PAPER PROJECT

Preliminary title: Management practices shape functional dimensions of plant metacommunities

Target journals: **Ecology Letters, Global Ecology and Biogeography.**

Aims

In a world where human activities have significantly reshaped landscapes and biodiversity patterns, understanding the interplay of ecological processes occurring at both local and regional scales is crucial. These scales intertwine within metacommunities – networks of local communities distributed across landscapes. **Yet, an integral part of this complex puzzle remains understudied: the role of species' functional dimensions – movement, tolerance, and interaction – in shaping these metacommunities.**

By investigating the influence of functional dimensions on vascular plant metacommunities across European forests, we aim to understand how the ability of species to colonize new sites (movement dimension), withstand environmental conditions (tolerance dimension) and compete with others (interaction dimension) play a role in metacommunity patterns. **Deciphering their role in community assembly can lead to a more comprehensive understanding of ecological patterns and processes**. Our focus will be on how various management practices affect these functional dimensions and, consequently, influence metacommunity configurations. **The ultimate goal is to identify which functional dimensions predominantly drive patterns within metacommunities.** This knowledge can help us to generalize the impacts of environmental changes on diverse meta-ecosystems.

Our research methodology involves four key steps. Initially, we will **compile and standardize species traits from the TRY database**, focusing on species with traits across all functional dimensions: movement, tolerance, and interaction. Then, we will **estimate the functional space of communities using multivariate kernel density methods, yielding a three-dimensional view of each community's hypervolume**. Following this, we will **gather and analyse climate and land use data from publicly available databases**, creating a detailed environmental profile for each study site. Finally, we will **employ a joint species distribution model, specifically the Bayesian hierarchical modelling of species communities (HMSC)**, to examine the underlying drivers of metacommunities. This will involve determining the extent of environmental filtering structured by species traits and estimating biotic interactions. The output of this process will provide insights into community composition under future scenarios and the impact of global changes on functional space.

First/lead author: Caio Graco-Roza

Core authors from BOTTOMS-UP: Sabina Burrascano, Francesco Chianucci, Francesca Napoleone

Core authors outside BOTTOMS-UP:

Please note that if the outline changes substantially (more than 1 aim is revised substantially) or co-author (s) are added to the above lists the governing board should re-vote on the project.

Further opt-in authors:

According to the BOTTOMS-UP Bylaws, any member of the BOTTOMS-UP Consortium can declare his/her interest in becoming an opt-in author. The first author is required to preliminarily accept one such offer from each dataset that represents at least 2% of the data in the analysis. It is at the discretion of the first author whether to accept any opt-in offer beyond this requirement. Persons interested in opt-in authorship can be nominated until 07.01.2024 with an e-mail to the first author (and cc: to the BOTTOMS-UP Governing Board), explaining which dataset(s) they represent and preferentially also how they could contribute. Note, however, that such a nomination only means the option to become a co-author. In the end, only those persons will be retained as actual co-authors who have made a significant intellectual contribution to the paper during its preparation (following BOTTOMS-UP Bylaws and compliance with ethics in the academy).

Data to be used: Plant data subject to different management practices across Europe

- Do you need data for specific regions, forest categories or silvicultural regimes?

Yes

- Will you use both datasets allowing for stand and plot-level aggregation of multi-taxon data, or only one of these two?

Plot level aggregation

- For which taxonomic group do you need data? Please refer to the attached list of taxonomic groups TAXA.xlsx

Vascular plants data

- Do you need data on standing trees (including snags, standing dead trees and stumps)?

Yes

- Do you need data on lying deadwood?

No

Timeline:

Deadline for permission of data usage from custodians: 15.01.2024

Extraction of data from BOTTOMS-UP: 20.01.2024
Data preparation and analysis: 11.02.2024

Raw results to be sent to the wider author team: 30.03.2024

Workshop with the wider author team:

Writing up of the paper (including preparation/optimization of figures): Feedback round of co-authors to MS: 15.05.2024
Submission: 15.07.2024

Confirmation:

I confirm that I will adhere to the BOTTOMS-UP Bylaws.

Date 28.11.2023

Signature