientation was defined hatchlings from a given nest orienting $> 45^\circ$ from the most direct path to the Gulf post-emergence (FWC 2016). Artificial lighting negatively affected 65% of applicable Pensacola Beach nests (n = 15 of 23; Fig. 16). Nine nests were not applicable due to the absence of viable offspring.

Artificial lighting negatively affected 100% of Perdido Key nests (n = 4 of 4).

Adult and hatchling disorientation reports are provided annually to FWC for evaluation. The most commonly noted sources of disorientation on reports provided to FWC during the 2022 season were interior and exterior lighting of various homes and condominiums and sky glow.

PK had one adult disorient post nesting. PB females from nests PB05 and PB11 had directional issues as well. All three turtles made it safely back to the water after extended crawls.

Obstructed Nesting Events

There was one obstructed nesting attempt on PB and zero on PK in 2021. Nest PB05 turtle nested in close proximity to an emergency beach exit 4X4 marker.

Research

Escambia County participated in a research program with FWC researcher Dr. Shigetomo Hiram on Hatchling Orientation. Data from a total of 21 nests were provided to this study.

Escambia County participated in a research program with USGS researcher Dr. Meg Lamont. Two temperature transects were installed on Pensacola Beach to collect data from 3 different depths on the mid beach and high beach. Temperature probes successfully collected data through the summer and through October. This replicated the 2021 effort.

Escambia County participated in a research program with the University of West Florida, Dr. Phillip Schmutz. The study is titled, The Spatial Variability of Sea Turtle Nest Sites Related to Beach Morphology Characteristics on Pensacola Beach, FL.

The University of West Florida Graduate student Lindsey Curl examined egg contents for plastic. Up to 10 eggs from each assessed nest were collected and later examined for this study.

Three nests were suspect to be possible hybrids between a green male and a female loggerhead that nested on Pensacola Beach. Samples from three nests were sent to FWC for DNA analysis. Hatchlings from these nests exhibited morphological features of green turtles, but the nests were laid by female loggerheads. FWC will perform DNA analysis to see if hatchlings are hybrids of a female loggerhead that mated with a male green sea turtle.

Strandings

A total of 35 marine turtle strandings were documented throughout 2022 in Escambia County (17 loggerhead, 8 alive, 2 green, 1 alive and 16 Kemp's ridley, 11 alive). There were 20 live turtle rescues either from the pier, in the surf or via lifeguards who captured 2 distressed turtles just offshore between Casino Reef and the PB fishing pier. Fishery related entanglements situations with turtles are increasing at the PB fishing pier.

The Escambia County Ambassador Program initiated increased presence on the PB Fishing Pier. The objectives include increasing public education and pier signage, scheduling routine piling and on deck clean-ups, providing nets so operators can assist hooked or entangled turtles, and to provide proper training so reporting and transport of hooked turtles to rehabilitation facilities occurs. (Fig. 24-26).

CONCLUSIONS AND RECOMMENDATIONS

Numerous nests were lost to erosion or over washed/flooded with low hatching success from high tides on full moons. It is recommended by staff and volunteers that a more reasonable “relocation line” in the sand be permitted, to allow the very low nests to be relocated to higher ground. FWC granted a 10 foot line above mean high water in early August, but no nests were laid after the issuance of the new line. The current Most recent High tide Line is literally only feet from the Gulf. It is expected that if the Most recent Storm Line were used, located typically somewhere around 25-35 feet up the beach, several nests per season could be relocated. Females that arrive to nest in the area, have to access and negotiate many anthropogenic impacts, before they emerge, as well as while crawling to their nests site. These include artificially designed/constructed beaches, sand shortages from the Army Corps of Engineers century long practice of dumping dredged sand from channels miles offshore, houses and condominiums constructed just above the vegetation line, that have lighting that alters the night sky, human physical presence on the beaches at all night time hours with flashlights/cell phone lights on that are readily observed for miles. It is impossible for a female turtle to experience natural conditions on our local beaches, and it is speculated they possibly nest lower than normal due to the myriad of human impacts.

Disorientation events were higher this season due to more nests hatching. Nests that hatch under new or less than half moon conditions typically witness disorientation. Coastal lighting which contributes to point source and non-point source (sky glow) continues to be an issue.

Limiting Disruption

Human presence on nesting beaches during nighttime hours has the ability to disrupt nesting turtles and their hatchlings. Human presence on the beach after dark are frequent in places and include flashlight/cell phone light usage, that illuminates the beaches. The 2022 season witnessed excessive use of lighting by beach goers in the core areas (Figures 19-20). This can be a deterrent to females attempting to emerge and nest on these beaches.

The Escambia County's Sea Turtle Ambassador program began to educate beach goers on this issue; however the problem presents unique challenges to changing visitor behavior, partly in due to the high number of short-term and day-use visitors on Pensacola Beach. Volunteers provided red flashlight and cell phone filters to the beach visitor centers and participating hotels to help reduce the amount of white light being cast on the beaches at night by beach goers.

Volunteer Time

Volunteers collectively submitted approximately 1200 hours for conducting marine turtle nesting surveys and another 450 hours on monitoring activities. Key issues that require dissemination to the public include how to reduce disorientation caused by artificial lighting, strandings caused by fisherman on and off piers, and improper waste disposal. Continuing to utilize permitted volunteers for stranding response and transport will be a beneficial use of volunteer resources and increase chances of survival for sick and injured marine turtles.

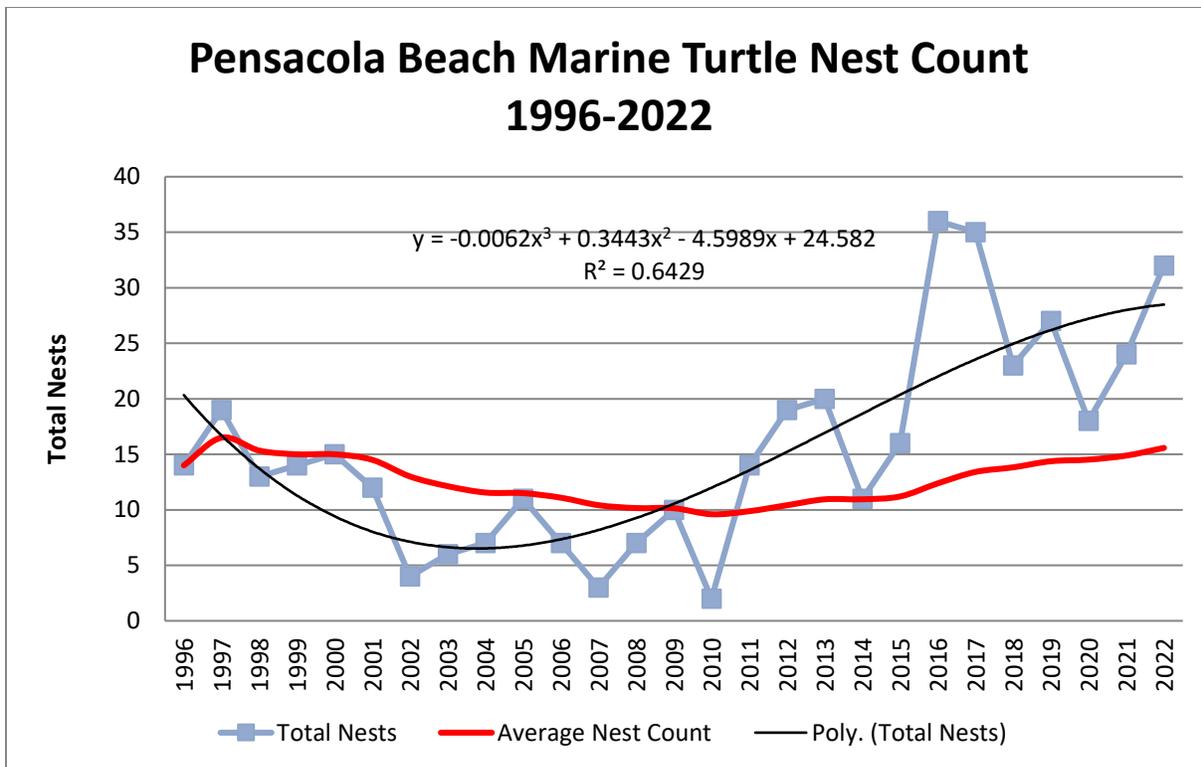


Figure 1: Pensacola Beach annual marine turtle nest count trend from the 1996 - 2022 seasons. Pensacola Beach has averaged 15.6 nests per season (SD ± 9.3) since annual surveys began, with 2022 exhibiting a nest count of 32. The best-fit trend line is displayed (polynomial; $R^2 = 0.6429$).

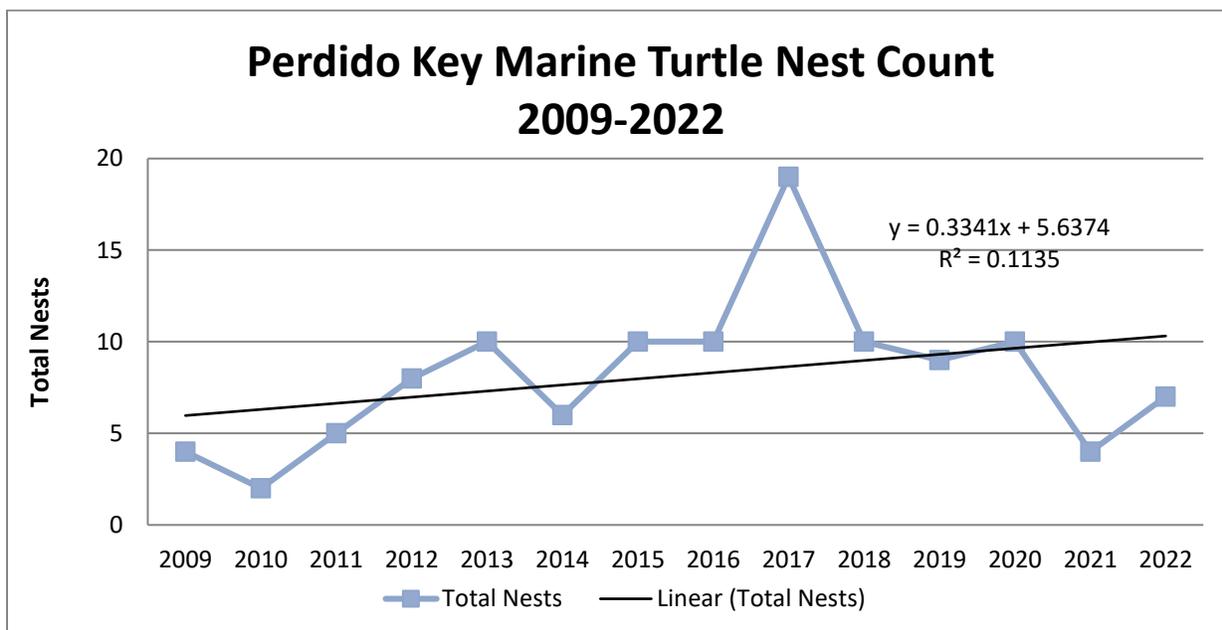


Figure 2: Perdido Key annual marine turtle nest count trend from the 2009 - 2022 seasons. Perdido Key has averaged 8.1 nests per season (SD ± 4.1) since 2009. The best-fit trend line is displayed (polynomial; $R^2 = 0.1135$).

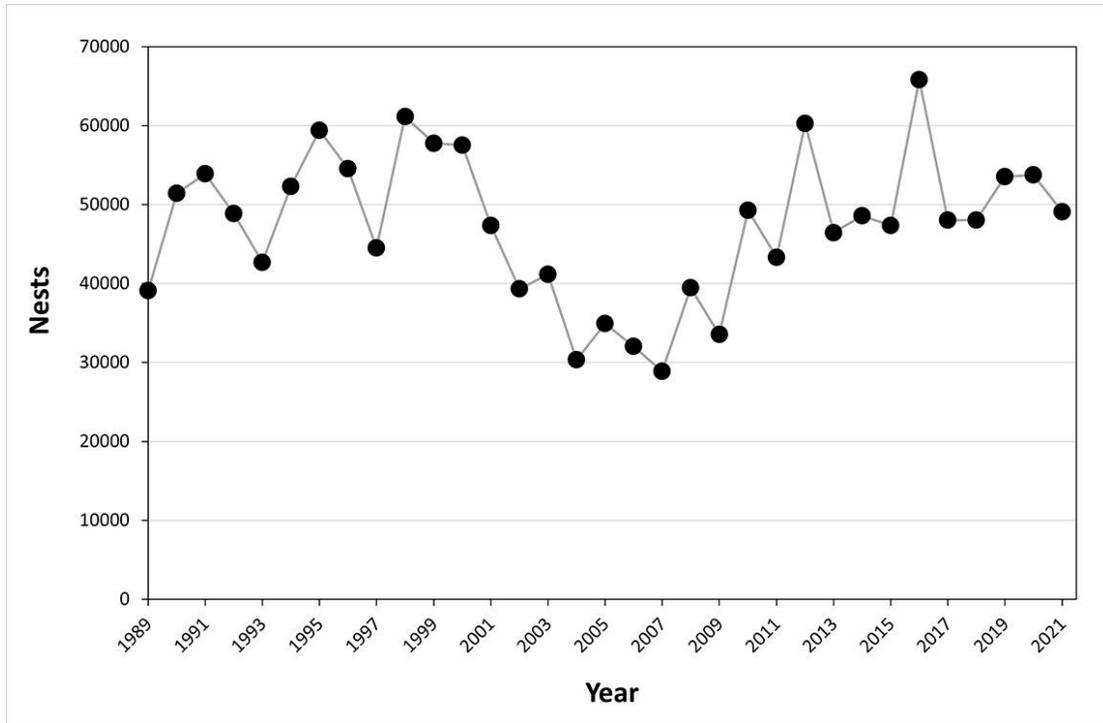


Figure 3: Number of loggerhead turtle nests counted on core index beaches in peninsular Florida, from 1989 through 2021. (FWC data)

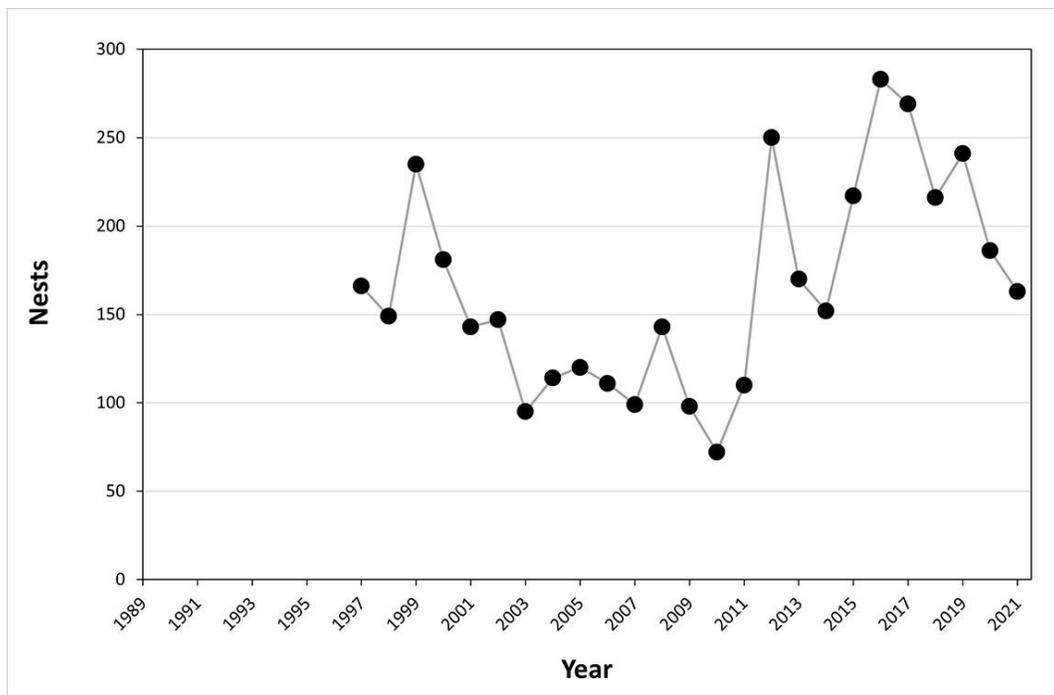
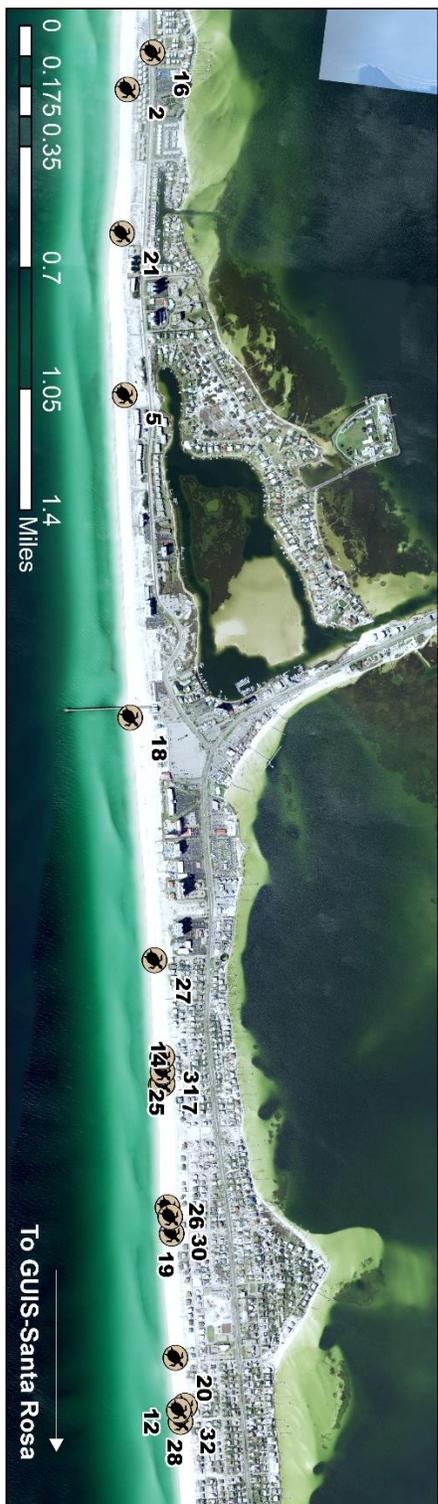


Figure 4: Number of loggerhead turtle nests counted on index beaches in the Florida Panhandle, from 1989 through 2021. (FWC data)

Escambia County 2022 Sea Turtle Nesting Pensacola Beach



Pensacola Beach West



Pensacola Beach East



- Legend**
- Loggerhead
 - Leatherback



Figure 5: GIS map displaying Pensacola Beach marine turtle nest locations for the 2022 season.

Escambia County 2022 Sea Turtle Nesting Perdido Key

Perdido Key West



Perdido Key East



Legend



Figure 6: GIS map displaying Perdido Key marine turtle nest locations for the 2022 season.

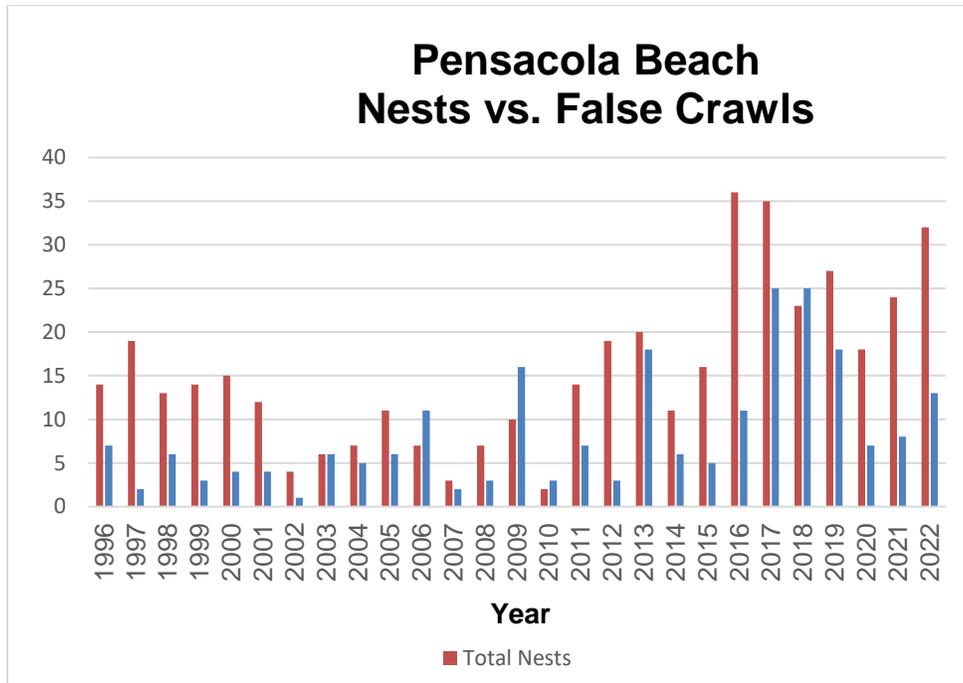


Figure 7: Marine turtle emergence data from Pensacola Beach including the number of nests compared to the number of non-nesting emergences (i.e. false crawls), 1996 - 2022.

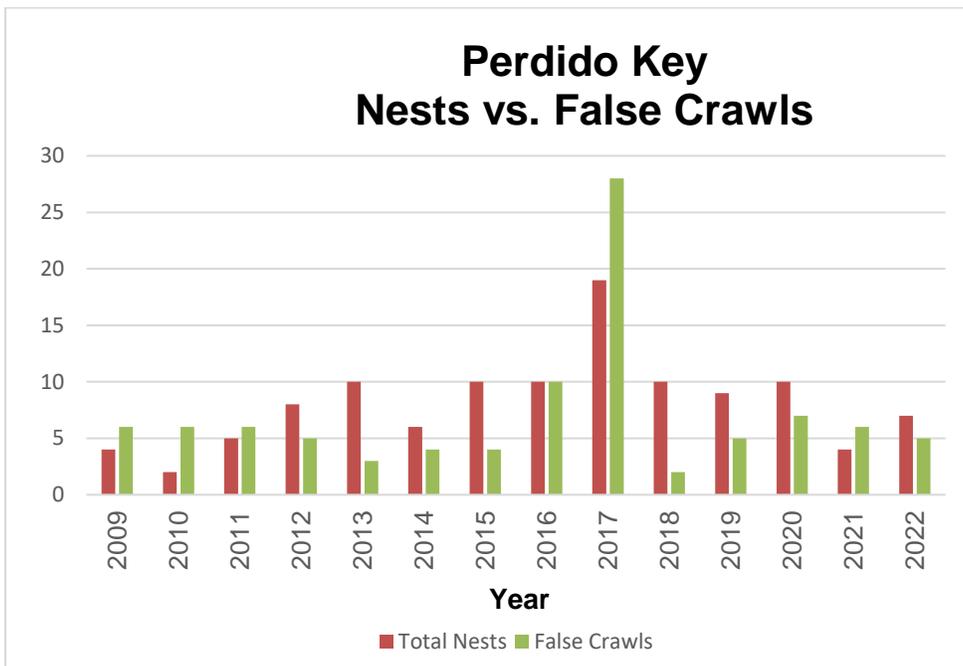
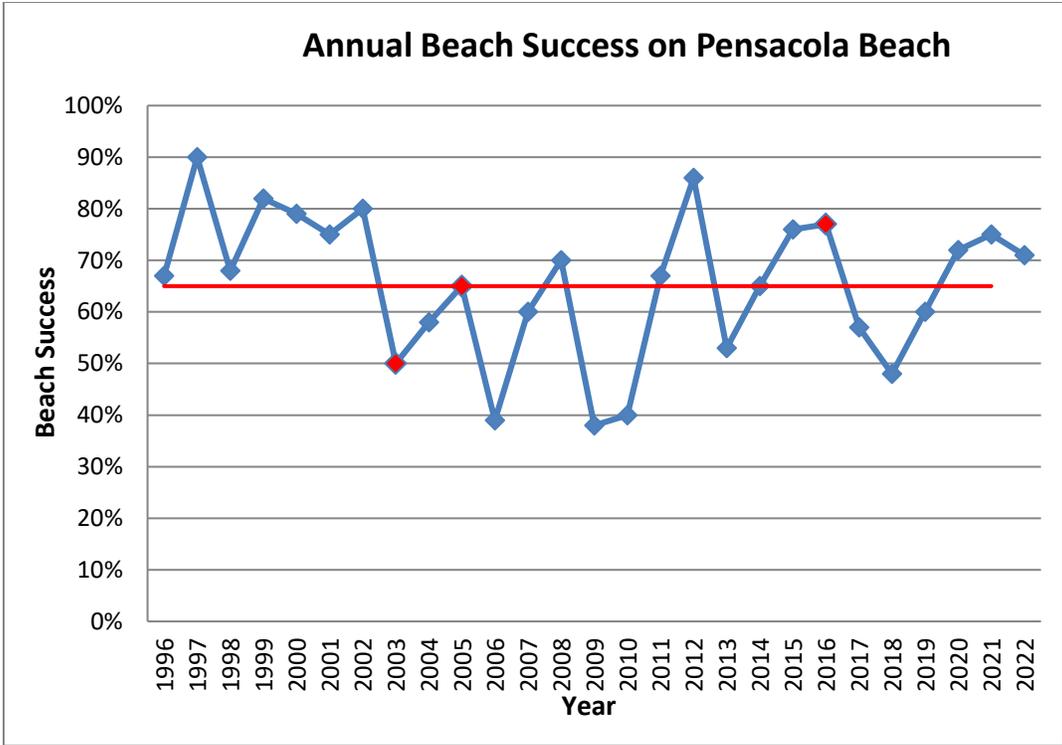
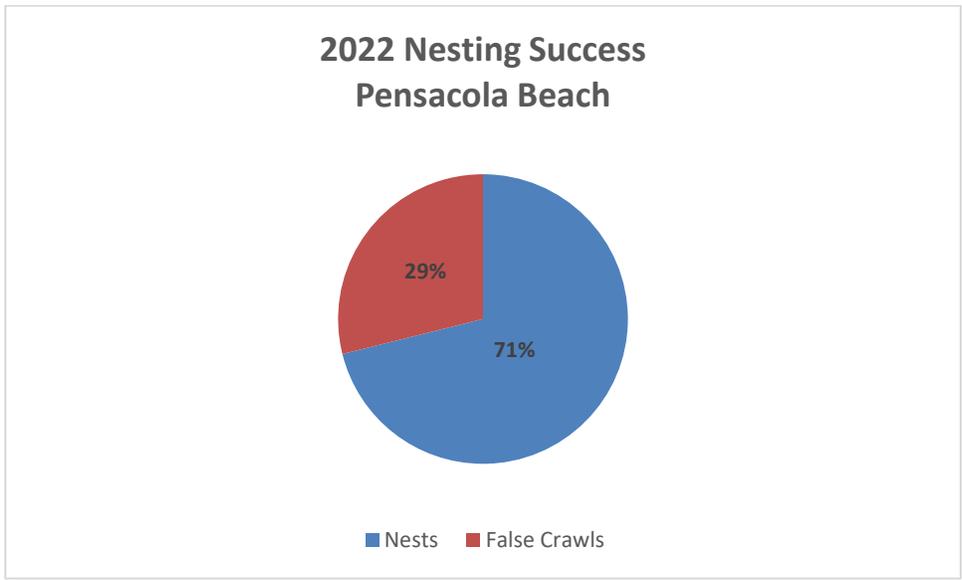


Figure 8: Marine turtle emergence data from Perdido Key including the number of nests compared to the number of non-nesting emergences (i.e. false crawls), 2009 - 2022.

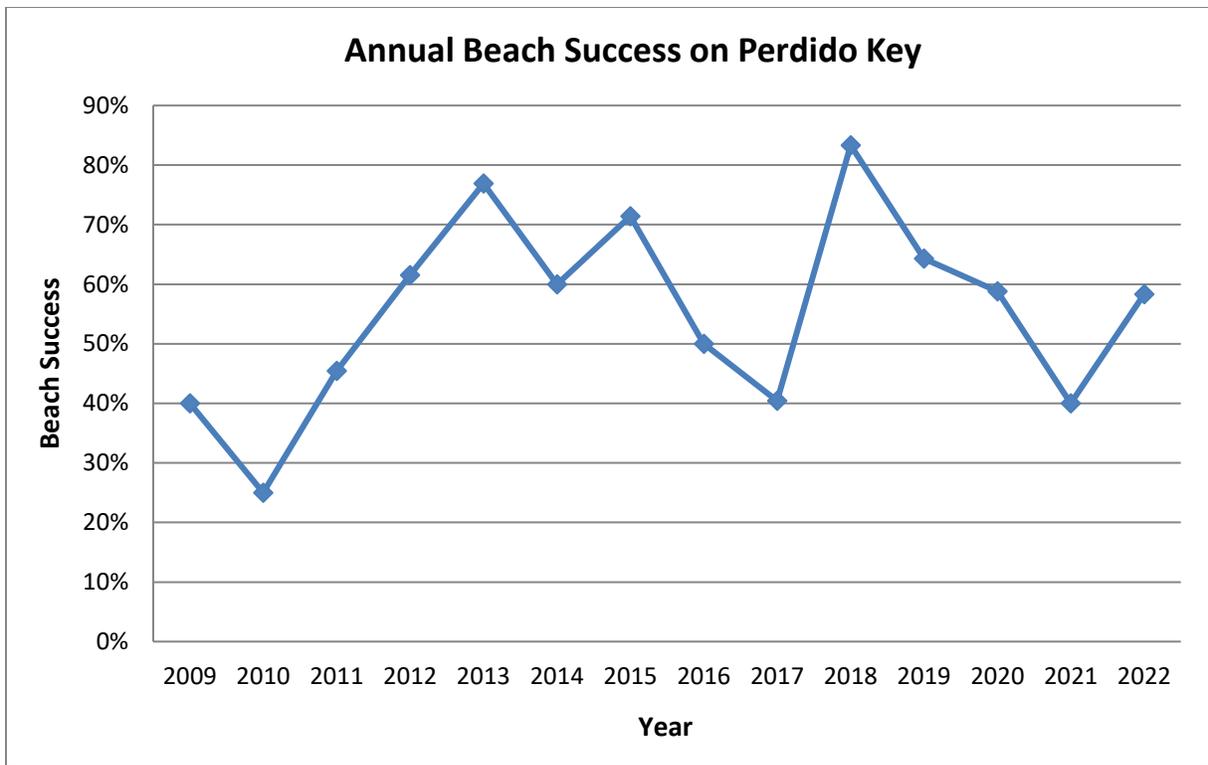


a.

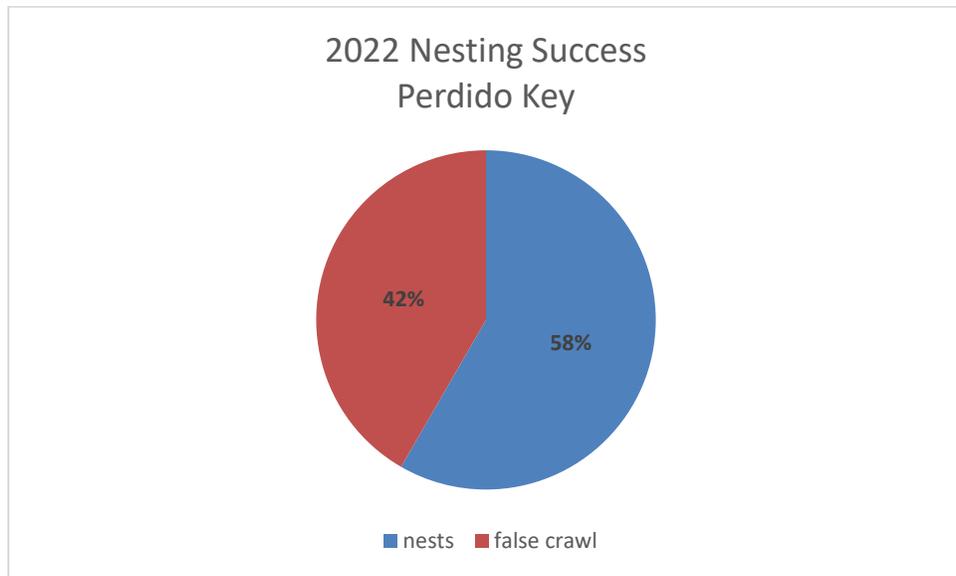


b.

Figure 9: Annual beach success data from Pensacola Beach, 1996-2022 (a). Beach success is defined as the proportion of nests laid to the total number of crawls. Beach nourishment project years are represented by red data points (2003, 2005, and 2016). Beach success for 2022 was 71%, compared to the 23 year average of 65%. (b). Proportion of nests to false crawls for 2022.



a.



b.

Figure 10: Annual beach success data from Perdido Key, 2009-2022 (a). Beach success is defined as the proportion of nests laid to the total number of crawls. Beach success for 2022 was 58%. Proportion of nests to false crawls for 2022 is also depicted (b).

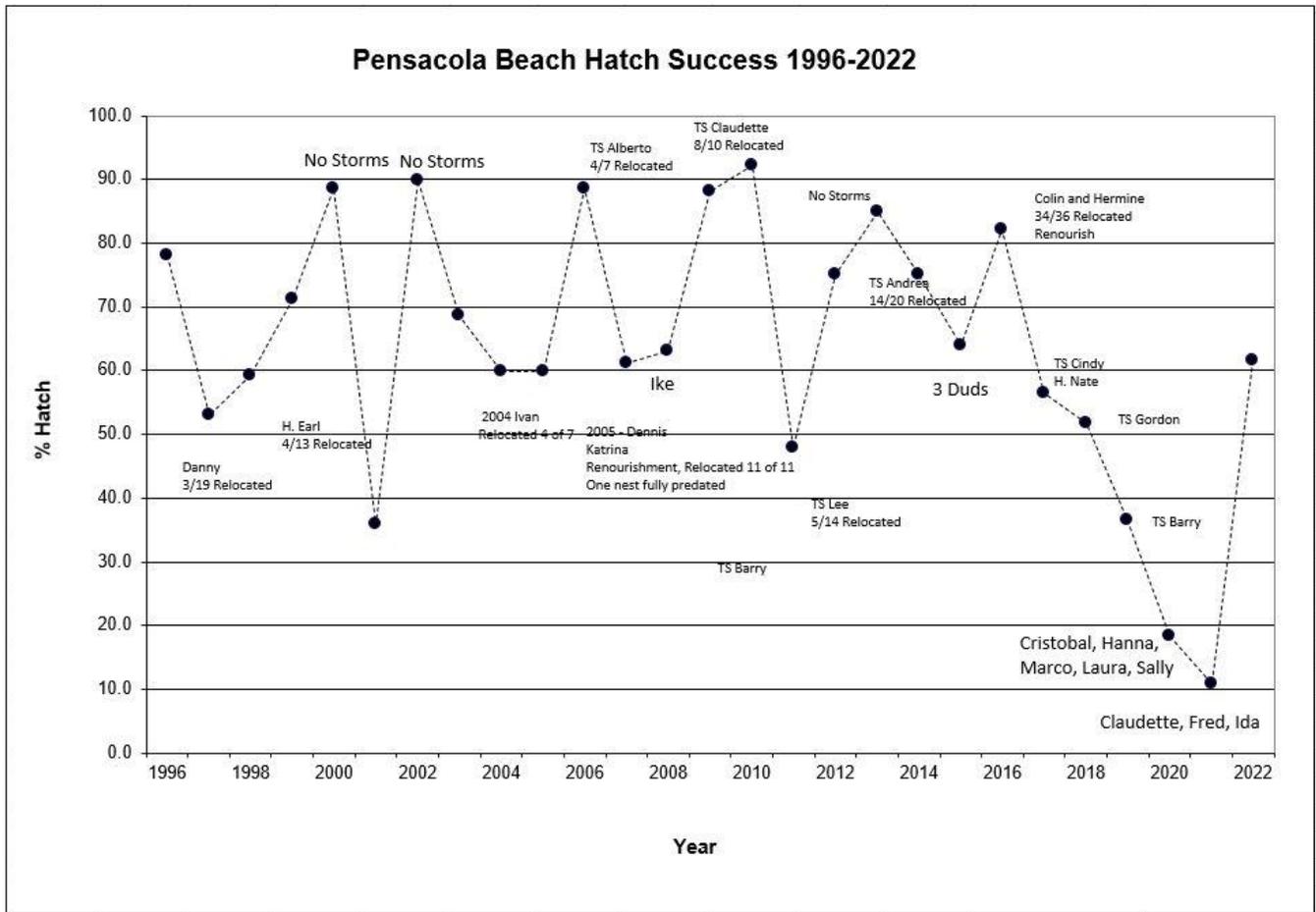


Figure 11: Annual mean hatch success (% hatch) from the 1996 - 2022 nesting seasons on Pensacola Beach. Mean hatch success for the 2022 season was 61.5 (SD ± 21%). Long-term monitoring efforts have established a 25 year mean hatch success of 63.8%.

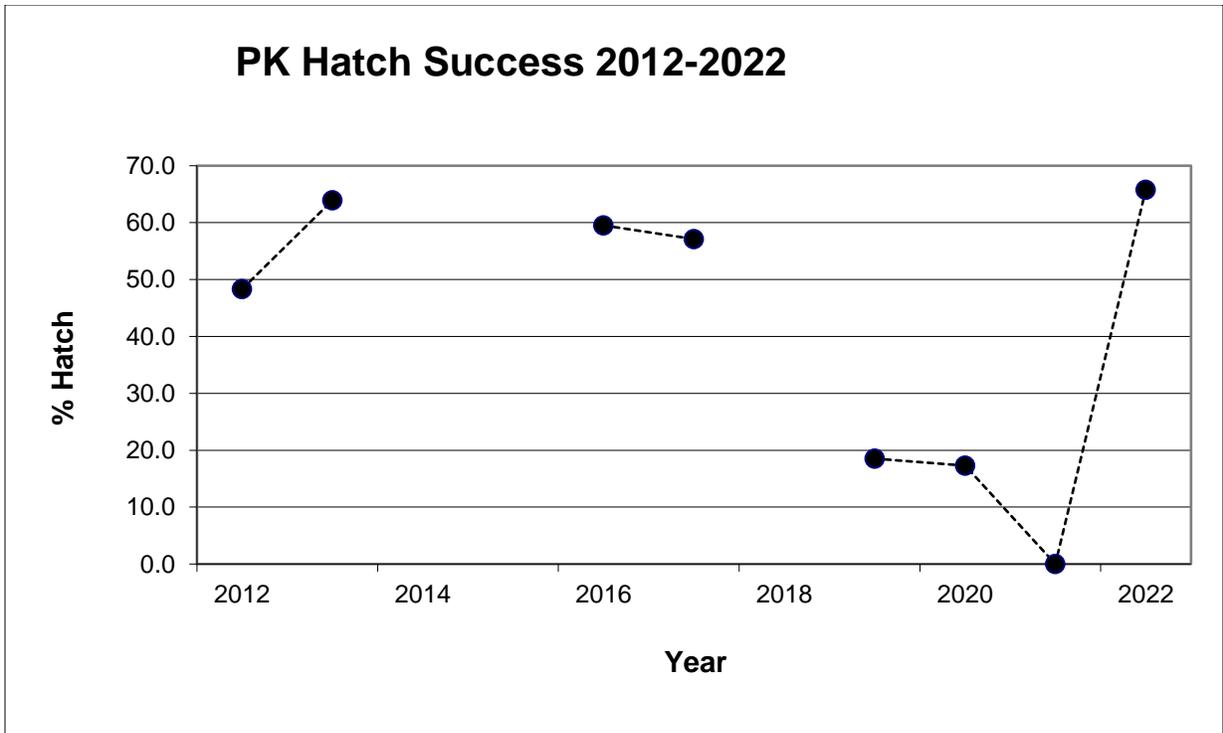


Figure 12: Annual mean hatch success (% hatch) from the 2012 - 2021 nesting seasons on Perdido Key. Data is missing or incomplete for some years. Mean hatch success for the 2022 season was 65.8%.

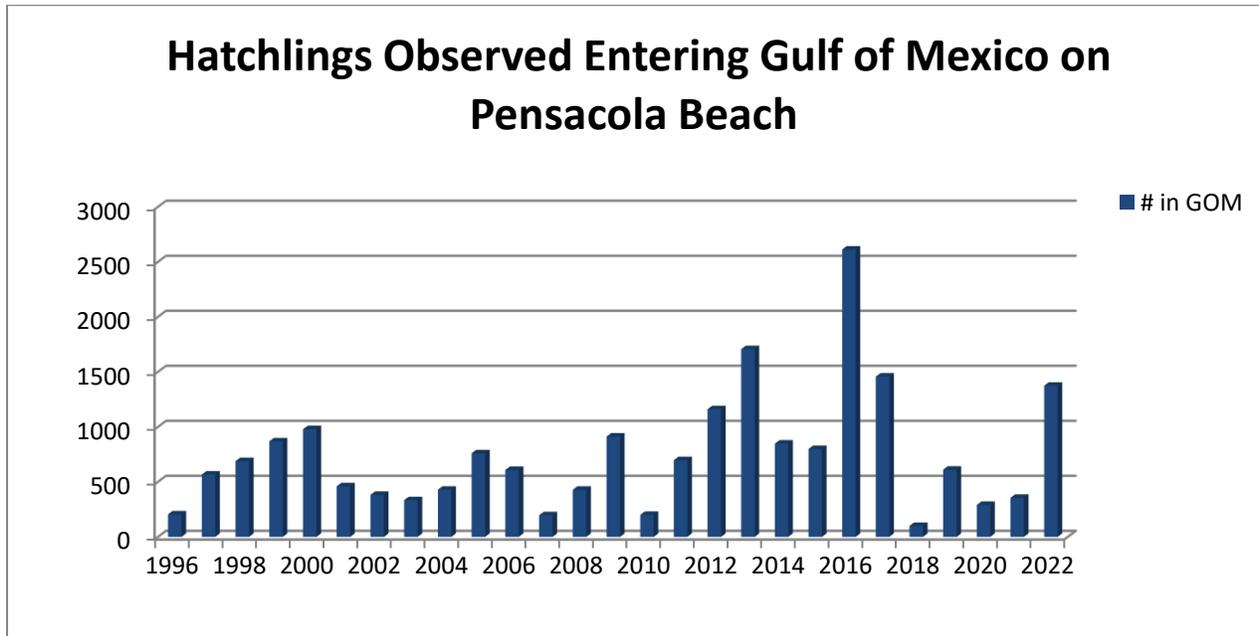


Figure 13: Number of hatchlings observed entering the Gulf of Mexico from the 1996 - 2022 nesting seasons on Pensacola Beach.

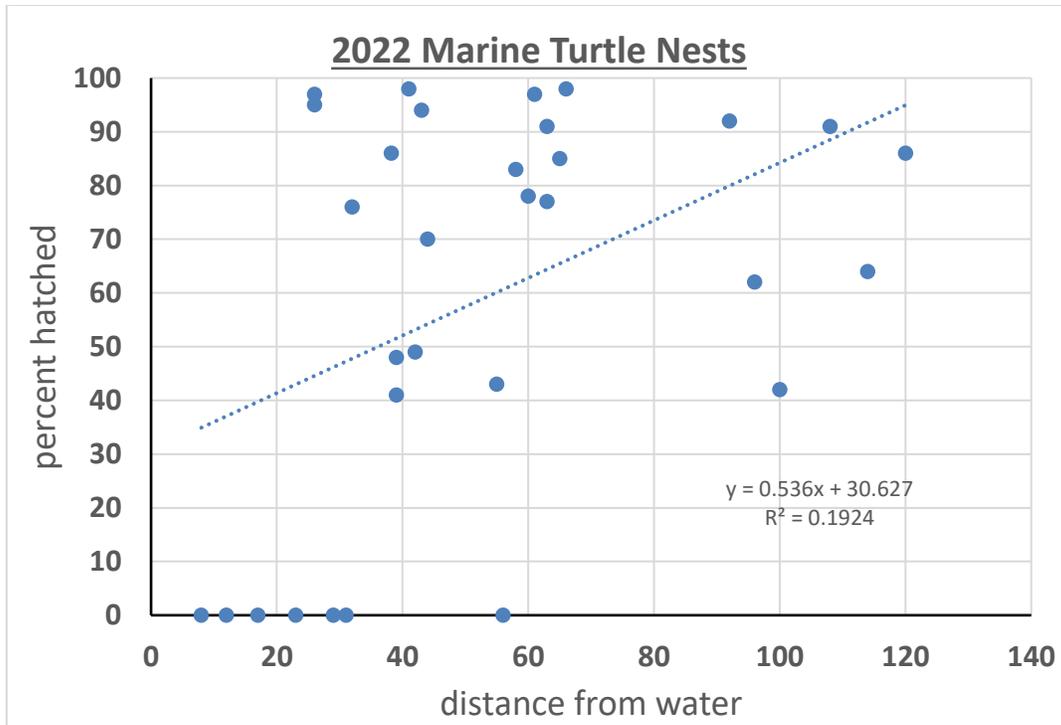


Figure 14: 2022 Pensacola Beach plotting nest hatching success versus distance nests are laid upland from the Gulf of Mexico.

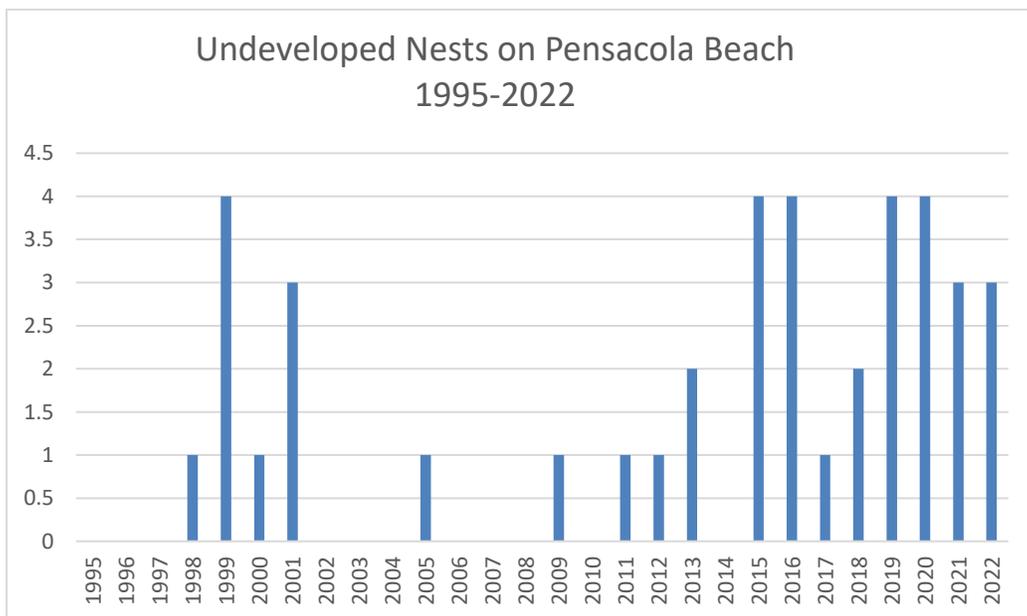


Figure 15: Pensacola Beach undeveloped nests from 1995-2022

Pensacola Beach Disoriented Nests 1996 - 2022

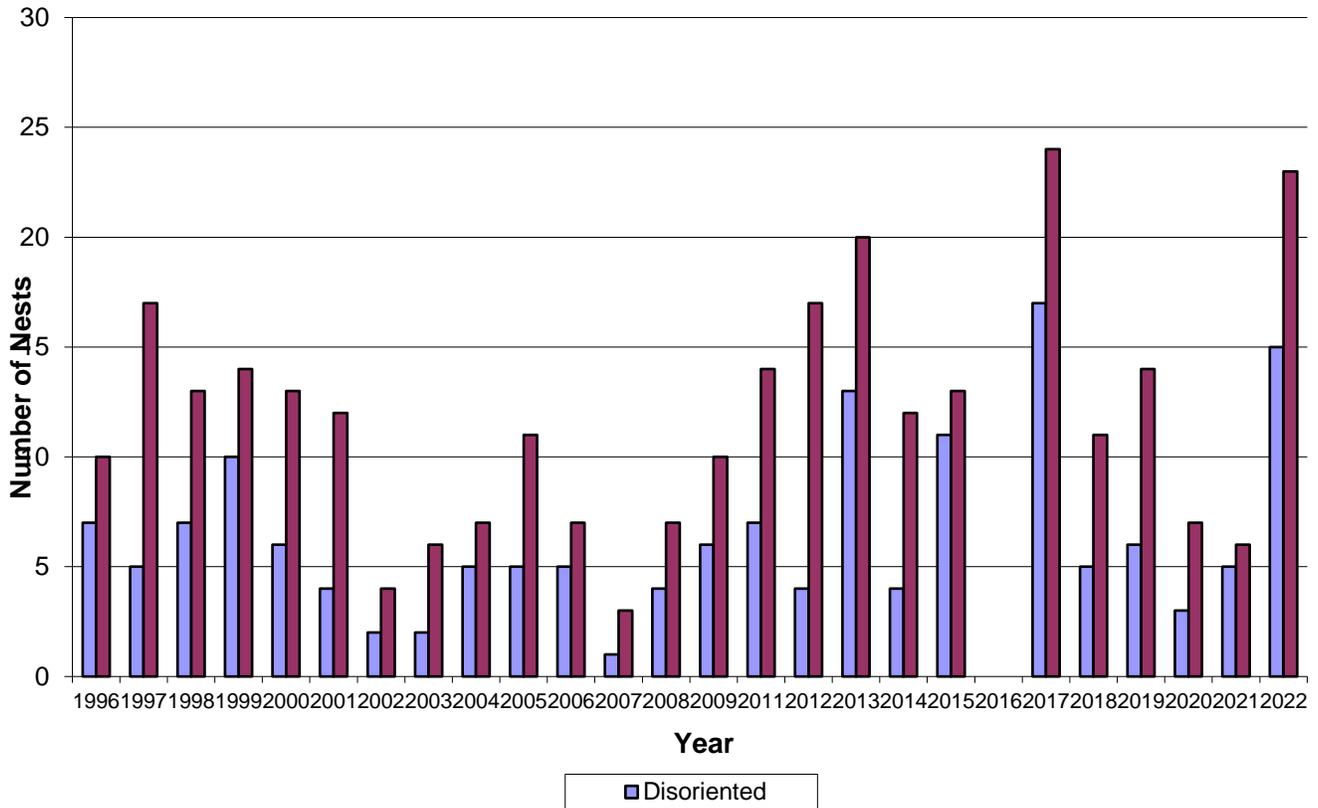


Figure 16: Comparison of marine turtle nests with hatchling disorientation to the total number of nests per season from 1996-2022 on Pensacola Beach. Disorientation data is not shown for the 2010 and 2016 seasons due to relocation of all incubating nests offsite during the 2010 Deepwater Horizon oil spill and 2016 nourishment project. Hatchling disorientation was defined as nests with ≥ 5 hatchlings crawling at $> 45^\circ$ angle from the direct path to the water. Hatchlings were required to crawl ≥ 10 feet to be classified as disoriented.



Figure 17: PK4W loggerhead turtle nest. Nest was only 17 feet from the Gulf when laid. This nest was lost to erosion from high tides associated with a full moon.



Figure 18: Nest PB 2, loggerhead. This nest hatched at 98%.



Figure 19: Photograph illustrating light pollution issues near nesting beaches. Lights on the left are beach goers with cell phones. Lights and movement will deter females from emerging to nest in this area.

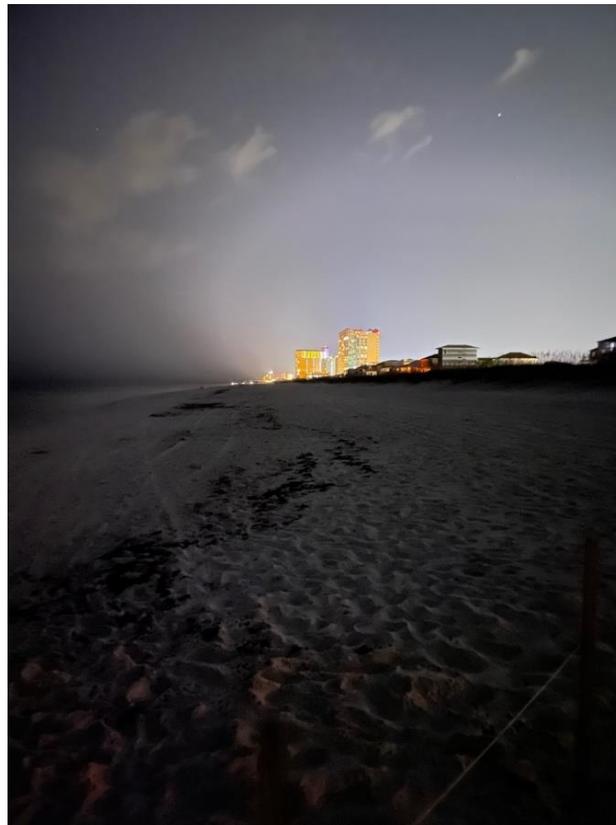


Figure 20: Western horizon from nest PB25



Figure 21: PB32 nest, laid only 17 feet from high tide line. This nest was over washed later that morning and the eggs failed to develop.



Figure 22: Leatherback hatchling from nest PB3.



Figure 23: Photograph of nest PB13 on high tide during full moon on July 11, 2022. The nest was laid only 23 above the high tide line. This nest was lost to erosion and did not hatch.

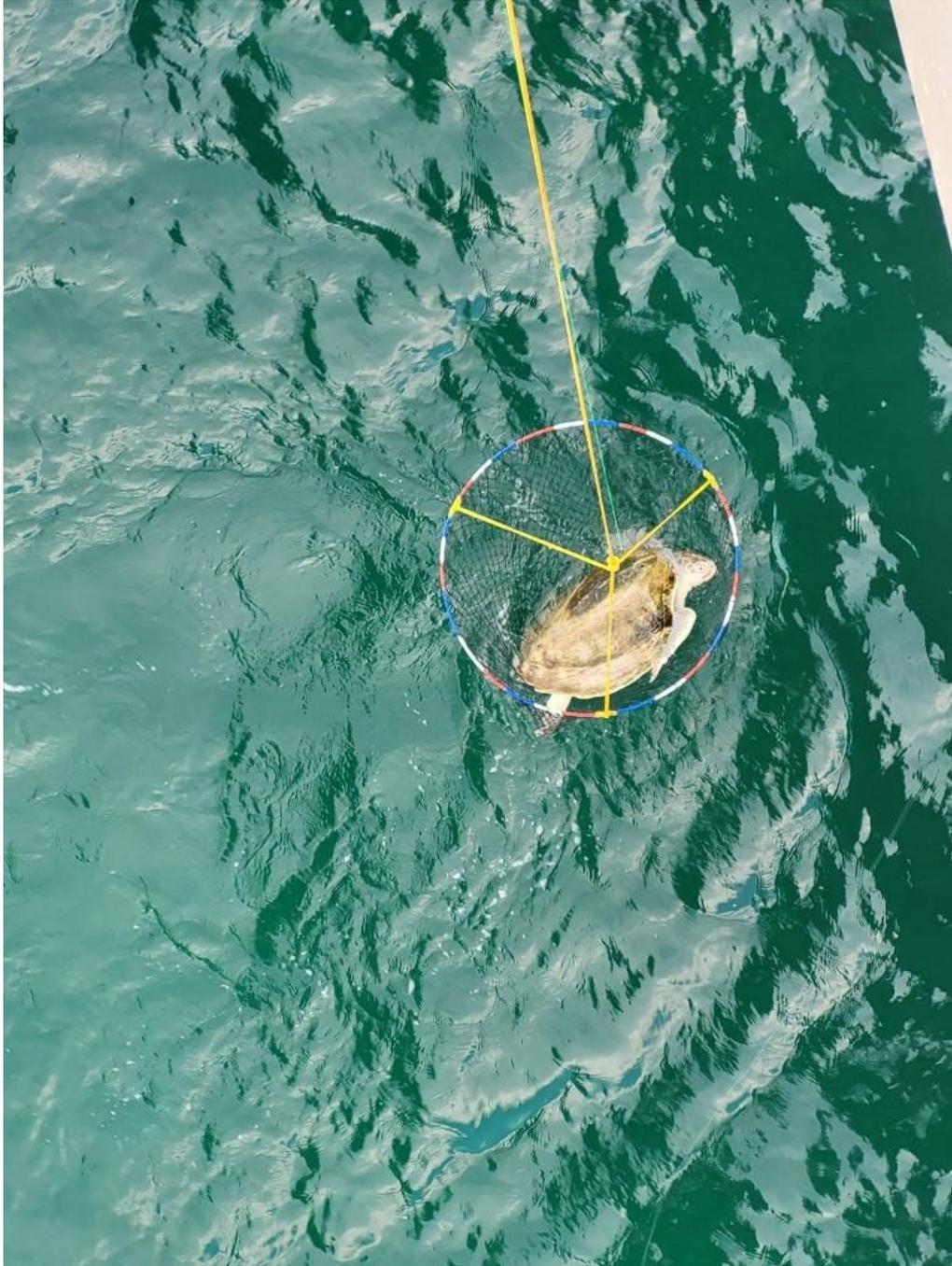


Figure 24: Kemp's ridley that was entangled/hooked in fishing line on the Pensacola Beach Pier being hoisted for recovery.



Figure 25: Loggerhead turtle spotted via a drone and reported by the public operator led to the recovery of this turtle. Escambia County Lifeguards were able to capture the turtle that was entangled in fishing line/hooks. The turtle was transported to Gulfarium for rehabilitation.



Figure 26: Loggerhead turtle became entangled in fishing line on August 6, 2022 on Pensacola Pier and was rescued by the fishermen/pier staff and was transported to Gulfarium by Escambia County sea turtle volunteer. A new larger net was purchased to aid in the capture of larger turtles.

Pensacola Beach 2022	Nest #	Date Laid	Species	Hatch Date	Incub Days	# Eggs	# Eggs Predicted	# without develop	# with develop	# Unhatched (including pipped)	# Hatched	# Emerged	% Hatch	% Emerge	Adult Dis. (NM)	Hatching Dis. (NM)	Tidal impact (NM)	# in water witnessed	Apex Tracks to GOM	Relocated (Y/N)	Crawl width (in)	Distance from duneveg (ft)	Distance from High Tide Line (ft)	2'18" scarp (NM)	Latitude	Longitude	
	1	5/11	Cc	7/24	74	99	0	12	2	0	85	84	86%	85%	N	Y	N	84	0	N	34	63	120	N	30.342860	-87.07528	
	2	5/18	Cc	7/26	69	101	0	2	0	0	99	98	98%	97%	N	Y	N	98	0	N	38	45	66	N	30.326090	-87.172140	
	3	5/24	Dc	8/7	78	94	0	15	6	1	72	61	77%	65%	N	N	N	72	0	N	77	39	63	N	30.349410	-87.045310	
	4	5/25	Cc	7/27	63	84	3	25	6	0	50	46	60%	55%	N	Y	N	24	3	N	38	0	96	N	30.345778	-87.062043	
	5	5/27	Cc	7/31	65	77	0	44	1	0	32	30	42%	38%	Y	Y	N	30	0	N	30	15	100	N	30.327857	-87.157477	
	6	5/31	Cc	8/5	66	128	0	3	1	0	124	124	97%	97%	N	Y	N	116	1	N	37	93	26	N	30.343103	-87.078867	
	7	6/7	Cc	NA	NA	63	0	63	0	0	0	0	0%	0%	N	NA	Y	0	0	N	44	143	33	N	30.333607	-87.124674	
	9	6/9	Cc	8/13	65	97	0	0	2	0	95	94	98%	97%	N	Y	Y	94	1	N	36	133	41	N	30.343349	-87.073370	
	10	6/15	Cc	8/14	58	86	0	29	0	2	55	55	64%	64%	N	Y	N	55	0	N	34	18	114	N	30.339845	-87.083616	
	11	6/21	Cc	8/26	66	79	0	15	2	0	62	62	78%	78%	Y	Y	N	62	0	N	30	110	60	N	30.349223	-87.049219	
	12	6/22	Cc	8/16	57	122	0	9	2	0	111	106	91%	87%	N	N	N	109	0	N	34	0	108	N	30.336577	-87.109474	
	13	6/22	Cc	NA	NA	114	NA	NA	NA	NA	0	0	0%	0%	N	NA	Y	0	0	N	31	140	23	N	30.344768	-87.066907	
	14	6/26	Cc	8/29	64	110	12	10	8	1	79	78	72%	71%	N	Y	Y	77	0	N	37	115	44	N	30.332720	-87.125123	
	16	6/26	Cc	8/28	63	119	0	60	1	0	58	57	49%	48%	N	Y	N	57	0	N	36	106	42	N	30.326894	-87.174088	
	17	6/30	Cc	9/3 or 9/4	65 or 66	117	0	2	1	0	114	113	97%	97%	N	NA	N	2	0	N	35	48	61	N	30.347080	-87.065520	
	18	7/1	Cc	NA	NA	114	NA	NA	NA	NA	0	0	0%	0%	N	NA	Y	0	0	N	33	248	12	N	30.330072	-87.14262	
	19	7/1	Cc	9/2	63	117	0	13	4	0	100	99	85%	85%	N	Y	N	100	0	N	34	72	65	N	30.334669	-87.117622	
	20	7/4	Cc	9/11	69	72	0	12	5	0	55	55	76%	76%	N	Y	Y	55	0	N	35	113	32	N	30.336869	-87.11701	
	21	7/4	Cc	9/1	59	99	0	5	0	0	94	93	95%	94%	N	N	N	94	0	N	24	32	26	N	30.325748	-87.165194	
	22	7/5	Cc	NA	NA	100	0	100	0	0	0	0	0%	0%	N	NA	Y	0	0	N	26	125	31	N	30.340015	-87.089524	
	23	7/5	Cc	9/6	63	115	0	5	2	0	108	108	94%	94%	N	Y	Y	108	0	N	36	125	43	N	30.346518	-87.044148	
	24	7/7	Cc	Unk	Unk	NA	0	NA	NA	NA	NA	NA	NA	NA	N	NA	Y	4	0	N	32	110	43	N	30.346620	-87.040990	
	25	7/15	Cc	9/21	68	78	0	8	2	3	65	65	83%	83%	N	Y	N	65	0	N	36	82	58	N	30.333655	-87.123316	
	26	7/15	Cc	NA	NA	89	0	89	0	0	0	0	0%	0%	N	NA	Y	0	0	N	42	87	29	N	30.334635	-87.118860	
	27	7/16	Cc	9/20	66	85	0	5	16	23	41	3	48%	4%	N	N	Y	3	1	N	34	96	39	Y	30.332669	-87.130601	
	28	7/16	Cc	9/13	59	111	0	8	7	0	96	96	86%	86%	N	N	Y	0	96	N	36	96	38	Y	30.336497	-87.108660	
	29	7/18	Cc	9/22	66	87	0	24	25	1	37	34	43%	39%	N	Y	Y	29	0	N	34	115	55	N	30.339270	-87.084447	
	30	7/22	Cc	NA	NA	83	0	83	0	0	0	0	0%	0%	N	NA	N	0	0	N	30	59	56	N	30.334809	-87.118416	
	31	7/25	Cc	9/29	66	97	0	6	3	0	88	86	91%	89%	N	N	N	1	0	N	36	91	63	N	30.333494	-87.126021	
	32	7/27	Cc	NA	NA	76	0	76	0	0	0	0	0%	0%	N	NA	Y	0	0	N	38	108	17	N	30.336360	-87.109200	
	33	8/1	Cc	10/3	63	69	0	30	11	0	28	28	41%	41%	N	Y	Y	28	0	N	30	160	39	N	30.344208	-87.073818	
	34	8/2	Cc	10/15	74	86	0	0	3	7	79	72	92%	84%	N	N	N	7	72	N	36	95	92	N	30.347667	-87.050655	
sum						23	31	32	32	32	1827	1747			2	23	32	1374	22	32	1143	2626.6	1735				
mean						65	96	1	22	2	66	65	61.6%	58.9%	2	15	15	56	0	0	36	88	54	2			
St Dev						18.1	2.7	26.5	2.4	0	40.7	40.3	0.4	0.4				42.0	0.7		8.5	51.4	28.9				
						114																					

Table 1: 2021 Pensacola Beach marine turtle nesting data summary.

APPENDIX A

MARINE TURTLE MONITORING REPORT

CIRCLE: PK PB

NEST NUMBER _____

REPORTED BY: _____
DATE: _____ TIME: _____ AM/PM
WEATHER _____

LOCATION: _____ YARDS/MILES EAST/WEST OF
MARKER: _____
DESCRIPTION: _____

SPECIES: (circle one)
Cc = Loggerhead
Cm = Green
Dc = Leatherback
Lk = Kemp's Ridley

INCIDENT TYPE:
NEST
FALSE CRAWL

MOST RECENT
HIGH TIDE LINE:
ABOVE
BELOW

**DISTANCE OF BODY PIT
FROM:** (feet/ meters)
WATER LINE: _____
VEGETATION LINE: _____

SIGNS/STAKES: from
center of body pit/egg cavity
(feet / meters)
Sign: _____

From the sign:
1st stake _____

2nd stake _____

CRAWL MEASUREMENTS:
ALTERNATING
SYMMETRICAL

WIDTH: _____ IN/CM

PREDATOR SCREENED: ___ YES ___ NO _____ DATE

RELOCATED: ___ YES ___ NO **If YES Proceed to back of form**

ADDITIONAL COMMENTS:

PLEASE DRAW A DIAGRAM BELOW

APPENDIX B
Nest Assessment Data Sheet
SEA TURTLE NEST ASSESSMENT REPORT

v.09.13.2017

DATE:	TIME:	NEST NUMBER:
LOCATION:	REPORTED BY:	

RELOCATED: Y / N

<12 HOURS / > 2 WEEKS

PREDATION:

NEST: _____

HATCHLING: _____

DISORIENTATION:

ADDITIONAL COMMENTS:

TOTAL EGGS FOUND	_____	LIVE IN NEST	_____
HATCHED EGGS	_____	DEAD IN NEST	_____
UNHATCHED W/ DEVELOPMENT	_____	% HATCH SUCCESS	_____
UNHATCHED W/O DEVELOPMENT	_____	DAYS INCUBATED	_____
PIPPED ALIVE	_____	WITNESSED ENTERING GULF	_____
PIPPED DEAD	_____	EMERGED	_____
		GHOST CRAB PREDATION	_____

- The # of hatched eggs + unhatched eggs + pipped alive & dead = # of eggs in nest
- Hatched eggs do not include "pipped" eggs

HATCHING (please initial all entries)

DATE	TIME in GOM	#HATCHLINGS	DISORIENTED	UNDER SCREEN	ROOTS	OBSERVER	COMMENTS

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