Spatial navigation in *Danionella cerebrum*: A food reward paradigm

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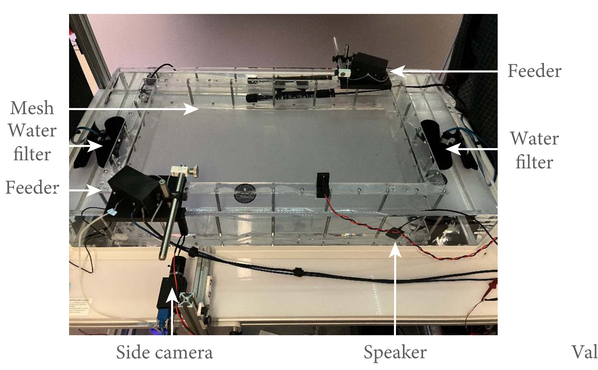
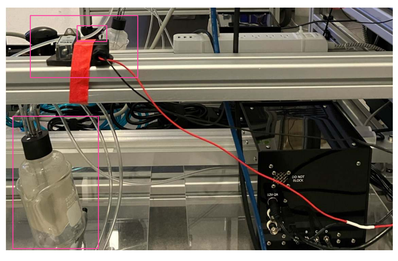
Introduction

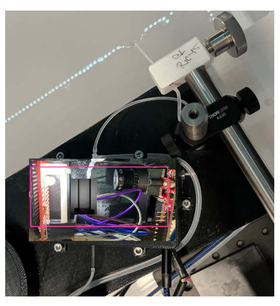
Recent experiments in *D. cerebrum* have demonstrated that these glassfish can use visual cues to navigate to desirable locations. We are interested in exploring whether the species can be used to study goal-directed navigation. To this end, we are designing a paradigm in which we can assess the sensitivity of animals' behavior to the expected value of reaching a desired target and their ability to flexibly adapt paths and strategies to the location when environmental conditions change. Here we describe the setup we have established for calibrated reward delivery and our early results from training animals to navigate to a feeder in response to a non-directional auditory cue.

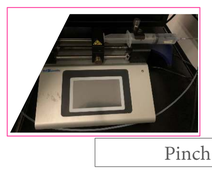
Experimental setup

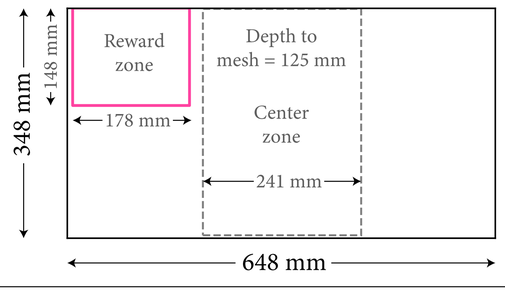
We placed an open arena for fish within their home tank to minimize handling stress. A speaker delivered a 700Hz tone for 1s to indicate reward availability at a designated feeder. Entry of any of three fish into a zone near the feeder within 30s triggered the release of 1-3 decapsulated brine shrimp eggs. Fish had several seconds to consume the egg(s) before they floated to the bottom of the tank through a fine mesh. A new trial was triggered when all three fish were out of the reward zone and inside a central zone. Fish typically performed tens of trials before satiation.

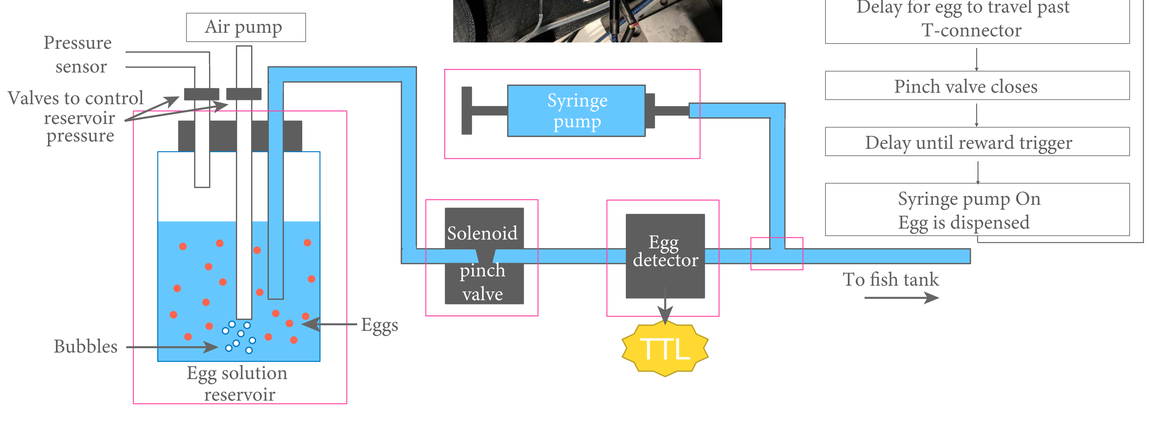


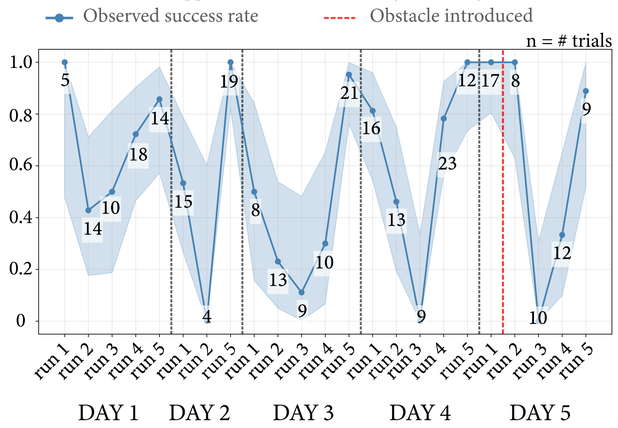






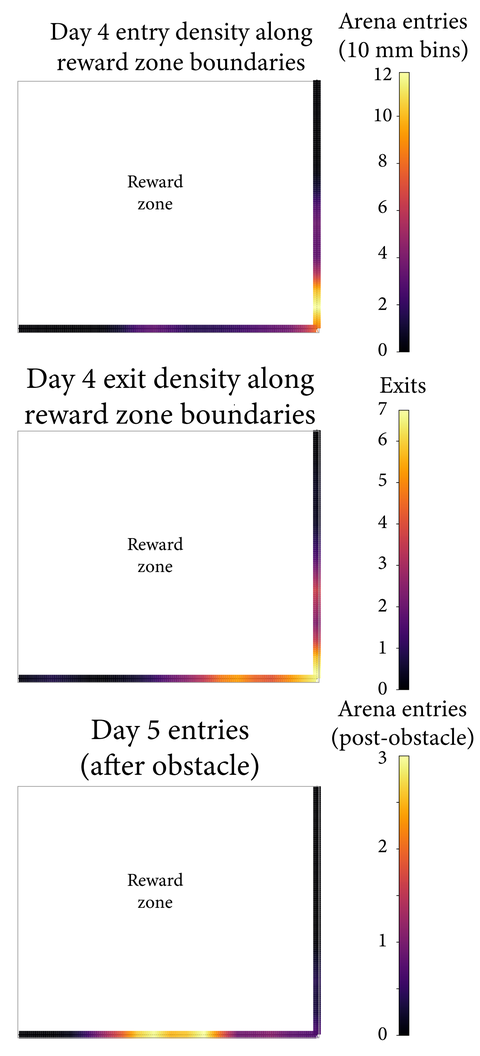


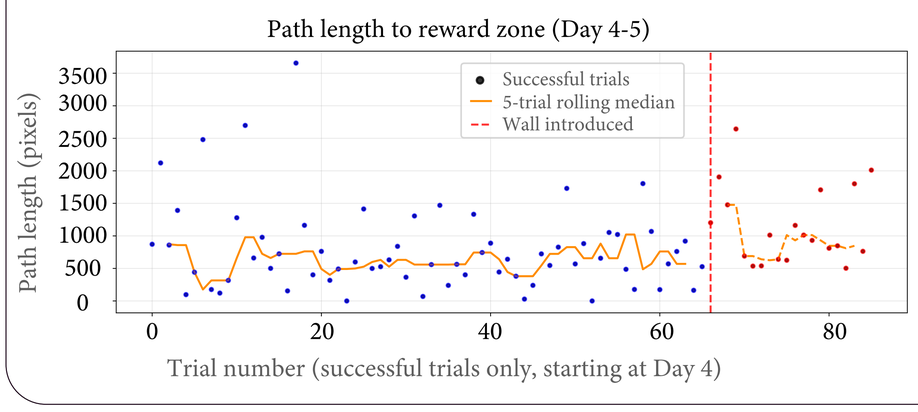


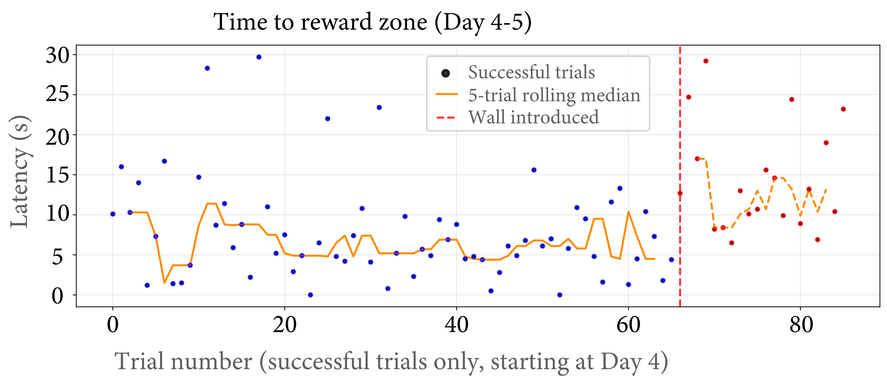


Experiments were performed in blocks ('runs'). We generally performed 5 runs per day, each lasting 10 minutes. The # of trials/run varied (see above).

Auditory cue-triggered navigation in a sample cohort







At least one among the cohort learned to navigate to the reward zone within the first few runs and also learned to leave the reward zone to reinitiate trials. Latencies to reward broadly tracked the length of paths traversed. However, performance was still variable across sessions, for reasons that we are still exploring.

References & Acknowledgements

Lee & Briggman (2023), Base & Nagel (2024), Rodriguez et al. (2021), Sibeaux et al. (2025)

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