



KONINKLIJK MUSEUM  
VOOR MIDDEN-AFRIKA  
MUSÉE ROYAL  
DE L'AFRIQUE CENTRALE



# CONGO NETWORK

Workshop Kisangani  
12-14 May 2011  
CSB-UNIKIS

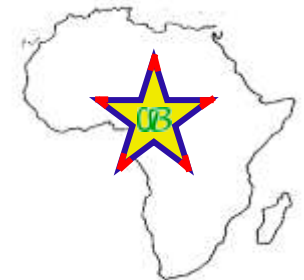
Ecological analysis of plant communities on copper hills vegetation  
of the Katangan Copper Belt (D.R. Congo)

By

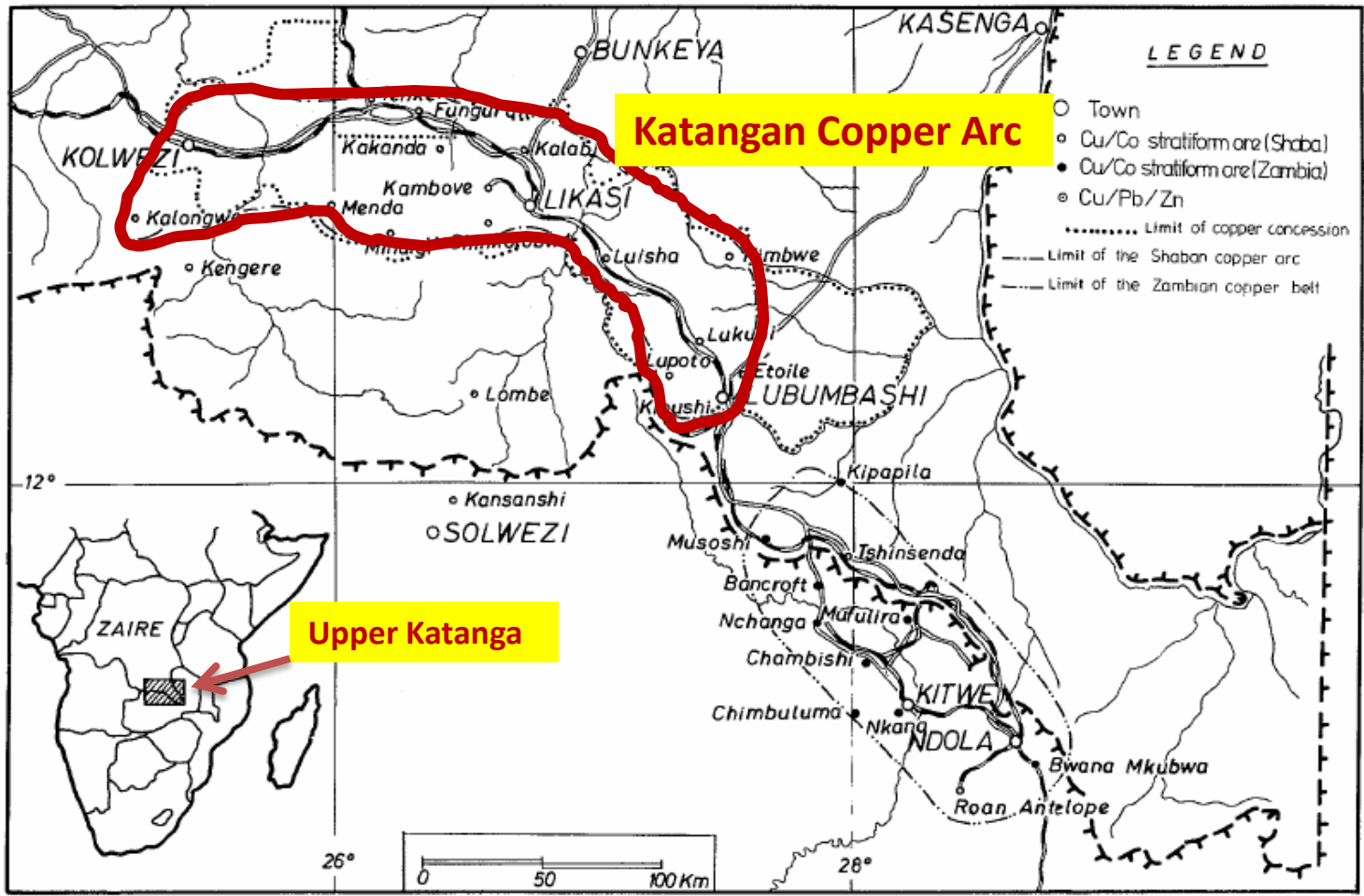
Edouard Ilunga wa Ilunga and Pr Grégory Mahy



AVEC LE SUPPORT DE  
LA COOPÉRATION  
BELGE AU DÉVELOPPEMENT .be

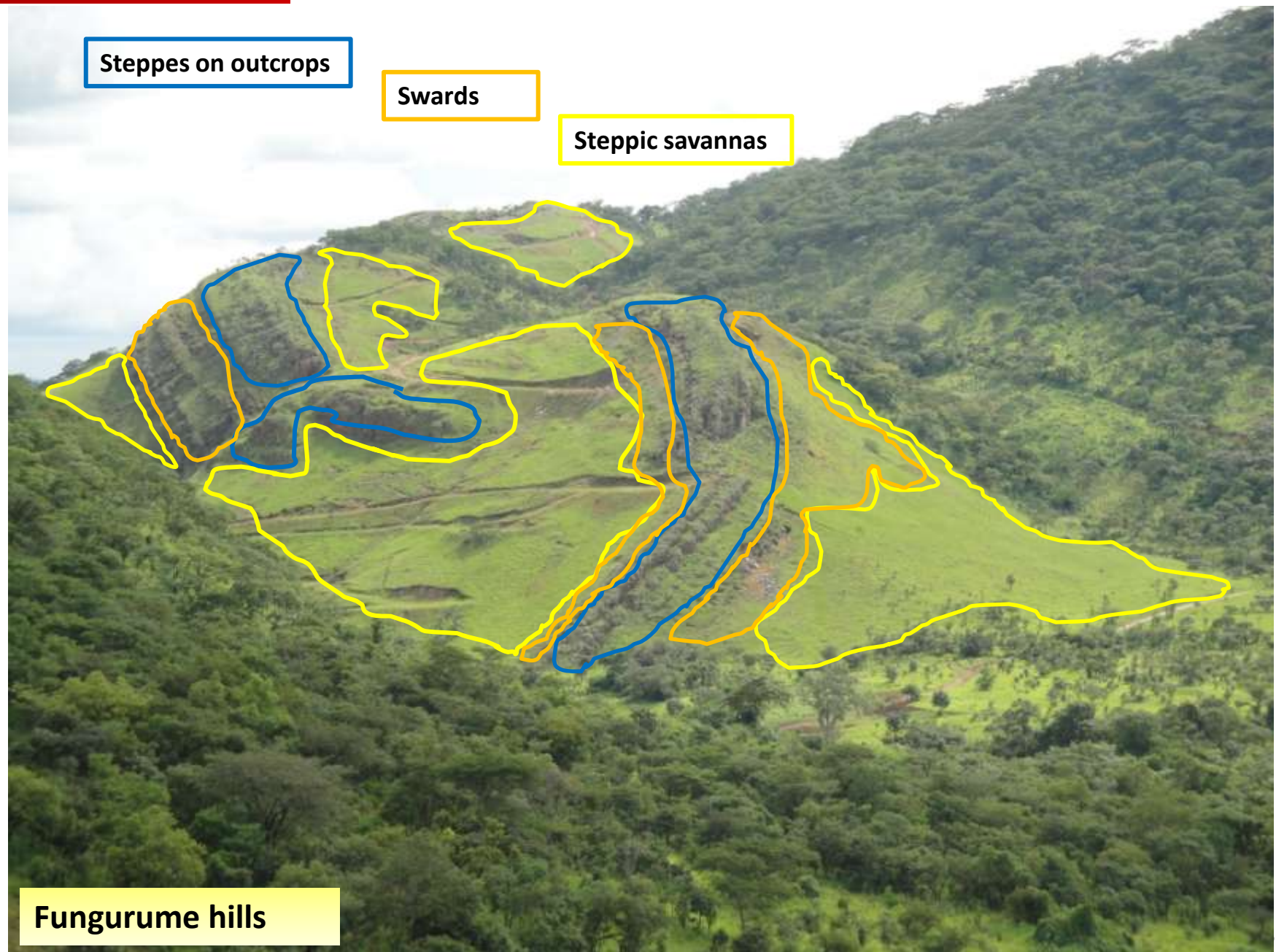


# Introduction



Location of the Katangan Copper Arc

# Introduction



Steppes on outcrops

Swards

Steppic savannas

Fungurume hills

# Introduction



*600 plant species tolerant to high Cu/Co concentrations in the soil (metallophytes)*

*31 strict endemics of metal-rich soil*



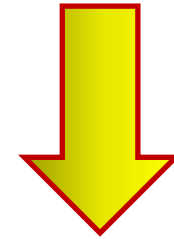
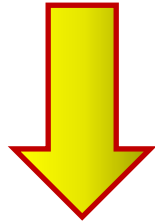
**Revival of mining activities**



**Irreversibly damages  
to plant communities**



## Urgent need to conserve plant communities for restoration



### Polluted soils by heavy metals



### Disturbed sites at mining closure

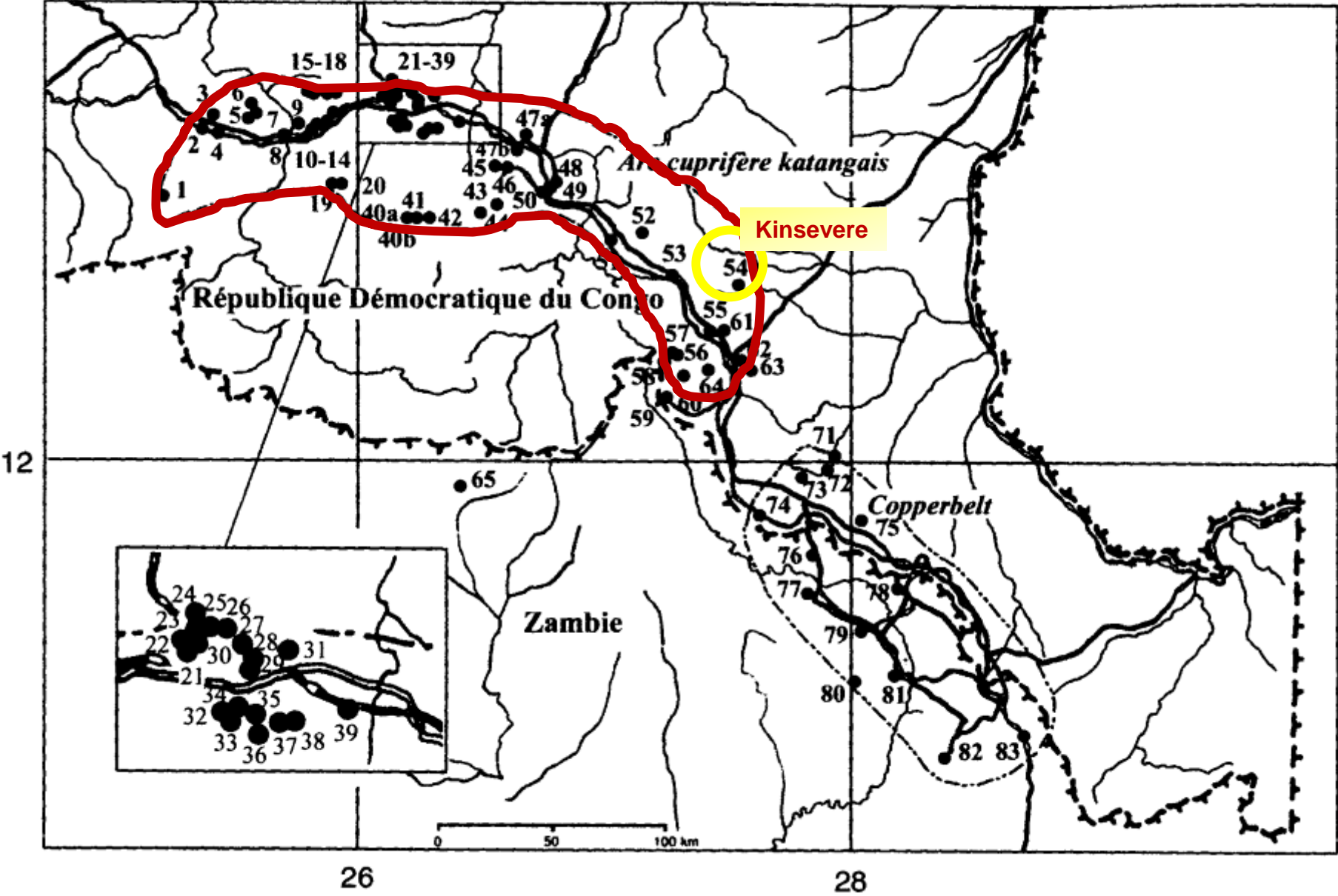


**The aim of this study is to better understand the ecology of plant communities threatened by mining activities**

**Specific aims are:**

1. Fine scale variation of plant communities along an ecological gradient at a site level (one hill)
2. Variation of plant communities at the landscape level (diversity and influence of spatial structure)
3. Understand the variation of plant communities by the study of their underground systems for reconstruction of ecosystems

# Characterization of plant communities at the site level



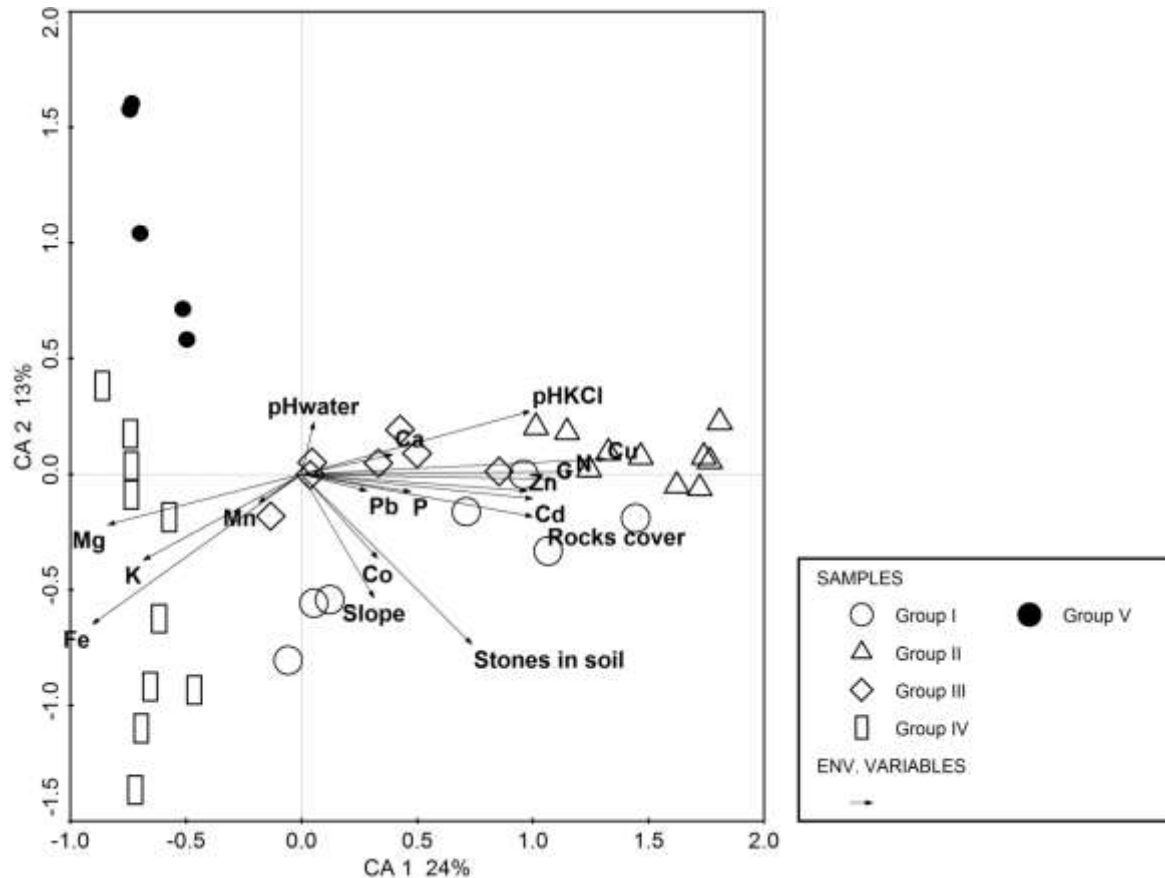
## Chapter I:

- Vegetation mapping (Arc GIS 9)
- Soil sample analyses (PCA)
- Identification of plant communities along an environmental gradient and comparison of plant communities between seasons (CA ordination; UPGMA, Bray-Curtis distance)
- Identification of indicator species: IndVal (Dufrene & Legendre, 1997)
- Ecological amplitude of species: GAM (Lepš & Šmilauer, 1999)



# Results (chapter I)

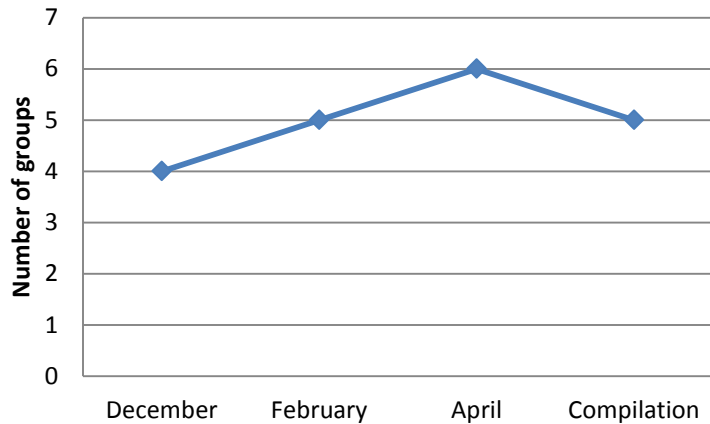
Variation of plant communities along an environmental gradient: plant-soil relationship



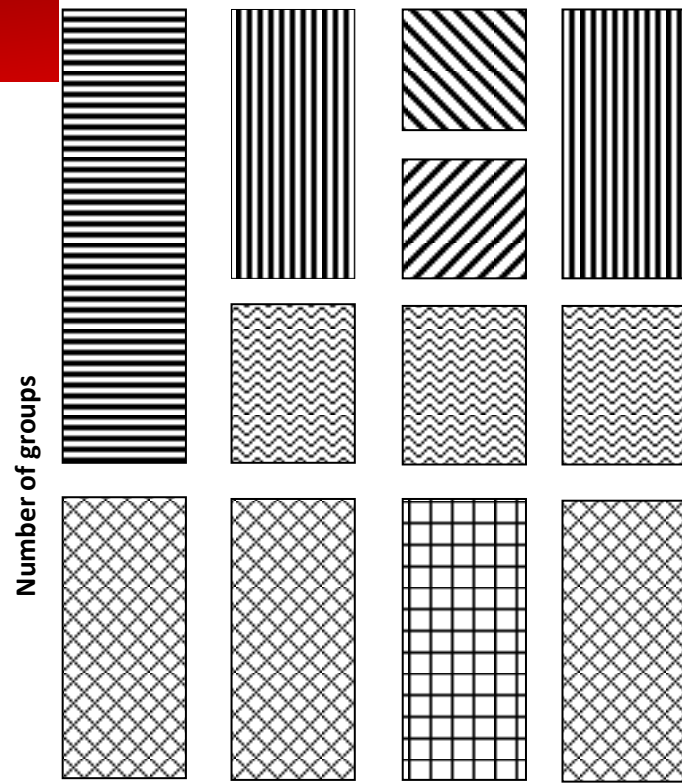
CA of 39 samples, 18 environmental variables and 59 species for the compiled sampling performed with CANOCO (Ter Braak, 2003). **Group I**, mixing of cupricolous swards and steppic savannas on disturbed soils; **Group II**, cupricolous sward; **Group III**, North-east steppic savanna; **Group IV**, mixing of North-east and South-west steppic savannas and **Group V**, dambo steppic savannas.

# Results (chapter I)

## Temporal variation of plant communities










Variation of plant communities between phenological stages



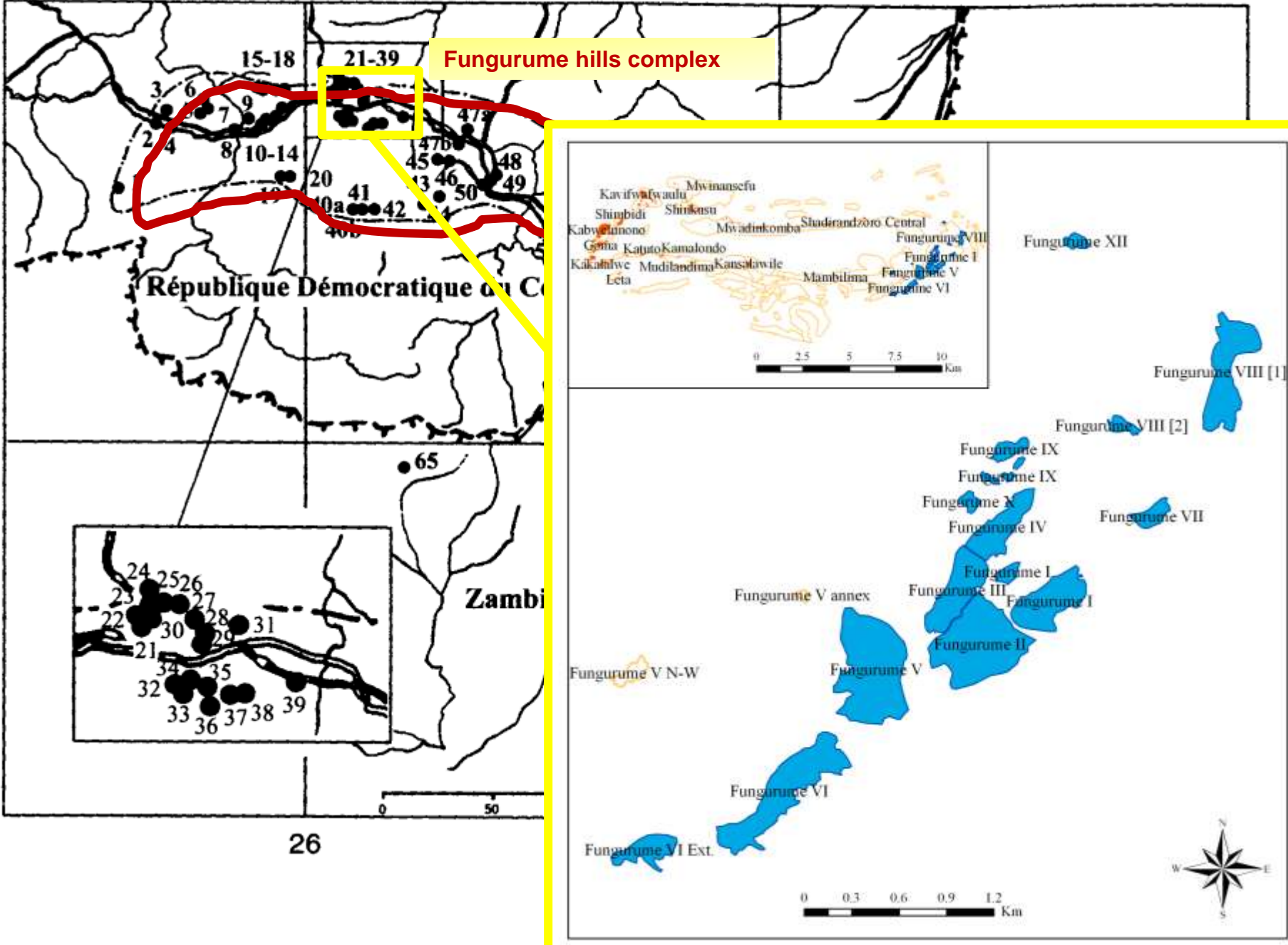
December February April **Compilation**

### Legend

-  Steppic savanna with *Cryptosepalum maraviense*
-  Steppic savanna on slope with *C. maraviense*
-  Dambo steppic savanna with *Eriosema cf englerianum*
-  S-W steppic savanna on slope with *Digitaria nitens*
-  N-E steppic savanna on slope with *Haumaniastrum prealtum*
-  Cupricolous sward with *Lapeirousia erythrantha*
-  Cupricolous sward with *Haumaniastrum katangense*

Connected communities between **phenological stages**

# Characterization of plant communities at the landscape level



## Chapter II

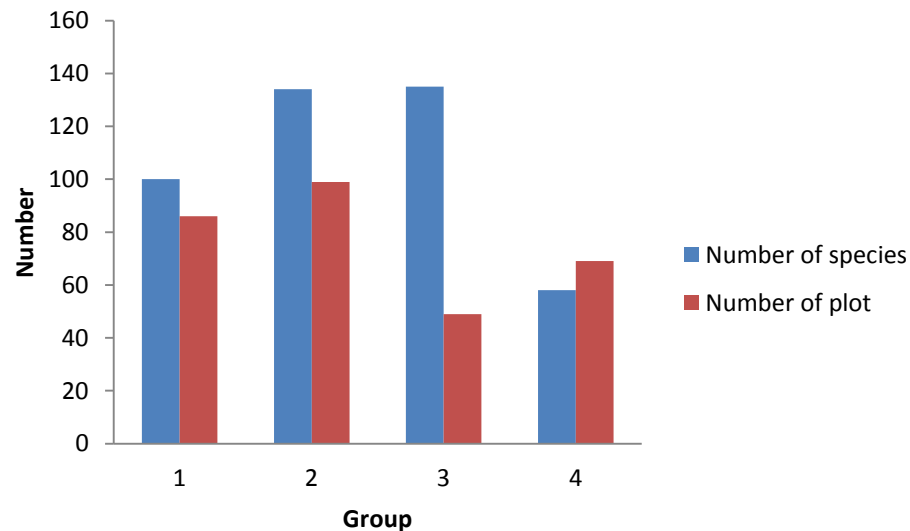
- Vegetation mapping (Arc GIS 9)
- Identification of plant communities within the hills complex (NMDS ordination; UPGMA, Bray-Curtis distance)
- Identification of indicator species: IndVal (Dufrene & Legendre, 1997)

# Results

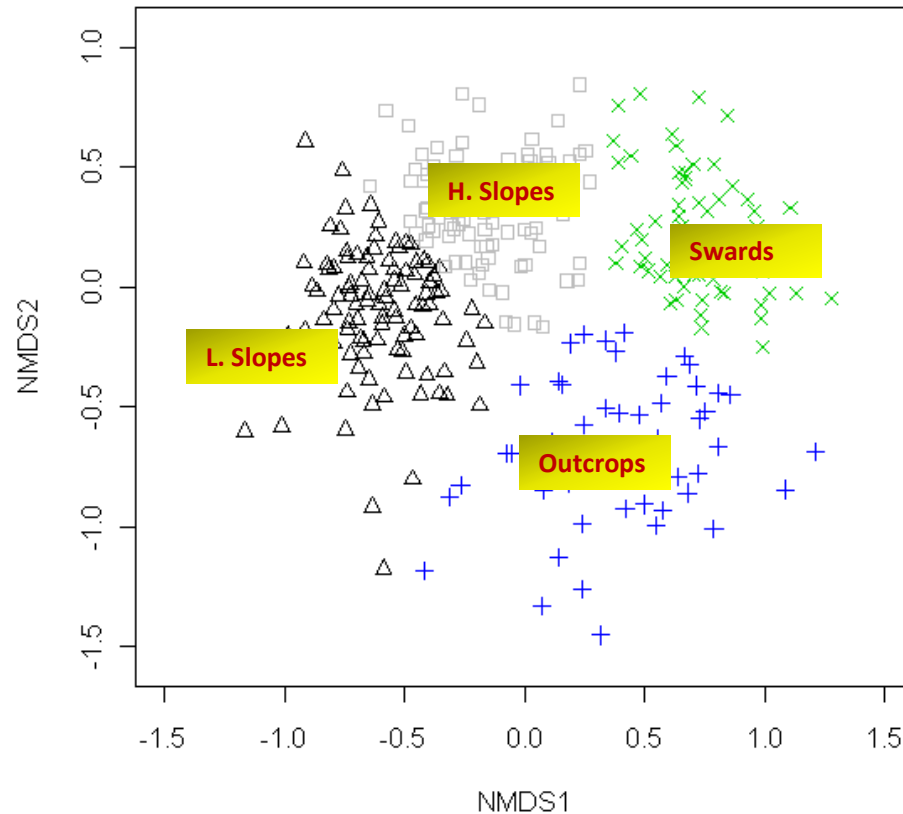
## Chapter II: Diversity and influence of spatial structure on plant communities within the Fungurume complex hill (DR Congo)

Community	Number of plots	Main habitat (and Name of the community)
1	86	Higher slopes steppic savanna (H. slopes)
2	99	Lower slopes steppic savanna and dambo (L. Slopes)
3	49	Rocky outcrops (Outcrops)
4	69	Swards (Swards)
Total	303	

### Diversity of plant communities

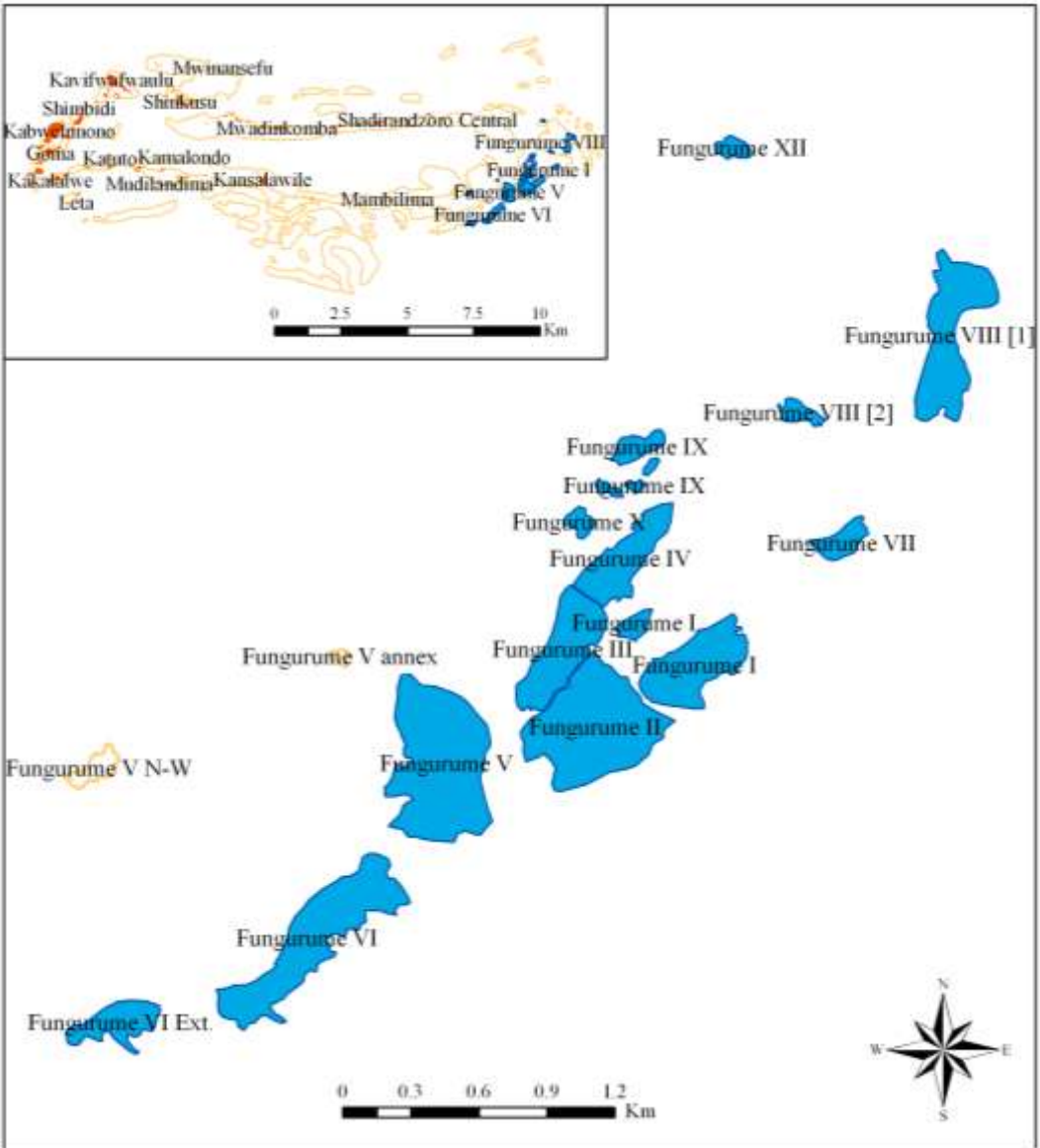


## Chapter II: Diversity and influence of spatial structure of plant communities within the Fungurume complex hill (D.R. Congo)



NMDS of the 303 samples with 185 species within 15 copper clearings

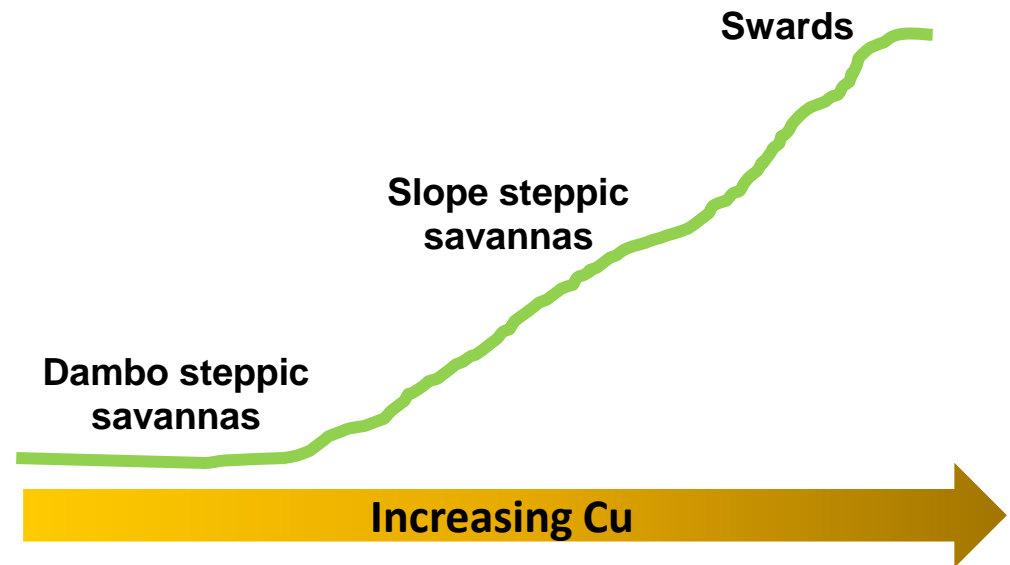
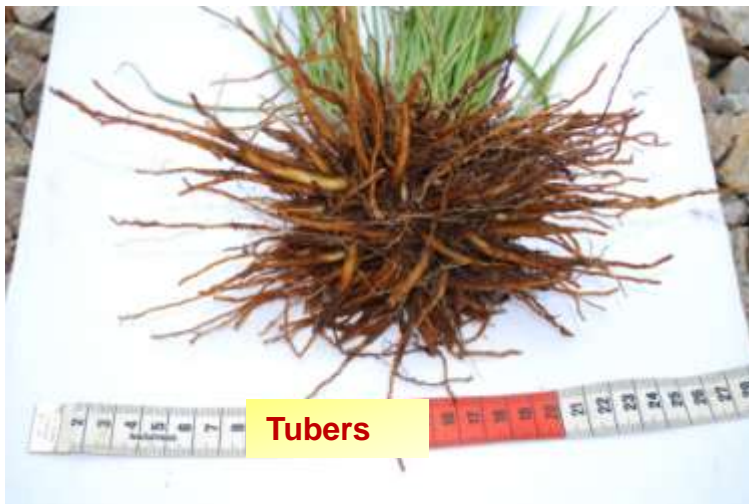
# Characterization of underground systems of plant communities for restoration purposes (in progress)



**86 species uprooted within 3 communities:**

- dambo steppic savannas,
- slope steppic savannas and
- cupricolous swards

# Ongoing Results (chapter III)





## Expected results for PhD

- Study of the autoecology of about 10 species
- Description of associated flora and plant communities
- Influence of soil conditions on plant communities
- Life forms of structuring species of plant communities
- Publication of scientific papers
- Communications in international congresses

## **Contribution to goals for biodiversity management and sustainable exploitation**

- Increasing knowledge about less known flora
- Conservation of endemic plant species with IUCN status
- Scientific support for the sustainable exploitation of mining industries
- Remediation of heavy metal polluted soils
- Restoration of destroyed habitats



**Thank you for your attention**

