[**TITLE**]

* I will be discussing the **topic of tropical forest regeneration** and the **role of biotic factors** in this process.
* [**REGEN**] It has long been believed that **plant-driven processes** alone govern the regeneration of tropical forests. Restoration of **species composition** and **ecosystem functions** that were lost due to disturbances happens mainly through bottom-up processes.This is reflected in the gap models like FORMIND and the use of static parameters for inter-species interactions. However, recent research has shed light on the **influence of natural enemies** and **other biotic factors like birds, bats, insects and pathogenic fungi** in shaping the composition and functions of these ecosystems.
* [**SLIDE**] In our first experiment on pioneering vegetation in lowland PNG we explored the influence of biotic factors by **setting up a manipulative** experiment in abandoned gardens. We established replicated plots and implemented different treatments. Specifically, we removed fungi insects, predators, and we added herbivores using locally most abundant weevil. We found **positive effects of insects on diversity**, and **fungi on density**. Insects were also **filtering plants based on their traits** and tend to promote high SLA plants.
* [**ELEVATION**] Ecological studies recognized the **importance of ecological gradients**, such as temperature, precipitation or altitude in influencing biotic interactions and ecological processes. Often considered gradient in ecology is elevation. Some patterns are linear and some tend to be nonlinear. From the biotic interaction perspective **changing abundances of prey**, increasing **proportion of insects in insectivorous bird diet** should have an effect on regenerating vegetation.
* [**EXTENDEDED EXPERINMENT**] In our new study, we sought to investigate the impact of biotic interactions on early 1 – 1.5 year-vegetation in the same system of fast-growing pioneer plants and how these effects vary with elevation.
* [**KEY**] 1. We observed a **nonlinear relationship** between elevation and the effects of biotic factors. Surprisingly, at **mid-elevation**, **there were minimal effects observed**. Also at mid elevation, insects had a significant impact on biomass, indicating a classic top-down effect, however, without affecting richness or diversity.
* The effects **at the highest elevation were similar to those at the lowest elevation**. At the low elevation, with a difference that additional herbivores reduced biomass, density and richness of plants.
* **Fungi** had a positive effect on richness and density of woody plants at both low and high elevations. Which may suggest a **density dependent mortality and increased richness**.
* Birds and bats had stronger effects on diversity, richness, and density at **the highest elevation.**
* [**SLIDE**] However, the correlation with insect effects did not match our initial expectations. **If we assume that effects of insects can be positive and negative, then if cascading effects are strong we would see a negative correlation between effects of insects and effects of their predators. Positive correlation means that the effect of an exclosure is the same as the effect of the insecticide treatment.**
* [**SLIDE**] 6. Community Composition: insecticide treatment consistently altered community composition, excluding certain targeted plants at each elevation. Fungi, on the other hand, affected community composition only at the highest elevation by reducing biomass of a different set of plants.
* Beta diversity can be partitioned in many ways one is to break it down into gradient and balanced components Andreas Baselga: Balanced responsible for turnover and gradient by changes in abundances. Insects at low elevation reduced dissimilarity between plants by equalizing community composition. At the mid-elevation, all treatments reduced species turnover, while at the highest elevation, insects and additional herbivores increased turnover. **Weak at low, contrasting at mid and high.**
* [**SLIDE**] 8. We used a simulation based approach to study community assembly processes: We cacluated the Raup-Crick index where -1 indicates that community changes in a deterministic and convergent way (that is what we would like to see), 0 random, 1 deterministically divergent.: The assembly process in Wanang, the plot with the smallest species number, shifted from deterministically divergent to random under the influence of additional herbivores. Numba showed random assembly process, that was changed by additional herbivores towards deterministically divergent. Yawan was similar to Wanang with a difference that all treatment effects were significant in making the community more deteministically divergent. We don’t generally see deterministic CONVERGENCE.
* [**SLIDE**] If we can’t predict species composition **CAN WE USE TRAITS SINCE WE CANNOT USE SPECIES?** Well.. Certain traits, such as specific leaf area (SLA) and water content at the community level, were closely related to richness. This may suggest, the trait composition appeared to be determined through competition between plants, while biotic factors mainly affected richness. What is interesting is that **neither of our treatment changed this relationship!**
* **Individual Species Responses**: We examined if traits could predict individual species responses. All sorts of variables at the community level and species level were added as well as phylogenetic correlation structure. SLA showed varying responses **only to predator presence** across elevations, with different patterns observed in Wanang, Numba, and Yawan: Wanang- average traits are excluded, Numba average traits promoted, Yawan – low sla promoted. Water content also exhibited differential effects depending on the treatments and elevation. Specifically, additional herbivores seem to promote high water content plants (maybe compensating for the damage). **Limited trait based effects.**
* [**SLIDE**] In conclusion, our study provides **limited insights** into the complex dynamics of tropical forest regeneration and the role of biotic factors along elevation gradients. **Although strong cascading effects were not observed**, there were intriguing correlations between the effects of predators, fungi, and herbivores. The **influence of biotic factors appeared to vary at different elevations**, with elevation-specific responses and interactions. Our findings suggest the **involvement of intermediate predators** and the possibility of additional mechanisms at play. Emphasizes the need to consider the broader ecological context and the species pools and regional richness.
* Thank you for your attention, and I would be happy to address any questions you may have.