Optimal Mating Strategies of Hermaphroditic Snails

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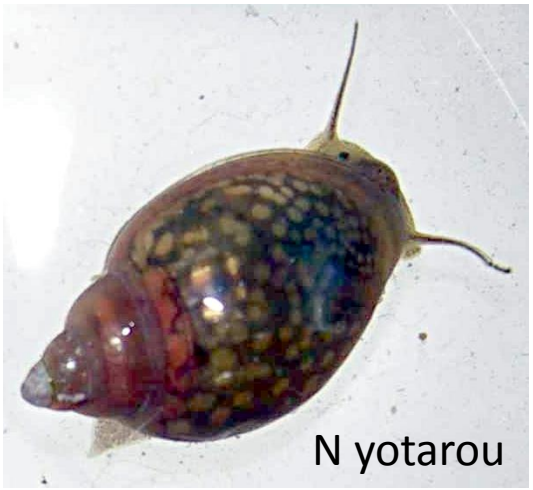
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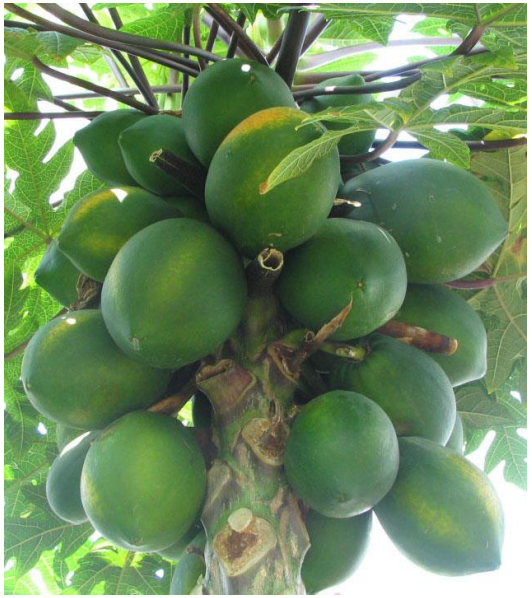
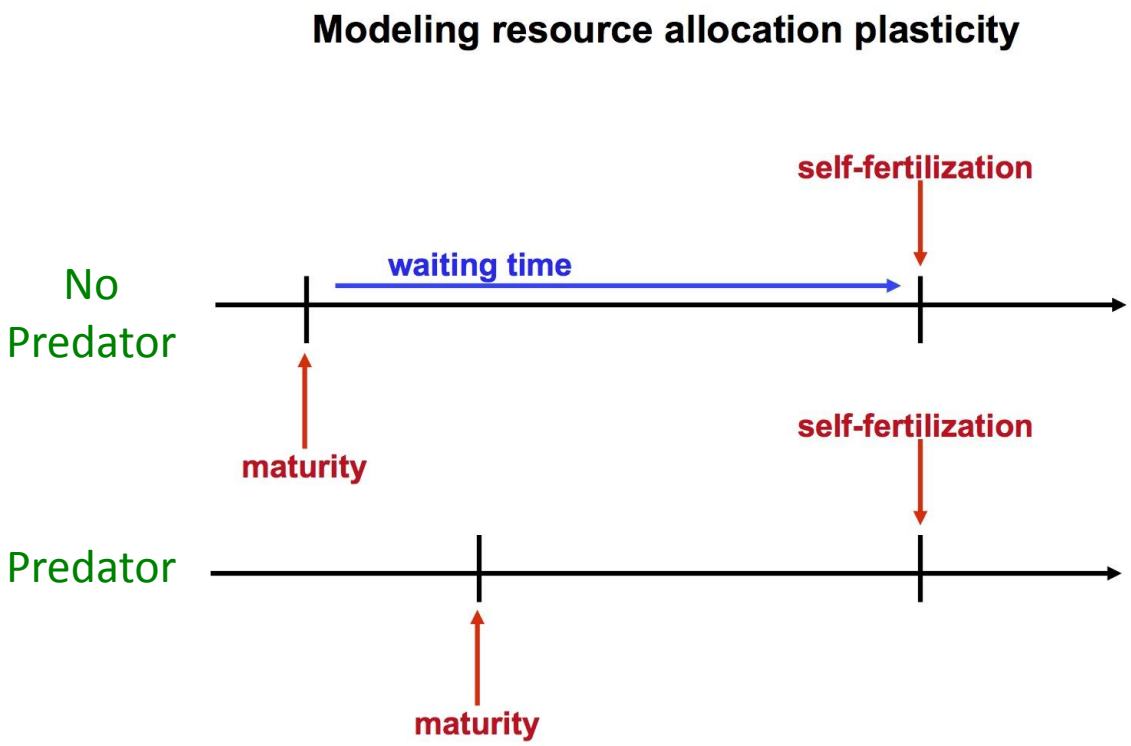


Life Histories



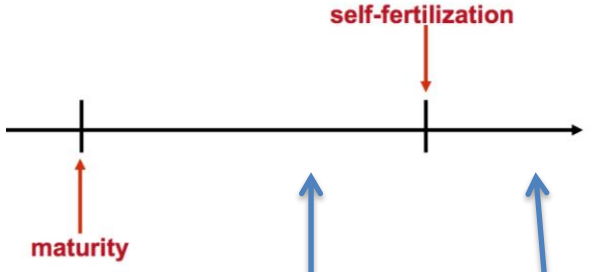
Theoretically modeled and experimentally verified

Seen only experimentally

- Maturity is at first outcrossing
- No growth once reproduction begins

Fitness

- Fitness: Total reproductive output
- Fitness model takes into account:
  - Predation
  - Mate encounter rate
  - Fecundity and Mortality
  - Defensive strategy
  - Inbreeding depression



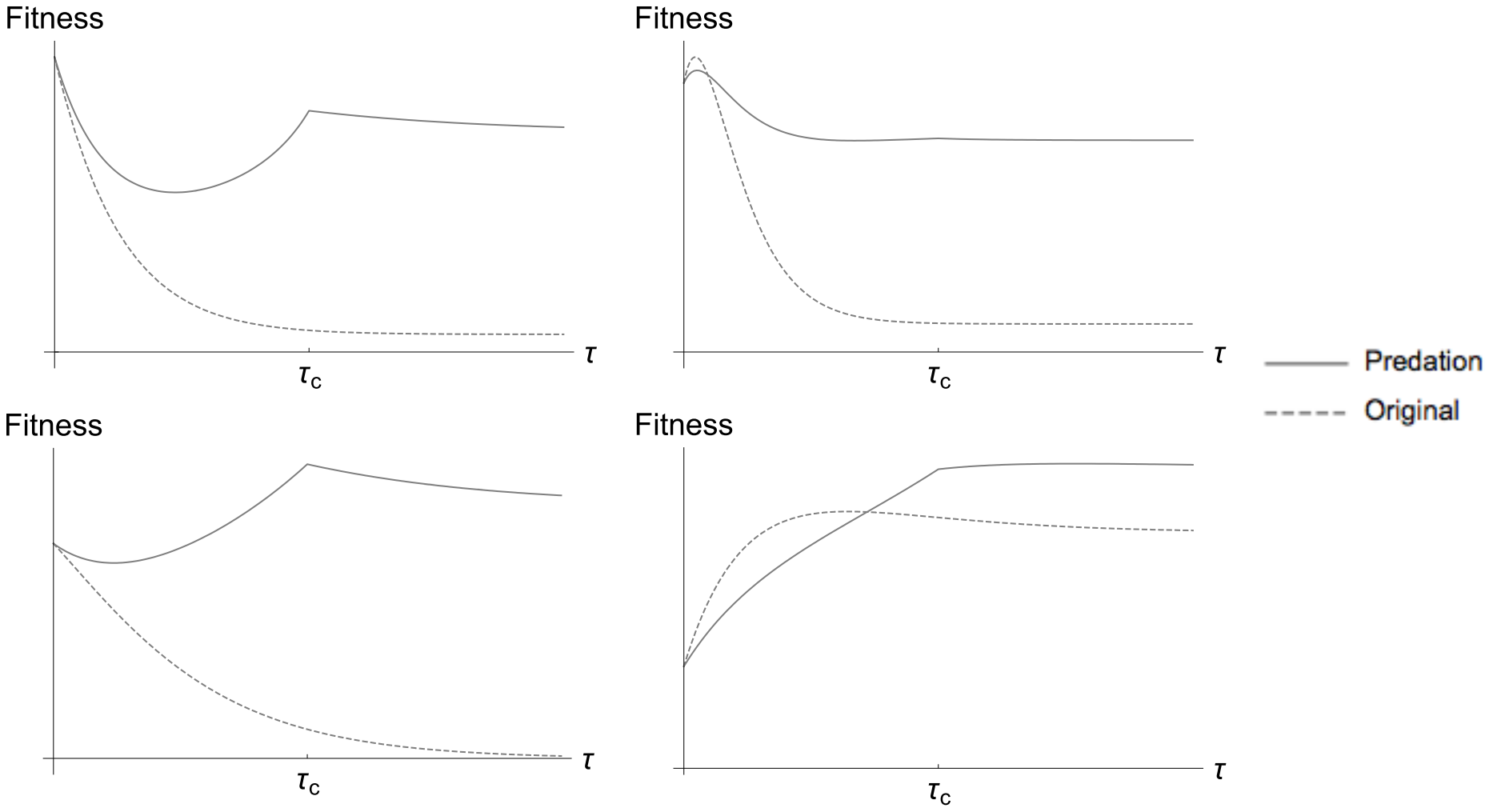
$$\int_0^{\tau} \left(\int_u^{\infty} l(x,u) b_o(x,u) dx \right) f(u) du +$$

$$\int_{\tau}^{\infty} \left(\int_{\tau}^{u} l(x,\tau) b_s(x,\tau) dx + \int_u^{\infty} l(x,\tau) b_o(x,\tau) dx \right) f(u) du.$$

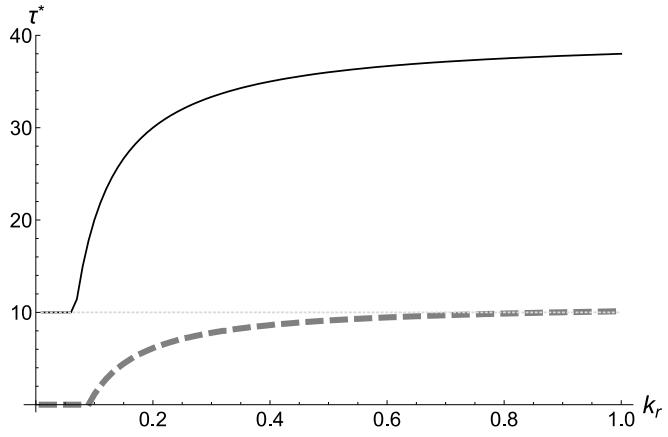
- What delay time (τ) will give optimum fitness?

Four Optimal Scenarios

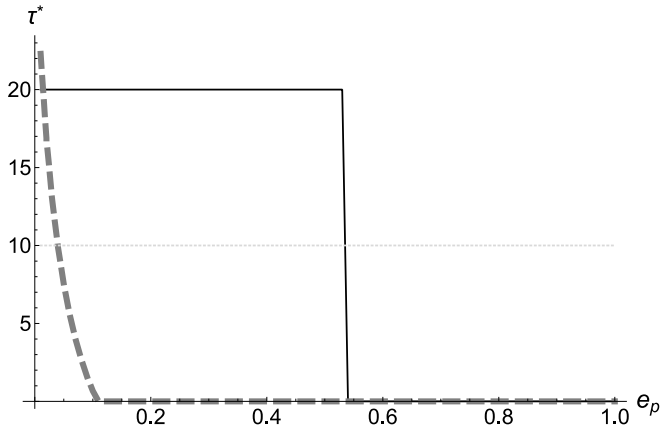
τ_c: Period of time it takes to fully defend against predation



Parameter Sweeps



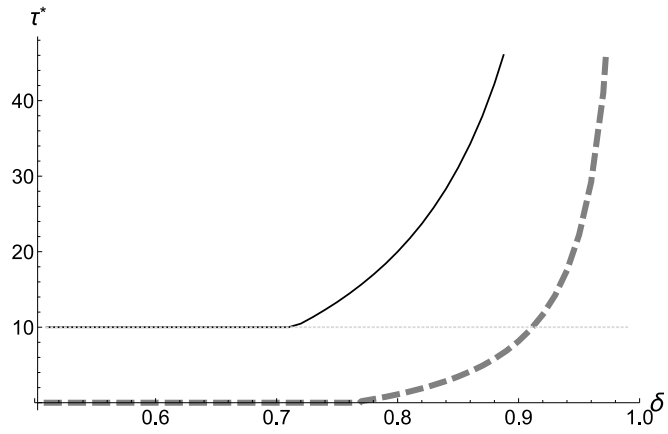
k_r: How growth affects fecundity



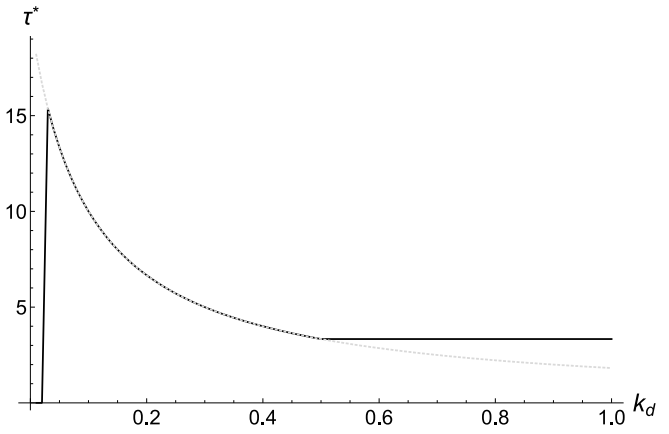
e_p: How likely death is

Predation

Original



δ: Strength of inbreeding depression



k_d: Effectiveness of defenses

Types of Predators

- Defensive strategy
  - Size
  - Size-independent defenses (e.g. shell morphology)
- How to allocate?

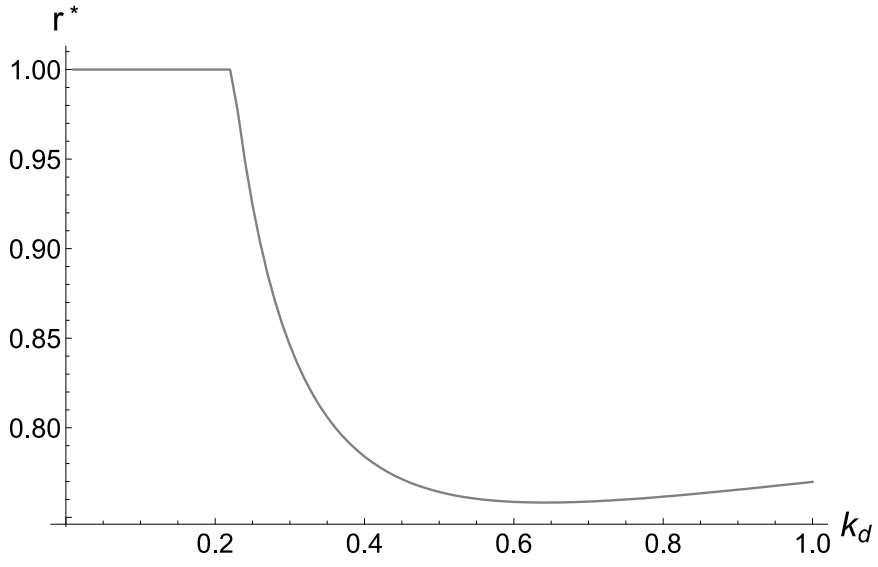
Small-preferential

Shell-breaking

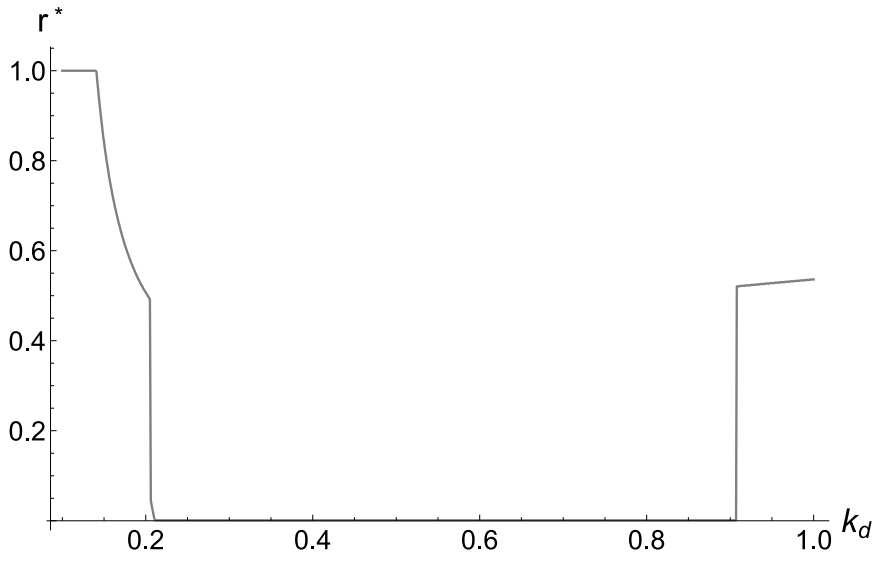
Large-preferential

Optimal Allocation

- r: Fraction of resources allocated to size
- k_d: Effectiveness of size-independent defenses



Low predation



High predation

Conclusions

- Shorter wait time with high predation
- Resource allocation strategies

Future Research

- Improve mortality model
- Experimental verification (almost done!)

Works Cited

- Tsitrone et al. 2003a

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  - National Science Foundation
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