Volitional Swimming Kinematics of The Blacktip Shark (*Carcharhinus Limbatus*)

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OBJECTIVES

- Determine body curvature, tailbeat frequency, tailbeat amplitude, and whole body swimming velocity in free-swimming shark.
- Compare data to existing data discovered in laboratories to determine the accuracy of both free-swimming and in lab methods.

BACKGROUND

- Blacktip sharks migrate annually along the Florida Coastline in the early spring, moving North towards the Carolinas. These sharks form large aggregations along the Florida Coastline, and individuals are easily visible from the air.[1]
- Previous studies have used either live animals confined in tanks, or robotic mimics to study swimming kinematics[2]. This study aims to be a less intrusive to the wild animals being used, while simultaneously being more accurate then robotic mimics.

Figure 1

Carcharhinus Limbatus

- Using an aerial drone, video of sharks can be obtained through noninvasive methods in the wild, and examined frame-by-frame using the Loggerpro software.
- By tracking points along the shark's midline, body curvature, tailbeat frequency, tailbeat amplitude, and whole body swimming velocity can extrapolated, providing greater insight into the swimming kinematics of this migratory species.

METHODOLOGY

- A DJI Phantom 4 Pro aerial drone will be used to capture videos of free-swimming sharks
- Shark footage will be obtained using a shutter speed of 1250, ISO level of 100, and an aperture of 2.8.
- Sharks will be recorded from 800-1200 eastern time to minimize glare from the sun on the open water.
- Smaller clips will be produced using iMovie for analysis.
- Logger Pro will be used to analyze body curvature, tailbeat frequency, tailbeat amplitude, and whole body swimming velocity. (tailbeat movement figure 4)[3]

Figure 2

DJI Phantom 4

Figure 3

The location of the Four points measured

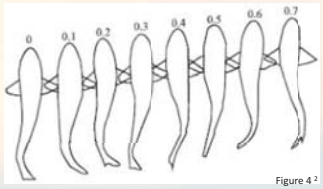

Figure 4 [2]

Shark tailbeat in a frame-by-frame analysis

PRELIMINARY RESULTS

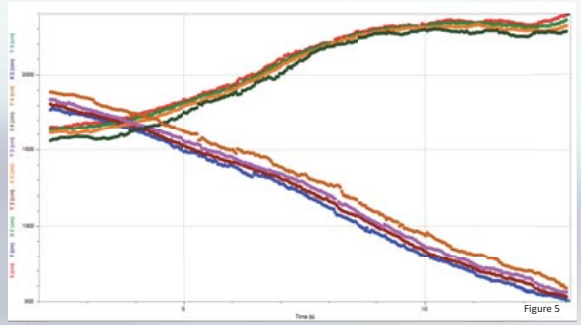

Figure 5

Data obtained from the four points in Logger Pro

ANTICIPATED OUTCOMES

- The results will be the first time kinematic data will be quantified in a free-swimming shark.
- This study aims to provide quantification for these Kinematic variables in *Carcharhinus Limbatus,* and provide insight into how these sharks are managing energy loss throughout this long migration.
- This study also aims to provide validity to this new methodology, so that it may be used in the future as less intrusive means for volitional swimming kinematic analysis.

Figure 6

Blacktip shark annual aggregation

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