Investigating The Behavior Of Juvenile Green Sea Turtles Using Animal-Borne Cameras

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INTRODUCTION

Science is built upon observations of the natural world. The methods of observation have recently been altered through the use of animal-borne cameras in an attempt to limit the observer effect. Animal-borne cameras have been used to collect data on a variety of marine animals, however, due to the limitations of modern technology, these cameras have been restrictively large and therefore have only been deployed on larger species. With the recent miniaturization of these cameras, the units are able to attach onto smaller wildlife without restricting the organism's movement or affecting its behavior. Since this development has come into place, we've been able to attach these animal-borne cameras onto juvenile green sea turtles.

The ideal location to conduct research on these turtles is in South Eleuthera. This is due to the abundance of mangrove creeks. Turtles migrate to these mangroves for two main factors: the abundance of food, and shelter from larger predators. CEI has been conducting a long-term tagging project throughout these creeks, which helps us to understand the growth rate of turtles (the size at which they enter the creeks and the size at which they leave). However, despite knowing this, we have limited information on how the individuals spend their time in the mangroves. Although many believe that turtles are not social animals, recent research has indicated that turtles are far more social than we previously thought. However, we are still unsure of the purpose of these interactions.

The primary objective of the TurtleCam project is to assess the social behaviors of turtles and the intentions of these interactions. Our research aims to answer the following questions: 1) what are the common activity patterns of juvenile green sea turtles? And 2) do the juvenile turtles take part in social interactions, and why?

METHODS

Fig. 1A. Starved Creek, where we deployed several cameras.
Fig. 1B. Chasing after a turtle before capture.

- Turtles are captured using the Rodeo method.
- After the turtle is on the boat, we take a series of measurements and tag the turtle when necessary.
- Following these measurements, we attach the camera unit by gluing plastic mesh pieces (attached to Galvanic timed releases) to the turtle's carapace.
- After three hours, we collect the camera using a radio receiver that communicates with the camera's transmitter by admitting an audible signal that allows us to find its approximate location.
- We then download the camera footage and look through it to see what kinds of behaviors the turtles are exhibiting, and whether their social interactions are aggressive or not.
- Through this analysis, we can also see how the camera is affecting the turtle's actions.

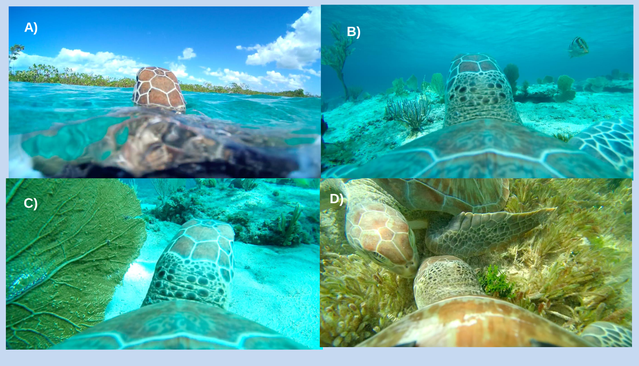

Fig. 2. Images taken with turtle cam of turtle

A) breathing

B) swimming

C) cleaning

D) social Interactions

RESULTS AND DISCUSSION

So far this semester, we have deployed ten TurtleCams. However, due to errors such as SD card difficulties or attachment point failures, we were only able to analyze data from five of the cams. We caught a range of turtles that spanned from 288 mm to 561 mm in curved carapace length. Each turtle caught gave us roughly 3 hours of footage, so we received and analyzed about 15 hours total. The data collected from these videos are shown in the following graph.

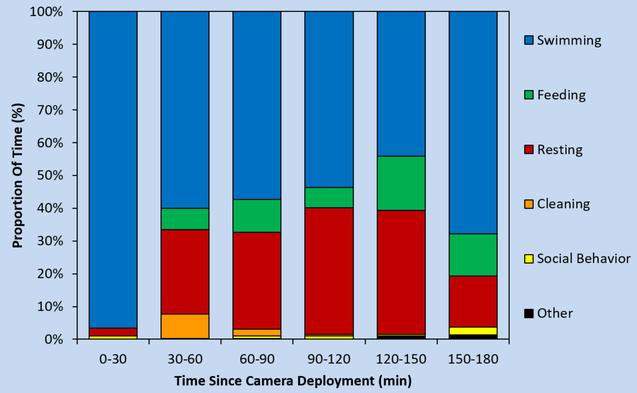

Fig. 3. bar graph depicting the different activities a turtle spends its time doing

The turtle spends the majority of its time swimming. In the first 30 minutes, the turtle spends more than 95% of its time swimming. This is most likely due to the turtle's heightened state of stress immediately after the turtle's release. The cleaning behavior is seen from 30-90 minutes, possibly because of the turtles' discomfort with the camera. After the first 90 minutes, their behavior becomes more natural, and we can receive the most authentic data. Once they have totally re-adapted to their environment, we see more of a balance with the behaviors. The turtles spend, on average, 10% of their time feeding, 20-40% of their time resting, and 50-70% of their time swimming. The social behavior, represented by yellow, has very limited data in all time ranges– the turtles only spent roughly 2% of the time interacting with others of their kind. (Fig. 3)

We divided the social interactions identified into five different categories; follow, inspect, approach/head bump, no response, and chasing/biting. The follow, inspect and approach/head bump categories are considered non-aggressive interactions. No response includes completely passive interactions, and chasing/biting is categorized as an aggressive interaction. This distribution of interactions is displayed in Fig. 4.

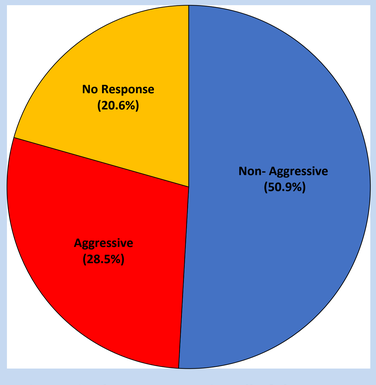

Fig. 4, pie chart representing all of the interactions and whether they were aggressive, no response or non- aggressive

RESULTS AND DISCUSSION

This next chart demonstrates where the turtles spend their time, and what types of social interactions occur in each environment. Out of all these different habitats, the turtles only showed aggressive behavior in the algae environment. In the rest of the habitats, all the interactions were either non aggressive or non responsive. In the algae habitat, around 50% of the social interactions were aggressive; this shows us that the turtles are aggressive in the algae environment due to competition over food.

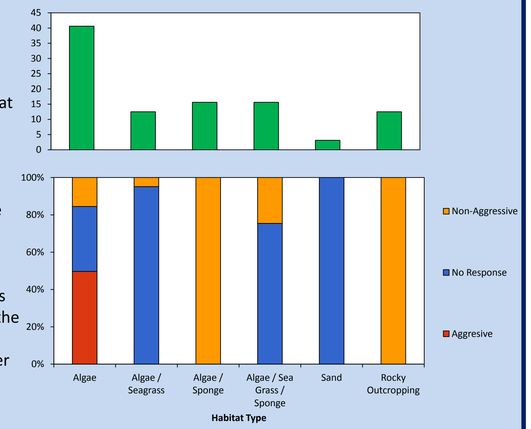

Fig. 5. bar graph depicting the types of social interactions that occur in each environment.

FUTURE OF TURTLECAM

We have collected many hours of footage which revealed everything from feeding to social behavior. If we collected more data our conclusions have the potential to be a lot stronger. We are unable to use the first hour and a half of the footage to investigate the turtle's natural behavior as it is affected by the presence of the TurtleCam. To fix this, future iterations of the TurtleCam project will deploy cameras with a delayed start function of two to three hours. With this we can collect more data and conduct a more detailed analysis on the turtles behavior, without the time being limited by the camera. Using this footage there will be an investigation on their foraging patterns and how much they eat per day in order to survive, and determine how many turtles these local habitats can support.

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