



# Evolution of Male Species Discrimination Reduces Population Viability

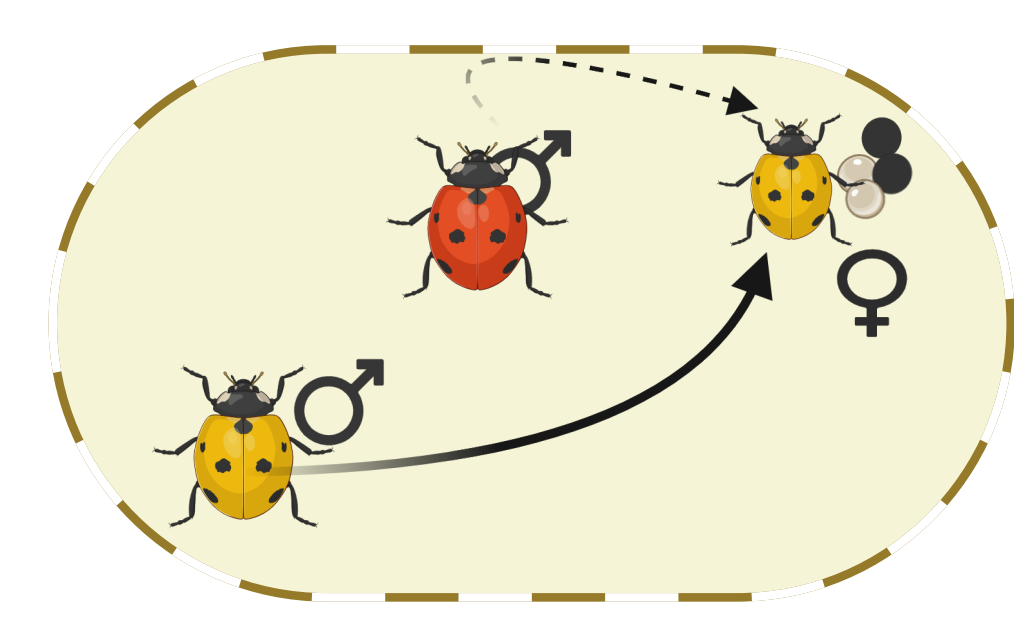
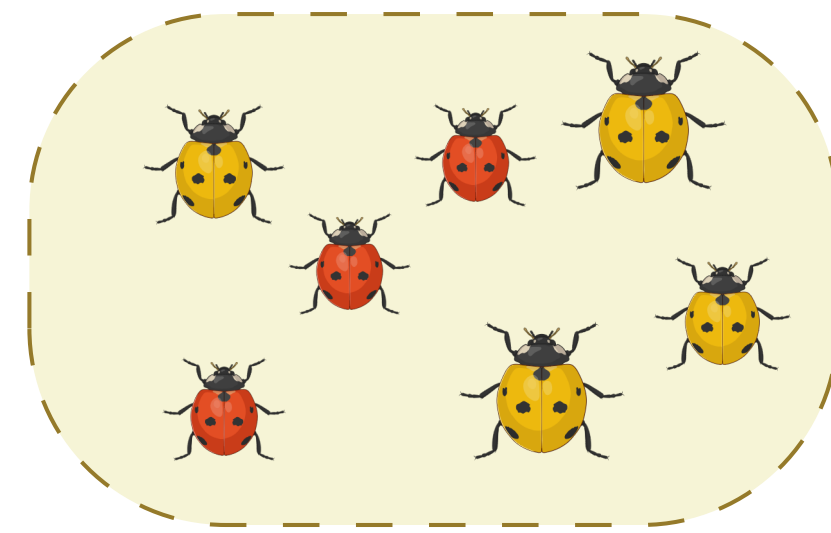
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## Background

Secondary contact b/w species

Interspecific mating is possible as species recognition is incomplete



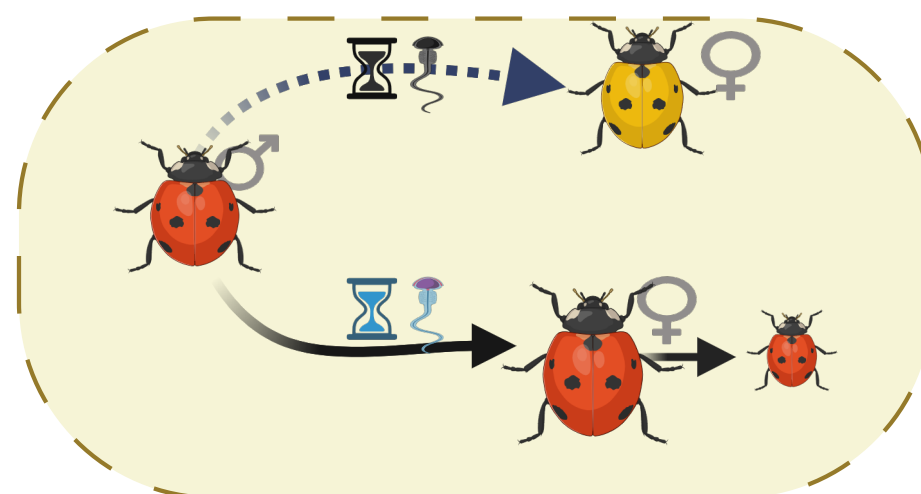
Hybrids have lower fitness, often inviable or infertile

This leads to a reduction of female fecundity

**Reproductive interference**

Males: courting heterospecifics leads to a wasting of resources

This results a reduced conspecific mating rate



## Objectives

1. Study eco-evolutionary dynamics of reproductive interference and mate choice (Male evolution)
2. Expand on competitive outcomes of sp. with varying evolvabilities

## The Model

- Species are in sympatry are under resource competition
- Females have a limited reproductive potential. Males can mate multiply
- Hybrids are completely inviable

Population dynamics equations:  
Resource competition and Reproductive interference

$$N_1(t+1) = \left( \frac{b_1 N_1(t)}{1 + \alpha_{11} N_1(t) + \alpha_{12} N_2(t)} \right) \cdot \left( \frac{N_1(1 + \alpha_1 \bar{z}_1)}{N_1(1 + \alpha_1 \bar{z}_1) + N_2(1 - y_1)(1 - \bar{z}_2)} \right)$$

$$N_2(t+1) = \left( \frac{b_2 N_2(t)}{1 + \alpha_{22} N_2(t) + \alpha_{21} N_1(t)} \right) \cdot \left( \frac{N_2(1 + \alpha_2 \bar{z}_2)}{N_2(1 + \alpha_2 \bar{z}_2) + N_1(1 - y_2)(1 - \bar{z}_1)} \right)$$

$$\Delta \bar{z}_1 = \frac{\alpha \sigma_{a_1}^2}{(1 + \alpha \bar{z}_1)}$$

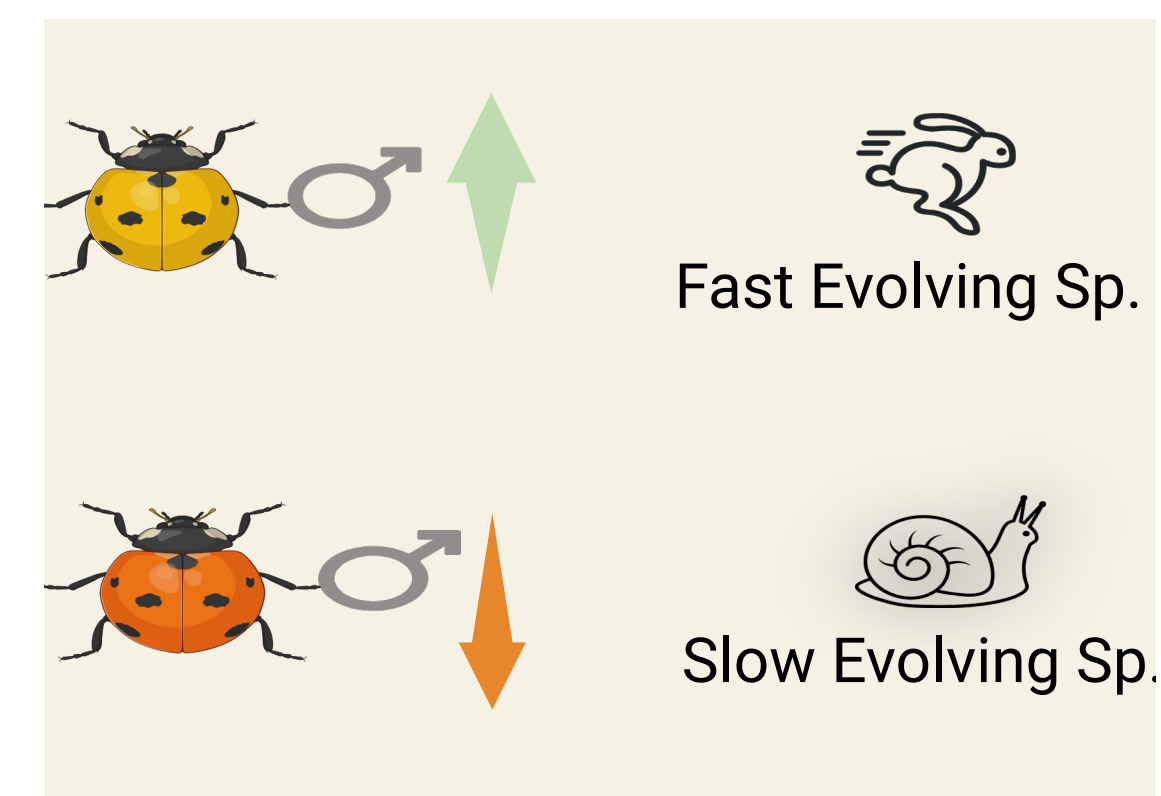
$$\Delta \bar{z}_2 = \frac{\alpha \sigma_{a_2}^2}{(1 + \alpha \bar{z}_2)}$$

- **z** : Male conspecific preference/Discrimination Trait
- Change in mean "z" each generation

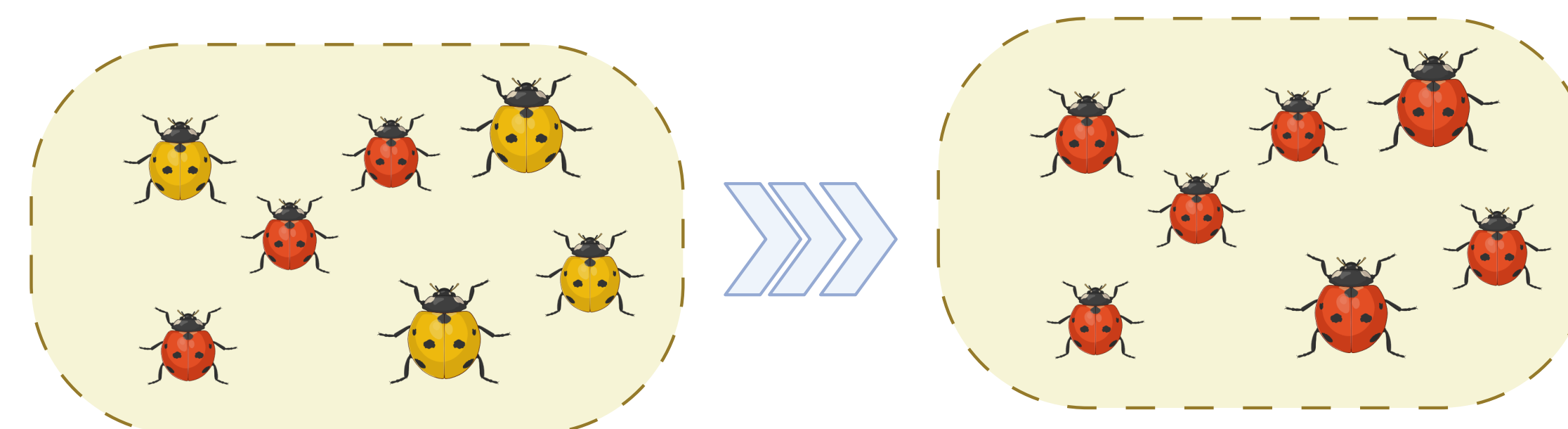
## Evolvability( $\sigma_z$ )

Evolvability : Trait change per unit selection pressure (Additive genetic variance)

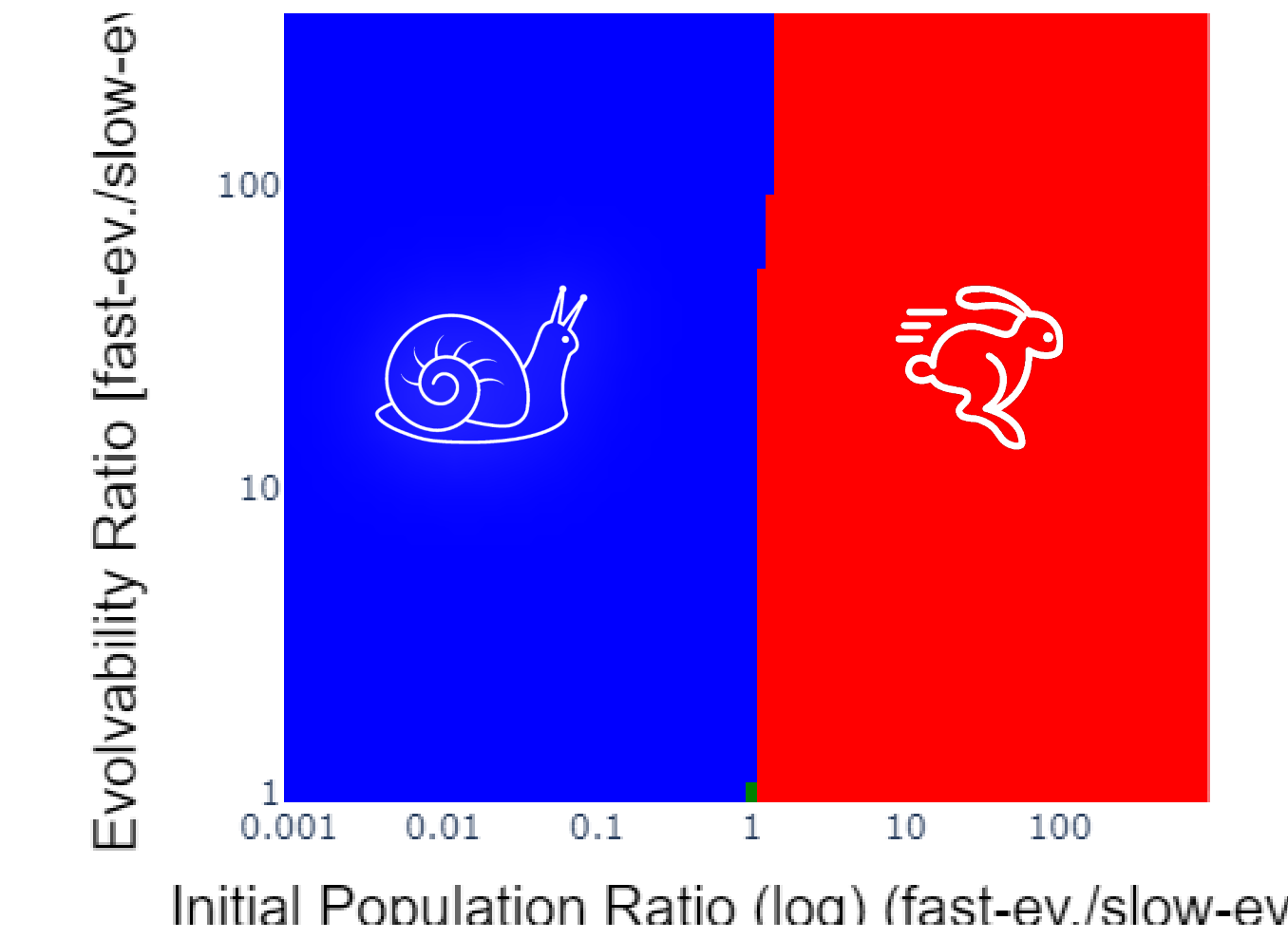
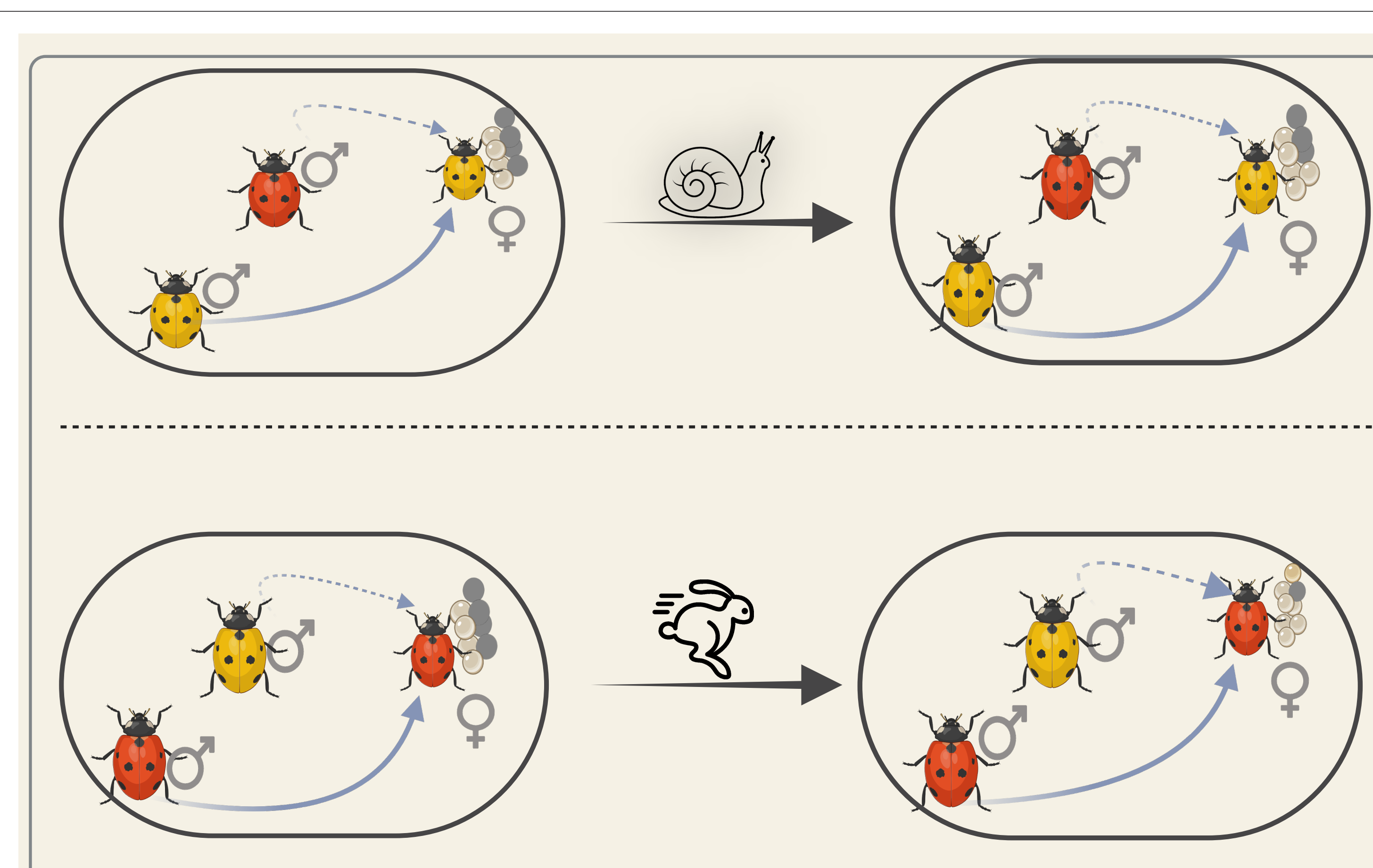
To investigate role of evolvability , we consider one of the sp. is fast evolving and the other slow evolving



## Results

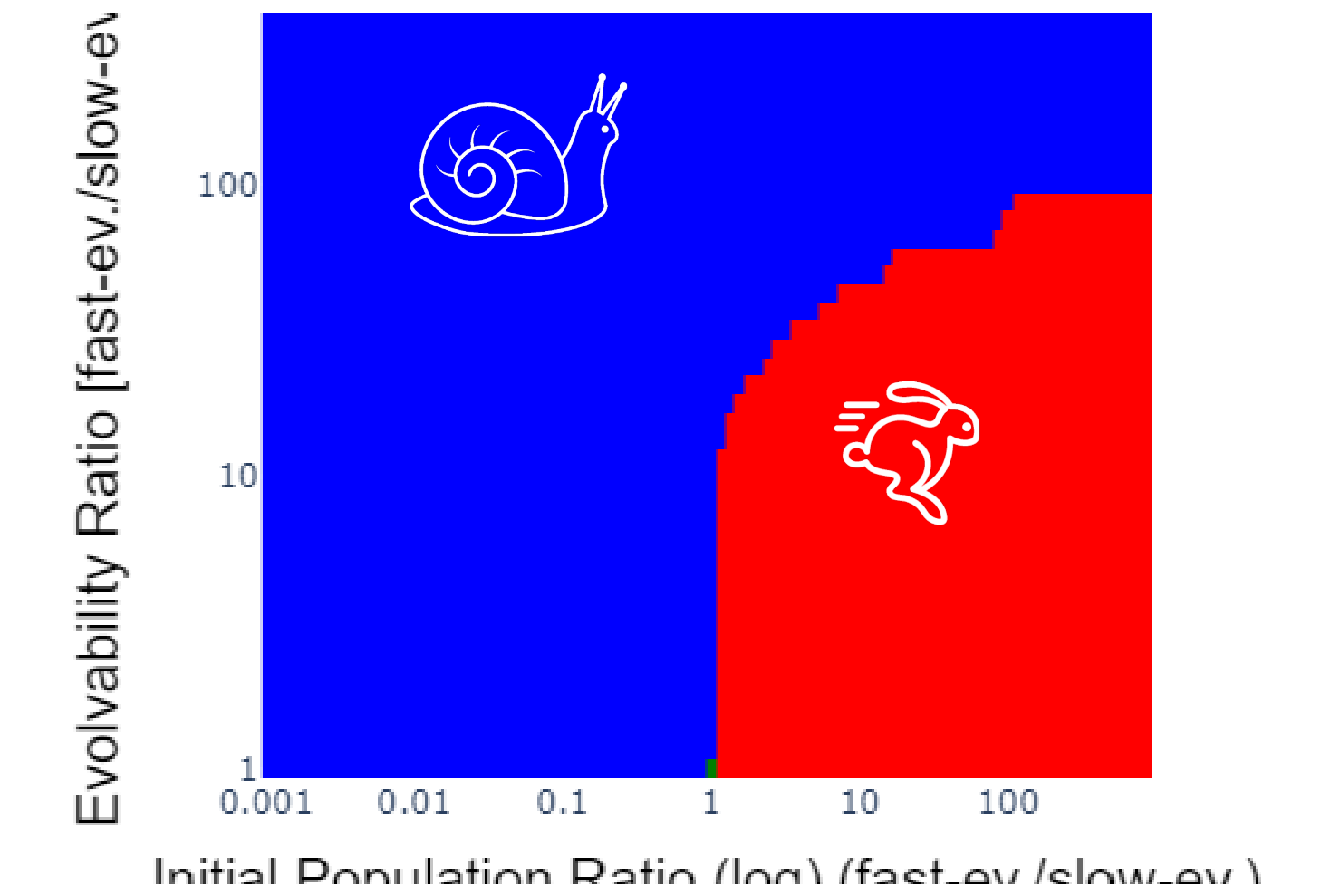


**Species which evolves discrimination faster gets competitively excluded {Evolutionary Suicide}**



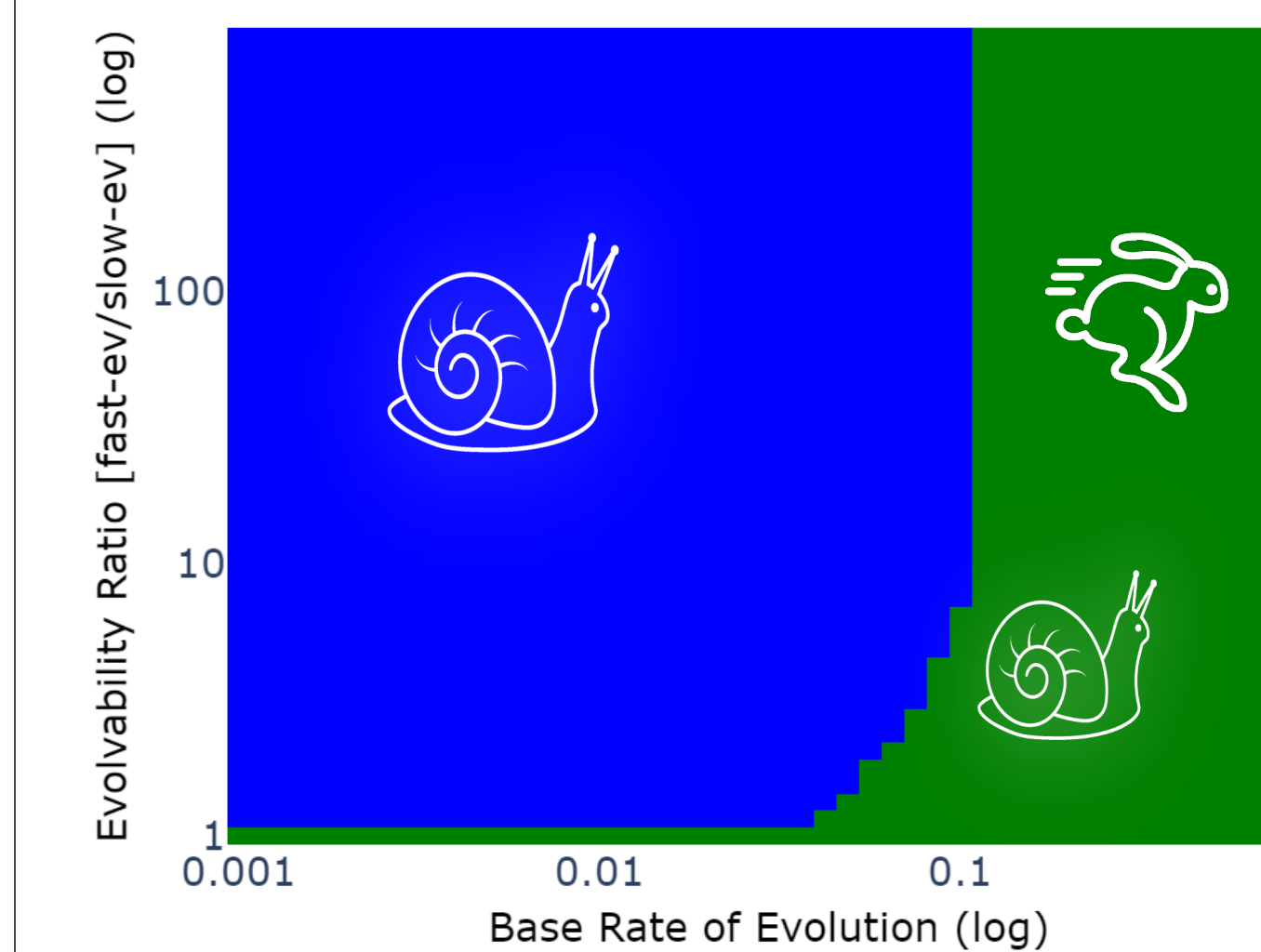
**Intersp. competition > Intrasp. competition**

- Outcome dependant on initial pop. numbers
- Evolutionary suicide effect negligible



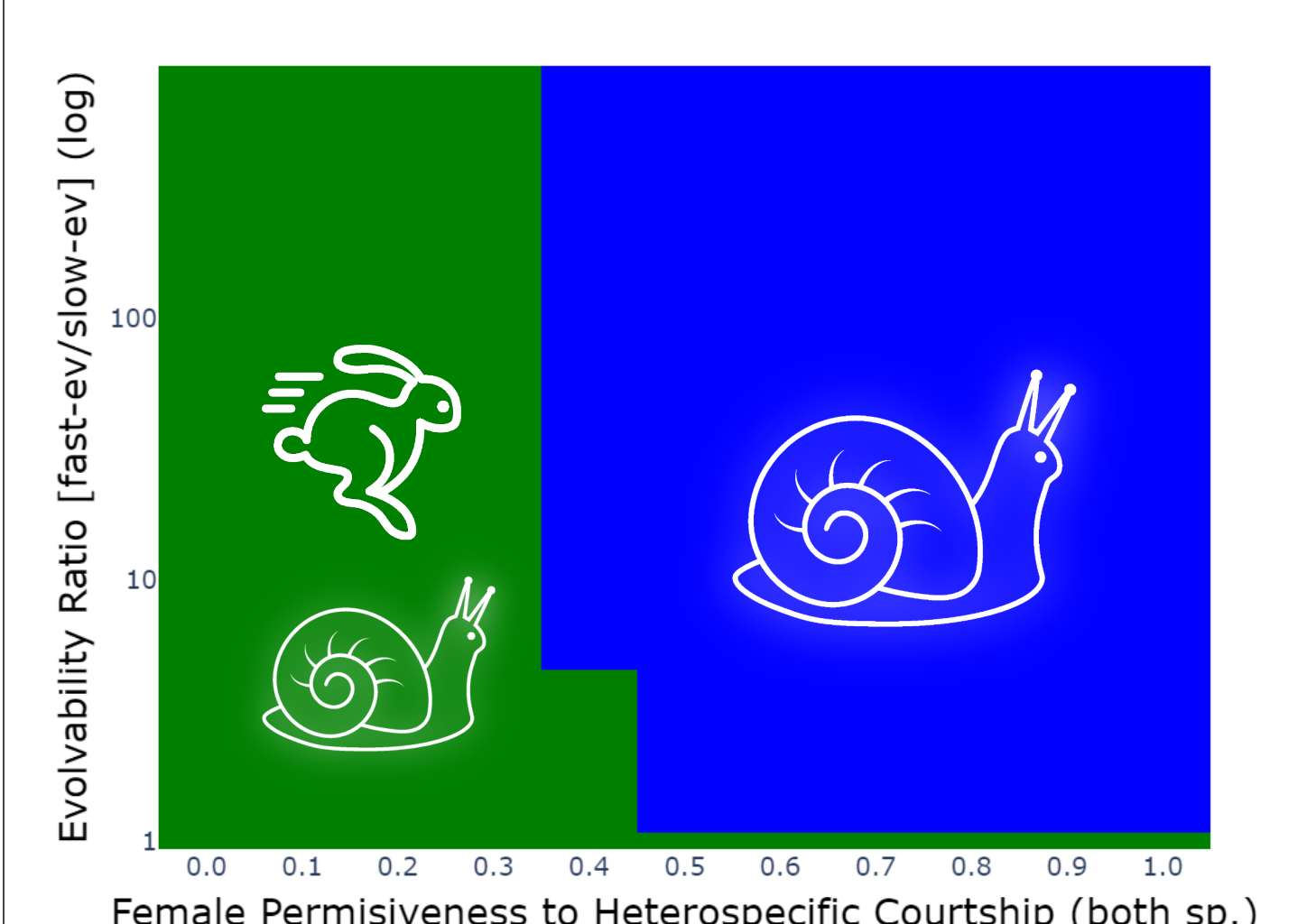
**Intersp. competition < Intrasp. competition**

- Evolutionary suicide can reverse outcome for high difference in evolvability



Evolutionary suicide only for low and moderate rates of evolution.

Coexistence if rates of evolution comparable to ecological timescale



Coexistence possible when females are resistant to heterospecific courtship

## Take-home Messages

1. Trait enhancing individual fitness can be counter-productive for the population as a whole in a competitive environment
2. Important to measure heritability\* of traits to make better predictions of competitive outcomes

## Future Work

1. Integrate evolution of female resistance to courtship (in progress)
2. Test using meta-analytic data of reproductive character displacement if integration of evolutionary suicide leads to better predictions

## References and Mathematical Derivations

