



Escambia County 2021 Marine Turtle Nest Monitoring Report



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ABSTRACT

In 2021, there were 23 loggerhead (*Caretta caretta*) nests, and 1 green (*Chelonia mydas*) nest on Pensacola Beach (PB). There was also a total of 8 loggerhead false crawls. There were 4 loggerhead nests recorded on Perdido Key (PK) along with 6 loggerhead false crawls. Tropical Storms and hurricanes impacted incubating nests through the summer with over wash and erosion of nests leading to poor hatch rates for the season. The mean hatch success for all nests on Pensacola Beach, was 10.8% while mean emergence success was 7.3%. Mean hatch success for all nests on Perdido Key, was 0%, and mean emergence success was 0%. 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. Artificial lighting negatively affected 83% of applicable Pensacola Beach nests (n = 5 of 6); 18 nests were not applicable due to the absence of viable offspring (0% hatch success). The low nest hatching success rates are attributed to turtles frequently nesting above the Most Recent High Tide Line (MRHTL) but below normal storm tide lines. Nests cannot be relocated, per the Florida Fish and Wildlife Commission (FWC) guidelines, if laid low unless they are below the MRHTL. As a result, higher than normal surf conditions and tropical storms negatively impact most nests. The 2021 season was the 5th consecutive nesting season that had a lower nesting success than the previous season. A total of 12 marine turtle strandings were documented throughout 2021 in Escambia County (6 loggerhead, 1 green and 5 Kemp's ridley).

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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 2021 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. Pensacola Beach has averaged 14.9 nests per season ($SD \pm 8.9$) since annual surveys began, with 2021 exhibiting a nest count of 24 (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 2021 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 2021 exhibiting a nest count of 4. (Fig. 2).

In general, marine turtle nesting in Florida has been increasing. (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 GUIIS and on the east end by the Santa Rosa area of GUIIS. 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 Gulf Islands National Seashore 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 2021 on Pensacola Beach and Perdido Key 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 2021 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 2021 season.

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 2021 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 on Pensacola Beach as follows:

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

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

Nest success was defined as the proportion of nests yielding hatch success $\geq 10\%$. Productivity was defined as the total number of emerged hatchlings estimated from all nests during the 2021 season.

Observed egg loss, hatchling loss and percentage of hatchlings and/or tracks witnessed entering the Gulf was evaluated.

RESULTS AND DISCUSSION

Crawl Activity and Beach Success

Nesting occurred between 28 May and 18 August on PB and between 28 June and 24 August for PK. The 2021 season witnessed 24 nests and 7 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 green turtle nested on PB. The remaining nesting and non-nesting emergences were identified as loggerheads. There were 2 nests this season on the University of West Florida (UWF) property, nests PB10 and PB19.

The 2021 season witnessed 4 nests and 6 false crawls on Perdido Key (Fig. 6). This yielded a beach success of 40% (Fig. 8; Fig 10.) All nesting activity were loggerheads.

All 28 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 and Productivity

In 2021, a total of 23 loggerhead nests and 1 green were laid on Pensacola Beach and monitored throughout incubation. Due to very low hatching success, only 4 of those nests provided incubation lengths. The average length of incubation on PB was 68 days (n = 4), with the shortest incubation period observed at 61 days for PB07. The longest incubation length was for PB1 at 74 days.

Many nests were lost to erosion, and assigned the “114” egg value that FWC recommends, resulting in an average clutch size of 106 eggs, ranging from 87- 105 (Table 1). Of the 24 monitored nests, 9 were assessed and 15 were completely lost to erosion. One nest was lost to erosion after it had hatched. The other 14 were completely washed out prior to hatching.

In 2021, a total of 4 loggerhead nests occurred on PK. The average clutch size was 107 eggs, with only one clutch size known, at 85 (Table 2). Of the 4 monitored nests, only 1 was assessed. One was completely lost to erosion. Two nests were buried so deeply that assessment was not possible.

A total of 6 nests produced viable offspring during the 2021 season on Pensacola Beach. Perdido Key had 0 of the 4 nests produce hatchlings. Mean hatch success for PB was 10.8% (SD \pm 33%) and PK was 0%. Compared with historical data obtained annually on PB since 1996, hatch success was very low this year compared to the 25-year average of 63.8%. (Fig. 11; Fig. 12).

The total number of hatchlings witnessed entering the Gulf from PB was approximately 355. (Figure 13) PK had 0 hatchlings witnessed entering the Gulf.

Hatching success is 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 5 seasons and have seen a significant decline in hatching success. This hatching success can vary somewhat, depending on when the first storms of the season arrive. Nests laid low on the beach that hatch pre storm, will do well. This occurred in 2017 and 2018. However, if storms arrive early, as in 2021, many low nests will be lost before hatching, and only the nests laid high on the beach are successful.

Seasons that had lower tropical activity, typically witnessed higher success rates of nests: such as 2000 and 2002. 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 2015 season had low tropical activity but had 3 nests fail, with none of the eggs developing, indicating they were possibly not fertile. This lowered the hatch success rate for that season substantially. The 2021 season was the lowest hatching success for PB since surveys were begun in 1996 (Fig.11).

Undeveloped Nests

Upon assessing a nest 3 days after it hatches, or at the day 70 mark of incubation, on occasion, a large amount of eggs have no development. We began to look further into this phenomenon. PB had 3 nests with 0% development in 2021. These eggs had no discernable development. The nests did not flood early on in their development.

Nests sheets were examined from 1995 to 2021. Nests that had notes regarding flooding from storms, such as washed over 5' north of nest sign, or washed over 20 feet north of nest site, were excluded if the nest flooded within the first 30 days. These nests were excluded to avoid including eggs that failed possibly due to environmental conditions. If a nest floods early on in the incubation, it is difficult to tell if embryos are present, or were present, on examination of the nest post hatch or post 70-80 days. Nests that did flood but in the last 30 days of incubation were included. Nests that developed for this extended period of time would have obvious embryos in the eggs. Nests that were relocated <12 hours after deposition were included in the sample.

Marine turtle nests that have 40 or more undeveloped eggs were selected as candidate nests, to track and monitor as nests that do not develop fully, for unknown reasons. Nests readily fail due to flooding from storms and then typically have developed embryos inside the eggs upon assessment of the nest. We chose to look at 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).

Some nests could have possibly been from the same female. Specifically, we looked for nests on the same beach, around two weeks apart that were not developed. In 2015 there are three nest that are possibly the same female.

We are curious about non development of eggs, caused by early mortality in the female or possibly from infertility, among our local nesting turtle population and we are now monitoring to determine if there is an increase of nests that are undeveloped, possibly infertile, or if there is a certain level of nests that are undeveloped every year. Mortality of embryos within the females, induced by females holding eggs in hypoxic conditions of the oviduct, longer than normal, possibly due to human disturbance on the beaches, is being considered.

Findings:

- There are 39 nests from 1995-2021 that had greater than 40 undeveloped eggs within the nest. Out of the 39 nests, there were 13 nests that were relocated and had no tidal impacts. There

were 8 nests out of the 39 that had tidal impacts, but it was during the last 30 days of incubation.

- From 2009 to 2021 there has been an increase in the number of nests with undeveloped eggs. Over the 13-year period from 2009 to 2021 there are 27 nests that qualify as undeveloped, and over the 13-year period 1995 to 2008 there were 12.
- In 2015 there are three nests laid almost two weeks apart that all had completely undeveloped nests. This could possibly be the same turtle. The three nests were laid on May 13th, May 25th, and June 10th.
- On average there are 2 nest every year without development. The average hatch success of the 39 nests is 23 percent. The loggerhead nests that were classified as undeveloped, had an average hatch success of 20%. The green sea turtle nests that were undeveloped had an average hatch success of 46%.

Effects of Erosion, Inundation and Tropical Weather

Direct impact of tides on a large number of 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.

Several named storms adversely impacted marine turtle nests this season. Around June 19, TS Claudette storm surge eroded one nest away and flooded several others. Tropical storm Fred also eroded and flooded nests on August 16 (Fig.17). Hurricane Ida occurred on August 30 and also eroded and flooded nests (Fig 11; Fig. 28).

In total, 22 of 24 nests on PB experienced tidal impacts to include erosion, repeated wash over and/or inundation. Of these 22 impacted nests, 14 experienced total loss of the eggs. (Table 1).

In total, 4 of 4 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).

Nest PB16 was washed over by Tropical Storm Fred and Hurricane Ida. Egg development had survived the high waters of Fred but had succumbed to the effects of Hurricane Ida (Fig. 27).

PB nests hatched at a rate of 10.8%, down from the average of 63.8%. PK hatch success was 0%.

Predation

Complete or partial predation of marine turtle nests did not occur in 2021. While egg and hatchling predation by ghost crabs was only observed at one nest, 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 emergences.

Nest Relocations

In 2021 the average distance of nests on PB to the water line was 52 feet (SD \pm 21.6 feet). For PK it was 65 feet (SD \pm 8.1 feet). Variance was high for both locations. No nests were relocated upon initial discovery during 2021 due to guidelines outlined in the FWC Marine Turtle Handbook stating only nests deposited seaward of the MRHTL are candidates for relocation (FWC 2016).

Light Pollution and Disorientation

Hatchling disorientation was defined as > 5 hatchlings from a given nest orienting $> 45^\circ$ from the most direct path to the Gulf post-emergence (FWC 2016). Artificial lighting negatively affected 83% of applicable Pensacola Beach nests ($n = 5$ of 6; Fig. 16); 75% of total nests ($n = 18$) were not applicable due to the absence of viable offspring (0% hatch success). One nest (17% of total hatched nests) did not experience hatchling disorientation this season.

Artificial lighting negatively affected 0% of Perdido Key nests ($n = 0$ of 4); as no nests hatched.

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 2021 season were interior and exterior lighting of various homes and condominiums and sky glow.

Obstructed Nesting Events

There was one obstructed nesting attempt on PB and zero on PK in 2021. The event on PB occurred during the Memorial Day holiday weekend when special permission was given to allow beach ware to remain on the beach over night (Figure 21).

Research

Escambia County participated in a research program with FWC researcher Dr Shigetomo Hiram on Hatchling Orientation. Only 2 nests, PB01 and PB02 were used in the study. Due to low hatching success of other nests, no data could be collected.

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, minus one week when removed for Hurricane Ida.

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

Strandings

There were 11 reported strandings in Escambia County in 2021; 6 loggerhead, 5 Kemp's ridley and 1 green (Fig. 23-25). 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.

CONCLUSIONS AND RECOMMENDATIONS

The largest impact to incubating nests in 2021 were tropical storms. Numerous nests were lost to erosion or over washed/flooded with low hatching success. For each of the last 5 seasons, the hatching success rates for nests have been lower than the previous season. 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. 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 lower this season due to most nests being eroded by tropical storms thus never hatching. However, nests that did hatch under new or less than half moon conditions did witness disorientation, one nest (PB15) hatched with 95% moon and clear skies and still disoriented. Coastal lighting which contributes to point source and non-point source (sky glow) continues to be an issue.

Limiting Disruption

Human and vehicular presence on nesting beaches during nighttime hours has the ability to disrupt nesting turtles and their hatchlings. Encountering an emerged turtle by happenstance can cause her to abandon nesting or choose a less suitable site. While vehicles are operated at night for public safety, some of the vehicles present are removing trash and debris in support of the County's 'Leave No Trace' ordinance. Further evaluation into whether the benefits of current 'Leave No Trace' operations outweigh the risks to marine turtles may be warranted due to possible conflicts with nesting marine turtles. Human disturbances on the beach after dark are excessive and include flashlight usage, and cell phone lights to illuminate the beaches. The 2021 season witnessed excessive use of lighting by beach goers (Figure 20). This continues to 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 700 hours for conducting marine turtle nesting surveys and another 150 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.

Training

Training is recommended for employees of Escambia County public works and vendors prior to commencement of the 2022 nesting season. Training provided by the 2022 marine turtle permit holder should include 1) crawl and nest identification, 2) how to respond to and report nests, injured wildlife, and stranded turtles (hooked turtles and those washed ashore), and 3) who to report events to for proper response.

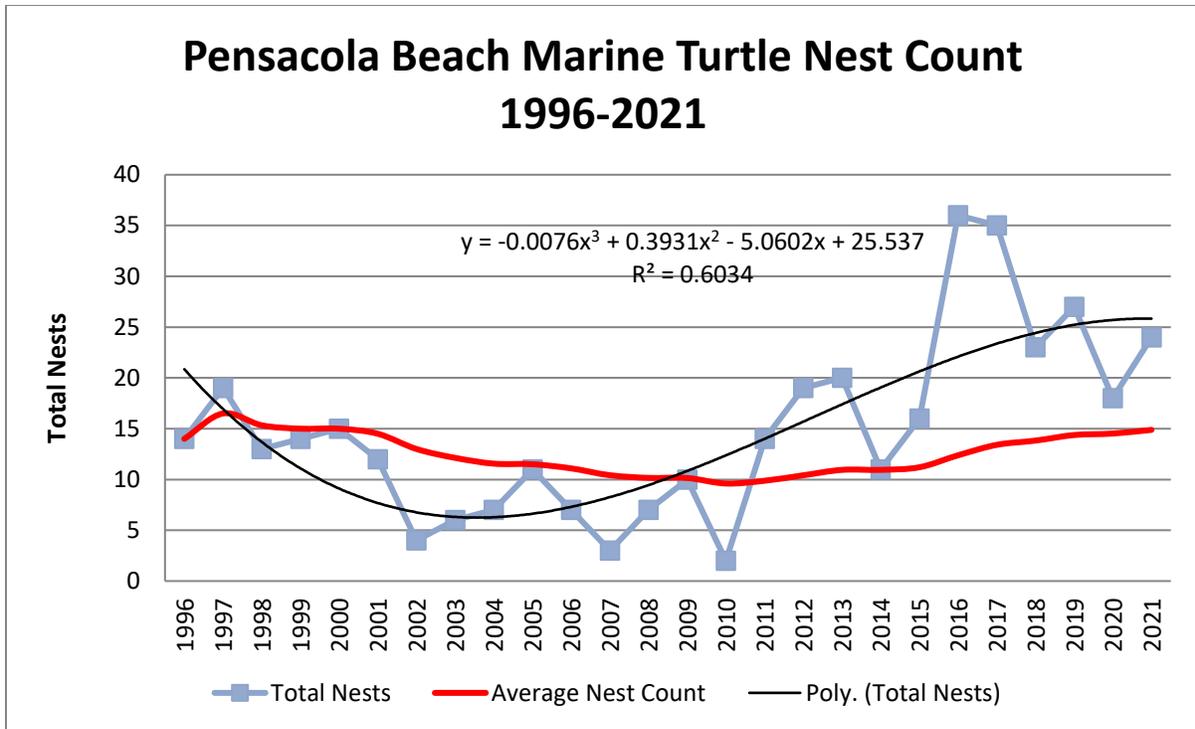


Figure 1: Pensacola Beach annual marine turtle nest count trend from the 1996 - 2021 seasons. Pensacola Beach has averaged 14.9 nests per season (SD ± 8.9) since annual surveys began, with 2021 exhibiting a nest count of 24. The best-fit trend line is displayed (polynomial; $R^2 = 0.5886$).

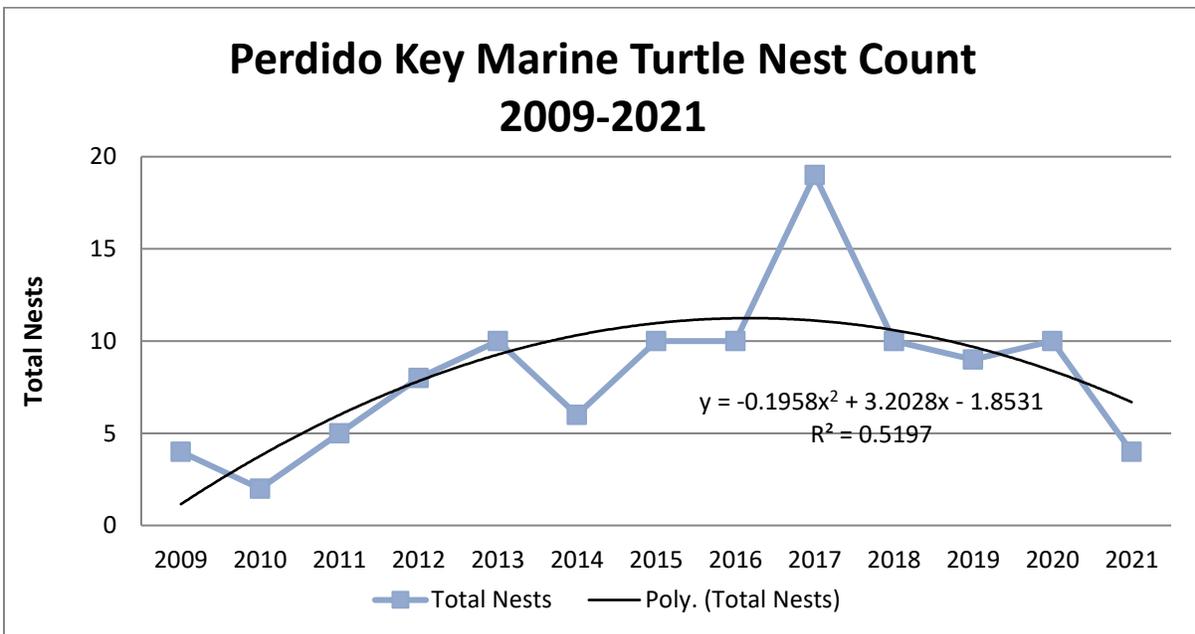


Figure 2: Perdido Key annual marine turtle nest count trend from the 2009 - 2020 seasons. Perdido Key has averaged 8.6 nests per season (SD ± 4.3) since 2009. The best-fit trend line is displayed (polynomial; $R^2 = 0.5987$).

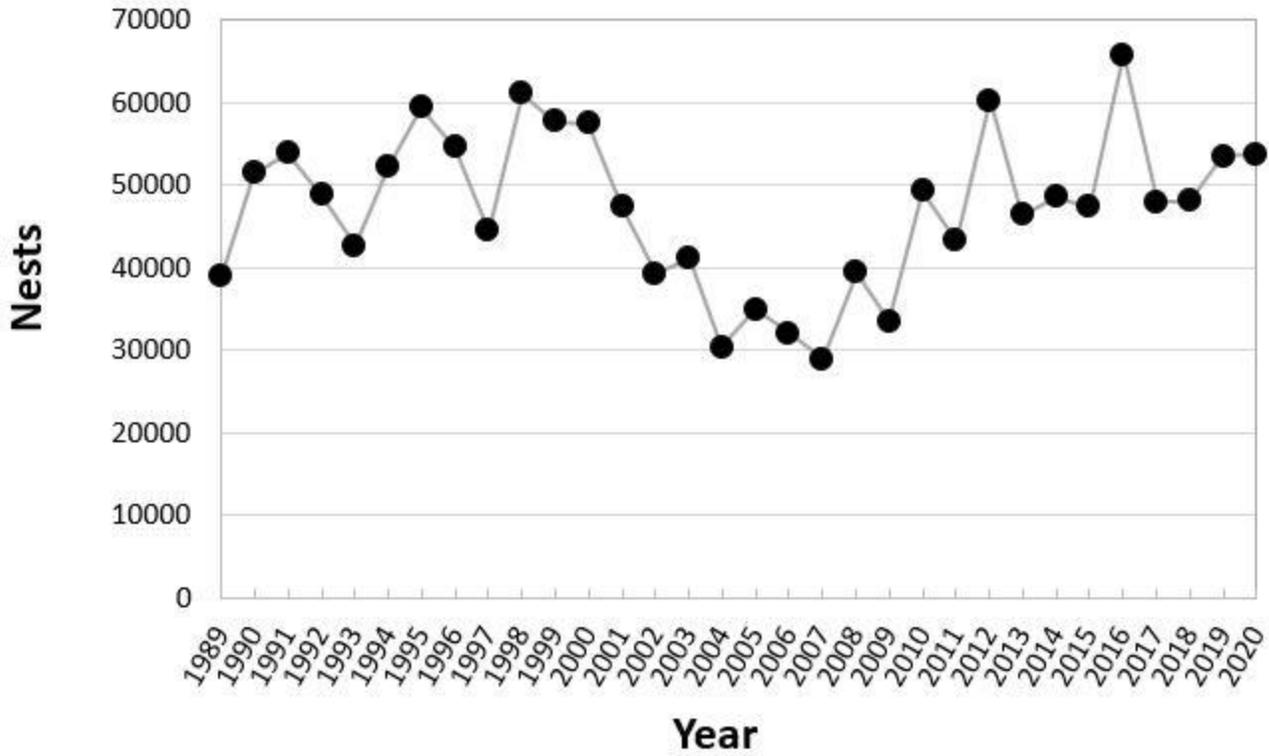


Figure 3: Statewide nesting loggerhead trend data, 1989 – 2020.

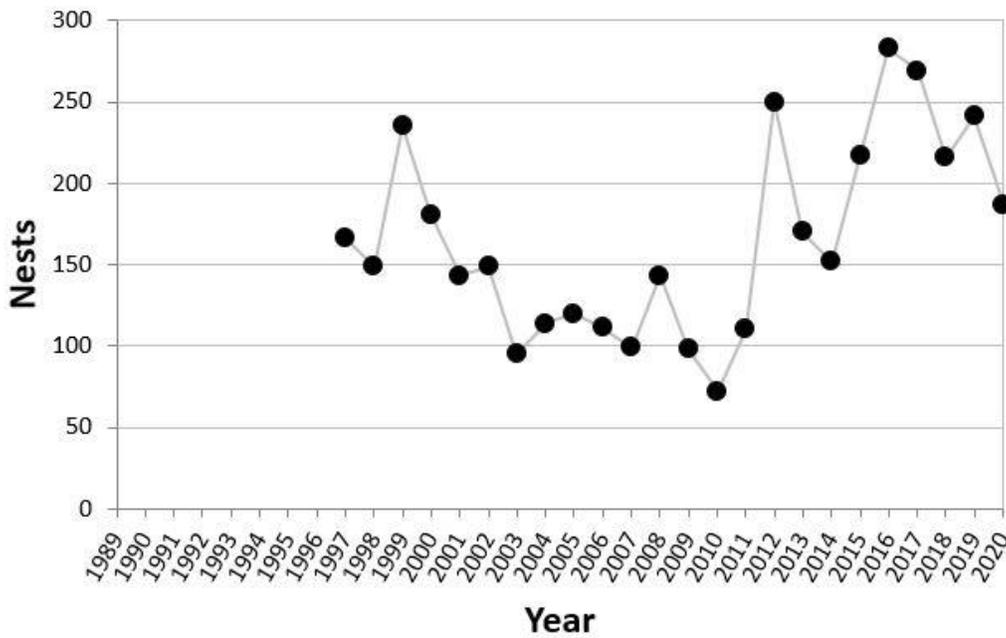


Figure 4: Florida panhandle nesting loggerhead trend data, 1997 – 2020.



Figure 5: GIS map displaying Pensacola Beach marine turtle nest locations for the 2021 season.

2021 Perdido Key Sea Turtle Nesting



Figure 6: GIS map displaying Perdido Key marine turtle nest locations for the 2021 season.

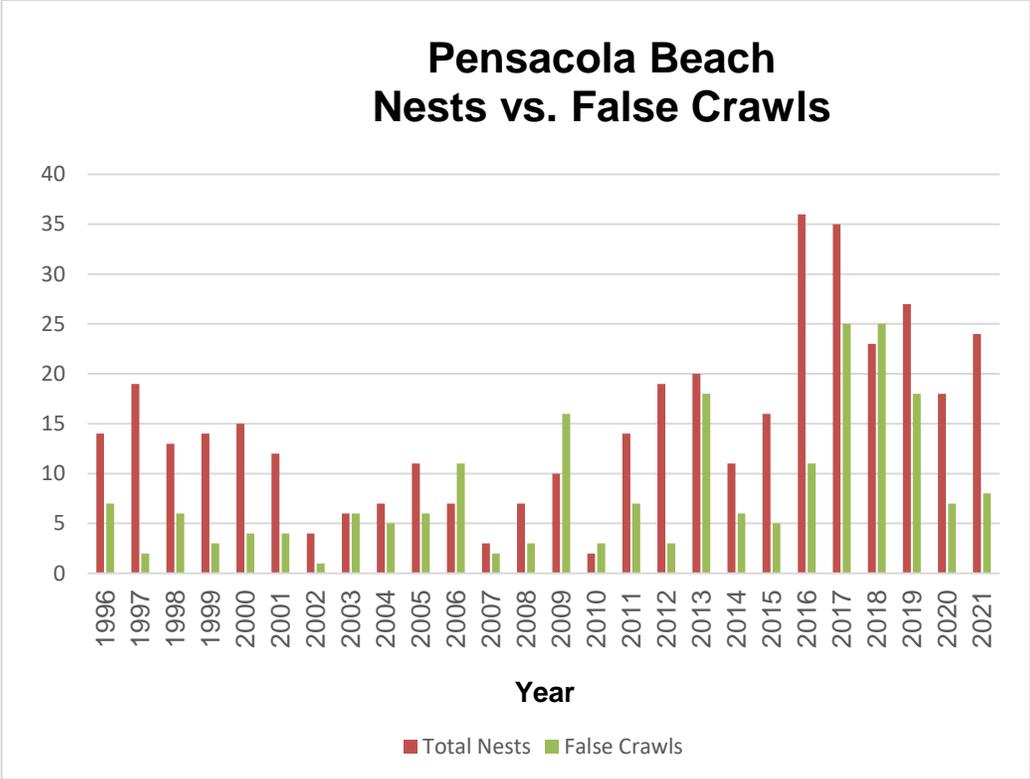


Figure 7: Marine turtle emergence data from Pensacola Beach including the number of nests compared to the number of non-nesting emergences (i.e. false crawls), 1996 - 2021.

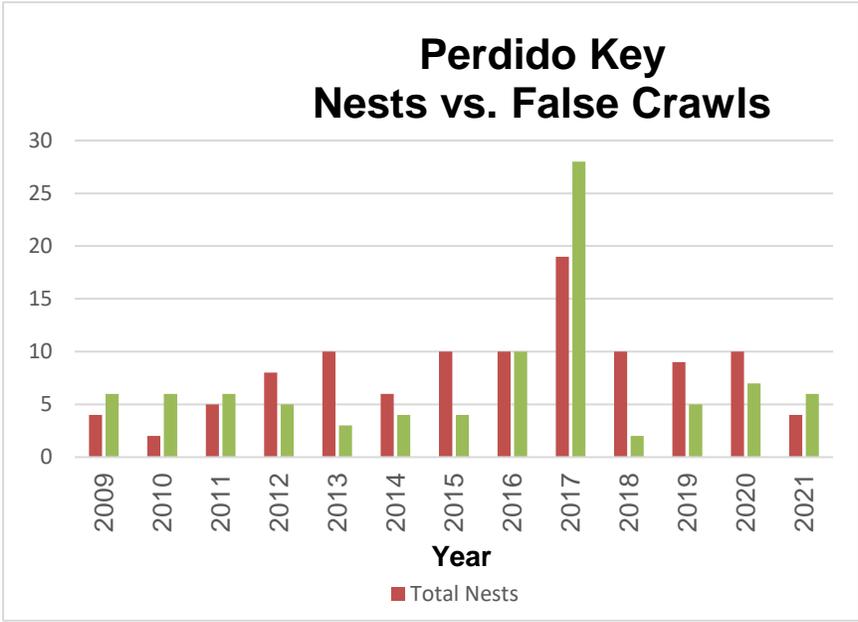
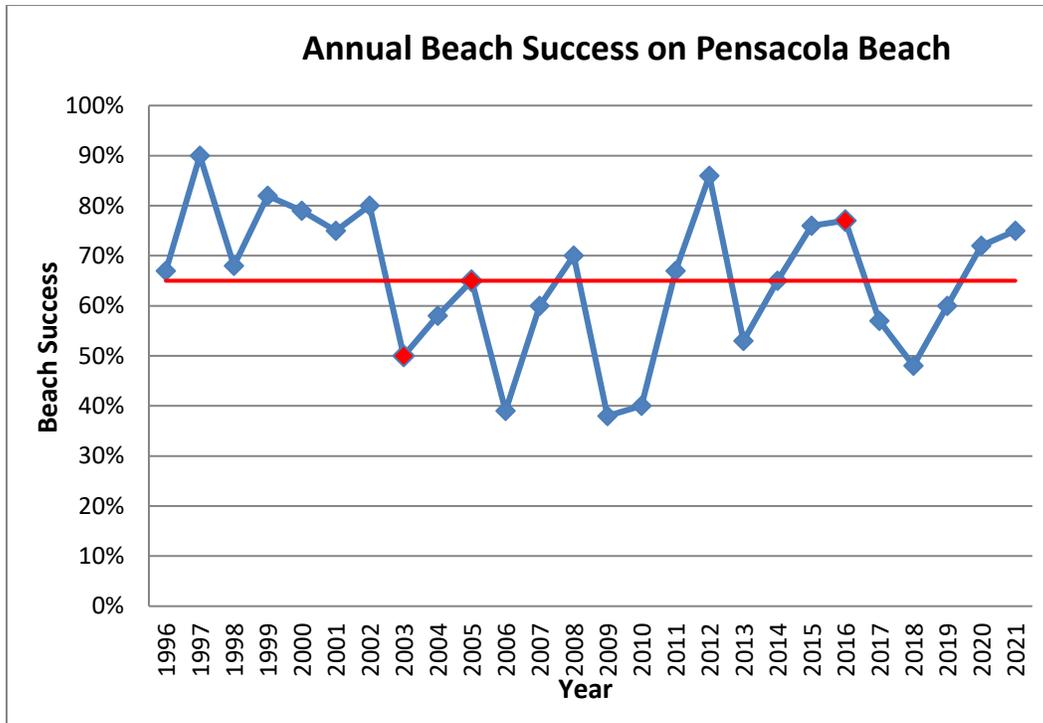
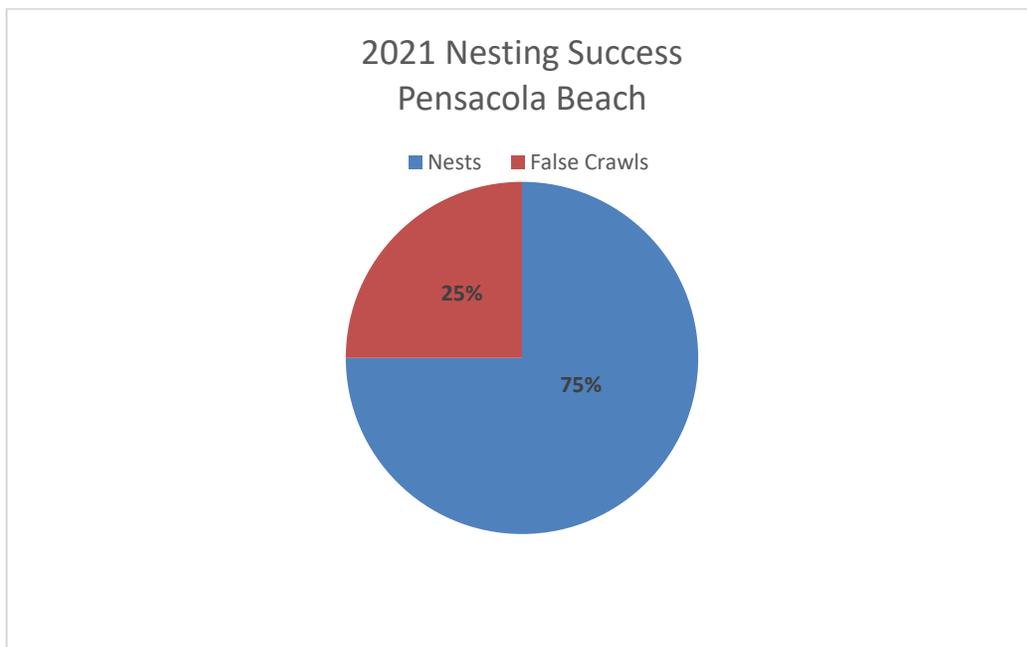


Figure 8: Marine turtle emergence data from Perdido Key including the number of nests compared to the number of non-nesting emergences (i.e. false crawls), 2009 - 2021.

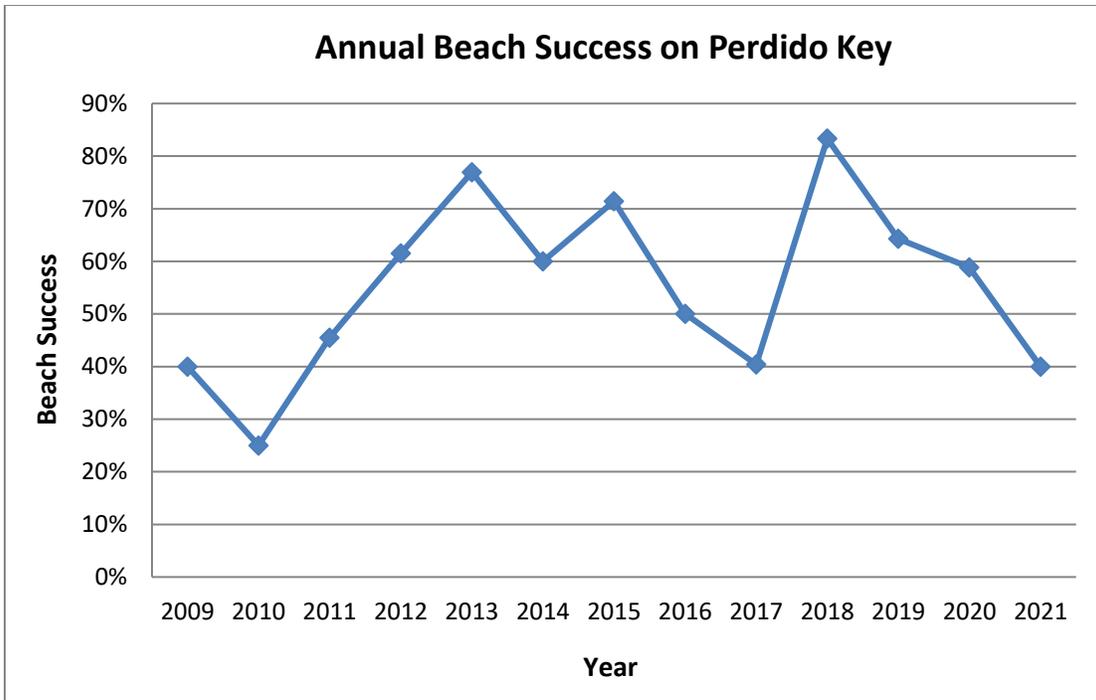


a.

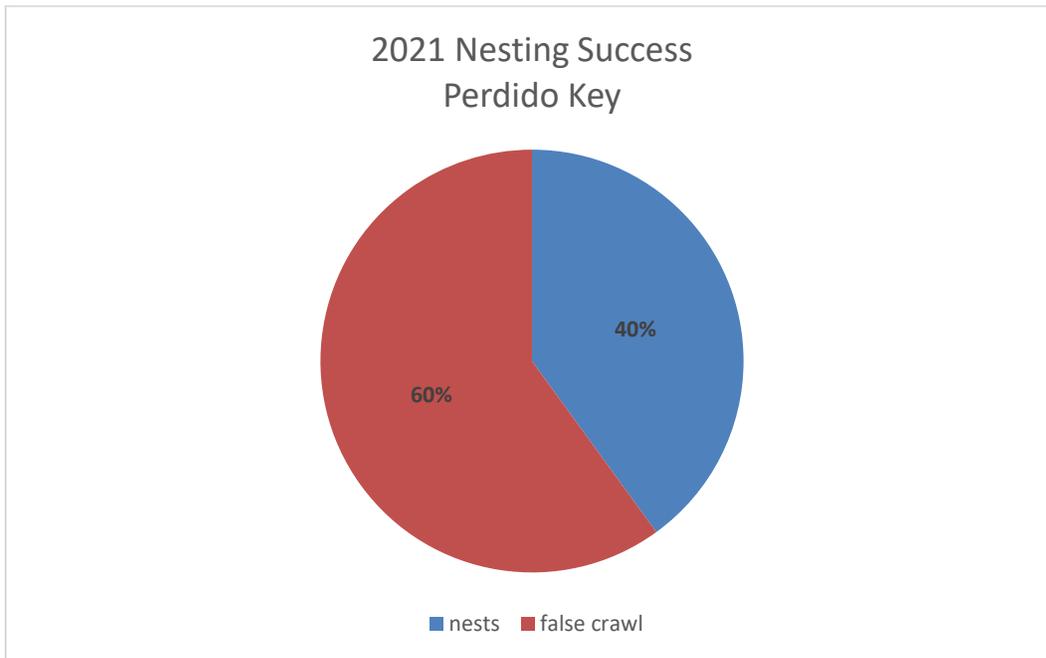


b.

Figure 9: Annual beach success data from Pensacola Beach, 1996-2021 (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 2021 was 75%, compared to the 23 year average of 65%. (b). Proportion of nests to false crawls for 2021.



a.



b.

Figure 10: Annual beach success data from Perdido Key, 2009-2021 (a). Beach success is defined as the proportion of nests laid to the total number of crawls. Beach success for 2021 was 40%. Proportion of nests to false crawls for 2021 is also depicted (b). Proportion of nests to false crawls for PK in 2021.

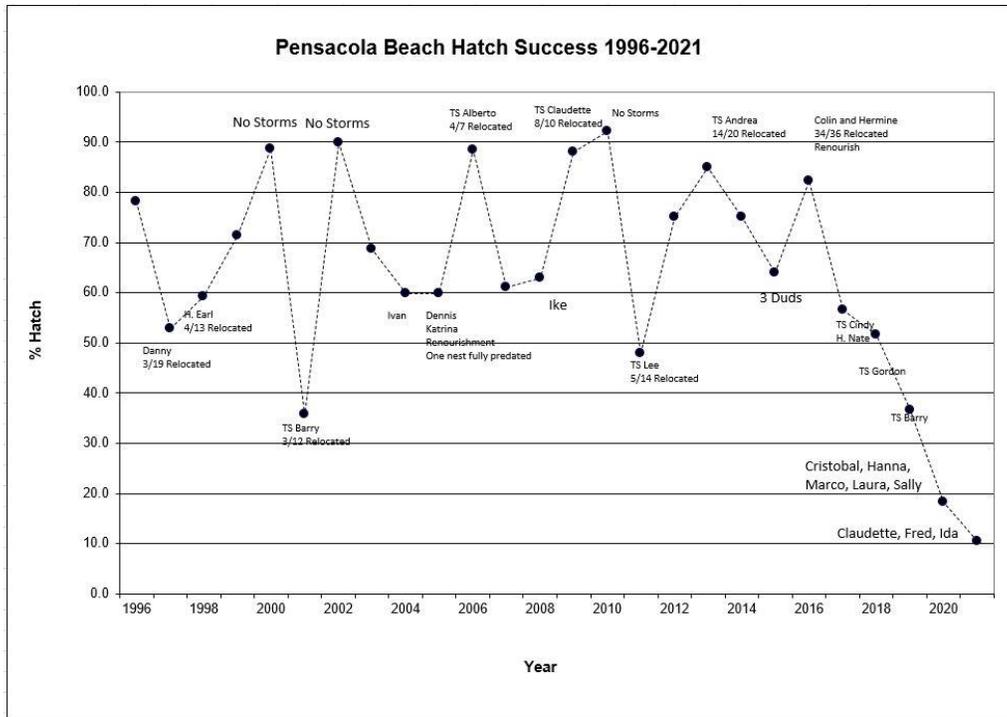


Figure 11: Annual mean hatch success (% hatch) from the 1996 - 2021 nesting seasons on Pensacola Beach. Mean hatch success for the 2021 season was 10.5% (SD ± 22%). Long-term monitoring efforts have established a 25 year mean hatch success of 63.8%.

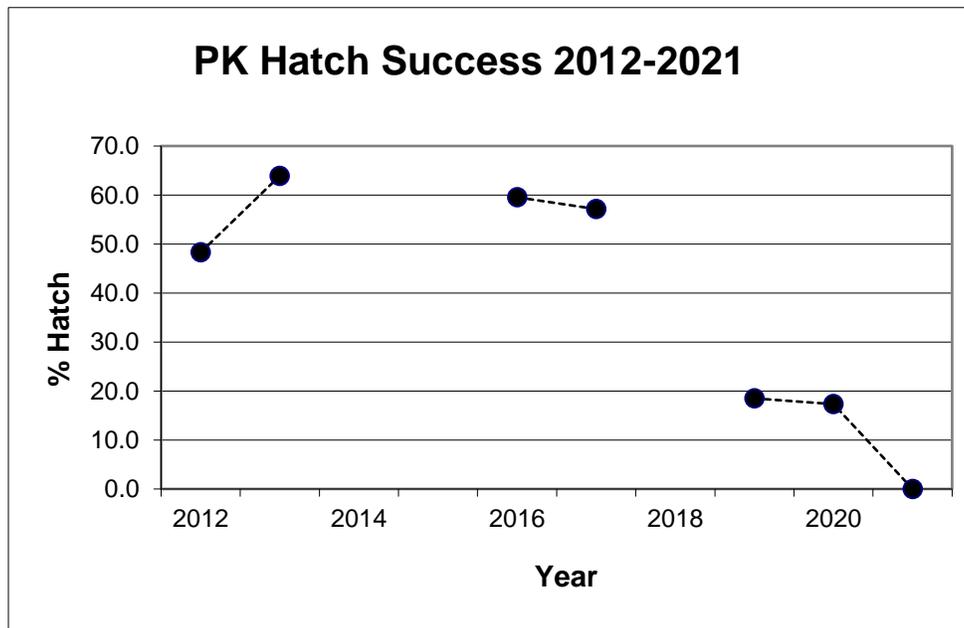


Figure 12: Annual mean hatch success (% hatch) from the 2012 - 2021 nesting seasons on Perdido Key. Data is missing or incomplete for some years. Mean hatch success for the 2021 season was 0.0%.

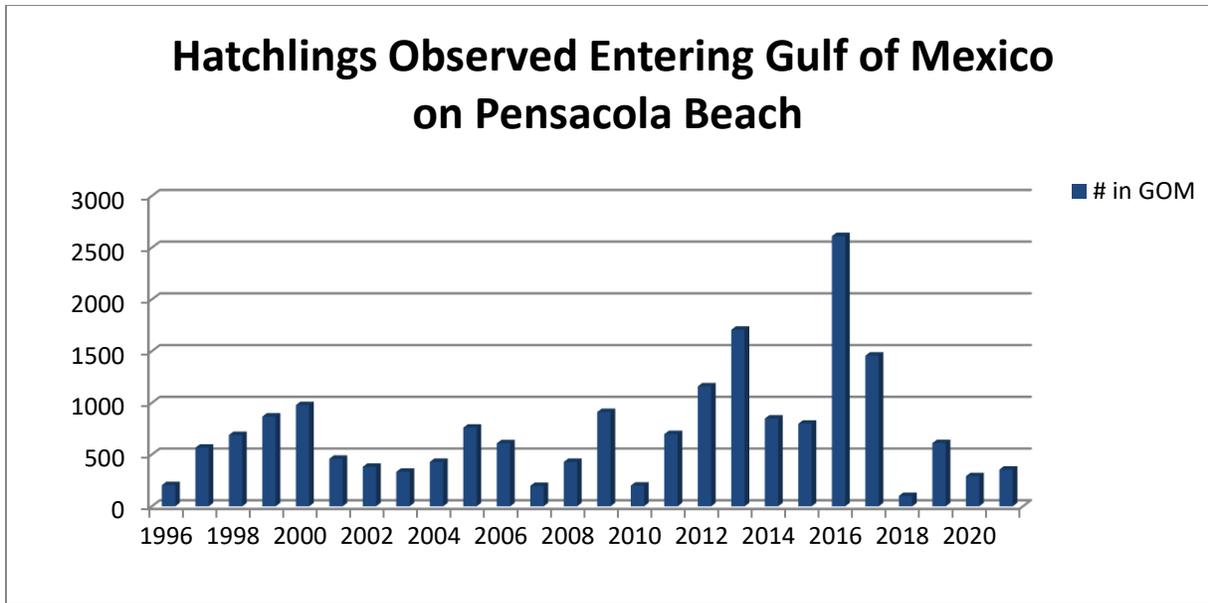


Figure 13: Number of hatchlings observed entering the Gulf of Mexico from the 1996 - 2021 nesting seasons on Pensacola Beach.

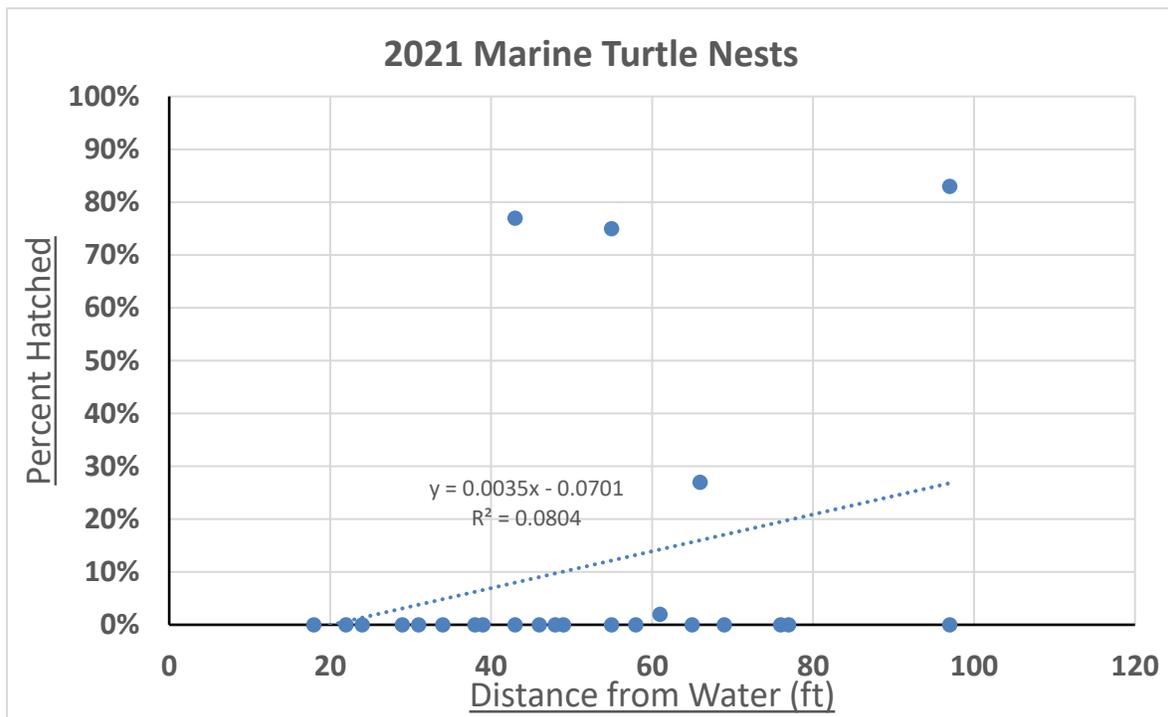


Figure 14: 2021 Pensacola Beach plotting nest hatching success versus distance nests are laid upland from the Gulf of Mexico.

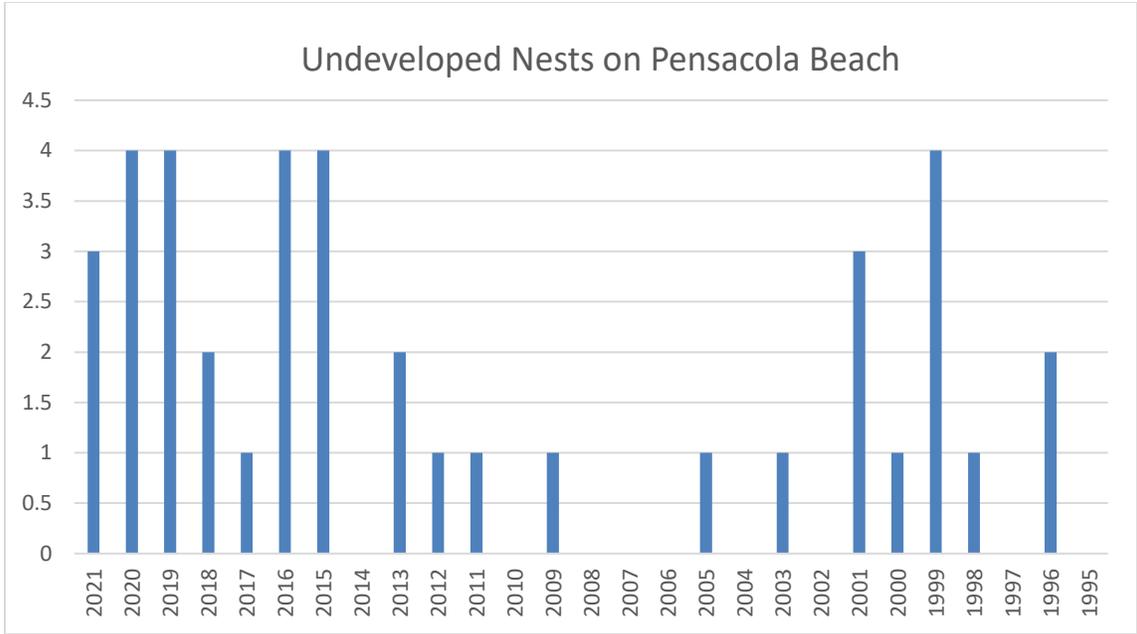


Figure 15: 2021 Pensacola Beach undeveloped nests.

Pensacola Beach Disoriented Nests 1996 - 2021

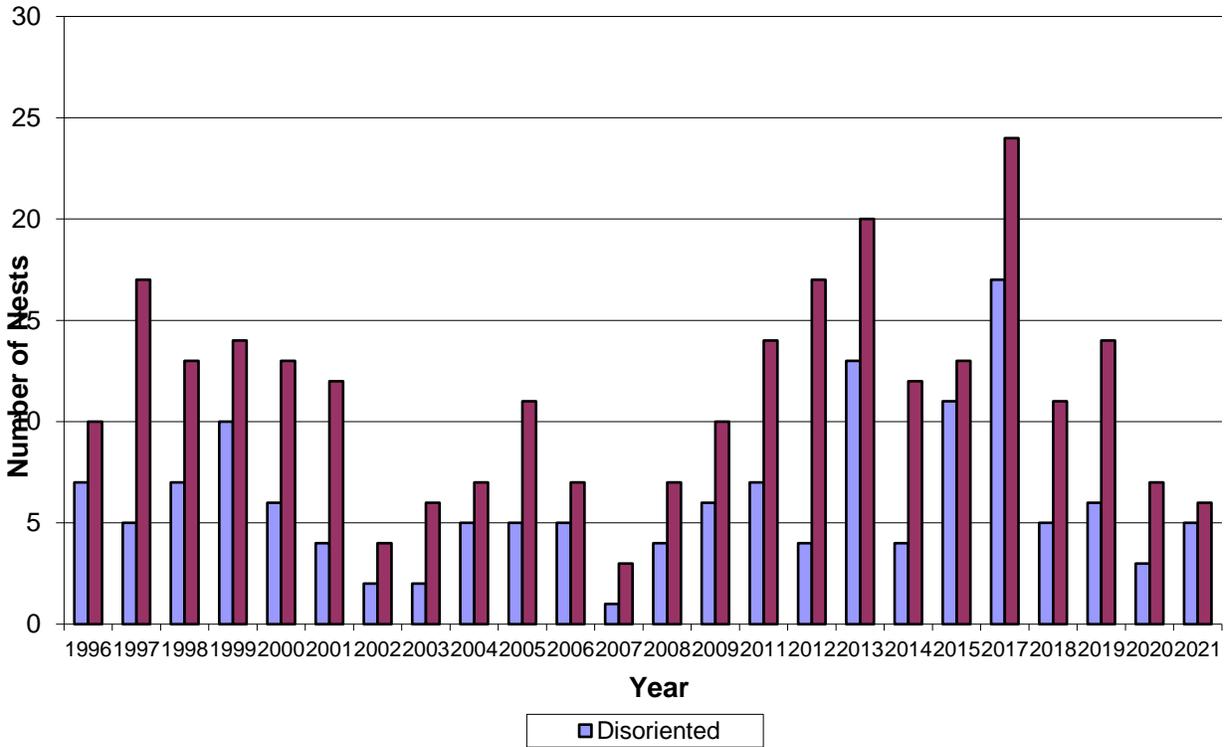
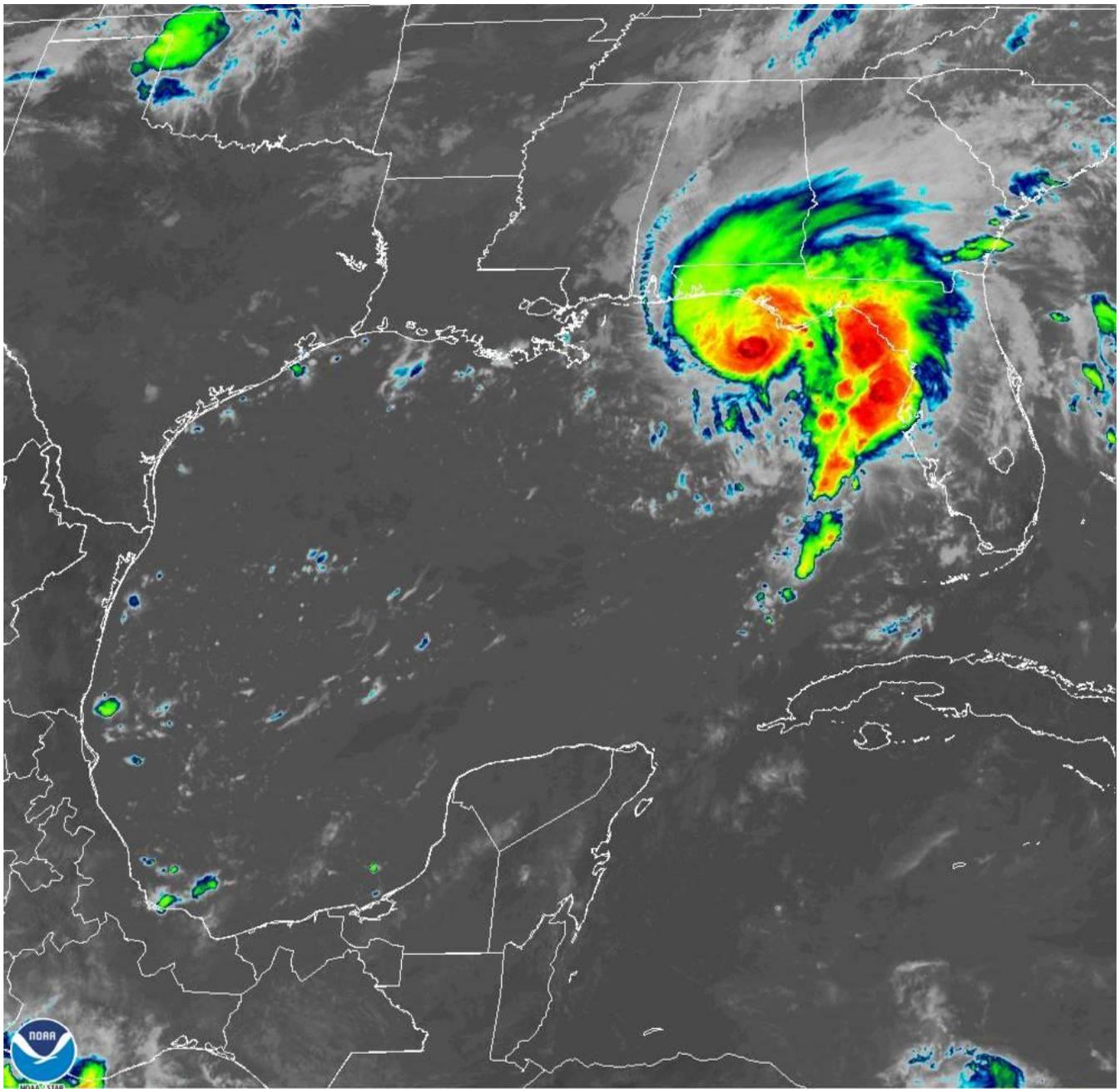


Figure 16: Comparison of marine turtle nests with hatchling disorientation to the total number of nests per season from 1996-2021 on Pensacola Beach. Disorientation data is not shown for the 2010 and 2016 seasons due to relocation of all incubating nests offsite during the 2010 Deepwater Horizon oil 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.



16 Aug 2021 15:11Z NOAA/NESDIS/STAR GOES-East Band 13

Figure 17: TS Fred



Figure 18: Nest PB01 was afforded additional protection due to its location just before Memorial Day crowds. Storm surge resulting from Tropical Storm Claudette flooded the nest in mid June. Public Works erected the additional enclosure to keep crowds off of the nest.



Figure 19: Photograph illustrating light pollution issues near nesting beaches.



Figure 20: Nightly occurrence on Pensacola beach is for beach goers to use flashlights/cell phones, thus inhibiting emergences by marine turtles to nest.



Figure 21: Loggerhead turtle had to negotiate a beach littered with beach goer debris during Memorial Day weekend when Leave No Trace is waived.



Figure 22: Disoriented green hatchling from PB15 located during morning survey post hatch.



Figure 23: Kemp's ridely entangled in line and rod, found by local fishermen. The turtle was untangled and released by the fishermen.



Figure 24: Release by fishermen after the line and rod were removed. The turtle was not hooked, just entangled in the line.



Figure 25: Kemp's ridley became entangled in fishing line on July 19, 2021 on Pensacola Pier and was rescued by the fishermen/pier staff and was transported to Gulfarium by Escambia County sea turtle volunteer.



Figure 26: Photograph of nest PB16 after tropical storm Fred. The wrack line is observed approximately 20 feet north of the nest. Hurricane Ida replicated the flooding 2 weeks later.



Figure 27: Photograph of embryo from nest PB16 which failed in development at the 40 day mark, corresponding to the same time frame that Hurricane Ida hit the area. Embryos had survived previous flooding from TS. Fred.



Figure 28. PK02W during Hurricane Ida on August 29, 2021. This nest failed to hatch.

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

Pensacola Beach 2021	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)	Total Impact (NM)	# in water witnessed (apx.)	Approx. Tracks to GOM	Relocated (NM)	Crawl width (ft)	Distance dune/weg from water (ft)	Distance $\geq 10'$ scarp (NM)	Latitude	Longitude		
	1	5/28	Cc	8/10	74	87	0	20	0	65	61	75%	70%	N	Y	Y	64	0	N	34	63	55	N	30.345175	87.068817	
	2	6/4	Cc	8/13	70	105	0	18	0	87	86	83%	82%	N	Y	Y	86	0	N	38	71	97	N	30.32206	87.152722	
	3	6/12	Cc	lba	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	36	49	49	N	30.33778	87.102500	
	4	6/18	Cc	Claudeite	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	36	180	29	N	30.331915	87.137068	
	5	6/24	Cc	lba	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	34	80	39	N	30.328167	87.17611	
	6	6/26	Cc	lba	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	34	48	38	N	30.335000	87.17222	
	7	6/28	Cc	828	61	NA	0	NA	NA	NA	NA	NA	NA	N	Y	Y	128	0	N	41	56	58	N	30.340000	87.091111	
	8	7/6	Cc	Fed	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	34	105	34	N	30.335343	87.15897	
	9	7/7	Cc	NA	NA	101	0	101	0	0	0	0%	0%	N	NA	N	0	0	N	36	15	69	N	30.334700	87.19800	
	10	7/7	Cc	lba	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	42	65	31	N	30.348700	87.046500	
	11	7/13	Cc	lba	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	37	90	46	N	30.327209	87.16746	
	12	7/18	Cc	lba	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	30	65	76	N	30.335717	87.14216	
	13	7/19	Cc	NA	NA	97	0	97	0	0	0	0%	0%	N	NA	Y	0	0	N	36	62	65	N	30.340366	87.078833	
	14	7/20	Cc	Fed	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	33	70	43	N	30.328503	87.153229	
	15	7/20	Om	923	65	92	0	13	48	31	29	34%	32%	N	Y	Y	4	15	N	37	5	66	N	30.344861	87.08270	
	16	7/21	Cc	NA	NA	101	0	6	95	0	0	0%	0%	N	NA	Y	0	0	N	36	56	77	N	30.349161	87.04927	
	17	7/25	Cc	Fed	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	36	82	55	N	30.32816	87.147094	
	18	7/31	Cc	Fed	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	37	127	48	N	30.325011	87.10899	
	19	8/1	Cc	Fed	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	30	109	18	N	30.330852	87.033371	
	20	8/4	Cc	NA	NA	52	0	44	7	1	0	2%	0%	N	N	Y	1	0	N	34	80	61	N	30.349000	87.051000	
	21	8/6	Cc	Fed	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0	0	N	39	150	24	N	30.325833	87.172028	
	22	8/7	Cc	Fed	NA	114	0	NA	NA	0	0	0%	0%	N	NA	Y	0		N	36	62	22	N	30.349944	87.05278	
	23	8/17	Cc	NA	NA	94	0	11	3	2	NA	83%	NA	N	Y	Y	72	0	N	38	35	43	N	30.328277	87.170888	
	24	8/18	Cc	NA	NA	98	0	98	0	0	0	0%	0%	N	NA	N	0	0	N	36	22	97	N	30.326667	87.164722	
n=	24					4	24	24	24	23	22	23	22	24	5	22	24	11	24	24	24	24	24			
sum						2423	0	408	153	2	282	176		0	6	24	355	15	0	859.8	1747.3	1240.1	0			
mean						105	0	45	17	2	11	8	10.8%	7.3%			15	1		36	73	52				
St.Dev						14.6	0.0	41.4	33.1	26.8	22.4	0.3	0.2			34.8	4.5		2.8	40.3	21.6					
						114	egg # assigned by PNC for nests last to person																			

Table 3: Hatchling disorientation events on Pensacola Beach in 2021.

Nest ID	Location/Landmark	Date of Event	Moon Phase	# Disoriented hatchlings (observed)	# of Non-disoriented hatchlings (observed)	# Disoriented hatchlings witnessed entering GOM	Probable/Possible Source	Comments
PB01	1 mile east of Portofino	10-Aug	5%, Waxing crescent	60	1	60	Portofino	loggerhead
PB02	Beach Club Condo	13-Aug	28%, Waxing crescent	80	0	80	Beach Club @ 18 Via DeLuna, Emerald Isle Condo	loggerhead
PB07	1754 Ensennada Sais	28-Aug	69%, Waxing gibbous	128	0	released offshore by Gullitatum in Gulf of Mexico	1754 Ensennada Sais	loggerhead
PB15	1 mile east of Portofino	23-Sep	91%, Waxing gibbous	40	0	3	Portofino	Green turtle
PB23	Portside Villas		40%, Waxing crescent	61 on 10/29, 11 on 10/30	0	72	Sky Glow to the north	loggerhead

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

NEST'S INCUBATION INCIDENTS

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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