Background

Shared Common Interests

During growth and development, long-lived parasites and their host have similar goals:

- Acquire abundant nutrients to fuel growth
- Minimize activity that wastes energy
- Reduce risk of disease and predation
- Avoid aggressive encounters with conspecifics

Behavioral Suppression of Host

When the host matures, its goals diverge from those of the parasite. Parasites must attempt to suppress the following natural host behaviors:

- Invest energy in primary & secondary sexual traits
- Search for mates within the environment
- Engage in costly sexually selected behaviors
- Fight conspecifics for access to mates

Inducing Novel Host Behaviors

As the parasite matures, it must emerge from its host in a suitable habitat to reproduce. It therefore must make the host behave in ways it normally would not.

- Increase random locomotion and aggression
- Seek open water & jump in so parasite can emerge

Hypothesis

Horsehair worm parasites modify levels of two crucial neurotransmitters, octopamine & serotonin, to modify host cricket behavior at two critical time points in development: host maturity and parasite emergence.

Predictions

1) Host Maturity

- Increased 5-HT levels
- Decreased OA levels

↓ Locomotion, Courtship calling, Aggression

2. Parasite Emergence

- Decreased 5-HT levels
- Increased OA levels

↑ Locomotion, Aggression, Water-seeking

CURAS HONORS

Alexandria Jones, Amanda Cohen, & Dr. Amy Worthington

are proud to present

Mischief Managed:

How Parasites Manipulate Their Hosts

Unfortunately, COVID-19 slowed our research progress. We are currently collecting data and hope to present our results soon!

Research Objective

We will identify the major neurological changes responsible for the behavioral manipulation of host insects infected with the long-lived parasitic horsehair worm at two critical timepoints in the host-parasite interaction:

1) Host maturity
2) Parasite emergence

Gryllus firmus
Sand field cricket

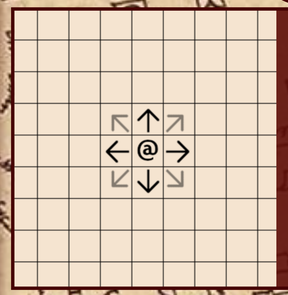
Scan to watch a horsehair worm emerge!

Paragordius varius
Horsehair worm

Materials & Methods

Accio: Summoning Charm

Quantifying courtship calling (# of 5-min intervals in 4 hrs spent calling for females) to test whether infected males sing less than healthy males.



Apparition: Teleportation Charm

Tracking cricket locomotion (total distance travelled in 10 mins) to test whether infected males travel less at host maturity, but more at parasite emergence.

Confringo: Blasting Charm

Assaying cricket aggression (fight duration, aggression level, & contest winner) to test effect of infection and time of infection on aggression.

Aguamenti: Water Spell

Testing water-seeking behavior of infected crickets (choice of aquatic or terrestrial habitat) to identify timing of major deviations in normal host behavior.

Diffindo: Severing Charm

Dissecting cricket brains to analyze octopamine and serotonin levels as the cause for behavioral changes in infected hosts.