

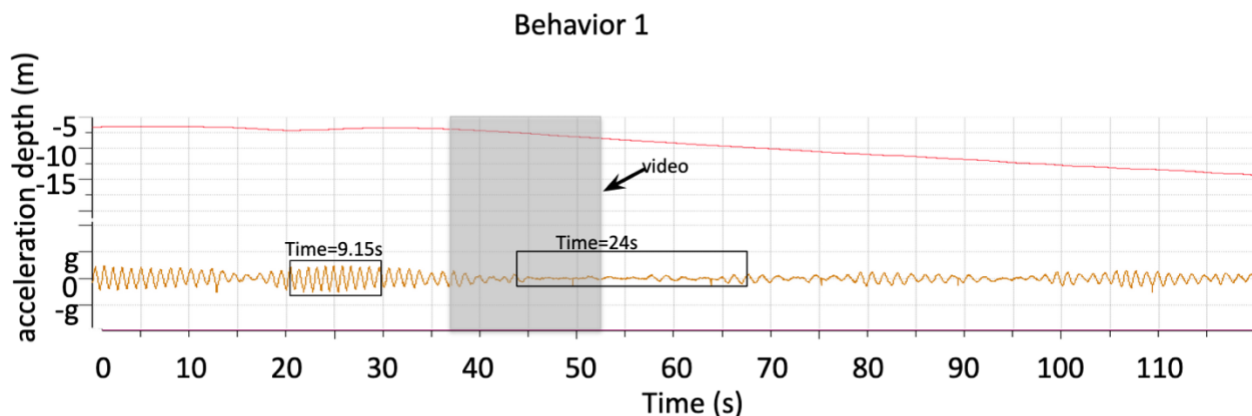
## Teacher Guide: Video and Frequency Matching Activity

### Swimming on an Empty Shark Tank

**Overview:** Students watch four videos taken from a datalogger affixed to the back of a shark. Each video shows a shark exhibiting a particular behavior (gliding, flat swimming, accelerated swimming, or breaching), and each behavior is associated with a particular tailbeat frequency pattern depicted on a data graph. After sharing the *videos*, give students the *Frequency vs Time Graphs* and ask them to match each video to one of the four behavior graphs. This will give them some understanding of how the tailbeat and depth data we will be looking at can be used to differentiate specific behaviors.

Below is additional information about how to interpret the graphs, and the answer key for matching videos with graphs.

**Data:** Each figure has several components. The top graph (red line) in each is the depth in meters over time. The bottom graph (burnt orange line) in each is the simultaneous acceleration over time. Each oscillation in the acceleration represents a tailbeat. The black boxes represent the time to complete 10 tailbeats. The box on the left is the typical tailbeat and the box on the right is the tailbeat during the unique behavior. The grey shaded area is the data from during the associated video.



### **Match Video with Behavior – KEY and interpretation**

Videodata 1 = Behavior 2: This is a breaching white shark. You can determine this from the rapid rise to the surface paired with the increase in the tailbeat frequency (indicated by the rapid head shaking in the video; the head is visible along the bottom of the screen).

Videodata 2 = Behavior 3: This is a shark bursting (aka accelerating). You can determine this from the rate that the head moves back and forth in the video-which is a proxy for what the tail is doing on the other end. Initially it's slow and consistent. But it then gets more erratic and swings back and forth showing an increase in frequency and amplitude signifying a burst. The data look similar to the breach, but the animal does not go as quickly to the surface.

Videodata 3 = Behavior 4: This is consistent level swimming. This is determined from the constant head movement and the level consistent swimming in the data.

Videodata 4 = Behavior 1: This is gliding behavior. One can see the head stop moving side to side and the animal starts gliding down. There are no real discernible tailbeats in the data while the animal is going deeper signifying a glide (similar to how birds flap and glide).