Evolution of Male Species Discrimination Reduces Population Viabilty

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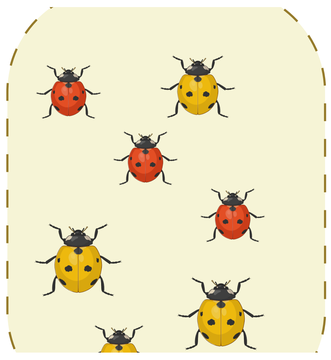
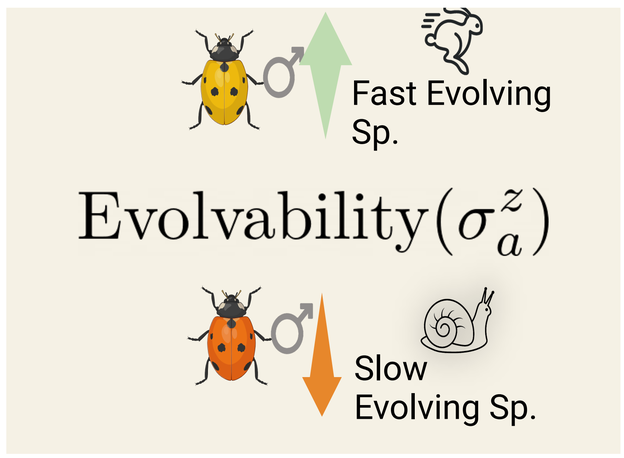
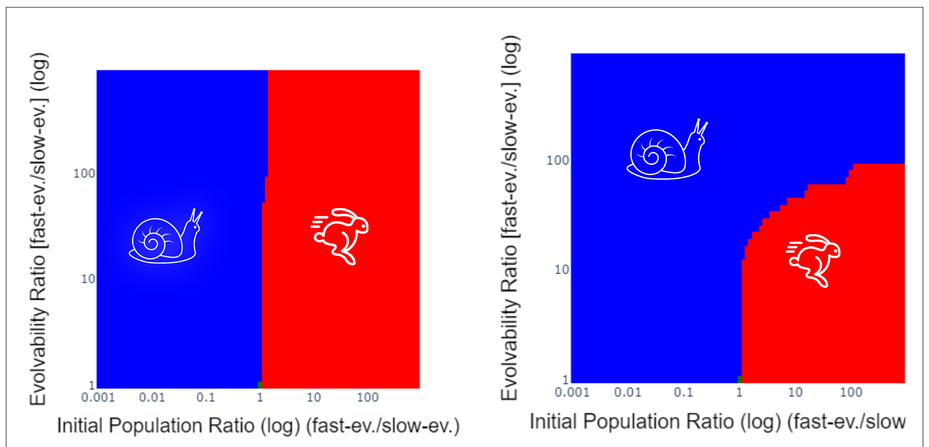
Background

Secondary contact b/w species

IIncomplete species recogniton. This leads to interspecfic reproductive interactions





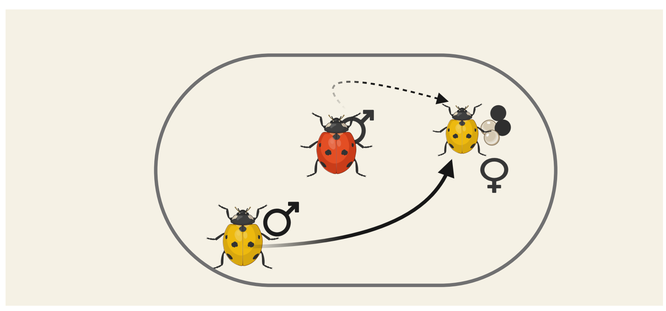


(Inter-sp. > Intra-sp.) competetion

Outcome dependant on initial pop. numbers . Evolutionary suicide effect negligeible

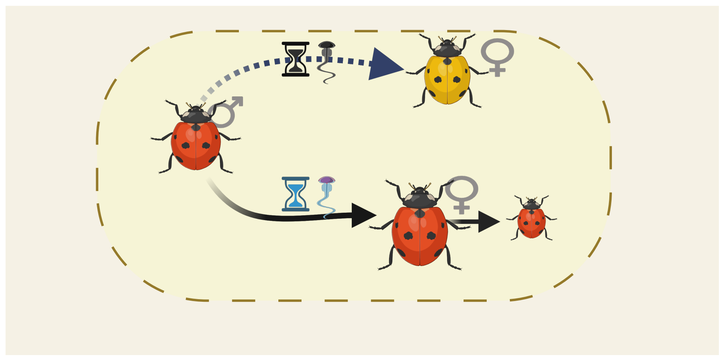
(Inter-sp. > Intra-sp.)competetion

Evolutionary suicide can reverse outcome for high difference in evolvability



Hybrids are inviable. Female fecundity is reduced.

Reproductive interference



Cost for males

Objectives

1. Eco-evolutionary dynamics: reproductive interfererence and mate choice *(Male evolution)*
2. Competetive outcomes of sp. with varying evolvabilities

The Model

- Species in sympatry: resource competetion
- Females: Limited reproductive potential
- Males have a large mating capacity

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

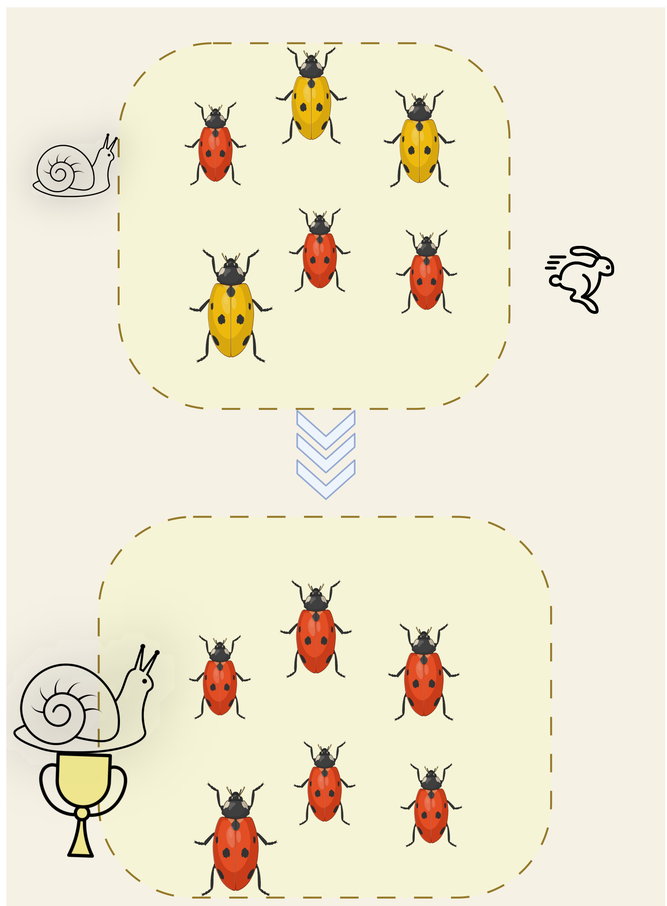
Analagous equation for sp.2

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

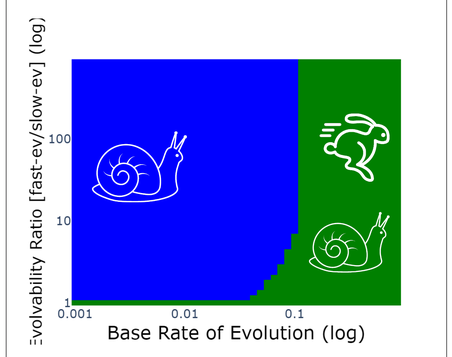
$$\Delta\bar{z}_2 = \frac{\alpha\sigma_{a_2}^2}{(1+\alpha\bar{z}_2)}$$

- Population dynamics: resource competetion + reproductive interference
- Discrimination trait mean change (z) derived using selection differential

Results

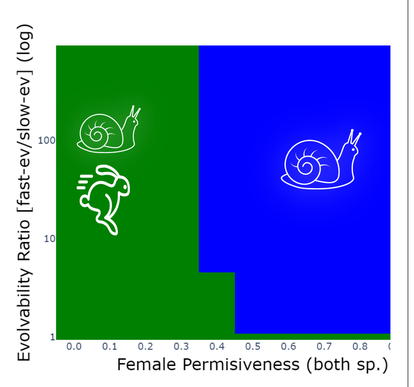


Species which evolves discrimination faster gets competetively excluded {Evolutionary Suicide}



Evolutionary suicde only for low and moderate rates of evolution.

Coexistence if rates of evolution comparable to ecological



Coexistence possible when females are resistant to heterospecfic courtship

Take-home Messages

1. Traits *enhancing indiviudal fitness may 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 competetive 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

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