

Peat bog communities :
Chances and limits of ecological studies
of Macrofungi

Pierre-Arthur Moreau, 15-I-2003

How to study fungal ecology ?

INDIVIDUAL
SCALE

Autoecology : direct influence of environmental factors on species (*in vitro*)

Synecology : relationships between environmental factors and species (*in situ*)

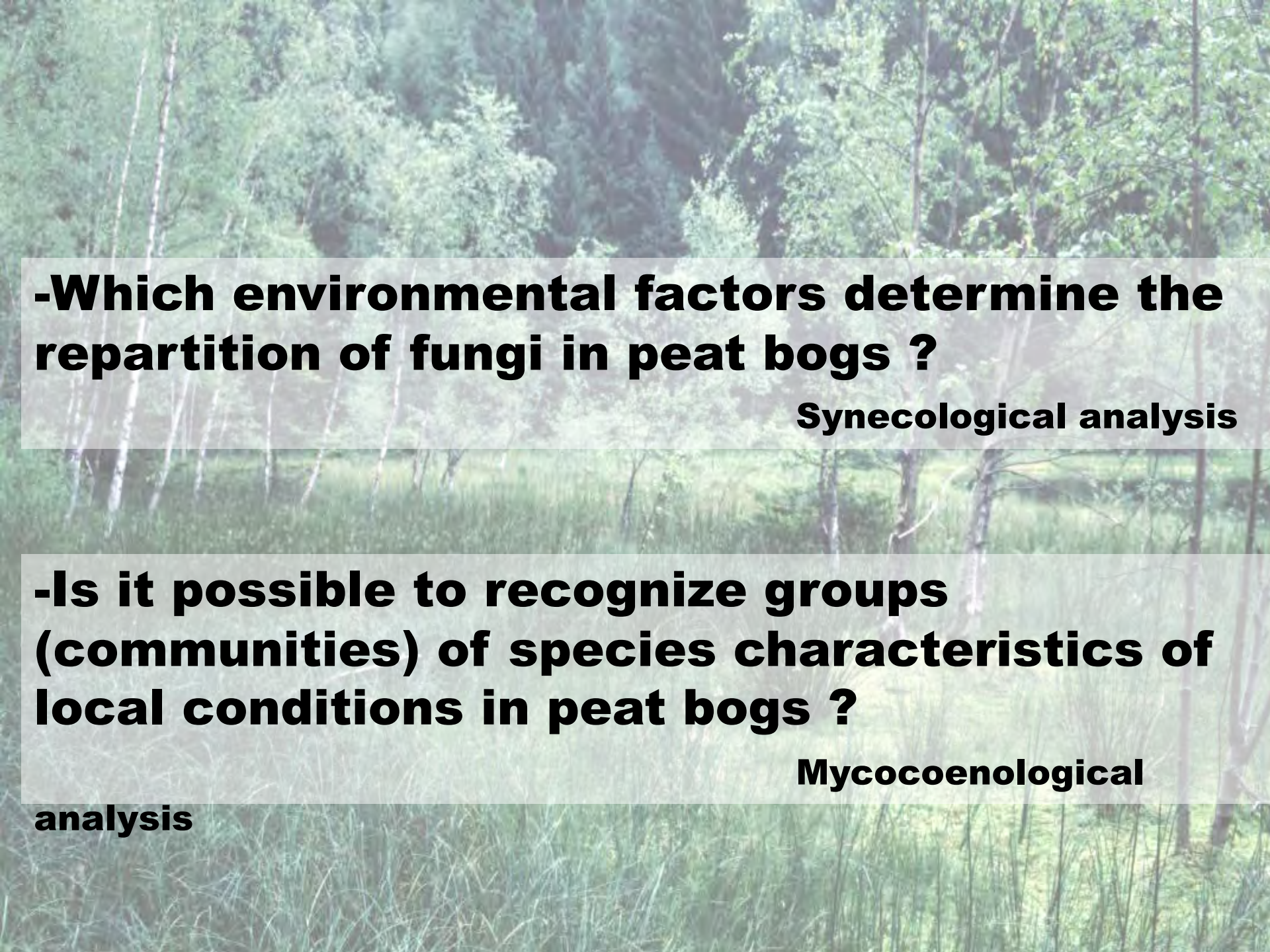
Mycocoenology : study of fungal communities in relation with eco-units (biocoenosis)

Mycosociology : study of fungal communities independantly from eco-units (mycosynecias)

Cartography : study of geographical distribution , biogeographical / climatic influences on species

Species Communities
scale
scale

LANDSCAPE/COUNTRY
SCALE



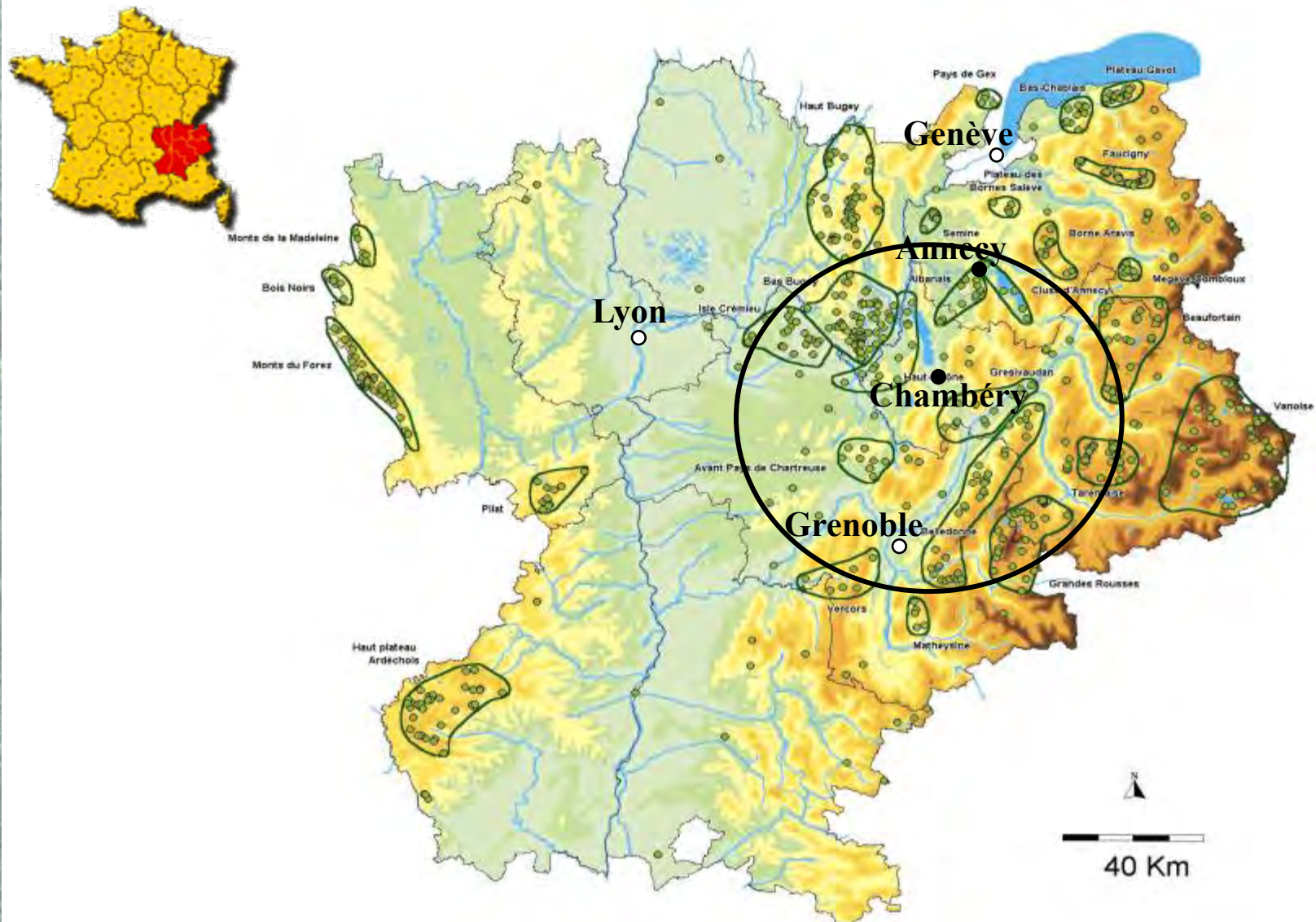
-Which environmental factors determine the repartition of fungi in peat bogs ?

Synecological analysis

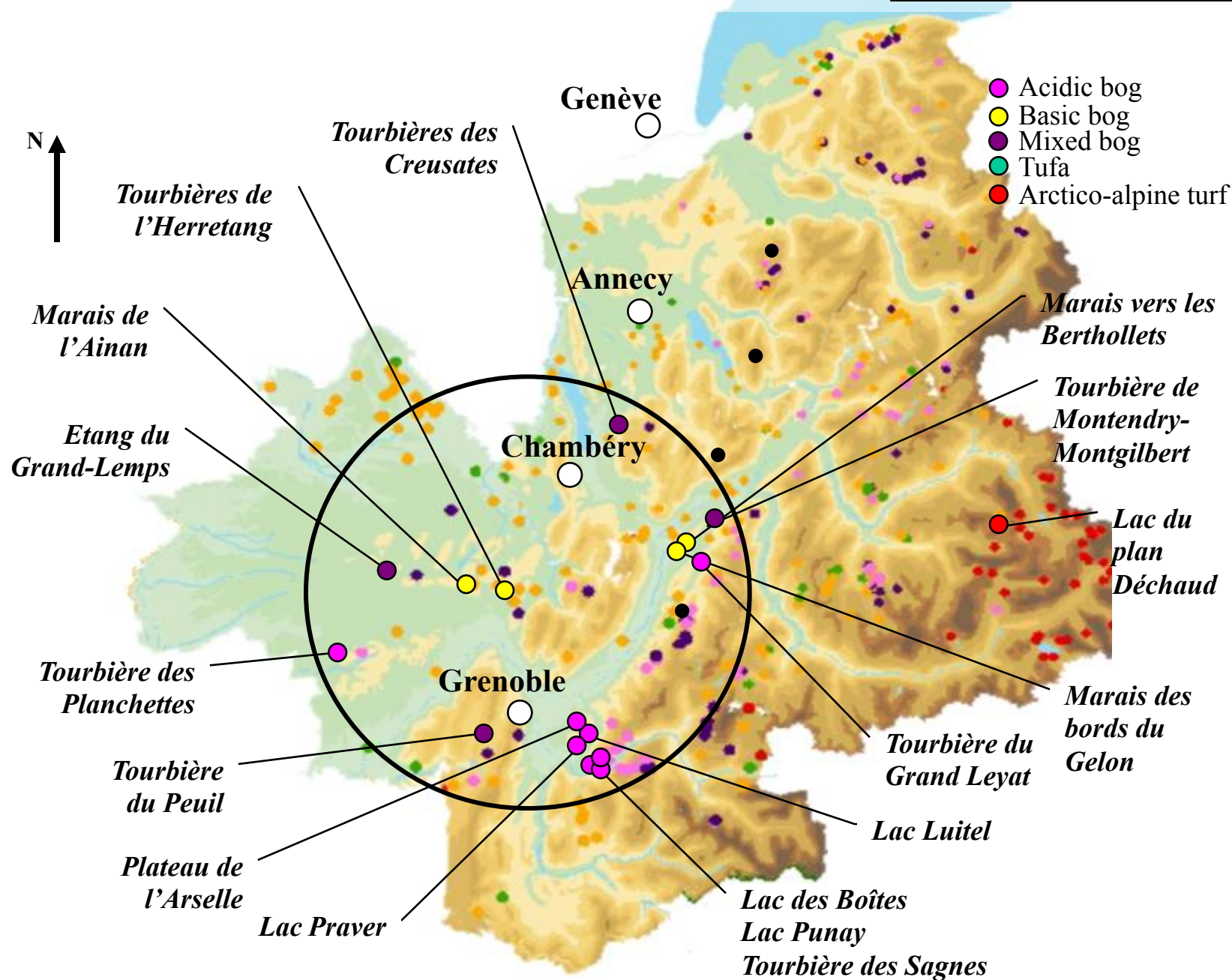
-Is it possible to recognize groups (communities) of species characteristics of local conditions in peat bogs ?

Mycocoenological analysis

Peat bogs in Rhône-Alpes



Carte : Coïc *et al.*, 2001- Inventaire des tourbières en Rhône-Alpes. C.R.E.N.

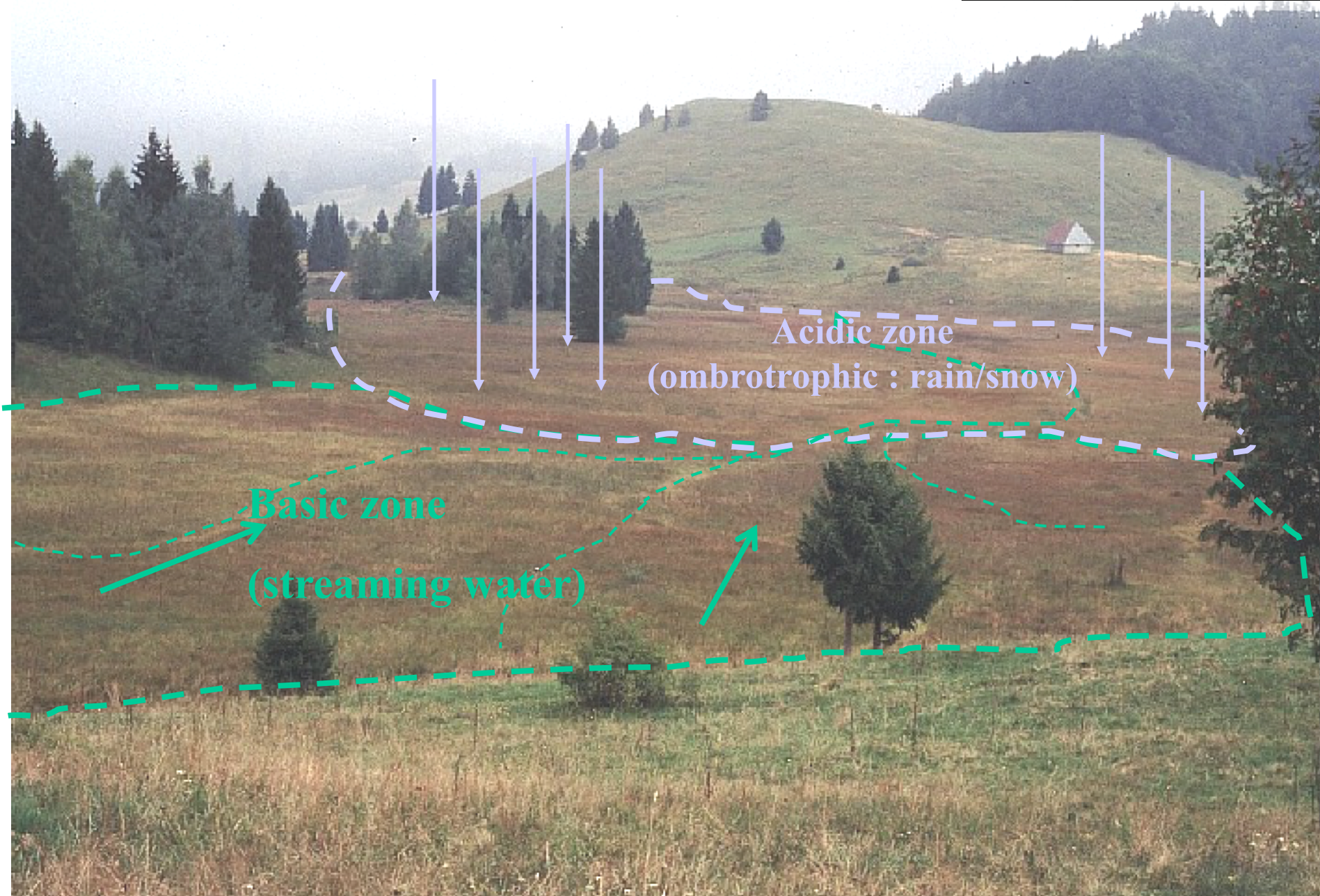




Praver lake (Isère) : acidic peat bog with *Sphagnum*



Herretang bog (Isère) : basic bog with *Carex*

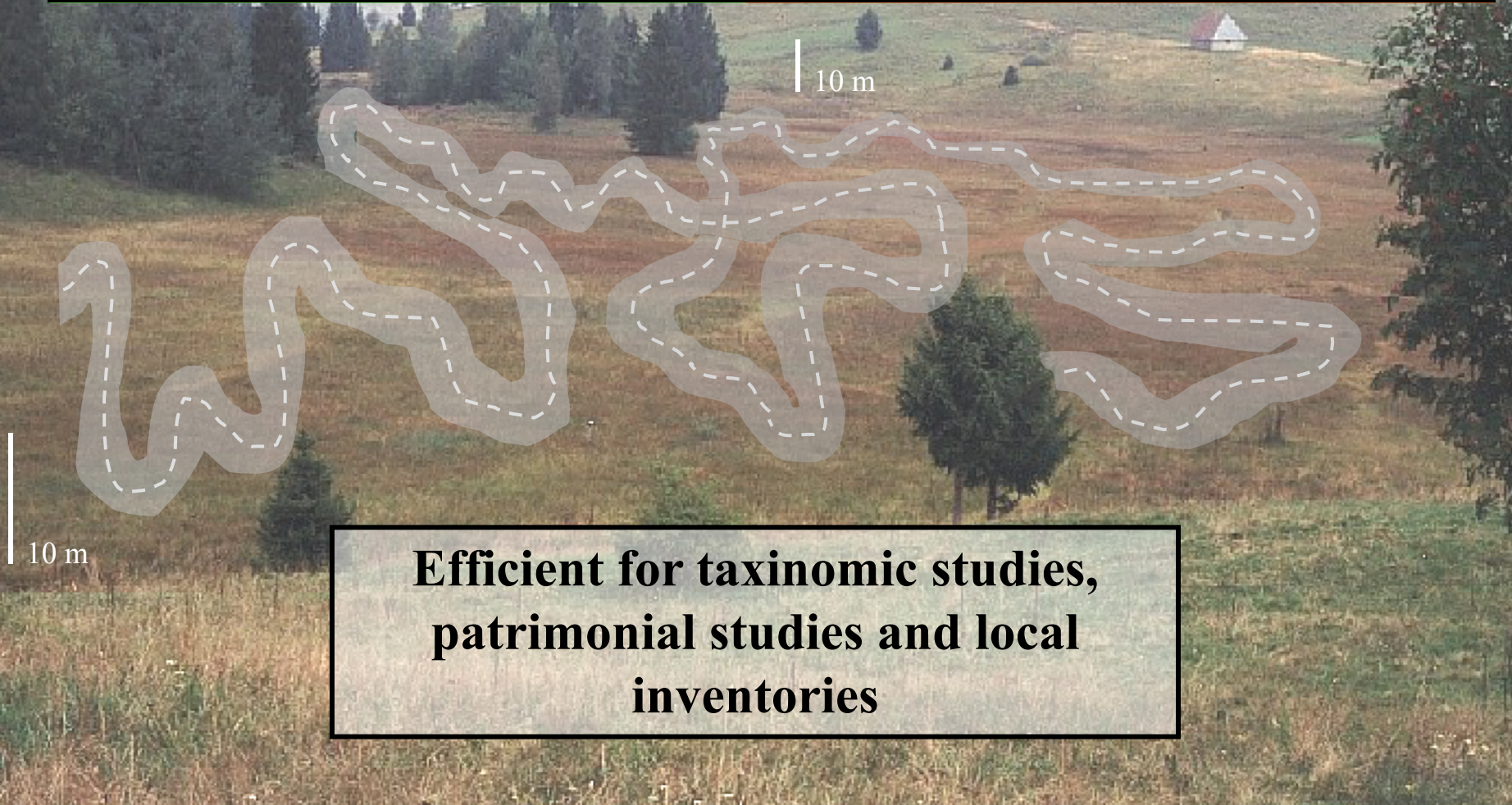


Creusates bog (Savoie) : mixed bog

Sampling method 1 : J. Favre, 1948, « random sampling »

Large surface sampled ;
rare species efficiently counted.

Spatial analysis difficult, ecological
data too diffuse.



Efficient for taxinomic studies,
patrimonial studies and local
inventories

Creusates bog (Savoie) : mixed bog

Sampling method 2 : M. Lange, 1948, « stratified sampling » on quadrates

Statistical treatment easy for
species-environment analyses

Rare species undersampled ; strong
influence of quadrat positions ; need
of materialisation of plots



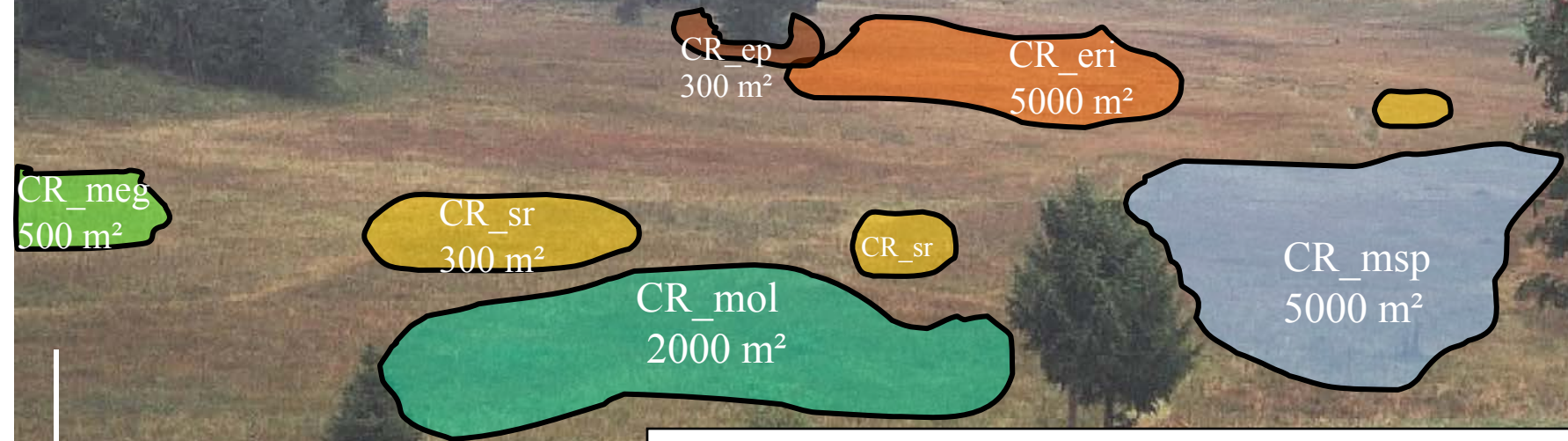
Efficient for precise ecological analyses

Creusates bog (Savoie) : mixed bog

Sampling method 3 : P.-A. Moreau, 2002, « fragmented sampling » on physionomically homogenous plots

Representative counting of rare species

Physionomical recognition of plots ; limited number of plots in each site



112 plots (18 sites)
609 species

Frequency of visits : monthly (2000-2001)

Sampled species : all sporophores > 3 mm diam.
(« higher Fungi »)

Possibility to combine taxinomic study, inventory of site and ecological study (population scale)

Synecological analysis :

Fungi-environnement relationships

On each plot :

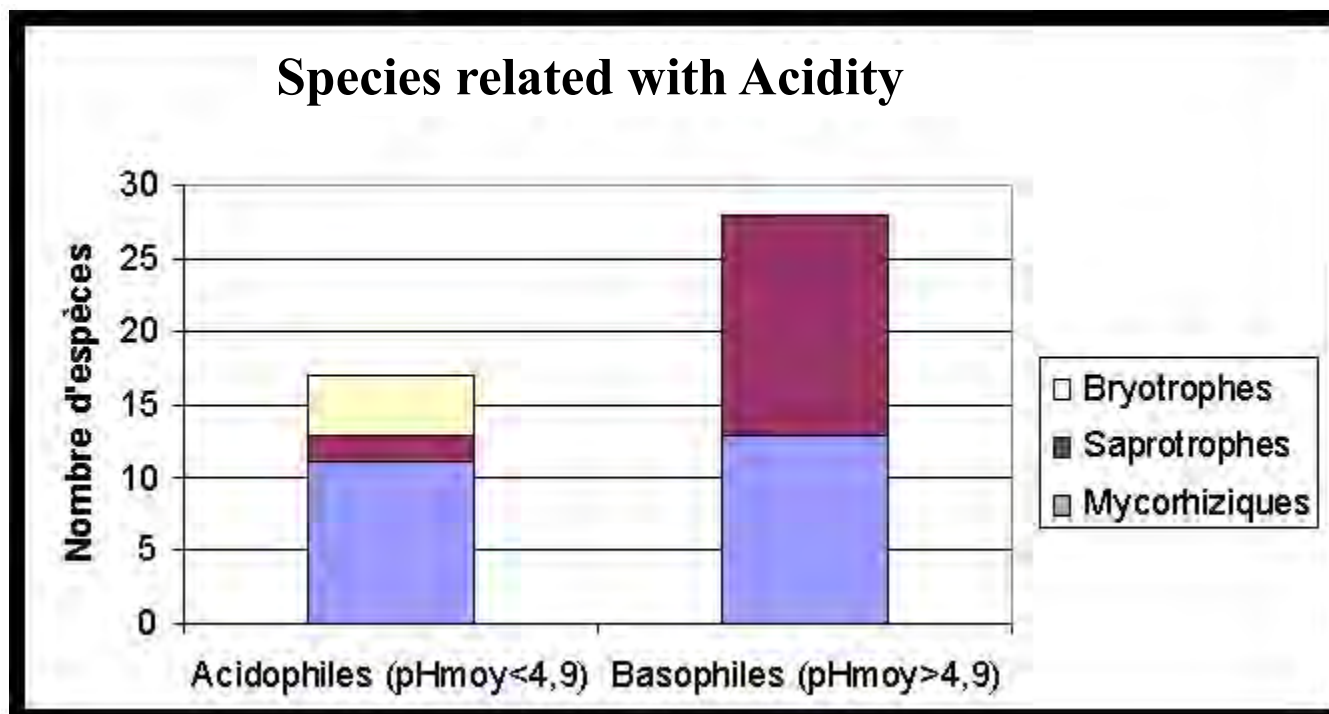
- List of species (maximal abundance observed, + specific bibliographic data)
- Environmental factors (altitude, hydrous level, acidity, level of organic matter decomposition)
- Vegetation (accounts of dominant vegetal species)

	Fungi 1	Fungi 2	...	Altitude	Hydrous lev.	pH	...	Plant 1	Plant 2	...
CR_mol	...	...	...	...	...	...	...	...	...	...
CR_msp	...	...	...	...	...	...	...	...	...	...
CR_eri	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...

→ Correlation analysis « Species/Factors »

Correlations with environmental factors

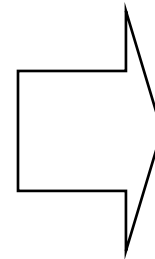
- acidity (pH, superficial layer) : 52 species related



- Which environmental factors determine repartition of fungi in peat bogs ?

1) All species : total nb of correlations (139 species analyzed)

- Tree covering : 87 species related
- Hydrous level : 55 sp.
- Acidity : 52 sp.
- Herbaceous vegetation : 48 sp.
- Altitude : 45 sp.
- Moss vegetation : 39 sp.
- Without any correlation : no species



**No species
independant from
environmental
factors**

**Most species are
related to several
factors**

- Which environmental factors determine repartition of fungi in peat bogs ?

2) Distinction by trophic status (trophic communities) :

- Mycorrhizal communities

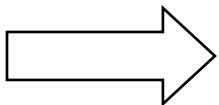
Determined by altitude and dominant tree species

- Saprotrophic communities

Determined by acidity (more specific for high pH values)

- Bryotrophic communities

Determined by acidity, altitude and hydrous level



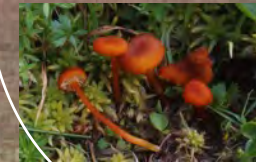
Trophic communities (« mycosynusias ») are mixed in the field, but differently influenced by the environment

Mycocœnological analysis: looking for species regroupings

Mycocoenosis C

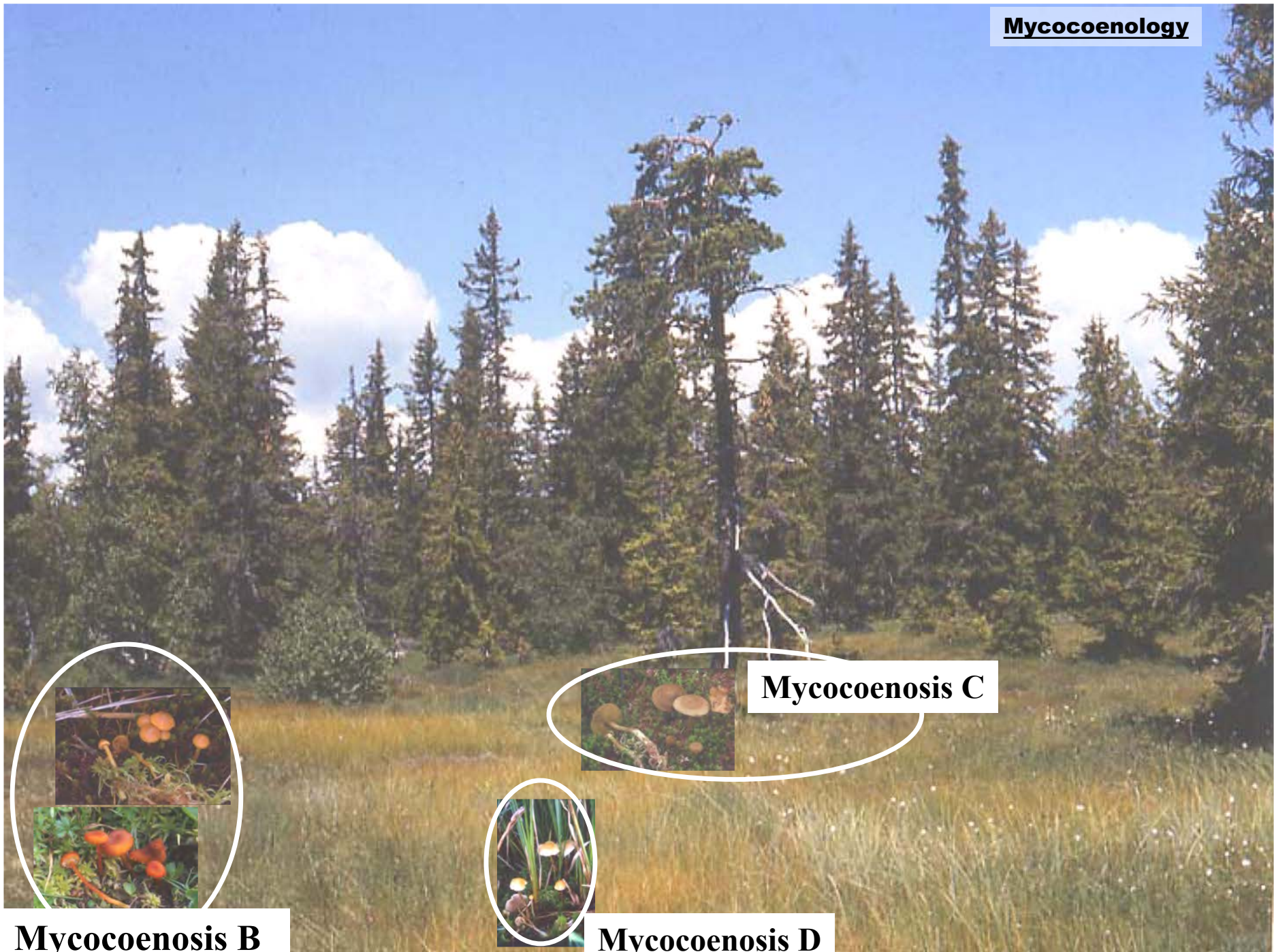


Mycocœnosis A



Mycocœnosis B

Mycocoenosis : a group of species (sporophores) living (fruiting) together in the same environment



Mycocoenosis C

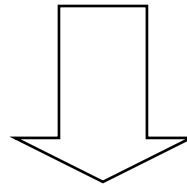
Mycocoenosis B

Mycocoenosis D

Principle of analysis : comparison of plots according to mycological data

	...	CR_mol	CR_msp	CR_eri	...
Fungi 1	...	...	...	...	...
Fungi 2	...	...	...	...	...
Fungi 3	...	...	...	...	...
...	...	...	...	...	...

Contingence table



**Factorial Analysis of Correspondances
(multivariate analysis)**