NEMATODE PARASITE REDUCES THE FIGHT OR FLIGHT REACTION IN ITS HOST

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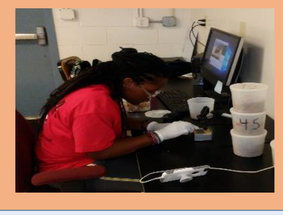


ABSTRACT

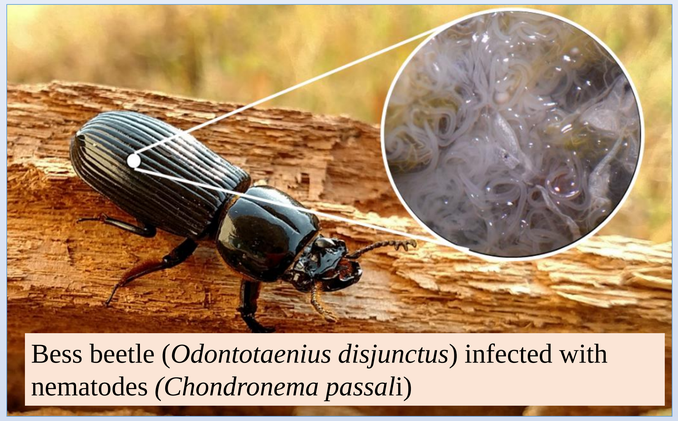
Parasites cause a range of unfavorable effects on host fitness, including reducing available energy. This could be detrimental in situations where the host needs to escape a harmful situation (in a "fight-or-flight" situation), though this is rarely studied in parasitology research. The bess beetle (*Odontotaenius disjunctus*) inhabits forests in the eastern United States and is host to a naturally-occurring nematode parasite (*Chondronema passali*), which can be extremely abundant within hosts. **The goal of this project was to evaluate the how nematode infection affects the fight-or-flight responses of the beetles under simulated predator attack**. A total of 150 beetles were collected locally and stored individually in plastic containers for 3 weeks. Each week, we assessed and video-recorded behavioral reactions to a series of "pokes and prods" (*simulating a predator attack*), then scored level of the reactions in the videos. We assessed the number of vocalizations during attack, plus levels of physical resistance using a scoring system (Fig. 2). Beetles were later dissected and their level of nematode infection was recorded. We found that beetles with nematode infections tended to have reduced fight-or-flight reactions to the predator attack compared to unparasitized individuals. The level of nematode infection had no effect on the amount of vocalization made by each individual during an attack. These results show that nematode infection has an energetic cost during situations where the host needs to respond quickly.

BACKGROUND

- Bess beetles or passalid beetles, are a family of beetles found in decaying wood all across the Eastern United States.
- Adults produce a very distinct squeaking or hissing sound when disturbed, by scraping their abdomen against their elytra.
- Bess beetles are commonly parasitized by *Chondronema passali*, a naturally occurring nematode that lives in the abdomen.
- Parasites by definition, draw energy from their host
- Few studies have examined parasite effects on stress reactions, which are energetically-expensive.

Our question: How does the parasite affect beetle fight or flight reactions?

Bess beetle in natural habitat



Bess beetle (*Odontotaenius disjunctus*) infected with nematodes *(Chondronema passali*)

METHODS

We collected beetles in Athens and housed in individual containers for 3 weeks. Once a each week, we assessed fight or flight reactions: beetles were restrained on a wooden board under a video camera, while we prodded it in three ways for 1 minute (a "**simulated predator attack**"), displayed in Fig. 1.

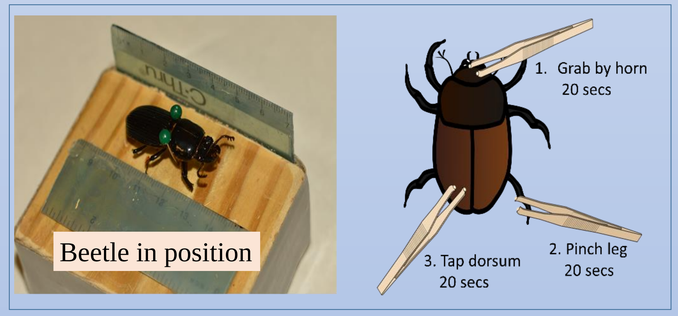


Figure 1. Three stimulated predator attacks, each performed for 20 secs

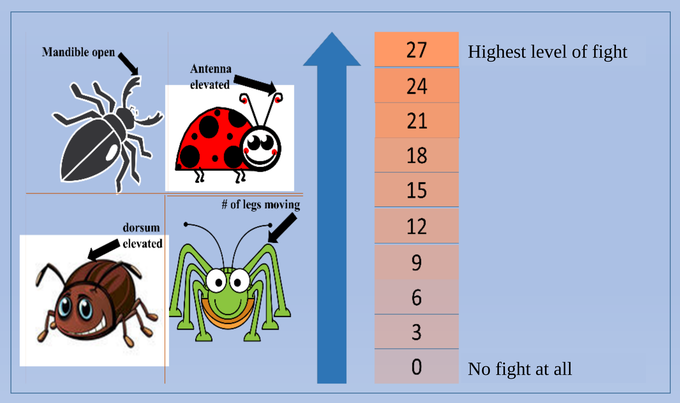


Figure 2. Fight or flight scores ranging from 0-27

In the videos we assessed 4 behaviors shown in F**igure 2**, using a system of scores that correspond to aggression, fighting, or escape behavior. The maximum score each beetle could receive was 27 for the 3 attacks. The lowest score recorded was 8 out of 27.

RESULTS

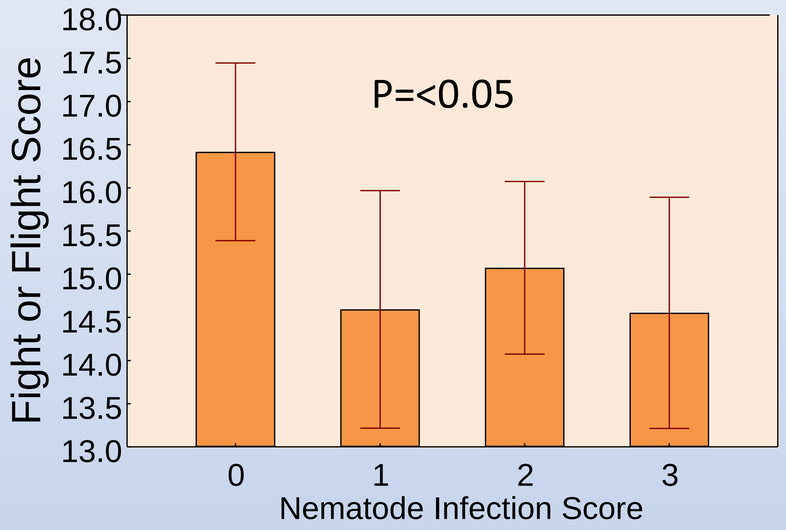
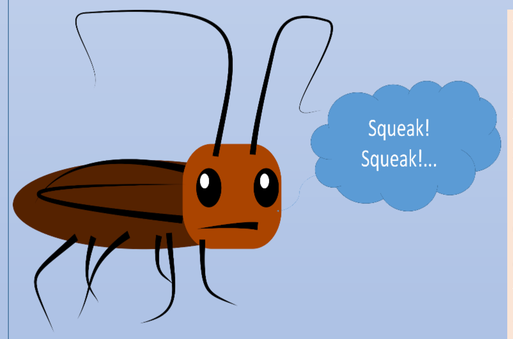


Figure 3. Average fight or flight scores of beetles across all parasite infection levels. Statistical comparison of means (ANOVA) showed significant variation ($p<0.05$). Parasitized beetles showed a 10% reduction in fight behavior during attack



We also measured the acoustic vocalizations of beetles during predator attack. We found no significant difference in level of attack-induced vocalizations across parasite scores.

CONCLUSION

- Our results show that beetles with nematode have a reduced fight or flight reaction, but only in terms of physical behavior – not acoustic.
- These results are consistent with the idea that parasites, even benign ones, can have energetic costs during energy-intensive times.

Special thanks to John Drake, Ania Majewska and Andrea Silletti for organizing this population biology REU program.