Environmental heterogeneity and the spatial distribution of Amazonia's trees

Jennifer P. Auler, Alexandre, A. Oliveira, Alberto Vicentini, Alvaro Duque, Renato Valencia, Dairon Cárdenas

Introduction

Niche partition and **dispersal limitation** are important **coexistence mechanisms** that can spatially structure tree communities. We aimed to verify the influence of **environmental heterogeneity** in the **relative importance** of those processes.

Methods

We used data from 3 ForestGEO plots located in terra firme forests of Amazonia (Fig. 1). We selected the most plausible of four concurrent spatial point process models: **Spatial Randomness (CSR), Niche (NH), Dispersal Limitation (DL), and both (NH+DL).** We than selected the most plausible model with a selection tree. A multinomial model was then fitted to **verify if the localities differed in the probability of selecting the spatial models**.

Environmental heterogeneity:

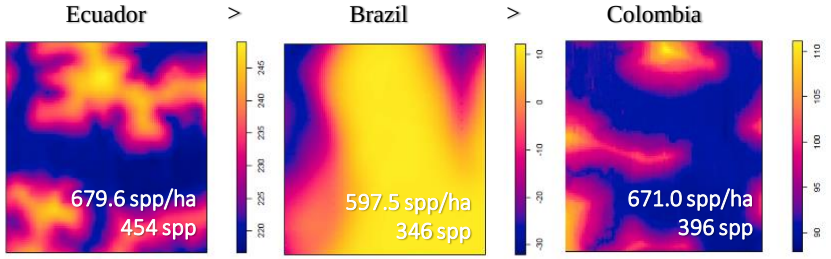

Fig. 1 – Mean elevation of the tree study locations in order of environmental heterogeneity. The mean number of species per hectare and the utilized in the study are reported.

Key Takeaways

- Environmental heterogeneity affects the relative importance of coexistence mechanisms in a tree community.
- Most species are spatially structured by both niche and dispersal limitation.
- Plots with a higher proportion of coexistence mechanisms (NH, DL, NH+DL) are also significantly more diverse (BR and EQ > CO).

Environmental heterogeneity **affects** the relative importance of coexistence mechanisms in a tree community.

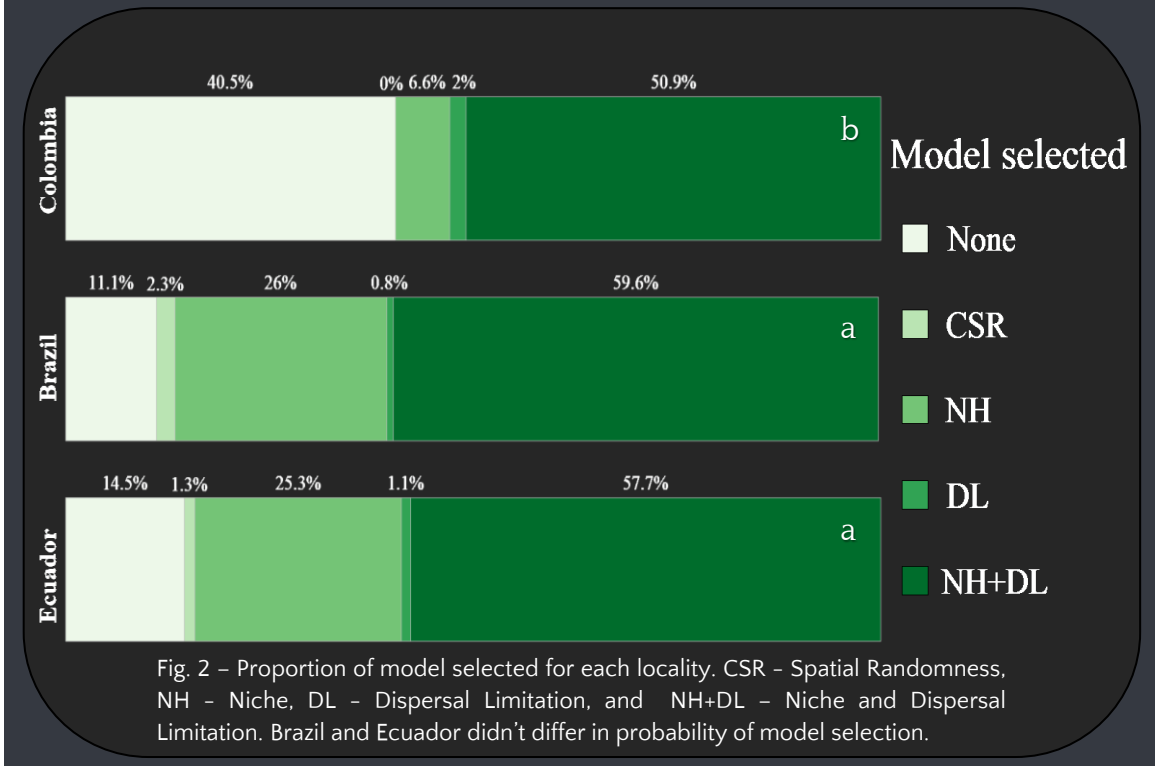

Fig. 2 – Proportion of model selected for each locality. CSR – Spatial Randomness, NH – Niche, DL – Dispersal Limitation, and NH+DL – Niche and Dispersal Limitation. Brazil and Ecuador didn't differ in probability of model selection.

Species not explained by any model (None in Fig. 2) could have distribution associated with processes not assessed by us, as, e.g. natural enemies.

Labtrop's webpage.
You can download a copy of the poster and abstract here.

Ecology Across Borders 2021

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Abstract

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Poster and abstract presented to Ecology Across Borders 2021

Niche and dispersal limitation are important coexistence mechanisms that can spatially structure tree communities. We aimed to verify the influence of environmental heterogeneity in the relative importance of those processes. We used data from ForestGEO plots with different environmental heterogeneity (Colombia-CO < Brazil-BR < Ecuador-EQ). We selected the most plausible of four concurrent spatial models: Randomness (CSR), Niche (NH), Dispersal Limitation (DL), and both (NH+DL). BR e EQ didn't diverge in the probability of model selection, having 85,6% and 83% of niche models selected (NH and NH+DL), while in CO only 57,5% were observed. The proportion of no model selected was four times higher in CO than in BR and EQ. We attribute these differences to CO's lesser environmental heterogeneity and conclude that it influences the relative importance of processes. Plots with a higher proportion of coexistence mechanisms are also significantly more diverse (BR and EQ > CO).