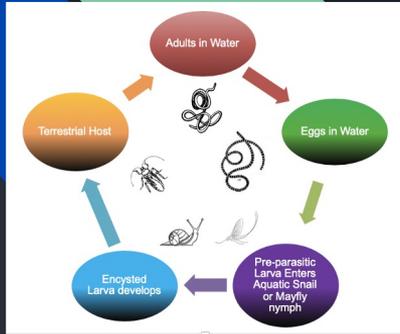




Environmental factors affecting the emergence of *Chordodes morgani* and host growth in *Parcoblatta fulvescens*

By: Matt Lawler, Russell Lee, John Shea SJ PhD



Research Questions

Question 1: What affects the timeline of the life cycle?

Question 2: Why is it that infected roaches have increased growth compared to the control?

Methods and Hypothesis

We housed the roaches in individual vials with the environmental conditions listed below. Each group contains a non-infected control group.

Introduction and Research Questions

Figueira *et al.* (in press) found and replicated a lifecycle consisting of the genus *Parcoblatta*

Through the replication of the life cycle in our lab with *Parcoblatta fulvescens*, some questions arose.

Results

Results are still currently being conducted.

Implications

Increased knowledge of the timeline of life cycle compared to lab conditions.

More information for what abiotic factors affect infected wood roach growth

	Room Temperature	Walk-In Refrigerator Temperature
Cat Food Supplement	Group 1 *fastest growth rate and worm emergence	Group 2 *Intermediate growth rate and worm emergence
No Supplement	Group 3 *Intermediate growth rate and worm emergence	Group 4 *slowest growth rate and worm emergence

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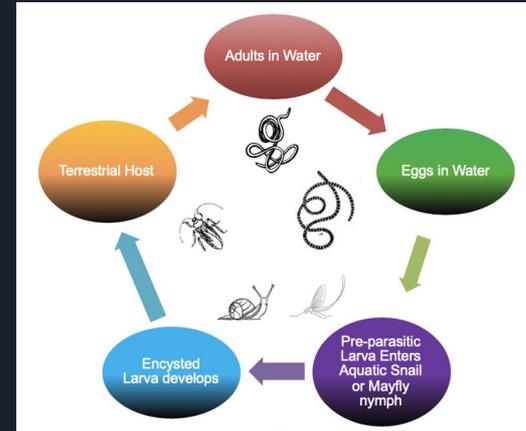
Chordodes morgani Life Cycle

The life cycle of *C. morgani* consists of a paratenic aquatic host and a terrestrial arthropod host.

Figueira *et al.* (in press) confirmed *Parcoblatta americana* as one of the likely terrestrial hosts for *C. morgani* in NE

The life cycle was replicated in the lab; however, abiotic factors such as temperature or food availability were not accounted for.

In the field, we find adults in July and they lay eggs that are consumed by aquatic hosts (mayflies).

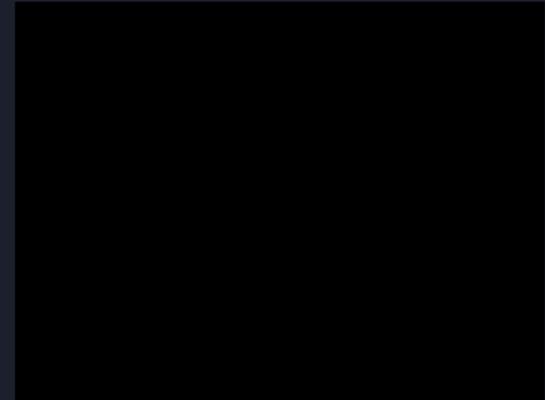
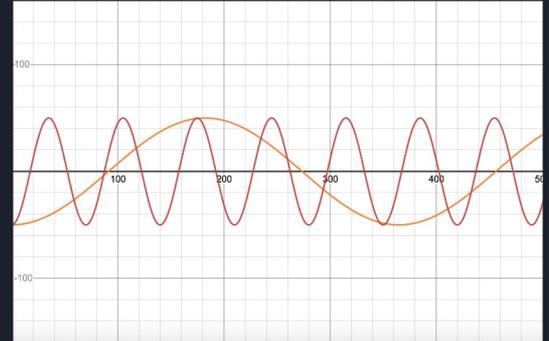


Mystery #1: Worm Emergence

Adult worms emerge from lab-reared roaches after 70 days while worms typically emerge from field roaches every July. But why?

Possible Explanations:

- Inability to find adult worms
- Overwintered mayflies
- Temperature and food availability
- Fix graph



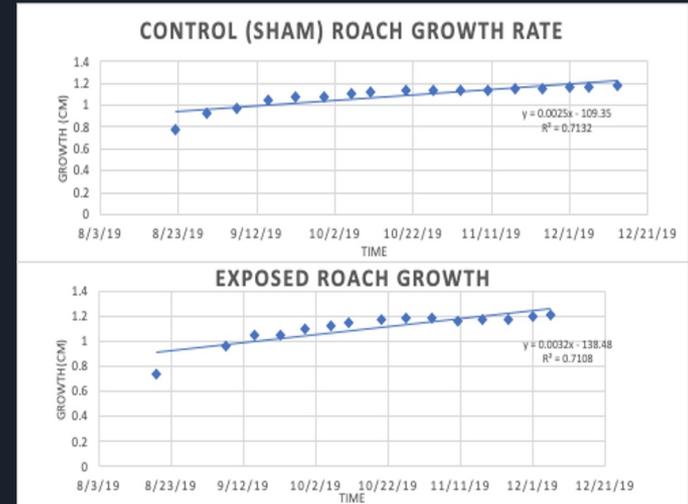
Mystery #2:

Infected roaches have higher growth rates

Our preliminary study found that the growth rate of infected roaches ($n = 21$) was significantly greater than sham infected roaches ($n=22$) ($p < 0.01$). (Look up worm emergence data and intensity). Worm length between roaches with high intensity.

Possible explanations for this: (Simplify)

- Increased pressure on the host's exoskeleton from the growth of *C. morgani*. (Increased worm density could increase this pressure as well).
- Lab conditions that allowed for an unlimited food source with a room temperature environment.





Methods - Favorable Lab Conditions

Lab-reared wood roaches (*Parcoblatta fulvescens*) were isolated and starved for 48 hours.

Infected snails and mayflies were counted for *Chordodes morgani* cysts and then fed to the wood roaches.

Wood roaches were sorted into four different housing environments. At least two sham infected roaches in each group.

After approximately 8 weeks and every following week, all of the wood roaches in each group will be placed in water to test for *C. morgani* emergence.

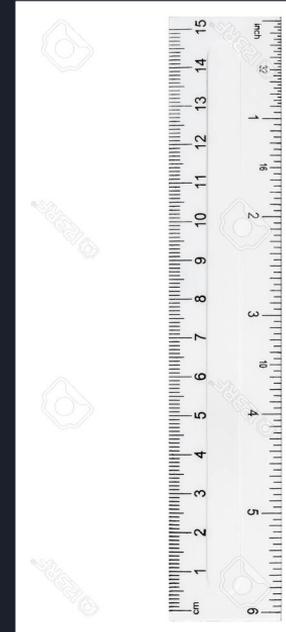
	Room Temperature	Walk-In Refrigerator Temperature
Cat Food Supplement	<u>Group 1</u>	<u>Group 2</u>
No Supplement	<u>Group 3</u>	<u>Group 4</u>

Methods - Growth of Infected Roaches

Every week, each sham and exposed roach within each category will be measured by length (cm).

The wood roach's length will also be measured after worm emergence occurs.

Measurements over the period of infection will then be analyzed to find any statistically significant data between the four different groups and the sham groups



Hypothesis delete text

We predict that wood roaches kept at room temperature and supplemented with cat food will grow the fastest and will produce horsehair worms the fastest. The opposite effects are true when kept at walk-in refrigerator temperature and not supplemented with cat food.

The table summarizes our predictions for worm emergence and growth rate.

	Room Temperature	Walk-In Refrigerator Temperature
Cat Food Supplement	<u>Group 1</u> *fastest growth rate and worm emergence	<u>Group 2</u> *Intermediate growth rate and worm emergence
No Supplement	<u>Group 3</u> *Intermediate growth rate	<u>Group 4</u> *slowest growth rate and worm emergence



Results

Worm emergence data will take time to collect due to the timing of the life cycle.

Measurement data is being collected currently during the development of the worms inside of the roach.



Implications

Mystery #1

Explaining the contrast between field emergence (~365 days) and biologically optimal emergence (~70 days) for *Parcoblatta fulvescens* would teach us more about roach behavior, worm behavior, and host manipulation.

Determining optimal emergence conditions would help us find infected roaches in the field. (Does baiting work? Where do roaches hide during the warmer seasons? Colder seasons?)

Mystery #2

Explaining the differences in growth patterns between groups can help us learn more about how certain abiotic factors that affect roach growth during a parasitic infection. This may also provide some insight into how amount of cysts consumed or melanization type could affect growth rates of the host.



Special Thanks

- John Shea SJ PhD
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- Briahna Teague
- Parasite Pals



References

T. Figueira, D. Owen, B. Hanelt, and J. F. Shea (in press) NEW DEFINITIVE HOST RECORD OF *CHORDODES MORGANI* (NEMATOMORPHA) IN NEBRASKA WITH NOTES ON ECOLOGY



Questions?

