Behavioral Effects of Ecotourism on Green Sea Turtles

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INTRODUCTION

The ecotourism industry is a large stimulus for the Bahamian economy. It makes up 20% of the GDP and provides over 50,000 jobs (WTTC 2017). Many tourists come to the Bahamas to interact with marine life like green sea turtles (*Chelonia mydas*). Green sea turtles are an endangered species and there is a great data deficiency concerning how ecotourism affects their behavior. Frequent human disturbance can lead to habitat abandonment or behavior change that can make them easier prey. It is important to know the effects of ecotourism on this species to protect the industry, economy, and the turtles. We are modeling our study off of Griffin (2017) who used in water observations with GoPro cameras to look at that behavioral responses of green sea turtles to suggest the best practice guidelines.

The purpose of our study is to build off of Griffin's methods by utilizing drone technology. We want to be able to quantify the behavioral responses of juvenile green sea turtles when disturbed by snorkelers in costal ecosystems in southern Eleuthera (Fig 1). We want to learn the potential impacts ecotourism has on these turtles because the industry is only growing in the Bahamas.

In our study, aim to find out if a turtle's size and approach angle influences how close a tourist can get to a turtle (Fig 6, 7). We hypothesize that if a turtle is smaller or is approached from head on, it will initiate a flight at a larger distance.

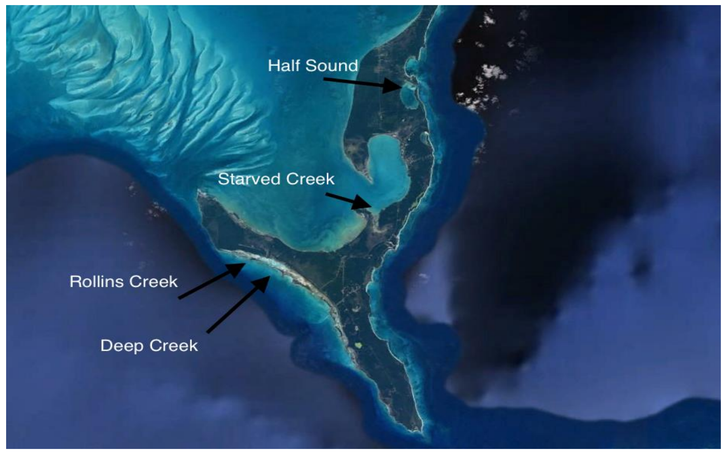

Fig 1. – Study site in Southern Eleuthera

RESEARCH QUESTIONS

Does the turtle size affect the flight initiation distance?

Does the approach angle influence the turtles avoidance behavior?

HYPOTHESIS

If a turtle has a smaller straight carapace length, then it will have a larger flihht initiation distance..

If a turtle is approached from an anterior angle (135°-180°), then it will have a larger flight initiation distance.

METHODS

Our study was conducted in mangrove creeks and coastlines in Southern Eleuthera (Fig 1.) By applying a standardized disturbance stimulus (Fig 2.), an overflying drone at an altitude of 35m captured disturbance events reflective of the activities of recreational snorkelers. Drone footage was later analyzed by trimming videos into individual disturbance events, sequenced using Adobe Premier video editing software, and disturbances quantified using Image J software (Fig 3). We collected the following data: Strait Carapace Length (SCL), Approach Angle (AA), and Avoidance Distance (AD). All measurements were calculated using an in frame scale object, approach angel was determined relative to the turtle's head (Fig 4).

Fig 2. – Disturbance stimuli in the water with a green sea turtle

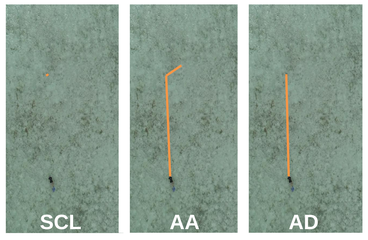

Fig 3. – Visual representation Strait Carapace Length (SCL), Approach Angle (AA), and Avoidance Distance (AD).

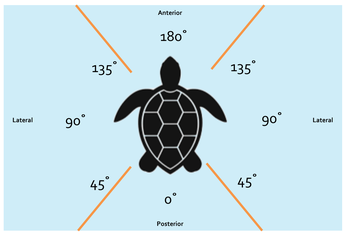

Fig 4. – Model of approach angle classifications

RESULTS

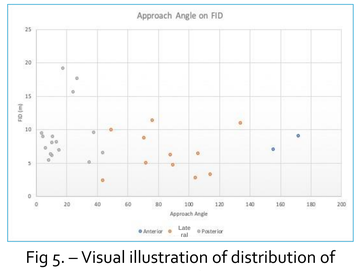

Fig 5. – Visual illustration of distribution of analysis

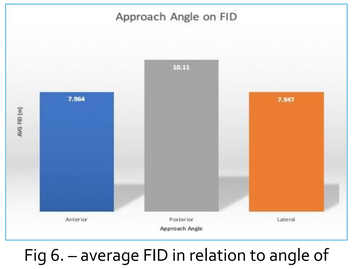

Fig 6. – average FID in relation to angle of approach

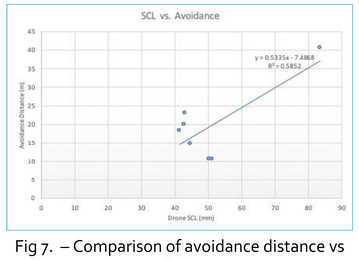

Fig 7. – Comparison of avoidance distance vs SCL.

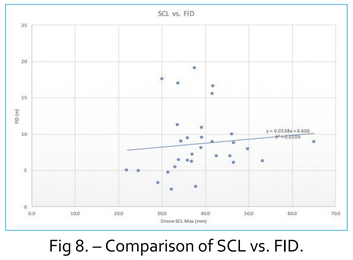

Fig 8. – Comparison of SCL vs. FID.

DISCUSSION

When analyzing the data, we found that the turtles initiated a flight response at 8.26 meters away from the snorkelers. The average distance between turtle and snorkeler regardless of approach angle or SCL was farther than the turbidity of the water would allow us to see.

In our original hypothesis we predicted that an approach from head on (anterior) would result in a larger FID, however, given our data we found the opposite to be true. We found that turtle initiate flight responses earlier when approached from the posterior (Fig 6). Figure 5 illustrates the distribution of our collected data, notice as the vast majority of interactions were recorded approaching from the posterior. By increasing our sample size and variety of approach angles, stronger correlations can be drawn as to the relevance to approach angle when considering best practices.

It is important to note that during our field trials we were unable to see the turtles while in the water, this lead us to the conclusion that the ecotourism industry should stray away from these shallow creek systems in South Eleuthera because the snorkelers are doing harm to the organisms while not viewing any turtles.

We also believe that all habitats inhabited with juvenile green sea turtles should be avoided. We have concluded this because adult sea turtles are very important to the industry due to their mellow behavior around humans. If the juvenile turtles abandon their habitat, then the industry would be losing an irreplaceable asset. However, if managed correctly the ecotourism industry can sustain itself and benefit both the country and animals.

LITERATURE CITED

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TEAM