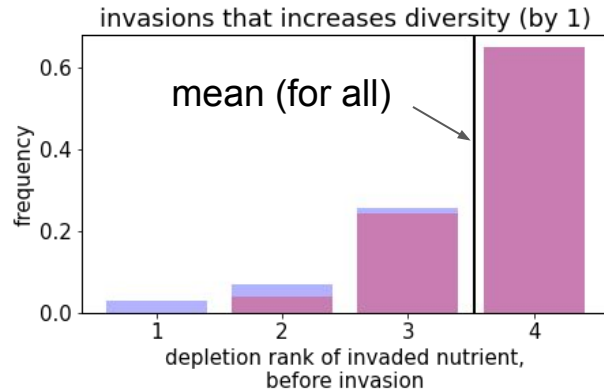


Secondary extinction events

- Definition: When the invasion does not increase the diversity, we say a **secondary extinction** happens.
- Questions: Why and when they happen, and how does that help us understand the assembly process. (Not advertising for putting them in any part of the paper, just that it solidifies our understanding)

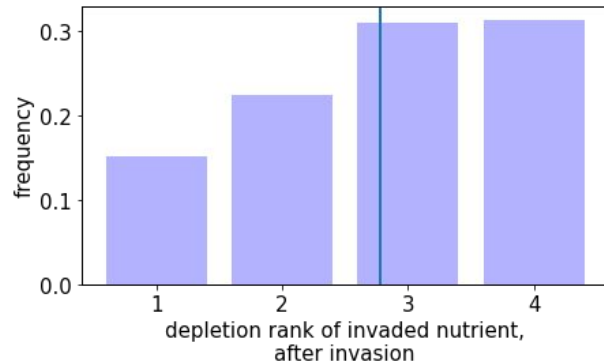
No secondary extinction: diversity increased, complementarity created



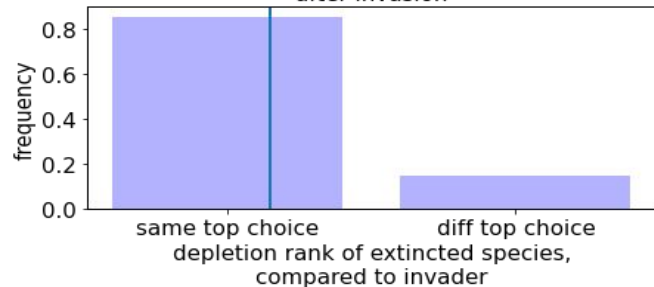
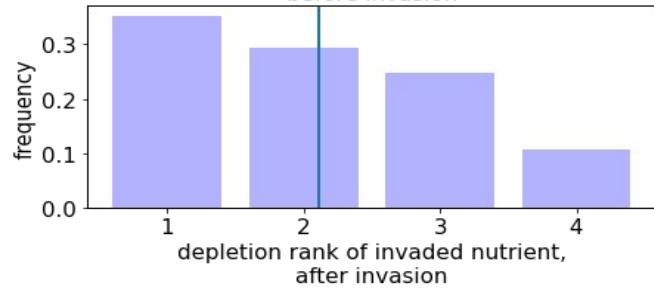
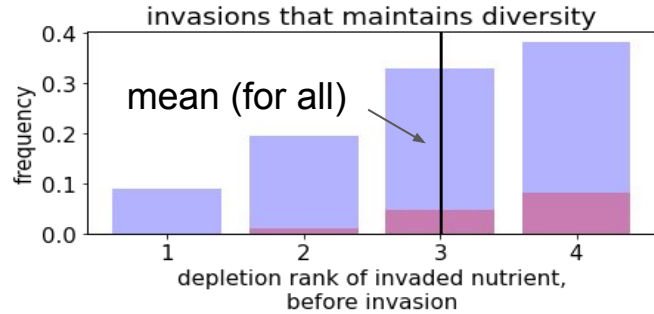
Red: Unoccupied resources
Blue: Occupied resources

When invaders invade and no one extinctions:

- It mostly invades on some unoccupied resources, or resources that are depleted later, which are most **unlikely to be anyone's top choice. (Creates complementarity)** It's like a species goes to take an empty niche.
- On average, it is better at growth than whom it invaded, and moves its top choice slightly forward on the depletion rank.



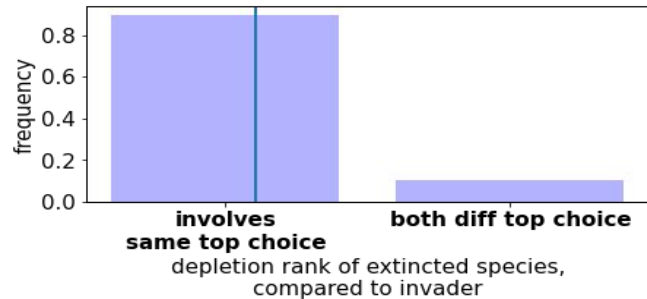
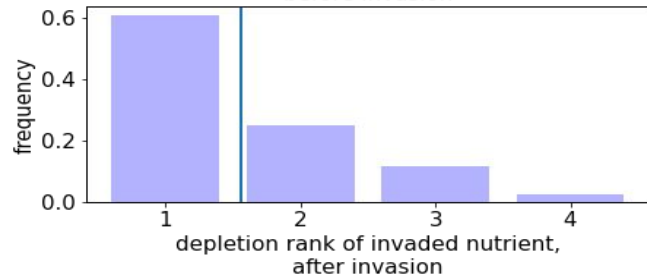
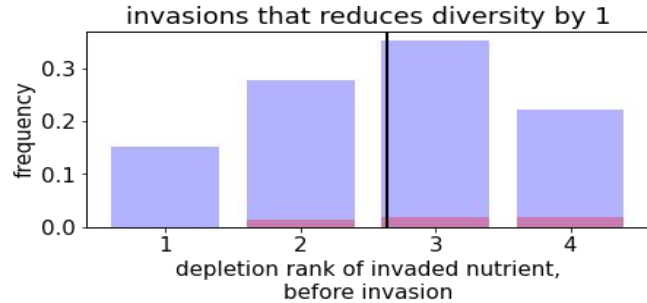
With secondary extinction: diversity maintained/dropped, complementarity maintained



When invader replaces one species in the system:

- The invader for most times invades some occupied resources(top), and the replaced nutrient for most times **share the same top choice** with the invader(bottom), which means this invasion **preserves complementarity**.
- The invader is relatively good at its top choice, since it often pushes it to be first depleted.

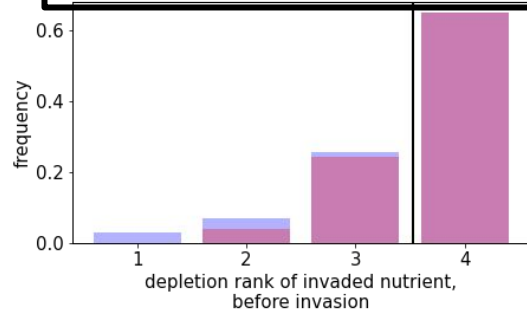
With secondary extinction: diversity maintained/dropped, complementarity maintained



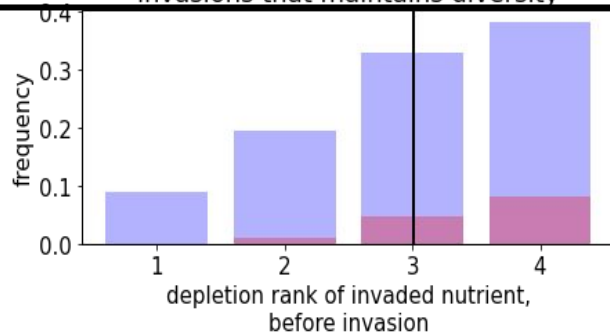
When invader eliminates more than one species in the system:

- Still true: The invader for most times invades some occupied resources(top), and the replaced nutrient for most times **share the same top choice** with the invader(bottom), which means this invasion **preserves complementarity**.
- In many cases the invader is the best grower in the system. This gives it the power to **reshape the niches** because it now has a headstart in biomass that makes its consumption order more important than others'. With the reshaping, some bugs that used to survive (and not directly competing with the new one) would die out.

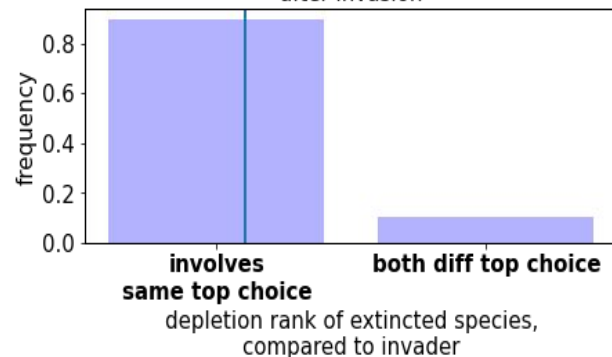
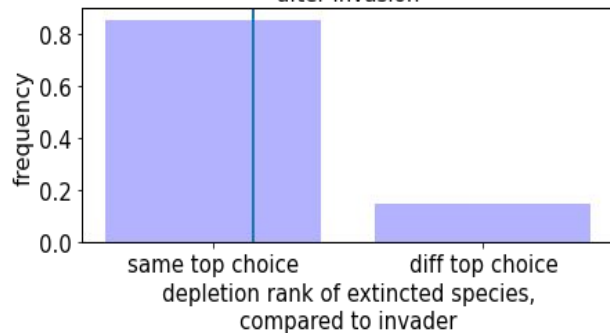
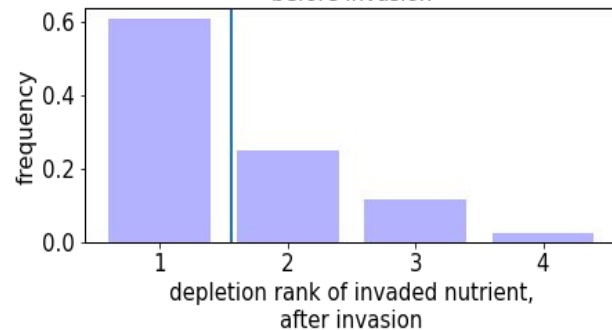
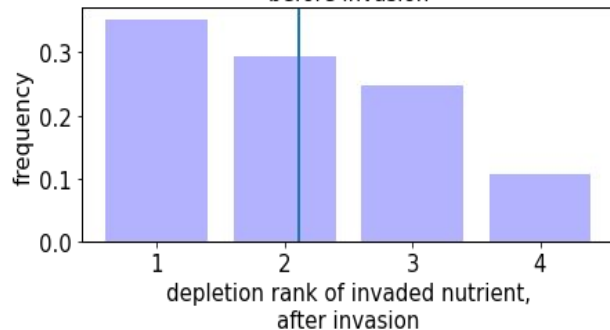
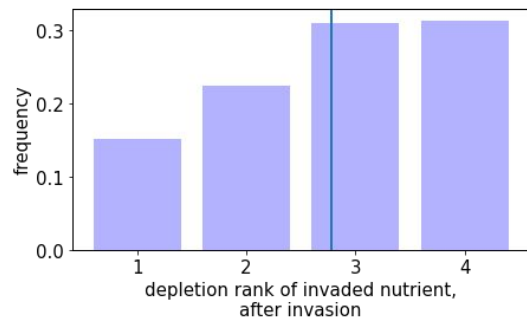
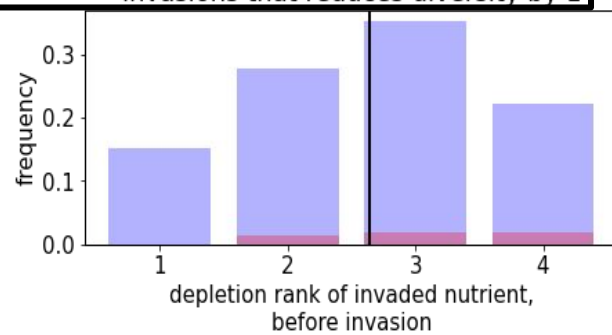
invasions that increases diversity (by 1)



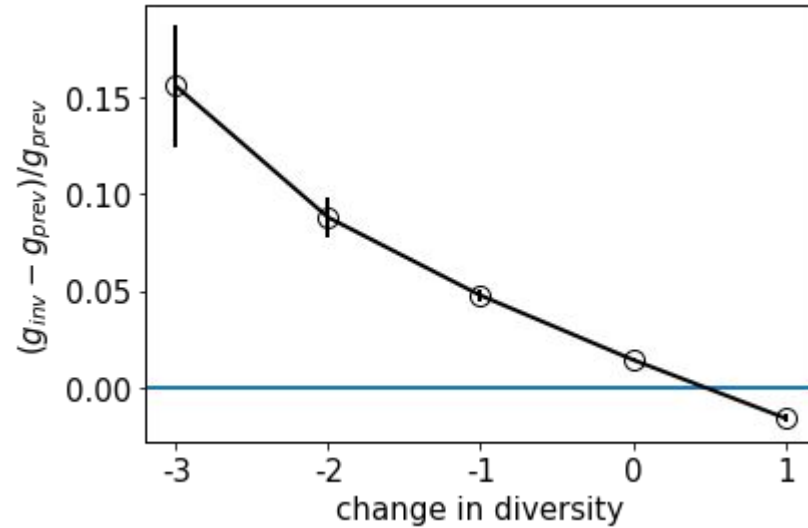
invasions that maintains diversity



invasions that reduces diversity by 1



Secondary extinctions involve superbugs



g_{prev} is the **mean** of top choice growth rates of bugs in the system, before invasion. For an invader, the more extinction it causes, the more advantage it has on top choice (or basically growth in general).

When do these events happen

