



A Preliminary Study of Environmental Impacts on the Reproduction and Survival of Loggerhead Sea Turtles in Hobcaw Beach - North Inlet Winyah Bay, South Carolina (2020-2022)

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Abstract:

Loggerhead sea turtles are vulnerable to extinction due to factors such as climate (sea level rise, natural disaster event frequency) and predation. This causes detrimental effects to sea turtle egg/nest success rates. By observing data from "Sea Turtle Nest Monitoring System" provided by South Carolina Department of Natural Resources and Sea Turtle Conservation Program, the data provides insight on the success rate, loss, and other findings of Hobcaw Beach, SC.

Background:

Turtles nesting sites are constantly facing obstacles in regards to their survival. Some of these obstacles include climate change and predation.

Climate change is causing a higher frequency/category of natural disasters (hurricanes) and sea level rise, which then in return causes erosion of beaches. Sea turtles embryos can only survive in certain climates, between 81° F and 89° F. This makes beach nesting sites limited, then add the effects from climate change and these nesting sites are becoming fewer and fewer every-year.

Predation is causing a decrease in survival rates of sea turtle embryos. The main predators that sea turtle embryos face are coyotes, raccoons, ghost crab, and sea birds. This is due to "sea turtle nest predators no-longer have natural predators themselves and the have adapted extremely well to living among people ... people living near the beach may be intentionally or unintentionally feed nest predators" (Sea Turtle Conservancy, 2022). This can lead to high levels of nest predation and a detrimental effect on the reproduction rate of sea turtles.

Methods:

Research Includes:

- Vessel and Aerial Surveying
- Nesting Beach Studies
- Satellite Tracking
- Mark Recapture (Tagging)
- By-Catch Datasets
- Observations of Environment
- Monitoring/Understanding Fisheries and Environmental Impacts

Acknowledgements:

1. **Special Thanks to Professor Kennie Leet and Professor Jason Smith for their guidance**
2. http://www.seaturtle.org/nestdb/index.shtml?view_beach=37&year=2022
(South Carolina Department of Natural Resources, South Carolina United Turtle Enthusiasts, 2022)
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3. http://www.seaturtle.org/nestdb/index.shtml?view_beach=37&year=2020
(South Carolina Department of Natural Resources, South Carolina United Turtle Enthusiasts, 2020)
4. <https://www.fisheries.noaa.gov/species/loggerhead-turtle>

Results:

2022 Nesting Season:

(Analysis Incomplete: 30%)
Nests: 40 (Loggerhead Only)
Relocated: 10 (25%)
Lost: 1 (2.5%)
Estimated Eggs to Date: 4275
Eggs Lost: 43 (1%)
Hatched Eggs: 3041
Emerged Hatchlings: 2929
Mean Hatch Success: 69.8%
Mean Emergence Success: 67.1%
Nest Success: 89.4%
Beach Success: 40.8%

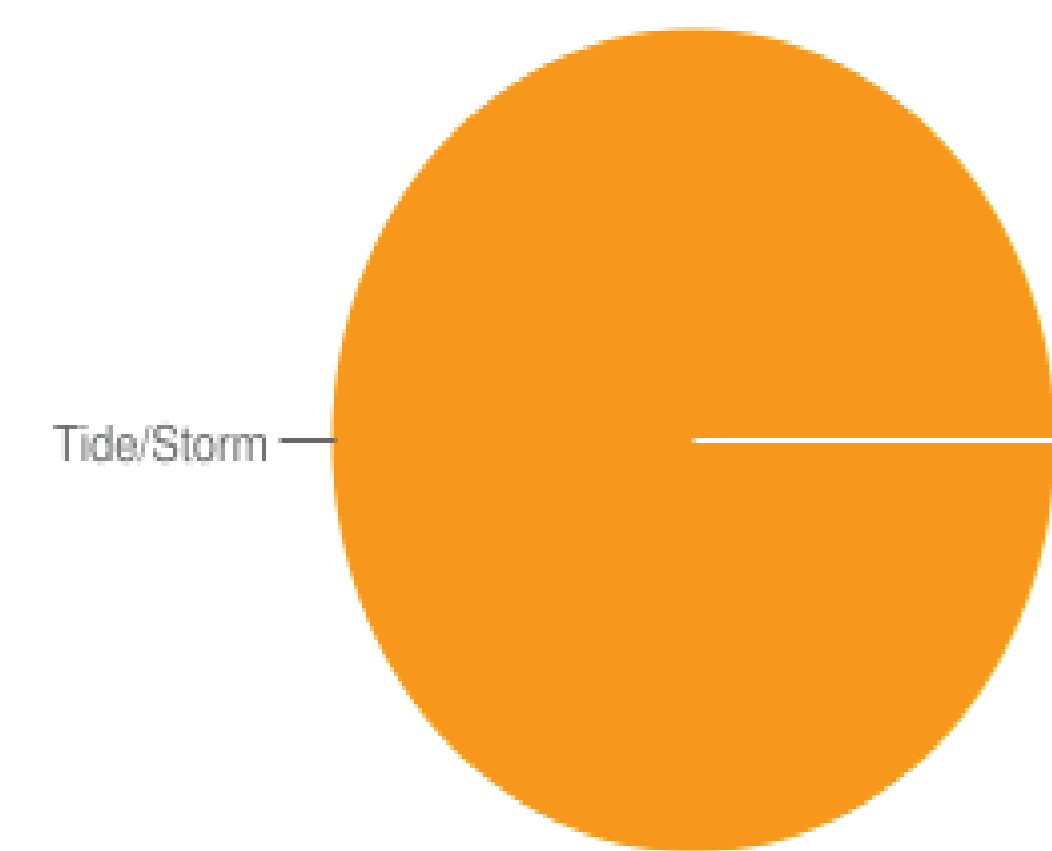


Figure 2: Nest Loss (2022)

Figure 1: Egg Loss (2022)

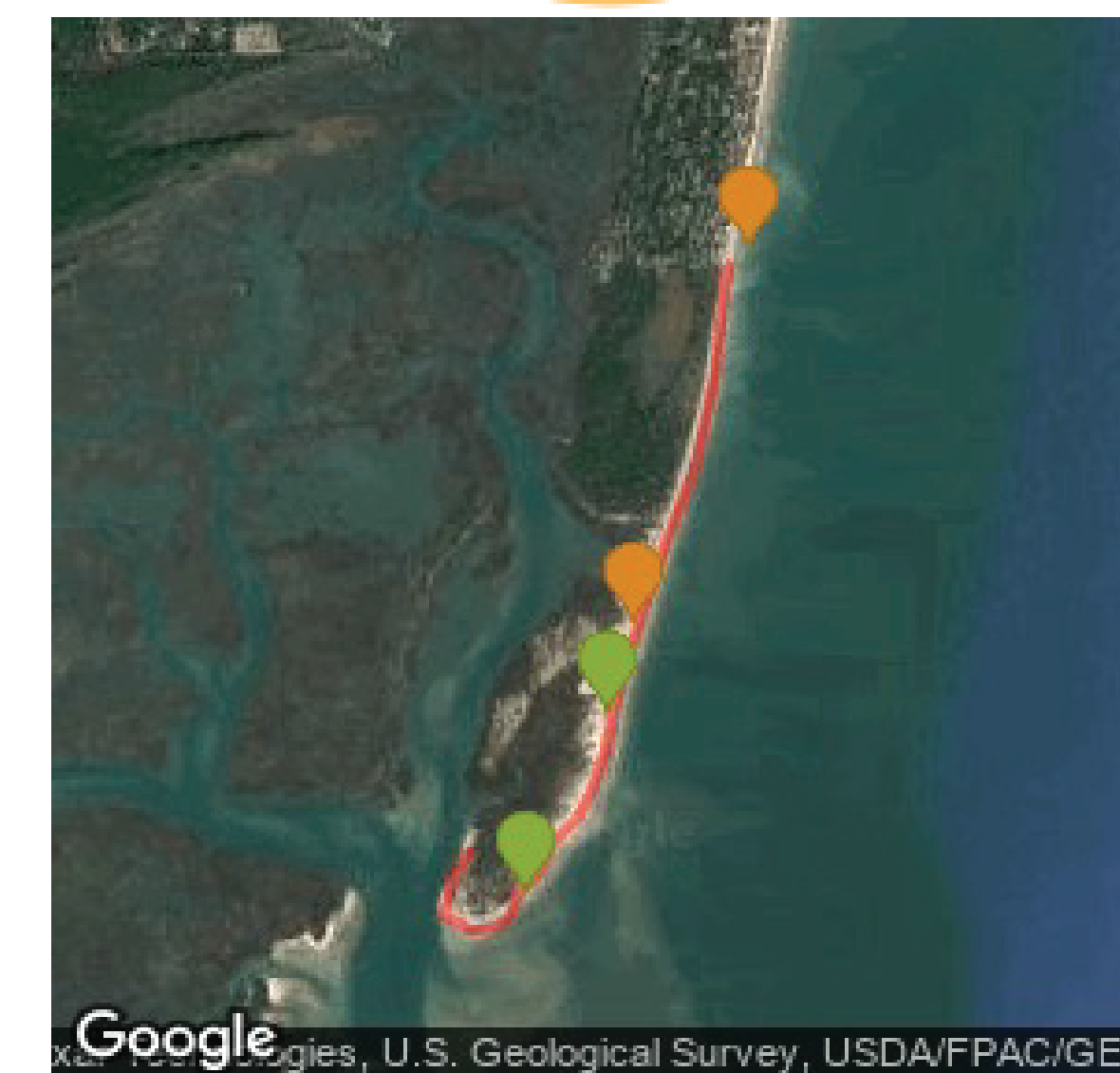
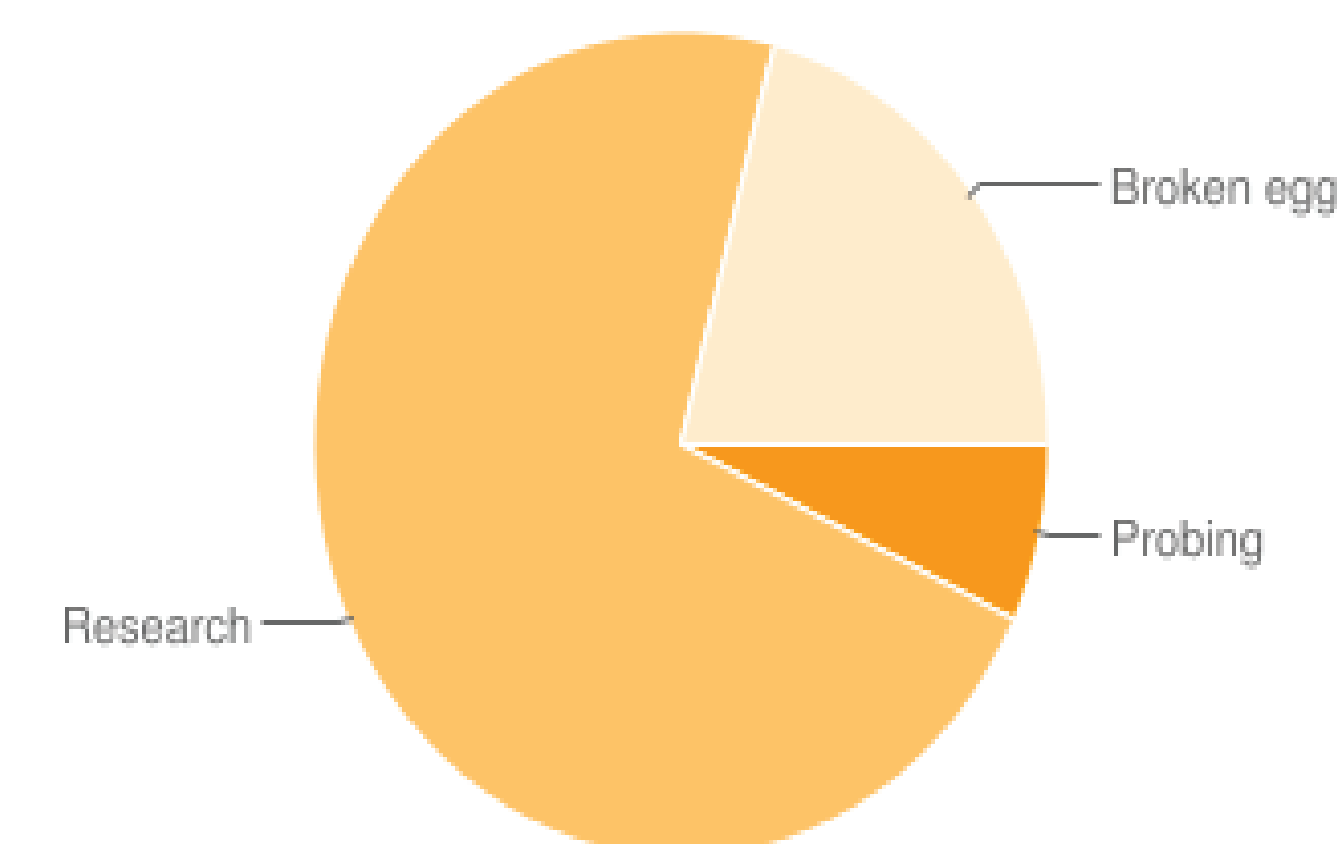


Figure 3: Nest Sites
Green (1-5), Orange (11-20)

Results:

2020 Nesting Season:

(Analysis Complete: 100%)
Nests: 46 (Loggerhead Only)
Relocated: 5 (10.8%)
Lost: 18 (39.1%)
Estimated Eggs to Date: 2112
Eggs Lost: 75 (3.5%)
Hatched Eggs: 1101
Emerged Hatchlings: 1010
Mean Hatch Success: 28%
Mean Emergence Success: 25.9%
Nest Success: 40%
Beach Success: 46.9%

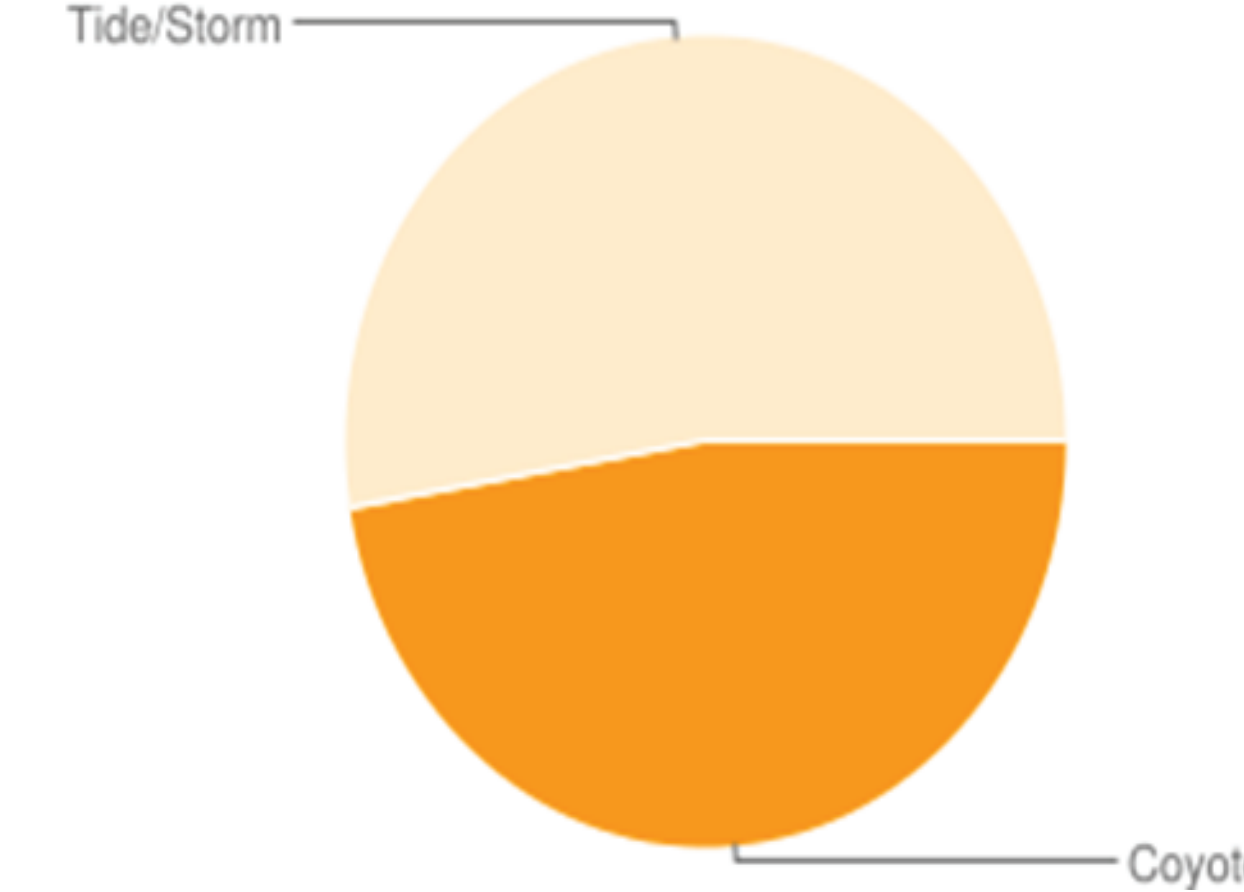


Figure 7: Nest Loss (2020)

Figure 8: Egg Loss (2020)

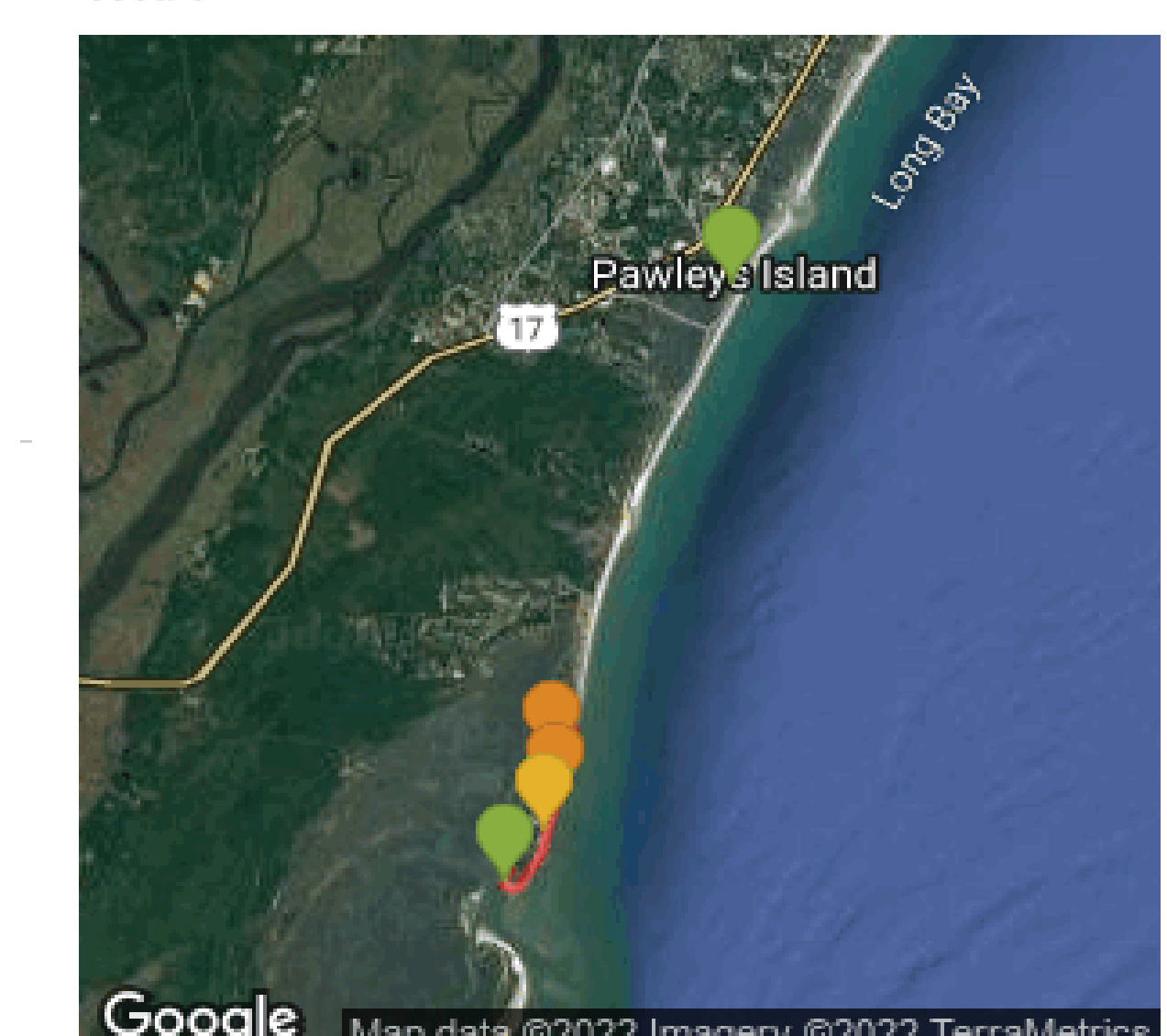
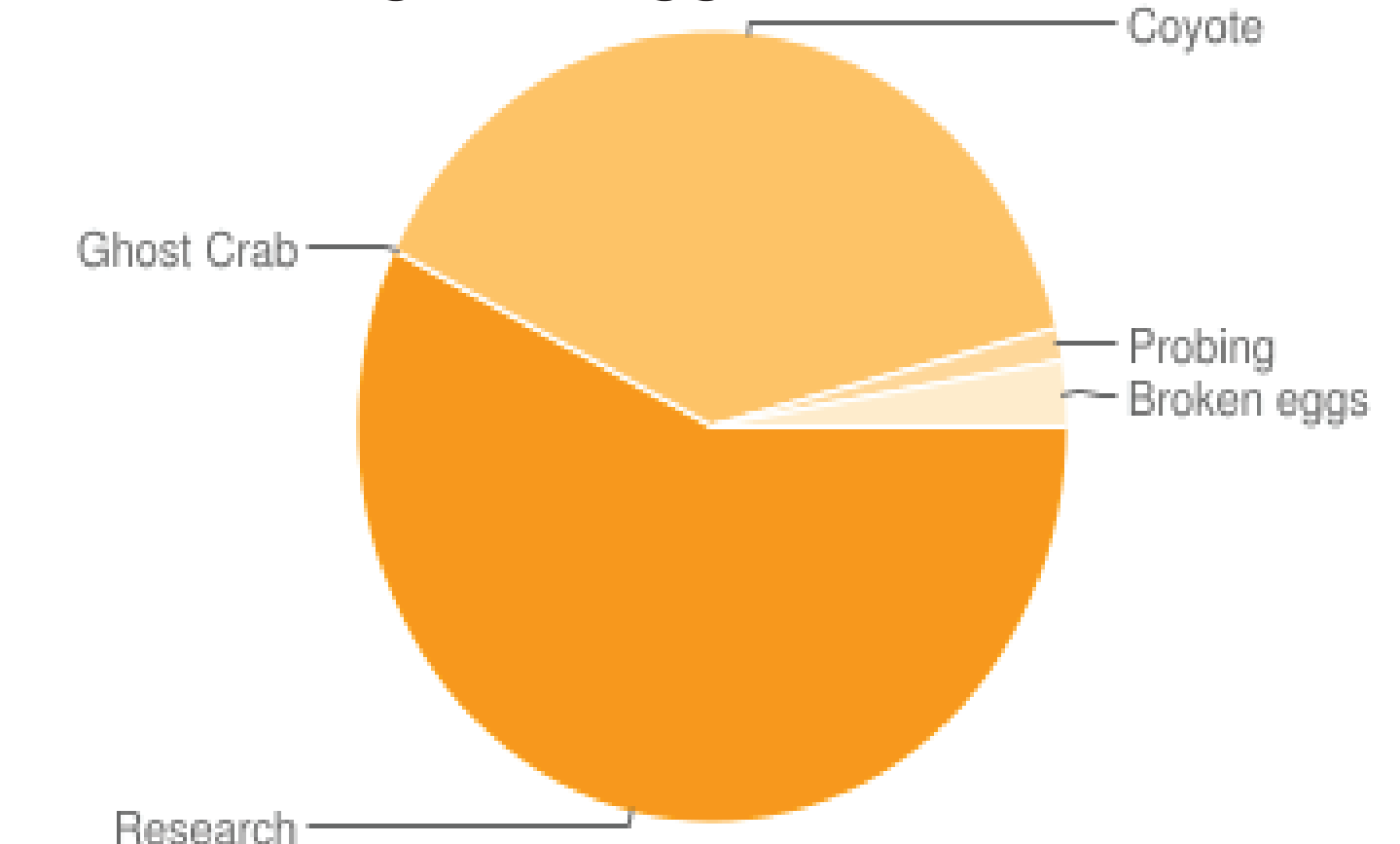


Figure 9: Nest Sites
Green (1-5), Yellow (6-10), Orange (11-20)

2021 Nesting Season:

(Analysis Complete: 100%)
Nests: 39 (Loggerhead Only)
Relocated: 9 (23%)
Lost: 1 (2.5%)
Estimated Eggs to Date: 3782
Eggs Lost: 69 (1.8%)
Hatched Eggs: 2600
Emerged Hatchlings: 2350
Mean Hatch Success: 67.4%
Mean Emergence Success: 60.8%
Nest Success: 87.1%
Beach Success: 60.9%

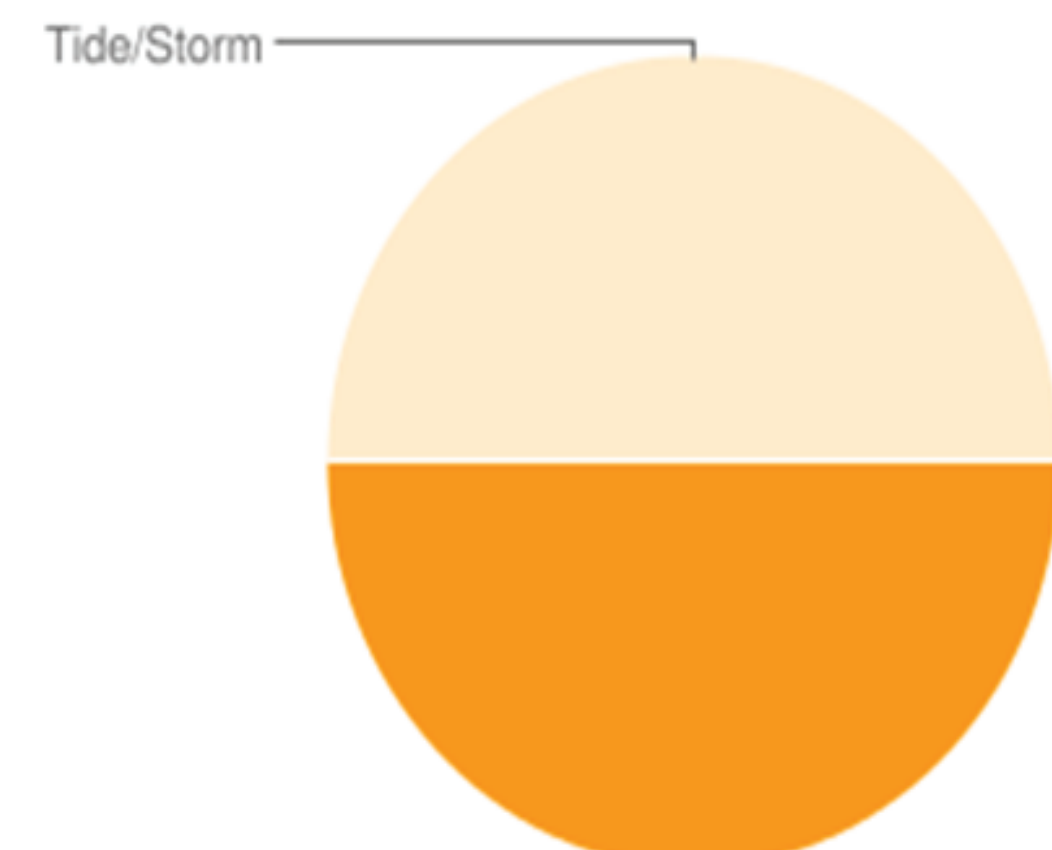


Figure 4: Nest Loss (2021)

Figure 5: Egg Loss (2021)

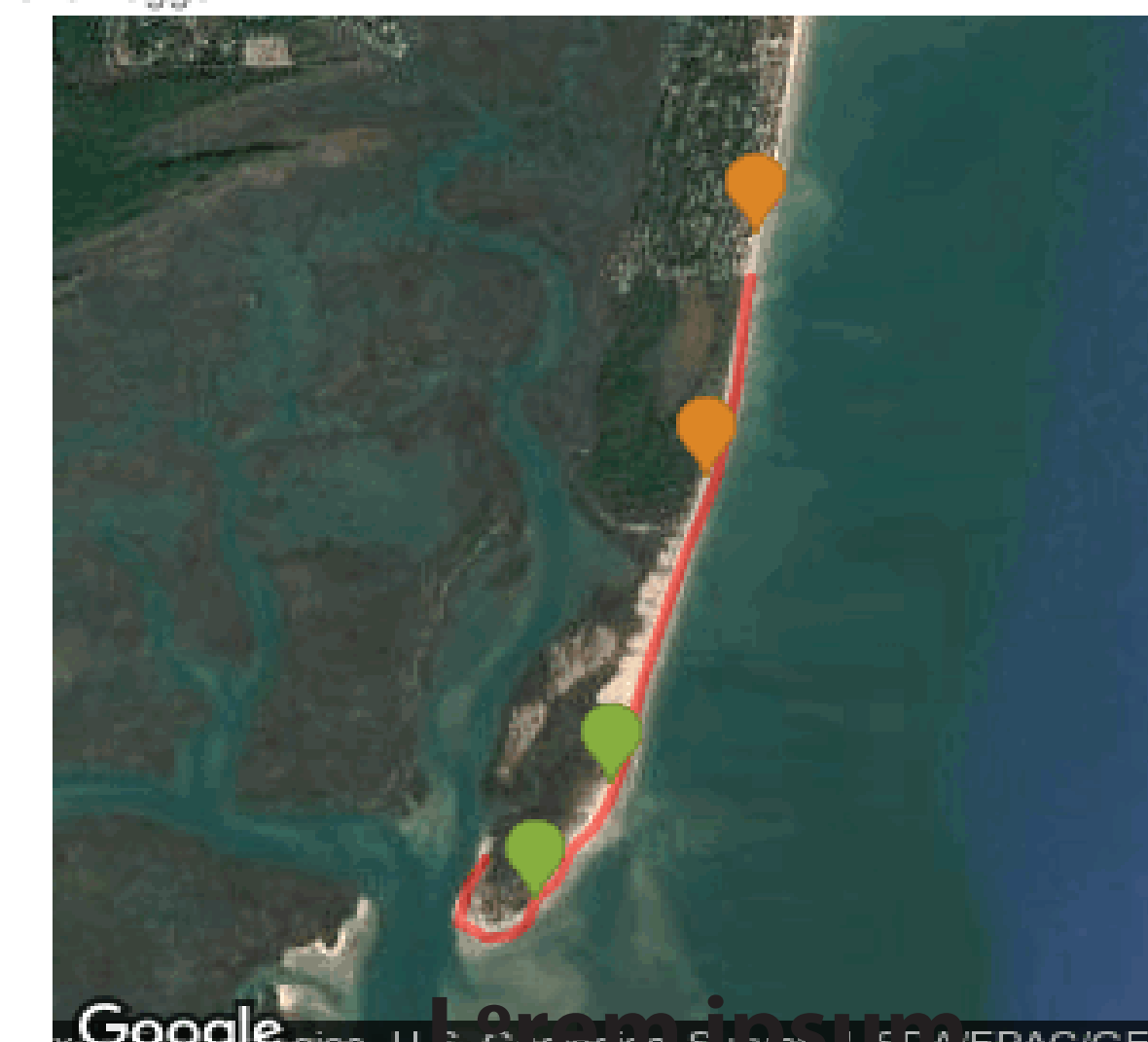
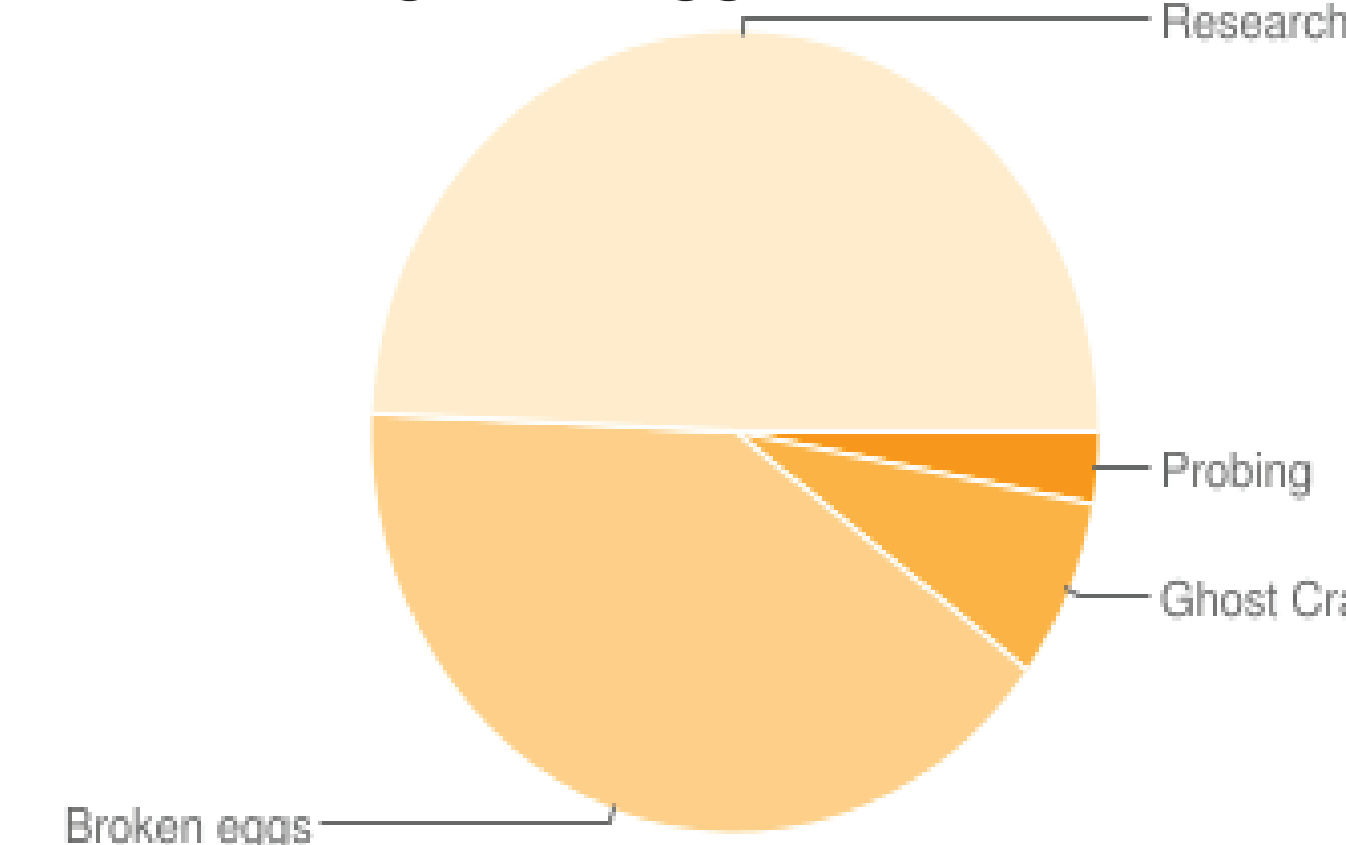


Figure 6: Nest Sites
Green (1-5), Orange (11-20)

Solutions:

1. Nest Relocation

By studying proper relocation sites and relocating at-risk egg clutches, the success of eggs and hatchlings are increased.

2. Anti-Predator Mesh Enclosures

Mesh nest enclosures proven to be useful at prevention predation of sea turtle nest, however these enclosures can only be used based on location and the amount of nest sites, due to limited space that occur from using nest enclosures, which then can disturb the emergence success rate.

3. Predator Management

These efforts of predator management were successful and cost effective.

Conclusions:

When one factor is paired with another factor, the effect on sea turtle nest and hatch success rate is detrimental. This is due to a correlation between the amount of loss, the cause of loss and the beach success rate for that overall nesting season. Solutions such as predation management, nest enclosures and relocation proven to effective for increasing sea turtle nest and hatch success rate.