# A Preliminary Analysis of Marine Turtle Behavioral Response to Vessel Approach during Transect Surveys

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## Background Information


***Figure 1**: A) vessel traffic in Destin, FL (UnSplash.com); B) loggerhead deceased due to vessel strike (Dr. Matt Ware).*

- Marine turtles are threatened with extinction, are ecologically important, and occur throughout Florida waters.
- Florida has high boat traffic, resulting in high rates of sea turtle strandings due to vessel strikes (Foley et al. 2019).
- Many studies to date have looked at the lethal effects of vessel-turtle interactions. Here, we aimed to assess the non-lethal effect of vessels on marine turtles.
- Examination of behavioral response to vessel approach may help to identify what factors (e.g., vessel distance, size, or marine turtle species) are important to determine how vessel-based abundance estimates may be influenced by animal behavior.
- Assessment of behavioral response to vessels can also help to inform how vessel traffic impacts energy expenditure and natural behavioral patterns and provide insights into how vessel characteristics impact collision risk (Hazel et al., 2007).

## Methods

### Data Collection:

- Distance sampling transects were conducted at three locations in the Gulf of Mexico (Fig. 2).
- Transects were designed to occur in commonly used channels, along the coast, or in large bays (Fig. 3).
- During transects, a drone was flown to validate visual observers.

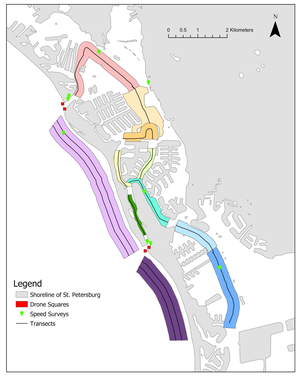


**Figure 2**: *Map of transects in St. Petersburg, Florida. Similar transect design was followed in Destin and Sarasota.*

### Video Analysis:

- All species of elasmobranchs, marine mammals, and marine turtles observed were recorded.
- The number of vessels in the videos was also recorded.

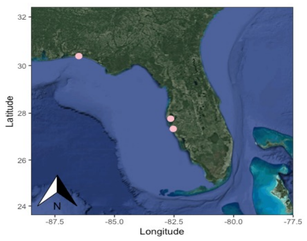


**Figure 3**: *Locations of surveys; Destin (East Pass), St. Petersburg (Blind Pass), and Sarasota (Big Sarasota/New Pass).*

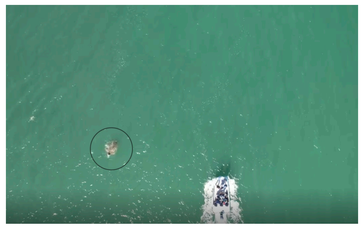

**Figure 4:** *Marine turtle observed during drone survey.*

## Methods Continued

**Evasive Behavior Analysis:**

For each turtle observed on the drone we recorded:

- Presence/absence of behavioral response
- Distance of response in ImageJ
- What type of response was (e.g., distance response, direction response, change in activity).
- Presence/absence of direction change
- Degree direction change using a protractor
- Presence/absence of speed change
- (speed up or slow down)
- Presence/absence of flee

ImageJ
Image Processing & Analysis in Java

## Results

- We watched 66 hours of drone footage. 162 transect surveys were conducted across locations.
- Across all videos, far more elasmobranchs and dolphins were observed (Fig. 5).
- In total, 4 marine turtles were observed (Fig. 6)

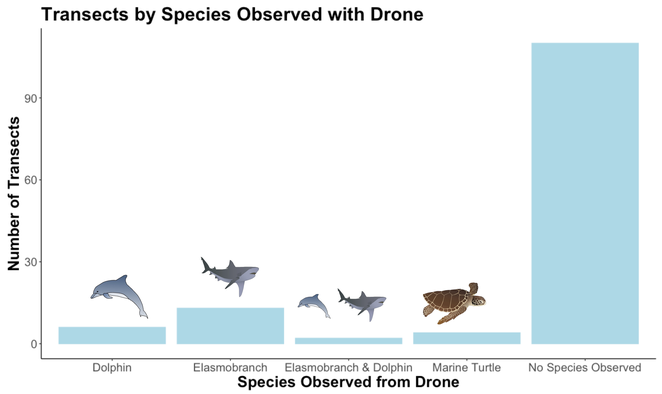


**Figure 5**: *breakdown of species groups observed in drone videos.*

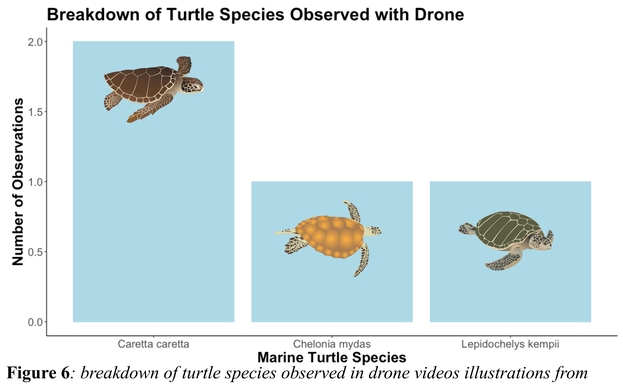


**Figure 6**: *breakdown of turtle species observed in drone videos illustrations from ian.umces.edu/media-library .*

## Results Continued

- Marine turtles portrayed different responses to vessels' approach.
- Juveniles have a faster distance response compared to adults (Table 1).

**Table 1**. *Breakdown of responses due to vessel approach.*

| Species | Stage | Response Distance (meters) | Change in activity | Degrees Direction Change |
|---|---|---|---|---|
| *Caretta caretta* | Adult | 5.166 | Dive, Change Direction | -45 |
| *Lepidochelys kempii* | Adult | 5.617 | Dive, Change Speed | 0 |
| *Caretta caretta* | Juvenile | 10.776 | Change Direction | 15 |
| *Chelonia mydas* | Juvenile | 17.562 | Dive, Change Speed, Change Direction | 45 |

## Preliminary Conclusions

- Behavioral responses of turtles to vessels varied:

some individuals displayed evasive behavior (e.g., displacement or direction change)
other individuals showed no behavioral response to the vessel approach.
the true variation of behavioral response of marine turtles to vessels can be determined with additional data from more individual turtles

- This data can be incorporated as an additional covariate into models of marine turtle abundance and density from drone surveys.
- Additional survey methods, such as biologgers, should be employed because they can collect data on turtle behavior to find a better solution to minimize the impacts of vessel traffic on turtles.

## Acknowledgments

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## References