Zak Hussain

**Jamming Avoidance Response Activity of *Eigenmannia sp*.**

**ABSTRACT**

In this lab we observe the jamming avoidance response in the interaction between the multiple weakly electric fish, *Eigenmannia sp.* By trapping these fish into a plastic meshed tube, and inserting recording wires on opposite end of the tube, we were able to record the characteristic electric organ discharge frequencies of our specimen. We hypothesized that during the interaction between two of these wavefish, the dominant fish would elicit higher frequencies; whereas, the inferior fish would lower the frequency of its EOD. We found this to be true, and that important indicators of which fish would be dominant include aspects of size( larger fishes will emit higher frequency EODs) and the duration of the negative phase in an EOD is a high indicator that a fish is more dominant.

**INTRODUCTION**

In this study we observed the jamming avoidance response(JAR) behavior of the weakly electric fish *Eigenmannia sp*(Knifefish). These fish consistently produce electric organ discharges which produce sinusoidal electric signals. These signals are around 200 Hz to 600 Hz, depending on the individual. By using JAR, this species is able to avoid interfering with each other’s EOD pattern, and effecting their electrolocation ability.

The avoidance response occurs when the fish senses the EOD of another. The signals combine between the two, and this causes a ‘beat pattern’ of a specific modulation frequency value.

By recording EOD signals from the weakly electric fish, we can analyze how they use their EOD signals to interact with other wavefish by modulating their EO discharges. we hypothesize that

in the presence of an intruding fish, the dominant (most-likely the larger) fish will elicit the higher frequency response, and the neighboring fish will in turn lower its EOD frequency as a means of JAR.

**METHODS**

The methods used in this experiment can be found in the “Introduction to System and Behavioral Neurobiology” manual, under the sections titled “ Week 7: Jamming Avoidance Resonse in the Weakly Electric Fish *Eigenmannia sp*.”

**RESULTS**

The results of this experiment show that each individual knifefish has a characteristic EOD, and will respond to the EOD of another fish based on the resting state activity of its own EOD. **Figure 1** shows the resting state activity of the Knifefish being observed. The average positive phase duration of the wave is approximately 0.6 ms and the average negative phase of the wave is 0.7 ms. **Figure 2** shows the spectrum estimate from frequency measurements of the fish’s EODs. This fish’s EOD was about 800.78 Hz. **Figure 3** displays the class data measurments of their specimens. On average the fish studied emitted EODs at 867.28 Hz, and were 7.86 cm long. This table also shows that on average, the duration of each fish’s EODs were 1.15 ms. The Negative phases for the two fish put together into one tanks were 0.7ms(Josie + Sarita) and .55 ms (Sarahi + Fernanda), and they were 7.5 cm and 6.5 cm respectively. **Figure 4** shows the table which consists of data from the interaction between these knifefish. We see that fish 1, prior to being placed into a tank with fish 2, emits EOD’s around 787 Hz, and in the presence of fish 2, fish 1 decreases the frequency of its EOD. Fish 2, however, does not change the frequency of its EODs in the presence of fish 1. There was a 6 Hz decrease in fish 1’s EODs, and a 0 Hz change in fish 2’s EODs. Finally, **Figure 5** shows the correlation between fish length (cm) and EOD frequency. We see a linear correlation, in which as the length of the fish increases, so does the frequency of its EOD discharge.

**DISCUSSION**

The results of the experiment showed that we were correct in hypothesizing that in the presence of an intruding fish, alpha fish will hold the higher frequency EOD, and the inferior fish will reduce its EOD frequency. This is supported by the fact that fish 2, with a length of 7.5 cm, and a negative phase EOD duration of 0.7 ms did not alter the frequency of its EOD in the presence of fish 1. Fish 1 had a length of 6.5 cm and the negative phase duration of its EOD was 0.55 ms; it reduced its EOD by 6 Hz in the presence of fish 2, and re-altered its EOD to its initial frequency when removed from the presence of fish 2. It is probable that through this interaction of JAR, these animals are capable of understanding their own dominance status in relation to that of other members ( Triefenbach, Zakon 2013).

During the experiment we had attempted to manipulate the fish’s EODs by stimulating it with different frequency sinusoidal waves; however, to no avail, we did not receive any response. It is possible that this is due to the fact that simple sin waves do not occur in nature; therefor the juvenile fish was incapable of responding to it, much less perform the jamming avoidance response.

**CITATIONS**

Bosma, Perkel, Kennedy, Canfield, Hass, Sisneros, (2016). *Introduction to Systems and Behavioral Neurobiology*. Department of Neurobiology, University of Washington, Seattle, Wa.

Triefenbach, and Zakon,(2013). *Effects of Sex, Sensitivity, and Status on Cue Recognition in the Weakly Electric Fish Apteronotus leptorhynchus*. The Association for the Study of Animal Behaviour, University of Texas, Austin, Texas.

Special thanks to Sarahi, Fernanda, Josie, and Sarita whom provided Ryan and I data to analyze.