

Social parasites increase standing army size in areas of greater invasion threat

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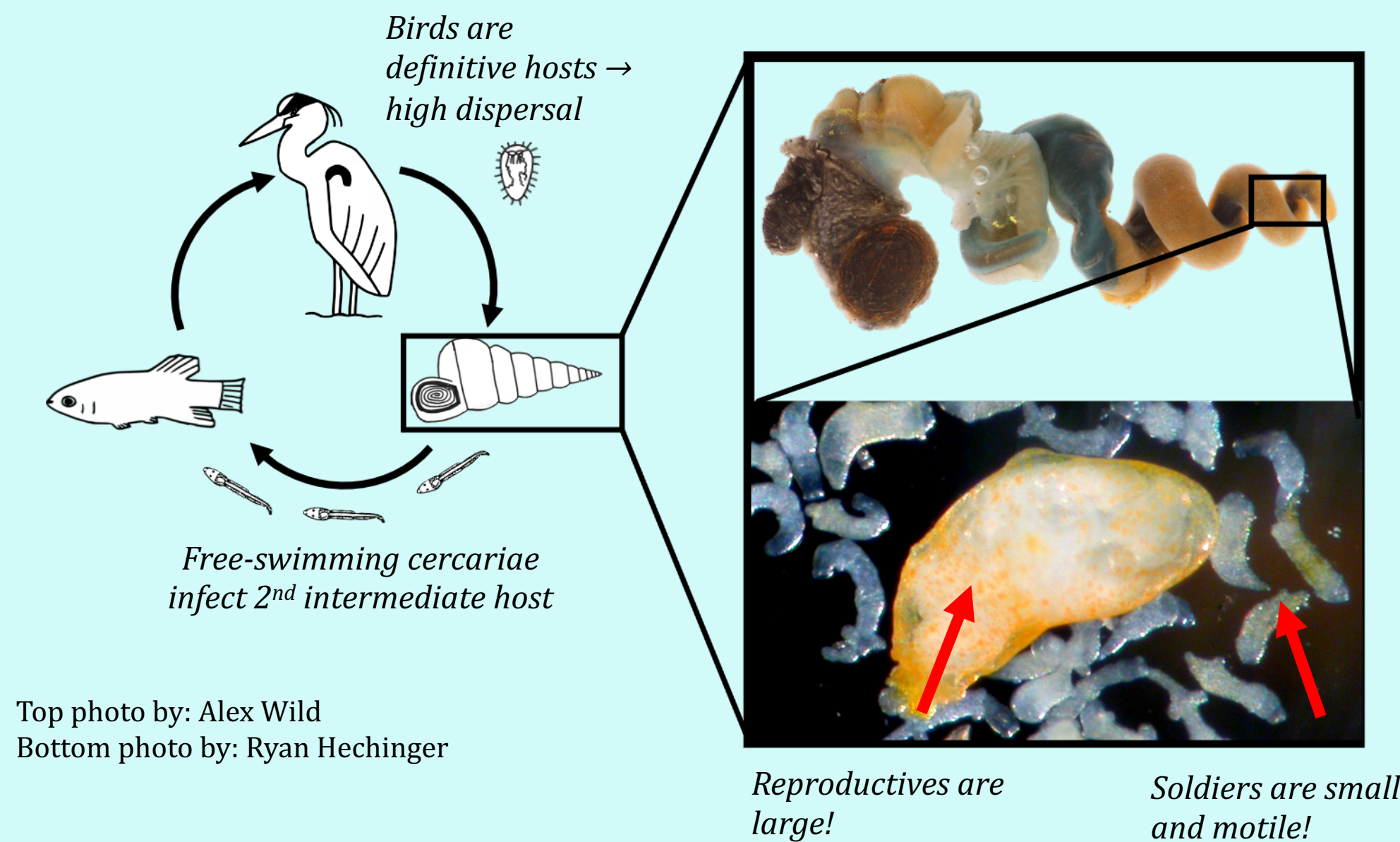
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BACKGROUND

Caste Allocation Theory predicts that colonies should be able to tailor their investments in reproduction and defense in response to ecological factors, such as predation and competition (Oster & Wilson, 1978).

Social trematodes are an ideal candidate to test the Caste Allocation Theory because:

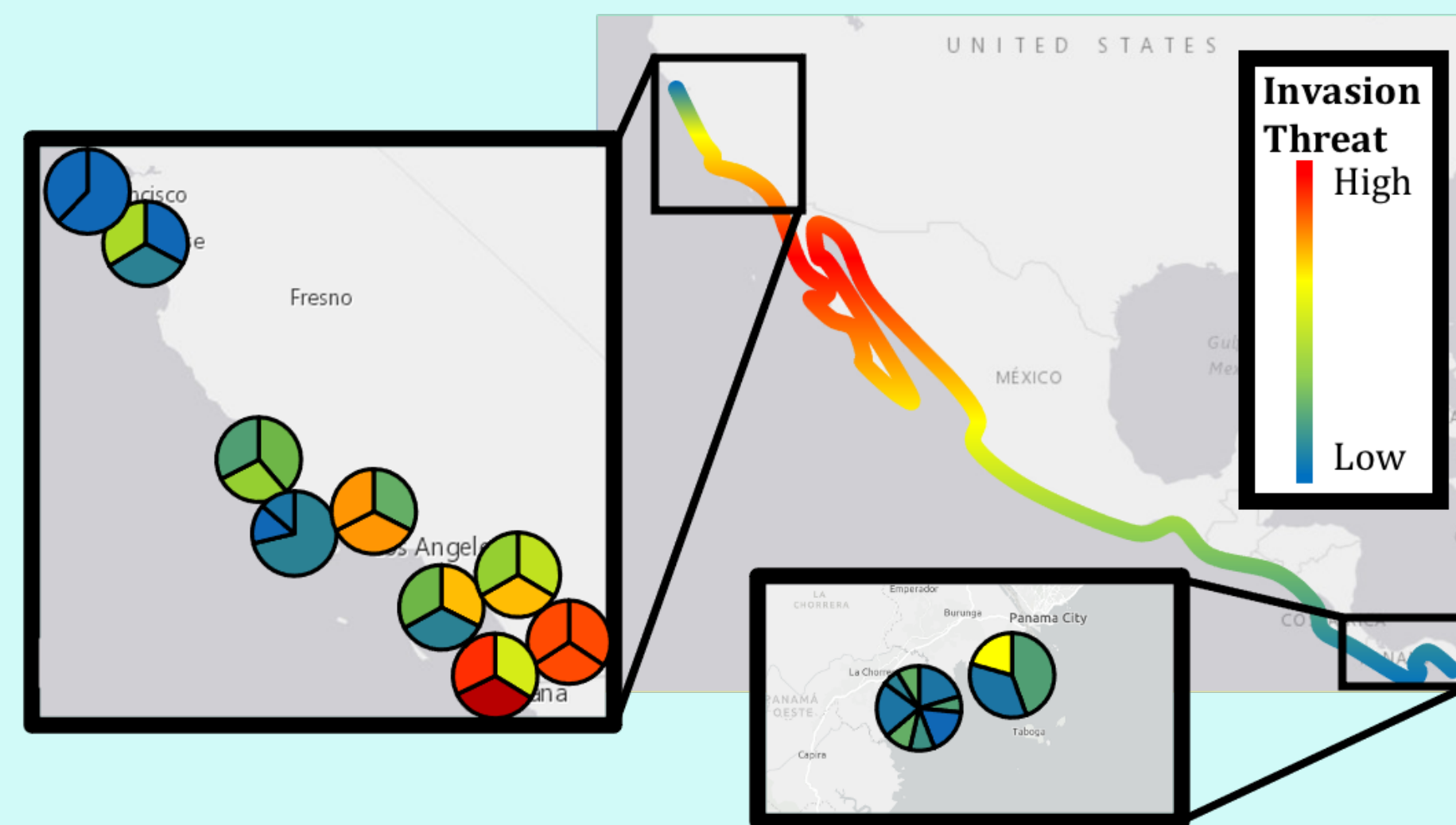
- 1) they have a division of labor (Hechinger et al. 2010),
- 2) can live up to 10 years in a snail's gonadal tissue, and
- 3) can experience widely varying levels of intra-guild predation.



Top photo by: Alex Wild
Bottom photo by: Ryan Hechinger

METHODS

Gradient of intra-guild predation (IGP) provides a natural system to test the impact of IGP on soldier investment (Torchin et al 2015).



Snails in the field are brought to the lab to determine:

- 1) Infection prevalence of ALL trematode species (proxy for IGP threat)
- 2) Colony investment in soldier defense for 6 trematode species

RESULTS

Q: Does soldier investment vary across a gradient of invasion threat (i.e. site-level prevalence)?

A: Yes! Trematode colonies from areas of higher invasion threat invest more in soldier defense!

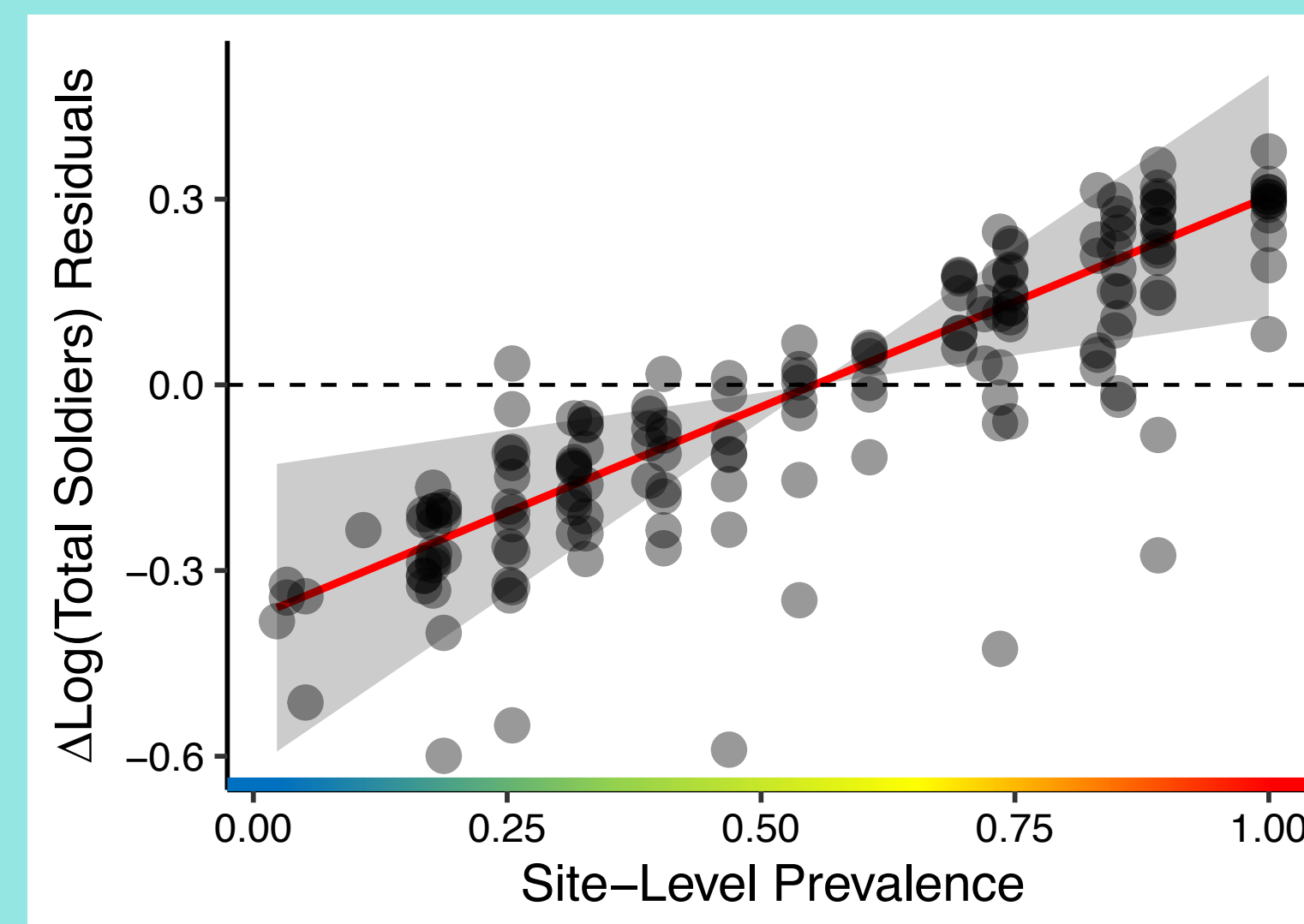
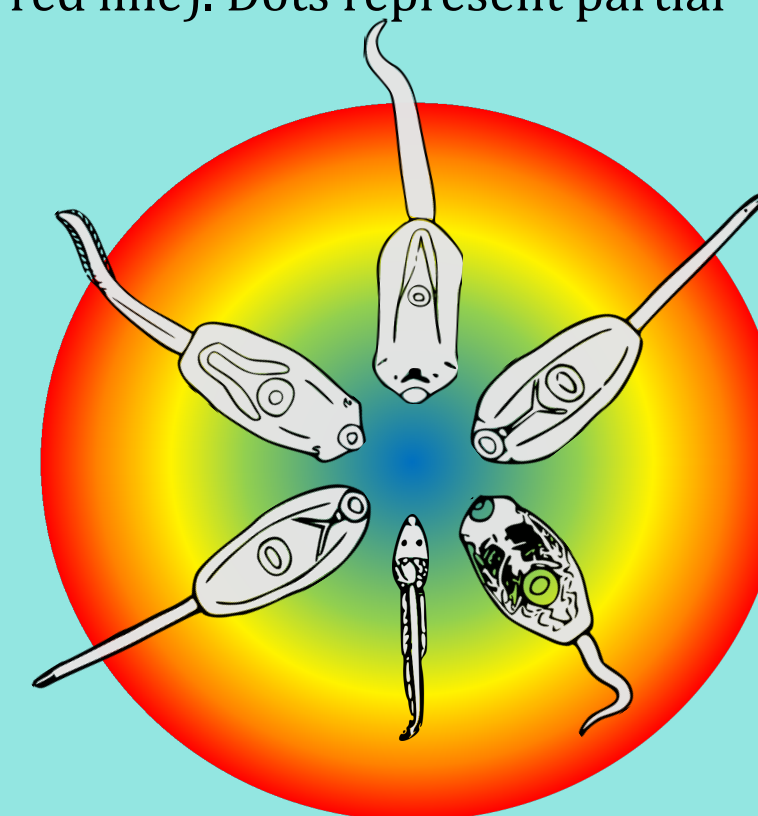


Figure 1: Partial residual plots for each species showing the effect of site-level prevalence (invasion threat) on total soldiers. Based on our best-fit model, all species have the same slope (effect size = 0.507 ± 0.229 , red line). Dots represent partial residuals.



Check out the paper for how these 6 species responded to invasion threat!



REFERENCES and ACKNOWLEDGEMENTS

- 1) Oster, G.F., & Wilson, E.O. (1978). Princeton, NJ: Princeton University Press.
- 2) Hechinger, R. F., et al (2011). *Proceedings of the Royal Society B*, 278, 656-665.
- 3) Torchin, M. E., Miura, O. & Hechinger, R. F. (2015). *Ecology* 96, 3033-3042.



CURRENT WORK

All totaled, there are over 20,000 trematode species, in league with the diversity of social insect groups, like ants. Of the 17 species investigated for a caste division of labor, 15 species have been found to have soldiers. The trematode system is rich with opportunity to study the evolution and ecology of sociality outside of insects.

Current Questions:

1. Is sociality phylogenetically conserved?
2. How many times has it evolved?
3. Do parasite or host traits correlate with gains/losses in sociality?

Currently I am working to identify trematodes in a variety of snail species, and investigate if they have a caste division of labour.



Figure 2: Soldier and reproductives (left) found in infected freshwater snail, *Pleurocera proxima* (right). Trematode species TBD. *P. proxima* photo by Chris Lukhaup.

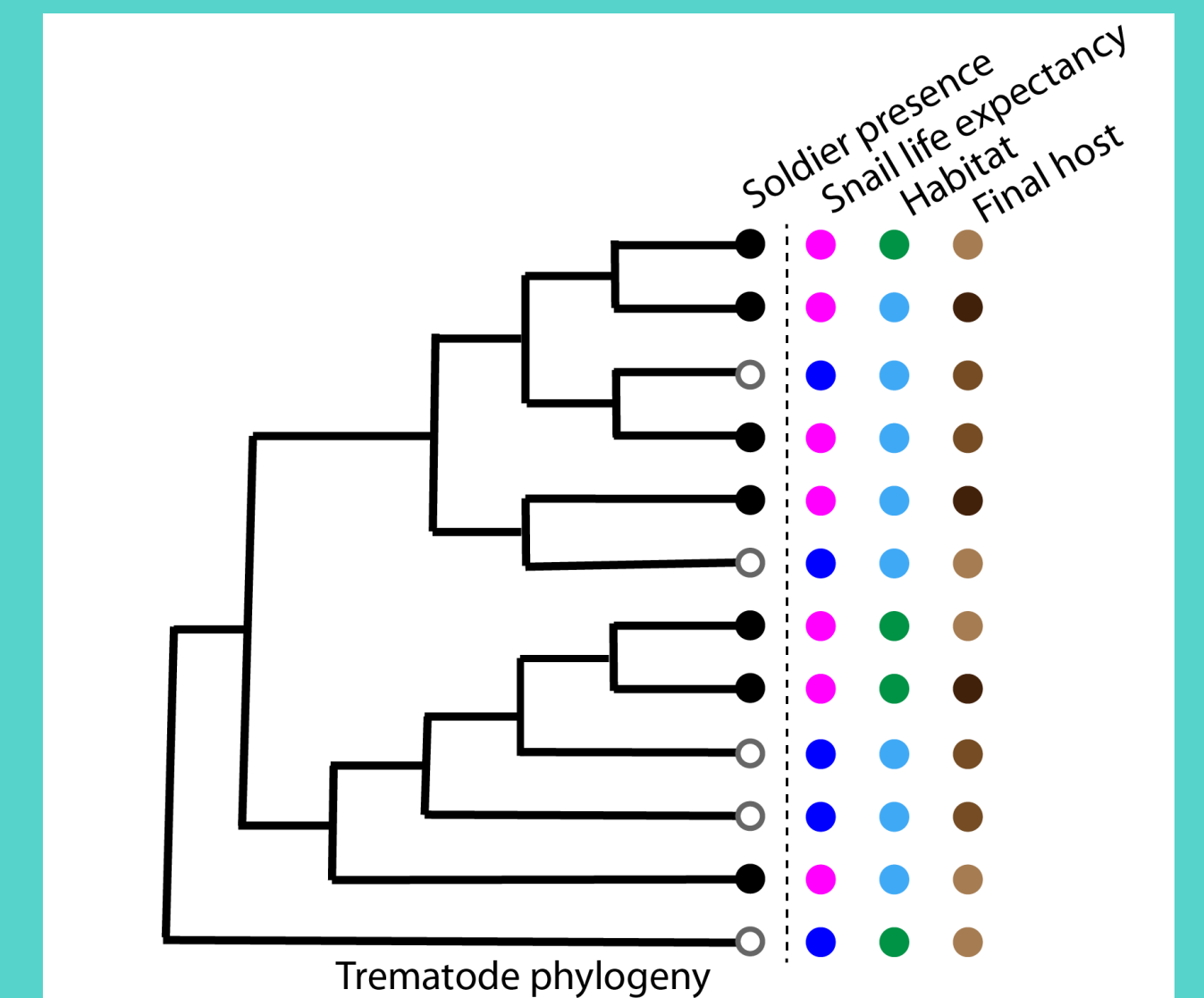


Figure 3: Hypothetical trematode phylogeny. Long-term goals of this project are to map trematode sociality, host and parasite traits onto the trematode phylogeny

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