

# Spatial patterns of macrofungal sporocarps analyzed and clustered

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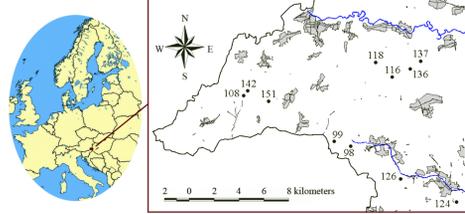
## What is behind the pattern?

### Introduction

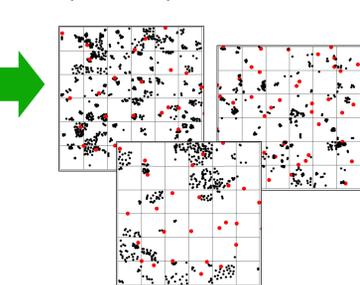
Investigation of spatial distribution of sporocarps can provide useful information on the vegetative spreading characteristics, and host and microhabitat preferences of forest-dwelling macrofungi in coarse scale. We aimed to compare conspecific sporocarp patterns mapped in even-aged, managed forest stands with different tree species compositions to reveal the effects of forest site on the spatial distribution of sporocarps.

### Materials and methods

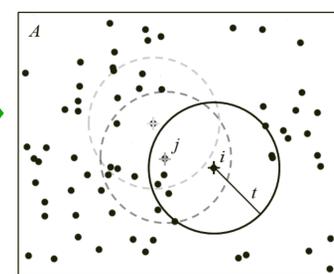
Eleven sampling areas of 30 m × 30 m in West Hungary, Central Europe



Fifty point patterns belong to 12 macrofungi species; 13,508 mapped sporocarps in total;  
• = sporocarp, • = tree



Second-order analysis; evaluated distance  $t$ : 0.1–6.3 m with an interval  $t$  of 0.1 m → 63 distance units in the L-function calculations

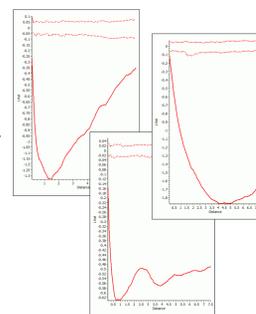


$$\hat{K}(t) = A \sum_{i=1}^n \sum_{j=1}^n \frac{I_r(i,j)}{n^2} \quad (i \neq j)$$

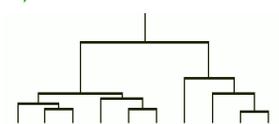
$$L(t) = t - \sqrt{\frac{\hat{K}(t)}{\pi}}$$

$d_{ij}$  = distance between points  $i$  and  $j$   
 $I_r(i, j)$  = indicator function, taking the value 1 if  $d_{ij} \leq t$  and 0 otherwise  
 $t$  takes a range of values

Fifty L-function curves to be clustered



Agglomerative clustering by testing 4 distance and 6 clustering methods (Table 1)



### Results

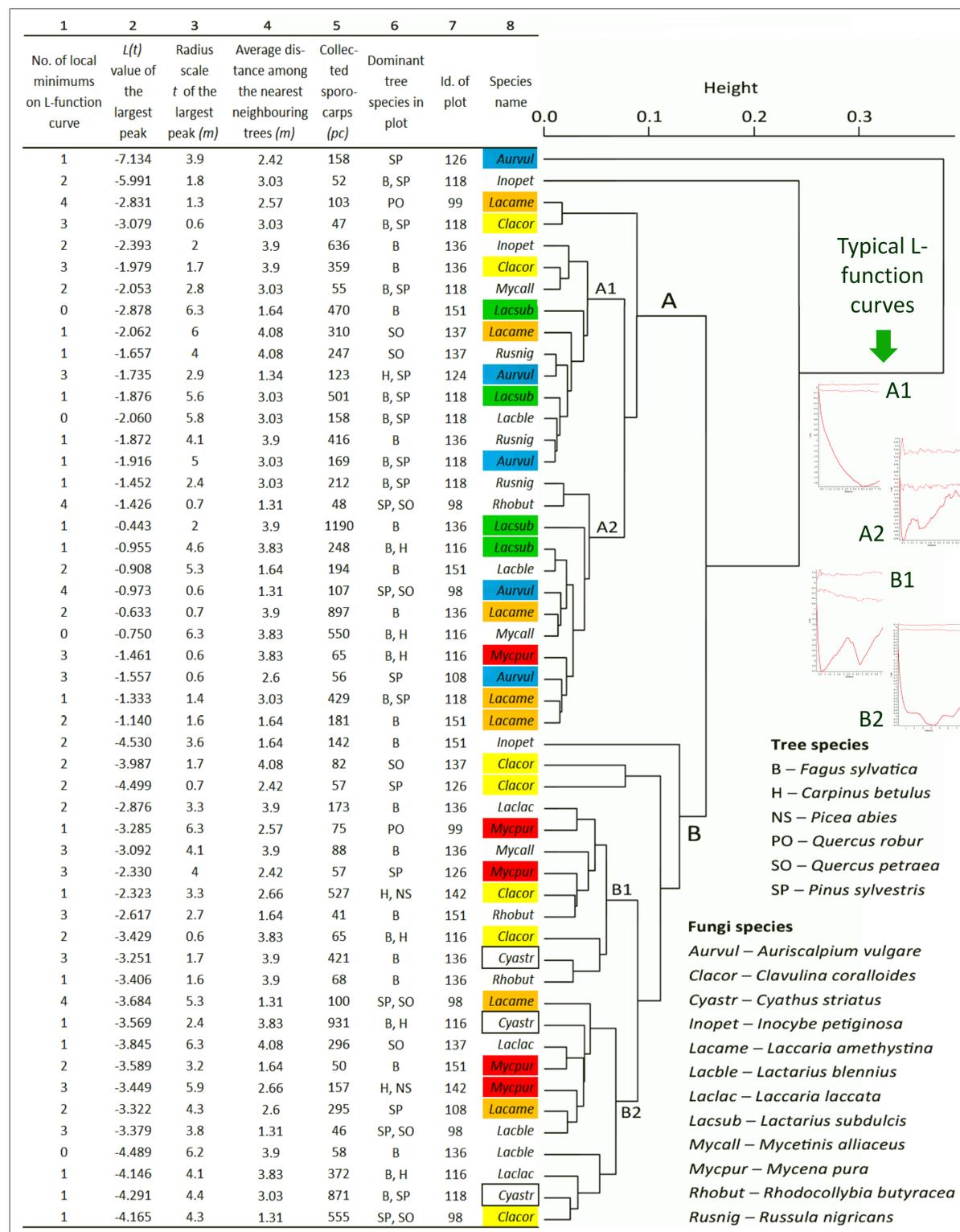


Figure 1. Dendrogram of sporocarp patterns

- Distance method: "Jaccard";
- Clustering method: "UPGMA";
- We tested 24 dendrograms in total: clustering methods "Median" and "Single" revealed 8 dendrograms with no two main branches compared to the dendrogram in Figure 1; the other 16 trees had similar structures to that of is shown here;
- **Column 2** reveals a clear tendentious data structure within branch A and B indicating that the applied clustering methods were sensitive to the level of sporocarp clumpings;
- Values of **Column 3** (the diameter of the areas where sporocarps showed the most clumped distribution) scattered often highly within fungi species (except: *Clacor*, *Lacble*, *Mycpur*); sometimes Column 3 had values that were consistently similar to the relating values of **Column 4** (see *Laclac* and *Rusnig*), but in a few cases (10 times out of 50) this accordance was indicated by local minimums only;
- Within or among species, values of **Column 5** had no tendencies corresponding to the branching order in the dendrogram;
- **Column 6**: dominant tree species in plots were sometimes corroborated with the branching structure of the dendrogram (see *Lacame*, *Rhobut*, *Aurvul*);
- **Column 7**: studied plots were arranged in a disordered way compared to the structure of the dendrogram (but see plot 118 scattering mostly in group A);
- Some fungi species (as *Aurvul*, *Cyastr*, *Laclac*, *Lacsub*, *Mycpur*, *Rusnig*) had similar sporocarp patterns among plots clustering exclusively or mostly in group A or B, but other taxa (as *Clacor*, *Inopet*, *Lacame*, *Lacble*, *Mycall*, *Rhobut*) showed different patterns scattering highly in the dendrogram.

Table 1. Tested distance & clustering methods

Distance method	Clustering method
"Bray-Curtis"	"Centroid"
"Canberra"	"Complete"
"Euclidean"	"Mcquitty"
"Jaccard"	"Median"
	"Single"
	"UPGMA"

### Conclusions

This study has shown that sometimes the spatial pattern of sporocarps can vary within fungi species by corresponding to the different tree species compositions of plots, but in most cases, however, such a relationship is hardly or not observable. Targeted studies dealing with fewer fungi species, more sampling plots and studied environmental factors are needed to get a clearer picture about the drivers of spatial distribution of sporocarps.