

Funding Request: Loggerhead Sea Turtle Genetics Project



Photo by Breanna Ondich

Project Purpose: Assessing the effects of human activities and management on the recovery of the loggerhead sea turtle population by continuing the long-term genetic tagging project.

Project Need: The loggerhead sea turtle is a threatened species that serves as indicator of ecosystem health in open ocean and coastal habitats. The number of loggerheads in the southeastern USA declined dramatically from human-related activities such as commercial fishing and negative impacts to their nesting beaches. After decades of nest protection and the implementation of turtle excluder devices in shrimp trawl nets, the annual number of nests has increased from its lowest point in 2004. However, nest numbers are still below historic levels.

Project Activities: Counting nests provides clues about how many mother turtles there are in the population, but alone does not provide the nesting histories of individual females that are needed for accurate population models. In 2006, Brian Shamblin at the University of Georgia developed new DNA markers that could be used to identify individual loggerhead turtles from egg samples. Since 2010, we have developed nesting histories from all known loggerhead nests in North Carolina, South Carolina, Georgia, and three counties in northeastern Florida (13,700 females) using samples collected by community science volunteers and staff. These nesting histories have been critical to choosing management actions, as they have allowed us to develop a population projection model that estimates changes in population size under different management activities. Nesting histories also provide compelling stories of unique mother turtles (see reverse side) that are shared with the general public via collaborator education programs to foster demonstrated public support for conservation. This project represents one of the largest of its kind in the world and is an example of successful collaboration among academia, state agencies, beach managers, biologists, and community science volunteers.

Expected Benefits: Many important questions remain unanswered. Because loggerhead turtles take decades to mature and live a long time, estimating female survival, new female recruitment, age of maturity, and how long they reproduce requires long-term data collection. At best, we have only recently laid the foundation and must continue collecting and analyzing samples to address important long-term questions. About 25% to 35% of the females identified each year are new females reaching maturity. Our goal is to continue the research until we can match a majority of these new females to a known mother in the genetics database. New aging techniques (called epigenetic aging) will make it possible to estimate the age of a loggerhead turtle from a genetics sample. It is critical that we keep collecting samples at the same sites, without any gaps in space or time, to ensure accurate estimates of age at sexual maturity and reproductive life span. Additionally, supplemental sampling of dead hatchlings from nests will provide information about elusive male loggerheads. Rising temperatures have led to a complete lack of male production in some sea turtle populations, so baseline data for adult male loggerheads in our region are needed. Finally, data from continued sampling will be used to refine and improve our population projection model that will be used to safeguard the survival of the species.

Requested Funding: The project was previously funded through grants from NOAA Fisheries. To continue our sampling and answer critical questions for management, we are requesting funds to analyze genetic samples. It costs approximately \$30 to collect, analyze, and archive each genetics sample.

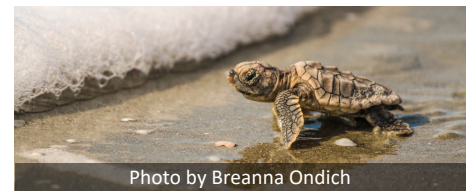


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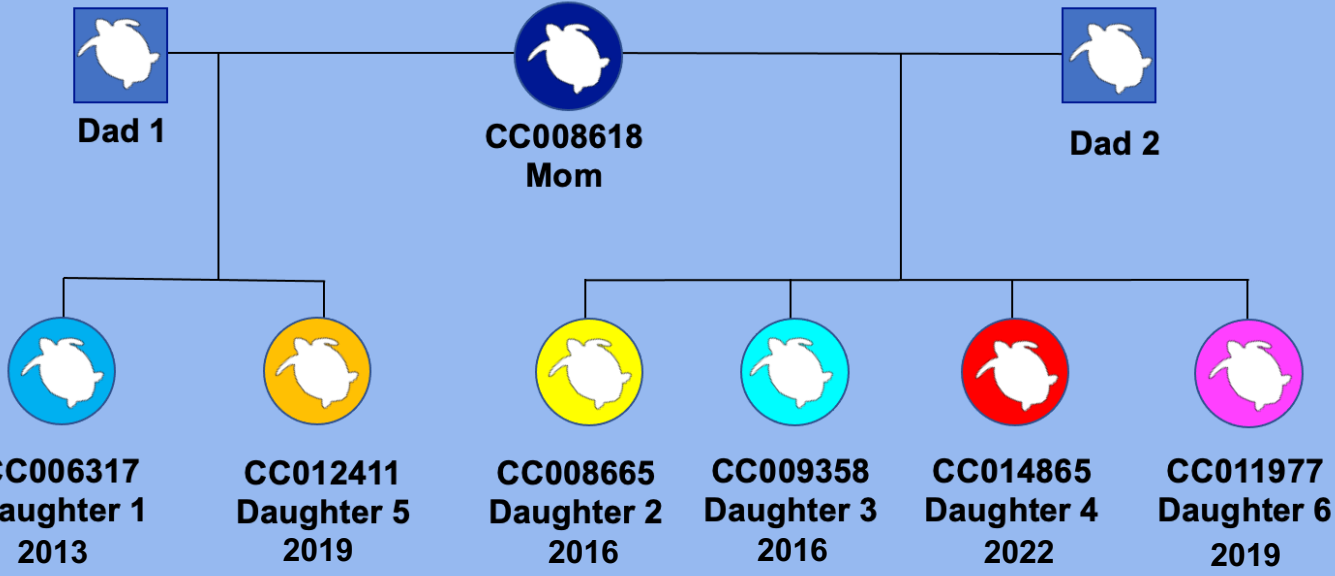
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The genetic markers we use to assign nests to individual females can also tell us about close relatives. Turtle CC008618 is a “super mom” that has six daughters that have started nesting recently! Having these family data is important for estimating how old the females are when they begin nesting and how many years they nest. They also provide valuable information on the size of the “natal neighborhood,” the area that a female returns to when she starts laying eggs. We are in a unique position of having genetic tags for Georgia and northeastern Florida’s loggerhead nesting population. We need to continue the genetic tagging project to estimate:

- 1) Survival of the nesting females,
- 2) Recruitment: how many new females are coming into the population,
- 3) Natal homing- defining where daughters nest in relation to their mothers

With new aging techniques in development, we hope that it will soon be possible to estimate the age of these females, so continued monitoring is critical for accurate age estimates. We are also testing ways to estimate the number of breeding male loggerheads that compliment the female genetic tagging.

