Quantifying sea turtle behavior using accelerometers

Byrd, A. T.[1],Goforth, K. M[1]
1.UNC- Biology Department Chapel Hill, NC, USA
Contact Info: Ashleytb@live.unc.edu

Can we use Accelerometer Data to Quantify Sea Turtle Behaviors? Could they be deployed on turtles to monitor behavior post release?

Background:

- Video analysis is time consuming and can be influenced by human bias
- Accelerometers measure position and motion along the X, Y, and Z axes (Fig. 1; *1)*
- Turtles are difficult to video underwater making it hard to monitor their health and rehabilitation status post-release.
- Knowing the success of a procedure can determine whether it should be performed

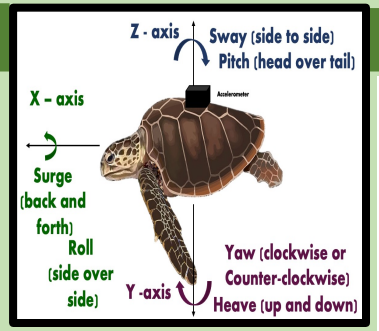

Fig 1. Accelerometer Diagram

Fig 2. Accelerometer on turtle

Methods:

1. Turtles (one year old) are tested with accelerometers attached (Fig. 2)
2. Behavior analyzed with video to produce an ethogram (Fig. 3)
3. Behavior analyzed with accelerometer (Fig. 4 A-E)
4. Comparison of video and accelerometer data (Fig. 5)

Behavior	Description	X, Y, Z Patterns
Forward Swim D	Swimming parallel to water surface	Peak, Dip, Peak
Breathe B	Nostrils and head above water	Peak, Peak, Peak
Dive A	Head and front flippers angled below tail end	Dip, Dip, Dip
Left Turn C	Swimming counterclockwise	Dip, Level, Dip
Right Turn E	Swimming clockwise	Dip, Peak, Dip

Fig 3. Ethogram and accelerometer patterns

Accelerometer Patterns:

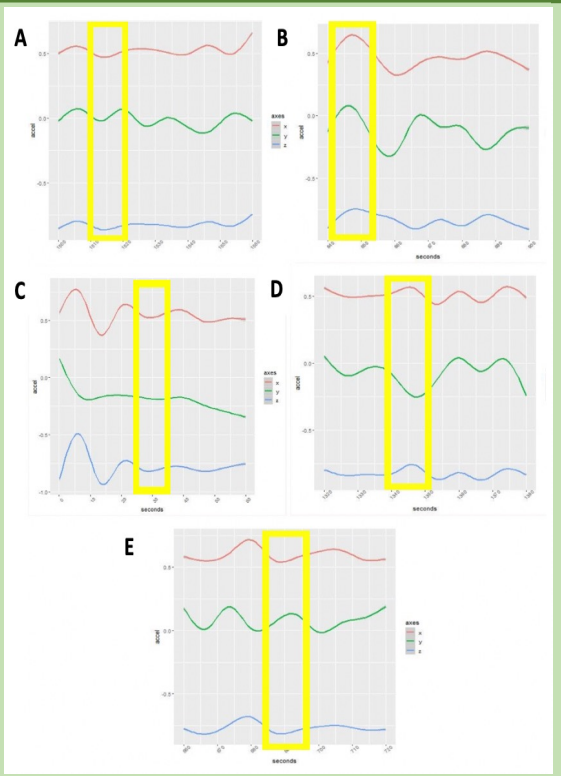

Fig 4 A-E. Accelerometer Data of Time vs. Acceleration.

Accelerometer Accuracy Data:

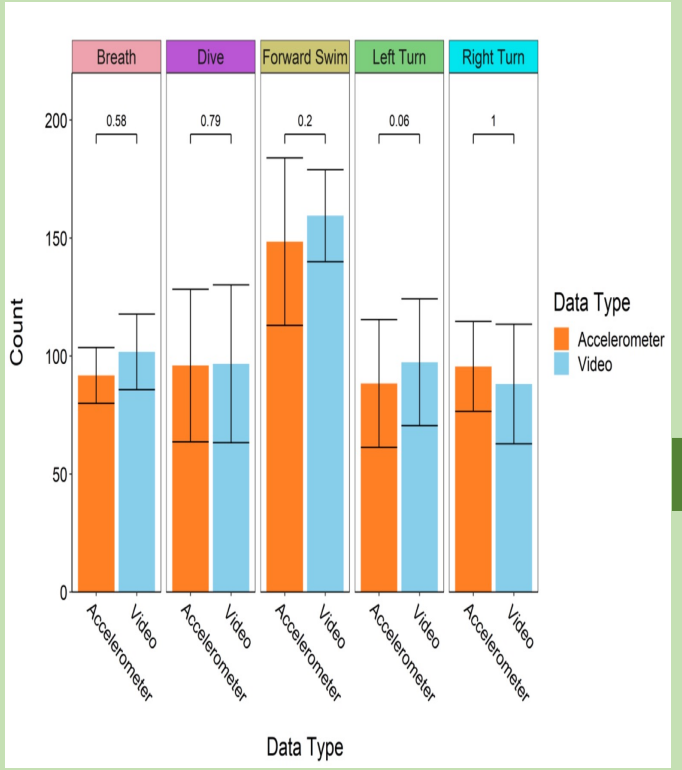

Fig 5. Comparison of the counts of each behavior in the video analysis data and the accelerometer analysis data with standard error bars and the results of the Wilcoxon Signed Rank tests for each behavior that was quantified.

Conclusions:

- Data indicates that specific turtle behaviors correlate to certain peak patterns in the accelerometer data
- The accelerometer can be used successfully to identify behaviors
- Accelerometer data is not significantly different from video data results

Future Work:

- Can be placed on turtles that are difficult to see to monitor success of procedures in order to help determine what medical care should be given
- Can be deployed in the field to monitor turtle behavior without video data in various behavioral experiments

References: 1.Fehlmann *et al.* (2017)
Acknowledgements: Bald Head Island Conservancy Staff, Lohmann Lab members, Catherine Lohmann, Loggerhead Sea Turtles