SOCIAL BEHAVIORS IN THE DEVELOPING DANIO RERIO LARVA AND ADULT DANIONELLA

James B. Newton (Adam Douglass, Ph.D.)

Department of Bioengineering

Larval zebrafish (*Danio rerio*) in most respects excel as an animal model in the study of neural networks, due to their small size and optical transparency. These traits permit optogenetic manipulation and live neuronal imaging of the entire brain, which, when paired with behavioral analysis, have potential to link specific CNS circuitry to behavior. These same traits, however, come at a cost of behavioral maturity. By the time most behaviors reach full development, imaging potential has been lost due to diminished zebrafish transparency and increased size.

One possible solution to the imaging vs. behavioral-maturity tradeoff exists in a closely related fish genus, *Danionella*, which retains traits of transparency and small size into adulthood. Our lab seeks to establish the potential utility of *Danionella dracula* in experimentation. As part of that aim, the goal of this project was to validate a published zebrafish social assay and then apply that assay for the first time to this novel experimental model, *Danionella*.

The social assay being replicated was developed by Dreosti *et al.*, August 2015 [1]. The assay creates a specialized arena in which a free-swimming fish has visual access to a conspecific(s) behind a glass divide while in one region of the arena, and no visual interaction in another. A tendency to spend time in the interactive region indicates a social preference. The assay was created to track the development of social behaviors in larval zebrafish, and was applied to 1, 2, and 3 week-old fish. The group reported a significant social tendency in most 3 week-old larvae. Of note is the fact that these findings place the development of any significant social behaviors outside the window of feasible imaging of the brain, rendering the assay useless in labs seeking to image neuronal circuitries of the zebrafish brain.

We first applied our replication of this social assay to larval zebrafish at 11, 12, 14, 16, 18, 25, and 32 days post fertilization (dpf), followed by application to adult *Danionella dracula*. Contrary to the results of Dreosti *et al.*, we observed significant social preferences in larval zebrafish as early as 11 dpf (n=8). Among those tested, maximum social tendencies were observed in the 11 dpf and 18 dpf (n=8) populations. Application of the assay to adult *Danionella* failed to reveal any significant social tendency (n=6). The results of these experiments suggest 1) that social assays may be of use with *Danio rerio* at early, imaging-conducive ages, and 2) alterations to or reinvention of the current social assay are required for successful application to *Danionella*.

1. E. Dreosti, L. Goncalo, A. R. Kampff, and S. W. Wilson. (2015, Aug.). Development of social behavior in young zebrafish. Front Neural Circuits. [Online] 9, 39. Available: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4539524