

62nd Annual Meeting of the Association for Tropical Biology and Conservation



Context-dependent outcomes of rodent-oak interactions in subtropical forested islands

Di ZENG

Zhejiang A&F University

Xishuangbanna, 2026-07-01





Vander Wall 1990; Zhang 2003; Xiao et al. 2013; Zeng et al. 2019; Zhang et al. 2025;

Background: Dual roles of rodents



Seed predator

Background: Dual roles of rodents



Seed predator

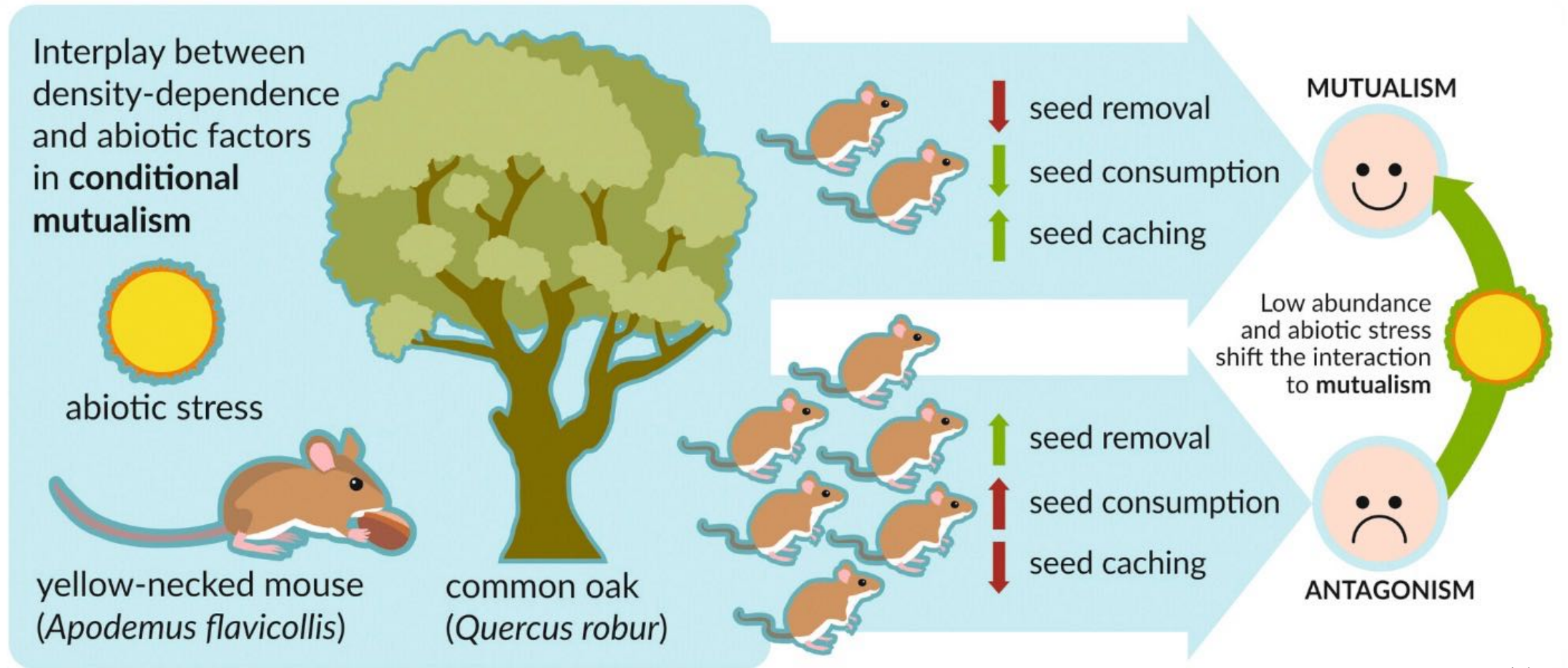


Seed disperser



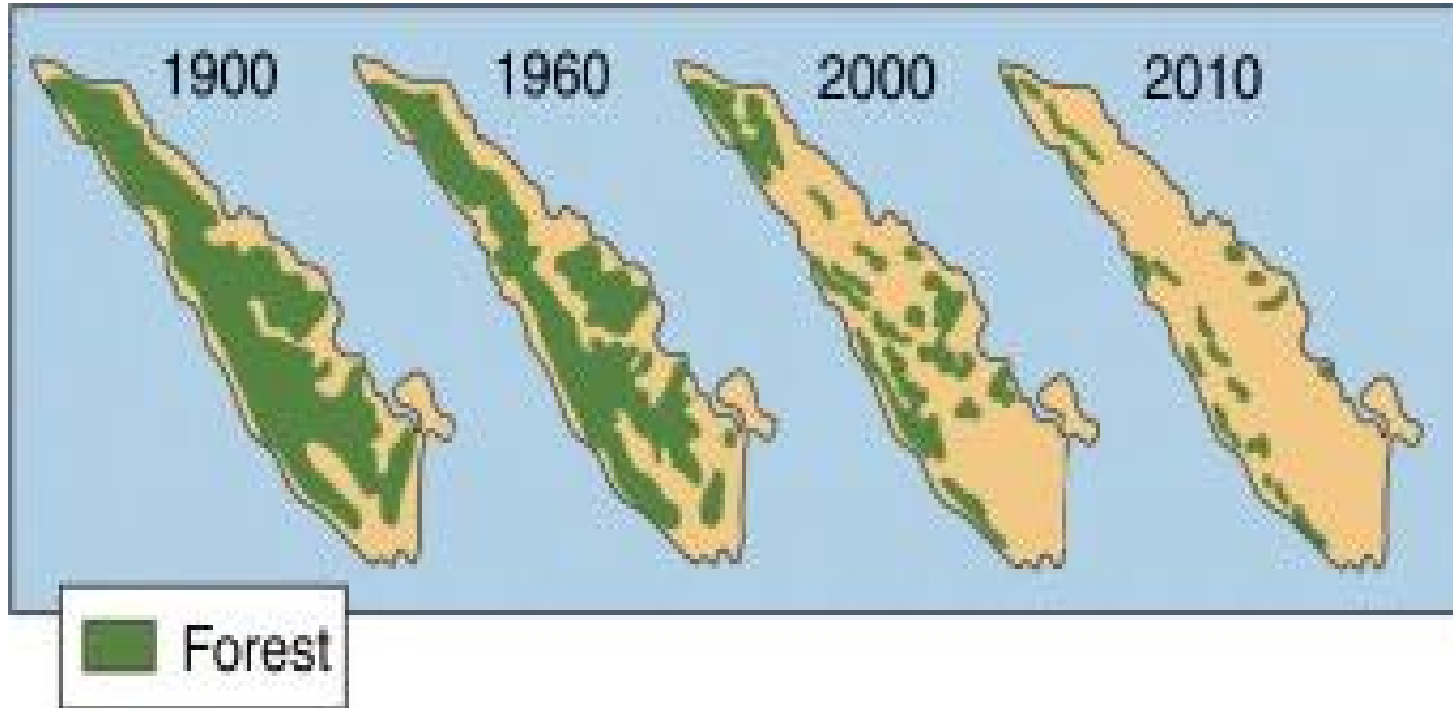
Background: Dual roles of rodents

Conditional mutualism



Zwolak et al. 2024;

Background: Habitat fragmentation

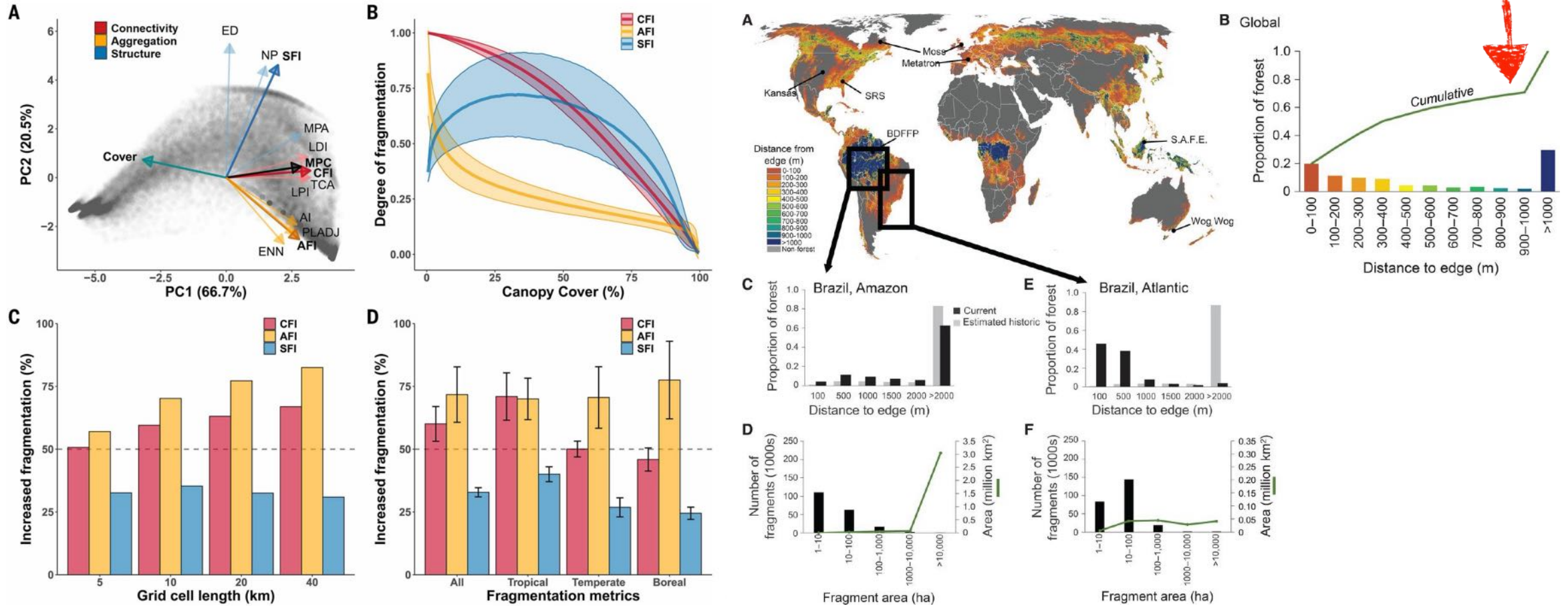


- ❖ Habitat loss
- ❖ Increasing isolation



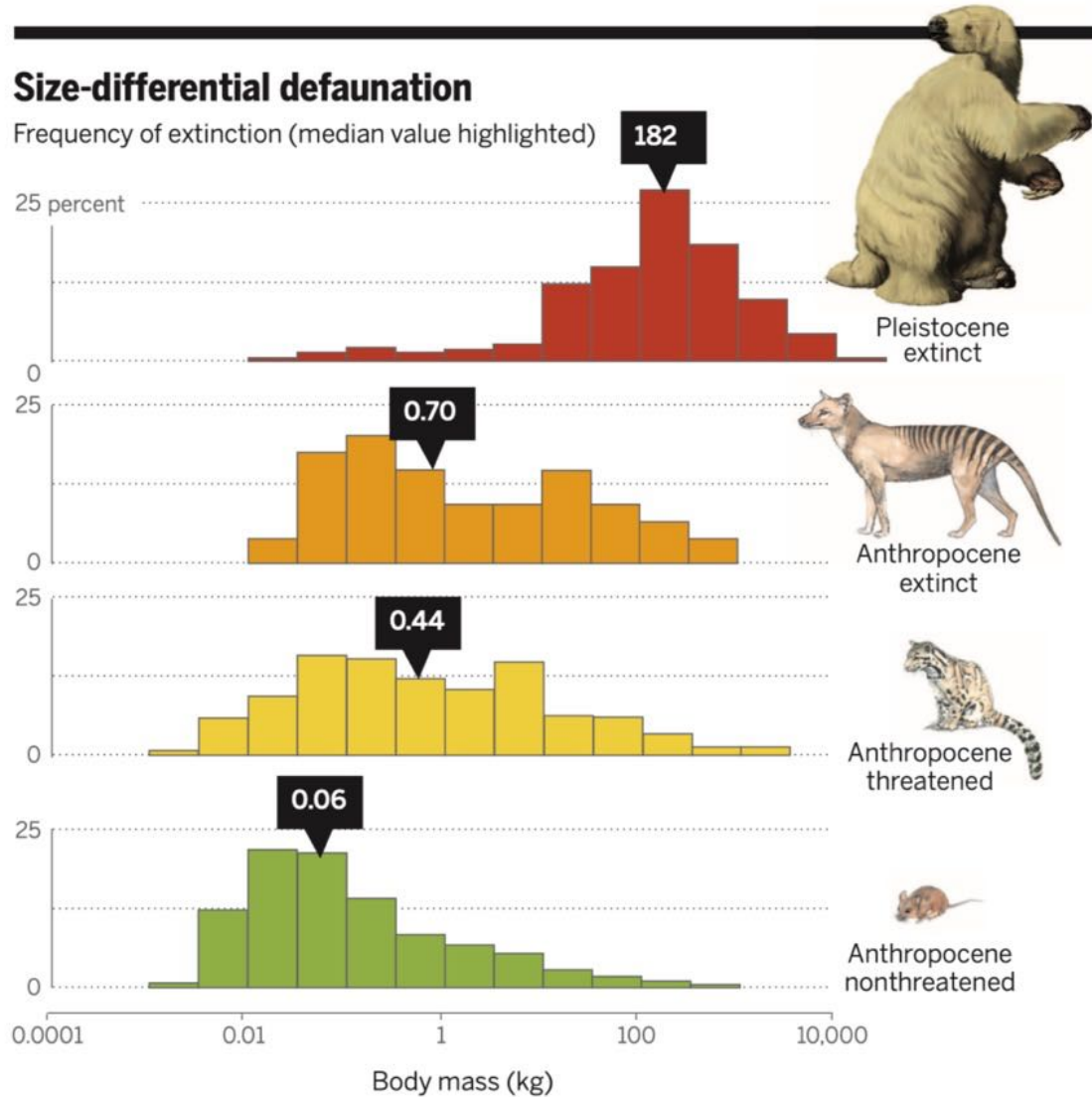
Background: Habitat fragmentation

About 70%



Haddad et al. 2015; Zou et al. 2025

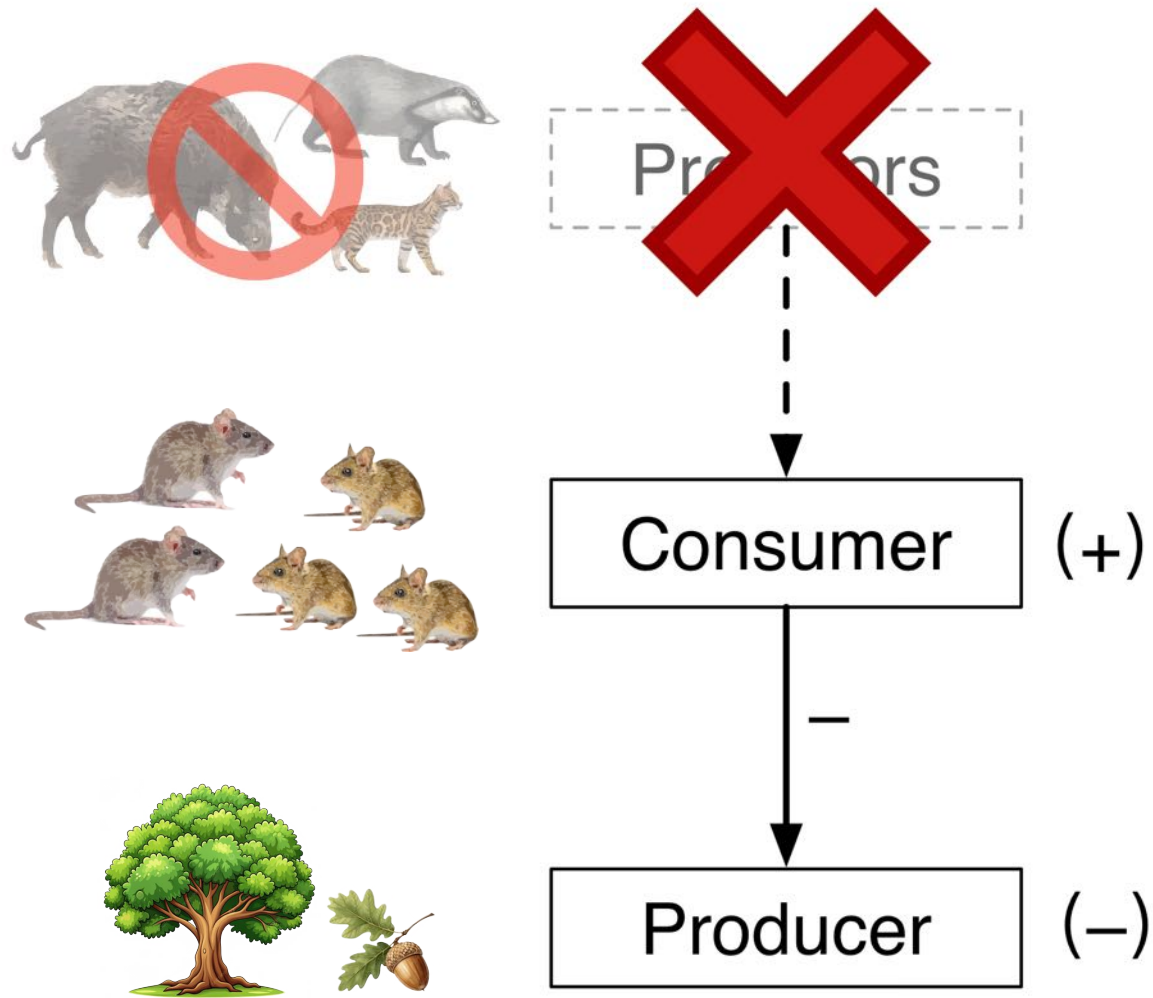
Background: Defaunation



❖ Species loss: One most consequence of habitat fragmentation

❖ Large-bodied species are lost first

Background: Defaunation

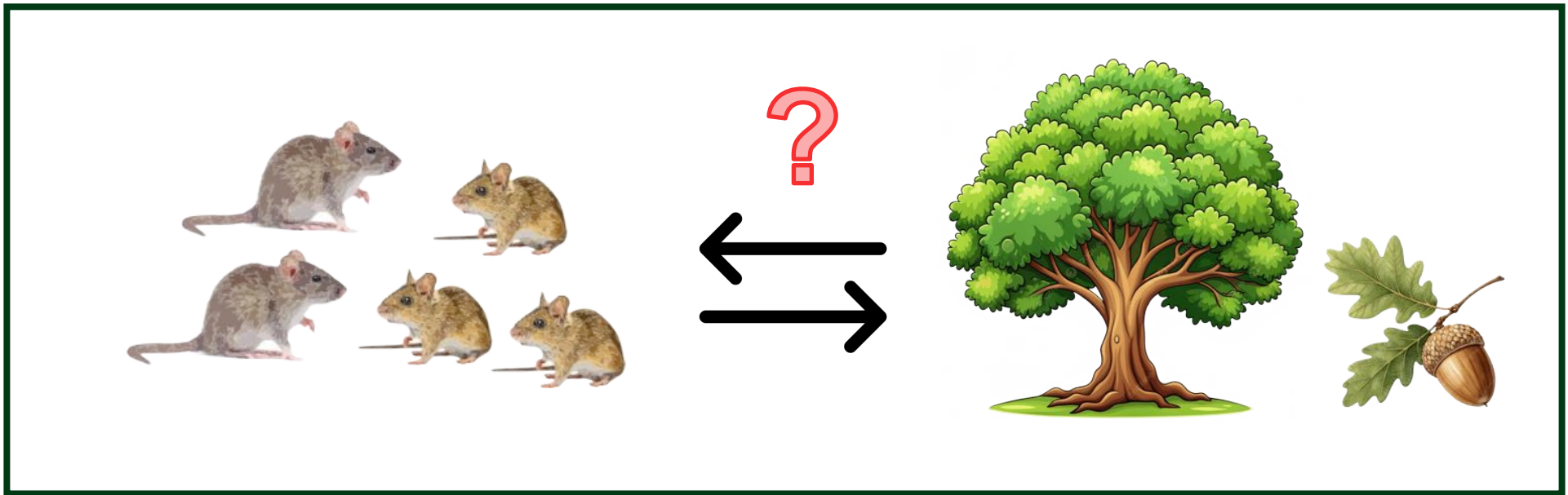


Releasing small mammals

Scientific questions

Q1

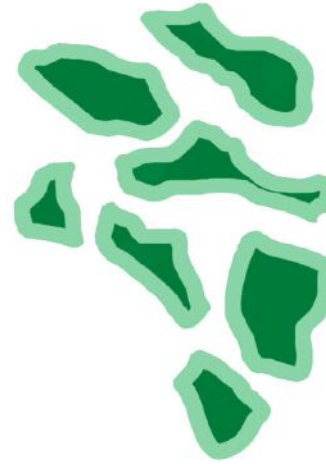
What determine the dynamics of conditional mutualism between rodents and plants?



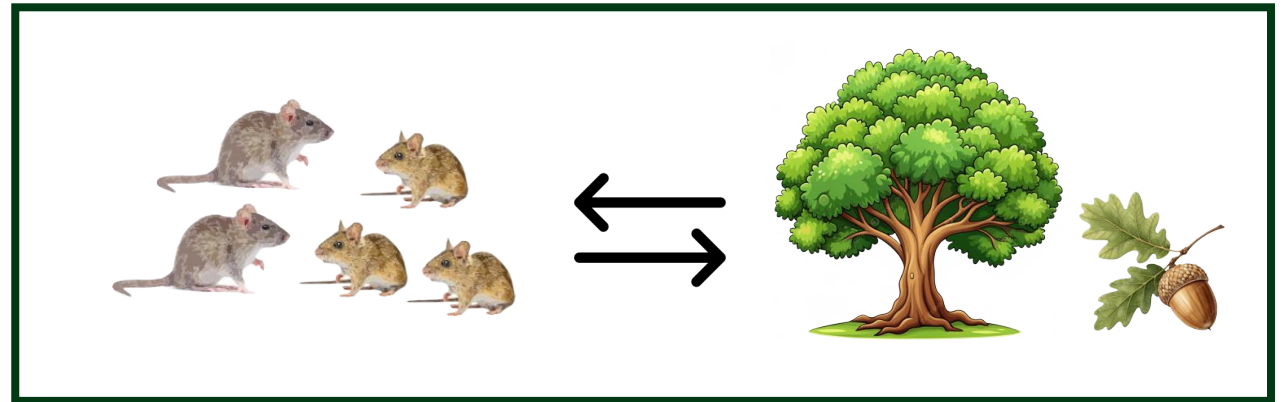
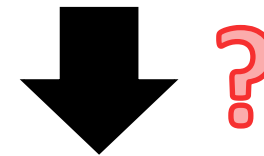
Scientific questions

Q2

How does habitat fragmentation affect the outcome of rodent–plant interactions?



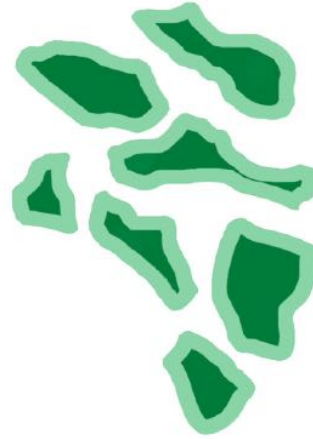
Habitat fragmentation



Conditional mutualism

Scientific questions

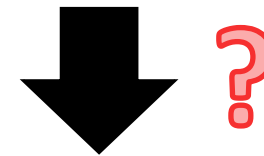
Q2



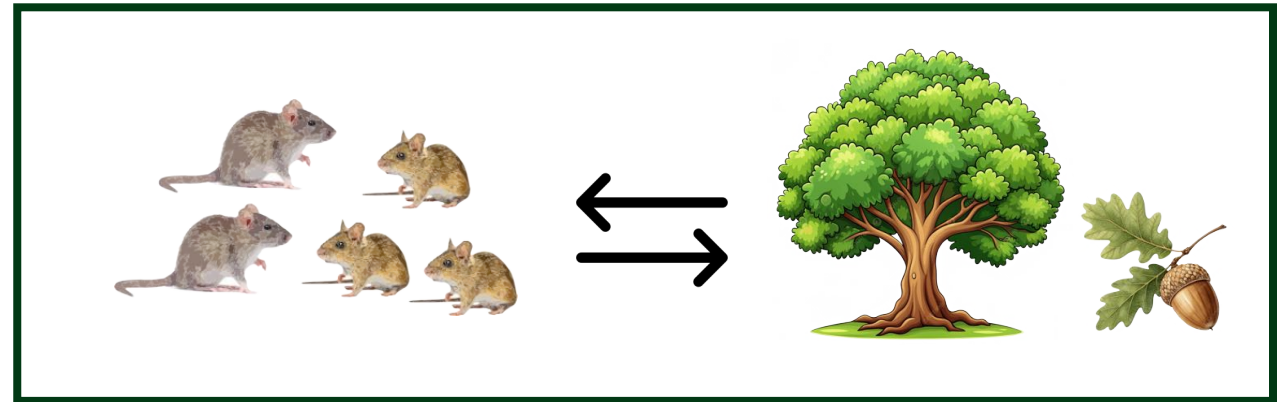
Habitat fragmentation



Defaunation



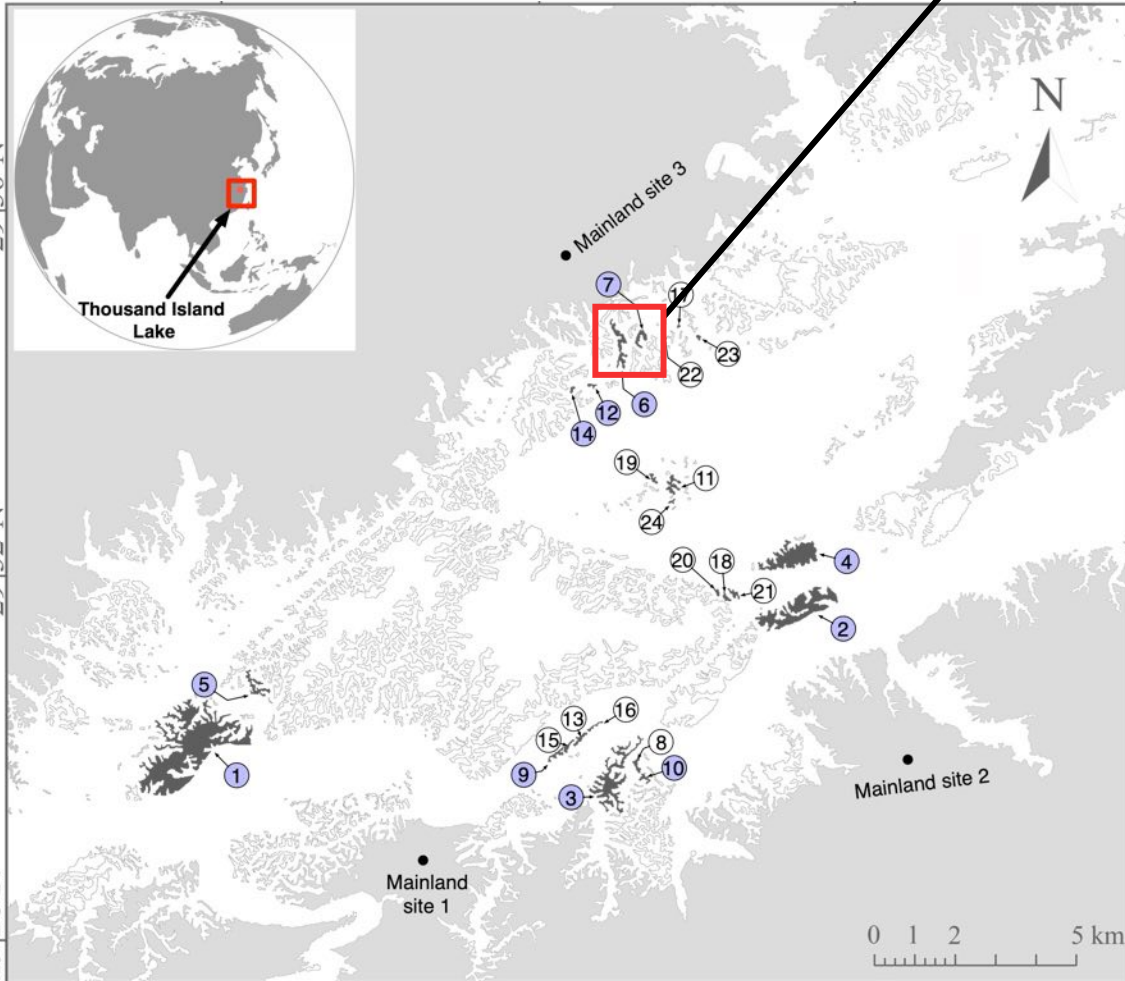
How does habitat fragmentation affect the outcome of rodent–plant interactions?



Conditional mutualism

Study site

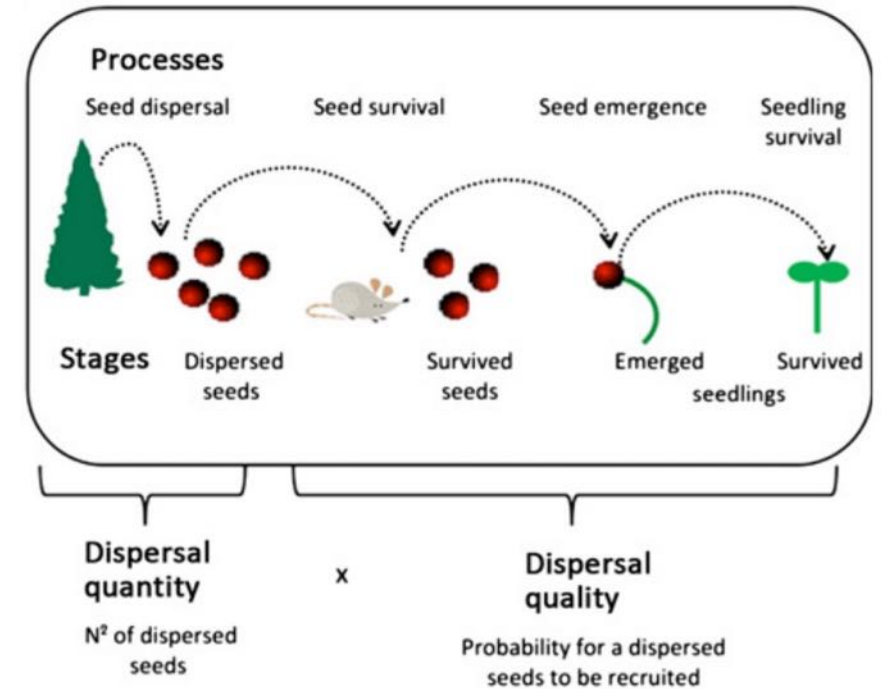
Thousand Island Lake



- Hydropower dam construction in 1959
- More than 1000 islands with area > 0.25 ha
- We selected 24 study islands

Model interaction

Rodent – oak (*Quercus serrata*)

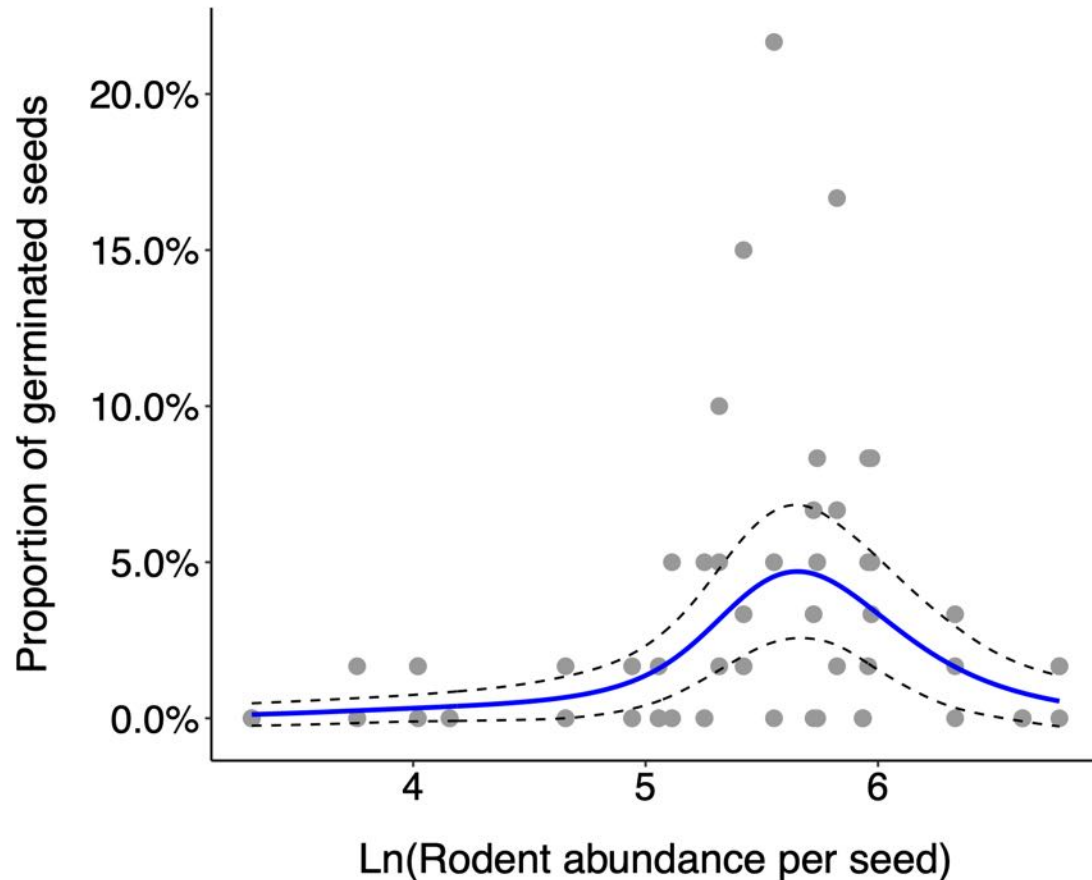


Seed dispersal effectiveness

Schupp 2003; Escibano-Avila et al. 2014

Results

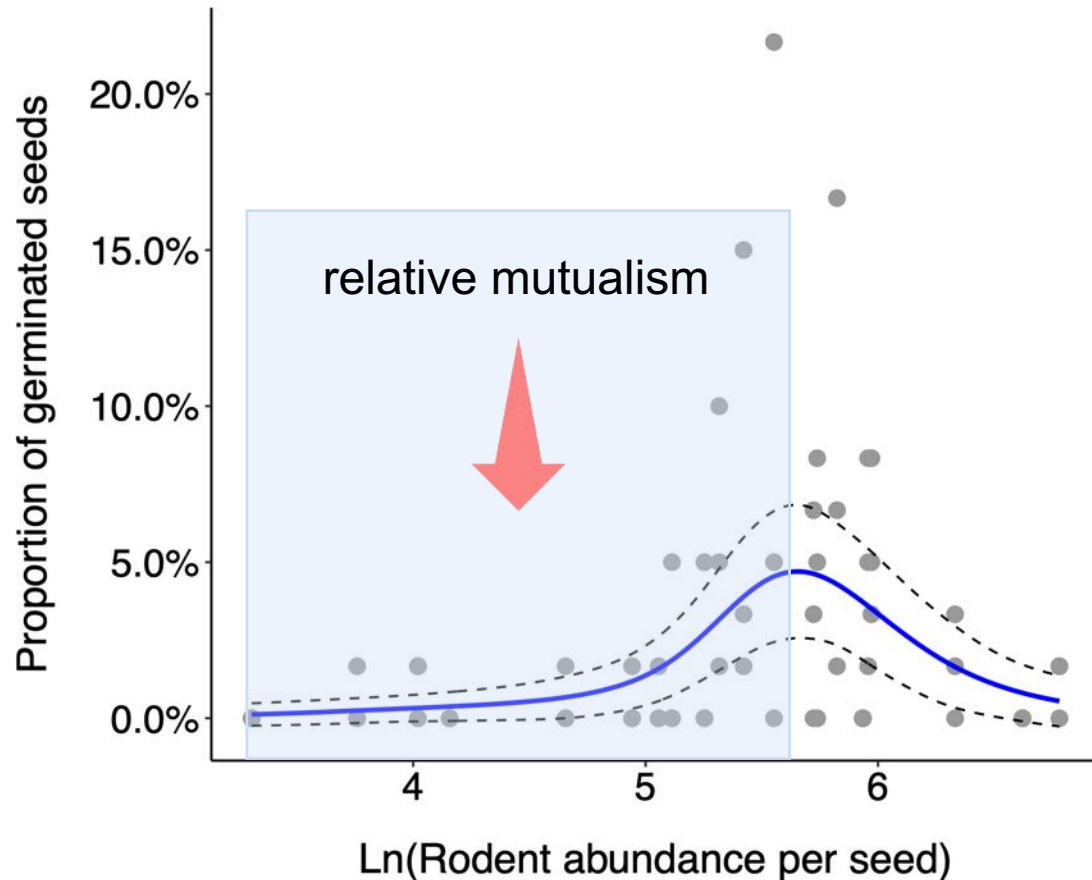
The non-monotonic rodent–plant interactions



❖ A dome-shaped relationship

Results

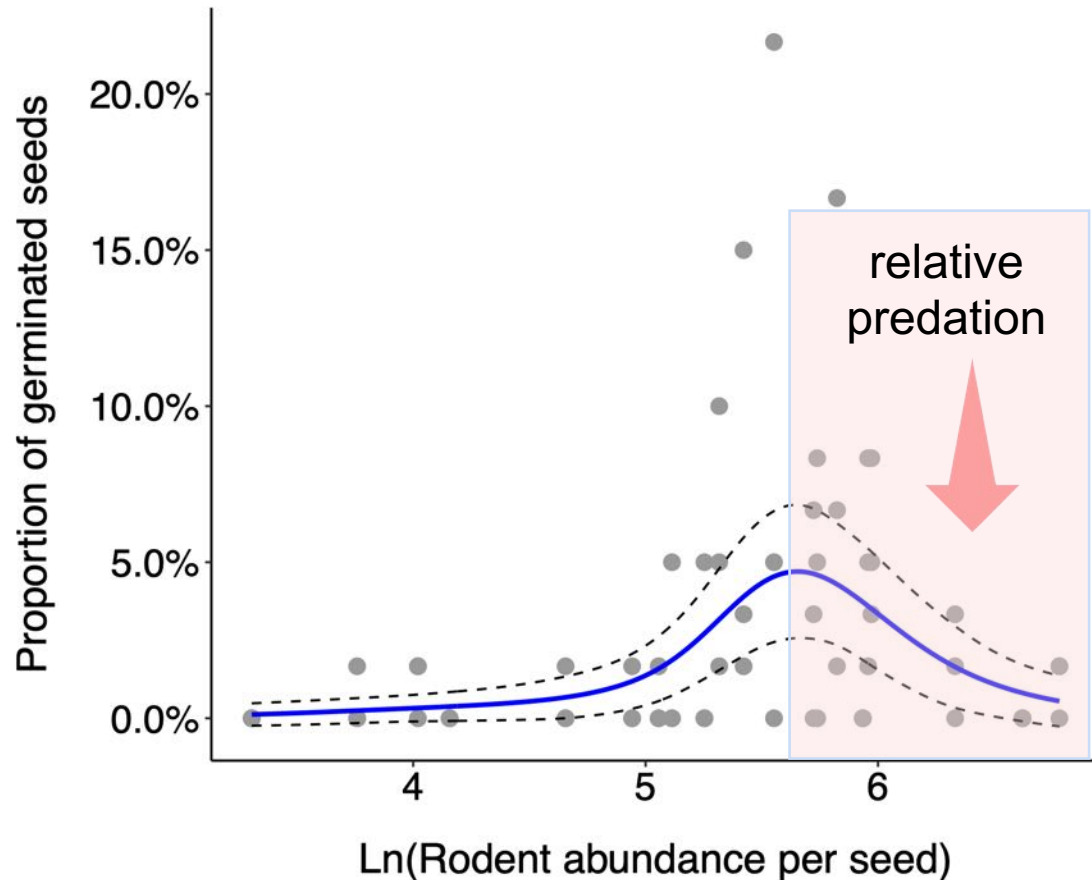
The non-monotonic rodent–plant interactions



- ❖ A dome-shaped relationship
- ❖ Low competition: relative mutualism

Results

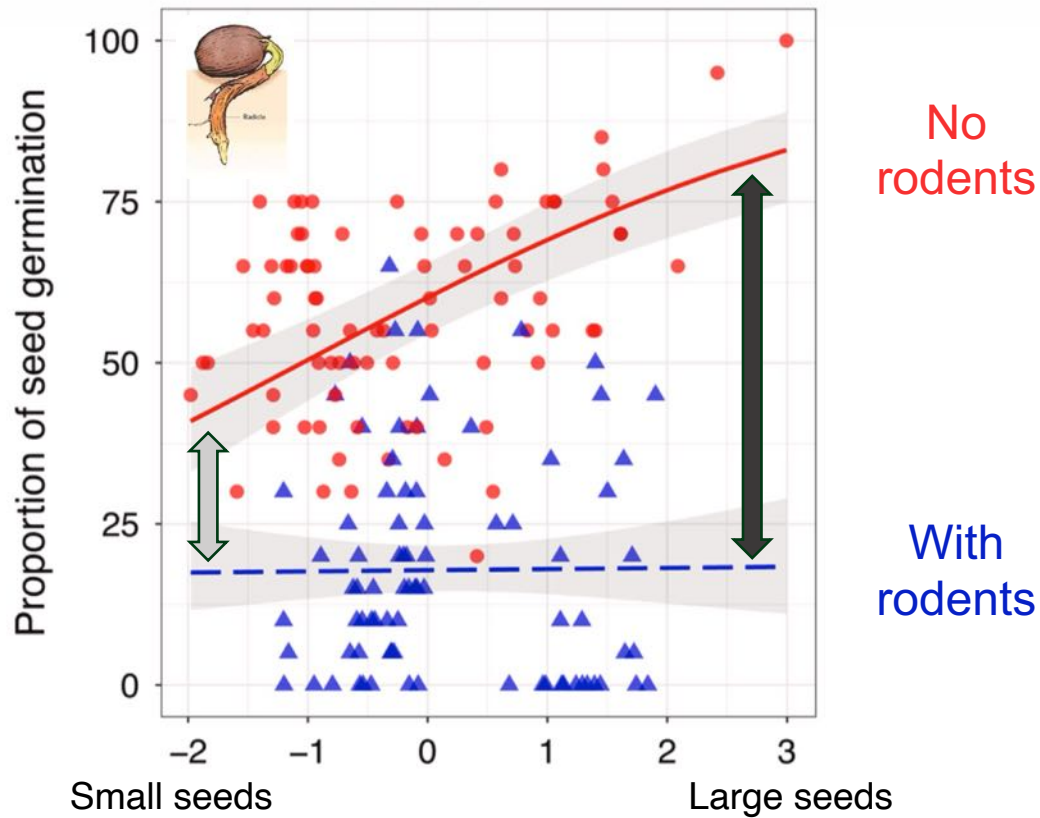
The non-monotonic rodent–plant interactions



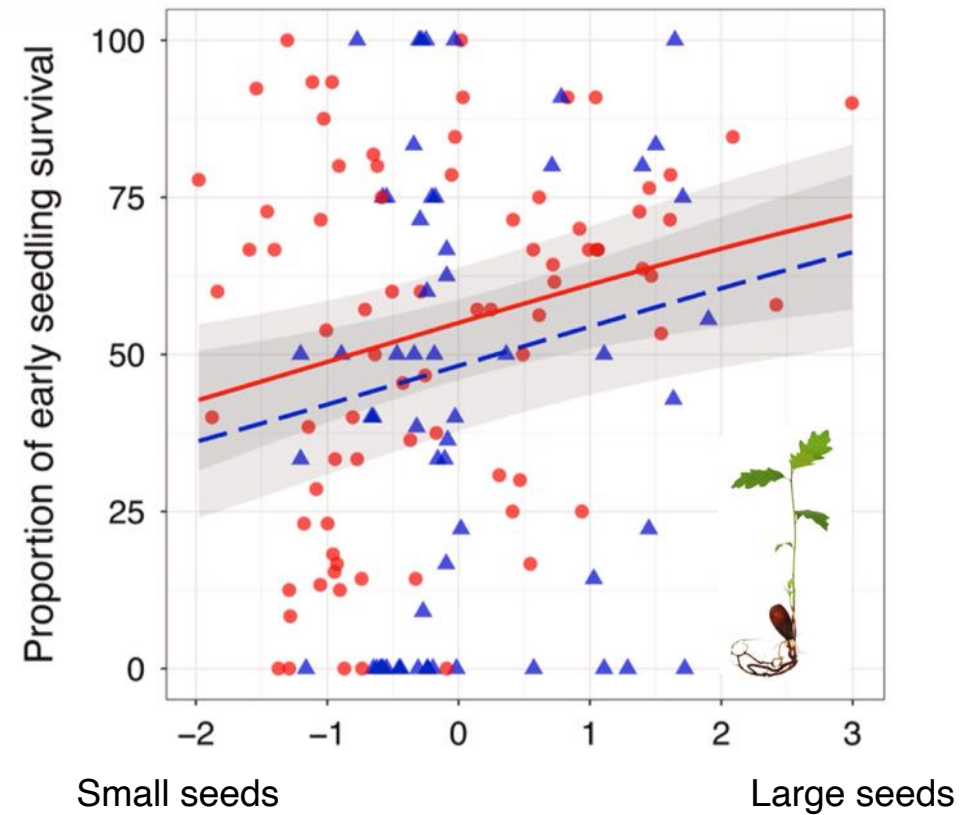
- ❖ A dome-shaped relationship
- ❖ Low competition: relative mutualism
- ❖ High competition: relative predation

Results

Seed size leading to ontogenetic trade-off



large seed >> lower germination



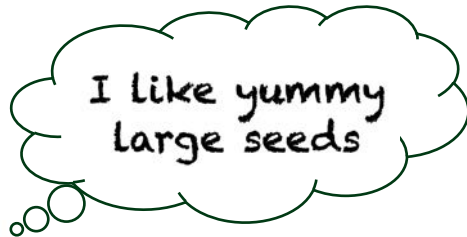
large seed >> strong seedling

Results

Seed size leading to ontogenetic trade-off



Germination stage



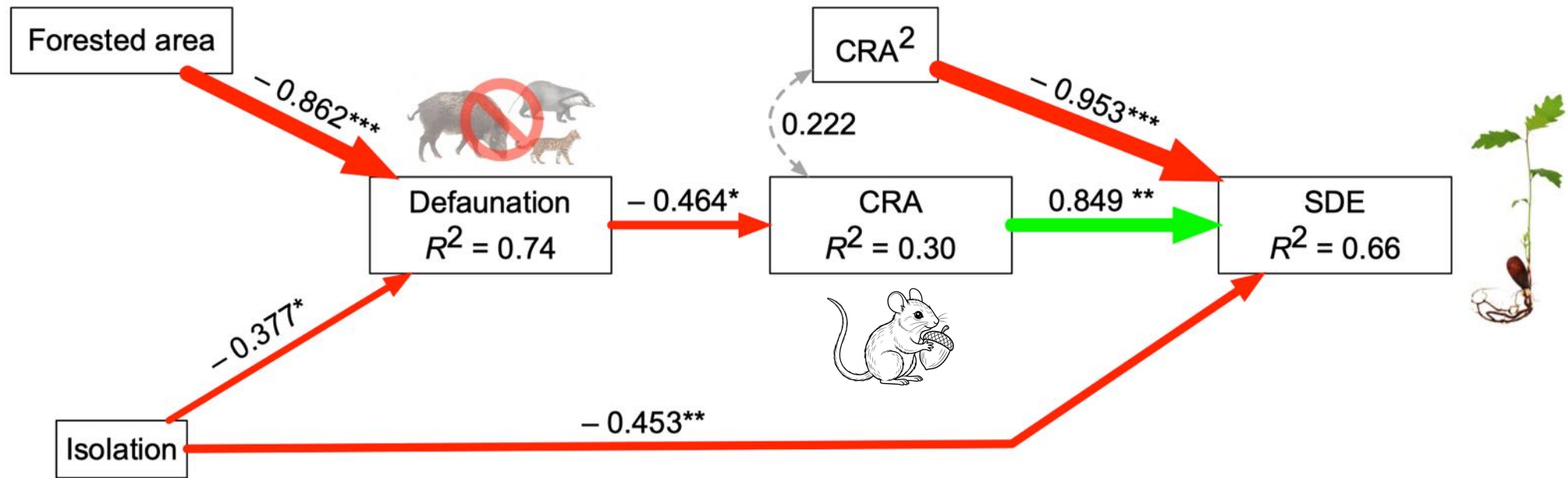
Early seedling stage



An ontogenetic, size-dependent bottleneck for oak regeneration

Results

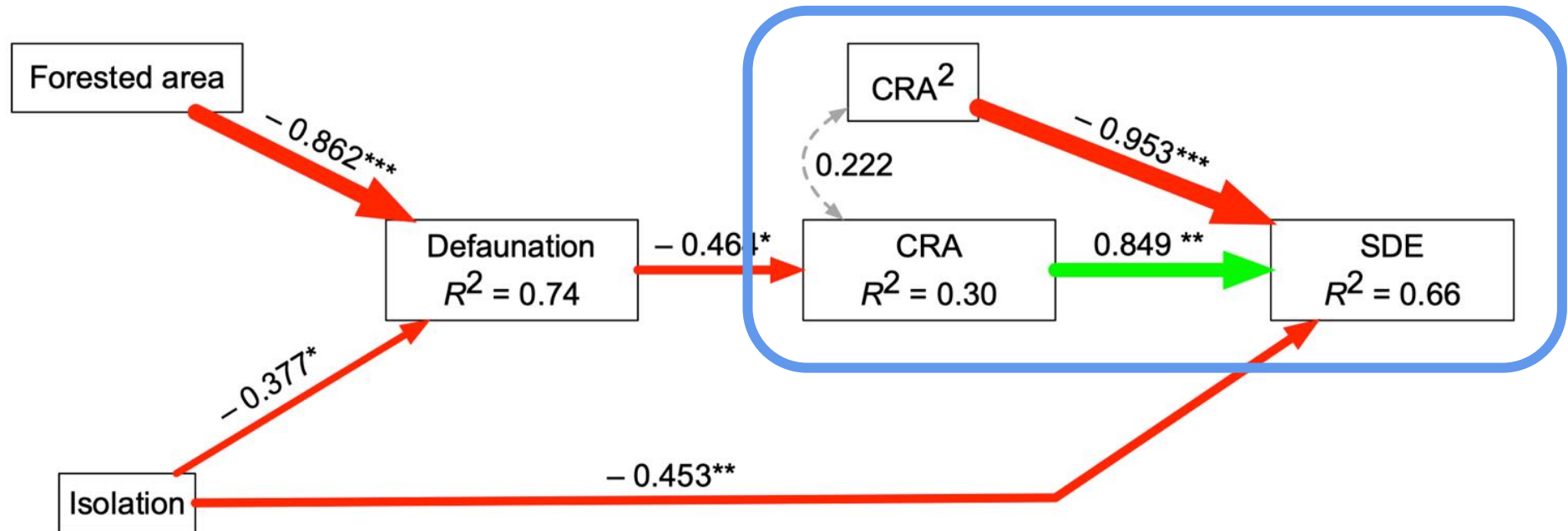
Cascading effects on seed dispersal



Small islands increased defaunation and rodent competition, leading to lower SDE!

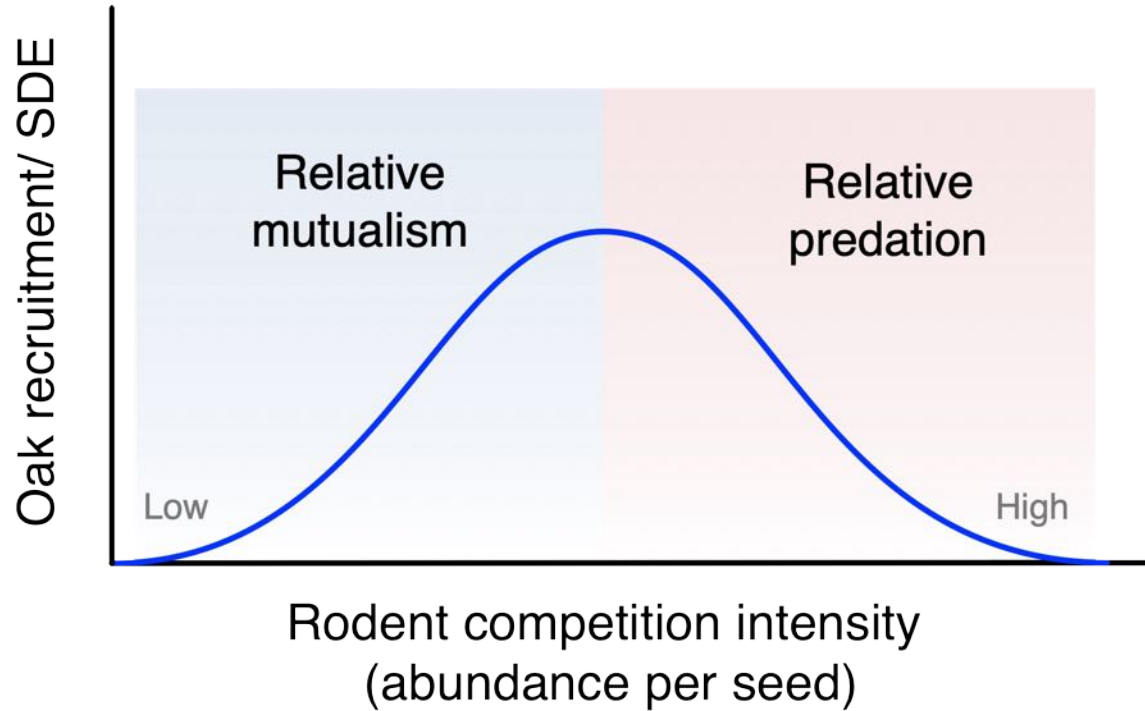
Results

Cascading effects on seed dispersal



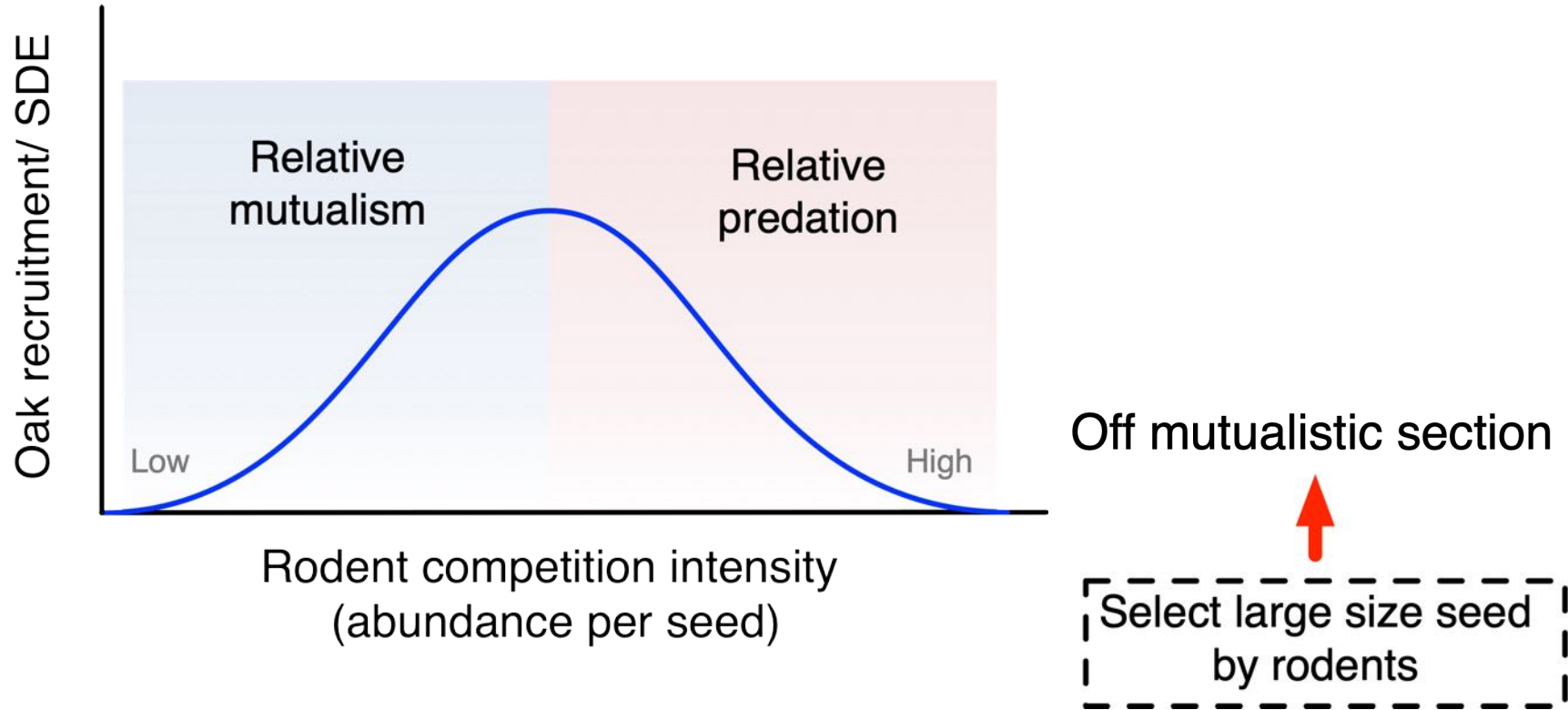
Confirming the non-monotonic interaction again!

Take home messages



- 1 The rodent–oak interaction is non-monotonic. The roles of rodents were determined by rodent competition for acorns.

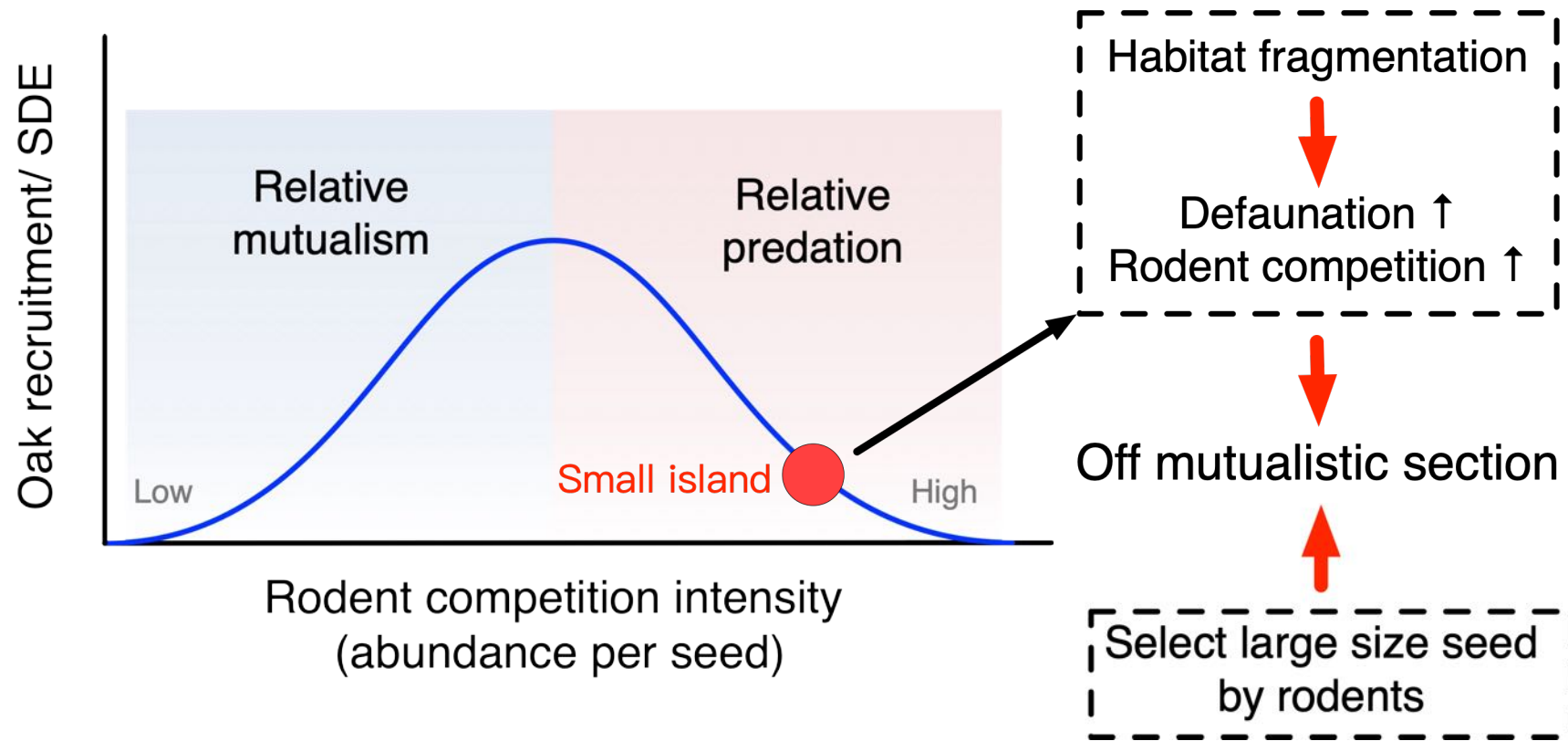
Take home messages



2

Rodent selection for large seed at germination stage is bottleneck of oak regeneration in TIL.

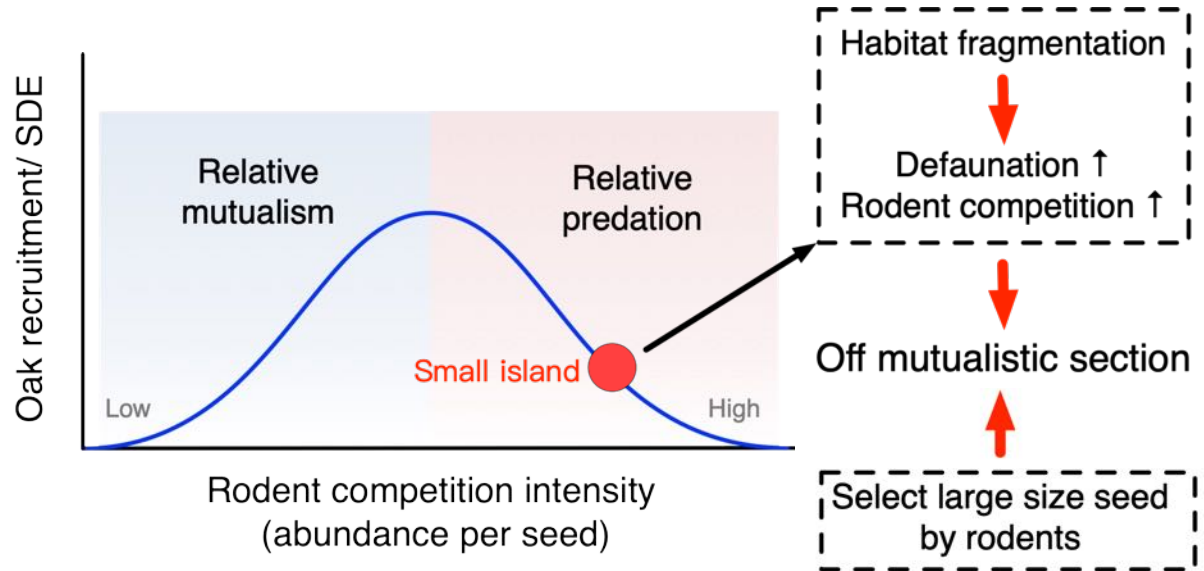
Take home messages



3

Habitat fragmentation in TIL drives the interaction off its mutualistic section via defaunation and rodent competition

Take home messages



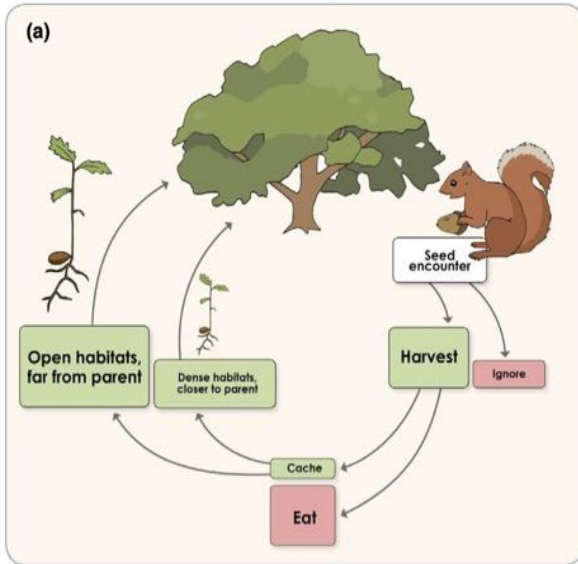
Limited oak regeneration in TIL

Very few oak seedlings on small islands in TIL

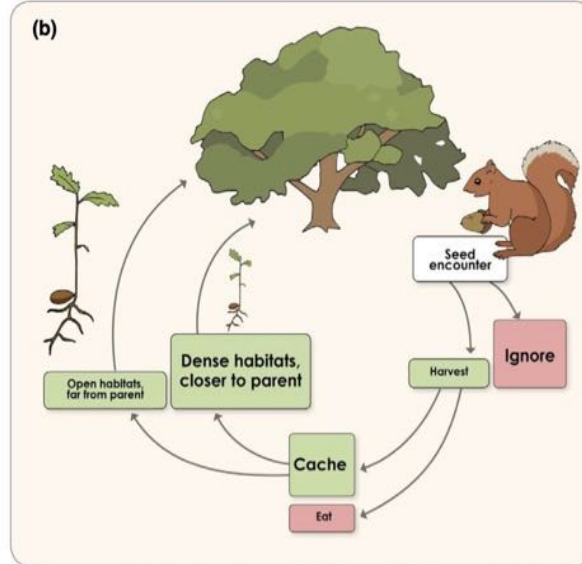
The next story.....

? How does animal personality affect this conditional mutualism under habitat fragmentation

Proactive



Reactive

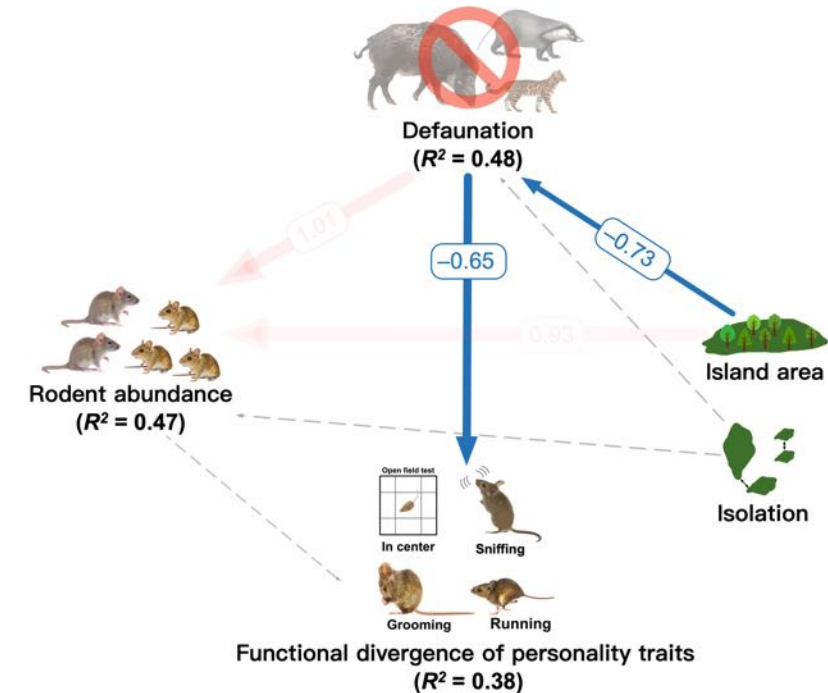


Zwolak et al. 2020

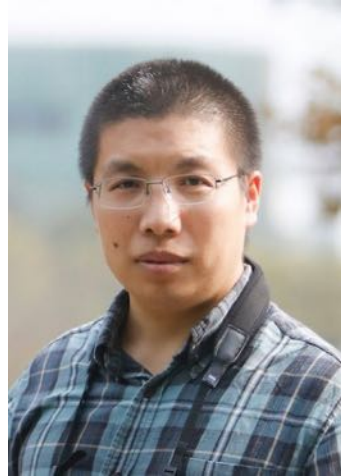
RESEARCH ARTICLE

Defaunation erodes the diversity of rodent personality traits in fragmented forests

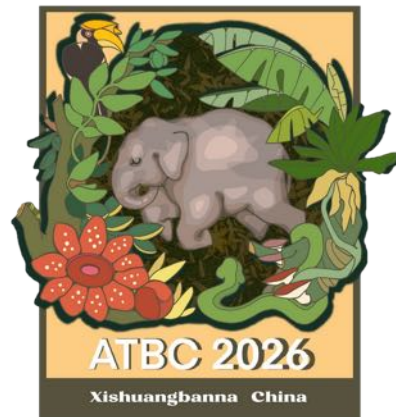
Di Zeng, Thomas J. Matthews, Rui Wang, Yuhao Zhao, Chuan Yan, Ping Ding, Xingfeng Si

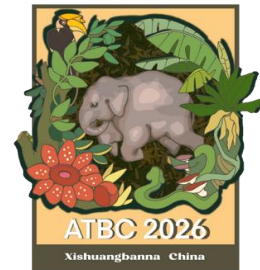


Acknowledgement

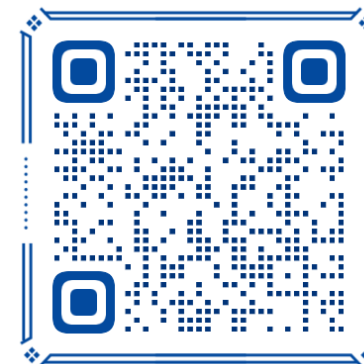


Prof. Ping Ding Prof. Xingfeng Si





Thanks for your attention!



Please scan for slides



Di Zeng

Zhejiang A&F University

 website.zengdi.org